



Quality Assurance Project Plan for Environmental  
Information in the Waste Characterization Study of  
the Solid Waste Infrastructure for Recycling Grant  
(SWIFR)

Nebraska Department of Environment and Energy  
Planning and Aid Division  
November 19, 2023

**1. Project Management (Group A)**

**1.1. Title and Approval Page**

**Quality Assurance Project Plan for**

**NEBRASKA DEPARTMENT OF ENVIRONMENT AND ENERGY  
 Solid Waste Infrastructure for Recycling Grant # 96705701**

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November 19, 2023

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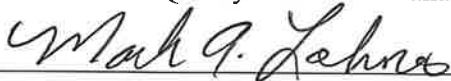
11/19/2023



NDEE Quality Assurance Manager: Mark Lohnes

Date:

11/28/23



USEPA Region 7 Grants Project Officer:

Date:

USEPA Region 7 Quality Assurance Manager:

Date:

**QAPP Revision History**

Revision No.	Description	Author	Date
0	Original Version	Douglas Barry	11/19/2023

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**Abbreviations**

BIL	Bipartisan Infrastructure Legislation
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
GHG	Greenhouse Gas
GHGRP	<a href="#">Greenhouse Gas Reporting Program</a> (40 CFR Part 98)
ICR	Information Collection Request
OAR	EPA Office of Air and Radiation
PM	Project Manager
PO	EPA Project Officer for Grant
POP	Period of Performance
POR	EPA Project Officer’s Representative
PWP	Project Work Plan
QA	Quality Assurance
QAMI	Quality Assurance Manager
QAMD	Quality Assurance Manager Delegate
QAPP	Quality Assurance Project Plan
QC	Quality Control
SIT	<a href="#">State Inventory Tool</a> (provided by the EPA)
TL	Task Leader
NDEE	Nebraska Department of Environment and Energy

**1.3. Distribution List**

This section presents the primary staff who will be working on the project. This section also includes all other staff who will be serving in project-specific roles for implementing the Quality Assurance Project Plan. The listing in **Table 1.1** includes staff responsible for implementing independent internal quality management steps and staff serving in external oversight roles.

This QAPP and, as applicable, all major deliverables relying on existing data will be distributed to the staff presented in **Table 1.1**. Additionally, this QAPP will be provided to any unlisted staff who are assigned to perform work under this project. A secured copy of this QAPP will be maintained in the project files under the *N:Grants Section/SWIFR as well as NDEE’s Electronic Content Manager (ECM)* directory.

**Table 1.1 QAPP Distribution List**

Name	Organization	Role
Gayle Hubert	US EPA, Region 7	EPA Project Officer (PO) or PO Representative (POR)
Diane E. Harris	US EPA, Region 7	EPA Quality Assurance Manager or Delegate
Kara Valentine	NDEE	Grantee Sr. Approver, Deputy Director
Sarah Starostka	NDEE	Grantee Project Manager, Planning & Aid Div. Administrator
Douglas A. Barry	NDEE	Grantee Technical Staff, Federal Grants Administrator III
Mark Lohnes	NDEE	Grantee Quality Assurance Manager
Kara Valentine	NDEE	Grantee Quality Control Coordinator

**1.4. Project/Task Organization**

The primary personnel responsible for implementation of this project are the Nebraska Department of Environment and Energy (NDEE) Project Manager (PM), Quality Assurance Manager (QAM), Quality Control Coordinator (QC Coordinator or QCC), and Task Leaders (TLs). Their duties are outlined briefly in this section. The project QAM is independent of the unit generating the data.

Sarah Starostka is the NDEE PM and will provide senior-level oversight as needed. The PM is responsible for NDEE’s technical and financial performance as well as maintaining communications with the EPA to ensure mutual understanding of grant requirements, EPA expectations, and conformity with EPA quality procedures; managing oversight and conduct of project activities including allocation of resources to specific tasks; ensuring that quality procedures are incorporated into all aspects of the project; developing, conducting, and/or overseeing QA plans as necessary; ensuring that any corrective actions are implemented; operating project activities within the documented and approved Quality Assurance Project Plan; and ensuring that all products delivered to the EPA are of specified type, quantity, and quality.

The NDEE PM will assign a TL for each technical task. **Table 1.1** presents the TLs for each technical task who will be responsible for day-to-day task-level activities, including planning, reporting, and controlling of technical and financial resources allocated to the task by the PM. Accordingly, each TL is primarily responsible for implementing the Quality Program and this Quality Assurance Project Plan on task-level assignments.

*Task-level management system.* For each of the major deliverables under each task, the assigned TL will review all QA-related plans and reports and is responsible for transmitting them to the QC Coordinator and the QA Manager for review and approval. Each TL is responsible for ensuring that quality procedures are implemented at the task level and for maintaining the official, approved, task-level QAPP content. Each TL will discuss any concerns about quality or any proposed revisions to task-level QAPP content with the QC Coordinator to identify, resolve, or preclude problems or to amend task-level plans, if necessary. In addition, each TL will work with the NDEE PM and the QA Manager to identify and implement quality improvements. The NDEE PM is responsible for ensuring the consistency of similar or related QA measures across tasks, and the TLs are responsible for overseeing task-level work performed by technical staff and providing assurance that all required QA/QC procedures are being implemented.

*Project-level management system.* Tasks are expected to proceed concurrently, in parallel. The PM will maintain close communications with each TLs and ensure any difficulties encountered or proposed changes at the task level are reviewed for implications on other similar or related tasks. The PM is also responsible for communicating progress or difficulties encountered (across all tasks) to the EPA PO or POR, who provides EPA's primary oversight function for this project at EPA OAR/ Region 7 and is responsible for review and approval of this QAPP and any future revisions. The PM (with support from TLs and assigned NDEE technical staff) will be responsible for consulting with the EPA PO or POR, on planning, scheduling, and implementing the QA/QC for all project deliverables and obtaining required EPA approvals.

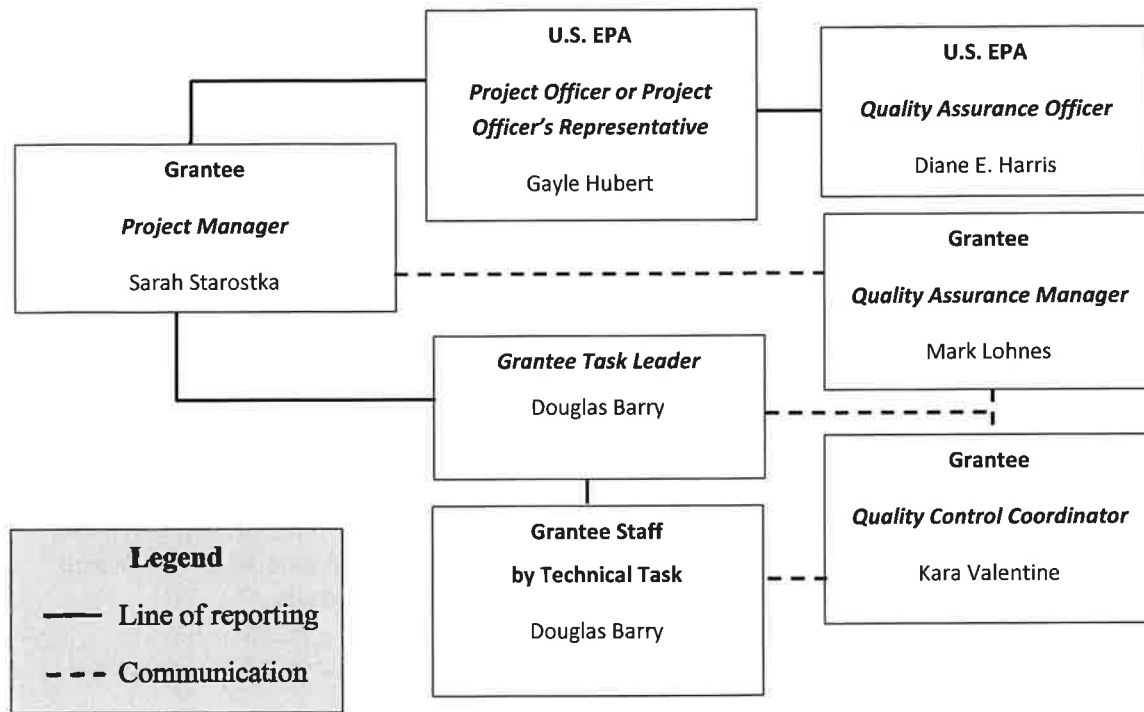
The QA Manager, Mark Lohnes, is responsible for overseeing the program quality system, monitoring, and facilitating QA activities on tasks, and generally helping the NDEE PM and TLs understand and comply with EPA QA requirements. He is employed by NDEE's Management Services group, which is in a separate division (Management Services) from NDEE's Grants section (Planning and Aid Division). For each task under this project, he is supported by the QC Coordinator, who will assist in the implementation of the quality system. At the request of the NDEE PM, Mr. Lohnes is responsible for conducting periodic independent audits of this project's QA program, and he will produce written documentation of the audit results and recommendations. He will work closely with the PM and QC Coordinator to improve any deficiencies noted during these audits.

The QC Coordinator (QCC), Deputy Director Kara Valentine, is responsible for assisting the PM and TLs in planning, documenting, and implementing the QA requirements for this project. Working with the PM, and in consultation with the QA Manager, she will ensure that process- and project-specific QA documents are developed; that required or recommended protocols are followed; that data are reduced, validated, and reported according to specific criteria; and that QC assessments are performed. The QCC will report to the PM and the QAM, as needed, on quality issues. If there is no QCC on the project, the QAM will assume the responsibilities of the QCC.

Additionally, QC functions will be carried out by other technical staff and monitored by the PM, who will work with the QA Manager and QC Coordinator to oversee this plan and implement quality improvements. Other technical staff will include technical reviewers, database specialists, quality auditors, and technical editors. The PM will ensure that technical staff do not review work in a QA capacity for which they were a primary or contributing author. **Exhibit 1.1** presents the organizational chart.



**Exhibit 1.1 Project Organization<sup>1</sup>**



**1.5. Problem Definition / Background**

Under this project, NDEE will develop a plan to carry out EPA's Solid Waste Infrastructure for Recycling (SWIFR) grants through activities that support long-term planning and data collection needs to demonstrate progress toward the National Recycling Goal and Food Loss and Waste Reduction Goal and advance a Circular Economy for materials, as well as support the state-led implementation of plans to advance post-consumer materials management. The Nebraska Department of Environment and Energy (NDEE) will contract with a vendor to conduct a State-wide Waste Characterization Study to meet the objectives of the SWIFR grant.

The purpose of Nebraska's Solid Waste program is to ensure proper management of solid waste, which includes solid waste typically collected and disposed in municipal landfills, and other non-hazardous waste. Solid Waste regulations are incorporated in NAC Title 132 - *Integrated Solid Waste Management Regulations*. The regulations provide technical criteria for land disposal areas and solid waste processing facilities.

Approximately half of global greenhouse gas emissions are the result of natural resource extraction and processing. Increasing recycling reduces climate, environmental, and social impacts of materials use, and keeps valuable resources in use instead of in landfills. Municipal solid waste management has long suffered from a lack of investment. Some communities that lack waste management infrastructure do not

<sup>1</sup> Under CIO 2105-S-02.0, section 3, the organization chart must also identify any contractor relationships relevant to environmental information operations.

have curbside waste collection services, recycling, or composting programs, which increases the burden on our landfills, decreases their capacity, and increases greenhouse gas emissions. The production and current management of organics contributes to a broad range of environmental impacts, including climate change, air pollutants, water scarcity, biodiversity loss, and soil and water quality degradation. When food waste and other organics go to the landfill, they release methane, a powerful greenhouse gas. In 2020, 14.5 percent of human-related methane emissions came from landfills. Mismanaged waste also can compound health, economic, and undesirable social conditions in historically disadvantaged, underserved and overburdened communities. In addition, as climate-related disasters increase in frequency and severity, the need to maximize the recycling and reuse of disaster debris to support keeping valuable materials out of landfills is becoming increasingly important.

The National Recycling Strategy proposes building a circular economy to reduce material use, redesign materials to be less resource intensive, and recapturing “waste” as a resource to manufacture new materials and products. This vision and strategy for a circular economy aligns with the language and the goals identified in the BIL regarding solid waste infrastructure and management in the United States.

#### **1.5.1. Historical**

In 2007 the department determined that a waste characterization study would be most beneficial to solid waste management professionals in Nebraska instead of an update of the state-wide solid waste management plan and initiated the process of hiring a contractor to perform the study.

The study was completed in 2009 and focused on establishing a baseline of waste going into municipal landfills in the state.

<http://dee.ne.gov/publica.nsf/PubsForm.xsp?documentId=E3B876E52F86F1A6862575C900733CCA&action=openDocument>

Included in the study was the measurement of E-Waste and food waste going into Nebraska landfills. The results of this study were presented, and the contractor developed a guidance document for landfills to conduct their own waste characterization studies and training was provided on the process.

#### **1.6. Project / Task Description**

The main objectives of this study is to determine the characteristics of Nebraska’s solid waste stream and establish a baseline of waste characterization data for the state. In addition, the results of the study will provide a differentiation of the characteristics of Nebraska’s solid waste stream among: (1) facilities based upon their grouping as large urban, small urban, large rural, or small rural; (2) the four seasons; (3) the generating sectors – residential, commercial, and mixed; and (4) items sighted during the visual inspection process. In order to better understand the purpose of this project, it is important to define waste characterization, also known as a waste sort or waste pick. In general, a waste characterization project encompasses sorting a portion of the solid waste stream. For this project, the waste sort encompassed sorting through a portion of the solid waste stream at predetermined selected facilities. Solid waste will be sorted during four seasonal field sorting events at each facility from a variety of users and will included residential, commercial or mixed waste.

##### **1.6.1. Measurements**

Waste samples will be sorted and weighed using a portable electronic scale. The gross weight of the bin and waste will be recorded and the bin emptied. When the categorization

process for each selected sample is complete, the gross weight (bin + waste), bin weight, and net weight (gross weight - bin weight) for each waste-material category will be totaled.

**1.6.2. Applicable Technical, Regulator, or Program-Specific Quality Standards**

N/A

**1.6.3. Special Personnel or Equipment Requirements**

Personal involved in sorting and weighing should be outfitted with Tyvek protective suits, Kevlar lined gloves, safety goggles, hard hats, and high-visibility safety vests at a minimum.

**1.6.4. Assessment Tools Needed**

Digital electronic scale accurate to 0.1 pound.

**1.6.5. Tasks and Timeline**

The project will begin approximately May 2024 and conclude no later than August 2026.

**Table 1.6.5 Tasks and Timeline**

<b>Tasks</b>	<b>Task Milestone Date</b>
<b>Request for Proposal Development and Process</b>	October 2023-April 2024
<b>Vendor Selected and Contract Issued</b>	May 2024
<b>Task 1: Pre-sort Workshop</b> <b>Description:</b> With Contractor principals, sort host facility representative(s) and Department representation attending in person or virtually. Contractor will present the waste sort approach, schedule and expectations.	June 2024
<b>Task 2: Review Previous Waste Sort Methodology</b> <b>Description:</b> Contractor will review methodology of previous Nebraska waste sorts to help ensure comparability with the 2024-25 Waste Characterization Study, to the greatest extent possible.	June 2024 – September 2024
<b>Task 3: Develop 2024-25 Nebraska Statewide Waste Characterization Study Methodology</b> <b>Description:</b> Contractor shall develop an industry accepted methodology to obtain data critical to the Study including but not limited to: customized sampling plan, including a visual C&D load sampling plan resulting in data most useful to the NDEE and Nebraskans.	October 2024
<b>Task 4: Conduct Waste Sorts</b> <b>Description:</b> Contractor will provide field supervisors and sort crew. Field supervisors will oversee all aspects of load selection, visual and manual material sorting including counts of deposit and non-deposit PET, glass and metal beverage containers, and data recording at each of the eight (8) sort locations.	Winter 2024 - Fall 2025
<b>Task 5: Data Analysis</b>	May 2026

<p><b>Description:</b> Sort data will be analyzed to determine the estimated weight and mean percent associated with each material sorted.</p>	
<p><b>Task 6:</b> Final Report Completion</p> <p><b>Description:</b> A comprehensive report will be prepared including, at a minimum, an executive summary, introduction and background for the study, discussions of the methodology used, a summary of the sampling and sorting plan, data collection and analytical techniques used, a summary of the number of samples characterized, waste composition profiles for the state as a whole and for each sort host facility, a summary of findings, conclusions, supporting documentation including composition, a comparison with previous waste sort studies and identification and recommendations of potential landfill diversion opportunities.</p>	<p>No later than July 2026</p>
<p><b>Task 7:</b> Presentation of Study Results</p> <p><b>Description:</b> Develop a PowerPoint and present study results and study-based recommendations at an in-statewide conference or through a virtual meeting at the NDEE's choosing. An electronic copy of the presentation shall be provided to the Department for review and approval no later than two weeks prior to the presentation.</p>	<p>No later than August 2026</p>

**1.6.6. Notes & QA Records/Reports**

Drivers will be interviewed regarding their vehicle ownership, type of collection vehicle, type of waste in the load, origin of load, and any anomalies noted about the load. This information along with a visual inspection regarding the load will be logged on a standard Driver Interview and Visual Inspection Form. The waste will then be sorted into categories then weighted. The weight will be logged on a standard waste data recording sheet. See Appendix A.

**1.7. Quality Objectives / Criteria**

The primary quality objective for this project is to develop and execute an accurate four-season characterization of waste going to Nebraska landfills and to develop/enhance alternate pathways for reusing, reducing, or recycling prior to being discarded. Accordingly, all quality objectives and criteria are aligned with these primary objectives. The quality system used for this project is the joint responsibility of the NDEE, PM, Task Leaders, and QC Coordinator. As discussed in Section 1.4, an organizationally independent QA Manager will maintain oversight of all required measures in this QAPP. QC functions will be carried out by technical staff and will be carefully monitored by the responsible Task Leaders, who will work with the QA Manager and QC Coordinator to identify and implement quality improvements. All activities performed under this project will conform to this QAPP.

**1.7.1. Data Quality, Management, and Analyses**

For this project, NDEE will use a variety of QC techniques and criteria to ensure the quality of data and analyses. Data of known and documented quality are essential components for the success of the project, as these data will be used to inform the decision-making process for analyzing recommendations regarding programs and policies leading to a reduction of solid waste and increasing marketability of recyclable materials.

The data quality objectives and criteria for this project are accuracy, precision, bias, completeness, representativeness, and comparability. *Accuracy* is a measure of the overall agreement of a measurement to a known value. It includes a combination of random error (precision) and systematic error (bias). *Precision* is a measure of how reproducible a measurement is or how close a calculated estimate is to the actual value. *Bias* is a systematic error in the method of measurement or calculation. If

the calculated value is consistently high or consistently low, the value is said to be biased. Our goal is to ensure that information and data generated and collected are as accurate, precise, and unbiased as possible within project constraints.

*Representativeness* is a qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. NDEE will use the most complete and accurate information available to compile representative data for this project.

Data *comparability* is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made. NDEE will compare datasets when available from different sources to check for the quality of the data. This QA step will also ensure that any highly correlated datasets or indicators are identified. Supporting data, such as information on test methods used and complete test reports, are important to ensure the comparability of emissions data.

### 1.7.2. Document Preparation

All documents produced under this project will undergo internal QC review, as well as technical review and an editorial review, prior to submission to the EPA PO. QC will be performed by an engineer, scientist, or economist, as appropriate, with sufficient knowledge. The technical reviewer will review the document for accuracy and integrity of the technical methodologies, analyses, and conclusions.

An editorial review of all final documents will be performed. Editors will verify clarity, spelling, and grammatical correctness, and ensure documents are free of typographical errors. Editors will verify that references are cited correctly. This will include a comparison against the original documents.

The *QC Documentation Form (Appendix B)* will be used to track the approval process. The form must be completed and signed for all document deliverables. The signatures required include those of the Task Leader and technical and editorial reviewers. Completion of this form certifies that technical review, editorial review, and all required QC procedures have been completed to the satisfaction of the TL and QC Coordinator. Copies of these signed forms will be maintained in the project files.

### 1.8. Special Training / Certifications

All NDEE staff assigned to work on this project shall have appropriate technical and QA training to properly perform their assignments. NDEE staff serving in QAM or QCC roles under this project will have completed a training course on QA/QC activities similar to the course available at <https://www.epa.gov/quality/training-courses-quality-assurance-and-quality-control-activities>.

No additional technical training is required.

### 1.9. Documents and Records

NDEE will document in electronic form (and/or hard copy) QC activities for this project. The TL is responsible for ensuring that copies of all completed QC forms, along with other QA records (including this QAPP), will be maintained in the project files. Project files will be retained by NDEE for 10 years after the approval date of this QAPP. The types of documentation that will be prepared for this project include:

- Planning documentation (e.g., QAPP)

- Implementation documentation (i.e., Review/Approval Forms and QA records)
- Assessment documentation (i.e., QA audit reports).

Detailed documentation of QC activities for a specific task or subtask will be maintained using the *QC Documentation Form* shown in **Appendix B**. One or more completed versions of these forms, as necessary, will be maintained in the project files. The types of documents for which QC will be conducted and documented may include raw data, data from other sources such as data bases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, and results of calibration and QC checks.

Technical reviews will be used along with other technical assessments (i.e., QC checks) and QA audits to corroborate the scientific defensibility of any data analyses. A technical review (i.e., internal senior review) is a documented critical review of a specific technical work product. It is conducted by subject matter experts who are collectively equivalent (or senior) in technical expertise to those who performed the work. Given the nature of the deliverables under this project, a technical review is an in-depth assessment of the assumptions, calculations, extrapolations, alternative interpretations, and conclusions in technical work products. Technical review of proposed methods and associated data will be documented in the *QC Documentation Form* shown in **Appendix B**. The form will include the reviewer's charge, comments, and corrective actions taken.

Additionally, NDEE has developed and instituted document control mechanisms for the review, revision, and distribution of QAPPs. Each QAPP has a signed approval form, title page, table of contents, and a document control format that conforms to EPA's [Environmental Information QAPP Standard](#); see header at top of the page. The distribution list for this QAPP was presented in **Table 1.1**. During the course of the project, any revision to the QAPP will be circulated to everyone on the distribution list, as well as to any additional staff supporting this project. Any revision to the QAPP will be documented in a QAPP addendum, approved by the same signatories to this QAPP, and circulated to everyone on the distribution list by the NDEE PM.

**2. Existing Data Acquisition and Management Protocols (Group B)**

**2.1. Sampling Process Design**

The design will be similar to the 2007-2009 State of Nebraska Waste Characterization Study project. The process is designed so the results of the study will provide a differentiation of the characteristics of Nebraska’s solid waste stream among: (1) facilities based upon their grouping as large urban, small urban, large rural, or small rural; (2) the four seasons; (3) the generating sectors – residential, commercial, and mixed; and (4) items sighted during the visual inspection process. The project encompasses sorting a portion of the solid waste stream. For this project, the waste sort encompassed sorting through a portion of the solid waste stream at predetermined selected facilities. Solid waste will be sorted during four seasonal field sorting events at each facility from a variety of users and will included residential, commercial, or mixed waste.

**2.1.1. Samples Required – Type & Number**

The number and type of samples required will be similar to that of the 2007-2009 State of Nebraska Waste Characterization Study.

**2.1.2. Sampling Network & Design**

The sampling network and design will be similar to that of the 2007-2009 State of Nebraska Waste Characterization Study.

**2.1.3. Sampling Locations**

Sampling is intended take place at the same eight facilities that participated in the 2007-2009 State of Nebraska Waste Characterization Study. These facilities are:

- 2.1.3.1. Pheasant Point Landfill located in Douglas County near Bennington, Nebraska. This facility primarily serves the Omaha metropolitan area.
- 2.1.3.2. City of Lincoln’s Bluff Road Landfill located in Lancaster County just north of Lincoln, Nebraska.
- 2.1.3.3. Norfolk Area Solid Waste Transfer Station located in Madison County within the city limits of Norfolk, Nebraska.
- 2.1.3.4. City of Hastings Landfill located in Adams County in the southwestern portion of Hastings, Nebraska.
- 2.1.3.5. Lexington Area Solid Waste Agency’s landfill located in Dawson County north of Lexington, Nebraska.
- 2.1.3.6. The Chadron Transfer Station serving the Solid Waste Agency of Northwest Nebraska. The facility is located in the community of Chadron, which is in Dawes County, Nebraska.
- 2.1.3.7. The Sidney Landfill, which serves the Sidney Area Solid Waste Agency and is located in the community of Sidney in Cheyenne County, Nebraska.
- 2.1.3.8. The Valentine Landfill, which serves the Valentine Area Solid Waste Agency and is located in Cherry County east of the community of Valentine, Nebraska.

**2.1.4. Sample Matrices**

N/A

### **2.1.5. Measurement Classification**

The weight and material type of each sample is critical for an accurate waste characterization analysis for this project.

### **2.1.6. Validation Study Information for Non-Standard Situations**

N/A

## **2.2. Sampling Methods Requirements**

This section identifies specific procedure, equipment, facilities and individuals required to complete the work.

### **2.2.1. Sample Collection Procedures**

The sampling design and methodology will be similar to that of the 2007-2009 State of Nebraska Waste Characterization Study.

- 2.2.1.1.** Drivers will be interviewed as to the origin and composition of their load and the information logged on a standard interview and inspection form. (Appendix A Example)
- 2.2.1.2.** Loads meeting the study requirements will be emptied and inspected with the information logged on a standard interview and inspection form. (Appendix A Example)
- 2.2.1.3.** Loads will be sorted into material categories then weighed and the information logged on a standard data recording sheet. (Appendix A Example)

### **2.2.2. Equipment Needed**

Electronic scale with an accuracy to 0.1 pound.

- 2.2.2.1.** Electronic scale with an accuracy to 0.1 pound
- 2.2.2.2.** Personal involved in sorting and weighing should be outfitted with Tyvek protective suits, Kevlar lined gloves, safety goggles, hard hats, and high-visibility safety vests at a minimum.
- 2.2.2.3.** Tables for sorting waste into material categories
- 2.2.2.4.** Bins to sort materials into for transport and weighing

### **2.2.3. Support Facilities**

Designated areas at each site will require protection from the elements such as a building or tent to sort in or under.

### **2.2.4. Responsible Corrective Action Individuals**

Senior vendor staff will be responsible at each site to make any corrective action determinations. Senior vendor staff will contact NDEE if additional guidance is needed.

### **2.2.5. Decontamination of Equipment**

N/A

### **2.2.6. Selection and Preparation of Sample Containers and Volumes**

The sampling design and methodology will be similar to that of the 2007-2009 State of Nebraska Waste Characterization Study. Sampling containers of appropriate typical sizes and consistency will be utilized for the characterization process and selected by the vendor.



**2.2.7. Preservation Methods**

N/A

**2.3. Sample Handling and Custody**

N/A

**2.4. Analytical Methods Requirements**

The analytical methods will be similar to those of the 2007-2009 State of Nebraska Waste Characterization Study.

**2.4.1. Analytical Methods**

Data collected will be entered into a spreadsheet for analysis. A sample control number will be utilized to track data associated with each sample. Sample control numbering will be such that sample data cannot be contaminated with data from another sample. Sample data collection will be reviewed at least twice daily at reasonable intervals for consistency and completeness.

**2.4.2. Validation Information for Non-Standard Methods**

Using the data analysis, a determination will be made regarding the extent of the impact of the outliers, whether the outliers are reflective of the randomness of the process or are a characteristic of the particular material category, and if any adjustments are necessary. It is anticipated that subtle adjustments to the sampling and sorting may occur as a result of this analysis; however, any modifications will be limited to addressing anomalies and large variances only.

**2.4.3. Responsible Corrective Action Individuals**

Senior vendor staff will be responsible at each site to make any corrective action determinations. Senior vendor staff will contact NDEE if additional guidance is needed.

**2.4.4. Laboratory Turn Around Time**

N/A

**2.5. Quality Control Requirements**

For consistency across all eight sites, each load will be inspected in detail and the information logged. A sample from the load will be selected at random by the same individual who performed the inspection with a sample weight goal of between 200-300 pounds.

**2.5.1. QC Procedures for sampling**

In addition to the weight of each sample, the type of waste comprising the captured sample is considered. Previous experience indicates that commercial waste differs in its composition than residential waste. Mixed waste differs in its composition than either commercial or residential waste. These variances will be considered when analyzing the samples and when evaluating sample anomalies.

**2.5.2. Procedures for QC Statistics**

To confirm the statistical relevance of the data, each category's weight and standard deviation will be determined. A dispersion graph for each category will be developed to identify outliers. This

dispersion analysis will be conducted at the end of each series of seasonal field sorting events. Additionally, this analysis will be used to evaluate the data collected at each site. Based on these analyses, it will be possible to initially determine that the data accurately reflects the solid waste stream at a particular site. In addition to the dispersion analysis the 90% confidence level for each material category will be determined.

It is anticipated that subtle adjustments to the sampling and sorting may occur as a result of this analysis; however, any modifications will be limited to addressing anomalies and large variances only.

**2.6. Instrument/Equipment Testing, Inspection & Maintenance**

N/A

**2.7. Instrument Calibration & Frequency**

N/A

**2.8. Inspections/Acceptance Requirements for Supplies & Consumables**

N/A

**2.9. Data Acquisition Requirements for Non-Direct Measurements**

N/A

**2.10. Data management**

All data will be reviewed by a senior technical staff member to assess data quality and completeness before use. In addition to reviewing and assessing the data collected, all data entered into spreadsheets and all calculations completed for analyses will be reviewed by a senior technical reviewer. The reviewer will evaluate the approach to ensure the methods are appropriate and have been applied correctly to the analysis. The technical reviewer will also confirm all data were entered correctly and that calculations are complete and accurate. Calculations will be checked by repeating each calculation, independently, and comparing the results of the two calculations. Any data entry and calculation errors will be identified and corrected. Data tables prepared for the draft and final reports will be checked against the spreadsheets used to store the data and complete the analysis.

Where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets and calculators to reduce typographical or translation errors—mathematical/statistical calculations are performed using spreadsheets or software programs with predefined formulas and functions. Standard Record Keeping and Data Storage

The vendor will design, maintain, and review data storage methodology suitable for managing and maintaining all data consistently and accurately throughout the project.

**2.10.1. Checklists or Standard Forms**

The vendor will design standard forms based on the examples shown in Appendix A suitable for logging and tracking all data associated with the project.

**2.10.2. Data Handling Equipment and Software**

The vendor will utilize and maintain all data handling equipment and software in a manner consistent with their intended purpose.

**2.10.3. Resource Management Requirements Assurance**

NDEE along with the vendor will conduct monthly meetings during the year-long four-season sampling waste characterization project to ensure all requirements are being met.

### 3. Assessment and Response Actions (Group C)

Under this project, we will concurrently implement existing quality management systems that NDEE has previously utilized for submissions to the EPA under Title I of the Act where task-level deliverables will be subjected to required, regular reviews (e.g., quarterly) to ensure that technical, financial, and schedule requirements of this project are consistent with the EPA PO's and QAM's expectations. This section discusses Elements C.1 (assessments and response actions) and C.2 (reporting) applicable to this project.

#### 3.1. Assessments and Response Actions

The QA program includes periodic review of data files and draft deliverables. The essential steps in the QA program are as follows:

1. Identify and define the problem
2. Assign responsibility for investigating the problem
3. Investigate and determine the cause of the problem
4. Assign and accept responsibility for implementing appropriate corrective actions
5. Establish the effectiveness of and implement the corrective action
6. Verify that the corrective action has eliminated the problem.

The TL will provide day-to-day oversight of the quality system. Periodic project file reviews will be carried out by the QC Coordinator, at least once per year to verify that required records, documentation, and technical review information are maintained in the files. The QC Coordinator will ensure that problems found during the review are brought to the attention of the Task Leader and are corrected immediately. All nonconforming data will be noted, and corrective measures to bring nonconforming data into conformance will be recorded.

The TLs and QA Manager are responsible for determining whether the quality system established for the project is appropriate and functioning in a manner that ensures the integrity of all work products. All technical staff have roles and will participate in the corrective action process. Corrective actions for errors found during QC checks will be determined by the TL and, if necessary, with the QA Manager. The originator of the work will make the corrections and will note on the QC form that the errors were corrected. A reviewer or TL, not involved in the creation of the work, will review the corrections to ensure the errors were corrected. Any problems noted during audits will be reviewed by the QA Manager and discussed with the TL as needed. Depending on the severity of the deficiency, the TL may consult the QA Manager and stop work until the cited deficiency is resolved. Deficiencies identified and their resolution will be documented in monthly project reports, as applicable. The TL will comply and respond to all internal and EPA audits on the project, as needed. The TL will produce a report outlining any corrective actions taken.

### 3.2. Reports to Management

The periodic progress reports (to the EPA PO) required in the grant agreement will be reviewed by the PM and the PM's manager (Kara Valentine, Deputy Director) to ensure the project is meeting milestones and that the resources committed to the project are sufficient to meet project objectives. These periodic progress reports will describe the status of the project, accomplishments during the reporting period, activities planned for the next period, and any special problems or events including any QA/QC issues. Reports to the EPA will be drafted by the TL or other project staff familiar with project activities during the reporting period.

Any QC issues impacting the quality of a deliverable, the project budget, or schedule will be identified and promptly discussed with the assigned TL and the PM or QCC as appropriate. All significant findings will be included in monthly reports with the methods used to resolve the specific QC issue or the recommendations for resolution for consideration by the EPA's PO or designee.

Based on the technical work completed during the reporting period, progress reports will be reviewed internally by an independent, qualified technical person (equivalent or senior to the TL), prior to submitting to the PM. The PM will conduct a final review of the report before transmitting the progress report to the EPA PO and the PM's manager will be cc'd on all progress reports.

#### **4. Data Validation and Verification (Group D)**

##### **4.1. Data Review, Validation, and Verification**

All work conducted under this project will be subject to technical and editorial review. Reviews will be conducted by an independent, qualified person—or a person not directly involved in the production of the deliverable. The term “validation” refers to whether the data meet the QAPP-defined user requirements while the term “verification” refers to whether conclusions can be correctly drawn from the data. The quality of data used and generated for the project will be reviewed and verified at multiple levels by the project team. This review will be conducted by the NDEE TL or a senior technical reviewer with specific, applicable expertise. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all units of measure will be checked for consistency. Any potential issues identified through this review process will be evaluated and, if necessary, data will be corrected, and analysis will be revised as necessary, using corrected data. These corrections will be documented in project records. These measures of data quality will be used to judge whether the data are acceptable for their intended use.

##### **4.1.1. State Criteria for Data Acceptance**

The State will accept data and results with a similar level of data integrity as the 2007-2009 Waste Characterization Study.

##### **4.1.2. Project Specific Calculations or Algorithms**

N/A

##### **4.2. Verification and Validation Methods**

As a standard operating procedure, all data will be verified and validated through a review of data files by an independent, qualified technical staff member (i.e., someone other than the document originator), and ultimately, the NDEE TL. Forms for documenting QC activities and review of deliverables are included in **Appendix B**. Documentation of calculations will be included in spreadsheet work products and in supporting memoranda, as appropriate.

The TL is responsible for day-to-day technical activities of tasks, including planning, data gathering, documentation, reporting, and controlling technical and financial resources. The TL is the primary person responsible for quality of work on tasks under this project and will approve all-related plans and reports. These reports will be transmitted by the TL to the PM for final review and approval.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Reviews of analyses will include a thorough evaluation of content and calculated values. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all measurement units will be checked for consistency. Any potential issues identified through this review process will be evaluated, errors corrected, and analysis repeated using the corrected data. All corrections will be documented in project records.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Typical data verification reviews can include checks of the following:

- Data sources are clearly documented,
- Calculations are appropriately documented,
- All relevant assumptions are clearly documented,

- Conclusions are relevant and supported by results, and
- Text is well-written and easy to understand.

The documented review process will be stored with deliverables for the project. For the narrative describing the methodologies used for the inventory, all comments on drafts will be clearly and concisely summarized including a description of how substantive issues raised by commenters were resolved.

As discussed in Section 1.7, QC objectives include verification that data in database tables are stored and transferred correctly, algorithms call data correctly, units are internally consistent, and reports pull the required data. These data management issues will be addressed as part of the QC checks of data acquisition and document preparation.

For this project, it is not anticipated that any special data validation software will be required. However, where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets (like Excel spreadsheets with predefined functions, or formulas) and calculators to reduce typographical or translation errors. General software available through the Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work as described in Section 1.6 for this project.

#### **4.2.1. Data Validation and Verification**

N/A

#### **4.3. Reconciliation with User Requirements**

All data and deliverables in this project will be analyzed and reconciled with project data quality requirements. To ensure deliverables meet user requirements, the TL or senior technical lead will review all data and deliverables throughout the project to ensure that the data, methodologies, and tools used meet data quality objectives, are clearly conveyed, and represent sound and established science.

NDEE will review each project with the EPA at the planning stage to ensure the approach is fundamentally sound and will meet the project objectives. The TL or senior technical lead will evaluate data continuously during the life term of the project to ensure they are of sufficient quality and quantity to meet the project goals. Prior to submission of draft and final products, the TL or senior technical lead will make a final assessment to determine whether the objectives have been fulfilled in a technically sound manner. Assumptions made in preparing project analyses will be clearly specified in the inventory.

As discussed in Section 1.7.1, uncertainty can be evaluated using a few different approaches. The most useful uncertainty analysis is quantitative and is based on statistical characteristics of the data such as the variance and bias of estimates. In a sensitivity analysis, the effect of a single variable on the resulting emissions estimate generated by a model (or calculation) is evaluated by varying its value while holding all other variables constant. Sensitivity analyses will help focus on the data that have the greatest impact on the output data. Additional statistical tests may be utilized depending on the need for more or less rigorous tools and on the specific inventory activity being evaluated.

#### **4.3.1. Data Validation and Verification**

N/A

## 5. References

EPA, *Chief Information Officer's Policy Directive on Information Technology / Information Management: Quality Assurance Project Plan (QAPP) Standard*, Directive # CIO 2105-S-02.0. Available at <https://www.epa.gov/irmpoli8/quality-assurance-project-plan-qapp-standard>. Accessed on 7/24/2023.



**Appendix A: Form Examples**

**EXAMPLE INTERVIEW AND VISUAL INSPECTION FORM**

<b>CONTROL #</b>		<b>SAMPLE BIN NUMBERS</b>	
<b>FACILITY</b>		<b>DATE</b>	
<b>TRUCK OWNER</b>		<b>TRUCK #</b>	
<b>TIME IN</b>		<b>NET WGT</b>	
<b>TYPE OF TRUCK</b>	<input type="checkbox"/> REAR <input type="checkbox"/> FRONT <input type="checkbox"/> SIDE <input type="checkbox"/> ROLL-OFF		
<b>SERVICE AREA</b>	County: _____ Community: _____		
<b>TYPE OF WASTE</b>	<input type="checkbox"/> RES <input type="checkbox"/> COM <input type="checkbox"/> MIX		
<b>DRIVER OBSERVATIONS</b>	<input type="checkbox"/> Single Family <input type="checkbox"/> Apartments <input type="checkbox"/> Retail <input type="checkbox"/> Offices <input type="checkbox"/> Restaurants <input type="checkbox"/> Nur Home <input type="checkbox"/> Hospital <input type="checkbox"/> Dr Offices <input type="checkbox"/> Schools		
<b>CPUs</b>		<b>Televisions</b>	<b>Sofas</b>
<b>Keyboards</b>		<b>VCR or DVD</b>	<b>Stuffed Chairs</b>
<b>Monitors</b>		<b>Tires</b>	<b>Mattresses</b>
<b>Printers</b>		<b>Wood Pallets</b>	<b>Fluorescent Bulb</b>
<b>Stereos</b>		<b>Small Apps</b>	<b>Oil Filters</b>
<b>Speakers</b>		<b>Large Apps</b>	<b>Dead Animals</b>
Lumber <input type="checkbox"/> Plumbing Fix <input type="checkbox"/> Elec Wire/Cable <input type="checkbox"/> Insulation <input type="checkbox"/> Siding <input type="checkbox"/> Shingles <input type="checkbox"/> PVC Pipe <input type="checkbox"/> Plastic Strap <input type="checkbox"/> Carpet <input type="checkbox"/> Metal <input type="checkbox"/> Doors <input type="checkbox"/> Windows <input type="checkbox"/> Drywall <input type="checkbox"/> Linoleum <input type="checkbox"/> Styrofoam <input type="checkbox"/> Plastic Bins <input type="checkbox"/> Patio Furn <input type="checkbox"/> Wood Furn <input type="checkbox"/> Metal Furn <input type="checkbox"/> Office Furn <input type="checkbox"/> Yard Equip <input type="checkbox"/> Garden Hose <input type="checkbox"/> Bicycles <input type="checkbox"/> Car Seats <input type="checkbox"/> Strollers <input type="checkbox"/> Plastic Toys <input type="checkbox"/> Stuffed Toys <input type="checkbox"/> Books <input type="checkbox"/> Car Parts - Body <input type="checkbox"/> Car Parts - Engine <input type="checkbox"/> Limbs & Brush <input type="checkbox"/> Yard Waste <input type="checkbox"/>			

**EXAMPLE DATA RECORDING SHEET**

<b>CONTROL NUMBER</b>		<b>SAMPLE BIN NO.</b>	
<b>FACILITY</b>		<b>DAY/DATE</b>	
<b>SAMPLE BIN WGT</b>		<b>SAMPLE BIN WGT</b>	
<b>SAMPLE BIN WGT</b>		<b>SAMPLE BIN WGT</b>	
<b>SAMPLE BIN WGT</b>		<b>SAMPLE BIN WGT</b>	
<b>GROSS SAMPLE WEIGHT</b>		<b>NET SAMPLE WEIGHT</b>	

<b>MATERIAL CATEGORY</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>
CARDBOARD						
OFFICE PAPER						
NEWSPRINT						
MAGAZINES						
PAPERBOARD/LINER BOARD						
MIXED PAPER/OTHER PAPER						
PET #1						
HDPE #2						
OTHER NUMBERED CON						
PLASTIC FILM/WRAP/BAGS						
OTHER PLASTICS						
CLEAR GLASS CONTAINERS						
BROWN GLASS CONTAINER						
GREEN GLASS CONTAINERS						
BLUE GLASS CONTAINERS						
OTHER GLASS						

**EXAMPLE DATA RECORDING SHEET (continued)**

<b>MATERIAL CATEGORY</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>	<b>WEIGHT</b>
<b>ALUMINUM CONTAINERS</b>						
<b>STEEL/TIN CONTAINERS</b>						
<b>OTHER FERROUS SCRAP</b>						
<b>OTHER NON-FERROUS</b>						
<b>FOOD WASTE</b>						
<b>DIAPERS</b>						
<b>TEXTILE/RUBBER/LEATHER</b>						
<b>YARD WASTE</b>						
<b>HHW</b>						
<b>E-WASTE</b>						
<b>NON-DISTINCT</b>						
<b>OIL FILTERS</b>						
<b>WASTE OIL</b>						
<b>LINOLEUM</b>						
<b>THERMOMETERS</b>						
<b>THERMOSTATS</b>						
<b>RAW MERCURY</b>						
<b>LIGHT-UP STUFF</b>						
<b>FLUORESCENT BULBS</b>						
<b>DRY-CELL BATTERIES</b>						
<b>MISC. C/D WASTE</b>						
<b>WOOD</b>						
<b>EMPTY AEROSOL CANS</b>						

