

<b>Project:</b>	Gold King Mine Long Term Monitoring		
<b>Document:</b>	Sampling and Analysis Plan and Quality Assurance Project Plan		
<b>Reviewer:</b>	CDPHE		
<b>Item</b>	<b>Reference</b>	<b>Comment</b>	<b>Response</b>
1	General	In general terms, the WQCD is concerned about the utility of the proposed study. Deposition of metals along the banks of the Animas River from mine workings and drainage tunnels in the Upper Animas River Basin have occurred since the 1860's. The WQCD is concerned that the proposed study will not be able to differentiate between metals deposited during the 2015 Gold King Mine Spill and metals deposited prior to the spill or even post-spill during the past year. Thus, the WQCD recommends that the study address this concern in the final study proposal for the study to be reviewed successfully.	<p>The NMED agrees that deposition of heavy metal laden sediment has occurred in the Upper Animas River Basin for the past 150 years or more and that the results of this study. In some cases with the combination of visual observation of sediment, depth of sample, and fluvial geomorphology, we believe that we will be able to make the distinction between sediment associated with the 2015 GKM Spill and sediment deposited historically in the basin. For example, if sediment is found on the surface (0 – 3 inches) along the banks of the Animas River, between Baker's Bridge and Durango, CO and it is golden colored, we can use that information to bound the possible time of deposition.</p> <p>Additionally, samples taken in locations that cannot be linked to GKM—upstream of the confluence of the Animas River and Cement Creek upstream of the confluence of the North Fork of Cement Creek and Cement Creek—can be useful in determining the metal load from each tributary. It may also be possible to trace certain contaminants in very high concentrations or in combinations with other metals to certain sources. Establishing a baseline for metals at or near the sediment surface is also one of the aims of this sampling effort.</p> <p>The sampling plan and QAPP have been combined into a single document. The document has been revised to better clarify how this assessment will address the determination of metals deposited during the 2015 GKM spill verses those deposited during historic mine releases.</p>
2	SAP, Background	It would be helpful to include a “problem statement” in order to lay out the question(s) to which they are trying to answer by collecting XRF data. In other words, what is the hypothesis? What is the study trying to prove or disprove?	Section 1.0 of the document has been revised to clarify the problem statement for this assessment.
3	SAP, Goals	The study appears to be concerned with only investigating hot spots. This can be a favorable approach to non-probability sampling where the researchers collect whatever samples are easiest to take as opposed to a probability sampling event where the collection is random. Is this what the study intends?	<p>This study is not using a probability sampling approach for the selection of sample locations. Instead samples were selected based on the following criteria:</p> <ul style="list-style-type: none"> <li>• Fluvial geomorphology using satellite imagery (dated October 2015) and aerial photography;</li> <li>• Sampling locations and data presented in the Church report (Church et al., 2007);</li> <li>• EPA fate and transport modeling presentation and data (EPA, 2016); and</li> <li>• Existing USGS and EPA data</li> </ul> <p>The document has been revised to clarify the selection criteria applied for sample locations.</p>
4	SAP, Goals	The WQCD believes that the selection of sentinel stations would be preferable to the investigation of hot spots along the affected areas of the Animas and San Juan Rivers.	<p>This study includes multiple sampling locations upstream along tributaries to the Animas and San Juan Rivers. Additionally, there are sample locations upstream of Silverton, CO on the Animas River and upstream of the Animas-San Juan confluence on the San Juan River.</p> <p>It is not clear how CDPHE would define sentinel locations and what the purpose would be in the context of this assessment. Sentinel locations would imply locations with a low to nondetectable concentrations of metals that could be monitored on a near real-time basis to provide an indication of the migration of contaminated sediment. Until the nature and extent of impacted sediment can be defined, identification and sampling of sentinel locations is not possible. Additional data is required.</p>
5	SAP, Goals	The draft study did not list the “appropriate risk-based screening levels.” Screening levels have varied across federal and state agencies but still remains open to interpretation. A table showing the specific risk-based screening levels would make clearer the thresholds upon which comparisons will be made later.	The document has been revised to clarify that the U.S. Environmental Protection Agency (EPA) residential soil screening levels (RSLs) will be used for screening results of both XRF and laboratory data.
6	SAP, Goals	Explain in further detail what the “Rule of 20” is.	At this time, the NMED does not plan on collecting a sample for TCLP analysis; we may revisit specific sample locations based on the results of this assessment for additional study and analysis, including TCLP. At that time, we will provide an updated QAPP and include a description of the “Rule of 20.”
7	SAP, Strategy	NMED identifies the risk-based screening levels as those being “residential” and being established by the EPA. Why not make that clear in the goal section rather than vaguely stating the “appropriate risk-based screening levels”?	The document has been revised to clearly state that XRF and laboratory results will be screened against the EPA RSLs for the residential scenario.
8	SAP, Strategy	The strategies are qualitative. For example, statements such as “visually observe” or “obtain vertical information.” Detailing how much sediment will be screened or the XRF readings that would correlate to high concentrations would be meaningful.	The document has been revised to clearly state the criteria that was used for the selection of sample locations and to better clarify how and how much sediment will be sampled. Both the XRF and laboratory analysis data will be tied to XY coordinates taken using a Trimble Geoplotter II. The depth and volume sampled will be recorded by the sampling team. This will allow for the NMED to quantitatively determine the distribution of metals along the Animas and San Juan rivers.

9	SAP, Methods	Sampling locations are not specific and appear to be subjective. This could potentially lead to sampling only at sediment hot spots without a true census of metals concentrations in sediment throughout the basin.	The document has been revised to outline the criteria followed for selection of sample locations, which included colocation of samples with samples collected by Church et al. (2007) and EPA during the GKM spill response and the 2016 Spring Runoff sampling. There are locations along the length of the Animas River and a segment of the San Juan River and include upstream locations on the rivers and three tributaries (North Fork Cement Creek, Cement Creek, and Mineral Creek). Figures illustrating the proposed sample locations are in the revised QAPP  Actual sample locations may vary from what is proposed in the plan. A variety of factors in the field, including access and stream flow, may limit the sample team's ability to get to a certain point. In the scenario of needing to omit or move a proposed sample location, the reasons for the change will be documented by the sample team.
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<b>Reviewer:</b>		Citizens Advisory Committee	
1	General	No Comments	
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<b>Reviewer:</b>		NNEPA	
1	SAP/QAPP	The sampling plan mentions sediment sampling along the San Juan River, but only the Animas River is mentioned in the QAPP. Is NMED planning to sample along the San Juan River? Also, will there be any sampling in irrigation canals?	Sampling will be conducted along the Animas and San Juan Rivers. The document has been revised to include sample location maps.  No sampling irrigation canals is planned as part of this assessment. The NMED is anticipating funding through a multi-purpose grant with the EPA that will fund irrigation ditch sediment sampling, as well as crop tissue sampling. This sampling effort will be covered in a separate, stand-alone QAPP document submitted following grant award.
2	SAP/QAPP	The sampling plan mentions that sediment samples may be taken from trenches and/or cores, but neither are mentioned in the QAPP. The purpose was to get a better understanding of historic deposition (either from past mining or natural geologic sources). Is this still planned?	The document has been revised to clarify that samples will be collected at the ground surface and at depth in order to obtain an understanding of the vertical and horizontal distribution of contaminated sediment. Samples collected at depth will be collected using either a shovel or an auger and will be advanced until refusal is encountered or a depth of 18-inches, whichever is encountered first.
3	SAP/QAPP	Assuming that there are differences in detection limits between the XRF and lab analysis, how will you address non-detects if a sample has metal concentrations above one detection limit but below the other?	It is expected that there will be a strong correlation between the handheld XRF and laboratory analyses, across the range of concentrations (including close to the XRF detection limit) for the prepared XRF samples and the laboratory samples. The study will be assessing the correlation and comparability of in situ and field XRF measurements with laboratory concentrations. Sample measurements at or below the XRF detection limit will be treated as non-detects in the correlation study.
4	SAP/QAPP	The list of supplies on page 4 of Appendix A includes aluminum drying pans. Given the importance of aluminum as a metal of concern from the spill, is there another type of drying pan available?	Appendix A has been revised to clarify that samples will be air-dried using polystyrene weighing dishes in order to prevent potential influence of an aluminum drying pan. Samples will be weighed daily and will be considered dry when there is no change in the weight of the sample between measurements.
5	SAP/QAPP	Only four metals were listed as being used for the XRF/lab analysis correlation. Is the XRF capable of measuring other metals? If so, what are they and will results be available for them as well?	The XRF is capable of measuring the following elements: V, Cr, Fe, Co, Ni, Cu, Zn, W, Hg, As, Se, Pb, Bi, Rb, U, Sr, Y, Zr, Th, Mo, Ag, Cd, Sn, Sb, Ti, Mn, Mg, Al, Si, P, S, Cl, K, and Ca. The four metals listed are the primary contaminants of concern that we will correlate, at a minimum. All measured metals will be reviewed and correlations will be completed for metals with concentrations greater than their respective EPA residential RSL.
6	SAP/QAPP	The emphasis seems to be sampling during periods of low flow. Will samples be collected from both the visible river bed and depositional areas on the bank/floodplain?	The NMED is targeting low flow conditions so that we can maximize our ability to access low-energy depositional environments like sand bars and sections of river bed. Sample locations have been selected to target river bank, floodplain, sand bars, and river bed based on a review of the fluvial geomorphology.
8	SAP/QAPP	No time frames are put forth in the documents. Is there a set period over which samples will be collected (e.g., winter 2016-2017, next years, etc.)?	The samples proposed in this assessment will be collected during the same mobilization event for sampling. This will provide a robust dataset that can be used to set a baseline for the time of sampling. The scheduled start date for this assessment is September 26 <sup>th</sup> and we anticipate taking a full week to complete the sampling. The document has been revised to indicate schedule.
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<b>Reviewer:</b>		USGS	
1	SAP, Background, 2 <sup>nd</sup> Paragraph, Last Sentence	"...gray and black." Is this relevant to the study? It seems like it would be. You should defined record Fe, Mn to see how those relate to As, Pb, and Al	The sampling and analysis plan has been combined with the QAPP for clarification and simplification. The document has been revised to clarify that concentrations will be recorded for the full range of elements that the DELTA Premium GeoChem Plus XRF analyzer is capable of measuring. This includes both iron (Fe) and manganese (Mn).
2	SAP, Strategy, Item 3, 3 <sup>rd</sup> Line	"...cadmium..." Aluminum?	The document has been revised to clarify that detected metal concentrations will be screened against the EPA residential RSL and will not be limited to just the elements listed in the original sampling and analysis plan.
3	QAPP, Section 2.1.3	I suggest this ["Rinse with de-ionized water"] because tap water may have detectable levels of elements of concern.	The QAPP has been revised to reference the use of DI water for decon of equipment instead of tap water.

4	QAPP, Section 2.3.3, 1 <sup>st</sup> Sentence	Is this method using an XRF? If not, you may find difference results due to method biases.	The analytical method to be used by the laboratory is for inductively coupled plasma (ICP). There are numerous studies that show there is no statistical difference between handheld XRF and ICP analyses when samples are prepared the same way.
5	QAPP, Appendix A, SOP, Section 2.2, 4 <sup>th</sup> Sentence	"...lead, arsenic, and aluminum..." Why only these three? It might be helpful in the long run to record all data.	The sampling and analysis plan has been combined with the QAPP for clarification and simplification. The document has been revised to clarify that concentrations will be recorded for the full range of elements that the DELTA Premium GeoChem Plus XRF analyzer is capable of measuring.
6	QAPP, Appendix A, SOP, Section 4.2, Last Sentence	"...estimated." This can be somewhat estimated by comparing the wet weight to the dry weight.	The document has been revised to clarify that the moisture content will be estimated through a comparison of the wet sample weight to the dry weight.
7	QAPP, Appendix A, SOP, Section 10.1, 2 <sup>nd</sup> to Last Paragraph, Last Sentence	"...for lead, arsenic, and aluminum..." Again, why only these three elements? I understand that these are the most important, but having the data for all elements could prove useful in the long term.	The sampling and analysis plan has been combined with the QAPP for clarification and simplification. The document has been revised to clarify that concentrations will be recorded for the full range of elements that the DELTA Premium GeoChem Plus XRF analyzer is capable of measuring.
8	QAPP, Appendix A, SOP, Section 10.1, Last Paragraph, 2 <sup>nd</sup> Sentence	"...aluminum drying pan..." Will this be an issue since you are scanning for aluminum?	Appendix A has been revised to clarify that samples will be air-dried using polystyrene weighing dishes in order to prevent potential influence of an aluminum drying pan. Samples will be weighed daily and will be considered dry when there is no change in the weight of the sample between measurements.
9	QAPP, Appendix A, SOP, Section 10.1, Last Paragraph, Last Sentence	Will you measure the total dry sample with the XRF prior to sieving? That will help to understand if there were moisture effects.	The document has been revised to clarify that a dry weight will be measured for each sample prior to sieving.
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<b>Reviewer:</b>		EPA Region 6	
1	General	EPA acknowledges the use of X-ray fluorescence (XRF) technology as a screening method with confirmatory analysis (EPA Method 6200, Section 1.2) The XRF method detection limits may not be adequate to meet the Data Quality Objectives (DQOs) of the sampling.	The data collected during this assessment will be used to identify the location and nature of contaminated sediment along the Animas and a portion of the San Juan River. In order to meet this data objective, it is important that the detection limit for both the handheld XRF analyzer and the laboratory method are sufficiently lower than the screening level being applied to the data. A comparison of the EPA residential RSLs, the screening level being applied by the NMED for this assessment, and the detection limit of the handheld XRF The document has been revised to better clarify the data quality objectives for this assessment and to address the detection limit of the handheld XRF analyzer.
2	General	EPA Method 6200 cautions XRF users of the method of the potential for interference between arsenic and lead. The spectrum overlap of arsenic and lead may cause interference in the quantitation of these elements if lead levels exceed arsenic levels by a ratio of 10:1 or more (EPA Method 6200, Section 4.7). If a site is encountered that contains lead at concentration greater than ten times the arsenic concentration, it is advisable to analyze the samples using other techniques (e.g., atomic absorption spectrophotometry (AAS) or inductively coupled plasma-atomic emission spectrophotometry (ICP).	The document has been revised to clarify that for XRF samples that have on-site handheld XRF measurements of lead concentrations greater than 10 times the arsenic concentration, a sample will be collected for laboratory analysis. The laboratory samples will be analyzed using ICP.
3	General	EPA recommends an expansion of the Data Quality Objectives (DQO) section (Section 1.2) of the Quality Assurance Project Plan (QAPP). Section 1.2 should present the entire seven step of the DQO process ( <a href="https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf">https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf</a> ).	The document has been revised to add a Table 3-1 with the seven steps of the DQO process and outputs.
4	General	EPA recommends that the information contained in the XRF Sampling Plan and Appendix A – Standard Operating Procedure (SOP) documents be incorporated into the QAPP. Since the plan is to follow the EPA Method 6200, a standalone XRF SOP is not needed. EPA recommends that the sampling methods outside of EPA Method 6200 referenced in the Sampling Plan and the XRF SOP should be incorporated into the QAPP.	The QAPP has been revised to combine the sampling and analysis plan and the QAPP. The SOP has been kept as a separate document so that it can be easily revised and included in other project planning documents as work continues on the NMED GKM Long-Term Monitoring Plan.
5	General	The EPA recommends that Regional Screening Levels (RSLs) for residential soil being proposed may not be the appropriate screening level for all sampling locations. The RSL for residential soil assumes substantial soil exposure (i.e., long-term (26 years), daily soil (350 days/year) from exposure pathways for ingestion, dermal exposure and inhalation). The locations such as those along Animas River that will be accessed by river raft and railroad permit do not lend themselves to the RSLs for residential soil and would be typical of a recreation exposure scenario.	The NMED believes that the EPA residential RSLs are the most appropriate screening levels for our stakeholders. While the NMED understands and agrees that the primary use of the Animas River in the Upper Animas River Basin is recreational, sediment found in this reach of the river have the potential to be resuspended and transported into Durango, Colorado and Aztec and Farmington New Mexico, for example, where we have residential risk scenarios. Due to the potential risk stemming from the transport and redeposition of the sediment, the NMED will continue to apply the EPA residential RSLs for all samples as it is the most protective approach for our residents.
6	General	As this QAPP identifies a non-random sampling approach, EPA recommends that further details be provided regarding sampling locations targeted under this plan. For instance, it is assumed that due to moisture interferences, samples collected from the river (inundated bed sediment) will not be screened in the field and that XRF collections will occur from drier river margins and inland. However, this is unclear. Language is recommended to help orient the sampler to intended sampling locations. Additionally, please clarify locations that might not be considered for sampling such as disturbed areas or areas devoid of finer sediments, if intended.	The document has been revised to clarify the criteria used for sample locations and sample locations. Samples will have a range of moisture content depending on sampling location, ranging from wet to dry. There will be on-site screening of samples with the handheld XRF, in addition to dry sample analysis following EPA Method 6200 and off-site laboratory analysis.

7	SAP, Background	This document recognizes that “metal-laden water had long-been released into the Animas River watershed by natural geologic sources and by legacy mining and milling operations.” As such, the ability of this sampling program to distinguish between metals historically released into the Animas River and those released on August 5, 2015 will be difficult if not impossible, to distinguish. The presence of ongoing releases from 48 historical mines and mining-related sources in the upper Animas River watershed is rationale for the listing of the Bonita Peal Mining District site in Colorado on the National Priorities List (NPL).	The document has been revised to clarify the objectives of this assessment.
8	SAP, Goal	The goal of the project is to identify and investigate potential hot spots of metal contaminated sediment along the Animas and San Juan Rivers. What concentrations of metals is being used to designate a location as a “hot spot?”	Metals concentrations greater than the EPA residential RSLs will be used to define a “hot spot” as this sediment poses a potential risk for residents in Colorado and NM. The document has been revised to clarify.
9	SAP, Strategy, Item 1	What is the purpose of collecting samples from auger holes or hand-dug trenches?	Samples collected at depth will provide a vertical distribution of metal contamination. Additionally, sampling at depth may also provide the data needed to delineate contamination from historic mining activities verses contamination from the GKM Spill. For example, if orange-colored sediment is encountered at depth immediately adjacent to a layer of cobbles, it can be reasonably assumed that sediment is from the August 2015 spill event and not historic mining activities.
10	SAP, Strategy, Item 2	EPA Method 6200, Section 4.3 cautions XRF users that moisture content may be a major source of error when analyzing samples of soil or sediment that are saturated with water. What provisions will be taken to dry the samples or standardize the moisture content of samples to minimize the error resulting from the moisture content of the sample?	Wet sample weights will be measured along with dry weights so that moisture content can be estimated. Estimated moisture content, along with a comparison of the on-site handheld XRF measurement, the EPA Method 6200 measurement, and the laboratory sample results will allow for an evaluation of the interference of moisture content on wet sample readings.
11	SAP, Strategy, Item 3	The EPA recommends that Regional Screening Levels (RSLs) for residential soil being proposed may not be the appropriate screening level for all sampling locations. The RSL for residential soil assumes substantial soil exposure. The locations such as those along Animas River that will be accessed by river raft and railroad permit do not lend themselves to the RSLs for residential soil and would be typical of a recreation exposure scenario.	The NMED believes that the EPA residential RSLs are the most appropriate screening levels for our stakeholders. While the NMED understands and agrees that the primary use of the Animas River in the Upper Animas River Basin is recreational, sediment found in this reach of the river have the potential to be resuspended and transported into Durango, Colorado and Aztec and Farmington New Mexico, for example, where we have residential risk scenarios. Due to the potential risk stemming from the transport and redeposition of the sediment, the NMED will continue to apply the EPA residential RSLs for all samples as it is the most protective approach for our residents.
12	SAP, Strategy, Item 4	What field XRF reading will be used to determine if toxicity characterization leaching procedure (TCLP) analysis will be conducted on the sample?	The document has been revised to remove references to TCLP. The NMED does not intend to collect TCLP samples at this time.
13	SAP, Methods	What is the purpose of vertical inspection and XRT testing of the shallow trench of approximately 18 inches? What specific EPA Method SW-846 Method will be used to analyze for total metals (i.e., Method 6010 B)?	Samples collected at depth will provide a vertical distribution of metal contamination. Additionally, sampling at depth may also provide the data needed to delineate contamination from historic mining activities verses contamination from the GKM Spill. For example, if orange-colored sediment is encountered at depth immediately adjacent to a layer of cobbles, it can be reasonably assumed that sediment is from the August 2015 spill event and not historic mining activities.  Laboratory samples will be analyzed using 200.7 and 200.8 following the EPA Method SW 846 (ICP). The document has been revised to clarify.
14	QAPP, Section 1.0, 2 <sup>nd</sup> paragraph	...provides that the elements of the proposed sampling and analysis associated with this work element in the NM LTMP. However, neither the QAPP nor the Sampling and Analysis Plan identifies the referenced work element in the October 2015, New Mexico Long Term Monitoring Plan. Please consider adding text that directly references the work element in the NM LTMP.	The document has been revised to indicate the proposed assessment is being completed to address data gaps relevant to LTMP Work Elements 3 and 4.
15	QAPP, Section 1.1	...indicates that the principle elements of the proposed sampling and analysis associated with the work elements in the NM LTMP are to "identify hot spots of impacted soil and sediment with the Animas River and its floodplain." We've reviewed the October 2015 New Mexico Long Term Plan and have found no reference to the identification of “hot spots,” impacted soils and sediment within the Animas and its floodplain. The NM LTMP, Monitoring Elements, No. 3 Sediment (Stream, Irrigation Ditches and Irrigated Croplands, discusses “Initial and periodic future sampling, especially after runoff/storm events, of surface water sediment and irrigated soils for heavy metals and evidence of increasing concentrations migrating into NM from CO.” However, the objective of this particular element seems to differ from the stated objective of the QAPP and Sampling and Analysis Plan. Consequently, please consider providing a clear crosswalk between the NM LTMP, QAPP, and Sampling and Analysis Plan to avoid future confusion regarding the stated objectives.	The document has been revised to indicate the proposed assessment is being completed to address data gaps relevant to LTMP Work Elements 3 and 4. The proposed assessment does not completely fill the data gaps for the referenced work elements but instead provide a critical first evaluation of the distribution and character of contaminated sediment so that the NMED can better plan and protect our residents and stakeholders.
16	QAPP, Section 1.2	...provides that the principle quantitative data quality objectives (DQOs) requiring quality assurance are to determine the presence or absence of heavy metals at detection limits that are equal to or less than screening criteria for the residential risk scenario and determine the presence or absence of heavy metals that are equal to or less than the screening criteria for the residential risk scenario. Please consider defining and providing these values.	The document has been revised to include a table (Table 3-2) with limits of detection for the handheld XRF analyzer and the respective EPA residential RSLs.
17	QAPP, Section 1.2, Last paragraph	...provides that the quantitative DQOs will be determined by the method detection limits (MDLs) and reporting limits (RLs) to be specified by the analytical laboratory, Scientific Laboratory Division (SLD) MDLs and RLs are highly dependent upon the sample matrix and concentrations of target constituents present. While this statement and paragraph is accurate, the SLD should be able to provide ranges of MDLs and RLs that they may be able to achieve. Additionally, there is no mention of XRF detection limits for the targeted analytes which will vary on the period of excitation.	The document has been revised to include a table (Table 3-2) with limits of detection for the handheld XRF analyzer and the respective EPA residential RSLs.
18	QAPP, Section 1.2, Data Quality Objectives	EPA recommends an expansion of this section to present the entire seven step of the DQO process ( <a href="https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf">https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf</a> ). The EPA recommends that Regional Screening Levels (RSLs) for residential soil being proposed may not be the appropriate screening level for all sampling locations. The RSL for residential soil assumes substantial soil exposure. The locations such as those along Animas River that will be accessed by river raft and railroad permit do not lend themselves to the RSLs for residential soil and would be typical of a recreation exposure scenario.	The document has been revised to add a Table 3-1 with the seven steps of the DQO process and outputs.

19	QAPP, Section 2.0, Data Generation and Acquisition	The QAPP states that <i>The nature and extent of contaminated soil and sediment resulting from the GKM spill that occurred on August 5, 2015 will be defined by observation, portable XRF, and off-site laboratory analysis.</i> However, the sampling and analysis approach, as identified in the QAPP and Sampling Plan, cannot differentiate between historic and on-going metals releases to the Animas River and those released to the Animas River on August 5, 2015. Visual observation, XRF analysis and laboratory analysis does not distinguish between these potential sources of metals. Results will reflect the sum of all sources of metals, natural and anthropogenic. Consequently, please consider providing a scientific hypothesis for delineating the nature and extent of contaminated soil and sediment resulting from the GKM spill from past mining activities.	The document has been revised to add a Table 3-1 with the seven steps of the DQO process and outputs, including clarification of the assessments problem statement and goals.
20	QAPP, Section 2.1, Sampling Methods	The QAPP states that information regarding general sampling procedures and collection techniques follow the SOP. Upon examining the SOP, several references are made to homogenized samples. It is recommended that a description of the technique to homogenize the samples be included in the SOP and QAPP (preferred) in addition to a level of effort needed to homogenize a sample. These descriptions would better standardize the process in the field and reduce variability and differing levels of effort by multiple samplers. Homogenization, as stated in section 11.4 of EPA Method 6200, has the greatest impact on the reduction of sampling variability.	Samples will be homogenized following the procedures specified in EPA Method 6200. No changes will be made to the QAPP or SOP as they already point to the EPA Method 6200 document and relevant procedures. No sample homogenization will happen in the field, as the intent is to collect an in situ reading that can be used for screening sediment. Table 3-1 outlines the DQO process and clarifies the intent of the various sample measurements and analysis.
21	QAPP, Section 2.1	It is recommended to identify any training or certification needed by field staff to operate the XRF analyzer and GPS (The use of a GPS is identified in the sampling plan, not the QAPP). Please note that EPA Method 6200 states that procedures are written <i>based on the assumption that they will be performed by analysts who are formally trained in at least the basic principles of chemical analysis and in the use of the subject technology.</i> Additionally, as stated in Section 1.5 of Method 6200, <i>Use of this method is restricted to use by, or under supervision of, personnel appropriately experienced and trained in the use and operation of an XRF instrument. Each analyst must demonstrate the ability to generate acceptable results with this method.</i>	The sample team will include NMED employees that have been trained and certified on the handheld XRF analyzer being used. The document has been revised to clarify the training or certification requirements for the sampling team.
22	QAPP, Section 2.1.1, 3 <sup>rd</sup> Sentence	...indicates that Portable XRF analyzer(s) will be utilized to screen soil and sediment for metals, specifically lead the primary constituent of concern. This statement isn't consistent with the GKM Sampling and Analysis Plan, Section 2 Goal, which indicates that "Metals concentrations will be measured systematically along the rivers, and in potential hot spots, for comparison with appropriate risk-based screening levels and with the Rule of 20 for the 8 TCLP metals." Please consider amending both documents to avoid any possible conflicts in the sampling goals.	The document has been revised to remove reference for TCLP as the NMED does not intend to collect samples for TCLP analysis at this time.
23	QAPP, Section 2.3.1, Analytical Methods	XRF measurement times are not defined in the QAPP, SAP or SOP. Identifying source measurement times, or ranges of times, would allow a reviewer to better evaluate the data quality objectives. For instance, will short source measurement times be primarily used for hot spot delineation and quick screening or will longer source measurement times be employed to meet higher precision and accuracy goals? If both, is there a trigger level which would signal the use of longer/shorter measurement times? Furthermore, last paragraph, second sentence, indicates that some number of samples may be collected and sent for laboratory analysis for the Toxicity Characteristic Leaching Procedure (TCLP) following SW-846 Test Method 1311 for TCLP. The Sampling and Analysis Plan, Section 2 Goals, calls for 1 in 20 samples will be analyzed in the laboratory. Furthermore, the GKM Standard Operating Procedure, Appendix A, calls for a field and laboratory XRF analysis.	The document has been revised to clarify the XRF beam measurement times and configuration.
24	QAPP, Section 2.3.3, XRF and Off-Site Laboratory Correlation Analysis	Aluminum is identified as one of four metals for which correlation analysis between XRF results and off-site laboratory will be determined. Please note that Aluminum is not included in the Scope and Application of Method 6200. Section 1.1 of Method 6200 states: <i>Some common elements are not listed in this method because they are considered "light" elements that cannot be detected by field portable x-ray fluorescence (FPXRF). These light elements are: lithium, beryllium, sodium, magnesium, aluminum, silicon, and phosphorus.</i> Therefore, it is recommended that Aluminum be excluded from the suite of parameters to be evaluated using XRF. This comment also applies to the SOP. Furthermore, third paragraph, indicates that a plot of the data will include points for XRF, a best-fit linear regression equation, and the correlation coefficient ( $r^2$ ) to illustrate the relationship between the XRF and laboratory results. A good correlation will be represented by an $r^2$ value greater than 0.9. However, the correlation coefficient ( $r$ ) for the results should be 0.7 or greater for the FPXRF data to be considered screening level data. If the $r$ is 0.9 or greater and inferential statistics indicate the FPXRF data and the confirmatory data are statistically equivalent at a 99 percent confidence level, the data could potentially meet definitive level data criteria. See Section 9.7, EPA Method 6200; and fourth paragraph, indicates that the relative percent difference (RPD) between the off-site laboratory and the XRF result will be calculated as a measure of accuracy. An RPD of 50% will be considered as acceptable. The XRF and laboratory results are seemingly being treated as field duplicates but with differing analytical methods. Field duplicates consist of two samples (an original and a duplicate) of the same matrix collected at the same time and location, to the extent possible, using the same sampling technique. The purpose of the field duplicate is to evaluate the precision of the overall sample collection and analysis process through the calculation of the RPD for duplicate pairs. While a sampling program can select a RPD of any value, typically, we see 30 percent as acceptable RPD. However, a RPD of 50 percent seems considerably high but may simply reflect the state's acknowledgment of the anticipated impression of the XRF method.	The NMED has purchased a handheld XRF instrument and processing software capable of measuring metal concentrations for the primary metals of concern, including aluminum. The limit of detection of the DELTA Premium GeoChem Plus Analyzer for aluminum is 140 to 1,400 mg/kg which is sufficiently lower than the EPA residential screening level of 7,700 mg/kg.
25	QAPP, Appendix A, SOP, Section 1.0, Scope and Application	Table 1 of the SOP was not provided for review.	Appendix A, SOP has been revised to include Table 1.

26	QAPP, Appendix A, SOP, Section 4.1, Chemical Matrix Interferences	If a locations are encountered that contains lead at concentration greater than ten times the arsenic concentration, it is advisable to analyze these samples using other techniques (e.g., AAS or ICP).	The document has been revised to include the collection of a sample for laboratory analysis when the on-site XRF analysis indicates a lead concentration ten times or more greater than arsenic.
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