

**WOODLAND HILLS SNOW-RUNOFF DRAINAGE
OPTIONS**

Project ID: CEEEn_2018CPST_007

by

SHOF

**Hanna Opdahl
Nicole Hastings
Ryan Smart
Daniel Fiso**

A Capstone Statement of Work

Submitted to

**Ted Mickelsen
Woodland Hills**

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

October 8, 2018

Introduction

PROJECT TITLE: WOODLAND HILLS SNOW-RUNOFF DRAINAGE OPTIONS
PROJECT ID: CEEEn_2018CPST_007
PROJECT SPONSOR: Woodland Hills
TEAM NAME: SHOF

Team SHOF will be working in collaboration with Jones and DeMille Engineering and the City of Woodland Hills to assess the existing snow-runoff drainage suggest improvements that complement the character of the City and prepare for the 10-year storm event. Doctor Dan Ames from the Department of Civil and Environmental Engineering at BYU will provide technical and academic support to the team throughout the course of the project. The project will be divided into three tasks: data collection, system analysis, and recommendations. Deliverables will include a GIS map indicating drainage basins, input and output points, city boundaries, watershed delineation, and the existing drainage capacity. In addition, a final report will be compiled to provide suggestions to the City that include typical design drawings and unit price estimates. A preliminary map and report will be submitted on March 14, 2019 to allow the City and Jones and DeMille the opportunity to provide feedback and revisions before final submission.

Proposed Work Plan

Task 1: Create the GIS Map

- Projected deadline: December 10, 2018

Task 1 consists of three parts: data collection, processing, and compiling into a GIS map of drainage basins and flow patterns. Data collection will be facilitated by GIS analysis at BYU lab facilities to identify drainage basins and base map boundaries. The team also anticipates routine visits to Woodland Hills during data collection to become acquainted with the character of the community and to identify potential areas of concern. Once sufficient data is collected, the team will build a GIS map that will show the current drainage lines, output points, and delineate the local watershed. At the end of task one, the team will prepare for task two by determining the design criteria such as the modeling, spreadsheets, and parameters that will be used to perform the analysis.

Task 2: Determine and Analyze Drainage Flow

- Projected deadline: February 8, 2019

Once the layout of the drainage basins and distribution system is mapped via ArcGIS, the team will determine the amount of flow carried through the system according to the 10-year storm event criteria. This data will be acquired from past rainfall intensity records and the local rainfall gauge. It is anticipated that this task will primarily be carried out at the lab facilities at BYU. This data will also be added to the GIS map.

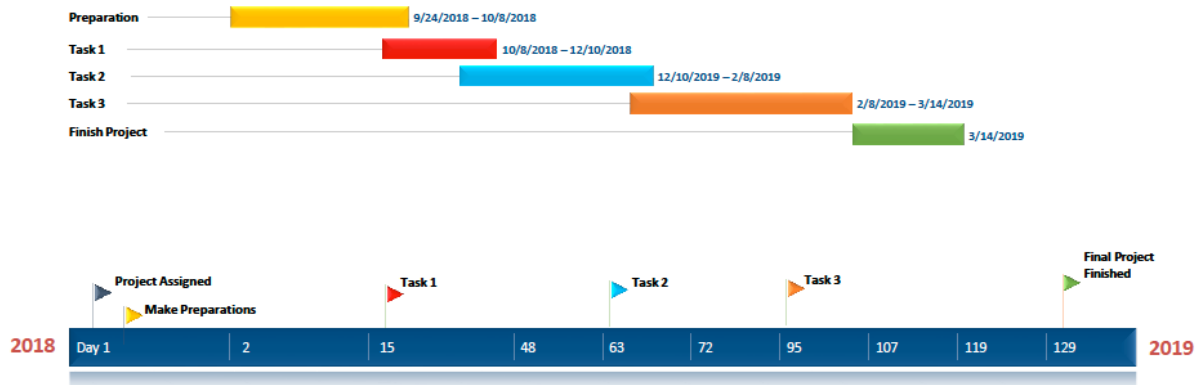
Task 3: Suggested Improvements

- Projected deadline: March 14, 2019

After the drainage system layout and flow is known and charted on the GIS map, the team will use the data to identify areas at risk of flooding. In collaboration with the City of Woodland Hills, new facilities and culvert sizes will be recommended according to low impact development standards to preserve the existing character of the community. This will most likely involve meeting with the City to discuss expectations and priorities. Each alternative will include typical design drawings (such as drainage swales or culvert crossing) and unit price estimates according to the standards provided by the City and Jones and DeMille Engineering.

Schedule

Project Timeline



- Weekly team meetings on Fridays at 12pm
- Biweekly meetings with Dr. Ames on Fridays at 10am
- Biweekly meetings with Ted Mickelsen
- Meetings with the Woodland Hills city council

Facilities, Tools, Data and Equipment

The tools needed to complete Task 1: ArcGIS Pro, to create the GIS map (obtained through Brigham Young University); and Google Maps, to locate the drainage basins near Woodland Hills (free software). The data needed to complete Task 1: locations of drainage basins near Woodland Hills (obtained through Google Maps), and drainage flows near Woodland Hills (obtained through Utah online GIS data). No specialized equipment or facilities, outside of BYU computer labs, are required for Task 1.

The tools needed to complete Task 2: HecRAS, hydraulic modeling software to perform hydraulic analysis (free software); and Microsoft Excel, for data processing before hydraulic analysis (obtained through Brigham Young University). The data needed to complete Task 2: rainfall data for the Woodland Hills area (obtained through Utah online data and an onsite rainfall gauge). No specialized equipment or facilities, outside of BYU computer labs, are required for Task 2.

The tools needed to complete Task 3: AutoCAD, drafting software to create conceptual drawings of the culverts and riprap designs (obtained through Brigham Young University); and Public Works Costbook based spreadsheet, budget data book for price estimation of culverts and rip rap designs (obtained through Jones and DeMille Engineering). The no additional data needed to complete Task 3 other than price estimations from the Public Works Costbook. No specialized equipment or facilities, outside of BYU computer labs, are required for Task 3.

Project Budget

Items	Budgeted Hours per Team Member
Task 1 - Creating GIS Map	
Determine Design Criteria	2
Data Gathering	4
Site Visits	5
Processing Data	4
Building Map	5
Task 2 - Determining Flow and Analysis	
Research	8
Site Visits	4
Analysis of Data	5
Task 3 - Consultation	
Design Culverts	5
Design Riprap	5
Produce CAD drawings	7
Contingency	
	6
Total Hours	60

Deliverables

Below is the list of deliverables that qualify as the project's exit criteria:

- GIS map of drainage basins in the Woodland Hills area
- Analysis of drainage flows
- Recommendations for culvert and rip rap sizing
- Descriptions and conceptual drawings of recommended LID improvements
- Unit price estimates for all recommendations
- Short regular status reports documenting challenges, solutions & progress
- A final report with design alternatives for the project that include economic and environmental considerations
- A poster reflecting a summary of your project to be presented to student, faculty and other interested individuals in the final undergraduate seminar
- A presentation summarizing your project to be presented to your sponsor

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

Dr. Daniel P. Ames, PE

- Professor in Civil & Environmental Engineering at Brigham Young University
- Research in hydroinformatics, water science big data, geographical information systems
- Editor in Chief of the journal, Environmental Modelling & Software
- Doctor of Philosophy, Civil Engineering from Utah State University

Ted Mickelson, PE

- Director at Jones and DeMille Engineering
- Expertise in water transmission and distribution, large scale projects, sewer collection, drainage facilities, pump stations
- Bachelor of Science, Civil Engineering from the University of Utah

Councilman Paul MacArthur

- City Councilman of Woodland Hills
- Juris Doctor, Law from J. Reuben Clark Law School at BYU

Corbett Stephens

- City Public Works Director of Woodland hills

Hanna Opdahl

- Bachelor of Science, Civil Engineering from Brigham Young University 2019
- Relevant Courses: Geomatics, Fluid Flow Theory, CAD Drafting
- Performed research on Water system master plan

Nicole Hastings

- Bachelor of Science, Civil Engineering from Brigham Young University 2019
- Relevant Courses: Geomatics, Hydraulic Engineering, Fluid Flow Theory, CAD Drafting
- Experience in AutoCAD Civil 3D
- Storm Water Drainage System Analysis project

Ryan Smart

- Bachelor of Science, Civil Engineering from Brigham Young University 2019
- Relevant Courses: Geomatics, Hydraulics Engineering, Fluid Flow Theory, CAD Drafting
- Experience in Revit

Daniel Fiso

- Bachelor of Science, Civil Engineering from Brigham Young University 2019
- Relevant Courses: Geomatics, Fluid Flow Theory, CAD Drafting
- Work experience in AutoCAD

Appendix A

Daniel Fiso

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731 N University Ave Provo, UT 84601
www.linkedin.com/in/daniel-fiso

EDUCATION

Aug '16 – Dec '19
Provo, UT

BRIGHAM YOUNG UNIVERSITY
Bachelor of Science, Civil Engineering
Minor, Mandarin Chinese

- Related Courses: Reinforced Concrete Design, Structural Analysis, Revit, AutoCAD, Statics, Material Science, Fluid Mechanics, Transportation Engineering
- Capstone Project: Woodland Hills Drainage Study
- Extra-Curricular: ASCE member

EXPERIENCE

May '18 – Aug '18
Pleasant Grove, UT

HORROCKS ENGINEERS
Structural Engineering Intern

- Analyzed details meticulously when checking shop drawings for compliance to structural drawings
- Designed retaining wall using Enercalc
- Calculated cost estimates for multiple projects
- Drafted various details in response to RFIs using AutoCAD and Revit

Aug '15 – Sept '17
Provo, UT

NU SKIN ENTERPRISES
Mandarin Distributor Support Representative

- Maintained excellent customer service ratings over the phone in Mandarin
- Solved problems for 25+ customers daily
- Consulted customers on how to maximize income and take advantage of company opportunities
- Composed detailed and organized notes regarding interactions with customers

Aug '14 – Aug '15
Provo, UT

RIMPORTS LLC.
Production Worker

- Maintained high quality of products through close attention to details
- Collaborated on Safety committee to ensure well-being of employees
- Certified to operate forklifts and other factory equipment
- Accomplished deadlines for production while self-monitoring work quality

SERVICE

- 2-year Religious Mission in Taiwan
 - Established standards as a leader of 40+ missionaries
 - Professionally speak, read, and write Mandarin Chinese
- Eagle Scout Project
 - Organized clothing drive for families in need

SKILLS

- Working proficiency in AutoCAD and Revit
- Reliable, independent worker
- Excellent organizational skills

HANNA OPDAHL

(503) 369-4155
HOPDAHL12@GMAIL.COM

EDUCATION

-
- **B.S. Civil Engineering, Brigham Young University; Provo, UT** April 2019
-Cumulative GPA 3.93/4.00
 - **Materials Engineering Research, University of Cambridge; Cambridge, UK** July 2018
 - **Tau Beta Pi; Engineering Honors Society**

WORK

-
- TA/Lab Director, Civil Engineering Department, BYU; Provo, UT** Jan 2018-Current
- Tutor a junior level course covering properties of engineering materials
 - Lead weekly lab of 10 students testing metals, wood, concrete and asphalt
- Engineering Intern, Lower Columbia Engineering; St Helens, OR** 2014-Current
- Research and compile a Water System Master Plan for a population of 2,200
 - Technical calculations for lateral and vertical engineering
 - Civil site development and field surveying using Total Station and RTK equipment
 - Reference: Andrew Niemi (503) 366-0399
- MEP Drafter, Electrical Engineering Department, BYU; Provo UT** Oct 2016-April 2017
- AutoDesk software (Visual, REVIT and AutoCAD)
 - Prepare cost estimates for commercial projects of value up to \$500,000
 - Develop software program for team communication and project status

VOLUNTEER

-
- Global Engineering Outreach, BYU & Navajo Nations; Bluff, UT** March 2018
- Construct a community center from rammed earth methods
- ASCE Member, BYU Student Chapter; Provo, UT** Sept 2013-Current
- Residential building projects with Habitat for Humanity
 - Provide engineering activities for children through Provo Community Action
- Full-time Representative, ASPERSUD; Trujillo, Peru** Feb 2015-Aug 2016
- Provide 12-week training to new volunteers
 - Record and follow-up with the individual progress of 15+ clients
 - Develop strategies, manuals, and goals for 150 volunteers

QUALIFICATIONS

-
- **Fluent in Spanish**
 - **Structural Analysis using SAP2000**
 - **Computer Programing with VBA**
 - **HAM radio certified**

Nicole Hastings

www.linkedin.com/in/nhastings3 -- (503) 519-3530 -- nicole.hastings@byu.edu

Education

April 2019

Provo, Utah

B.S. Civil and Environmental Engineering *Brigham Young University*

Relevant courses:

Hydraulic Engineering, Foundation Engineering, Reinforced Concrete Design, Structural Analysis, Fluid Mechanics, Concrete and Steel Properties

Experience

June 2018 - Present

Provo, Utah

Research Assistant

Brigham Young University – C-UAS Prism Lab

- ◆ Learning to pilot unmanned aerial vehicles (UAV's) to further research
- ◆ Creating 3D models of buildings and areas using Agisoft PhotoScan and Bentley ContextCapture from pictures and videos taken by UAV's
- ◆ Traveled to Italy in June 2018 to survey and fly UAV's over landslides and city ruins caused by the earthquakes in 2016

Feb 2018 - June 2018

Provo, Utah

Civil Engineering Intern

Brigham Young University – Physical Facilities

- ◆ Surveyed storm drains and manholes for storm drain inventory and analysis project
- ◆ Created topographic surfaces for project planning
- ◆ Updated master utility and site plans to maintain validity

May 2016 - Feb 2018

Provo, Utah

Computer Technician

Brigham Young University – Physical Facilities

- ◆ Assisted with 7+ service calls a day for network and hardware problems
- ◆ Communicated with coworkers and clients about computer issues daily
- ◆ Kept printers operational by exchanging toner or parts

Skills

Computer

- ◆ Working proficiency in Bentley ContextCapture and Agisoft PhotoScan
- ◆ Working proficiency in Microsoft Word and Excel
- ◆ Working proficiency in AutoCAD Civil 3D
- ◆ Basic proficiency in Revit and ArcGIS
- ◆ Basic knowledge of C++, Python and VBA
- ◆ Working proficiency in Troubleshooting

General

- ◆ Organizational skills
- ◆ Learn new programs quickly
- ◆ Moderate proficiency in modern surveying
- ◆ Passed Utah FE Exam in March 2018
- ◆ Licensed Amateur Ham Radio Operator

Ryan A. Smart

1209 E 1040 N Orem, UT 84097 | 801-319-9297 | ryan.smart22@gmail.com

Summary

I am a Civil Engineering student at Brigham Young University specializing in Structural Engineering, I like to solve problems and enjoy the sense of accomplishment in building, translating plans into reality, and creating new things.

Education

B.S. IN CIVIL ENGINEERING | BRIGHAM YOUNG UNIVERSITY

- Major: Structural Engineering
- Anticipated graduation date: December 2019
- Capstone project of citywide drain analysis for the city of Woodland Hills in Utah.

AUGUST 2011-APRIL 2012; JANUARY 2015-APRIL 2016 | UTAH VALLEY UNIVERSITY

- Completed Pre-Engineering courses through April 2016

Experience

STUDENT ASSISTANT | LDS PHILANTHROPIES | MAY 2016-PRESENT

- Support the Executive Assistant to the Managing Director of LDS Philanthropies

LABORER - CARPENTRY | ARTISAN BUILDERS & CONSTRUCTORS | SEPT. 2015 - MAY 2016

- Constructed various remodels and basement finishing in Utah county

LABORER | CHRISTENSEN BROS. CONSTRUCTION | JUNE 2015 - SEPT. 2015

- Prepared and installed a radiant heating system for a driveway remodel

INSULATION INSTALLER | SUNROC BUILDING MATERIALS | NOV. 2014 - MAY 2015

- Installed insulation in Utah and Salt Lake counties

Skills & Abilities

- Revit and AutoCAD skills
- Tagalog language
- Woodworking skills
- Graphic Design
- Wiki Pages

References

RYAN DEWEY - ENTREPRENEUR, FORMER COO KT TAPE - 801-494-9429

DR. CRAIG COOK - SURGEON, INTERMOUNTAIN HEALTHCARE COMPANY - 801-368-2559