Borehole Geophysics Proposal Considerations		
1	Do the data quality objectives and scope of work meet the project objectives?	
2	Does the proposal specify the equipment and order of tools to be used (for example, equipment model, software version)?	
3	Is the tool appropriate for the site?	
	Has the tool matrix (resolution, scale, targets, weaknesses/limitations of tool) been reviewed to determine tool applicability?	
	Has the considerations for the tool checklist been evaluated to determine tool applicability?	
	What site conditions may prove challenging for implementation?	
	What potential is there for false positive signals? What are they and have they been tested for response?	
	What is the methodology for QA/QC in field and during post-processing?	
	Are there any deviations or recommendations from a requested suite of tools with supporting justification?	
4	Has a rationale for survey design been provided?	
	Has (or will) the proposer reviewed background information for the site (for example, geologic and hydrogeologic maps, previous studies, geography, aerial photographs, site history, historic fire insurance maps)?	
5	Does the proposal provide a description of the workflow process?	
	How the tool will be implemented?	
	What method will be used to ensure data location accuracy?	
	Does the proposal address several “what if” scenarios to deal with special issues?	
	Is there flexibility in the proposed work to expand the footprint and depth of the investigation?	
	Is there a plan and budget for targeted confirmatory sampling when unexpected, interesting, or questionable responses are observed?	
6	Does the proposal comply with safety requirements for the site?	
	What safety concerns may make the site unusual?	
	Are field personnel properly trained?	
7	Does the proposal specify the data deliverables?	
	Will raw data digital files be provided?	
	Will locational data be provided (for example, will I be able to relocate the area at a later time?)	
	Will copies of field notebooks be provided?	
	Will a report or memo summarizing the investigation and data interpretation be provided?	

Borehole Geophysics Proposal Considerations		
8	Does the proposal provide detailed costs?	
	Are subcontractors identified?	
	Are proposed hours appropriate?	
	Are equipment costs appropriate?	
	Are commodities/supplies appropriate?	
	Has a comparison of costs per day versus production (feet/day) per day been conducted to see which is likely to be more cost effective?	
9	Does the proposal provide a clear project timeline?	
10	What is the contractor's level of experience?	
	Are resumes provided?	
	Are references and other projects of similar scope provided?	
11	Are any permits are required?	
12	What are the insurance requirements?	

Borehole Geophysics Report Considerations		
1	Is there a summary of the tools and methods utilized?	
2	Does the report include limitations that constrained the study physically (for example, interferences, safety considerations, access) or due to other reasons beyond control of the contractor?	
3	Was the solicited scope of work followed as requested or were there deviations from the scope that were performed? If so, is there adequate justification for the deviations and was the user aware of them/approving of them in advance?	
4	What type of post processing was performed on the data? Does the report summarize the methods and assumptions used?	
5	What type of QA/QC was performed? Were there QA/QC steps in the field that were adequately followed? Was there data processing/interpretation QA/QC performed and is it described? Were there any deviations from the QA/QC plan?	
6	How are borehole logs provided?	
	How soon are draft borehole logs provided? Typically can be provided within 1-2 days. If targeting areas for sampling or determining the need to seal off a borehole, you may need to know potential flow zones ASAP depending on your site	
	When are legible finalized borehole logs be provided? Each borehole will have all of the data compiled into a format that should be easily interpreted. Depending on the suite of tooling used this could be one final log or multiple. Typically ATV and OTV are compiled onto one for comparison. Scale should be of such that features can be easily identified.	
7	Is there a narrative summary of the findings and results?	
	Is there a description of the types of responses observed, their potential origins, and whether they were confirmed with sampling?	
	Is there a description of lines of evidence observed to support/refute on-site interpretations?	
	Were there any limitations of the technology (were there any suspected false negatives)?	
	Were fracture traces and interpretation (for example, orientation/open/closed, fluid filled, dip/aperture) provided?.	
	Was fracture analysis performed, and are rose diagrams and stereonet plots provided?	
	Are there recommendations for follow-up sampling locations if definitive confirmation was not accomplished during the `investigation?	
8	Are raw data files provided?	
	Are summary tables of logs and identified features provided?	

Borehole Geophysics Report Considerations		
	Are logs presented in at least two appropriate scale factors (typically very low for absence/presence determinations and high for semi-quantitative site-wide comparisons of impact)?	
	Are raw WellCad files provided?	
9	Is there at least one plan view figure of the study area and the transects?	
10	What types of graphics are provided to illustrate the findings? Are there 2D or 3D profiles of responses with adequate scale, color ramp definitions?	

Borehole Geophysics Quality Control		
1	Log repeat/duplicate runs. What logs are repeated, footage rate are they completed at, and how often?	
2	HPFM requires multiple measurements (3+) at each elevation to confirm readings collected	
3	3-arm caliper results can be compared to results from the acoustic televiewer (ATV) or video survey. ATV results can be utilized to generate a caliper log for a borehole.	
4	Repeat data collection at casing/bedrock interface. Steel casing will influence orientation of some logs/distort results due to internal magnetometer.	
5	Necessary calibration procedures for tools and calibration checks	
6	Start and end elevation footage for measurements. These should be the same to make sure the winch did not slide and/or cable did not stretch	
7	Decontamination procedures (if applicable to your site). Clean tooling	
8	Compare with lithologic logs, do the contact or lithologic changes match depth wise	
9	Inspect equipment – does it appear clean and in good working order	
10	Site cleanup and proper equipment security	

Borehole Geophysics Fluid Temp/Res, Formation Resistivity, ATV/OTV, and Gamma Considerations		
1	Do open boreholes exist that can be logged? While the cost to implement the standard suite of geophysical tools is relatively reasonable, installation of boreholes/wells may be a significant cost to consider depending on subsurface conditions.	
2	Do you have access to the borehole? The equipment is heavy and requires a power source; therefore, you need to be able to get the equipment to the borehole location. Some contractors can only log from a vehicle, while others have remote logging capabilities.	
3	Is the borehole open or is it cased? Some tools require an open borehole to collect measurements. OTV illuminates and collects a direct image of the borehole wall; therefore, logging of a cased borehole would only provide an image of the casing. While the ATV sends out an acoustic signal to generate an image of the borehole, the signal will not effectively travel through casing materials. In addition, steel casing within boreholes can have an adverse effect on image quality for both the OTV and ATV. The borehole image generated by both tools is orientated to north by use of an internal magnetometer, which is influenced when in proximity of the steel casing and requires correction during post-processing of the data.	
4	Is there information available regarding regional/local lithology? Soil types and mineralogy can affect the response for some tools, such as gamma, and proper analysis requires an understanding of the possible soil types that may be present.	
5	Is the borehole fluid filled? Some probes must be submerged in water or light mud-filled intervals of boreholes to transmit and measure signals. Information regarding native formation fluids should be considered as pore fluid salinity/TDS can result in differing response for some tools. Fluid clarity is of concern for OTV as this tool collects a direct image of the borehole wall. Dark or cloudy fluid may not facilitate image collection with the OTV. ATV requires a fluid filled borehole to transmit acoustic signal.	
	Boreholes can be dry for temperature logging and will provide a direct measurement of fluid temperature within the formation.	
	Borehole can be logged while in equilibrium under ambient conditions or when a stress is applied. If conditions in the borehole haven't equilibrated, some of the smaller temperature/resistivity fluctuations may not be evident in the logging results. Logging under pumping conditions may enhance identification of water-bearing zones.	
6	What is the diameter of the borehole? Minimum/maximum diameter for operations of tools. Need >2-inch diameter borehole for most of the tooling and in general the ideal diameter is between 4 and 8 inches.	

Borehole Geophysics Fluid Temp/Res, Formation Resistivity, ATV/OTV, and Gamma Considerations		
7	Is the borehole straight and stable? Unstable and/or uneven borehole walls can result in collapse or the tool getting stuck. These specialized tools are expensive to replace if damaged or lost down a well. The original borehole diameter and any deviations in the borehole diameter are important considerations for proper log analysis as well. Uneven borehole diameter can also result in an adverse effect on image quality. Some of the tools rely on centralizers to keep the tool evenly spaced between the borehole walls. Deviation from the center of the borehole will result in distortion of the image or misinterpretation of the results.	
8	Do you have Safe working area/conditions? Understanding of work zone, contaminants (if applicable), long hours [work at night?]?	

Borehole Geophysics Heat Pulse Flowmeter or Impellert Considerations		
1	Do open boreholes exist that can be logged? While the cost to implement geophysical tools is relatively reasonable, installation of boreholes/wells may be a significant cost to consider depending on subsurface conditions. Open boreholes should be drilled and logged before the tool is utilized.	
2	Do you have access to the borehole? The equipment is heavy and requires a power source; therefore, you need to be able to get the equipment to the borehole location. Some contractors can only log from a truck, while others have remote logging capabilities.	
3	Borehole should be flushed of drill cuttings/sediment and needs to be fluid filled to measure groundwater flow	
4	Have potentially transmissive zones been identified? Borehole needs to have been logged using other geophysical tools, such as caliper, ATV, fluid temp/resistivity, or video, so that potentially transmissive zones can be targeted for flow measurements.	
5	Is there a general understanding of fluid flow within the formation? The limits of detection for the heat pulse flowmeter ranges from 0.03 gpm to 1.0 gpm. Use of the impeller flowmeter is typically required for rates greater than 1.0 gpm. This needs to be considered and evaluated during the logging process to ensure all zones of flow are identified and the objectives of the investigation are met.	
6	Are the flow measurements are going to be collected under stressed/pumped conditions? Are proper management of investigation derived waste needs to be considered?	
7	What is the diameter of the borehole? Need >2-inch diameter borehole for most of the tooling and in general and there are limitations on how large the borehole can be. The ideal diameter for boreholes ranges from 4-8 inches.	
8	Is the borehole straight and stable? Unstable and/or uneven borehole walls can result in collapse or the tool getting stuck. These tools are expensive, and no one wants to lose one down a borehole ($$$$). Uneven borehole diameter can also result in an adverse effect on image quality. The tools both rely on centralizers to keep the tool evenly spaced between the borehole walls. Deviation from the center of the borehole will result in distortion of the image, especially with the ATV tool.	
9	Is the working area/conditions safe? Understanding of work zone, contaminants (if applicable), long hours [work at night?]?	

Borehole Geophysics Nuclear Magnetic Resonance Considerations		
1	How are NMR data acquired? NMR logs can be acquired in open boreholes, using Geoprobe direct-push methods, or in wells constructed with nonconductive casings or screens (for example, PVC). When logging in open boreholes, a temporary casing is recommended if the borehole could potentially be unstable (unconsolidated material). There is no requirement for the borehole to be fluid-filled.	
2	Are you in a highly industrialized area? Industrial “noise” such as power lines and electric generators in the proximity of the logging location can interfere with NMR signals.	
3	What is the diameter of the original borehole and well casing? Various NMR tools are designed to accommodate different well casing diameters, and each will have a corresponding maximum sensitive shell diameter that must be greater than the original borehole diameter to collect data within the geologic unit of interest. Conversely, if conditions in the well’s annular space is of interest, select a tool with the appropriate sensitive shell diameter.	
4	What vertical resolution is necessary to identify features of interest? Different NMR tools provide different levels of vertical resolution ranging from 1 meter (approximately 3 feet) to less than ½ meter (1.5 feet or less).	
5	How many locations and vertical feet of logging are desired? NMR logging is a fairly slow process compared to other borehole geophysical methods. Logging rates of 15 meters per hour (approximately 50 feet per hour) are typical, and for some applications the logging rate is slower. Considering time for mobilization/demobilization and decontamination between wells, 60 to 75 meters (200-250 feet) is the maximum log production that should be expected in a typical work day for most near-surface applications. For deeper wells with a single mobilization greater log production is feasible.	
6	If self-performing the data acquisition, do you have staff trained on the use of the equipment? While designed to be user friendly, some level of training (typically 1-2 days) is needed to be proficient in data acquisition and processing. Alternatively, a geophysical service provider can rent the equipment and perform logging on your behalf.	
7	Do you have a secure location to store NMR tools when not in use? NMR tools are expensive (typically in the range of $250,000) so security and insurance requirements need to be considered while the equipment is in your possession.	

Borehole Geophysics Nuclear Magnetic Resonance Considerations		
8	Is the working area/conditions safe? Understanding of work zone, contaminants (if applicable), long hours [work at night?]. Be mindful of weather conditions, particularly electrical storms, that can affect data acquisition and cause damage to equipment. Be aware that the NMR tool contains powerful magnets that can disrupt pacemakers in the proximity of the tool.	