



**Data Validation Report  
SDG 160-18633-1**

**Characterization of Structures, Items, Solutions, and Soil at the  
Proposed Outfall 200 Treatment System Sites  
Y-12 National Security Complex**

Revision 0

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Date: 10/14/2016

## SCOPE

This report contains Level 3 data validation results for analytical data for SDG No. 160-18633-1 for three soil samples collected at the Y-12 Outfall 200 (Project ORNL Y-12 Outfall 200 Characterization). The evaluation covers analyses for toxicity characteristic leaching procedure (TCLP) metals, polychlorinated biphenyls (PCBs), and radionuclides (tritium, total beta strontium, and technetium-99).

## METHOD

The analytical data were validated using the following guidelines:

- Sampling and Analysis Plan / Quality Assurance Project Plan for Geotechnical and Waste Characterization of the Outfall 200 Mercury Treatment Facility Area at the Y-12 National Security Complex, Oak Ridge, Tennessee (November, 2015)
- *Guidance on Environmental Data Verification and Data Validation - EPA QA/G-8, EP A/240/R-02/004*, United States Environmental Protection Agency, Washington D.C
- National Functional Guidelines for Superfund Organic Methods Data Review (August 2014)
- National Functional Guidelines for Inorganic Superfund Data Review (August 2014)
- Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation. ANSI/ANS-41.5-2012. (February, 2012)
- Multi-Agency Radiological Laboratory Analytical Protocols Manual (July, 2004)

## VERIFICATION AND VALIDATION RESULTS

### Completeness

Results for three soil samples (SDG No. 160-18633-1) were evaluated. Analyses were performed by TestAmerica in Earth City, Missouri (TA-St. Louis). The following lists analytical methods and sample numbers for reported results.

Analysis	Project Sample ID Numbers	Laboratory Sample ID Numbers
TCLP metals, PCBs, and radionuclides (tritium, total beta strontium, and technetium-99)	YMTFA54 SO 010	160-18633-1
TCLP metals, PCBs, and radionuclides (tritium, total beta strontium, and technetium-99)	YMTFA54 SO 010D	160-18633-2
TCLP metals, PCBs, and radionuclides (tritium, total beta strontium, and technetium-99)	YMTFA58 SO 010	160-18633-3

### Holding times

The date of sample collection (08/12/16) and dates of sample analyses were evaluated. Based on these, all recommended holding times per the analytical methods were met.

### Preservation and Laboratory Sample Receipt

All samples arrived at TAL intact and in good condition under valid chain of custody (COC). The COC was signed indicating the samples were appropriately relinquished by the sampler and accepted by the

analytical laboratory. All samples were received outside temperature criteria at 12°C. Per the laboratory SDG narrative, the client was contacted regarding the temperature exceedance and the lab was instructed to proceed with analysis. The TCLP metals, PCB and radiochemistry sample results do not require qualification for temperature at receipt. Tamper indicator devices (TIDs) were not present on the coolers which were shipped by Federal Express. The laboratory sample receipt checklist documents that the coolers and samples do not appear to have been compromised or tampered with.

### **Analytical Methods, Reporting Units, and Detection Limits**

All analytical methods specified (or equivalent to those specified) on the COC (COC No.160-4416-2171.2) were utilized for the analyses. All results were reported in appropriate units. The detection limits were appropriate for all methods.

### **Transcription (COC and Lab Data)**

There were no transcription errors in sample numbers or other information listed on COCs and in data reports that would impact the results.

### **Trip Blank**

Not Applicable.

### **Equipment Blanks (EB)**

Not applicable.

### **Field Blank (FB)**

Not applicable.

### **Field Duplicates**

One field duplicate sample was collected and reported. The field duplicate pair is: Sample YMTFA54 SO 010 and field duplicate YMTFA54 SO 010D. Field duplicate analytical results met QC acceptance criteria.

### **Laboratory Case Narratives**

The following issues were noted in the case narratives:

PCBs:

- The CCV recoveries for Aroclor 1260 and surrogate compound DCB were outside the lower QC criteria on the secondary column. The recoveries were within criteria on the primary column. Surrogate recoveries were within criteria for the samples. No sample qualification was required. PCBs were not detected above the RL in the samples.

TCLP Metals (ICP) and Mercury:

- Mercury was detected in method blank LB 160-266071/1-A at a level above the method detection limit but below the reporting limit. Mercury detected below reporting limit in the samples was qualified as nondetect at the reporting limit.

- Per the laboratory case narrative, the TCLP mercury samples were re-digested/re-extracted due to the calibration curve and calibration QC expiring before analysis was performed. The MS/MSD was therefore spiked after preservation. No sample qualification was required.

**Radionuclides:**

- For technetium-99, the following samples, including the BKG, counted off the upper end of the quench curve parameter (tSIE): YMTFA54 SO 010, YMTFA54 SO 010D, YMTFA58 SO 010, LCS 160-265402/2-A, and MB 160-265402/1-A. A small amount (10 uL) of quenching agent (nitromethane) was added to the affected vials and recounted. The recount results were within the quench curve parameter and are reported. No sample qualification was required.

**Verification/Validation Checklists, Data Qualifiers, and Qualifier Definitions**

Verification and validation checklists are presented in Appendix A and Appendix B. Applicable validation qualifier codes are defined in the table below.

Qualifier	Definition
U	analyte is not detected at or above the stated reporting limit
UJ	analyte is not detected but there is uncertainty about the reporting limits
J	result is estimated
R	result is rejected

**TCLP Extractions**

Three soil samples were extracted by SW-846 Method 1311 with appropriate batch QC. There were no problems noted during the extraction.

**Metals (ICP) and Mercury**

TCLP extracts of three samples were prepared and analyzed for ICP metals by SW-846 Method 6010C and mercury by SW-846 Method 7470A. Holding times, initial and continual calibrations, batch QC (blank, LCS, MS/MSD) were acceptable except for the following: Mercury was detected in a method blank. Therefore, Hg detects <RL for the samples are qualified as ND at the RL (0.0010 U mg/L). No further qualification of metals data was required.

**Polychlorinated Biphenyl by GC**

Three samples were extracted and analyzed for PCBs by SW-846 Method 8082A. Holding times, initial and continual calibrations, batch QCs (blank, LCS, MS/MSD) and sample specific QCs (internal standards, surrogates) were acceptable. No qualification of data was required.

**Radionuclides**

Three samples were analyzed for the following radionuclides: tritium, total beta strontium, and technetium-99. Holding times, applicable instrument calibrations, and sample and batch QCs were acceptable for all methods. Traceable standard certificates were acceptable.

**Gas Flow Proportional Counter**

Total beta strontium analysis was performed by gas flow proportional counter. The Laboratory Control Sample (LCS) had acceptable percent recovery. The laboratory duplicate analyses had acceptable relative percent difference (RPD) and duplicate error ratio (DER) results. Chemical recoveries and yields were

within acceptable limits. Method blank results were less than the MDAs. No qualification of data was required.

Liquid Scintillation Counter

Tritium and technetium (Tc-99) were analyzed by liquid Scintillation counter. The Laboratory Control Sample (LCS) and matrix spike (MS) had acceptable percent recoveries. The laboratory duplicate analyses had acceptable relative percent difference (RPD) and duplicate error ratio (DER) results. Chemical recoveries and yields were within acceptable limits. Method blank results were less than the MDAs.

**Summary**

- Mercury was detected in a method blank. Therefore, Hg detects <RL are qualified as ND at the RL (0.0010 U mg/L).

**Summary of Result Qualifiers**

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA54 SO 010	Mercury	0.00011 J	0.0010 U	mg/L	J	U
YMTFA54 SO 010D	Mercury	0.00012 J	0.0010 U	mg/L	J	U
YMTFA58 SO 010	Mercury	0.00016 J	0.0010 U	mg/L	J	U

**Appendix A**  
**Verification Summary Table**

<b>Data Verification SDG 160-18633-1</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>	<b>Comment</b>
<b>Custody of Samples</b>				
Are samples traceable through inspection of signature records on field and laboratory chains of custody (COCs)?	x			
Has contractual turn-around time been met for all samples?			x	
Have all samples been preserved correctly and pertinent documentation included?		x		All samples were received outside temperature criteria at 12°C. Per the laboratory SDG narrative, the client was contacted regarding the temperature exceedance and the lab was instructed to proceed with analysis. The TCLP metals, PCB and radiochemistry sample results do not require qualification for temperature at receipt.
Is the laboratory log in sample receipt checklist present	x			
Are any sample receipt non-conformances noted?		x		
<b>Standard Traceability</b>				
Have certificate(s) been included for the LCS and MS?	x			
Standards have not exceeded the certificate expiration date		x		
Are chemical standards and reference materials traceable to a reliable source? (Reagent traceability summary)	x			
<b>Analytical Completeness</b>				
Are all COC samples and associated analytical results reported in the laboratory data package?	x			
<b>Data Summaries</b>				
The case narrative is present and summarizes the sample receipt and analysis information including any analytical anomalies for all methods reported in the data package.	x			
Other data summary forms are present as applicable (detection, sample results, surrogate, tracer/carrier, QC results and association, prep and analysis chronicle,	x			

<b>Data Verification SDG 160-18633-1</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>	<b>Comment</b>
method and sample summaries)				
<b>Sample Data</b>				
Is the Sample Data included for each COC requested analytical method?	x			
Is the calibration data included for each method? (ICAL, ICV, CCAL as required for each method)	x			
Are the QC summary forms included for each method? (MB, ICS/CCB, LCS/LCSD, MS/MSD, surrogates, internal standards, serial dilution as required and applicable for each method)	x			
Are the method run logs and/or bench sheets included for each method?	x			
Are the method preparation/extraction logs included for each applicable method?	x			
Is the sample and QC raw data included for each method?	x			
Is the internal Laboratory Review documented by checklists and included in the data package?		x		Lab internal review checklists for the sample analyses are not included.

**Appendix B**  
**Validation Summary Tables**

<b>TCLP Extraction</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Was a ZHE vessel used for VOAs?			x		
Was ZHE checked for leaks after extraction?			x		
Did the lab use proper bottles?			x		No non-compliances were noted in the preparation logs
Was the %solid determined correctly?	x				
If appropriate, did the lab reduce particle size?			x		
Was the correct extraction fluid used?	x				Extraction fluid #1
Was the pH of the extraction fluid correct?	x				
Was the correct weight of extraction fluid used?	x				
For VOAs, was the sample weight 25 grams or less?			x		
Were the TCLP extracts properly preserved?	x				
Is there a TCLP blank with the TCLP fluid for a batch of up to 20 samples?	x				

TCLP Metals by ICP (SW6010) TCLP Mercury by CVAA (SW7470A)	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?			x		
Are sample preparation sheets present and account for all extractions and digestions for reported samples?	x				
Have the samples been prepared and analyzed within holding times?	x				
<b>Detection Limits and Target Analytes</b>					
Do all samples show RLs <= the SAP Recommended Reporting Limits?	x				Due to high salts in the sample matrix, the ICP analyses were performed at a 5x analytical dilution for the samples in this SDG.
Are all the SAP target analytes reported?	x				
<b>Initial Calibration</b>					
Was the Calibration within acceptance criteria?	x				
<b>Calibration Verification</b>					
Was a second source ICV analyzed after calibration with recoveries within acceptance criteria?	x				
Were CCVs analyzed at the required frequency with recoveries within acceptance criteria? For ICP, CCVs and low level CCVs (CCVL) as applicable.	x				
Are the ICV and CCV/CCVL Summary forms present?	x				
Was the ICP CRQL Check Standard analyzed with recoveries within acceptance criteria?	x				
<b>Method Blank and ICB/CCBs</b>					
Has at least one method blank been prepared For each batch of up to 20 samples?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				TCLP

<b>TCLP Metals by ICP (SW6010) TCLP Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Were target analytes detected in the method blank above the MDL?	x			Hg detects <RL in the samples are qualified as ND at the RL (0.0010 U mg/L)	Hg LB160-266071/1-A: Hg detected at 0.000137 J mg/L  All other MB results were < MDL.
Were the ICB and CCBs analyzed at the required frequency with results within acceptance criteria?	x				
Are the Method Blank and ICB/CCB Summary forms present?	x				
<b>ICP Interference Check Samples</b>					
Were the ICP ICSA/ICSAB interference check standards analyzed as required with results within acceptance criteria?	x				
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?			x		Aqueous LCS for the TCLP samples
Is the LCS spiked with all target analytes listed in the SAP?	x				
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?			x		
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch containing up to 20 samples?	x				
Are the MS/MSD spiked with all target analytes listed in the SAP?	x				
Are MS and MSD %RECs within the applicable QC limits?			x		The batch QC was not performed on a sample in this SDG.
Are MS/MSD RPDs within the applicable QC limits?			x		
<b>Duplicates</b>					

<b>TCLP Metals by ICP (SW6010) TCLP Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Has a laboratory duplicate been prepared for a batch containing up to 20 samples? (If an MS/MSD pair has been prepared, the laboratory duplicate is not required.)			x		
If a laboratory duplicate was analyzed, were the RPDs within acceptance criteria?			x		
Was a field duplicate collected?	x				
If a field duplicate was analyzed, were the RPDs within the 50% acceptance criteria?	x				The barium results were within the acceptance criteria. All other reported metals results were non-detect for the sample and the field duplicate.
<b>Serial Dilution</b>					
Was the Serial Dilution within acceptance limits?	x				
<b>Sample Quantitation and Documentation</b>					
Are reported sample concentrations within the instrument linear range?	x				
Have sample reporting limits and reported concentrations been adjusted for analytical dilutions?	x				
Are instrument runlogs present and account for all reported sample results?	x				

<b>TCLP Metals by ICP (SW6010)</b> <b>TCLP Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Have all Laboratory Case Narrative comments and findings been addressed in the data validation process?	x			None	Per the laboratory case narrative, the TCLP mercury samples were re-digested/re-extracted due to the calibration curve and calibration QC expiring before analysis was performed. The MS/MSD was therefore spiked after preservation.

<b>Polychlorinated Biphenyl (Method 8082A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?			x		
Have the samples been analyzed within holding times?	x				
<b>Detection Limits and Preservation</b>					
Are all laboratory RLs <= recommended RLs in the SAP?	x				
<b>Initial Calibration</b>					
Are minimum calibration curve with minimum 5 points analyzed prior to sample analysis?	x				
Are %RSDs within method criteria?	x				
<b>Calibration Verification</b>					
Are calibration verification standard analyzed at the appropriate frequency?	x				
RT within RT windows established by initial calibration?	x				
Are %D (difference or drift) within 20% of the average initial calibration factors?	x				The CCV recoveries for Aroclor 1260 and DCB are outside the lower QC limits on the secondary column, but within acceptable QC limits on the primary column. Sample qualifications are not required. (CCVs analyzed 8/25/16 20:12 and 8/26/16 00:43)
<b>Method Blank</b>					
Is the Method Blank extracted and analyzed for each analytical batch of up to 20 samples?	x				

<b>Polychlorinated Biphenyl (Method 8082A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Is the Method Blank Summary form present?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				
Is the blank at similar (low, medium, or trace) concentration level?	x				
Does the blank have any detects above MDL?		x			
<b>Surrogate Recovery</b>					
Are all samples and QCs spiked with surrogate compounds?	x				
Are percent recoveries within the method criteria results?	x				
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?			x		The lab QC samples are spiked with Aroclor 1016 and 1260
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?			x		
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch with sample counts up to 20 samples?	x				
Are the MS/MSD spiked with target analyte specified in the SAP?			x		The lab QC samples are spiked with Aroclor 1016 and 1260
MS and MSD %RECs within the applicable QC limits?			x		The batch QC was not performed on a sample in this SDG.
MS/MSD RPDs within the applicable QC limits?			x		
<b>Internal Standards</b>					
Were internal standards added to all samples and QC samples?	x				

<b>Polychlorinated Biphenyl (Method 8082A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Are internal standard retention times within method criteria?	x				
Are internal standard areas within method criteria?	x				
<b>Target Analyte Identification</b>					
Do the positively identified compounds meet the identification criteria?			x		No Aroclor detections are reported for the samples.
Are the RTs of the positively identified target analytes within RT windows established by initial calibration standards?			x		
<b>Target Analyte Quantitation and Reported Quantitation Limit</b>					
Are the results for all positively identified analytes calculated correctly?			x		Target analytes were not reported for the samples.
Are the reporting limits calculated for the non-detects and reported correctly	x				

<b>Radiological Data Validation</b> <b>Gamma Spectrometry</b> <b>Gas Flow Proportional Counting</b> <b>Liquid Scintillation Counting</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Sample Handling and Preservation</b>					
Were samples preserved correctly?	x				
<b>Holding Times</b>					
Were samples analyzed within holding times?	x				
<b>Standard Traceability</b>					
Were all certificates included for the LCS and MS samples?	x				
Were all standards and reference materials traceable to reliable source material?	x				
<b>Calibration Verification</b>					
Are efficiencies within tolerance limits?	x				
Are energies within tolerance limits?	x				
Are background performance check count rates within tolerance limits?	x				For the technetium-99 analysis, the samples in this SDG, including BKG, and the lab QC LCS and MB samples, counted off the upper end of the quench curve parameter (tSIE). 10 µL of quenching agent (nitromethane) was added to the affected vials and recounted. The recount results were within the quench curve parameter and are reported.
Are appropriate peak resolution within appropriate control criteria?	x				
<b>LCS</b>					
Has at least one LCS been prepared for up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				

<b>Radiological Data Validation</b> <b>Gamma Spectrometry</b> <b>Gas Flow Proportional Counting</b> <b>Liquid Scintillation Counting</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Are LCS %D (or %R) within QC acceptance limits?	x				
<b>Laboratory Duplicate</b>					
Has at least one laboratory duplicate been prepared for up to 20 samples?	x				
ARE RPD and DER within QC acceptance limits?	x				The strontium lab duplicate was performed on a sample in this SDG. The technetium-99 and tritium lab duplicate batch QC was performed on a sample not in this SDG.
<b>Matrix Spike</b>					
Has at least one MS been prepared for up to 20 samples?	x				An MS was analyzed for tritium. The batch QC was performed on a sample not in this SDG.
Is MS %D (or %R) within QC acceptance limits?	x				
<b>Method Blank</b>					
Has at least one method blank been prepared for up to 20 samples?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				
Are the results less than 1.65 * CSU or within control limits?	x				
<b>Chemical Yield - Tracers and Carriers</b>					
Is yield reported for all samples and QC samples in the reporting batch?	x				
Are percent recovery criteria satisfied for all yield results?	x				

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	9/8/16
SDG No(s).	18633-1; 18633-2		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
1.	Case Narrative Present	X				
2.	Lab Qualifiers Present	X				
3.	Methods Specified in SAP or Equivalent Methods were Used	X				
4.	Data is Complete for All Requested Analytes with All Samples	X				
5.	Units are as Specified in SOW/Contract or Otherwise are Appropriate	X				
6.	Detection Limits Meet Contract Required Detection Limits or Other Project Defined Limits (e.g., regulatory limits)	X				
7.	Samples IDs and Analytes Agree with those on COCs	X				
8.	Samples IDs Agree Throughout Report	X				
9.	Raw Data Results Agree with Data Reports and Electronic Data	X				
10.	COCs – Samples Traceable	X				
11.	All Samples Preserved Correctly		X			Cooler received at 12 deg C. FedEx failed to deliver on Saturday as listed on Air Bill
12.	Samples Arrived Intact	X				
13.	Custody Seals on Samples			X		COC seals on coolers only
14.	Holding Times Met	X				
	-Metals other than Mercury ≤ 180 days			X		
	-Mercury ≤28 days			X		
	-TCLP Metals other than Mercury to TCLP Extraction ≤180 days	X				
	-TCLP Metals other than Mercury TCLP Extraction to Analysis ≤180 days	X				
	-TCLP Mercury to TCLP Extraction ≤28 days	X				
	-TCLP Mercury TCLP Extraction to Analysis ≤28 days	X				
	-VOAs to Extraction/Analysis ≤14 days			X		

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	9/8/16
SDG No(s).	18633-1; 18633-2		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
	-SVOAs to Extraction ≤7 days (liquids), ≤14 days (solids)			X		
	-SVOAs Extraction to Analysis ≤40 days			X		
	-Pesticides to Extraction ≤7 days (liquids), ≤14 days (solids)			X		
	-Pesticides Extraction to Analysis ≤40 days			X		
	-Herbicides to Extraction ≤7 days (liquids), ≤14 days (solids)			X		
	-Herbicides Extraction to Analysis ≤40 days			X		
	PCBs - none	X				
	-TCLP VOAs to TCLP Extraction ≤14 days			X		
	-TCLP VOAs TCLP Extraction to Analysis ≤14 days			X		
	-TCLP SVOAs to TCLP Extraction ≤14 days			X		
	-TCLP SVOAs TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP SVOAs Prep Extraction to Analysis ≤40 days			X		
	-TCLP Pesticides to TCLP Extraction ≤14 days			X		
	-TCLP Pesticides TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP Pesticides Prep Extraction to Analysis ≤40 days			X		
	-TCLP Herbicides to TCLP Extraction ≤14 days			X		
	-TCLP Herbicides TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP Herbicides Prep Extraction to Analysis ≤40 days			X		
	TOC ≤28 days			X		

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	9/8/16
SDG No(s).	18633-1; 18633-2		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
	-Hexane Extractable Material, Oil and Grease ≤28 days			X		
	-Chloride, Fluoride, Nitrate, Sulfate ≤28 days			X		
	-Cyanide ≤14 days			X		
	-Sulfide ≤7 days			X		
	-pH – immediately			X		
	-Specific Conductance - immediately			X		
	-Radionuclides 180 days (best practice)	X				