F- and H-Area Seepage Basins Water Treatment System Process Optimization and Alternative Chemistry Ion Exchange/Sorbent Material Screening Clearwell Overflow Study

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DOE Contract No. **DE-AC09-96SR18500**

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WSRC-TR-99-00020
Revision 0

Keywords: F and H Seepage Basins, groundwater treatment, treatability study, ion exchange, strontium, technetium, uranium, iodine

Retention: Permanent

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January 18, 1999

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Authorized Derivative Classifier
Does Not Contain UCNI

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1.0 Executive Summary

During startup of the water treatment units (WTUs) at the F- and H-Area Seepage Basins several system performance deficiencies have been encountered in meeting the contract performance specifications. These deficiencies have included not consistently meeting effluent quality not be and frequent change-outs of sorbent/exchange media.

This study investigated alternative ion exchange/sorbent materials and polishing chemistries designed to remove specific radionuclides (e.g., C-14, Tc-99, Sr-90, and I-129) not removed during the neutralization/precipitation/clarification process.

Generally, the experimental approach for this study consisted of passing clearwell water from both the F- and H-Area WTUs through a series of small-scale columns each packed with one of 14 different sorbent materials. Effluent water from these experiments was analyzed for specific radionuclides (C-14, Tc-99, Sr-90, and I-129), gross activities (gross alpha and nonvolatile beta), hazardous constituents (RCRA metals), and major stable cations (iron and aluminum). Analysis of time-dependent concentration data was used to determine the contaminant breakthrough characteristics of each sorbent material.

The results of this study indicate that significant improvements to the water polishing chemistry over the current design, both in terms of costs and operations, can be made using commercially available ion exchange materials. In general, relative sorbent effectiveness was similar for clearwell samples from both areas.

The following are the major findings and recommendations resulting from this study.

1. A number of sorbents were found to be substantially more effective in removing Sr-90 than the SIR600 zeolite specified or chosen by ADTECHS. In the short term, ADTECHS' SIR600 zeolite should be replaced with the inexpensive commercial water softening resin CG8. The implementation of the more highly cross-linked cation resins (AG50Wx12, AG50Wx8, AGMP-50) and the titanic oxide Sr-Treat material should be evaluated based on additional laboratory data.
2. Removal for the anionic radionuclides (I-129, Tc-99, and C-14) was problematic.
    - In samples from both areas, I-129 was not removed by activated carbon, the material chosen by ADTECHS for I-129 removal. It is recommended that this sorbent be removed from the WTUs due to its ineffectiveness in I-129 removal and its potential for biofouling of the injection wells. In general, the more highly cross-linked anion resins were more effective in I-

129 removal than either the DOWEX21K (the anion exchange material chosen by ADTECHS) or the activated carbon.

- Two anion exchange resins (AG1X8 and Reillex HQL) appear to remove Tc-99 more effectively than DOWEX21K (than the anion exchange resin chosen by ADTECHS). In F-Area, none of the sorbent materials were capable of reducing effluent activities for Tc-99 to below about 40 pC_i/L (inadequate DF).
- None of the sorbent materials effectively removed C-14. If C-14 removal is necessary, airsparging should be used rather than ion exchange.

3. Because the current operating practice for resin/sorbent materials is to dispose of these materials after a single breakthrough cycle and many of these resins are capable of being regenerated multiple times, an evaluation of the feasibility and cost effectiveness of resin regeneration should be conducted.
4. The chemical form of many of the constituents targeted for removal in this system are sensitive to redox changes (e.g., I, Tc, and U) and no monitoring or control of the redox conditions of the WTUs is currently being completed. It is recommended that the redox of the system be monitored.
5. A thorough mass balance of contaminants as they pass through neutralization/precipitation/clarification process should be conducted and these results compared to effectiveness of resin polishing of the groundwater without reverse osmosis and chemical treatment.

2.0 Introduction

During startup of the water treatment units (WTUs) at the F- and H-Area Seepage Basins several problems have been encountered in meeting the contract performance specifications. These problems have included (Peer Review Panel, 1998):

- effluent water quality not being consistently met;
- system design flow rates are not being achieved;
- secondary waste criteria are not being met; and
- the system reliability has been poor.

Additionally, a recent independent peer review panel (Peer Review Panel, 1998) indicated that there was "considerable uncertainty regarding whether or not the existing chemistry can be optimized or if an alternative chemistry is more appropriate." They further recommended that bench-scale treatability testing be conducted to evaluate alternative processes and/or optimize the current process.

This study investigated alternative ion exchange/sorbent materials and polishing chemistries designed to remove of specific radionuclides (e.g., C-14, Tc-99, Sr-90, and I-129) not removed during the neutralization/precipitation/clarification

process. For simplicity, this report will use the terms ion exchange material and sorbent material synonymously, even though the term ion exchange describes a specific sorption mechanism.

When alternative chemistries are tested, this new process or combination of processes must be capable of meeting effluent water quality requirements for all constituents of concern (COCs). A summary of the primary COCs at each area is given in Table 1. In this table, the COCs are categorized as either α-emitters, β-emitters, stable metals, or organics. Also given in this table are the average and maximum concentrations activities, and acceptance limits (i.e., reinjection standards) for the COCs at each site area. As shown in Table 1, alpha-emitting COCs include isotopes of Ra, Th, U, Am, and Cm; beta-emitters include C-14, Co-60, Ni-63, Sr-90, Tc-99, I-129, Cs-137, and Ra-228; stable metals include Ni, Cd, Hg, and Pb; and a single organic, trichloromethane. Because gross alpha and nonvolatile beta measurements represent the sum of several alpha and beta emitting radionuclides, water treatment processes designed to reduce these gross measurements have to target the contributing radionuclides in order to be effective. During startup testing of the WTUs, removal of alpha and/or beta emitters was insufficient in the majority of system tests. Residual alpha emitters included U-238, U-234, Cm-244, Am-241, Th-230, and Ra-226. Beta emitters remaining after treatment included nonvolatile Sr-90, Y-90 (Y-90 is in secular equilibrium with Sr-90), and Ra-228, as well as potentially volatile C-14, Tc-99, and I-129.

Generally, the experimental approach for this study consisted of passing clearwell water from both the F- and H-Area WTUs through a series of small-scale columns each packed with a different sorbent material. Effluent water from these experiments was analyzed for specific radionuclides (C-14, Tc-99, Sr-90, and I-129, gross activities (gross alpha and nonvolatile beta); hazardous constituents (RCRA metals), and major cations (iron and aluminum). Analysis of time-dependent concentration data was used to determine the contaminant breakthrough characteristics of each sorbent material.

Because this is primarily a screening study, additional bench-scale studies are necessary to optimize the process and to collect design/cost data on the alternative sorbents.

Table 1
Contaminants Requiring Removal from F and H Area Groundwaters
(Concentration data from Attachment 4 of Specification M-SPP-G-00194)

Area	Contaminant Type and Units	Contaminant Identification	Concentrations		
			Average	Maximum	Acceptance Limit
F	α-emitter, pCi/L	Gross α	541	2070	15
"	"	U-238	425	1600	15 for α sum
"	"	U-234	188	420	15 for α sum
"	"	Ra-226	39	556	5 for Ra sum
"	"	Am-241	33	220	15 for α sum
"	"	Th-228	31	350	15 for α sum
"	"	Th-230	23	85	15 for α sum
"	"	U-235	13	49	15 for α sum
"	"	Cm-244	11	59	15 for α sum
"	"	Am-243	10	33	15 for α sum
"	"	Cm-246	8	15	15 for α sum
"	"	Th-232	3	11	15 for α sum
"	β-emitter, pCi/L	Nonvolatile β	1817	5220	50
"	"	Sr-90	402	970	8
"	"	Tc-99	159	350	50 for β sum
"	"	Cs-137	100	982	50 for β sum
"	"	I-129	66	270	50 for β sum
"	"	C-14	53	100	50 for β sum
"	"	Ra-228	47	170	5 for Ra sum
"	Metal, µg/L	Cadmium	7.8	37	5
"	"	Lead	38	1095	50
"	"	Mercury	0.63	7.4	2
"	"	Nickel	50	334	200
"	Organic, µg/L	Dichloromethane	2.6	31	5
H	α-emitter, pCi/L	Gross α	30	612	15
"	"	Th-230	43	220	15 for α sum
"	"	Th-228	20	140	15 for α sum
"	"	Ra-226	17	50	5 for Ra sum
"	"	U-238	15	60	15 for α sum
"	β-emitter, pCi/L	Nonvolatile β	1970	16000	50
"	"	Sr-90	1901	4900	8
"	"	C-14	348	1500	50 for β sum
"	"	Tc-99	110	340	50 for β sum
"	"	Ra-228	86	830	5 for Ra sum
"	"	Co-60	82	320	50 for β sum
"	"	Ni-63	82	140	50 for β sum
"	"	I-129	23	110	50 for β sum
"	Metal, µg/L	Mercury	2.4	16	2
"	"	Lead	8.3	130	50
"	Organic, µg/L	Dichloromethane	3.1	44	5

3.0 Materials and Methods

This section describes the materials and methods used to evaluate ion exchange/sorbent materials for use in polishing radionuclides from clearwell water at the F&H WTUs. Included in this section are: the selection of sorbent materials, collection and characterization of process water samples, the experimental approach, and sample analyses/quality assurance.

3.1 Selection of Sorbent Materials

Exchange materials evaluated in this testing were selected based on the results of the literature review. Concurrence from appropriate Environmental Restoration Department/Environmental Restoration Engineering technical representatives on the selected materials was also obtained. A literature review of supplier information (e.g., recommendation of flow rates, exchange capacity, and application), material safety data sheets, existing WTU performance data, trade journal data, DOE site experience, and cost data were used in this evaluation process. As a baseline, sorbent materials currently used by ADTECHs in the WTUs were also evaluated.

The selected sorbent materials are listed in Table 2 and fall into four categories: (1) those used in the current system, (2) materials targeting Sr removal, (3) commercial anion resins, and (4) commercial cation resins.

Table 2 – Sorbent Materials

Material	Comments	Size
SIR600	ADTECHS's Zeolite for Cation Removal	~16–30 Mesh
DOWEX21K	ADTECHS's Anion Resin 4% Crosslinked	16–30 Mesh
Activated Carbon	ADTECHS's Iodine Removal	Powder
GC8	ResinTech Commercial Water Softener for Sr Removal	16-50 Mesh
Sr Treat	Titanic Oxide for Sr Removal	0.30-0.85 mm
Chelex20	Chelating Cation Resin	20-50 Mesh
AG1x2	Biorad Anion 2% Crosslinked	100-200 Mesh
AG1x8	Biorad Anion 8% Crosslinked	200-400 Mesh
Reillex HQL	Reilly Anion	30-60 Mesh
Powered Iron	Redox/Sorption Removal Actinides and Tc	>100 Mesh
Monosodium Titanate	Sr Removal	Powder
AGMP-50	Biorad Cation Macroporous	200-400 Mesh
AG50Wx8	Biorad Cation 8% Crosslinked	100-200 Mesh
AG50Wx12	Biorad Cation 12% Crosslinked	100-200 Mesh
Experimental Blank	Glass Wool Column Plugs	Not Applicable

3.2 Clearwell Sample Collection and Characterization

ER personnel collected and transported clearwell overflow water from each of the WTUs to SRTC. Samples were collected on 8/18/98 and 7/6/98 for the F- and H-Area WTUs, respectively. The samples were unpreserved and stored at room temperature prior to analysis. Prior to sampling, the WTUs had been in operation for a minimum of 16 hours.

Experimental blanks were conducted with each set of column tests and allowed for the characterization of the clearwell samples. These experimental blanks consisted of glass wool packing in disposable 20-mL plastic columns. Effluent samples from these columns were collected and analyzed by an outside certified contract lab to provide characterization of the clearwell overflow. A more detailed description of the experimental approach is provided below in Section 3.3.

3.3 General Experimental Approach

The source of influent water for these tests was clarifier overflow from each of the F- and H-Area WTUs. Influent retention times on the sorbent material were approximately two minutes and column effluent samples were collected in sequential one-liter aliquots. To determine contaminant breakthrough, effluent samples from both the experimental blank column (glass wool plugs) and sorbent test columns were analyzed for the radionuclides of interest (including C-14, Tc-99, Sr-90, I-129, gross alpha, and nonvolatile beta).

All bench-scale testing was conducted using established test methods and the general approach contained in the following procedures.

- ASTM D 1782-91, "Test Methods for Operating Performance of Particulate Cation-Exchange Materials"

- ASTM D 2187-94, "Standard Test Methods for Physical and Chemical Properties of Particulate Ion Exchange Resins"

Because this study was designed for a rapid screening of the performance of a large number of sorbent materials rather than a characterization of these materials, modifications to the field conditions and ASTM procedures (column dimensions, mass of sorbent, and flow rate) were necessary.

A schematic of the experimental setup is presented in Figure 1 and the experimental protocols were as follows:

1. Ten mL of sorbent material were placed into disposable 20 mL plastic columns with small glass wool plugs on the top and bottom of sorbent. In one column for every test set, two small glass wool plugs were placed in a column and run as an experimental blank. Fourteen-gauge silicone tubing was used to transfer the influent from the sample carboy, through the pump, and into the bottom of the column.

2. Influent flow rate was run at 5 mL/min ± 5% (0.25 mL/min out of 5 mL/min) and record flow rate from each column.

3. Columns were conditioned by washing each with a minimum of 100-mL DI water at a flow rate of 5mL/min.

4. Tubing was placed into influent sample and sorbent materials were back eluted at a flow rate of 5 mL/min. Twenty sequential 1-L samples were collected for each sorbent material and the experimental blank.

5. Sequential 1-L aliquots were submitted to an offsite certified laboratory for appropriate analyses (Sr-90, I-129, Tc-99, C-14, gross alpha, nonvolatile beta, RCRA metals, iron, and aluminum) (see Table 3 for specific analyses by sorbent and WTU sample).

6. Photographs were taken of used sorbent materials to document visual evidence of column fouling.

3.4 Sample Analysis and Quality Assurance

GEL Laboratories of Charleston, SC analyzed effluent samples under contract AB80091N with WSRC. Details of analytical procedures and QA requirements for these analyses are contained in this contract. Standard QA practices were utilized to maximize usefulness of the experimental data. This included: a) use of an accredited analytical laboratory; b) routine submittal of experimental blanks; and c) submittal of experimental replicates. The SRTC Conduct of R&D Manual was employed for this work and a Hazard Screening Checklist was completed.

4.0 Results and Discussion

The results of ion exchange/sorbent material screening for clearwell water collected from the WTUs at both the F- and H-Area Seepage Basins are presented in this section. Column effluent concentrations/activities and photographic documentation were completed as a part of these experiments and form the basis for evaluation of sorbent performance.

Analytical results of column effluent concentrations/activity are reported in a tabular summary for each sorbent material or experimental blank for clearwell samples from each of the WTUs in Appendix A. Included in these tables are the:

sample ID, analyte, average bedvolume, result qualifier, analytical result, accuracy (reported at 2σ), and the units of the analysis. The average bedvolume is calculated as the volume of influent passed through the column in liters minus 0.5 liters to account for mixing of effluent into the one-liter final sample volume all divided by the resin/sorbent volume in liters (0.010L for these experiments).

Graphs of bedvolume versus activity for all radioactive analytes were developed to evaluate column breakthrough and are included in Appendix B.

Table 3 – Analyte List By Sorbent and Area

WTU	Sorbent	Analyses
F-Area	Blank A and B	Gross Alpha, Nonvolatile Beta, C-14, Cs-137, I-129, Sr-90, Tc-99, RCRA Metals
F-Area	Activated Carbon	Gross Alpha, Nonvolatile Beta, C-14, Cs-137, I-129, Sr-90, Tc-99, RCRA Metals
F-Area	AG1-X2	Gross Alpha, Nonvolatile Beta, C-14, I-129, Tc-99, RCRA Metals
F-Area	AG1-X8	Gross Alpha, Nonvolatile Beta, C-14, I-129, Tc-99, RCRA Metals
F-Area	AG50Wx12	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	AG50Wx8	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	AGMP50	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	CG8	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	Chelex 20	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	DOWEX21K	Gross Alpha, Nonvolatile Beta, C-14, Cs-137, I-129, Sr-90, Tc-99, RCRA Metals
F-Area	Monosodium Titanate	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
F-Area	Reillex HQL	Gross Alpha, Nonvolatile Beta, C-14, I-129, Tc-99, RCRA Metals
F-Area	SIR600 Zeolite	Gross Alpha, Nonvolatile Beta, C-14, Cs-137, I-129, Sr-90, Tc-99, RCRA Metals
F-Area	SR Treat	Gross Alpha, Nonvolatile Beta, Cs-137, Sr-90, RCRA Metals
H-Area	Blank A and B	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	Activated Carbon	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	AG1-X2	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	AG1-X8	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	AG50Wx12	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	AG50Wx8	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	AGMP50	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	CG8	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	Chelex 20	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	DOWEX21K	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	Iron Powder	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	Monosodium Titanate	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	Reillex HQL	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	SIR600 Zeolite	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe
H-Area	SR Treat	Gross Alpha, Nonvolatile Beta, C-14, I-129, Sr-90, Tc-99, Al, Fe

4.1 *Influent Characterization (Column Blank Test Results)*

Blank concentrations, averaged over both blank runs and all effluent samples, for both F- and H-Area WTU clearwell influent are summarized by analyte in Tables 4 and 5. Average concentrations from Tables 4 and 5 that do not meet the relevant acceptance limits in Table 1 are shaded. For the F-Area WTU clearwell sample, analytes that do not meet the acceptance criteria are gross alpha, nonvolatile beta (i.e., gross beta), C-14 (sum of beta), I-129 (sum of beta), Sr-90, and Tc-99 (sum of beta). H-Area WTU acceptance criteria are not met for nonvolatile beta (i.e., gross beta), C-14 (sum of beta), Sr-90, and Tc-99 (sum of beta). Even though the acceptance criteria apply at the effluent tank, those analytes not meeting the acceptance criteria in the clearwell are the primary focus of the remaining data analysis. Average RCRA metals concentrations for F-Area WTU clearwell blank samples were below acceptance limits and, therefore, further data analysis of these constituents was not conducted.

For the F-Area clearwell blanks, there is an obvious outlier for Sr-90 in Blank B at an average bedvolume of 1050. The result for this analysis was –0.0356 pC_i/L, where the other three Sr-90 analyses averaged 264 +/- 31 pC_i/L. Not including this Sr-90 outlier, variability for the analytes exceeding acceptance criteria among the blank samples were about 15 and 20 percent, respectively, for the F- and H-Area clearwell samples. Of this total variability about 5 percent can be attributed to analytical error and the remainder is thought to be due to sample heterogeneity and/or aging.

Table 4 - F-Area Clearwell Column Blanks Average Concentration

Analyte	Average	Std Dev (one Sigma)	Percent Std Dev	Units
Ag_{TOT}	0.108	0.102	95	UGL
Alpha Gross	487	84	17	PCL
As_{TOT}	-1.371	0.504	37	UGL
Ba_{TOT}	76.7	3.6	5	UGL
Beta Gross	707	81	12	PCL
C-14	55.7	14.7	26	PCL
Cd_{TOT}	0.122	0.013	11	UGL
Cr_{TOT}	0.694	0.109	16	UGL
Cs-137	16.8	3.6	22	PCL
Hg_{TOT}	-0.052	0.070	135	UGL
I-129	401	36	9	PCL
Pb_{TOT}	0.045	0.019	43	UGL
Se_{TOT}	-114	26	23	UGL
Sr-90 (All Data)	198	134	68	PCL
Sr-90 (w/o single outlier)	264	31	12	PCL
Tc-99	304	16	5	PCL

Table 5 – H-Area Clearwell Column Blanks Average Concentration				
Analyte	Average	Std Dev (one Sigma)	Percent Std Dev	Units
Alpha Gross	4.74	3.84	81	PCL
Al_{TOT}	47	7	16	UGL
Beta Gross	519	223	43	PCL
C-14	612	135	22	PCL
Fe_{TOT}	60.6	23.7	39	UGL
I-129	36.9	3.3	9	PCL
Sr-90	546	108	20	PCL
Tc-99	108	12	11	PCL

4.2 F-Area - Results by Analyte

For the F-Area WTU clearwell sample, analytes that did not meet the acceptance criteria were C-14 (sum of beta), I-129 (sum of beta), Sr-90, and Tc-99 (sum of beta), gross alpha, nonvolatile beta (i.e., gross beta). The results of each of these analytes and Cs-137 for the range of sorbent materials tested are addressed by individual analyte in this section.

4.2.1 C-14

C-14 analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B8. The results of recent tests of H-Area WTU water suggest that the carbon in this system is in the inorganic form and can be effectively removed via acidification and air sparging (report to be published). The anion exchange resins were largely ineffective in removing C-14 from clearwell overflow samples. The best removal, only a DF ~ 2, for C-14 was observed for the Dowex 21K resin, where decontamination factor (DF) is defined as the ratio of the concentration or activity of the influent to that of the effluent.

At the pH of the clearwell samples (~ 8), the predominant specie for inorganic carbon will be the bicarbonate anion (HCO_3^-) (Stumm and Morgan, 1981). Being monovalent, HCO_3^- is generally less effectively removed by anion exchange resins than would the divalent carbonate (CO_3^{2-}) anion. The carbonate anion is the dominant specie only above pH 10. If C-14 removal via ion exchange is required it is recommended that this exchange reaction be carried out at pH values of around 10.5.

4.2.2 Cs-137

Cs-137 activities in clearwell samples used in this study averaged 16.8 pC_i/L and were, therefore, below the acceptance criteria of sum of beta less than 50 pC_i/L. This suggests that expending exchange capacity to remove Cs-137 may not be the most efficient method of operating the F-Area WTU. Existing process chemistry data should be reviewed to ensure that Cs-137 activities measured in this study are representative of Cs-137 activities observed during system operation.

Cs-137 analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B11. The best removal, a DF ~ 5, for Cs-137 was observed for the SIR600 zeolite. If Cs-137 removal is determined to be important, it is recommended that other, less expensive, sorbent materials with a high affinity for Cs (e.g., Duolite ARC-359, mica, and vermiculite) be evaluated as a potential replacement for the SIR600 zeolite.

4.2.3 I-129

I-129 analyses of clearwell overflow effluent for all sorbent materials are summarized in Figure B12. Of these materials, the AG1x8, Reillex HQL, and Dowex 21K anion resins were the only materials that were effective in removing I-129. The AG1X2 resin (2% crosslinkage) was ineffective for I-129 removal. DF values were as high as ~50 and DF for AG1x8> Reillex HQL>Dowex 21K. Breakthrough of I-129, however, occurred after only few hundred bedvolumes.

The precise chemical form of the I-129 in these systems is not known. Because I-129 was removed only by anionic resins and is unaffected by the activated carbon and zeolite, it is highly probable that iodine is in an inorganic and anionic form. If the majority of the I-129 does not currently exist as iodide, then reduction of the iodine to iodide is expected to enhance the removal effectiveness.

Recommendations regarding the I-129 removal process include: (1)conduct lab studies on the affect of redox potential on iodine removal; (2) remove activated carbon from the treatment system due to its lack of effectiveness in iodine removal and its source of organic carbon (potential injection well fouling problems (Serkiz and Thibault, 1998)); and (3) evaluate effectiveness of other sorbent materials (e.g., organic clays and silver impregnated activated carbon) for I-129 removal.

4.2.4 Sr-90

Sr-90 analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B15 and for the Sr-specific sorbents in Figure B16. The most effective sorbents where AG50Wx12, AG50Wx8, AGMP-50, CG8, SIR600 zeolite, and Sr Treat. The maximum DF value was at least 15 and similar for

AG50Wx12, AG50Wx8, AGMP-50, CG8, and Sr Treat. The DF for SIR600 zeolite used in the ADTECHs design is ~5. Breakthrough of Sr-90, above 24 pC_i/L (3 times the regulatory limit to account for permeate dilution), occurred before 400 bedvolumes for the SIR600 zeolite, about at 800 bedvolumes for the CG8 resin, and does not occur for AG50Wx12, AG50Wx8, AGMP-50, or Sr Treat up to 1300 bedvolumes.

Based on these data, it is recommended that: (1) SIR600 zeolite be replaced with CG8 resin, based the lower resin cost of this; (2) conduct additional laboratory studies on AG50Wx12, AG50Wx8, AGMP-50, CG8 and Sr Treat to determine Sr-90 breakthrough; and (3) once breakthrough has been determined for the resins in Item (2), conduct an economic analysis of Sr removal based on, at a minimum, resin cost and expected operating life (from breakthrough studies). If Cs-137 removal is required by polishing to meet reinjection requirements, then a lesser amount of the SIR600 zeolite, or a suitable substitute, will have to be included in the polishing system (see discussion in Section 4.2.4).

4.2.5 Tc-99

Tc-99 analyses of clearwell overflow effluent for all sorbent materials are summarized in Figure B19. Of these materials, the activated carbon, AG1x2, AG1x8, Reillex HQL, and Dowex 21K were the only materials that removed Tc-99 in these experiments. Of these resins, AG1x8 and Reillex HQL anion resins gave the highest DF (~6) and this value did not change as a function of number of bedvolumes during the experiment. The activated carbon, AG1x2, and Dowex 21K materials all initially had similar DF to the AG1x8 and Reillex HQL anion resins. Their performance, however, degraded significantly (to a DF of 1 and complete breakthrough) over the course of the test.

The precise chemical form of the Tc-99 in these systems is not known. Under the redox conditions found in the groundwater, Tc-99 should exist as Tc(VII) as the TcO_4^- specie (Serkiz, 1995 Memo). After RO concentration and iron addition, it is possible that all or a fraction of Tc(VII) is reduced to Tc(IV) as the $TcO(OH)_x$ where the number of hydroxides present (x) is dependent on pH. Because anion resins are initially effective in removing about 80 percent of the Tc-99, it is probable that the majority of the Tc-99 is as pertechnetate anion (TcO_4^-). The result that none of the sorbent materials were capable of reducing effluent activities to below about 40 pC_i/L, suggests that some fraction of the Tc is present in a non-pertechnetate form.

Recommendations regarding the Tc-99 removal process include: (1) lab studies on the effect of redox potential on Tc-99 removal (e.g., examine anion exchange under oxidizing condition); (2) additional laboratory studies should be conducted on AG1x8 and Reillex HQL to determine Tc-99 breakthrough; and (3) once breakthrough has been determined for the resins in Item (2), conduct an

economic analysis of Tc removal based on, at a minimum, resin cost and expected life (from breakthrough studies).

4.2.6 Gross Alpha

Gross alpha in F-Area groundwater is thought to be the result of contributions from isotopes of U, Ra, Am, Th, Cm with the majority of the alpha activity resulting from U-238 and U-234 (see Table 1). In the absence of carbonate and in oxidizing systems, uranium is predicted to be dominated by the $UO_2(OH)_3^-$ specie at a pH of 8 and in the presence of as little as 5 mg C/l (as carbonate) the dominant specie at a pH of 8 is predicted to be $UO_2(CO_3)_2^{2-}$ (Langmuir, 1979). Given the speciation of uranium coming from the clearwell, uranium removal should be greatest for anion exchange materials. Conversely, at low pH values, where uranium is expected to exist as the cation UO_2^{2+}, a cation exchange resin would be expected to be more effective at uranium removal.

Gross alpha analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B1 and for the most effective sorbents in Figure B2. The greatest gross alpha reduction was observed for conventional anion exchange resins (Dowex 21K, AG1x2, and AG1x8) and the chelating resin Chelex 20.

4.2.7 Nonvolatile Beta

The nonvolatile beta contributors in F-Area groundwater are primarily Sr-90/Y-90 and to a lesser extent Cs-137 and Ra-228. It should be noted that C-14, Tc-99, and I-129 are volatile beta contributors that do not contribute to the nonvolatile beta activity. The nonvolatile beta radionuclides are in a wide variety of cationic valence states (Sr^{+2}, Y^{+3}, Cs^{+}, and Ra^{+2}). Therefore, a single exchange/sorbent material would not be expected to be completely effective at reducing nonvolatile beta activity from these waters.

Nonvolatile beta analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B4 and for the strontium-specific sorbents in Figure B5. Based upon the screening results for Sr-90 (primary nonvolatile beta contributor), process knowledge, and field experience, these nonvolatile beta data are suspect and not thought to provide meaningful information.

4.3 H-Area - Results by Analyte

For the H-Area WTU clearwell sample, analytes that did not meet the acceptance criteria were nonvolatile beta (i.e., gross beta), C-14 (sum of beta), Sr-90, and Tc-

99 (sum of beta). The results of each of these analytes and I-129 for the range of sorbent materials tested are addressed by individual analyte in this section.

4.3.1 Nonvolatile Beta

Beta contributors in H-Area groundwater include Sr-90, Y-90, Tc-99, I-129, C-14, Co-60, Ni-63 and Ra-228. These radionuclides are in a wide variety of chemical forms from anionic (e.g., Tc and I) to cationic (e.g., Sr, Co, and Ni). Therefore, a single exchange/sorbent material would not be expected to be completely effective at reducing nonvolatile beta activity form these waters.

Nonvolatile beta analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B6 and for the most effective sorbents in Figure B7. The most effective sorbents where those that target Sr removal (AG50Wx12, AG50Wx8, AGMP-50, CG8, SIR600 zeolite, and Sr Treat). This is consistent with the highest proportion of the beta activity being associated with Sr-90 in secular equilibrium with Y-90. Of these sorbents: (1) ADTECHS' strontium sorbent SIR600 zeolite exhibited some breakthrough (above detection limit but below acceptance criteria of 50 pC_i/L) between 600 and 1000 bedvolumes; and (2) AG50Wx12, AG50Wx8, AGMP-50, CG8, and Sr Treat did not exhibit any sign of breakthrough to almost 1600 bedvolumes.

4.3.2 C-14

C-14 analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B9 and for anion resins and activated carbon in Figure B10. The results of recent tests of H-Area WTU water suggest that the carbon in this system is in the inorganic form and can be effectively removed via acidification and air sparging (report to be published). The anion exchange resins were largely ineffective in removing C-14 from clearwell overflow samples.

As stated previously, at the pH of the clearwell samples (~ 8), the predominant specie for inorganic carbon will be the bicarbonate anion (HCO_3^-) (Stumm and Morgan, 1981). Being monovalent, HCO_3^- is generally less effectively removed by anion exchange resins than would the divalent carbonate (CO_3^{2-}) anion. The carbonate anion is the dominant specie only above pH 10. If C-14 removal via ion exchange is required it is recommended that this exchange reaction be carried out at pH values of around 10.5.

4.3.3 I-129

I-129 analyses of clearwell overflow effluent for all sorbent materials are summarized in Figure B13 and for anion resins and activated carbon in Figure B14. Consistent with the results from the F-Area clearwell screening, AG1x8, Reillex HQL, and Dowex 21K anion resins were the most effective materials for

removing I-129 (the AG1X2 resin (2% crosslinkage) was less effective). DF values for these three resins were initially ~5 and over the entire test DF for AG1x8> Reillex HQL>Dowex 21K. Unlike the F-Area testing, early breakthrough of I-129 does not occur for these three resins. Breakthrough for Dowex 21K occurred at about 1200 bedvolumes and for AG1x8 and Reillex HQL it has not occurred at the end of the test (~1800 bedvolumes).

The precise chemical form of the I-129 in these systems is not known. Because I-129 was removed only by anionic resins and is unaffected by the activated carbon and zeolite, it is highly probable that iodine is in an inorganic and anionic form.

Recommendations regarding the I-129 removal process include: (1) conduct lab studies on the affect of redox potential on iodine removal; (2) activated carbon from the treatment system due to its lack of effectiveness in iodine removal and its source of organic carbon (potential injection well fouling problems (Serkiz and Thibault, 1998)); (3) conduct additional laboratory studies on AG1x8, Reillex HQL, and Dowex 21K to determine I-129 breakthrough; and (4) once breakthrough has been determined for the resins in Item (3), conduct an economic analysis of I-129 removal based on, at a minimum, resin cost and expected operating life (from breakthrough studies). Before removal of the activated carbon material, its usefulness in Tc-99 removal should be evaluated against its affect on injection water quality and ineffective I-129 removal.

4.3.4 Sr-90

Sr-90 analyses of clearwell overflow effluent for all sorbent materials evaluated are summarized in Figure B17 and for the Sr-specific sorbents in Figure B18. Like the F-Area screening results, the most effective sorbents where AG50Wx12, AG50Wx8, AGMP-50, CG8, SIR600 zeolite, and Sr Treat. Maximum DF value was ~ 100 and similar for AG50Wx12, AG50Wx8, AGMP-50, CG8, and Sr Treat. The DF for SIR600 zeolite used in the ADTECHs design varies from ~100 to ~10 over the course of the experiment. Breakthrough of Sr-90, above 24 pC_i/L (3 times the regulatory limit to account for permeate dilution), occurred between 800 and 1400 bedvolumes for the SIR600 zeolite, between 1300 and 1900 bedvolumes for AG50Wx8, and does not occur for AG50Wx12, AGMP-50, CG8 resin, or Sr Treat up to 1300 bedvolumes.

Based on these data, it is recommended that: (1) replace SIR600 zeolite with CG8 resin, based on the lower cost of this resin and greater operation life for Sr removal; (2) conduct additional laboratory studies on AG50Wx12, AG50Wx8, AGMP-50, CG8 and Sr Treat to determine Sr-90 breakthrough; and (3) once breakthrough has been determined for the resins in Item (2), conduct an economic analysis of Sr removal based on, at a minimum, resin cost and expected operating life (from breakthrough studies).

4.3.5 Tc-99

Tc-99 analyses of clearwell overflow effluent for all sorbent materials are summarized in Figure B20 and for anion resin, iron powder, and activated carbon in Figure 21. Of these materials, the activated carbon, AG1x2, AG1x8, iron powder, Reillex HQL, and Dowex 21K were the only materials that removed Tc-99 in these experiments. The iron powder column clogged after about 500 bedvolumes and testing of this material was stopped. The remaining five materials exhibited similar behavior with minimum DF of 6 that did not change significantly over the course of the testing.

Recommendations regarding the Tc-99 removal process include: (1) conduct additional laboratory studies on activated carbon, AG1x2, AG1x8, Reillex HQL, and Dowex 21 to determine Tc-99 breakthrough; (2) once breakthrough has been determined for the resins in Item (1), conduct an economic analysis of Tc removal based on, at a minimum, resin cost and expected life (from breakthrough studies); and (3) evaluate the addition of iron powder to the flocculation tank as a means of promoting heterogeneous floc growth and Tc removal via chemical reduction.

4.4 Post-Test Photographic Documentation

Digital photographs of the columns were taken after completion of the clearwell overflow sorbent screening experiments and are included as Appendix C. Visual inspection of these photos indicates that some fouling is occurring in on these sorbent materials (up to about one-third of the column length) after about 1900 bedvolumes. This fouling is red in color and is thought to be resulting from iron precipitation. Determination of the elemental composition and character of the fouling precipitates could be completed to further evaluate the fouling of these sorbent materials in future phases of this work.

5.0 Conclusions and Recommendations

The results of this study indicate that significant improvements in the water polishing chemistry over the current design, both in terms of costs and operations, can be made using commercially available ion exchange materials.

In general, sorbent effectiveness was similar for clearwell samples from both areas. Specific conclusions for each nuclide examined are summarized below.

Alpha activity is above the performance specification for the F-Area clearwell sample only and the majority of this activity is from U-238 and U-234. Under the conditions found in the clearwell, uranium should be present as anionic species (e.g., $UO_2(OH)_3^-$ or $UO_2(CO_3)_2^{2-}$). Consistent with this speciation, greatest gross

alpha reduction was observed for conventional anion exchange resins (Dowex 21K, AG1x2, and AG1x8) and the chelating resin Chelex 20.

The total beta activity for both areas is dominated by Sr-90 in secular equilibrium with Y-90. Lesser beta contributors include: (1) Volatile Tc-99, I-129, and C-14; (2) nonvolatile Ra-228; and (3) Cs-137 (nonvolatile) for F Area. These radionuclides are in a wide variety of chemical forms from anionic (e.g., Tc and I) to cationic (e.g., Sr and Cs) and, therefore, a single exchange/sorbent material would not be expected to be completely effective at reducing all beta activity from these waters. As would be expected, those sorbents that are effective at removing Sr-90 are also effective in reducing nonvolatile beta activity.

A number of sorbents were found to be substantially more effective in removing Sr-90 than the SIR600 zeolite chosen by ADTECHS. The best performers (no breakthrough at the equivalent of over two weeks of operation at full flow) were the more highly cross-linked cation resins (AG50Wx12, AG50Wx8, AGMP-50) and the titanic oxide Sr-Treat material. Additionally, the inexpensive commercial water softening resin CG8 provided significantly better Sr-90 removal than the SIR600 zeolite.

For this study, the most problematic removal was observed for the anionic radionuclides (I-129, Tc-99, and C-14). In water samples from both areas, I-129 was not removed by activated carbon, but was removed to some degree by the commercial anion resins (AG1x8, Reillex HQL, and Dowex 21K). For these anionic resins, F-Area clearwell water showed I-129 breakthrough after only the equivalent of a few days of full-flow operations and for H-Area clearwell water it was between one and two weeks. Like I-129, Tc-99 was most effectively removed by the commercial anion resins (AG1x2, AG1x8, Reillex HQL, and Dowex 21K). For F-Area water none of the sorbent materials were capable of reducing Tc-99 effluent activities to below about 40 pC_i/L (inadequate DF) and some fraction of the Tc (c. 20%) appears non-anionic. Several of the resins did not reach breakthrough at the equivalent of several weeks of full-flow operations (for both areas). For I-129 and Tc-99, the removal effectiveness by anion exchange resin appeared to increase with the degree of resin cross-linkage. All of the sorbents evaluated were largely ineffective for C-14 removal.

Based on historical data, Cs-137 activity is expected to be problematic only for F Area and activities for the water used in this study was below the acceptance criteria of sum of beta less than 50 pC_i/L. This suggests that expending exchange capacity to remove Cs-137 may not be the most efficient method of operating the F-Area WTU.

As a result of reviewing the F- and H-Area WTU operations and evaluating data from this study several general recommendations regarding the polishing chemistry of this system have been developed. Because the current operating practice for resin/sorbent materials is to dispose of these materials after a single breakthrough cycle and many of these resins are capable of being regenerated multiple times, an evaluation of the feasibility and cost effectiveness of resin

regeneration should be conducted. Also, because the chemical form of many of the constituents targeted for removal in this system are sensitive to redox changes (e.g., I, Tc, and U) and no monitoring or control of the redox conditions of the WTUs is currently being completed, it is recommended that the redox of the system be monitored at a minimum in the clearwell, coming into the polishing system, and in the injection tank. Lastly, neutralization/precipitation/clarification process may be having limited benefit, especially at the H-Area WTU, in removing COCs. A thorough mass balance of contaminants as they pass through neutralization/precipitation/clarification process should be conducted and these results compared to effectiveness of resin polishing of the groundwater without reverse osmosis and chemical treatment.

Recommendations for polishing of specific radionuclides in clearwell water are as follows.

Gross Alpha
Gross alpha activities do not require treatment in H-Area clearwell water. For F-Area groundwater the majority of the alpha activity is expected to be due to isotopes of uranium. Uranium activities should be measured in clearwell to confirm that gross alpha activity is due to uranium. If the alpha activity is due to uranium, then efforts should be made to optimize precipitation/flocculation chemistry to remove uranium prior to polishing stage of the process.

Sr-90
Replace SIR600 zeolite with CG8 resin (lower cost and better Sr Removal) and determine Sr-90 breakthrough for the most effective resins (AG50Wx12, AG50Wx8, AGMP-50, and Sr Treat) and complete cost analysis.

I-129

Remove activated carbon from the treatment units, because of its ineffectiveness for removing I-129 and its effects as a probable source of biological fouling (note: before removal in H-Area evaluate its efficacy in Tc-99 removal). Conduct optimization studies on the effect of redox potential on iodine removal. For H-Area water determine breakthrough for AG1x8 and Reillex HQL and complete cost analysis. Evaluate effectiveness of other iodine-specific sorbents, such as silver impregnated activated carbon.

Tc-99
Because necessary DFs are not being achieved for Tc-99 in F-Area water, additional studies on the effect of redox potential on Tc-99 removal are needed. Additionally, Tc-99 breakthrough for AG1x8 and Reillex HQL, and cost analysis needs to be completed.

C-14
If C-14 removal is necessary, airsparging should be used rather than ion exchange.

Cs-137
Confirm that Cs-137 activities measured in F Area for this study are representative of Cs-137 activities observed during system operation.

6.0 References

Langmuir, D. 1979. Uranium Solution-Mineral Equilibria at Low-Temperatures with Application to Sedimentary Ore Deposits. Geochim. Cosmochim. Acta 42:547-569.

Peer Review Panel. February 1998. Review of Water Treatment Units for the F and H Area Seepage Basins Groundwater prepared for the Westinghouse Savannah River Corp., Savannah River Site.

Serkiz, S. M. 1995. Memo to John Pierpoint and John Adams. "Follow-up to the Adtechs Vendor Meeting on 10-11-95 - Issues Regarding the Groundwater Treatment System for the F&H Area Seepage Basins Remediation (U)" Westinghouse Savannah River Company Internal Memo SRTC-WED-95-0211, Aiken, SC.

Serkiz, S. M. and Thibault, J. J. 1998. Characterization of Solids Collected from H-Area Injection Wells and Injection Tank Chemistry From Both F- and H-Area Water Treatment Units (WTUs). Westinghouse Savannah River Site Report WSRC-TR-98-00442, Aiken, SC.

Stumm W. and Morgan, J.J. (1981). *Aquatic Chemistry*. Wiley & Sons, New York.

7.0 Attachments

Appendix A – Analytical Results by Experimental Blank or Sorbent Material

Appendix B – Graphs of Bedvolume versus Activity by Analyte

Appendix C – Post Test Column Photographs

8.0 Approvals

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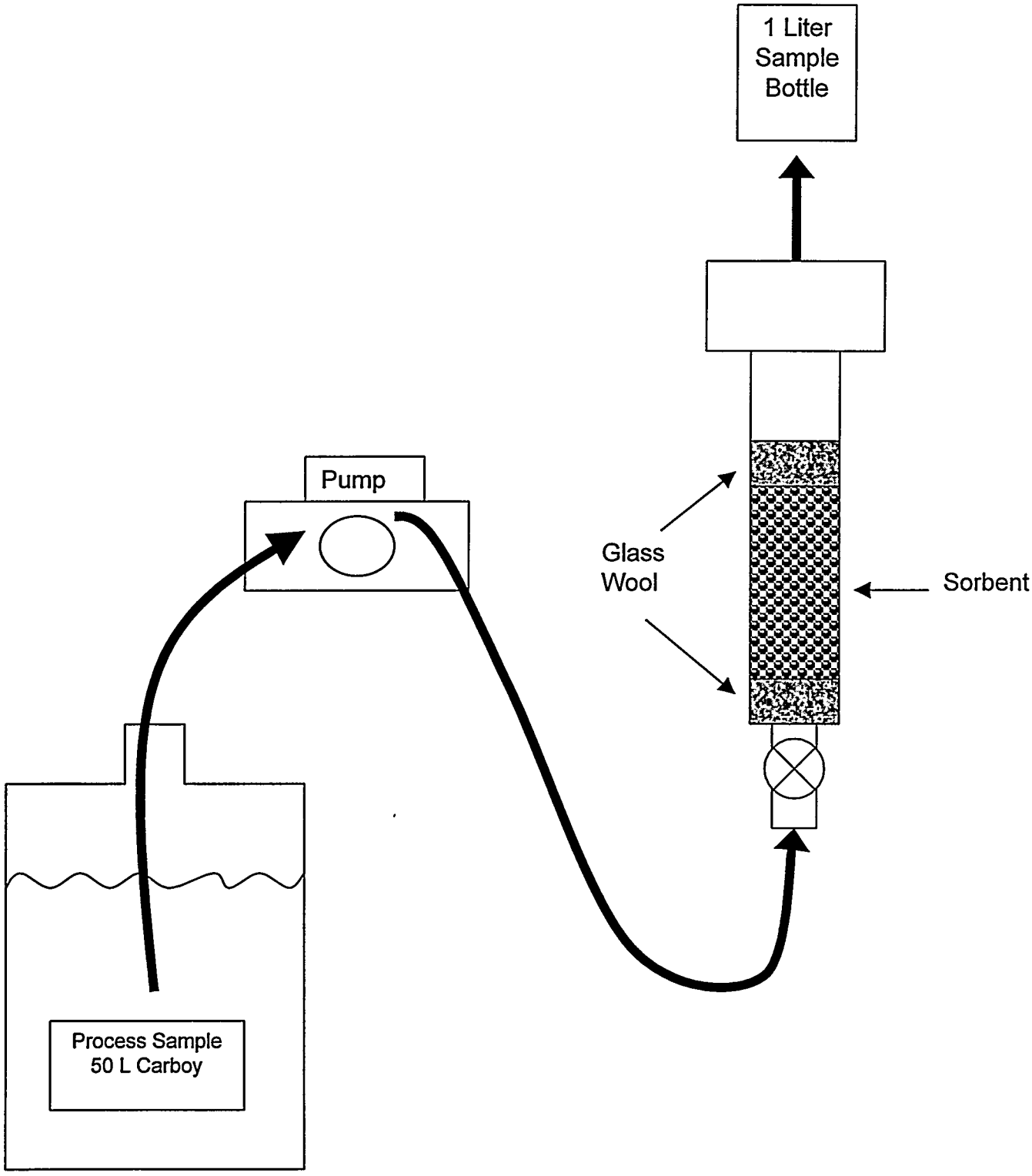
Figure 1 – Experimental Schematic
(Not to Scale)



Appendix A

Analytical Results by Experimental Blank or Sorbent Material

F-Area WTU Clearwell						
Blank A						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 06A-05	AGTOT	450		0.247	NR	UGL
FCO 06A-12	AGTOT	1150		0.102	NR	UGL
FCO 06A-01	ALPHAG	50		453	108	PCL
FCO 06A-08	ALPHAG	750		441	111	PCL
FCO 06A-11	ALPHAG	1050		356	102	PCL
FCO 06A-18	ALPHAG	1750		556	125	PCL
FCO 06A-05	ASTOT	450		-0.705	NR	UGL
FCO 06A-12	ASTOT	1150		-1.28	NR	UGL
FCO 06A-05	BATOT	450		74.6	NR	UGL
FCO 06A-12	BATOT	1150		81.7	NR	UGL
FCO 06A-01	BETAG	50		685	109	PCL
FCO 06A-08	BETAG	750		743	115	PCL
FCO 06A-11	BETAG	1050		693	117	PCL
FCO 06A-18	BETAG	1750		802	119	PCL
FCO 06A-02	C14	150		41.3	4.78	PCL
FCO 06A-03	C14	250		46.7	4.9	PCL
FCO 06A-06	C14	550		70.2	5.28	PCL
FCO 06A-07	C14	650		69.9	5.52	PCL
FCO 06A-16	C14	1550		46.2	4.89	PCL
FCO 06A-17	C14	1650		42.2	5.65	PCL
FCO 06A-05	CDTOT	450		0.135	NR	UGL
FCO 06A-12	CDTOT	1150		0.125	NR	UGL
FCO 06A-05	CRTOT	450		0.686	NR	UGL
FCO 06A-12	CRTOT	1150		0.547	NR	UGL
FCO 06A-09	CS137	850		22	6.42	PCL
FCO 06A-10	CS137	950		14.6	7.92	PCL
FCO 06A-13	CS137	1250		20.9	7.21	PCL
FCO 06A-14	CS137	1350		12.7	5	PCL
FCO 06A-05	HGTOT	450		0.0456	NR	UGL
FCO 06A-12	HGTOT	1150		-0.1	NR	UGL
FCO 06A-02	I129	150	J	398	52.7	PCL
FCO 06A-03	I129	250	J	444	66	PCL
FCO 06A-06	I129	550	J	456	64.1	PCL
FCO 06A-07	I129	650	J	370	56.7	PCL
FCO 06A-16	I129	1550	J	410	69.1	PCL
FCO 06A-17	I129	1650	J	403	63.2	PCL
FCO 06A-05	PBTOT	450		0.066	NR	UGL
FCO 06A-12	PBTOT	1150		0.024	NR	UGL
FCO 06A-05	SETOT	450		-76.8	NR	UGL
FCO 06A-12	SETOT	1150		-118	NR	UGL
FCO 06A-04	SR90	350		237	28.8	PCL
FCO 06A-15	SR90	1450		257	31.3	PCL
FCO 06A-05	TC99	450		301	13.6	PCL
FCO 06A-12	TC99	1150		326	14	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

F-Area WTU Clearwell						
Blank B						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 06B-05	AGTOT	450		0.002	NR	UGL
FCO 06B-12	AGTOT	1150		0.081	NR	UGL
FCO 06B-01	ALPHAG	50		457	115	PCL
FCO 06B-08	ALPHAG	750		602	129	PCL
FCO 06B-15	ALPHAG	1450		543	118	PCL
FCO 06B-05	ASTOT	450		-1.64	NR	UGL
FCO 06B-12	ASTOT	1150		-1.86	NR	UGL
FCO 06B-05	BATOT	450		73.6	NR	UGL
FCO 06B-12	BATOT	1150		76.7	NR	UGL
FCO 06B-01	BETAG	50		620	109	PCL
FCO 06B-08	BETAG	750		599	109	PCL
FCO 06B-15	BETAG	1450		804	117	PCL
FCO 06B-02	C14	150		65	8.4	PCL
FCO 06B-03	C14	250		56.9	9.3	PCL
FCO 06B-09	C14	850		35.5	17.3	PCL
FCO 06B-10	C14	950		61.1	9.16	PCL
FCO 06B-16	C14	1550		48.8	8.41	PCL
FCO 06B-17	C14	1650		84.8	9.32	PCL
FCO 06B-05	CDTOT	450		0.103	NR	UGL
FCO 06B-12	CDTOT	1150		0.123	NR	UGL
FCO 06B-05	CRTOT	450		0.741	NR	UGL
FCO 06B-12	CRTOT	1150		0.802	NR	UGL
FCO 06B-06	CS137	550		13.6	4.17	PCL
FCO 06B-07	CS137	650		14.8	5.49	PCL
FCO 06B-13	CS137	1250		20.2	5.31	PCL
FCO 06B-14	CS137	1350		15.9	5.24	PCL
FCO 06B-05	HGTOT	450		-0.0471	NR	UGL
FCO 06B-12	HGTOT	1150		-0.106	NR	UGL
FCO 06B-02	I129	150	J	371	44.4	PCL
FCO 06B-03	I129	250	J	368	43.5	PCL
FCO 06B-09	I129	850	J	379	44.4	PCL
FCO 06B-10	I129	950	J	468	55.5	PCL
FCO 06B-16	I129	1550	J	369	43.6	PCL
FCO 06B-17	I129	1650	J	377	44.1	PCL
FCO 06B-05	PBTOT	450		0.055	NR	UGL
FCO 06B-12	PBTOT	1150		0.034	NR	UGL
FCO 06B-05	SETOT	450		-128	NR	UGL
FCO 06B-12	SETOT	1150		-134	NR	UGL
FCO 06B-04	SR90	350		298	31.1	PCL
FCO 06B-11	SR90	1050	U	-0.0356	3.1	PCL
FCO 06B-05	TC99	450		301	13.6	PCL
FCO 06B-12	TC99	1150		288	13.3	PCL

Notes: J= LT reporting limit
NR = Not Reported
U= LT detection limit
C= lab control sample not met
R= ICP interference check not met
V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
Activated Carbon						
Sample ID	Analyte	Avg Bedvol	Qualifier	Result	Accuracy	Units
FCO 12-05	AGTOT	450		0.043	NR	UGL
FCO 12-12	AGTOT	1150		0.028	NR	UGL
FCO 12-01	ALPHAG	50		261	84.6	PCL
FCO 12-08	ALPHAG	750		378	102	PCL
FCO 12-15	ALPHAG	1450		281	64.8	PCL
FCO 12-05	ASTOT	450		-1.17	NR	UGL
FCO 12-12	ASTOT	1150		-1.33	NR	UGL
FCO 12-05	BATOT	450		76.8	NR	UGL
FCO 12-12	BATOT	1150		74	NR	UGL
FCO 12-01	BETAG	50		556	101	PCL
FCO 12-08	BETAG	750		762	117	PCL
FCO 12-15	BETAG	1450		685	83.9	PCL
FCO 12-02	C14	150		46.5	11	PCL
FCO 12-03	C14	250		18.7	10.4	PCL
FCO 12-09	C14	850		64.4	5.3	PCL
FCO 12-10	C14	950		69.7	5.31	PCL
FCO 12-16	C14	1550		49.8	4.94	PCL
FCO 12-17	C14	1650		50.3	5.57	PCL
FCO 12-05	CDTOT	450		0.089	NR	UGL
FCO 12-12	CDTOT	1150		0.081	NR	UGL
FCO 12-05	CRTOT	450		0.739	NR	UGL
FCO 12-12	CRTOT	1150		0.73	NR	UGL
FCO 12-06	CS137	550		15.4	5.3	PCL
FCO 12-07	CS137	650		13.7	4.9	PCL
FCO 12-13	CS137	1250		13.6	5.62	PCL
FCO 12-14	CS137	1350		14.5	5.35	PCL
FCO 12-05	HGTOT	450		-0.0954	NR	UGL
FCO 12-12	HGTOT	1150		-0.0848	NR	UGL
FCO 12-02	I129	150	J	353	42.2	PCL
FCO 12-03	I129	250	J	333	39.6	PCL
FCO 12-09	I129	850		311	43	PCL
FCO 12-10	I129	950		362	51.6	PCL
FCO 12-16	I129	1550		362	48.7	PCL
FCO 12-17	I129	1650		432	64.4	PCL
FCO 12-05	PBTOT	450		0.062	NR	UGL
FCO 12-12	PBTOT	1150		0.03	NR	UGL
FCO 12-05	SETOT	450		-112	NR	UGL
FCO 12-12	SETOT	1150	J	-123	NR	UGL
FCO 12-04	SR90	350		255	27.3	PCL
FCO 12-11	SR90	1050		276	29.1	PCL
FCO 12-05	TC99	450		77.4	7.78	PCL
FCO 12-12	TC99	1150		158	10.4	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

F-Area WTU Clearwell						
AG1_X2 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 08-04	AGTOT	350		0.039	NR	UGL
FCO 08-09	AGTOT	850		0.031	NR	UGL
FCO 08-14	AGTOT	1350		0.021	NR	UGL
FCO 08-01	ALPHAG	50		20.8	6.59	PCL
FCO 08-06	ALPHAG	550	U	2.15	6.00	PCL
FCO 08-11	ALPHAG	1050	U	4.85	6.07	PCL
FCO 08-16	ALPHAG	1550	U	9.09	8.10	PCL
FCO 08-04	ASTOT	350		-1.23	NR	UGL
FCO 08-09	ASTOT	850		-1.5	NR	UGL
FCO 08-14	ASTOT	1350		-2.05	NR	UGL
FCO 08-04	BATOT	350		85.2	NR	UGL
FCO 08-09	BATOT	850		78.6	NR	UGL
FCO 08-14	BATOT	1350		85.1	NR	UGL
FCO 08-01	BETAG	50		376	14.2	PCL
FCO 08-06	BETAG	550		443	15.2	PCL
FCO 08-11	BETAG	1050		489	15.8	PCL
FCO 08-16	BETAG	1550		514	16.8	PCL
FCO 08-02	C14	150		51.7	4.94	PCL
FCO 08-03	C14	250		42.8	4.75	PCL
FCO 08-07	C14	650		73.2	5.4	PCL
FCO 08-08	C14	750		69.2	5.92	PCL
FCO 08-12	C14	1150		56.9	5.11	PCL
FCO 08-13	C14	1250		55.4	5.89	PCL
FCO 08-17	C14	1650		36.1	6.17	PCL
FCO 08-18	C14	1750		54.2	4.95	PCL
FCO 08-04	CDTOT	350		0.137	NR	UGL
FCO 08-09	CDTOT	850		0.105	NR	UGL
FCO 08-14	CDTOT	1350		0.13	NR	UGL
FCO 08-04	CRTOT	350		0.842	NR	UGL
FCO 08-09	CRTOT	850		0.797	NR	UGL
FCO 08-14	CRTOT	1350		0.714	NR	UGL
FCO 08-04	HGTOT	350		-0.0405	NR	UGL
FCO 08-09	HGTOT	850		-0.0301	NR	UGL
FCO 08-14	HGTOT	1350		-0.03	NR	UGL
FCO 08-02	I129	150	J	371	51.6	PCL
FCO 08-03	I129	250	J	362	57.9	PCL
FCO 08-07	I129	650	J	365	52.9	PCL
FCO 08-08	I129	750	J	377	52.5	PCL
FCO 08-12	I129	1150	J	413	66.2	PCL
FCO 08-13	I129	1250	J	330	47.5	PCL
FCO 08-17	I129	1650	J	395	59.6	PCL
FCO 08-18	I129	1750	J	390	58.9	PCL
FCO 08-04	PBTOT	350		0.054	NR	UGL
FCO 08-09	PBTOT	850		0.019	NR	UGL
FCO 08-14	PBTOT	1350		0.043	NR	UGL
FCO 08-04	SETOT	350		-108	NR	UGL
FCO 08-09	SETOT	850		-158	NR	UGL
FCO 08-14	SETOT	1350		-162	NR	UGL
FCO 08-04	TC99	350	R	63.5	6.99	PCL
FCO 08-09	TC99	850		84.8	7.58	PCL
FCO 08-14	TC99	1350		301	13.4	PCL

Notes: J= LT reporting limit NR = Not Reported
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R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
AG1X8 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 09-04	AGTOT	350		0.084	NR	UGL
FCO 09-09	AGTOT	850		0.049	NR	UGL
FCO 09-14	AGTOT	1350		0.033	NR	UGL
FCO 09-01	ALPHAG	50	U	0.955	5.72	PCL
FCO 09-06	ALPHAG	550	U	5.65	6.73	PCL
FCO 09-11	ALPHAG	1050	U	8.79	6.18	PCL
FCO 09-16	ALPHAG	1550	U	3.5	4.48	PCL
FCO 09-04	ASTOT	350		-1.33	NR	UGL
FCO 09-09	ASTOT	850		-1.53	NR	UGL
FCO 09-14	ASTOT	1350		-1.76	NR	UGL
FCO 09-04	BATOT	350		84.1	NR	UGL
FCO 09-09	BATOT	850		77.9	NR	UGL
FCO 09-14	BATOT	1350		85.1	NR	UGL
FCO 09-01	BETAG	50		349	14.4	PCL
FCO 09-06	BETAG	550		472	14.8	PCL
FCO 09-11	BETAG	1050		524	15.6	PCL
FCO 09-16	BETAG	1550		393	13.8	PCL
FCO 09-02	C14	150		50.6	4.86	PCL
FCO 09-03	C14	250		42.1	4.54	PCL
FCO 09-07	C14	650		66.9	5.01	PCL
FCO 09-08	C14	750		68	5.22	PCL
FCO 09-12	C14	1150		52.3	4.79	PCL
FCO 09-13	C14	1250		55.7	5.25	PCL
FCO 09-17	C14	1650		62.4	5.92	PCL
FCO 09-18	C14	1750		63.2	6.71	PCL
FCO 09-04	CDTOT	350		0.133	NR	UGL
FCO 09-09	CDTOT	850		0.107	NR	UGL
FCO 09-14	CDTOT	1350		0.153	NR	UGL
FCO 09-04	CRTOT	350		0.494	NR	UGL
FCO 09-09	CRTOT	850		0.647	NR	UGL
FCO 09-14	CRTOT	1350		0.719	NR	UGL
FCO 09-04	HGTOT	350		-0.0442	NR	UGL
FCO 09-09	HGTOT	850		-0.017	NR	UGL
FCO 09-14	HGTOT	1350		-0.013	NR	UGL
FCO 09-02	I129	150	U	3.94	13.3	PCL
FCO 09-03	I129	250		40.6	22.3	PCL
FCO 09-07	I129	650		422	66.3	PCL
FCO 09-08	I129	750		352	50.3	PCL
FCO 09-12	I129	1150		386	56.6	PCL
FCO 09-13	I129	1250		422	58.1	PCL
FCO 09-17	I129	1650		367	57.9	PCL
FCO 09-18	I129	1750		409	55.7	PCL
FCO 09-04	PBTOT	350		0.055	NR	UGL
FCO 09-09	PBTOT	850		0.041	NR	UGL
FCO 09-14	PBTOT	1350		0.046	NR	UGL
FCO 09-04	SETOT	350		-131	NR	UGL
FCO 09-09	SETOT	850		-155	NR	UGL
FCO 09-14	SETOT	1350		-146	NR	UGL
FCO 09-04	TC99	350	R	47.2	6.19	PCL
FCO 09-09	TC99	850	R	49.2	6.41	PCL
FCO 09-14	TC99	1350	R	67.4	7.08	PCL

Notes: J= LT reporting limit
NR = Not Reported
U= LT detection limit
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V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
AG50Wx12 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 15-03	AGTOT	250		0.024	NR	UGL
FCO 15-04	AGTOT	350		0.016	NR	UGL
FCO 15-07	AGTOT	650		0.021	NR	UGL
FCO 15-08	AGTOT	750		0.012	NR	UGL
FCO 15-11	AGTOT	1050		0.053	NR	UGL
FCO 15-12	AGTOT	1150		0.062	NR	UGL
FCO 15-15	AGTOT	1450		0.045	NR	UGL
FCO 15-16	AGTOT	1550		0.018	NR	UGL
FCO 15-01	ALPHAG	50		56.1	10.1	PCL
FCO 15-05	ALPHAG	450		392	102	PCL
FCO 15-09	ALPHAG	850		362	105	PCL
FCO 15-13	ALPHAG	1250		281	89.1	PCL
FCO 15-17	ALPHAG	1650		363	99.2	PCL
FCO 15-03	ASTOT	250		-1.69	NR	UGL
FCO 15-04	ASTOT	350		-2.24	NR	UGL
FCO 15-07	ASTOT	650		-1.53	NR	UGL
FCO 15-08	ASTOT	750		-1.47	NR	UGL
FCO 15-11	ASTOT	1050		-2.11	NR	UGL
FCO 15-12	ASTOT	1150		-1.25	NR	UGL
FCO 15-15	ASTOT	1450		-1.61	NR	UGL
FCO 15-16	ASTOT	1550		-1.52	NR	UGL
FCO 15-03	BATOT	250		0.778	NR	UGL
FCO 15-04	BATOT	350		0.506	NR	UGL
FCO 15-07	BATOT	650		0.246	NR	UGL
FCO 15-08	BATOT	750		0.215	NR	UGL
FCO 15-11	BATOT	1050		0.157	NR	UGL
FCO 15-12	BATOT	1150		0.446	NR	UGL
FCO 15-15	BATOT	1450		0.19	NR	UGL
FCO 15-16	BATOT	1550		0.185	NR	UGL
FCO 15-01	BETAG	50		52.4	6.93	PCL
FCO 15-05	BETAG	450		416	93	PCL
FCO 15-09	BETAG	850		364	91.8	PCL
FCO 15-13	BETAG	1250		289	88.3	PCL
FCO 15-17	BETAG	1650		280	82.6	PCL

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E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell AG50Wx12 Res	Cont					
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 15-03	CDTOT	250		0.097	NR	UGL
FCO 15-04	CDTOT	350		0.062	NR	UGL
FCO 15-07	CDTOT	650		0.071	NR	UGL
FCO 15-08	CDTOT	750		0.063	NR	UGL
FCO 15-11	CDTOT	1050		0.067	NR	UGL
FCO 15-12	CDTOT	1150		0.08	NR	UGL
FCO 15-15	CDTOT	1450		0.087	NR	UGL
FCO 15-16	CDTOT	1550		0.085	NR	UGL
FCO 15-03	CRTOT	250		0.724	NR	UGL
FCO 15-04	CRTOT	350		0.661	NR	UGL
FCO 15-07	CRTOT	650		0.651	NR	UGL
FCO 15-08	CRTOT	750		0.609	NR	UGL
FCO 15-11	CRTOT	1050		0.932	NR	UGL
FCO 15-12	CRTOT	1150		0.562	NR	UGL
FCO 15-15	CRTOT	1450		0.601	NR	UGL
FCO 15-16	CRTOT	1550		0.604	NR	UGL
FCO 15-03	CS137	250		18.6	5.51	PCL
FCO 15-04	CS137	350		13.8	4.03	PCL
FCO 15-07	CS137	650		10.2	6.26	PCL
FCO 15-08	CS137	750		24.4	8.49	PCL
FCO 15-11	CS137	1050		20.2	7.64	PCL
FCO 15-12	CS137	1150		16.1	5.33	PCL
FCO 15-16	CS137	1550		20.6	5.82	PCL
FCO 15-03	HGTOT	250		-0.0858	NR	UGL
FCO 15-04	HGTOT	350		-0.0372	NR	UGL
FCO 15-07	HGTOT	650		-0.017	NR	UGL
FCO 15-08	HGTOT	750		-0.0474	NR	UGL
FCO 15-11	HGTOT	1050		-0.0222	NR	UGL
FCO 15-12	HGTOT	1150		-0.0985	NR	UGL
FCO 15-15	HGTOT	1450		-0.0189	NR	UGL
FCO 15-16	HGTOT	1550		-0.0478	NR	UGL
FCO 15-03	PBTOT	250		-0.017	NR	UGL
FCO 15-04	PBTOT	350		-0.004	NR	UGL
FCO 15-07	PBTOT	650		-0.025	NR	UGL
FCO 15-08	PBTOT	750		-0.034	NR	UGL
FCO 15-11	PBTOT	1050		-0.023	NR	UGL
FCO 15-12	PBTOT	1150		0.02	NR	UGL
FCO 15-15	PBTOT	1450		-0.021	NR	UGL
FCO 15-16	PBTOT	1550		-0.01	NR	UGL
FCO 15-03	SETOT	250		-1.85	NR	UGL
FCO 15-04	SETOT	350		-5.5	NR	UGL
FCO 15-07	SETOT	650		-13.7	NR	UGL
FCO 15-08	SETOT	750		-6.33	NR	UGL
FCO 15-11	SETOT	1050		-287	NR	UGL
FCO 15-12	SETOT	1150		-1.19	NR	UGL
FCO 15-15	SETOT	1450		-7.09	NR	UGL
FCO 15-16	SETOT	1550		-6.8	NR	UGL
FCO 15-02	SR90	150	U	3.51	11	PCL
FCO 15-06	SR90	550	U	-3.12	3.1	PCL
FCO 15-10	SR90	950	U	1.2	1.82	PCL
FCO 15-14	SR90	1350	U	-0.822	2.36	PCL

Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
AG50Wx8 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 14-03	AGTOT	250		-0.067	NR	UGL
FCO 14-04	AGTOT	350		0.202	NR	UGL
FCO 14-07	AGTOT	650		0.091	NR	UGL
FCO 14-08	AGTOT	750		0.086	NR	UGL
FCO 14-11	AGTOT	1050		0.029	NR	UGL
FCO 14-12	AGTOT	1150		0.014	NR	UGL
FCO 14-15	AGTOT	1450		0.083	NR	UGL
FCO 14-16	AGTOT	1550		0.037	NR	UGL
FCO 14-01	ALPHAG	50		107	18	PCL
FCO 14-05	ALPHAG	450		344	28.6	PCL
FCO 14-09	ALPHAG	850		534	87.4	PCL
FCO 14-13	ALPHAG	1250		563	83	PCL
FCO 14-17	ALPHAG	1650		339	67.9	PCL
FCO 14-03	ASTOT	250		-0.574	NR	UGL
FCO 14-04	ASTOT	350		-3.78	NR	UGL
FCO 14-07	ASTOT	650		-3.19	NR	UGL
FCO 14-08	ASTOT	750		-2.66	NR	UGL
FCO 14-11	ASTOT	1050		-2.24	NR	UGL
FCO 14-12	ASTOT	1150		-2.19	NR	UGL
FCO 14-15	ASTOT	1450		-1.63	NR	UGL
FCO 14-16	ASTOT	1550		-1.58	NR	UGL
FCO 14-03	BATOT	250		0.914	NR	UGL
FCO 14-04	BATOT	350		0.843	NR	UGL
FCO 14-07	BATOT	650		0.54	NR	UGL
FCO 14-08	BATOT	750		0.513	NR	UGL
FCO 14-11	BATOT	1050		0.407	NR	UGL
FCO 14-12	BATOT	1150		0.405	NR	UGL
FCO 14-15	BATOT	1450		0.618	NR	UGL
FCO 14-16	BATOT	1550		0.543	NR	UGL
FCO 14-01	BETAG	50		87.2	12.4	PCL
FCO 14-05	BETAG	450		233	13.1	PCL
FCO 14-09	BETAG	850		374	65.5	PCL
FCO 14-13	BETAG	1250		338	61	PCL
FCO 14-17	BETAG	1650		224	55.9	PCL

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E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
AG50Wx8 Resin	Cont					
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 14-03	CDTOT	250		0.084	NR	UGL
FCO 14-04	CDTOT	350		0.114	NR	UGL
FCO 14-07	CDTOT	650		0.067	NR	UGL
FCO 14-08	CDTOT	750		0.074	NR	UGL
FCO 14-11	CDTOT	1050		0.066	NR	UGL
FCO 14-12	CDTOT	1150		0.112	NR	UGL
FCO 14-15	CDTOT	1450		0.074	NR	UGL
FCO 14-16	CDTOT	1550		0.096	NR	UGL
FCO 14-03	CRTOT	250		0.451	NR	UGL
FCO 14-04	CRTOT	350		0.69	NR	UGL
FCO 14-07	CRTOT	650		0.62	NR	UGL
FCO 14-08	CRTOT	750		0.672	NR	UGL
FCO 14-11	CRTOT	1050		0.592	NR	UGL
FCO 14-12	CRTOT	1150		0.571	NR	UGL
FCO 14-15	CRTOT	1450		0.649	NR	UGL
FCO 14-16	CRTOT	1550		0.623	NR	UGL
FCO 14-03	CS137	250		15	6.29	PCL
FCO 14-04	CS137	350		19.4	5.86	PCL
FCO 14-07	CS137	650		13.6	6.09	PCL
FCO 14-08	CS137	750		18.9	6.47	PCL
FCO 14-11	CS137	1050		18.3	6.77	PCL
FCO 14-12	CS137	1150		14	4.65	PCL
FCO 14-15	CS137	1450		16.2	5.57	PCL
FCO 14-16	CS137	1550		16.4	4.43	PCL
FCO 14-03	HGTOT	250		-0.0637	NR	UGL
FCO 14-04	HGTOT	350		9.02	NR	UGL
FCO 14-07	HGTOT	650		0.0656	NR	UGL
FCO 14-08	HGTOT	750		-0.0907	NR	UGL
FCO 14-11	HGTOT	1050		-0.0634	NR	UGL
FCO 14-12	HGTOT	1150		-0.0755	NR	UGL
FCO 14-15	HGTOT	1450		-0.109	NR	UGL
FCO 14-16	HGTOT	1550		-0.0783	NR	UGL
FCO 14-03	PBTOT	250		0.127	NR	UGL
FCO 14-04	PBTOT	350		0.018	NR	UGL
FCO 14-07	PBTOT	650		-0.005	NR	UGL
FCO 14-08	PBTOT	750		-0.005	NR	UGL
FCO 14-11	PBTOT	1050		-0.036	NR	UGL
FCO 14-12	PBTOT	1150		0.069	NR	UGL
FCO 14-15	PBTOT	1450		-0.006	NR	UGL
FCO 14-16	PBTOT	1550		0.003	NR	UGL
FCO 14-03	SETOT	250	J	-13.3	NR	UGL
FCO 14-04	SETOT	350		-2.07	NR	UGL
FCO 14-07	SETOT	650		-6.41	NR	UGL
FCO 14-08	SETOT	750		-0.04	NR	UGL
FCO 14-11	SETOT	1050		-24	NR	UGL
FCO 14-12	SETOT	1150		-3.48	NR	UGL
FCO 14-15	SETOT	1450		-7.07	NR	UGL
FCO 14-16	SETOT	1550		-0.91	NR	UGL
FCO 14-02	SR90	150	U	-0.725	3.63	PCL
FCO 14-06	SR90	550	U	-0.971	2.56	PCL
FCO 14-10	SR90	950	U	2.37	3.48	PCL
FCO 14-14	SR90	1350		6.77	3.18	PCL

Notes: J= LT reporting limit NR = Not Reported
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Accuracy Reported at 2δ

F-Area WTU Clearwell						
AGMP50 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 05-03	AGTOT	250		0.093	NR	UGL
FCO 05-04	AGTOT	350		0.057	NR	UGL
FCO 05-07	AGTOT	650		0.042	NR	UGL
FCO 05-08	AGTOT	750		0.031	NR	UGL
FCO 05-10	AGTOT	950		0.032	NR	UGL
FCO 05-11	AGTOT	1050		0.024	NR	UGL
FCO 05-14	AGTOT	1350		0.021	NR	UGL
FCO 05-15	AGTOT	1450		0.065	NR	UGL
FCO 05-01	ALPHAG	50		313	92.2	PCL
FCO 05-06	ALPHAG	550		480	115	PCL
FCO 05-12	ALPHAG	1150		439	114	PCL
FCO 05-16	ALPHAG	1550		463	110	PCL
FCO 05-18	ALPHAG	1750		550	125	PCL
FCO 05-03	ASTOT	250		-1.52	NR	UGL
FCO 05-04	ASTOT	350		-1.93	NR	UGL
FCO 05-07	ASTOT	650		-2.49	NR	UGL
FCO 05-08	ASTOT	750		-2.73	NR	UGL
FCO 05-10	ASTOT	950		-2.3	NR	UGL
FCO 05-11	ASTOT	1050		-2.75	NR	UGL
FCO 05-14	ASTOT	1350		-2.41	NR	UGL
FCO 05-15	ASTOT	1450		-2.5	NR	UGL
FCO 05-03	BATOT	250		2.02	NR	UGL
FCO 05-04	BATOT	350		1.87	NR	UGL
FCO 05-07	BATOT	650		0.717	NR	UGL
FCO 05-08	BATOT	750		1.8	NR	UGL
FCO 05-10	BATOT	950		0.86	NR	UGL
FCO 05-11	BATOT	1050		0.821	NR	UGL
FCO 05-14	BATOT	1350		0.905	NR	UGL
FCO 05-15	BATOT	1450		0.585	NR	UGL
FCO 05-01	BETAG	50		422	96.1	PCL
FCO 05-06	BETAG	550		268	83.4	PCL
FCO 05-12	BETAG	1150		368	90	PCL
FCO 05-16	BETAG	1550		236	78.7	PCL
FCO 05-18	BETAG	1750		337	88	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

F-Area WTU Clearwell						
AGMP50 Resin	Cont					
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 05-03	CDTOT	250		0.051	NR	UGL
FCO 05-04	CDTOT	350		0.071	NR	UGL
FCO 05-07	CDTOT	650		0.057	NR	UGL
FCO 05-08	CDTOT	750		0.063	NR	UGL
FCO 05-10	CDTOT	950		0.064	NR	UGL
FCO 05-11	CDTOT	1050		0.073	NR	UGL
FCO 05-14	CDTOT	1350		0.058	NR	UGL
FCO 05-15	CDTOT	1450		0.051	NR	UGL
FCO 05-03	CRTOT	250		0.411	NR	UGL
FCO 05-04	CRTOT	350		0.429	NR	UGL
FCO 05-07	CRTOT	650		0.523	NR	UGL
FCO 05-08	CRTOT	750		0.537	NR	UGL
FCO 05-10	CRTOT	950		0.499	NR	UGL
FCO 05-11	CRTOT	1050		0.452	NR	UGL
FCO 05-14	CRTOT	1350		0.375	NR	UGL
FCO 05-15	CRTOT	1450		0.34	NR	UGL
FCO 05-03	CS137	250		12.1	7.62	PCL
FCO 05-04	CS137	350		18.9	6.89	PCL
FCO 05-07	CS137	650		18.9	8.74	PCL
FCO 05-08	CS137	750		12.7	5.48	PCL
FCO 05-10	CS137	950		13.3	4.67	PCL
FCO 05-11	CS137	1050		14.6	5.9	PCL
FCO 05-14	CS137	1350		12.9	5.22	PCL
FCO 05-15	CS137	1450		15.9	4.52	PCL
FCO 05-03	HGTOT	250	J	-0.132	NR	UGL
FCO 05-04	HGTOT	350	J	-0.134	NR	UGL
FCO 05-07	HGTOT	650	J	-0.119	NR	UGL
FCO 05-08	HGTOT	750	J	-0.11	NR	UGL
FCO 05-10	HGTOT	950	J	-0.111	NR	UGL
FCO 05-11	HGTOT	1050	J	-0.0876	NR	UGL
FCO 05-14	HGTOT	1350	J	-0.0964	NR	UGL
FCO 05-15	HGTOT	1450	J	-0.124	NR	UGL
FCO 05-03	PBTOT	250		-0.003	NR	UGL
FCO 05-04	PBTOT	350		-0.019	NR	UGL
FCO 05-07	PBTOT	650		0.005	NR	UGL
FCO 05-08	PBTOT	750		-0.015	NR	UGL
FCO 05-10	PBTOT	950		0.033	NR	UGL
FCO 05-11	PBTOT	1050		-0.014	NR	UGL
FCO 05-14	PBTOT	1350		0.011	NR	UGL
FCO 05-15	PBTOT	1450		0.001	NR	UGL
FCO 05-03	SETOT	250		-41	NR	UGL
FCO 05-04	SETOT	350		-54.6	NR	UGL
FCO 05-07	SETOT	650		-47.6	NR	UGL
FCO 05-08	SETOT	750		-40.6	NR	UGL
FCO 05-10	SETOT	950		-42.6	NR	UGL
FCO 05-11	SETOT	1050		-42.1	NR	UGL
FCO 05-14	SETOT	1350		-39.4	NR	UGL
FCO 05-15	SETOT	1450		-37.5	NR	UGL
FCO 05-02	SR90	150	U	1.05	4.21	PCL
FCO 05-05	SR90	450	U	-0.274	3.36	PCL
FCO 05-09	SR90	850	U	1.64	3.3	PCL
FCO 05-13	SR90	1250	U	0.268	3.47	PCL
FCO 05-17	SR90	1650	U	1.55	3.33	PCL

Notes: J= LT reporting limit NR = Not Reported
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R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
CG8 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 01-03	AGTOT	250		0.028	NR	UGL
FCO 01-04	AGTOT	350		0.205	NR	UGL
FCO 01-07	AGTOT	650		0.105	NR	UGL
FCO 01-08	AGTOT	750		0.068	NR	UGL
FCO 01-10	AGTOT	950		0.051	NR	UGL
FCO 01-11	AGTOT	1050		0.035	NR	UGL
FCO 01-14	AGTOT	1350		0.031	NR	UGL
FCO 01-15	AGTOT	1450		0.036	NR	UGL
FCO 01-01	ALPHAG	50		363	97.8	PCL
FCO 01-06	ALPHAG	550		401	110	PCL
FCO 01-12	ALPHAG	1150		354	97.9	PCL
FCO 01-16	ALPHAG	1550		349	97.3	PCL
FCO 01-18	ALPHAG	1750		341	93.6	PCL
FCO 01-03	ASTOT	250		-1.66	NR	UGL
FCO 01-04	ASTOT	350		-0.732	NR	UGL
FCO 01-07	ASTOT	650		-1.19	NR	UGL
FCO 01-08	ASTOT	750		-1.45	NR	UGL
FCO 01-10	ASTOT	950		-1.68	NR	UGL
FCO 01-11	ASTOT	1050		-1.85	NR	UGL
FCO 01-14	ASTOT	1350		-1.94	NR	UGL
FCO 01-15	ASTOT	1450		-2.09	NR	UGL
FCO 01-03	BATOT	250		0.263	NR	UGL
FCO 01-04	BATOT	350		0.39	NR	UGL
FCO 01-07	BATOT	650		0.189	NR	UGL
FCO 01-08	BATOT	750		0.459	NR	UGL
FCO 01-10	BATOT	950		0.396	NR	UGL
FCO 01-11	BATOT	1050		0.442	NR	UGL
FCO 01-14	BATOT	1350		0.643	NR	UGL
FCO 01-15	BATOT	1450		0.708	NR	UGL
FCO 01-01	BETAG	50		398	91.7	PCL
FCO 01-06	BETAG	550		422	96	PCL
FCO 01-12	BETAG	1150		422	97.7	PCL
FCO 01-16	BETAG	1550		426	93.6	PCL
FCO 01-18	BETAG	1750		500	95.7	PCL

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E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
CG8 Resin	Cont					
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 01-03	CDTOT	250		0.116	NR	UGL
FCO 01-04	CDTOT	350		0.076	NR	UGL
FCO 01-07	CDTOT	650		0.048	NR	UGL
FCO 01-08	CDTOT	750		0.032	NR	UGL
FCO 01-10	CDTOT	950		0.053	NR	UGL
FCO 01-11	CDTOT	1050		0.06	NR	UGL
FCO 01-14	CDTOT	1350		0.053	NR	UGL
FCO 01-15	CDTOT	1450		0.056	NR	UGL
FCO 01-03	CRTOT	250		0.777	NR	UGL
FCO 01-04	CRTOT	350		0.28	NR	UGL
FCO 01-07	CRTOT	650		0.369	NR	UGL
FCO 01-08	CRTOT	750		0.438	NR	UGL
FCO 01-10	CRTOT	950		0.467	NR	UGL
FCO 01-11	CRTOT	1050		0.475	NR	UGL
FCO 01-14	CRTOT	1350		0.391	NR	UGL
FCO 01-15	CRTOT	1450		0.302	NR	UGL
FCO 01-03	CS137	250		20.7	5.86	PCL
FCO 01-04	CS137	350		17.3	6.46	PCL
FCO 01-07	CS137	650		17.3	6.3	PCL
FCO 01-08	CS137	750		15.9	4.81	PCL
FCO 01-10	CS137	950		16.9	4.47	PCL
FCO 01-11	CS137	1050		15.4	5.86	PCL
FCO 01-14	CS137	1350		20	5.94	PCL
FCO 01-15	CS137	1450		14.3	5.37	PCL
FCO 01-03	HGTOT	250		-0.0997	NR	UGL
FCO 01-04	HGTOT	350	J	-0.149	NR	UGL
FCO 01-07	HGTOT	650	J	-0.13	NR	UGL
FCO 01-08	HGTOT	750	J	-0.128	NR	UGL
FCO 01-10	HGTOT	950	J	-0.138	NR	UGL
FCO 01-11	HGTOT	1050	J	-0.124	NR	UGL
FCO 01-14	HGTOT	1350	J	-0.137	NR	UGL
FCO 01-15	HGTOT	1450	J	-0.137	NR	UGL
FCO 01-03	PBTOT	250		0.033	NR	UGL
FCO 01-04	PBTOT	350		-0.018	NR	UGL
FCO 01-07	PBTOT	650		-0.034	NR	UGL
FCO 01-08	PBTOT	750		-0.044	NR	UGL
FCO 01-10	PBTOT	950		0.001	NR	UGL
FCO 01-11	PBTOT	1050		0.02	NR	UGL
FCO 01-14	PBTOT	1350		-0.006	NR	UGL
FCO 01-15	PBTOT	1450		-0.003	NR	UGL
FCO 01-03	SETOT	250		-129	NR	UGL
FCO 01-04	SETOT	350		-79.5	NR	UGL
FCO 01-07	SETOT	650		-59.9	NR	UGL
FCO 01-08	SETOT	750		-59.9	NR	UGL
FCO 01-10	SETOT	950		-60.1	NR	UGL
FCO 01-11	SETOT	1050		-52.9	NR	UGL
FCO 01-14	SETOT	1350		-61.2	NR	UGL
FCO 01-15	SETOT	1450		-59.6	NR	UGL
FCO 01-02	SR90	150	U	-1.58	2.49	PCL
FCO 01-05	SR90	450	U	0.0703	2.99	PCL
FCO 01-09	SR90	850	U	1.81	2.11	PCL
FCO 01-13	SR90	1250		22.4	3.48	PCL
FCO 01-17	SR90	1650		108	21.7	PCL

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E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
Chelex 20 Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 04-03	AGTOT	250		-0.024	NR	UGL
FCO 04-04	AGTOT	350		-0.052	NR	UGL
FCO 04-07	AGTOT	650		-0.056	NR	UGL
FCO 04-08	AGTOT	750		-0.066	NR	UGL
FCO 04-11	AGTOT	1050		-0.003	NR	UGL
FCO 04-12	AGTOT	1150		-0.039	NR	UGL
FCO 04-15	AGTOT	1450		-0.059	NR	UGL
FCO 04-16	AGTOT	1550		-0.042	NR	UGL
FCO 04-01	ALPHAG	50	U	9.16	8.35	PCL
FCO 04-05	ALPHAG	450	U	27.4	19.3	PCL
FCO 04-09	ALPHAG	850	U	8.12	9.37	PCL
FCO 04-13	ALPHAG	1250	U	3.58	8.63	PCL
FCO 04-17	ALPHAG	1650	U	5.07	9.17	PCL
FCO 04-03	ASTOT	250		0.014	NR	UGL
FCO 04-04	ASTOT	350		0.014	NR	UGL
FCO 04-07	ASTOT	650		-0.009	NR	UGL
FCO 04-08	ASTOT	750		0.14	NR	UGL
FCO 04-11	ASTOT	1050		-0.376	NR	UGL
FCO 04-12	ASTOT	1150		-0.222	NR	UGL
FCO 04-15	ASTOT	1450		-0.027	NR	UGL
FCO 04-16	ASTOT	1550		-0.37	NR	UGL
FCO 04-03	BATOT	250		3.66	NR	UGL
FCO 04-04	BATOT	350		4.19	NR	UGL
FCO 04-07	BATOT	650		43.4	NR	UGL
FCO 04-08	BATOT	750		51.6	NR	UGL
FCO 04-11	BATOT	1050		71.5	NR	UGL
FCO 04-12	BATOT	1150		72.5	NR	UGL
FCO 04-15	BATOT	1450		76.8	NR	UGL
FCO 04-16	BATOT	1550		94.4	NR	UGL
FCO 04-01	BETAG	50		84.5	10.5	PCL
FCO 04-05	BETAG	450		224	30	PCL
FCO 04-09	BETAG	850		535	19.8	PCL
FCO 04-13	BETAG	1250		548	20.5	PCL
FCO 04-17	BETAG	1650		572	20.9	PCL

Notes: J= LT reporting limit
NR = Not Reported
U= LT detection limit
C= lab control sample not met
R= ICP interference check not met
V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

F-Area WTU Clearwell						
Chelex 20 Resin Cont						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 04-03	CDTOT	250		0.078	NR	UGL
FCO 04-04	CDTOT	350		0.091	NR	UGL
FCO 04-07	CDTOT	650		0.07	NR	UGL
FCO 04-08	CDTOT	750		0.084	NR	UGL
FCO 04-11	CDTOT	1050		0.073	NR	UGL
FCO 04-12	CDTOT	1150		0.081	NR	UGL
FCO 04-15	CDTOT	1450		0.074	NR	UGL
FCO 04-16	CDTOT	1550		0.073	NR	UGL
FCO 04-03	CRTOT	250		0.433	NR	UGL
FCO 04-04	CRTOT	350		0.441	NR	UGL
FCO 04-07	CRTOT	650		0.521	NR	UGL
FCO 04-08	CRTOT	750		0.559	NR	UGL
FCO 04-11	CRTOT	1050		0.446	NR	UGL
FCO 04-12	CRTOT	1150		0.449	NR	UGL
FCO 04-15	CRTOT	1450		0.389	NR	UGL
FCO 04-16	CRTOT	1550		0.475	NR	UGL
FCO 04-03	CS137	250		11.3	5.12	PCL
FCO 04-04	CS137	350		21	5.6	PCL
FCO 04-07	CS137	650		18.3	7.61	PCL
FCO 04-08	CS137	750		18.2	5.75	PCL
FCO 04-11	CS137	1050		12.3	7.1	PCL
FCO 04-12	CS137	1150		14.8	6.52	PCL
FCO 04-15	CS137	1450		17.6	6.17	PCL
FCO 04-16	CS137	1550		17.4	5.83	PCL
FCO 04-03	HGTOT	250		-0.0241	NR	UGL
FCO 04-04	HGTOT	350		-0.0319	NR	UGL
FCO 04-07	HGTOT	650		-0.0335	NR	UGL
FCO 04-08	HGTOT	750		-0.0255	NR	UGL
FCO 04-11	HGTOT	1050		-0.0125	NR	UGL
FCO 04-12	HGTOT	1150		0.00441	NR	UGL
FCO 04-15	HGTOT	1450		-0.0536	NR	UGL
FCO 04-16	HGTOT	1550		-0.0646	NR	UGL
FCO 04-03	PBTOT	250		0.104	NR	UGL
FCO 04-04	PBTOT	350		0.169	NR	UGL
FCO 04-07	PBTOT	650		0.072	NR	UGL
FCO 04-08	PBTOT	750		0.147	NR	UGL
FCO 04-11	PBTOT	1050		0.079	NR	UGL
FCO 04-12	PBTOT	1150		0.109	NR	UGL
FCO 04-15	PBTOT	1450		0.062	NR	UGL
FCO 04-16	PBTOT	1550		0.167	NR	UGL
FCO 04-03	SETOT	250		-16.7	NR	UGL
FCO 04-04	SETOT	350		-5.88	NR	UGL
FCO 04-07	SETOT	650		-5	NR	UGL
FCO 04-08	SETOT	750		-3.42	NR	UGL
FCO 04-11	SETOT	1050		-18.1	NR	UGL
FCO 04-12	SETOT	1150		-16.3	NR	UGL
FCO 04-15	SETOT	1450		-4.34	NR	UGL
FCO 04-16	SETOT	1550		-3.75	NR	UGL
FCO 04-02	SR90	150		235	25.2	PCL
FCO 04-06	SR90	550		183	9.95	PCL
FCO 04-10	SR90	950		283	13	PCL

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R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

Resin F-Area WTU Clearwell						
Dowex 21K						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 03-05	AGTOT	450		0.012	NR	UGL
FCO 03-12	AGTOT	1150		0.013	NR	UGL
FCO 03-01	ALPHAG	50	U	6.43	7.47	PCL
FCO 03-08	ALPHAG	750	U	11.8	9.79	PCL
FCO 03-15	ALPHAG	1450	U	21.5	19.7	PCL
FCO 03-05	ASTOT	450		-1.2	NR	UGL
FCO 03-12	ASTOT	1150		-1.53	NR	UGL
FCO 03-05	BATOT	450		72.8	NR	UGL
FCO 03-12	BATOT	1150		72.7	NR	UGL
FCO 03-01	BETAG	50		390	17.3	PCL
FCO 03-08	BETAG	750		544	19.6	PCL
FCO 03-15	BETAG	1450		520	43.2	PCL
FCO 03-02	C14	150		26.7	15.7	PCL
FCO 03-03	C14	250		17.1	8.33	PCL
FCO 03-09	C14	850		16.8	8.93	PCL
FCO 03-10	C14	950		31.3	10.9	PCL
FCO 03-16	C14	1550		14.7	7.6	PCL
FCO 03-17	C14	1650	U	11.5	10.2	PCL
FCO 03-05	CDTOT	450		0.122	NR	UGL
FCO 03-12	CDTOT	1150		0.098	NR	UGL
FCO 03-05	CRTOT	450		0.674	NR	UGL
FCO 03-12	CRTOT	1150		0.68	NR	UGL
FCO 03-06	CS137	550		14.7	6.61	PCL
FCO 03-07	CS137	650		19	6.87	PCL
FCO 03-13	CS137	1250		17.7	7.32	PCL
FCO 03-14	CS137	1350		14.4	4.63	PCL
FCO 03-05	HGTOT	450		-0.0201	NR	UGL
FCO 03-12	HGTOT	1150		-0.0661	NR	UGL
FCO 03-02	I129	150	J	87.6	11.4	PCL
FCO 03-03	I129	250	J	166	20	PCL
FCO 03-09	I129	850	J	368	44	PCL
FCO 03-10	I129	950	J	371	43.5	PCL
FCO 03-16	I129	1550	J	369	44.2	PCL
FCO 03-17	I129	1650	J	350	41.2	PCL
FCO 03-05	PBTOT	450		0.047	NR	UGL
FCO 03-12	PBTOT	1150		0.055	NR	UGL
FCO 03-05	SETOT	450		-136	NR	UGL
FCO 03-12	SETOT	1150		-142	NR	UGL
FCO 03-04	SR90	350		211	27.9	PCL
FCO 03-11	SR90	1050		246	11	PCL
FCO 03-05	TC99	450	R	30.3	5.68	PCL
FCO 03-12	TC99	1150		111	8.67	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

F-Area WTU Clearwell Monosodium Titanate						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 13-03	AGTOT	250		-0.054	NR	UGL
FCO 13-04	AGTOT	350		-0.058	NR	UGL
FCO 13-07	AGTOT	650		-0.075	NR	UGL
FCO 13-08	AGTOT	750		-0.076	NR	UGL
FCO 13-11	AGTOT	1050		-0.075	NR	UGL
FCO 13-12	AGTOT	1150		-0.003	NR	UGL
FCO 13-15	AGTOT	1450		-0.047	NR	UGL
FCO 13-16	AGTOT	1550		-0.051	NR	UGL
FCO 13-01	ALPHAG	50	U	6.22	11.4	PCL
FCO 13-05	ALPHAG	450		128	45.8	PCL
FCO 13-09	ALPHAG	850		291	65.4	PCL
FCO 13-13	ALPHAG	1250		168	50.9	PCL
FCO 13-17	ALPHAG	1650		175	51.9	PCL
FCO 13-03	ASTOT	250		-0.024	NR	UGL
FCO 13-04	ASTOT	350		-0.577	NR	UGL
FCO 13-07	ASTOT	650		-0.197	NR	UGL
FCO 13-08	ASTOT	750		-0.332	NR	UGL
FCO 13-11	ASTOT	1050		-0.116	NR	UGL
FCO 13-12	ASTOT	1150		-0.619	NR	UGL
FCO 13-15	ASTOT	1450		-0.617	NR	UGL
FCO 13-16	ASTOT	1550		-0.582	NR	UGL
FCO 13-03	BATOT	250		28.5	NR	UGL
FCO 13-04	BATOT	350		35.7	NR	UGL
FCO 13-07	BATOT	650		47.6	NR	UGL
FCO 13-08	BATOT	750		49.4	NR	UGL
FCO 13-11	BATOT	1050		51.4	NR	UGL
FCO 13-12	BATOT	1150		49.1	NR	UGL
FCO 13-15	BATOT	1450		50	NR	UGL
FCO 13-16	BATOT	1550		49.1	NR	UGL
FCO 13-01	BETAG	50		374	34.9	PCL
FCO 13-05	BETAG	450		571	75.1	PCL
FCO 13-09	BETAG	850		683	81	PCL
FCO 13-13	BETAG	1250		657	77.3	PCL
FCO 13-17	BETAG	1650		729	80.6	PCL

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Accuracy Reported at 2δ

F-Area WTU Clearwell						
Monosodium Titanate		Cont				
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 13-03	CDTOT	250		0.066	NR	UGL
FCO 13-04	CDTOT	350		0.102	NR	UGL
FCO 13-07	CDTOT	650		0.08	NR	UGL
FCO 13-08	CDTOT	750		0.071	NR	UGL
FCO 13-11	CDTOT	1050		0.096	NR	UGL
FCO 13-12	CDTOT	1150		0.049	NR	UGL
FCO 13-15	CDTOT	1450		0.084	NR	UGL
FCO 13-16	CDTOT	1550		0.06	NR	UGL
FCO 13-03	CRTOT	250		0.432	NR	UGL
FCO 13-04	CRTOT	350		0.456	NR	UGL
FCO 13-07	CRTOT	650		0.299	NR	UGL
FCO 13-08	CRTOT	750		0.397	NR	UGL
FCO 13-11	CRTOT	1050		0.33	NR	UGL
FCO 13-12	CRTOT	1150		0.373	NR	UGL
FCO 13-15	CRTOT	1450		0.318	NR	UGL
FCO 13-16	CRTOT	1550		0.387	NR	UGL
FCO 13-03	CS137	250		15.8	5.1	PCL
FCO 13-04	CS137	350		15	8.07	PCL
FCO 13-07	CS137	650		13.8	7.71	PCL
FCO 13-08	CS137	750		13.9	6.09	PCL
FCO 13-11	CS137	1050		15.3	6.79	PCL
FCO 13-12	CS137	1150		15	6.24	PCL
FCO 13-15	CS137	1450		16.8	5.33	PCL
FCO 13-16	CS137	1550		21.2	6.17	PCL
FCO 13-03	HGTOT	250		-0.0423	NR	UGL
FCO 13-04	HGTOT	350		-0.0452	NR	UGL
FCO 13-07	HGTOT	650		-0.0517	NR	UGL
FCO 13-08	HGTOT	750		-0.056	NR	UGL
FCO 13-11	HGTOT	1050		-0.048	NR	UGL
FCO 13-12	HGTOT	1150		-0.0635	NR	UGL
FCO 13-15	HGTOT	1450		0.00336	NR	UGL
FCO 13-16	HGTOT	1550		-0.0627	NR	UGL
FCO 13-03	PBTOT	250		0.055	NR	UGL
FCO 13-04	PBTOT	350		0.073	NR	UGL
FCO 13-07	PBTOT	650		0.063	NR	UGL
FCO 13-08	PBTOT	750		0.062	NR	UGL
FCO 13-11	PBTOT	1050		0.065	NR	UGL
FCO 13-12	PBTOT	1150		0.093	NR	UGL
FCO 13-15	PBTOT	1450		0.113	NR	UGL
FCO 13-16	PBTOT	1550		0.095	NR	UGL
FCO 13-03	SETOT	250		-5.85	NR	UGL
FCO 13-04	SETOT	350		-14.6	NR	UGL
FCO 13-07	SETOT	650		-15.2	NR	UGL
FCO 13-08	SETOT	750		-15.3	NR	UGL
FCO 13-11	SETOT	1050		-15.8	NR	UGL
FCO 13-12	SETOT	1150		-16.4	NR	UGL
FCO 13-15	SETOT	1450		-18.6	NR	UGL
FCO 13-16	SETOT	1550		-15.7	NR	UGL
FCO 13-02	SR90	150		292	31	PCL
FCO 13-06	SR90	550		233	27.1	PCL
FCO 13-10	SR90	950		190	9.63	PCL
FCO 13-14	SR90	1350		221	11.2	PCL

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Accuracy Reported at 2δ

F-Area WTU Clearwell						
Reillex HQL Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 10-04	AGTOT	350		0.024	NR	UGL
FCO 10-09	AGTOT	850		0.024	NR	UGL
FCO 10-14	AGTOT	1350		0.045	NR	UGL
FCO 10-01	ALPHAG	50	U	0.879	5.9	PCL
FCO 10-06	ALPHAG	550		10.8	7.07	PCL
FCO 10-11	ALPHAG	1050		123	62.7	PCL
FCO 10-16	ALPHAG	1550		218	80.2	PCL
FCO 10-04	ASTOT	350		-1.76	NR	UGL
FCO 10-09	ASTOT	850		-1.86	NR	UGL
FCO 10-14	ASTOT	1350		-1.55	NR	UGL
FCO 10-04	BATOT	350		81.6	NR	UGL
FCO 10-09	BATOT	850		74.9	NR	UGL
FCO 10-14	BATOT	1350		78.9	NR	UGL
FCO 10-01	BETAG	50		376	14	PCL
FCO 10-06	BETAG	550		418	15	PCL
FCO 10-11	BETAG	1050		718	119	PCL
FCO 10-16	BETAG	1550		698	113	PCL
FCO 10-02	C14	150		52.6	6.32	PCL
FCO 10-03	C14	250		43.5	5.95	PCL
FCO 10-07	C14	650		65.8	7.42	PCL
FCO 10-08	C14	750		64	6.65	PCL
FCO 10-12	C14	1150		44.4	6.11	PCL
FCO 10-13	C14	1250		45.1	6.22	PCL
FCO 10-17	C14	1650		37.8	5.96	PCL
FCO 10-18	C14	1750		45.6	6.3	PCL
FCO 10-04	CDTOT	350		0.119	NR	UGL
FCO 10-09	CDTOT	850		0.12	NR	UGL
FCO 10-14	CDTOT	1350		0.114	NR	UGL
FCO 10-04	CRTOT	350		0.773	NR	UGL
FCO 10-09	CRTOT	850		0.595	NR	UGL
FCO 10-14	CRTOT	1350		0.605	NR	UGL
FCO 10-04	HGTOT	350		-0.0101	NR	UGL
FCO 10-09	HGTOT	850		-0.044	NR	UGL
FCO 10-14	HGTOT	1350		0.019	NR	UGL
FCO 10-02	I129	150		27.4	16.3	PCL
FCO 10-03	I129	250		116	22.9	PCL
FCO 10-07	I129	650		363	57.9	PCL
FCO 10-08	I129	750		325	47	PCL
FCO 10-12	I129	1150		361	53.9	PCL
FCO 10-13	I129	1250		346	49.1	PCL
FCO 10-17	I129	1650		343	52.9	PCL
FCO 10-18	I129	1750		368	51.6	PCL
FCO 10-04	PBTOT	350		0.042	NR	UGL
FCO 10-09	PBTOT	850		0.051	NR	UGL
FCO 10-14	PBTOT	1350		0.038	NR	UGL
FCO 10-04	SETOT	350		-146	NR	UGL
FCO 10-09	SETOT	850		-147	NR	UGL
FCO 10-14	SETOT	1350		-134	NR	UGL
FCO 10-04	TC99	350	R	59.3	6.58	PCL
FCO 10-09	TC99	850	R	62.6	7.06	PCL
FCO 10-14	TC99	1350	R	76.6	7.68	PCL

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F-Area WTU Clearwell						
SIR600 Zeolite						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 07-05	AGTOT	450		0.063	NR	UGL
FCO 07-12	AGTOT	1150		0.058	NR	UGL
FCO 07-01	ALPHAG	50		453	112	PCL
FCO 07-08	ALPHAG	750		322	94.7	PCL
FCO 07-11	ALPHAG	1050		388	99.1	PCL
FCO 07-18	ALPHAG	1750		462	112	PCL
FCO 07-05	ASTOT	450		-1.3	NR	UGL
FCO 07-12	ASTOT	1150		-1.09	NR	UGL
FCO 07-05	BATOT	450		22.4	NR	UGL
FCO 07-12	BATOT	1150		17.2	NR	UGL
FCO 07-01	BETAG	50		351	90.2	PCL
FCO 07-08	BETAG	750		349	86.1	PCL
FCO 07-11	BETAG	1050		516	96.8	PCL
FCO 07-18	BETAG	1750		542	104	PCL
FCO 07-02	C14	150		57.6	5.05	PCL
FCO 07-03	C14	250		45.5	4.89	PCL
FCO 07-06	C14	550		35.2	4.79	PCL
FCO 07-07	C14	650		66.4	5.33	PCL
FCO 07-16	C14	1550		60.4	6.19	PCL
FCO 07-17	C14	1650		54.7	5.11	PCL
FCO 07-05	CDTOT	450		0.113	NR	UGL
FCO 07-12	CDTOT	1150		0.121	NR	UGL
FCO 07-05	CRTOT	450		0.724	NR	UGL
FCO 07-12	CRTOT	1150		0.571	NR	UGL
FCO 07-09	CS137	850	U	-0.656	2.53	PCL
FCO 07-10	CS137	950	U	1.52	2.75	PCL
FCO 07-13	CS137	1250	U	0.251	7.38	PCL
FCO 07-14	CS137	1350	U	3.78	4.28	PCL
FCO 07-05	HGTOT	450		-0.0264	NR	UGL
FCO 07-12	HGTOT	1150		-0.0255	NR	UGL
FCO 07-02	I129	150	J	396	54.2	PCL
FCO 07-03	I129	250	J	406	63.5	PCL
FCO 07-06	I129	550	J	385	60.3	PCL
FCO 07-07	I129	650	J	410	58.5	PCL
FCO 07-16	I129	1550	J	424	62.6	PCL
FCO 07-17	I129	1650	J	338	56.4	PCL
FCO 07-05	PBTOT	450		0.046	NR	UGL
FCO 07-12	PBTOT	1150		0.063	NR	UGL
FCO 07-05	SETOT	450		-119	NR	UGL
FCO 07-12	SETOT	1150		-117	NR	UGL
FCO 07-04	SR90	350		41.3	4.15	PCL
FCO 07-15	SR90	1450		92.4	4.97	PCL
FCO 07-05	TC99	450		317	14.1	PCL
FCO 07-12	TC99	1150		316	13.8	PCL

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F-Area WTU Clearwell						
SR Treat Resin						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 02-03	AGTOT	250		0.016	NR	UGL
FCO 02-04	AGTOT	350		0.072	NR	UGL
FCO 02-07	AGTOT	650		0.04	NR	UGL
FCO 02-08	AGTOT	750		0.03	NR	UGL
FCO 02-11	AGTOT	1050		0.025	NR	UGL
FCO 02-12	AGTOT	1150		0.143	NR	UGL
FCO 02-15	AGTOT	1450		0.061	NR	UGL
FCO 02-16	AGTOT	1550		0.003	NR	UGL
FCO 02-01	ALPHAG	50		616	131	PCL
FCO 02-05	ALPHAG	450		681	140	PCL
FCO 02-09	ALPHAG	850		133	61.8	PCL
FCO 02-13	ALPHAG	1250	U	8.85	6.58	PCL
FCO 02-17	ALPHAG	1650	U	4.96	6.73	PCL
FCO 02-03	ASTOT	250		-2.76	NR	UGL
FCO 02-04	ASTOT	350		-1.67	NR	UGL
FCO 02-07	ASTOT	650		-2.37	NR	UGL
FCO 02-08	ASTOT	750		-2.52	NR	UGL
FCO 02-11	ASTOT	1050		-2.6	NR	UGL
FCO 02-12	ASTOT	1150		-0.135	NR	UGL
FCO 02-15	ASTOT	1450		-0.216	NR	UGL
FCO 02-16	ASTOT	1550		-0.016	NR	UGL
FCO 02-03	BATOT	250		4.68	NR	UGL
FCO 02-04	BATOT	350		4.42	NR	UGL
FCO 02-07	BATOT	650		7.19	NR	UGL
FCO 02-08	BATOT	750		1.54	NR	UGL
FCO 02-11	BATOT	1050		2.57	NR	UGL
FCO 02-12	BATOT	1150		1.99	NR	UGL
FCO 02-15	BATOT	1450		0.566	NR	UGL
FCO 02-16	BATOT	1550		1.29	NR	UGL
FCO 02-01	BETAG	50		712	115	PCL
FCO 02-05	BETAG	450		952	126	PCL
FCO 02-09	BETAG	850		269	77.9	PCL
FCO 02-13	BETAG	1250		79.6	9.81	PCL
FCO 02-17	BETAG	1650		109	11.2	PCL

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F-Area WTU Clearwell						
SR Treat Resin	Cont					
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
FCO 02-03	CDTOT	250		0.065	NR	UGL
FCO 02-04	CDTOT	350		0.046	NR	UGL
FCO 02-07	CDTOT	650		0.032	NR	UGL
FCO 02-08	CDTOT	750		0.068	NR	UGL
FCO 02-11	CDTOT	1050		0.044	NR	UGL
FCO 02-12	CDTOT	1150		0.08	NR	UGL
FCO 02-15	CDTOT	1450		0.088	NR	UGL
FCO 02-16	CDTOT	1550		0.07	NR	UGL
FCO 02-03	CRTOT	250		0.602	NR	UGL
FCO 02-04	CRTOT	350		0.493	NR	UGL
FCO 02-07	CRTOT	650		0.527	NR	UGL
FCO 02-08	CRTOT	750		0.466	NR	UGL
FCO 02-11	CRTOT	1050		0.475	NR	UGL
FCO 02-12	CRTOT	1150		0.213	NR	UGL
FCO 02-15	CRTOT	1450		0.277	NR	UGL
FCO 02-16	CRTOT	1550		0.446	NR	UGL
FCO 02-03	CS137	250		5.97	5.7	PCL
FCO 02-04	CS137	350		7.29	6.6	PCL
FCO 02-07	CS137	650		9.02	6.68	PCL
FCO 02-08	CS137	750		16.5	6.15	PCL
FCO 02-11	CS137	1050		11	6.43	PCL
FCO 02-12	CS137	1150		16.3	6.76	PCL
FCO 02-15	CS137	1450		16.4	5.96	PCL
FCO 02-16	CS137	1550		19.4	5.46	PCL
FCO 02-03	HGTOT	250	J	-0.0773	NR	UGL
FCO 02-04	HGTOT	350	J	-0.131	NR	UGL
FCO 02-07	HGTOT	650	J	-0.127	NR	UGL
FCO 02-08	HGTOT	750	J	-0.115	NR	UGL
FCO 02-11	HGTOT	1050	J	-0.133	NR	UGL
FCO 02-12	HGTOT	1150		-0.00853	NR	UGL
FCO 02-15	HGTOT	1450		-0.0277	NR	UGL
FCO 02-16	HGTOT	1550		-0.0257	NR	UGL
FCO 02-03	PBTOT	250		0.361	NR	UGL
FCO 02-04	PBTOT	350		0.351	NR	UGL
FCO 02-07	PBTOT	650		0.208	NR	UGL
FCO 02-08	PBTOT	750		0.094	NR	UGL
FCO 02-11	PBTOT	1050		0.458	NR	UGL
FCO 02-12	PBTOT	1150		0.187	NR	UGL
FCO 02-15	PBTOT	1450		0.14	NR	UGL
FCO 02-16	PBTOT	1550		0.553	NR	UGL
FCO 02-03	SETOT	250		-41	NR	UGL
FCO 02-04	SETOT	350		-33.7	NR	UGL
FCO 02-07	SETOT	650		-43.6	NR	UGL
FCO 02-08	SETOT	750		-42	NR	UGL
FCO 02-11	SETOT	1050	J	-35.7	NR	UGL
FCO 02-12	SETOT	1150		-13.2	NR	UGL
FCO 02-15	SETOT	1450		-14.7	NR	UGL
FCO 02-16	SETOT	1550		-16.6	NR	UGL
FCO 02-02	SR90	150	U	3.06	3.36	PCL
FCO 02-06	SR90	550	U	4.33	3.56	PCL
FCO 02-10	SR90	950	U	3.6	4.14	PCL
FCO 02-14	SR90	1350	U	-0.649	3.21	PCL

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H-Area WTU Clearwell Blank_A						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 6A-1	ALPHAG	50		7.62	2.76	PCL
HCO 6A-6	ALPHAG	550		5.25	1.76	PCL
HCO 6A-11	ALPHAG	1050		7.45	2.29	PCL
HCO 6A-16	ALPHAG	1550		-1.11	1.53	PCL
HCO 6A-5	ALTOT	450		50	NR	UGL
HCO 6A-10	ALTOT	950	E	30.2	NR	UGL
HCO 6A-15	ALTOT	1450		50	NR	UGL
HCO 6A-1	BETAG	50		843	14.1	PCL
HCO 6A-6	BETAG	550		380	9.36	PCL
HCO 6A-11	BETAG	1050		501	11	PCL
HCO 6A-16	BETAG	1550		371	5.7	PCL
HCO 6A-3	C14	250	C	50.8	14.9	PCL
HCO 6A-4	C14	350		52.9	15	PCL
HCO 6A-7	C14	650		38.3	15.6	PCL
HCO 6A-8	C14	750		94.3	16.6	PCL
HCO 6A-12	C14	1150		71.4	16.3	PCL
HCO 6A-13	C14	1250		71.2	15.5	PCL
HCO 6A-17	C14	1650		52.3	15.7	PCL
HCO 6A-18	C14	1750		57.3	15.9	PCL
HCO 6A-5	FETOT	450		114	NR	UGL
HCO 6A-10	FETOT	950		50	NR	UGL
HCO 6A-15	FETOT	1450		50	NR	UGL
HCO 6A-3	I129	250		41.5	7.51	PCL
HCO 6A-4	I129	350		38.6	5.89	PCL
HCO 6A-7	I129	650		38.7	6.8	PCL
HCO 6A-8	I129	750	C	41.1	7.17	PCL
HCO 6A-12	I129	1150		40.5	7.77	PCL
HCO 6A-13	I129	1250	C	31.9	6.05	PCL
HCO 6A-17	I129	1650		38.3	6.65	PCL
HCO 6A-18	I129	1750		32.4	5.05	PCL
HCO 6A-2	SR90	150		642	11.5	PCL
HCO 6A-9	SR90	850		631	11.8	PCL
HCO 6A-14	SR90	1350		660	12.3	PCL
HCO 6A-19	SR90	1850	C	491	13	PCL
HCO 6A-5	TC99	450		121	14.7	PCL
HCO 6A-10	TC99	950		121	17.9	PCL
HCO 6A-15	TC99	1450		122	14.3	PCL

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Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

H-Area WTU Clearwell Blank_B						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 6B-1	ALPHAG	50	IC	1.52	0.959	PCL
HCO 6B-6	ALPHAG	550	C	9.4	2.02	PCL
HCO 6B-11	ALPHAG	1050		7.03	1.89	PCL
HCO 6B-16	ALPHAG	1550	C	0.766	1.95	PCL
HCO 6B-5	ALTOT	450		50	NR	UGL
HCO 6B-10	ALTOT	950		50	NR	UGL
HCO 6B-15	ALTOT	1450		50	NR	UGL
HCO 6B-20	ALTOT	1950		50	NR	UGL
HCO 6B-1	BETAG	50	V	273	4.03	PCL
HCO 6B-6	BETAG	550	V	487	6.71	PCL
HCO 6B-11	BETAG	1050		420	6.17	PCL
HCO 6B-16	BETAG	1550	V	880	9.03	PCL
HCO 6B-3	C14	250		59.3	15.2	PCL
HCO 6B-4	C14	350		49.8	15.2	PCL
HCO 6B-7	C14	650		61.6	16	PCL
HCO 6B-8	C14	750		63.9	7.91	PCL
HCO 6B-12	C14	1150		46.9	23	PCL
HCO 6B-13	C14	1250		62.9	16.7	PCL
HCO 6B-17	C14	1650		71.5	15.4	PCL
HCO 6B-18	C14	1750		74	15.6	PCL
HCO 6B-5	FETOT	450		53.8	NR	UGL
HCO 6B-10	FETOT	950		56.5	NR	UGL
HCO 6B-15	FETOT	1450		50	NR	UGL
HCO 6B-20	FETOT	1950		50	NR	UGL
HCO 6B-3	I129	250		35.5	6.63	PCL
HCO 6B-4	I129	350		36	5.38	PCL
HCO 6B-7	I129	650		35.6	6.67	PCL
HCO 6B-8	I129	750		35.2	5.61	PCL
HCO 6B-12	I129	1150		30.8	6.62	PCL
HCO 6B-13	I129	1250		35.7	6.04	PCL
HCO 6B-17	I129	1650	C	38.9	7.15	PCL
HCO 6B-18	I129	1750	C	39.7	7.46	PCL
HCO 6B-2	SR90	150		428	20.3	PCL
HCO 6B-9	SR90	850	C	365	8.28	PCL
HCO 6B-14	SR90	1350		590	11.3	PCL
HCO 6B-19	SR90	1850	C	563	14.1	PCL
HCO 6B-5	TC99	450		98	16	PCL
HCO 6B-10	TC99	950		98.7	16.1	PCL
HCO 6B-15	TC99	1450		99	16.5	PCL
HCO 6B-20	TC99	1950		99.4	16.1	PCL

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R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell Activated_Carbon						
SRS Sample ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 12-1	ALPHAG	50	C	1.78	1.72	PCL
HCO 12-6	ALPHAG	550	C	11	2.36	PCL
HCO 12-11	ALPHAG	1050		7.2	2.86	PCL
HCO 12-16	ALPHAG	1550	C	2.77	0.894	PCL
HCO 12-5	ALTOT	450		50	NR	UGL
HCO 12-10	ALTOT	950		50	NR	UGL
HCO 12-15	ALTOT	1450		50	NR	UGL
HCO 12-20	ALTOT	1950		50	NR	UGL
HCO 12-1	BETAG	50	V	314	5.27	PCL
HCO 12-6	BETAG	550	V	920	9.21	PCL
HCO 12-11	BETAG	1050		603	11.7	PCL
HCO 12-16	BETAG	1550	V	272	4.73	PCL
HCO 12-3	C14	250		71.2	15.9	PCL
HCO 12-4	C14	350		50.1	14.8	PCL
HCO 12-7	C14	650		37.5	15.4	PCL
HCO 12-8	C14	750		68.2	7.26	PCL
HCO 12-12	C14	1150		50.4	16.7	PCL
HCO 12-13	C14	1250		44.8	16.9	PCL
HCO 12-17	C14	1650		76.3	15.4	PCL
HCO 12-18	C14	1750		48.5	14.9	PCL
HCO 12-5	FETOT	450		55.6	NR	UGL
HCO 12-10	FETOT	950		90.6	NR	UGL
HCO 12-15	FETOT	1450		50	NR	UGL
HCO 12-20	FETOT	1950		50	NR	UGL
HCO 12-3	I129	250		29.6	5.78	PCL
HCO 12-4	I129	350		32.5	5.3	PCL
HCO 12-7	I129	650		33.6	6.6	PCL
HCO 12-8	I129	750		32	5.47	PCL
HCO 12-12	I129	1150		36.4	5.68	PCL
HCO 12-13	I129	1250		34.7	5.32	PCL
HCO 12-17	I129	1650	C	26.2	5.73	PCL
HCO 12-18	I129	1750	C	29.6	6.01	PCL
HCO 12-2	SR90	150	C	489	11.8	PCL
HCO 12-9	SR90	850	C	440	13.4	PCL
HCO 12-14	SR90	1350		582	10.6	PCL
HCO 12-19	SR90	1850	C	551	13.5	PCL
HCO 12-5	TC99	450		2.58	8.92	PCL
HCO 12-10	TC99	950		4.24	9.39	PCL
HCO 12-15	TC99	1450		15.7	9.58	PCL
HCO 12-20	TC99	1950		27.8	11.2	PCL

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E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell						
AG1_X2 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 8-1	ALPHAG	50		4.05	1.65	PCL
HCO 8-6	ALPHAG	550		0.717	1.55	PCL
HCO 8-11	ALPHAG	1050		20	10.2	PCL
HCO 8-16	ALPHAG	1550		3.71	1.29	PCL
HCO 8-5	ALTOT	450		50	NR	UGL
HCO 8-10	ALTOT	950		50	NR	UGL
HCO 8-15	ALTOT	1450		50	NR	UGL
HCO 8-20	ALTOT	1950		50	NR	UGL
HCO 8-1	BETAG	50		415	9.77	PCL
HCO 8-6	BETAG	550		328	5.33	PCL
HCO 8-11	BETAG	1050		962	36.4	PCL
HCO 8-16	BETAG	1550		332	5.45	PCL
HCO 8-3	C14	250	C	47.1	14.8	PCL
HCO 8-4	C14	350		52.6	17.4	PCL
HCO 8-7	C14	650		39.3	15.6	PCL
HCO 8-8	C14	750	C	42.2	14.6	PCL
HCO 8-12	C14	1150		55.5	15.8	PCL
HCO 8-13	C14	1250		21.6	13.8	PCL
HCO 8-17	C14	1650		77.4	16.5	PCL
HCO 8-18	C14	1750		66.8	15.8	PCL
HCO 8-5	FETOT	450		50	NR	UGL
HCO 8-10	FETOT	950		50	NR	UGL
HCO 8-15	FETOT	1450		50	NR	UGL
HCO 8-20	FETOT	1950		50	NR	UGL
HCO 8-3	I129	250		10.2	3.7	PCL
HCO 8-4	I129	350		12.1	2.67	PCL
HCO 8-7	I129	650		40.2	7.46	PCL
HCO 8-8	I129	750		36.7	7.15	PCL
HCO 8-12	I129	1150		32.1	6.23	PCL
HCO 8-13	I129	1250	C	29.3	5.87	PCL
HCO 8-17	I129	1650		37.7	5.47	PCL
HCO 8-18	I129	1750		41.5	6.25	PCL
HCO 8-2	SR90	150		655	7.79	PCL
HCO 8-9	SR90	850		699	14.4	PCL
HCO 8-14	SR90	1350		612	16.3	PCL
HCO 8-19	SR90	1850		469	24.6	PCL
HCO 8-5	TC99	450		4.54	7.49	PCL
HCO 8-10	TC99	950		7.31	10.1	PCL
HCO 8-15	TC99	1450		5.26	7.21	PCL
HCO 8-20	TC99	1950		9.79	7.63	PCL

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Accuracy Reported at 2δ

H-Area WTU Clearwell						
AG1_X8 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 9-1	ALPHAG	50		8.2	2.88	PCL
HCO 9-6	ALPHAG	550		2.34	1.67	PCL
HCO 9-11	ALPHAG	1050		1.39	1.39	PCL
HCO 9-16	ALPHAG	1550		9.92	2.08	PCL
HCO 9-5	ALTOT	450		50	NR	UGL
HCO 9-10	ALTOT	950		50	NR	UGL
HCO 9-15	ALTOT	1450		50	NR	UGL
HCO 9-20	ALTOT	1950		50	NR	UGL
HCO 9-1	BETAG	50		460	10.5	PCL
HCO 9-6	BETAG	550		391	5.85	PCL
HCO 9-11	BETAG	1050		503	6.78	PCL
HCO 9-16	BETAG	1550		392	5.81	PCL
HCO 9-3	C14	250		64.8	16.1	PCL
HCO 9-4	C14	350		71.3	15.6	PCL
HCO 9-7	C14	650		65.8	15.3	PCL
HCO 9-8	C14	750	C	35.2	15.8	PCL
HCO 9-12	C14	1150	C	46.4	14.8	PCL
HCO 9-13	C14	1250	C	47	14.8	PCL
HCO 9-17	C14	1650		49.3	17	PCL
HCO 9-18	C14	1750		53.7	16	PCL
HCO 9-5	FETOT	450		50	NR	UGL
HCO 9-10	FETOT	950		50	NR	UGL
HCO 9-15	FETOT	1450		50	NR	UGL
HCO 9-20	FETOT	1950		50	NR	UGL
HCO 9-3	I129	250		12.3	3.51	PCL
HCO 9-4	I129	350		10.3	3.14	PCL
HCO 9-7	I129	650	C	11.1	3.62	PCL
HCO 9-8	I129	750		8.37	4.14	PCL
HCO 9-12	I129	1150		12.4	4.15	PCL
HCO 9-13	I129	1250		10.9	3.24	PCL
HCO 9-17	I129	1650		10.8	2.43	PCL
HCO 9-18	I129	1750		10.7	2.69	PCL
HCO 9-2	SR90	150		637	11.4	PCL
HCO 9-9	SR90	850		649	11.4	PCL
HCO 9-14	SR90	1350		600	11.1	PCL
HCO 9-19	SR90	1850		520	20.5	PCL
HCO 9-5	TC99	450		-1.9	8.47	PCL
HCO 9-10	TC99	950		-3.44	8.75	PCL
HCO 9-15	TC99	1450		0.156	7.31	PCL
HCO 9-20	TC99	1950		2.9	7.04	PCL

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Accuracy Reported at 2δ

H-Area WTU Clearwell						
AG50Wx12 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 15-1	ALPHAG	50	C	1.35	0.44	PCL
HCO 15-6	ALPHAG	550	C	1.72	0.881	PCL
HCO 15-11	ALPHAG	1050		2.21	1.46	PCL
HCO 15-16	ALPHAG	1550	C	1.79	0.866	PCL
HCO 15-5	ALTOT	450		50	NR	UGL
HCO 15-10	ALTOT	950		50	NR	UGL
HCO 15-15	ALTOT	1450		50	NR	UGL
HCO 15-20	ALTOT	1950		50	NR	UGL
HCO 15-1	BETAG	50	V	15.5	1.05	PCL
HCO 15-6	BETAG	550	V	9.75	1.11	PCL
HCO 15-11	BETAG	1050		10.1	2.3	PCL
HCO 15-16	BETAG	1550	V	11.8	1.09	PCL
HCO 15-3	C14	250		5.22	13.5	PCL
HCO 15-4	C14	350		7.52	13.6	PCL
HCO 15-7	C14	650		31.9	15.2	PCL
HCO 15-8	C14	750		45.8	9.16	PCL
HCO 15-12	C14	1150		66.3	17.4	PCL
HCO 15-13	C14	1250		65.1	14.9	PCL
HCO 15-17	C14	1650	C	54.4	15.1	PCL
HCO 15-18	C14	1750	C	43	15.7	PCL
HCO 15-5	FETOT	450		50	NR	UGL
HCO 15-10	FETOT	950		50	NR	UGL
HCO 15-15	FETOT	1450		50	NR	UGL
HCO 15-20	FETOT	1950		50	NR	UGL
HCO 15-3	I129	250		24.7	4.41	PCL
HCO 15-4	I129	350		34	5.99	PCL
HCO 15-7	I129	650		43.6	7.43	PCL
HCO 15-8	I129	750		38.9	6.3	PCL
HCO 15-12	I129	1150		37.9	6.29	PCL
HCO 15-13	I129	1250		40.6	6.04	PCL
HCO 15-17	I129	1650		34.7	8.28	PCL
HCO 15-18	I129	1750		34.9	6.94	PCL
HCO 15-2	SR90	150		0.033	0.944	PCL
HCO 15-9	SR90	850	C	-0.43	1.02	PCL
HCO 15-14	SR90	1350		0.748	0.723	PCL
HCO 15-19	SR90	1850	C	0.605	0.741	PCL
HCO 15-5	TC99	450		113	17	PCL
HCO 15-10	TC99	950		102	16.2	PCL
HCO 15-15	TC99	1450		117	17.3	PCL
HCO 15-20	TC99	1950		96	15.1	PCL

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Accuracy Reported at 2δ

H-Area WTU Clearwell						
AG50Wx8 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 14-1	ALPHAG	50		0.851	0.449	PCL
HCO 14-6	ALPHAG	550	C	1.65	0.801	PCL
HCO 14-11	ALPHAG	1050		1.13	1.58	PCL
HCO 14-16	ALPHAG	1550	C	0.839	0.63	PCL
HCO 14-5	ALTOT	450		50	NR	UGL
HCO 14-10	ALTOT	950		50	NR	UGL
HCO 14-15	ALTOT	1450		50	NR	UGL
HCO 14-20	ALTOT	1950		50	NR	UGL
HCO 14-1	BETAG	50		16.4	1.31	PCL
HCO 14-6	BETAG	550	V	8.12	1.02	PCL
HCO 14-11	BETAG	1050		10.7	2.41	PCL
HCO 14-16	BETAG	1550	V	14.9	1.28	PCL
HCO 14-3	C14	250		-2.85	13.4	PCL
HCO 14-4	C14	350		5.77	14.4	PCL
HCO 14-7	C14	650		80.7	16.2	PCL
HCO 14-8	C14	750		67.8	7.51	PCL
HCO 14-12	C14	1150		66.7	15.6	PCL
HCO 14-13	C14	1250		67.6	7.22	PCL
HCO 14-17	C14	1650		50.6	15	PCL
HCO 14-18	C14	1750		72.6	18.6	PCL
HCO 14-5	FETOT	450		50	NR	UGL
HCO 14-10	FETOT	950		68.3	NR	UGL
HCO 14-15	FETOT	1450		50	NR	UGL
HCO 14-20	FETOT	1950		50	NR	UGL
HCO 14-3	I129	250		16.8	3.78	PCL
HCO 14-4	I129	350		31.4	5.31	PCL
HCO 14-7	I129	650	C	37.3	7.76	PCL
HCO 14-8	I129	750		40	6.44	PCL
HCO 14-12	I129	1150		38	6.08	PCL
HCO 14-13	I129	1250		35.5	5.38	PCL
HCO 14-17	I129	1650		36.8	6.37	PCL
HCO 14-18	I129	1750	C	38.7	7.79	PCL
HCO 14-2	SR90	150	C	1.78	0.928	PCL
HCO 14-9	SR90	850	C	-0.398	0.657	PCL
HCO 14-14	SR90	1350		0.981	0.801	PCL
HCO 14-19	SR90	1850	C	333	8.28	PCL
HCO 14-5	TC99	450		100	16.1	PCL
HCO 14-10	TC99	950		118	17.5	PCL
HCO 14-15	TC99	1450		111	16.8	PCL
HCO 14-20	TC99	1950		90.9	15.2	PCL

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H-Area WTU Clearwell						
AGMP50 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 5-1	ALPHAG	50		2.4	1.15	PCL
HCO 5-6	ALPHAG	550		1.08	0.657	PCL
HCO 5-11	ALPHAG	1050		2.4	1.47	PCL
HCO 5-16	ALPHAG	1550		1.2	0.799	PCL
HCO 5-5	ALTOT	450		50	NR	UGL
HCO 5-10	ALTOT	950		50	NR	UGL
HCO 5-15	ALTOT	1450		50	NR	UGL
HCO 5-20	ALTOT	1950		50	NR	UGL
HCO 5-1	BETAG	50		19.4	2.74	PCL
HCO 5-6	BETAG	550		5.55	0.868	PCL
HCO 5-11	BETAG	1050		17.3	2.7	PCL
HCO 5-16	BETAG	1550		6.33	0.911	PCL
HCO 5-3	C14	250		57.8	15.1	PCL
HCO 5-4	C14	350		55.6	15.2	PCL
HCO 5-7	C14	650		27.8	15	PCL
HCO 5-8	C14	750		84.5	16.1	PCL
HCO 5-12	C14	1150		30.2	15.4	PCL
HCO 5-13	C14	1250		72.5	17.5	PCL
HCO 5-17	C14	1650		74.3	15.9	PCL
HCO 5-18	C14	1750	C	48.1	16.4	PCL
HCO 5-5	FETOT	450	E	47.1	NR	UGL
HCO 5-10	FETOT	950		50	NR	UGL
HCO 5-15	FETOT	1450		50	NR	UGL
HCO 5-20	FETOT	1950		50	NR	UGL
HCO 5-3	I129	250	C	33	7.11	PCL
HCO 5-4	I129	350		36.2	6.26	PCL
HCO 5-7	I129	650		36.4	6.81	PCL
HCO 5-8	I129	750	C	39.9	7.44	PCL
HCO 5-12	I129	1150		31.8	6.6	PCL
HCO 5-13	I129	1250		35.1	5.51	PCL
HCO 5-17	I129	1650		39	5.84	PCL
HCO 5-18	I129	1750		34.2	7.29	PCL
HCO 5-2	SR90	150		0.933	0.882	PCL
HCO 5-9	SR90	850		-0.122	1	PCL
HCO 5-14	SR90	1350		0.33	0.742	PCL
HCO 5-19	SR90	1850		-0.00944	0.85	PCL
HCO 5-5	TC99	450		119	14.2	PCL
HCO 5-10	TC99	950		116	17.3	PCL
HCO 5-15	TC99	1450		122	14.2	PCL
HCO 5-20	TC99	1950		122	14.1	PCL

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Accuracy Reported at 2δ

H-Area WTU Clearwell						
CG8 Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 1-1	ALPHAG	50		-0.0117	1.23	PCL
HCO 1-6	ALPHAG	550		1.26	0.785	PCL
HCO 1-11	ALPHAG	1050		2.16	1.63	PCL
HCO 1-16	ALPHAG	1550		1.95	0.959	PCL
HCO 1-5	ALTOT	450		50	NR	UGL
HCO 1-10	ALTOT	950		50	NR	UGL
HCO 1-15	ALTOT	1450		50	NR	UGL
HCO 1-20	ALTOT	1950		50	NR	UGL
HCO 1-1	BETAG	50		10.6	2.34	PCL
HCO 1-6	BETAG	550		14.7	1.27	PCL
HCO 1-11	BETAG	1050		11.6	2.38	PCL
HCO 1-16	BETAG	1550		13.1	1.2	PCL
HCO 1-3	C14	250	C	29.9	18.4	PCL
HCO 1-4	C14	350		43.5	15.7	PCL
HCO 1-7	C14	650		32.1	15.2	PCL
HCO 1-8	C14	750		75.7	16.5	PCL
HCO 1-12	C14	1150		59.7	16.6	PCL
HCO 1-13	C14	1250		66.3	14.9	PCL
HCO 1-17	C14	1650		61.3	16	PCL
HCO 1-18	C14	1750		53.6	15.8	PCL
HCO 1-5	FETOT	450		393	NR	UGL
HCO 1-10	FETOT	950		50	NR	UGL
HCO 1-15	FETOT	1450		50	NR	UGL
HCO 1-20	FETOT	1950		50	NR	UGL
HCO 1-3	I129	250		38.2	8.36	PCL
HCO 1-4	I129	350		39.5	6.38	PCL
HCO 1-7	I129	650		32.3	6.44	PCL
HCO 1-8	I129	750	C	35.9	7.7	PCL
HCO 1-12	I129	1150		35.4	6.61	PCL
HCO 1-13	I129	1250	C	33.8	7.33	PCL
HCO 1-17	I129	1650		39.2	5.93	PCL
HCO 1-18	I129	1750		36.8	5.79	PCL
HCO 1-2	SR90	150		1.44	0.778	PCL
HCO 1-9	SR90	850		0.383	0.928	PCL
HCO 1-14	SR90	1350		1.69	0.845	PCL
HCO 1-19	SR90	1850		0.0618	0.972	PCL
HCO 1-5	TC99	450		119	14.3	PCL
HCO 1-10	TC99	950		98	15.8	PCL
HCO 1-15	TC99	1450		122	14	PCL
HCO 1-20	TC99	1950		122	14.3	PCL

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Accuracy Reported at 2δ

H-Area WTU Clearwell						
Chelex 20 Resin						
Lab ID	Analyte		Anal Qual	Anal Result	Accuracy	Result Units
HCO 4-1	ALPHAG	50	C	-0.102	0.467	PCL
HCO 4-6	ALPHAG	550	C	0.781	0.556	PCL
HCO 4-11	ALPHAG	1050		0.747	2.22	PCL
HCO 4-16	ALPHAG	1550	C	0.92	0.673	PCL
HCO 4-5	ALTOT	450		50	NR	UGL
HCO 4-10	ALTOT	950		50	NR	UGL
HCO 4-15	ALTOT	1450		50	NR	UGL
HCO 4-20	ALTOT	1950		50	NR	UGL
HCO 4-1	BETAG	50	V	11.6	0.953	PCL
HCO 4-6	BETAG	550	V	9.69	0.872	PCL
HCO 4-11	BETAG	1050		356	9.15	PCL
HCO 4-16	BETAG	1550	V	665	7.51	PCL
HCO 4-3	C14	250		67.8	17.7	PCL
HCO 4-4	C14	350		67.4	15.5	PCL
HCO 4-7	C14	650		43.9	15.3	PCL
HCO 4-8	C14	750		53	8.83	PCL
HCO 4-12	C14	1150		54.9	15.2	PCL
HCO 4-13	C14	1250		57.2	7.13	PCL
HCO 4-17	C14	1650		56.8	17.2	PCL
HCO 4-18	C14	1750	C	46.9	14.8	PCL
HCO 4-5	FETOT	450		50	NR	UGL
HCO 4-10	FETOT	950		61.7	NR	UGL
HCO 4-15	FETOT	1450		50	NR	UGL
HCO 4-20	FETOT	1950		50	NR	UGL
HCO 4-3	I129	250		36.9	6.23	PCL
HCO 4-4	I129	350		35.5	5.42	PCL
HCO 4-7	I129	650		38.9	6.36	PCL
HCO 4-8	I129	750		32.2	6.01	PCL
HCO 4-12	I129	1150		34.4	5.22	PCL
HCO 4-13	I129	1250		36.7	6.07	PCL
HCO 4-17	I129	1650		30.9	5.26	PCL
HCO 4-18	I129	1750		37.1	6.93	PCL
HCO 4-2	SR90	150	C	400	11.6	PCL
HCO 4-9	SR90	850	C	55.1	4.18	PCL
HCO 4-14	SR90	1350		556	10.4	PCL
HCO 4-19	SR90	1850	C	589	12.2	PCL
HCO 4-5	TC99	450		95.3	15.1	PCL
HCO 4-10	TC99	950		95.6	15.9	PCL
HCO 4-15	TC99	1450		101	16.2	PCL
HCO 4-20	TC99	1950		95.1	15.7	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

H-Area WTU Clearwell						
Dowex 21K Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 3-1	ALPHAG	50		6.59	1.7	PCL
HCO 3-6	ALPHAG	550	C	0.914	1.79	PCL
HCO 3-11	ALPHAG	1050		2.89	1.72	PCL
HCO 3-16	ALPHAG	1550	C	2.76	1.04	PCL
HCO 3-5	ALTOT	450		50	NR	UGL
HCO 3-15	ALTOT	1450		50	NR	UGL
HCO 3-20	ALTOT	1950		50	NR	UGL
HCO 3-1	BETAG	50		386	5.97	PCL
HCO 3-6	BETAG	550	V	725	8.18	PCL
HCO 3-11	BETAG	1050		348	5.51	PCL
HCO 3-16	BETAG	1550	V	953	8.99	PCL
HCO 3-3	C14	250		56.3	16.6	PCL
HCO 3-4	C14	350		56.4	17.1	PCL
HCO 3-7	C14	650	C	48	16.2	PCL
HCO 3-8	C14	750		66.2	7.16	PCL
HCO 3-12	C14	1150		6.57	13.2	PCL
HCO 3-13	C14	1250		60.6	7.16	PCL
HCO 3-17	C14	1650	C	45.4	16.6	PCL
HCO 3-18	C14	1750		58.5	15.6	PCL
HCO 3-5	FETOT	450		50	NR	UGL
HCO 3-15	FETOT	1450		50	NR	UGL
HCO 3-20	FETOT	1950	E	48.9	NR	UGL
HCO 3-3	I129	250		11.2	2.69	PCL
HCO 3-4	I129	350		11.6	3.28	PCL
HCO 3-7	I129	650		12.4	4.22	PCL
HCO 3-8	I129	750		13	2.89	PCL
HCO 3-12	I129	1150		15.3	3.72	PCL
HCO 3-13	I129	1250		26.1	4.43	PCL
HCO 3-17	I129	1650		36.2	7.08	PCL
HCO 3-18	I129	1750		27.1	5.02	PCL
HCO 3-2	SR90	150	C	-1.25	1.36	PCL
HCO 3-9	SR90	850	C	554	13.3	PCL
HCO 3-14	SR90	1350		608	11.7	PCL
HCO 3-19	SR90	1850	C	0.149	0.583	PCL
HCO 3-5	TC99	450		-5.19	8.35	PCL
HCO 3-15	TC99	1450		-6.15	8.33	PCL
HCO 3-20	TC99	1950		0.422	8.98	PCL

Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell						
Iron Powder						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 11-1	ALPHAG	50		2.13	1.98	PCL
HCO 11-4	ALTOT	350		50	NR	UGL
HCO 11-1	BETAG	50		565	10.1	PCL
HCO 11-4	FETOT	350		50	NR	UGL
HCO 11-3	SR90	250		622	11.1	PCL
HCO 11-4	TC99	350		13.1	8.17	PCL

Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell						
Monosodium Titanate						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 13-1	ALPHAG	50	C	-0.00304	0.469	PCL
HCO 13-6	ALPHAG	550	C	2.43	0.85	PCL
HCO 13-11	ALPHAG	1050		1.24	1.71	PCL
HCO 13-16	ALPHAG	1550	C	2.53	1.13	PCL
HCO 13-5	ALTOT	450		50	NR	UGL
HCO 13-10	ALTOT	950		50	NR	UGL
HCO 13-15	ALTOT	1450		50	NR	UGL
HCO 13-20	ALTOT	1950		50	NR	UGL
HCO 13-1	BETAG	50	V	10.1	0.938	PCL
HCO 13-6	BETAG	550	V	567	5.74	PCL
HCO 13-11	BETAG	1050		474	10.5	PCL
HCO 13-16	BETAG	1550	V	302	5.1	PCL
HCO 13-3	C14	250		62.2	15.7	PCL
HCO 13-4	C14	350		57.6	15.4	PCL
HCO 13-7	C14	650		26	16.5	PCL
HCO 13-8	C14	750		68	15.6	PCL
HCO 13-12	C14	1150		51.9	17.2	PCL
HCO 13-13	C14	1250		52	18	PCL
HCO 13-17	C14	1650		48.4	15.2	PCL
HCO 13-18	C14	1750		65.5	15.7	PCL
HCO 13-5	FETOT	450		50	NR	UGL
HCO 13-10	FETOT	950		50	NR	UGL
HCO 13-15	FETOT	1450		50	NR	UGL
HCO 13-20	FETOT	1950		94.9	NR	UGL
HCO 13-3	I129	250		35.7	5.72	PCL
HCO 13-4	I129	350		26.4	5.05	PCL
HCO 13-7	I129	650		36.5	6.83	PCL
HCO 13-8	I129	750		32.3	5.41	PCL
HCO 13-12	I129	1150		34.6	5.81	PCL
HCO 13-13	I129	1250		32.7	6.16	PCL
HCO 13-17	I129	1650		31.3	5.21	PCL
HCO 13-18	I129	1750	C	37.3	7.39	PCL
HCO 13-2	SR90	150	C	1.78	1.02	PCL
HCO 13-9	SR90	850		470	10.3	PCL
HCO 13-14	SR90	1350		426	9.74	PCL
HCO 13-19	SR90	1850	C	536	12.1	PCL
HCO 13-5	TC99	450		95.3	15.6	PCL
HCO 13-10	TC99	950		122	16.7	PCL
HCO 13-15	TC99	1450		102	16.1	PCL
HCO 13-20	TC99	1950		113	16.6	PCL

Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell						
Reillex HQL Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 10-1	ALPHAG	50		5.15	3	PCL
HCO 10-6	ALPHAG	550		1.07	1.51	PCL
HCO 10-11	ALPHAG	1050		4.4	2.33	PCL
HCO 10-16	ALPHAG	1550		2.35	0.904	PCL
HCO 10-10	ALTOT	950		50	NR	UGL
HCO 10-15	ALTOT	1450		50	NR	UGL
HCO 10-20	ALTOT	1950		50	NR	UGL
HCO 10-1	BETAG	50		577	11.6	PCL
HCO 10-6	BETAG	550		385	5.88	PCL
HCO 10-11	BETAG	1050		497	10.8	PCL
HCO 10-16	BETAG	1550		305	5.11	PCL
HCO 10-3	C14	250	C	45.3	16	PCL
HCO 10-4	C14	350		61.8	15.5	PCL
HCO 10-7	C14	650	C	61.5	15.5	PCL
HCO 10-8	C14	750		87.2	16.3	PCL
HCO 10-12	C14	1150		76.2	15.8	PCL
HCO 10-13	C14	1250	C	41.7	15.5	PCL
HCO 10-17	C14	1650		53	15.8	PCL
HCO 10-18	C14	1750		38.8	14.8	PCL
HCO 10-10	FETOT	950		50	NR	UGL
HCO 10-15	FETOT	1450		50	NR	UGL
HCO 10-20	FETOT	1950		50	NR	UGL
HCO 10-3	I129	250		11.5	2.91	PCL
HCO 10-4	I129	350		13.1	2.89	PCL
HCO 10-7	I129	650		9.3	3.5	PCL
HCO 10-8	I129	750	C	10.9	3.88	PCL
HCO 10-12	I129	1150	C	10.4	2.94	PCL
HCO 10-13	I129	1250		12.4	3.98	PCL
HCO 10-17	I129	1650		16.7	3.27	PCL
HCO 10-18	I129	1750		19	4.99	PCL
HCO 10-2	SR90	150		522	11.4	PCL
HCO 10-9	SR90	850		605	12.5	PCL
HCO 10-14	SR90	1350		457	9.58	PCL
HCO 10-19	SR90	1850		687	14.1	PCL
HCO 10-10	TC99	950		-5.46	8.73	PCL
HCO 10-15	TC99	1450		-3.07	6.41	PCL
HCO 10-20	TC99	1950		4.63	7.64	PCL

Notes: J= LT reporting limit
U= LT detection limit
R= ICP interference check not met
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ
NR = Not Reported
C= lab control sample not met
V= lab blank contaminated

H-Area WTU Clearwell						
SIR600 Zeolite						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 7-1	ALPHAG	50		1.42	1.24	PCL
HCO 7-6	ALPHAG	550		0.694	1.18	PCL
HCO 7-11	ALPHAG	1050		1.62	2.26	PCL
HCO 7-16	ALPHAG	1550		1.46	0.763	PCL
HCO 7-5	ALTOT	450		50	NR	UGL
HCO 7-10	ALTOT	950		50	NR	UGL
HCO 7-15	ALTOT	1450		50	NR	UGL
HCO 7-20	ALTOT	1950		50	NR	UGL
HCO 7-1	BETAG	50		13.4	2.52	PCL
HCO 7-6	BETAG	550		13.5	2.74	PCL
HCO 7-11	BETAG	1050		33.9	3.42	PCL
HCO 7-16	BETAG	1550		41.3	1.94	PCL
HCO 7-3	C14	250		78.6	15.8	PCL
HCO 7-4	C14	350		53.5	15.7	PCL
HCO 7-7	C14	650		80	15.6	PCL
HCO 7-8	C14	750	C	47.3	15	PCL
HCO 7-12	C14	1150	C	46.8	15.6	PCL
HCO 7-13	C14	1250		77	15.9	PCL
HCO 7-17	C14	1650	C	34.7	14.4	PCL
HCO 7-18	C14	1750		21.1	14.7	PCL
HCO 7-5	FETOT	450		130	NR	UGL
HCO 7-10	FETOT	950		50	NR	UGL
HCO 7-15	FETOT	1450		50	NR	UGL
HCO 7-20	FETOT	1950		50	NR	UGL
HCO 7-3	I129	250	C	33.6	7.55	PCL
HCO 7-4	I129	350		38.3	6.43	PCL
HCO 7-7	I129	650	C	36.1	6.36	PCL
HCO 7-8	I129	750		36.1	7	PCL
HCO 7-12	I129	1150		38	6.86	PCL
HCO 7-13	I129	1250	C	28.9	5.69	PCL
HCO 7-17	I129	1650		28.9	5.72	PCL
HCO 7-18	I129	1750		45.8	9.95	PCL
HCO 7-2	SR90	150		1.57	0.847	PCL
HCO 7-9	SR90	850		6.05	1.49	PCL
HCO 7-14	SR90	1350		32.1	2.86	PCL
HCO 7-19	SR90	1850		46.6	3.58	PCL
HCO 7-5	TC99	450		115	14.6	PCL
HCO 7-10	TC99	950		120	17.4	PCL
HCO 7-15	TC99	1450		111	14.1	PCL
HCO 7-20	TC99	1950		138	15.3	PCL

Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

H-Area WTU Clearwell						
SR-Treat Resin						
Lab ID	Analyte	Avg Bedvol	Anal Qual	Anal Result	Accuracy	Result Units
HCO 2-1	ALPHAG	50		0.731	0.671	PCL
HCO 2-6	ALPHAG	550	C	0.329	0.679	PCL
HCO 2-11	ALPHAG	1050		0.605	1.35	PCL
HCO 2-16	ALPHAG	1550		0.796	0.625	PCL
HCO 2-5	ALTOT	450		50	NR	UGL
HCO 2-10	ALTOT	950		50	NR	UGL
HCO 2-15	ALTOT	1450		50	NR	UGL
HCO 2-20	ALTOT	1950		50	NR	UGL
HCO 2-1	BETAG	50		7.07	0.977	PCL
HCO 2-6	BETAG	550	V	4.04	0.711	PCL
HCO 2-11	BETAG	1050		5.75	2.15	PCL
HCO 2-16	BETAG	1550		6.83	1.28	PCL
HCO 2-3	C14	250		90.7	16.2	PCL
HCO 2-4	C14	350		65.7	15.8	PCL
HCO 2-7	C14	650		62.5	15.9	PCL
HCO 2-8	C14	750		74.2	7.5	PCL
HCO 2-12	C14	1150		77.6	18.9	PCL
HCO 2-13	C14	1250		76.4	15.5	PCL
HCO 2-17	C14	1650	C	40.2	15.2	PCL
HCO 2-18	C14	1750		58.9	15.8	PCL
HCO 2-5	FETOT	450		92.6	NR	UGL
HCO 2-10	FETOT	950		129	NR	UGL
HCO 2-15	FETOT	1450		50	NR	UGL
HCO 2-20	FETOT	1950		73	NR	UGL
HCO 2-3	I129	250		37.3	6.5	PCL
HCO 2-4	I129	350		35.5	5.11	PCL
HCO 2-7	I129	650		31.1	6.27	PCL
HCO 2-8	I129	750		32.9	5.36	PCL
HCO 2-12	I129	1150		33.7	6.11	PCL
HCO 2-13	I129	1250		44.5	6.84	PCL
HCO 2-17	I129	1650		32.3	5.91	PCL
HCO 2-18	I129	1750		35.2	5.66	PCL
HCO 2-2	SR90	150	C	59.2	3.49	PCL
HCO 2-9	SR90	850		0.202	0.739	PCL
HCO 2-14	SR90	1350		1.09	0.751	PCL
HCO 2-19	SR90	1850	C	2.8	1.02	PCL
HCO 2-5	TC99	450		106	16.5	PCL
HCO 2-10	TC99	950		109	16.8	PCL
HCO 2-15	TC99	1450		104	16.5	PCL
HCO 2-20	TC99	1950		115	17	PCL

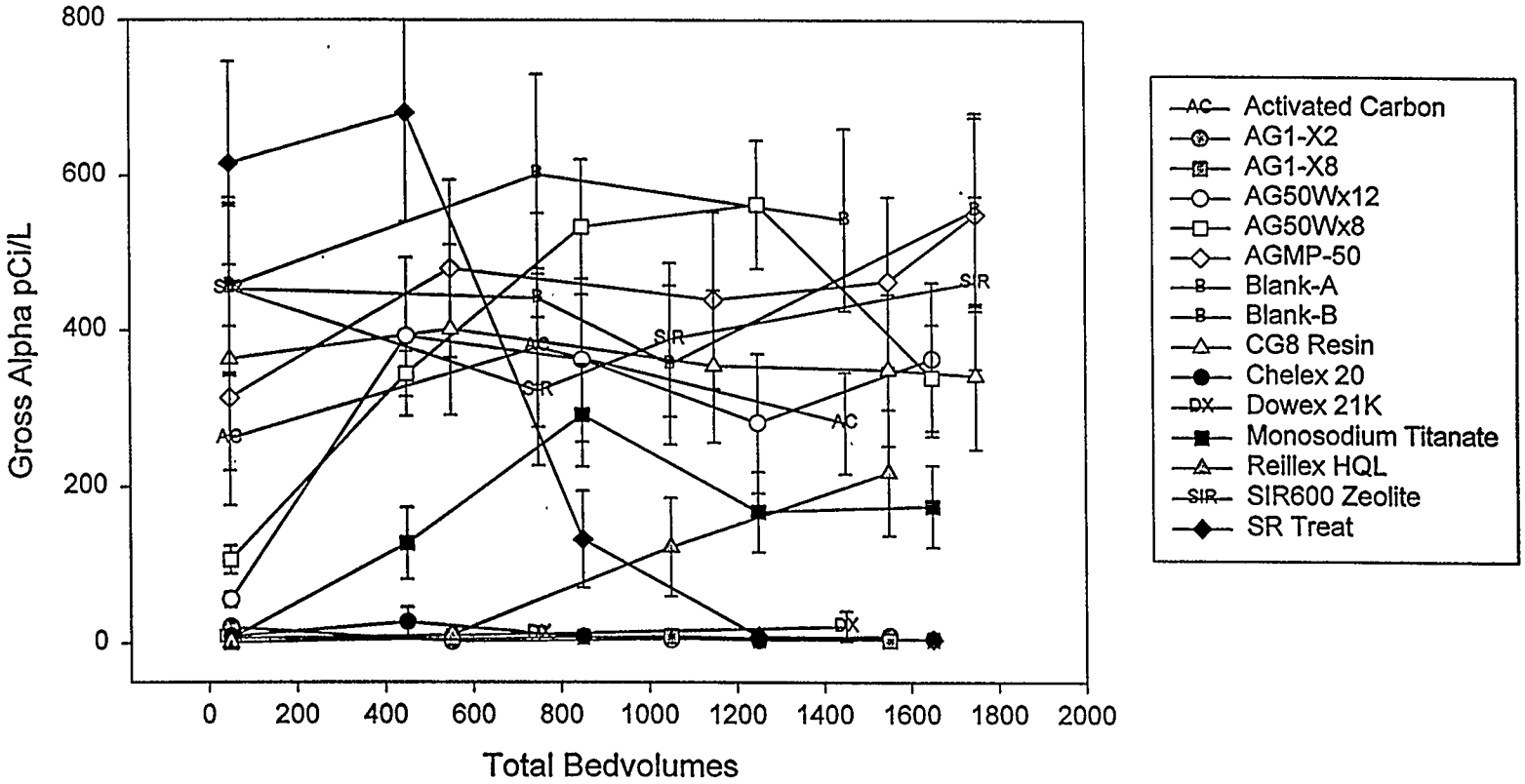
Notes: J= LT reporting limit NR = Not Reported
U= LT detection limit C= lab control sample not met
R= ICP interference check not met V= lab blank contaminated
E= value between sample specific EQL and detection limit
Accuracy Reported at 2δ

Appendix B – Graphs of Bedvolume versus Activity by Analyte

List of Graphs			
Fig. No.	WTU	Analyte	Sorbents
B1	F	Gross Alpha	All
B2	F	Gross Alpha	Selected
B3	H	Gross Alpha	All
B4	F	Nonvolatile Beta	All
B5	F	Nonvolatile Beta	Sr Materials
B6	H	Nonvolatile Beta	All
B7	H	Nonvolatile Beta	Sr Materials
B8	F	C-14	All
B9	H	C-14	All
B10	H	C-14	C-14 Materials
B11	F	Cs-137	All
B12	F	I-129	All
B13	H	I-129	All
B14	H	I-129	I-129 Materials
B15	F	Sr-90	All
B16	F	Sr-90	Sr Materials
B17	H	Sr-90	All
B18	H	Sr-90	Sr Materials
B19	F	Tc-99	All
B20	H	Tc-99	All
B21	H	Tc-99	Tc-99 Materials

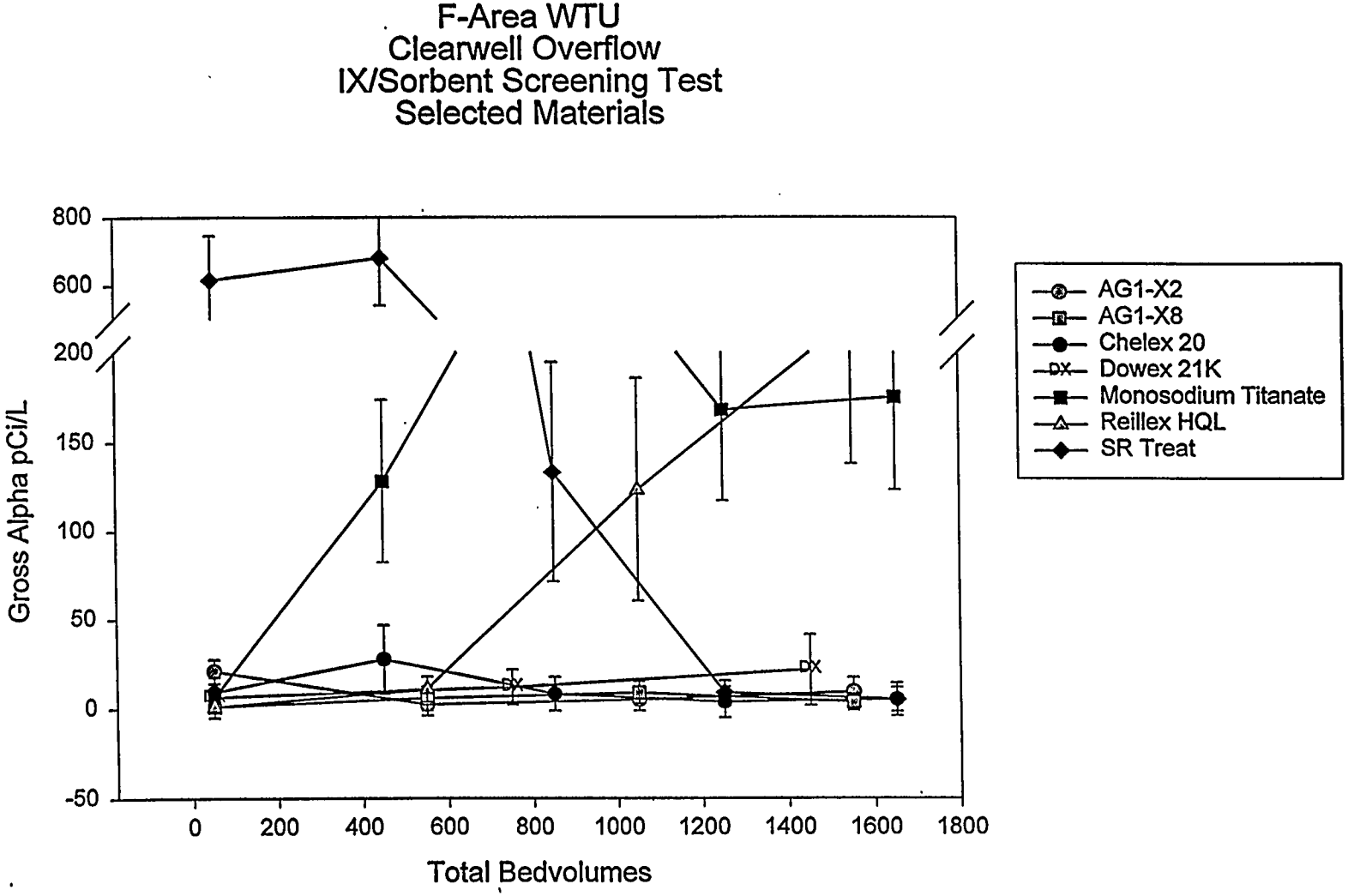
Figure B1

F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Gross Alpha is 15 pCi/L
(2) Average Lower Detection Limit for Gross Alpha is 51 pCi/L

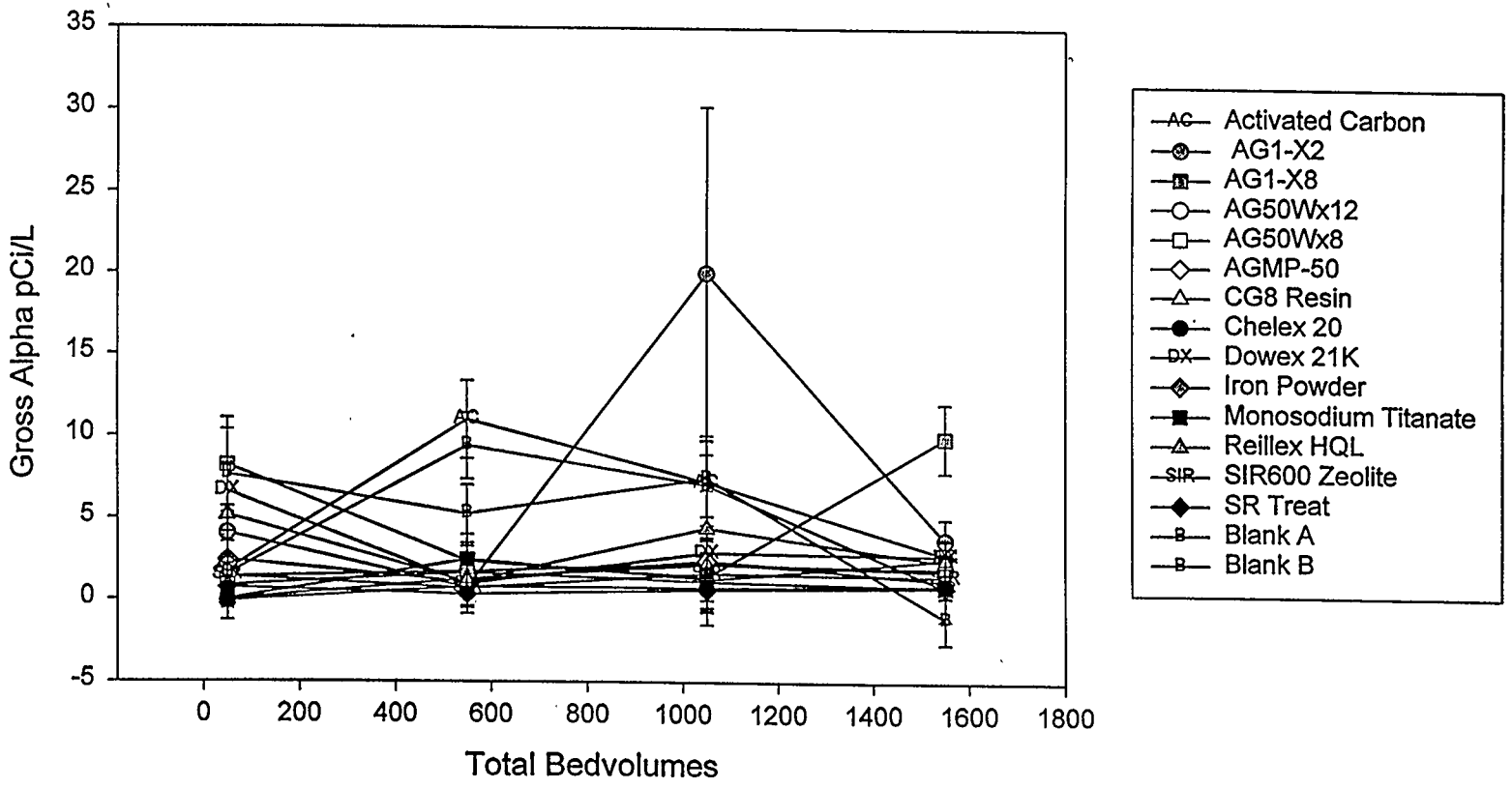
Figure B2



Notes : (1) Regulatory Limit for Gross Alpha is 15 pCi/L
(2) Average Lower Detection Limit for Gross Alpha is 51 pCi/L

Figure B3

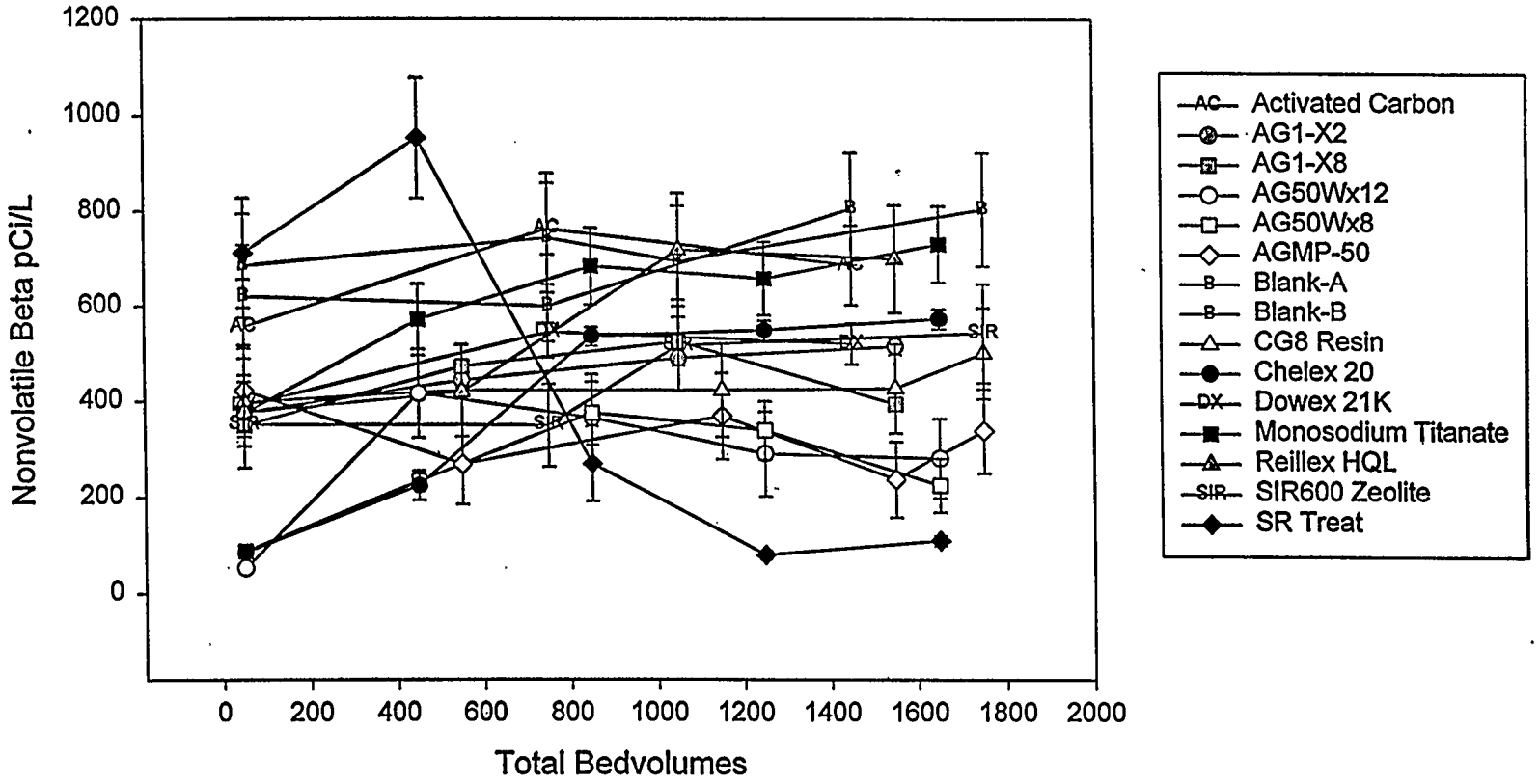
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Gross Alpha is 15 pCi/L
(2) Average Lower Detection Limit for Gross Alpha is 2 pCi/L

Figure B4

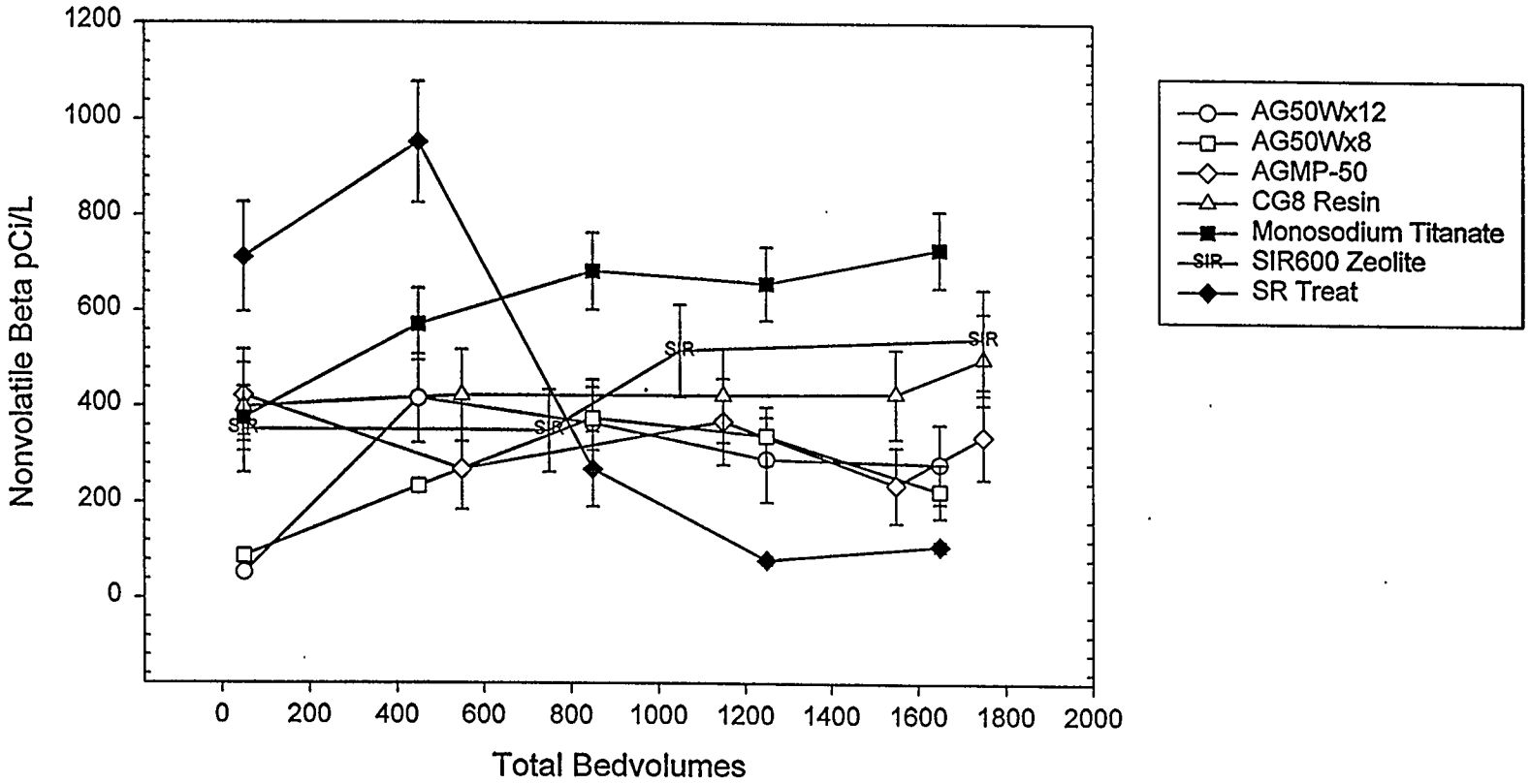
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Nonvolatile Beta is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Nonvolatile Beta is 85 pCi/L

Figure B5

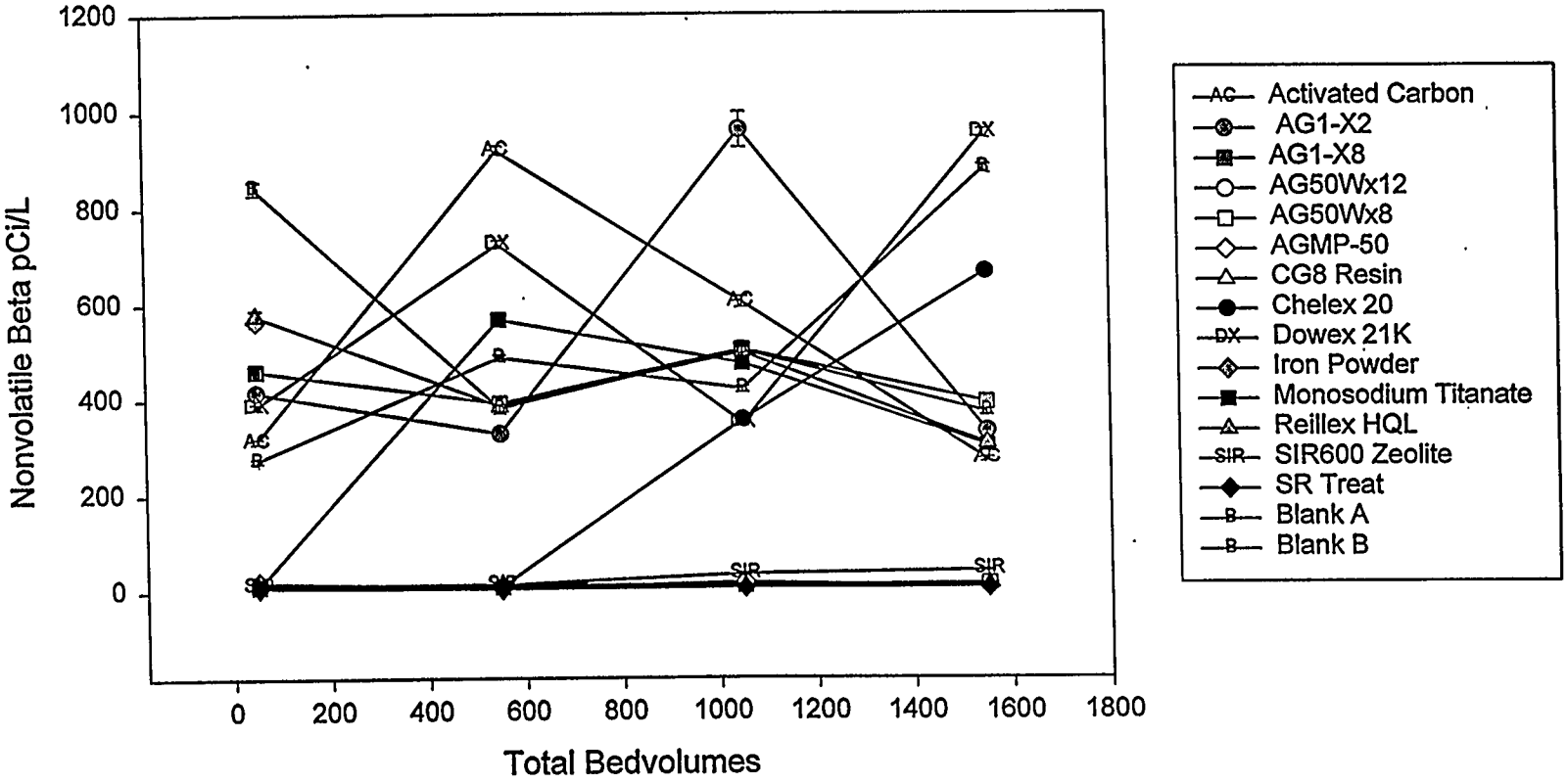
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
Sr Materials



Notes : (1) Regulatory Limit for Nonvolatile Beta is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Nonvolatile Beta is 85 pCi/L

Figure B6

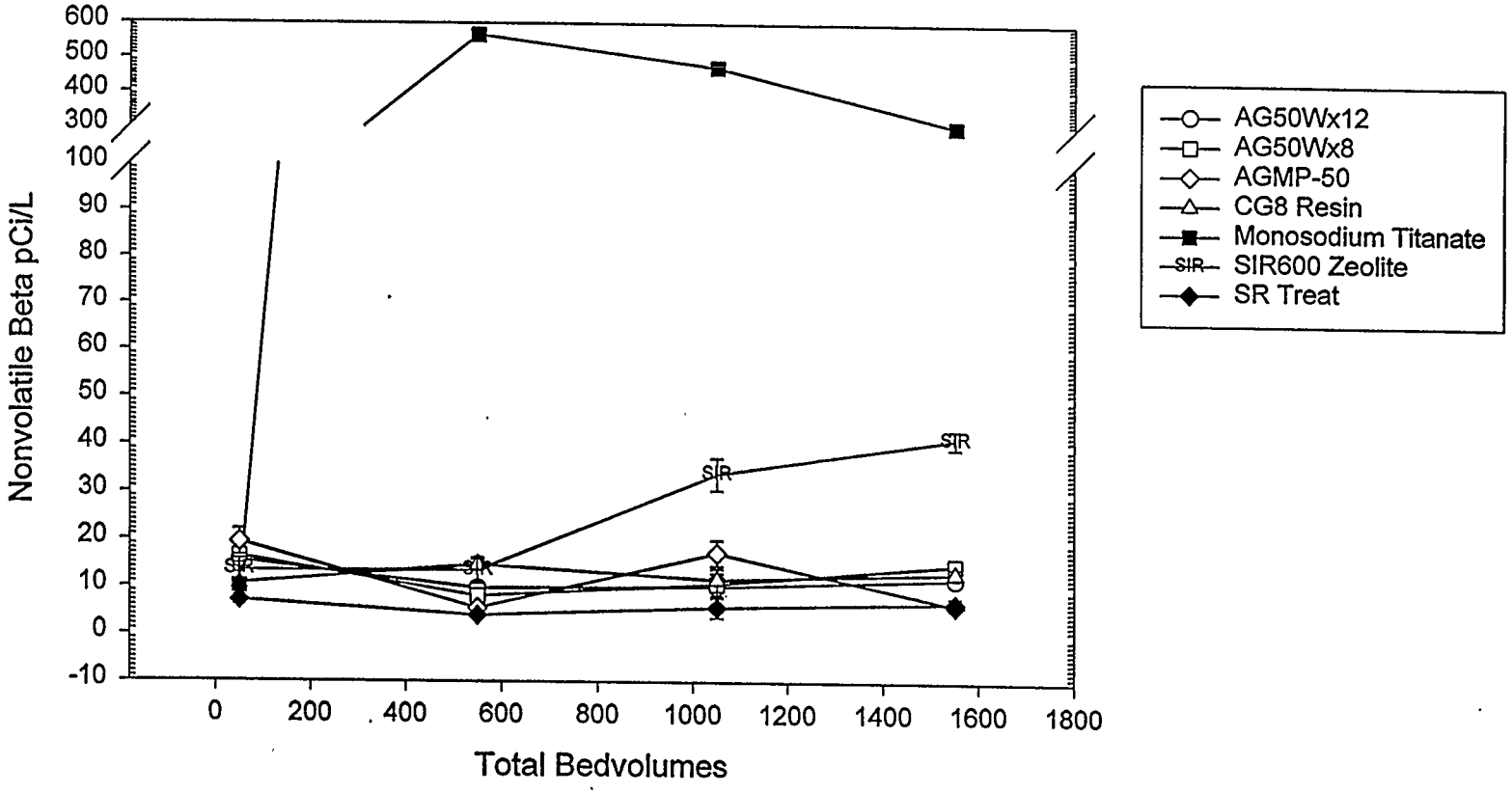
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Nonvolatile Beta is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Nonvolatile Beta is 2 pCi/L

Figure B7

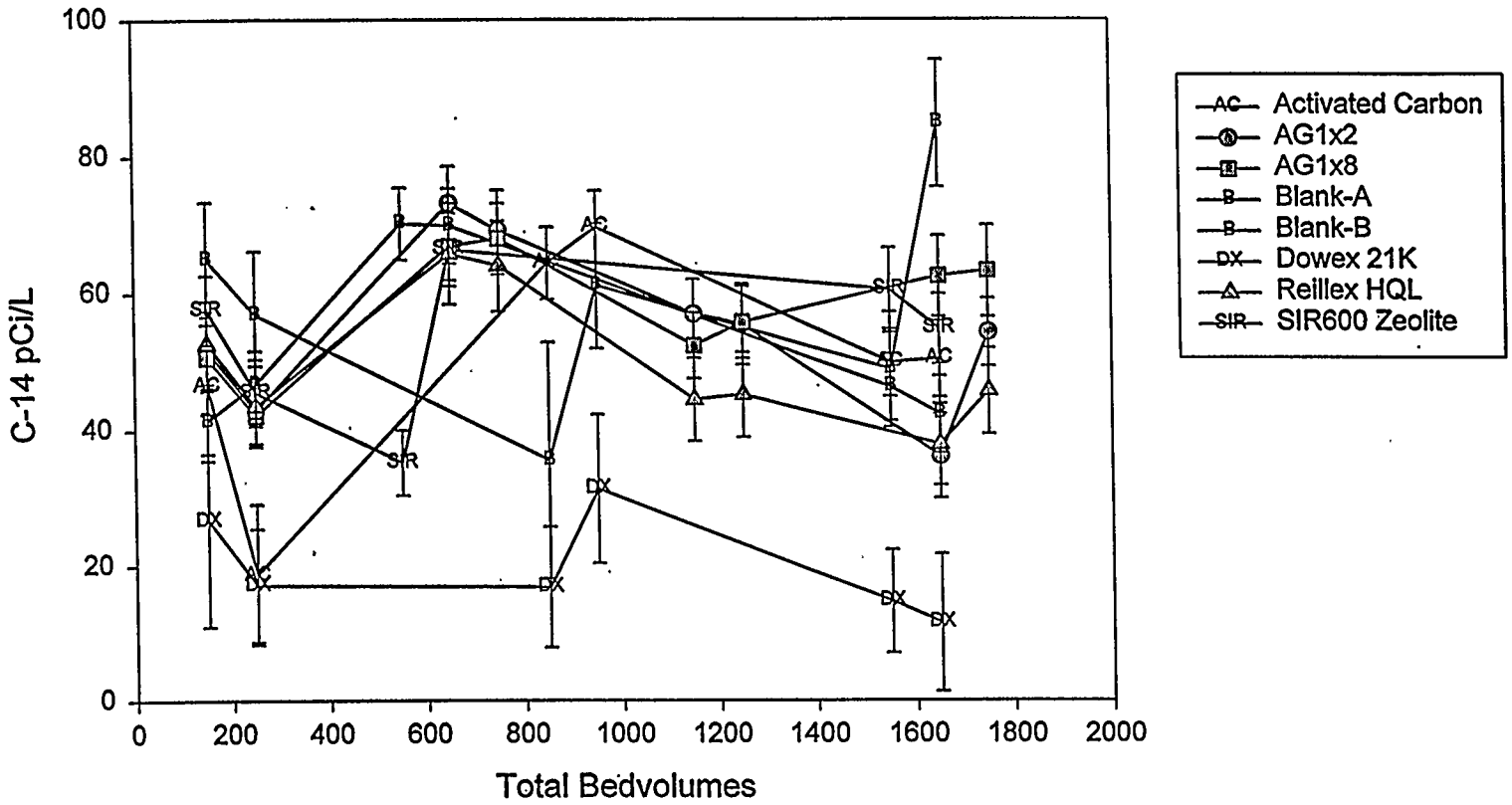
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
Sr-90 Materials



Notes : (1) Regulatory Limit for Nonvolatile Beta is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Nonvolatile Beta is 2 pCi/L

Figure B8

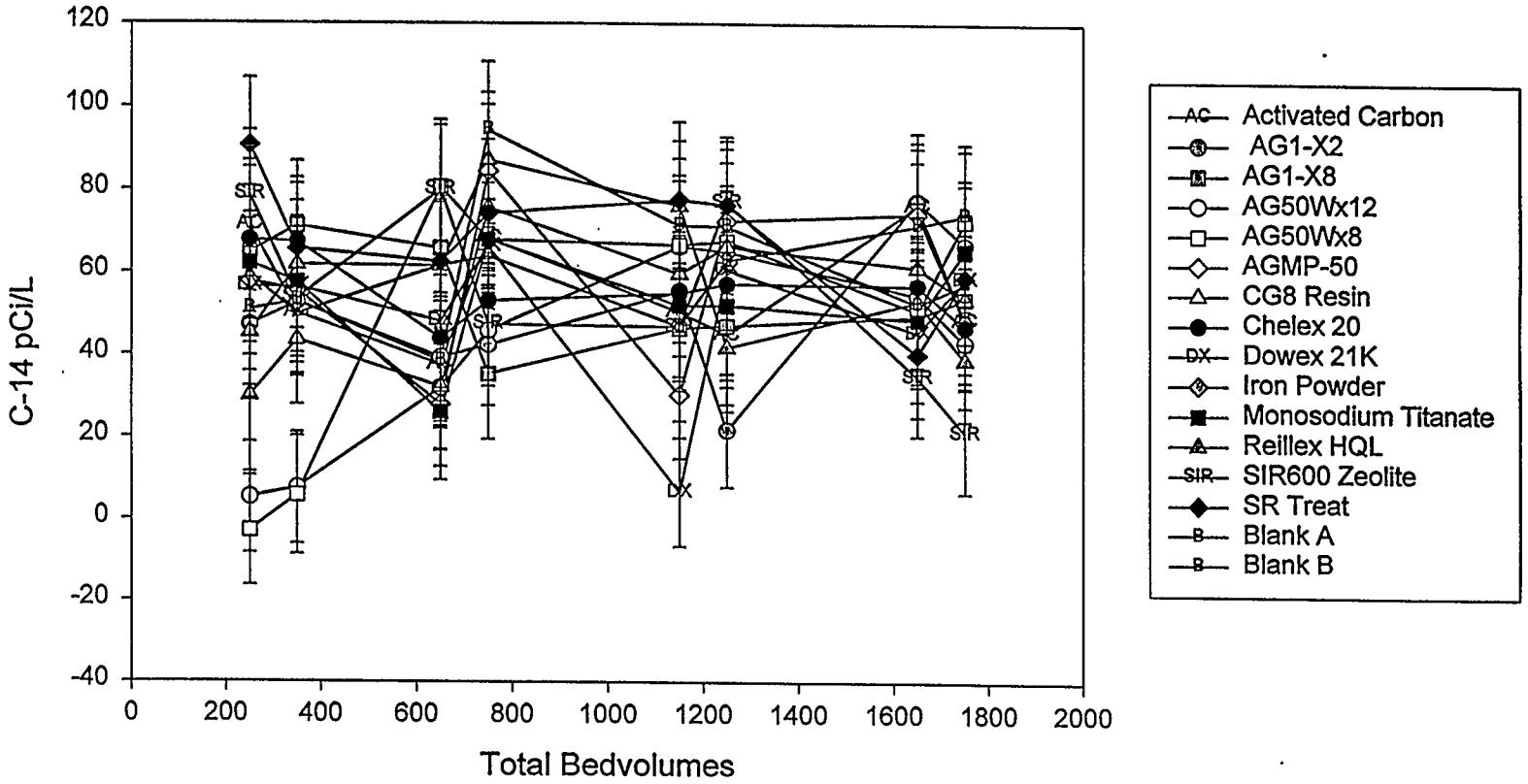
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for C-14 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for C-14 is 10 pCi/L

Figure B9

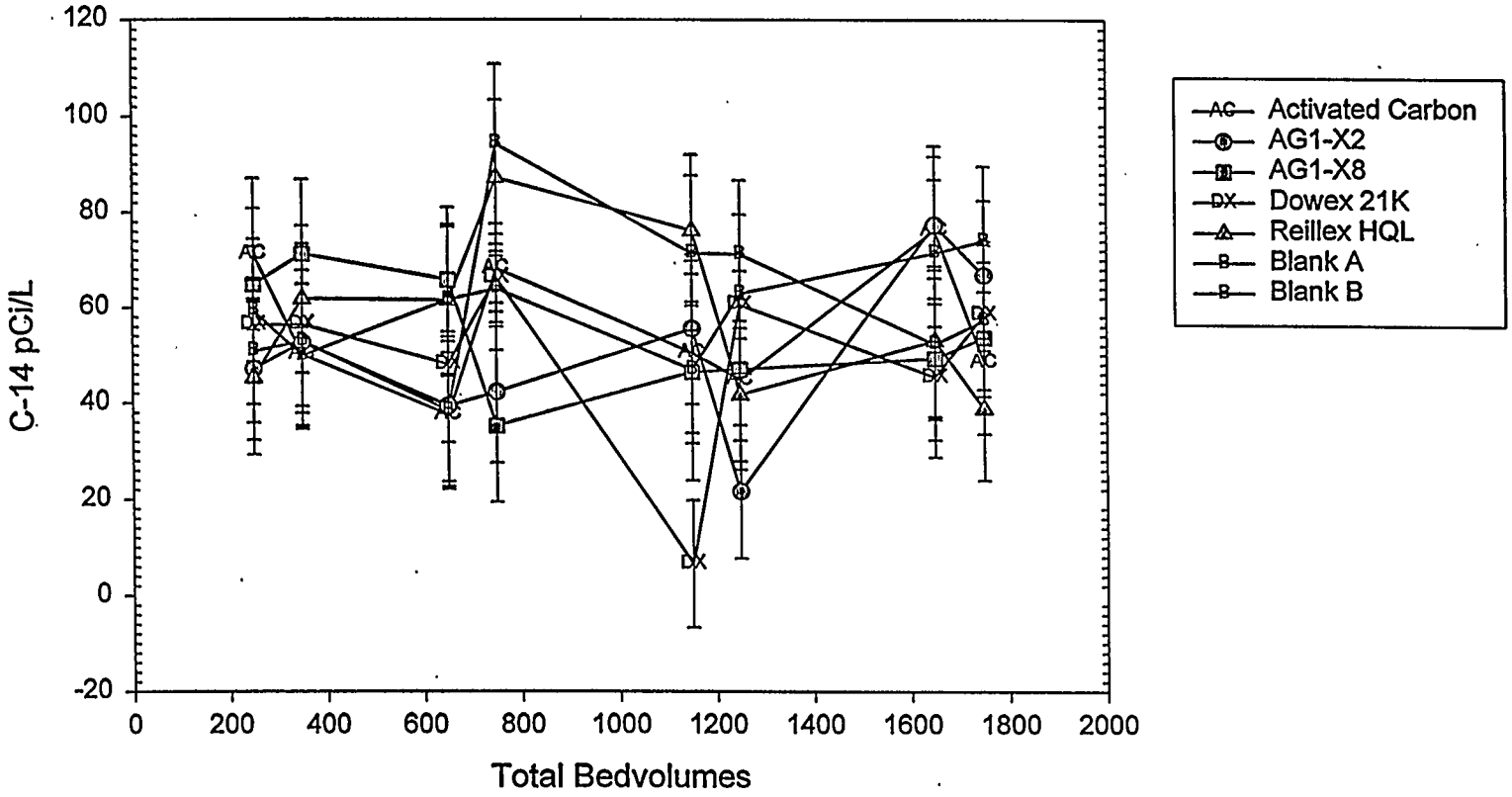
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for C-14 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for C-14 is 23 pCi/L

Figure B10

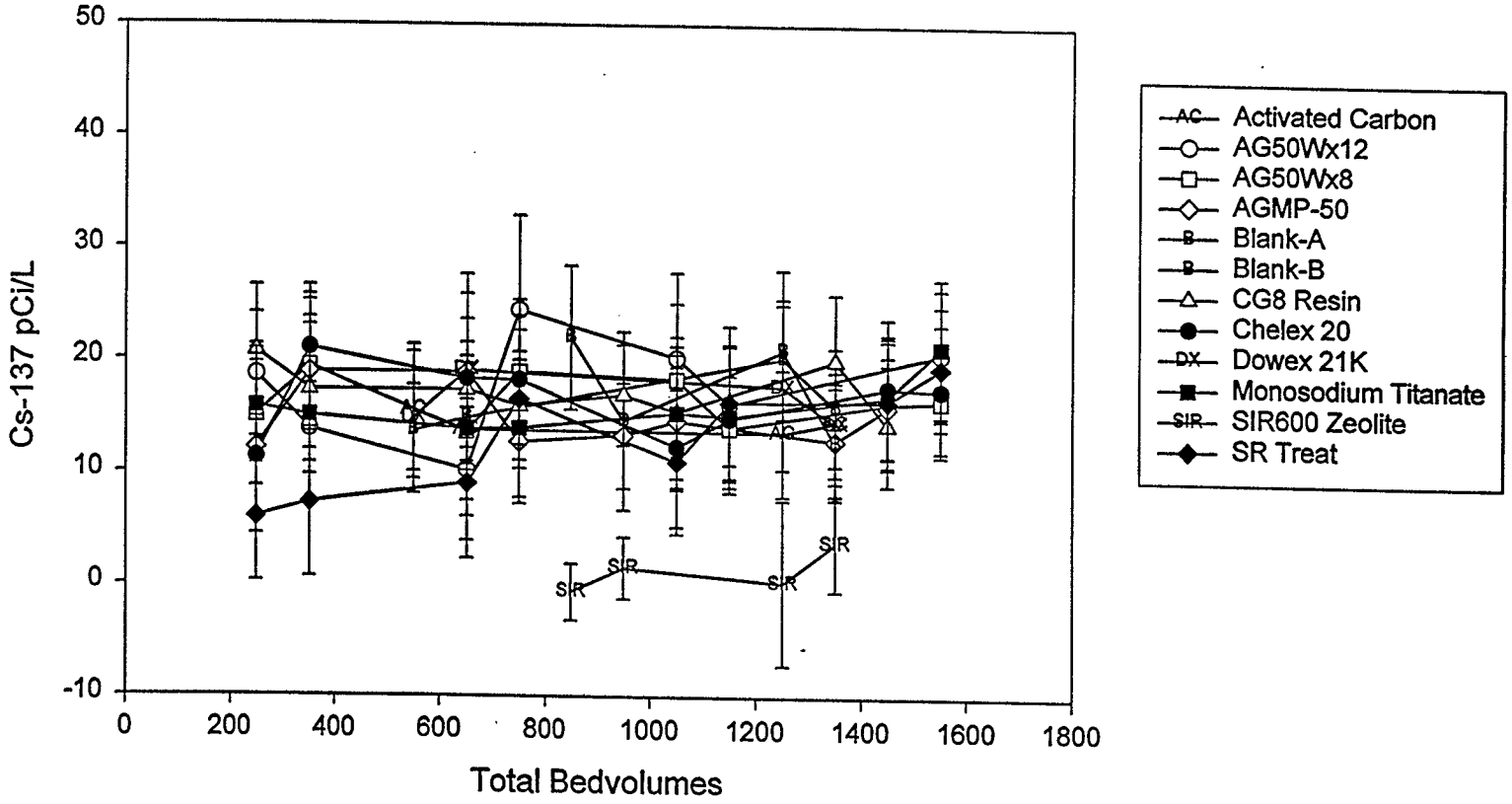
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
C-14 Materials



Notes : (1) Regulatory Limit for C-14 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for C-14 is 23 pCi/L

Figure B11

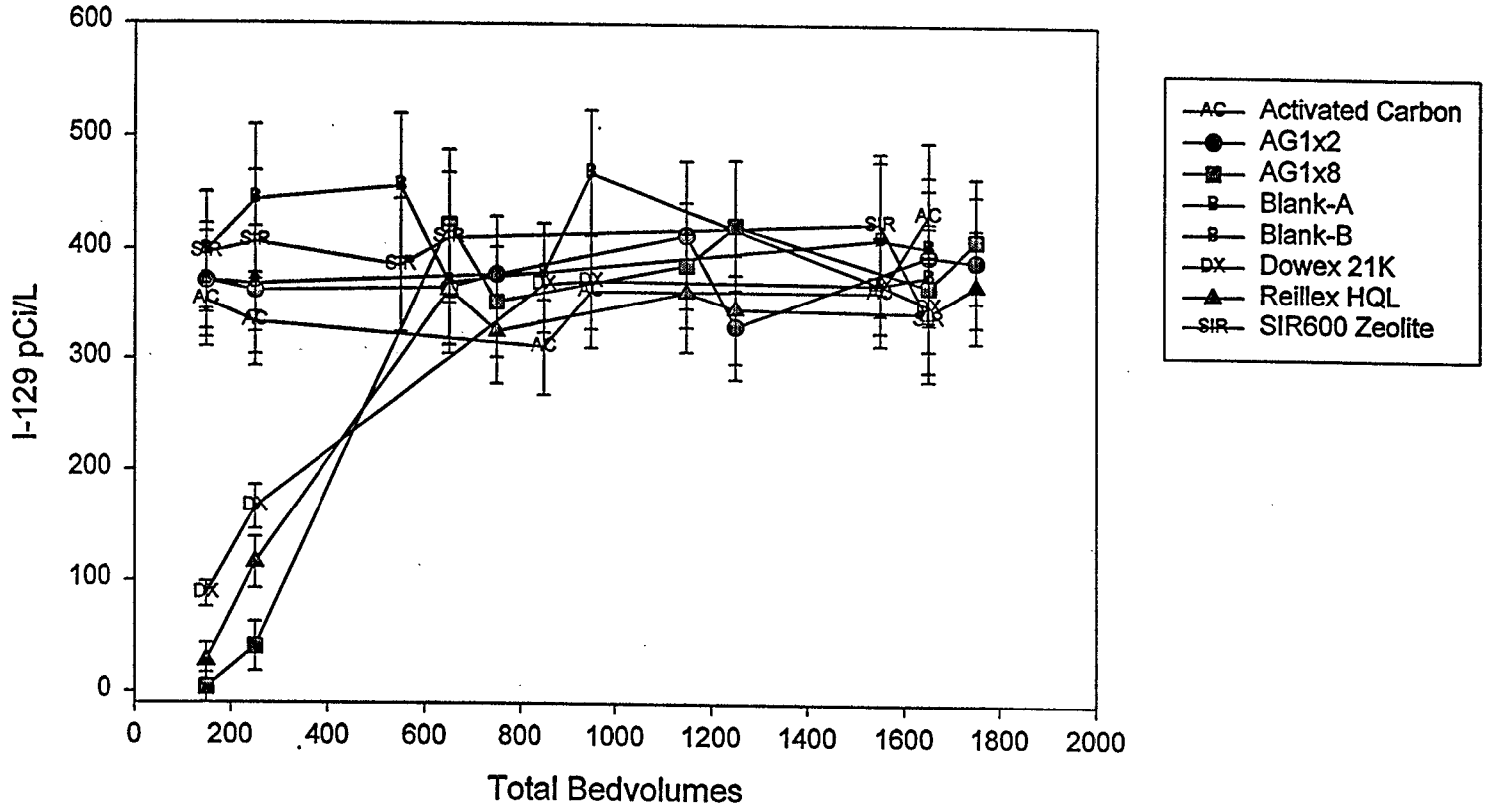
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Cs-137 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Cs-137 is 5 pCi/L

Figure B12

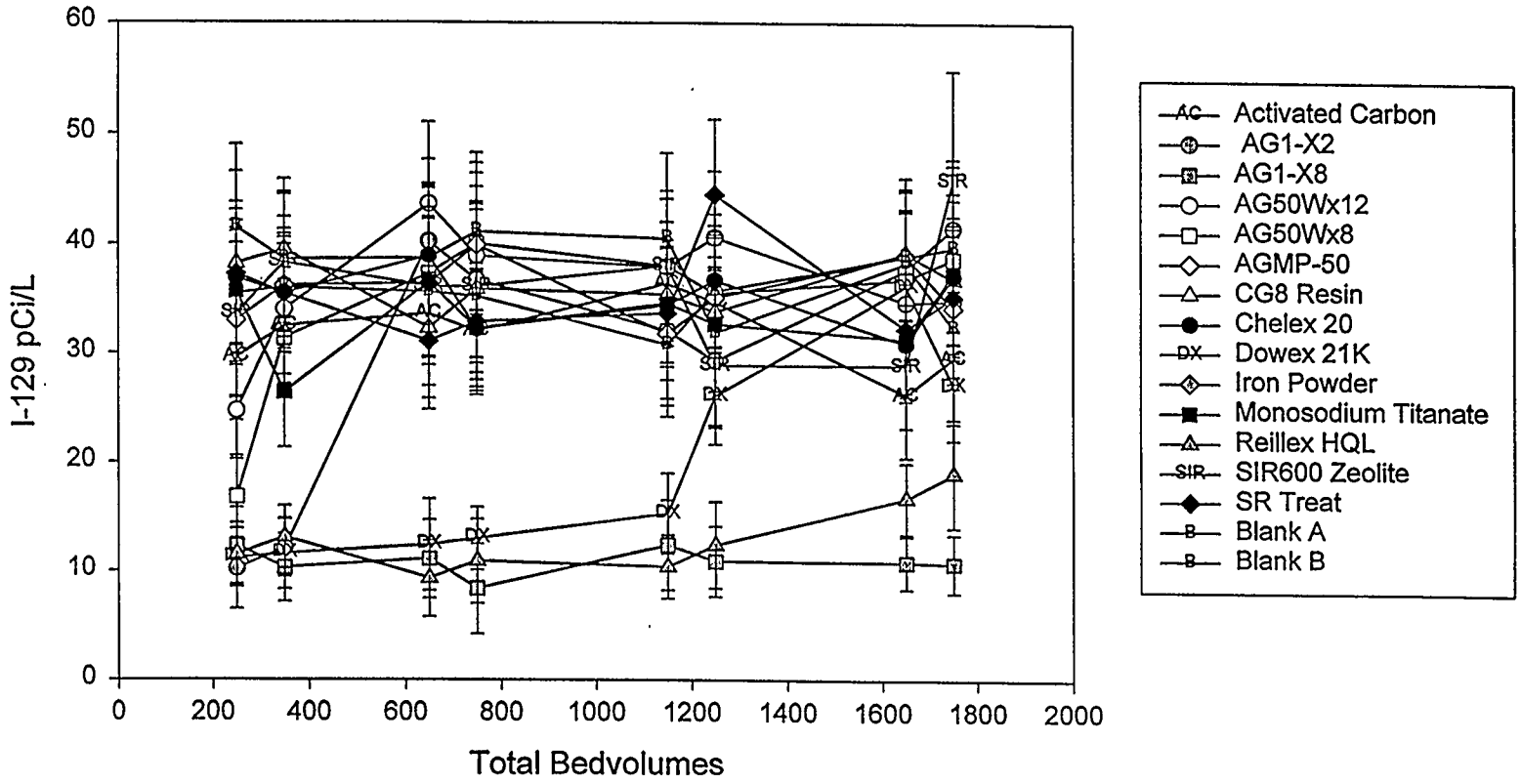
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for I-129 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for I-129 is 16 pCi/L

Figure B13

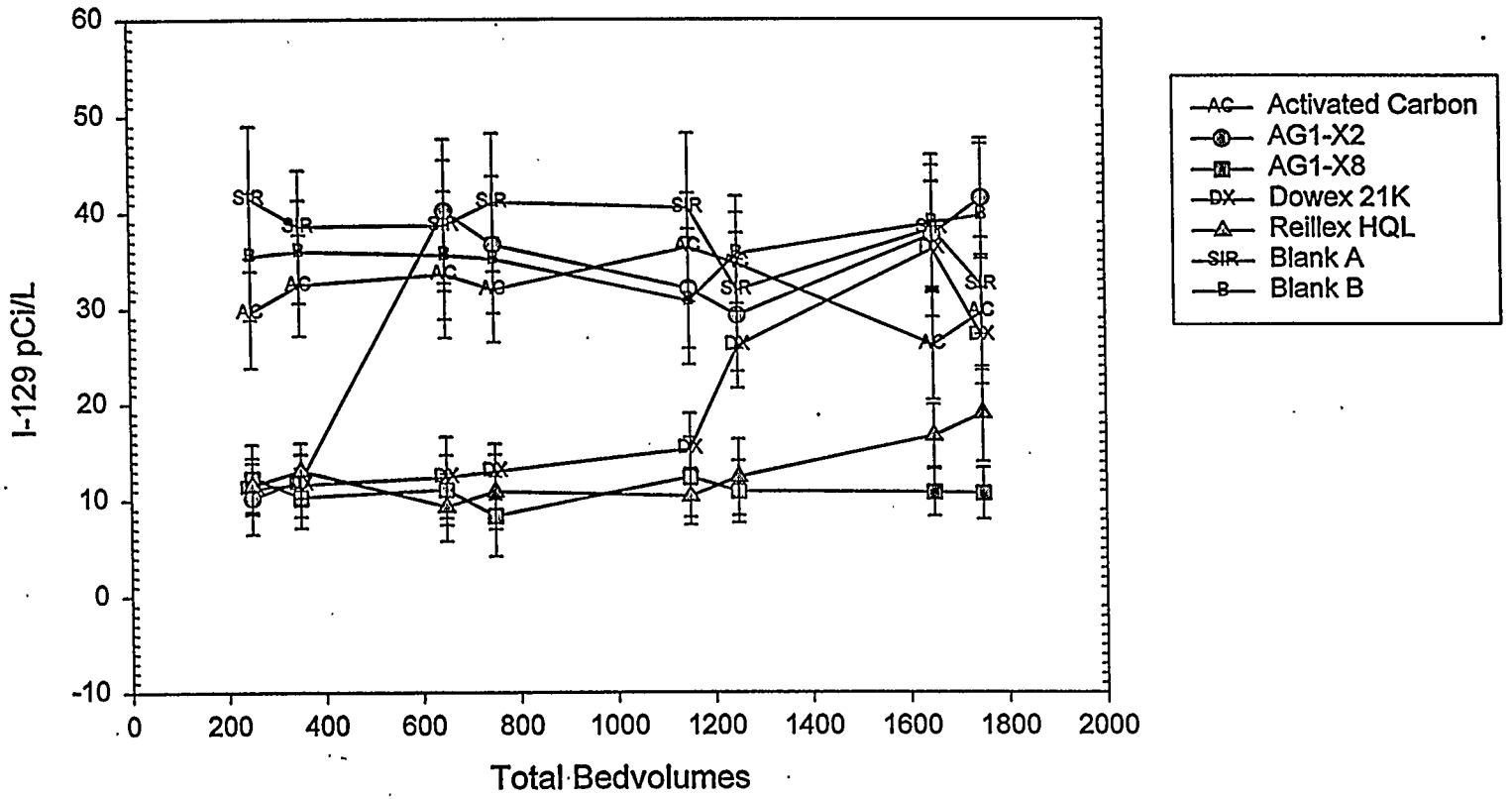
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for I-129 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for I-129 is 2 pCi/L

Figure B14

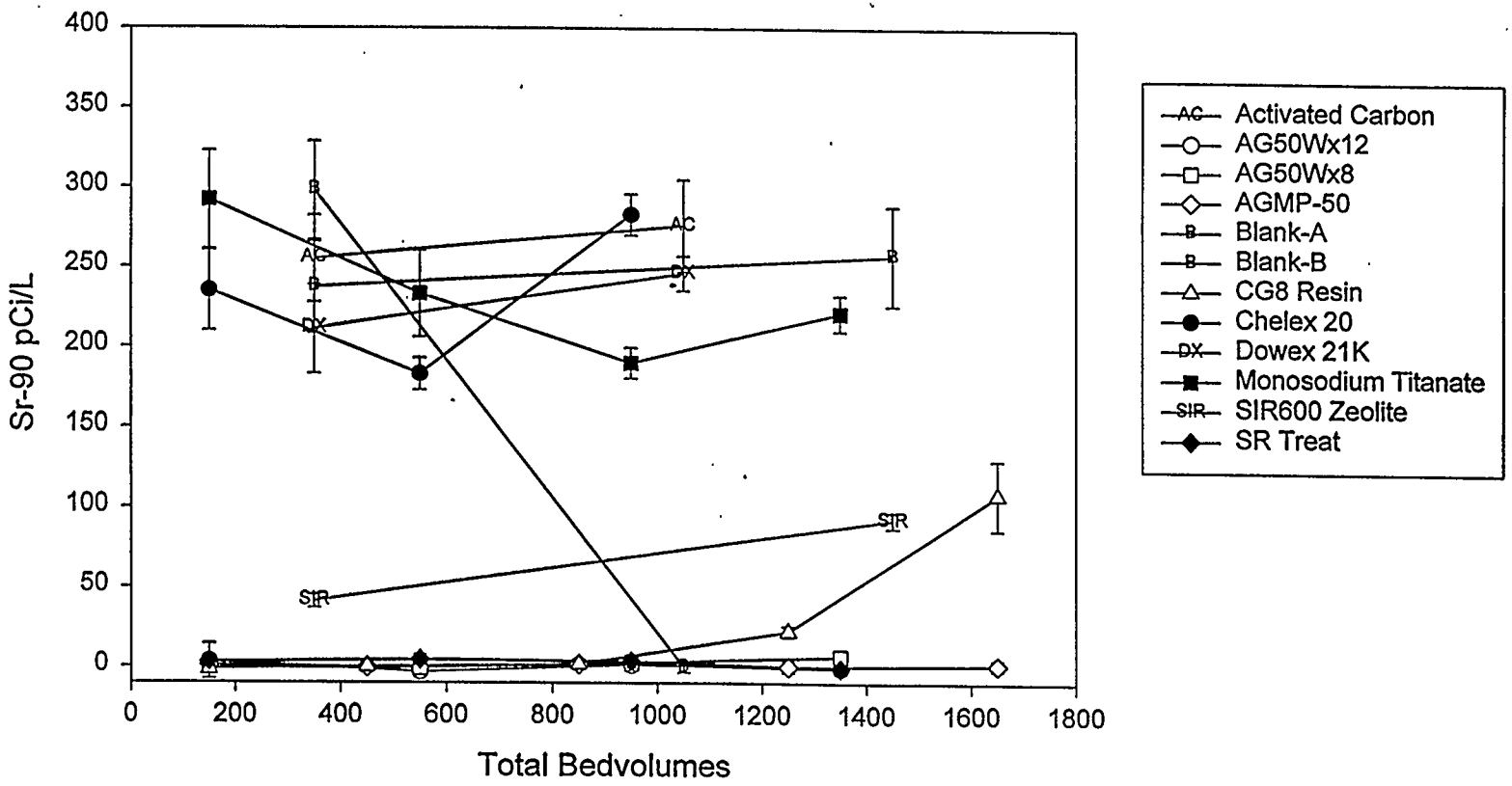
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
I-129 Materials



Notes : (1) Regulatory Limit for I-129 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for I-129 is 2 pCi/L

Figure B15

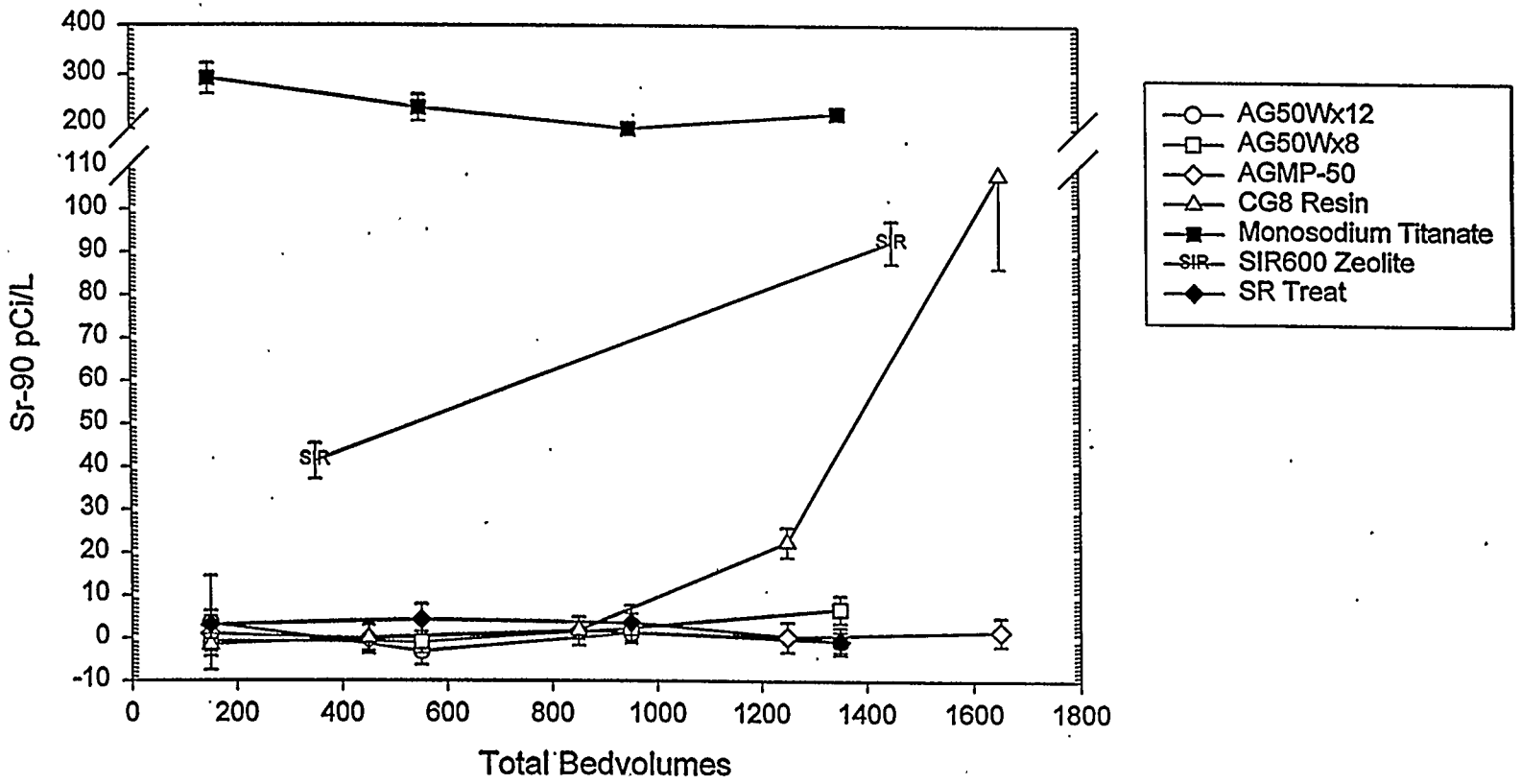
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Sr-90 is 8 pCi/L
(2) Average Lower Detection Limit for Sr-90 is 16 pCi/L

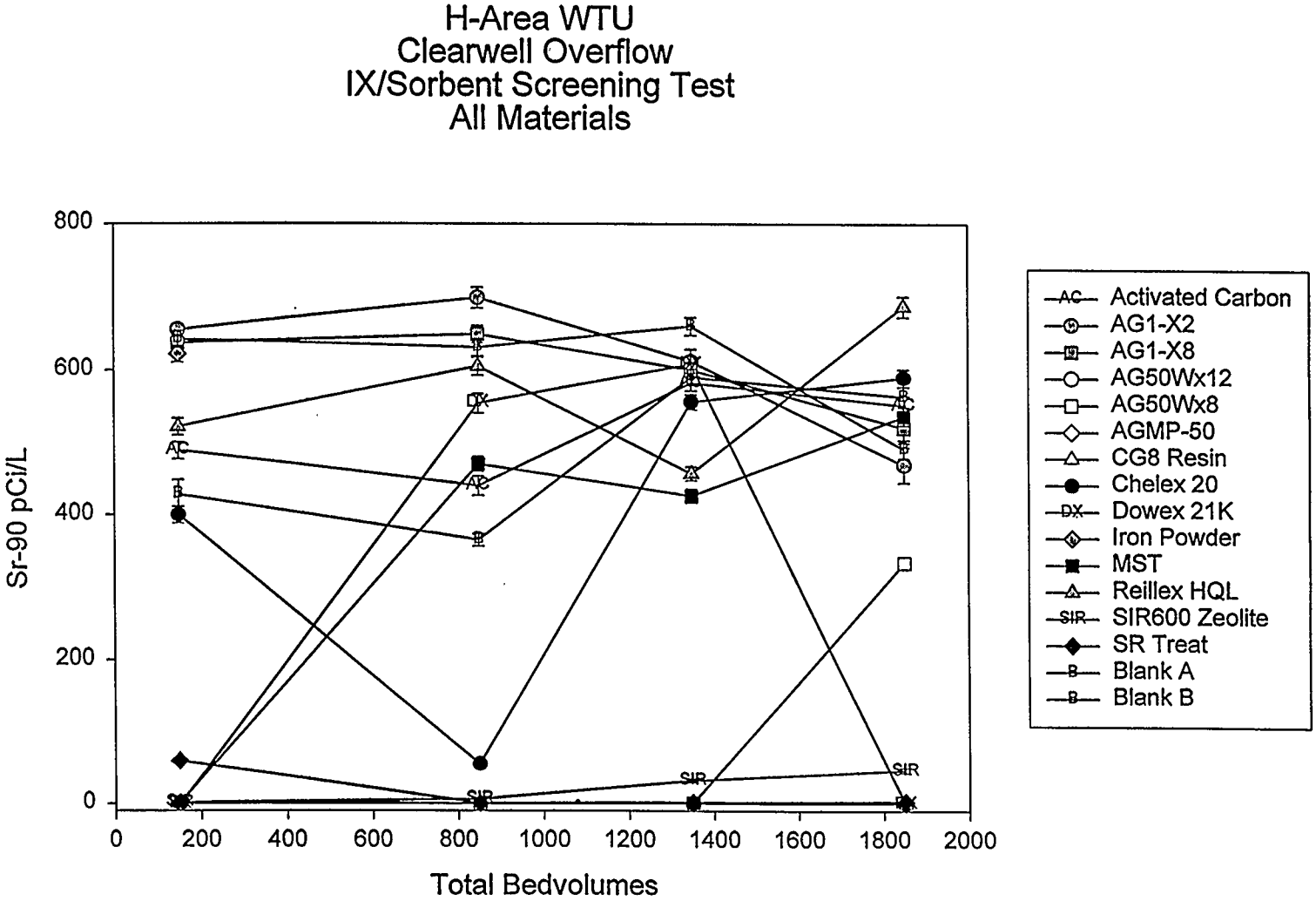
Figure B16

F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
Sr Materials



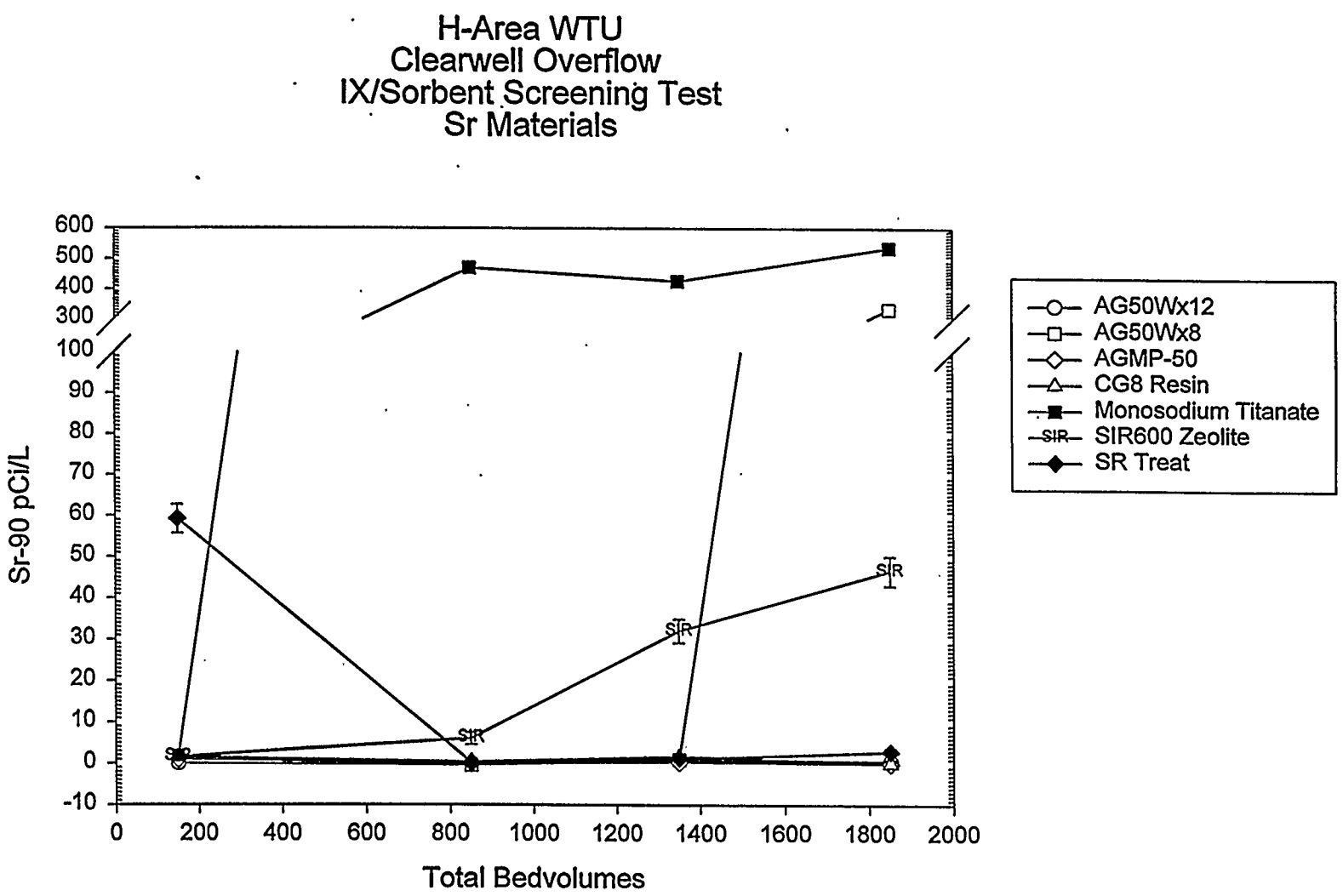
Notes : (1) Regulatory Limit for Sr-90 is 8 pCi/L
(2) Average Lower Detection Limit for Sr-90 is 16 pCi/L

Figure B17



Notes : (1) Regulatory Limit for Sr-90 is 8 pCi/L
(2) Average Lower Detection Limit for Sr-90 is 3 pCi/L

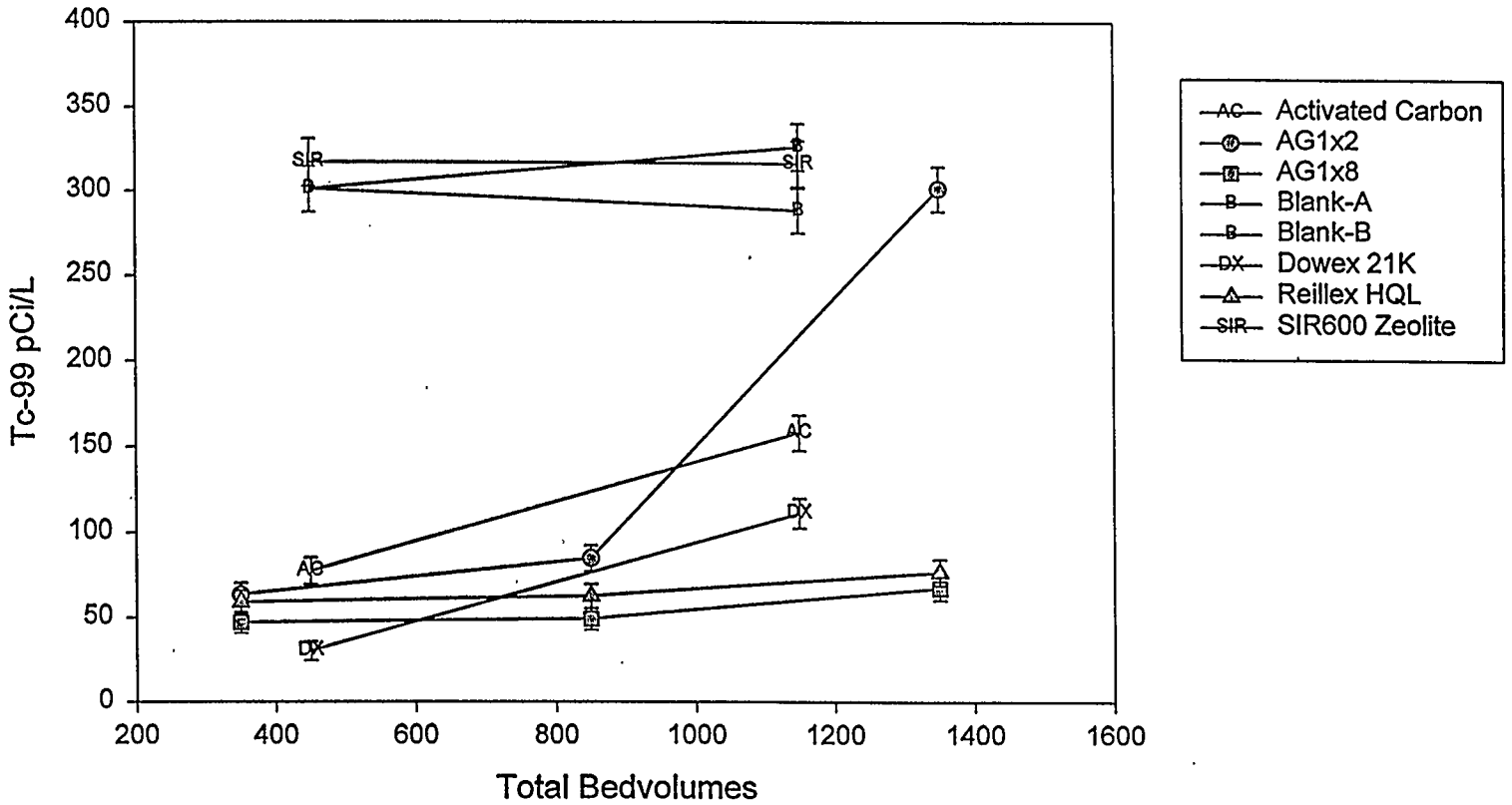
Figure B18



Notes : (1) Regulatory Limit for Sr-90 is 8 pCi/L
(2) Average Lower Detection Limit for Sr-90 is 3 pCi/L

Figure B19

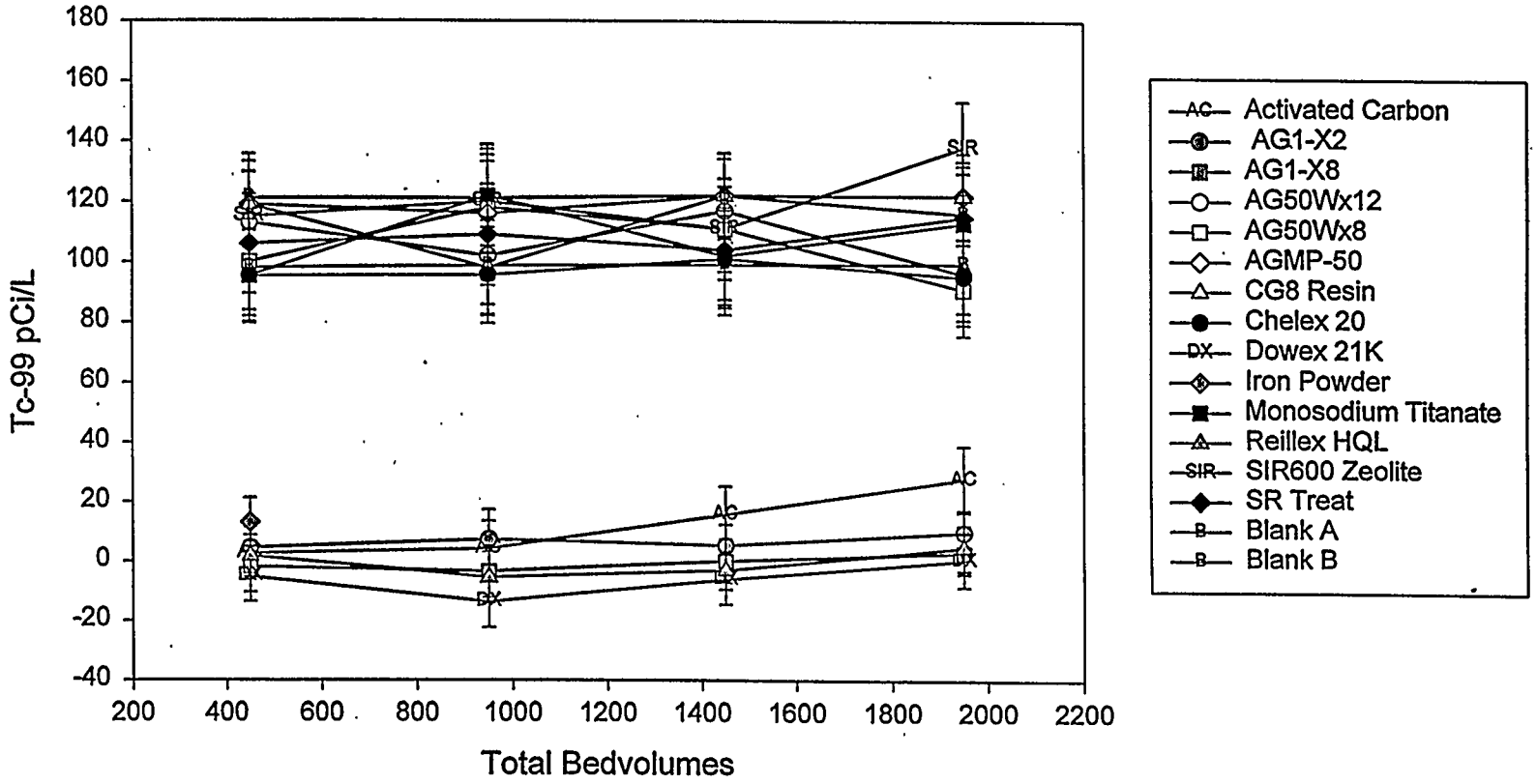
F-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



Notes : (1) Regulatory Limit for Tc-99 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Tc-99 is 9 pCi/L

Figure B20

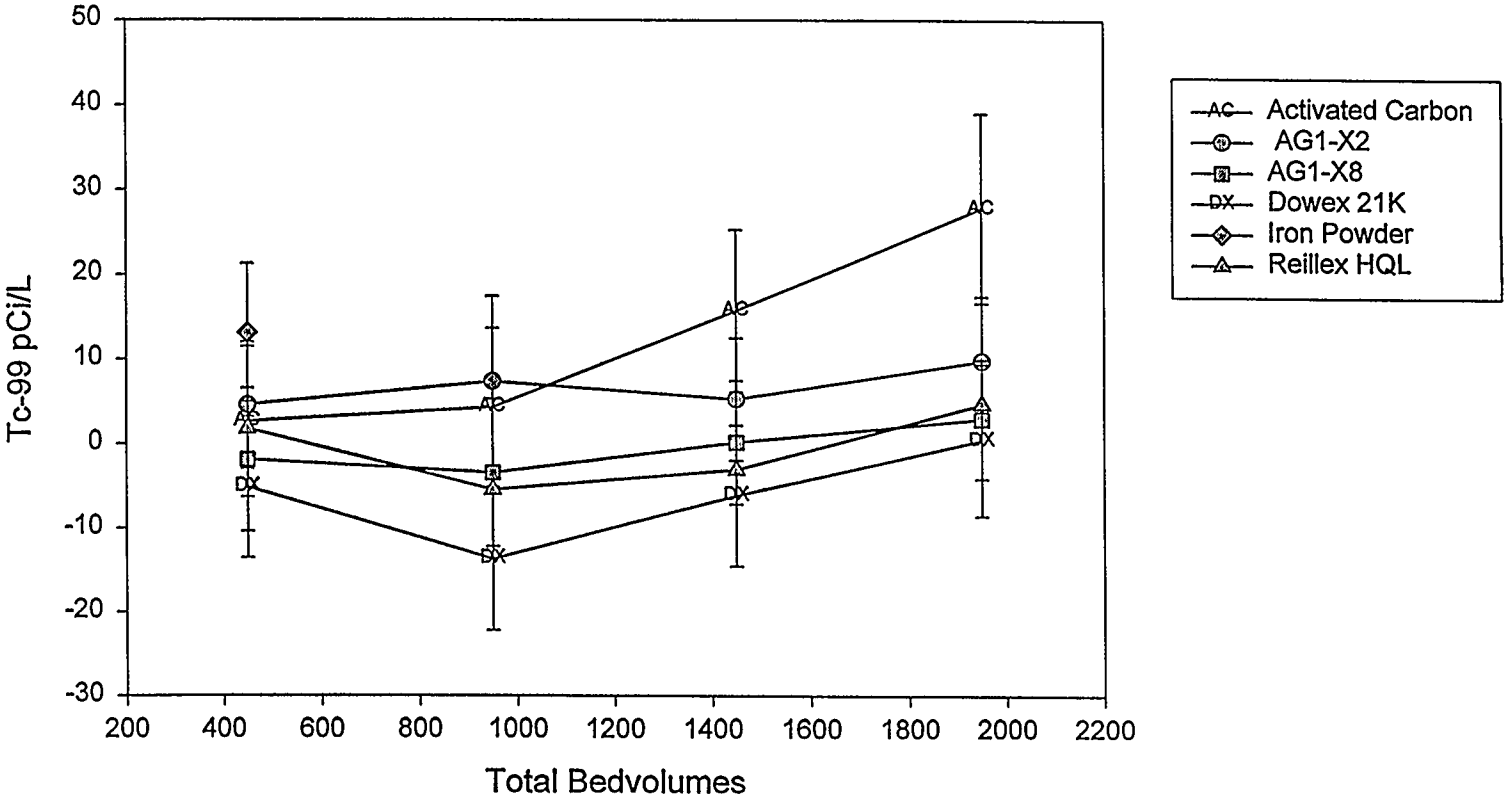
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
All Materials



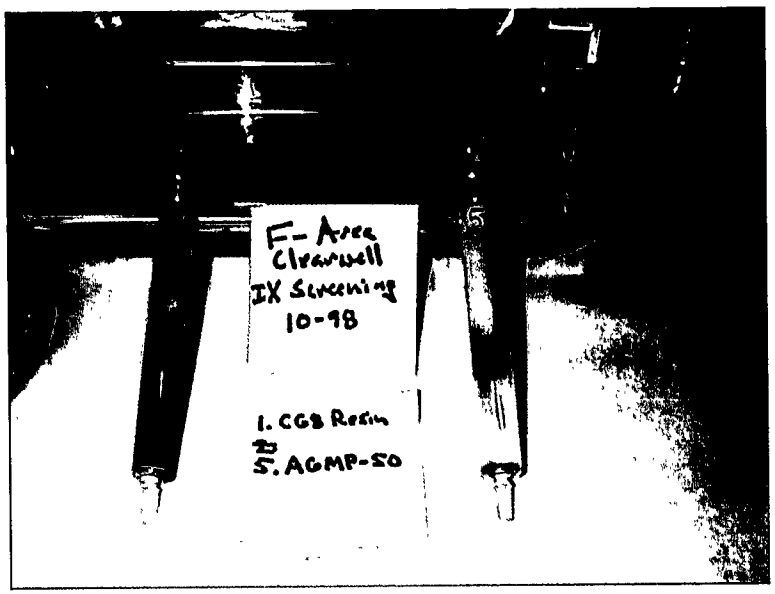
Notes : (1) Regulatory Limit for Tc-99 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Tc-99 is 20 pCi/L

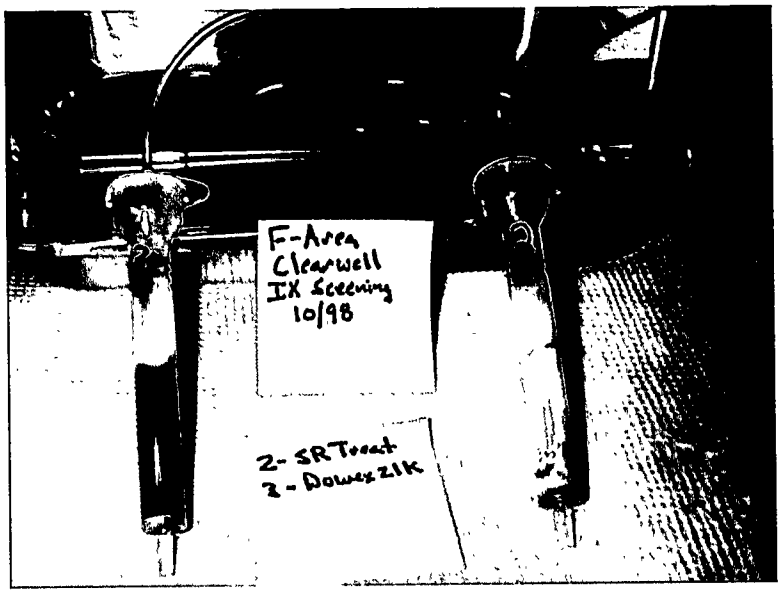
Figure B21

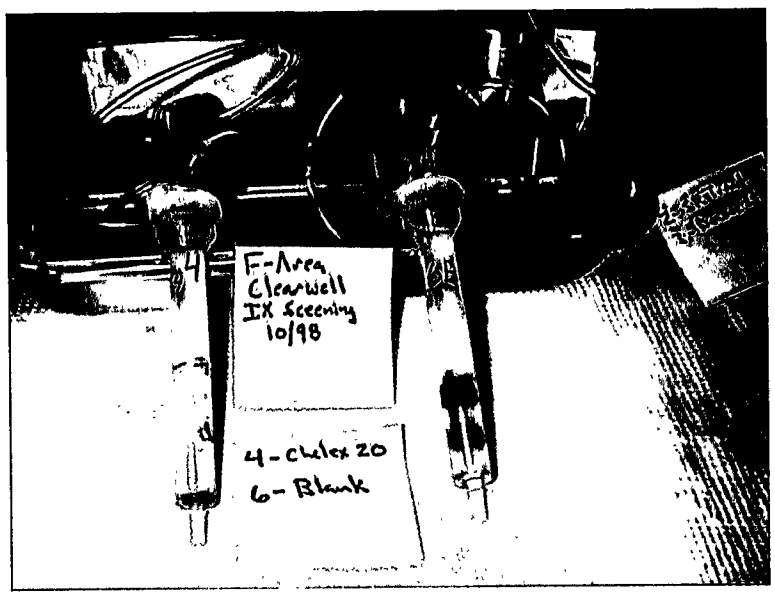
H-Area WTU
Clearwell Overflow
IX/Sorbent Screening Test
Tc-99 Materials

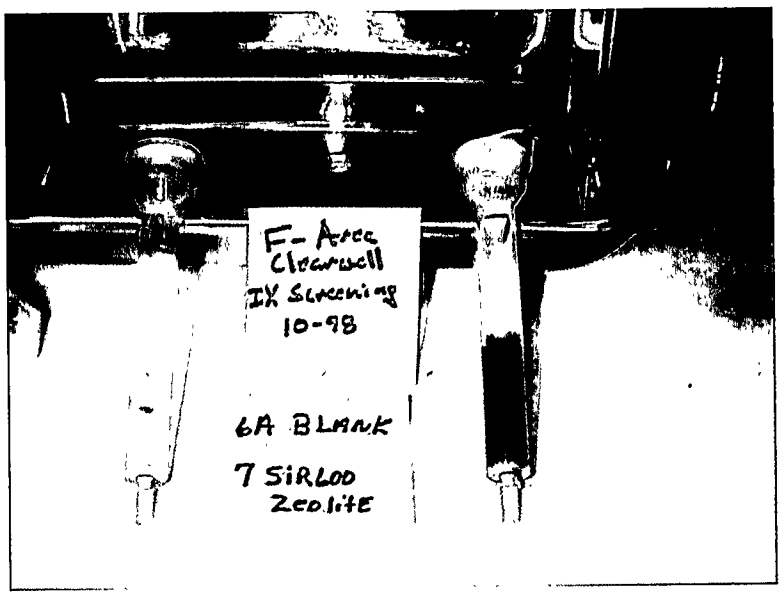


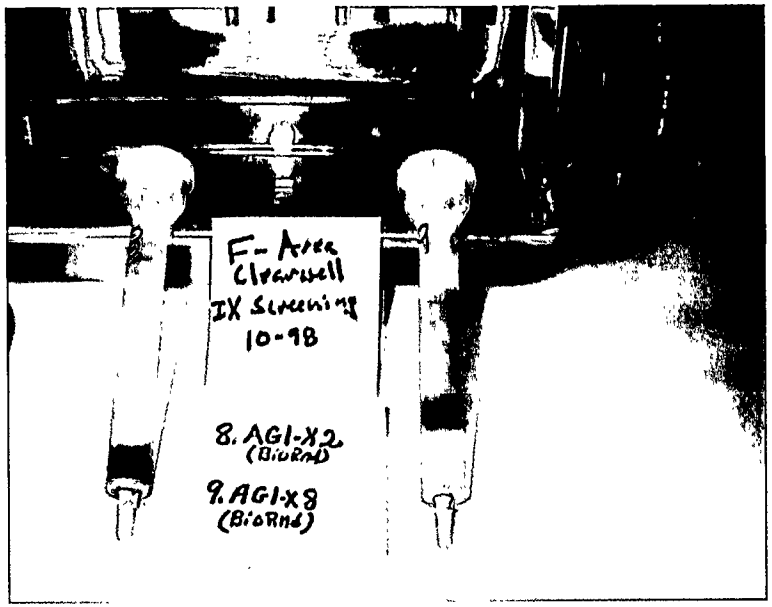
Notes : (1) Regulatory Limit for Tc-99 is Sum of Beta<50 pCi/L
(2) Average Lower Detection Limit for Tc-99 is 20 pCi/L

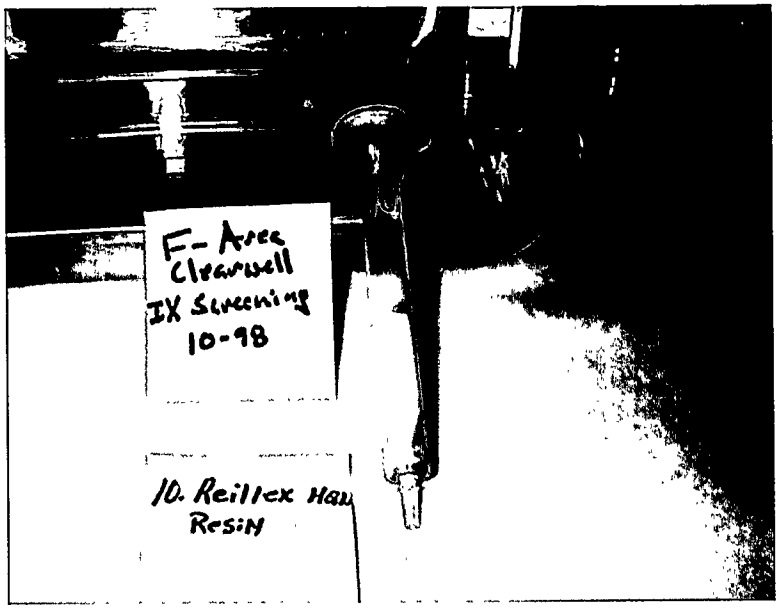

F-Area
Clearwell
IX Screening
10-98
1. CGS Resin
5. AGMP-50

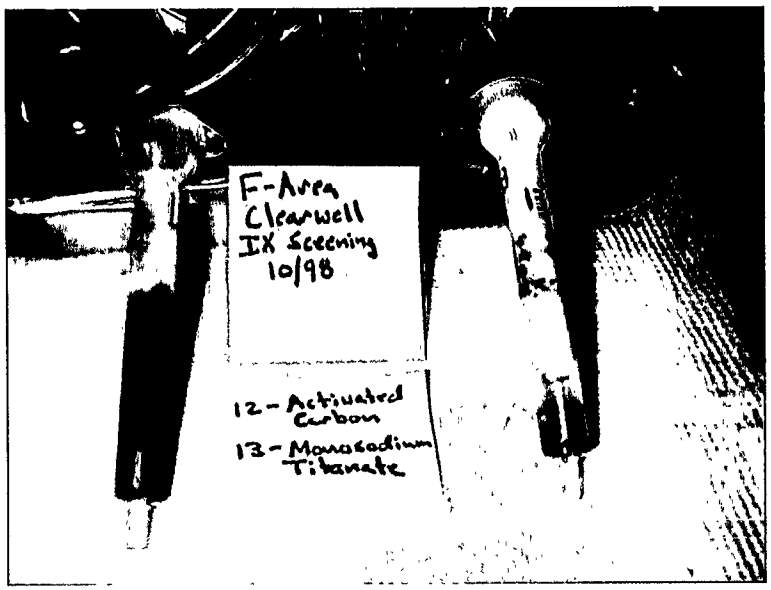

F-Area
Clearwell
IX Screening
10/98
2- SR Treat
3 - Dowex 21K

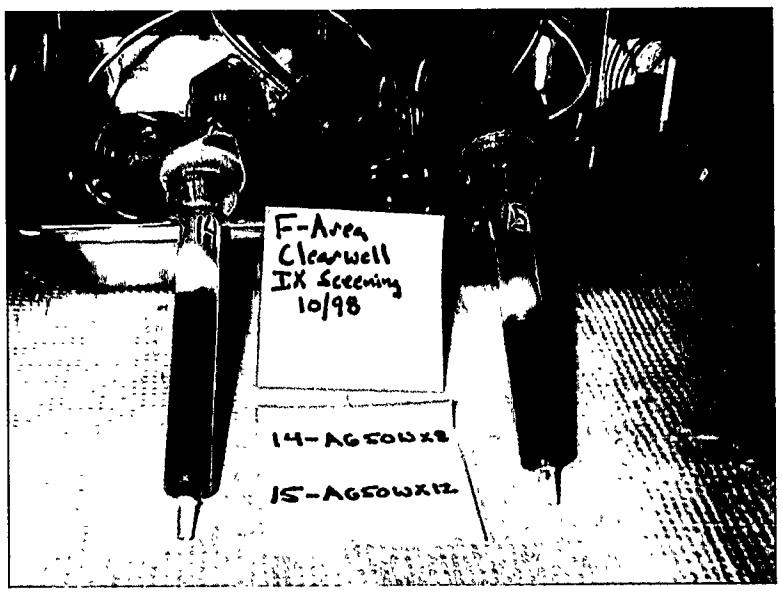

F-Area
Clearwell
IX Screening
10/98
4 - Chelex 20
6 - Blank

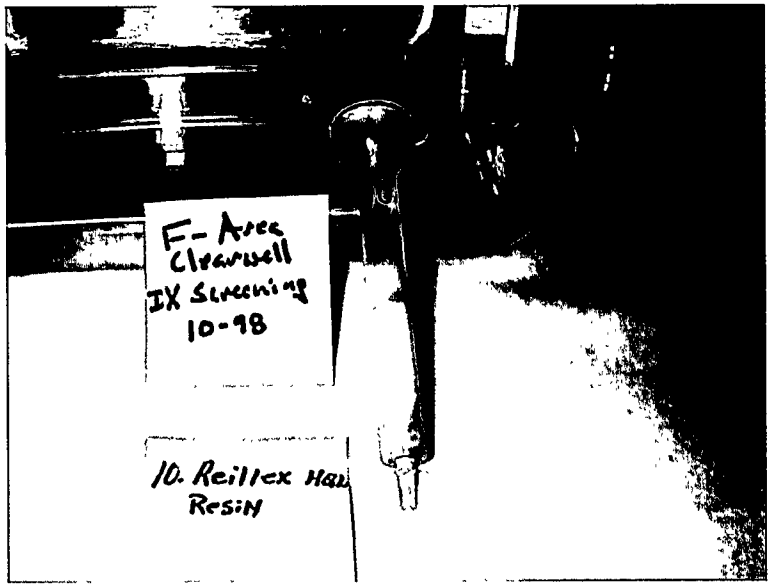

F-Area
Clearwell
IX Screening
10-98
6A BLANK
7 SiR-100
Zeolite

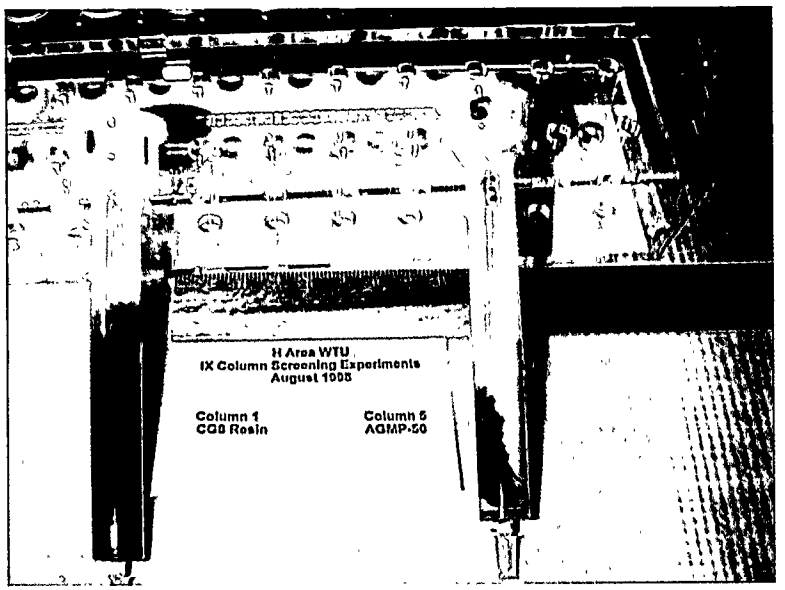

F-Area
Clearwell
IX Screening
10-98
8. AG1-X2
(BioRad)
9. AG1-X8
(BioRad)

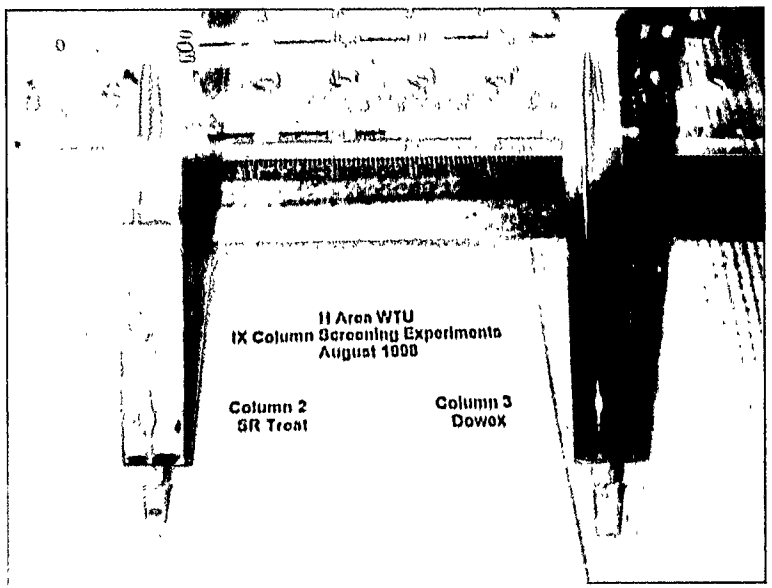

F-Area
Clearwell
IX Screening
10-98
10. Reillex HAU
Resin

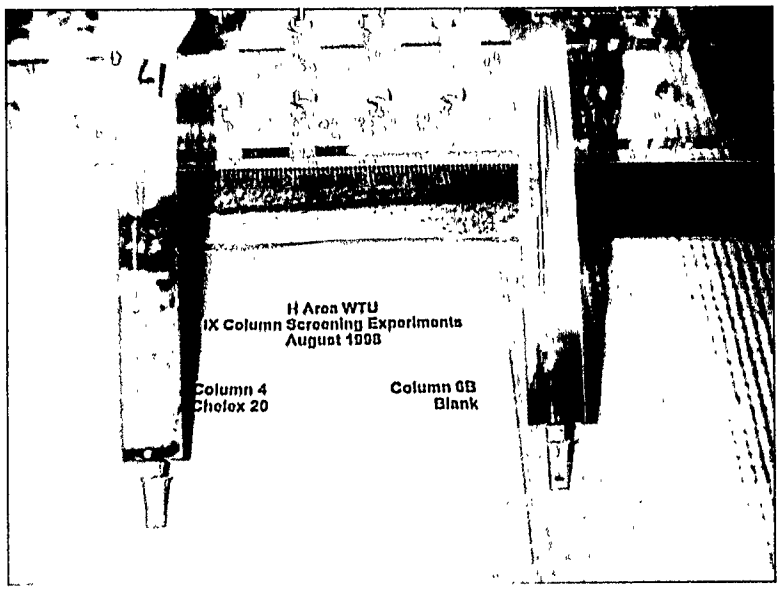

F-Area
Clearwell
IX Screening
10/98
12-Activated
Carbon
13-Monosodium
Titanate

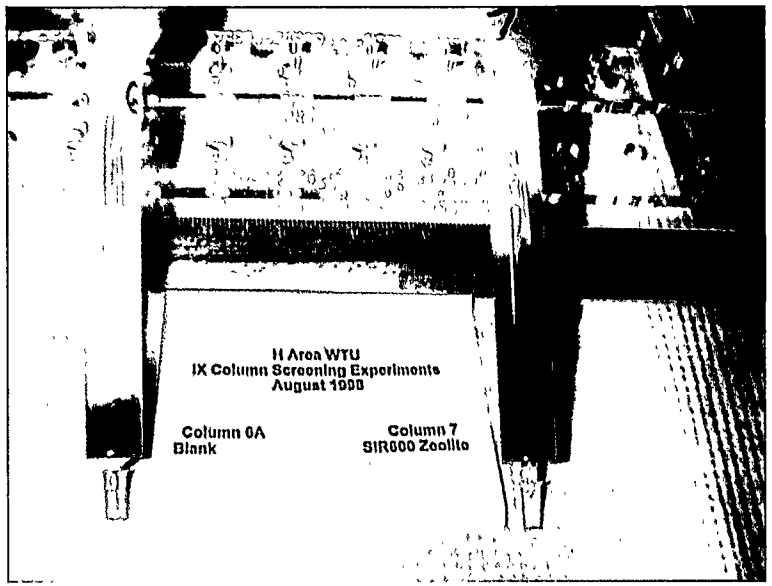

F-Area
Clearwell
IX Screening
10/98
14-AG50WX8
15-AG50WX12

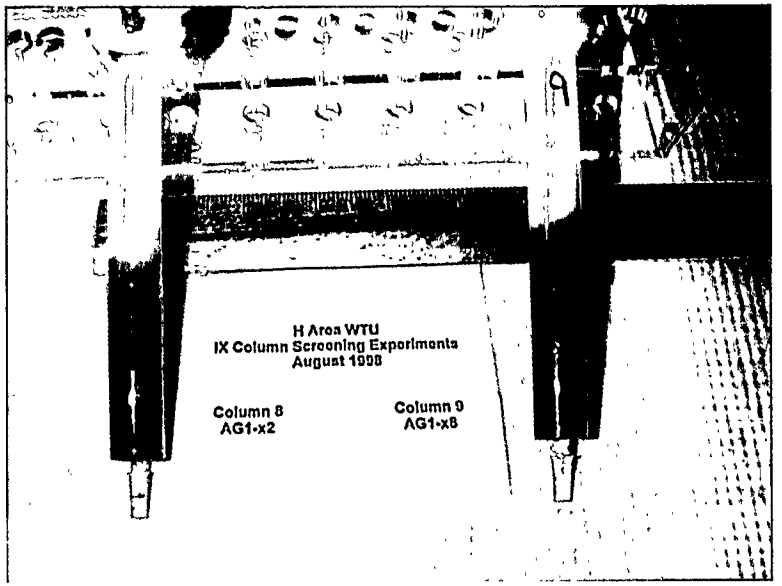

F-Area
Clearwell
IX Screening
10-98
10. Reillex HAL
Resin

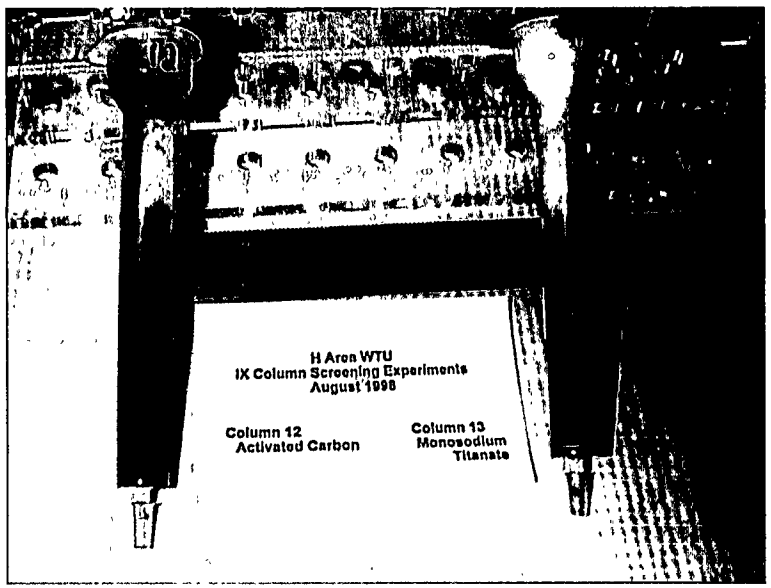

H Area WTU
IX Column Screening Experiments
August 1998
Column 1
CG8 Resin
Column 5
AGMP-50

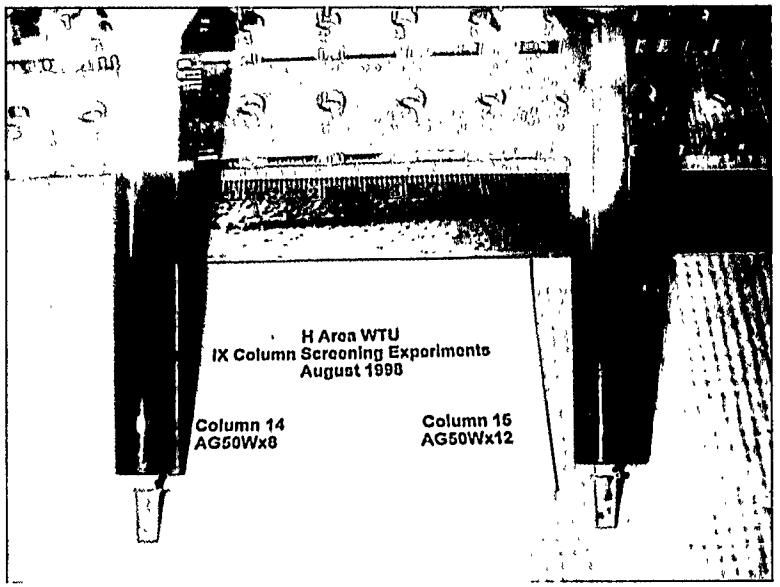

H Area WTU
IX Column Screening Experiments
August 1998
Column 2
SR Treat
Column 3
Dowex


H Area WTU
IX Column Screening Experiments
August 1998
Column 4
Chelex 20
Column 6B
Blank


H Area WTU
IX Column Screening Experiments
August 1998
Column 6A
Blank
Column 7
SIR600 Zeolite


H Area WTU
IX Column Screening Experiments
August 1998
Column 8
AG1-x2
Column 9
AG1-x8


H Area WTU
IX Column Screening Experiments
August 1998
Column 12
Activated Carbon
Column 13
Monosodium
Titanate


H Area WTU
IX Column Screening Experiments
August 1998
Column 14
AG50Wx8
Column 16
AG50Wx12

Distribution:

W. E. Stevens, 773A
Lynn V. Ehrke, 730-2B
Timothy W. Lewis, 730-2B w/o Attachments
Sean R. Bohrer, 730-2B
Michael J. Hartz, 730-2B w/o Attachments
Bruce G. Schappell, 730-2B
D. B. Moore-Shedrow, 773A w/o Attachments
Tom Butcher, 773-43A
STRC/WPT file, 773-A

Tech. Info. Mgmt, 703-43A
Edward M. McNamee, 730-2B
Alvin A. Siddall, 730-2B
James M. Lovekamp, 730-2B
James M. Clark, 730-2B
Joseph P. Kanzleiter , 730-2B
Scott Reboul, 730-2B
Walter Tamosaitis, 773A

WSRC-TR-99-00020, Rev. 0