Multnomah County
Underground Injection Control System
Monitoring Plan

Water Pollution Control Facilities (WPCF) Permit For
Class V Stormwater Underground Injection Control Systems

Permit Number: 103076

DATE April 29, 2014

Land Use and Transportation
Department of Community Services
Multnomah County

Facilities and Property Management
Department of County Management
Multnomah County

Prepared by: Multnomah County and PBS Engineering and Environmental Inc.

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Table of Contents

1.0 Introduction

Multnomah County (County) owns and maintains a system of Underground Injection Controls (UICs) to manage stormwater runoff from building roofs, facilities parking lots, and public roadways. Pollutants associated with the stormwater from vehicular traffic and landscaping practices from both commercial and industrial land uses can pose a risk to groundwater if they are allowed to infiltrate into UICs at concentrations beyond the action levels specified in Table 1 of the Multnomah County UIC Water Pollution Control Facility (WPFC) permit. This monitoring plan is designed to provide quantitative data to help manage this risk.

Stormwater pollutant concentrations can vary by season, traffic volume, rain event size and intensity, and many other factors. However, the range of concentrations for the pollutants found in characterizations of urban stormwater in Oregon typically fall well below the action levels specified in this permit[1]. Stormwater data from the County jurisdiction is currently limited; however, the County is in close proximity to larger municipalities that also implement a monitoring plan in conformance with their own UIC WPCF permit (i.e., City of Portland, City of Gresham, and Clackamas County). Therefore, assumptions that stormwater generated in the County area is similar to that of neighboring jurisdictions have guided the County's stormwater management strategies. This monitoring plan guides County operations to fill important data gaps, in an adaptive way, to help refine the management of UICs.

The Multnomah County Monitoring Plan is a requirement of the UIC WPCF permit, along with the companion documents: UIC System-Wide Assessment and UIC Management Plan. These documents summarize the physical characteristics of County UICs, management strategies, and water quality data gathering needed to ensure that groundwater resources are protected while infiltrating stormwater in UICs.

2.0 Goals and Objectives

The County UIC monitoring plan has three primary goals:

1. Confirming assumptions of risk
2. Filling data gaps
3. Demonstrating compliance

[1] Kennedy/Jenks Consultants (December 16, 2009). Compilation and Evaluation of Existing Stormwater Quality Data from Oregon. Technical Report for Oregon Association of Clean Water Agencies. K/J Project No. 0891020.00.

The County applies a science and risk-based approach to monitoring UICs. Stormwater data will be collected from UIC locations where pollutant concentrations are hypothesized to be the highest to establish an understanding of risk for the entire UIC system from conventional stormwater pollutant concentrations. Key objectives to develop this understanding of risk include: 1) data comparison with permit action levels and regional stormwater data, 2) selecting representative monitoring sites, and 3) conducting literature reviews for emerging pollutant issues.

3.0 Adaptive Management

The County intends to adaptively manage the monitoring plan, so that the data continues to inform management actions and future monitoring needs. It is assumed that data needs will change over time as our baseline understanding improves and new issues emerge. Evaluation of risk at intervals during the permit term will be important to determine any new goals and objectives as well establishing baseline knowledge.

Periodic data reviews will be conducted at the following intervals and include evaluations of different monitoring program elements:

1. Annual reviews – data summary for annual report
2. Year 2 Intermediate review – review of site selection
3. Year 5 Mid-term review – review of site selection and pollutant selection
4. Term-end summary – review of monitoring data and overall monitoring approach

During the fifth year mid-term review, trends in emerging pollutant types and concentrations will be evaluated from local and regional data, revised environmental laws or regulations, literature reviews, and relevant industry news that becomes available. The implications of this evaluation for the protection of beneficial groundwater uses and selection/implementation of best management practices will be addressed in the fifth year report.

4.0 Site Selection Criteria

Site selection for the initial rounds of stormwater monitoring were based on presence of the sources of pollutants identified in Schedule A.2 of the County UIC permit, existence of pre-treatment devices, and the presence of nearby wells. These risk factors for County UICs were evaluated together in a matrix (Table 1 for roads; Table 2 for facilities) and the priority concerns for monitoring were identified.

The potential for a site to contribute pollutants of concern are dependent largely on the location of the UIC. The potential for pentachlorophenol runoff is reduced or limited where utility poles are set in vegetated areas compared to where utility poles are set in the sidewalk. Similarly, limited areas of lawn or landscaping in a road segment or parking lot reduce the potential for lawn chemical runoff in stormwater. The proximity of trash dumpsters to a catchment basin may also affect the potential for risk due to leaking of residual waste fluids or leaching of heavy metals from scrap materials in contact with stormwater. The presence of stormwater pretreatment devices reduces the risk of groundwater pollution; therefore, UICs with pretreatment were deemed low risk and were not selected as potential monitoring sites.

Table 1. Pollutant sources and risk factors identified for County road segments with UICs.

Site	*Traffic (ADT)*	*Agriculture*	*Utility poles*	*Wells*	*Commercial land use*	*Lawns Landscaping*	*PRIORITY CONCERN*
NE Sandy Boulevard	1,690	-	○	●	○	-	No concerns
NE 242nd Avenue	3,000	●	●	●	-	-	Pentachlorophenol
SW Cherry Park Road (east)	4,820	-	●	-	-	●	Pentachlorophenol
NE Halsey Street	8,200	-	○	●	-	●	Lawn chemicals
SW Cherry Park Road (west)	9,240	●	-	●	●	●	Agricultural pesticides
SW 257th Avenue	18,400	-	●	●	-	○	Traffic pollutants

● = *significant potential*
○ = *limited potential*
- = *no known potential*

During the first two years, monitoring for stormwater pollutants at County roadways will occur on SW Cherry Park Road (west) and SW 257th Avenue where the presence of a range of traffic generated pollutants, pesticides and pentachlorophenol may be expected.

Table 2. Pollutant sources and risk factors identified for County facilities with UICs.

Facility Name (Bldg. #)	*Traffic (ADT)*	*Traffic pollutants*	*Fuel spills*	*Utility poles*	*Lawns landscaping*	*Waste dumpsters*	*Wells*	*Pre-treatment (Yes/No)*	*PRIORITY CONCERN*
North Portland Library (612)	-	-	-	-	○	○	-	No	Lawn chemicals
Rockwood Library (614)	-	-	-	-	-	-	-	No	No concerns
Wikman Building (465)	-	-	-	-	-	-	-	No	No concerns
Springdale Road Shop (432)	<100	○	○	-	-	-	-	No	Fuel spills
Holgate Library (609)	371	○	-		-	●	-	No	Dumpster fluids
Woodstock Library (618)	418	○	-	-	-	○	-	No	Dumpster fluids
Saint Johns Library (615)	567	○	-		○		-	No	Lawn chemicals
Mid-County Health Clinic (430)	681	○	-		-	○	-	No	Dumpster fluids
North Portland Health Clinic (325)	828	○	-		-	○	-	Yes	No concerns
Midland Library (611)	1458	●	-		-	○	-	No	Traffic pollutants
Gateway Children's Center (439, 448, 451)	1517	●	○		-	○	-	No	Traffic pollutants
Title Wave Bookstore / Library Administration (317, 617)	2578	●	-		-	-	-	No	Traffic pollutants
East County Courthouse (488)	3068	●	○		-		-	Yes	No concerns
Walnut Park Complex (322)	3126	●	-		-	○	-	Yes	No concerns
Hansen Complex (313, 318)	3428	●	○		-	○	-	No	Traffic pollutants
Juvenile Justice Center (311)	15310	●	○		○		-	No	Traffic pollutants

● = *significant potential*
○ = *limited potential*
- = *no known potential*

During the first two years, monitoring for stormwater pollutants at County facilities will occur at the Juvenile Justice Center, Hansen Complex, and Midland Library. Juvenile Justice Center is a large facility with 34 stormwater UICs that includes a variety of land uses; stormwater runoff draining to a UIC that serves both parking and landscaped areas will be monitored (UICJ26). The Hansen Complex and Midland Library represent

monitoring locations where a range of traffic generated pollutants would be expected due to high traffic volume estimates.

5.0 Monitoring Analytes

Pollutants of concern are specified in Table 1 of Schedule A in the UIC WPCF Permit. The County intends to conduct monitoring of these pollutants to assess their potential risk to groundwater. This risk assessment will be conducted after two years of monitoring and will support the adaptive management of the County's monitoring strategy. The list of monitoring analytes, including the analytical method, method reporting limit (MRL), and action level for each analyte are summarized in Table 3 below.

Table 3: Monitoring Parameter List, MRLs, and Action Levels

Parameter	Analytical Method	Method Reporting Limit (µg/L)	Action Level (µg/L)
Benzo(a)pyrene	EPA Method 8270D (SIM)	0.01	2
Di(2-ethylhexyl)phthalate	EPA Method 8270D (SIM)	0.5	300
Pentachlorophenol	EPA Method 8270D PCP	0.08	10
Total Copper	EPA Method 200 Series	0.2	1,300
Total Lead	EPA Method 200 Series	0.1	500
Total Zinc	EPA Method 200 Series	0.5	50,000

µg = microgram; L = Liter

Pesticide Monitoring

The UIC WPCF Permit requires monitoring for the fungicide pentachlorophenol. In addition to this required analyte, the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (NPDES MS4) permit, issued to Multnomah County by the Oregon Department of Environmental Quality (DEQ) on December 30, 2010, requires the County to monitor pesticides as part of the environmental monitoring program. For ease of implementing the monitoring requirements in both permits, all pesticide monitoring has been combined into this single monitoring plan (as reported to DEQ in a letter from Multnomah County dated April 25, 2011).

To assess pesticides to be included in this monitoring plan, we highlighted two major objectives:

1. What pesticides are already commonly detected?
2. What pesticides are likely to be detected?

An initial list of pesticides was compiled from several recent local, state, and federal reports and assessed against lists of priority pesticides identified in state programs. Pesticides used by County Facilities and Road Services Divisions were also included in this list as pesticides required to be considered from the NPDES MS4 permit. The pesticide assessment is found in Appendix A.

Through the assessment it was discovered that 17 of the 21 pesticides identified on the priority list in Oregon including the 2009 Pesticide User Reporting System Annual Report (Top Urban Use)[2] and 2012-2013 Water Quality Pesticide Management Team Pesticide of Interest (POI) and Pesticide of Concern (POC)[3] have been detected in previous pesticide studies. Of the 14 pesticides included for consideration in the NPDES MS4 permit, all but three had previously been detected. All the pesticides used in County facilities and road maintenance had also been previously detected.

In addition to typical urban land uses, the permit area includes one agricultural property, currently in operation as a raspberry farm. This farm is on private property and not affiliated with the County. The potential for pesticide runoff from this farm is unknown. Lists of pesticides specifically used on raspberry plants are available in agricultural handbooks. This list of pesticides was added as pre-screening criteria to the pesticide assessment in Appendix A.

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[2]

[3] *US-EPA and Oregon Pesticides of Interest (POI) and Concern (POC) (2012-13).* (2012-2013). State of Oregon online. Retrieved January 23, 2013 from Resources: Complete list of pesticides of interest and concern on http://www.oregon.gov/ODA/PEST/pages/water_quality.aspx

Based on the available data and the information reviewed, two potential reasonable approaches for selecting pesticides for this plan were identified: 1) focus on a few common pesticides with high toxicity to aquatic life or human health, or 2) conduct a pesticide screen of a wide-range of pesticides to establish a local baseline. Since one of the goals of this monitoring plan is to fill data gaps, the approach to cast a wide net and establish a baseline was selected. The list of pesticides included in the Pacific Agricultural Laboratory (PAL) Multi-residue Pesticide Screen and Chlorinated Acid Herbicides Profile are included in Appendix A.

Monitoring Summary

Table 4: Summary of Monitoring Sites, Frequency and Parameters

Site	*# of UICs*	*UIC Well ID*	*Frequency*	*2013-2014 Analytes*
SW Cherry Park Avenue (west)	1	1100243	2 storms	Schedule A Table 1; Chlorinated Acid Herbicides Profile; Multiresidue Screen
SW 257th Avenue	1	1100198	2 storms	Schedule A Table 1; Chlorinated Acid Herbicides Profile
Juvenile Justice Center	1	311J26	2 storms	Schedule A Table 1; Chlorinated Acid Herbicides Profile; Multiresidue Screen
Hansen Complex	1	313J01	2 storms	Schedule A Table 1; Chlorinated Acid Herbicides Profile
Midland Library	1	611L01	2 storms	Schedule A Table 1; Chlorinated Acid Herbicides Profile

6.0 Sampling Quality Assurance / Quality Control (QA/QC)

1. Sampling Event Criteria:

    a. Two samples will be collected annually (July 1 to June 31 being the annual sampling year) for each of the sites described in the Site Selection section of this plan. Given the small number of sampling locations, it is expected that all locations can be sampled during the same storm event. However, in the event that rainfall ceases and some locations cannot be sampled, an additional storm event will be sampled to make up those missed sample locations. Due to the unpredictable nature of suitable storm events, it is possible that a sampling event may be missed due to conditions beyond the County's control.

Storm event criteria - Prior to initiating a sampling event, the storm will be predicted and evaluated against the criteria listed below to assess whether the predicted storm should be targeted as a potential sampling event.

- Predicted rainfall amount of ≥ 0.2 inches per storm
- Predicted rainfall duration ≥ 6 hours
- Antecedent dry period ≥ 6 hours (as defined by < 0.1 inches of precipitation over the previous 6 hours). When possible, samples will be collected after an antecedent dry period of 24 hours
- The first predicted storm event occurring in late summer/early fall will be targeted in order to investigate any water quality differences that may be associated with the first significant rainfall of the season. Storms meeting these criteria that were either unpredicted or were predicted to have less rainfall intensity or duration are not included as potential sampling events
- Sampling is to be conducted within normal business hours, 8:00 am to 5:00 pm, Monday through Friday, and only under safe sampling conditions (e.g., not during severe weather, flooding, or abnormally heavy traffic conditions)

Based on experience and review of historic weather data related to stormwater monitoring in this region, storms meeting these criteria are expected to provide the volume of runoff necessary to perform sampling. It is possible that a sampled storm may not meet the target criteria listed above when the sampling event is completed, but so long as sufficient runoff is generated from a storm predicted to meet the listed quantity or duration, data collected from that event will be deemed representative.

2. Sampling Event Coordinator:

Stormwater monitoring for Facilities will be coordinated by the Compliance Section Lead within the County Facilities and Property Management Division. Stormwater monitoring for public roadways will be coordinated by the Water Resources Specialist within the County Transportation Division. The Water Resources Specialist will have overall responsibility for tracking stormwater data, initiating corrective actions, and reporting. The responsibilities of this position includes, but are not limited to, track weather patterns and select storm events to be monitored, designate staff to track storms and sample, designate staff to ensure sampling equipment is organized and updated, ensure team members are trained in stormwater sampling procedures, oversight of the entire sampling event, and to ensure proper transmittal of samples to designated analytical laboratories.

3. Personal Safety:

   Sampling sites may be situated in locations that require traffic control. Sampling will be suspended if potential hazards and personal safety issues are identified during any sampling event. The following general health and safety recommendations are provided as a guideline for sampling personnel.

   i. Wear ANSI Class 2 safety vests on any sampling event.
   ii. Do not access sampling stations until traffic control has been established, if required. If traffic is excessive during certain times of the day (such as rush hour), protocol may be established to sample during certain times of the day when traffic does not pose a safety concern, provided there is a suitable storm event.
   iii. Never leave an open manhole unattended. Remove and replace manhole covers using proper equipment (e.g., a manhole cover lifting hook).
   iv. Avoid confined space entries. Grab samples are required, and hence sampling staff will break the manhole plane with sampling equipment (such as a sampling pole and bottle) only.

4. Sample Collection, Handling, and Laboratory Documentation:

   Prior to stormwater sampling, a cooler and pre-preserved sampling containers must be obtained from an accredited analytical laboratory. Table 5 lists the parameters, methods, and hold times for sampling and analyses.

Table 5: Stormwater Sample Container and Holding Time Requirements

Parameter	Analytical Method	Minimum Sample Required	Holding Time	Container Type	Preservative
Benzo(a)pyrene	EPA Method 8270D (SIM)	1 L	7 days	1 L Amber	No
Di(2-ethylhexyl)phthalate	EPA Method 8270D (SIM)	1 L	7 days	1 L Amber	No
Pentachlorophenol	EPA Method 8270D PCP	1 L	7 days	1 L Amber	No
Total antimony, copper, lead and zinc	EPA Method 200 Series	100 mL	6 months	250 mL HDPE	Cool 4°C HNO_3
2,4-D (i.e.,Chlorinated Acid Herbicides Profile)	EPA Method 8151	1 L	7 days	1 L Amber	No
Multiresidue Pesticide Screen	EPA 8081B EPA 8141B EPA 8270D EPA 8321B	1 L	7 days	1 L Amber	No

Note: Any additional parameters will be sampled and analyzed in accordance with 40 CFR 136
mL = milliliter; L = Liter
HDPE = high density polyethylene
HNO_3 = Nitric Acid
°C = degrees Celsius

The following clean sampling techniques apply to sample collection activities to minimize the potential for introducing cross-contamination to stormwater samples:

1. Field sampling equipment should be inspected prior to use to ensure it is in proper working order and decontaminated.
2. Disposable latex or neoprene gloves shall be worn during sampling.
3. Care should be taken during all sampling operations to avoid contamination of the water samples by foreign materials or as a result of handling.
4. The sample bottle lid must be protected from sources of contamination while conducting sampling. It should not be placed on the ground.
5. Always sample with the opening of the bottle facing the direction of water flow, if applicable.
6. Samples must be obtained from an area where the water has a moderate flow. Do not sample from stagnant water and avoid extremely turbulent flows if possible.

7. Avoid touching the bottom or sides of the channel, piping or other structures to avoid stirring up solid particles that can flow into the sample container.
8. Do not rinse bottle prior to sampling.
9. Fill the bottle to approximately one-half inch from the top of the bottle. Do not overfill the bottle. If the bottle is overfilled, discard and start over with a new sample bottle.
10. The lid must be placed on the bottle immediately after collecting the sample.
11. A label must be placed on the bottle after collecting the sample. Ensure that the appropriate information is recorded on the label to avoid confusion at the laboratory.
12. Transfer pertinent sampling information (including sample identification code, date and time of sampling, name of sampler, sample matrix and type, number of containers, required analyses, and other relevant field observations) to the chain-of-custody form.
13. Sample bottles should be placed in a re-sealable plastic bag and placed within a cooler with ice or other cooling medium for transportation to the laboratory.
14. Complete the stormwater sample collection field form.

Submitting Samples to an Accredited Laboratory

The following are sample packaging requirements that must be completed prior to shipment of the samples to the laboratory:

- Stormwater samples will be collected in sample containers provided by the analytical laboratory. These sample containers will have their lids adequately sealed to avoid spillage or contamination during transportation
- Each individual container will be labeled with the appropriate information
- Sample bottles will be transported in a plastic cooler with adequate additional space for ice or other cooling medium
- Place the completed and signed chain of custody within a re-closable plastic bag and tape this plastic bag to the inside of the cooler lid
- Close cooler, apply the signed custody seals (if needed), and tape the cooler securely closed with strapping tape

Quality Control Procedures

Quality Assurance – A field duplicate sample will be collected at one of the five monitoring locations every stormwater sampling event. Since the goal is to monitor five stations each sampling event, a field duplicate will be gathered at 20 percent of the monitoring locations. Any data or sample values outside of the expected range for the constituent being measured will be rechecked for validity with the laboratory or in the

field by the field team as appropriate. Data that continue to be outside the expected values will be further investigated in an effort to determine the cause.

Field decontamination blanks will also be collected for every sampling mobilization event. Equipment blanks will be generated annually by the City of Portland Water Pollution Control Laboratory (WPCL) to ensure that equipment and bottles provided by the lab are not producing false positive readings.

Representativeness - Stormwater samples are collected from the center of the flow to obtain a well mixed sample representative of the stormwater conditions.

Comparability - The objective is to ensure that collected data are either directly comparable, or comparable with defined limitations, to literature data or other applicable criteria. UIC stormwater samples are collected and analyzed in a similar manner as those collected for other monitoring conducted by neighboring jurisdictions (i.e., City of Gresham and City of Portland).

Completeness - Completeness is a measure of the amount of valid data obtained from the analytical measurement system compared to the amount that was expected to be obtained. It is defined as the total number of samples taken for which valid analytical data are obtained divided by the total number of samples collected and multiplied by 100. Based on QA/QC procedures outlined in this UIC System Monitoring Plan, the monitoring goal is to achieve a 100 percent complete data set for all analyses.

Notification of Changes

The sampling event coordinator will be notified of all changes to sampling procedures made in the field, including the reason for the change. The County will notify DEQ of any significant changes to field procedures described in this Monitoring Plan within 30 days of the sampling event.

Data Management

Multnomah County contracts with the Portland WPCL for sample custody and analysis. The County stores electronic data reports from the WPCL and enters data into a Monitoring Program database. In addition, the WPCL maintains files containing any records necessary to reconstruct the analytical details associated with a particular rainfall event. Records maintained by the WPCL include:

- COC forms
- Instrument calibration and tuning records (as applicable)
- Analytical standards preparation logs

- Method SOPs
- Analytical QC results (including method blanks, internal standards, surrogates, replicates, spike and spike duplicate results, as applicable)
- Raw data, specifically instrument printouts
- Bench work sheets and/or quantification reports
- Details of the QA/QC program in place at the time that the data analyses were conducted

Precautions will be taken in the analysis and storage of data to prevent the introduction of errors or loss or misinterpretation of data. Original laboratory data sheets will be maintained in PDF format on County servers. Copies of original data should be used for compiling the data to prevent loss or damage.

Appendix A. Pesticide Assessment for Stormwater Monitoring

Multnomah County - Pesticide Assessment for Stormwater Monitoring
Last Updated: March 1, 2013

Type	*Pesticide*	*Prescreen Criteria*					*Previous Studies*					*County Monitoring Plan*	
		Pesticides from NDPES	OR PURS Top Urban Use	OR WQPMT POI/POC	County Use	Raspberry pesticides	Gresham 2013	USGS 1998	USGS 2000	USGS 2008	DEQ 2009	PAL multi-residue pesticide screen	PAL chlorinated acid herbicides profile
insecticide	1,3-Dichloropropene					•							
herbicide	2,4,5-T						⊙						•
herbicide	2,4,5-TP						⊙						•
herbicide	2,4-D	•	•	•	•				⊙	⊙	•		•
herbicide	2,4-DB						•						•
insecticide	3-Hydroxycarbofuran											•	
herbicide	Acetochlor									•		•	
insecticide	Acetamiprid					•							
herbicide	Acifluorfen						⊙			•			•
herbicide	Alachlor						•			•		•	
insecticide	Aldicarb									•		•	
insecticide	Aldrin (legacy)										•	•	
herbicide	Ametryn											•	
insecticide	Amitraz											•	
insecticide	Aspon											•	
herbicide	Atrazine			•			•	⊙	⊙	⊙	⊙	•	
insecticide	Azadirachtin					•							
insecticide	Azinphos-methyl			⊙							⊙		
fungicide	Azoxystrobin					•						•	
insecticide	Bendiocarb									•		•	
herbicide	Benefin												
herbicide	Benfluralin									•		•	
herbicide	Benomyl									⊙			
herbicide	Bensulfuron-methyl									•			
herbicide	Bensulide											•	
herbicide	Bentazon						⊙			⊙			•
insecticide	BHC											•	
insecticide	Bifenthrin	•	•			•				•		•	
insecticide	Bifenazate					•							
fungicide	Boscalid					•						•	
herbicide	Bromacil							⊙	⊙	⊙		•	
insecticide	Bromopropylate											•	
herbicide	Bromoxynil									•			
herbicide	Butylate									•			
fungicide	Captafol											•	
fungicide	Captan					•						•	
insecticide	Carbaryl	•		⊙		•		⊙	⊙	⊙	⊙	•	
insecticide	Carbofenothion											•	

insecticide	Carbofuran					•		•				•			•				
herbicide	Carfentrazone-ethyl					•									•				
insecticide	Chlordane (legacy)							•						•	•				
insecticide	Chlorfenvinphos														•				
insecticide	Chlorobenzilate														•				
fungicide	Chloroneb														•				
insecticide	Chloropicrin					•													
fungicide	Chlorothalonil	•	•									⊙	⊙		•				
insecticide	Chlorantraniliprole					•													
herbicide	Chlorpropham														•				
insecticide	Chlorpyrifos			⊙						⊙	⊙	⊙			•				
herbicide	Clethodim					•													
insecticide	Clothianidin														•				
herbicide	Clopyralid							•				•					•		
insecticide	Coumaphos														•				
herbicide	Cyanazine											•			•				
herbicide	Cycloate											⊙							
insecticide	Cyfluthrin		•									•			•				
insecticide	Cyhalothrin											•			•				
insecticide	Cypermethrin/Permethrin	•				•						•			•				
herbicide	Dacthal (DCPA)								⊙	⊙	⊙				•				
herbicide	Dalapon							•											
herbicide	DCPMU														•				
herbicide	DDT,DDE (legacy)									⊙	⊙				•				
insecticide	DEET													⊙					
herbicide	Deethylatrazine (CIAT)								⊙	⊙									
insecticide	Deltamethrin														•				
insecticide	Demeton														•				
insecticide	Diazonon					•			⊙	⊙	⊙	•			•				
herbicide	Dicamba		•		•			⊙				•					•		
herbicide	Dichlobenil				•	•			⊙	⊙	⊙				•				
insecticide	Dichlorofenthion														•				
herbicide	Dichloroprop (2,4-DP)							⊙									•		
insecticide	Dichlorvos											⊙			•				
herbicide	Diclofop-methyl														•				
fungicide	Dicloran														•				
insecticide	Dicofol											•			•				
insecticide	Dicrotophos											•			•				
insecticide	Dieldrin (legacy)									⊙	⊙				•				
herbicide	Dimethenamid										⊙				•				
insecticide	Dimethoate											•			•				
herbicide	Dinoseb (banned 1986)							⊙				⊙					•		
herbicide	Diphenylamine														•				
herbicide	Diphenamid											•							
herbicide	Diquat							•											
insecticide	Disulfoton											•			•				
herbicide	Diuron		•	⊙		•			⊙	⊙	⊙	⊙		⊙	•				
herbicide	Dithiopyr														•				
insecticide	Endosulfan											⊙		⊙	•				
herbicide	Endothall							•											
insecticide	Endrin														•				
insecticide	Entroprop			⊙					⊙	⊙	⊙	•							

insecticide	EPN											•	
insecticide	Esfenvalerate					•					•	•	
herbicide	Ethalfluralin									•		•	
insecticide	Ethion									•		•	
herbicide	Ethofumesate											•	
insecticide	Ethoprop											•	
fungicide	Etridiazole											•	
herbicide	Ethyl dipropylthiocarbamate							⊙					
fungicide	Famoxadone					•							
insecticide	Famphur											•	
insecticide	Fenamiphos									•		•	
herbicide	Fenarimol											•	
fungicide	Fenbuconazole											•	
insecticide	Fenbutatin					•							
fungicide	Fenhexamid					•							
insecticide	Fenitrothion											•	
insecticide	Fenobucarb											•	
herbicide	Fenoxaprop-ethyl											•	
insecticide	Fenpropathrin					•							
insecticide	Fensulfothion											•	
insecticide	Fenthion									•		•	
herbicide	Fenuron									⊙		•	
insecticide	Fenvalerate											•	
insecticide	Fipronil	•								•		•	
insecticide	Fluazifop-P-butyl					•						•	
fungicide	Fludioxonil					•						•	
herbicide	Flumioxazin					•						•	
herbicide	Flumetralin									•			
herbicide	Flumetsulam									•			
herbicide	Fluometuron									•	⊙	•	
herbicide	Fluroxypyr-meptyl											•	
fungicide	Flutolanil											•	
insecticide	Fluvalinate												
fungicide	Folpet											•	
insecticide	Fonofos								⊙	⊙			
herbicide	Glufosinate				•					•			
herbicide	Glyphosate/AMPA	•	•		•	•	•			⊙			
insecticide	Heptachlor											•	
fungicide	Hexachlorobenzene											•	
herbicide	Hexazinone									⊙	⊙	•	
insecticide	Hexythiozox					•							
herbicide	Imazaquin								⊙	⊙			
herbicide	Imazethapyr									•			
insecticide	Imidacloprid	•				•				⊙	⊙	•	
insecticide	Imidan										•		
fungicide	Iprodione					•				⊙		•	
insecticide	Isofenphos									•			
herbicide	Isoxaben					•						•	
insecticide	Lindane						•			•			
herbicide	Linuron								⊙	•		•	
insecticide	Malathion	•		⊙		•			⊙	⊙	•	•	
herbicide	MCPA						•			⊙			•

herbicide	MCPP						•						•
fungicide	Mefenoxam					•						•	
herbicide	Merphos											•	
herbicide	Mesotrione					•							
fungicide	Metalaxyl									⊙		•	
insecticide	Methidathion									•		•	
insecticide	Methidathion									•			
insecticide	Methiocarb									⊙		•	
insecticide	Methomyl									•		•	
insecticide	Methoxychlor											•	
insecticide	Methylparathion										•		
herbicide	Metolachlor			•		•		⊙	⊙	⊙	⊙	•	
herbicide	Metribuzin			•						•		•	
herbicide	Metsulfuron-methyl				•					⊙			
insecticide	Mevinphos											•	
insecticide	Mirex											•	
herbicide	Molinate									•			
insecticide	Monocrotophos											•	
herbicide	Monuron											•	
fungicide	Myclobutanil	•				•				⊙		•	
insecticide	Naled									•			
herbicide	Napropamide					•			⊙	⊙	⊙		
herbicide	Neburon									•		•	
herbicide	Nicosulfuron									•			
herbicide	Norflurazon					•				⊙		•	
herbicide	Oryzalin		•		•	•				⊙		•	
insecticide	Ovex											•	
herbicide	Oxadiazone											•	
insecticide	Oxamyl									•	⊙	•	
insecticide	Oxydemeton					•							
herbicide	Oxyfluorfen					•				⊙		•	
herbicide	Paraquat					•							
insecticide	Parathion									•		•	
metabolite	Pentachloroaniline											•	
fungicide	PCNB											•	
herbicide	Pebulate									•			
herbicide	Pendimethalin	•	•		•				⊙	⊙	⊙	•	
fungicide	Pentacchloronitrobenzene		•										
fungicide	Pentachlorophenol						⊙						
insecticide	Permethrin											•	
insecticide	Phorate									•		•	
insecticide	Phosmet									•	•	•	
insecticide	Phosphamidon											•	
herbicide	Picloram						⊙			•			•
insecticide	Pirimicarb											•	
herbicide	Prodiamine											•	
insecticide	Profenofos									•			
herbicide	Prometon							⊙	⊙	⊙	⊙	•	
herbicide	Prometryn									•		•	
herbicide	Pronamide					•			⊙	⊙		•	
herbicide	Propachlor							⊙		•		•	
herbicide	Propanil									•		•	

insecticide	Propargite								•		•	
herbicide	Propazine										•	
insecticide	Propetamphos								•			
herbicide	Propham								•		•	
fungicide	Propiconazole	•	•		•				⊙	⊙	•	
insecticide	Propoxur								⊙		•	
fungicide	Pyraclostrobin				•						•	
insecticide	Pyridaben										•	
fungicide	Pyrimethanil										•	
insecticide	Pyriproxyfen									•		
insecticide	Pyrethrin				•							
herbicide	Quinclorac			•		•						•
insecticide	Ronnel										•	
herbicide	Sethoxydim				•						•	
herbicide	Siduron								•		•	
herbicide	Silvex								•			
herbicide	Simazine		•	•	•		⊙	⊙	⊙	⊙		
herbicide	Simetryn										•	
herbicide	S-metolachlor				•							
insecticide	Spinetoram				•							
insecticide	Spinosad				•							
herbicide	Sulfentrazone										•	
herbicide	Sulfometuron-methyl		•	•					⊙			
insecticide	Sulfotep								•			
insecticide	Sulprofos								•		•	
fungicide	Tebuconazole								•		•	
insecticide	Tebupirimphos								•			
herbicide	Tebuthiuron						⊙	⊙	⊙		•	
insecticide	Tefluthrin								•			
insecticide	Temephos								•			
herbicide	Terbacil				•			⊙	⊙		•	
insecticide	Terbufos								•		•	
herbicide	Terbuthylazine								•			
insecticide	Tetrachlorvinphos										•	
fungicide	Thiabendazole										•	
insecticide	Thiamethoxam				•							
herbicide	Thiobencarb								•		•	
fungicide	Thiophanate-methyl											
insecticide	Tokuthion									•	•	
insecticide	Toxaphene									•	•	
herbicide	Tralkoxydim				•							
fungicide	Triadimefon									•	•	
insecticide	Tricloronate									•	•	
herbicide	Triallate								•			
herbicide	Tribufos								•			
herbicide	Triclopyr	•		•		⊙	⊙	⊙	⊙			•
fungicide	Trifloxystrobin										•	
fungicide	Triflumazole										•	
herbicide	Trifluaralin	•		•	•			⊙	⊙	⊙	•	
fungicide	Vinclozolin										•	

Notes:

- • POI
- ⊙ POC
- • Sampled
- ⊙ Detected

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