

November 11, 2016

Jared Penrod, EIT
City of Orem
56 North State Street
Orem, Utah 84057
(801) 229-7331

Dear Jared Penrod:

We are very grateful for the time that you have allotted to us to meet in regards to the Soil Data Percolation App Development. We have recently received a RFP from our project manager, Alex Arndt, and have created a proposal based on the RFP as well as our meeting with you. We hope to exceed your expectations and we are devoted to your satisfaction.

Please look over the proposal enclosed and feel free to contact us regarding anything that you see fit to mention. We appreciate this opportunity and look forward to meeting with you again soon.

With warm regards,

SWL Engineers
Alex Arndt
Cameron Lusvardi
William Shelton
Jacob Wadman

clusvardi@gmail.com
(801) 745-7357

Enclosed

**SOIL DATA PERCOLATION APP DEVELOPMENT
CEEn-2016CPST-002**

By

**SWL Engineers
Alex Arndt / Project Manager
Cameron Lusvardi / Team Lead
William Shelton / Task Lead
Jacob Wadman / Task Lead**

A Capstone project submitted to

**Jared Penrod
City of Orem**

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

Nov 14, 2016

Introduction

PROJECT TITLE: Soil Data Percolation App Development
PROJECT ID: CEEEn-2016CPST-004
PROJECT SPONSOR: Jared Penrod, City of Orem
TEAM NAME: SWL Engineers

The Project that the SWL Engineers will complete for the City of Orem is the creation of a spreadsheet application capable of comparing different stormwater retention devices primarily R-tanks, Sumps, and Doghouses. This will be done by analyzing the soil percolation rates along with the city IDF curve and collating the data into a database. An excel spreadsheet application will then be built to analyze the efficiencies and capacities of stormwater retention devices by referring to the database.



The team will consist of Alex Arndt as the project manager, Cameron Lusvardi as the application specialist, William Shelton as the ArcGIS specialist, and Jacob Wadman as the data analysis and technical writing specialist. The City of Orem will provide the city IDF curve and percolation data to the SWL Engineers for use in the project. The soil data will then be analyzed and any additional information needed to complete the database will be collected. Once the data is compiled, it will be inserted into an Excel spreadsheet. The data will then be used to in a user friendly application to calculate the capacities and

efficiencies for various water retention devices in any location of the city.

The project will begin upon the receipt of the current data from the City of Orem by January 2017. Research on the various stormwater detention devices and equations will be completed by February 2, 2017. The compilation of the soil percolation data along with any additional tests will be completed February 12, 2017. The analysis and collation of the data will be completed no later than February 14, 2017. App development will initiate on February 6 and will continue through March 24, 2017. The SWL Engineers will deliver the final product as an Excel spreadsheet application. A final report, presentation, and poster will be included with the application and all items are to be delivered by April 10, 2017 to the sponsor and Capstone Committee. Between January and April 2017, monthly progress reports will be shared with the sponsor to aid in accounting for the progress of the project and to identify any issues that the team may have encountered.

This proposal includes the team's proposed work plan, detailed schedule, summary of facilities, tools, data, and equipment to be used, the project budget, deliverables, performance standards, and statement of qualification.

Proposed Work Plan

Soil data received from the city of Orem will first be analyzed to determine if there may be any need to perform additional percolation tests to complete the database. The compiled data will take into account areas that already have existing sumps and sewage lines. A map will be generated using Geographic Information System (GIS) software to observe the locations of the percolation test for Orem City, Utah. The GIS model will be constructed and reviewed no later than February 14, 2017. William Shelton will be the task lead of the development of the GIS model and soil percolation database.

While the soil data is being analyzed, all the necessary equations will be compiled and any necessary research about the stormwater retention systems will be performed to ensure accurate and reliable results. William Shelton will be in charge of the research for Dog Houses, Jacob Wadman will be in charge of the research for Sumps, and Cameron Lusvardi will be in charge of the research for R-Tanks.



Once all of the necessary soil data has been obtained, work on the spreadsheet application will begin. All data generated on the GIS software will be accessible for input on the spreadsheet application so that accurate values of percolation rates can be determined for any location within city boundaries. Drainage predictions based on the IDF curve and the rational flow equation will be used in conjunction with the percolation rates to determine the capacities and efficiencies of the stormwater retention devices. Cameron Lusvardi will lead of the spreadsheet application development.



Figure 1. Sump (Left), R-Tank (Center), Dog House (Right)

The team will spend 8 hours a week per student with at least 3 hours a week working together. Weekly meetings will be held to account for the work individually performed, to converse about problems encountered, and to create action plans to keep the project on schedule.

Microsoft Excel will be the primary program for the spreadsheet application development. This will allow for easy modification by Orem City for future projects. Visual Basic for Applications will be employed if needs be to create a user friendly interface.

Microsoft Word, Google Documents, and PowerPoint will be used to construct the final report, presentation, and poster delivered to the sponsor and Capstone Committee.

Project Budget

No monetary value will be accepted for the work performed. The project will be completed on a “best effort” basis. Each team member is expected to devote 8 hours a week per person on the project with a three-hour weekly meeting and collaboration held on Mondays. For a detailed timeline of each task please see the Figure 2.

Deliverables

The deliverables of the project will include a completed database of the soil percolation rates for Orem City, a spreadsheet application, a final report, a final presentation, a project overview poster, and monthly status reports. Each product of the Soil Data Percolation App Development Project will be delivered by April 10, 2017. The monthly status reports will be delivered at the end of each month between January and April 2017. A list of the deliverables with their respective aspects are presented below.

- Soil Data Percolation Spreadsheet Application
 - Using the IDF curve, rational equation, and database of percolation rates for Orem City, the user will input a few design parameters which in turn will compare the effectiveness of several different water retention devices including R-Tanks, Sumps, and Dog Houses. The Microsoft Excel spreadsheet application will have the ability to interpolate the soil percolation values for any location of the city and estimate the percolation which can be subtracted from the predicted rainfall runoff flows. The design codes for the retention devices and capacities will be based off of specifications provided by Orem City and the stormwater management manufacturers.
- Soil Percolation Database
 - A complete soil percolation database will be compiled to determine the distribution of various soil types and percolation rates for any area in Orem City. This Excel Spreadsheet will include the previous data received from Orem City as well as any

data collected from SWL Engineers. The database will be useful in determining stormwater management efficiency by interpolating the expected percolation at a desired location based off of the percolation results near that location.

- Final Report
 - The PDF final report will be delivered to Orem City as well as the Capstone Committee. The report will explain how to use the application, its intended use, capabilities, and possible modifications. A summary of all work done in the development of the spreadsheet application will be included in the final report. Key assumptions, equations, and other data required for the execution of the application will be presented and explained. Additionally, the final report will look at possible design alternatives for the project that will include economic and environmental considerations.
- Final presentation
 - A final presentation will be delivered to Orem City as well as the Capstone Committee. The PowerPoint and oral presentation will summarize the project purpose and outcome achieved by the SWL Engineers. The spreadsheet application will be demonstrated with its instructions and capabilities.
- Final Poster
 - A final poster will be presented to student, faculty and other interested individuals in the final undergraduate seminar. The professionally printed poster will reflect a summary of the spreadsheet application development with its applications for Orem City.
- Monthly Progress Reports
 - Short monthly PDF reports will be delivered to the sponsor to aid in accounting for the progress of the project. The progress reports will specifically include the current status of the capstone project, challenges that the team may have encountered, and the progress and actions to overcome the challenges and stay on schedule.

Performance Standards

The 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 SWL Engineers are uniquely qualified for the project because the team has been academically prepared on Civil Engineering applications at Brigham Young University. The intense and rigorous courses teach important skills such as problem solving, technical writing, report building, and proficiency in engineering programs such as AutoCAD, ArcGIS, and Microsoft Office. The team member collaboration plan will be based on working closely with the project manager and sponsor so that we can meet and exceed expectations. The team will meet weekly to account for the progress made on the project, review team member actions, and plan for the next steps needed to be taken to finish the project on schedule. Each team member is expected to act professionally and be open to constructive feedback.

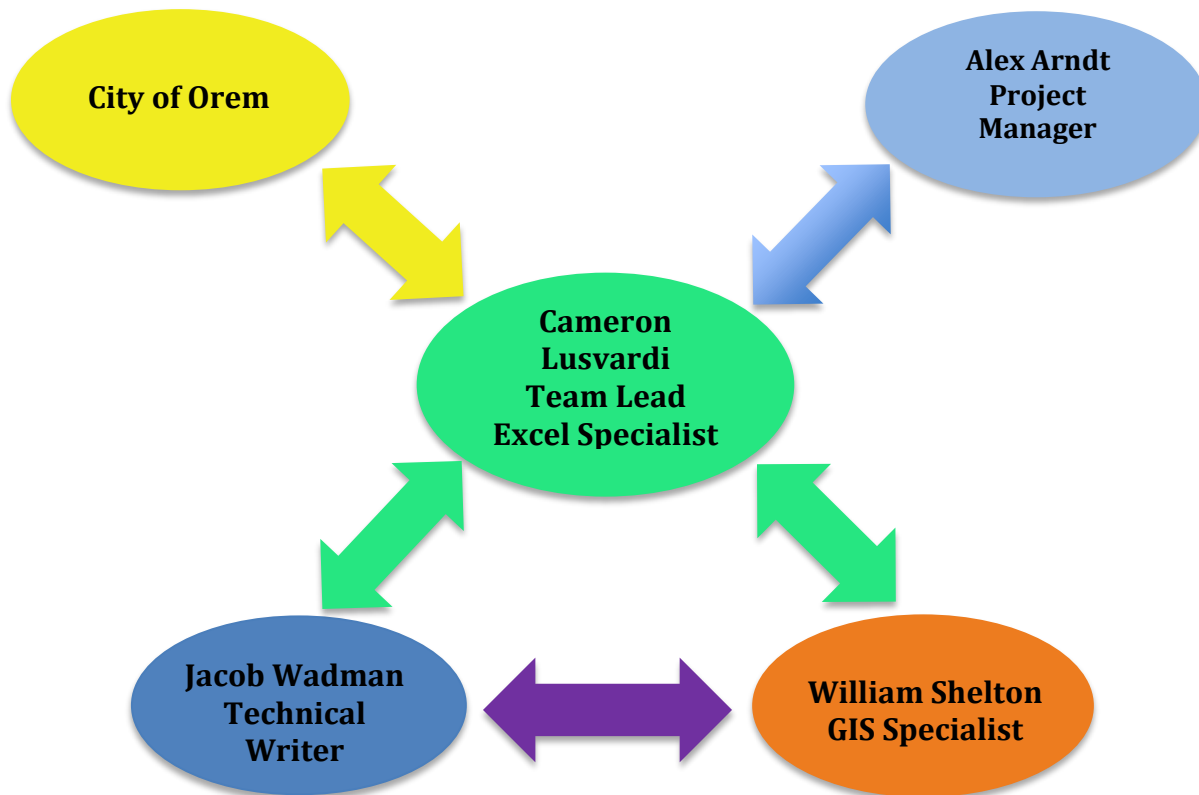


Figure 3. Team Organization Chart

A layout of the objectives and qualifications of the team and consultants are as follows:

Alex Arndt



Project Manager

BS in Civil Engineering, BYU
Geotechnical Engineering experience with Gerhart Cole INC.

Cameron Lusvardi



Excel Specialist

Team Lead

Liaison between the Team and the Sponsor

Task Lead

App Development, R-tank Research

Relevant Coursework

CEEn 270 Computational methods

Relevant Work Experience

Teaching Assistant for CEEn 270 Computational methods
Managerial experience with TRACO Manufacturing
Research Assistant for Dr. Kyle Rollins

William Shelton



ArcGIS Specialist

Task Lead

GIS mapping, Dog-house Research

Relevant Coursework

CEEn 414 Engineering Applications of GIS

CEEn 270 Computational methods

Relevant Work Experience

Experience with water facilities
Engineer in Training with Redwood Engineering
Research Assistant

Jacob Wadman



Data Analyst and Technical Writer

Task Lead

Data Analysis, Report Building, Sump Research

Relevant Coursework

ENGL 316 Technical Writing

CEEn 270 Computational methods

Normal Jones, Ph.D.

Project Faculty Advisor

Appendix A

ALEX ARNDT

663 North University Ave. Provo, UT 84601
801-867-9719
arndtal@gmail.com

SUMMARY

An excited and intelligent graduate civil engineering student pursuing a MS degree in Civil Engineering with a focus in Geotechnical Engineering. A hard working and self-motivated person, I enjoy working with others to accomplish ambitious team goals.

WORK EXPERIENCE

BRIGHAM YOUNG UNIVERSITY, Provo, Utah 8/2014-Present

Research Assistant

- Worked with a team of student researchers collecting and analyzing soil data from old geotechnical reports in Utah County to create liquefaction hazard maps.
- Conducted research related to performance-based liquefaction triggering from Cone Penetration Test data (CPT).
- Worked with a student team to create a standalone app capable of efficiently calculating complex performance-based liquefaction calculations.

GERHART COLE INC, Draper, Utah 7/2016-9/2016

Geotechnical Engineering Intern

- Performed Quality assurance and Quality control at project sites.
- Assisted with preliminary shoring design for projects requiring significant excavations.
- Conducted on-site Nuclear Density Gauge testing. EDUCATION MS in Civil Engineering, Brigham Young University, Provo, UT (expected 04/2017) BS in Civil Engineering, Brigham Young University, Provo, UT, 2015

SKILLS AND QUALIFICATIONS

- Key Courses: AUTO CAD, Mechanics of Materials, Hydrology, Fundamentals of Geotechnical Engineering, Surveying, Reinforced Concrete Design, Advanced Foundation Design, Advanced Soil Mechanics, and Engineering application of GIS.
- Proficient with MS Office, including Excel. Also proficient with AUTO CAD and ARC GIS. Experience with python scripting in ARCMAP. Familiarity with other geotechnical software including LPILE and UTEXAS. Coding experience in Python, C++, and VBA.

Cameron Lusvardi
clusvardi@gmail.com
(801) 745-7357

Objective

Team Leader for Capstone Project regarding Soil Data Percolation App Development

Employment

Research Assistant / Graduate Work - Department of CE: Dr. Kyle Rollins [Spring 2016 - 2016]

- Performed on site tests during blast induced liquefaction to observe effects of Micropile Foundations
- Analyzed test data for academic publications beneficial to seismic and soil institutions

Teacher's Assistant - Computational Methods CE EN 270 [Fall 2015 - 2016]

- Mastered visual basic coding skills in Excel to review, fix, and create programs for 40 students each semester
- Taught difficult concepts in a manner easily comprehensible to aspiring engineers

Dock Manager - TRACO Manufacturing [Summer 2015]

- Improved the efficiency and organization of warehouse procedures to improve customer satisfaction and revenue
- Managed a shipping and delivery team of 10 people and trained 9 new employees

Architect and Marketing Manager - BBM Concrete [Fall 2012 - 2014]

- Redesigned products and plans using SketchUp for the customer's demands
- Created an in-depth instructional video of the product through simplified installation steps

Office Assistant - Kingsley Management Corporation [Winter 2010 - Summer 2010]

- Created an intricate system of organization for important documents to guarantee simplicity, efficiency and longevity of the company

Education

B.S. in Civil Engineering, Minor: Mathematics [Anticipated December 2017]

Brigham Young University, Provo, UT

GPA: 3.8/3.7

- CEEEn 270 - Computation Methods A
- CEEEn 332 - Hydraulics & Fluid Flow Theory A-
- CEEEn 341 - Elementary Soil Mechanics A-
- CEEEn 414 - Engineering Applications of GIS A

Awards and Skills

- Competent in ArcMap, Auto CAD, Revit, Inventor, Sketchup, Photoshop, Lightroom, Dream Weaver, Visual Basic, and Office
- Member of the Tau Beta Pi Honors Association and Academic Scholarship Recipient

William Robert Shelton

380N 1020E Apt. 102 Provo, Utah 84604

williamsheltonis@hotmail.com

(864)421-2527

Objective: Searching for part time position or internship in order to obtain real world engineering experience

Summary of Qualifications:

Speak, write, and read fluent Portuguese	Plastering/Concrete Work	Visual Basics Programming
Proficient in Microsoft Excel and Word	Property Management	Proficient in ArcMap GIS
Proficient in AutoCAD	Field Surveying	Experience with Water Facilities

Education: Brigham Young University, Provo, UT (GPA: 3.67)

Expected Graduation: April 2017

Major: Civil Engineering

Member of American Society of Civil Engineers

Participated in a project aimed at building longest flying solar glider, while on the team I created a tail that was 20% lighter. I have participated on the steel bridge team which competes at Rocky Mountain Conference. I played an essential role in the design, computer modeling, and stress analysis of the connections used on the bridge.

Work Related Experience:

Engineer in Training (EIT) at Redwood Engineering May 2015-Present

- Design roof/floor framing plans for custom homes and cabins
- Perform all necessary structural engineering calculations on new homes and remodels
- Read floor and framing plans to engineer homes
- Update floor and framing plans on CAD with changes made from engineering
- Call out construction details on plans

Research Assistant Dec. 2014-April 2015

- Responsible for ensuring correct slope of model river built in a flume
- Devised new method of measuring slope for model

Maintenance Technician, Brigham Young University, Provo Utah Jun. 2014-May 2014

- Diagnose problems and repair essential components of on campus student housing

Maintenance Technician, Seven Peaks Water Park, Provo Utah Mar. 2014-Jun. 2014

- Rebuilt broken infrastructure and park attractions to prepare for state health inspections
- Used ingenuity to decrease time needed to clean pools of debris by 25%
- Received weekly safety training including safe handling of caustic chemicals
- Installed chemical lines from chemical storage to the water treatment facilities

Job Shadow Project Manager, Dearborn Midwest Conveyor Belt Company, VA Jan. 2012

- Assisted project manager relay information from contractor to engineer

Jacob V. Wadman
669 E 800 N Apt. N307, Provo, UT, 84606
Phone 805-990-4482 wadmanjv@att.net

Education

Associate of Arts - Mathematics, Moorpark Community College, Moorpark, CA.
Graduation May 2011. G.P.A: 3.72
Bachelor of Science – Civil Engineering, Brigham Young University, Provo, UT.
Expected graduation, April 2017. G.P.A: 3.74

Work Experience

Teaching Assistant - Brigham Young University, Provo, UT 2016 - Present

- Listen to student questions and identify areas of inadequate understanding
- Teach and reinforce concepts missed during regular class sessions
- Review assignments and provide feedback for student progress

Route Manager - Aptive Environmental, Orem, UT Summer 2016

- Manage service routes
- Contact numerous people and help them identify potential areas of pest infestations
- Initiate one year service agreement
 - Detail services and benefits of the service
 - Customize the service to specific customer needs
 - Provide a walkthrough of the service
 - Provide clear explanations to obstacles and customer issues

Clerk - Brigham Book and Copy, Provo, UT 2015 - Present

- Move and organize books and materials
- Responsible for maintaining store merchandise

Volunteer representative - Colombia Barranquilla Mission 2013 - 2015

- Contact people in various public spaces
- Accomplished proficiency in speaking, reading and writing in the Spanish language
- Performed frequent personal service to help improve individual's circumstances
- Coordinate all activities with local leaders
- Responsible for training new and experienced representatives in weekly meetings
- Follow up on goals progress with individual representative teams on a daily basis and provide feedback for further improvement

Skills

Technical skills

Fluently speak, read and write Spanish; Proficient in MS office; Experience with AutoCAD; Experience with ArcGIS

Interpersonal skills

Quick Learner; Able to understand and adapt to different cultures; Can tailor explanations to audience; Analyze and identify requirements; Conflict resolution; Excellent listener; Able to adapt concepts to individual level of understanding; Excels in a collaborative environment; Excellent group and personal leadership skills.

Accomplishments

Associates Degree at 17 years of age; Eagle Scout Award; Ham radio license.