PERFORMANCE REPORT

Quality Assurance Program - January to June 2011

The following discussion is prepared in accordance with the requirements for a Semiannual Performance Report on the Quality Assurance Program. This performance report evaluates data used for the Semiannual Effluent Report and for the routine first and second quarter 2011 water and environmental/occupational monitoring reports. This Quality Assurance Program Performance Report summarizes the data review and assessment processes for validation of quality control samples and quality assurance verification and assessment of sample related data.

Assessment of Cotter generated data consists of the following activities:

- Review of field data and sampling practice by sampling and quality assurance personnel.
- Review of Sample Submittal Tracking Forms (SSTF), chain of custody, and LIMS log-in documents by quality assurance personnel.
- Review and approval of the samples and QC sample data on a sample-batch basis by laboratory personnel.
- Review and approval of sample results and QC data on a sample-batch or LIMS "WorkSheet" basis by quality assurance personnel.
- Investigation of questionable or non-compliant data and subsequent follow-up.
- End-user ("Data User") data review.
- Monitoring and reporting of QC related performance criteria by quality assurance personnel.

Cotter assessment of reported data generated by non-Cotter offsite laboratories consists of similar activities:

- Review of Sample Submittal Tracking Forms (SSTF), chain of custody, and LIMS log-in documents by quality assurance personnel.
- Review and approval of sample results and QC data on a sample-batch or LIMS "WorkSheet" basis by quality assurance personnel.
- Investigation of questionable or non-compliant data and subsequent follow-up.
- End-user ("Data User") data review.
- Monitoring and reporting of QC related performance criteria by quality assurance personnel.

During any of these activities, corrective action follow-up may entail undocumented immediate request for needed investigation or corrections or the formally documented Data Request (DR), Data Verification Request (DVR), or Corrective Action – Improvement Request (CAIR) processes.

QUALITY CONTROL VALIDATION -

The May 22, 2009 Revision of the *Quality Assurance Program Plan for Environmental and Occupational Sampling and Monitoring Studies for the Cotter Corporation, Canon City Milling Facility And Lincoln Park, Colorado Superfund Site* or "QAPP Manual" established Program Performance Criteria which specify quality control and quality assurance requirements. The Program Performance Criteria require quality control data processing and data qualification or flagging. Specific to this report the Program Performance Criteria require: 1) Calculation and monitoring of the "Total Uncertainty" (TU) of accuracy (Matrix Spike) and precision (Laboratory Duplicate) sample results; 2) Determination and monitoring of batch sample result "Usability" based on TU and/or related quality control factors; 3) Monitoring the percent of qualified or "flagged" data on sample batch basis; 4) Calculation and monitoring of data "Completeness"; and 5) Monitoring and control of specific analyte detection limits.

To accomplish these requirements quality control validation begins with review of the analytical records documented in the "WorkSheet" (sample batch) data packet. Packet contents are inventoried and any batch specific notations are reviewed. Sample results and detection limits are evaluated. Quality control calculations are validated. Quality control results are evaluated for acceptability or requirement for qualification indicator ("flagging"). The WorkSheet's per cent Total Uncertainty value (%TU) is calculated and recorded. Sample batch usability is determined and recorded. From these data packet reviews, WorkSheets containing qualified data are tracked and the percent of data completeness is determined.

The %TU, usability, data qualification/flagging and completeness are being determined and recorded by the data reviewer. The Quality Assurance Department has developed an excel spreadsheet which processes and records the %TU and associated results. This spreadsheet automatically calculates %TU, determines data usability, and documents qualifier flagging for the sample batches containing matrix spike and duplicate data. The usability of data in sample batches not containing matrix spike and/or duplicate quality control samples is also determined and recorded in the %TU spreadsheet. Qualifier flagging for Laboratory Control sample (LCS) or Prep Blank quality control failure is recorded manually in the %TU spreadsheet. Compliance with detection limit controls and the percentage of qualified data within a sample batch are determined manually. Data completeness is determined from queried LIMS records and TU-usability determination summaries.

A total of 374 analyte WorkSheets (sample batch data packets) were processed by the QA Department for this report. A small amount of data generated by non-Cotter laboratories was also recorded in the LIMS WorkSheets and reviewed during the preparation for this report. A contract laboratory performed uranium in urine bioassay analyses through early March 2011. This data has also been subjected to Cotter quality assurance review to the extent attainable by existing supplier-client agreements, is included in the total WorkSheet count, and has had the associated quality control data carried into the %TU spreadsheet.

Quality review and assessment has been completed on all data for samples collected during the first and second quarter monitoring periods of 2011 and addressed in the aforementioned reports. The Quality Assurance Department reviewed 374 analytical sample batch sample data folders

("WorkSheet Data Packets") for this report. All of these WorkSheet Data Packets were determined to contain usable data. "Data Completeness" is 99.2%" for the 374 WorkSheets processed. 227 of the WorkSheets reported acceptable TU values ranging from 0 to 29.0% Total Uncertainty. 147 did not allow TU calculation but were determined to be usable. Three WorkSheets contained flagged or "qualified" data. The data from all three of the flagged WorkSheets was determined to be "usable". One of these "qualified" sample batches consisted of bioassay sample results reported by a contract laboratory. Quality control data in this contract lab's sample batch was flagged during Cotter QA Department review because one of the three associated matrix spike samples failed to meet the routine Cotter QAPP Section 10.2.2 quality control acceptance criteria. The contract laboratory's QC acceptance criteria are broader than those in the Cotter QAPP. The sample batch's QC was considered acceptable by the contracting lab's broader QC acceptance criteria. The Cotter Quality Assurance Department subsequently identified the batch's QC as "acceptable" under the alternate acceptance criteria allowance of QAPP Section 10.2.2. A notation was made in the WorkSheet record in the TU spreadsheet.

The overall percentages of completion of the quality control validation at the time this performance report is being written are depicted on the accompanying Graph PRQ1, *Quality Control Validation – First Half 2011*. The depicted quality control validation completion percentages are estimated to be 99% for QC blanks and 94% for each of the other three QC data types. The reduced percentage completion values may be attributed to two factors: (1) a detailed trend chart analysis has not been performed, and (2) automated LIMS qualification of data is not yet implemented.

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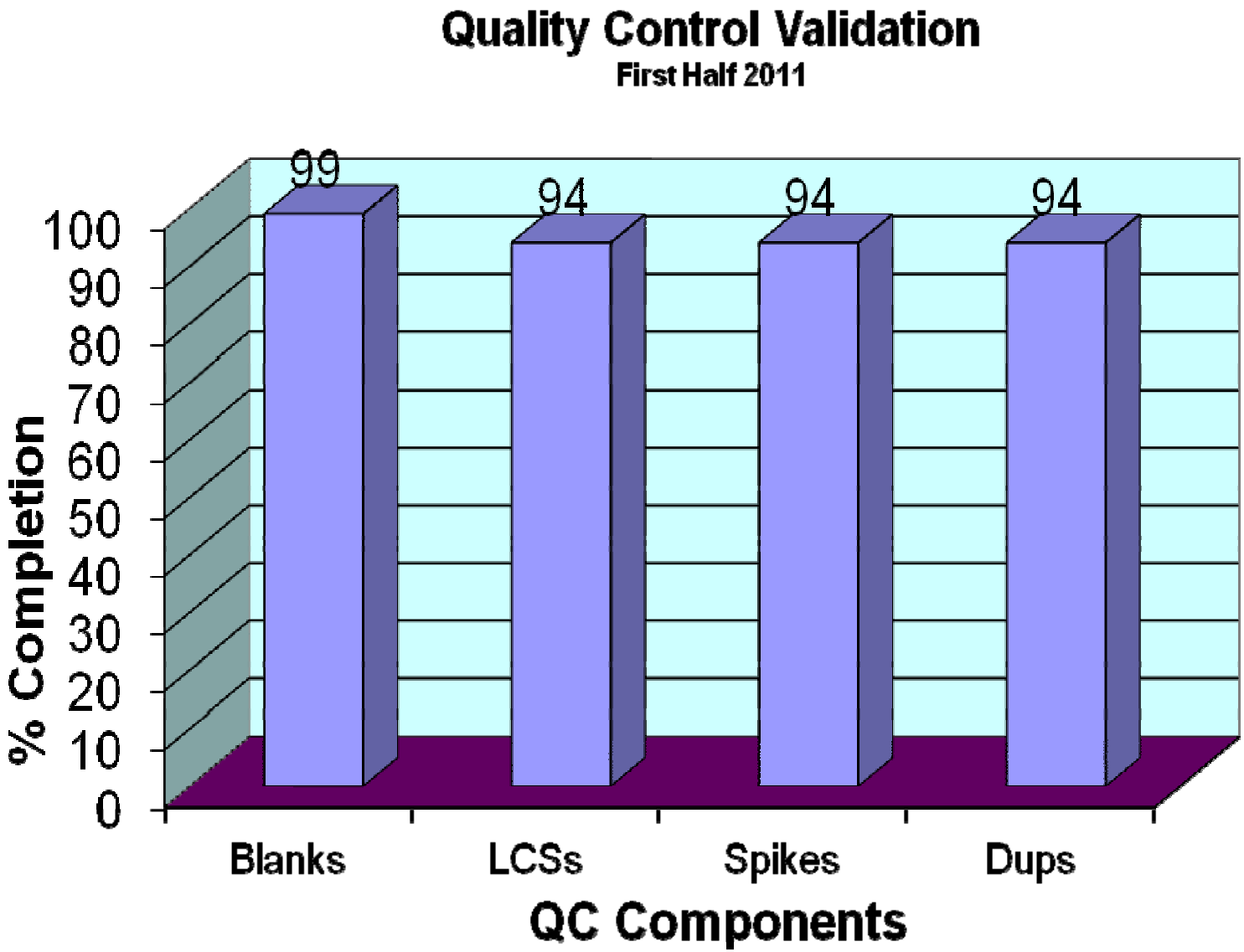
Graph PRQ1


Quality Control Validation
First Half 2011
% Completion
100
90
80
70
60
50
40
30
20
10
0
99
94
94
94
Blanks
LCSs
Spikes
Dups
QC Components

QUALITY ASSURANCE VERIFICATION -

General quality assurance verification may include evaluation of sampling and/or analytical procedures and activities, program or project design and activities, and data processing and reporting. In addition to the review activities discussed above, the data contained within the report undergoes other types of QA verification assessment. The basis for the additional data verification assessment may include historical knowledge of constituent levels, radiochemical equilibrium ratios, material-specific constituent proportions, known environmental conditions, and comparisons of final results to preliminary screening data. Data verification may also include evaluation of the reported detection limits versus required detection limits and the effect of failed QC samples on data usability. Discovery of questionable, unacceptable, anomalous, or unexpected results is followed by a review of field or lab records, investigation of sample acquisition, handling, preparation or analysis, or a request for reanalysis. The Cotter Quality Assurance Department provides oversight and documentation of required formal quality assurance data verification and follow-up.

A number of data quality investigations were documented by the Quality Assurance Department during the time period covered by this report. There were four Data Requests (DR) recorded. Three were for additional new analyses of first and second quarter occupational air samples or composites. The fourth was for primary impoundment environmental monitoring data. Thirteen quality assurance related Data Verification Request - Assay Correction Form investigations (DVR/ACFs) were generated by data reviewers and data users. The Cotter lab was responsible for responding to ten of these - eight for groundwater, one for vegetation, and one for in-house quality assurance testing. Commercial labs were responsible for responding to the remaining three DVRs - one for environmental radon results and two for environmental water samples from an off-site location. All have been resolved. The DVR/ACFs addressed a total of 178 sample results. Not all data verification investigations result in required data correction when resolved. There was one Corrective Action - Improvement Request (CAIR) issued this reporting related to this QA Performance Report. The QA Department requested replacement of a broken fitting on an environmental sampler calibrator. The QA Department also conducted and reported nine quality assurance assessment “Evaluation” reports during this reporting period. Five focused on environmental sampling and monitoring procedures and practices. Four were quality assurance performance evaluations.

The Cotter Analytical Laboratory began utilizing a Perkin Elmer NexION® 300X ICP-MS (Inductively Coupled Plasma-Mass Spectrometer) in early 2011 for most metals analyses. This ICP-MS eventually assumed the analysis of all metals and uranium previously conducted via AA (atomic absorption flame and graphite furnace analyses of metals) and KPA (Kinetic Phosphorimetric Analysis of uranium). The ICP-MS operation and result reporting have undergone continuous improvement during this reporting period.

This Quality Assurance Program Report focused on evaluation of environmental and effluent monitoring data quality. The related quality assurance verification assessed data that can be categorized roughly into the following four environmental sample categories: Air, Water, Soil, and Vegetation. At this time, the overall percentages of completion of quality assurance

verification are believed to be 100% for each category and are depicted in graph PRQ2, *Quality Assurance Verification – First Half 2011*.

The attached Error Analysis – First Half 2011 Tables summarize potential data errors that were identified during the data quality assessments. Table 1 addresses quality control validation issues. Table 2 addresses quality assurance verification errors.

Graph PRQ2

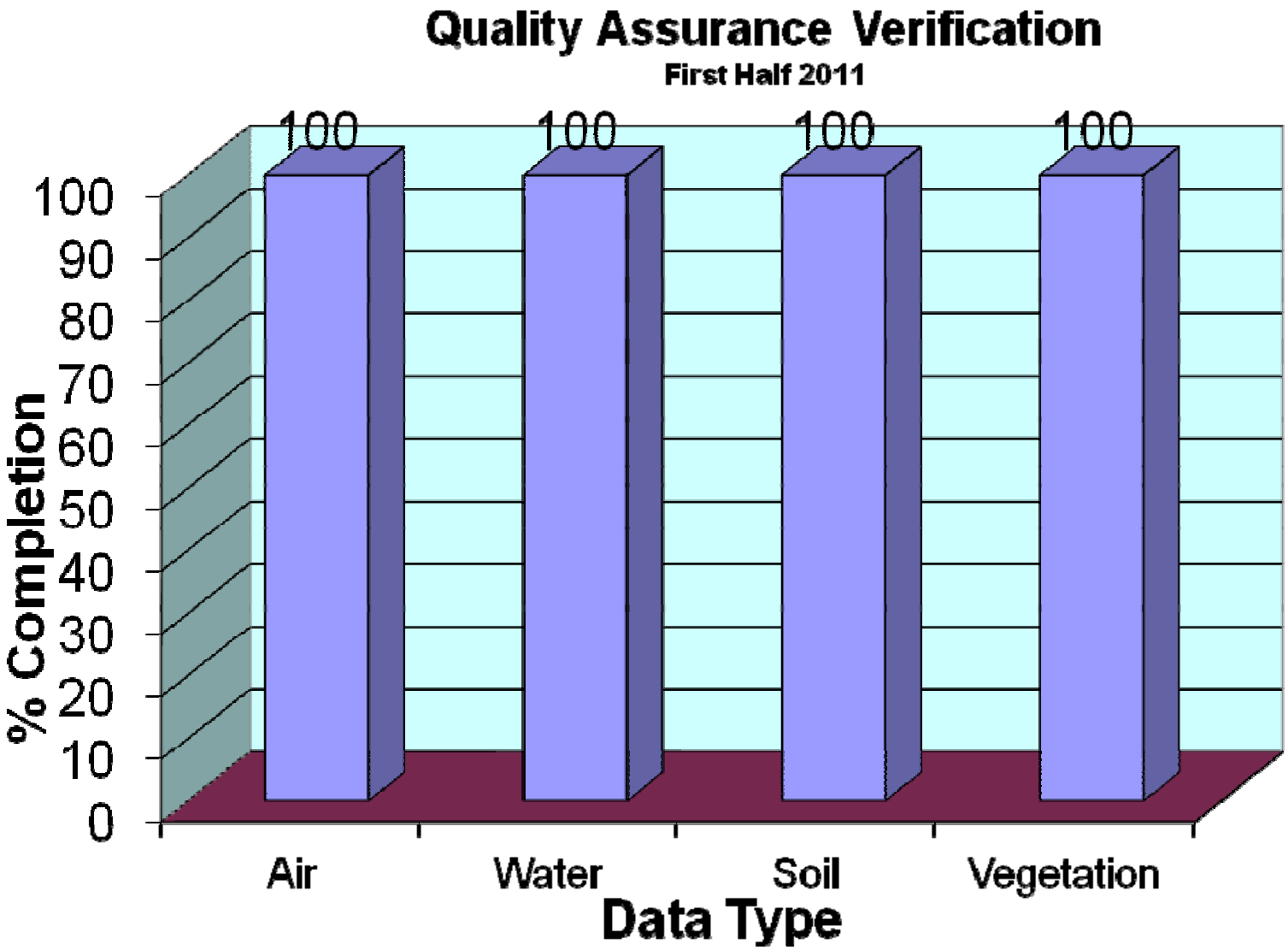

Quality Assurance Verification
First Half 2011
100
100
100
100
100
90
80
70
60
50
40
30
20
10
0
% Completion
Air
Water
Soil
Vegetation
Data Type

Table PRQ1
Error Analysis – First Half 2011

Quality Control Validation Issues

Description	Samples Affected	Frequency of Occurrence	Does Pattern Exist? Explain	Resolution
1) The methodology used to assess quality control accuracy and precision data in the LIMS (Aspen) is not consistent with the methodology prescribed in the QAPP. 2) Data qualification	Blanks, Duplicates, Spikes, and LCSs.	Numerous	Yes. These issues will exist until a LIMS customization is complete and any required modifications to the QC processing sections of the LIMS have been completed.	Modification and customization of the Cotter LIMS is ongoing. The LIMS QC Summary report sheets are used primarily to verify proper data entry/data upload into the LIMS. Manual QC review and approval will continue to be performed using calculations docum
Manual data input or transfer can result in erroneous information in analytical documentation and/or within the LIMS database.	All data	Estimated to be < 5%.	Not consistently. Due to the large volume of data that is manually input occasional random data entry errors are likely.	These types of errors are detected during internal laboratory and QA/QC data reviews. Corrections are made to the documentation and/or the LIMS database, as necessary. Once data is input or produced in a transferable format it is transferred (imported or

Table PRQ2
Error Analysis – First Half 2011

Documented Quality Assurance Verification Errors

Document or Record	Sample/Result Type	# Results Affected	Apparent Error Type	Results of Investigation	Does Pattern Exist? Explain
DVR/ACFs: 3-9-2011-1 and 3-14-2011-1	Off-site Water Samples	4	Missing Results	Commercial lab failed to report results. Result report revised.	This is an unusual problem related to customer - service provider communication.
DVR/ACFs: 5-312011-1, 8-12-2011-1, 8-26-2011-1, 9-19-2011-1, 9-19-2011-3	Groundwater, Environmental Air (Radon)	39	Suspect or anomalous results requiring reanalysis.	Reanalysis was performed followed by correction in laboratory WorkSheet Data Packet and LIMS database when required.	This problem is usually detected during data user QA review of results and is usually followed by a request for reanalysis. Only formal documented requests resulting in sample result changes are tracked here.
DVR/ACFs: 5-312011-1, 7-1-2011-1, 9-19-2011-2, 9-26-2011-1	Groundwater, Vegetation	103	Dilution Error	Error detected and sample either reanalyzed or data reprocessed.	This problem encountered more often when gaining experience with new analytical instrumentation and developing new procedures.
DVR/ACFs: 7-1-2011-1, 9-19-2011-2, and 9-26-2011-1	Groundwater, Vegetation	128	Calculation Error - error in formula references	Discovered wrong cell references in spreadsheet formulas or incorrectly calculated dilution values. Cell references and dilution calculations corrected, data reprocessed and corrected results reported and documented.	This is problem arises occasionally during the development of new data collection and processing tools.
Field Logs, Chain of Custody SSTF Forms, Sample Evaluation Worksheets, Procedural Records.	Environmental and Occupational	Variable	Misinterpretation or misidentification of field data	Data reviewed and discussed. Chain of events reconstructed and reevaluated. Corresponding records consulted. Corrections made when discovered or verified. Retraining often provided.	This problem is often detected during data user or QA reviews and can be common with manually collected and recorded data and when implementing new activities or employing new personnel.
DVR/ACFs: 5-31-2011-1 and 9-22-2011-1	Groundwater Field and Analytical Data	Variable	Input Error	Data misallocated on processing or reporting sheets	'This is a fairly common error associated with manual input and transfer of data. This problem is occasionally detected during review of lab data and comparison to historical data.

Note: A sample result may be affected by more than one error type.
Data verification and subsequent correction of specific sample results often results in additional correction and revision of associated samples.
Numerous analytical results were investigated and verified through the DVR/ACF documentation and required no change in reported values.

Performance Report –Laboratory Program January to June 2011

This report describes the types and numbers of analytical determinations as well as the dates the results were posted to the Laboratory Information Management System (LIMS). All of the data was available by September 26, 2011. Some of the measurements, for example, "perimeter" or environmental air sampler filter paper weights and urinalysis for uranium, are typically posted within a week or two of collection.

Analytical Work Summary -

- First (1st) and Second (2nd) quarter anion analyses - one thousand six hundred (1600) analyses entered into LIMS no later than 07-01-11
- Three hundred thirty (330) perimeter (environmental) air sampler filter weights each weighed twice (660 data points) entered into LIMS by 06-29-11.
- Occupational air, perimeter air, and water for total uranium - one thousand four hundred eighty (1480) sample analyses by ICP-MS entered into LIMS by 08/15/11.
- Perimeter air and water analyses for ^{226}Ra – ninety eight (98) sample analyses.
- Perimeter air and water analyses for ^{210}Pb - eighty seven (87) sample analyses.
- Water analysis for ^{210}Po – forty-six (46) sample analyses.
- Occupational air, perimeter air and water analyses for ^{230}Th - one hundred thirty (130) sample analyses.
- Occupational and perimeter air analyses for ^{232}Th – seventy six (76) sample analyses.
- Uranium in urine analyses - eight hundred twenty eight (828) sample analyses including three hundred fifty five (355) analyses performed by Energy Laboratories Inc.
- pH and conductivity of water sample determinations - one hundred twenty one (121) sample determinations.
- First (1st) quarter analyses for metals: Ca, Fe, K, Mg, Mn, Mo, Na, and Se – one thousand one hundred eighty one (1181) analyses by ICP-MS entered into LIMS by 05-26-11.
- Second (2nd) quarter analyses for metals: Ca, Fe, K, Mg, Mn, Mo, Na and Se - seven hundred seventeen (717) analyses by ICP-MS entered into LIMS by 09-13-11.
- Gross alpha/beta breathing zone and general area air samples filters were collected and submitted by Radiation Safety Department technicians for assessment of airborne concentrations relative to the ALARA program and to monitor occupational dose. The sample load resulting from these analyses was one thousand six hundred fifty (1650) samples for the first half of the year. Preliminary results were either available within twenty-four (24) hours of sample receipt or by the next business day for samples collected on weekends. Final analysis of these samples in all cases was completed well within the report preparation requirements.

The Cotter Laboratory encountered significant problems with instrumentation and subsequently lost analysis time during the report period. The Kinetic Phosphorescence Analyzer's (KPA) laser failed and the KPA became unusable in late December 2010. This resulted in a backlog of uranium analysis. The Cotter Analytical Laboratory acquired a Perkin Elmer NexION® 300X

ICP-MS (Inductively Coupled Plasma-Mass Spectrometer) in January of 2011, with installation set for February 2011. This instrument assumed all uranium and metal analyses that the KPA and Atomic Absorption instruments had been performing. To meet the needs of the ICP-MS, extensive modifications were made to portions of the laboratory building. After installation and initial start-up the new ICP-MS unit failed. On February 16th the first Cotter Nexion 300X ICP/MS was declared not repairable by Perkin Elmer and a replacement was ordered. The replacement was shipped to Cotter and installed during the week of March 7th. The second ICP-MS was started up and lab technician training was conducted the week of March 14th. The replacement ICP-MS was deemed operational and put into preliminary analytical service the week of March 21st. The ICP/MS was down July 11th through July 18th due to a power board issue. The server was down from July 27th to Aug 8th and a planned power outage had the laboratory down on Sept 19th and Sept 20th.

Most metals analysis for the second quarter water report and the first (1st) half 2011 semiannual report was produced by Cotter's new ICP-MS instrumentation.