

**Nebraska Department of Environment and Energy
Standard Operating Procedure (SOP)**

**Water Quality Division
Water Quality Assessment Section – GW**

SOP Number: GW-061

Title: Quality Assurance/Quality Control (QA/QC) Groundwater Samples

Written Date: July 2024

Purpose: To achieve proper QA/QC of groundwater samples.

Equipment/Materials Needed:

- Appropriate groundwater sampling equipment as per SOP # GW-030, Appendix A
- Arrangement with an outside lab for surrogates, spikes, or reference samples, if desired

Procedures:

1. The following types of QA/QC samples are required for all groundwater sampling.
 - 1.1. Duplicates (Replicates): These samples consist of groundwater from a sampling site and are collected and handled at the same time and in the same manner as another regular sample. The results of these samples are compared against those of the appropriate regular sample.
 - 1.1.1. At a convenient site in the field, collect and handle duplicates in the same manner as all other samples.
 - 1.1.2. Label duplicate samples as per the examples in Appendix A.
 - 1.1.3. Collect at least 10% duplicates as compared to regular samples (i.e. at least one (1) duplicate for every 10 regular samples) OR 1 duplicate each day when at least 3 samples are taken.
 - 1.2. Field blanks: These samples consist of deionized water, prepared in the field, and preserved and handled in the same manner as regular samples. The results of the field blank analysis are compared against deionized water; that is, the blanks should exhibit levels below detection for all parameters. Detections of various parameters in field blanks can indicate the introduction of outside contaminants during the sampling process or from sampling equipment and supplies.
 - 1.2.1. Obtain adequate supply of deionized water in a clean multi-gallon container from the NDEE Bio Lab as per SOP # GW-030, Appendix A.

- 1.2.2. At a convenient site in the field, collect blanks from deionized water container, and handle them in the same manner as all other samples.
 - 1.2.3. Label field blanks as per the examples in Appendix A.
 - 1.2.4. Collect at least 10% field blanks as compared to regular samples (i.e. at least one (1) field blank for every 10 regular samples) OR 1 field blank each day when at least 3 samples are taken.
2. The following types of QA/QC samples can be used as necessary or desired. Use of these types of samples will be determined by the individual project manager.
 - 2.1. Trip (transport) blanks: These samples consist of deionized water, prepared at the laboratory immediately before leaving on a sampling run. The trip blanks are then placed in a cooler which will be filled by other samples; the trip blanks are handled in the same manner as other samples. Detections of various parameters in trip blanks can indicate introduction of outside contaminants during sample handling in the field or from containers.
 - 2.1.1. Immediately before leaving the lab on a sampling run (an individual sampling event or, in the case of an ongoing study, an individual week of sampling), collect trip blanks from the lab's deionized water container, and handle them in the same manner as all other samples.
 - 2.1.2. Label the trip blanks as per the example in Appendix A.
 - 2.1.3. Collect at least one (1) set of trip blanks for every sampling run. If problems are indicated in trip blank results, this number can be increased to no more than one (1) set of trip blanks per cooler or other multi-sample container.
 - 2.2. Equipment rinsate blanks: These samples are utilized only if a sampling device (pump, bailer, etc.) is used, and are taken to evaluate the likelihood, amount, and type of contamination which may be introduced into samples by the sampling device.
 - 2.2.1. At a convenient location, and after the device has been cleaned, fill the device with final rinse (usually deionized) water.
 - 2.2.2. Pump or drain the rinse water from the device, and fill sample containers in the same manner as all other samples.
 - 2.2.3. Label the sample containers as per the example in Appendix A.
 - 2.2.4. Collect at least 10% equipment blanks as compared to regular samples (i.e. at least one (1) equipment blank for every 10 regular samples) OR 1 equipment blank each day when at least 3 samples are taken.

- 2.3. Split samples (second laboratory samples): These are samples that are obtained at approximately the same time as regular samples and which are handled in the same manner as regular samples, but which are sent to a second or outside laboratory for analysis. The split samples are analyzed for the same parameters as the regular samples, and the results are compared.
 - 2.3.1. If a sample splitter is available, use it to split the discharge into two approximately equal streams. Collect two sets of samples at approximately the same time, handling them in the same manner.
 - 2.3.2. If a sample splitter is not available, collect individual samples, filling individual containers a third or half at a time and alternating between containers. Handle all sample sets in the same manner.
 - 2.3.3. Label individual samples as desired, generally using a format similar to examples in Appendix A and in SOP # GW-060, Appendix A.
 - 2.3.4. Collect split samples if problems with the regular laboratory are suspected, or if a higher degree of QA/QC is desired.
- 2.4. Spiked samples: These are samples into which a known amount of material is introduced, which will produce a known concentration of a certain parameter in that sample. The results of the sample analysis are then compared to the known concentration.
 - 2.4.1. Types of spiked samples
 - 2.4.1.1. Field spikes: These are spikes prepared in the field. Contact DHHS or other laboratory for specific instructions.
 - 2.4.1.2. Second laboratory spikes (known blinds): These are spikes prepared by a second laboratory and verified to provide a certain concentration of the parameter(s) of interest. These are similar to reference samples (see 2.5 below), except that they are prepared in the lab rather than in the field. Contact DHHS or other laboratory for specific instructions.
 - 2.4.1.3. Matrix (split) spikes: These are duplicate or split samples spiked with a known amount of material, which will provide a parameter concentration a known amount higher than that parameter in the regular sample. Contact DHHS or other laboratory for specific instructions.
 - 2.4.2. After deciding which type(s) of spikes to use, prepare them or have them prepared according to instructions. In general,

spikes should be added to fortify the sample in a range from 30 to 500% of the expected concentration.

2.4.3. Label spikes in a manner which conceals their purpose, e.g. label them with a fictitious name.

2.4.4. Handle spikes in the same manner as all other samples.

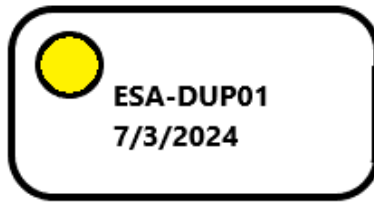
2.5. Reference samples: These are composed of a standard solution of a known concentration which is brought into the field. Then, at a suitable location, containers are filled with the standard solution, and handled in the same manner as all other samples. Analytical results are then compared to the known concentration.

2.5.1. At a convenient location in the field, fill sample containers with the appropriate amounts of standard solution.

2.5.2. Label reference samples in a manner which conceals their purpose, e.g. label them with a fictitious name.

2.5.3. Handle reference samples in the same manner as all other samples.

APPENDIX A. Examples of QA/QC sample container labels (Note: use appropriate color codes for various parameters as per SOP # GW-060, Appendix A).



Label for duplicate sample.



Label for a field blank.



Label for a trip (transport) blank.



Label for equipment rinsate blank.