Tasks List

Task 1: Research and Preparation

To conform to all state and county codes, all applied regulations must be determined. It will be followed by research into technological options to meet the client's needs and is up to code.

Task 1.1: City and State Regulations

To conform to local codes and regulations, all such standards will require research. The agencies involved include Yavapai County, Arizona Department of Environmental Quality, the City of Dewey-Humbolt, and the State of Arizona. All of these should include their regulations on the construction and operation of such septic systems.

Task 1.1.1: ADEQ, Yavapai, Dewey-Humboldt Construction Regulations

Task 1.1.2: Operation Regulation

Task 1.2: Alternative Septic System Research

As the last step for the preparation phase, many options for technology to achieve the client's goal of a septic system with irrigation. While code research may not allow certain methods, a variety of technologies will be investigated. It is better to have this done early instead of during the design phase since certain technologies may require soil qualities that will be investigated in the following steps.

Task 2: Site Investigation

The site investigation is the first task performed after the research and preparation. The first site investigation will be performed and just a visual investigation. On the final site investigation with three subtasks that will be performed next fall over 3 days to gain the technical data below.

Task 2.1: Site visit

To perform a site visit a NAU (Northern Arizona University) fleet vehicle will be rented to drive down to Dewey-Humboldt. Once we arrive at the site we will get out and do a visual inspection of the site.

Task 2.2: On-Site Soil Characterization test

To perform the soil characterization test using the ASTM (American Society of Testing and Materials) D5921-96e1, ABCC Projects members would normally dig a hole that is at least 4 feet deep, then look at the soil layers and determine the soil types.

Task 3: Data Analysis

The data analysis will be broken down into two tasks: finding the topographical map and completing and analyzing the results of the soil composition test. These calculations will allow all design scenarios to work with similar data and be designed under the same conditions, as well as consider how individual technologies might react with the soil.

Task 3.1: Topographical Map

A topographical map will be made using online sources and imported into AutoCAD for further use in design scenarios.

Task 3.2: Soil Composition Test

Analysis of the soil will be done using ASTM D5921-96e1 to determine the soil characterization [5] of soil using the discovery hole method. This will show what the major composition of the soil is and will lay the path for more intricate math involving technologies. This will be supplemented with other online sources that show soil composition for areas around the United States, including the USDA's Web Soil Survey.

Task 4: Design Solutions

This step will be the bulk of the project by brainstorming and designing proposed solutions. This task will include design alternatives, a decision matrix, and will lead to a final design recommendation. Since it will include a large amount of AutoCAD/Civil3D work, involve math from earlier data analysis, and involve several design technological options, this step will involve a great deal of time.

Task 4.1: Design Alternatives

This task will take the research performed in task 1.1 and data from Task 3 to create different alternative septic system designs in compliance with Yavapai country standards and ADEQ. It will be most of the work designing the system, and work will be split amongst members by technology to maximize time efficiency. Finally, plans and design alternatives will be discussed amongst all members to ensure accuracy and redundancy.

Task 4.1.1: Final Site Location

This will be determined using the topographic map created in Task 3.1 and using the data collected from the onsite perc test in Task 2.3. For overall simplicity and efficiency, one final leach field and septic tank site will be chosen, and all following design alternatives will use the same chosen sites.

Task 4.1.2: Separate Design Configurations

Each member of the team will both individually and together create ideas for an alternative septic system design that allows for irrigation. To assist in maximizing time issues, each member will work individually on separate technology options, and once

most stages of design are complete, the group will convene to assure accuracy and redundancy, and thus reduce errors. This will require a large amount of AutoCAD/Civil3D work and should result in several final files of finished or mostly finished design plans.

Task 4.2: Design Decision Matrix

In this task each design will be rated using a weighted point system. The system will incorporate several factors such as budget, water quality, ease of operation, and system reliability weighted for importance. The final design with the most points that also completes all criteria and constraints for the project will be chosen for final design.

Task 4.3: Final Design Recommendation

This final recommendation will solve all the problems, constraints, and criteria, as well as all client needs for the system. It will have graded the highest on the Design Decision Matrix and will have general agreement from members of ABCC Projects individual judgement. If the final design file is not entirely completed by this point due to time constraints, it will be fully completed in this step.

Task 5: Impact Analysis

This task will be an analysis of the economic, social, and environmental impacts of the installation of the septic system. The economic impacts might include the cost of running the system, social impacts would include the requirements of running the system, and the environmental impact of the system on the environment.

Task 6: Installation and Operation

Due to the nature of a Septic System, it will be operated by non-professionals on site, in this case the residents of the site. To ensure the system is installed properly, plan sets for the final recommended design will be created so that any construction or installation group can do the installation. To ensure the system is used properly, an Owners and Operators Manual will be created.

Task 6.1: Installation Plan set

Once the Final Design Recommendation is completed, the AutoCAD/Civil3D files used to make it will be turned into a plan set that will outline installation of the system. This plan-set should be readable by any agency that applies to install the system and should be easy to follow.

Task 6.2: Owners and Operators Manual

Since this septic system will be owned and operated by the residents of the site, a guide will be created for the operators so that the system can be run properly. The guide will include actions that should not be taken to prolong the life of the system and avoid

Task 7: Project Management

Project management is an important, recurring step that will occur for the duration of the entire project. It will include planning meetings, keeping a schedule, ensuring progress, and marking down use of time and physical resources used throughout the project. Keeping records of all these items is important for final reporting as well as concurrent progress planning.

Task 7.1: Meeting Minutes

Meetings will occur with the client, with the teaching advisor, and with the grading instructor throughout the course of the project. There should be at least one client meeting, four TA (Teaching Assistant) meetings, and as many GI meetings as there are submittals, if not more than that as needed. All meetings will be prefaced with an agenda of tasks and points for the meeting and recorded within a meetings binder.

Task 7.2: Schedule Management

Schedule management will include following the created schedule and Gantt chart and ensuring that it is completed at the timepoints marked down. Schedule management will also include modifying the schedule as needed to consider time changes, setbacks, or excess progress. It will also keep track of the total hours that ABCC Projects team members spend on this project.

Task 7.3: Resource Management

Keeping track of physical resources will be an important part of managing the project. This task is typically intertwined with schedule management as ABCC Projects members' time is considered a valuable resource as well. Once design plans are made and Task 4 is completed, if not at least in its final stages, the cost of physical resources and materials to design the system will be considered at this stage. Additionally, any physical resources required for completion of the project, from access to technology to physical paper use will be catalogued as well.

Task 8: Deliverables

To ensure that the project is progressing in a timely manner, a series of tasks have been created to gauge the completion of the project at several stages. Each of the percentage submittals requires a report and presentation of progress achieved so far, and several milestones have been set up to align with those goals.

Task 8.1: 30% Submittal

For this submittal, the goals to be achieved include having completed the research and preparation process, have visited, surveyed, and sampled the site, and completed all

applicable laboratory tests required to understand the soil composition of the site. With these completed, all the required data is now collected so that the design process can begin.

Task 8.1.1: Milestone: Tasks 1-3

Task 8.1.2: 30% Report and Presentation

Task 8.2: 60% Submittal

For this submittal, while the milestone achieved is much lower, having only completed a single main task, it is the largest of tasks that require doing. Task 4 will be concerned with the design of all alternatives for this setup. Since there are many ways of designing the system that include an irrigation setup, there will be several alternatives that take a great deal of time to make. After all of them are created, a design matrix and final recommendation are the major outputs of this Task.

Task 8.2.1: Milestone: Task 4

Task 8.2.2: 60% Report and Presentation

Task 8.3: 90% Submittal

For this submittal, most of the work for this project is complete by this point. The final parts of analyzing the impact of the system of economic, social, and environmental scales will be done, as well as the creation of final plan sets for installations and an Owners and Operators Manual. These final pieces are required for the Septic System to be installed and used properly.

Task 8.3.1: Milestone: Tasks 5-7

Task 8.3.2: 90% Report and Presentation

Task 8.4: Final Submittal

To bring this project to completion, a final submittal, including a final report, website, and presentation of the project is required. At this stage, all the design work is done, and the project has all prior tasks completed. This last step includes taking all the work that has occurred and organizing it into a final presentable form.

Task 8.4.1: Final Report

A final report will be made to give a more detailed view of the process it took to complete the project. Much like the final presentation, the entire project will be outlined in this report. However, unlike the presentation, the report will be written for an entirely technical audience. It will include many details about the project, as well as math, methodology, and figures of detail.

Task 8.4.2: Website

To catalog the process, parts, and members of this project, a website will be created. The website will be worked on throughout the entire project, adding to it as items reach completion. It will act as a permanent way to store and view project details, for both personal portfolio and future reflection.

Task 8.4.3: Presentation

This final presentation will give an overview of the entire process that occurred for this project to come to completion. A general overview with enough detail to be presented to engineers and consulting groups, but simple enough that the client is capable of understanding. All members of ABCC Projects will participate in this presentation.

Exclusions

The following items will not be performed over the extent of this project. They are tasks that are unnecessary within the extents of designing a Septic System and/or deemed unnecessary by authoritative counsel.

Hydrologic Analysis

A hydrologic analysis is unneeded for two reasons. The first is that the water table below Sedona is deep enough that under EPA Septic System Design there should be no immediate issues. This will be explored and proven within Task 5.3: Environmental Impacts. Second, under Yavapai County, the design criteria for Septic Systems only requires planning around existing structures such as wells, and not distance to the water table.

Water Utilities Planning

Water utilities planning is unnecessary as it is outside of the scope of this project, and because the planned residence will be fed via water storage instead of local municipal water.

System failure environmental impact

While a system failure impact statement and guide could be useful to the owners of the system, it is more plausible to include actions to prevent system failure and steps to take in case of a system failure within the Owners and Operators Guide. Additionally, many such failures require the consultation of a local septic system maintenance agency to properly fix any issues within the system, the impact of which will be analyzed by said agency.

Installation

Instillation is not a part of our project. ABCC has signed a contract for design.