



Appendix E:

Tool for Evaluating Stormwater Data

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APPENDIX E: **TOOL FOR EVALUATING STORMWATER DATA**

For the sake of readability, the term “stormwater” refers to all types of samples used to create this tool, including stormwater, catch basin sediment and suspended sediment samples.

The following charts were created using contaminant concentration data from stormwater samples collected at Portland Harbor-area industrial sites. They are intended to be used as a screening tool for distinguishing “typical” industrial stormwater from stormwater containing potentially elevated contaminant concentrations. Elevated contaminant concentrations are an indication that contamination may be present at the site and that additional investigation and source control may be needed.

There are two sets of charts – one for water and one for solids. Charts were developed for 12 contaminants and Total Suspended Solids (water only). The contaminants include:

| | | |
|----------------------------|---------|------------|
| Arsenic | Copper | Silver |
| Bis(2-Ethylhexyl)phthalate | Lead | Total PAHs |
| Cadmium | Mercury | Total PCBs |
| Chromium | Nickel | Zinc |

Dioxin-furan congener charts for water were added in 2024.

While the charts can be used to identify samples that “stand out from the crowd” they *do not* provide an indication of the potential for stormwater discharges to result in waterbody impacts. The charts were not developed to support that type of determination.

Section 1: Basis for Using the Charts as a Screening Tool

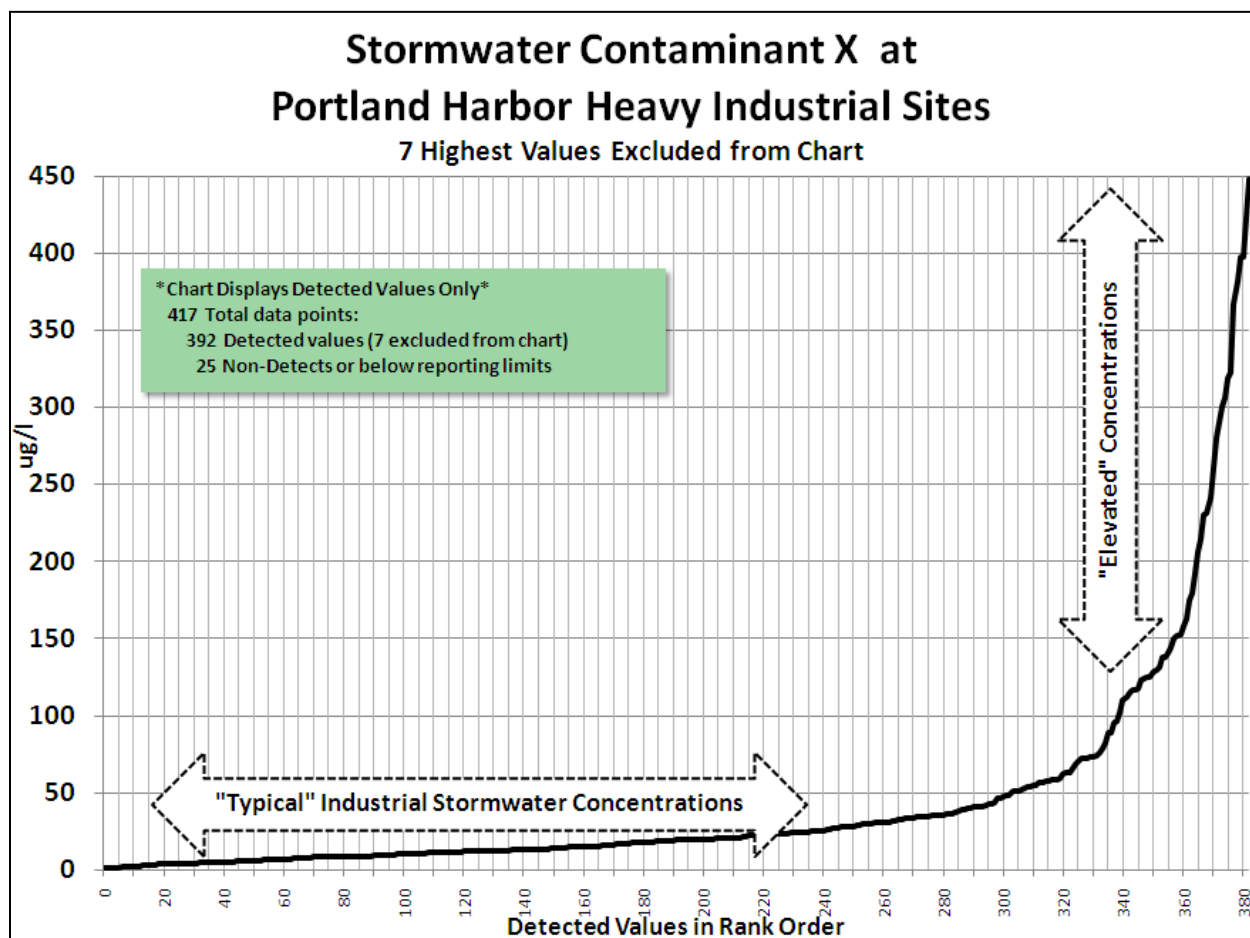
The use of these charts as a screening tool is based on the premise that many kinds of industrial materials and activities have the potential to result in minor releases of contaminants, such as petroleum products in drips of oils, greases and fuels used for vehicles and machinery, phthalates off-gassing from paints and PVC piping, and zinc from galvanized building materials. Off-site sources, including highway traffic, operations at neighboring sites and atmospheric deposition, can also contribute to the contaminant load in stormwater runoff from a site.

As a result, industrial stormwater is likely to contain a somewhat predictable list of contaminants within a predictable concentration range even when good stormwater management practices are being implemented. If contaminant concentrations exceed these ranges, DEQ considers this to be a potential indicator of an uncontrolled source of contaminants at the site.

Due to the highly variable nature of stormwater, interpretations made using these charts should only be considered in the context of other lines of evidence and should not be presumed to provide conclusive evidence of the presence or absence of contamination at a site.

Section 2: Screening Stormwater Data Using the Charts

An example of a typical chart for a stormwater contaminant is provided below. In most charts there is a definitive “knee” in the curve and the majority of data points fall within the relatively flat portion of the curve below the knee. To screen stormwater data from a specific site, determine where the contaminant concentrations fall along the curve on the relevant chart.



The upper and lower bounds of the “knee” are purposefully left undefined on the charts to help avert a misinterpretation of the screening results. Defining these bounds might suggest that the charts were developed with more statistical rigor than was the case, or that the range of typical vs. elevated concentrations is the same for all sites.

Section 3: Interpreting the Results

Stormwater data are one line of evidence to consider when conducting a stormwater pathway evaluation and the charts are a tool for interpreting the data.

- Concentrations falling within the **upper/steeper portion of the curve** are an indication that uncontrolled contaminant sources may be present at the site and additional evaluation and/or source control measures may be warranted. The objective would be to determine the source(s) of the elevated concentrations and based upon that, whether and what types of source control measures are needed.
- Concentrations falling within the **lower/flatter portion of the curve** suggest that stormwater is not being unusually impacted by contaminants at the site and is therefore representative of “typical” industrial stormwater for Portland Harbor sites. However, this interpretation should not be considered to be a conclusive line of evidence. A determination that no additional source control or evaluation is necessary should be corroborated by other lines of evidence.

Section 4: Additional Considerations

The screening results need to be evaluated based upon the characteristics of the site. Some sites can be expected to have higher concentrations of certain types of contaminants simply as a result of the type of operations (e.g., phthalates associated with painting activities, PAHs associated with heavy equipment and fueling). Slightly higher concentrations of specific contaminants might be considered to be “normal” at these sites but indicate potential contamination at others. However, neither *typical* nor *normal* is the same as *acceptable*. As stated above, these charts were developed for identifying potentially contaminated sites and helping to guide source control evaluations. They are not designed to be used for evaluating the potential waterbody impacts of stormwater discharges.

An additional consideration when evaluating stormwater data is whether the data are likely to be representative of typical stormwater discharges from the site. Stormwater samples taken from the same location can show widely varying concentrations depending on the duration and intensity of the storm events that were sampled, whether the sample was collected early or late in the storm, the length of the dry period preceding the storms, and the activities occurring at the site since the previous storm event or catch basin cleanout. This should be considered when determining how much weight to apply to stormwater data in the course of a stormwater evaluation and/or whether additional data are needed to support a decision.

Section 5: Process and Quality Assurance Steps for 2015 Update

This Appendix E tool was first made available in October 2010. DEQ completed an update of these curves in October 2015. The 2015 update improved the tool by enhancing the datasets represented with additional data collected at the same sites as well as new sites that drain to the

Portland Harbor Superfund study area. Section 5 was added to document the process and quality control and assurance steps taken to improve confidence in the reliability of this screening tool.

Data Compilation

The first step was to compile stormwater and stormwater solids data collected between the original development of the tool in 2009 and the update in 2015. DEQ contacted representatives at sites engaged in stormwater source control work and requested submittal in Excel format of all stormwater and stormwater solids data collected during this period. In early 2015, DEQ received data from 25 sites – 9 new sites and 16 sites with data previously included in the original curves. Data were checked to make sure it was not already in the original graphs. Sample results entered into master spreadsheets were checked to ensure they had been correctly copied over from the site provided data set files.

Compiled data were culled to remove individual results that were not compatible with the master set. Data removed included:

- NPDES data
- Dissolved concentrations (only total concentrations were included)
- Duplicate samples
- Erodible soil samples
- Samples of groundwater infiltration into stormwater pipes (dry weather flow samples)
- Isolated roof runoff samples

For results with individual PCBs and PAHs, DEQ calculated total values by summing sum of all detectable measurements. If all measurements were below the method detection limit (MDL), DEQ classified the sample as a non-detect and use the largest MDL as the sample's value. If calculated totals were provided, DEQ confirmed the same methodology was used or recalculated.

DEQ then reformatted the new data into the configuration used to create the original charts, standardized analyte names, checked for unit continuity, eliminated extraneous information, checked for errors and backed up the new master dataset. After creating a master spreadsheet of both new and old data, new versions of all charts were generated, and these were reviewed by several staff and compared against the original charts.

Comparison to Original Charts and Additional QA/QC

Y-The vertical axes were scaled to allow a meaningful direct comparison to the original charts; outlier results were confirmed, excluded and accounted for; and x-axes were shortened to include only the number of samples represented. Other observations led to an addition QA/QC round.

These included:

- Random sampling indicated there might be some repeated entries in the stormwater datasets. We needed to confirm that data was not repeated or remove any confirmed to be repeated.
- Many of the curves looked remarkably similar, so we needed to double check that all the new data made it into the master datasets.
- The chart for PCBs in stormwater solids does show a visually significant shift from the 2010 version. Because the PCB datasets in the original stormwater and stormwater solids

charts was the smallest dataset, DEQ suspected that additional data might shift these curves. DEQ re-evaluated the PCBs solids curve to ensure this visually apparent difference is accurate. The 2015 chart appears to have a point of increasing curvature around 200 ug/kg, where previously increasing curvature was noted around 170 ug/kg.

In evaluating the above issues, DEQ determined that 192 stormwater data points with detected results were potential repeats, or approximately three percent, mostly found in the original curves data sets. No stormwater solids repeats were identified. Because these were mainly from the original data as compiled, they were removed to avoid expending the effort to recheck each individual original dataset. Charts were created again following removal of the potential repeated data. In addition, some repeated data were identified among the non-detected stormwater results, where were removed from the master datasets. Because non-detected values are excluded from the charts, however, this change has no effect on the charts.

All data points were grouped and recounted as detects, non-detects and excluded outliers, for both the stormwater and stormwater solids datasets. This verified that all original chart data (excluding the repeated results) and all newly compiled data were appropriately displayed.

Each old and newly added data point with a detected result in the PCB solids chart was reverified and duplicates were screened for a final time to confirm that the slight shift was an accurate result of the enhancement of the dataset.

Section 6: 2024 Dioxin-Furans Stormwater Curve Addition

Dioxin-furan congener charts for water were added in 2024 to support source control evaluations.

Data Compilation

DEQ requested water dioxin-furan samples be collected at multiple sites engaged with source control work. Throughout 2023 DEQ received results from 12 sites. Stormwater results from two investigations overseen by EPA as part of the Portland Harbor Superfund site remedial design work were also included. Site identification and report reference information are included in the data spreadsheets for each congener. Sample results entered into the master spreadsheets were checked to ensure they had been correctly copied over from the site provided data files or transcribed from submitted reports.

Compiled data were filtered to remove individual results that were not compatible with the master dataset. Data removed included:

- Duplicate samples
- Isolated roof runoff samples

The data set did not include any of the following data types:

- NPDES data
- Dissolved concentrations (only total concentrations were submitted)
- Erodible soil samples

- Samples of groundwater infiltration into stormwater pipes (dry weather flow samples)

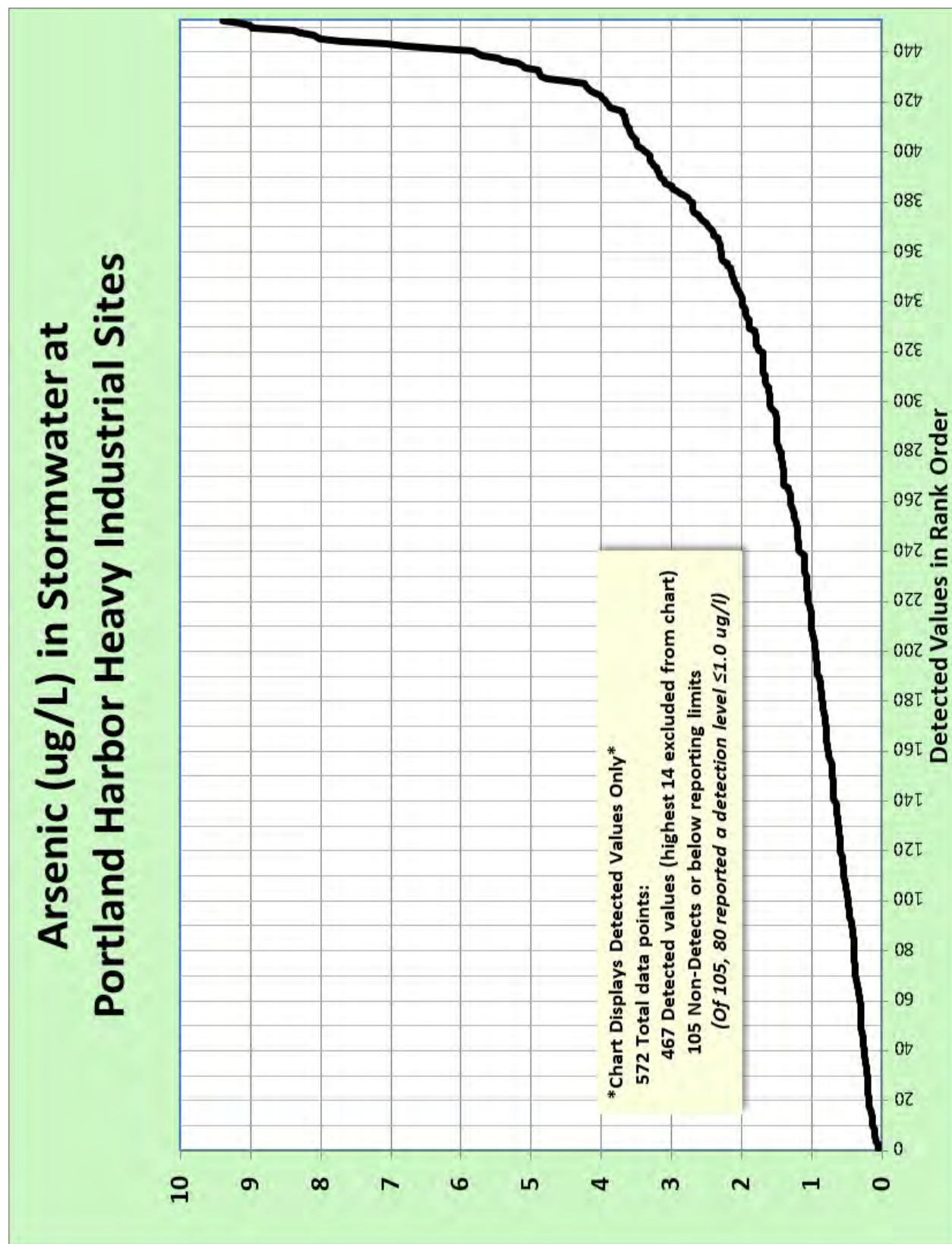
Charting Data

Results for some congeners showed a high proportion of non-detection (below method detection limit). DEQ determined that frequency of detection and method detection limits was informative when evaluating dioxin-furan congener data and included both detected values (shown as red squares) and non-detected values at the method detection limit (shown as blue diamonds) in the charts below. The complied data and resulting charts are presented in a similar fashion as the original data and charts but include this refinement.

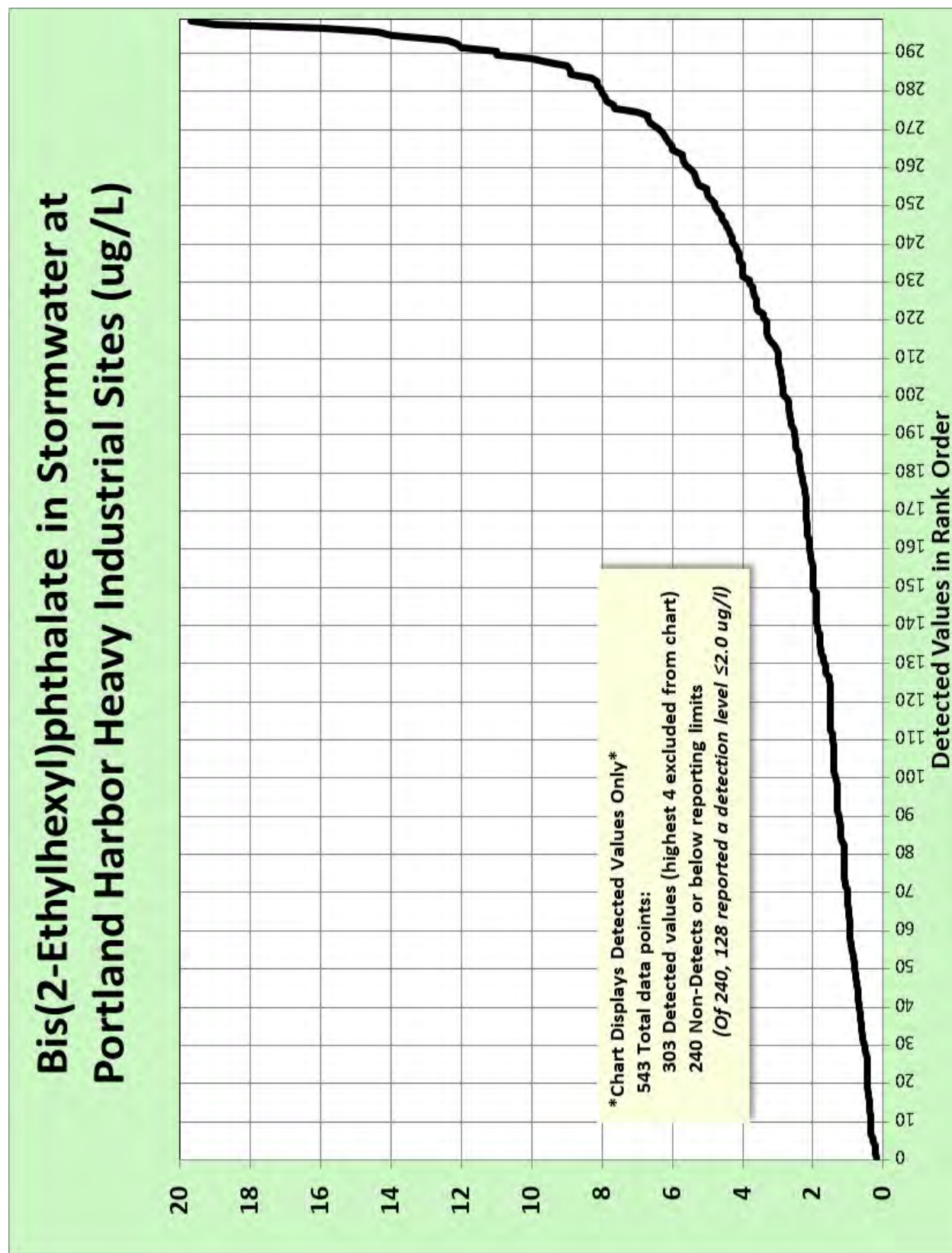
STORMWATER CHARTS

All stormwater data represents whole water/unfiltered samples.

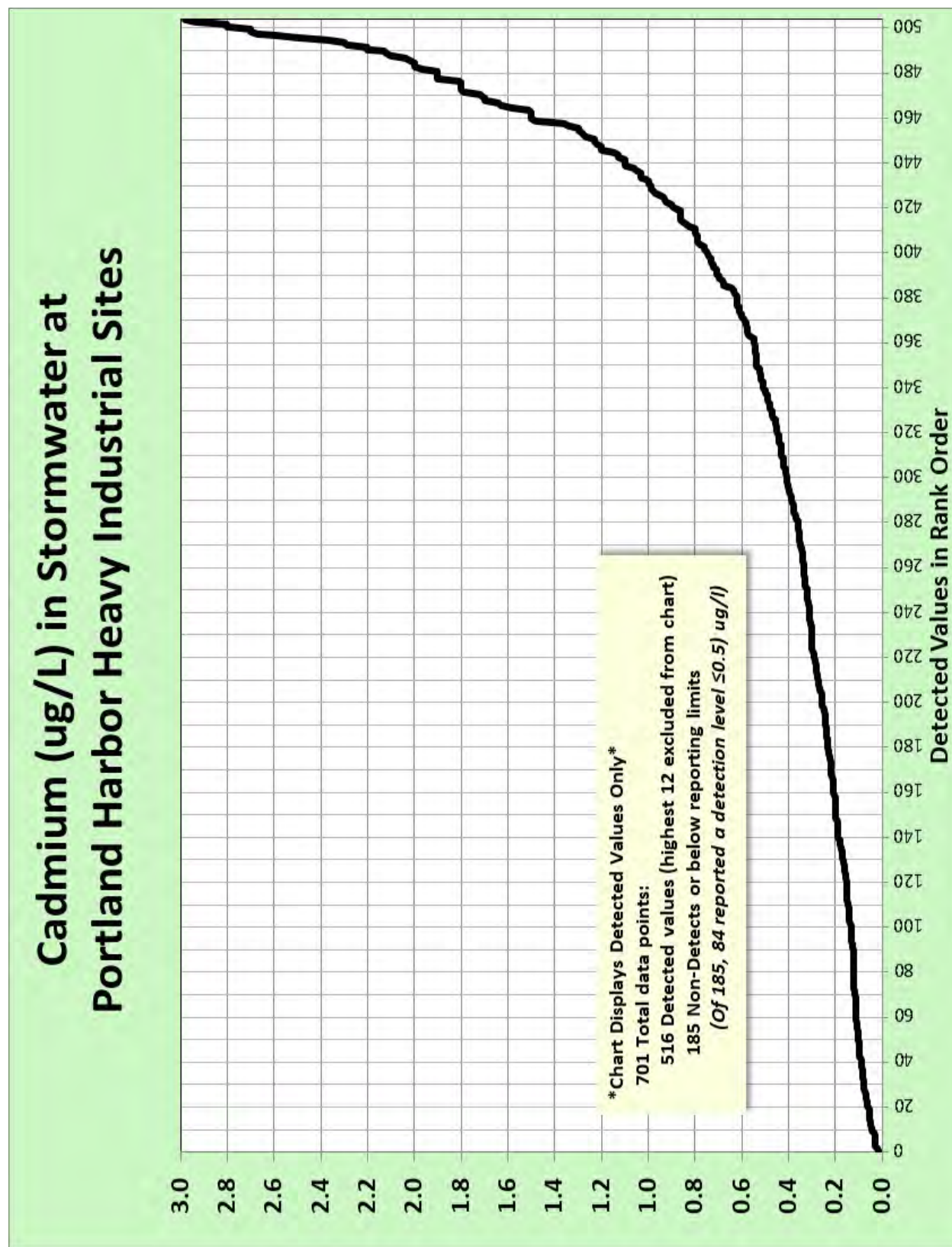
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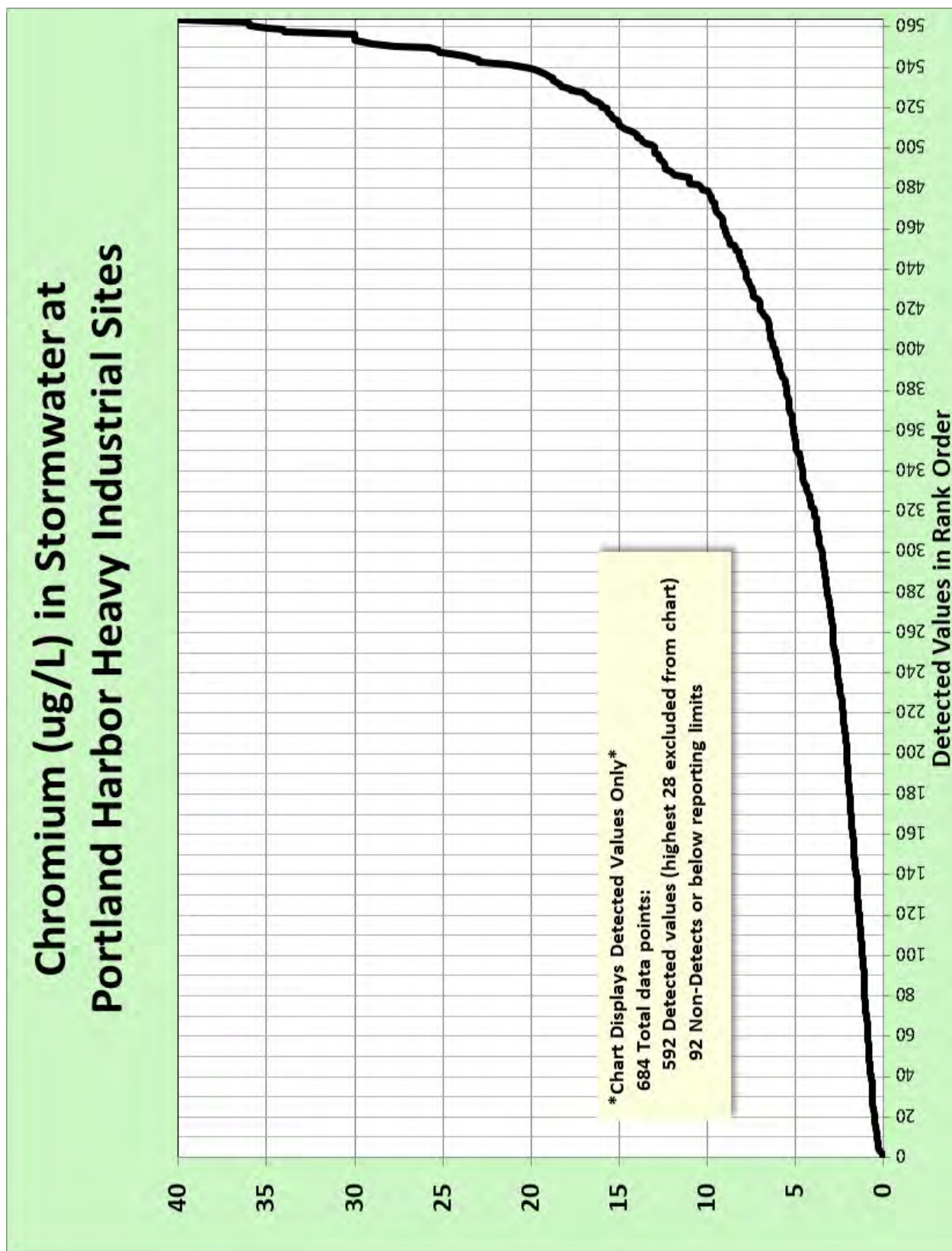
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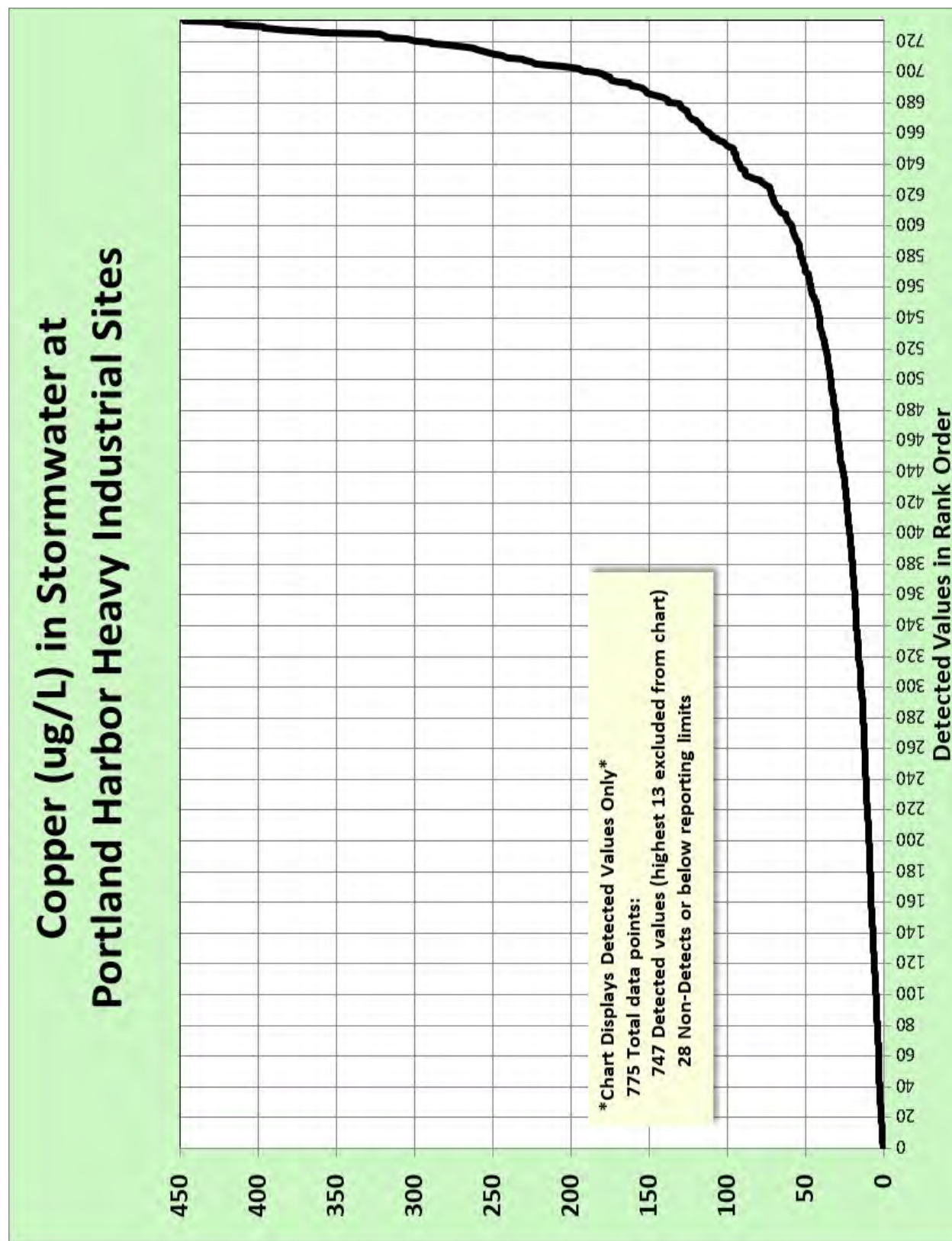
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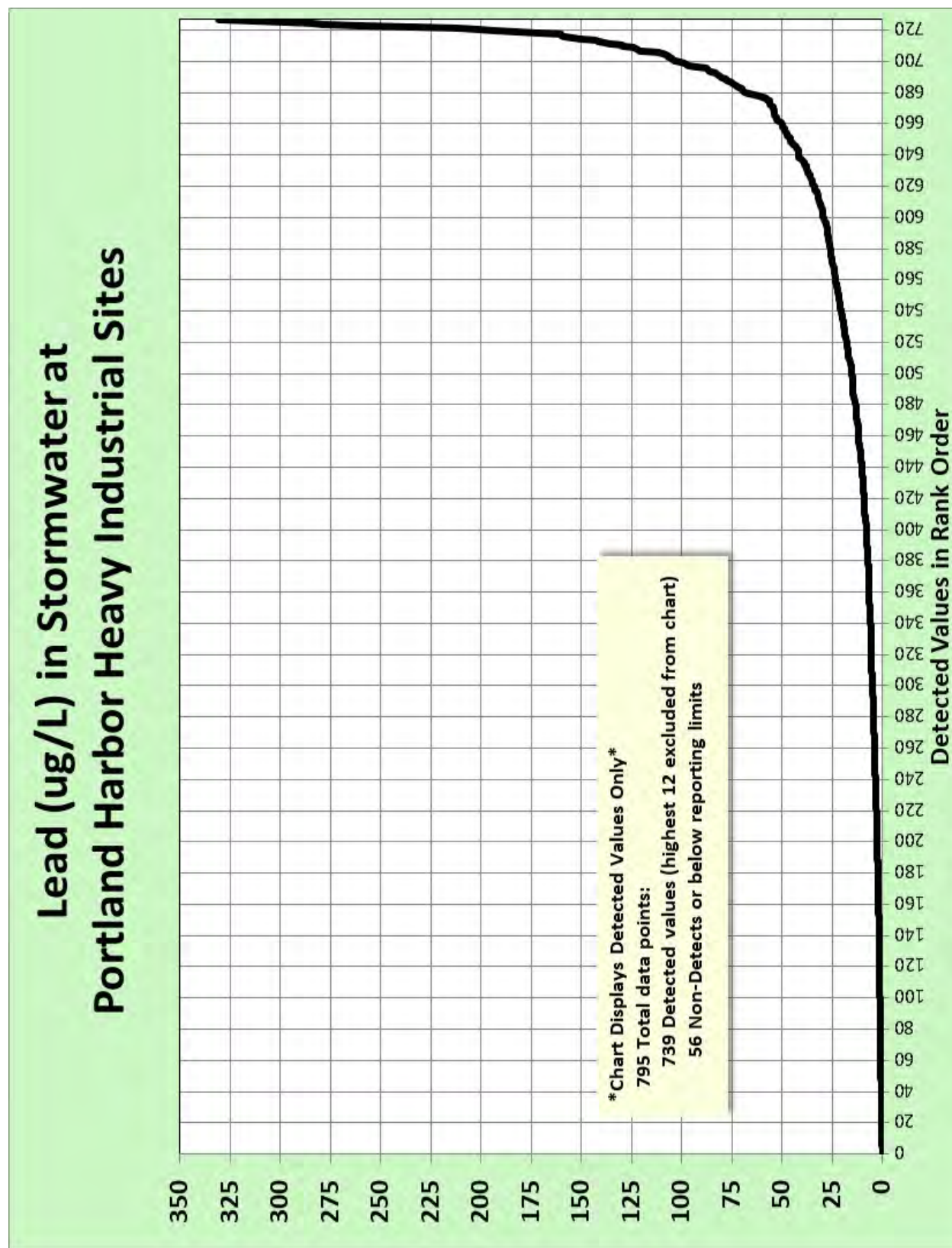
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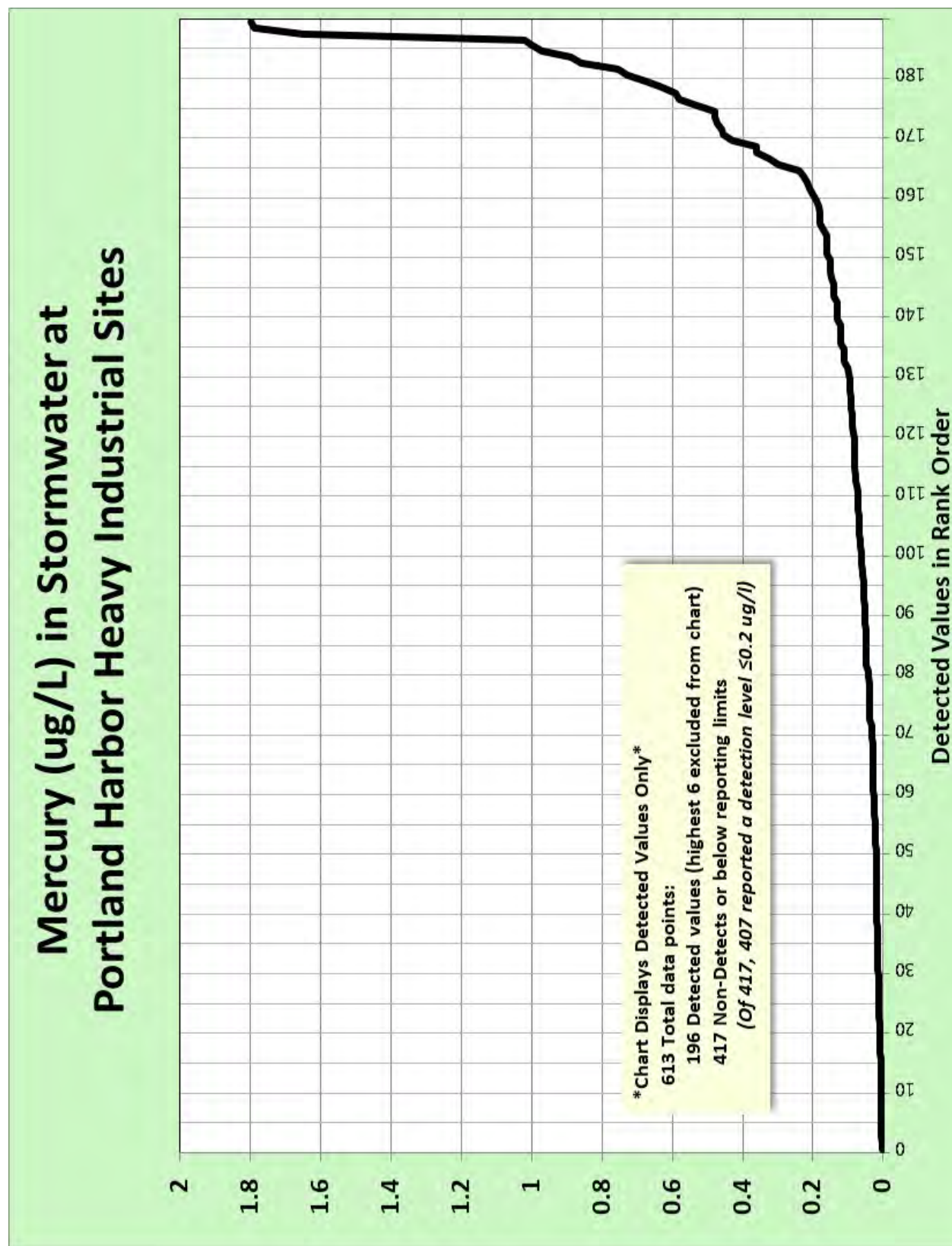
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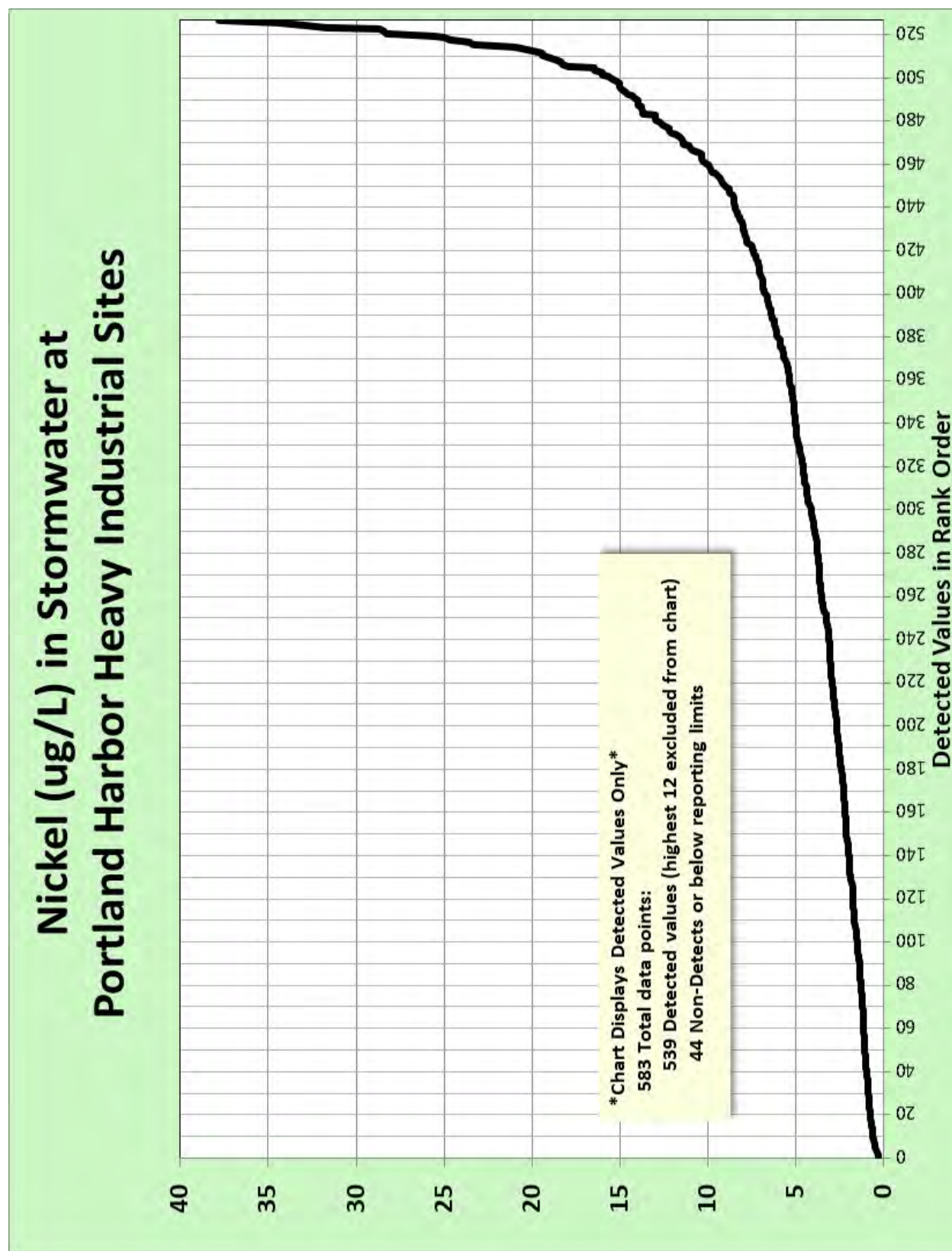
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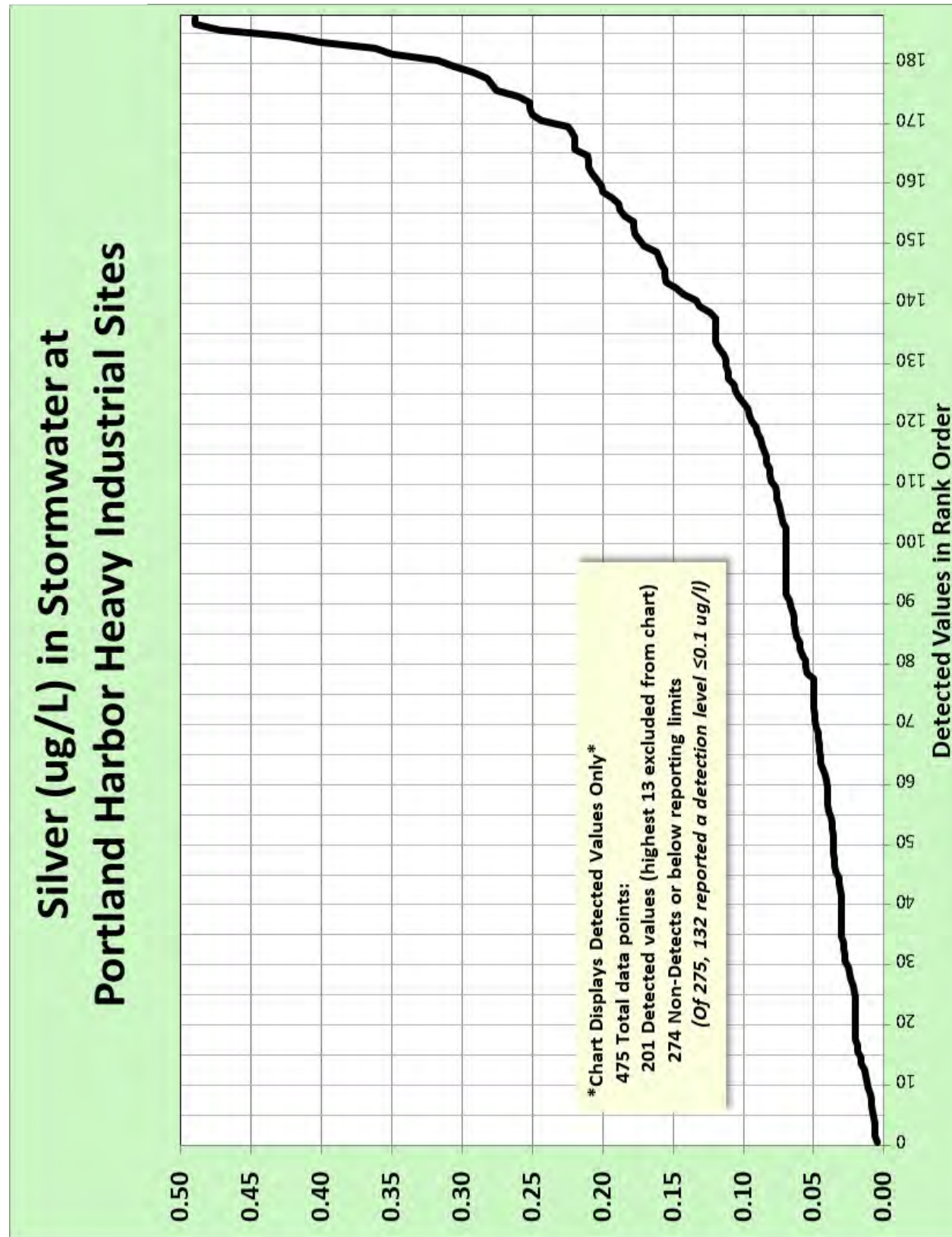
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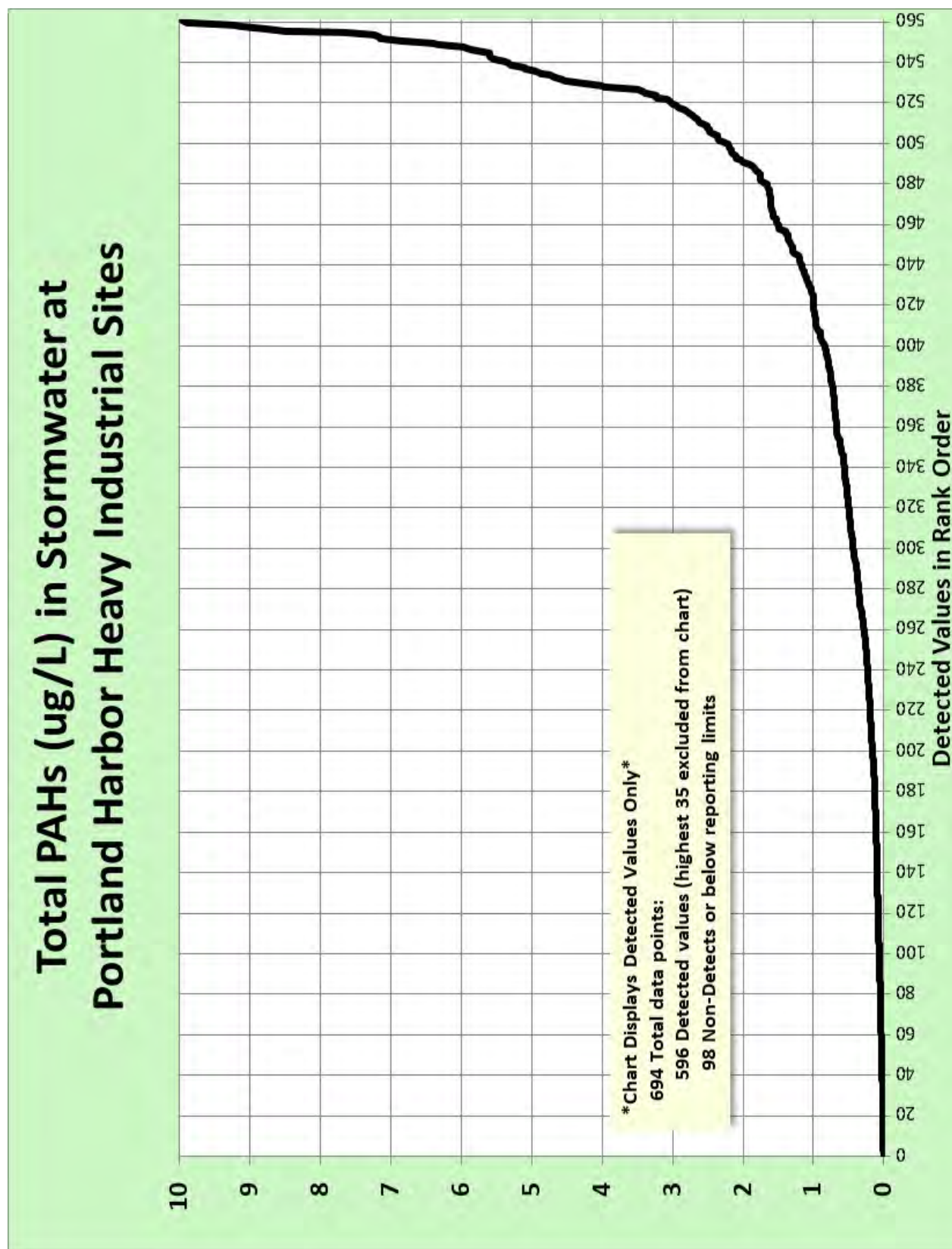
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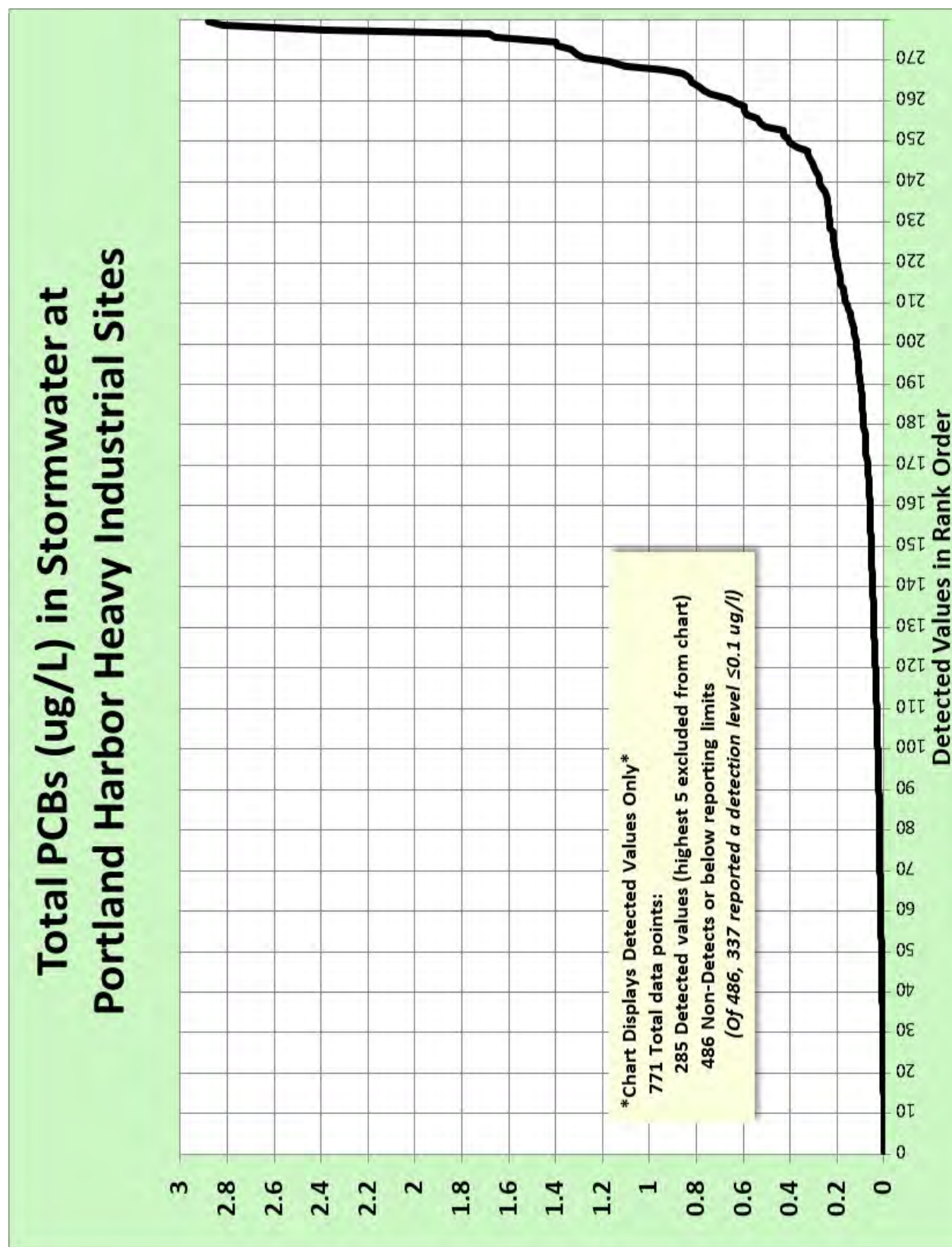
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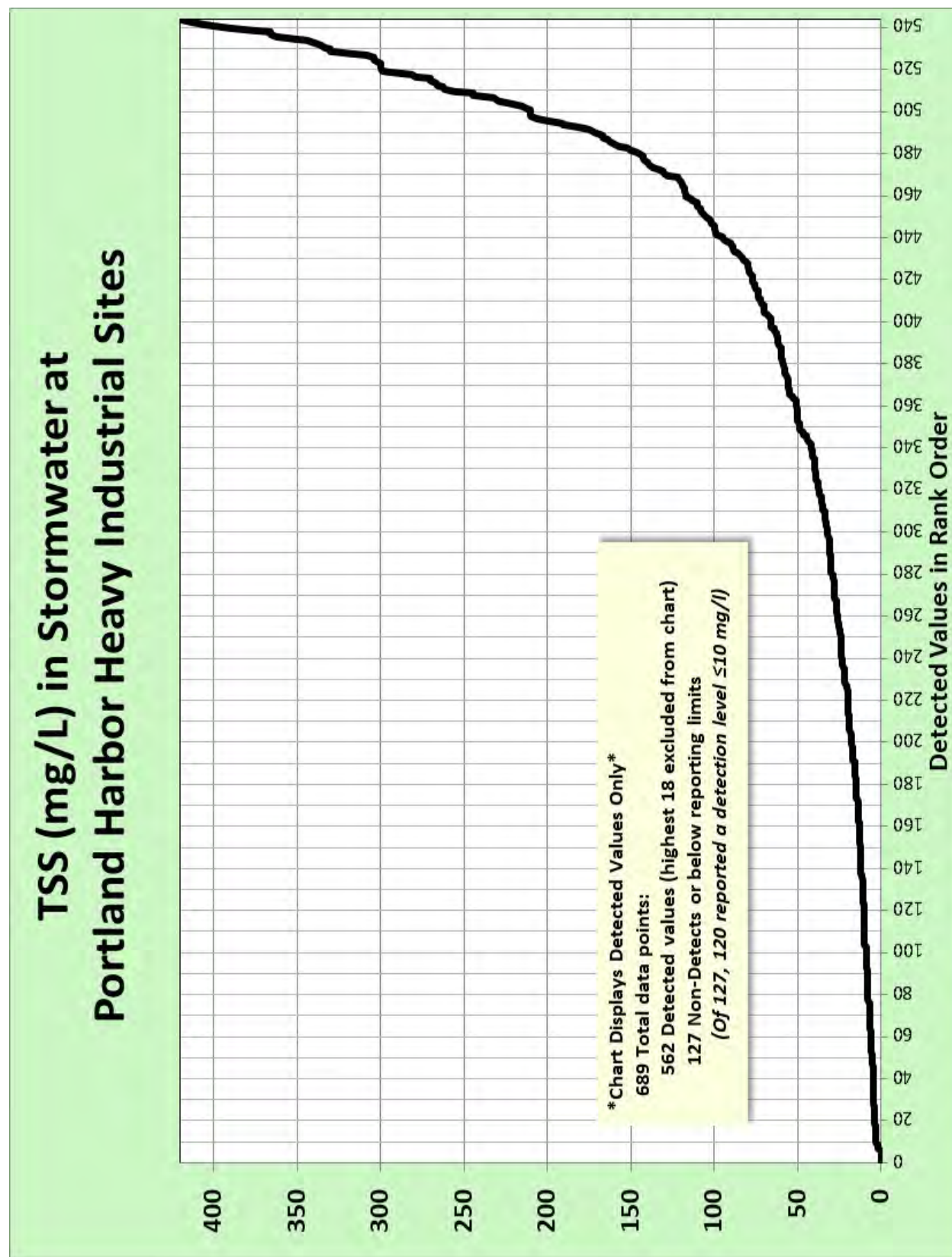
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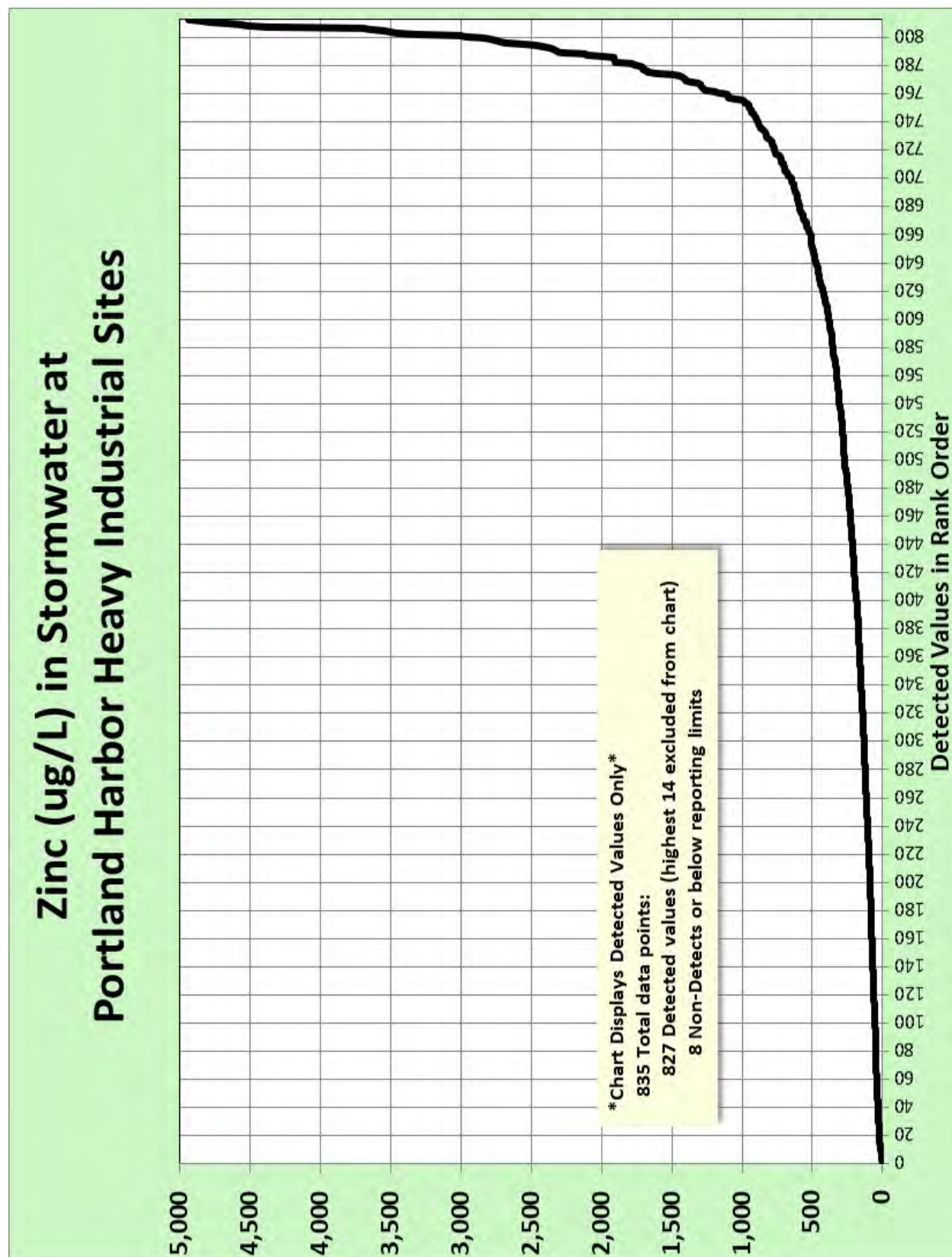
TOTAL PCBS



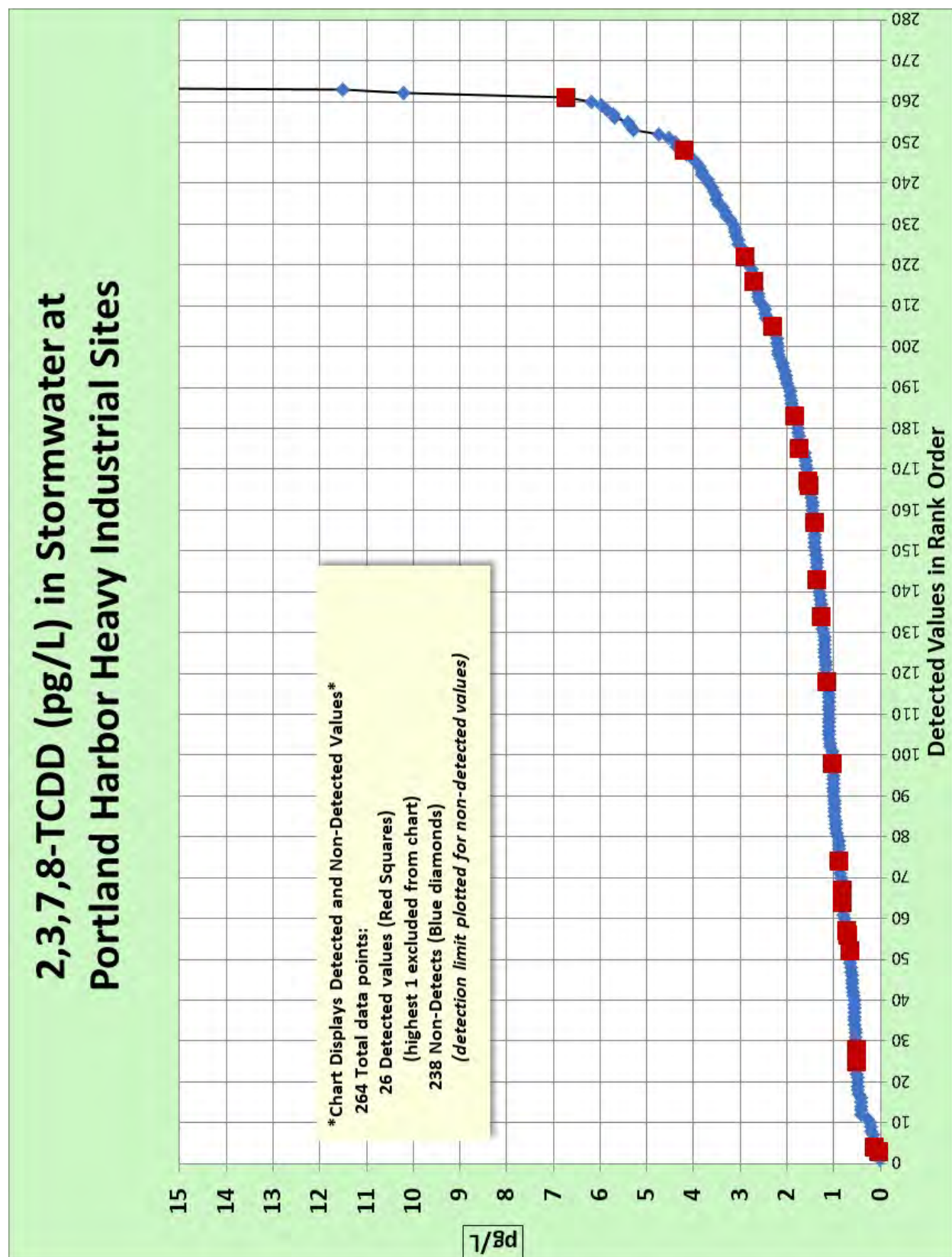
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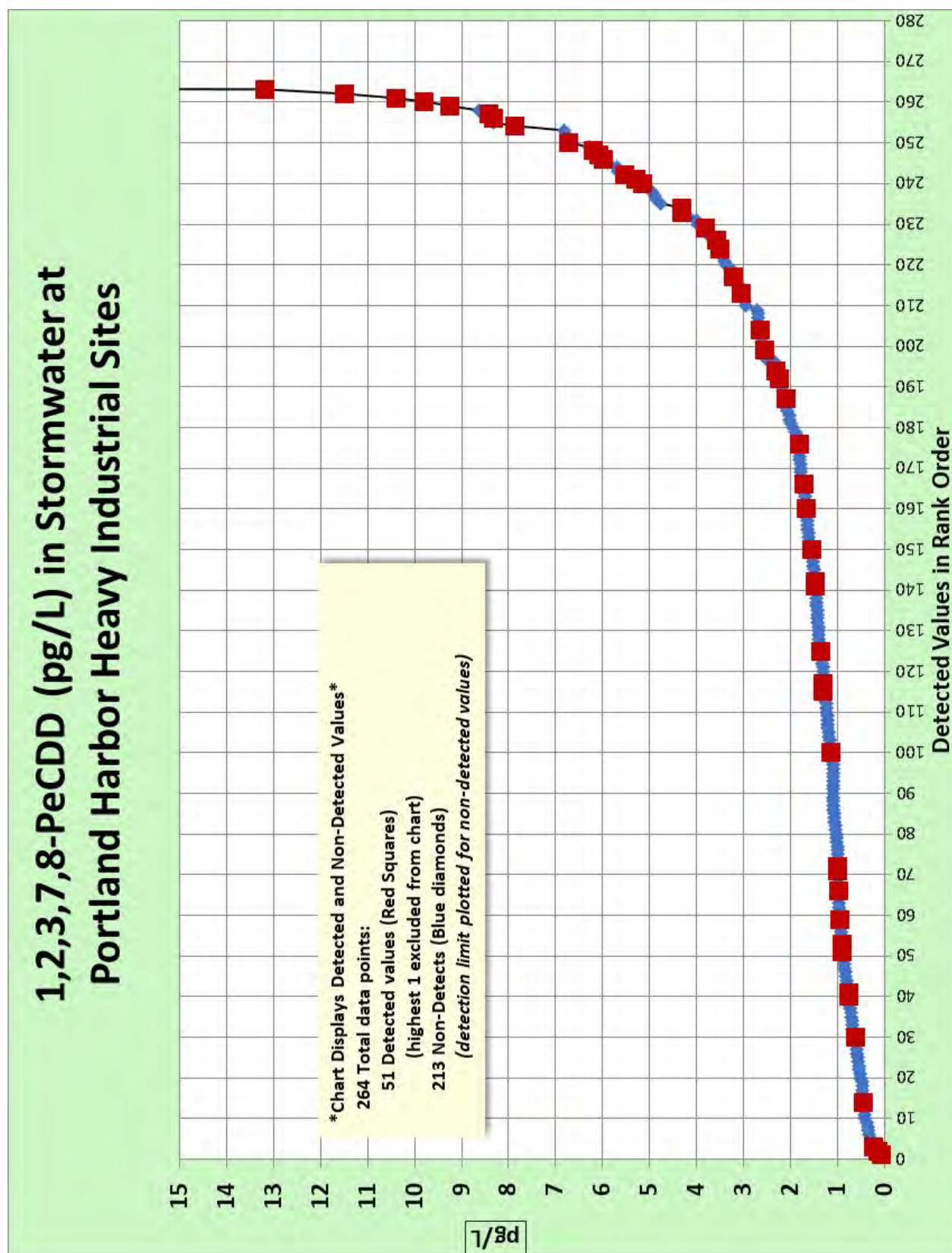
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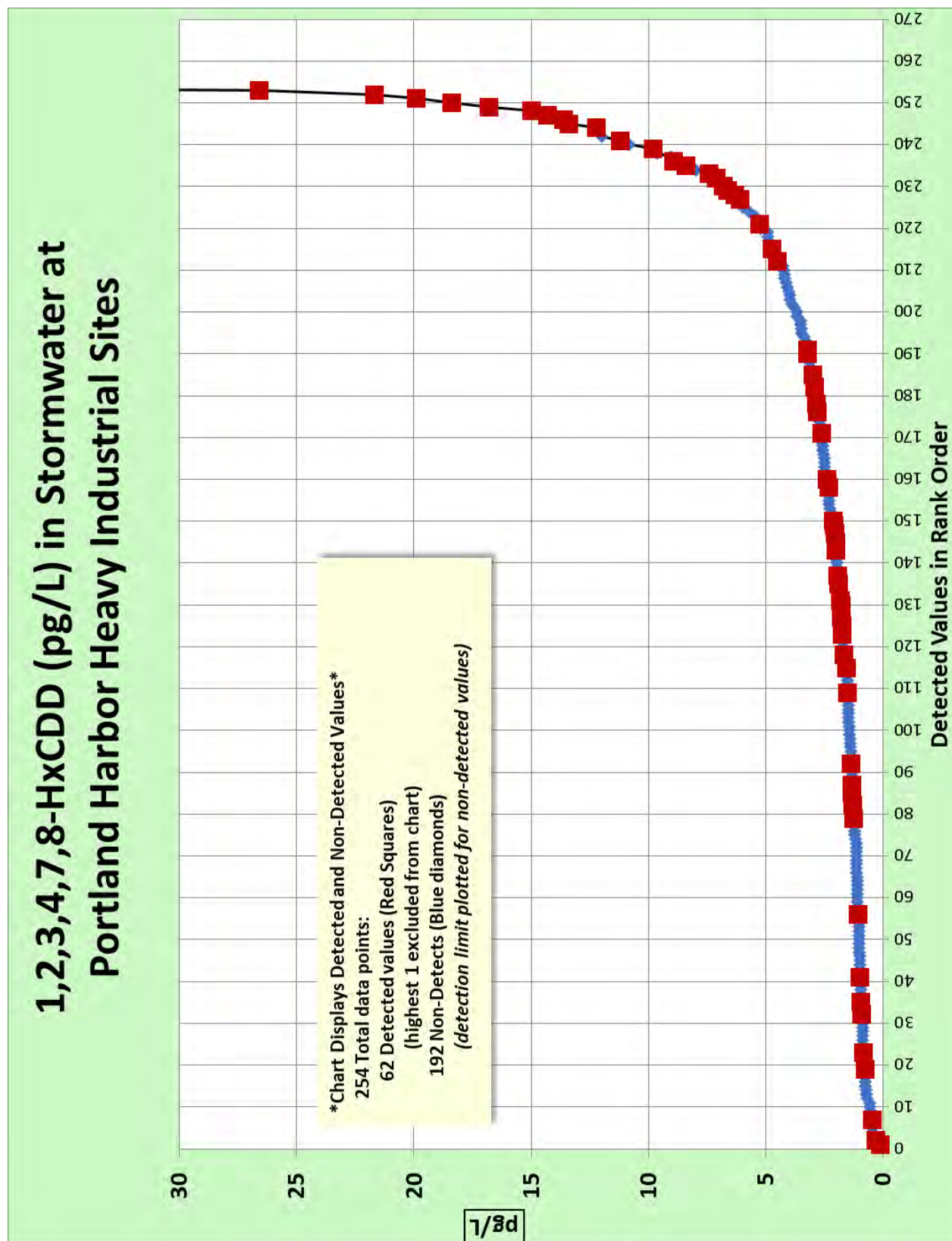
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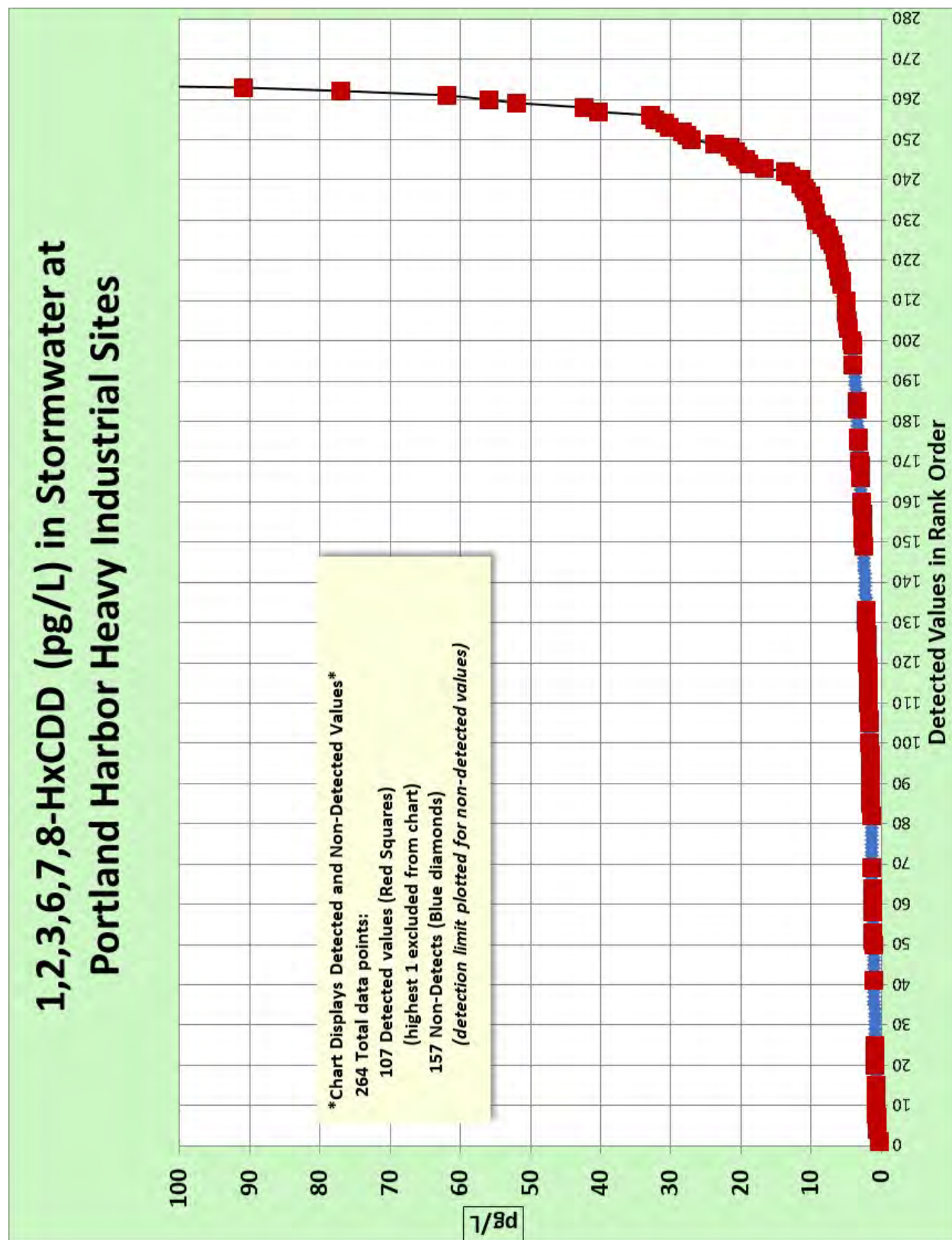
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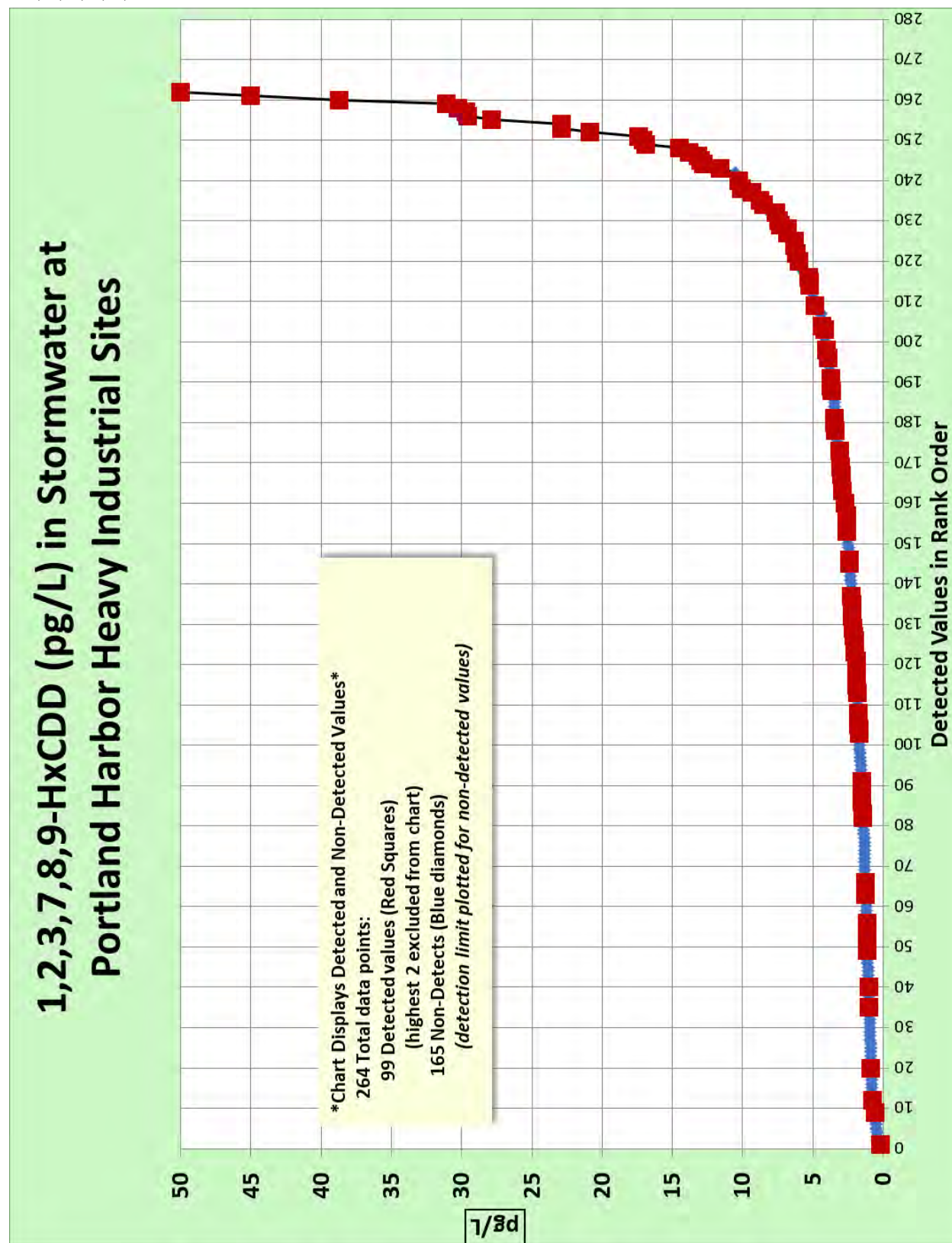
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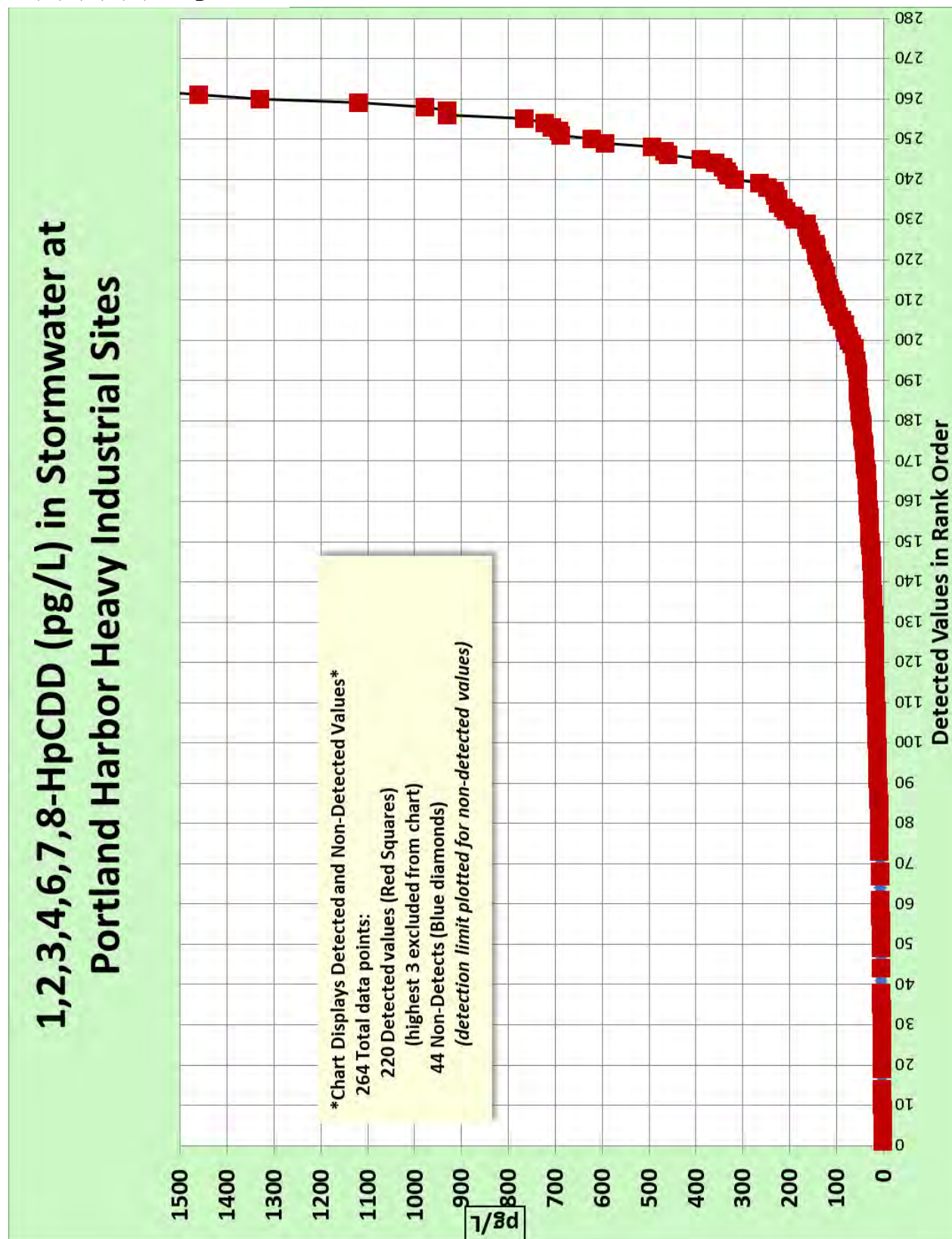
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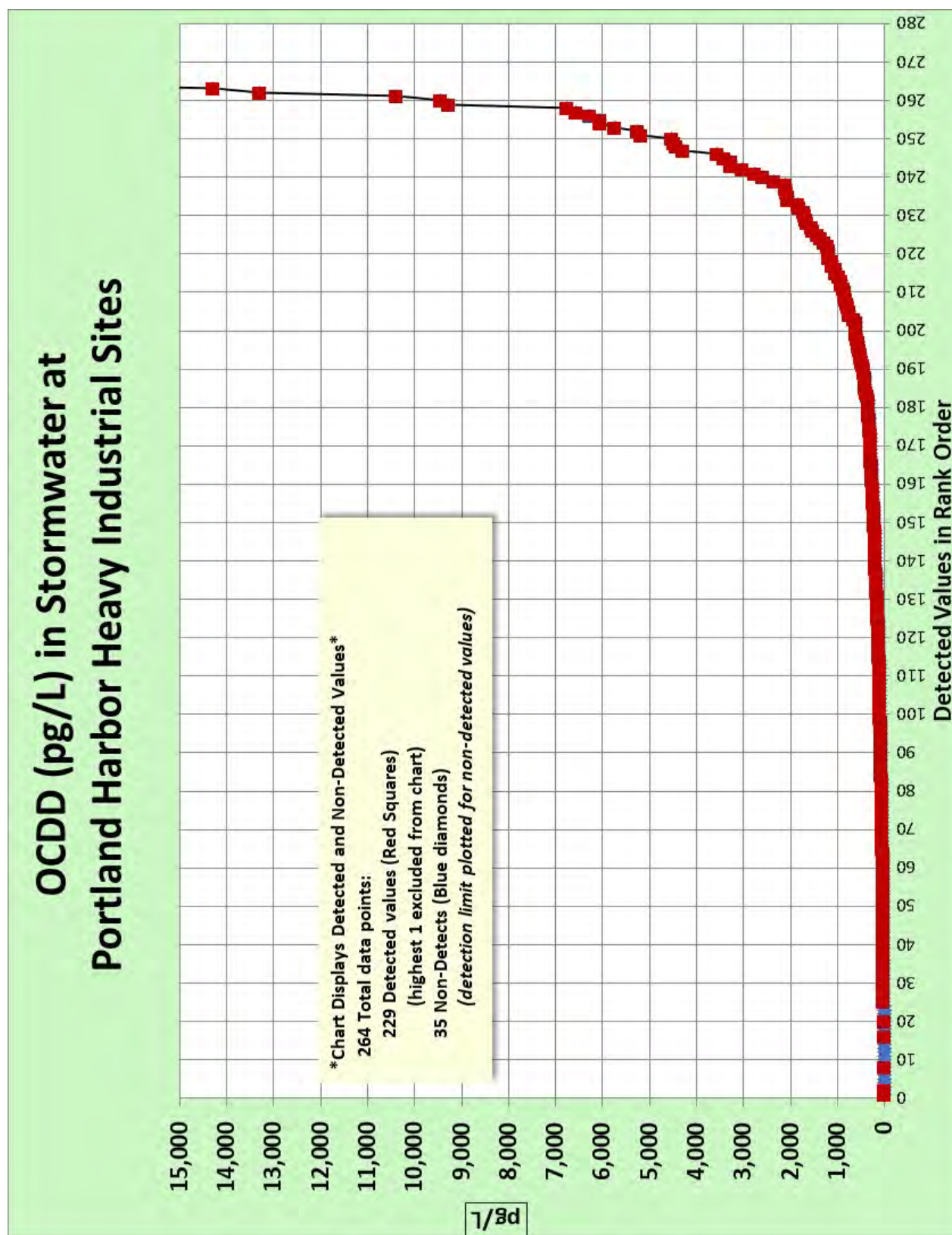
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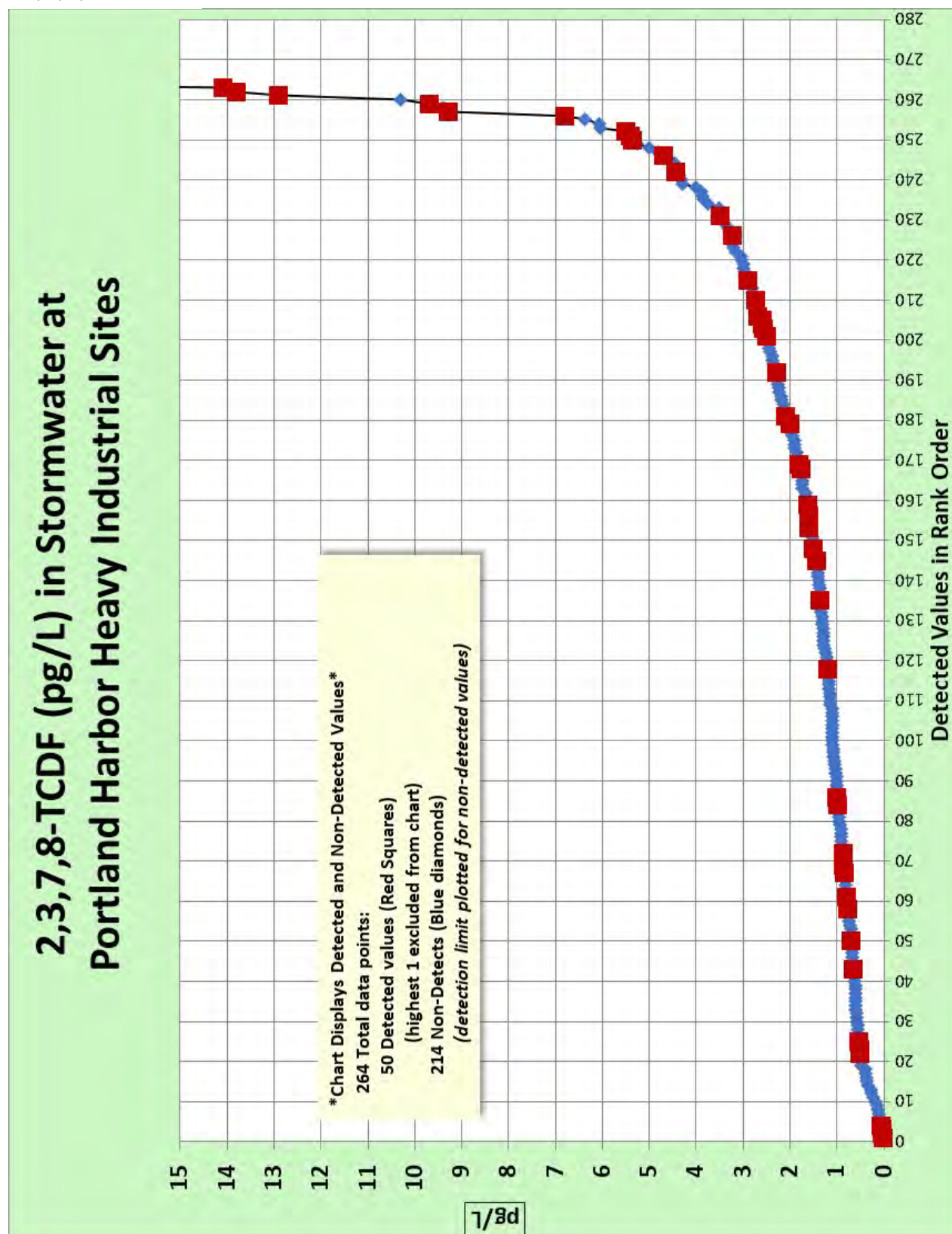
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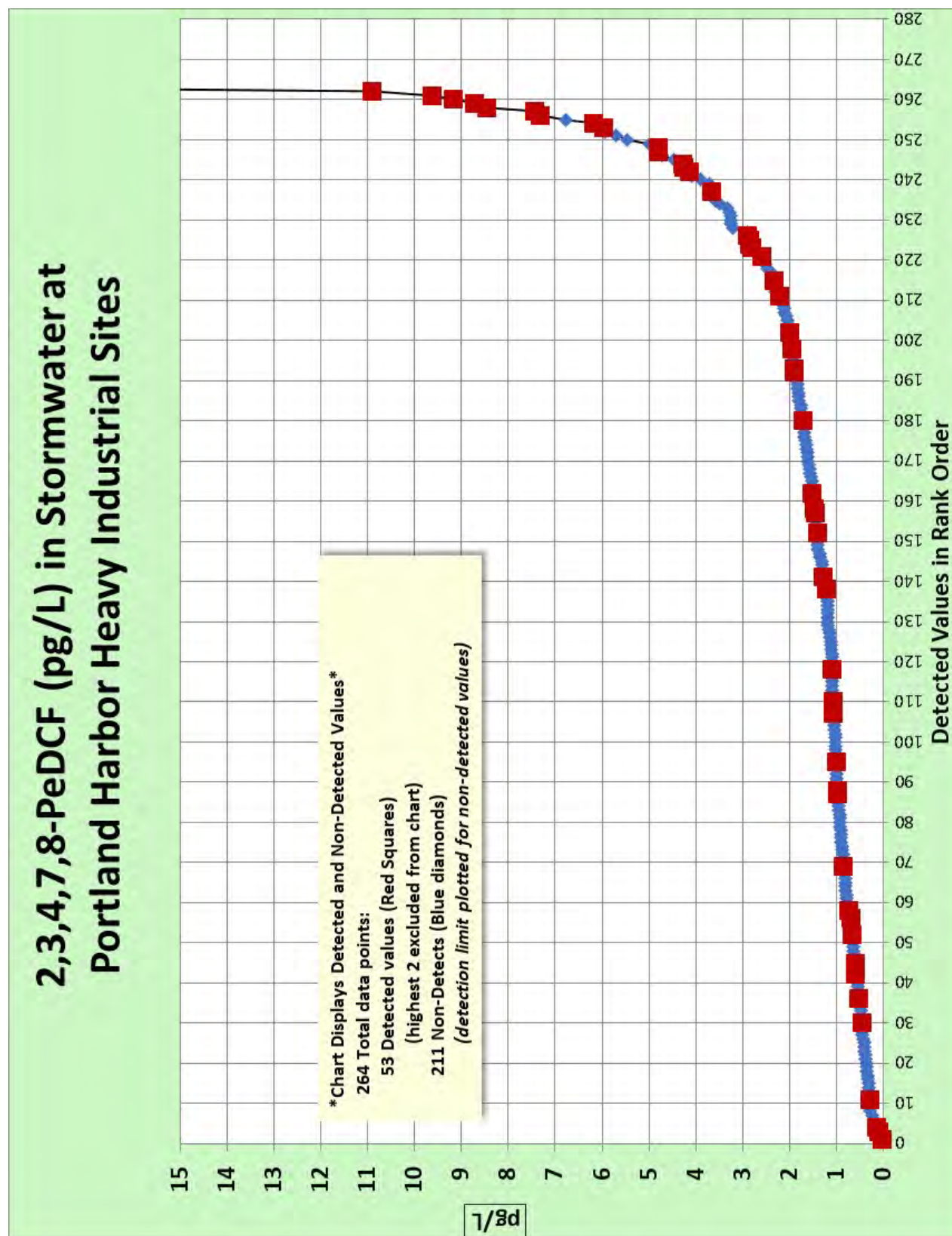
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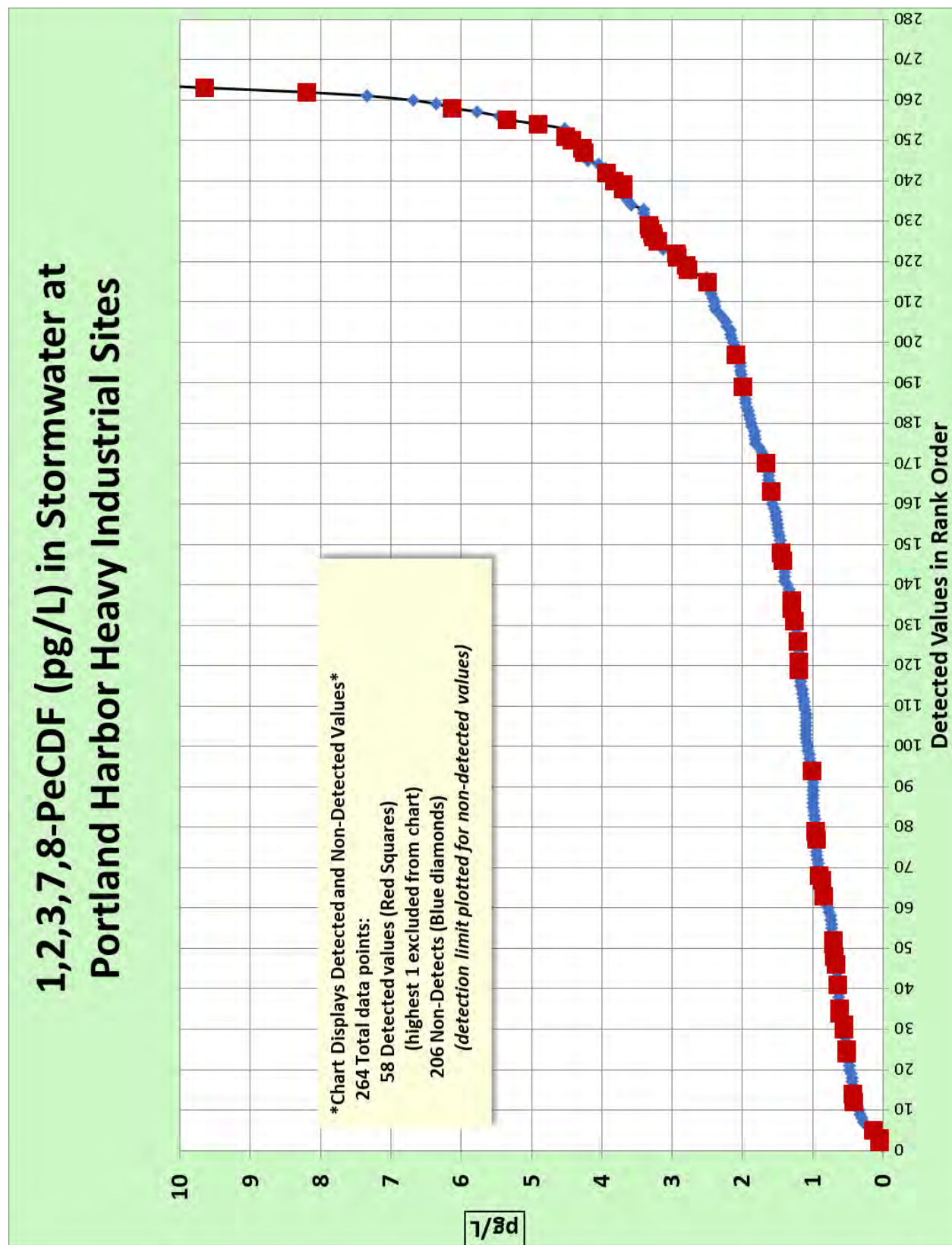
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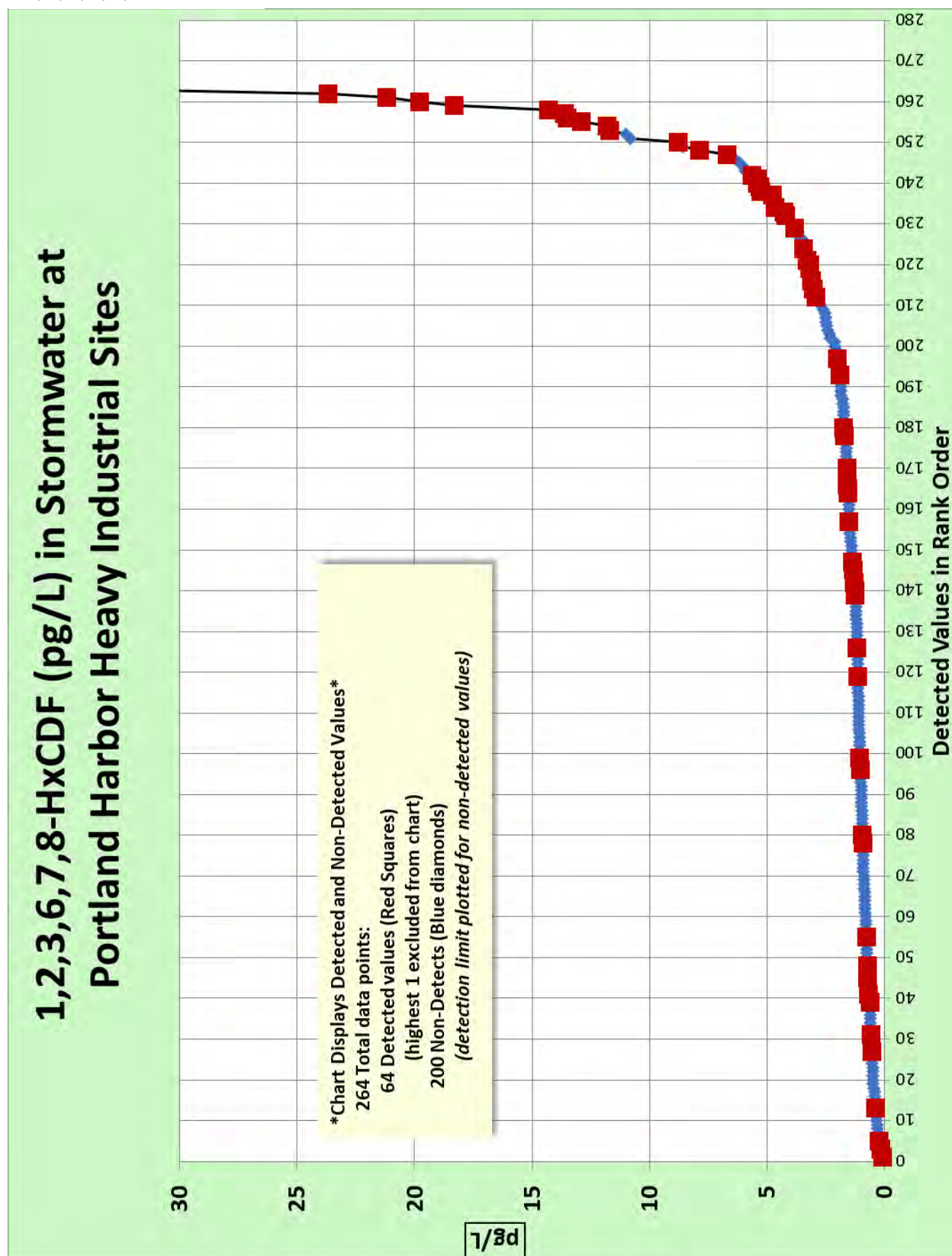
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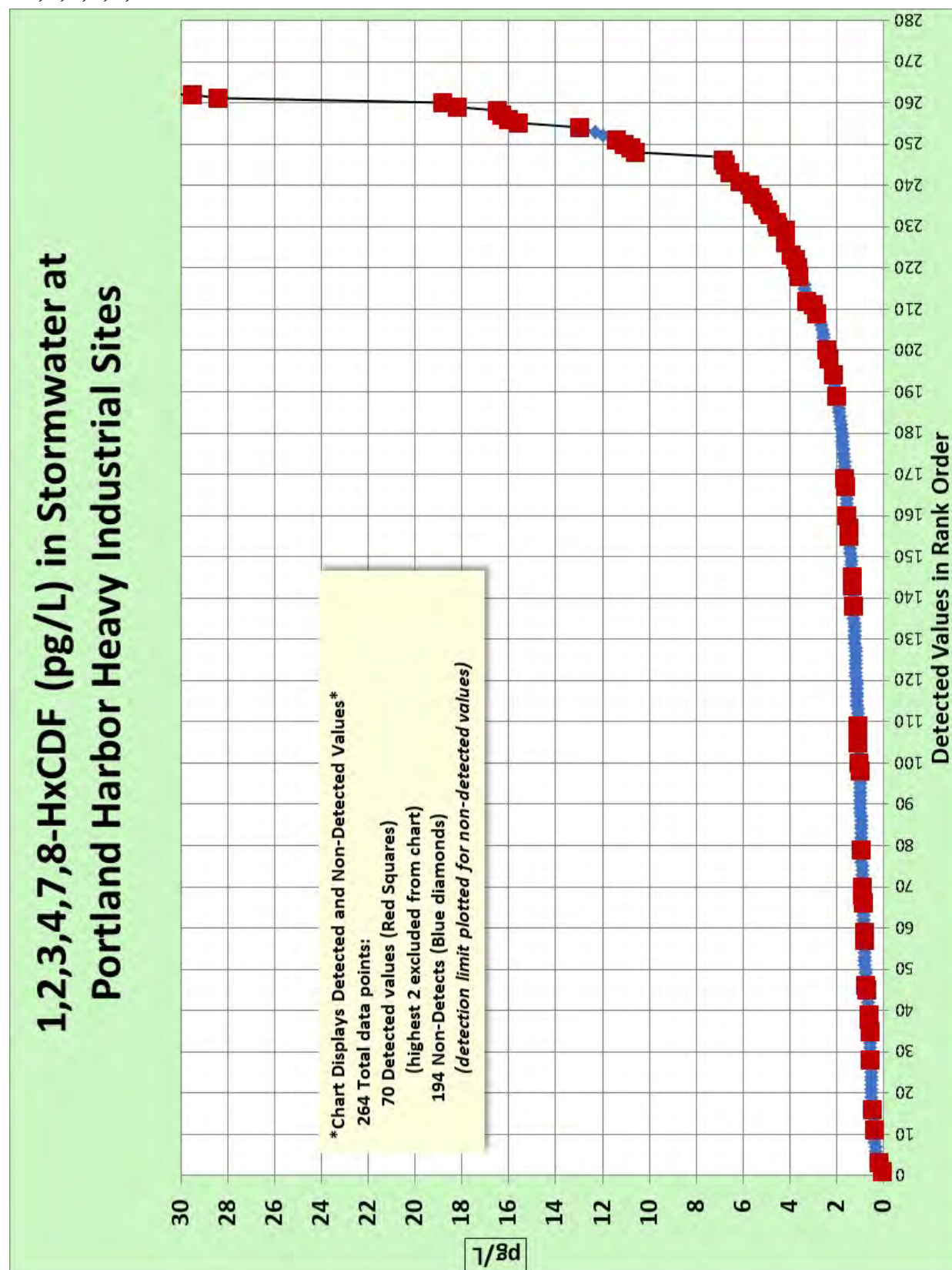
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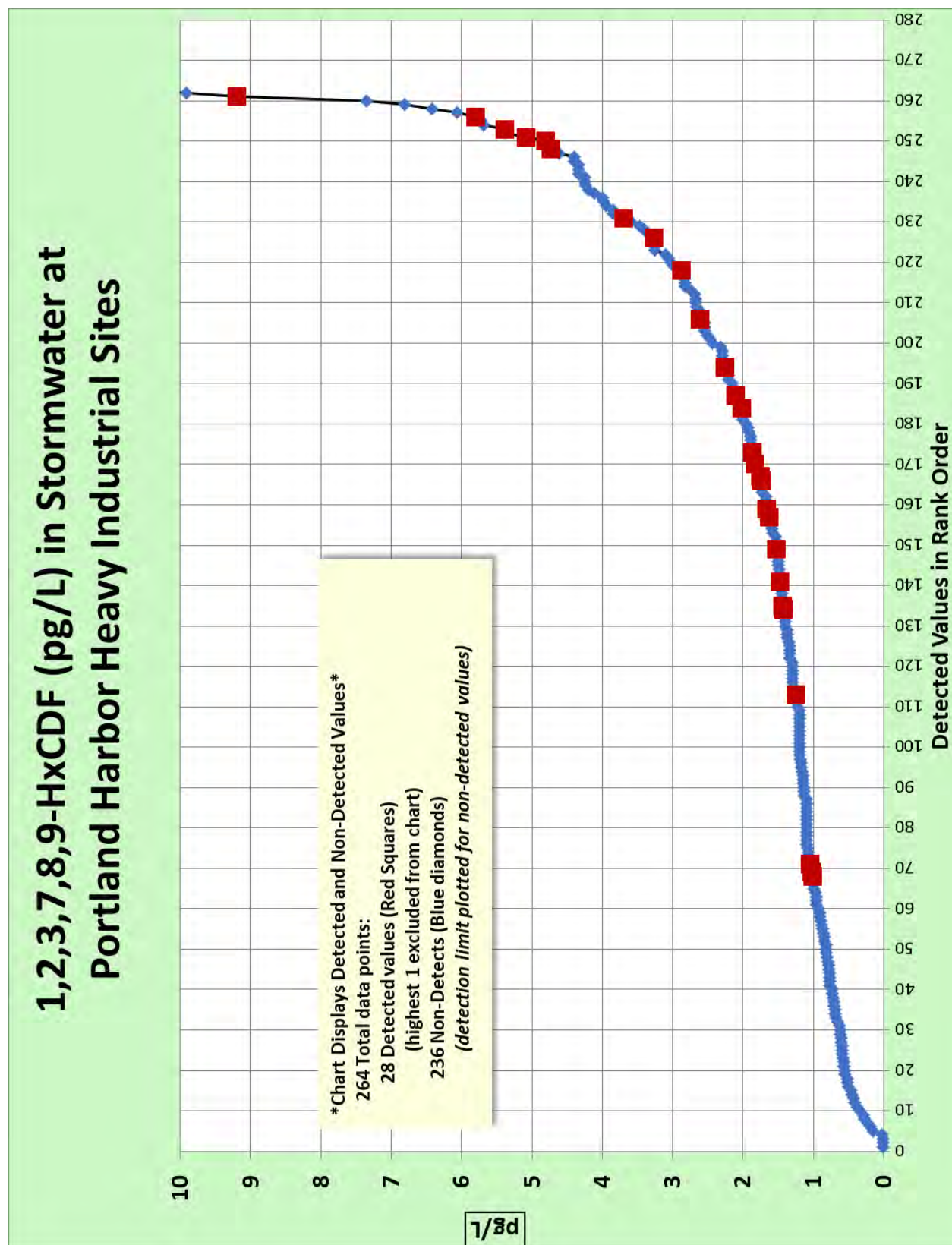
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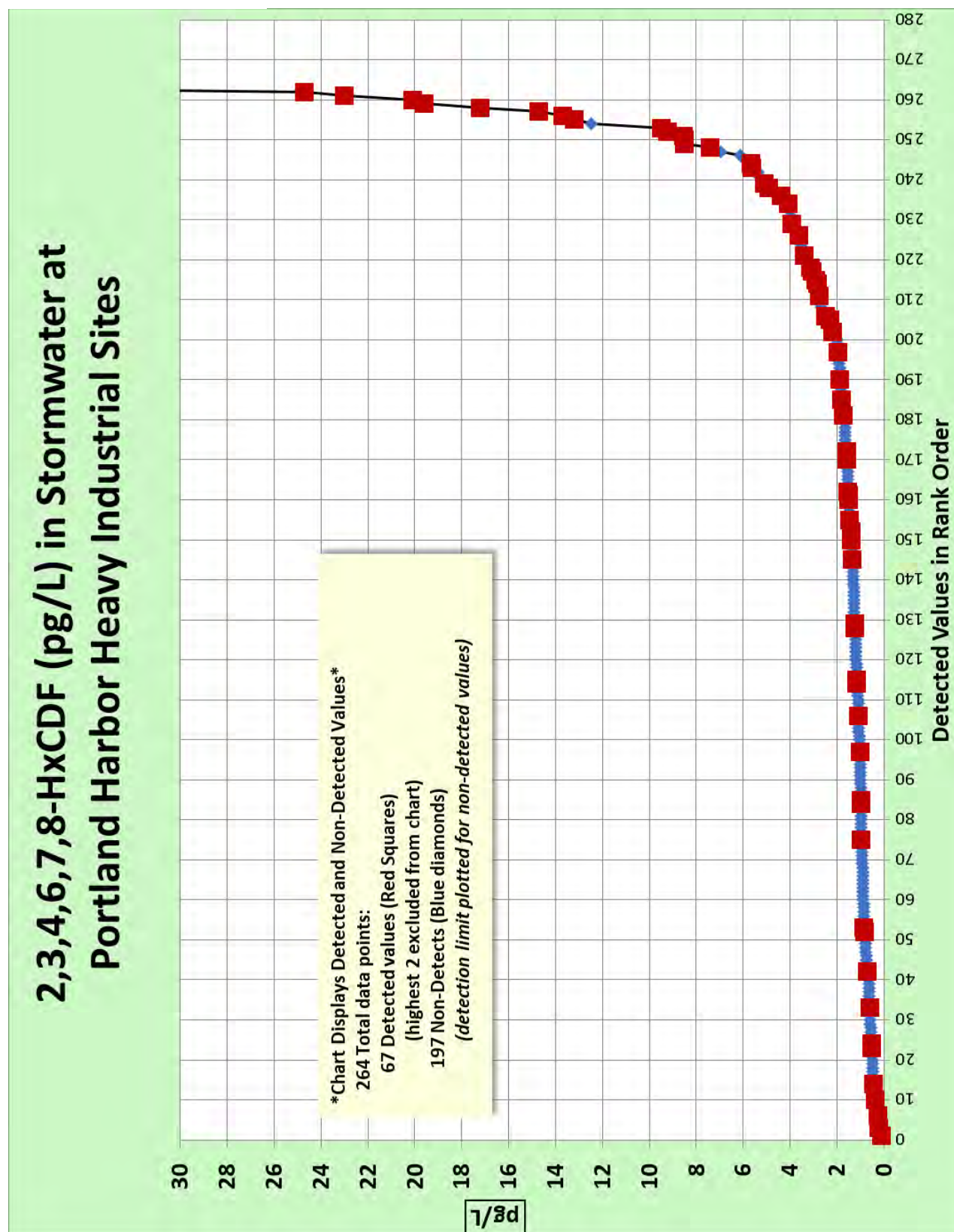
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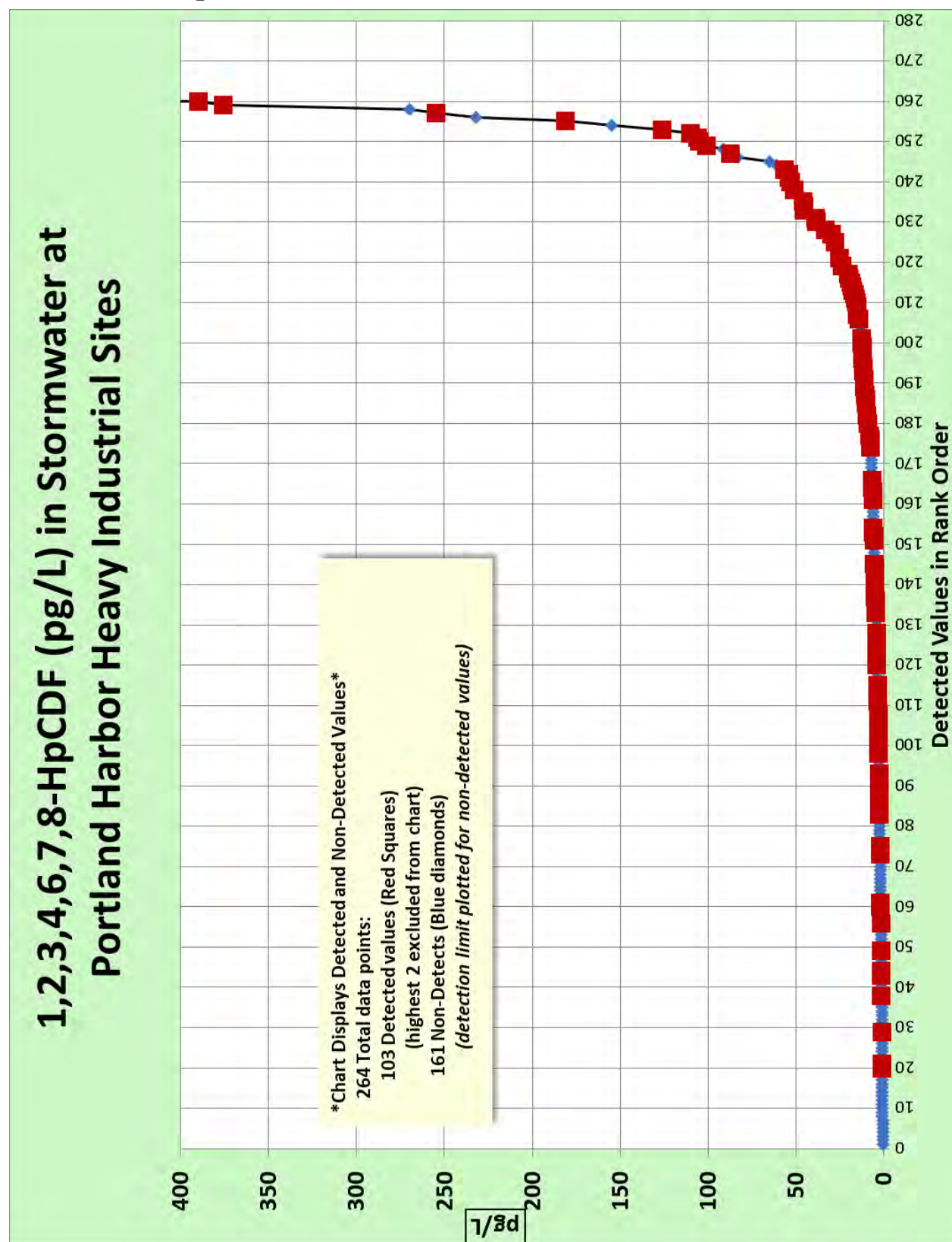
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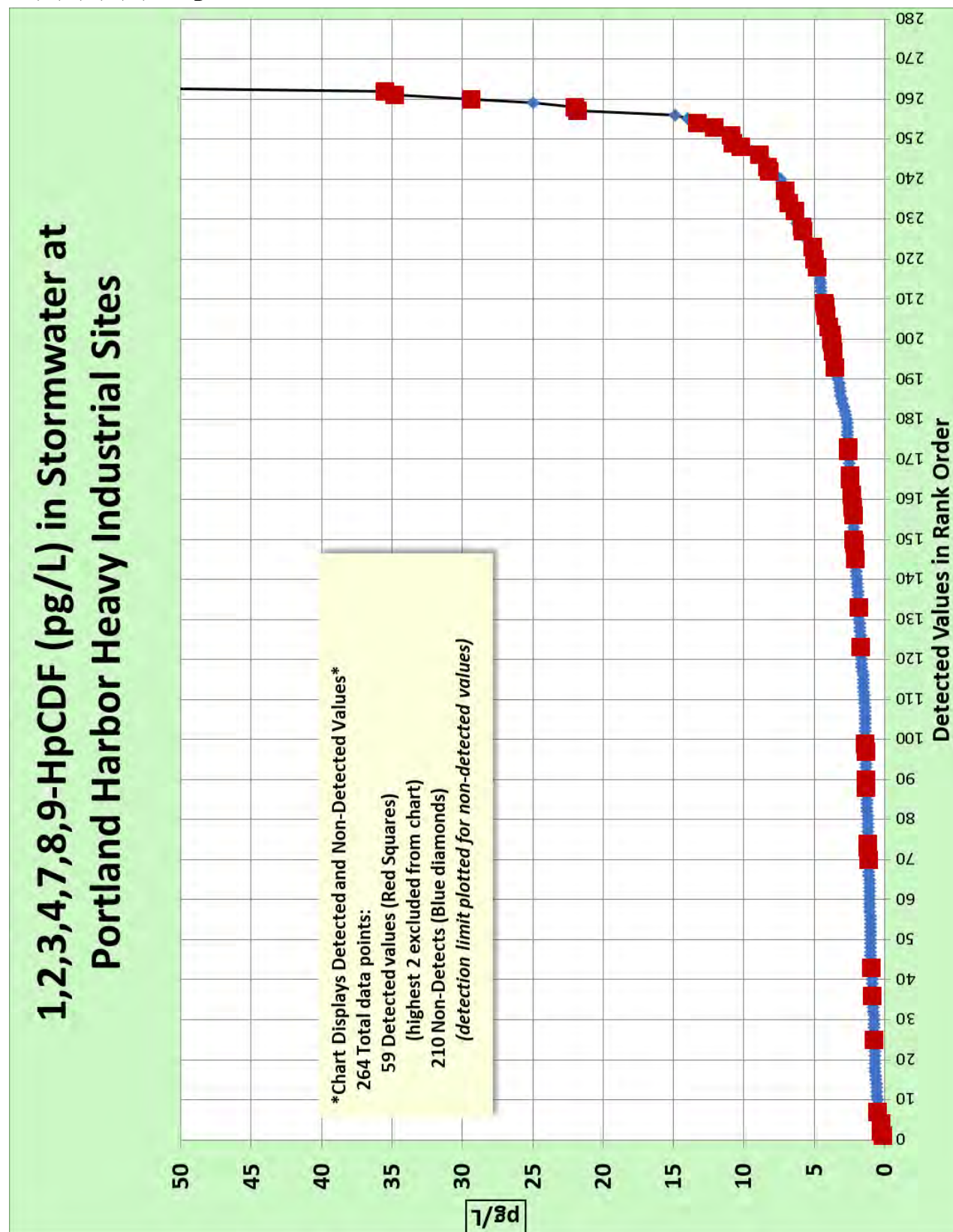
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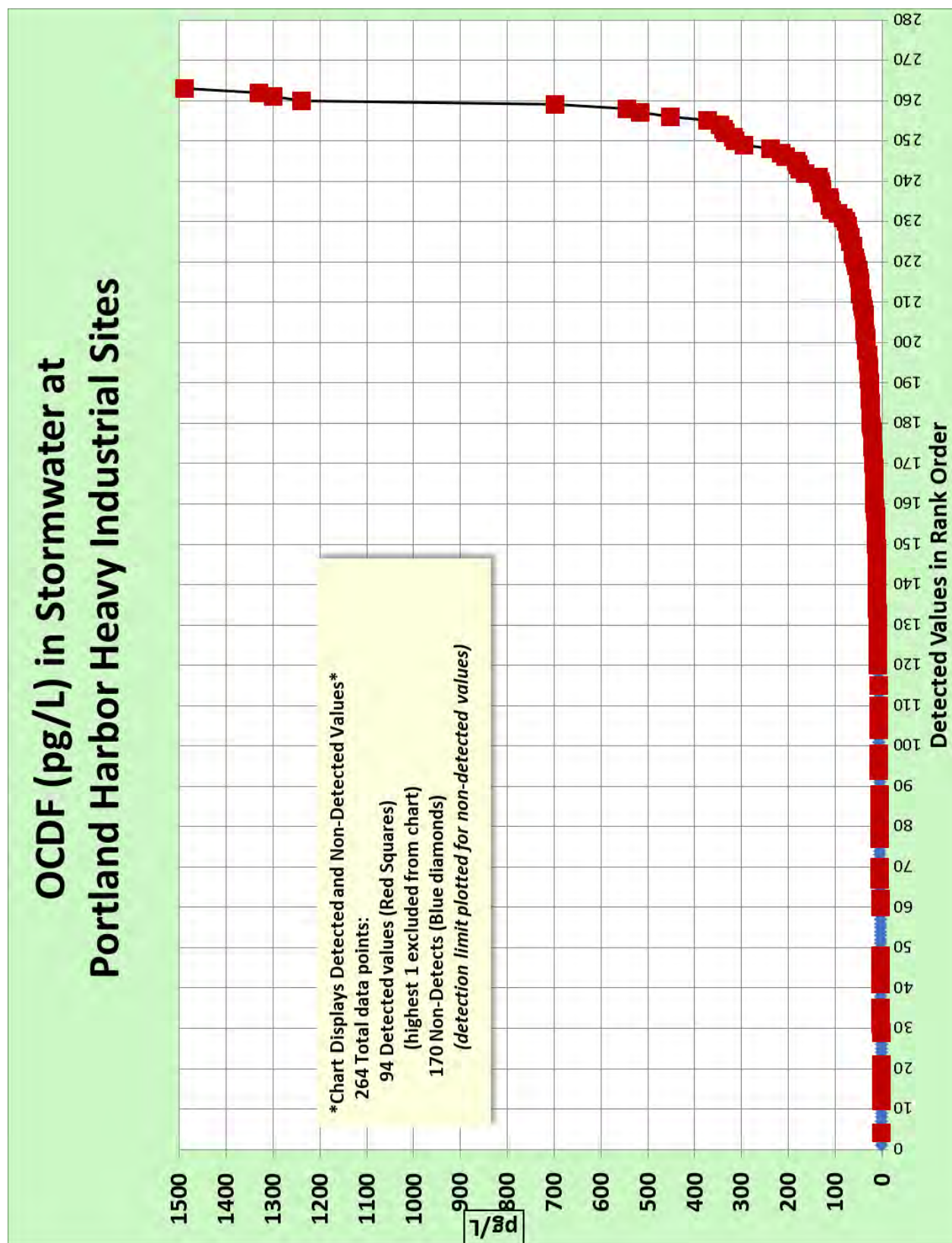
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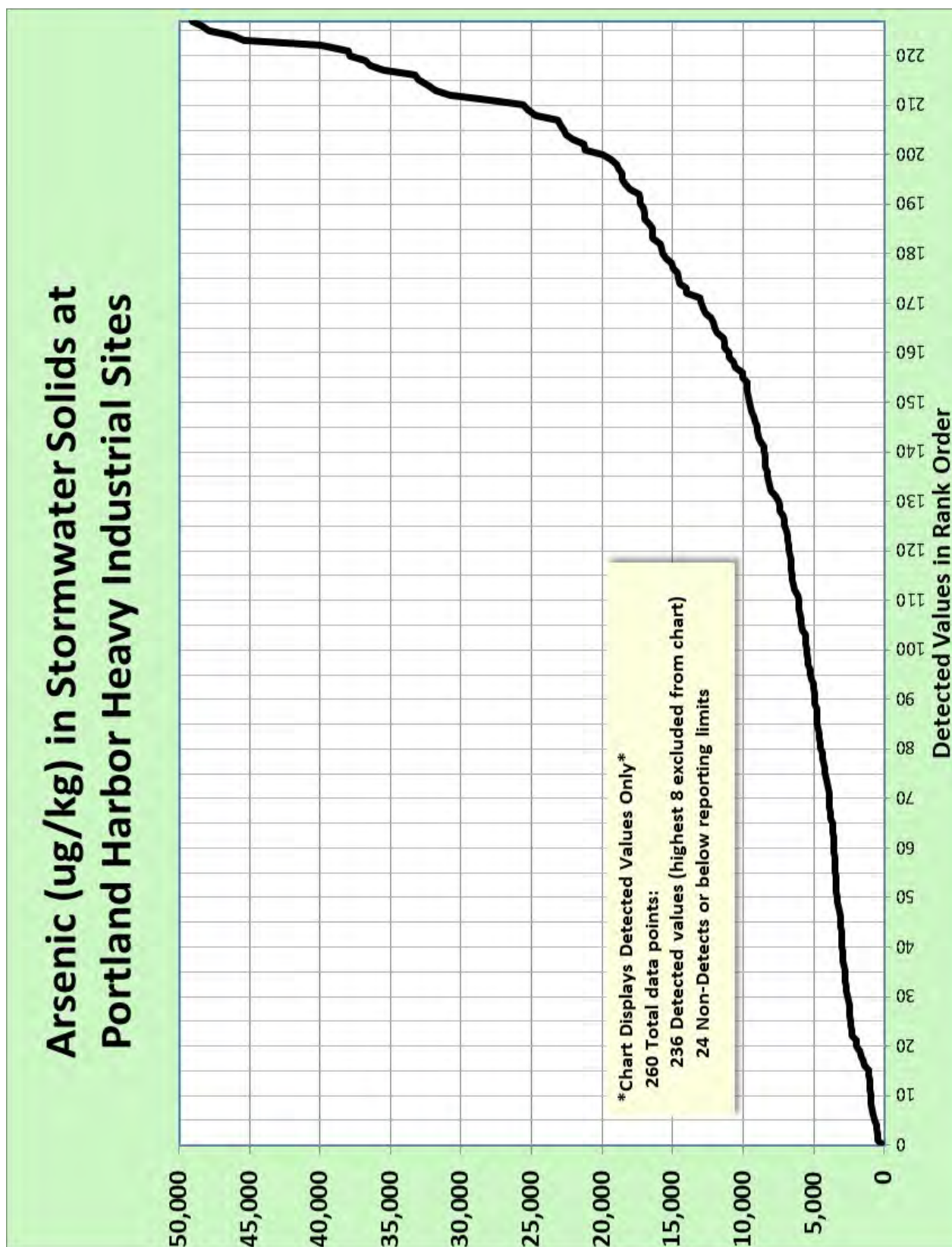
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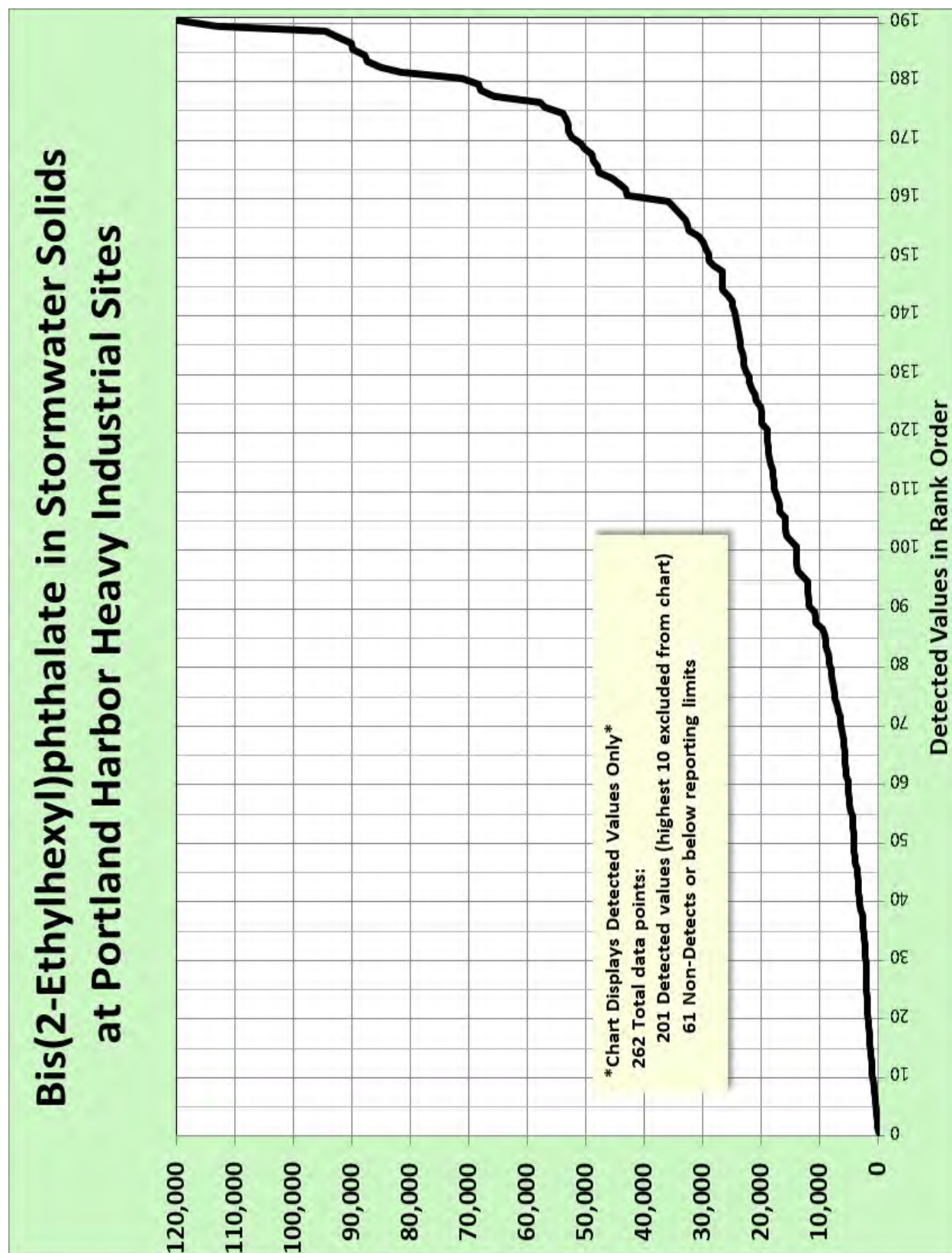
SEDIMENT CHARTS

Data used to create the charts include catch basin sediment samples and suspended sediment samples. Suspended sediment samples were collected in sediment traps placed within stormwater pipes for a minimum of three months during the rainy season.

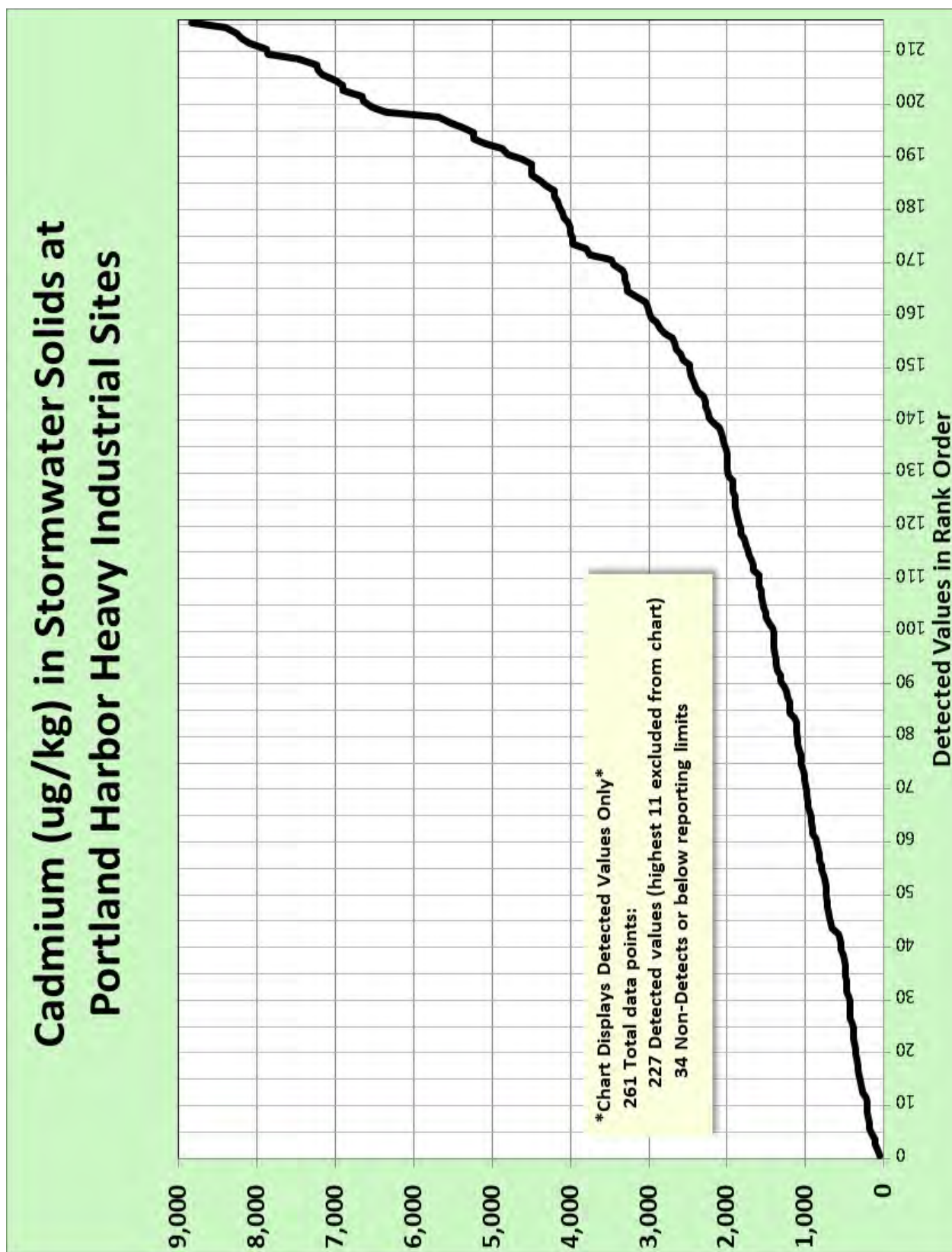
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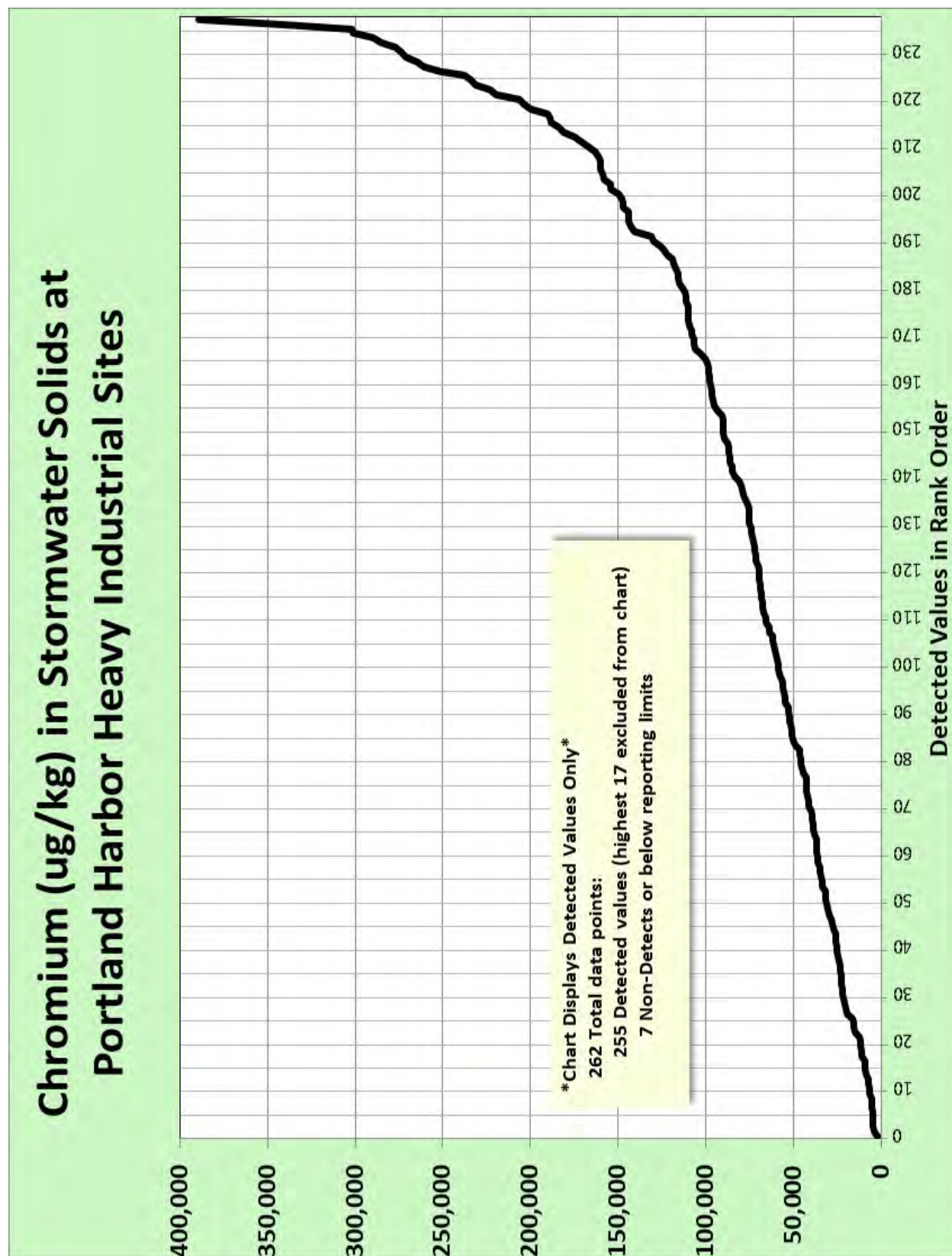
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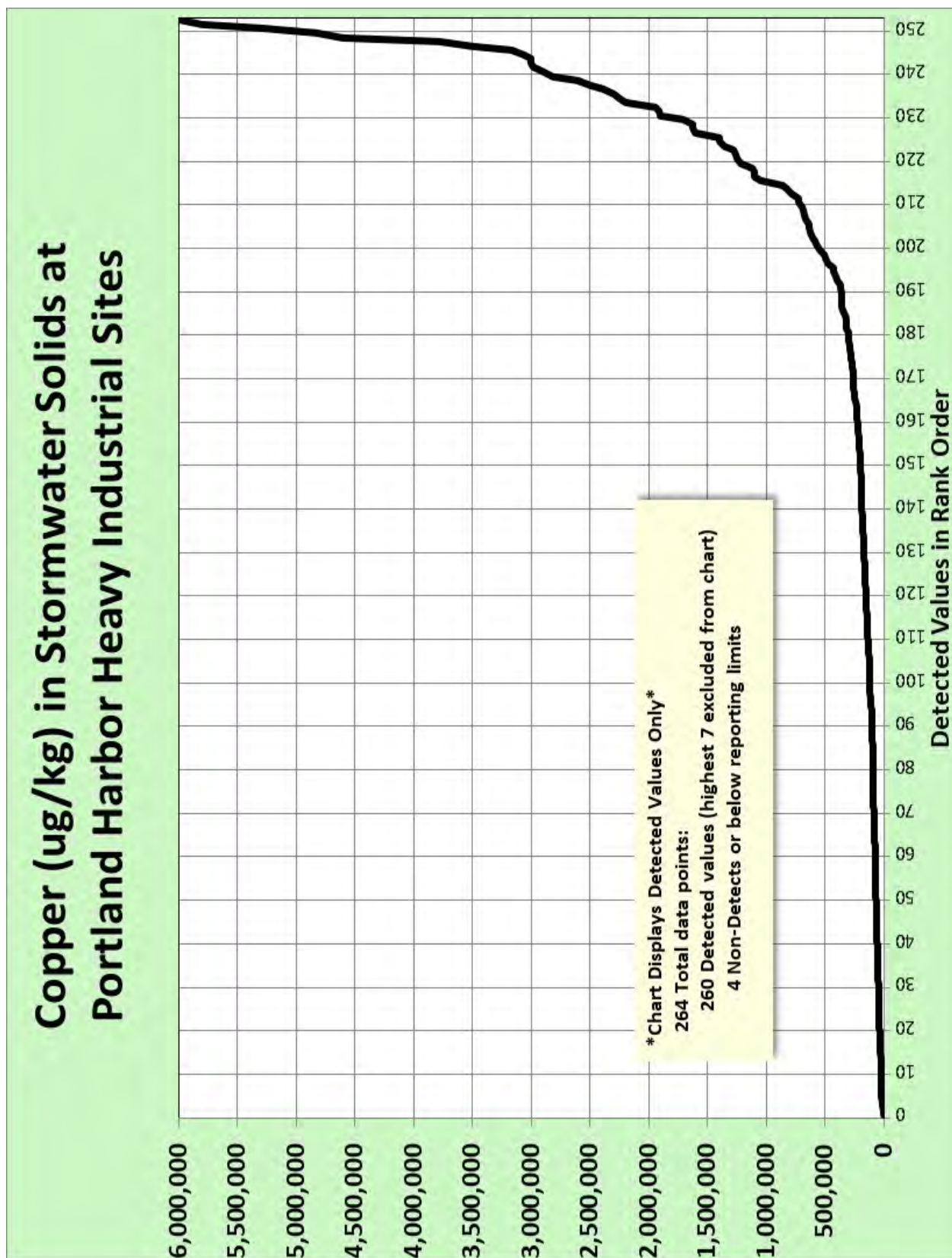
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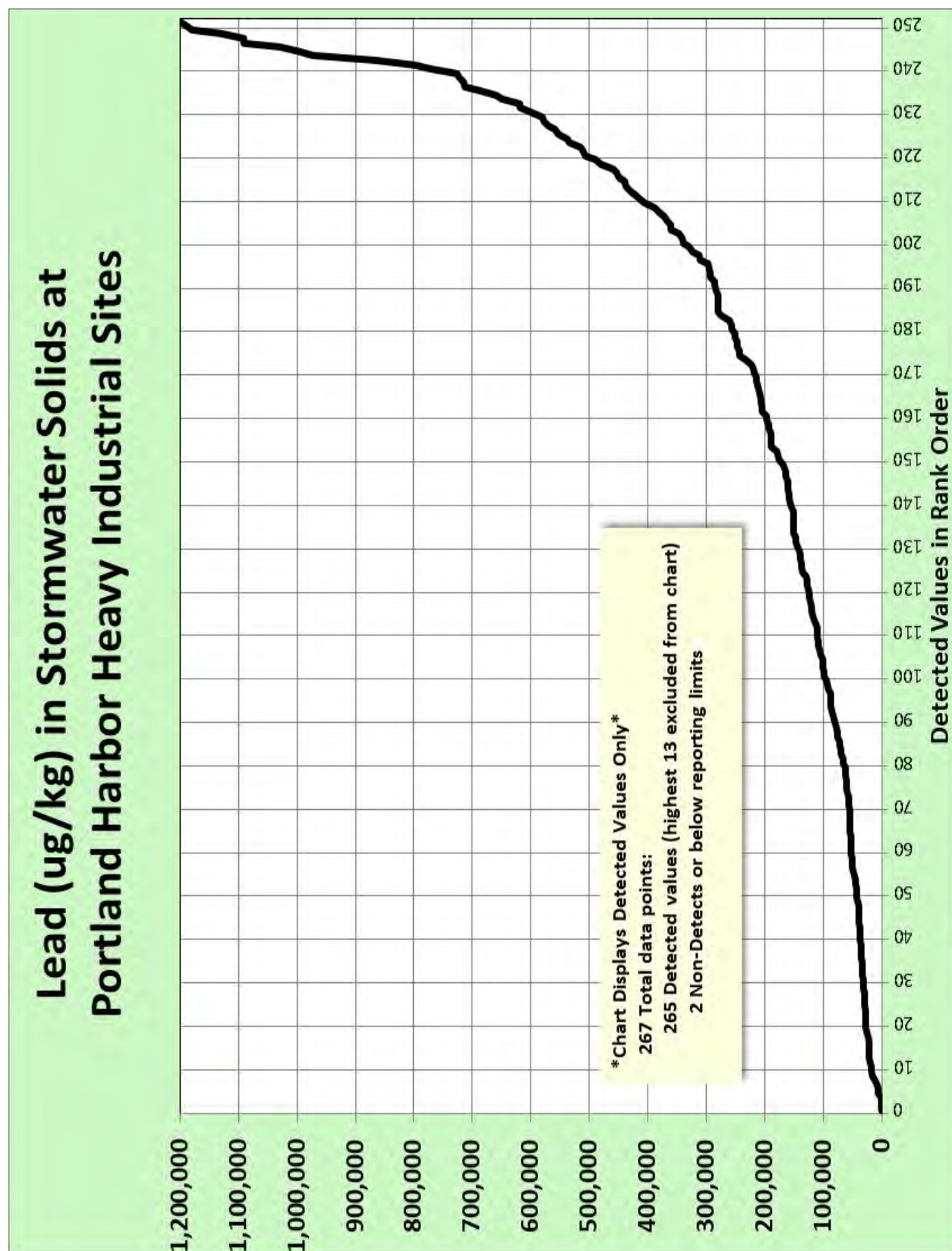
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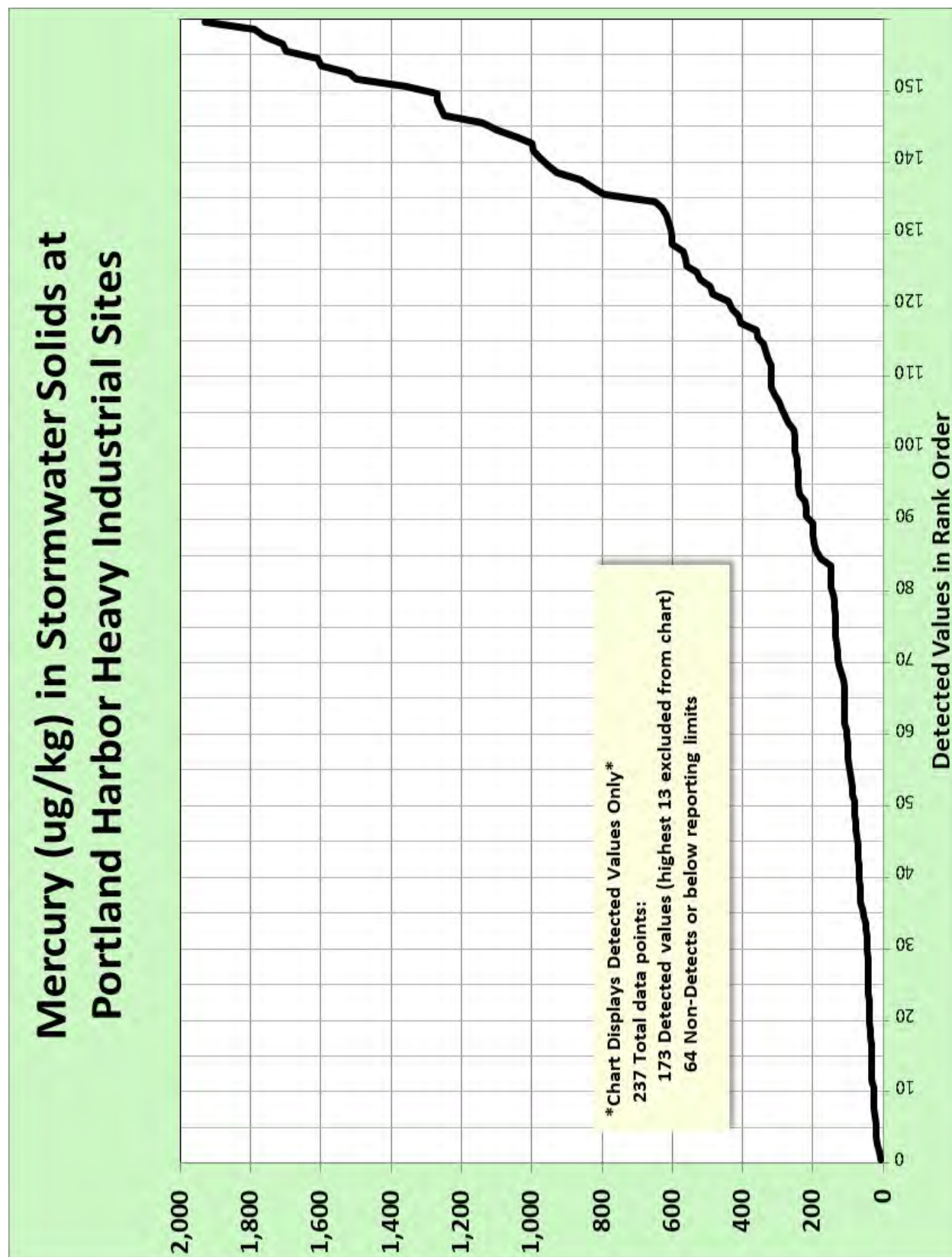
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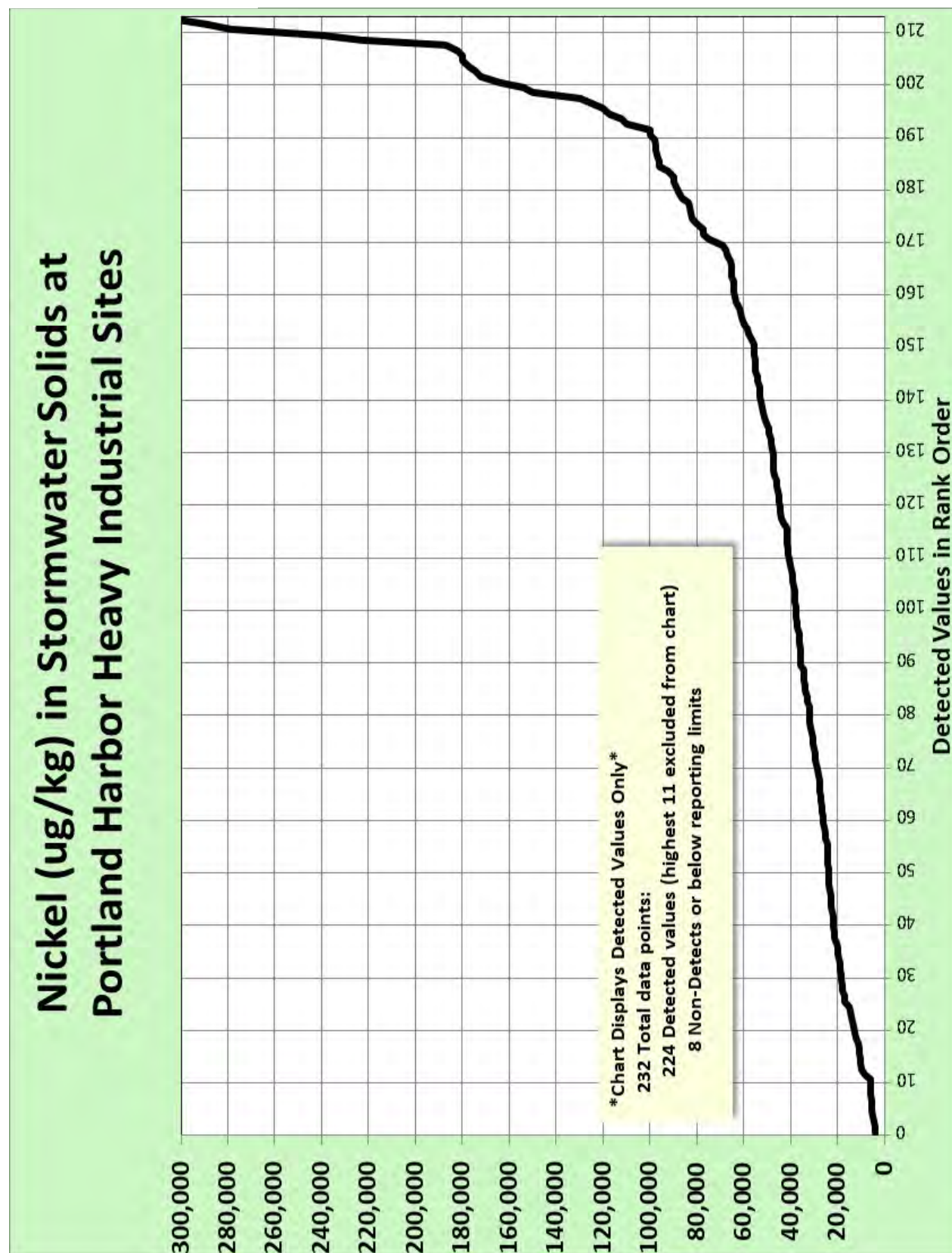
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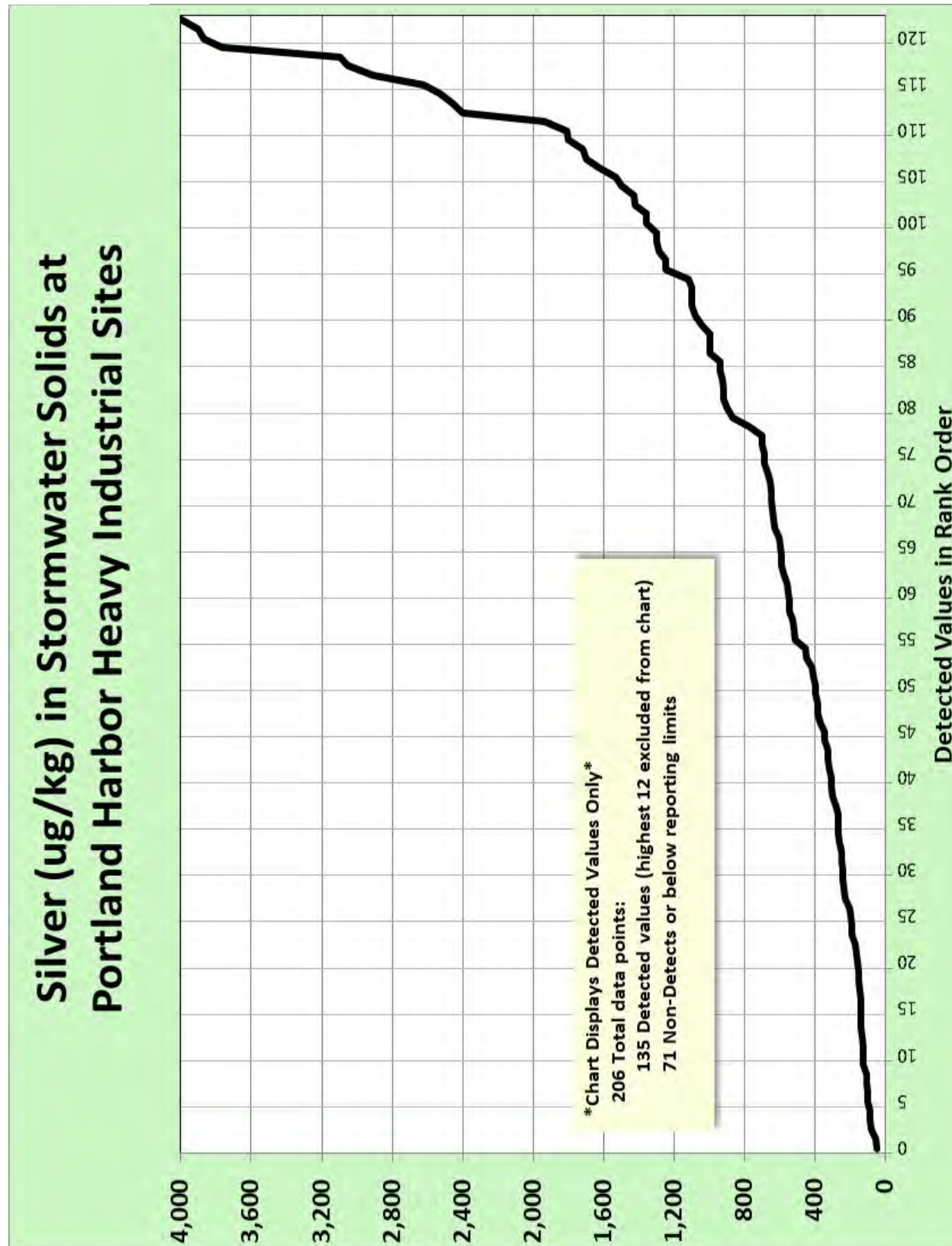
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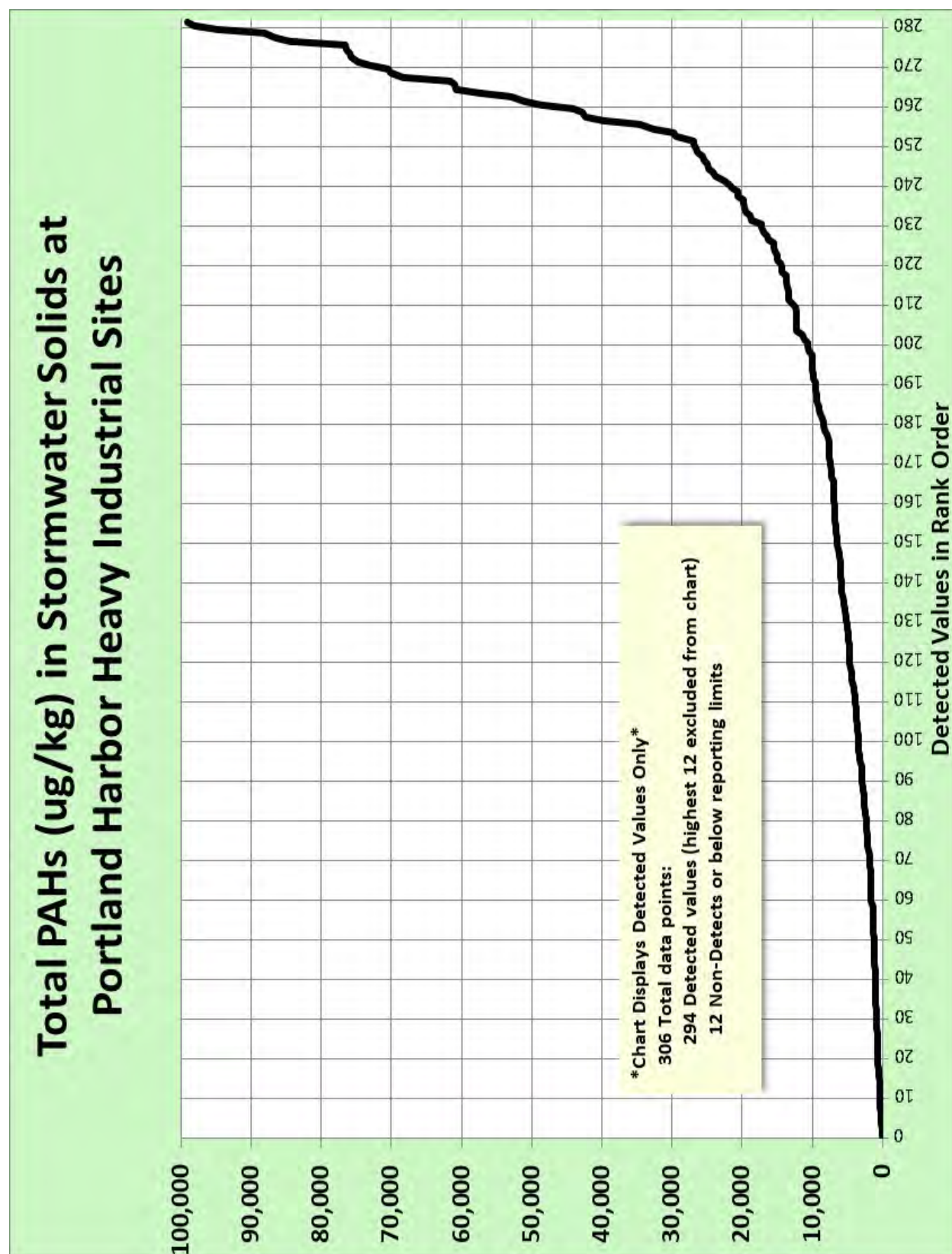
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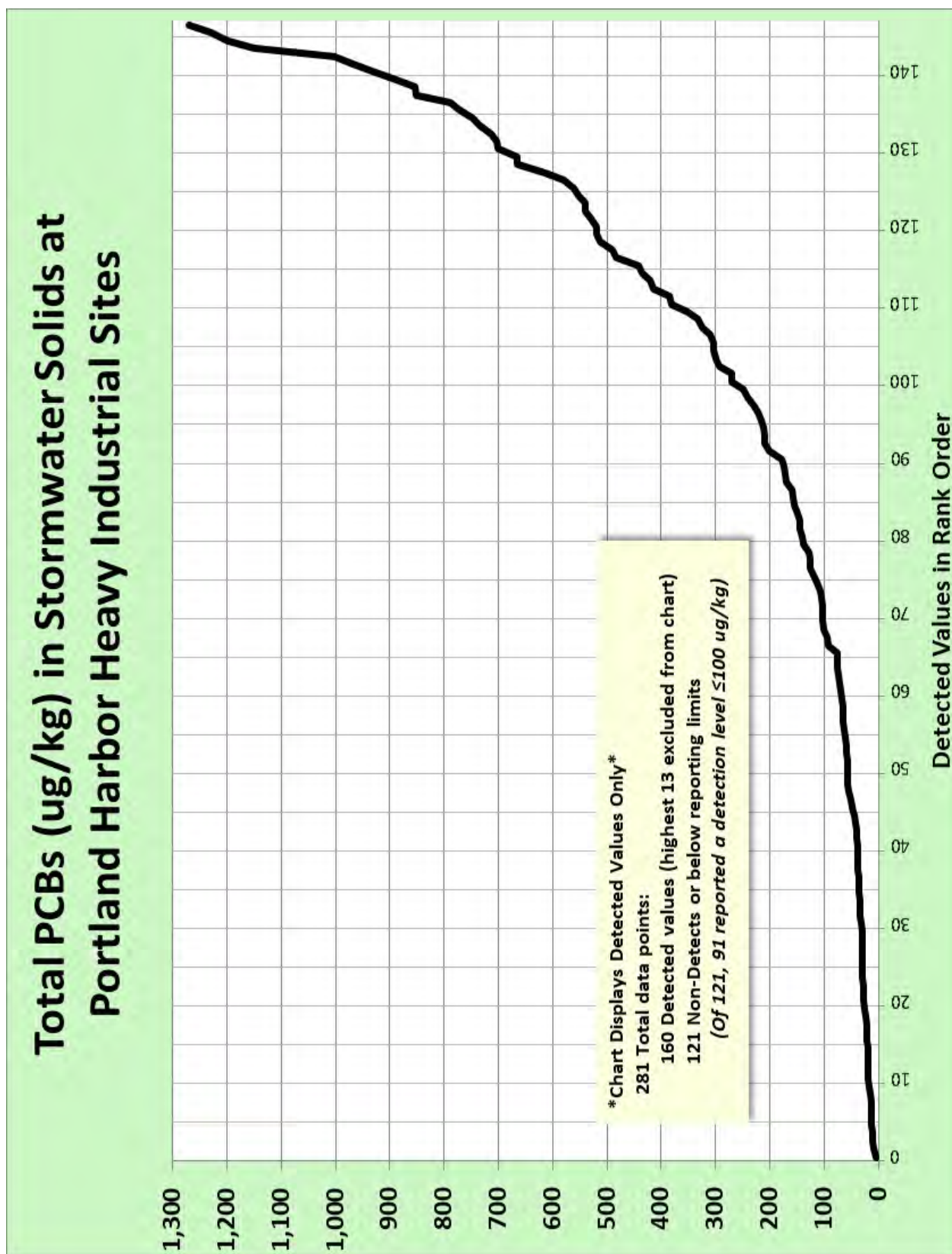
SILVER



TOTAL PAHS



TOTAL PCBS



ZINC

