

March 9, 2008

Mr. Glenn Morelli
Sonoma County Department of Transportation
and Public Works
500 Mecham Road
Petaluma, CA 94952

Subject: Landfill Underdrain Evaluation, Sonoma County Central Landfill

Dear Mr. Morelli:

The following letter report summarizes the results of a review of publicly available sources of information to identify nonhazardous solid waste landfills in California that were constructed with groundwater underdrains beneath a liner system. The purpose of this study was to evaluate whether sufficient data were available to develop conclusions regarding general water quality conditions associated with underdrains below primary liner systems at different landfill facilities in California. The scope of work completed for this investigation was limited to review of publically available information on various regulatory agency websites and information that was obtained during phone conversations with regulatory agency personnel. Specific landfill facilities are not identified in this letter report.

PROCEDURES

During the first phase of this study, information from a California Integrated Waste Management Board (CIWMB) database of construction information for 224 active and closed landfills in the California was reviewed to identify different facilities with underdrains.¹ The CIWMB database was compiled as part of a study that was completed in 2003 and Phase I of the study included a comprehensive inventory and assessment of MSW landfill performance across all environmental media for the time period of January 1998 through December 2001. The database does not include any information regarding landfill construction after December 2001. Although completed after December 2001 and not included in the CIWMB database, the Sonoma County Central Disposal Site Landfill 2 was included in the evaluation because it is a Subtitle D lined landfill that includes an underdrain.

The CIWMB database indicated through the end of 2001, 22 of the 224 identified California landfills had underdrains. However, subsequent review of records on various Regional Water Quality Control Board (RWQCB) websites and in the State Water Resources Control Board

¹See <http://www.ciwmb.ca.gov/Landfills/ComplyStudy/> for complete study results.

(SWRCB) GeoTracker system indicated five of the 22 facilities with underdrains did not include a geomembrane or composite liner system above the underdrain.² As a result, these five facilities were not considered further and the evaluation of the remaining facilities focused on addressing: (i) whether the underdrain water was monitored and whether it had ever been sampled and analyzed for volatile organic compounds (VOCs); (ii) whether VOCs had been detected in the underdrain, and if so, which compounds had been detected; and (iii) total VOC concentrations and trends for those facilities where VOCs were detected in the underdrain. In addition, data were reviewed to collect information regarding underdrain discharge management and whether or not regulatory enforcement actions had been implemented in direct response to the presence of VOCs in the underdrain.

The principal sources of information used to address these questions included the Waste Discharge Requirements (WDRs) and associated Monitoring and Reporting Programs (MRPs) for each landfill and the Self-Monitoring Reports submitted to the RWQCB. In most cases the WDRs were available on-line from the RWQCB websites, although some were obtained by request from RWQCB staff. Self-Monitoring Reports were available on the GeoTracker database for all but three of the 17 sites. RWQCB staff were able to provide information for two of the missing sites and the discharger provided a report for the third.

FINDINGS

Analytical Data

The results of the evaluation are summarized in Tables 1, 2, and 3. As indicated in these tables, of the 18 sites with underdrains beneath a geomembrane or composite liner system, six have apparently never sampled the discharge water for VOCs (at five of these six sites, the underdrain water is commingled with leachate). Of the remaining 12 sites that have analyzed underdrain water, VOCs were found in all but two. As shown in Table 2, a total of 36 different VOCs have been reportedly detected and 11 of these compounds are common to five or more sites.

As indicated in Tables 1 and 2, the underdrain data from a number of the different landfill facilities could not be unambiguously associated with the Subtitle D lined cell or portion of the landfill. As a result, all of the data presented in Table 2 cannot be used to develop specific conclusions regarding the presence or absence of VOCs in underdrains below lined landfills. Therefore, Table 3 summarizes data from the six landfills with underdrains and underdrain analytical data that appeared

²See <http://www.swrcb.ca.gov/> and <http://www.geotracker.waterboards.ca.gov/>.

to be unambiguously associated with the lined disposal cell. As shown in this table, VOCs have been detected in the underdrain water from all of these facilities; VOCs associated with 50 percent or more of the underdrain discharge at the six facilities include: Vinyl chloride, Benzene, cis-1,2-Dichloroethane, 1,1-Dichloroethane, Methyl tet-butyl ether (MTBE), Toluene, Acetone, Ethyl benzene, Trichloroethene, and 1,1,1-Trichloroethane.

Concentrations and Trends

The data reviewed for this study indicated total VOC concentrations ranged from below the reporting limits (i.e., VOCs were present at concentrations between the reporting limit and the method detection limit for the specific analyses) to more than 100 ug/L. Data are not sufficient, however, to draw conclusions regarding "typical" or average VOC concentrations in the underdrains. Quantitative underdrain VOC concentration trend information was largely unavailable in the documents and data reviewed for this study.

Regulatory Responses

In most cases, the underdrain water is not considered "groundwater" for the purpose of detection monitoring, and therefore the presence of VOCs was not interpreted to be "evidence of a release" as defined in California Code of Regulations (CCR) Title 27. Nevertheless, the RWQCB requested or required the discharger to implement Evaluation Monitoring and/or Corrective Action at several the facilities. One Cleanup and Abatement Order (CAO) was issued specifically for VOCs in the underdrain. Typically, the underdrain discharge is commingled with leachate, or with contaminated groundwater pumped from wells in a corrective action program, before treatment, onsite use, or disposal.

Source of VOCs

Although it was not specifically a subject of this research, the source of the VOCs was identified as landfill gas migration in many of the site documents that were reviewed. Leachate migration through the liner system was identified as a likely source for the detected VOCs in only one case. Several facilities responded by increasing gas collection and/or other landfill gas-related measures and this resulted in reductions in VOC concentrations in the underdrain water quality.

Mr. Glenn Morelli
Sonoma County Department of Transportation
and Public Works Underdrain Evaluation
March 9, 2008
Page 4

RMC Geoscience, Inc.

CONCLUSIONS

Definitive conclusions regarding landfill liner performance and underdrain water quality are difficult to develop due to the limited number of facilities identified with underdrains and the limited amount of underdrain data clearly associated with a Subtitle D lined disposal cell. However, the results of this evaluation indicate that VOCs typically are present in the discharge from groundwater drains constructed directly beneath a composite landfill liner system. The available data also indicate that most facilities attribute these VOCs to landfill gas and that increased landfill gas extraction reduces total VOC concentrations in the underdrain. Regulatory responses to these detections appears to vary widely across the state (and even within a single region) but typically do not involve enforcement actions. The most common approach taken at most facilities has been to manage underdrain discharge as if it were leachate. In this regard, the underdrain is functioning as part of the landfill containment system.

I trust this letter provides you the information you need at this time. Please contact me if you have any questions or need additional information.

Very truly yours,
RMC Geoscience, Inc.


Richard A. Mitchell
Certified Engineering Geologist 1371

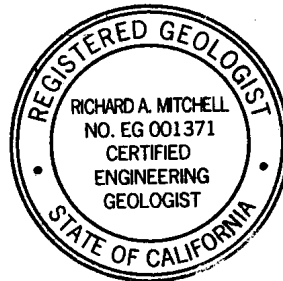


Table 1
SUMMARY OF LANDFILL FACILITIES WITH UNDERDRAINS IDENTIFIED ON CIWMB, RWQCB, AND SWRCB WEBSITES

FACILITY	DESCRIPTION	REPORTED VOCs	CONCENTRATIONS & TRENDS	COMMENT
A	Canyon Fill, Strip Drain. The most recent WDRs do not specify any monitoring of subdrain discharge separate from leachate. It is not clear whether the subdrains beneath the composite lined cells are also connected to the leachate system, however, commingled leachate and subdrain water is stored in two lined surface impoundments before treatment with granular activated carbon.	No Data.	No Data.	
B	Canyon Fill, Trench Drain. A Subtitle D lined cell was constructed downgradient from the older unlined landfill beginning in 1994. A groundwater interceptor drain was constructed at the toe of the existing fill to collect groundwater affected by leachate migration from the unlined fill. A channel drain was constructed downgradient from the I-drain, along the existing drainage channel, to control groundwater levels beneath the base of the lined cell.	Acetone, Benzene, Carbon disulfide, Chlorobenzene, Chloroethane, Chloromethane, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethene, Methylene chloride, MTBE, Vinyl chloride	Concentrations in the interceptor drain have stabilized at 10 to 15 ug/L total VOCs.	Results probably more representative of leakage from lined area.
C	Canyon Fill, Blanket Subdrain. Two groundwater drains exist beneath this fully Subtitle D-lined facility. The drain underlying the composite liner system is monitored monthly.	Benzene, MTBE, 1,1-Dichloroethane, cis-1,2-Dichloroethene, 1,1,1-Trichloroethane (TCA), Trichloroethene (TCE), Tetrachloroethylene (PCE), Vinyl chloride	Not Available.	
D	Canyon Fill, Blanket Drain. Initial construction in 1985 included a thin clay or gunnite liner over prepared subgrade and a spring water interceptor system (subdrain). The subdrain discharge became contaminated and was connected to the leachate collection system. Subsequent development beginning in 1993 included composite liner systems over blanket subdrains. These areas are upgradient from Cell 1.	Not reported.	Not Reported.	The WDRs do not specify monitoring of subdrain discharge separate from leachate.
E	Canyon Fill, Dendritic & Blanket Drains. There are two subdrain systems at this site, one beneath an older unlined portion of the landfill (GD-1) and one beneath the Subtitle D liner system (GD-2). Discharge from both drains is routed to a treatment unit. VOCs are present in the combined influent; the source is attributed to leachate from the unlined area.	1,2,4-Trimethylbenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 4-Chlorotoluene, Acetone, Benzene, cis-1,2-Dichloroethene, Ethylbenzene, Isopropylbenzene, Xylenes, MTBE, Naphthalene, n-Butylbenzene, n-Propylbenzene, p-Isopropyltoluene, Styrene, Toluene, Vinyl chloride	Thirty VOCs were detected in the combined influent in 2006; total VOC concentrations were 215 ug/l in the first quarter, and 80 ug/l in the second quarter.	Results probably more representative of leakage from unlined area
F	Canyon Fill, Drain Type(s) Uncertain. This facility includes an older unlined landfill adjacent to more recent Subtitle D lined cells. Underdrains have been constructed to control groundwater levels beneath certain of the lined cells. Groundwater collected by these drains contains low concentrations of certain VOCs, attributed to landfill gas migration. In 2006, there were two underdrain sampling points.	Acetone, Benzene, Chloroethane, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, cis-1,2-Dichloroethene, Methylene chloride, MTBE, Tetrahydrofuran, Toluene, 1,1,1-Trichloroethane, Trichlorofluoromethane, Vinyl chloride, Xylene	Total VOCs in one underdrain have declined from a maximum of 159 ug/l (February 1996) to trace levels. Total VOCs in the other underdrain have declined from 43 ug/l in December 2003 to trace or non-detect levels.	Results may be influenced by adjacent unlined area.

**Table 1
SUMMARY OF LANDFILL FACILITIES WITH UNDERDRAINS IDENTIFIED ON CIWMB, RWQCB, AND SWRCB WEBSITES**

FACILITY	DESCRIPTION	REPORTED VOCs	CONCENTRATIONS & TRENDS	COMMENT
G	Canyon Fill, Trench Drains. There are two subdrain systems below this facility and each is monitored at a discharge point. Both are dendritic "valley drain" systems placed along the natural channels in the canyon floor. One drain system underlies a clay-lined area and one system underlies a Subtitle D-lined area.	Acetone, Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethene, 1,2-Dichloropropane, Ethylbenzene, Diethyl ether, Tetrahydrofuran; Toluene, Vinyl chloride	VOCs are detected in both drains. Concentrations appear to be stable and average around 35 ug/L total VOCs.	Both drain locations are included as leachate monitoring points in the WDRs.
H	Canyon Fill, Strip Drains. This facility includes older unlined areas and Subtitle D composite-lined areas constructed in 1999 and later. WDRs indicate groundwater subdrains were constructed under certain areas of the liner, however, no monitoring or management of the discharged water was specified. No monitoring reports were found in GeoTracker.	No Data.	No Data.	
I	Canyon Fill, Drain Type(s) Uncertain. This facility began receiving waste in 1990. Three subdrains exist and are sampled as Vadose Zone Monitoring points. The subdrains discharge to a surface impoundment, along with leachate. The initial development was lined with clay and a "vapor barrier" and is drained by a subdrain. Subsequent developments have been lined to meet Subtitle D standards and are drained by two subdrains.	Several sporadic detections in Subdrain 2, with the most recent being Acetone in May 2005.	All 2006 samples were non-detects.	
J	Canyon Fill, Blanket Drain. This facility includes 35 acres of unlined landfill, and an adjacent 6-acre Subtitle D lined cell with a groundwater underdrain. The underdrain discharges directly to a surface drainage course and is not sampled for VOCs.	No Data.	No Data.	
K	Canyon Fill, Dendritic Drains. Waste Management Unit 2 of this site is constructed with a composite liner, leachate collection, and groundwater underdrains. According to the WDRs, VOCs were detected in the underdrain discharge beginning in December 2002.	Acetone, Benzene, Chloroethane, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethene, 1,2-Dichloropropane, Ethylbenzene, Isopropylbenzene, p-Isopropyltoluene, Methylene chloride, MTBE, n-Propylbenzene, tert-Amyl methyl ether, Tetrachloroethene, Tetrahydrofuran, Toluene, 1,1,1-Trichloroethane, Trichloroethene, 1,2,3-Trimethylbenzene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Vinyl chloride, Xylenes	WDRs indicate VOC concentrations are high and appear to be representative of leachate. No monitoring data available.	Evaluation monitoring program required by RWQCB.
L	Canyon Fill, Trench Drains. Subdrain monitoring is performed in lieu of vadose zone monitoring in areas where subdrains are necessary to control groundwater. There are several groundwater subdrains and seeps that are sampled when liquid is present. The 2006/07 monitoring report included data from three sampling points.	Benzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, 1,2-Dichloropropane, Ethylbenzene, Trichloroethene, Tetrachloroethene, Toluene, Vinyl chloride, Xylenes	All listed VOCs detected above reporting limits. Several other VOCs (not listed) detected at trace concentrations.	

**Table 1
SUMMARY OF LANDFILL FACILITIES WITH UNDERDRAINS IDENTIFIED ON CIWMB, RWQCB, AND SWRCB WEBSITES**

FACILITY	DESCRIPTION	REPORTED VOCs	CONCENTRATIONS & TRENDS	COMMENT
M	Canyon Fill, Drain Type(s) Unknown. Subdrain systems beneath the composite-lined portion of the landfill are drained by pumping from wells located near the toe of the fill.	No Data.	Available data indicates total VOC concentrations have declined from a maximum of about 125 ug/l (in 1996) to non-detect.	
N	Canyon Fill, Trench Drains. Several groundwater drains apparently exist beneath portions of this landfill, including an extensive system to intercept groundwater beneath a Subtitle D lined area. Older portions of the landfill are unlined or clay-lined, and groundwater contamination has migrated beyond the limits of these areas. Groundwater is pumped from several wells and treated by air-stripping. Discharge (if any) from the groundwater underdrains is commingled with the pumped groundwater before treatment and is not sampled or analyzed separately. RWQCB staff indicate the underdrains are typically dry.	No Data.	No Data.	
O	Canyon Fill, Dendritic Drains. Underdrains are installed as a standard design along the canyon floors. There are no provisions in the WDRs or MRP to monitor water quality in the drains.	No Data.	No Data.	
P	Canyon Fill, Drain Type(s) Unknown. The CIWM study indicates that groundwater subdrains are included in the liner system design. The most recent WDRs do not mention any groundwater underdrains. RWQCB staff confirmed that a groundwater subdrain is present and that it is tested quarterly.	None detected.		
Q	Canyon Fill, Drain Type(s) Uncertain. This landfill began accepting waste in 1996 and is fully Subtitle D lined with a composite liner system. At least ten subdrains have been installed beneath lined areas at this site. Discharges from the drains are monitored as part of the vadose zone monitoring program. VOCs have been detected variously in seven of the subdrains since September 2000.	Benzene, 1,1-Dichloroethane, cis-1,2-Dichloroethene, MTBE Trichloroethylene, Vinyl chloride	Total VOC concentrations in 2006 for the principal contaminants appear to range from about ~5 ug/L to ~40 ug/L.	The RWQCB issued a CAO requiring implementation of a Corrective Action Plan for the contaminated subdrains. The CAP requires corrective action including management of VOC impacted subdrain water, management of landfill gas, removal of preferred landfill gas migration pathways, and a revised Monitoring and Reporting Program.

Table 1
SUMMARY OF LANDFILL FACILITIES WITH UNDERDRAINS IDENTIFIED ON CIWMB, RWQCB, AND SWRCB WEBSITES

FACILITY	DESCRIPTION	REPORTED VOCs	CONCENTRATIONS & TRENDS	COMMENT
R	Canyon Fill, Blanket Drain. This landfill is a separate phase of development in an adjacent canyon to an older unlined landfill. The landfill was constructed and began accepting waste in 2002. The facility includes a fully Subtitle D compliant liner system with a blanket underdrain.	1,1-Dichloroethane, MTBE, Toluene, 1,1,1-Trichloroethane, Trichlorofluoromethane	Total reported concentrations less than 10 ug/L.	

Notes:

1. Data obtained primarily from: <http://www.ciwmb.ca.gov/landfills/complystudy/>; <http://www.swrcb.ca.gov/>; and <http://www.geotracker.waterboards.ca.gov/>.
2. Facilities with underdrains not completed or constructed by December 2001 are not included in the CIWMB database and are not included in this table except for Landfill 2 at the Sonoma County Central Disposal Site.
3. Limited information and data also verbally provided by RWQCB staff.

Table 2
SUMMARY OF VOCS DETECTED IN DIFFERENT LANDFILL UNDERDRAINS

CONSTITUENT	TOTAL NUMBER OF FACILITIES WITH UNDERDRAINS	TOTAL NUMBER OF FACILITIES WITH UNDERDRAIN VOC DATA AVAILABLE	TOTAL NUMBER OF FACILITIES WITH VOCs IN UNDERDRAIN	TOTAL NUMBER OF FACILITIES WITH COMPOUND IN UNAERDRAIN	LANDFILL																	
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Vinyl Chloride	18	11	10	9	NA	X	X	NA	X	X	X	NA		NA	X	X	NA	NA	NA	NA	X	X
Benzene	18	11	10	8	NA	X	X	NA	X	X	X	NA		NA	X	X	NA	NA	NA	NA	X	
cis-1,2-Dichloroethane	18	11	10	8	NA	X	X	NA	X	X	X	NA		NA	X	X	NA	NA	NA	NA	X	
1,1-Dichloroethane	18	11	10	7	NA	X	X	NA		X	X	NA		NA	X	X	NA	NA	NA	NA	X	
Methyl tert-butyl ether (MTBE)	18	11	10	7	NA	X	X	NA	X	X		NA		NA	X		NA	NA	NA	NA	X	X
Toluene	18	11	10	6	NA	X	X	NA	X		X	NA		NA	X	X	NA	NA	NA	NA		X
1,4-Dichlorobenzene	18	11	10	5	NA	X		NA	X	X	X	NA		NA	X		NA	NA	NA	NA		
Acetone	18	11	10	5	NA	X		NA	X	X	X	NA	X	NA	X		NA	NA	NA	NA		
Ethyl benzene	18	11	10	5	NA		X	NA	X		X	NA		NA	X	X	NA	NA	NA	NA		
Trichloroethene	18	11	10	5	NA		X	NA				NA		NA	X	X	NA	NA	NA	NA	X	
Xylenes	18	11	10	5	NA		X	NA	X	X		NA		NA	X	X	NA	NA	NA	NA		
1,1,1-Trichloroethane	18	11	10	4	NA		X	NA		X		NA		NA	X		NA	NA	NA	NA		X
Methylene Chloride	18	11	10	4	NA	X	X	NA		X		NA		NA	X		NA	NA	NA	NA		
1,2-Dichlorobenzene	18	11	10	3	NA	X		NA	X		X	NA		NA			NA	NA	NA	NA		
1,2-Dichloroethane	18	11	10	3	NA		X	NA		X		NA		NA		X	NA	NA	NA	NA		
1,2-Dichloropropane	18	11	10	3	NA			NA			X	NA		NA	X	X	NA	NA	NA	NA		
Chloroethane	18	11	10	3	NA	X		NA		X		NA		NA	X		NA	NA	NA	NA		
p-Isopropotoluene	18	11	10	3	NA		X	NA	X			NA		NA	X		NA	NA	NA	NA		
Tetrachloroethene	18	11	10	3	NA		X	NA				NA		NA	X	X	NA	NA	NA	NA		
Tetrahydrofuran	18	11	10	3	NA			NA		X	X	NA		NA	X		NA	NA	NA	NA		
1,2,4-Trimethylbenzene	18	11	10	2	NA			NA	X			NA		NA	X		NA	NA	NA	NA		
1,3-Dichlorobenzene	18	11	10	2	NA			NA	X			NA		NA	X		NA	NA	NA	NA		
Chlorobenzene	18	11	10	2	NA	X		NA			X	NA		NA			NA	NA	NA	NA		
Isopropylbenzene	18	11	10	2	NA			NA	X			NA		NA	X		NA	NA	NA	NA		
n-Propylbenzene	18	11	10	2	NA			NA	X			NA		NA	X		NA	NA	NA	NA		
Trichlorofluoromethane	18	11	10	2	NA			NA		X		NA		NA			NA	NA	NA	NA		X
1,1-Dichloroethene	18	11	10	1	NA			NA				NA		NA		X	NA	NA	NA	NA		
1,2,3-Trimethylbenzene	18	11	10	1	NA			NA				NA		NA	X		NA	NA	NA	NA		
1,3,5-Trimethylbenzene	18	11	10	1	NA			NA				NA		NA	X		NA	NA	NA	NA		
4-Chlorotoluene	18	11	10	1	NA			NA	X			NA		NA			NA	NA	NA	NA		
Carbon disulfide	18	11	10	1	NA	X		NA				NA		NA			NA	NA	NA	NA		
Chloromethane	18	11	10	1	NA	X		NA				NA		NA			NA	NA	NA	NA		
Dichlorodifluoromethane	18	11	10	1	NA		X	NA				NA		NA			NA	NA	NA	NA		
n-Butylbenzene	18	11	10	1	NA			NA	X			NA		NA			NA	NA	NA	NA		
Styrene	18	11	10	1	NA			NA	X			NA		NA			NA	NA	NA	NA		
tert-Amyl methyl ether	18	11	10	1	NA			NA				NA		NA	X		NA	NA	NA	NA		

NOTES:

1. NA - No data are available for the facility.
2. Facilities and compound indicators (X) shown in *italics type and shaded* are results for underdrains unambiguously associated with Subtitle D-lined disposal cells.

Table 3 SUMMARY OF VOCs DETECTED IN DIFFERENT LANDFILLS WITH UNDERDRAINS UNAMBIGUOUSLY ASSOCIATED WITH SUBTITLE D LINED DISPOSAL CELLS									
CONSTITUENT	TOTAL NUMBER OF FACILITIES WITH UNDERDRAINS	TOTAL NUMBER OF FACILITIES WITH COMPOUND IN UNDERDRAIN	PERCENT DETECTION	LANDFILL					
				C	G	I	K	Q	R
Vinyl Chloride	6	5	83	X	X		X	X	X
Benzene	6	4	67	X	X		X	X	
cis-1,2-Dichloroethane	6	4	67	X	X		X	X	
1,1-Dichloroethane	6	4	67	X	X		X	X	
Methyl tert-butyl ether (MTBE)	6	4	67	X			X	X	X
Toluene	6	4	67	X	X		X		X
Acetone	6	3	50		X	X	X		
Ethyl benzene	6	3	50	X	X		X		
Trichloroethene	6	3	50	X			X	X	
1,1,1-Trichloroethane	6	3	50	X			X		X
1,4-Dichlorobenzene	6	2	33		X		X		
Xylenes	6	2	33	X			X		
Methylene Chloride	6	2	33	X			X		
1,2-Dichloropropane	6	2	33		X		X		
p-Isopropotoluene	6	2	33	X			X		
Tetrachloroethene	6	2	33	X			X		
Tetrahydrofuran	6	2	33		X		X		
1,2-Dichlorobenzene	6	1	17		X				
1,2-Dichloroethane	6	1	17	X					
Chloroethane	6	1	17				X		
1,2,4-Trimethylbenzene	6	1	17				X		
1,3-Dichlorobenzene	6	1	17				X		
Chlorobenzene	6	1	17		X				
Isopropylbenzene	6	1	17				X		
n-Propylbenzene	6	1	17				X		
Trichlorofluoromethane	6	1	17						X
1,2,3-Trimethylbenzene	6	1	17				X		
1,3,5-Trimethylbenzene	6	1	17				X		
Dichlorodifluoromethane	6	1	17	X					
tert-Amyl methyl ether	6	1	17				X		