**SPOKANE RIVER REGIONAL TOXICS TASK FORCE**

HYDROSEED PILOT PROJECT

SUMMARY REPORT

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Definitions

**Arolcors** - trade name of the commercial PCB mixtures manufactured by the Monsanto Chemical Company and sold in the United States. An Aroclor PCB mixture might consist of over 100 different individual PCB congeners. There were nine common PCB Aroclor mixtures (1221, 1232, 1242, 1016, 1248, 1254, 1260, 1262, and 1268), and each of them has a distinctive gas chromatographic pattern.

**Congeners -** any single, unique well-defined chemical compound in the PCB category. Individual congeners are identified by the number and position of the chlorine atoms around the biphenyl rings. There are a total of 209 different PCB congeners.

**Homologues** - subcategories of PCB congeners having equal numbers of chlorine substitutions. All the PCB chemicals that have the same number of chlorine atoms are said to belong to the same homolog group. Homolog groupings can vary from one to ten.

**Hydroseed** (or Hydraulically Applied Erosion Control Product, hydraulic mulch seeding, hydro-mulching, hydraseeding, ) - is a planting process that uses a slurry of seed and mulch. The slurry is transported in a tank, either truck or trailer mounted and sprayed over prepared ground.

**PCBs -** a synthetic organic chemical compound of chlorine attached to biphenyl. PCBs were widely used as dielectric and coolant fluids in electrical apparatus, cutting fluids for machining operations, carbonless copy paper and in heat transfer fluids. Due to PCBs' environmental toxicity and classification as a persistent organic pollutant, PCB production was banned by the United States in 1979.

**Practical Quantification Limit (PQL)** - the lowest concentration measurement that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions.

**Quality Assurance Project Plan (QAPP)** – a document that establishes the guideline for sampling and analysis to ensure data quality and consistency in interpretation of the data.

**Surfactant** - additive in some Hydroseed to enhance moisture retention and reduce water repellency.

**Tackifier** - additive in some Hydroseed to enhance the chemical bond within the mulch matrix to help hold and protect seed and for better moisture retention. Used to reduce erosion on difficult slopes, challenging soil conditions, high surface winds or heavy weather conditions.

**Total PCBs** – are the sum total of all valid 209 congeners reported from the laboratory data. How the data is interpreted and totalized may vary based on blanked corrected data, use of non- detect values, method detection limits and other parameter considerations. See the referenced QAPPs for methods used in Total PCB analysis for this study.

Background

The purpose of the Spokane River Regional Toxics Task Force (SRRTTF, see <http://srrttf.org/>) is to “work collaboratively to characterize the sources of toxics in the Spokane River and identify and implement appropriate actions needed to make measurable progress towards meeting applicable water quality standards for the State of Washington, State of Idaho, and the Spokane Tribe of Indians and in the interests of public and environmental health.”

In addition, the 2014 legislature adopted Senate Bill 6086 that requires State agencies to establish a purchasing and procurement policy that provides a preference for products that do not contain PCBs (<http://apps.leg.wa.gov/billinfo/summary.aspx?bill=6086&year=2013>). Spokane County and the City of Spokane adopted similar ordinances in response to concerns with PCB impairment of the Spokane River (<https://my.spokanecity.org/smc/?Section=07.06.172>). The City of Spokane’s ordinance requires City departments to purchase PCB-free items (defined as less than the practical quantification limit using EPA Method 1668) if a feasible alternative is available at less than a 25% cost increase. To implement the ordinance, the City is gathering more information about products known to contain PCBs. In 2014, the City sampled Nature’s Own Hydroseed manufactured by Hamilton Manufacturing, Inc. and discovered concentrations of Total PCBs exceeding 2,500 parts per billion (ppb). In comparison, the current water quality standard for the State of Washington is 170 parts per quadrillion (ppq), equal to 0.000170 ppb.

The Washington State Department of Transportation (WSDOT) [Qualified Products List (QPL)](http://www.wsdot.wa.gov/Business/MaterialsLab/QPL.htm) was referenced in order to seek out Hydraulically Applied Erosion Control Product (HECP) manufacturers active in the Washington State market.  The City of Spokane uses the WSDOT Specification Book supplemented with General Special Provisions. ([https://static.spokanecity.org/documents/business/designstandards/general-special-provisions.pdf](https://iep.iepco.com/owa/redir.aspx?C=2507a85e597a404f85005d613ffe7c4a&URL=https%3a%2f%2fstatic.spokanecity.org%2fdocuments%2fbusiness%2fdesignstandards%2fgeneral-special-provisions.pdf)). Unlike the WSDOT, the City currently does not have an approved supplier list for Hydroseed or HECP. The City uses WSDOT policies and procedures for State and Federal funded projects. After contracts go out to bid for City funded projects, the contractor can select anyone they like who meets the project requirements.

The SRRTTF Advisory Committee approved the Hydroseed Analysis and Reformulation PCB Removal Pilot Project during the February, 2015 meeting. This report summarizes findings from the laboratory analysis. Results from this analysis can be used to assist manufacturers of Hydroseed to develop specifications/reformulations with reduced levels of PCBs.

# Project Description

HMI Hamilton Manufacturing, Inc., Rainier, Tensar International Corporation and Terra Novo voluntarily participated in this pilot project to examine the specific components that may be contributing to PCBs in their end product. The study focused on these suppliers with consistent distribution and installation of their products in Washington State.

The four suppliers that volunteered to participate in this study have differing base materials and components used in the manufacture of their final product. In general, the Hydroseed products are comprised of a base material, dye, surfactant and tackifier or some combination of the above. The analysis of these four suppliers provides a good cross section of the differing materials and components of Hydroseed products that are distributed throughout the State.

Sampling and analysis was performed in accordance with the QAPP used by the City of Spokane, supplemented with the PCB Product Sampling QAPP Addendum for Supplemental Product Sampling: SRRTTF (Appendix A). The QAPP addendum reflects the samples identified in this work plan.

AXYS Analytical Services was used to perform the laboratory testing of the samples. Testing was performed using AXYS in-house method MLA-007 for the quantitative determination by GC and low resolution MS/ECD detection of PCB congeners, total PCBs by congener group, PCBs as Aroclor equivalents, and Total PCB by summing individual congeners. Method MLA-007 has a higher detection limit than EPA 1668, which was used for the City’s previous sampling. Because the PCB concentrations within the City’s original Hydroseed sample were relatively high, it was determined that the less sensitive and less expensive MLA-007 method should be sufficient as a screening method to identify any “bad actors” within the Hydroseed matrix. MLA-007 provided a practical quantification limit (PQL) of 0.2 ppb to about 31 ppb, well below the 2,500 ppb levels detected in the sample analyzed by the City.

The purpose of this study was to confirm the elevated levels observed from the City’s original analysis and to identify specific component(s) that may be contributing to these elevated levels. This study should be considered an initial screening procedure of the various Hydroseed matrices. Additional testing may be needed to further substantiate any significant results.

# Manufacturer Agreement

HMI Hamilton Manufacturing, Inc., Rainier, Tensar International Corporation and Terra Novo have agreed to participate in this study on the basis that the results will be protected due to the proprietary nature of their various products and blends. Therefore, the project was executed in accordance with an agreement with the suppliers, stipulating that the finish product component analyses remain anonymous.

# Results

Total PCBs using Axys method MLA-007 for each of the four Hydroseed brands and associated components are shown in Table 1. Blank corrections were applied to these values when any congener was detected at less than three times the concentration found in the associated laboratory blank.

Table 1 - Summary of Results (Total PCB, ppb or ng/g)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Product #1 | Product #2 | Product #3 | Product #4 |
| Finished Product | ND<4.3 | ND<0.294 | 4.65 | ND <0.284 |
| Base Material | ND<4.47 | ND<0.248 | ND<0.491 | ND <0.157 |
| Base Material #2 | N/A | N/A | 0.513 | N/A |
| Dye | 1.82 | 2.11 | 0.599 | ND<0.763 |
| Surfactant | ND<1.13 | N/A | ND<30.9 | N/A |
| Tackifier  | N/A | ND<0.604 | ND<0.885 | ND <0.704 |
| Tackifier #2 | N/A | 4.89 | N/A | N/A |
| Tackifier #3 | N/A | ND<0.617 | N/A | N/A |
| Water | ND<0.0006 | N/A | N/A | N/A |

Notes:

N/A = not applicable (not used in product or supplied to laboratory)

ND = Not Detectable (<detection limit)

<X.XX = represents the highest reporting limit of all the congeners

Analyses shown as “ND” in Table 1 indicate that PCBs were not detected for any of the 209 congeners above their respective reporting limits. The “<X.XX” number following the ND represents the highest reporting limit given for an individual congener for that sample’s 209 different congener results. This does not necessarily mean that PCBs are not present in the sample; it simply means that PCBs were not detected above the reporting limits using this test method.

Many of the congeners were flagged by the laboratory as “NJ” and therefore not included in the total PCB summation in accordance with the QAPP. NJ flags are data qualifiers given by the laboratory when a peak is detected in the instrumentation, but did not meet quantification criteria. A value is assigned to the congener that represents the estimated maximum concentration. Each of the samples contained congeners with NJ flags with the exception of the tackifier from Product #4. Total PCBs including NJ flagged congeners can give some insights into where PCB compounds may be found in products, but these data cannot be relied on as reportable total PCB values per QC requirements.

As stated under the Project Description above, a less sensitive and less expensive method was used for this study as an initial screening method since the City’s original Hydroseed Total PCB results were relatively high. Because of the higher detection limits, very few of the 209 possible PCB congeners were detected above the practical quantification limits (PQL). The results of this study were well below the levels detected by the City of Spokane from their original analysis of the Nature’s Own Hydroseed manufactured by Hamilton Manufacturing, Inc. Although no “smoking guns” were identified that contributed to similar levels of PCBs found in the original sample, there appears to be potential contribution of PCB’s from the dyes and some tackifiers in the ppb range. The following provides a brief summary of the composite products and each component analyzed where “detectable” levels of PCBs were observed using this test method. As stated above, this does not necessarily mean that PCBs are not present in the other samples analyzed; it simply means that PCBs were not detected above the reporting limits using this test method:

### Finished Product

The “Finished Product” is the composite product that includes all of the various components of that product (base material, dye, surfactant, tackifier, etc.) that would be sold and marketed under the Product # indicated. The only finish product with detectable PCBs above the reporting threshold is Product #3 with a Total PCB concentration of 4.65 ppb, consisting entirely of the PCB-29 congener.

### Base Material

Base materials make up the product’s mulch, and can be composed from a number of different feed stocks such as hard or soft wood, paper, cotton, straw, etc. The only base material with detectable PCBs above the reporting threshold is the second base material provided with Product #3 that had a Total PCB concentration of 0.513 ppb, consisting entirely of the PCB-15 congener.

### Dye

Product #1, 2 and #3 dye samples all contained detectable PCBs above the reporting threshold, varying from 0.6 to 2.1 ppb. All three dye samples with detectable PCBs were entirely composed of the PCB-209 congener that has been associated with green pigments. In the City’s recent PCB sampling study, PCB-209 was detected in green utility marking paint, yellow and white road paint, and PVC pipe, which has a blue-green color.

### Tackifier

Most of the tackifiers supplied for analysis did not contain detectable PCBs above the reporting threshold with the exception of Tackifier #2 from Product #2. Unlike the other samples, a variety of different congeners were detected. The homologue pattern for Product #2 Tackifier #2 is shown in Chart 1 below. Homologues are groups of congeners with the same level of chlorination.

Chart 1 – Homologue Pattern of Tackifier #2 from Product #2

The Axys data package also included quantification of Aroclors which are trade names for historical commercial mixtures of PCBs. Tackifier #2 in Product #2 had a detection of Aroclor 1242 at a concentration of 5.56 ppb. Note that Arochlors are calculated differently than Total PCBs, thus the difference in values. This was the only Aroclor detection in the entire dataset.

# Conclusions and Recommendations

This study should be considered an initial screening procedure of the various Hydroseed matrices. It is recommended that additional testing be conducted to further substantiate the results prior to implementation of any decisions on product selection or product modifications.

As stated in the Project Description, the purpose of this study was to confirm the elevated levels observed from the City’s original analysis and to identify specific component(s) that may be contributing to these elevated levels. Samples from the SRRTTF dataset were unable to confirm the elevated levels of PCBs found by the city of Spokane’s previous analysis of Nature’s Own Hydroseed manufactured by Hamilton Manufacturing, Inc. The orders of magnitude difference between the City’s original test results and that of this study demonstrates why additional confirmatory testing is required prior to making purchasing decisions. There are many variables that can affect the overall results and consistency of those results, such as: product variations, contamination during product handling and sampling, laboratory error, etc.

However, this study does indicate that PCBs are commonly detected in Hydroseed, particularly in the dye, some base materials and tackifiers. Because of the consistent PCB concentration in the dyes, it is recommended that the State of Washington consider the potential for dye-free Hydroseed application. However, as suggested above additional product testing should be performed to provide support for changes to materials standard specifications. An alternative may be to further research the type of dye used in Product #4, which did not have detectable PCB concentrations per Method MLA-007. It should be determined if this dye is in fact different than the other three dye products, and what the concentrations are using more sensitive procedures such as EPA Method 1668.

Another approach to using this data would be to investigate why Product #2 and Product #4 Finished Products have lower PCB detection limits. This may be a result of using unique ingredients, or manufacturing differences, such as process or location.

Tackifier #2 in Product #2 had detectable levels of Aroclor 1242 at significant concentrations relative to the water quality standards. After confirmatory testing, the manufacturer of Product #2 should consider using either tackifiers #1 or #3, or other low-PCB containing tackifiers used by the industry.

**Appendix A**

PCB Product Sampling QAPP Addendum

 Supplemental Product Sampling: Spokane River Regional Toxics Task Force

 Prepared by City of Spokane Wastewater Management Department

 March 2015

## Background

The City of Spokane recently performed PCB product sampling under a Department of Ecology Grant of Regional or Statewide Significance (GRSS), number G1400545. Product sampling followed the procedures in the approved Quality Assurance Project Plan, Polychlorinated Biphenyls in Municipal Products, prepared by LimnoTech, August 5, 2014. Additional sampling beyond the scope of the grant will be performed to help further understand the sources and content of PCBs in products.

## Description of Additional Studies

The Spokane River Regional Toxics Task Force has authorized studies that supplement the work performed under the City’s GRSS Grant. The objective of these efforts is to further identify the sources of PCBs in products and components of products. This work will assist manufacturers in producing lower-PCB alternatives for the State and City to purchase, therefore reducing the amount of PCBs imported to our watersheds.

The first samples to be collected will include various brands of Hydroseed and their associated components. Some of the components to be sampled will include items such as dye, surfactant, and water used in the manufacturing process. Other products may be sampled, including items such as tackifiers and different formulations of 2,4-D, as funding allows.

## Sampling, Measurement, and Quality Control Procedures

Sampling will be performed by the manufacturer in many cases. A copy of the QAPP and this addendum will be sent to the sampler to ensure proper collection.

The Sampling Procedures in Section 6 of the QAPP will be followed for sample collection, with the following exceptions:

* Because manufacturers may not have the standard sampling equipment on hand, the contract laboratory will prepare and ship sampling kits including coolers, sample instructions, gloves, laboratory-prepared sample jars, and chain of custody to the sampler.
* Sample labeling: Samples will be labeled by the sampler at the time of sample collection using the following format:
	+ Manufacturer ID – Product ID – collection date (MMDDYY) – collection time (military).
		- Example: XYZ Manufacturing collected a sample of their dye on March 17, 2015 at 3:00 in the afternoon. The sample would be labeled XYZ-dye-030715-1500
		- The Manufacturer and Product ID codes will be chosen by the sampler and a written description will be sent to the contract laboratory with the samples.

The Measurement Procedures in Section 7 of the QAPP originally included only EPA Method 1668, which gives results for all 209 PCB congeners to a very low detection limit, but is more costly. Based on funding and the need for less expensive screening-level testing, sampling for the SRRTTF study may be performed using EPA Method 8270D GC/LRMS (EPA, 1994), 8081 modified by EPA 625 (Axys in-house method MLA-007). This method gives results for the 209 PCB congeners, but at a higher detection limit and lower cost. The preferred method of analysis will be denoted on the sample chain of custody. The following tables supplement the associated tables in the QAPP specifying laboratory methods and quality objectives:

Supplemented QAPP Table 4. Measurement Quality Objectives

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Analyte | Analytical Method | Daily Calibration Verification | Laboratory Control Samples | Surrogate Recovery | Laboratory Blanks | Laboratory Duplicate | Sensitivity |
|  |  | % recovery limits | % recovery limits | % recovery limits | Concentration (ppb) | Relative Percent Difference c | Detection limit/congener (ppb) |
| PCB congeners (low-detection limit) | EPA 1668C | 50-145% | 60-135% | 5-145%a10-145%b | 0.05 – 0.2 | + 25% | 0.02 to 0.1 |
| PCB congeners (lower cost, higher detection limit) | Axys MLA-007 |  |  |  |  |  | 0.1 to 0.5 |

 a – MoCB to TriCB

b – remaining congeners

c – applies only when values are > 10 times the detection limit

Supplemented QAPP Table 10. Laboratory Methods and Detection Limit

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Sample Matrix | Detection Limit | Expected Concentrations | Analytical Method | Laboratory |
| PCB congeners (low-detection limit) | Solid, liquid | 0.0001 ppb | 0.01-2,500+ ppb | EPA 1668C | Ecology-Accredited |
| PCB congeners (lower cost, higher detection limit) | Solid, liquid | 0.2 ppb | 0.5 – 2,500+ ppb | Axys MLA-007 | Axys |

The Data Management Procedures in Section 9 will be followed with the exceptions noted below. Samplers will be asked to fill out a copy of the sample sheet on page 32 of the QAPP, or equivalent.

* Field QC samples (replicates, equipment blanks) will not be collected.
* Electronic data management will be managed through the SRRTTF and/or Ecology’s database as appropriate and available. An electronic data deliverable (EDD) template will be provided by SRRTTF to the contract laboratory.