Water Solutions, Inc.

Technical Memorandum

To: Catherine Corbett/LCREP

From: Heidi Blischke, RG / GSI Water Solutions

Date: August 5, 2011

Re: **Lower Columbia River Estuary Contaminant Data Compilation and Synthesis Project**

Introduction

The Lower Columbia River Estuary Partnership (Estuary Partnership) contracted GSI Water Solutions, Inc. (GSI) to compile an Access Database of the readily available electronic data from local agencies for selected toxics in lower Columbia River water, sediment, and biota. GSI worked in close association with Estuary Partnership staff and the Lower Columbia Monitoring Subgroup, which consists of staff from the various agencies. The goal of this work was to develop a database of selected toxic pollutants to assist in identifying data gaps in the understanding of water quality within the lower Columbia River estuary, and to inform development of the Estuary Program long-term monitoring plan.

Project Description

The lower Columbia River estuary is an "Estuary of National Significance," one of only 28 in the nation. The mission of the Estuary Partnership is to preserve and enhance the water quality of this important estuary so it can support its biological and human communities. The Estuary Partnership was created in 1995 by the governors of Washington and Oregon and the United States (US) Environmental Protection Agency (EPA) under EPA's "National Estuary Program" to be the lead regional entity that coordinates and converges regional scientists and habitat restoration partners, advances science, and implements actions to improve ecological conditions in the lower Columbia River estuary.

The Estuary Partnership's Management Plan was the first regional bi-state plan to articulate the estuary's importance and identify a set of actions to address priority issues. The priority issues are: habitat loss and modification, degradation by human activities, toxic and conventional

pollution, multiple entities with competing responsibilities for the lower Columba River, and public engagement. The Plan identifies 43 actions with specific environmental goals and objectives that address these priority issues in the lower river. One of the actions identified is Action 27: Implement the Estuary Program Information Management Plan. In 2009, the Estuary Partnership and EPA Toxics Reduction Working Group developed a strategy for the Columbia River Basin to support regional monitoring and contaminant reduction actions. The monitoring strategy divides the Columbia River into five evaluation reaches and prioritizes locations for sampling within each reach based on three key datasets including: tributary flow rates, stressors, and previously collected monitoring data.

The Toxics Reduction Working Group compiled flow and stressor data for tributaries between Bonneville Dam and the Columbia River's mouth. Compilation and analysis of previously collected data on this reach of the Columbia are limited to flame retardants, mercury, DDT, and PCBs in fish that were compiled for EPA's "*Columbia River Basin: State of the River Report for Toxics*"(2009).

The Estuary Partnership and EPA identified the synthesis of recent contaminant datasets as a critical pathway for completing the detailed monitoring plan for the lower Columbia River and, in turn, supporting regional monitoring and contaminant reduction efforts.

This technical memorandum addresses the compilation of recent datasets (primarily post-2000 with the inclusion of the 1996 bi-state study) into a relational Microsoft Access® database (database) and provides a preliminary synthesis of the findings through the following actions:

- Collected accessible databases or electronic data files that contained toxics data for the lower Columbia River from various agencies.
- Coordinated with the monitoring team regarding standardization of the database input files and the basic database set-up so that it can readily be used and maintained by the Estuary Partnership, monitoring team, and other potential users.
- Reviewed the database for readily identifiable duplicates, accuracy of lists within each header, data units, and other typical data quality issues for databases.
- Used the database to produce maps and statistics on selected toxics.
- Provided recommendations regarding data gaps.

While limited concentration trend data was examined for this reporting effort, the database does include data for the bi-state report from 1996 and other pre-2000 data that could be used to determine trends for individual toxins where multiple years of data are available.

Available Datasets for the Lower Columbia River

Data and information on the Columbia River are spread amongst many agencies and in multiple databases. To effectively manage the river, the data need to be readily accessible to all who are interested. The Estuary Partnership relational Microsoft Access® database was pulled together from a number of sources. Data was collected from the US Army Corps. of Engineers (ACOE), Oregon Department of Environmental Quality (DEQ), Washington Department of

Ecology (DOE), US Environmental Protection Agency (EPA), Portland Harbor Lower Willamette Group (LWG), National Oceanic and Atmospheric Administration (NOAA), and US Geological Survey (USGS). Attachment A includes a list of the data provided by each agency (Table A1) and the electronic raw data files obtained from each source (see attached DVD).

Data obtained from the various sources was included in the project database if the sample was collected from the identified reaches of the lower Columbia River as shown in Figure 1. The media and parameters that were compiled in the database from within the area of interest are summarized in Table 1. The media included sediment, biota, and water (conventional grab and semi-permeable membrane device, or SPMD) samples. The parameters included polycyclic aromatic hydrocarbons (PAHs), flame retardants, polychlorinated biphenyls (PCBs), pesticides, metals (including mercury), water temperature, and dissolved oxygen. Primarily, the data included in the database are from post-2000 samples; however, data from the bi-state study from the mid-1990's were also included at the request of the monitoring team[1].

Table 1: Media and Parameters Compiled

Media	Parameters
Biota	Pesticides Flame Retardants PAHs Metals PCBs
Sediment	Pesticides Flame Retardants PAHs Metals PCBs
SPMD	Pesticides Flame Retardants PAHs Metals PCBs
Water	Pesticides Flame Retardants PAHs Metals PCBs Temperature Dissolved oxygen

[1] A summary of the database process and preliminary results for updating the LCREP Toxics monitoring plan (including the development of the database, figures, and findings presented in this technical memorandum) was prepared by Mike Cox, EPA. This summary which includes meeting notes for October 27, 2010, December 9, 2010, and April 13, 2011 is presented in Attachment B.

Standardization of the Data Sets for Incorporation into the Lower Columbia River Access® Database

Several steps were taken to reduce the data set from each source to obtain information required for the database. The following section describes the steps taken to compile the data and create the relational Microsoft Access® Database.

Creating the Database

Obtaining the Data

The data were either pulled from a respective agency's online database or were given to GSI in electronic format (i.e., Microsoft Excel® spreadsheets). Once received, the data were filtered and databases queried based on Estuary Partnership's criteria (Table 1). To be incorporated into the project database, chemical data for sediment, tissue, or water (grab sample or SPMD) samples where extracted from the source data. Chemical data for the following analyte groups were extracted from the source files for inclusion in the database: flame retardants, metals, PAHs, PCB congeners, PCB Aroclors, pesticides, temperature, and dissolved oxygen (pH was also included where available). A complete list of analytes included in the database is provided in Attachment A – Table A2.

Limiting the Area

Many of the source data file contained data for samples outside of the lower Columbia River estuary area of interest; data for these samples were not incorporated into the project database. The data were formatted for spatial analysis in GIS. In order to plot the data, it was necessary that all of the sample locations had coordinates and that the coordinates utilized the same coordinate system. Latitude and longitude were selected as the universal coordinate system for the database. For sample locations without coordinates, additional research was conducted. In some cases, the source agency was contacted to obtain sample coordinates.

Using the latitude and longitude, the data were plotted on a map within the Estuary Partnership's area of interest. The data were clipped to the area of interest; therefore, reducing the data selected for inclusion in the project database to include only those samples within the desired area of interest. The reduced data were exported out of GIS and into new spreadsheets. Each spreadsheet contained an individual dataset that was filtered by location, media, and parameters of interest.

Standardizing the Database Fields

Standardizing the data from the various sources was a very important step in developing the project database. Standardization allows the project database to be queried to select discrete datasets for plotting concentration trends, mapping contaminant distributions, and conducting statistic evaluations of contaminant data. The GSI team met with the Estuary Partnership and the monitoring team to agree upon the appropriate database fields and terminology for each

field[2]. In addition to determining the fields and terminology, units of measurement were standardized for consistency.

Based on the sixty fields to be included in the database, five relational Microsoft Access® database tables were created: tblAnalyteInfo, tblLocation, tblReport, tblSample, and tblValue. These database tables are described below.

TblAnalyteInfo:

- This table contains all the information associated with the analyte.
- It houses the specific analyte name, group, and CAS number[3].
- Both the "Analyte" and "CASNumber" fields are unique.

TblLocation:

- All information directly associated with sample location is stored in this table.
- Fields include "StationID", "LocationName", "LocationDescription", "Latitude", "Longitude", "RiverMile", "Elevation", "ElevationDatum", WaterBodyName", WaterBodyType", "County" and "State".
- The "LocationID" field is unique.

TblReport:

- The report table stores all information associated with the source of the data.
- Fields include: "ReportName", "ReportDescription", "AuthorName", "AuthorCompany", "SourceName", and "SourceCompany".
- "SourceName" and "SourceCompany" are two of the few fields that were populated by GSI; these fields identify who actually provided the data.
- "ReportName" is the unique field in the table.

TblSample

- "TblSample" includes all information associated with the sample.
- Thirty two fields include information such as the Sample ID, when the sample was collected, how it was collected, the depth at which it was collected, what type of sample is it, and information specific to tissue data, such as age, gender, and weight.
- "SampleID" is the unique field in this table.

TblValue

- The value table contains all information associated with the sample result value.
- Information in this table includes: result, qualifier associated with result, method detection limit, reporting detection limit, value's unit, analysis date, lab method and whether the sample was total or dissolved.

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[2] See Footnote 1.

[3] CAS Registry Numbers are unique numerical identifiers assigned by the "***C**hemical **A**bstracts **S**ervice*" to every chemical described in the open scientific literature. Source: Wikipedia "CAS Registry Numbers". http://en.wikipedia.org/wiki/CAS_registry_number . Downloaded: August 3, 2011.

- There are two result fields in this table. "Result" and "ResultValue". "Result" is a text field and "ResultValue" a numerical field. The reason for this is that Access tends to round numbers in numerical fields which can result in the loss of significant figures. The text field "backup" ensures that significant figures are maintained.
- This table also includes a unique "ID" field, generated solely for that purpose. Microsoft Access® populated this field with a sequential number set. Each table needs to have a unique field in order to run efficiently. The "ID" field will not affect the data in any way and will not appear in any of the queries.

These five tables are related to one another based on their unique fields. "TblAnalyteInfo" is related to "tblValue" through the "Analyte" field. The analyte field is unique in the "tblAnalyteInfo" and is also included in the "tbleValue" although is not unique in this table. The tables "tblLocation" and "tblReport" are both related to "tblSample" through the fields "StationID" and "ReportName" (respectively) and these fields are both unique in their respective tables. Lastly, "tblSample" is related to "tblValue" through the unique "SampleID" field in "tblSample". The tables are not meant to be used individually but because they are related they can be used in Access ® queries to produce usable tables. The reason for individual tables is to keep similar data organized together while keeping the database efficient. .

Once the database had been designed and the table formats created, the Microsoft Excel ® files with the source data were parsed out into the five above-listed Access ® database tables. Standardized Microsoft Excel ® files were then uploaded into the Access database. The GSI team did not attempt to fill in fields with data that were not populated in the original database. During this process, all sample IDs, station IDs and report names were checked and, if not already, made unique. Generally to make a sample ID or station ID unique, the source name was appended to the ID. It was also during this process that analyte names, matrix, species, qualifiers, and units were standardized. No other manipulations of or assumptions about the data were made. As a result, many fields in the database are blank; data found in the database representatives how it was received from the source. If there are questions or concerns regarding the data, the source fields can be used to resolve any issues by reviewing the source data. Database entry instructions are presented in Attachment A.

Using the Database

The database consists of six tables and five queries. In addition to the five relational tables, described above, there is also a look up table. "TblDefinitions" is meant to be used as a look up tool. This table defines all the abbreviations found throughout the tables and also lists the fields in which the abbreviation can be found.

The average user will most likely use the queries as a data resource. All the fields from the five relational tables are pulled together through five queries; one for all data, and four that are matrix-specific. "QryAllData" pulls together all of the data in the database for all matrices. For information about a specific matrix, biological, sediment or water, it is more efficient to use the

query specific to that matrix. The benefit of using the matrix specific query is efficiency. For example, "qrySediment" only has sediment data and there are far fewer records than in "qryAllData". Fewer records allow the database to run faster. In addition to the three matrix specific queries there is also a SPMD specific query. Although the data's matrix is water, the collection method is unique and was thought important enough to have its own query. Each query is set up so the user can easily filter fields to show the desired results. To filter a field, simply click on the small arrow adjacent to the field header on the right. A drop down window will open and the desired boxes may be checked as on and off. To easily remove all filters running on the query, click the "Filtered" button, located on the bottom left next to the search bar.

Quality Assurance/Quality Control

A quality assurance/quality control evaluation was conducted after the database was built. This evaluation is important to conduct before using the database to ensure that the information derived from the database is useable and representative. The quality assurance/quality control consisted of the following actions:

Duplicate Records
Duplicate records were found and removed. To find the duplicate records, a "Find Duplicate Query" was run based on the following fields: "SampleDate", "Matrix", "Parameter", "Result", "Latitude", "Longitude", "Sampletype", "Lowerdepth", "Species", and "LipidPercent". Any records with the same values for all ten fields were marked as duplicates. A script was then run on only the duplicate data to remove all but one of the duplicated records. Temperature, pH and dissolved oxygen data were excluded from the "Find Duplicates Query" due to the likelihood that these data could in fact have results of the same value at the same location on the same date as one another because of the high frequency of their collections. However, in review of the database, it was noted that Portland Harbor LWG data were present in multiple databases with changes to the sample names which resulted in those duplicates being missed during the initial elimination of duplicates. This resulted in reloading the database and not including Portland Harbor data from any sources outside of the LWG Site Characterization/Risk Assessment (SCRA) database.

Samples with multiple results for a single analyte
The maximum value was marked as reportable. This was done without regard to detection.

Zero or negative result values
Analytes with result values of 0 or a negative number were marked as not-reportable.

The following table changes were made to the "tblValue" during the quality assurance/quality control (QA/QC) evaluation:

- Added and populated the cas_rn field. This field links to the rt_analyte table for analyte names and sort orders. Analyte names were not changed in the tblValue table.

- When an analysis method was unknown or not provided, GSI inserted the word METHOD into the analytic_method field. This was done to prevent Null errors in queries.
- Populated the totaldissolved field with NA where the field was null. This was done to prevent Null errors in queries.
- Added the field interpreted_qualifiers. This field is a simplified interpretation of laboratory assigned qualifiers.
- Added the detect_flag field. This field is a simple yes/no to indicate whether a value was detected, as opposed to a non-detected value. It is much more stable to use this flag rather than the qualifiers for determining detection.
- Added the reportable field. This field is a simple yes/no to indicate that a result is to be used in reporting and calculations. This is a way to remove rejected results and multiple results from reporting and calculations without removing them from the database.
- Added the notes field. This is a memo field for additional documentation on result data.
- Added the result_type_code field. This field is used to identify and differentiate result types, and is helpful for limiting queries and simplifying reporting. Valid values and definitions include:

  TRG = target analyte
  PHPR = physical property
  SUR= surrogate

Summing of Analytes

Estimated total analyte group (e.g., Total PCBs, Total PAHs) concentrations were estimated by summing individual analyte concentration for specific analytes/congeners within the analyte group. The list of analytes/congeners used in a given calculated total concentration are defined Attachment A - Table A3. Calculated totals are the sum of all detected concentrations including estimated contaminant concentrations (i.e., J qualified data). The "detect_flag" is designated as Y. Where all of the individual analytes within a group were not detected, then the highest RDL/PQL was the selected value for the calculated total, and a U qualifier was added to indicate the lack of detected values. Nondetects for these sums are designated in the "detect_flag" as N. The "Lab Method" database field is populated with "GSI-Calc" to indicate the analyte group total concentration is a GSI derived value.

Analysis of Available Data and Selected Maps

With direction from the monitoring subgroup[4], GSI prepared figures and tables to summarize available analytical data for the lower Columbia River contained in the project database. Analytes and media presented in this technical memorandum were selected by the subgroup to represent various analyte groups (e.g., metals, PAHs, PCBs, pesticides, flame retardants) and

[4] See Footnote 1.

based on the availability of data and risk based screening level values. Tables 2 through 5 summarize by analyte, the number of samples analyzed the number of detections, minimum concentration and maximum concentration for each media. The sample counts included in these tables do not include the Portland Harbor LWG data as that data would skew the numbers, based on the large number of samples in that reach of the Willamette River. Two types of figures were prepared for select analytes in water (grab, SPMD), sediment and biological samples including:

1. Contaminant distribution maps. These maps present sample locations, contaminant concentration ranges above risk based screening level values, and the location of potential monitoring sites proposed in 1999. Portland Harbor data from the LWG SCRA database is included in these figures; however, because the resolution for the Portland Harbor data are poor at the scale plotted for the entire watershed, additional Portland Harbor figures from the Portland Harbor *Draft Remedial Investigation Report*[5] are included in Attachment C.

2. Concentration versus river mile plots. These plots present data for two time periods. Data collected pre-2000 are presented in the upper portion of the figure and data collected post-2000 are presented in the lower portion of the figure. For several analytes, duplicate plots are presented with different concentration scales. In addition, plots fore selected analytes are presented for the Willamette River.

The following paragraphs describe the general occurrence and distribution of analytes selected by the monitoring subgroup.[6]

Copper

- Copper was detected in about
  - 99 percent of sediment samples (Table 2)
  - 96 percent of surface water grab samples (Table 3)
  - 94 percent of biological samples (Table 4)
- Limited surface water data for copper in the lower Columbia River are available (Figure 2).
- Most available data are from the Portland Harbor Superfund Site located on Willamette River (Figure 3).
- Most copper data above risk based screening level values

Chloropyrifos

- Chloropyrifos was detected in about 70 percent of surface water grab samples (Table 3)
- No surface water data for chloropyrifos were identified in the lower Columbia River (Figure 4).

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[5] *Portland Harbor RI/FS Remedial Investigation Report. Draft*. Prepared for the Lower Willamette Group. Portland, OR. October 27, 2009. Prepared by Integral Consulting Inc., Windward Environmental LLC, Kennedy/Jenks Consultants, and Anchor QEA, LLC.

[6] See Footnote 1.

- Limited data were identified in the Willamette River (Figure 4).

Mercury

- Mercury was detected in about
  - 84 percent of sediment samples (Table 2)
  - 78 percent of surface water grab samples (Table 3)
  - 94 percent of biological samples (Table 4)
- Concentrations generally low compared with other areas in basin
- Pre-2000 data had more outliers; apparent concentration decrease since pre-2000
- Post-2000 concentrations slightly higher concentrations upriver than downstream
- No big spikes; no obvious sources
- Higher concentrations in Willamette River than Columbia River
- Concentrations exceed risk based screening levels values in both rivers
- Biological sample data for mercury in the lower Columbia River is widely available and sample locations are distributed in each reach of the river (Figure 5).
- Biological sample data are densest in the Portland Harbor Superfund Site located on Willamette River (Figure 5).
- Mercury concentrations in biological samples sediment were generally less than 0.2 milligrams per kilogram (mg/kg) in the Columbia River samples collected pre-2000 (Figure 6) and approximately seven sample concentrations exceeded 0.5 mg/kg. Post-2000 samples are generally less than 0.15 mg/kg (Figure 6), with only 1 sample concentration exceeding 0.5 mg/kg.
- Mercury concentrations in tissue are also fairly uniform, primarily ranging from 0.01 to 0.6 mg/kg (Figure 6) in the Columbia River and from ND to 0.9 in the Willamette River (Figure 7)

Total PAHs

- Total PAHs were detected in about
  - 58 percent of sediment samples (Table 2)
  - 72 percent of surface water grab samples (Table 3)
  - 61 percent of biological samples (Table 4)
  - 38 percent of the SPMD samples (Table 5)
- Limited sediment data for Total PAHs in the lower Columbia River are available (Figures 8, 9a and 9b) and most concentrations are in the lowest mapped concentration range (0 – 465 ug/kg). A few higher concentration samples are present in the Kelso/Longview area.
- Majority of concentrations below laboratory detection limits (i.e., non-detects)
- Sediment sample data are densest in Portland Harbor Superfund Site located on Willamette River (Figures 8, 10a and 10b) and most concentrations are in the highest mapped concentration ranges (>22,800 ug/kg).
- No apparent concentration trends in pre-2000 to post-2000 data
- Both pre and post-2000 data shower higher concentrations at mouth of the Columbia, and near Longview and Portland
- Potential PAH source area near Longview

- Highest concentrations in the lower Willamette River and most concentrations are above risk based screening concentrations.

Total PCBs

- Total PCBs were detected in about
    - 47 percent of sediment PCB Aroclor samples (Table 2)
    - 42 percent of surface water PCB Aroclor samples (Table 3)
    - 60 percent of biological PCB Aroclor samples (Table 4) and 90 percent in PCB congener samples
    - 100 percent of the SPMD PCB Aroclor and congener samples (Table 5)
- Limited post-2000 biological sample data for Total PCBs in the lower Columbia River are available (Figures 11, 12a and 12b) and most concentrations are in the lowest mapped concentration ranges (0 – 265,000 ng/kg).
- Very limited pre-2000 biological data are available for the Columbia River (Figures 14 and 15) and no data are available for the Willamette River (Figures 13a and 13b)
- Concentrations in Columbia River above risk based screening levels, but less than concentrations in the lower Willamette River.
- Post-2000 Columbia River data indicates potential concentration spikes which could may be related to sources
- Biological sample data are densest in Portland Harbor Superfund Site located on Willamette River (Figures 11, 13a and 13b) and most concentrations are in the highest mapped concentration ranges (>880,000 ng/kg).
- Highest concentrations noted in the lower Willamette River and most concentrations are above risk based screening concentrations

Total DDx

- Total DDx (i.e., DDT/DDD/DDE, o, p' and p,p' iomers) were detected in about
    - 53 percent of sediment samples (Table 2)
    - 88 percent of surface water grab samples (Table 3)
    - 96 percent of biological samples (Table 4)
    - 100 percent of the SPMD samples (Table 5)

Sediment Samples

- Sediment data for Total DDx in the lower Columbia River are widely available and sample locations are distributed in each reach of the river (Figures 14, 15a and 15b) and most concentrations are in the three lower concentration ranges (< 46.1 ug/kg).
- Higher sediment concentrations noted in Columbia River at river miles 10, 35, and 100
- Concentrations in Columbia River above risk based screening levels, but generally less than concentrations in the lower Willamette River
- Sediment sample data are densest in Portland Harbor Superfund Site located on Willamette River (Figures 14, 16a and 16b) and most concentrations are in the two higher mapped concentration ranges (>46.1 ug/kg)
- Highest concentrations in the lower Willamette River and most concentrations are above risk based screening concentrations

- Widespread pre-2000 and post-2000 sediment data are available for Total DDx in the Columbia River (Figures 15a and 15b). During both time periods, Total DDx concentrations are generally not detected and detected concentrations are mostly less than 5 ug/kg
- Limited pre-2000 sediment data are available for the Willamette River (Figures 16a and 16b). Total DDx sediment sample data are densest in Portland Harbor Superfund Site located on Willamette River (Figures 14 and 16b) and concentrations are in the highest at river miles 6 and 7

Biological Samples

- Biological data for Total DDx in the lower Columbia River are widely available and sample locations are distributed in each reach of the river (Figures 17, 18a and 18b) and concentrations are highly variable
- Concentrations in Columbia River above risk based screening levels, but generally less than concentrations in the lower Willamette River
- Biological sample data are densest in Portland Harbor Superfund Site located on Willamette River (Figure 17) and concentrations are highly variable.
- Widespread pre-2000 and post-2000 biological data are available for Total DDx in the Columbia River (Figures 18a and 18b). Total DDx concentrations were mostly less than 400 ug/kg I pre-2000 data and lest than about 100 ug/kg in post-2000 data
- Pre-2000 biological data are very limited for the Willamette River (Figures 19a and 19b). Post-2000 Total DDx biological sample data are densest in Portland Harbor Superfund Site located on Willamette River and concentrations are in the highest at river miles 6 and 7
- Pre-2000 biological sample data had higher concentrations than post-2000 sample data
- Post-2000 biological sample data shows higher concentrations at mouth of Columbia River and near river miles 75, 80, and 140

SPMD Samples

- SPDM sample data have not been collected and analyzed for DDx within the Columbia or the Willamette Rivers. Available data are from the Columbia Slough (Figures 20 and 21)

PBDEs

- Total PBDEs were detected in about
    - 89 percent of biological samples (Table 4)
    - 88 percent of the SPMD samples (Table 5)
- SPDM sample data have not been collected and analyzed for PBDEs within the Columbia River. Only one sample was collected within the Willamette River (Figures 22 and 23)
- Biological sample PDBE data are available within each reach of the study area and concentrations are variable (Figure 24)
- Pre-2000 biological sample PBDE data are not available for the Columbia and Willamette Rivers

- Post-2000 biological sample PBDE data are available for the Columbia River and most densely collected between river miles 100 and 130 (Figures 25a and 25b)
- Biological sample data concentrations in Columbia River are above risk based screening levels and similar to concentrations in the lower Willamette River
- Post-2000 biological sample PBDE data are limited in the Willamette River (Figures 26a and 26b)

Summary and Recommendations for Future Monitoring

GSI compiled existing data on a limited set of analytes (i.e., toxics) and media to assist the Columbia River monitoring subgroup in developing a prioritization tool for the Columbia River Basin. The purpose of the tool is to assist agencies in prioritizing where to conduct future monitoring for toxic contaminants and possibly in updating their Long-term Monitoring Plan for toxics. GSI reviewed available Columbia River data and assisted group on whether to retain, add, or update the sampling sites for toxics.

The monitoring subgroup reviewed plots and figures provided by GSI and EPA including:

1. Maps for selected analytes and media and the concentration of the analytes within specific ranges (based on various risk based screening levels) for the lower Columbia River study area.
2. Plots of analyte concentration by river mile (Columbia River and Willamette River) for selected analytes and media.
3. Cumulative distribution plots (see Appendix D) for selected analytes and displaying risk based screening levels.

The monitoring subgroup reviewed the information listed above in conjunction with the recommendations on potential sampling sites from the 1999 LCREP report. The subgroup discussed each proposed monitoring location and whether the location was suitable for future monitoring for evaluating status, trends or source tracking.

It was determined that more detailed research was needed in order to make recommendations for selection future monitoring locations in the lower Columbia River. However, the group identified several site selection criteria for selecting future monitoring locations. A list of the proposed sampling stations is included in EPA's notes presented in Appendix B.

The following section summarizes the monitoring subgroups observations and recommendations[7] for selected analytes and media:

Copper and Chlorpyrifos (Surface Water Samples)

- Limited data available
- Most copper data above risk based screening level values

[7] See Footnote 1.

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations-upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Focus monitoring locations to fill spatial gaps

Mercury (Biological Samples)

- Concentrations generally low compared with other areas in basin
- Pre-2000 data had more outliers; apparent concentration decrease since pre-2000
- Post-2000 concentrations slightly higher concentrations upriver than downstream
- No big spikes; no obvious sources
- Higher concentrations in Willamette River than Columbia River
- Concentrations exceed risk based screening levels values in both rivers

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations-upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Consider monitoring for other metals

Total PAHs (Sediment Samples)

- Majority of concentrations below laboratory detection limits (i.e., non-detects)
- No apparent concentration trends in pre-2000 to post-2000 data
- Both pre and post-2000 data shower higher concentrations at mouth of the Columbia, and near Longview and Portland
- Highest concentrations in the lower Willamette River and most concentrations appear to be above risk based screening concentrations
- Potential PAH source area near Longview

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations-upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Fill spatial gaps above river mile 110 in the Columbia River

Total PCBs (Biological Samples)

- Very limited pre-2000 PCB data available
- Highest concentrations in the lower Willamette River and most concentrations are above risk based screening concentrations
- Concentrations in Columbia River above risk based screening levels, but less than concentrations in the lower Willamette River.
- Post-2000 Columbia River data indicates potential concentration spikes which could may be related to sources

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations- upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Focus future sample above river mile 65 in the Columbia River

Total DDx (Sediments and Biological Samples)

- Samples distributed throughout the lower Columbia River study area
- Many samples have high detection limits
- Highest concentrations in the lower Willamette River and most concentrations are above risk based screening concentrations
- Concentrations in Columbia River above risk based screening levels, but generally less than concentrations in the lower Willamette River
- Higher sediment concentrations noted in Columbia River at river miles 10, 35, and 100
- Pre-2000 biological sample data had higher concentrations than post-2000 sample data
- Post-2000 shows higher concentrations at mouth of Columbia River and near river miles 75, 80, and 140

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations- upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Focus monitoring location in mouth of the Columbia River or within Reach A (see Figure 1)
- Fill spatial gaps in biological samples between rile miles 10 and 40 of Columbia River

PBDEs (SMPD and Biological Samples)

- Limited data available (e.g., no pre-2000 data, limited sample locations in Willamette River)
- Biological sample data density highest for Columbia River between river miles 100 and 130.
- Biological sample data concentrations in Columbia River are above risk based screening levels and similar to concentrations in the lower Willamette River

Recommendation:

- Distribute future monitoring locations in Columbia River mainstem (> 3 stations- upstream, middle, lower)
- Collect samples in Willamette River (>2 stations upstream and downstream)
- Fill spatial data gaps in middle and lower reaches of the Columbia River