



DEPARTMENT OF
ECOLOGY
State of Washington

Periodic Review Mica Landfill

**Facility Site ID 633
Cleanup Site ID 1020**

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Publication and Contact Information

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Introduction

This report presents the Washington State Department of Ecology's third periodic review for the Mica Landfill (Site). This periodic review is required as part of the Site cleanup process under the Model Toxics Control Act, Ch. 70.105D Revised Code of Washington, implemented by the Washington State Department of Ecology (Ecology). Periodic reviews evaluate post-cleanup Site conditions and monitoring data to assure human health and the environment are being protected and are required for sites where an institutional control is part of the cleanup action.

Interim cleanup actions were conducted at the Site by Spokane County in 1995. These actions included installing a landfill cap and methane and leachate control systems. A review of these interim actions took place in 2001, and Ecology determined they were performing as intended and would represent the final cleanup action for the Site.

Summary of Site Conditions

Site description and history

Mica Landfill is a 161-acre municipal solid waste landfill located approximately 11 miles southeast of Spokane, Washington, and 1.5 miles north of the Town of Mica (Figure 1). The landfill was operated by Spokane County from 1972 until 1990, and jointly by Spokane County and the City of Spokane from 1990 through 1991. Mica Landfill stopped receiving waste in late 1991. The landfill received approximately 65,000 tons of waste per year in the form of residential and municipal solid waste, dewatered sewage treatment plant sludge, demolition debris and industrial wastes. Demolition debris was generally mixed with municipal waste, or used as base material for landfill roads. Industrial wastes included pesticides, fungicides, herbicides, fertilizers, electronics industry chemicals, petroleum products, degreaser solvents, dyes and paints, industrial sludges, baghouse dust wastes, and other miscellaneous chemicals. Also, approximately 24,000 tons of black dross, which is a byproduct of the aluminum production industry, was disposed of in a designated area of the landfill. Dross was disposed between 1974 and 1987.

In 1974, the Mica monitoring well was installed at the south end of the Site to assess the impacts to groundwater from the south-central leachate pond. In 1975, leachate samples were collected from a drain line and analyzed to evaluate potential leachate impacts to groundwater.

In 1986, Spokane County purchased 24 acres of land immediately adjacent to the southwest corner of the landfill. This land was used to build an additional lined leachate pond for the southwest landfill drainage system. In conjunction, an additional monitoring well was installed to measure any potential groundwater impacts downgradient of the new leachate pond and existing leachate collection system.

Site investigations and cleanup

Formal investigations were initiated by Spokane County in 1981 when volatile organic compounds were detected in the Mica well and in an off-site domestic well. An assessment of potential groundwater contamination from the landfill was conducted by Spokane County. The assessment was completed in three phases ending in 1983 and involved field investigations and the installation of groundwater monitoring wells.

The landfill was added to the National Priorities List in 1985 after an evaluation by the U.S. Environmental Protection Agency (EPA), and Ecology became the lead agency at the Site. A two-phase Remedial Investigation (RI) was completed in 1988 and 1992 under a consent decree. The RI included groundwater, landfill gas, sediment, and leachate sampling, and geophysical surveys. Work on a Feasibility Study was initiated but never completed.

In 1992, Ecology proposed that a major component of the remedial work be completed at the Site by implementing an Interim Action (IA). After completing the construction components of

the IA in February 1994, compliance monitoring began with collection of groundwater and leachate samples, and has continued since then with minor modifications.

At the end of the five-year monitoring period, the data collected during the IA was reviewed to determine if the remedy was performing as planned. Ecology then prepared a Cleanup Action Plan (CAP) in 2001 that established the IA as the final remedy for the Site, established the parameters and schedule for all future Site compliance monitoring, and required the placement of a deed restriction on the property. A consent decree was negotiated to implement the selected cleanup action.

Summary of cleanup action

A presumptive remedy was implemented as an IA for the landfill. Cleanup actions completed during the IA included:

- Capping existing cells with a double-layered geosynthetic and engineered clay cap;
- Installing a leachate collection system that originally discharged to leachate collection ponds and was transported by trucks, but currently is transported by gravity-fed pipe to the Spokane County Regional Water Reclamation Facility;
- Installing a landfill gas collection and treatment system using passive flares; and
- Installing a stormwater control system to facilitate the removal of water off the landfill surface and to minimize erosion.

The intent of the IA was to minimize precipitation infiltration and leachate generation, eliminate direct exposure to landfilled materials, and contain and treat landfill byproducts such as leachate and methane gas. During the five-year IA operation period, minor modifications were made to the system to correct or enhance operation. Generally, these involved the operation of the leachate collection system and the gas flare system.

Periodic Review

Regulation

A periodic review of the cleanup action takes place at least every five years after the initiation of the cleanup action. A periodic review is required at sites where any of the following occur:

- Ecology conducts a cleanup action.
- Ecology approves a cleanup action under an order, agreed order, or consent decree.
- As resources permit, whenever Ecology issues a no further action opinion.

AND one of the following conditions exists:

- An institutional control and/or financial assurance is required as part of the cleanup action.
- The cleanup level is based on a practical quantitation limit as provided for under Washington Administrative Code (WAC) 173-340-707.
- Modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the Site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When conducting a periodic review of a cleanup action and evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

- The effectiveness of ongoing or completed cleanup actions.
- New scientific information for individual hazardous substances or mixtures present at the Site.
- New applicable state and federal laws for hazardous substances present at the Site.
- Current and projected Site use.
- Availability and practicability of higher preference technologies.
- The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Because the Site underwent a cleanup action Ecology approved under a consent decree and institutional controls were required as part of the cleanup action, periodic reviews are required at a frequency of at least every five years. The first periodic review was completed in 2008, and the second one was completed in 2018.

Basis

This review is based on documents describing the actions listed in the site investigations and cleanup section, and on five years of compliance monitoring reports documenting Site conditions and contaminant concentrations.

The effectiveness of ongoing or completed cleanup actions

Evaluating the cleanup action effectiveness involves verifying the status of engineered and institutional controls and assessing contaminant levels and trends. The Site's cleanup action is a presumptive remedy that involves the use of engineering controls in the form of an engineered landfill cap, leachate collection system, and gas collection and treatment system. The cap has been in place for 20 years. The condition of engineered controls is measured by Spokane County staff on at least a weekly basis through inspections of the cap and physical barriers, including flares, leachate ponds, pumps, and fences. Any observances, such as erosional features, vegetative growth, or signs of vandalism, that may indicate a weakness or potential deficiency in the cap are monitored and/or repaired according to the Operation & Maintenance Plan. Markers are established at points on the landfill cover to measure any settlement taking place. These are checked on a visual basis monthly, and marker elevations are surveyed annually. Maintenance of flares and ponds is performed yearly; flare flame arrestors are removed, inspected, and cleaned, and leachate ponds are drained so liners can be inspected and repaired, if needed. Leachate pond outfalls are also inspected and cleaned weekly to monthly, depending on the leachate flow volumes. These actions provide reasonable assurance that engineered controls are effective.

Institutional controls in the form of deed restrictions are in place for the Site. These restrictions limit or prohibit any activity that will interfere with the integrity of the cap or may cause a release, require the maintenance of fences and locked gates, and require any future owners to comply with them. In addition, state law prevents the installation of any groundwater supply wells within 1,000 feet of the permitted landfill boundary as specified in WAC 173-160.

Cap performance can be measured by the quantity of leachate generation, and the concentrations and trends of contaminants in groundwater. In the last five years, leachate quantities have shown a slightly reducing trend, although groundwater elevation still drives the leachate volumes. Quarterly groundwater sampling is performed for 20 conventional, inorganic, volatile and semi-volatile organic compounds. Twelve on-site monitoring wells and three off-site water supply wells are used to track contaminant movement in four drainages (Figure 2). A review of the past five years of data from these monitoring wells helps assess contaminant levels and trends.

Tables 1 and 2 show contaminant trends in the monitoring wells sampled under the CAP, organized by drainage. Increasing or decreasing trends can be viewed along with any exceedances of established Method B cleanup levels. The first six columns for each well represent each year of monitoring, and the last column indicates any trend in the six years of data. Table 3 summarizes the indicator analytes and cleanup levels used to evaluate groundwater quality data. A review of these tables shows that many contaminants have not been detected

above cleanup levels during the monitoring period. Of the wells that are monitored, MW-16 and MW-23 show the largest numbers of contaminants above cleanup levels. MW-16 has the most contaminants with increasing trends. This is consistent with past data trends documented in the previous periodic review. Graphs showing contaminant levels in these wells are presented in figures 3 through 5. The majority of trends are decreasing; for those that are increasing, they are within expected ranges for a landfill. In the case of contaminants like vinyl chloride at MW-16, concentrations are expected to increase with time as other contaminants degrade and turn into vinyl chloride.

Zinc levels increased in DW-1 and DW-2 during this monitoring period due to repairs in the pump and piping for the water system supplied by these wells. Zinc levels have been decreasing since those repairs, and they will continue to be monitored.

Since this is the third periodic review, we now have 15 years of post-CAP data. An evaluation was performed of trends over that time scale. Figures 6 through 9 show 15-year trends for select contaminants at MW-16 and MW-23. Some decreasing trends are observed in MW-16, particularly for the chlorinated solvents shown in Figure 9. Since tetrachloroethane degrades to trichloroethane, then cis-1,2-dichloroethane, and then to vinyl chloride, these decreasing trends indicate that natural breakdown of these contaminants is occurring.

New scientific information for individual hazardous substances or mixtures present at the Site

There is no new scientific information that affects the Site.

New applicable state and federal laws for hazardous substances present at the Site

No new federal or state laws exist that would apply to contaminants at the Site.

Current and projected Site and resource uses

The Site has been in operation as a landfill for over 30 years and is zoned Rural Conservation. This designation applies to environmentally sensitive areas and wildlife corridors, and encourages low-impact uses and utilizes rural clustering to protect sensitive areas and preserve open space. Deed restrictions in place at the property limit the property's current and future use. These restrictions limit or prohibit any activity that will interfere with the integrity of the cap, or may cause a release. Current zoning designation, the presence of deed restrictions, and the nature of the Site (i.e., presence of landfill gas and active leachate discharge) all strongly support no change in future Site use. These mechanisms all minimize the chance of a Site use that would diminish the remedial action's effectiveness or cause a release.

The availability and practicability of more permanent remedies

The cleanup action implemented a presumptive remedy for the Site. An evaluation of other remedial options for the Site was completed in the CAP. Operating a groundwater pump-and-treat system was evaluated as an enhancement to the current action and was determined to not provide a significant remedial benefit. Higher preference cleanup options such as source removal remain available, but are still not practicable.

The availability of improved analytical techniques to evaluate compliance with cleanup levels

For the established contaminants present at the landfill, the techniques in use are Methods SM2320/2310B for inorganics, EPA 350.1 for ammonia, SM5310 for total organic carbon, Methods EPA 6020B, EPA 6010B, and EPA 7040A for metals, Method EPA 8260B for volatiles, and Method EPA 8270D for semi-volatiles. These methods are widely accepted for the analysis of groundwater contaminants. There are no improved analytical techniques available. However, the reporting limits for both methylene chloride and vinyl chloride are above the cleanup levels. Laboratory analysis should be adjusted such that reporting limits are below cleanup levels.

Conclusions

Ecology has determined the remedy at Mica Landfill is generally protective of human health and the environment. The measures that were taken for the original cleanup action remain protective today. Continued compliance monitoring ensures contamination remaining in Site soils and groundwater does not migrate off-site. The existence of institutional controls in the form of deed restrictions confirms Site uses will remain consistent with the presence of contamination. Further periodic reviews will be required as long as institutional controls are in place at the Site, in accordance with WAC 173-340-420(7).

References

Washington State Department of Ecology, 2001, *Final Cleanup Action Plan, Mica Landfill Site*.

Washington State Department of Ecology, 2001, Model Toxics Cleanup Act Regulation Chapter 173-340 WAC.

Figures

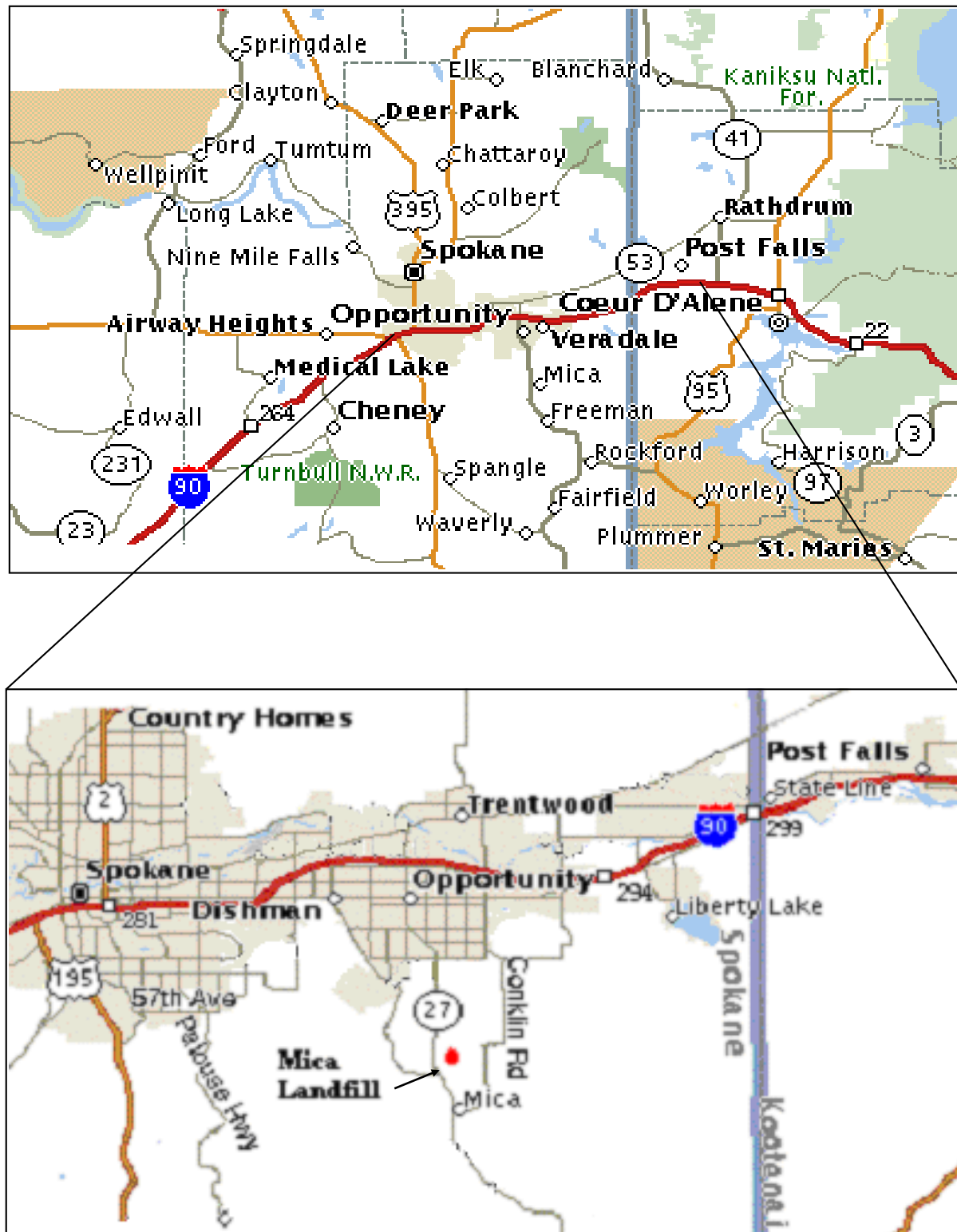


Figure 1: Mica Location

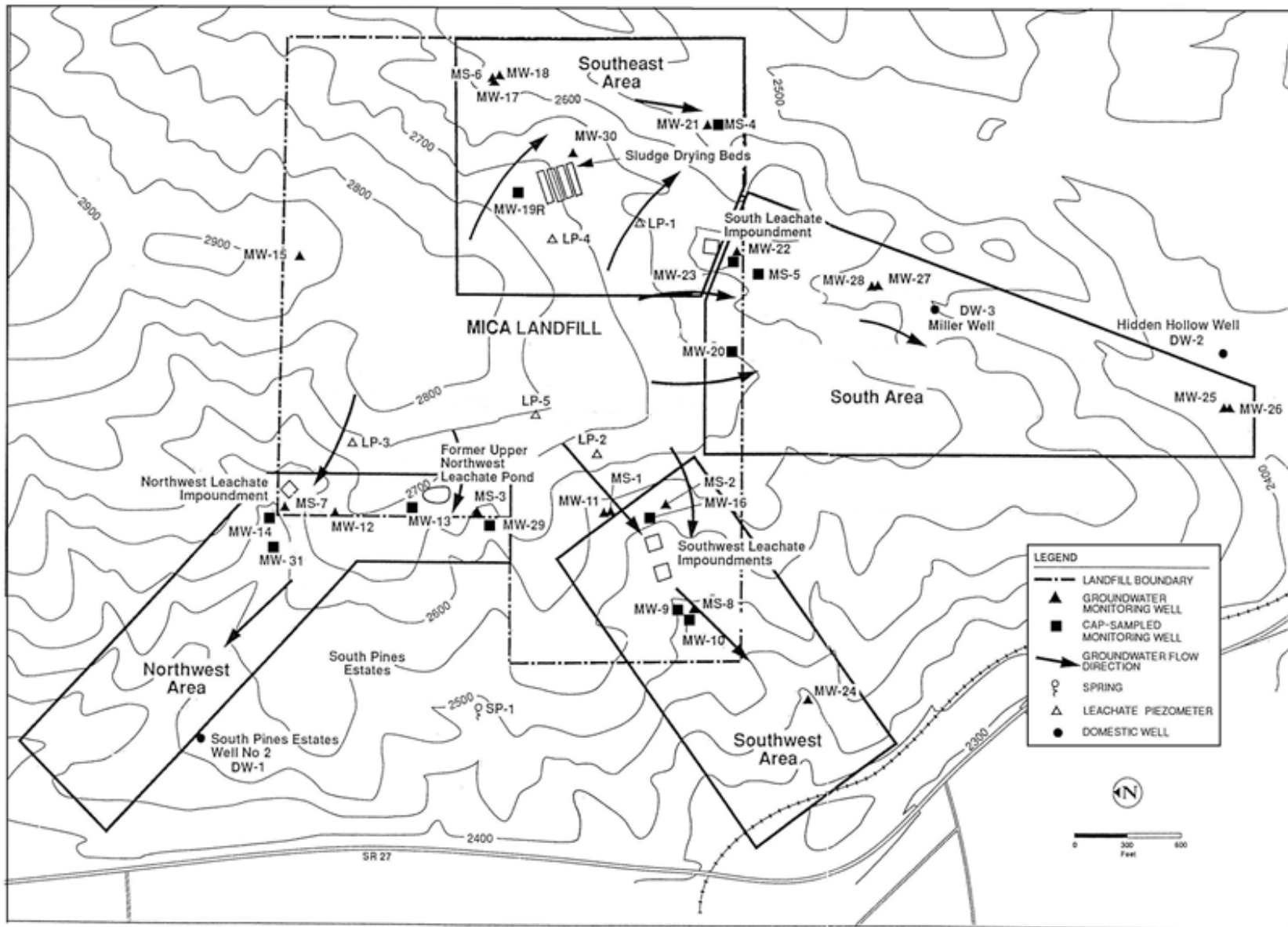


Figure 2: Well Locations and Drainages

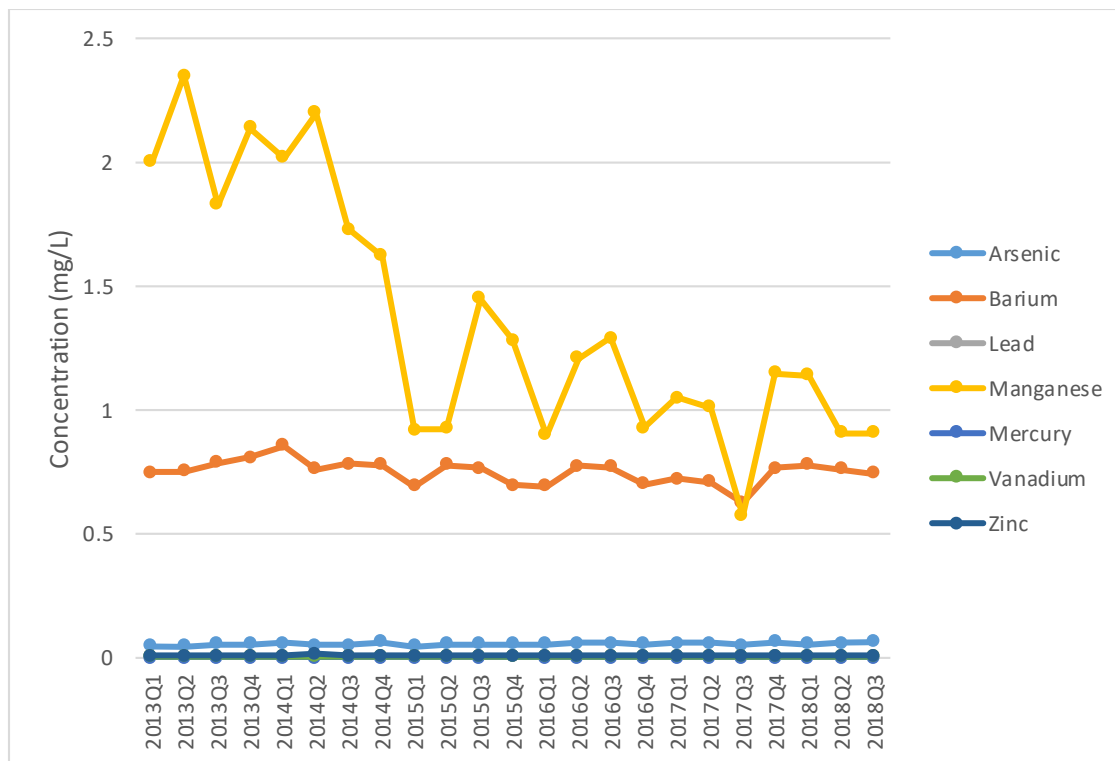


Figure 3: MW-16 Inorganic/Conventional Concentrations

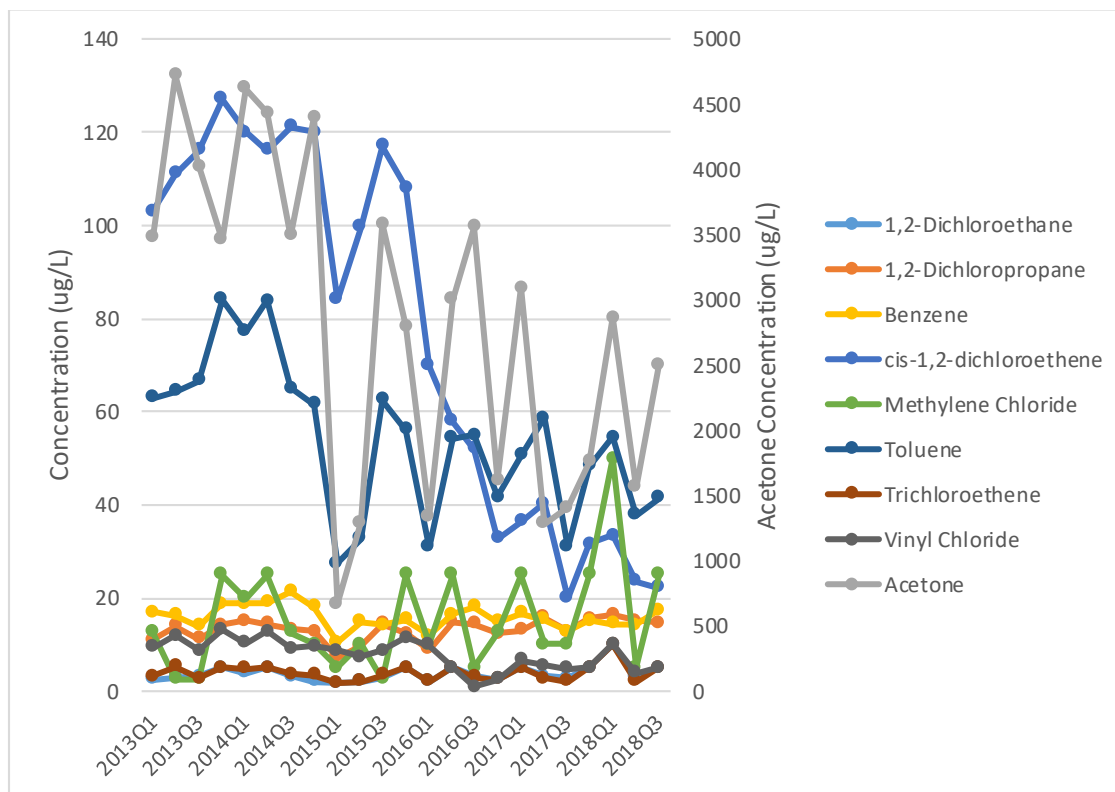


Figure 4: MW-16 Volatile Organic Compound Concentrations

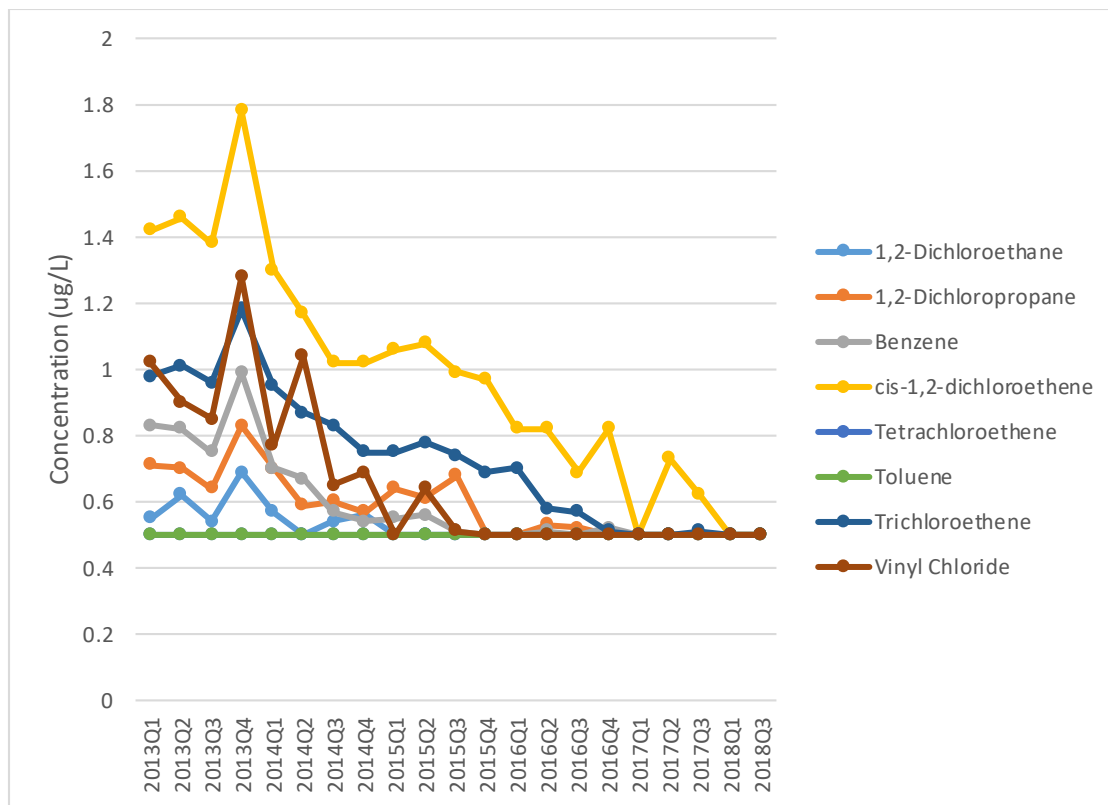


Figure 5: MW-23 Volatile Organic Compound Concentrations

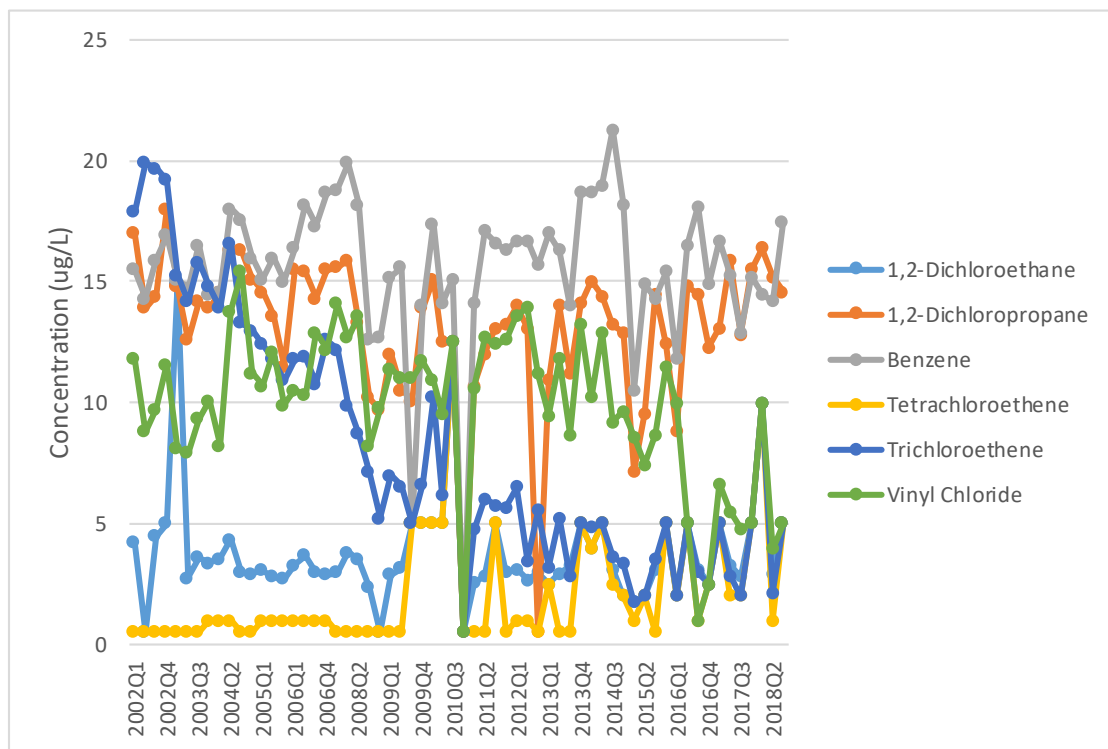


Figure 6: MW-16 Volatile Organic Compound Concentrations, 15-Year Trend (partial)

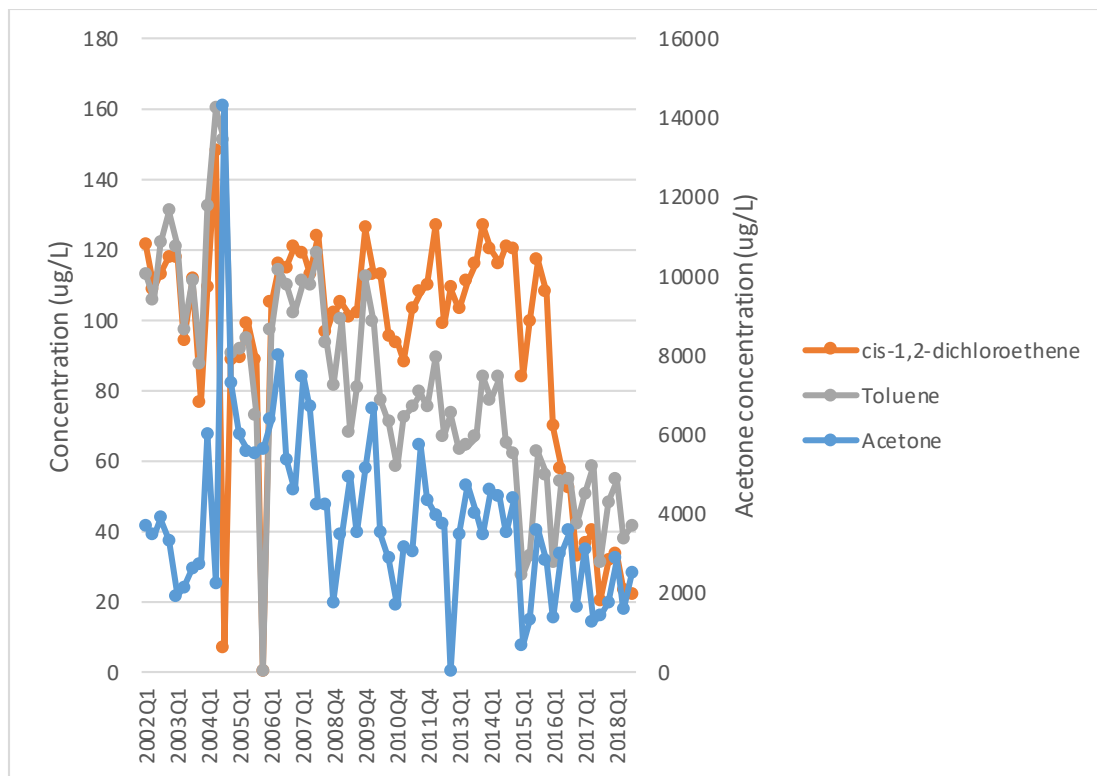


Figure 7: MW-16 Volatile Organic Compound Concentrations, 15-Year Trend (partial)

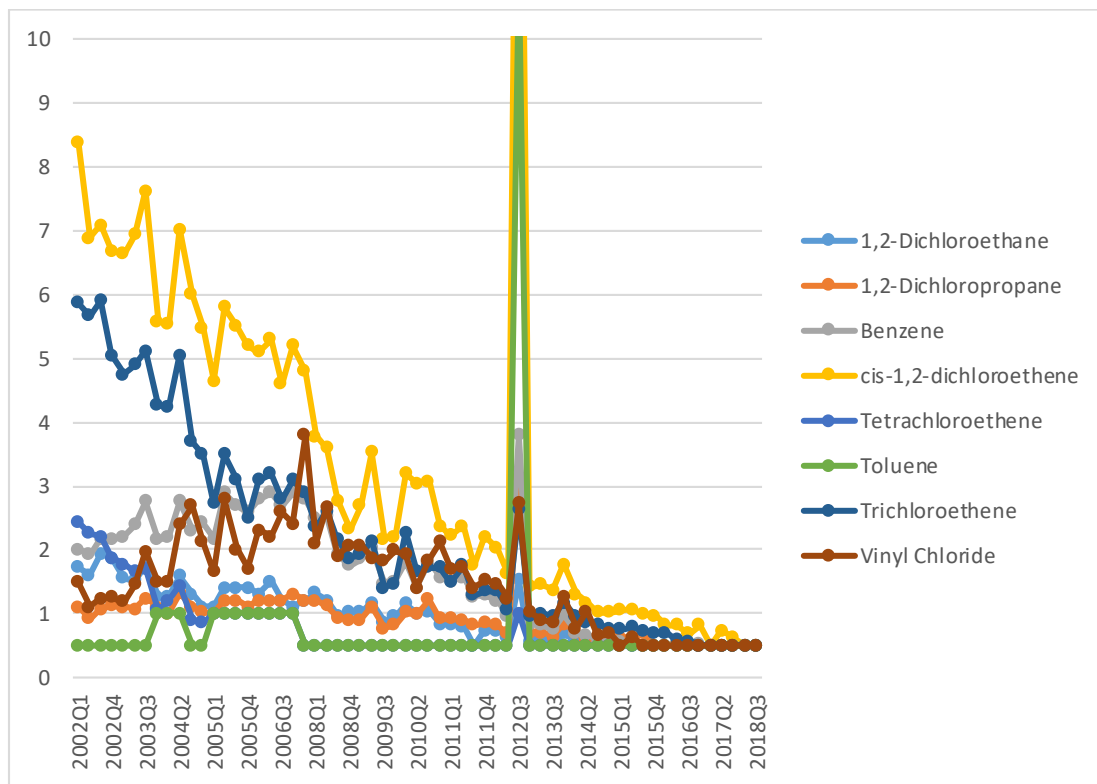


Figure 8: MW-23 Volatile Organic Compound Concentrations, 15-Year Trend

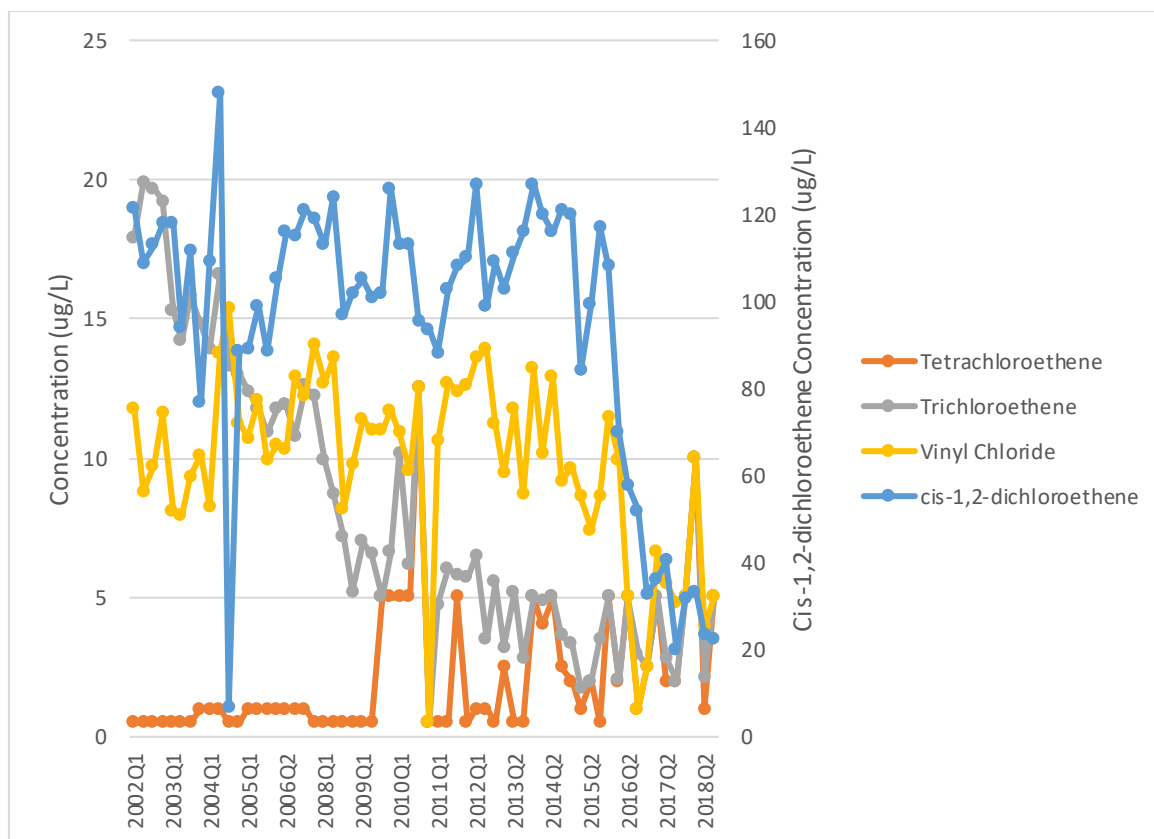


Figure 9: MW-16 Chlorinated Solvents, 15-Year Trend

Tables

Table 1: Trends and Exceedances in Northwest and Southwest Wells

Analyte	Northwest Drainage																Southwest Drainage													
	MW-13				MW-14				MW-29				MW-31				MW-9				MW-10				MW-16					
ammonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	
nitrate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	
arsenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	
barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
lead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
manganese	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
zinc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1,2-dca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↗	
1,2-dcp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	
acetone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
cis-1,2-dce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
methylene chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
pce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
tce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
vinyl chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	
behp	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	-	-	-	-	-	-	-	-	N	N	N	N	N	N

yellow = > ½ of measurements exceed CUL

orange = < ½ of measurements exceed CUL

- = not detected or within 10% of detection limit

blank = detected below CUL

N = not required to be sampled

↑ = increasing trend over the five year period

↓ = decreasing trend over the five year period

↗ = slight increasing trend over the five year period

↘ = slight increasing trend over the five year period

- = no significant trend over the five year period

Notes: CUL – cleanup level

Table 2: Trends and Exceedances in South, Southeast, and Drinking Water Wells

Analyte	South Drainage									Southeast Drainage						Drinking Water Wells										
	MS-5			MW-20			MW-23			MS-4			MW-19R			DW-1			DW-2			DW-3				
ammonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
nitrate																										
arsenic	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
lead	-	-	-	-																						
manganese	-	-	-	-																						
mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
zinc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dcp	-	-	-	-	-	-	-	-	-																	
acetone				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
benzene	-	-	-	-	-	-	-	-	-																	
cis-1,2-dce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
methylene chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vinyl chloride	-	-	-	-	-	-	-	-	-																	
behp		-	-	-	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

yellow = > ½ of measurements exceed CUL

orange = < ½ of measurements exceed CUL

- = not detected or within 10% of detection limit

blank = detected below CUL

N = not required to be sampled

↑ = increasing trend over the five year period

↓ = decreasing trend over the five year period

↗ = slight increasing trend over the five year period

— = no significant trend over the five year period

Notes: CUL – cleanup level

Table 3: Indicator Analytes and Cleanup Levels

Indicator Analyte	Method B Cleanup Level, µg/L
Conventionals	
n-ammonia	272,000
nitrate	800
Inorganics	
arsenic	5
barium	560
lead	15
manganese	1,926
mercury	0.4
vanadium	112
zinc	400
Volatile Organics	
1,2-dichloroethane	1.2
1,2-dichloropropane	0.643
acetone	688
benzene	0.795
cis-1,2-dichloroethene	33
methylene Chloride	5
tetrachloroethene	0.858
toluene	100
trichloroethene	3.98
vinyl Chloride	0.023
Semi-volatile Organics	
bis(2-ethylhexyl)phthalate	6