

**Stormwater Quality Monitoring Data Summary for Modeling Use  
Recycled Metal Transfer Station (RMTS) at Puget Sound Naval Shipyard (PSNS) and  
Intermediate Maintenance Facility (IMF), Bremerton, WA**

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## Summary

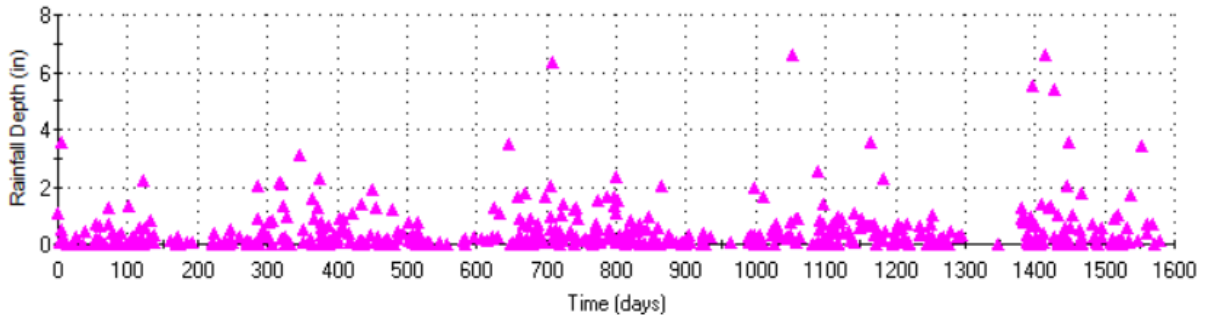
The RMTS monitored area has a drainage area that contains metal and wiring staging activities. The runoff is treated by a Contech CDS separator followed by 23 ZPG (zeolite, perlite and granular activated carbon) Contech StormFilter cartridges in a vault. Two ISCO samplers were installed with one at the inlet of the hydrodynamic separator and other at the outlet of the cartridge filter. TSS concentrations were very low and had very small reductions with treatment, with median particle sizes of about 15  $\mu\text{m}$ . Heavy metal concentrations were moderate, with large fractions in filtered forms, and had low treatment benefits. The PAHs and PFAS congeners had very low concentrations and little treatment benefit. Modeled results of the treated effluents agreed with the monitored values, while some of the modeled influent values were greater than observed.

## Monitored Events

Three events were sampled for flow and water quality by the Texas Tech and PSNS field teams. The three rains were sampled on the following dates, along with the approximate Rv (volumetric runoff coefficient, the ratio of the runoff depth to the rainfall depth over the drainage area):

| date      | rainfall    | Approx. Rv |
|-----------|-------------|------------|
| 10/9/2020 | 0.41 inches | 0.53       |
| 11/3/2020 | 0.38 inches | 0.51       |
| 2/18/2021 | 0.12 inches | n/a        |

The following shows the rainfall pattern for the four to five years from 2009 through 2013.



The average annual rainfall during this short period was about 56 inches, with most of the rain occurring during October through March. During this period, five rains were also greater than 5 inches, about 15 were between 2 and 5 inches, while most rains were less than 1 inch in depth.

### Monitored Stormwater Quality

Most of the metals had complete size fractionation data for all three events. The first event had some size fractionation data for the PAHs, but most were not detected. PFAS size fractionation was not attempted due to relatively low concentrations of PFAS congeners in this site. All constituents were monitored for filtered and non-filtered (bulk) fractions, and particulate strength data were therefore available for all events and constituents for the total particulates. Appendix A summarizes the data for TSS and heavy metal, Appendix B summarizes the data for PAHs, and Appendix C summarized the PFAS data.

The TSS concentrations for the three events were very low, with an average inlet concentration of only 17.5 mg/L. The treated effluent TSS concentrations were only slightly reduced, to an average of 13.6 mg/L. Most of the TSS mass was associated with the 5 to 63  $\mu\text{m}$  particle size range in the influent and effluent samples, with average median particle sizes of about 15  $\mu\text{m}$ . The greatest TSS mass reductions were associated with the largest particle size monitored (>63  $\mu\text{m}$ ), with the average inlet size fraction concentration of 4.1 mg/L reduced to 1.7 mg/L (both being very low values).

The heavy metal concentrations were generally of moderate concentrations, likely due to the site activities (being a recycled metal staging area, plus the presence of the metal roofing and building materials). The filtered forms of the metals were relatively high in the influent samples, with the filtered fraction slightly increased for most metals after treatment (preferential removal of particulate forms of the metals). Lead had the most consistent positive removals for all particle sizes, while most of the other metals indicated concentration increases for many size ranges. The particulate strengths for the metals indicated larger values for the largest particle size range (>63  $\mu\text{m}$ ) for Cr, Mn, Cu, and Pb common for metal material storage industrial areas, but that size range had lower pollutant masses than the smaller particles.

The concentrations of the monitored PAHs were all very low. The PAHs had an overall average filtered fraction of 43% in the influent which increased to 77% in the effluent. In general, stormwater PAHs are mostly particulate bound. The particulate concentrations had moderate reductions with treatment (about 50% overall), while the filtered concentrations indicated increased concentrations for many of the PAHs with treatment.

The PFAS congener concentrations were also very low. The highest average influent PFAS concentration was for PFOA (17 ng/L), followed by PFBA and PFOS (both about 4 ng/L). The fraction of the PFAS congeners in filtered forms ranged from about 30 to 80%. There were no likely concentration reductions of PFAS congeners with treatment. PFOS had an average particulate strength of 0.8 mg/kg, and PFOA had an average particulate strength of 0.5 mg/kg, while the other PFAS congeners had much smaller particulate strengths (0.05 to 0.3 mg/kg).

The PSNS has also conducted NPDES monitoring. 115 samples were collected and analyzed between April 29, 1994, and March 19, 2005, including four samples at the RMTS during 1994 to 1996. The following table compares the NPDES sampling results with the recent monitoring results.

|                        |                | As, total,<br>µg/L | Cu, total,<br>µg/L | Cu, filtered,<br>µg/L | Pb, total,<br>µg/L | Pb, filtered,<br>µg/L |
|------------------------|----------------|--------------------|--------------------|-----------------------|--------------------|-----------------------|
| PSNS NPDES             | Min and max    | 0.3 to 140         | 5.7 to 1300        | 1.8 to 215            | 0.8 to 1200        | 0.3 to 23             |
|                        | Average (COV)  | 7.7 (2.4)          | 122 (1.4)          | 42 (1.12)             | 64 (2.6)           | 1.2 (2.7)             |
|                        | No. of samples | 72                 | 101                | 51                    | 99                 | 51                    |
| EPA area 30 NPDES RMTS | Min and max    | 31 to 63           | 140 to 660         |                       | 83 to 1200         |                       |
|                        | Average (COV)  | 78 (0.7)           | 343 (0.7)          |                       | 473 (1.1)          |                       |
|                        | No. of samples | 3                  | 4                  |                       | 4                  |                       |
| SERDP RMTS             | Min and max    |                    |                    |                       |                    |                       |
|                        | Average (COV)  | 1.1 (0.4)          | 90 (0.5)           | 38                    | 5 (0.8)            | 3                     |
|                        | No. of samples | 3                  | 3                  | 3                     | 3                  | 3                     |

|                        |                | Zn, total,<br>µg/L | Zn, filtered,<br>µg/L | Hg, total,<br>µg/L | TSS, mg/L  |
|------------------------|----------------|--------------------|-----------------------|--------------------|------------|
| PSNS NPDES             | Min and max    | 8 to 2800          | 2 to 335              | 0.002 to 13        | 4 to 420   |
|                        | Average (COV)  | 287 (1.4)          | 91 (0.8)              | 0.38 (4.7)         | 52 (1.5)   |
|                        | No. of samples | 101                | 51                    | 52                 | 74         |
| EPA area 30 NPDES RMTS | Min and max    | 530 to 2800        |                       |                    |            |
|                        | Average (COV)  | 1833 (0.5)         |                       | 0.8                |            |
|                        | No. of samples | 4                  |                       | 1                  |            |
| SERDP RMTS             | Min and max    |                    |                       |                    |            |
|                        | Average (COV)  | 190 (0.7)          | 77                    | 0.007 (0.3)        | 17.5 (0.8) |
|                        | No. of samples | 3                  | 3                     | 3                  | 3          |

The PSNS data indicate that the early RMTS samples had the highest concentrations observed for Pb and Zn at the whole base. The current RMTS metal concentrations are all much less than the early RMTS concentrations, and somewhat lower than the average early PSNS site wide data. The current SERDP Pb average concentration (5 ug/L) is much less than the earlier Pb observations.

### **Watershed Area Description**

The following summarizes the drainage system and shows an aerial image of the same area. The drainage area is comprised of only a few source area categories:

| subarea                                       | Approximate area  |
|---|---|
| Wycott Way                                    | 0.3 acres (32 ft wide, with curb and gutters on both sides of the road) |
| Permanent roofs (metal roofing, slight pitch) | 0.2 acres   |
| Paved storage/staging areas                   | 2.1 acres (about half designated with much galvanized metal exposure)   |
| Total drainage area                           | 2.6 acres   |

The aerial image also shows that there are many small storage bins and trailers parked on the paved area.

google map Puget Sound Naval Shipyard/... Google Maps

Photos - RMTS drainage aeri... Fullscreen

Sound+Naval+Shipyard/@47.5576722,-122.6394464,299m/data=!3m1!1e3!4m6!3m5!1s0x5... A [checkmark] [refresh] [star] [share] [user]

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Wycoff Way

Wycoff Way

Wycoff Way

Wycoff Way

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Imagery ©2022 Maxar Technologies, U.S. Geological Survey, USDA/FPAC/GEO, Map data ©2022 United States Terms Privacy Send feedback 100 ft

74°F Cloudy

Windows taskbar icons: File Explorer, Microsoft Edge, PowerPoint, Excel, Word, ST4, ST4, Moon, Visual Studio Code, Photoshop, Brave, and Windows Search.

11:29 PM 5/5/2022

### WinSLAMM Modeling of RMTS Site

WinSLAMM used the previously calibrated Bremerton parameter files, with four industrial source areas (streets, galvanized metal roofs, and moderate laydown area areas with large amounts of galvanized material exposure). The following special source areas to describe these areas (in addition to the street area):

#### WinSLAMM other impervious areas

|    |                   |  |           |
|----|-------------------|--|-----------|
| 84 | Other Imp Area 1  | OIA1 - Airfield apron/runway paved areas |           |
| 85 | Other Imp Area 2  | OIA2 - Airfield other paved areas        |           |
| 86 | Other Imp Area 3  | OIA3 - Light laydown concrete areas      |           |
| 87 | Other Imp Area 4  | OIA4 - Moderate laydown concrete areas   |           |
| 88 | Other Imp Area 5  | OIA5 - Heavy laydown concrete areas      |           |
| 89 | Other Imp Area 6  | OIA6 - Light laydown asphalt areas       |           |
| 90 | Other Imp Area 7  | OIA7 - Moderate laydown asphalt areas    | 1.1 acres |
| 91 | Other Imp Area 8  | OIA8 - Heavy laydown asphalt areas       |           |
| 92 | Other Imp Area 9  | OIA9 - Galvanized metal roofs            | 0.2 acres |
| 93 | Other Imp Area 10 | OIA10 - Other galvanized materials       | 1.0 acres |
| 94 | Other Imp Area 11 |  |           |
| 95 | Other Imp Area 12 |  |           |
| 96 | Other Imp Area 13 |  |           |
| 97 | Other Imp Area 14 |  |           |
| 98 | Other Imp Area 15 |  |           |

#### WinSLAMM other non-paved areas

|     |                        |                                  |
|-----|------------------------|----------------------------------|
| 99  | Other Non-Paved Area 1 | ONPA1 - Light laydown unpaved    |
| 100 | Other Non-Paved Area 2 | ONPA2 - Moderate laydown unpaved |
| 101 | Other Non-Paved Area 3 | ONPA3 - Heavy laydown unpaved    |
| 102 | Other Non-Paved Area 4 |                                  |
| 103 | Other Non-Paved Area 5 |                                  |

The following screen shows the layout of the modeled area, along with the Contech CDS hydrodynamic separator and StormFilter media filter units.

WinSLAMM v 10.5 Data File: [C:\WinSLAMM Files\SERDP 2021\Bremerton\RMSTS.mdb] - [Land Use Model]

File Current File Data Pollutants Tools Run Utilities Help

RES INS COM IND OU FRE GS CB WP BF PP HD OD FS SF UF IR

**Land Use:**

| Source Area # | Source Area                | Area (acres) | Source Area Parameters | First Control Practice | Second Control Practice |
|---------------|----------------------------|--------------|------------------------|------------------------|-------------------------|
|               | <b>Roofs</b>               | 0.000        |                        |                        |                         |
|               | <b>Parking</b>             | 0.000        |                        |                        |                         |
|               | <b>Driveways/Sidewalks</b> | 0.000        |                        |                        |                         |
|               | <b>Streets</b>             | 0.300        |                        |                        |                         |
| 37            | Streets 1                  | 0.300        | Entered                | --                     | --                      |
|               | <b>Landscaped Areas</b>    | 0.000        |                        |                        |                         |
|               | <b>Other Areas</b>         | 2.300        |                        |                        |                         |
| 90            | Other Impervious Areas 7   | 1.100        | Entered                | --                     | --                      |
| 92            | Other Impervious Areas 9   | 0.200        | Entered                | --                     | --                      |
| 93            | Other Impervious Areas 10  | 1.000        | Entered                | --                     | --                      |

| Land Use # | Land Use Type | Land Use Label | Land Use Area (acres) |
|------------|---------------|----------------|-----------------------|
| 1          | Industrial    | Industrial 1   | 2.600                 |

| CP # | Control Practice Type | Control Practice Name or Location |
|------|-----------------------|-----------------------------------|
| 1    | Hydrodynamic Device   | DS Hydrodynamic Device # 1        |
| 2    | StormFilter           | DS StormFilter # 1                |

Current File Data Entered | Total Area = 2.600 acres | No Upstream Source Areas | LU# = 1 | Index Number = 1 | Remaining Icons = 253 | Start Date: 01/01/09 | End Date: 04/29/13

The following screen shows the parameter files used in the RMSTS modeling analyses, including the previously calibrated files.

Current File Data

**SLAMM Data File Name:**  
 C:\WinSLAMM Files\SERDP 2021\Bremerton\RMSTS.mdb

Site Descript.:

**Edit** Seed:

**Edit** Rain File: C:\WinSLAMM Files\Rain Files\WA Bremerton National AP 0913.RAN

**Edit** Start Date:   Winter Season Range  
**Edit** End Date:  Start of Winter (mm/dd)  End of Winter (mm/dd)

**Edit** Pollutant Probability Distribution File: C:\WinSLAMM Files\Navy Northwest Nov 12 2013.ppd

**Edit** Runoff Coefficient File: C:\WinSLAMM Files\NorthWest April 05 2014.rsvx

**Edit** Particulate Solids Concentration File: C:\WinSLAMM Files\Navy Northwest Nov 10 2013.pscx

**Edit** Street Delivery File (Select LU): C:\WinSLAMM Files\Northwest street Res and Other Urban.std

Residential LU  Other Urban LU  
 Institutional LU  Freeways   
 Commercial LU  
 Industrial LU

**Edit** Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\psd files\PSD source area SSC.csv

Use Cost Estimation Option

The following screen shows the dimensions of the Contech CDS hydrodynamic separator:

Hydrodynamic Device

**Drainage System Control Practice**  
Hydrodynamic Device Number 1

**Hydrodynamic Control Device General Information - Enter for Both Single Chamber and Proprietary Devices**

|  |       |
|--|-------|
| Device Drainage Area (ac)                        | 2.600 |
| Fraction of Drainage Area Served by Device (0-1) | 1.000 |
| Number of Devices                                | 1     |
| Device Density (units/ac)                        | 0.400 |

**Model Hydrodynamic Device with Lamella Plates or Settling Tubes**

|  |  |
|--|--|
| Fraction of device area with plates or tubes             |  |
| Average tube diameter or distance between plates (ft)    |  |
| Number of plates or tubes a vertical line will intersect |  |

**For Device Cleaning, Select Either**

**Device Cleaning Dates**

| Device Cleaning No. | Device Cleaning Date (mm/dd/yy) |
|---------------------|---------------------------------|
| 1                   |                                 |
| 2                   |                                 |
| 3                   |                                 |
| 4                   |                                 |
| 5                   |                                 |

**Device Cleaning Frequency**

OR

Monthly  
 Three Times per Year  
 Semi-Annually  
 Annually  
 Every Two Years  
 Every Three Years  
 Every Four Years  
 Every Five Years  
 Never

---

**Single Chamber Device Characteristics**

|   |                         |
|---|-------------------------|
| 1 - Average Sump Depth below Device Outlet Invert (ft)                          | 5.00                    |
| Depth of Sediment in Device at Beginning of Study Period (ft)                   | 0.00                    |
| 2 - Typical Outlet Pipe Diameter (ft)   | 2.00                    |
| Typical Outlet Pipe Manning's n   | 0.012                   |
| 3 - Typical Outlet Pipe Slope (ft/ft)   | 0.0200                  |
| Typical Device Sump Surface Area (sf)   | 75.0                    |
| 4 - Device Depth from Sump Bottom to Street Level (ft)                          | 10.00                   |
| Inflow Hydrograph Peak to Average Flow Ratio                                    | 3.8                     |
| 5 - Minimum Allowable Scour Depth Below Outlet Invert (ft)                      | 1.0                     |
| Maximum Flow to In-Line Sump (cfs)  | N/A - Click to Activate |
| 6 - Diameter of Orifice that Controls Flow to In-Line Sump (ft)                 | 2.00                    |
| 7 - Inflow Orifice Invert Elevation (ft)  | 5.00                    |
| 8 - Length (ft) of Overflow Structure Acting as a Sharp-Crested Weir            | 0.00                    |
| 9 - Elevation of Overflow Structure to Bypass In-Line Sump (ft above sump base) | 0.00                    |

**Or Use Proprietary Hydrodynamic Control Device Information**

Manufacturer - Model

|   |  |
|---|--|
| 1 - Average Sump Depth below Device Outlet Invert (ft)        |  |
| Depth of Sediment in Device at Beginning of Study Period (ft) |  |
| 2 - Typical Outlet Pipe Diameter (ft)                         |  |
| Typical Outlet Pipe Manning's n                               |  |
| 3 - Typical Outlet Pipe Slope (ft/ft)                         |  |
| Inflow Hydrograph Peak to Average Flow Ratio                  |  |
| 5 - Minimum Allowable Scour Depth Below Outlet Invert (ft)    |  |
| Device Sump Surface Area (sf)                                 |  |

Copy Hydrodynamic Device Data | Paste Hydrodynamic Device Data

**To Delete This Practice, Right Mouse Click on Icon and Select Delete**

Save or Delete Hydrodynamic Device Data to Database File | Get Hydrodynamic Device Data From Database File

Cancel | Continue

Control Practice #: 1 | CP Index #: 1

The following screen shows the Contech StormFilter media unit used at the site:

Stormwater Management StormFilter(R) (by Contech)

**Drainage System Control Practice**

Media Type: **SPG**

Cartridge Height:  12 inches  18 inches  27 inches

Cartridge Specific Flow Rate:  1 gpm/sf  2 gpm/sf

Head Difference (ft) Between Inlet and Outlet Inverts (Minimum Difference = 2.3')

Bypass Structure Location:  
 Online - Within cartridge chamber  
 Offline - Upstream of cartridge chamber

Activate Upstream Storage Gallery

Volume Based Chamber Size  
 Runoff Depth (in)   
 Storage Chamber Depth (ft)

Pipe Storage  
 Storage Pipe Diameter (ft)   
 Storage Pipe Length (ft)   
 Chamber Sump Depth (ft)

Box Storage  
 Chamber Footprint Area (sf)   
 Chamber Depth (ft)   
 Chamber Sump Depth (ft)

Solve for Given Conditions  
 Number of Cartridges: 23 | Chamber Dimensions = 8' x 14'

OR

Solve Iteratively for Desired Percent Reduction or Effluent Concentration

Treatment Goal - Percent TSS (0.45-75 um) Removed   
 Treatment Goal - Percent SSC (>0.45 um) Removed   
 Treatment Goal - Effluent TSS Concentration (mg/L)   
 Treatment Goal - Effluent SSC Concentration (mg/L)

Have Model Determine Cleaning/Replacement Frequency

Copy Media Filter Data | Paste Media Filter Data

Save or Delete StormFilter Data to Database File | Get StormFilter Data From Database File

**To Delete This Practice, Right Mouse Click on Icon and Select Delete**

Cancel | Continue

Cartridge Flow Rate = 15.00 gpm | Internal Overflow Weir Height = 4.50 ft. | Tank Height = 5.5 ft.

Not To Scale

Control Practice #: 2 | CP Index #: 2 | Upstream Drainage Area



The model used the Bremerton rain file that includes 522 rains from 01/01/2009 to 04/29/2013, ranging from 0.01 to 6.61 inches, with an average of 0.46 inches. The following table summarizes the model calculated influent and effluent concentrations. In addition, the calculated weighted Rv was 0.79. Rains close to the monitored events had Rv values of about 0.65, higher than the observed Rv of about 0.5 to 0.55. This difference is likely associated with drainage area errors associated with the crude measurement of the drainage area from the aerial photographs and drainage system map.

|                     | influent        | After hydrodynamic separator | After StormFilter |
|---------------------|-----------------|------------------------------|-------------------|
| TSS (mg/L)          | 84 (70 – 219)   | 39 (15 – 103)                | 15 (1 – 33)       |
| Cu, total (µg/L)    | 41 (40 – 48)    | 40 (39 – 46)                 | 26 (2 – 30)       |
| Cu, filtered (µg/L) | 38 (38 – 45)    | 38 (38 – 45)                 | 25 (2 – 29)       |
| Pb, total (µg/L)    | 1.7 (0 – 14)    | 0.8 (0 – 6.8)                | 0.4 (0 – 2.3)     |
| Pb, filtered (µg/L) | 0.2 (0 – 0.2)   | 0.2 (0 – 0.2)                | 0.2 (0 – 0.2)     |
| Zn, total (µg/L)    | 150 (127 – 178) | 115 (130 – 130)              | 79 (4 – 88)       |
| Zn, filtered (µg/L) | 86 (63 – 88)    | 86 (63 – 88)                 | 67 (3.5 – 71)     |

The predicted TSS and total Cu and Zn influent concentrations are greater than the average SERDP monitored value, but the predicted effluent values are close to the observed values. The filtered Cu and Zn observed average values are the close to the predicted influent and effluent values.

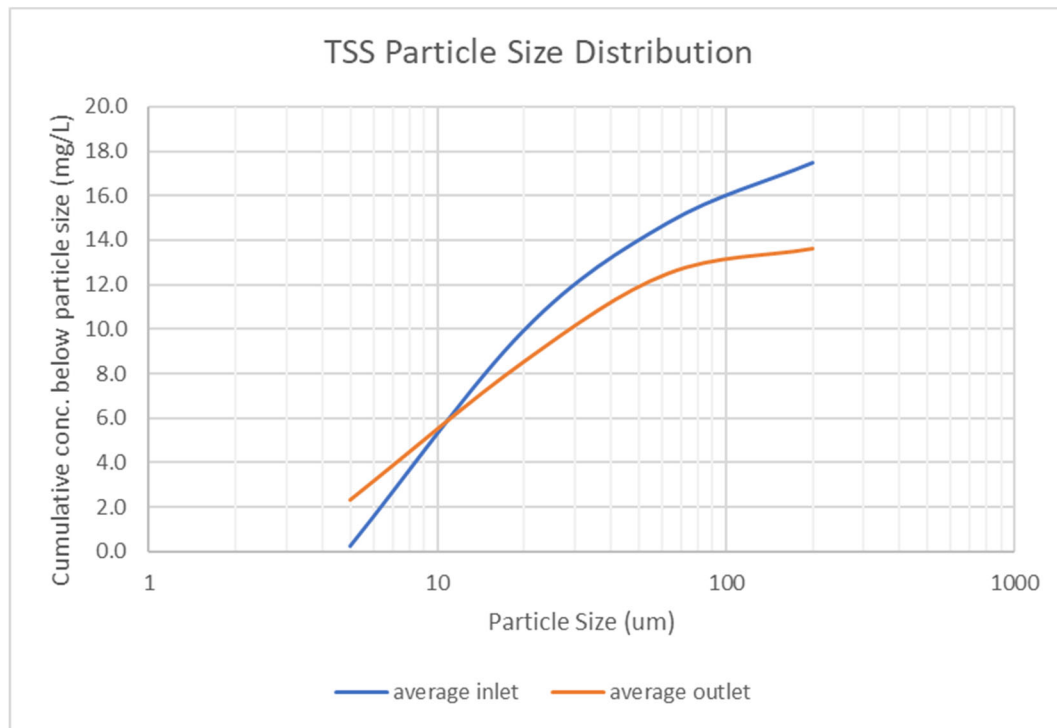
## Appendix A: TSS and Heavy Metal Stormwater Monitoring Results at RMTS

TSS and Metal Stormwater Monitoring Results Overall and by Particle Size

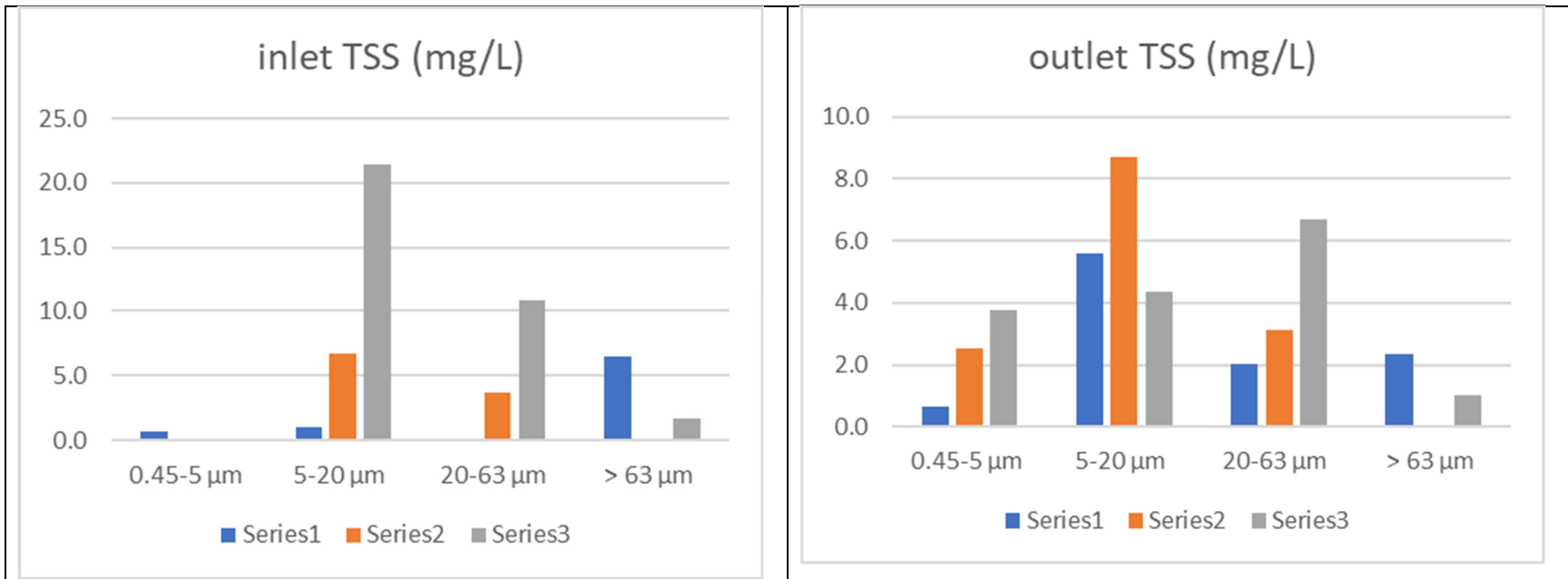
|                                  | TSS mg/L | Cr µg/L | Mn µg/L | Ni µg/L | Cu µg/L | Zn µg/L | As µg/L | Cd µg/L | Pb µg/L | Hg ng/L |
|----------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>avg inlet total</b>           | 17.5     | 6.64    | 19.7    | 13.6    | 90.1    | 190     | 1.12    | 2.45    | 5.23    | 7.49    |
| <b>COV inlet total</b>           | 0.82     | 0.72    | 0.21    | 0.50    | 0.53    | 0.68    | 0.37    | 0.61    | 0.76    | 0.28    |
| <b>count inlet total</b>         | 3        | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       |
|                                  |          |         |         |         |         |         |         |         |         |         |
| <b>avg outlet total</b>          | 13.6     | 6.12    | 50.6    | 16.8    | 101     | 260     | 1.08    | 2.66    | 4.37    | 6.52    |
| <b>COV outlet total</b>          | 0.20     | 0.22    | 0.18    | 0.19    | 0.17    | 0.19    | 0.29    | 0.42    | 0.30    | 0.46    |
| <b>count outlet total</b>        | 3        | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       |
|                                  |          |         |         |         |         |         |         |         |         |         |
| <b>% part influent</b>           | 100.0    | 56.7    | 34.6    | 41.3    | 58.0    | 59.3    | 20.1    | 52.0    | 54.7    | 46.2    |
| <b>% part effluent</b>           | 100.0    | 34.1    | 36.0    | 22.6    | 44.5    | 51.9    | 19.1    | 31.5    | 46.6    | 63.0    |
|                                  |          |         |         |         |         |         |         |         |         |         |
| <b>influent avg</b>              |          |         |         |         |         |         |         |         |         |         |
| <b>Particulate (&gt;0.45 µm)</b> | 17.5     | 3.76    | 6.81    | 5.61    | 52.25   | 113     | 0.23    | 1.27    | 2.86    | 3.46    |
| <b>&lt;0.45 µm</b>               | nd       | 2.88    | 12.9    | 7.97    | 37.8    | 77.4    | 0.89    | 1.17    | 2.37    | 4.03    |
| <b>0.45-5 µm</b>                 | 0.7      | 0.13    | 0.66    | 0.12    | 4.15    | 18.3    | 0.09    | 0.15    | nd      | 0.30    |
| <b>5-20 µm</b>                   | 9.7      | 1.33    | 2.19    | 3.55    | 28.4    | 53.8    | 0.16    | 0.52    | 3.76    | 1.95    |
| <b>20-63 µm</b>                  | 7.3      | 1.32    | 3.32    | 1.93    | 47.6    | 18.9    | 0.19    | 0.45    | 1.38    | 1.14    |
| <b>&gt; 63 µm</b>                | 4.1      | 0.98    | 4.81    | 1.22    | 15.7    | 28.0    | nd      | 0.37    | 2.00    | 0.83    |
|                                  |          |         |         |         |         |         |         |         |         |         |
| <b>effluent avg</b>              |          |         |         |         |         |         |         |         |         |         |
| <b>Particulate (&gt;0.45 µm)</b> | 13.6     | 2.09    | 18.2    | 3.81    | 44.8    | 135     | 0.21    | 0.84    | 2.03    | 4.11    |
| <b>&lt;0.45 µm</b>               | nd       | 4.04    | 32.3    | 13.0    | 56.0    | 125     | 0.87    | 1.82    | 2.33    | 2.41    |
| <b>0.45-5 µm</b>                 | 2.3      | 0.46    | 1.35    | 0.26    | 28.7    | 20.4    | 0.02    | nd      | nd      | 0.47    |
| <b>5-20 µm</b>                   | 6.2      | 0.87    | 5.98    | 2.00    | 9.38    | 15.2    | 0.13    | 0.27    | 0.91    | 1.97    |
| <b>20-63 µm</b>                  | 4.0      | 0.48    | 4.90    | 1.13    | nd      | 35.0    | 0.10    | 0.26    | 1.00    | 1.12    |
| <b>&gt; 63 µm</b>                | 1.7      | 0.71    | 6.44    | 0.59    | 58.4    | 76.1    | 0.05    | 0.31    | 0.15    | 0.83    |

### TSS and Metal Reductions by Particle Size

| % reduction                      | TSS    | Cr     | Mn     | Ni     | Cu     | Zn     | As   | Cd    | Pb   | Hg    |
|----------------------------------|--------|--------|--------|--------|--------|--------|------|-------|------|-------|
| <b>Particulate (&gt;0.45 µm)</b> | 22.0   | 44.6   | -167.6 | 32.0   | 14.2   | -19.4  | 8.2  | 34.3  | 28.8 | -18.5 |
| <b>&lt;0.45 µm</b>               | n/a    | -40.3  | -151.5 | -63.3  | -48.2  | -61.4  | 2.0  | -55.4 | 1.7  | 40.2  |
| <b>0.45-5 µm</b>                 | -238.2 | -258.5 | -104.5 | -106.8 | -590.6 | -11.6  | 80.6 | n/a   | n/a  | -55.5 |
| <b>5-20 µm</b>                   | 35.9   | 34.5   | -173.3 | 43.6   | 66.9   | 71.8   | 16.1 | 48.2  | 75.7 | -0.8  |
| <b>20-63 µm</b>                  | 45.3   | 63.4   | -47.5  | 41.6   | n/a    | -85.6  | 48.3 | 42.3  | 27.4 | 1.6   |
| <b>&gt; 63 µm</b>                | 58.7   | 27.2   | -34.1  | 51.6   | -271.7 | -171.2 | n/a  | 17.0  | 92.6 | -0.8  |

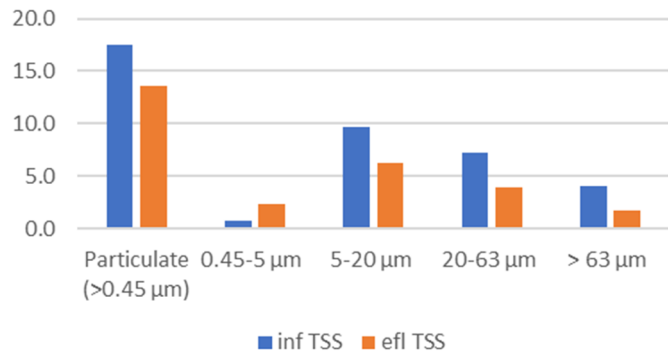


Average Particulate Solids Particle Size Distributions for Inlet and Outlet Samples

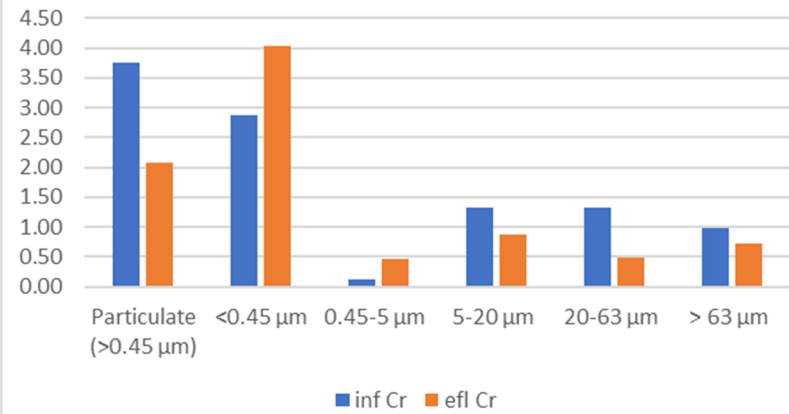


Particulate Solids Inlet and Outlet Concentrations by Particle Size for Three Monitored Events

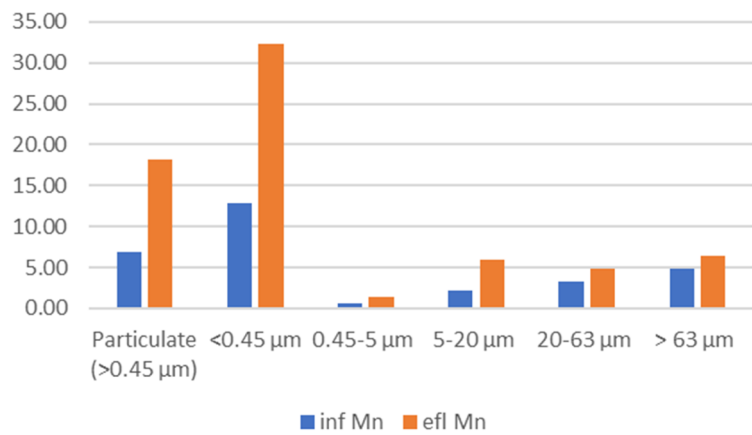
influent and effluent TSS (mg/L)



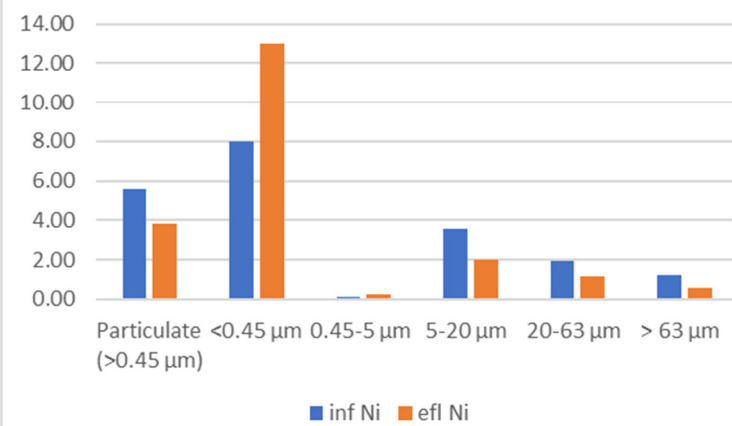
influent and effluent Cr (ug/L)



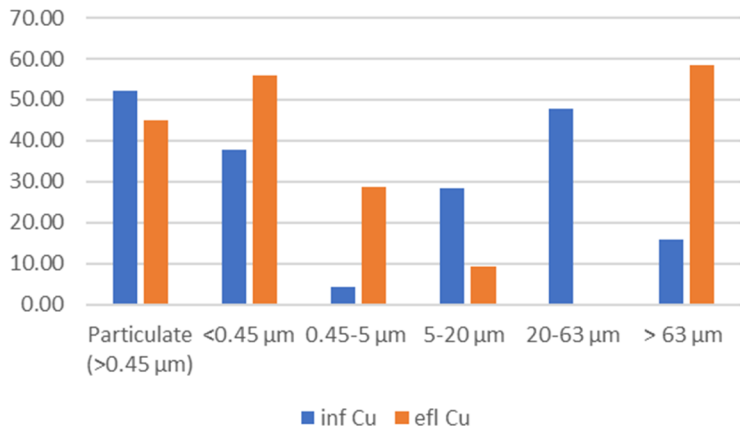
influent and effluent Mn (ug/L)



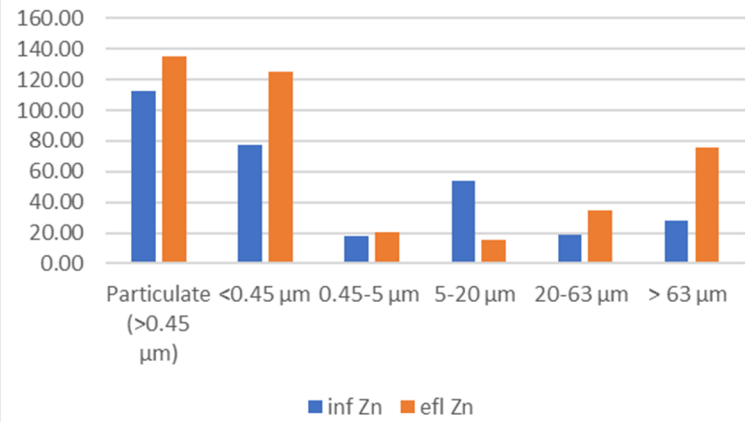
influent and effluent Ni (ug/L)



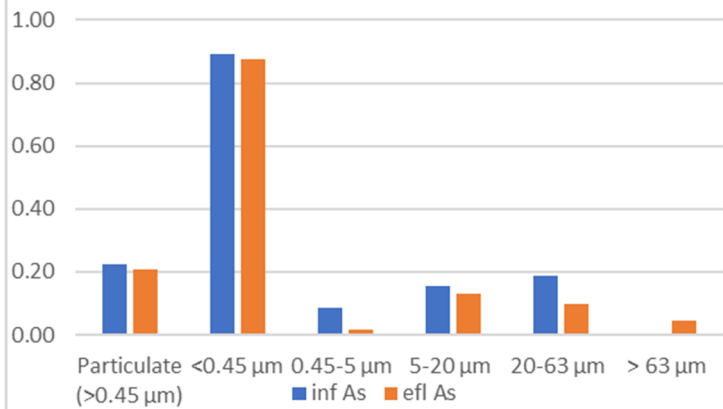
influent and effluent Cu (ug/L)



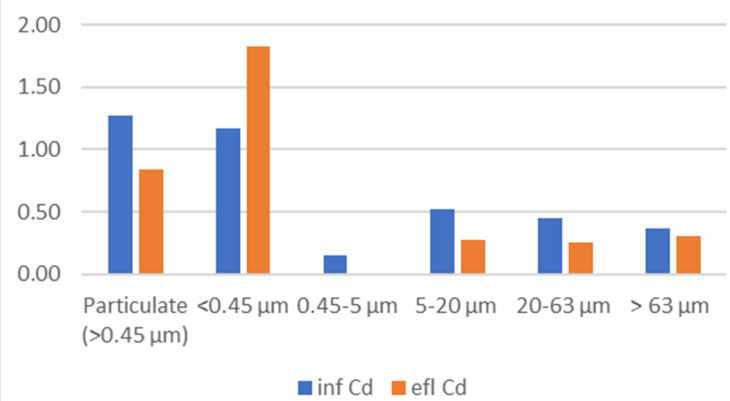
influent and effluent Zn (ug/L)



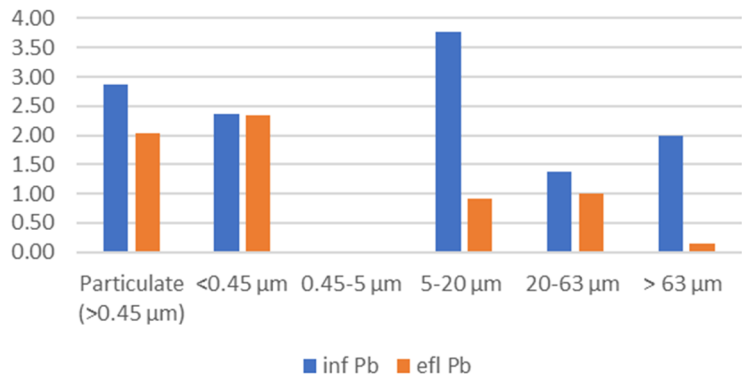
influent and effluent As (ug/L)



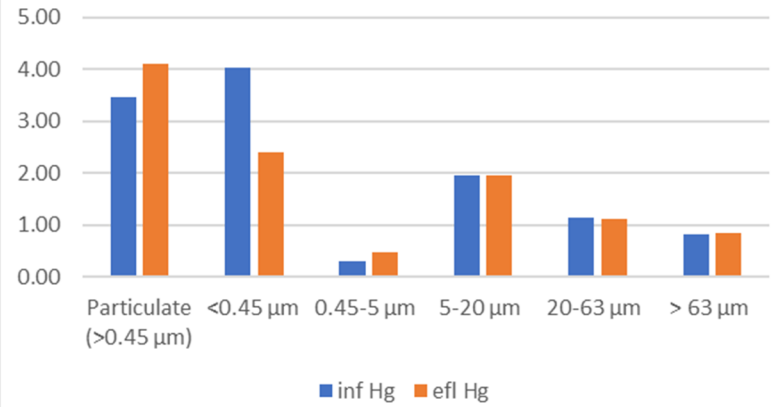
influent and effluent Cd (ug/L)



influent and effluent Pb (ug/L)



influent and effluent Hg (ng/L)



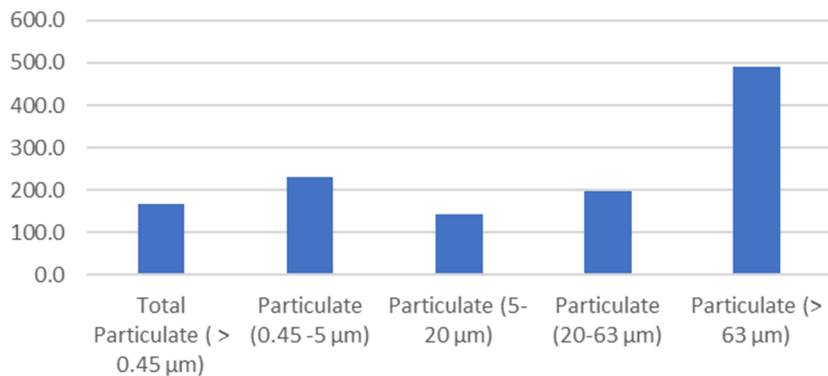
Average Inlet and Effluent Concentrations by Particle Size

### Heavy Metal Particulate Strengths by Particle Size and Overall

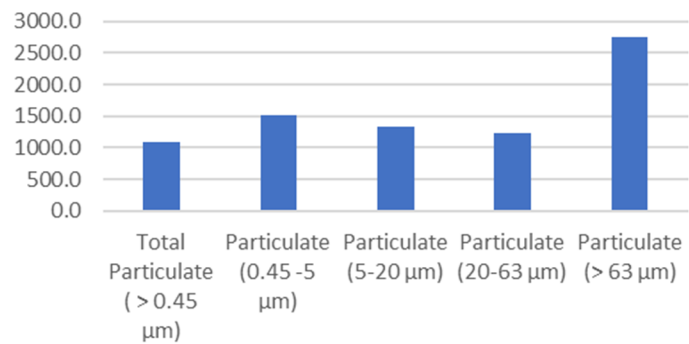
| <b>average part strength (mg/kg, except for Hg ug/kg):</b>                     | <b>Cr</b> | <b>Mn</b> | <b>Ni</b> | <b>Cu</b> | <b>Zn</b> | <b>As</b> | <b>Cd</b> | <b>Pb</b> | <b>Hg</b> |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Total Particulate ( > 0.45 µm)   | 167       | 1,091     | 277       | 3,205     | 8,767     | 14.1      | 81        | 116       | 266       |
| Particulate (0.45 -5 µm)   | 231       | 1,517     | 135       | 31,696    | 24,277    | 6.6       | 412       |           | 550       |
| Particulate (5-20 µm)  | 142       | 1,325     | 596       | 8,396     | 14,239    | 14.7      | 81        | 169       | 268       |
| Particulate (20-63 µm)   | 196       | 1,234     | 315       | 4,398     | 8,053     | 23.3      | 61        | 214       | 270       |
| Particulate (> 63 µm)  | 490       | 2,756     | 533       | 9,613     | 18,503    | 9.9       | 179       | 641       |           |
|  |           |           |           |           |           |           |           |           |           |
| <b>COV part strength:</b>  |           |           |           |           |           |           |           |           |           |
| Total Particulate ( > 0.45 µm)   | 0.48      | 0.74      | 0.26      | 0.66      | 0.53      | 0.75      | 0.83      | 0.86      | 0.42      |
| Particulate (0.45 -5 µm)   | 0.20      | 1.36      | 1.63      | 1.05      | 1.14      |           |           |           | 1.52      |
| Particulate (5-20 µm)  | 0.50      | 0.50      | 1.00      | 1.78      | 1.86      | 0.76      | 1.40      | 0.84      | 0.63      |
| Particulate (20-63 µm)   | 0.64      | 0.23      | 0.18      |           | 0.52      | 0.47      | 0.27      | 0.53      | 0.99      |
| Particulate (> 63 µm)  | 1.18      | 0.67      | 1.48      |           | 0.52      | 1.41      | 0.58      | 1.28      |           |
|  |           |           |           |           |           |           |           |           |           |
| <b>count part strength:</b>  |           |           |           |           |           |           |           |           |           |
| Total Particulate ( > 0.45 µm)   | 6         | 6         | 6         | 6         | 6         | 6         | 6         | 6         | 6         |
| Particulate (0.45 -5 µm)   | 2         | 3         | 3         | 2         | 2         | 1         | 1         | 0         | 3         |
| Particulate (5-20 µm)  | 5         | 4         | 5         | 5         | 5         | 5         | 6         | 4         | 5         |
| Particulate (20-63 µm)   | 5         | 4         | 5         | 1         | 5         | 4         | 5         | 5         | 5         |
| Particulate (> 63 µm)  | 4         | 3         | 4         | 1         | 4         | 2         | 4         | 2         | 3         |
|  |           |           |           |           |           |           |           |           |           |
| <b>Normalized ratios of part strengths to total part. particulate strength</b> |           |           |           |           |           |           |           |           |           |
| Particulate (0.45 -5 µm)   | 0.87      | 0.89      | 0.87      | 2.34      | 1.49      | 0.48      | 2.25      | 0.80      | 1.62      |
| Particulate (5-20 µm)  | 0.54      | 0.78      | 0.54      | 0.62      | 0.88      | 1.08      | 0.44      | 0.53      | 0.79      |
| Particulate (20-63 µm)   | 0.74      | 0.72      | 0.74      | 0.33      | 0.50      | 1.71      | 0.33      | 0.67      | 0.80      |
| Particulate (> 63 µm)  | 1.85      | 1.61      | 1.85      | 0.71      | 1.14      | 0.72      | 0.98      | 2.00      | 0.80      |
|  |           |           |           |           |           |           |           |           |           |
| <b>COV of ratio of part strength of size to total part:</b>                    |           |           |           |           |           |           |           |           |           |
| Particulate (0.45 -5 µm)   | 0.20      | 1.26      |           | 1.05      | 1.14      |           |           |           | 1.52      |
| Particulate (5-20 µm)  | 0.94      | 1.86      | 0.92      | 1.09      | 1.81      | 0.45      | 1.17      | 0.90      | 0.58      |
| Particulate (20-63 µm)   | 0.99      | 1.63      | 0.13      | 0.00      | 0.61      | 0.40      | 0.30      | 0.60      | 0.95      |
| Particulate (> 63 µm)  | 0.19      | 1.25      | 1.16      | 1.41      | 0.54      | 1.41      | 0.58      | 1.24      | 1.26      |
|  |           |           |           |           |           |           |           |           |           |
| <b>count of ratio of part strength of size to total part:</b>                  |           |           |           |           |           |           |           |           |           |
| Particulate (0.45 -5 µm)   | 2         | 3         | 1         | 2         | 2         | 1         | 1         | 0         | 3         |
| Particulate (5-20 µm)  | 5         | 4         | 5         | 5         | 5         | 4         | 5         | 4         | 5         |
| Particulate (20-63 µm)   | 5         | 4         | 5         | 1         | 5         | 4         | 5         | 5         | 5         |
| Particulate (> 63 µm)  | 3         | 3         | 3         | 2         | 4         | 2         | 4         | 2         | 3         |



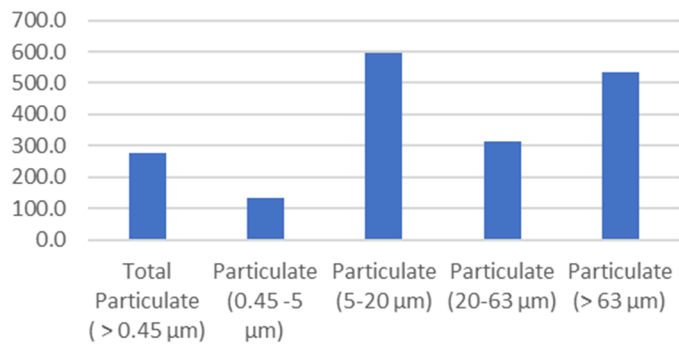
Cr (mg/kg)



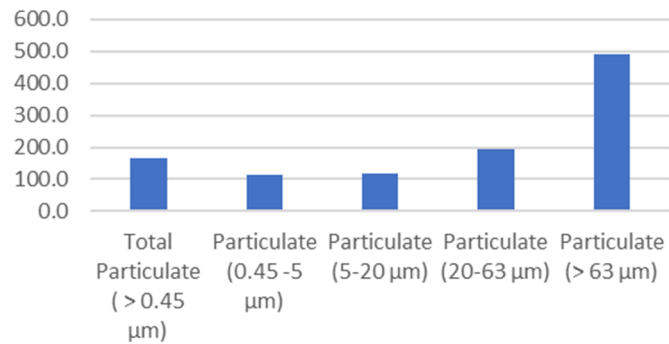
Mn (mg/kg)



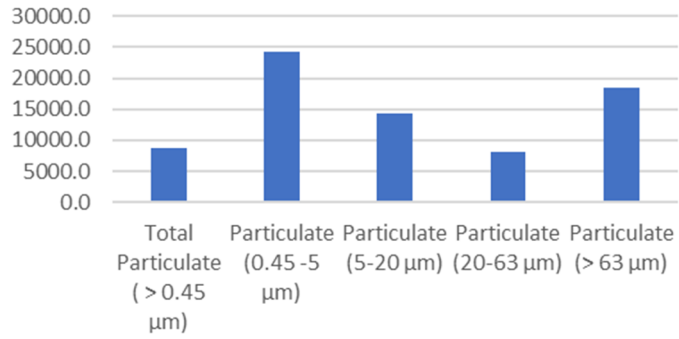
Ni (mg/kg)



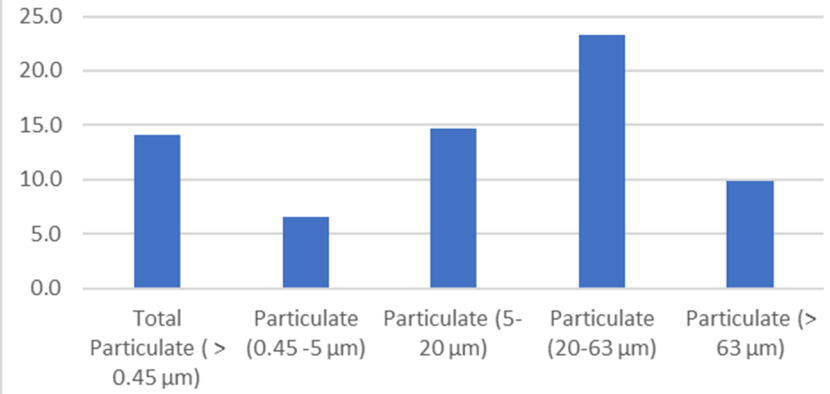
Cu (mg/kg)



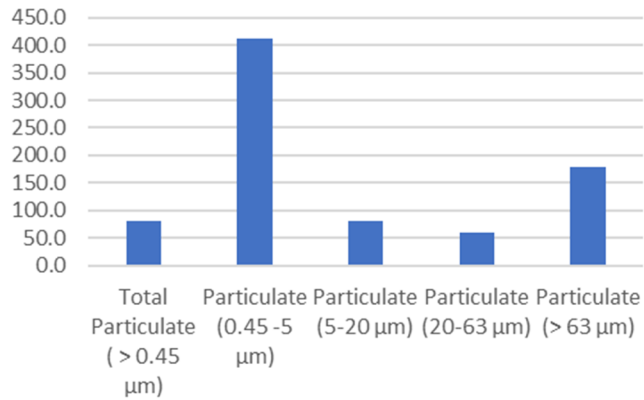
### Zn (mg/kg)



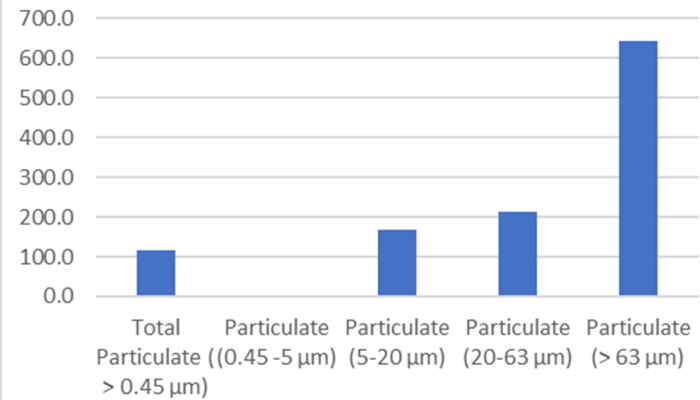
### As (mg/kg)

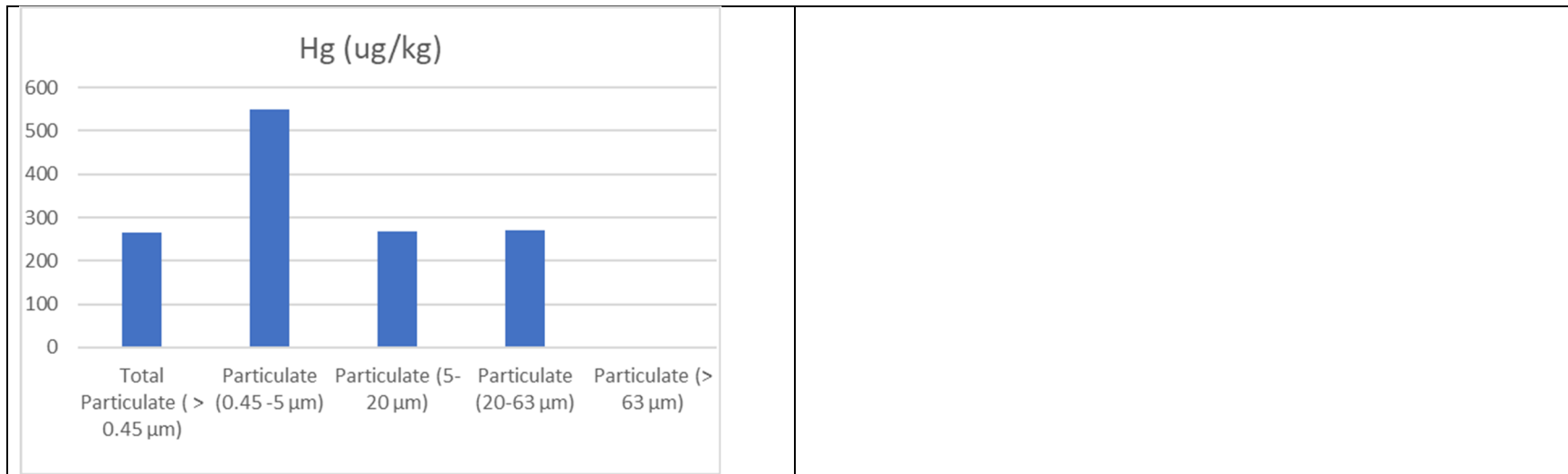


### Cd (mg/kg)



### Pb (mg/kg)





Metal Particulate Strengths for Different Particle Sizes

## Appendix B: PAH Stormwater Monitoring Results at RMTS

### PAH Stormwater Monitoring Results

|  | Naphthalene | 2 – methyl-naphthalene | 1 – methyl-naphthalene | 2 – ethyl-naphthalene | 1 – ethyl-naphthalene | 2,6 – dimethyl-naphthalene | 1,3 – dimethyl-naphthalene |
|--|-------------|------------------------|------------------------|-----------------------|-----------------------|----------------------------|----------------------------|
| avg inlet Filtered (<0.7µm)                          | 7.52        | 6.430                  | 3.262                  | 0.881                 | 0.147                 | 1.655                      | 1.434                      |
| COV inlet filtered                                   | 0.11        | 0.64                   | 0.72                   | 0.23                  | 0.23                  | 0.61                       | 0.56                       |
| number of obs inlet filtered                         | 3           | 3                      | 3                      | 3                     | 3                     | 3                          | 3                          |
| avg inlet Total Particulate (>0.7 µm)                | 3.40        | 0.085                  | 0.000                  | 0.174                 | 0.024                 | 0.156                      | 0.127                      |
| COV inlet part                                       | 1.69        | 1.73                   |                        | 0.80                  | 1.11                  | 1.45                       | 1.56                       |
| number of obs inlet part                             | 3           | 3                      | 3                      | 3                     | 3                     | 3                          | 3                          |
| average outlet Filtered (<0.7µm)                     | 23.7        | 12.331                 | 5.482                  | 2.118                 | 0.280                 | 3.315                      | 2.584                      |
| COV outlet filtered                                  | 1.33        | 1.11                   | 1.20                   | 0.97                  | 1.05                  | 0.70                       | 0.84                       |
| number of obs outlet filtered                        | 3           | 3                      | 3                      | 3                     | 3                     | 3                          | 3                          |
| average outlet Total Particulate (>0.7 µm)           | 0.37        | 0.407                  | 0.154                  | 0.043                 | 0.004                 | 0.127                      | 0.071                      |
| COV outlet part                                      | 1.73        | 1.73                   | 1.73                   | 1.73                  | 1.73                  | 1.73                       | 1.73                       |
| number of obs outlet part                            | 3           | 3                      | 3                      | 3                     | 3                     | 3                          | 3                          |
| Filtered concentration reductions (<0.7µm)           | -215.2      | -91.8                  | -68.0                  | -140.5                | -90.0                 | -100.2                     | -80.2                      |
| Total Particulate concentration reductions (>0.7 µm) | 89.0        | -376.1                 |                        | 75.5                  | 82.7                  | 18.6                       | 44.3                       |
| % filtered inlet                                     | 68.8        | 98.7                   | 100.0                  | 83.5                  | 86.2                  | 91.4                       | 91.9                       |
| % filtered outlet                                    | 98.4        | 96.8                   | 97.3                   | 98.0                  | 98.6                  | 96.3                       | 97.3                       |
| average particulate strength mg/kg                   | 0.55        | 0.067                  |                        | 0.009                 | 0.002                 | 0.042                      | 0.036                      |
| COV particulate strength                             | 1.16        | 0.88                   |                        | 0.11                  |                       |                            |                            |
| number of particulate strength observations          | 3           | 3                      |                        | 2                     | 1                     | 1                          | 1                          |

PAH Stormwater Monitoring Results (cont.)

|  | 2 – isopropyl-naphthalene | acenaphthylene | 1.2 – dimethyl-naphthalene | 1.8 – dimethyl-naphthalene | acenaphthene | 2.3.5 – trimethyl-naphthalene | fluorene |
|--|---------------------------|----------------|----------------------------|----------------------------|--------------|-------------------------------|----------|
| avg inlet Filtered (<0.7µm)                          | 0.036                     | 0.149          | 0.283                      | 0.390                      | 0.666        | 0.648                         | 2.696    |
| COV inlet filtered                                   | 0.50                      | 0.32           | 1.14                       | 1.69                       | 0.16         | 0.32                          | 0.26     |
| number of obs inlet filtered                         | 3                         | 3              | 3                          | 3                          | 3            | 3                             | 3        |
| avg inlet Total Particulate (>0.7 µm)                | 0.007                     | 0.060          | 0.296                      | 0.012                      | 0.264        | 0.200                         | 0.610    |
| COV inlet part                                       | 1.11                      | 0.90           | 1.26                       | 1.73                       | 1.45         | 0.89                          | 0.90     |
| number of obs inlet part                             | 3                         | 3              | 3                          | 3                          | 3            | 3                             | 3        |
| average outlet Filtered (<0.7µm)                     | 0.095                     | 0.536          | 0.392                      | 0.031                      | 2.066        | 1.279                         | 6.407    |
| COV outlet filtered                                  | 0.88                      | 0.98           | 0.44                       | 0.53                       | 1.33         | 0.73                          | 0.75     |
| number of obs outlet filtered                        | 3                         | 3              | 3                          | 3                          | 3            | 3                             | 3        |
| average outlet Total Particulate (>0.7 µm)           | 0.003                     | 0.019          | 0.075                      | 0.000                      | 0.032        | 0.028                         | 0.203    |
| COV outlet part                                      | 1.73                      | 1.73           | 1.15                       | 1.73                       | 1.73         | 1.73                          | 1.73     |
| number of obs outlet part                            | 3                         | 3              | 3                          | 3                          | 3            | 3                             | 3        |
| Filtered concentration reductions (<0.7µm)           | -161.2                    | -259.0         | -38.6                      | 92.1                       | -210.4       | -97.4                         | -137.6   |
| Total Particulate concentration reductions (>0.7 µm) | 51.7                      | 69.1           | 74.8                       | 96.2                       | 87.7         | 86.0                          | 66.7     |
| % filtered inlet                                     | 83.7                      | 71.3           | 48.8                       | 97.1                       | 71.6         | 76.4                          | 81.6     |
| % filtered outlet                                    | 96.5                      | 96.7           | 84.0                       | 98.6                       | 98.5         | 97.9                          | 96.9     |
| average particulate strength mg/kg                   |                           | 0.010          | 0.014                      | 0.002                      | 0.070        | 0.026                         | 0.055    |
| COV particulate strength                             |                           |                | 0.59                       | 1.30                       |              |                               | 0.71     |
| number of particulate strength observations          |                           | 1              | 4                          | 3                          | 1            | 1                             | 5        |

## PAH Stormwater Monitoring Results (cont.)

|  | 1 – methyl-fluorene | phenanthrene | anthracene | 2 – methyl-phenanthrene | 2 -methyl-anthracene | 1 – methyl-phenanthrene | 9 – methyl-anthracene |
|--|---------------------|--------------|------------|-------------------------|----------------------|-------------------------|-----------------------|
| avg inlet Filtered (<0.7µm)                          | 1.454               | 10.537       | 0.316      | 2.064                   | 1.719                | 1.192                   | 0.042                 |
| COV inlet filtered                                   | 0.59                | 0.26         | 0.09       | 0.63                    | 1.64                 | 0.93                    | 0.49                  |
| number of obs inlet filtered                         | 3                   | 3            | 3          | 3                       | 3                    | 3                       | 3                     |
| avg inlet Total Particulate (>0.7 µm)                | 0.166               | 5.521        | 0.624      | 2.305                   | 1.484                | 1.134                   | 0.036                 |
| COV inlet part                                       | 0.21                | 0.32         | 1.13       | 0.53                    | 1.36                 | 0.49                    | 0.34                  |
| number of obs inlet part                             | 3                   | 3            | 3          | 3                       | 3                    | 3                       | 3                     |
| average outlet Filtered (<0.7µm)                     | 2.490               | 23.828       | 0.452      | 3.539                   | 1.060                | 1.446                   | 0.060                 |
| COV outlet filtered                                  | 0.80                | 0.82         | 0.93       | 0.66                    | 1.46                 | 0.64                    | 0.78                  |
| number of obs outlet filtered                        | 3                   | 3            | 3          | 3                       | 3                    | 3                       | 3                     |
| average outlet Total Particulate (>0.7 µm)           | 0.060               | 1.142        | 0.219      | 0.603                   | 0.619                | 0.314                   | 0.013                 |
| COV outlet part                                      | 1.73                | 1.73         | 0.96       | 0.99                    | 1.45                 | 1.04                    | 1.73                  |
| number of obs outlet part                            | 3                   | 3            | 3          | 3                       | 3                    | 3                       | 3                     |
| Filtered concentration reductions (<0.7µm)           | -71.3               | -126.1       | -43.1      | -71.5                   | 38.3                 | -21.3                   | -43.6                 |
| Total Particulate concentration reductions (>0.7 µm) | 63.9                | 79.3         | 64.9       | 73.8                    | 58.3                 | 72.3                    | 64.3                  |
| % filtered inlet                                     | 89.7                | 65.6         | 33.6       | 47.2                    | 53.7                 | 51.2                    | 53.5                  |
| % filtered outlet                                    | 97.6                | 95.4         | 67.3       | 85.4                    | 63.1                 | 82.2                    | 82.2                  |
| average particulate strength mg/kg                   | 0.013               | 0.34         | 0.033      | 0.13                    | 0.098                | 0.069                   | 0.002                 |
| COV particulate strength                             | 0.90                | 0.27         | 0.43       | 0.49                    | 1.37                 | 0.56                    | 0.68                  |
| number of particulate strength observations          | 2                   | 5            | 2          | 5                       | 6                    | 5                       | 2                     |

## PAH Stormwater Monitoring Results (cont.)

|  | 2-ethylanthracene | fluoranthene | pyrene | 9.10 - dimethylanthracene | 2 - tertbutylanthracene | 1 - methylpyrene | Benz (a) anthracene |
|--|-------------------|--------------|--------|---------------------------|-------------------------|------------------|---------------------|
| avg inlet Filtered (<0.7µm)                          | 0.635             | 3.267        | 2.177  | 0.117                     | 0.079                   | 0.042            | 0.150               |
| COV inlet filtered                                   | 0.70              | 0.22         | 0.98   | 0.40                      | 1.07                    | 0.58             | 0.96                |
| number of obs inlet filtered                         | 3                 | 3            | 3      | 3                         | 3                       | 3                | 3                   |
| avg inlet Total Particulate (>0.7 µm)                | 1.229             | 9.997        | 11.950 | 0.014                     | 0.034                   | 1.184            | 1.884               |
| COV inlet part                                       | 0.66              | 0.66         | 0.72   | 1.26                      | 0.88                    | 0.52             | 0.72                |
| number of obs inlet part                             | 3                 | 3            | 3      | 3                         | 3                       | 3                | 3                   |
| average outlet Filtered (<0.7µm)                     | 0.789             | 5.665        | 2.675  | 0.154                     | 0.078                   | 0.061            | 0.147               |
| COV outlet filtered                                  | 0.68              | 0.97         | 0.42   | 0.66                      | 0.57                    | 0.64             | 0.24                |
| number of obs outlet filtered                        | 3                 | 3            | 3      | 3                         | 3                       | 3                | 3                   |
| average outlet Total Particulate (>0.7 µm)           | 0.294             | 5.956        | 5.393  | 0.005                     | 0.018                   | 0.470            | 0.991               |
| COV outlet part                                      | 1.00              | 0.58         | 0.22   | 1.73                      | 1.73                    | 0.16             | 0.09                |
| number of obs outlet part                            | 3                 | 3            | 3      | 3                         | 3                       | 3                | 3                   |
| Filtered concentration reductions (<0.7µm)           | -24.3             | -73.4        | -22.9  | -32.0                     | 1.1                     | -45.7            | 1.9                 |
| Total Particulate concentration reductions (>0.7 µm) | 76.1              | 40.4         | 54.9   | 65.1                      | 47.0                    | 60.3             | 47.4                |
| % filtered inlet                                     | 34.1              | 24.6         | 15.4   | 89.6                      | 69.8                    | 3.4              | 7.4                 |
| % filtered outlet                                    | 72.9              | 48.7         | 33.2   | 97.0                      | 81.2                    | 11.5             | 12.9                |
| average particulate strength mg/kg                   | 0.060             | 0.57         | 0.59   |                           |                         | 0.061            | 0.096               |
| COV particulate strength                             | 0.80              | 0.47         | 0.34   |                           |                         | 0.29             | 0.09                |
| number of particulate strength observations          | 5                 | 6            | 6      |                           |                         | 5                | 6                   |

## PAH Stormwater Monitoring Results (cont.)

|  | chrysene | Benzo (b)<br>fluoranthene | 7.12-<br>methylbenz (a)<br>anthracene | Benzo (k)<br>fluoranthene | Benzo (e)<br>pyrene | Benzo (a)<br>pyrene | perylene |
|--|----------|---------------------------|---------------------------------------|---------------------------|---------------------|---------------------|----------|
| avg inlet Filtered (<0.7µm)                          | 0.586    | 0.198                     | 0.063                                 | 0.166                     | 0.178               | 0.103               | 0.101    |
| COV inlet filtered                                   | 0.65     | 0.45                      | 0.27                                  | 0.28                      | 0.56                | 0.41                | 0.43     |
| number of obs inlet filtered                         | 3        | 3                         | 3                                     | 3                         | 3                   | 3                   | 3        |
| avg inlet Total Particulate (>0.7 µm)                | 6.425    | 3.248                     | 0.247                                 | 2.400                     | 3.806               | 2.011               | 0.256    |
| COV inlet part                                       | 0.57     | 0.64                      | 1.19                                  | 0.74                      | 0.59                | 1.13                | 1.38     |
| number of obs inlet part                             | 3        | 3                         | 3                                     | 3                         | 3                   | 3                   | 3        |
| average outlet Filtered (<0.7µm)                     | 0.626    | 0.308                     | 0.082                                 | 0.266                     | 0.273               | 0.222               | 0.137    |
| COV outlet filtered                                  | 0.31     | 0.62                      | 0.48                                  | 0.67                      | 0.54                | 0.83                | 1.03     |
| number of obs outlet filtered                        | 3        | 3                         | 3                                     | 3                         | 3                   | 3                   | 3        |
| average outlet Total Particulate (>0.7 µm)           | 3.856    | 2.113                     | 0.142                                 | 1.517                     | 2.175               | 0.567               | 0.032    |
| COV outlet part                                      | 0.31     | 0.28                      | 1.70                                  | 0.37                      | 0.24                | 0.61                | 1.04     |
| number of obs outlet part                            | 3        | 3                         | 3                                     | 3                         | 3                   | 3                   | 3        |
| Filtered concentration reductions (<0.7µm)           | -6.8     | -55.6                     | -29.9                                 | -59.9                     | -53.3               | -115.2              | -34.9    |
| Total Particulate concentration reductions (>0.7 µm) | 40.0     | 34.9                      | 42.5                                  | 36.8                      | 42.8                | 71.8                | 87.3     |
| % filtered inlet                                     | 8.4      | 5.8                       | 20.4                                  | 6.5                       | 4.5                 | 4.9                 | 28.4     |
| % filtered outlet                                    | 14.0     | 12.7                      | 36.8                                  | 14.9                      | 11.1                | 28.1                | 80.8     |
| average particulate strength mg/kg                   | 0.38     | 0.19                      | 0.003                                 | 0.13                      | 0.21                | 0.11                | 0.014    |
| COV particulate strength                             | 0.26     | 0.27                      | 1.02                                  | 0.31                      | 0.21                | 0.26                | 0.52     |
| number of particulate strength observations          | 6        | 6                         | 3                                     | 6                         | 6                   | 3                   | 2        |



PAH Stormwater Monitoring Results (concluded)

|  | Indeno (123-cd)<br>pyrene | Dibenzo (ah)<br>anthracene | Benzo (ghi)<br>perylene | total PAHs |
|--|---------------------------|----------------------------|-------------------------|------------|
| avg inlet filtered (<0.7µm)                          | 0.205                     | 0.219                      | 0.147                   | 51.953     |
| COV inlet filtered                                   | 0.50                      | 0.32                       | 1.65                    | 0.43       |
| number of obs inlet filtered                         | 3                         | 3                          | 3                       | 3          |
| avg inlet total particulate (>0.7 µm)                | 1.964                     | 0.488                      | 4.688                   | 68.511     |
| COV inlet part                                       | 0.85                      | 0.56                       | 1.12                    | 0.51       |
| number of obs inlet part                             | 3                         | 3                          | 3                       | 3          |
| average outlet filtered (<0.7µm)                     | 0.316                     | 0.262                      | 0.132                   | 105.678    |
| COV outlet filtered                                  | 0.53                      | 0.68                       | 1.69                    | 0.95       |
| number of obs outlet filtered                        | 3                         | 3                          | 3                       | 3          |
| average outlet total particulate (>0.7 µm)           | 1.157                     | 0.319                      | 2.583                   | 32.098     |
| COV outlet part                                      | 0.62                      | 0.39                       | 0.89                    | 0.04       |
| number of obs outlet part                            | 3                         | 3                          | 3                       | 3          |
| Filtered concentration reductions (<0.7µm)           | -54.0                     | -19.4                      | 10.7                    | -103.4     |
| Total Particulate concentration reductions (>0.7 µm) | 41.1                      | 34.7                       | 44.9                    | 53.1       |
| % filtered inlet                                     | 9.5                       | 31.0                       | 3.1                     | 43.1       |
| % filtered outlet                                    | 21.5                      | 45.1                       | 4.9                     | 76.7       |
| average particulate strength mg/kg                   | 0.11                      | 0.034                      | 0.32                    | 3.62       |
| COV particulate strength                             | 0.25                      | 0.26                       | 0.03                    | 0.20       |
| number of particulate strength observations          | 5                         | 3                          | 3                       | 6          |

## Appendix C: PFAS Stormwater Monitoring Results at RMTS

### Monitored Stormwater PFAS Concentrations\*

| inlet ng/L                                 | PFBA  | PFPeA  | PFHxA | PFHpA  | PFOA  | PFNA  |
|--|-------|--------|-------|--------|-------|-------|
| avg inlet <0.7µm (filtered)                | 4.06  | 0.70   | 3.35  | 1.20   | 17.16 | 0.78  |
| COV inlet <0.7 um                          | 0.42  | 0.65   | 0.29  | 0.42   | 0.09  | 0.28  |
| number of observations                     | 3     | 3      | 3     | 3      | 3     | 2     |
| avg inlet Bulk                             | 3.78  | 0.55   | 3.40  | 0.91   | 18.25 | 1.45  |
| COV inlet bulk                             | 0.44  | 0.61   | 0.38  | 0.14   | 0.25  | 0.24  |
| number of observations                     | 3     | 3      | 3     | 3      | 3     | 3     |
| % filtered                                 | 107.4 | 127.1  | 98.6  | 132.3  | 94.0  | 53.5  |
| % particulate                              | -7.4  | -27.1  | 1.4   | -32.3  | 6.0   | 46.5  |
|  |       |        |       |        |       |       |
| outlet ng/L                                |       |        |       |        |       |       |
| avg outlet <0.7µm (filtered)               | 3.75  | 1.39   | 3.12  | 1.22   | 18.55 | 0.71  |
| COV outlet <0.7 um                         | 0.34  | 0.17   | 0.24  | 0.18   | 0.03  | 0.48  |
| number of observations                     | 3     | 3      | 3     | 3      | 3     | 3     |
| avg outlet Bulk                            | 5.22  | 1.77   | 4.98  | 2.29   | 23.24 | 2.05  |
| COV outlet bulk                            | 0.75  | 0.37   | 0.36  | 0.31   | 0.24  | 0.17  |
| number of observations                     | 3     | 3      | 3     | 3      | 3     | 3     |
| % filtered                                 | 72.0  | 78.2   | 62.6  | 53.3   | 79.8  | 34.5  |
| % particulate                              | 28.0  | 21.8   | 37.4  | 46.7   | 20.2  | 65.5  |
|  |       |        |       |        |       |       |
| % concentration reduction                  |       |        |       |        |       |       |
| <0.7µm (filtered)                          | 7.6   | -99.0  | 6.8   | -1.3   | -8.1  | 9.2   |
| Bulk                                       | -37.9 | -223.4 | -46.8 | -151.4 | -27.3 | -40.9 |
|  |       |        |       |        |       |       |
|  |       |        |       |        |       |       |
| average PFAS particulate strengths (mg/kg) | 0.096 | 0.050  | 0.15  | 0.081  | 0.54  | 0.081 |
| COV PFAS particulate strengths             | 1.41  | 0.03   | 0.65  | 0.68   | 0.71  | 0.63  |
| number of observations                     | 2     | 2      | 3     | 3      | 3     | 6     |

Monitored Stormwater PFAS Concentrations (concluded)

| inlet ng/L                                 | PFDA  | PFUdA | PFDoA | PFHxS  | PFOS  | 6:2 FTS |
|--|-------|-------|-------|--------|-------|---------|
| avg inlet <0.7µm (filtered)                | 0.78  |       | 0.41  | 0.72   | 3.90  | 1.68    |
| COV inlet <0.7 um                          | 0.32  |       |       | 1.41   | 0.23  | 0.01    |
| number of observations                     | 3     | 0     | 1     | 2      | 3     | 2       |
| avg inlet Bulk                             | 1.28  |       | 1.26  | 2.34   | 11.14 | 2.42    |
| COV inlet bulk                             | 0.48  |       |       | 1.13   | 0.61  | 0.63    |
| number of observations                     | 3     | 0     | 1     | 3      | 3     | 2       |
| % filtered                                 | 60.9  |       | 32.6  | 30.6   | 35.0  | 69.5    |
| % particulate                              | 39.1  |       | 67.4  | 69.4   | 65.0  | 30.5    |
|  |       |       |       |        |       |         |
| outlet ng/L                                |       |       |       |        |       |         |
| avg outlet <0.7µm (filtered)               | 0.86  |       |       | 1.84   | 4.74  | 2.55    |
| COV outlet <0.7 um                         | 0.20  |       |       | 0.38   | 0.78  | 0.41    |
| number of observations                     | 3     | 0     | 0     | 3      | 3     | 2       |
| avg outlet Bulk                            | 1.61  | 0.57  | 0.40  | 5.39   | 17.73 |         |
| COV outlet bulk                            | 0.25  |       |       | 0.47   | 0.36  |         |
| number of observations                     | 3     | 1     | 3     | 3      | 3     | 0       |
| % filtered                                 | 53.7  |       |       | 34.2   | 26.7  |         |
| % particulate                              | 46.3  |       |       | 65.8   | 73.3  |         |
|  |       |       |       |        |       |         |
| % concentration reduction                  |       |       |       |        |       |         |
| <0.7µm (filtered)                          | -10.7 |       |       | -156.8 | -21.6 | -51.8   |
| Bulk                                       | -25.6 |       | 68.4  | -130.2 | -59.2 |         |
|  |       |       |       |        |       |         |
|  |       |       |       |        |       |         |
| average PFAS particulate strengths (mg/kg) | 0.070 | 0.051 | 0.047 | 0.33   | 0.81  | 0.094   |
| COV PFAS particulate strengths             | 0.60  |       | 0.81  | 0.68   | 0.78  | 0.84    |
| number of observations                     | 5     | 1     | 4     | 4      | 6     | 2       |

\*not detected in any samples: 4:2 FTS, PFBS, PFDS, PFHpS, PFNS, PFOSA, PFPeS, PFTeA, and PFTrA