

**Cinnamon Creek Campground Power Supply Study
Project ID: CEEEn_2016CPST_011**

by

**J.A.M. Engineers
Sarva Pulla (Project Manager)
Alex Barrow (Task Lead)
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A Capstone project submitted to

**Roy McDaniel
The Church of Jesus Christ of Latter Day Saints**

**Department of Civil and Environmental Engineering
Brigham Young University**

November 14, 2016

Introduction

PROJECT TITLE: Solar Generator Feasibility Study
PROJECT ID: CEEEn-2016CPST-011
PROJECT SPONSOR: The Church of Jesus Christ of Latter Day Saints
TEAM NAME: J.A.M. Engineers

The Church of Jesus Christ of Latter-day Saints, the sponsor for this project, is a prominent international religious organization. The Church holds business interests and assets to serve the needs of its members and the community alike. The Cinnamon Creek Campground is one such asset that the church built for providing a safe environment for wholesome outdoor activities for church groups and families. The Church's natural resources department located in Salt Lake City is responsible for maintaining, managing and operating this campground.

The Cinnamon Creek Campground is located near Avon, UT. The Camp consists of nine separate camps with multiple camp sites spread out over approximately 2 miles along a stream which accommodates up to 1,100 campers. The camp has additional amenities such as RV parking, toilets, sinks, hot-showers, amphitheaters. However, the camp does not have any electricity or sufficient lighting at night for the patrons. The purpose of this project is to perform a feasibility study for installing a Solar Generator and/or a Hydro-Electric Generator. This electricity would be used to provide lighting throughout the pavilions in the campgrounds.

Proposed Work Plan

The purpose of this project is to create a design and a feasibility report to highlight the feasibility of Solar Generator and/or Hydro-electric generator for the Cinnamon Creek Campground. The client will then determine their future course of action based on this report.

- Design includes a report on the number, type, shape and size of the solar panels that will be needed for the campground. It should also evaluate the type, size and effectiveness of using a Hydro-Electric generator on one of the two springs in the camp site or by the collection tank. The final design template should include the respective drawings and calculations.
- Feasibility report will provide a summary of the financial implications of each design criteria. It should also provide the minimum requirements for making each design have a sustainable life span.
- The following is a list of major tasks that need to be completed as part of this study:
 - Determine the ideal location for solar panels
 - Determine the ideal location for setting up a hydroelectric generator

- Determine the ideal flow conditions for setting up a small hydroelectric generator
 - Provide a summary of the financial implications of each design
 - Provide structural, mechanical and schematic diagrams of the solar/hydro equipment and their relevant location on the campgrounds.
- The following is a list of Project Milestones and Expectations:
- Preliminary Site Visit: October 29, 2016
 - Proposal Approval: December 6, 2016
 - Solar Generator Design: January 2, 2017
 - Hydro Electric Design: February 6, 2017
 - Feasibility Report comparing Solar and/or Hydro: March 6, 2017
 - Final Report, Presentation and Poster: April 10, 2017
- The Sponsor has provided the following resources (More resources can be provided as needed):
- Cinnamon Creek Water System Plan
 - Vicinity Map
 - Water System CAD Drawings
 - Hydraulic Grade Profile
 - Redevelopment Plan
 - Tank, Collection Box details

Schedule

Weekly Schedule:

Status Meetings - Wednesdays 3-4pm.
Group Work Meetings - Fridays 3-5pm

Site Visit: Jan. 6, 2017
Site Revisit: Feb. 25, 2017

Project Timeline:

Jan. 6, 2017-Feb. 25, 2017: Primary research on resources available and requirements for facility to be completed.

Feb. 25, 2017-March 25, 2017: Drawings and Calculations completed for multiple proposals.

April 14, 2017: Deliver proposal and recommendations to client.

PROJECT TIMELINE

Each team member is expected to work an average of 6 hours per week on the project and any meetings with the client will be prioritized around their schedule and needs.

Task	Timeline
Meetings and coordination	October-April
Collect Data	January - March
Analysis	February - March
Preliminary report	February
Design	March
Final Report	April
Poster and presentation	April

Facilities, Tools, Data and Equipment

The feasibility report will be conducted using data found via internet for insolation maps and charts, and specifications on various solar arrays and storage options. A site visit will be conducted to determine structural conditions for solar arrays. Information regarding water flows and conditions for hydroelectric power will be acquired from client and site operators. Software, such as AutoCAD and excel, will be used to draw proposed plans and show calculations for the proposed plans.

Project Budget

The following sections describe project expenses and give estimates as to the cost that will be expended. These estimates should be considered budgetary, thus should be held to a certain tolerance of error.

Billable Hours

The study should occur over the course of fifteen weeks, beginning on January 6th. Each week there will be a minimum of 24 man hours expended. making for a total of 360 billable hours expected of normal project work. In addition to normal anticipated hours there will be a total of 48 man hours dedicated to site visits and meetings with the client. Man hours will be billed at a rate of \$35 per hour. Other than man hours logged by our team members, we plan to leverage expertise

by independent consultants contracted on an hourly rate. It is expected that 10 total hours of independent consulting is necessary, billed at a rate \$75 per hour.

Independent Consulting

The client should not be expected to dedicate significant time to this project except to satisfy their own desire to be involved. The client will be invited to weekly project meetings to understand progress but will not be expected to attend on a weekly basis.

Resources Leveraged

It is expected that the team will leverage specialty software already secured by the team. This software includes but is not limited to Autodesk and all programs included therein, GIS, HRun, CRun, Hydro modeling, Sunlight Modeling. The cost of this software will be applied to the project at a rate of \$10 per hour. It is expected that this software will be used during half of the normal project work billable hours, specifically a total of 180 hours over the course of the project.

Deliverables

- Deliverable specifications
 - A final feasibility report with design alternatives that include economic and environmental considerations
 - No longer than 15 pages
 - PDF Format
 - A poster summarizing the design
 - A presentation summarizing the feasibility report
- Minimum required deliverables
 - Short monthly status reports documenting challenges, solutions & progress
 - Answers to 4 questions
 - What challenges have your team encountered in your project?
 - What actions did your team decided to do to overcome these challenges?
 - Any progress in overcoming these challenges?
 - Summarize the current status of your Project
 - Did challenges negatively impact the progress of your project?
 - A final report with design alternatives for the project that include economic and environmental considerations
 - Incorporate status reports in final report as project progresses to reduce workload on final report
 - A poster reflecting a summary of your project to be presented to faculty and other interested individuals in the final undergraduate seminar
 - A presentation summarizing your project to be presented to your sponsor
 - Any other additional reports as proposed and agreed upon between team & sponsor
 - In most cases, there should not be any additional reports
- All deliverables are tentatively due on Monday April 10th 2017.

Performance Standards

Team will provide work for this Capstone project “as is” using best practices and with best effort. Project results cannot be construed as work performed by licensed professionals and cannot be used as “stamped deliverables” without first being reviewed, approved and stamped by a qualified and relevant license professional engineer.

Statement of Qualification

The project will require the assistance of Roy McDaniel, the site operator, Dr. Lee and Brett Borup, Vector: Structural Engineers, and Trailhead Engineering. Skills in AutoCAD and excel spreadsheets will be utilized for efficient and precise work. Our team has experience in structural analysis for solar arrays as well as cost analysis to help weigh the options and what is most feasible and cost effective. All team members are emphasizing structures or water resources in their education.

Appendix A

Sarva T. Pulla

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801-906-3191 sarvateja@gmail.com

Education

Brigham Young University

Master of Science: Civil Engineering

- Cumulative GPA: 3.71

Expected Graduation April 2017

Provo, Utah

Brigham Young University

Bachelor of Science: Civil Engineering

- President BYU ASCE, *Fall 2015*
- Second Vice-President BYU ASCE, *Fall 2011 and Winter 2015*
- Teaching Assistant for Engineering Applications of GIS, *Fall 2015 and Fall 2016*
- Teaching Assistant for GIS Programming, *Winter 2016*
- Netherlands Water Resources Study Abroad Program, *Spring 2016*
- Chine Mega-Structures and Mega-Cities Study Abroad Program, *Spring 2015*

December 2015

Provo, Utah

Work Experience

Brigham Young University

Graduate Research Assistant

- Develop web applications for SERVIR Global hub
- Maintain worldwater.byu.edu (A Data Portal for Hydrologic Information)
- Integrate National Water Model into Tethys Framework (A Django based web-framework for developing web-applications)

January 2016 – Present

Provo, Utah

Brigham Young University

Teaching Assistant

- Helped with ongoing development and design of curriculum for CE 414 and CE 514
- Provided effective and timely feedback on lab assignments
- Taught a weekly lab section for CE 414

August 2015 – Present

Provo, Utah

Brigham Young University

Undergraduate Research Assistant

- Maintained and developed HydroServer Lite (A web application for managing, storing and retrieving hydrological information)
- Developed a web application for calculating ecosystems services for NRPA (National Recreation and Parks Association)

October 2014 – December 2015

Provo, Utah

Volunteer Experience

The Church of Jesus Christ of Latter-day Saints

Missionary

- Taught others about the LDS Church
- Trained other missionaries in teaching and communication skills
- Coordinated religious and service activities with local leaders

January 2012 – January 2014

Queens, New York

Alexander Barrow

abarrow91@gmail.com | (281) 912-4032 | www.linkedin.com/in/alexanderbarrow

EXPERIENCE

Workflow Automation Intern | Trailhead Engineering | Salt Lake City, Utah May 2016 - Present

- Offer of full time employment extended
- Maintain equipment datasheets as well as calculation tools and design software
- Write Visual Basic scripts that drive design software (backend and frontend). Focus on manipulating HYSYS

Cost Estimation Specialist | Trailhead Engineering | Salt Lake City, Utah September 2015 – May 2016

- Created and managed a procurement database, used primarily for cost estimation and capital planning
- Coordinated technical communications between engineering disciplines
- 90% accuracy of predicting certain equipment costs, accelerating bidding process greatly
- Drafted proposals and bids for prospective work

Project Engineer Intern | Trailhead Engineering | Salt Lake City, Utah May 2015 – September 2015

- Invited to continue working at the end of the internship
- On design team for a 40 MMSCFD LPG Plant, oversaw all pump and line sizing
- Saw plant through to commissioning, assisting in as-build design drafting and equipment logistics

Intellectual Property Intern | Novatek, a Schlumberger company | Provo, Utah April 2014 – April 2015

- Successfully won 3 patents
- Drafted patents related to cutting edge drilling technologies and coal extraction equipment
- Provided intellectual property asset value analysis to board members

Environmental Compliance Specialist | BYU Risk Management | Provo, Utah February 2014 – April 2014

- Worked to analyze air emissions laws and operating permits to ensure compliance to regulations

Roustabout | First American Oil Company LLC | Jim Hogg County, Texas March 2013 – August 2013

- Operated a producing asset, 110% production increase in 5 months
- Conveyed direction from engineers to contractors on a regular basis while assisting to oversee maintenance, construction, drilling and completion work done by contractors
- Interpreted drilling engineer's direction to Spanish speaking workers

Asset Recovery Worker | BTU Solutions | Kemah, Texas December 2010 – February 2011

- Assisted in the demolition and dismantling of a 2300MW power generating station with the objective of recovering valuable assets for resale

EDUCATION

BS Civil Engineering, Brigham Young University, December 2017

- Serves as Vice President of the Society of Petroleum Engineers Student Chapter at BYU
- Member of the SPE executive council for four years (two years as vice president)
- Member of ASCE

MISCELLANEOUS

- Extremely proficient with VBA, experience with C++
- Spanish fluency
- Experience with CAD systems such as, but not limited to NX8, CATIA, AutoCAD, HYSYS, ProE, Solid Works, Revit, & SketchUp.
- Eagle Scout, BSA
- Served as a full time volunteer missionary in Tuxtla Gutierrez, Mexico from February 2011 until March 2013

Matthew Heninger

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Orem, UT 84058
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maheninger@gmail.com

Structural Engineering is fascinating and my skills and education have prepared me to be able to perform with precision and efficiency in this field. My work within sports teams and communication classes have made me a better team player and communicator. I would be a great fit on your team.

Skills

- Basic use of AutoCAD
- Basic knowledge in Revit
- Excellent in facilitating discussion

Education

Expected Dec. 2017

Bachelors of Science – Civil Engineering

Brigham Young University

- Learned many design software classes, such as AutoCAD and Revit
- Excelled in structural classes
- ASCE member

Sept. 2012-May 2014

Associates of Science with Integrated Studies

LDS Business College

- Acquired Certificate in Professional Sales
- Worked with many groups and teams and developed teamwork skills
- Took persuasive communications classes to improve communication with others

Work Experience

Aug. 2016 - Present

Project Manager

Vector Structural Engineers

Here I learned to work with other engineers and how engineers handle problems. I learned the basics of analyzing roof trusses and rafters.

- Learned how to distribute loads over a system.
- Began to learn basic software like Risa 3D
- Improved speed of computer skills.

Summer 2015

Site Development Crew Member

Brigham Young University Grounds

It is one thing to plan a construction job, but another to understand how it is carried out. Now I can plan my work so that it can be carried out by a crew easily.

- Functioned well within large crew
- Firsthand experience on how construction jobs are carried out

JENCE KOFOED

801-960-7595



jencekofoed@gmail.com



Spanish Fork, UT



PROFESSIONAL PROFILE

I am a highly efficient, hardworking and resourceful entry-level engineer with a comprehensive understanding of basic civil engineering principles. I am motivated by deadlines with a detail-oriented personality. I am a constant communicator with a team-worker mentality. I am eager to find a challenging and suitable engineering position with an ambitious company that offers opportunities for career development and advancement.

EDUCATION

BRIGHAM YOUNG UNIVERSITY
BACHELORS IN CIVIL ENGINEERING
Concentration on Structures
Current GPA - 3.67
Provo, UT
2014--Current

UTAH VALLEY UNIVERSITY
ASSOCIATES DEGREE
Orem, UT
2012-2014

SKILLS

Optimistic

Innovative

Disciplined

Reliable

Effective problem solver

Fluent in Russian

Manual labor & heavy equipment

Adept to obtain and process information

Proficient with CATIA, CAD, GIS, EXCEL

EMPLOYMENT & WORK EXPERIENCE

Maintenance manager

Affiliated First Title | Orem, UT | 2013 – Present

- Managed the cleaning and building maintenance for a six-office complex
- Budgeted for all supplies and cut previous costs by over 30 percent in the first 3-6 months

Intern

Willowstick Technologies | Sandy, UT | JUNE 2015 – AUG 2015

- Geophysical groundwater investigations, measured and recorded data
- Assisted with research and development in seismic electric techniques

Sales representative

Berett Pest Control | Houston, TX | MAY 2013 – AUG 2013

- Top salesman out of a branch of 17 salesmen while working 70+ hours per week
- Generated over \$60k in company revenue in three months

Project Manager

All-American Vinyl | Provo, UT | MARCH 2012 – AUG 2012

- Managed the precision, materials shop and oversaw warehouse labor and logistics
- Completed 50+ projects on time and within budget
- Increased shop efficiency and improved labor crew organization

VOLUNTEER EXPERIENCE

Full-time Missionary

The Church of Jesus Christ of Latter-day Saints | Donetsk, Ukraine |

FEBRUARY 2010 - MARCH 2012

- Appointed to the highest leadership position available to missionaries for 4 months
- Taught, trained and supervised over 60 full-time missionaries