Village Safe Water

Design Review Procedures

Revised March 6, 2013

Objective

These procedures standardize the review of designs of sanitation facilities projects managed by the Alaska Department of Environmental Conservation Village Safe Water (VSW) Program. The ultimate goal of these procedures is to **achieve excellence** in building **sustainable sanitation facilities** for communities in rural Alaska. Standardized design review procedures will:

- Provide guidance for the complete development of quality design documents
- Promote efficiency
- Provide continuity and consistent methodology
- Minimize project risk.

VSW is responsible for the development of design, administering the construction and assisting in the operation of sustainable sanitation facilities that meet the following goals:

- Designs that are simple but reliable – as fail safe as reasonably possible
- Construction that is cost effective yet results in quality improvements
- Operation that is affordable and protects human health and the environment

To this end, the State of Alaska Legislature added the following intent language in the SFY 06 Capital Budget for funding VSW projects:

> *It is the intent of the Legislature that the Department of Environmental Conservation (DEC) will establish guidelines for deciding whether proposed project costs are reasonable and whether proposed projects are sustainable; ensure that projects are limited to systems that are reasonable and sustainable; and exercise final decision authority as to project costs and the types and extent of projects to be constructed.*

Procedures

The design review process consists of four distinct phases:

- Phase I – Design Project Setup
- Phase II - Conceptual Design
- Phase III – Design Analysis Report and 35% Design Drawings
- Phase IV – Production Drawings

The design review phases are illustrated in the "*VSW Design Review Flowchart*" (Attachment 1). Design reviews are a key element of quality assurance in the design development process. These reviews must be documented to create a record of the comments that were received and how the designer addressed them.

The VSW Project Manager will be responsible to make arrangements for setting up the design review meeting and distribution of the design plans and associated documents. Each member of the Design Review Team will receive an invitation to the design review meeting. The meeting will be scheduled to allow team members at least 15-business days to review the design – this amount of review time is required for all phases of design. However, depending on the complexity of the project and critical time constraints, the design review period can be decreased or increased subject to the concurrence of the VSW Lead Engineer. and the "Gate Keeper."

The VSW Project Manager is responsible for the initiation and maintenance of a checklist and schedule, referred to as the "*Design Phases and Tasks Checklists/Schedul*e" (Attachment 2). The checklist is to be used for documenting the completion of the design phases and associated tasks.

The design review process incorporates a quality control measure consisting of a series of review gates. Completion of a review gate and transition to the next review gate is a key milestone in the design project's life cycle. All gates require the submission of summary documents (defined herein) to the "Gate Keeper" (VSW Program Manager or his/her designee) and the Lead Engineer for review. A review gate identifies a point at which clear decisions are made about projects, and whether to continue the project or modify parameters of the project, such as project scope, schedule and/or resources.

Although written approval from the Gate Keeper is not required for gate passage, the Gate Keeper has the authority within **5-business days** of receipt of the summary documents to stop the progress of the design review process. The Gate Keeper clock does not begin until Lead Engineer has completed summary document review. If the Gate Keeper determines the summary documents are deficient, he/she may require the submission of additional documentation to demonstrate that the project outcomes at that specific point in the design review process have been achieved and that the project is ready to proceed to the next review gate.

The review gates are shown as "diamond" shaped steps on the aforementioned flowchart. The following list presents the design review summary documents that are required for passage through each of the five review gates:

- ✓ Review Gate 1 - Design Execution Plan in Phase I
- ✓ Review Gate 2 – Conceptual Design Review Memorandum in Phase II
- ✓ Review Gate 3 – 35% Design Review Memorandum in Phase III
- ✓ Review Gate 4 – 65% Design Review Memorandum in Phase IV
- ✓ Review Gate 5 - 95% Design Review Memorandum in Phase IV

The remainder of this procedures document describes in detail the requirements for design review under each phase. The individual tasks noted under each phase are provided for guidance, and may vary depending on the scope of the work for each design project. The VSW Project Manager, with the concurrence of the VSW Lead Engineer will determined the specific design review tasks.

All design reviews will incorporate the use of the "VSW Design Review Comments and Response Form" (Attachment 5), for the assembly and documentation of design questions, comments and requested modifications. The form will be distributed via the internet. All members of the Design Review Team will provide their comments in writing on the design review form. The VSW Project Manager will collect all review comment forms from the design review team and submit them to the Design Engineer for a response.

Comments can be collected from a number of individuals (as email attachments) and simply sorted and pasted (consolidated) into a single document. The form allows for easy sorting of comments and eliminates duplicate comments. Written comments also require the reviewer to provide a more well thought out and coherent review thus minimizing the possibility of misinterpretation.

Design Dispute Resolution Process

In the event that there are unresolved design disputes that can't be resolved by the design review team, such disputes may be elevated to the VSW Program Manager for resolution and final decision.

Upon concurrence from the VSW Lead Engineer, the process starts with the VSW Project Manager notifying the VSW Program Manager with a request to intervene and resolve the design disputes by providing a written narrative of each dispute and information supporting the opposing views of each dispute. Within 5-business day, the VSW Program Manager will schedule a meeting to hear verbal arguments on each dispute. Besides the VSW Program Manager, this meeting will be attended by the following:

- VSW Project Manager
- VSW Lead Engineer
- Consultant (Project Manager and/or Design Engineer)
- Third Party Expert (optional)

Within 10 business days of either the written request or if in effect, the meeting, the VSW Program Manager will make a final decision based on the written request and if held, the information presented at the meeting. The VSW Program Manager will document each decision in writing.

Phase I – Design Project Setup

1.1 Assign VSW Project Engineer, Feasibility Study Completed and Design Engineer Hired

The first step in the design review process is initiated subsequent to the following actions:

- VSW Project Manager is assigned –

  VSW Program Manager will assign a qualified engineer to serve as the VSW Project Manager for managing the design of the sanitation facility proposed for a designated community. The VSW Project Manager will be the primary point of contact for the community for the duration of the design project including the construction phase of work.

- Feasibility Study Completed –

  The VSW Project Manager will procure an engineering firm to prepare the feasibility study (or Sanitation Master Plan). The feasibility study should recommend the design and development of sustainable sanitation improvements that effectively balance the following needs:

  - ✓ Design simplicity and reliability
  - ✓ Accomplish desired function, such as water treatment.
  - ✓ Cost, quality, and ease of construction
  - ✓ Cost and ease of operation
  - ✓ Standardized regional designs, equipment, and materials to promote and create opportunities for improving the efficiency and quality of service delivery

  The engineering firm responsible for the preparation of the feasibility study should collect baseline design data including but not limited to the following: house counts, population projections, water demands, water source characteristics, sewage flows, solid waste generation, environmental conditions, land status, soil material borrow sources, electrical power generation, bulk fuel storage, existing archaeological or historic reports, record drawings of existing facilities, and background information on erosion, flooding and seismic activity. VSW will review and approve the feasibility study in accordance with VSW Program Policies and Procedures.

  - ✓ Attachment 8: Sanitation Facilities Master Plan Outline (Feasibility Study) – Table of Contents

- Design Engineer Hired –

The VSW Project Manager will initiate the procurement of services of an engineering firm (referred to as the Design Engineer in this document) to prepare the design of the proposed sanitation facility recommended in the feasibility study. The design engineering firm will complete all field investigations, pilot studies, and sampling necessary to design the proposed sanitation facility. Also, all of the applicable pertinent site information necessary for design that was beyond the scope of the feasibility study should be collected and compiled by the Design Engineer.

Before the contract for architectural and/or engineering design services has been awarded, the Design Engineer prepares and submits a proposal for these services to the VSW Project Manager based on a request for proposal prepared by the VSW Project Manager. After negotiations are completed between the Design Engineer, VSW and the community, a contract is executed and a notice to proceed is issued. In some cases, an NTP may depend on funding and, in other cases, the NTP may be dependent on the outcome of work performed under a previous NTP. Regardless, the contract needs to reference and follow these design review procedures in Phases II, III and IV.

1.2 Prepare Project Design Notebook

A Project Design Notebook will be prepared and maintained by the VSW Project Manager for each design project. The Design Notebook will consist of a three-ring binder with the VSW project number provided on the notebook's front cover and spine. The notebook shall be prepared in accordance with the assembly information provided in the "*Project Design Notebook Requirements and Notebook Index*" (Attachment 3).

Proper documentation is required for all design projects. The Design Notebook is a repository for all relevant design information. The notebook will be completed as the work progresses. A permanent record must be maintained for all communications, meetings, and other applicable design information. This information will be invaluable in future years as a reference for design calculations, significant correspondence, and documentation of decisions. Documentation of the design is useful in explaining why certain actions were taken, and why certain decisions were made.

1.3 Designate Design Review Team

The project Design Review Team will be identified early in the project. The VSW Project Manager will select the members of the design review team. The team will vary in composition depending on the project's size, complexity and timing, and should typically include the following individuals as team members:

- ✓ VSW Project Manager
- ✓ VSW Lead Engineer
- ✓ VSW Engineer(s) (subject to availability and related expertise)
- ✓ VSW Construction Observer
- ✓ ADEC Operations Assistance Program Representative

- ✓ Regional Remote Maintenance Worker (RMW) subject to availability
- ✓ ADEC Regulatory/Permitting Staff (selected by region and applicable regulation)
- ✓ ADEC Facilities Environmental Review Person (Program NEPA Compliance Officer)
- ✓ Specialty Term Contractor as necessary to represent professional design disciplines (mechanical, electrical, structural, geotechnical, cost estimator, etc.)

Other individual(s) whose expertise or knowledge could improve project constructability or sustainability may be included on the project team.

1.4 Prepare Design Execution Plan (Review Gate 1)

The VSW Project Manager and the Design Engineer shall prepare a Design Execution Plan (DEP) that will clearly define the project scope. The project scope must be developed in a concise format that will ensure consistency with the scope of the funding source(s) and which is achievable within the project budget. The DEP will include a summary of the project objectives, proposed scope of work, budget, preliminary project schedule, designated Design Review Team members and other pertinent information that define the design project. Depending on the complexity of the design, the DEP will vary in content. For instance, for the more complicated designs, additional information may be needed to identify data gaps and sensitive issues.

As a guide for the preparation of the Design Execution Plan, it is recommended the table of contents follow the outline *Example of Table of Contents for Design Execution Plan* (Attachment 4).

At this first review gate, the Design Execution Plan will be submitted to the Lead Engineer and to the "Gate Keeper" (VSW Program Manager or his/her designee) for review. Upon passing Review Gate 1, the Design Execution Plan will be distributed to the design review team and the community representatives. The Design Execution Plan will be saved to the electronic community folder project file, and a hard copy inserted in the Design Notebook.

Phase II - Conceptual Design

2.1 Conduct Design Project Kickoff Meeting

A design project kickoff meeting will be held to provide an overview of the project, discuss the Design Execution Plan and involve the community. Community involvement is imperative early in the design process to ensure that the scope of work properly addresses the needs of the community. If it is feasible, project kickoff meeting should be held in the community with the governing council of the community, or a community designated "planning committee."

The kickoff meeting is intended to review the project scope (what will be built by the design), introduce the key members of the project design team, and obtain design-related

input from the community. The VSW Project Manager is responsible for coordinating the design project kickoff meeting and determining attendees.

2.2 Prepare Conceptual Design

The conceptual design establishes and clarifies the design scope of work of the project based on a previous plan or study. In essence, the conceptual design of the project is the beginning layout of what is planned. Taking existing planning information and updating the information as needed, the Design Engineer will prepare and submit a conceptual design for review. For instance, this may include proposed routings (overlaid on land status mapping), building plan views or basic site plans. Also, the conceptual design would include some of the following elements, if applicable:

- ✓ Identify basic project design criteria (environmental, water usage, population)
- ✓ Identify processes that will be incorporated in the project design
- ✓ Define the primary function of each process
- ✓ Prepare the first draft of the water and sewer system schematic
- ✓ Identify the required agencies approvals and permits
- ✓ Define project budget and schedule and any unusual project constraints such as community/operator capacity, etc.
- ✓ Prepare a conceptual construction cost estimate to verify that sufficient funding is available for the proposed scope of work.
- ✓ Incorporate pertinent information solicited during the design kick-off meeting.

2.3 Conduct Conceptual Design Meeting

A conceptual design meeting with the Design Engineer and Design Review Team will be coordinated by the VSW Project Manager to discuss an overview of the project and discuss any unique issues or project requirements including funding limits/restrictions. The purpose of this meeting is to gain consensus on the scope of the project and identify any major technical issues affecting the design scope, where more alternative analysis is needed before deciding on a type of component(s) of the system or facility that will be designed. The design schedule in the contract with the Design Engineer and an updated construction cost estimate will be discussed and revised, if needed.

Information that should be available for review at the conceptual design meeting will include the following:

- ☑ Aerial photographs of the community
- ☑ Detailed scope of work
- ☑ Photographs of existing structures, proposed building sites, community equipment, material borrow sites and other pertinent site conditions.
- ☑ Copies of record drawings of past projects as applicable
- ☑ Copy of feasibility study and/or sanitation master plan for the project

In some cases where the design requirements are not complex, the Design Review Team can determine if 35% drawings are needed for review. Subject to the conceptual design results, the Design Review Team may request to skip the preparation and review of Phase III documents and instead, direct the Design Engineer to prepare and submit the final designs of Phase IV.

2.4 Technical Memorandums and Review Meetings (as required)

As a result of the conceptual design and subsequent conceptual design meeting, major technical issues affecting the design scope and approach may be identified and they would need to be resolved prior to Phase III. Examples include but are not limited to:

- ☑ Site Control & Access
- ☑ Water Source
- ☑ Thermal Analysis
- ☑ Water Treatment Process
- ☑ Facility Siting
- ☑ Above Ground Versus Buried Piping
- ☑ Water and Sewer System Routing
- ☑ Geotechnical
- ☑ Permitting and Plan Approval (including environmental review)

Separate technical memorandums would address each technical issue. These memorandums would be incorporated into the design scope of Phase III.

2.5 Prepare Conceptual Design Review Memorandum (Review Gate 2)

The VSW Project Manager and the Design Engineer will prepare a Conceptual Design Review Memorandum (DRM) that will clearly define the project scope based on the results of 2.1, 2.2, 2.3, and 2.4. The project scope must be developed in a concise format that will ensure consistency with the intent of the funding source(s) and which is achievable within the project budget. Comments received and issues discussed during the meetings shall be summarized and documented in the DRM. All design reviews must be formally documented in the DRM for the record with the comment/response sheet as an attachment.

At Review Gate 2, the Conceptual DRM will be submitted to the VSW Lead Engineer and the "Gate Keeper" (VSW Program Manager or his/her designee) for review. Upon passing Review Gate 2, the Conceptual DRM will be saved to the electronic community folder project file, and a hard copy inserted in the Design Notebook.

Phase III – Design Analysis Report and 35% Design Drawings

3.1 Prepare Design Analysis Report (DAR)

The Design Engineer will be responsible for the preparation of the Design Analysis Report (DAR).

The DAR further develops the conceptual design of Phase II by analyzing and documenting the design approach, design requirements, and construction considerations. Specifically, the DAR addresses all applicable design elements such as site control, environmental impacts, water treatment process, well capacity, pumping and horsepower calculations, thermodynamic calculations, power requirements, hydraulic calculations, foundation design calculations, calculations of capital and operating costs, wastewater treatment loading calculations, and pipeline configuration and sizing.

However, the DAR does not evaluate alternatives of major importance to the design. If applicable, such alternative analyses are addressed and determined in Phase II. Examples include, but not limited to, evaluating floor plan alternatives, site plan options, and buried versus above ground piping options.

As a general guide for the preparation of the DAR, it is recommended the table of contents follow the outline *Example of Table of Contents for Design Analysis Report for Water and Sewer System Design* (Attachment 6**).** The table of contents will be modified as needed to fit the scope of work.

3.2 Review DAR

The VSW Project Engineer, with the concurrence of the VSW Lead Engineer, will select representative members from the Design Review Team to review the DAR. The DAR review team should include members who have appropriate disciplines and expertise related to the scope of the design analysis. The VSW Project Manager is responsible for coordinating the review process with the Design Engineer, and reaching a consensus on the acceptance of the DAR. The design criteria, alternatives considered, calculations, and code/regulation requirements and cost estimates must be documented and filed in the Design Notebook.

The VSW Project Manager will ensure that environmental review requirements and permits are identified in the DAR per the DAR Table of Contents (attachment 6). These requirements will be confirmed by the ADEC Facilities Environmental Review Person. The environmental review level, Categorical Exclusion or Environmental Assessment, will be identified by the end of this phase.

3.3 Prepare 35% Design Drawings

The 35% design package must include the appropriate drawing sheets listed in "*Basic Plan Set Requirements"* (Attachment 7). A 35% construction cost estimate will be prepared by the Cost Estimating Contractor to verify that sufficient funding is available for the proposed scope of work.

The Design Engineer shall prepare permit applications that do not require stamped plans. Some agencies, including the Alaska Department of Environmental Conservation (ADEC) and State Fire Marshall require stamped plans for review; pre-application meeting is

suggested with these agencies. The permit application package for these agencies must be completed when construction documents are final and stamped by the engineer.

3.4 Review 35% Design Drawings – Conduct Design Review Team Meeting 2

The VSW Project Manager will coordinate the 35% design drawings review meeting. Invitation and review material requirements will follow the procedures previously described in Section 2.3.

3.5 Prepare DAR and 35% Design Review Memorandum (Review Gate 3)

The VSW Project Manager will prepare a DAR and 35% Design Review Memorandum (DRM) that describes the results of the DAR and 35% design and serves as a decision document to proceed with the preparation of the production drawings (Phase IV) or terminate the project because the project is not sustainable. At Review Gate 3, the DAR and 35% DRM will be submitted to the VSW Lead Engineer and the "Gate Keeper" (VSW Program Manager or his/her designee) for review. Upon passing Review Gate 3, the DAR and 35% DRM will be saved to the electronic community folder project file, and a hard copy inserted in the Design Notebook.

Phase IV - Production Drawings

If the outcome of Phase III is to proceed with design, the next and final phase is the Phase IV - Production Drawings. This phase produces final design drawings based on the completed DAR and 35% design drawings of Phase III. The 65%, 95%, and 100% design documents are completed during this phase. Prior to commencing with this phase of the work, the VSW Project Manager must ensure that all design issues are resolved, and critical aspects of the design have been identified.

4.1 Prepare 65% Design Drawings (Preliminary)

At the 65% design stage, most of the main drawings (plan views, profiles, structure plans, and elevations) are substantially complete. Details and annotations are typically outlined. Site control work is substantially complete. Construction and materials specifications are provided in draft form on the plan sheets. The 65% design package must include the appropriate drawing sheets listed in "*Basic Plan Set Requirements"* (Attachment 7)**.**

The Design Engineer will prepare an O&M cost estimate based on the 65% design drawings and conduct a user rate analysis to determine if the user fees are within the recommended 5% of Median Household Income as defined by the Alaska Department of Community Advocacy.

4.2 Review 65% Design – Conduct Design Review Team Meeting 3

The 65% review is typically the most important review during the design process. The 65% design review will address unique project issues and focus the design review on operability, constructability and code review.

A cost estimator will prepare the 65% construction cost estimate for the proposed scope of work. The VSW Project Manager will check the construction budget to ensure funds are available to complete the proposed facility as designed.

The VSW Project Manager will coordinate the 65% design review meeting. Invitation and review material requirements will follow the procedures previously described in Section 2.3.

4.3 Present 65% Design to Community

The 65% plans should be presented to the community to allow an opportunity for review and comment. The VSW Project Manager is responsible for coordinating the community meeting. It is not required, but is recommended that the community approve the 65% plans via written concurrence. The VSW Project Manager is responsible for summarizing the meeting and generating a memorandum and/or trip report to the file to document meeting highlights. Comments received and issues discussed during the meeting will be summarized in the memo/report and distributed to each team member and the community.

4.4 Prepare Environmental Review Approval

Project Manager should ensure that Design Engineer provides environmental review documentation at this time. Project Manager should forward to the Facilities Environmental review person such documentation including record of public notice, checklists associated with the environment review, and other agencies corresponence. The Facilities Environmental Review person should have the necessary information to dialogue with SHPO at this time and, subject to that clearance, draft the environmental approval.

Permits that require stamped plans such as Fire Marshal review, or Drinking Water or Wastewater Plan Approval, should be clearly identified during this phase.

4.5 Prepare 65% Design Review Memorandum (Review Gate 4)

The VSW Project Manager and the Design Engineer will prepare a 65% Design Review Memorandum (DRM) that describes the 65% design and includes the memo/trip report on the community meeting and capital and O&M cost estimates and the results of the design reviews. At this fourth review gate, the 65% DRM will be reviewed and documented as complete for proceeding to the preparation of the 95% design drawings.

4.6 Prepare 95% Design Drawings (Issue for Agency Review)

At 95%, all main drawings, details, and specifications are complete. The 95% design package must include the appropriate drawing sheets listed in "*Basic Plan Set Requirements*" (Attachment 7). The last 5% of the design drawing development should be reserved for

correcting errors and ensuring that all references in the plan set and specifications documents are coordinated and correct.

As a rule, the 95% design plans are submitted by the Design Engineer to the appropriate ADEC regulatory program for review and issuance of a certificate to construct.

A 95% construction cost estimate will be prepared to verify that sufficient funding is available for the proposed scope of work and will include a construction schedule and a capital and O&M cost estimates.

4.7 Review 95% Design Drawings – Conduct Design Review Team Meeting 4

The VSW Project Manager will coordinate the 95% design review meeting. Invitation and review material requirements will follow the procedures previously described in Section 2.3. This review is mainly for quality control to check correction of errors and references. The review will include an operability, constructability and code review.

4.8 Prepare 95% Design Review Memorandum (Review Gate 5)

The VSW Project Manager and the Design Engineer will prepare a 95% Design Review Memorandum (DRM) that describes the 95% design and includes the results of the design reviews, construction schedule and cost estimates. At this fifth review gate, the 95% DRM will be reviewed and documented as complete for proceeding to preparation of 100% final drawings.

4.9 Complete 100% Final Drawings (Issue For Construction)

The Design Engineer Manager will prepare the 100% final construction plans and documents. The 100% design package must include the appropriate drawing sheets listed in "*Basic Plan Set Requirements"* (Attachment 7). Comments received from the 95% review will be addressed in detail, and all land rights required for site control must have been acquired.

A 100% construction cost estimate will be prepared by the Design Engineer to verify that sufficient funding is available for the proposed scope of work and a review of the schedule will be made. Also, the Design Engineer will provide an O&M cost estimate based on the Issue for Construction drawings, which will be used to update the business plan for the project.

Construction plans will be sealed by each design discipline. All seals will be signed and dated by the respective registrant before the plans are submitted for construction.

The Environmental Review and public notice process must be completed at this stage. All regulatory permits must be obtained and all site control issues must be resolved before construction can proceed. The Design Engineer shall provide a written notice of receipt for all permits to the VSW Project Engineer.

The Design Engineer will coordinate with the ADEC regulatory program on the design submittal and review in accordance with department policy. The ADEC regulatory program will review and approve design submittals for completeness and compliance with ADEC drinking water (18 AAC 80) and wastewater (18 AAC 72) regulations.

The Design Engineer will be responsible for engineering review and receiving approval (certificates) to construct before construction can begin on the project. A minimum of 30 days for ADEC to review the plans and provide comments should be allowed.

In most cases, plan modifications that are required by ADEC can be accommodated through field direction and recorded. Changes to engineering plans for construction purposes will be made using the revision block on the approved plans and annotated and clouded per industry standards.

List of Attachments

- **Attachment 1:** *VSW Design Review Flowchart*
- **Attachment 2:** *Design Phases and Tasks Checklists/Schedule*
- **Attachment 3:** *Project Design Notebook Requirements*
- **Attachment 4:** *Example of Table of Contents for Design Execution Plan*
- **Attachment 5:** *VSW Design Review Comments and Responses Form*
- **Attachment 6:** *Example of Table of Contents for Design Analysis Report*
- **Attachment 7:** *Basic Plan Set Requirements*
- **Attachment 8:** Sanitation Facilities Master Plan – Table of Contents

Proposed Table of Contents (TOC)

Design Analysis Report
Water/Wastewater Facilities
_____, Alaska

This TOC is general and comprehensive. Use this outline in creating a TOC that is applicable for the planned improvements.

1. **Executive Summary**
2. **Introduction**
3. **Background**
   - **3.1. Location**
   - **3.2. Existing Site Conditions**
     - **3.2.1. Existing Facilities**
     - **3.2.2. Land Status**
4. **Water Source**
5. **Site Plan**
6. **Design Requirements and Considerations**
   - **6.1. Building**
     - **6.1.1. Site Civil and Foundation**
       - **6.1.1.1. Soil Conditions**
       - **6.1.1.2. Select Fill Material and Source**
       - **6.1.1.3. Site Grade**
       - **6.1.1.4. Foundation Type**
     - **6.1.2. Architectural**
       - **6.1.2.1. Building Form**
       - **6.1.2.2. Exterior and Interior Materials**
       - **6.1.2.3. Thermal Envelope (Wall and Roof Systems)**
     - **6.1.3. Structural**
       - **6.1.3.1. Design Criteria**
       - **6.1.3.2. Footings and Structural Members**
     - **6.1.4. Mechanical**
       - **6.1.4.1. Design Criteria**
       - **6.1.4.2. Mechanical Systems and Equipment**
     - **6.1.5. Electrical**
       - **6.1.5.1. Electric Utility's Current Capacity and Conditions**
       - **6.1.5.2. Added Electrical Load**
       - **6.1.5.3. Electrical Service and Equipment**
   - **6.2. Water Storage**
     - **6.2.1. Design Criteria**
     - **6.2.2. Tank Size**
     - **6.2.3. Foundation**
   - **6.3. Water Treatment**
     - **6.3.1. Well Water Quality**

6.3.2. Design Criteria
6.3.3. Water Treatment System Upgrades
6.4. Wastewater Collection, Treatment and Disposal
6.4.1. Design Criteria
6.4.2. Lift Station and Lagoon Upgrades
6.5. Environmental Determination and Permits
7. Floor Plan
7.1.1. Building Components
7.1.2. Construction Cost Estimate
8. Cost Summaries
8.1.1. Capital
8.1.2. Operation and Maintenance
9. Recommendations

List of Tables

List of 35% Drawings (11” x 17”)

1. **Site Plan**
2. **Building Floor Plan and 2 Section Views**
3. **Building: Elevation Views, Finish Schedule, Door Schedule, & Typical Wall Section**
4. **Foundations: Plan and Section Views for Building and Water Storage Tank**
5. **Water Treatment Process Schematic**
6. **Water Storage Tank Plan and Elevation Views**
7. **Lagoon Plan and Section Views**
8. **Mechanical**
9. **Electrical**

Appendices

A. **Trip Reports**
B. **Well Log and Pump Test Results**
C. **Water Quality Analyses**
D. **Geotechnical Findings and Recommendations**
E. **Outline Specifications (using the appropriate CSI’s Divisions 2 through 16)**
F. **Laundry Equipment Data Sheets**
G. **Detailed Cost Estimates**

Basic Plan Set Requirements

DRAWING CATEGORY & CONTENT	35%	65%, 95% and Stamped
GENERAL		
Cover Sheet & Sheet Index	x	x
General Legend & Vicinity Map	x	x
Abbreviations & General Notes	x	x
Scope of Work & Community/Climate Data	x	x
Overall Site Plan with Topography	x	x
System Schematic(s)	x	x
Soil Boring Data	x	x
SURVEY		
Easement Index Map	x	x
Basis of Bearing Map		x
Parcel Boundary Map		x
CIVIL		
Design Criteria	x	x
Legend & Abbreviations	x	x
General Material & Installation Notes	x	x
Individual Site Plans	x	x
Plan & Profile Index Map	x	x
Plan & Profiles	x	x
Standard Details	x	x
Project Specific Details		x
Grading Plan		x
Fencing Plan		x
PROCESS		
Design Criteria	x	x
Legend & Abbreviations	x	x
Piping Floor Plans	x	x
Piping & Instrumentation Diagram	x	x
Operation Description	x	x
General Material & Installation Notes	x	x
Standard Details	x	x
Equipment Schedule & Specifications		x
Equipment Floor Plans		x
Project Specific Details		x
MECHANICAL		
Design Criteria	x	x
Legend & Abbreviations	x	x
Equipment Floor Plan	x	x
Piping & Instrumentation Diagram		x
Operation Description		x

General Material & Installation Notes		x
Equipment Schedule & Specifications		x
Piping Floor Plans		x
Standard Details		x
Project Specific Details		x
ARCHITECTURAL		
Design Criteria	x	x
Legend & Abbreviations	x	x
Code Analysis	x	x
Floor Plans	x	x
General Material & Installation Notes	x	x
Elevations	x	x
Equipment Schedule & Specifications		x
Sections		x
Standard Details		x
Project Specific Details		x
STRUCTURAL		
Design Criteria & Loads	x	x
Legend & Abbreviations	x	x
Code Analysis	x	x
Foundation Plan	x	x
General Material & Installation Notes	x	x
Equipment Schedule & Specifications		x
Elevations		x
Sections		x
Standard Details		x
Project Specific Details		x
ELECTRICAL		
Design Criteria & Loads		x
Legend & Abbreviations	x	x
Code Analysis	x	x
Operation Description		x
General Material & Installation Notes	x	x
Power One Line & Panel List	x	x
Equipment Schedule & Specifications		x
Floor Plans		x
Elevations		x
Sections		x
Panel Faces		x
Panel Wiring Diagrams		x
Standard Details		x
Project Specific Details		x

GENERAL REQUIREMENTS FOR PLAN SHEETS

A typical set of drawings will contain many of the following sheets in the order in which they appear in the list.. The type of sheets contained in the plan set will vary depending on the scope of work for the project and the complexity of the proposed facility.

- Cover Sheet and Sheet Index
- General (G Sheets)
- Survey (V Sheets)
- Geotechnical (B Sheets)
- Civil (C Sheets)
- Structural (S Sheets)
- Architectural (A Sheets)
- Plumbing (P Sheets)
- Process (D Sheets)
- Mechanical (M Sheets)
- Electrical (E Sheets)
- Contractor/Shop Drawings (Z Sheets)

The following provides a detailed overview of the type of information that is normally included on drawings in the plan set:

I. Cover Sheet and Sheet Index

VSW's standard cover sheet will be used for all VSW projects.

II. General Legend and Vicinity Map (G Sheet)

VSW's standard General Legend and Vicinity Map format will be used for all VSW projects.

III. Scope of Work and Community/Climate Data (G Sheet)

The project scope of work, community data, climate data and project phasing plan is provided on this sheet.

IV. System Schematic and Project Specific Design Criteria (G Sheet)

Separate Schematic Sheets should be drawn for water and sewerage systems. The Schematic Sheet will serve as a line diagram of the overall systems. The schematic sheets should include the following:

A. Water

1. General perspective view of the entire water system with major features

2. Storage tanks with base and overflow elevations and capacities
3. Major points of use
4. Major elevation references
5. Operational pressures during both minimum and maximum flows

B. Well Data

1. Pump House/Washeteria location and note the source of power
2. Date of construction, contractor, well number, and surface elevation
3. Depth and size of bore hole
4. Static water level and the date of measurement

C. Sewerage

1. General

a. General perspective view of the entire sewerage system designating direction of flow, major features, and force-mains
b. Lagoon(s) with the number of cells, capacities of each cell, dimensions, floor elevations, overflow elevations, if applicable
c. Community septic tanks with number of chambers, capacities of each chamber, dimensions, and inlet/outlet elevations, if applicable
d. Community drainfield information with areas, materials, soil type, percolation rate, and elevations, if applicable
e. Outfall lengths, materials, elevations, and diffuser type, if applicable
f. Major points of use
g. Major elevation references
h. All manholes
i. All lift stations

2. Lift Stations

a. Type of lift station
b. Make, model, horsepower, voltage, phasing and capacity of pump(s)
c. Static, dynamic, and total discharge heads

V. Survey (V Sheets)

A. Survey Easement Index Map
B. Basis of Bearing and Vertical Control Map (including coordinates of monuments used)
C. Parcel Boundary Map
D. Project Right-of-Ways and Easements

VI. Geotechnical (B Sheets)

A. Site plan with test hole locations and legend
B. Test boring/hole logs with reference to boring/hole locations

VII. Civil Drawings (C Sheets)

A. Civil/Survey Legend
B. Civil General Material and Installation Notes
C. Civil System Layout and Sheet Locator Map(s)

The System Layout Sheet(s) will be a plan view of the water and/or sewer system(s) showing all (or a large portion) of the system on one sheet. For larger systems, the scale should be between 1" = 400' and 1" = 1,000', depending on the density of services provided. For smaller systems, the scale should be as needed in order to show sufficient detail on one sheet. If the system cannot be put on one sheet, an index sheet should be provided that shows the waterline locations (without valves), major features such as roads, rivers, etc. and a reference to the areas covered by each layout sheet. The system layout and sheet locator map will provide the following:

1. Highways, roads, streets, major drainage features, and major buildings. Aerial photographs can be used as a map base if the overlays are readable.
2. Sketch of the community sewer system(s) and wastewater treatment system location(s)
3. Reference areas designating which plan or plan and profile view sheet numbers apply to specific areas of the system
4. House numbers and names of homeowners in tabular form
5. Dwelling locations, with house numbers
6. Identity and approximate location of existing subsurface utilities
7. Main line gate valves (without markers and/or tie-ins)
8. North arrow and bar scale
9. Dimensional data for pipeline material used. (Example: ID., O.D., SDR, ASTM specification and pressure rating designation for each size of pipe used.) Pipeline distances between gate valves and appurtenances can be shown if desired but is not mandatory.
10. Topography existing & proposed contours. Proposed grade contours are shown on final stamped construction plans

D. Civil Plan and Profile Views

1. <u>General</u>

a. North arrow with drawings oriented so that the north arrow is pointing more toward the top of the sheet than the bottom
b. A bar scale
c. Individual homes to be served and corresponding house numbers.

d. Adequate information (coordinates, distance to property lines, etc.) to stake the designed improvements in the field
e. Profile views are generally “left to right” but in certain instances to require them to go “right to left”.

2. Water

a. Fire hydrants
- Distance to the mainline and shut-off valve from the hydrant
- Size of the hydrant

b. Gate Valves, Air Release Valves, and Pressure Reducing Valves (PRV)
- Location of each valve with respect to at least two permanent points (i.e., buildings, hydrants, power poles, etc.) within 100 feet, if available
- Size of the valves
- Approximate depths of bury
- Size of PRV valve(s) including incoming and outgoing pressures, and ground elevations

c. Water main
- Proposed marker post locations on the plans, when appropriate. markers should be located at line of sight intervals or 1,500 feet apart (maximum)
- Nominal pipe size, material, type of joints, class, pressure rating, etc. (Example: 6”X 12” Aluminum Jacketed Arctic Pipe, HDPE, SDR 11, 160 psi, butt fused joints)
- Description and location of tees, elbows, crosses, bends, and reducers
- Profiles for 1) all road crossings, 2) any wash crossing which requires casing, 3) steep sections of water line where the slope exceeds 10%, 4) any area where the waterline is not at standard bury depth and 5) flow lines of deep ditch lines or drainages

d. Water Services
- Routing of service line with "dots" designating location of curb stop, meter, and corporation or domestic stop as applicable
- Use appropriate symbol from the “tool palette” and assign line type to the W/S layer

3. Sewer

a. Manholes and Cleanouts
- Ground, rim and invert (in and out) elevations
- Distances between manholes and/or cleanouts
- Number & type of each manhole and cleanout.

b. Sewer main

- Materials, type of joints, size, length, SDR, class, schedule, slope, etc.

c. Sewer Services

- Service/main connection location distances from a downstream manhole or stationing
- Routing of the sewer service line, indicating the cleanouts with "dots" use symbol from tool palette

d. Lift Stations

- Site map information similar to that of a well site
- Elevation and plan view with pump type, make, capacity, total discharge head (show both static and dynamic heads), voltage, phase, and horse power

e. Force mains

- Proposed pipeline marker locations on the plans (when appropriate)
- Nominal pipe size, material, type of joints, class, pressure rating, etc. (Example: 6" DI, Class 51, 350 psi, integral bell)
- Description and location of elbows, valves, reducers, and cleanouts
- Profiles for all road crossings, any wash crossing which requires casing, steep sections of force main where the slope exceeds 10% or any area where the force main is not at standard bury depth

E. Civil Site Plan and Elevation Views

1. Water Source

a. Site plan of the well and/or pump house/washeteria, proposed grading plan, drainage, access and power source
b. Date of construction, contractor, well number, and surface elevation
c. Depth and size of bore hole
e. Size, depth, type, and location of casing
f. Length, location, type, and slot size of screen, if applicable
g. Gradation of gravel pack, if applicable
h. Depth of grout envelope
i. Static water level and date of measurement
j. Make, model, horsepower, voltage, phasing, full load amperage of pump(s), and elevation of the pump probes. Actual or estimated pumping depth for the planned pumping rate.
k. Depth of setting of the water level indicator and type

l. Type and size of drop pipe and size of submersible cable
m. Type, size, etc., of a pitless unit, if applicable

2. Water Storage Tank

a. Size of the tank including the thickness of the floor, wall, and roof members
b. Tank manufacturer
c. Paint system and paint/primer brands used on the tank.
d. Map of operational valves, fencing, surface drainage plan, and maintenance access
e. Telemetry or controls if applicable
f. Elevations of floor, inlet, outlet, overflow, and probes, if used
g. Details of complex features such as controls, cathodic protection, if applicable
h. Details of the foundation
i. Overflow and drain locations and erosion protection

3. Pump House/Washeteria/Water Treatment Facility/Lift Station

a. Building footing drain and discharge location
b. Finish floor elevations
c. Site plan of the building site, road access with curve radius, buried utilities, surface drainage, ditching, fencing, danger trees/site clearing, etc.
d. Elevation view with classified fill, excavation limits, compaction, etc.

4. Wastewater Treatment System

a. Site plan showing drainage and horizontal dimensions
b. Side slopes, wave protection detail
c. Number of cells, surface area per cell, maximum liquid volume per cell, and depth of cells
d. Piping sizes and materials
e. Fence and gate location and sign detail
f. Location and lengths of inlet and outlet structures
g. Locations of liquid level control structures, over-flow lines and surface drainage ditches, and sewage flow routing
h. Elevations of top of berm, lagoon floor, overflow structure, and inlet(s)

5. Individual Site Plans

a. Site plan, drawn to visual scale, for each structure served including homeowner name, house number, if appropriate, and a north arrow.
b. Water Service
   • Service saddle location
   • Size, length, and type of service line materials used

- Appurtenances (curb stop, meter can, and domestic stop) tied to dwelling corners if within 100 feet

c. Sewer Service
- Cleanout locations
- Size, length, and type of pipe used

d. Septic tank and drainfield
- Size of the septic tank and the material it is made of
- Tie to the septic tank inspection manhole(s) and the corners of the drainfield to at least two permanent points (i.e., building corners, power poles, trees, etc.) within 100 feet, if available
- Configuration and depth of the drainfield, and the type of materials used (e.g., 4-inch D3034 PVC, slip-on joint)

VIII. Structural Drawings (S Sheets)

A. Structural Legend, Design Criteria and General Notes
B. Structural Plan Views
1. Foundation plan
2. Floor framing plan
3. Roof framing plan
4. Diaphragm schedule

C. Structural Elevations and Sections
1. Foundation sections
2. Wall sections
3. Shear wall schedule
4. Header elevations and schedule

D. Structural Details
1. Splice details
2. Wall intersections
3. Miscellaneous connections
4. Bracket details
5. Fastener details
6 Anchor details
7. Tie down details

IX. Architectural Drawings (A Sheets)

A. Architectural Legend and General Notes
1. Architectural Plan Views All building and room dimensions
2. Room name and numbering
3. Interior finish schedule
4. Exterior finish schedule
5. Wall Types
6. Door schedule
7. Window schedule
8. Roof plan

9. Code design data

B. Architectural Elevations and Sections

1. Front, rear, left side and right side views
2. Wall sections
3. Foundation sections
4. Bathroom/Laboratory/Treatment room/etc. elevations
5. Cabinet elevations

C. Architectural Details

1. Headers (internal and external)
2. Sills (internal and external)
3. Jams (internal and external)
4. Door frame schedule
5. Handrails and guard rails
6. Cabinet details
7. Stair and landing details
8. Ridge detail
9. Eave detail
10. Rake detail
11. Valley detail
12. Vent detail
13. Vapor barriers
14. Window seal
15. Insulation
16. Access hatch

X. Plumbing Drawings (P Sheets)

A. Plumbing Legend and General Notes
B. Plumbing Equipment Schedule
C. Plumbing Plan Views
D. Plumbing Elevation Views and Sections

1. Plumbing Isometrics

E. Plumbing Details

1. Equipment details
2. Equipment mounting
3. Equipment locations
4. Piping installation
5. Piping supports

XI. Process Drawings (D Sheets)

A. Process Diagram Legend
B. Treatment Process Diagram and Operational Narrative
C. Treatment Piping and Instrumentation Diagram
D. Heating and Ventilation Process Diagram and Operational Narrative
E. Heating and Ventilation Piping and Instrumentation Diagram

XII. Mechanical Drawings (M Sheets)

A. Mechanical Legend and General Notes
B. Mechanical Equipment Schedule and Operational Description
C. Mechanical Plan Views
   1. Piping plan
   2. Heating plan
   3. Ventilation plan
D. Mechanical Elevation Views and Sections
   1. Piping Isometrics
   2. Equipment elevations and sections
E. Mechanical Details
   1. Equipment details
   2. Equipment mounting
   3. Equipment locations
   4. Piping installation
   5. Piping supports
   6. Equipment control interface
   7. Fuel oil
   8. Ducting

XIII. Electrical Systems (E Sheets)

A. Electrical Legend, Design Criteria and Loads
B. Electrical Code Analysis and Operation Description
C. Electrical Equipment Schedule
D. Electrical Power One Line and Panel List
E. Electrical Plan View
   1. Exterior electrical site plan
   2. Power floor plan
   3. Electrical control device plan
   4. Electrical equipment plan
   5. Electrical signal plan
F. Electrical Elevation Views
   1. Electrical panel layout
   2. Electrical panel wiring diagram
   3. Panel schedule
   4. Ladder diagram for all control panels
G. Electrical Details
   1. Panel Faces

XIV. Contractor/Shop Drawings (Z Sheets)

A. Drawings of water storage tank construction, premanufactured buildings, foundation design, filter construction, or other fabricated equipment
B. Vendor cut sheets such as pumps, wall mounted instruments or other equipment