Drinking Water and Wastewater Utilities: Recommended Approach to Assessing Operations and Maintenance Costs
at Tribal Utilities

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Prepared by:

The Cadmus Group, Inc.
2620 Colonial Drive, Suite A
Helena, MT 59601

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Executive Summary

Purpose of the Report

The Infrastructure Task Force (ITF) has identified operations and maintenance funding including support of tribal capacity development as a barrier to increasing access to safe drinking water and wastewater disposal in Indian country. Understanding operations and maintenance (O&M) costs of tribal drinking water and wastewater systems is an important step in understanding the financial capacity of tribally operated utilities. This capacity directly impacts: a tribe's ability to maintain water system regulatory compliance and the longevity of the infrastructure funded by extensive national investment.

The proposed survey will assess the difference in O&M spending levels at benchmark tribal utilities deemed to be adequately funded to a random sample of tribal utilities. The outcomes of this survey are intended to answer the question

> *To what extent are the operations and maintenance costs reported by tribal utilities sufficient to properly operate and maintain the drinking water system and wastewater system infrastructure through their design life?*

and could be used to:

- Improve targeting of capital infrastructure program resources
- Raise tribal leader and community awareness of the connection between O&M cost and capital infrastructure
- Enrich the discussion regarding the delivery structure of current federal capital infrastructure programs

If the recommendations of this report are fully implemented resulting in an assessment on a national leveal, it will improve understanding of the O&M costs necessary to not only ensure that critical infrastructure investments are appropriately supported but also ensure that future federal investments in infrastructure meet their full anticipated design life and ultimately help ensure tribal utilities remain sustainable.

National Study Recommendations

The recommended approach compares actual O&M costs to costs reported by representative adequately funded tribally operated utilities. Similar but separate assessments will be implemented for AI and ANV utilities in recognition of the significant differences between their public drinking water and wastewater system infrastructure, configurations, and unique geographic challenges.

The recommended approach relies on two phases of data collection. The first phase collects information from tribal utilities that are considered to be adequately funded or close to adequately funded to establish benchmark costs. Representative utilities serving 14,000 or fewer persons will be identified for this benchmark role. All AI utilities serving over 14,000 persons will also be included in phase 1 (no ANV utilities serve over 14,000 persons). In the second phase, information from a statistical sample of the remaining utilities will be used to estimate actual O&M costs. A statistical sample is necessary due to anticipated resource constraints and

the large number of tribal utilities nationally. Data analysis will then compare the actual costs to the adequately funded benchmark costs. The report will convey the findings nationally and by AI and ANV utilities. This approach supports a broad-brush assessment of O&M costs in the most efficient manner possible and using readily available information to minimize the burden on tribal utilities and participating government agencies. Exhibit ES.1 provides an overview of the two-phased approach and key steps within each phase.

PHASE 1: Establish Tribal Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks
1. Validate Inventory of Tribal Utility Organizations and Assign Groupings Based on Similarities
2. Identify Adequately Funded Benchmark Utilities
3. Collect and Compile Data for Utilities Selected as Adequately Funded Benchmarks
4. Develop Adequately Funded Utility Benchmark O&M Cost Models

PHASE 2: Survey Remaining Tribal Drinking Water and Wastewater Utility Organizations and Prepare Final Report
1. Select Sample of Remaining Utilities
2. Collect and Compile Data for Sample of Remaining Utilities
3. Compare Survey-Collected Data to Benchmark Data Collected in Phase 1 and Calculate Estimated Funding Gap
4. Prepare Final Report

Exhibit ES.1 Recommended Two-Phased National Study Approach

In the recommended method, adequate O&M costs are defined as the costs necessary to operate and maintain public drinking water and/or wastewater disposal systems in a sustainable manner. Actual O&M costs will be the current annual costs reported by tribal utilities at the time of the assessment. Information collected on O&M costs include budgets and expenditures for staff, electrical and other utility services, water and wastewater treatment chemicals, and other non-capital expenses. General information on revenue sources will also be collected. Infrastructure information to be collected is related to the O&M costs and includes major assets and their capacities, with some indication of whether the overall system is in good, fair, or poor condition.

The recommended approach relies on data collection by the Indian Health Service (IHS) and the Alaska Native Tribal Health Consortium (ANTHC), with support from the Environmental Protection Agency (EPA) and contractors. Tribal contributions include information on their O&M costs and major assets. The approach assumes data collection would coincide with the IHS Sanitation Deficiency System (SDS) annual data collection efforts.

Contractor support cost estimates for the national study, the number of AI and ANV utilities proposed for the assessment, and the estimated Level of Effort (LOE) which, in this case is the number of hours for government agency participation, are included in Exhibit ES.2. The costs reported in Exhibit ES.2 are for contractors to support various efforts including training on assessment methods, assisting IHS and ANTHC with data collection, data compilation, data analysis, and report preparation, among other tasks. The cost estimates include development of a database which could be used to transfer the asset and O&M cost information to the IHS Operation and Maintenance Data System (OMDS) after OMDS is modified to receive it. The number of utilities proposed is derived from the statistical design of the survey, which is explained further in this report. The approach supports options for the timing of the phases as well as for the AI and ANV assessments in general. That is, the two phases can be scheduled in different fiscal years, and the AI and ANV assessments do not need to occur simultaneously.

Phase	Brief Description	Sample Size[1]	Level of Effort for Government Agencies (hours)[2]	Preliminary Cost Estimate[3]
AI Phase 1	Establish AI Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks	18	949	$146,640
AI Phase 2	Survey Remaining AI Drinking Water and Wastewater Utility Organizations and Prepare Final Report	104	2,888	$308,400
AI Total Preliminary Sample Size, Government LOE, and Cost Estimate		122	3,837	$455,000
ANV Phase 1	Establish ANV Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks	16	369	$102,000
ANV Phase 2	Survey Remaining ANV Drinking Water and Wastewater Utility Organizations and Prepare Final Report	74	1,536	$224,400
ANV Total Preliminary Sample Size, Government LOE, and Cost Estimate		90	1,905	$326,400
Total Preliminary Cost Estimate				$781,400

[1] The sample is designed to estimate a 90 percent confidence interval of ±20 percent.

[2] For AI LOE hours estimate, it is assumed half of the data collection will consist of site visits and half will be completed through file reviews. For ANV, it is assumed that all data collection will be through file reviews.

[3] Cost estimate reflects contractor costs and assumes data is collected by EPA, IHS, and/or ANTHC with oversight by the contractor, and the contractor develops the database and supports data upload, data analysis, and report preparation.

Exhibit ES.2 Preliminary LOE and Cost Estimate for the Two-Phased Approach

Development of the Recommended Approach

The recommended approach was developed during the preceding two-year period. Efforts included an extensive investigation of existing options for estimating adequate O&M costs,

options for the statistical approach to the assessment, and completing a nine-utility pilot study of data collection tools and methods.

Existing options for estimating adequate O&M costs of small tribal utilities were found to be limited. Interviews with consulting engineers on estimating O&M costs of new projects and with the Rural Community Assistance Partnership (RCAP) on their evolving method of studying similar systems revealed a common approach of using comparable systems to estimate O&M needs. Very limited existing information was identified that could guide development of O&M costs based on very small drinking water or wastewater system assets or by using utility user fee rate structures. References from the New England Interstate Water Pollution Control Commission (NEIWPCC) were useful in identifying considerations important to O&M activity expectations. American Water Works Association (AWWA) materials and the results of the EPA's 2006 Community Water System Survey provided some information on O&M costs, but emphasized non-tribal systems and systems larger than typical AI or ANV communities. These findings suggested it would be important to use an approach that recognizes tribal utilities are sufficiently different from non-tribal utilities, and supported developing O&M cost benchmarks from AI and ANV entities.

Options for the statistical approach considered sampling designs by tribal drinking water and wastewater system characteristics as well as by utility. The findings of the pilot study provided insight into budget and expenditure tracking on a utility level and led to the recommendation that the statistical approach be utility-based rather than system-based.

The nine utilities that participated in the pilot study were selected by IHS and/or EPA personnel to represent a variety of system characteristics (based on infrastructure inventory, population served, and geographic distribution). Two of the pilot study participants were ANV utilities; the seven others were AI utilities. During the pilot study, IHS personnel were typically on-site during the interviews to assist with the interview and to obtain available cost and budget documents. Contractors facilitated the interviews by conference call for eight utilities and performed an on-site interview for one utility. EPA personnel assisted with drinking water system asset information and participated in the phone interviews. Contractor support was also used for planning, training, interview coordination, data compilation, and data analysis.

The pilot study revealed detailed infrastructure budget and expenditure information is not readily available from many tribal utilities. Preparing for the pilot study also found there is no database collecting information on existing infrastructure assets at tribal drinking water and wastewater systems. The study indicated that a broad-brush national assessment is feasible and could be based on limited infrastructure asset and budget detail. The study also found on-site support for data collection was extremely helpful, but could this type of support could be substituted with good asset and financial records and familiarity with the utility and its drinking water and wastewater systems.

Next Steps

This report identifies the recommended scope and estimated cost of a national assessment of AI and ANV utility costs. Much of the work to design a national assessment has been completed. However, commitment to implementing this important study and funding the related efforts comprise the critical next steps for the project.

1.0 Introduction

1.1 Purpose of the Project

In Fiscal Year 2012, sixteen percent of the population served by community water systems in Indian country did not receive drinking water that met all applicable health-based drinking water standards. Comparatively, six percent of the United States population served by community water systems did not receive drinking water that met all of those standards. It is assumed a similar disparity exists for the adequacy and reliability of the wastewater systems that serve tribal communities.

The Infrastructure Task Force (ITF) has identified operations and maintenance funding including support of tribal capacity development as a barrier to increasing access to safe drinking water and wastewater disposal in Indian country. Understanding operations and maintenance (O&M) costs of tribal drinking water and wastewater systems is an important step in understanding the financial capacity of tribally operated utilities. This capacity directly impacts: a tribe's ability to maintain water system regulatory compliance and the longevity of the infrastructure funded by extensive national investment.

The proposed survey will assess the difference in O&M spending levels at benchmark tribal utilities deemed to be adequately funded to a random sample of tribal utilities. The outcomes of this survey are intended to answer the question

> *To what extent are the operations and maintenance costs reported by tribal utilities sufficient to properly operate and maintain the drinking water system and wastewater system infrastructure through their design life?*

and could be used to:

- Improve targeting of capital infrastructure program resources
- Raise tribal leader and community awareness of the connection between O&M cost and capital infrastructure
- Enrich the discussion regarding the delivery structure of current federal capital infrastructure programs

1.2 Scope of the Project

This national assessment of the O&M costs will compare actual costs of tribal utilities to benchmark costs reported by tribal utilities that are identified as adequately funded. This report describes a recommended approach to implement the national assessment. The assessment will require widespread participation of tribal utilities and support from several federal agencies.

Because of the unique characteristics and challenges of AI and ANV communities, the assessment will be performed as separate efforts for AI and ANV utilities. Due to the number of tribal utilities in the nation, the recommended approach also uses statistical samples of AI and ANV utilities to derive the national estimates. Findings from the two efforts will culminate in a report of the national assessment, with AI and ANV results also presented separately.

Information will be collected on community drinking water systems and wastewater systems of tribal utilities. Community water systems included in the assessment are defined as serving at least 15 connections used by year-round residents or at least 25 year-round residents. Wastewater systems addressed by the assessment include subsurface disposal systems, mechanical wastewater treatment facilities, or discharging or non-discharging wastewater lagoons that serve tribal homes and are operated and maintained by a tribal utility.

Actual O&M costs will be based on the reported costs at tribal utilities at the time of the assessment. Adequate O&M costs are defined as the expenditures necessary to operate and maintain drinking water and/or wastewater systems in a sustainable manner. Adequately funded benchmark utilities will be selected based on their regulatory compliance history, ability to sufficiently operate and maintain their systems, and other factors that contribute to a sustainable utility.

1.3 Project Oversight

Development of the recommended approach was guided by lead agency coordinators from the EPA Office of Ground Water and Drinking Water, EPA Office of Waste Management, U.S. Department of Agriculture, and the Indian Health Service. Oversight was provided by the Infrastructure Task Force Operations and Maintenance Workgroup (OMW). Members of the OMW include representatives from tribes, Minnesota Rural Water Association, Rural Community Assistance Partnership, Iowa Rural Utility Services, USDA, and EPA.

1.4 How Utility Operations and Maintenance Costs are Defined

For the purposes of this project, utility O&M costs include employee wages necessary to perform O&M activities (including benefits associated with those wages), administrative support costs, infrastructure and equipment-related maintenance costs, costs associated with laboratory fees for compliance monitoring, electrical and fuel costs, drinking water and wastewater treatment chemical costs, and costs associated with replacing short-lived assets.

Typical O&M activities anticipated to be covered by employee wages include treatment facility operations, compliance monitoring and reporting, meter-reading, preventive maintenance, inspection and monitoring of lift stations and pump stations, repair of equipment or infrastructure that is not considered major rehabilitation, and administrative functions such as employee supervision, budgeting, and billing. Examples of infrastructure and equipment-related O&M activities include motor repair, valve or hydrant repair, and locating and repairing broken mains.

Replacement costs for major infrastructure assets are considered to be capital investments and are not included in this definition of O&M costs. Major rehabilitation projects are also considered to be capital costs. Since the majority of capital replacement projects and major rehabilitation projects of drinking water and wastewater systems in Indian country are funded via the federal government, these costs are not included in this assessment. Major rehabilitation projects typically require specialized contractors rather than in-house staff and include, for example, tank or treatment facility rehabilitation and cleaning and lining of drinking water transmission or distribution mains or wastewater collection pipe.

1.5 Overview of this Report

This report presents a recommended approach for conducting a national tribal utility O&M cost assessment, how the approach was derived, and the next steps in the process of implementing a national study.

- ***Chapter 1 – Introduction (this section).*** Summarizes the purpose and scope of the project, defines O&M efforts and costs, and outlines the remainder of the report's chapters.

- ***Chapter 2 – National Study Recommendations.*** Describes the recommended two-phased approach, the statistical design of that approach, and the estimated cost for the national study.

- ***Chapter 3 – Development of Recommended Approach.*** Provides an overview of the literature search findings and the nine-utility pilot study that informed the recommended approach, and alternatives that were investigated as potential approach options.

- ***Chapter 4 – Next Steps.*** Identifies the actions needed for implementation of a national study, including funding considerations and federal agency commitment to support the assessment.

2.0 National Study Recommendations

The recommended approach to the national study compares actual O&M costs to costs reported by representative adequately funded tribally operated utilities. Similar but separate assessments will be implemented for AI and ANV utilities in recognition of the significant differences between their public drinking water and wastewater system infrastructure, configurations, and unique geographic challenges.

The recommended approach relies on two phases of data collection. The first phase collects information from utilities that are considered to be adequately funded or close to adequately funded to establish benchmark O&M costs. The seven AI utilities serving more than 14,000 persons will also be included in the first phase of the sample (there are no ANV utilities that serve more than 14,000 persons). It is more practical to collect data from all seven of these larger utilities rather than from a sample of them because they may have substantial differences between them and because there are so few of that size. They are included in the first phase because information regarding the larger utilities will assist in the development of the benchmark cost models. In the second phase, information from a statistical sample of the remaining utilities will be used to estimate the actual O&M costs. Data analysis will then compare the actual costs to the adequately funded benchmark costs. The data will allow reporting of the findings nationally and by AI and ANV utilities.

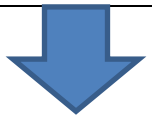
This approach supports a broad-brush *national* assessment of O&M costs in the most efficient manner possible; it does not compare O&M costs by specific drinking water or wastewater system. The approach minimizes the burden on tribal utilities and participating government agencies by using readily available information.

2.1 Recommended Two-phased Approach

Phase 1 begins by establishing the inventory of AI and ANV utilities to support the statistical sampling needed for phase 2. It includes collecting and analyzing data from the utilities that have been identified as adequately funded benchmarks for the ANV effort (ANTHC has already identified these utilities). For the AI effort, it includes identifying the benchmark utilities and then collecting and analyzing their data.

Exhibit 1 shows the two-phased approach and the steps within each phase. This section describes each phase and the activities associated with that phase. Although the assessments are similar, the specific differences between the AI and ANV approaches are identified, where applicable. Detailed flow charts that include activities associated with each step by responsible party for both the AI and ANV assessments are included in Appendix A.

PHASE 1: Establish Tribal Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks
1. Validate Inventory of Tribal Utility Organizations and Assign Groupings Based on Similarities
2. Identify Adequately Funded Benchmark Utilities
3. Collect and Compile Data for Utilities Selected as Adequately Funded Benchmarks
4. Develop Adequately Funded Utility Benchmark O&M Cost Models



PHASE 2: Survey Remaining Tribal Drinking Water and Wastewater Utility Organizations and Prepare Final Report
1. Select Sample of Remaining Utilities
2. Collect and Compile Data for Sample of Remaining Utilities
3. Compare Survey-Collected Data to Benchmark Data Collected in Phase 1 and Calculate Estimated Funding Gap
4. Prepare Final Report

Exhibit 1. Recommended Two-Phased National Study Approach

2.1.1 Phase 1 Activities by Task

The purpose of phase 1 is to determine a select number of adequately funded utilities from similar groups of utilities, collect the data, and use the data to develop benchmark O&M cost models. Exhibit 2 provides the detailed activities for each step in phase 1. The entity completing the activity is denoted by a checkmark. Activities for each step are discussed in more detail following the exhibit.

Phase I - Establish Tribal Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks	IHS	ANTHC	EPA Region	State of AK	Contractor
1. Validate Inventory of Tribal Utility Organizations and Assign Groupings Based on Similarities					
- Develop inventory of utility organizations including critical information for grouping utilities based on similarities.	✓	✓	✓	✓	✓
- Prepare final validated inventory and assign groups.					✓
2. Identify Adequately Funded Benchmark Utilities					
- AI: Use pre-screening form to identify candidate benchmark utilities and select utilities for each group.	✓		✓		✓
- ANV: Select benchmark utilities for each grouping based on ANTHC recommendations.		✓			✓
3. Collect and Compile Data for Utilities Selected as Adequately Funded Benchmarks					
- Train IHS/ANTHC on data collection and form completion.	✓	✓			✓
- Develop working database to allow data to be compiled and analyzed.	✓	✓			✓
- Collect benchmark utility information via site visits or file review of existing records and complete forms.	✓	✓	✓	✓	✓
- Collect census AI utility information via site visit or file review of existing records and complete forms.	✓		✓		✓
- Review utility data, resolve inconsistencies, and upload data.					✓
4. Develop Adequately Funded Utility Benchmark O&M Cost Models					
- Analyze data and refine data collection forms as needed.					✓
- Develop benchmark O&M cost models.					✓

Exhibit 2. Phase 1 Activities by Task and the Entity Completing the Activity

Validate Inventory of Tribal Utility Organizations and Assign Groupings Based on Similarities

The first step in phase 1 involves ensuring the inventory of tribal utility organizations and their respective drinking water and wastewater systems and populations is correct (e.g., the list does not include inactive utilities or inactive systems within a utility). This process ensures that the utilities selected for the statistical sample in phase 2 are valid utilities with valid drinking water and/or wastewater systems and are represented by accurate populations (population is one characteristic used to group the systems in the statistical sample).

The inventory will be generated by the contractor based on information from the IHS Operation and Maintenance Data System (OMDS). The list will be reviewed and corrected, as necessary, by EPA Regions and IHS personnel for AI utilities, and EPA Region 10, ANTHC, and the state of Alaska for ANV utilities. A typical revision may consist of adjusting the population served or correcting the utility to which a drinking water or

wastewater system is assigned. Once reviewed, the contractor will maintain the updated inventory master list.

Identify Adequately Funded Benchmark Utilities

Slightly different approaches will be used to identify adequately funded AI and ANV utilities. For AI, EPA and IHS will use a pre-screening form to identify candidate benchmark utilities. The contractor will review completed pre-screening forms and select a sufficient number of utilities for each group of utilities used for the statistical design of the assessment. Exhibit 3 shows an example of the pre-screening form. The elements of the pre-screening form were based on observations made during the nine-utility pilot study, IHS's O&M scoring system criteria, and information provided by ANTHC on characteristics of ANV utilities that they consider to be adequately funded.

For the ANV study, benchmark utilities are selected based on recommendations from ANTHC. ANTHC has detailed knowledge of the characteristics, condition, financial status, and O&M activities of each of the ANV communities to which they provide assistance. In effect, this knowledge base of ANTHC has already served as the pre-screening function of phase 1. Like the AI effort, a sufficient number of ANV utilities will be selected to represent each grouping of similar utilities.

Pre-screen Form for Determining American Indian Adequately Funded Utilities

Utility Name: _____ Organization #:_____

Person Completing Questionnaire_____ Date: _____

Check boxes that apply:

- ☐ Combined (provides both drinking water and wastewater service)
- ☐ Single (provides either drinking water or wastewater service - circle which applies)
- ☐ Serves >3,300 to 14,000 (do not complete for utilities serving >14,000 people)
- ☐ Serves ≤3,300

Instructions: Select 'Yes' or 'No' for questions 1 through 9. Check the applicable box for questions 10 and 11.

		Yes	No
1.	Is the Utility budget sufficient for:		
	Operations tasks		
	Financial tasks		
	Managerial tasks		
2.	Is the Utility budget followed?		
3.	Does the utility have adequate revenue sources (i.e., no consistent budget shortfalls)?		
4.	Are at least 90% of revenues paid each month?		
5.	Does the Utility have a Master Utility Plan that is updated at least once every five (5) years by ordinance or tribal law and includes Operational and Capital Improvement Plans?		
6.	Does the Utility have adequate FTEs to complete:		
	Operations tasks		
	Financial tasks		
	Managerial tasks		
7.	Is the Utility compliant with all regulations?		
8.	Does the utility have a historical record of high (more than 3 years) operator retention?		
9.	Does the Utility have a certified operator(s)?		
10.	What is the frequency the utility requires assistance (TUC, field engineer) regarding operational and/or regulatory compliance? ☐ day-to-day ☐ month-to-month ☐ less		
11.	Compared to average tribal utilites in your area, is this utility ☐ more or ☐ less complex, or ☐ comparable? (Complex relates to drinking water or wastewater treatment technologies applied.)		

Exhibit 3. Pre-screening Form for American Indian Adequately Funded Utilities

Collect and Compile Data for Utilities Selected as Adequately Funded Benchmarks

For this step, the contractor will conduct trainings for IHS, ANTHC, EPA, and the state of Alaska on the type of data to be collected and how to populate the data collection form. The contractor will also assist IHS with the utility interviews and provide follow-up to IHS and ANTHC for obtaining cost and budget documents and completing forms. The data to be collected for the assessment is discussed in Section 2.2.

The cost estimate for this recommended approach assumes the contractor will develop a working database to compile the data and support data analysis. The database will be designed such that it could be used to transfer the information to the IHS OMDS database at a later date. The estimated cost does not include modification of OMDS to accept the data, nor does it ensure design of the database to support data transfer without additional programming.

IHS, ANTHC, EPA, and the state of Alaska will collect the data for the benchmark utilities by conducting site visits or file reviews and will submit the data to the contractor. In addition, data will be collected for all AI utilities that serve over 14,000 people. Data for these utilities will be collected under phase 1 because it is anticipated they may have information useful to developing the benchmark cost models. The seven largest AI utilities (according to total population served in the July 2013 IHS OMDS database) that will be included in the first phase are:

- Navajo Tribal Utility Authority
- Ost Rural Water Supply System
- Shakopee-Mdewakanton Sioux Bus. Council
- Stockbridge-Munsee Division Of Community Housing
- Tohono O'Odham Utility Authority
- Tulalip O&M Org.
- White Mountain Apache (WMA) Utility Authority

The contractor will review the information, address any issues or inconsistencies with the data, and upload the data to the database.

Develop Adequately Funded Utility Benchmark O&M Cost Models

In the final step of phase 1, the contractor will analyze the information for the utilities as a whole and in each grouping. Critical data will be identified and used to develop benchmark O&M cost models. The models will be used to compare data from utilities sampled in phase 2. Based on the findings of phase 1, the data collection form will be revised or refined as needed.

2.1.2 Phase 2 Activities by Task

The purpose of phase 2 is to select a sample of utilities from among similar groups of utilities, collect their data, and compare their data to the benchmark O&M cost models developed in phase 1. Exhibit 4 presents the detailed activities for each step in phase 2. The entities responsible for each activity are denoted by a checkmark. Activities for each step are discussed in more detail following the exhibit.

Phase II - Survey Remaining Tribal Drinking Water and Wastewater Utility Organizations and Prepare Final Report	IHS	ANTHC	EPA Region	State of AK	Contractor
1. Select Sample of Remaining Utilities					
- Confirm or adjust groups of utilities based on Phase 1 results and select sample.					✓
2. Collect and Compile Data for Sample of Remaining Utilities					
- Collect utility information via site visits or file review of existing records and complete forms.	✓	✓	✓	✓	✓
- Review submitted data, resolve inconsistencies, and upload data.					✓
3. Compare Survey-Collected Data to Benchmark Data Collected in Phase 1 and Calculate Estimated Funding Gap					
- Compile data from Phase 2 and apply final weights to sample.					✓
- Compare utility data to benchmark O&M cost models.					✓
- Estimate funding gap.					✓
4. Prepare Final Report					
- Develop report graphics and text.	✓	✓			✓

Exhibit 4. Phase 2 Activities by Task and the Entity Completing the Activity

Select Sample of Remaining Utilities

The first step in phase 2 involves the contractor examining the groups of utilities established in phase 1 and adjusting them, if needed, based on the results of phase 1. Adjustments may be necessary if the data shows that less or more groups are needed. For example, if the data shows vast differences within a group, the group may be divided further or another category may be identified and used. If adjustments are needed that change the number of utilities needed for phase 2, it may affect the cost estimates for the project.

Collect and Compile Data for Sample of Remaining Utilities

Like phase 1, data will be collected by IHS, ANTHC, EPA, and the state of Alaska for systems in the sample through site visits or file reviews. Contractor support will assist IHS with utility interviews and IHS and ANTHC with follow-up to obtain related documents and completed forms. The contractor will also upload the data to the project database. The contractor will review the information from the working database and address any issues or inconsistencies with the data.

Compare Survey-Collected Data to Benchmark Data Collected in Phase 1 and Calculate Estimated Funding Gap

Once data collection is complete and all data has been entered into the database, the contractor will analyze the data. Quality control techniques will be applied to identify any errors and/or anomalies. Also, depending on response rates for each group of utilities, sample

weights (the weight applied to a utility in the sample that represents other like utilities) will be adjusted as necessary.

Once the data has been 'scrubbed,' comparisons will be made between utility data from the sample and the adequately funded utilities using the benchmark O&M cost models. Based on this analysis, the estimated funding gap will be calculated.

Final Report

When all data collection and analysis activities are complete, IHS, ANTHC, and the contractor will develop a final report to show the findings of the assessment. The findings will be reported on a national level and separately for AI and ANV utilities.

2.2 Data Collection

Similar to other surveys of small systems (those serving 3,300 or fewer persons), such as the EPA Drinking Water Infrastructure Needs Survey and Assessment (DWINSA) and Community Water System Survey, the recommended approach assumes data collection will be provided by trained professionals from IHS and ANTHC with assistance from EPA, the state of Alaska, and the contractor as needed. Training on the assessment and completing the data collection forms would not be directly provided to the utilities because it is recognized they do not typically have the resources to provide the information without assistance.

In the recommended approach, data will be collected for AI utilities through site visits or file reviews and for ANV utilities through file reviews. Contractor assistance will be provided to the government agencies during the utility interviews and for follow-up support to obtain critical information. To minimize burden, it is anticipated that data collected via site visits will coincide with IHS annual SDS data collection efforts. Other data collection alternatives that apply the two-phased recommended approach but include a reduced contractor role and an increased contractor role are presented in Appendix B.

Once the data is collected, the information will be entered into the project database. Cost estimates for the recommended approach and the two options presented in Appendix B include development of the database.

2.2.1 Data to be Collected

Capturing critical information that affects O&M costs without creating high response burden or non-response issues are a priority for this assessment. The pilot study performed in the development of the recommended approach showed that the level of detail originally sought was not reliably available and less detailed information is needed than originally envisioned.

The data to be collected falls within the four general categories of: utility information, financial information, staffing information, and drinking water and wastewater system major infrastructure. Each of these categories is described in detail below. The data collection form designed to record the information is included as Appendix C. The form will be used in its Microsoft Excel format, and designed so that the data can be easily transferred to the working database.

Utility Information

Utility information includes utility ownership (to confirm ownership as AI, ANV, Federal, etc.), contact information, utility population, total number of connections, and the geographic area of the homes served by the utility. Geographic area is collected to provide a general indication of the extent to which the distance between drinking water and wastewater systems within the utility's jurisdiction could impact driving time requirements for utility staff.

The utility information on the form also includes the number of drinking water and wastewater systems operated by the utility and, for each system, the population and number of connections, the source type (drinking water), treatment type (wastewater), and if septic systems are used whether they are maintained by the homeowner or utility. This information is necessary to determine the number and general characteristics of the systems the utility's O&M budget must cover.

Financial Information

The financial information to be collected focuses on total O&M costs rather than identifying details on costs for specific items such as energy costs, water or wastewater treatment chemical costs, administrative costs, etc. This decision is supported by the pilot study findings that budget details and formats varied widely between the nine utilities surveyed, making it difficult to compare such information between utilities. The pilot study also showed that the key financial information necessary to compare utilities was a utility's budget, expenses, and revenue for a given year. The recommended approach will request that a copy of the O&M budget, expenditures, and revenue information be provided. The supporting documentation is anticipated to be useful during quality assurance review of the data and to help resolve questions about the data that may arise during data analysis. Supporting documentation will not be required.

The utility information will also include an indication of whether there is an operating budget, the time period covered by the operating budget, how often it is reviewed or updated, the data used to update the budget, whether it is actively followed by the utility, and if it covers multiple drinking water and/or wastewater systems. This information will help inform how well the budget information reflects actual expenditures.

Information will also include the total budget for the utility (in dollars) and the year in which the budget applies. If the utility has the budget separated by drinking water and wastewater systems, that information would also be included. Also, the percentage of the budget assigned to labor expenses is requested. A common theme in the pilot study was lack of sufficient manpower to cover all necessary O&M activities; therefore, this information is collected to indicate whether an increase in labor could have a significant impact on a utility's overall budget.

If available, actual expenses are requested for the utility as a whole and also by individual drinking water and/or wastewater system(s). In addition, the year that the expenses were incurred is requested to verify whether it coincides with the budget year. Actual expenses are expected to indicate whether the budget was reasonable.

Finally, revenue information is requested as budgeted revenue and actual revenue along with the associated fiscal year. Like expenditure information, the revenue information must be for the same year as the budget information. The revenue information is requested for the utility as a whole and also by individual drinking water and/or wastewater system(s). Revenue sources (user fees, federal funding direct, and/or tribal funds (e.g., enterprise funds)), user fee rates (water, wastewater, or combined), and the percent of user fees that are collected, if user fees apply, are also requested.

After the financial data is collected it will be adjusted to a standard year, such as January 2015 dollars, to accurately compare between utilities.

Staffing Information

Information requested for the staffing portion of the form includes the title of each individual working for the utility, whether they are a staff member or contractor, and the full-time equivalent number or the number of hours per day (or week, month, etc.) they spend on operations and maintenance at the utility.

Drinking Water and Wastewater Assets

This section of the form requests that each major infrastructure asset be listed as well as the asset's capacity (or length, depending on the asset). Major assets include wells, intakes, spring collectors, treatment plants (drinking water and wastewater), water storage tanks, pumps stations, lift stations, water mains (transmission/distribution), sewer mains (collection/force), lagoons, septic tanks, emergency generators, and meters. Units of measure are standardized for each asset type and include gallons per minute (gpm), gallons (gal), feet (ft), miles, acres, and kilowatts (kW). In addition, the form asks for the overall condition of the utility, providing the following choices: good, fair, and poor. The list of assets will be used to assign the appropriate benchmarks to the utility's costs.

Information on infrastructure assets that are pending or are in construction but are not reflected in the O&M budget will not be collected. This is because the O&M budget is expected to address activities and costs related to existing infrastructure. Capital project costs, such as installation of a new well or rehabilitation of a storage tank, are not included as O&M costs unless they are funded by the utility's O&M budget and no other sources of revenue.

2.3 Statistical Design of the National Study

The objective of the full study is to compare the O&M expenditures of a sample of utilities to utilities that are adequately funded. The study will address AI utilities and ANV utilities in separate but similar efforts.

In the first phase, the study will collect information about AI and ANV utilities that are considered to be adequately funded. Phase 1 will also include data collection from seven AI utilities that will be sampled with certainty due to the larger populations they serve (over 14,000 persons). In the second phase, the study will collect data for representative samples of the remaining utilities serving ANVs and AI communities. It will compare the samples to the adequately funded utility benchmarks and estimate the funding gap.

The study will use the IHS OMDS data to develop the national list of tribal utilities. The sample will be designed to estimate the funding gap with a 90 percent confidence interval of plus or

minus 20 percent. Because this is the first study of its kind, several assumptions have been made about the funding gap to design the study. Two critical assumptions are:

1. Utilities with similar configurations will have similar O&M issues. Therefore, for both ANV and AI utilities, the sample will be stratified by the utility characteristics described in section 2.3.1.
2. The coefficient of variation (CV) of the funding gap is 1.5, as explained in section 2.3.2. The CV is a measure of the variation among utilities in the funding gap. (Appendix D explains why the CV is assumed to be 1.5 and the implications of alternative assumptions.) This assumption will be examined and refined following phase 1 of the assessment.

The precision targets for this evaluation are lower than adopted by other studies of drinking water and wastewater utilities. The lower precision targets are warranted for two related reasons. First, it would be expensive to collect the necessary data for a larger sample. Increasing the sample size to reduce the margin of error to ±10 percent, for example, would approximately double the required sample size inceasing the overall cost of the assessment. Second, the CV of the funding gap is unknown and prior estimates do not exist; therefore, the level of precision may be higher or lower than estimated. The assumed CV of 1.5 is relatively large, so the sampling rate is relatively large as well. If the variance of the funding gap is lower, the study will achieve a higher level of precision. On the other hand, if the actual CV is larger than 1.5, it would be prohibitively expensive to reduce the margin of error of the study to less than ±20 percent.

2.3.1 Inventory of Water and Wastewater Systems

The unit of analysis for this effort is a tribal utility, which is responsible for the operation and maintenance of one or more community drinking water systems or wastewater systems. The assessment divides utilities into several categories:

- ANV or AI utilities.
- For ANV utilities, distinguish between three types of utilities:
    - Utilities with pressurized distribution systems for drinking water and gravity collection systems for wastewater.
    - Utilities that circulate drinking water in the distribution system and use gravity collection systems for wastewater.
    - Utilities with pressurized or circulated drinking water distribution systems and vacuum wastewater collection systems.
- For AI utilities, distinguish between:
    - Combined drinking water and wastewater utilities, and utilities that provide only drinking water or only wastewater services.
    - Small utilities that serve fewer than 3,301 people, utilities that serve 3,301 to 14,000 persons, and those serving more than 14,000 persons.

According to OMDS, there are 158 ANV utilities and 338 AI utilities. The full national evaluation will require a thorough verification of the list of utilities by IHS and the EPA to ensure that the information in the OMDS inventory (or frame) is correct.

2.3.2 Sampling Design

To estimate the sample sizes needed for phase 2 of the study, the CV is assumed to be 1.5. If the CV is larger, sample sizes would need to be increased. On the other hand, additional information about the variance in the funding gap may support more efficient estimates. The estimate of the CV will be refined if additional information becomes available.

The first phase of the study will collect data from systems that are adequately funded. Sixteen ANV systems have been identified to serve this role. These systems were identified by ANTHC personnel who have robust familiarity with the condition, assets, and O&M programs and funding for their drinking water and wastewater systems.

The seven AI utilities serving greater than 14,000 people will also be included in the first phase of the sample because they are not believed to be sufficiently similar to support a statistical sample of this utility group. They may also contribute information useful to developing the adequately funded utility benchmarks. Eleven additional AI utilities will be identified to sample in phase 1 as adequately funded benchmark utilities. These utilities will be selected from a list developed by IHS and EPA Region personnel using the pre-screening guide previously described. The adequately funded benchmark AI utilities will be selected as follows:

- 3 from combined utilities serving fewer than 3,300 persons
- 3 from combined utilities serving 3,301 to 14,000 persons
- 3 from single utilities serving fewer than 3,300 persons
- 2 from single utilities serving 3,301 to 14,000 persons

Exhibit 5 shows the number of ANV utilities by stratum and the sample size required to meet the precision target of ±20 percent, with 90 percent confidence. Exhibit 6 shows the inventory and sample size needed to meet the same precision target for AI utilities. In each case, the CV of the funding gap is assumed to be 1.5. (See Appendix D for additional details.) The statistical design also assumes the level of precision applies to the sample as a whole, not to each stratum. The sample is allocated proportionately among the strata. The exhibits also show the percentage of total utilities that will be sampled in phase 1 and 2.

Type of Drinking Water System	Type of Wastewater System	Inventory	Phase 1 Sample	Phase 2 Sample	Total Sample
Pressure	Gravity	77	2	39	41
Circulate	Gravity	62	11	27	38
Pressure/Circulate	Vacuum	19	3	8	11
Total		158	16	74	90
Sampling Fraction			10%	47%	57%

Exhibit 5. ANV Utilities Inventory and Sample Needed to Meet Precision Target of ±20% with 90% Confidence

Type of Utility	Population Served	Inventory	Phase 1 Sample	Phase 2 Sample	Total Sample
Combined	<3,300	152	3	47	50
	3,301-14,000	35	3	10	13
	>14,000[1]	6	6	0	6
Single	<3,300	140	3	45	48
	3,301-14,000	4	2	2	4
	>14,000[1]	1	1	0	1
Total		338	18	104	122
Sampling Fraction			5%	31%	36%

[1]Utilities serving more than 14,000 persons are selected with certainty.

Exhibit 6. AI Utilities Inventory and Sample Needed to Meet Precision Target of ±20% with 90% Confidence

2.4 Estimated Cost of the National Study

The level of effort (LOE) estimate and cost estimate for the two-phased approach are determined, in large part, by the number of utilities surveyed. As discussed in the previous section, the sample design for this assessment, which is projected to be at a level of confidence of 90 percent with a margin of error of ± 20 percent and a CV of 1.5, dictates the sample size. For both AI and ANV, Exhibit 7 provides a brief description of each phase, the sample size, the LOE (in hours) required for the government agencies participating, and the preliminary cost estimate for contractor support for each phase of the recommended two-phased approach.

Phase	Brief Description	Sample Size[1]	Level of Effort for Government Agencies (hours)[2]	Preliminary Cost Estimate[3]
AI Phase 1	Establish AI Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks	18	949	$146,640
AI Phase 2	Survey Remaining AI Drinking Water and Wastewater Utility Organizations and Prepare Final Report	104	2,888	$308,400
AI Total Preliminary Sample Size, Government LOE, and Cost Estimate		122	3,837	$455,000
ANV Phase 1	Establish ANV Drinking Water and Wastewater Utility Organization Inventory and Adequately Funded Utility Benchmarks	16	369	$102,000
ANV Phase 2	Survey Remaining ANV Drinking Water and Wastewater Utility Organizations and Prepare Final Report	74	1,536	$224,400
ANV Total Preliminary Sample Size, Government LOE, and Cost Estimate		90	1,905	$326,400
Total Preliminary Cost Estimate				$781,400

[1] The sample is designed to estimate a 90 percent confidence interval of ±20 percent. See Appendix D for additional details.

[2] For AI LOE hours estimate, it is assumed half of the data collection will consist of site visits and half will be completed through file reviews. For ANV, it is assumed that all data collection will be through file reviews.

[3] Cost estimate reflects contractor costs and assumes data is collected by EPA, IHS, and/or ANTHC with oversight by the contractor, and the contractor develops the database and supports data upload, data analysis, and report preparation.

Exhibit 7. Preliminary LOE and Cost Estimate for the Two-Phased Approach Option

In order to minimize the cost of the assessment, it is expected that data collection will be conducted by government agencies with assistance provided by a contractor. If all the data collection were performed by a contractor, the cost to conduct the assessment would increase significantly. In addition, different statistical designs greatly impact the cost of the assessment. A higher confidence interval and/or a lower margin of error would increase the sample size dramatically. For example, if the margin of error for AI utilities was decreased from ± 20 percent to ± 10 percent at the same confidence interval (90 percent) and CV (1.5), the AI sample size would double (from 104 utilities to 210 utilities). Refer to Appendix B for other data collection options and their associated costs, and Appendix D for more details on the statistical design.

The estimated level of effort for the participating government agencies is dependent on the number of utilities included in the study and the number of hours each activity is expected to require for completion. For utilities serving 14,000 or fewer people, the process of collecting data and completing the forms is expected to take approximately 20 hours when file reviews are performed and approximately 35 hours when conducting site visits. The increased hours for site visits take into account some travel time to and from the utility and coordination of the visit with other annual SDS review efforts. It could take more or less time to collect the data depending on the size and complexity of the utility (e.g., multiple drinking water and/or wastewater systems could require more time for data collection). For the seven utilities serving more than 14,000 people, it is anticipated that site visits will be conducted to support face-to-face discussion of their O&M program information. Based on the complexity of these utilities, the level of effort is expected to be approximately 40 hours to collect the data and complete the forms. These hours assume no travel time associated with obtaining this data.

2.4.1 Options for Scheduling the Assessment's Two Phases

The recommended two-phased approach represents a statistically valid, cost-efficient strategy. Still, the cost to conduct the assessment can be a limiting factor. In order to address this issue, the assessment could be conducted over a two-year period. The following are suggested strategies and associated annual costs for a two-year assessment:

1. Conduct the ANV assessment in year one and the AI assessment in year two.
   - Year one cost: $326,400
   - Year two cost: $455,000
2. Conduct Phase 1 for both AI and ANV in year one and conduct Phase 2 in year two.
   - Year one cost: $248,600
   - Year two cost: $532,800

If option 1 is pursued, knowledge gained from the ANV assessment may help inform the AI assessment, allowing the sample size to be reduced or other similar cost-saving measures. Likewise, if option 2 is pursued, knowledge gained from phase 1 activities could provide information that could reduce the sample size for phase 2 or other similar cost-saving measures.

3.0 Development of the Recommended Approach

3.1 Overview of the Nine-Utility Pilot Study

Utilities selected for the pilot study were identified by ANTHC and IHS based on the utilities' willingness to participate in the study and because it was thought they represented various tribal utility configurations. The AI utilities that participated in the pilot study included: Passamaquoddy Tribe at Pleasant Point, Poarch Band of Creek Indians, Pueblo of Zia, Confederated Salish and Kootenai Tribe, Howonquet Indian Council/Smith River Rancheria, Kashia Band of Pomo Indians/Stewarts Point, and Stockbridge-Munsee Tribe. The ANV utilities that participated in the pilot study included the Native Villages of Kotlik and Koyuk.

The pilot study was implemented using existing information to the extent possible to reduce the burden on the participating utilities. Data provided by EPA and IHS and data from OMDS was used to pre-populate the data collection forms. The information used to prepopulate the forms included drinking water system sanitary survey reports, wastewater system inspection reports, other existing utility asset inventory data, and asset inventories from the 2011 DWINSA. A phone interview was conducted for each utility to collect information and fill in data gaps. In most cases, the IHS area representative was on-site to assist the utility with understanding the information requests. Appendix E includes summaries of the data collected for each of the utilities in the pilot study.

In general, the pilot study revealed that budget content and format varied between utilities based on their individual needs, making it difficult to populate the form and compare the financial information between utilities and drinking water and wastewater systems within utilities. In addition, the level of detail requested regarding a utility's assets proved to be burdensome to obtain and difficult to compare between utilities. Rather than focusing on asset-specific tasks, utilities preferred to talk in terms of Full Time Equivalents[1] (FTEs). A common theme for the majority of the utilities was that they lacked the number of FTE's needed to perform operations and maintenance tasks as well as administrative tasks. Knowledge gained from the pilot study regarding these issues was used to develop the recommended approach. For the recommended approach, the data collected is more streamlined to address what is believed to be feasible to obtain and how useful it will be for data analysis. See Chapter 2 for a discussion on the recommended approach and the data to be collected.

3.2 Limitations of the Recommended Approach

As described earlier in this report, the recommended approach assesses utility O&M costs nationally, not costs of drinking water or wastewater systems on an individual basis. The information obtained from this assessment will be valuable to understanding the extent of funding challenges for adequate O&M programs at AI and ANV tribal utilities as a whole. This broad-brush approach was selected to assess funding of O&M in the most efficient manner

[1] Full-time equivalent (FTE) – is a unit used to describe an employee's workload. For example, if an employee works forty hours per week, they are considered 1.0 FTE. If an employee works 20 hours per week, they are considered 0.5 of an FTE.

possible, using readily available information to minimize the burden on tribal utilities and participating government agencies.

3.3 Other Assessment Approaches Investigated

In developing the recommended approach, other alternatives were investigated which would support efficient and effective data collection and analysis. Extensive literature searches and interviews with individuals actively working in related areas were performed. Options to assign O&M time based on infrastructure inventory and to develop asset lists based on system type were considered. Literature searches revealed limited existing information to support estimating O&M costs by infrastructure inventory for small tribal drinking water and wastewater systems. This section discusses the resources found and their value and limitations for this purpose.

3.3.1 Rural Community Assistance Partnership

The Rural Community Assistance Partnership (RCAP) has developed another approach to assist small water and wastewater systems better understand their system management and maintenance staffing needs. More specifically, this study was developed to recommend areas where the system should look to increase or decrease staff. Their approach involves a detailed comparison of similar systems and establishes how many FTEs a comparable system requires to operate. The approach covers approximately 40 questions and can allow for comparisons of FTE requirements over age, size, condition, technology employed, topography, and density of the service area rather than looking strictly at costs. They focus on FTE rather than cost because of the observation that costs can vary greatly due to local economic conditions, while an FTE in Ohio is assumed to equal 2080 hours per year as does an FTE in California.

RCAP has tested the methodology with non-tribal public water providers and believes that this project along with information already collected will help identify trends in staffing requirements and could be used for developing standards to apply to any system. Because the RCAP program is in development, a full-scale survey is needed to collect more data and develop staffing standards for both drinking water and wastewater systems. Refer to Appendix F for a complete description of the RCAP method that was provided by RCAP in June 2014.

While the RCAP method is very thorough, it is beyond the resources assumed to be available for this more broad-brush tribal utility effort. However, the premise in the recommended approach that comparable systems can be the source of valuable O&M information is supported by the RCAP approach. In addition, since the recommended approach is not intended to develop standards for use by individual systems, collaboration between the two projects would be mutually beneficial to meeting both projects' objectives. Concerns that cost differences due to local economic conditions may complicate comparisons will be considered when analyzing data for the national assessment.

3.3.2 New England Interstate Water Pollution Control Commission

The New England Interstate Water Pollution Control Commission (NEIWPCC) developed a tool that assists utilities in estimating staffing needs to operate and maintain wastewater treatment plants. Using their tool, labor hours can be estimated based on specific system details. However, the tool is limited to wastewater systems and the smallest design size used for the tool is 0.25 MGD, which is far greater than most of the tribal systems that would be surveyed in this project. In addition, the level of detail needed to use the tool is far more than what was attempted to be collected in the pilot study. Further, infrastructure expected to be common with some of the tribal utilities such as lagoons without aeration was not included in the tool. Information regarding NEIWPCC and the tool they developed can be found on their website at http://www.neiwpcc.org/staffing-guide.asp.

3.3.3 Water Industry Database: Utility Profiles

The Water Industry Database was developed by AWWA in 1992 and updated in 1998. It provides an O&M cost per $1,000 gallons of drinking water delivered based on the population served by the utility. The database addresses only drinking water systems, not wastewater systems, and the smallest population range (10,000 people served) is far greater than most of the tribal utilities that will be surveyed. In addition, tribal utilities surveyed may not have data on gallons of drinking water delivered. The Water Industry Database can be accessed, free for members and for a fee to non-members, at :

http://www.waterrf.org/Pages/Projects.aspx?PID=275.

3.3.4 Asset-Based O&M Estimates

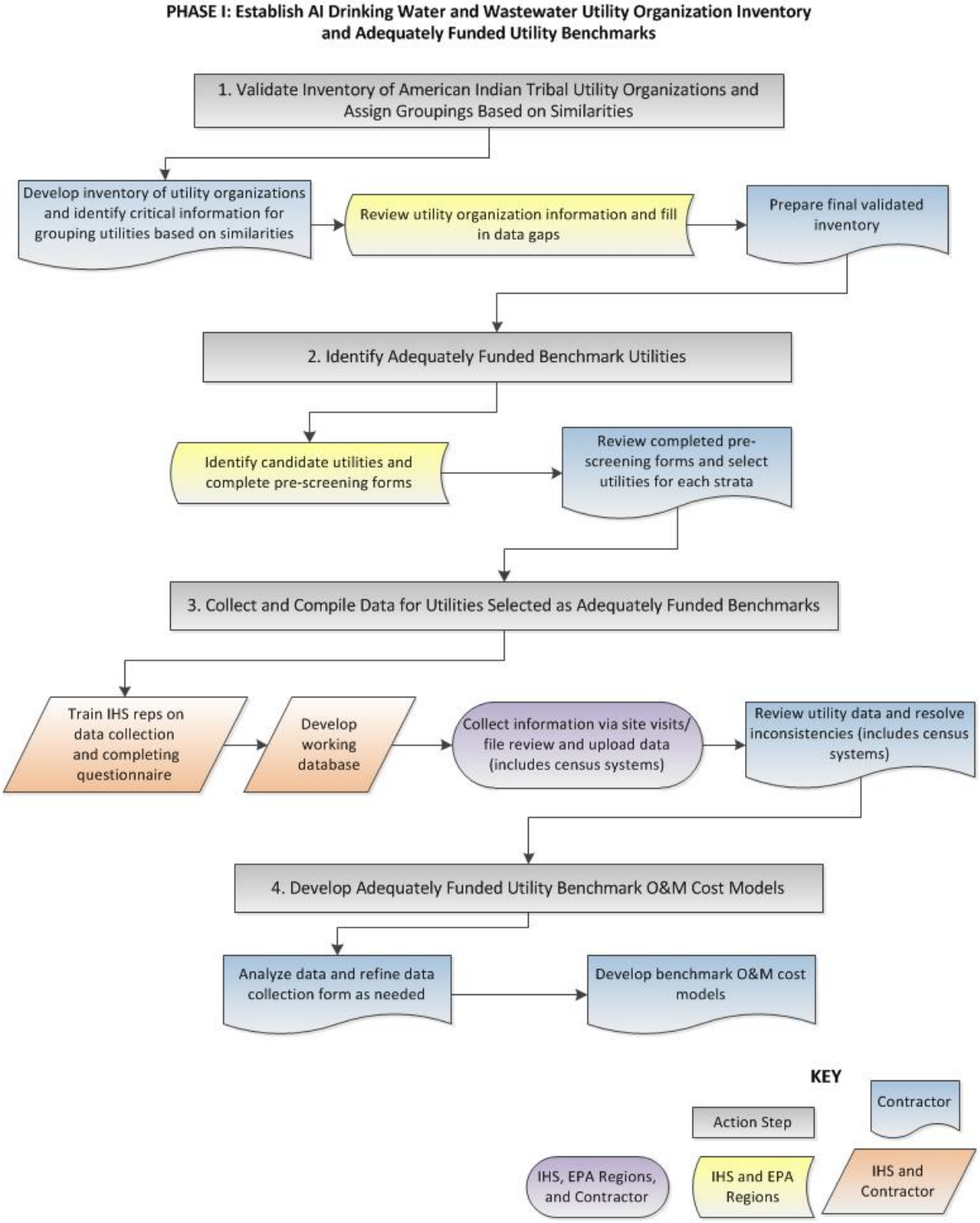
A Licensed Professional Engineer that routinely performs water and wastewater system design was interviewed to determine their method of estimating O&M costs of new systems or new system components. The method used relied on information from systems with similar assets and capacities; basically the comparable approach included in the recommendation. No published or otherwise compiled data on estimating O&M costs was available.

4.0 Next steps

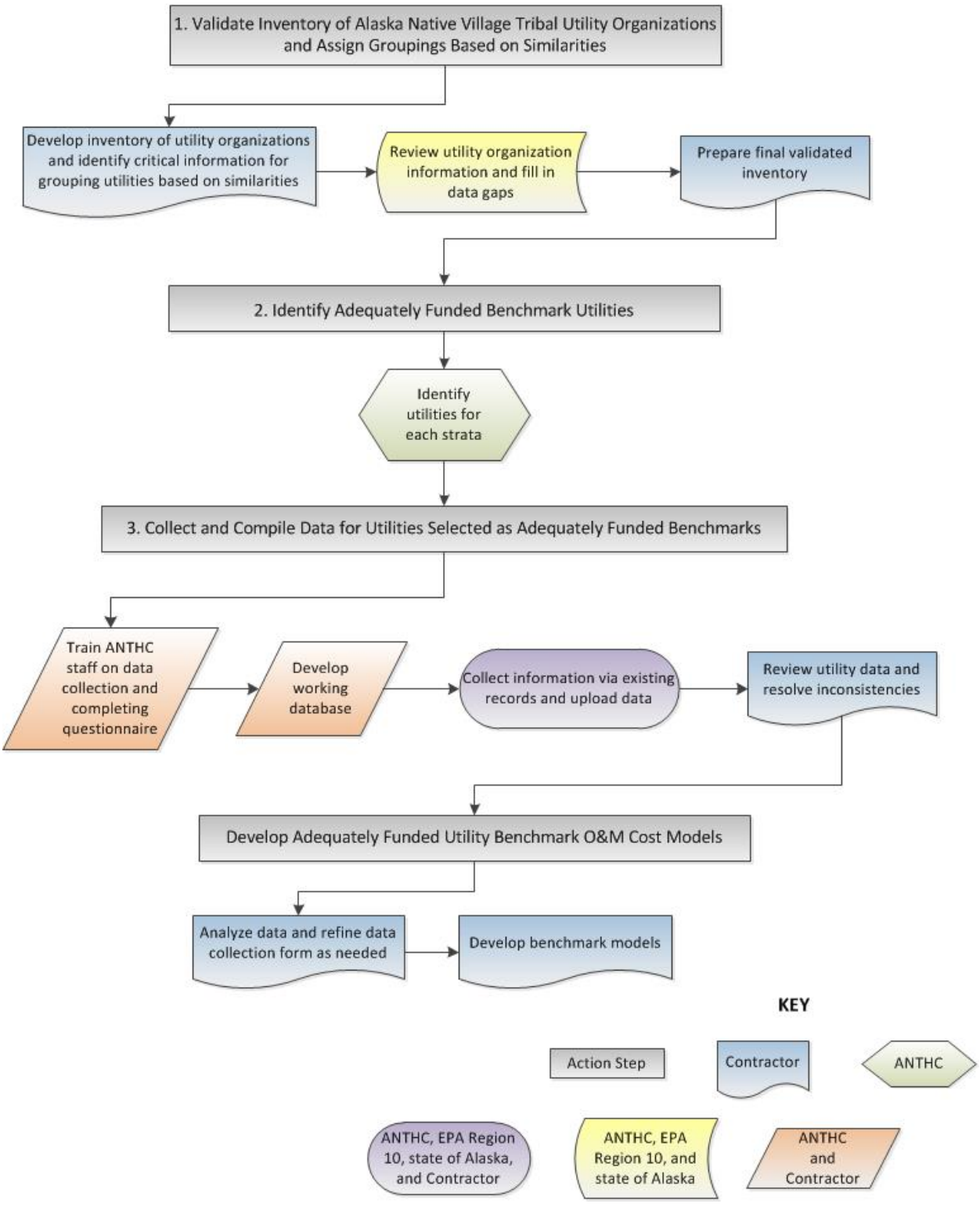
This report identifies the recommended scope and estimated cost of a national assessment of AI and ANV utility O&M costs. Much of the work to design a national assessment has been completed over the previous two-year period. Development of the design incorporated experience from other surveys of small systems, knowledge of tribal drinking water and wastewater systems, and project oversight by EPA and IHS.

The next step for this project is for the ITF to review the purpose and recommended method for the study and to provide comments to the project oversight group. Following ITF review, the critical final step for project planning is to obtain commitments for federal agency support for the national assessment and funding commitments to ensure completion of the full project.

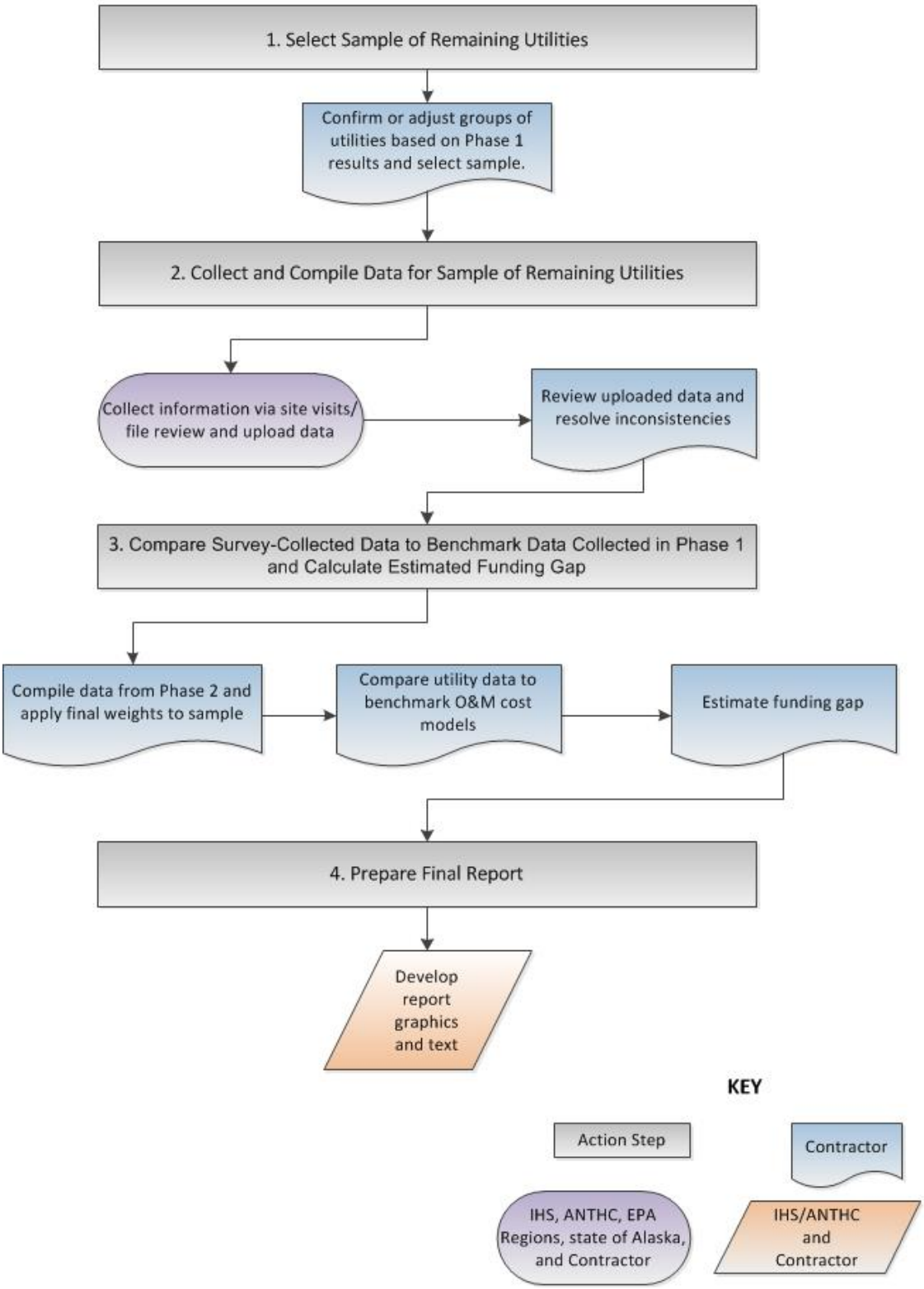
Appendix A – Detailed Flow Charts for the Two-phased Recommended Approach



PHASE I: Establish ANV Drinking Water and Wastewater Utility Inventory and Adequately Funded Utility Benchmarks



PHASE II: Survey Remaining Tribal Drinking Water and Wastewater Utility Organizations and Prepare Final Report



Appendix B. Costs of Other Data Collection Responsibility Options

Three options were evaluated to determine how the data collection portion of the assessment should be conducted: by a government agency(s), by a government agency(s) with contractor support, or by a contractor. Data collection involves obtaining utility information, interviewing the utility, completing the data collection form, and uploading the data to a database for data analysis. Regardless of who performs data collection, contractor costs will be incurred for activities other than data collection such as developing the database, data compilation and analysis, and report writing. Exhibit B.1 provides contractor costs to support the three options evaluated for the Tribal O&M cost assessment. The sample size for each of these options is the same.

Phase	Sample Size[1]	Contractor Cost if IHS/ANTHC/EPA Performs Data Collection and Contractor Uploads Data	Contractor Cost if Shared Responsibility for Data Collection and Contractor Uploads Data	Contractor Cost if Contractor Performs Data Collection and Uploads Data
AI Phase 1	18	$126,000	$146,640	$201,600
AI Phase 2	104	$208,560	$308,400	$513,360
AI Total	122	$334,600	$455,000	$715,000
ANV Phase 1	16	$86,640	$102,000	$125,040
ANV Phase 2	74	$153,360	$224,400	$370,560
ANV Total	90	$240,000	$326,400	$495,600
Totals	**212**	**$574,600**	**$781,400**	**$1,210,600**

[1] 90 % confidence interval with a margin of error of ± 20 % and a coefficient of variation (CV) of 1.5

Exhibit B.1 Contractor Cost Estimates Based on Data Collection and Upload Responsibility

Appendix C. Data Collection Form

Appendix C includes the data collection form instructions and each section of the data collection form. The data collection form includes four main sections:

- Utility Information
- Financial Information
- Employees and Contractors
- Drinking Water and Wastewater Assets

Instructions for the Data Collection Form

The data collection form was developed in Excel. There are 4 tabs included in the data collection form. Each tab and the requested content are described below.

Tab 1 - Utility Information

This sheet captures information related to the utility name, ownership (AI, ANV, Federal, other), contact information, utility population, number of connections, and the geographic area the utility serves. It also includes a section to enter information regarding the utility's drinking water and/or wastewater systems. The form requests the following information:

- A list of all drinking water systems the utility operates, the population served, the number of connections, and the source type (surface/GWUDI, ground, purchased).
- A list of all wastewater systems the utility operates, the population served, the number of connections, and the treatment type (mechanical, lagoon, septic, honey bucket). If the utility has septic systems, indicate who is financially responsible for maintaining the septic system (the homeowner or the utility).

Tab 2 – Utility Financials

This sheet is intended to capture the utility's financial information. It includes sections for budget, expenditure, and revenue information. If any of the financial information requested is conveyed by the utility but not documented, that will be noted on the form in each applicable section.

- Budget information
    - Questions specific to budget: This section includes questions related to the utility's budget such as whether they have a budget, the time period it covers, how often it is updated/reviewed, data used to update the budget, whether it is followed, and whether the budget covers multiple drinking water/wastewater systems. In addition, for benchmark utilities only, the form asks if the utility considers their budget adequate. If they are a benchmark utility, they are considered to have an adequate or nearly-adequate budget so information is collected to identify and quantify funding limits. Information on the reported limitation is included on the form with an associated dollar value. For example,

the utility may believe they need an additional 0.5 FTE to be considered adequately funded.

- Budget totals: The total utility budget and the year are recorded (can be calendar or fiscal year depending on the utility's budget cycle). The year is included to verify other financial information is for the same year. For example, if the utility has an FY2014 budget but FY2014 has not been completed, they will not have expenditure or revenue information for that fiscal year. In that case, information from FY2013 would be requested. If the utility has separate budget totals for drinking water and wastewater, that information would be included. The percentage of the budget attributed to labor is also recorded.

- Expenditure information
  - Questions specific to expenditures: This section asks if the utility tracks expenses. They may track expenses but may not have a means to provide the financial information. If that is the case, the interviewer would make note of that detail in the 'notes' column.
  - Expenditure totals: The total expenditures incurred by the utility and the year the expenses were incurred are recorded. Expense information is collected for the same fiscal year as the budget. If the utility has separate drinking water and wastewater expense information, information is included for each.

- Revenue information
  - Questions specific to revenue: This section asks if the utility tracks revenues; the sources of revenue (user fees, federal funding direct, and/or tribal funds); the rates charged for drinking water, wastewater, and/or a combined rate if not tracked separately; and the collection percentage for the year (i.e., what percentage of user fees were collected). General information on all sources of revenue is noted.
  - Revenue totals: The total budgeted revenue and actual revenue for a given fiscal year are recorded. The critical information is total actual revenue. It is important to obtain revenue information for the same fiscal year as the budget and expenditures. If the utility separates revenue for its drinking water and wastewater systems, information is included for each.

Tab 3 - Employees and Contractors

This sheet captures information regarding labor. O&M labor is divided into two categories in this form: utility staff and contractor.

- Utility Staff – Lists each staff member, providing their title (e.g., superintendent, operator, utility manager, utility supervisor, administrative assistant, bookkeeper, etc.), labor type (list 'S' for staff), and their FTEs or hours worked per unit of time (which could be per day, week, month, etc). Information on FTEs or hours worked are the time spent working for the utility. For example, if an operator works 20 hours per week and half of his time is spent working for solid waste collection, he would be considered 0.25 FTEs for the drinking water/wastewater portion of his costs.

- Contract Labor – All contractors are listed under the title column and include 'C' (for contractor) under labor type. The title listed can simply be 'contractor' or can specify the type of services the person provides (e.g., engineer).

Tab 4 - Drinking Water and Wastewater Assets

This sheet is for recording a utility's drinking water and wastewater assets.

- Overall condition - Provides the overall utility condition in terms of infrastructure. The choices are: good, fair, poor.
- Major assets - Lists major utility assets for each drinking water and wastewater system in the utility, providing the capacity (or length depending on the asset), and the applicable units in gallons per minute (gpm), feet, miles, kilowatts (kW), etc. If the capacity/length is not known, 'unknown' is listed in the capacity/length column.
    - Major assets and their associated units are as follows:
        - Wells, intakes, spring collectors, treatment plants (drinking water and wastewater), pumps stations, and lift stations - reported in gpm.
        - Tanks – reported in gallons (gal) or million gallons (MG)
        - Water mains (transmission/distribution) and sewer mains (collection/force) – reported in feet or miles.
        - Lagoons – reported in acres.
        - Septic tanks – reported as the number the utility is responsible for.
        - Generators – reported in kW.
        - Meters – reported in diameter and total number.

Utility Information Section

Water and Wastewater Utility Operation and Maintenance Assessment

United States Environmental Protection Agency Draft 07/2014

UTILITY NAME:		**Interviewer Name:**	
Participants:		**Affiliation:**	
		Phone Number:	
		Date of Interview:	

UTILITY OWNERSHIP

☐ American Indian ☐ Alaska Native Village ☐ Federal Government (e.g., BOR, BIA) ☐ Other _____

CONTACT AND OTHER UTILITY INFORMATION

Contact Name		Utility Population Served	
Title		Utility Connections	
Phone		Geographic area covered (acres, km^2, etc.)	
Fax			
E-mail			

INFORMATION FOR SYSTEMS IN UTILITY

How many systems does the utility operate? _____ # Drinking Water Systems _____ # Wastewater Systems

For all drinking water and wastewater systems in the utility, provide the following information:

System Name (separate W and WW?)	Population Served	Connections	Drinking Water System Type (surface/GWUDI, ground, purchased)	Wastewater System Type (mechanical, lagoon, septic, honey bucket)	If septic system, is it maintained by homeowner or utility?

Financial Information Section

UTILITY NAME				
If financial information is conveyed by utility but not documented, please note that on the form in the applicable section.				
BUDGET INFORMATION				
		Yes	No	Notes
Does the utility have a Budget?[1]				
What is the time period covered by the Budget? (Annual or Multiple)				
How often is the Budget update/reviewed?				
What data is used to update the Budget?				
Is the Budget followed?				
Does the Budget cover multiple drinking water and wastewater systems?				
For benchmark utilities only, does the utility consider their budget adequate? If no, explain why in the notes column and associate a dollar value that would make the budget adequate. For example, if the utility states they need 0.5 FTE to be adequately funded, list that information and provide an estimate of the cost for that 0.5 FTE.				
[1]Attach copy of O&M budget to survey.				
	Budget Total	**Budget Year**	Note: Budget, expense, and revenue information collected should all be for the same fiscal year.	
General Utility				
Drinking Water System				
Wastewater System				
Percentage of Budget for Labor Expenses				
EXPENDITURE INFORMATION				
		Yes	No	Notes
Does the utility track expenses?[2]				
	Total Expenditures	**Year Expenses Incurred**		
General Utility				
Drinking Water System				
Wastewater System				
[2]Attach copy of O&M expenses to survey.				

REVENUE INFORMATION				
		Yes	No	Notes
Does the utility track revenue?[3]				
	Budgeted Revenue	**Actual Revenue**	**Fiscal Year**	
General Utility				
Drinking Water System				
Wastewater System				
Revenue Sources (check all that apply):	☐ User fees	☐ Federal funding direct	☐ Tribal funds (e.g., enterprise funds)	
	Drinking Water	Wastewater	Combined	Note: enter rates in combined column if utility does not separate rates by drinking water and wastewater
Rates (if user fees checked above)				
Collection percentage				
[3]Attach copy of O&M revenue to survey.				

Employees and Contractors Section

UTILITY STAFF AND CONTRACTOR LABOR		
Title	**Labor Type Staff (S) Contractor (C)**	***List FTEs (or hrs/xx) for each utility staff person. For contractors, leave blank.***

Drinking Water and Wastewater Assets Section

UTILITY ASSETS			
Please indicate overall utility condition:	☐ Good	☐ Fair	☐ Poor
Instructions: List major utility assets for each drinking water and wastewater system in the utility. Major assets include wells, intakes, spring collectors, treatment plants (drinking water and wastewater), tanks, pumps stations, lift stations, water mains (transmission/distribution), sewer mains (collection/force), lagoons, septic tanks, generators, and meters. If capacity/length is not known, list "unknown."			

Infrastructure Item	Capacity/Length	Units (gpm, ft, miles, kW, acre, etc.)

Appendix D. Inventory and Sampling Design Options

Section 2 provides an overview of the sampling design proposed for the national assessment. This appendix provides additional detail, including a description of the assumptions made to design the sample and a summary of the impact of the assumptions on the sample size estimates.

The objective of the full study is to compare the operation and maintenance (O&M) expenditures of a sample of utilities to utilities that are adequately funded. The study will address American Indian (AI) utilities and Alaska Native Village (ANV) utilities in separate but similar efforts. In the first phase, the study will collect information about AI and ANV utilities that are considered to be adequately funded. Phase 1 will also include data collection from seven AI utilities that will be sampled with certainty due to the larger populations they serve. In the second phase, the study will collect data for representative samples of the remaining utilities serving ANVs and AI communities. It will compare the samples to the adequately funded utilities and estimate the funding gap.

The size of the sample needed for the second phase of the data collection depends on (1) the number of ANV and AI utilities, (2) the level of precision required by the study, and (3) the variance of the O&M funding gap as measured by its coefficient of variance (CV). The study will use the Indian Health Service (IHS) Operation and Maintenance Data System (OMDS) data to develop the national list of tribal utilities. The study will need to make assumptions regarding the CV to estimate the sample needed to meet alternative precision targets. The sampling design will be refined as additional information—including information from the first phase of the study—becomes available.

D.1 Water and Wastewater System Inventory Data Sets

The unit of analysis for this effort is a tribal utility, which is responsible for the operation and maintenance of one or more community water systems or wastewater systems. For purposes of designing the sample, we use the organization field in OMDS to identify utilities and the drinking water and wastewater systems under each utility's purview. Many of the drinking water systems in OMDS can be linked through their Public Water System Identification number (PWSID) to the list of community water systems in U.S. EPA's Safe Drinking Water Information System (SDWIS), but there are some discrepancies that must still be resolved before the full survey would proceed. (Some OMDS systems could not be linked with SDWIS systems. Other systems were not assigned an organization name in OMDS.). We divide utilities into several categories:

- ANV or AI utilities.
- For ANV utilities we distinguish among three types of utilities:
    - Utilities with pressurized distribution systems for drinking water and gravity collection systems for wastewater.

  - Utilities that circulate drinking water in the distribution system and use gravity collection systems for wastewater.
  - Utilities with pressurized or circulated drinking water distribution systems and vacuum wastewater collection systems.

- For AI utilities, we distinguish between combined drinking water and wastewater utilities and utilities that provide only drinking water or only wastewater services.
- For AI utilities, we also distinguish between small utilities that serve fewer than 3,301 people and utilities that serve 3,301 to 14,000 persons, and those serving more than 14,000 persons. The size of the population served by combined utilities is the larger of the sum of the population served by all of the drinking water or wastewater systems within the utility organization.
- Seven AI utilities serve more than 14,000 persons:
  - Navajo Tribal Utility Authority
  - Ost Rural Water Supply System
  - Shakopee-Mdewakanton Sioux Bus. Council
  - Stockbridge-Munsee Division Of Community Housing
  - Tohono O'Odham Utility Authority
  - Tulalip O&M Org.
  - White Mountain Apache (WMA) Utility Authority

The estimated number of utilities serving ANV communities is shown in Exhibit D.1. The inventory of AI utilities is shown in .

Type of Drinking Water System	Type of Wastewater System	Inventory
Pressure	Gravity	77
Circulate	Gravity	62
Pressure/Circulate	Vacuum	19
Total		158

Exhibit D.1. Inventory of ANV Utilities

Type of Utility	Population Served	Inventory
Combined	<3,301	152
	3,301-14,000	35
	>14,000	6
Single	<3,301	140
	3,301-14,000	4
	>14,000	1
Total		338

Exhibit D.2. Inventory of AI Utilities

The final sampling frame will contain the exhaustive list of utilities serving ANV and AI communities. It will resolve remaining discrepancies between OMDS and SDWIS and will need to include the information required to select the sample. The final frame must include the following elements:

- Tribe served by the utility
- Reservation
- Name of the utility
- OMDS organization number and name
- Community served (ANV or AI)
- The utility type (drinking water, wastewater, or combined drinking water and wastewater)
- For ANV, the type of drinking water system (pressure or circulating)
- For ANV, the type of wastewater system (gravity or vacuum)
- Public water system identification number (PWSID) of drinking water systems served by the utility
- The size of the population served by the utility as determined by the larger of the sum of the population served by all of the drinking water or wastewater systems within the utility organization.

The full national evaluation will require a thorough verification of the data set by IHS and the EPA Regions to ensure that the information in the frame is correct.

D.2 Precision Targets

The level of precision needed for the study will affect the size of the ANV and AI samples. The study has several options, depending on the level of confidence needed and the margin of error required. The EPA's Community Water System Survey (CWSS), for example, was designed to estimate proportions for 16 categories of systems with a 95 percent confidence interval of ±10 percentage points. Similarly, the EPA Drinking Water Infrastructure Needs Survey and Assessment is designed to estimate each state's need with a 95 percent confidence interval of ±10 percent. This study is intended to estimate the O&M gap for all ANV and for all AI utilities. It considers four precision targets that would apply separately to the ANV and the AI utilities:

1. 95 percent confidence interval with a margin of error of ±10 percent.
2. 95 percent confidence interval with a margin of error of ±20 percent.
3. 90 percent confidence interval with a margin of error of ±10 percent.
4. 90 percent confidence interval with a margin of error of ±20 percent.

D.3 The Coefficient of Variation of the Funding Gap

The CV is a measure of variability. It is the standard deviation of a variable divided by the variable's mean. The more dispersed the data, the larger the CV, and the larger the sample that will be needed to meet a given precision target. A CV of 1.0 means the standard deviation is equal to the mean. (An interval of ±1 standard deviation will include approximately 68 percent of a standard normal distribution.)

Ideally, we would use an estimate of the CV of the funding gap to estimate the sample sizes needed. Unfortunately, little data are available on the funding gap because this is the first time a study of this kind will be undertaken. We therefore do not know the mean size of the gap or its variance. The CWSS provides some information on the CV for O&M spending for state-

regulated water systems, but is imperfect. (The CWSS data are for systems, not utilities. It does not include wastewater systems, ANV systems, or AI systems.) For systems serving 50,000 or fewer persons, the CV for O&M spending from the 2006 CWSS is approximately 2.6.

It is likely that the CV will be considerably lower than 2.6 for both the ANV and AI utilities. The ANV sample will be largely utilities of a single small drinking water and wastewater system and the AI sample will be largely utilities consisting of a few small systems. The variance among small systems is lower than for all systems serving fewer than 50,000 people. For example, the CWSS CV for systems serving 14,000 or fewer persons is approximately 1.85. Furthermore, the variance among utilities should be smaller than among systems. Finally, the variance of the funding gap—either the difference between actual and adequate funding or the ratio of adequate and actual funding—may be lower than the variance in total O&M spending. (This will depend, in part, on how the gap is measured.)

Study Design: Critical Questions

1.0 ***Precision targets.*** Total need is the "variable of interest." What degree of confidence do we require that the estimate of the current O&M cost is close to the actual cost?

2.0 ***Frame***. The target population is the universe of tribally owned and operated community water and wastewater system utilities. What data source(s) contains the best information on the universe of these utilities?

3.0 ***Stratification.*** What factors are likely to influence the O&M costs of the utilities and how can utilities be grouped so that those with similar O&M needs are in the same group?

4.0 ***Sample sizes.*** For each group ("stratum"), how many utilities must be selected to meet the precision targets?

To estimate the sample sizes needed for phase 2 of the study, we assume the CV is 1.5. If the CV is larger, we will need to increase the sample sizes. On the other hand, additional information about the variance in the funding gap may let us produce more efficient estimates. The phase 1 sample may provide information on the overall CV and the CV for each stratum. (While adequately funded utilities may provide useful information about the variance O&M spending, we expect the variance will be different than that of other utilities and therefore cannot be used to directly estimate the samples needed in phase 2.) We will refine the estimate of the CV if additional information becomes available.

D.4 Alternative Sampling Designs

The first phase of the study will collect data from systems that are adequately funded. EPA has identified 16 ANV systems that it will include in phase 1. These systems were identified by ANTHC personnel who have robust familiarity with the condition, assets, and O&M programs and funding for their drinking water and wastewater systems.

The seven AI utilities serving greater than 14,000 people will also be included in the first phase of the sample because they are not believed to be sufficiently similar to support a statistical sample of this utility group. We also will identify 11 additional AI utilities to sample in phase 1 as adequately funded benchmark utilities. These utilities will be selected from a list developed by IHS and EPA Region personnel using a pre-screening guide:

- 3 from combined utilities serving less than 3,300 persons
- 3 from combined utilities serving 3,301 to 14,000 persons
- 3 from single utilities serving less than 3,300 persons
- 2 from single utilities serving 3,301 to 14,000 persons

Several alternative designs for the ANV and AI surveys are shown in Exhibits D.3 and D.4. In each exhibit, the first two designs shown assume the level of confidence is 95 percent. The first design assumes a margin of error of ±10 percent. The second assumes a margin of error of ±20 percent. The third and fourth estimates assume the level of confidence is 90 percent. The third option assumes the margin of error is ±10 percent and the last option assumes the margin of error of ±20 percent. In each case, we assume the level of precision applies to the sample as a whole, not to each stratum. The sample is allocated proportionately among the strata. The exhibits also show the percentage of total utilities that will be sampled in phase 1 and 2. Exhibit D.3 shows the sample sizes required for the ANV survey if the CV is 1.5. Exhibit D.4 shows the AI sampling options assuming a CV of 1.5.

				Phase 2 Sample			
				Confidence Level of 95 Percent		Confidence Level of 90 Percent	
Type of Drinking Water System	Type of Wastewater System	Inventory	Phase 1 Sample	Margin of error of ±10%	Margin of error of ±20%	Margin of error of ±10%	Margin of error of ±20%
Pressure	Gravity	77	2	64	45	61	39
Circulate	Gravity	62	11	44	31	42	27
Pressure/Circulate	Vacuum	19	3	14	10	13	8
Total		158	16	122	86	116	74
Sampling Fraction Phase 1 and 2				87%	65%	84%	57%

Exhibit D.3. Sampling Options for ANV Utilities CV of 1.5

Type of Utility	Population Served	Inventory	Phase 1 Sample	Phase 2 Sample			
				Confidence Level of 95 Percent		Confidence Level of 90 Percent	
				Margin of error of ±10%	Margin of error of ±20%	Margin of error of ±10%	Margin of error of ±20%
Combined	<3,300	152	3	109	59	97	47
	3,301-14,000	35	3	23	13	21	10
	>14,000[1]	6	6	0	0	0	0
Single	<3,300	140	3	100	55	90	45
	3,301-14,000	4	2	2	2	2	2
	>14,000[1]	1	1	0	0	0	0
Total		338	18	234	129	210	104
Sampling Fraction Phase 1 and 2				75%	43%	67%	36%

[1]Utilities serving more than 14,000 persons are selected with certainty.

Exhibit D.4. Sampling Options for AI Utilities CV of 1.5

The sample size depends on the estimated CV. For example, the sample sizes are reduced by as much as 40 percent if the CV is only 1.0. Exhibit D.5 shows the ANV utility sample sizes need to meet the precision targets if the CV is 1.0. Exhibit D.6 shows the sample sizes needed to meet the precision targets for AI utilities if the CV is 1.0.

Type of Drinking Water System	Type of Wastewater System	Inventory	Phase 1 Sample	Phase 2 Sample			
				Confidence Level of 95 Percent		Confidence Level of 90 Percent	
				Margin of error of ±10%	Margin of error of ±20%	Margin of error of ±10%	Margin of error of ±20%
Pressure	Gravity	77	2	55	30	49	24
Circulate	Gravity	62	11	37	21	34	17
Pressure/Circulate	Vacuum	19	3	12	7	11	5
Total		158	16	104	58	94	46
Sampling Fraction Phase 1 and 2				76%	47%	70%	39%

Exhibit D.5. Sampling Options for ANV Utilities CV of 1.0

Type of Utility	Population Served	Inventory	Phase 1 Sample	Phase 2 Sample			
				Confidence Level of 95 Percent		Confidence Level of 90 Percent	
				Margin of error of ±10%	Margin of error of ±20%	Margin of error of ±10%	Margin of error of ±20%
Combined	<3,300	152	3	80	33	67	24
	3,301-14,000	35	3	18	7	15	6
	>14,000[1]	6	6	0	0	0	0
Single	<3,300	140	3	75	32	63	24
	3,301-14,000	4	2	2	2	2	2
	>14,000[1]	1	1	0	0	0	0
Total		338	18	175	74	147	56
Sampling Fraction Phase 1 and 2				57%	27%	49%	22%

[1]Utilities serving more than 14,000 persons are selected with certainty.

Exhibit D.6. Sampling Options for AI Utilities CV of 1.0

D.5 Next Steps

The size of the ANV and AI samples selected will depend on the size of the final verified inventory and the resources available for the study. Next steps include:

- Verify the sampling frame.
  - Verification ensures that the census and sample is drawn from a valid universe of systems.
  - To verify the list of systems, the data compiled from the EPA and IHS databases would be provided to EPA Regions and IHS Area Representatives for review and correction. A typical revision may consist of adjusting population served or the type of treatment used, or correcting the utility to which a water or wastewater system is assigned.
  - The master list will be updated based on the review conducted by IHS and EPA. Any changes to the data set would not be immediately incorporated in to the IHS or EPA databases; rather, a separate database for this study would be maintained. The IHS and EPA databases would only be updated when the data's quality has been assured and the information is verified.
- Select sampling design based on available budget and final frame.
- Randomly select the sample of systems for phase 2 from the final frame based on the chosen sampling design.

Ideally, the final sampling frame will contain accurate information about each utility. But it is common in studies such as this for some of the information to be inaccurate. The study will need to establish policies to address any inaccuracies in the sampling frame when the national evaluations are implemented. These policies would address how to handle utilities that were inadvertently excluded from the frame or utilities that were assigned to the wrong strata.

Appendix E. Pilot Study Summaries

Exhibit E.1 summarizes basic information regarding the nine utilities surveyed in the pilot study. Following the exhibit is a summary of key findings obtained in the pilot study for each of the nine utilities.

System Name	Confederated Salish and Kootenai Tribes	Kashia Utility District - Stewarts Point Rancheria	Kotlik	Koyuk	Smith River	Stockbridge-Munsee	Passamaqoddy	Poarch Band of Creek Indians (Poarch Creek)	Pueblo Zia
EPA Region	Region 8	Region 9	Region 10 - ANV	Region 10 - ANV	Region 9	Region 5	Region 1	Region 4	Region 6
Water									
Number of Systems	14 (there are additional systems that are non-public)	1	1	1	1	1	1	1	2
Population Served	Multiple systems: smallest: 30 largest: 840	80 (winter) 150 (summer)	601	347	220	396 community 495 NTNC - casino employees 1,500 TNC - casino customers	822	600 community 750 NTNC - casino employees 6,000 TNC - casino customers	System #1 - 750 System #2 - 150
Type of System	11 - Disinfection only (groundwater); 2 - Manganese greensand plant (groundwater); 1 - Softening plant (groundwater)	Microfiltration plant (surface water)	Conventional filtration package plant (surface water)	Disinfection only (groundwater)	Filtration and disinfection (GWUDI)	Disinfection only (groundwater)	Purchased (not a PWSID)	Aeration, filtration, disinfection (Groundwater)	Both systems are disinfection only (groundwater)
Wastewater									
Number of Systems	7 (there are additional systems that are non-public)	1	1	1	1	2	1	1	1
Population Served	Data not provided	80 (winter) 150 (summer)	601	347	<100 residents >100 NTNC and TNC	System #1 - Casino customers/employees and a few residents (approx. 2,000 people) System #2 - Approx. 385 residents	822	600 community 750 NTNC - casino employees 6,000 TNC - casino customers	884
Type of System	7 lagoons	Subsurface disposal	Lagoon	Lagoon	Membrane biological reactor wastewater treatment plant	System #1 - Membrane biological reactor (MBR) wastewater treatment plant; System #2 - Lagoon	Diffused air wastewater treatment plant	Activated sludge wastewater treatment plant	Lagoon

Exhibit E.1. Summary of Nine Utilities Surveyed in the Pilot Study

Kotlik

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Surface Water/GWUDI	Lagoon
No. Connections	121	121
Population Served	601	601
Avg Daily Flow	14,300 gpd	14,300 gpd
Max Daily Flow	19,000 gpd	19,000 gpd

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Submersible River Pump - includes ice skid (winter) and float (summer)	No data provided		• This system is an Alaska Rural Utility Collaborative (ARUC) system. ARUC is a program through ANTHC. • The system is described by the ANTHC representative as one of the best managed in the consortium • Three operators (local) split 70 hrs/week between the drinking water and wastewater systems • Additional support is available from a consortium engineer (0.2 FTEs), a Utility (Regional) Manager (0.1 FTEs), and finance and admin staff (2 employees paid a flat rate of $500/month total) • In general the drinking water system infrastructure is described as being in "fair" to "good" condition • One of the biggest O&M issues for the water system is service line repairs which account for 10 hours of labor-intensive O&M per week. Repairs are needed due to issues
Alternate Pump	No data provided		
Conventional Filtration Package Plant	No data provided		
Chemical Addition (Soda Ash, Polymer ,Aluminum Sulfate, Chlorine)	No data provided		
Circulation Pumps	No data provided		
Pressure Pumps	No data provided		
Boilers	No data provided		
HDPE Circulating Mains	4" inch – 4,200 feet 6" inch – 8,500 feet 2" inch – 660 feet		
Three 28" Utilidor loops (hold both water and sewer mains)	9,030	feet	

Asset	*Capacity*	*Units*	*General Notes*
1" Service Lines	130	connections	related to freeze/thaw conditions that result in frequent elevation changes causing damage to service line connections at the home and/or main.

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
4" x 12" Force Main	1,740	Feet	• The system is described by the ANTHC representative as one of the best managed in the consortium • The wastewater system is generally described as being in "fair" to "good" condition • In comparison to a gravity system, the vacuum system takes more energy and O&M to operate; however, recent upgrades to the vacuum system have reduced energy costs by 25%. • The biggest O&M issues for the wastewater system are vacuum toilet repairs which require 10 hours per week of operator time and service line repairs which require 5 hours per week of operator time.
4" Vacuum Mains	9,030	Feet	
2" Service Line	130	connections	
Vacuum Toilets	130	Units	
Vacuum Pump	12	Hp	
Collection Tank	No data provided		
Discharge Pump	5	Hp	
Lagoon	No data provided		

Typical O&M Activities Performed

Drinking Water	*Wastewater*
• Daily WTP inspection • Periodic pump inspections • Grease and change pump seals • Make-up chemical feed • Inspect and clean boilers • Take daily readings and inspect package plant • Clean package plant tanks monthly • Drain and clean storage tank annually • Flush mains annually • Re-level utilidors annually • Repair and maintain service lines	• Change filters and oil in vacuum pump • Inspect and maintain discharge pump • Clean of collection tank annually • Detect and repair leaks • Repair vacuum toilet • Repair and maintain service lines • Manage lagoon discharge to stream

Drinking Water	*Wastewater*
• Inspect river pumping system skid/float. Switch to skid in winter and float in summer.	

O&M Activities Deferred

Drinking Water	*Wastewater*
• No specific activities mentioned.	• No specific activities mentioned; however, representative did mention that if additional funds were available, they would go toward staff time to increase maintenance and repair of vacuum toilet system to extend the life of the expensive vacuum pumps.

Budget - Annual

- Total: $135,586 (Drinking Water); $90,391 (Wastewater)
  - Salary for engineer and utility manager is not included in utility budget. They are paid by ANTHC (both are ANTHC employees).
  - Salaries for three operators and for finance manager and admin/finance staff person are paid for with user fees.
  - Budget information on the questionnaire was filled in by a consortium representative. A copy of the budget was provided. Although separate budget totals are given for the drinking water and wastewater systems, the line items of the budget are combined.
  - High cost line items in the budget include: salary and benefits for the three operators ($70,000), fuel reserve fund ($25,130), electric costs ($25,000) and replacement parts reserve ($15,600)
- Adequacy:
  - ANTHC representative believes budget is fairly adequate for staffing and routine annual expenditures; however, some additional funding could be used to increase staff time for maintenance and repair of the vacuum toilet system which would extend the life of the infrastructure.

Revenue

- Revenue Sources: user fees, USDA grant (covers consortium engineer and utility manager salary) and discretionary funds from ANTHC
- Collection Rate: 95%

	Combined Water/Sewer Rates
Residential	$105.50/month
Commercial	$157.50/month
School	$0.15/gallon

Staff

- Operations Staff (70 hrs/week), Utility Manager (0.1 FTE), Engineer (0.2 FTE), Finance Manger ($200/month flat rate), Administrative Assistance ($300/month flat rate)

Koyuk

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Groundwater/Disinfection	Lagoon
No. Connections	72*	72*
Population Served	347	347
Avg Daily Flow	No data provided	No data provided
Max Daily Flow	No data provided	No data provided

*8 homes are not served (not connected to the system)

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
3 Wells	No data provided		• The system consists of 3 wells; however, one is currently out of service. • The Treatment Plant/Washeteria building is currently quite deteriorated. • The system is planning major capital improvements to both the water and wastewater systems. At the time of the interview, the City of Koyuk had hired a grant writer to research and apply for available grants. • During the interview, the system had one operator who was not certified. The utility was in the process of hiring a second operator. • Typically two operators share the single FTE position although turnover is high. • Typical O&M activities and general system condition information were not obtained during the interview.
Chlorine disinfection	No data provided		
Fluoridation	No data provided		
8 High Service Pumps	20-80 (each)	gpm	
3 Pressure Tanks	275 (Tank #1 & #2) 420 (Tank #3)	gallons	
Heat Exchangers	No data provided		
Storage Tank	200,000	gallons	
4" East Loop Distribution Mains	8,734	feet	
West Loop Distribution Mains	No data provided		

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Force Mains	Data not provided		• The wastewater system is a gravity system which flows to a septic tank and is then pumped to a lagoon. The lagoon effluent is discharged via a pumped diffuser system over the tundra • A single FTE operates both the drinking water and wastewater facilities
Collection Mains	Data not provided		
Diffuser System	Data not provided		
Lift Station (includes pumps)	Data not provided		
Septic Tank (includes effluent pump)	6,000	gallons	
Lagoon	2.4	acres	
Aeration System	Data not provided		

Typical O&M Activities Performed

Drinking Water	*Wastewater*
• No data provided	• No data provided

Typical O&M Activities Deferred

Drinking Water	*Wastewater*
• No data provided • System has ongoing challenges related to staff turnover, staffing levels and budget insufficiencies	• No data provided • System has ongoing challenges related to staff turnover, staffing levels and budget insufficiencies

Budget - Annual

- Total: $158,802
  - Includes water and wastewater – unable to separate
  - Budget information was provided by a utility representative
  - High cost line items in the budget include: staff wages for all three employees ($52,520), fuel oil costs ($43,422), electricity ($18,000), pumps and vehicles ($10,000), and payroll taxes ($8,752)
- Adequacy:
  - The utility operates on a very limited budget and according to budget documents, often has trouble covering expenses. Additional funding is needed to meet staffing needs, planned capital projects, and routine O&M costs.

Revenue

- Revenue Sources: user fees, Tribal funds (City of Koyuk)
  - Previously, the Tribe has subsidized the utility's fuel costs and budget shortfalls. However, the Tribe has said they will be unable to cover these expenses for 2013. The utility is planning a rate increase to cover these and other O&M expenses.
  - The school receives funds from outside sources to pay the water/wastewater user fee.
- Collection Rates:
  - Residential: 60%
  - Commercial: ~100%
  - School and Teacher Units: 100%

	Water/Wastewater Rates
Residential	$71.40/month
Commercial	$150.00 + tax/month
School	$3,700.00/month
8 Teacher Units (paid for by school)	$71.40/month

Staff

- 1 Part-Time Utility Clerk (~ 0.4 FTE), 1 Operator FTE (position split between 2 people)

Passamaquoddy

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Purchased (not a PWSID – see general notes)	Mechanical
No. Connections	325	325
Population Served	822	822
Avg Daily Flow	49,350	78,000
Max Daily Flow	51,645	400,000

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Finished Water Storage (Standpipe)	347,000	Gallons	• The system purchases water from the Passamaquoddy Water District (PWD) so there is no O&M required for source or treatment infrastructure. • The water system is considered a PWD connection not a consecutive system because the Tribe does not treat the water or sell it to its residents. • System staff spend approximately 17% of their time on the water system (note: superintendent works approx. 60 hrs/wk on both water and wastewater system). • The system infrastructure is fairly new and is generally described as being in "good" condition with the exception of the storage tank. There have been ongoing corrosion problems with the storage tank since installation.
6" Water Mains	8,060	Feet	
8" Water Mains	9,705	Feet	
AMR Meters	325	Units	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Diffused Air WWTP (headworks, grit chambers, bar screens, anoxic tank, ditch tank, aerator, influent well, clarifiers, sludge wells, chlorination/dechlorination, pumps, digester, aerators)	Designed for 150,000 gpd but can temporarily handle flows of 300,000 to 400,000 gpd		• Plant was built in 1994. It is described as generally in "good" condition because it is well maintained; however, it is beginning to show signs of age. • Approximately 83% of staff time is spent on the wastewater system. • The utility estimates it requires close to 2 FTEs to operate the WWTP (which may be possible with the new hire). • The utility has detailed descriptions of the O&M tasks performed as well as estimates of time needed to properly maintain each piece of infrastructure. • The system is also working to develop an asset management plan. • In the past, some O&M tasks have not been performed on schedule due to staff shortages. Recent hiring of a Plant Aid is expected to help address this issue.
2"– 8" Force Mains	10,153	feet	
6" Sewer Mains	1,013	feet	
8" Sewer Mains	21,787	feet	
Lift Stations	10	units (9 active, 1 inactive)	

Typical O&M Activities Performed

Drinking Water	*Wastewater*

• Storage tank inspection (checking water levels, checking screen, check vent, lube locks)
• Mowing storage tank area
• Take samples (in distribution system)
• Leak detection and repair
• Record meter readings, validate meter data
• Clean and inspect meter pits
• Check hydrants
• Flush lines
• Exercise valves
	• Flush sewer lines
	• Locate, inspect and clean manholes
	• Lift stations
	  o Monitor controls
	  o Pull and check pumps
	  o Clean & maintain building
	  o Oil pump motor bearings and replace mechanical seals
	  o Check and empty wet well basket
	  o Mowing and snow removal
	  o Inspect and maintain fencing
	• WWTP
	  o Mowing and snow removal
	  o Daily inspection and cleaning
	  o Monitor controls
	  o Service headworks
	  o Exercise valves
	  o Clean filters
	  o Visually inspect each unit process and associated controls
	  o Clean air inlet filters
	  o Grease and lubricate pump motors and gears
	  o Calibrate instrumentation
	  o Perform daily lab work
	  o Inspect and maintain fencing

O&M Activities Deferred

Drinking Water	*Wastewater*
• No specific activities mentioned.	• Superintendent did not mention specific activities but did state that staffing shortages have caused some O&M tasks to be postponed. He felt the new hire would help the utility get caught up on these tasks.

Budget - Annual

- Total: $476,205 (approved);
  - Approximately: $285,723 (wastewater) and $190,482 (drinking water)
  - According to utility representatives, approximately 1% of the utility budget is covered by fees from tribally-owned government buildings and the remainder is from funding sources listed in the Revenue section below.
  - Budget information was provided by a utility representative. It is updated quarterly by the Tribe and weekly by the utility.
  - High cost line items in the budget include: salaries + fringe for three employees ($192, 626); water distribution and system care fund where 80% of the budget amount is for purchasing water and fire protection from PWD ($170,000); energy costs ($51,925); wastewater treatment costs for biosolids removal ($29,000); preventative maintenance and repairs ($28,000)
- Adequacy:
  - The superintendent does not believe the budget is adequate; staffing shortages have caused some O&M tasks to be postponed. With the new hire, the operators will have more time to perform maintenance duties that have been otherwise neglected. However, this will result in the budget decreasing at a faster rate. The superintendent works, on average, 60 hours/week (salaried) and would like assistance with administrative functions and with applying for grants.

Revenue

- Revenue Sources: user fees (less than 1% from Tribally-owned government buildings), Tribal General Fund (just under 50%), BIA Special Revenue Fund (just over 50%)
- A portion of the revenues provided by the General Fund are enterprise funds from a Tribally-owned blueberry company. The blueberry company funds the majority of the superintendent's budget that comes from the General Fund. Other funds included in the general fund are grants received by the Tribe and funds for specific contracts.
- Collection Rate: No data provided

	Combined Water/Wastewater Rates
Residential	No fee
Public Building/Facilities	$36.78 per month for the first 400 cubic feet of water used. The cost per cubic foot decreases as more water is used.

Staff

- Superintendent (certified operator, also performs financial and administrative duties), Maintenance/Operator, Plant Aide (new hire).
- Occasional engineering assistance from IHS or outside source which is not paid for through utility budget.
- Some fiscal duties performed by Tribe's CFO (not paid for through utility budget).

Poarch Band of Creek Indians (Poarch Creek)

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Groundwater with Treatment	Mechanical Treatment
No Connections	251	320
Population Served	600 community residents 750 NTNC – casino employees 6000 TNC – casino customers	600 residents and casino complex
Avg Daily Flow	200,000 gpd	No data provided
Max Daily Flow	350,000 gpd	No data provided

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Well #1 (aeration, bag filtration, fluoridation, disinfection (chlorine gas), corrosion control)	440	gpm	• Well #1 was installed in 2004 and Well #2 in 2009. • In 2011, Poarch Creek consolidated its two systems, each with one well. • The system's drinking water infrastructure is described as being in "good" condition with some variability within the distribution mains due to age. • The system operators adhere to clear written O&M procedures. As a result the system is very well maintained.
Well #2 (aeration, fluoridation, disinfection (chlorine gas), corrosion control)	840 (rated 700)	gpm	
Storage Tank #1	200,000	gallons	
Storage Tank #2	1	MG	
Transmission Distribution Mains	~ 41,000	feet	
Water Meters	132	units	
SCADA	1	unit	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Activated Sludge Wastewater Treatment Plant (sequencing batch reactors, diffusers, rotating disk filters, digester)	No data provided		• The wastewater system serves both residents and the casino complex. • The wastewater treatment system is described as being in "good" condition. • The lift stations, force mains, and sewer mains are described as being in "fair" condition. • Currently 1.5 FTEs are dedicated to running the complex wastewater system. The head operator indicated that 2.0 FTEs would be ideal for optimal wastewater O&M.
Sewer Mains	No data provided		
Force Mains	No data provided		
Lift Stations	10 major stations, 3 small stations		

Typical O&M Activities

Drinking Water	*Wastewater*
• Inspection of well pumps and controls • Checking and filling chemical feed tanks • Recording pH, disinfection residuals • Cleaning pumphouses and maintaining grounds around pumphouse • Locating distribution lines • Exercising, replacing and repairing valves • Installation repair and replacement of meters	• Inspection and lining of wet wells • Repair, replacement and unclogging of pumps • Locating force mains (for construction projects) • Replace belts • Inspection of plant processes • Greasing and cleaning mixers • Cleaning contact chamber and changing tubing on sulfur pump for chlorination/dechlorination system • Inspect pneumatic actuators and valves • Process lab and control samples • Recordkeeping tasks

O&M Activities Deferred

Drinking Water	*Wastewater*
• No specific activities mentioned.	• No specific activities mentioned.

Budget - Annual

- Total: $1,055,300
  - System provided written budget including actuals for fiscal year 2012. The utility director who is in charge of finances was unable to attend utility interview call.
  - Includes water, wastewater, and minimal amount for solid waste – unable to separate between utilities
  - Largest line items include: salaries and budgeted expenses ($823,300); small and large equipment ($85,000); and charges against revenue (e.g., recurring costs related to material and labor for certain activities [such as pumping customers septic tanks] that is not otherwise accounted for in budget costs ($147,000)).
  - Other types of 2012 budget items include: system repairs and supplies ($156,000); fuel, maintenance, and insurance for utility vehicles ($71,800); staff travel and training ($12,200); stipends and travel for the board of directors ($12,100); office supplies, phone/internet and building insurance ($34,250)
- Adequacy:
  - Representative stated that budget is fairly adequate; however the system would like to hire one or two more full-time employees (0.5 FTE for the wastewater system and 0.5 FTE for miscellaneous tasks)

Revenue

- Revenue Sources: user fees (water and sewer), septic tank pumping fees, invoiced work (plumbing etc. for customers outside utility), connection fees, penalties, Tribal subsidies (revenue from other enterprises)
  - System is close to being self-sufficient with user fees

- Collection Rate: 100%

	Water Rates	Wastewater Rates
Residential	$14/month for first 2,000 gallons $3.50 for each additional 1000 gallons	$7/month for first 2000 gallons $3.50 for each additional 1000 gallons
Commercial	$35/month for first 2000 gallons $4.85 for each additional 1000 gallons	Flat rate of $3.50 per 1000 gallons
Irrigation	$1.00 per 1000 gallons	

Staff

- 8 full-time employees (2 of the employees spend 30% of their time on garbage collection)
- 1 contractor (engineer) hired as needed

Pueblo Zia

	Water System *(Number of systems = 2)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Groundwater/Disinfection	Lagoon
No. Connections	172 (Community); 37 (Chamisa)	197 (approx. 12 homes on private septic)
Population Served	750 (Community); 150 (Chamisa)	884
Avg Daily Flow	50,500 gpd (Community - based on 12 hour pump day); 4,271 gpd (Chamisa)	56,700 gpd (Community); 11,700 gpd (Chamisa)
Max Daily Flow	63,000 gpd (Community); No data provided for Chamisa	180,000 gpd (Community); 95,000 gpd (Chamisa)

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Community Water System			• The utility operates two drinking water systems; the Community System was built in the 1970's and the Chamisa system is approximately 15 years old • The utility plans to consolidate these systems in order to address arsenic issues in both. Construction is expected to start this year. • Most of the drinking water system is described as being in "good" to "fair" condition • There is one utility director who spends approximately 80% of her time on the water and wastewater systems (position supposed to be 0.25 FTE). • There are 3 Tribal maintenance operators that, in total, account for 0.5 FTEs for the drinking water and wastewater systems. As a result there is limited staff availability for O&M activities. • Technical O&M such as pump replacement or tank cleaning is performed by contractors
Community Well	75	Gpm	
Pumphouse	1	Unit	
Chlorinator	5	Gpd	
2" – 8" Distribution Mains	36, 174	Feet	
Tank #1	65,000	Gallons	
Tank #2 (not in service)	105,000	Gallons	
Generator	5.5	kW	
Meters	14	Units	
Chamisa Water System			
Chamisa Well	67	Gpm	
Pumphouse	1	Unit	
Chlorinator	5	Gpd	
6" – 8" Distribution Mains	9,043	Feet	

Asset	*Capacity*	*Units*	*General Notes*
Chamisa Tank	60,000	Gallons	• Tank #2 (Community System) is offline due to high concentrations of lead paint on the tank exterior (the interior has been sand-blasted and recoated).
Meters	17	Units	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Force Mains	1,835	feet	• The wastewater system is described as being in "good" to "fair" condition • Most infrastructure in the system has been installed in the last 20 years • As noted before, staffing shortages limit the amount of routine O&M performed on the wastewater system and, therefore, activities such as visual inspections and mowing are not performed as often as needed. • The utility director and IHS representative noted that due to the climate (high evaporation rate), the lagoons rarely overflow. They also do not accumulate a significant volume of sludge and have never been dredged.
Sewer Mains	27,774	feet	
Lift Station #1 (2 pumps)	No data provided		
Lift Station #2 (2 pumps)	260 (total)	gpm	
Lift Station #3 (2 pumps)	120 (total)	gpm	
Lagoon #1	3.95	acres	
Lagoon #2	7.7	acres	

Typical O&M Activities Performed

Drinking Water	*Wastewater*

• Daily inspection including checking meter readings and checking chlorine residuals[2]
• Sweep/clean pumphouse
• Monthly, quarterly, and yearly sampling activities
• Pipe repair and trenching
• Inspect tank and coordinate with contractor for cleaning
• Flush hydrants
	• Coordinate sewer root removal
	• Lift Stations
	  o Daily operational monitoring - check pumps and record pressure and flow[1]
	  o Record watts generated from solar panels
	  o Clean bar screens
	  o Mowing
	  o Pick up debris and trash
	  o Splash down wet well
	• Lagoons
	  o Daily inspection*
	  o Maintain fencing

*The utility director stated that these activities should be performed daily but may not be.

O&M Activities Deferred

Drinking Water	*Wastewater*
• O&M activities intended to be performed daily are not occurring at that frequency due to limited staff dedicated to the water system.	• O&M activities intended to be performed daily are not occurring at that frequency due to limited staff dedicated to the wastewater system. • Mowing around the lagoon.

Budget - Annual

- Total: $177,274
  - Unable to separate drinking water and wastewater
  - Budget information was provided by a utility representative.
  - The utility was under Administrative Order to develop a budget. However, it does not appear that the budget is currently being followed. For example the budget lists 2 full-time salaried positions that are currently vacant. Twenty-five percent of the utility director's salary is paid for by the utility budget; however, this line item is not reflected in the budget provided. The three maintenance operator salaries are paid for by the Tribal General Fund.
  - It appears that, at present, expenses are reviewed and approved by the governor and are paid for by submitting work orders and purchase orders to the Tribal finance office. It does not appear that actual spending is tracked against the budget at this time.

[2] The utility director stated that these activities should be performed daily but may not be.

  - Other than the salaries for the 2 vacant positions, the highest cost item in the budget is $37,500 which covers both water and wastewater O&M activities. Because expenses are not tracked against the budget, it is unclear what is actually being spent on O&M.
  - The utility is almost fully subsidized by the Tribe, with funds coming from the Tribal General Fund.

- Adequacy:
  - The system lacks dedicated personnel to perform activities and properly maintain the system. The utility director has no operators working directly under her supervision and no assistance with administrative tasks. At current staffing levels, it is not possible to ensure the utility is properly maintained while also performing financial and compliance duties (preparing reports, sampling, etc.). The utility director also noted that a dedicated utility building is needed so that supplies can be stored and organized.

Revenue

- Revenue Sources: user fees (limited), Tribal General Fund.
  - The vast majority of utility expenses are paid for by the Tribal General Fund. Funding for the Tribal General Fund comes from land use contracts (movie productions) and natural resource funds. Natural resource funds are derived from oil and gas leases, mineral rights, and BIA funds to manage crops/grazing area for cattle.
  - A very small source of revenue comes from user fees.
- Collection Rate: ~50%

	Combined Water/Wastewater Rates
Standard Rate	$1.00/year per adult tribal member

Staff

1 Utility Director (0.25 FTE assigned to utility, however, she spends approximately 80 percent of her time on water and wastewater duties), 3 Maintenance Operators (combined 0.5 FTE for utility, not funded by utility)

Confederated Salish and Kootenai Tribes (CSKT)

	Water System *(Number of systems = 14*)*	*Wastewater System* *(Number of systems = 7*)*
Type of Source/System	11 – GW (disinfection only) 2 – GW (manganese green sand) 1 – GW (cartridge filtration and softening)	7 – Lagoon Systems
No. Connections	Smallest: 10 Largest: 161	Limited data provided
Population Served	Community Population Range Smallest: 30 Largest: 840	Limited data provided
Avg Daily Flow	No data provided	No data provided
Max daily Flow	No data provided	No data provided

***** There are additional systems serviced by the CSKT utility which do not meet the criteria of public water systems. These systems change as different housing complexes are utilized. The CSKT Utility estimates they serve approximately 29 total drinking water and wastewater systems.

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*General Notes*
Wells	1-2 wells per system 15-100 gpm	• The CSKT Utility operates 12 public water systems and several small water systems that do not meet the definition of a PWS. • The condition of the systems varies; utility representatives noted that the largest systems do not always require the most time to maintain. Often the oldest systems require more of the operator's time (proportioning budget to population served was not recommended). • A significant amount of time is spent driving between locations (utility area is 54 miles long). • The utility's priority is to keep systems in compliance and in service; preventative maintenance can be difficult to accomplish due to lack of staff.
Chemical Feed/Disinfection	Each system	
Cartridge Filter	1 system No capacity data provided	
Manganese Greensand	2 systems No capacity data provided	
Distribution Mains	Generally: <6" diameter Approx. 1-2 miles per system	
Service Lines	See connection data	
Tanks	1-2 per system	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*General Notes*
Sewer Mains	All of the wastewater systems managed by the CSKT Utility are lagoon systems.	• The CSKT utility operates 7 wastewater treatment systems, all lagoon systems • As with the drinking water infrastructure, emphasis is placed on keeping systems running; there is little time for preventive O&M. • Work on wastewater systems is somewhat seasonal with a lot of mowing required in the summer.
Force Mains		
Manholes		
Lift Stations		
Lagoon		
Aeration		
Discharge Line		
UV Trailer		

Typical O&M Activities Performed

Drinking Water	*Wastewater*
• Daily inspection and chlorine residuals • Monthly and yearly sampling activities • Pipe repair as needed • Tank inspection (cleaning is contracted) • Flush hydrants • Flush valves • Backwash filters • Change solar panel batteries (where required) • Change filter media (where required) • Mowing • Telemetry maintenance and repair	• Bi-weekly lagoon inspection • Mowing • Sampling activities • Maintain aerators (annually) • Maintain UV system • Setup and move UV system between locations

O&M Activities Deferred

Drinking Water	*Wastewater*
• CSKT reported that preventative maintenance is often deferred.	• CSKT reported that preventative maintenance is often deferred.

Budget - Annual

- Total: $419,024
  - Budget information was provided by a utility representative
  - Budget cannot be separated by drinking water/wastewater or by system
  - The utility representative explained that 26% of the utility budget goes to indirect costs such as facility rent, heat, administrative support and staffing
  - Other high cost line items include: vehicles and fuel ($84,850), maintenance costs ($26,050), and environmental testing costs ($9,000).

- Adequacy:
  - The utility representative believes budget does not provide adequate funding to replace old infrastructure, establish reserves, or hiring the required number of staff.
  - Most capital projects are not approved for funding by the Tribal government unless the system is already out of compliance.
  - The age of the infrastructure and lack of preventative maintenance increases the required O&M time.
  - The utility has requested permission to raise user rates but the increase was denied by the Tribal government.

Revenue

- Revenue Sources: user fees, Tribal government funding, grants
- Collection Rate: no data provided

	Wastewater/Water Rates	Wastewater Rates
Residential	No data provided	
Commercial	No data provided	
Irrigation	No data provide	

Staff

- Operators (2 FTEs), 1 Engineer (0.3 FTE), Finance Manager (0.2 FTE), Administrative Staff (0.2 FTE), Customer Service (0.2 FTE), Custodial (0.2 FTE), Landscaping (0.2 FTE), Legal (0.2 FTE), Auditing (0.2 FTE)

Smith River

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Surface Water & GWUDI/ Filtration & Disinfection	MBR System
No Connections	58 (52 Active)	13
Population Served	220 community residents	‹100 community residents (est.) ›100 NTNC and TNC (est.) (system sized for total population)
Avg Daily Flow	Data not provided	2,500 gpd
Max Daily Flow	20 gpm (WTP capacity)	25,000 gpd

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Infiltration gallery	‹10	gpm (est.)	• The infiltration gallery was developed in the 1970's and the system's well was installed in 1996. • All other treatment, storage, and most distribution infrastructure were installed between 2000 and 2013. • Aside from the infiltration gallery the drinking water system infrastructure is described as being in "good" condition and requires only routine levels of O&M. • The infiltration gallery lines will need to be replaced in the near future.
Well	10	gpm	
Wet Well	Data not provided		
Pressure Filters	20	gpm (combined)	
Cartridge Filters	20	gpm (combined)	
UV Disinfection System	20	gpm	
Chemical Feed System (pumps, storage tanks)	No data provided		
Clearwell	2500	gallons	
Storage Tank	104,000	gallons	
Transmission Mains	1,500	feet	
Distribution Mains	14,100	feet	
Water Meters	58	meters	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Membrane Biological Reactor Wastewater Treatment System	25,000 (avg) 50,000 (peak)	Gpd	• The MBR wastewater system was constructed in 2009, all infrastructure in the system is described as being in "good" condition and requires only routine levels of O&M. • MBR system is sized to serve the entire community. Due to lack of funding, there are currently very few residents (13 out of possible 52) connected to the wastewater system although connections for properties have been stubbed-out. As the tribe can set aside funding, tribal properties will be connected to the system. • The only concern regarding this infrastructure is that it is run significantly under capacity.
Collector Mains	24,763	Feet	
Force Mains	12,144	Feet	
Lift Station #1	Data not provided		
Lift Station #2	Data not provided		
Discharge Lines from Community Drainfield	24 runs at 320 feet per run		
Drainfield	58,000	Gpd	

Typical O&M Activities Performed

Drinking Water	*Wastewater*
• Infiltration gallery collector lines cleaned annually • Well cleaning annually • Wet well cleaned and pumped to waste annually • Pump repair • Backwashing filters • Change cartridges in cartridge filter units • Change UV bulbs • Change chemical feed tubing • Exercise and flush valves	• Visual inspections • Annual pump repair and maintenance (contracted) • Membranes cleaned in place bi-annually • Membranes removed for cleaning annually

O&M Activities Deferred

Drinking Water	*Wastewater*
• No specific activities mentioned. • Representatives noted that rates cover a very limited portion of budget and all large capital expenses must be approved by tribal leadership before inclusion in the utility budget.	• No specific activities mentioned. • Representatives noted that rates cover a very limited portion of budget and all large capital expenses must be approved by tribal leadership before inclusion in the utility budget.

Budget - Annual

- Total: $159,601 – total budget for drinking water & wastewater
  - Written budget including actuals for calendar year 2012 was received from the utility.
  - Budget separated by system: $54,108 (Drinking Water), $105,493 (Wastewater – MBR).
  - In several cases there were substantial differences between budgeted amounts and actual spending, the line items listed below are actuals for FY 2012
  - Large line items include: salaries and benefits ($45,792), chemical materials and supplies ($26,818), office building utilities ($24,337), and waste disposal ($10,285).
- Adequacy:
  - The representative noted that since this is a fairly new system, the budget is generally adequate for the required O&M. However, the budget does not cover large capital projects.

Revenue

- Revenue Sources: user fees (water & sewer) and other tribal revenues.
  - Difference between budgeting spending and user fees is covered by other tribal revenues.
  - Collection Rate: 90%

	Water Rates	Wastewater Rates
Residential/Commercial (Tribal)	$16.00/month for first 2,000 cf (~15,000 gallons) $0.70 for each additional 100 cf (~750 gallons)	$25.00/month
Residential/Commercial (Non-tribal)	$24.00/month for first 2,000 cf (~15,000 gallons) $1.14-$1.38 for each additional 100 cf (~750 gallons)	$50.00/month

Staff

- 5 employees: 1 full-time utility manager, 1 operations manager (0.6 FTE), 2 part-time operators (0.25 FTE each), 1 environmental protection officer who compiles and submits official monitoring and compliance reports to EPA (0.06 FTE).
- Administrative, legal and engineering staff provided as needed from other tribal entities.
- Contractors hired as needed.

Kashia Utility District - Stewarts Point Rancheria

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 1)*
Type of Source/System	Surface Water/GWUDI	Multiple septic tank and subsurface disposal
No Connections	19 (18 plus school)	18 (school on own septic)
Population Served	80 (winter)/150 (summer)*	80 (winter)/150 (summer)[1]
Avg Daily Flow	No data provided	5,000 gal/day winter
Max Daily Flow	50 gpm (treatment plant design capacity)	6,000-7,000 gal/day summer

*Tribe reports that summer population increases due to tribal gatherings.

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
Infiltration Gallery	45+	gpm	• Most of the drinking water infrastructure was installed less than 5 years ago and is described as being in "good" condition. • Due to the recent installation of the equipment, the drinking water system requires limited O&M activity. • When repair is required, operator often uses outside assistance such as manufacturer representatives or rural assistance professionals. • Some automation at the water plant has not been operational at times.
Wet Well	33 x 8	feet (depth x diameter)	
Raw Water Pumps	50 (total)	gpm	
Raw Water Storage Tank	5000	gallons	
Microfiltration Plant	50	gpm	
2 Finished Water Pumps	100 (total)	gpm	
Finished Water Storage Tank	70,000	gallons	
4" Transmission Main	5,280	feet	
Distribution Mains	No data provided		
7 Pressure Tanks	<700 (total)	gallons	
Water Meters	19	units	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
Sewer Main	No data provided		• The wastewater system is generally described as being in fair/good condition. • Initially, the utility experienced problems with the pump motors at the lift station. Since new pumps (from a different manufacturer) have been installed the issues have been resolved. • The utility is not currently using its aeration system due to the high electrical costs to operate. • The utility would like to replace the holding tank with a treatment system to remove more solids upfront allowing less to pass through to the drainfield. • Due to limited staff availability, some routine O&M tasks at the wastewater system are not completed on a regular basis (i.e. mowing).
Force Main	No data provided		
Holding Tank	No data provided		
Aeration	No data provided		
Drainfield	No data provided		
Generator	No data provided		

Typical O&M Activities

Drinking Water	*Wastewater*
• Daily system inspection • Process monitoring and recording • Replace chemical feed tubing as needed • Pump repairs (contracted)	• Daily systems inspection • Clean baskets and floats at lift station monthly • Read meters monthly • Service pumps and motors at lift station • Pump repairs (contracted)

O&M Activities Deferred

Drinking Water	*Wastewater*
• In general, although the drinking water infrastructure is fairly new and requires limited O&M, some tasks are not addressed because of limited personnel availability. • One specific example given is that some automation at the water plant has not been operated at times.	• Due to limited staff availability some O&M tasks are deferred, one example given was mowing at the wastewater system. • In general, O&M and general function of the wastewater system is impacted by budget and staffing constraints (e.g. aeration not used due to high energy costs).

Budget - Annual

- Total: $92,774 – described as "rough estimate"
  - A written budget was received from the utility for fiscal year 2012; the budget reflects proposed spending by the utility including staff salaries. A separate spreadsheet was also included containing actual system expenditures. The spreadsheet shows the entities (utility, other funding sources) that pay for each line item.
  - Includes water and wastewater – unable to separate
  - Largest line items from the budget report include: staff salaries and fringe ($49,377), insurance ($10,400), replacement and purchase of equipment ($10,000), contractual water testing and repair work ($9,000), fuel and electric costs ($6,000) and travel ($5,000).
- Adequacy:
  - According to the representative, the budget is insufficient. In particular, additional FTEs are needed to complete O&M tasks.
  - Infrastructure is fairly new, however, inadequate staffing and lack of standard maintenance procedures and a preventative maintenance schedule result in a "fix-it-when-it-breaks" policy.

Revenue

- Revenue Sources: Kashia Utility District (KUD) water sales and government grants from the Kashia Dept. of Environmental Protection (KDEP) budget, BIA (which can include funding from Aid to Tribal Government), Indian Community Development Block Grants, and other government funds.
  - Revenue from user fees = $9,016
  - Government grants pay for salaries and fringe, operator travel and training, insurance on solar panels, and the utility's phone. This equates to approximately 65 percent of the budget.
  - The remainder of the budget is the responsibility of KUD (approximately $30,000). In 2010, KUD's actual expenses were $11,700. Based on expenses versus budgeted amounts for specific line items, it appears either the budget estimate was too high or line items were not completed due to lack of funds.
- Collection Rate: greater than 95%

	Water User Rates	Wastewater User Rates
Residential/Commercial	$5 per month base plus $2.50 per 1000 gallons consumed.	$20 flat fee

Staff

- 3 part-time employees that equate to approximately 0.7 FTEs: Main Operator (0.5 FTE), Assistant Operator (0.1 FTE), and Environmental Planning Director (0.1 FTE).
- The main operator is considered 0.5 FTE for budget purposes; however, he works nearly full-time (6 to 8 hours per day). He spends approximately 90% of his time on the water system and 10% of his time on the wastewater system.

Stockbridge-Munsee

	Water System *(Number of systems = 1)*	*Wastewater System* *(Number of systems = 2)*
Type of Source/System	Groundwater/Disinfection Only	1 Lagoon System 1 MBR System
No. Connections	107	107
Population Served	396 community residents 495 NTNC – casino employees 1500 TNC – casino customers	396 community residents 495 NTNC – casino employees 1500 TNC – casino customers
Avg Daily Flow	49,400 gpd	41,500 gpd (MBR)/15,000 gpd (Lagoon)
Max Daily Flow	111,150 gpd	120,000 gpd (MBR)/39,000 gpd (Lagoon)

Inventory of Major Assets – Drinking Water

Asset	*Capacity*	*Units*	*General Notes*
3 Wells	142-144	gpm (each)	• Wells for the drinking water system and chlorine disinfection were installed in 2007 and are generally described as in "excellent" condition. • Booster station was installed in 2009 and is also in excellent condition. • The system has some fluoridation equipment but has chosen not to fluoridate based on community input. • Due to the new condition of the equipment, the drinking water system requires limited O&M activity.
Chlorine disinfection	24	Gpd	
Booster station	17,200	Gpd	
SCADA	1	Unit	
Pump house	1	Unit	
Distribution Mains	No data provided		
Storage Tank #1	250,000	gallons	
Storage Tank #2	60,000	gallons	
Meters	107 (assumed one per connection)	meters	
Emergency generator	100	kW	

Inventory of Major Assets – Wastewater

Asset	*Capacity*	*Units*	*General Notes*
MBR Wastewater Treatment Plant			• The MBR WWTP serves primarily casino customers and a limited number of residents. • Discrepancies exist between stated system capacity and MBR plant capacity. • The MBR plant was constructed in 2011 and is generally in good condition. • The lagoon system was installed in the 1960's. • Lagoon requires typical level of O&M.
Membrane biological reactor WWTP	41,500 (avg. daily) 120,000 (max. day)	gpd	
Drainfield	No data provided		
6 Lift Stations	40-509	gpm	
Lagoon System			
Force Mains	No data provided		
Collection Mains	No data provided		
2 Lift Stations	110 and 128	gpm	
3-cell lagoon	10.14	acres (total)	

Typical O&M Activities Performed

Drinking Water	*Wastewater*
• Daily inspection • Plow and mow around pumphouse • Cleaning pump house • Check for proper operation of chemical feed pump and replace tubing as needed • Check booster pumps, VFDs, and ramp speeds • Check SCADA • Exercise and replace valves • Clean out storage tank overflow and drain lines • Flush mains • Run and service generator	• Inspect chemical feed and filter basin • Check diffusers • Clean valves • Visual and audible check of WWTP system processes • Complete testing for Nitrate and ammonia • Collection and sampling of mixed liquor • Change out chemical feed tanks • Spray down and sweep plant • Clean probes and bar screens • Report information for compliance • Sample lagoon quarterly • Maintain fencing around lagoon • Raise/lower lagoon discharge valve

O&M Activities Deferred

Drinking Water	*Wastewater*
• No specific activities mentioned other than sandblasting and painting the older water tank. • Representatives noted that securing funding and planning for large cost capital projects is often not possible due to budget constraints.	• No specific activities mentioned. • Representatives noted that securing funding and planning for large cost capital projects is often not possible due to budget constraints.

Budget - Annual

- Total: $539,707
  - Budget information on the questionnaire was filled in by a utility representative. The utility filled in budget information on the questionnaire but declined to submit original budget documents.
  - $211,359 (Drinking Water), $155,206 (Wastewater – Lagoon), $173,142 (Wastewater – MBR)
  - Interest expenses were listed as the highest cost line item in the budget (budgeted amount $111,400, actual expense $278,456). Interest expenses entail interest from a USDA loan (sand filter, water tower, sewer, housing water inter-tie) and Shakopee Note (MBR Wastewater Treatment Facility).
  - Other high cost line items in the budget include: salaries for four employees ($137,000), fringe benefits ($62,621), utilities ($79,500), system repair and maintenance ($54,700), and supplies ($33,500).
- Adequacy:
  - Representative believes budget is fairly adequate for staffing and routine annual expenditures; however it can be difficult to obtain funding for large capital projects.

Revenue

- Revenue Sources: user fees (water & sewer), Tribal, and casino subsidies
  - User fees fund about 40% of the utility budget; remainder is funded through Tribal and casino subsidies.
- Collection Rate: 90%

	Water Rates	Wastewater Rates
Residential	$25.00 for first 5,000 gallons/month $2.00 for each additional 1000 gallons/month	Combined with Water Rates
Commercial	$65 per month flat fee	Combined with Water Rates
Irrigation	$12.00 per 1,000 gallons/month	Combined with Water Rates

Staff

- 4 employees: 1 full-time utility supervisor, 2 full-time maintenance technicians, 1 part-time office manager, contractors hired as needed.

Appendix F. RCAP Method

Concept for Future Uses of the Comparative Staffing Analysis©

Small water and wastewater systems need staffing standards to better manage and sustain their systems. Personnel costs typically make up 50 to 60% of the annual operating expenses for small utilities and when budgets are tight cutting staff is seen as a way to recover the most cost. The impacts of these decisions can be catastrophic over the long term of the utility and lead to an unsustainable situation in the future. Deferred maintenance, repairs done improperly (and the list goes on) will eventually render the utility out of compliance and/or require significant capital investment to get it functioning properly.

In order to answer small system managers questions regarding appropriate staffing levels the Rural Community Assistance Partnership (RCAP) has developed a comparative approach to recommend areas where the system should look to increase or decrease staff. This is done by comparing similar systems and establishing how many Full Time Equivalents (FTEs) a comparable system requires to operate. Whereas RCAP has developed and tested a survey system that can allow for comparisons of FTE requirements over age, size, condition, technology employed, topography, and density of the service area rather than looking strictly at costs. Costs can vary greatly due to local economic conditions; an FTE in Ohio is assumed to equal 2080 hours per year as does an FTE in California.

RCAP has tested the methodology with public water providers and believes that this project along with information already collected will help identify trends in staffing requirements. RCAP believes by surveying systems with multiple FTE's in the various functions of the operation that standards could be determined and applied to very small systems (under 200 connections). The methodology was tested on systems that covered larger geographic service areas, generally parts of two counties, with similar technology, topography, size, age and condition. One system was more compact and served a similar number of customers. Trends and observations from the test show that this methodology also has value to utility managers of very small systems. RCAP observed that in all the systems surveyed approximately one FTE is required for every 100 miles of distribution line. By surveying a statistically valid number of systems, trends can be observed leading to standards. Thus the standards can in turn be fractionalized to allow for smaller systems (i.e., it could be assumed 50 miles of distribution would require .5 FTE and 25 miles of line would require .25 FTE).

Methodology

RCAP developed a survey with approximately forty questions to capture data specific to a water system's management, administrative, distribution, and source-treatment functions. Care was taken to avoid common discrepancies relating to financial information by removing financing and capital costs and reserves from the expense statements. The survey also looked at capacity, demand, and loss and unbilled water for analyzing age and condition in the metrics of staffing requirements. Treatment technology was compared by testing on site canvassing with management and comparing similar systems. General comparisons of systems with similar geographic service areas and topography were used in the test comparison analysis to mitigate unlike labor needs.

Once the data was collected various ratios were tested in each function of the utility to determine what trends and observations could be derived from the analysis. After this part of the process was completed multiple ratios were used to show how the systems ranked against one another in each function. Particular attention was given to ranges and mean values in the ratios. A report was then provided to the subject system within a board meeting with questions and answers about what was observed.

Initial Findings

Soft recommendations were given to the board for use in future decision considerations. RCAP found that the governing board should look at the treatment process and consider labor saving technology as one possible saving. Further RCAP found that the utility may realize more efficient use of labor and assets by devoting more staff time to managing assets. Currently the utility is in the process of completing an Asset Management Plan to enhance its overall sustainability.

More importantly, RCAP found that having a statistically valid number of surveys in both water and wastewater utilities could be used for **developing standards** that could be applied to any system with multiple practical decision making uses. These decisions include but are not limited to: changes in size and scope of a utility; shared resources; budgets in new and changing utilities; regionalization services, the cost vs. saving of asset management; better life cycle cost analysis; decision maker education; workforce needs and analysis; impact of age and condition to labor requirements; financing and lending decisions; and so forth.

Next Steps

In order to create standards that can be applied to water and wastewater systems more data is needed and more systems need to be surveyed. Therefore, RCAP is working to develop a database that can be loaded from the field or synchronized to when the survey is completed and internet is not available. RCAP believes energy efficiency can be incorporated into survey and data collection.

A statistically valid number of surveys would need to be taken. More comparable systems range in size and capacity. More distribution systems are needed to look at trends of compact vs. rural. Wastewater

utilities should be surveyed as well. Systems should be surveyed that are both in compliance and are not in compliance and reviewed for trends.

Once the surveys are completed similar systems surveyed should be catalogued as such and analyzed for trends in ranges and mean values. Ratios of metrics would indicate possible standards for future use. This work should lead to better understanding of staffing requirements for water and wastewater systems and could be used in budgeting, optimization, decisions by local officials, standards and ranges. Standard benchmarks developed from this process could be applied to very small systems as a guide toward staffing levels. These standards would be indicators of staffing needs for smaller systems where comparisons between very small systems would be of less to decision makers.