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Plan

Idaho Cleanup Project Liquid Effluent Monitoring Program Plan

Idaho Cleanup Project

CH2M • WG Idaho, LLC is the Idaho Cleanup Project contractor for the U.S. Department of Energy

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ACRONYMS

CFR	Code of Federal Regulations
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ICP	Idaho Cleanup Project
IDAPA	Idaho Administrative Procedure Act
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LEMP	Liquid Effluent Monitoring Program
MCP	management control procedure
PDD	program description document
PER	permit
PLN	plan
PRD	program requirements document
QA	quality assurance
QC	quality control
SPR	sampling procedure
TPR	technical procedure
TRAIN	Training Records and Information Network

1. INTRODUCTION

1.1 Scope

This plan applies to monitoring nonhazardous, nonradioactive liquid effluents from Idaho Cleanup Project (ICP) facilities, operations, and activities at the Idaho National Laboratory (INL) Site. The plan addresses requirements in the Wastewater Reuse Permit (PER-143) issued by the Idaho Department of Environmental Quality (DEQ) and U.S. Department of Energy (DOE) environmental protection objectives.

1.2 Organization

This plan follows the guidelines of:

- EPA-QA/R-5, "EPA Requirements for Quality Assurance Project Plans"
- Program Requirements Document (PRD) -5093, "Management of Environmental Data"
- Management Control Procedure (MCP) -561, "Quality Program Plan/Quality Assurance Project Plan Development"

Table A-1 in Appendix A compares this plan to EPA-QA/R-5, PRD-5093, and MCP-561.

2. PROGRAM DESCRIPTION

To comply with the permit requirements and satisfy DOE environmental protection objectives, this plan can be divided into five implementation phases:

- Identification
- Characterization
- Determination of risk
- Monitoring
- Assessment.

The benefits to be gained from this plan with clearly identified phases are:

- Focused effort during each phase of monitoring
- Clearly defined decision points.

The following subsections briefly describe each phase and emphasize their key characteristics.

2.1 Identification

During the identification phase, a decision is reached as to whether the liquid effluent is derived from a process, activity, or source that has the potential to produce an adverse impact to the environment

or human health. This is achieved by process knowledge or by sampling. Decisions concerning the need to permit a liquid effluent waste stream are also made during this phase.

Although initial liquid effluent evaluations are of limited duration, the identification phase is an ongoing process. The criteria can be used to add or remove liquid effluent waste streams and to assess process changes that could affect existing waste streams. Liquid effluent monitoring data are periodically reviewed in accordance with MCP-9235, "Reporting Requirements for the Liquid Effluent Monitoring and Wastewater Reuse Permit Groundwater Monitoring Program," to ensure the other four phases of the plan are functioning properly and established criteria are still applicable to the program objectives.

2.2 Characterization

Once a liquid effluent waste stream has been identified, and it is determined that there is a source with the potential to introduce contaminants into the waste stream, the effluent must be characterized. The objectives of characterization are to provide data from which risk can be quantified and to establish baseline conditions for measuring change. Decision drivers are identified for each effluent stream. These decision drivers are either compliance or performance based. Compliance drivers are based on wastewater reuse permit limits and DOE Order 458.1 requirements for releasing liquids containing radionuclides to the environment. Performance drivers are based on the need to detect changes that indicate a loss of control or an unplanned release.

Each of these decision drivers has an associated time frame that must be considered. Compliance drivers are based on a compliance period that ranges from daily maximum concentrations to average annual concentrations. For others, the time frame for decisions is not defined by regulation, but by the need to identify changes in the process. The performance review period is based on a management decision concerning the frequency at which independent evaluation of system control and unplanned releases is necessary.

Characterization involves determining the volume and concentration characteristics of the waste stream. With this information, three key analyses are performed:

- What is the probability that a single measurement of a parameter can exceed a release level?
- What is the probability that the average concentration of a parameter can exceed a release level?
- What is the expected concentration and the variance of concentrations for parameters?

2.3 Determination of Risk

Once a liquid effluent stream has been characterized, the next step is to use the characterization data to design a monitoring scheme that is commensurate with the degree of environmental assurance associated with the effluent stream. The design approach is fully documented in *A Risk-Based Approach to Liquid Effluent Monitoring* (INEL-95/0499). This plan uses risk as the measure of the level of assurance needed.

Risk is defined to have two components:

- Likelihood—the probability of an adverse consequence
- Severity—the impact of an adverse consequence.

An adverse consequence occurs when the concentration of a parameter measured in a sample collected from a liquid effluent stream exceeds the corresponding release level.

The likelihood is the statistical probability that the concentration of a parameter will exceed the corresponding release level. Two probabilities are calculated:

- The probability that a single measurement could exceed the release level
- The probability that the average concentration could exceed the release level.

Release levels are not necessarily regulatory in nature, and so exceeding a release level may not result in a noncompliance. Some release levels for wastewater ponds at the INL Site are based on the effects of long-term chronic exposure, and so briefly exceeding a release level may not result in any human health or environmental impacts. Even in cases where the release level is based on compliance with a permit limit, compliance may be based on an average concentration over time. Rather than define severity in terms of noncompliance or the impact of noncompliance, severity is defined to be the time available to recover from exceeding a release level.

The calculated likelihoods and severities are used to evaluate risk, and decisions are made on the need to monitor, the appropriate frequency, and documented in Environmental Project Support files. Using this approach, this plan was designed to focus on risk and system performance. The frequency of sampling and the list of parameters are adjusted to address risk and to comply with permit conditions.

2.4 Monitoring

During the monitoring phase, data are gathered from effluent streams following the monitoring plan developed during the characterization phase. The monitoring data collected are periodically input to the decision process. The timing and frequency of the decision process generally will be driven by external factors such as wastewater reuse permit reporting requirements. In the decision process, monitoring data are compared to release levels and to historical data by answering the following:

- Does the concentration of a parameter exceed the release level set for this effluent stream?
- Does the concentration of a parameter indicate that a change has occurred?

The procedure by which monitoring data are compared to release levels and historical data are documented in *A Risk-Based Approach to Liquid Effluent Monitoring* (INEL-95/0499) and Environmental Project Support procedures. When release levels are exceeded or new data are not consistent with historical data, an assessment is initiated in accordance with MCP-9235.

Results of monitoring are documented in reports. A decision is made and documented in the report as to whether release levels of each parameter in each effluent stream have been exceeded and whether there is evidence of a change in the level of the parameter.

2.5 Assessment

The assessment phase runs concurrently with the monitoring phase. An assessment is initiated whenever monitoring results indicate an "out-of-control" condition. An out-of-control condition is indicated when a concentration exceeds a release level or when a concentration is outside the expected range of historical data.

An assessment is an activity conducted to reach a decision concerning the out-of-control condition. As such, it has specific time duration, involves well defined activities, and ends with a decision. Based on the assessment, an appropriate response action is initiated. The response could be "no action," recharacterize the effluent, or install a treatment technology.

3. REQUIREMENTS AND OBJECTIVES

This section discusses the requirements and objectives of liquid effluent monitoring conducted by the ICP at the INL Site. DOE orders identify additional objectives for effluent monitoring beyond demonstrating compliance with regulations. This section discusses how these additional effluent monitoring objectives are met.

MCP-3675, "Environmental Requirements Management," provides instructions for reviewing, identifying, interpreting, and implementing applicable environmental laws and regulations. Regulations are continually changing, so this plan is periodically evaluated to ensure that the program remains in compliance. Applicable federal regulations, State of Idaho rules, and DOE orders are listed in Table 1.

Table 1. Regulatory drivers for Liquid Effluent Monitoring Program.

Regulatory ID	Title
40 CFR 136	Guidelines Establishing Test Procedures for the Analysis of Pollutants
IDAPA 58.01.11	Ground Water Quality Rule
IDAPA 58.01.16	Wastewater Rules
IDAPA 58.01.17	Recycled Water Rules
DOE Order 458.1	Radiation Protection of the Public and the Environment
DOE Order 414.1D	Quality Assurance

3.1 State of Idaho

Liquid effluent is managed in percolation ponds or evaporation ponds. Discharge of wastewater to percolation ponds must be permitted under Idaho Administrative Procedure Act (IDAPA) 58.01.17, "Recycled Water Rules." The regulation applies to any structure or system designed or used to treat municipal or industrial wastewater through application to the land. DEQ has issued a wastewater reuse permit for the Idaho Nuclear Technology and Engineering Center (INTEC) New Percolation Ponds (PER-143).

Permit conditions are developed on a facility-specific basis; very few monitoring requirements or discharge limits are explicitly specified in IDAPA 58.01.17. Wastewater samples are analyzed using test

methods from 40 Code of Federal Regulations (CFR) 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," or other methods approved by DEQ.

An annual Wastewater Reuse Site Performance Report must be submitted to DEQ no later than March 1 of each year. The period covered by the report is November 1 to October 31 and is specified by the permit. The report must include all permit-specific monitoring data, discussion of special compliance activities, and a discussion of the monitoring data, with particular attention to the environmental impacts of the facility.

At the INL Site, wastewater discharges to percolation ponds may eventually reach the Snake River Plain Aquifer. The State of Idaho has an antidegradation policy to maintain existing uses of waters of the state, including groundwater. It is the policy of the State of Idaho to maintain and protect the existing high quality of the state's groundwater (IDAPA 58.01.11.006.01).

The Wastewater Reuse Permit requires groundwater not exceed primary constituent standards or secondary constituent standards of the "Ground Water Quality Rule" (IDAPA 58.01.11) at compliance wells. However, discharge to the pond does not necessarily have to comply with these levels if retention, decay, and dispersion will reduce concentrations to the point that groundwater is not adversely affected. Established release levels (MLA-3-97; ASR-09-95) are used to compare releases of pollutants to ponds to concentration levels that will not adversely impact groundwater or pose an unacceptable risk to human health by other exposure pathways. The development and use of these release levels are discussed in Section 3.3.

The percolation ponds and evaporation ponds are regulated by IDAPA 58.01.16, "Wastewater Rules." These rules establish the procedures and requirements for planning, design, and operation of wastewater facilities and discharge of wastewaters and human activities that may adversely affect public health and water quality in the waters of the state.

3.2 Department of Energy

This section discusses DOE orders that govern liquid effluent monitoring at the INL Site.

3.2.1 DOE Order 458.1

Paragraph 4(g) of DOE Order 458.1, "Radiation Protection of the Public and the Environment," establishes specific requirements related to control and management of radionuclides from DOE activities in liquid discharges. Activities must be managed in a manner that protects groundwater resources and ensures that radionuclides contained in liquid effluents do not cause private or public drinking water systems to exceed the drinking water maximum contamination limits in 40 CFR Part 141, "National Primary Drinking Water Regulations."

DOE Standard DOE-STD-1196-2011, "Derived Concentration Technical Standard," supports the implementation of DOE Order 458.1 and provides Derived Concentration Standards as reference values to control effluent releases from DOE facilities. While the Derived Concentration Standards provide relative guidance for the ranking of potential radionuclides in effluent streams released from facilities, they are not intended to be used to infer the dose to members of the public nor to demonstrate compliance with DOE radiation protection dose limits.

Demonstrations of compliance with DOE Order 458.1 requirements are based on calculations that use information from the Liquid Effluent Monitoring Program (LEMP). To ensure quality, radiological liquid effluent monitoring recommendations in DOE publication DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*, are followed.

3.3 Liquid Effluent Release Levels

The policy of the DOE is to conduct operations in a manner that does not adversely impact human health or the environment. With the addition of the INL Site to the National Priority List under the Comprehensive Environmental Response, Compensation, and Liability Act, it has become clear that routine operations need to be evaluated to ensure that current operations do not generate releases to the environment that result in future clean up. In addition, the permit requires that wastewater disposal facilities do not degrade the quality of groundwater so that it cannot be used as a potable water source. DOE Order 458.1 prohibits the discharge of radionuclides to soil columns. Guidance for disposal of wastewater effluent to surface ponds should meet these objectives:

- Do not discharge quantities of pollutants that could result in soil or groundwater concentrations that could pose an unacceptable risk to human health

- Do not discharge quantities of pollutants that could cause groundwater concentrations to exceed Idaho groundwater quality standards or cause private or public drinking water systems to exceed the drinking water maximum contamination limits in 40 CFR Part 141.

The second objective is contained within the scope of the first because groundwater quality standards are set to protect the public from an unacceptable exposure to hazardous materials. The second objective is stated because it has the added imperative of being required to comply with the Wastewater Reuse Permit and DOE Order 458.1. The primary and secondary constituent standards (IDAPA 58.01.11, Section 200) are used as the release levels to ensure that the long-term accumulation of contaminants does not pose an unacceptable risk to human health or the environment.

3.4 Quality Assurance

The U.S. Environmental Protection Agency (EPA) has developed guidance for quality programs for environmental monitoring and sampling activities. Because this guidance was developed specifically for environmental investigations, it is commonly adopted by environmental sampling and monitoring programs. The data collected under this plan are sent to the State of Idaho and the DOE for review. These regulators are most familiar with quality programs based on EPA guidance and are more likely to readily accept a program designed around it. All elements of a quality program required by DOE Order 414.1D are readily incorporated into this quality program following the formats of EPA QA/R-5.

4. BASIS AND DESIGN

Most of the design requirements are derived from the permit requirements. Other factors integral to the design basis of the program are discussed under project data quality objective (DQO) development in Section 6.

4.1 Monitoring Locations

Monitoring locations are set by permit requirements. Table 2 lists the current liquid effluent monitoring locations. Other sites have been monitored to gather characterization data so that risk (likelihood of exceeding release levels) could be evaluated. Sufficient characterization data have been obtained for those sites, and surveillance monitoring beyond permit requirements is now conducted based on results of the risk evaluations or as requested.

Table 2. ICP Liquid Effluent Monitoring Program routine sampling sites at the INL Site.

Site Identifier[a]	Site Name	Wastewater Sampling Point/Permit Number
Wastewater Reuse Permitted Facilities		
CPP-769	Influent to INTEC Sewage Treatment Plant	Serial # WW-013002; Permit # LA-000130-05
CPP-773	Effluent from Sewage Treatment Plant, prior to combining with Service Waste	Serial # WW-013003; Permit # LA-000130-05
CPP-797	Combined effluent prior to discharge to percolation ponds	Serial # WW-013001; Permit # LA-000130-05
a. CPP = Idaho Nuclear Technology and Engineering Center.		

4.2 Monitoring Frequency and Parameters

Monitoring frequency is driven by permit requirements and by the need to achieve acceptable levels of certainty regarding high and moderate severity events. Permit requirements specify that 24-hour composite samples be collected for most parameters once per month. Except for the monthly pH grab samples, all samples are collected as 24-hour flow-proportional composites. Permit requirements also require measuring total daily flow volumes for wastewater discharges. Flow measurement at each location is the responsibility of the facility manager. Sampling to demonstrate compliance with release levels occurs semiannually and was determined by analyzing historical characterization data. The sample frequency for each parameter is specified in Sampling Procedure (SPR) -101, "Liquid Effluent Sampling."

Parameters have been chosen at each site based on the requirements in the permit, characterization of sources, and historical monitoring data. Monitoring parameters for each site listed in Table 2 are presented in SPR-101.

5. PROGRAM ORGANIZATION AND RESPONSIBILITIES

This section describes the LEMP organization and the responsibilities of key program positions.

5.1 Program Responsibilities

5.1.1 Environmental and Regulatory Services Director

The Environmental and Regulatory Services director is responsible for implementing the LEMP, including seeking necessary funding to implement the program as defined in this program plan, and obtaining trained staff and facilities to carry out the monitoring activities. The Environmental and Regulatory Services director is also responsible for maintaining a records management system for quality records generated by this program plan.

5.1.2 Liquid Effluent Monitoring Program Technical Resource

The LEMP technical resource ensures that the program plan and implementing procedures meet regulatory and company requirements; provides direction to program personnel in conformance with plan requirements; ensures that monitoring is conducted in compliance with the permit requirements, DOE orders and agreements, company procedures, and the program plan; monitors work schedules to ensure compliance with plan commitments; assigns personnel to verify, validate, interpret, and maintain monitoring data; reviews monitoring data and identifies issues arising from the data; reports monitoring data, as required; reviews reports to ensure compliance with this program plan; and communicates monitoring results and issues to facility management and support personnel.

5.1.3 Liquid Effluent Monitoring Field Team Leader

The Liquid Effluent monitoring field team leader ensures that all field activities are conducted according to the requirements of this plan and supporting procedures. The field team leader establishes a system of recordkeeping; recommends standards for purchasing; coordinates sampling, analysis, and validation; ensures assigned personnel are adequately trained to perform required sampling; and, in conjunction with the LEMP technical resource, identifies and resolves issues.

5.1.4 Liquid Effluent Monitoring Field Team Member

Liquid Effluent field team members are responsible for conducting field activities following this plan, and all associated procedures and job safety analyses.

5.2 Personnel Training

Based on the scope, complexity, and nature of the work to be performed, and on a review of the education, experience, and proficiency of personnel or each new employee, the Environmental and Regulatory Services director, with input from the LEMP technical resource, develops or modifies the individual training plan consistent with the needs of the individual and in accordance with MCP-27, "Preparation and Administration of Individuals Training Plans." In addition, the Environmental and Regulatory Services director identifies the task-specific training requirements and submits them to the training coordinator for updating the individual training plan in the Training Records and Information Network (TRAIN).

6. DATA QUALITY OBJECTIVES

The DQO process was developed by EPA to facilitate setting quality assurance (QA) objectives for environmental data collection activities (EPA-540/87/003; Neptune, Moorhead and Michael 1990; EPA-540/R-93-071). The DQO process provides qualitative and quantitative statements, which specify the types and amounts of data to collect and the levels of uncertainty in data that will be acceptable to support decisions.

6.1 Decisions to be Made

Section 3 identifies a number of objectives the ICP LEMP supports. Those objectives can be rephrased as decisions, as follows:

- Is liquid effluent in compliance with discharge limits and monitoring requirements set in the permit?

- Are concentrations of compounds in liquid effluent below levels that could result in a future cleanup liability?

- Are concentrations in effluent unchanged from previous time periods when processes were in control and there were no unplanned releases?

If the answers to these questions are "Yes," then no action is necessary. If the answer to some or all of these questions is "No," then the field team leader identifies the concerns to the LEMP technical resource or facility personnel. The LEMP technical resource or facility personnel will evaluate the situation and develop alternative actions if required.

6.2 Data Needed to Support Decisions

The first decision is based on performing required monitoring and meeting discharge criteria specified in the permit. Data needed to make the first decision include:

- The number and collection dates of samples collected at each location

- The type of sample collected, the point of collection, and the duration for composite samples

- The list of analyzed parameters

- Laboratory method quality control (QC) criteria

- Discharge limits in permit

- Current concentrations of compounds in wastewater.

For the second decision, concentrations of parameters released to the environment are compared to the primary and secondary constituent standards (IDAPA 58.01.11) (i.e., release levels). Data needed to make this decision are:

- Concentration and amount of a parameter that can be safely discharged to the environment, to a pond, or surface release site for the expected lifetime of the release

- Volumetric discharge for a wastewater disposal site

- Current concentrations of parameter in wastewater.

To reach the third decision, the information needed is:

- The average or typical concentrations and corresponding variance when processes were in control and there were no unplanned releases

- Current concentrations of parameter in wastewater.

6.3 Specific Tolerance Limits on the Decision Error

The uncertainty in the analytical data from laboratory measurement is determined during the data validation process. Acceptable limits for laboratory uncertainty are published in the EPA analytical methods and summarized by Wagner (1996). Uncertainty from field activities, such as sample collection, packaging, and shipping, are determined using field QC samples. Uncertainties in the decisions to be made with the data were selected during the development of the risk-based approach to liquid effluent monitoring.

6.3.1 Acceptable Quality of Laboratory Data

In specifying particular analytical methods to be used to obtain data to meet permit requirements, the State of Idaho also specifies the tolerable level of laboratory analytical uncertainty in data. Analytical methods specify that certain QC checks be performed during sample analysis, and specify the limits within which the QC checks must fall. These limits are specified in the analytical methods. Environmental Project Support provides these requirements to the analytical laboratories through the laboratory statement of work. The laboratory is required to include the results of laboratory QC measurements with the analytical results.

The data validation process involves checking the QC data against the method-specified limits to ensure that QA goals were met. Data flags are used to mark analytical data that either do not conform to QC limits or may be questionable because of laboratory findings. In this way, the quality of laboratory data is marked so that the level of uncertainty is known during data interpretation.

Performance evaluation samples consist of standards with known concentrations that are submitted to the analytical laboratory as a regular sample. The performance evaluation sample is used to assess laboratory accuracy; results should be within the performance acceptance limits specified on the QC standards certification.

6.3.2 Acceptable Quality of Field Practices

To quantify measurement uncertainty from field activities, a duplicate sample is collected annually at each sample location (SPR-101). Equipment rinsates are collected annually. The field QC sample results are used to determine uncertainty contributed by field sample collection and are compared to programmatic QA objectives. If the QA goals for the program are not met, corrective action is triggered as discussed in Section 15.2. Field QA goals are:

- The relative percent difference determined from field duplicates should be 35% or less for 90% of the analyses
- Equipment rinsates should be less than five times the method detection limit.

Duplicate concentrations that occur near the method detection limit will not always be 35% or less because of parameter interference, instrument noise, detector sensitivity, analyst techniques, and varying other conditions.

6.3.3 Uncertainty in Demonstrating Compliance with Release Levels

Liquid effluent monitoring is based on the likelihood and severity of exceeding a release level. Severity is based on the time available for recovery from exceeding a release level. For a permit-specified discharge limit that is based on a single measurement, there is no time for recovery. This is considered a high severity event. Other release levels are based on an average concentration over time—one month, or even one year. If a concentration exceeding a release level is measured, there is time to recover from that event. This is considered a moderate severity event. Characterization data were gathered from each liquid effluent stream. Using the historical monitoring data, the probability of a high severity event and a moderate severity event were calculated. Some effluent streams have the potential for both high and moderate severity events. Other effluent streams can have only one or the other, depending on governing regulations and the point of discharge.

A level of certainty of 99% has been adopted for high severity events where one sample exceeds a discharge limit with no time for response. A 99% level of certainty is used for moderate severity events where the average concentration of an effluent stream exceeds the release level. Where these levels cannot be reached by collecting a reasonable amount of monitoring data, then process changes at the facility are recommended to reduce effluent concentrations. In many instances, demonstration of these levels of certainty is very easy. For most parameters at most effluent locations, these levels of certainty can be demonstrated with one sample per quarter.

6.3.4 Uncertainty in the Ability to Detect Changes and Unplanned Releases

This section discusses the acceptable uncertainty in determining whether a change has occurred in the concentration or variation of a parameter. This evaluation is made periodically for each parameter in each effluent stream. The principal concern about change is that an increase in the concentration of a parameter can increase the likelihood of an adverse consequence (i.e., increase the risk). With the exception of pH (which has upper and lower limits), all parameters have a release level as a ceiling. Changes that indicate an increase in concentration are of more concern than changes that indicate a decrease.

The period over which change is evaluated is called the decision period. For many parameters and effluent steams, the decision period is based on a permit requirement. For effluent covered by the Wastewater Reuse Permit, an annual report is required by DEQ. In the annual report, the data must be discussed in terms of potential environmental impact. The absence of change in parameters over the year is one indication that environmental impacts have not changed. An effluent monitoring section of the annual report is prepared annually. Data are evaluated at least annually for discussion in the annual report.

The potential for change (possible loss of control or unplanned releases) can be assessed qualitatively during the initial review of the data (particularly effective if no changes are indicated) or more formally using control charts When a process is in control, the control chart will show the following characteristics:

- Most points will fall near the centerline
- A few points will spread out and approach specific limits
- No points will fall a great distance from the centerline

- Values will fall both above and below the centerline.

Assessment for change is triggered when an event occurs that is considered unlikely when compared to the previously observed conditions. Three types of unlikely events are identified as:

- A single measurement falls extremely far from the centerline (outside the control limit)
- A series of three measurements falls far enough from the centerline to be considered unlikely (outside the warning limit)
- A series of measurements (seven out of eight) falls on one side of the centerline (above or below the average).

The Student's t distribution (Johnson 1988) is used to determine warning and control limits. Characterization data are used to determine the centerline, warning limit, and control limit. The control chart approach is based on the assumption that the data used to develop the chart are in control. Because Student's t distribution is used to calculate the limits, the more data available, the more degrees of freedom there are, and the value of t used to calculate limits will gradually decrease and converge on the z score. Control charts are calculated so that there is a 5% chance of exceeding a warning limit and a 1% chance of exceeding a control limit.

A number of parameters (trace metals) may have all of the observations below the detection limit. The major problem with these compounds is that the sample variance is undefined, preventing the calculation of probabilities and control limits. As long as the release level is above the detection limit, it is assumed the probability of a single measurement or the mean exceeding the release level is acceptably low, even though they cannot be quantified. The warning limit will be set to the detection limit, and the control limit set to 10 times the detection limit, or the release level, whichever is less, when the detection limit is constant and all data are below the detection limit.

Monitoring data are analyzed at least qualitatively to determine if change may have occurred. Control charts may be employed for a more formal evaluation of change (see Section 15.1.3). If there is indication that a change may have occurred, assessment is performed to determine whether the probability of exceeding a release level has changed. Possible changes are evaluated in an assessment to determine if the probability of exceeding a release level has changed, as well as evaluating for unplanned releases or loss of process control. If all data meet the control chart decision criteria, then there is no evidence of change, and no assessment is needed.

6.4 Procedures to Assess Data Precision, Accuracy, and Completeness

The analytical data are systematically assessed to ensure conformance to programmatic QA objectives. Analytical data are validated against method requirements following MCP-9236, "Analytical Data Verification." The data validation process ensures that data precision and accuracy requirements specified in EPA analytical methods and in the laboratory contract statement of work are met.

Accuracy is assessed by submitting performance evaluation samples to the laboratory and by evaluating the laboratory's internal QC results. To meet the QA objective for performance evaluation samples, the results should fall within the concentration ranges specified in certification statements from the manufacturer of the performance evaluation samples.

Part of the laboratory's internal QC analyses is the matrix spike samples and laboratory control samples. Matrix spike and laboratory control sample accuracy are measured in terms of percent recovery (%R):

$$\%R = \frac{C_m}{C_k} \times 100 \tag{1}$$

Where:

C_m = Measured concentration

C_k = Known concentration.

The QA objective for percent recovery (%R) for matrix spike samples is 80–120% or 75–125%, depending on the analysis type. Laboratory control samples should have a %R of 80–120%.

Accuracy is also determined from the analysis of laboratory preparation blanks. The preparation blanks control limits for inorganic and miscellaneous analyses are established where the absolute concentration value of the preparation blanks is less than or equal to five times the method detection limit for each parameter. Preparation blanks control limits for metals analyses are established where the absolute concentration value of the preparation blanks is less than or equal to each parameter's required detection limit, or three times their associated instrument detection limit, whichever is greater.

Precision is measured by calculating the relative percent difference between the original sample result and its associated duplicate sample result (including both field duplicates and internal laboratory duplicates). The relative percent difference is calculated as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100 \tag{2}$$

Where:

C_1 = Concentration of sample

C_2 = Concentration of duplicate.

The QA objective for acceptable method precision for laboratory duplicate comparisons is a relative percent difference of 20% or less when detected concentrations are five times greater than the required detection limit. The relative percent difference determined from field duplicates should be 35% or less for 90% of the analyses.

Completeness is measured by comparing the number of samples required for compliance with the wastewater permit to the number of compliance samples collected. The goal for completeness is 100% since only compliance samples are included in the calculation.

7. SAMPLING PROCEDURES

Generating quality data, upon which sound regulatory compliance decisions can be based, begins with collecting representative samples. Samples must be collected in a manner that is representative of the liquid effluent and avoids alteration of the sample composition during sampling, handling, or shipping. Sampling procedures must follow requirements in the permit. Sampling is performed in accordance with well documented field procedures and job safety analyses that closely follow accepted EPA protocols to ensure that samples are representative of the media being monitored.

7.1 Sample Collection Procedures and Methods

The sample collection procedures are documented in SPR-101.

7.2 Sample Containers and Sample Preservation

The appropriate method-required containers and preservation techniques are documented in SPR-101. Containers and preservation follow requirements in 40 CFR 136.

7.3 Sample Security and Storage

Samples are collected and transported under chain of custody as discussed in Section 8.

Sample storage by the subcontract laboratory will follow the analytical laboratory QA plan to ensure sample integrity. The laboratory QA plan is reviewed and approved during the laboratory procurement process.

7.4 Sample Packaging and Shipping

Samples are packaged according to MCP-9228, “Managing Nonhazardous Samples.” Samples are packaged in a cooler with sufficient cooling material to maintain sample temperatures following preservation recommendations.

Samples are shipped by overnight carrier to ensure sample integrity and to meet EPA-required holding times and preservation requirements for unstable compounds. The holding times and preservation requirements are documented in SPR-101.

7.5 Recordkeeping

Records that document liquid effluent monitoring activities are managed appropriately to ensure they are legible, readily retrievable, and protected against damage, deterioration, and loss. MCP-557, “Records Management,” includes specific instructions for managing environmental records. Record retention times are established and documented in company procedures.

7.5.1 Sample Identifier

Each sample must have a unique identifier to ensure that analytical data are uniquely identified and can be associated with the time and place of its collection. The LEMP assigns a 15–character identifier to each sample. A complete explanation of the numbering scheme is presented in SPR-101.

7.5.2 Sample Label

Environmental Project Support requirements for sample labels are implemented in MCP-9228. Each sample bottle is clearly labeled using waterproof ink. Samples are labeled so that laboratory results obtained from the sample material are correctly related to the sampling time and location. Sample labels must be robust and protected to ensure recorded information is not lost. Sample labels are not maintained in the project records.

7.5.3 Chain of Custody Form

The chain of custody form accompanies the sample and provides documentation of the handling and transfer of the sample. Use of chain of custody forms is further explained in MCP-9228. The chain of custody form is maintained as a project record.

7.5.4 Field Logbook

Field logbooks are used to record field activities and to document the results of field measurements. Entries are signed by the person making the entry. Field logbooks are retained as a project record. Further information on maintaining field logbooks is contained in MCP-9227, "Environmental and Regulatory Services Logkeeping Practices." Specific information to record in logbooks for liquid effluent monitoring is given in SPR-101.

7.5.5 Laboratory Analytical Data Package

Results of laboratory analyses are recorded in an analytical data package, which is transmitted from the laboratory to the Liquid Effluent field team leader. Contents of laboratory data packages are specified in the laboratory statement of work and generally include the analytical results and a summary of laboratory method QC data. The laboratory data package is the quality record that documents the sample analysis results. Laboratory analytical data packages are retained as project quality records. If an electronic copy of the laboratory analytical data package accompanies the paper copy, the paper copy is the quality record. An electronic version is for convenience only.

Data validation reports document the review of the analytical data to ensure that the data conform to method QA and QC requirements. Data validation reports are considered to be quality records for the project and are retained in project files.

Information concerning the laboratory QA program and procedures is reviewed during the laboratory procurement process. Documentation of the review and approval of the laboratory quality documents is maintained in Sample and Analysis Management files.

7.5.6 Computer Records

Laboratory analytical data are frequently entered into computerized data management systems for convenience in retrieval for analysis and report preparation. Computer records are maintained for convenience and are not part of the quality record for the project.

7.5.7 Record Retention

Records are retained per MCP-557. Records of review and approval of analytical laboratory quality documents are maintained by the Sample and Analysis Management.

7.6 Equipment Decontamination

Equipment will be decontaminated using SPR-101 All sampling equipment will be cleaned prior to use and wrapped in protective material (such as aluminum foil or plastic bag) to prevent contamination during storage and transport to the field. Equipment will be rinsed in the field after use to remove visible contamination or dirt. Full cleaning will be performed in a sample preparation area or other specified location.

7.7 Disposition of Excess Sample Material

Laboratory contracts and statements of work are written to assign to the laboratory responsibility for disposal of excess sample material and residuals from sample analysis.

8. SAMPLE CUSTODY

Sample chain of custody provides traceability of analytical results to the time and location at which the sample was collected. Formal chain of custody also documents the handling and transfer of sample material from the time and location of sampling through the analysis procedure in the laboratory (EPA-540/G-90/008). Under formal chain of custody, custody (as defined in Section 8.1) is maintained at all times, and all transfers are documented with signatures on the chain of custody form.

Chain of custody forms will be prepared for all samples in accordance with MCP-9228. Custody will be maintained to the extent practicable, and transfers will be documented with signatures on the chain of custody form. A break in the formal chain of custody will not invalidate the analytical results for use as long as the analytical results can be clearly identified with the date and location of sample collection. Sample identity is verifiable from the field logbook and laboratory analytical sheets as well as the chain of custody form.

8.1 Definition of Custody

A sample is considered to be in an individual's custody if the sample is one of the following:

- In the physical possession or view of the responsible party
- Secured by the responsible party to prevent tampering
- Placed in a restricted area by the responsible party.

A sample preparation area is used to store samples in a secured area with restricted access. It is locked to restrict access whenever Environmental Project Support personnel are not present.

8.2 Transfer of Custody

Samples are accompanied by a chain of custody form. When possession of the samples is transferred, the individual relinquishing the samples signs and records the date and time on the chain of custody form. The individual receiving the samples also signs and records the date and time on the chain of custody form. When samples are sent to the laboratory, the chain of custody form is sealed in the shipping container and is not available for documenting transfers. Security of the samples during shipping

is monitored by sealing the shipping containers prior to shipment. The laboratory records the condition of the containers upon receipt to document that the seals were intact upon arrival. Information on the condition of the containers and samples upon arrival at the laboratory and a copy of the original chain of custody form are included with the analytical data package. The shipping forms from the freight carrier are maintained by and retrievable from Packaging and Transportation.

8.3 Laboratory Custody Procedures

Upon receipt of the samples, the laboratory signs the chain of custody form and writes the condition of the samples on the form. Any conditions, such as temperature in excess of preservation requirements, are noted. The laboratory notifies the Liquid Effluent field team leader, or designee, of any evidence of tampering, broken sample containers, chain of custody discrepancies, etc. The laboratory follows internal chain of custody procedures documented in laboratory standard operating procedures. These internal laboratory procedures are reviewed for adequacy during the laboratory procurement process.

9. STANDARDIZATION PROCEDURES AND FREQUENCY

Analytical and sampling equipment is standardized or calibrated, whichever is applicable for the equipment being used, to ensure that it is operating correctly and that information provided by the instrumentation is accurate.

9.1 Field Instrumentation

Field water quality data (temperature, pH, conductivity) are collected using a Hydrolab Quanta Water Quality Multiprobe or other comparable field instrument. This instrument is standardized per the manufacturer's guidelines, using standards appropriate to the type of instrument and the linear range established for the method. Methods and frequency of standardization are discussed in Technical Procedure (TPR) -6539, "Calibrating and Using the Hydrolab Quanta Water Quality Multiprobe." Records of standardization are maintained in instrument or field logbooks, which are retained as quality records.

9.2 Laboratory Instrumentation

Standardization and calibration frequencies for laboratory analytical equipment are defined in EPA analytical methods specified in 40 CFR 136. Compliance with method–specific calibration procedures is required in the analytical statement of work in the procurement contract between ICP and the analytical laboratory. Laboratory compliance with method requirements is checked during the procurement process. Continued compliance with method–specific standardization and calibration requirements is confirmed by validation of laboratory analytical data packages.

10. ANALYTICAL PROCEDURES

Liquid effluent monitoring is conducted to comply with the Wastewater Reuse Permit. The permit requires that monitoring be conducted according to test procedures presented in 40 CFR 136.

10.1 Laboratory Selection Process

Method requirements for testing samples submitted to laboratories are communicated to the laboratory in the statement of work that accompanies the contract between ICP and the analytical laboratory. Guidelines for drafting laboratory statements of work and evaluating proposals are discussed in MCP-591, "Supplier Evaluation and Qualification."

10.2 Required and Optional Analytical Procedures

The Wastewater Reuse Permit issued by DEQ requires analyses be performed using appropriate analytical methods as given in 40 CFR 136 or other methods approved by DEQ. Radiological techniques are based on accepted methods derived from EPA methods. Analytical parameters, current detection limits, and recommended analytical methods are presented in Table 3. Minimum release levels are presented in MCP-9235.

Some of the parameters are monitored because they are required for compliance with the Wastewater Reuse Permit. Other parameters are discretionary, but are monitored because they have the potential to build up in soil or groundwater and could pose a threat to human health.

10.3 Laboratory Data Deliverables

The LEMP receives a standard deliverable laboratory analytical package as described in SOW-362.

Table 3. Typical detection limits and analytical methods for liquid effluent monitoring parameters.

Parameter	Detection Limit	EPA Analytical Method or Equivalent
Metals	**mg/L**	
Aluminum	0.010	200.7, 200.8, 200.9
Arsenic	0.010	200.7, 200.8, 200.9
Cadmium	0.001	200.7, 200.8, 200.9
Chromium	0.010	200.7, 200.8, 200.9
Copper	0.025	200.7, 200.8, 200.9
Iron	0.060	200.7, 200.9
Manganese	0.010	200.7, 200.8, 200.9
Selenium	0.005	200.7, 200.8, 200.9
Silver	0.010	200.7, 2008, 200.9
Sodium	0.25	200.71
Mercury	0.0002	245.1, 245.2, 1631
Inorganic Compounds	**mg/L**	
Chloride	1.0	300.0
Fluoride	0.2	300.0
Solids, total dissolved	10	SM2540C
Solids, total suspended	4	SM2540D
Nutrient Parameters	**mg/L**	
Nitrogen, total Kjeldahl	0.1	351.1, 351.2

Table 3. (continued).

Parameter	Detection Limit	EPA Analytical Method or Equivalent
Nitrogen, nitrate + nitrite	0.01	300.0, 353.2
Phosphorous, total	0.01	365.1, 365.3, 365.4
Oxygen Demand	**mg/L**	
Oxygen demand, biochemical	nd[a]	405.1
Field Parameters		
Electrical conductivity	nd	120.1
Hydrogen ion (pH)	0.1	150.1
Temperature	nd	170.1
Radionuclides	**pCi/L**	
Americium-241	10	Gamma spectrometry or equivalent
Antimony-125	10	Gamma spectrometry or equivalent
Barium-137m	10	Gamma spectrometry or equivalent
Cerium-144	10	Gamma spectrometry or equivalent
Cesium-134	10	Gamma spectrometry or equivalent
Cesium-137	10	Gamma spectrometry or equivalent
Cobalt-58	10	Gamma spectrometry or equivalent
Cobalt-60	10	Gamma spectrometry or equivalent
Europium-152	10	Gamma spectrometry or equivalent
Europium-154	10	Gamma spectrometry or equivalent
Europium-155	10	Gamma spectrometry or equivalent
Manganese-54	10	Gamma spectrometry or equivalent
Nobium-95	10	Gamma spectrometry or equivalent
Potassium-40	10	Gamma spectrometry or equivalent
Radium-226	10	Gamma spectrometry or equivalent
Ruthenium-103	10	Gamma spectrometry or equivalent
Ruthenium-106	10	Gamma spectrometry or equivalent
Silver-108m	10	Gamma spectrometry or equivalent
Silver-110m	10	Gamma spectrometry or equivalent
Uranium-235	10	Gamma spectrometry or equivalent
Zinc-65	10	Gamma spectrometry or equivalent
Zirconium-95	10	Gamma spectrometry or equivalent
Gross alpha	4	Gas flow proportional or equivalent
Gross beta	4	Gas flow proportional or equivalent
Total Strontium	1	Gas flow proportional or equivalent

a. nd—not determined.

11. DATA VALIDATION, ASSESSMENT, INTERPRETATION, AND REPORTING

This section discusses activities conducted with analytical data provided by the analytical laboratory. Data are validated to determine the quality of the data based on conformance with sampling and laboratory analysis procedures and conditions. Once the quality of the data is assessed, data are used for reporting and comparing to standards or release levels. The Wastewater Reuse Permit requires periodic reporting of analytical results. An annual compliance monitoring report is also issued to comply with DOE orders and to document monitoring results and decisions concerning the effectiveness of pollution abatement programs.

11.1 Method Validation

Analytical data packages received from the laboratory are reviewed to assess the quality of the analytical data. Laboratory analytical data collected by the LEMP are validated, at a minimum, following MCP-9236. Radiological data collected by the LEMP are validated following GDE-205, "Radioanalytical Data Validation." Quality of data is based on adherence to sample collection requirements and laboratory method requirements. Data that fully meet all requirements are of acceptable quality. Where data may have a somewhat greater uncertainty than normal due to small deviations from the requirements, the data may be labeled with a "J" qualifier flag to indicate the value is an estimated value. Estimated data are still a reasonable estimate of actual concentrations in liquid effluent. If conditions significantly deviate from requirements during collection or laboratory analysis, the data must be rejected for use. Rejected data are qualified with an "R" qualifier flag. Rejected data are not considered to provide any information about liquid effluent, and they are not considered in completeness goals.

11.2 Data Assessment

Once the quality of the data has been determined, the Liquid Effluent field leader assesses the data for usability. This assessment determines that regulatory requirements have been met and sufficient information has been transmitted. The assessment also evaluates the programmatic QC samples (equipment rinsates, performance evaluation samples, and field duplicates) to determine whether programmatic QA objectives have been met.

11.3 Data Interpretation

Qualified data are used to assess trends in pollution concentrations in liquid effluent and to compare to standards that indicate waste streams do not adversely impact human health or the environment. Individual measurements are compared to release levels and decisions made concerning the effectiveness of programs.

11.4 Data Reporting

Reporting is conducted for two purposes. The first purpose is to meet the mandatory requirements of the Wastewater Reuse Permit for reporting monitoring results. The second purpose is to document the decisions made based on the monitoring data concerning the waste stream's impact on human health or the environment.

Monitoring results from wastewater reuse permit monitoring sites must be submitted to DEQ in an annual report on March 1 of each year. The LEMP technical resource is responsible for preparing the monitoring results for submission to DEQ. Monitoring results are also published in the Idaho National Laboratory Annual Site Environmental Report.

12. INTERNAL QUALITY CONTROL CHECKS

Data quality is monitored with internal QC checks as stated in program-specific procedures and this plan.

12.1 Field Activities

Assessments are periodically conducted by Environmental Project Support personnel not specifically associated with the LEMP. Those assessments are conducted to ensure that plans and procedures are being followed.

QA/QC samples are included with samples to assess field activities and laboratory performance. The types and frequencies of submissions are described in Section 6.3.2.

12.2 Laboratory Activities

The analytical laboratory follows approved EPA wastewater analysis methods to prepare and analyze laboratory samples. Internal laboratory QC checks are specified in analytical methods. Data validation verifies that QC checks were performed and that results conform to method requirements.

13. PERFORMANCE AND SYSTEM AUDITS

13.1 System Audits

Environmental Project Support, in coordination with Sample and Analysis Management, may conduct an annual audit of an analytical laboratory's operation and performance. The audit may be an onsite evaluation or a desk evaluation of a laboratory's past performance at the discretion of Sample and Analysis Management. DOE Consolidated Audit Program audits of the laboratory will be considered as part of the evaluation information. Audits are conducted according to:

- MCP-591, "Supplier Evaluation and Qualification"
- MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment"
- Plan (PLN) -2106, "Environmental and Regulatory Services Performance Assurance and Assessment Program Plan"
- PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment
- PRD-5093, "Management of Environmental Data."

Performance evaluation of analytical laboratories is addressed in PLN-491, "Laboratory Performance Evaluation Program Plan," which is owned by Sample and Analysis Management.

13.2 Self-Assessments

A self-assessment is a systematic check to determine whether personnel are complying with the requirements outlined and referenced in this plan and the Liquid Effluent Program procedures. The scheduling frequency of field activity assessments is the responsibility of the Environmental and Regulatory Services director. This is accomplished by implementing MCP-8, "Performing Management Assessments and Management Reviews," and MCP-9172, "Developing, Integrating, and Implementing Assessment Schedules." The self-assessment schedule is tracked in the companywide Integrated Assessment Schedule Database. Any issues from a self-assessment are identified, and response actions are scheduled and tracked in ICARE (Issue Communications and Resolution Environment) in accordance with MCP-598, "Corrective Action System," and MCP-538, "Control of Non-Conforming Items."

14. PREVENTIVE MAINTENANCE PROCEDURES

Field instruments are backed up by a functionally equivalent instrument in case of a catastrophic instrument failure. Also, as a preventive measure, an adequate supply of bottles, preservatives, and miscellaneous sampling supplies are kept in a sample preparation area.

15. CORRECTIVE ACTION

The identification, cause, and corrective actions for conditions adverse to quality are documented and reported to appropriate levels of management according to implementing procedures. Subsequently, the cause of any adverse condition that affects compliance with the applicable technical or QA/QC requirements is determined, and action is taken to preclude its recurrence. Nonconforming items are controlled per MCP-538, and corrective actions are taken per MCP-598.

When errors, deficiencies, or out-of-control situations exist, the QA Program provides systematic procedures and corrective actions to resolve problems and restore proper function to the analytical system. Corrective action procedures are described in Section 15.2

15.1 Exceeding a Trigger Level in Liquid Effluent

This section discusses the assessments that will be conducted in response to monitoring results that indicate possible permit violations or that changes have occurred. Because of the statistical nature of the comparison to control limits, there will be false positive situations where the data trigger an alarm even though no change has occurred. To account for this false positive rate, confirmatory sampling is part of assessment. Assessments must also be graded to risk to avoid overly rigorous responses to triggers. In some instances, the change, even if real, will not substantially change the likelihood of exceeding a discharge limit. In this case, there is no need to do an extensive analysis of the change, but to flag the parameter for continued awareness. In other cases, the change, if real, could mean a change in the probability of exceeding a discharge limit. In this case, rapid data collection would be indicated to make a more definitive determination of whether the change was real.

15.1.1 Causes Behind Triggers

An assessment will be conducted to determine the cause behind the concentrations that exceed a trigger value. Five causes have been identified for investigation during assessments:

1. Errors in data, such as field notes, laboratory problems, or data manipulation

2. Changes to procedures, sampling locations, laboratories, or other programmatic change

3. Outliers due to one-time spikes from out of control equipment or an unusual disposal

4. Samples that fall in the tails of the distribution chart

5. Changes to the sources or processes that result in a change in mean or variance in the effluent stream.

The first two causes can be investigated by reviewing data packages and programmatic activities. No confirmatory sampling needs to be conducted to evaluate the first two sources of error or change. However, new characterization data may need to be collected in response to changes caused by programmatic changes. The third cause may be identified by talking to facility and process managers and evaluating the source and processes contributing to the effluent stream. If the assessment does not identify any errors, changes in programmatic activities, or known releases, then confirmatory sampling would be conducted to test for an outlier, a rare response, or a change in the process.

Confirmatory sampling will consist of two additional samples. Each of the three samples must be statistically independent. This can be accomplished by collecting and submitting the samples to the laboratory separated by sufficient time to ensure that they are not analyzed in the same sample delivery group. Two samples analyzed within the same delivery group might not qualify as statistically independent (Davis and McNichols 1994). If a sufficient number of routine samples has been collected following the outlier, routine samples can serve as confirmatory samples. Based on frequency of routine sampling, it is the discretion of the project manager whether additional confirmatory samples are required.

15.1.2 Assessment When Release Level Is Exceeded

This section discusses assessment activities that are conducted when the concentration of a parameter measured in an effluent stream exceeds a release level. This may or may not trigger a noncompliance, depending on the response time associated with the release level and whether the release level is self-imposed or a permit discharge limit.

If the concentration measured in the effluent stream exceeds a discharge limit in a permit and there is no response time, then a permit violation may have occurred. An assessment for causes one and two is conducted to make sure there is not an error in data reduction or reporting and that no programmatic changes occurred that may have lead to the results. The facility manager is then requested to evaluate sources and processes to determine if the cause of the high concentration can be determined. If simple explanations cannot be found, then confirmatory sampling is conducted to determine if the concentration in the discharge is still over the discharge limit. Two additional samples are collected in an expeditious manner, but retain statistical independence. If even one of these samples also exceeds the discharge limit, then the facility manager will conduct additional source or process investigations to determine the cause of the increased level of contamination and to take action to decrease the releases. If neither of the confirmatory samples exceeds the discharge limit, and the source investigation does not identify a likely cause, then it will be concluded that the extreme observation was an outlier.

If a release level is exceeded, but there is response time, the actions will be different than if a permit violation has occurred. Some parameters will only be planned to be sampled once per compliance period because the likelihood associated with the parameter was deemed to be sufficiently low. If no additional samples were planned for that parameter, the two confirmatory samples will be collected sometime during the remainder of the compliance period. This will give a total of three samples to

calculate a mean for comparison to the release level. If additional sampling is already planned, no additional actions are necessary. For samples with response time, parameters near the release level may have significant probabilities of single samples exceeding the release limit. For these parameters, sampling frequency is set so that the average over the compliance period will be below the level. The program should be designed to accommodate occasional measurements above release levels for parameters with response time.

15.1.3 Assessment When Change is Indicated

A qualitative evaluation of the data is performed to determine if there are any anomalous results that may indicate an unplanned release or a marked change in effluent concentrations. If desired, control charts can be used to evaluate change by determining if:

1. One sample exceeds a control limit
2. Three samples in a row exceed a warning limit
3. Seven of eight samples fall on one side of the mean.

Responses to each of these events will be somewhat different.

The response of one sample exceeding the control limit will be similar to the response to exceeding a release level. An assessment for the first, second, and third causes will be conducted to determine if the extreme value is attributable to error, programmatic change, or a known facility condition. If the causes cannot be identified from this review, confirmatory sampling is indicated. Two confirmatory samples will be collected in an expeditious manner while still maintaining statistical independence. If all three samples exceed the warning limit, more extensive review of sources to the effluent will be conducted to attempt to determine the cause of the change. If a change is confirmed, recharacterization to calculate a new probability of exceeding a release level is necessary. If the additional samples do not confirm the change, no response action is necessary.

When three samples in a row exceed a warning limit, it is an indication that a change has occurred in the effluent. A review is conducted for causes 1, 2, and 3 to determine if the change is attributable to known causes. The new data are used to estimate a new probability of exceeding release levels. This probability is used to determine if the effluent has changed to the point that monitoring strategy must be adjusted. If a conclusion is reached that the concentration in an effluent stream has changed, then recharacterization must be done for that parameter. With the new characterization data, likelihood is evaluated and a new monitoring strategy or frequency established if necessary.

If change is indicated by a series of seven out of eight samples falling to one side of the centerline, a small change or long-term trend may be indicated. Review of historical control charts indicates that this type of trigger is commonly related to a change in the detection limit for a parameter. Cause 2, therefore, needs to be carefully evaluated when this trigger is activated. The probability of exceeding the release level is calculated from the last eight data points and a determination made whether the change could alter the likelihood of exceeding a release level. If no increase in likelihood is indicated, then the data are used to establish a new baseline for the effluent stream. If the likelihood of exceeding a release level has moved to a different level, the frequency and strategy of the LEMP are evaluated to determine if a program modification is warranted based on the new information.

15.2 Laboratory and Programmatic Quality Control

QC samples are used to measure the performance of the analytical laboratory and for the overall sampling program. Method requirements for analytical QC are published in EPA methods, and conformance to the method requirements is documented by data validation. Field QC samples (duplicates, equipment blanks) are used to assess the introduction of a bias and uncertainty from the entire sampling and analysis process. Programmatic goals for field QC samples are presented in Section 6.3.2. When QC samples fail to meet method requirements or programmatic goals, then corrective action is taken to bring the program back under control.

15.2.1 Laboratory Quality Control

Laboratory QC is measured against QC criteria published in EPA analytical methods and is evaluated during the data validation procedure.

15.2.2 Programmatic Quality Control

Programmatic QC is measured using field QC samples and is evaluated against criteria identified in Section 6.3.2. When programmatic QC criteria are exceeded, laboratory QC criteria are evaluated by reviewing the data validation report to determine if the source of the problem is the laboratory. If laboratory QC is in control, then field techniques and sample handling are reviewed by the program to identify potential sources of error.

16. QUALITY ASSURANCE REPORTS TO MANAGEMENT

The QA reporting system consists of self-assessments and is a valuable tool for measuring the overall effectiveness of the QA Program. It serves as an instrument for evaluating the program design, identifying problems and trends, and planning for future needs. Results of all self-assessments are presented to the Environmental and Regulatory Services director. Compliance issues with requirements or instructions are managed per MCP-598.

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Appendix A

Comparison of Plan to PRD-5093, MCP-561, and EPA-QA/R-5

Table A-1. Comparison of Liquid Effluent Monitoring Program Plan to PRD-5093, MCP-561, and EPA-QA/R-5.

PLN-729 Elements		PRD-5093[a] Elements	MCP-561[b], Appendix B Elements		EPA-QA/R-5[c] Elements	
	Title Page		1.1	Cover Sheet, Form 412.14, with provision for approval signatures for the project manager, and quality engineer	A1	Title and Approval Sheet
	Document Revision Form with record of concurrence signatures		1.2	Document Approval Sheet, Form 412.15 for recording concurrence signatures (not required if concurrence signatures are recorded on a DRF)	A1	Title and Approval Sheet
	Table of Contents		1.3	Table of contents	A2	Table of Contents
2	Program Description	Program Description	1.4 (5.3)	Project description	A5	Problem Definition/Background
3	Requirements and Objectives				A6	Project/Task Description
4	Basis and Design					
5.1	Organization and Responsibilities	Organization	1.5 (5.4)	Project organization and responsibility	A3 A4 A8 A9	Distribution List Project/Task Organization Special Training/Certification Documents and Records
5.2	Personnel Training		1.6.1	Personnel qualifications	A8	Special Training/Certification
6	Data Quality Objectives	QA Objectives for Data	1.6 (5.5)	QA Objectives for measurement data in terms of precision, accuracy, completeness, representativeness and comparability	A7	Quality Objectives and Criteria
7	Sampling Procedures	Sampling Procedures	1.7 (5.6)	Sampling procedures	B1 B2	Sampling Process Design Sampling Methods
			1.18	Change control or revision process while QAPjP is effective		

Table A-1. (continued).

PLN-729 Elements		PRD-5093[a] Elements	MCP-561[b], Appendix B Elements		EPA-QA/R-5[c] Elements	
7.5	Recordkeeping	Records	1.20	Records	A9 & B10	Documents and Records Data Management
8	Sample Custody	Transportation Chain-of-Custody	1.8 (5.7)	Sample custody	A7 B3	Quality Objectives and Criteria Sample Handling and Custody
9	Standardization Procedures and Frequency	Laboratory Quality Control	1.9 (5.8)	Calibration procedures and frequency	A7 B7	Quality Objectives and Criteria for Measurement Data Instrument/Equipment Calibration and Frequency
10	Analytical Procedures	Laboratory Quality Control	1.10 (5.9)	Analytical procedures	B4	Analytical Methods
11	Data Validation, Assessment, Interpretation, and Reporting	Data Validation Evaluation	1.11 (5.10) (5.14)	Data reduction, validation and reporting	A7 B9 B10 D1 D2 D3	Quality Objectives and Criteria for Measurement Data Non-Direct Measurements Data Management Data Review, Verification and Validation Verification and Validation Methods Reconciliation with User Requirements
			1.19	Reporting		

Table A-1. (continued).

PLN-729 Elements		PRD-5093[a] Elements	MCP-561[b], Appendix B Elements		EPA-QA/R-5[c] Elements	
12	Internal Quality Control Checks	Field QC Laboratory Quality Control	1.12 (5.11)	Internal quality control checks and frequency	B2 B5 B6 B7 B9	Sampling Methods Quality Council Instrument/Equipment Testing, Inspection, and Maintenance Instrument/Equipment Calibration and Frequency Non-Direct Measurements
13	Performance and System Audits	Performance and System Audits/ Assessments	1.13 (5.12)	Performance and system audits and frequency	C1	Assessments and Response Actions
14	Preventative Maintenance Procedures		1.14	Preventive maintenance procedures and schedules	B6	Instrument/Equipment Testing, Inspection, and Maintenance
			1.15	Specific routine procedures to be used to assess data precision, accuracy and completeness of specific measurement parameters involved	D3	Reconciliation with User Requirements
15	Corrective Action	Corrective Action	1.16 (5.15)	Corrective action	C1	Assessments and Response Actions
			1.16.1	Deviations		
16	Quality Assurance Reports to Management	Reports to Management	1.17 (5.16)	Quality assurance reports to management	A7 C2	Quality Objectives and Criteria for Measurement Data Reports to Management

a. PRD-5093, "Management of Environmental Data."

b. MCP-561, "Quality Program Plan/Quality Assurance Project Plan Development."

c. EPA-QA/R-5, "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations."