

ENGINEERING CHANGES VS. NEIGHBORHOOD IMPACT ASSESSMENT

Project ID: CEEEn-2016CPST-004

Prepared by:
BMK Engineers

Spencer McDonald: Graduate Mentor
Martin Seneca: Team Lead
Brad Fellows: Sponsor Relations
Kaylee Bateman: Software Analyst

A Capstone project submitted to:
Jared Penrod
City of Orem Department of Transportation
Department of Civil and Environmental Engineering
Brigham Young University

November 14, 2016

Mr. Sam Kelly
Mr. Paul Goodrich
Mr. Jared Penrod

Dear Mr. Kelly, Mr. Goodrich, and Mr. Penrod:

Attached is our proposal for the city of Orem's 400 North Intersection analysis project. BMK Engineering will provide you with the skills and knowledge required to complete this analysis in a professional manner. We are committed to working together to develop accurate results during the provided time. The BMK team is confident in their abilities.

Thank you for giving us this opportunity. We look forward to hearing from you.

Best regards,

BMK Engineering.

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Brad Fellows (713)-562-1825
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Executive Summary

Orem is a city in central Utah County. It is the 5th largest city in Utah with a 2010 population of 88,328. With each passing year, the city's population increases, which has been effecting traffic flow. The 800 East corridor in Orem has experienced peak hour problems. The intersections at 800 North and on Center street have been especially problematic with D, E, and F level-of-service (LOS) ratings during peak hours. Throughout the corridor, all but one of the major intersections are controlled by traffic signals. The intersection at 400 North is currently a 4-way stop.

Orem city wishes to acquire consulting services to analyze the 800 East corridor. This analysis is to be focused particularly at the 400 North 800 East intersection to determine how changing its intersection control system would affect the peak-hour problems at 800 N and at Center Street.

The specific needs of the client are:

- The effect of control systems on peak-hour problems at 800 N and at Center Street
- A proposal for a new signal timing for the 800 East corridor for both peak and off-peak hours
- Roundabout and signal analysis
- Modification of intersections to help Northbound and Southbound flow

BMK Engineering has reviewed the requirements of Orem City's Engineering division. We are committed to providing Orem City's Engineering division with the necessary assistance to meet these needs.

The following is a brief outline of the timeline for this project:

January 20, 2016: Compile all necessary traffic data

February 31, 2016: Complete all traffic analysis for several different intersection options

March 31, 2016: Complete final report and presentation with analysis and recommendations

Key deliverables are a final written report with traffic analysis, cost benefit analysis, and design alternatives.

At BMK Engineering, we are confident our abilities will provide results that meet the client's needs in a cost efficient, timely, and professional manner.

Proposed Work Plan

To provide accurate design alternatives and analysis, the engineering team will gather traffic and intersection counts and other raw data regarding the flow at the designated intersection and adjacent streets. This data will be analyzed according to engineering standards for intersections and roundabouts. The engineering team will complete a cost-benefit analysis of each design option. Based on the analysis, recommendations on the best course of action for future use at this intersection will be given. These components will constitute the final deliverables.

The numerical analysis will take place either at the Orem Department of Transportation offices or at Brigham Young University's engineering computer lab. Once the numerical analysis is complete, the engineering team will work on Brigham Young University campus to complete the report and recommendations. The schedule for these tasks is contained in the schedule.

Schedule

The final report and analysis for the city of Orem will be completed by April 10, 2016. The following are intermediate deadlines for various portions of the project:

- January 20, 2016: Gather all intersection timing and traffic count data for the intersections included in the study
- February 10, 2016: Finish analysis of raw data from the city of Orem. This includes the analysis of the different type of intersection options.
- February 31, 2016: Finish analysis of neighborhood impact. This includes the assessment of various traffic options and their impact on the surrounding areas.
- February 31, 2016: Meet with the City of Orem to check analysis and request additional information for the report.
- March 15, 2016: Complete feasibility analysis of the different intersection types. This includes the cost to the department of transportation and any social costs incurred by the surrounding areas.
- March 31, 2016: Complete report of analysis and our recommendations to the changes necessary at the proposed intersections.

Team members will meet weekly at the designated class period, every Thursday, for a three-hour time period. Each team member will be responsible for a dedicating an additional three hours of individual work each week. The team meetings will be held after this class period in order to establish weekly goals and deadlines. Team members will also use these meetings to discuss any challenges to their work. We will contact the sponsor as necessary during these meetings. As a group, we can assure that our work will be completed according to schedule.

Facilities, Tools, Data and Equipment

The city of Orem and Brigham Young University will provide traffic analysis software in order to facilitate our recommendations. We have been offered access to the computers at the Orem department of transportation office. Analysis will also use Microsoft Excel and Word programs.

Project Budget

Gather and organize raw data: 8 hours
Analyze data to predict traffic patterns of different intersection options: 18 hours
Analyze neighborhood impact: 10 hours
Meetings with sponsor: 4 hours
Feasibility analysis: 12 hours
Report and recommendations: 15 hours

Outcome and 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.

Deliverables

The final deliverables will include a word document outlining the process of data analysis and recommending a specific course of action. This report will include how the data was organized and analyzed with computer software. The appendix will include key reports generated from the traffic software. A cost benefit analysis is included. The design alternatives portion will focus on the benefit of the proposed system currently and in the future. Environmental impacts will be assessed. A slide deck will be prepared with key analysis and the recommendation. This slide deck will be presented to the Orem Department of Transportation. A poster presentation will be prepared to summarize the results of the project.

Minor deliverables include monthly status reports documenting the challenges, solutions, and progress of the group. These reports will focus on the following questions.

- What challenges has the team encountered?
- What actions did the team decide to do to overcome these challenges?
- What is the progress in overcoming these challenges?
- Is the project on schedule?

The reports may also state guidance and assistance given by the sponsor in order to help the team solve problems and stay on schedule. These reports will be included in the final report.

After the project deadline, a presentation will be scheduled for students and the general public.

Statement of Qualifications

Introduction

At BMK Engineering, we are committed to providing accurate, professional work. Projects we design will be carried out in a timely manner, meeting all deadlines. Each member of the team is ethical and prepared to provide the City of Orem with the expertise required for this project.

Education

As a team, we have taken part in courses that will assist us throughout this project. Some of the coursework we have completed includes:

- CeEn 361: Introduction to Transportation Engineering
- CeEn 113: Engineering Measurements

These courses, along with others, have familiarized us with the knowledge needed to assist the engineers in the city of Orem. A few of the skills we have developed include:

- Level of Service Analysis
- Cost/Benefit Analysis
- Roundabout/Signal Analysis

Relevant Work Experience

- *Kaylee Bateman* -- Kaylee has interned for an industrial engineering company, providing her with experience working and coordinating with other project engineers to review projects for construction. Currently, she is working as a research assistant, which has taught her how to collect and analyze data efficiently and accurately.
- *Brad Fellows* -- Brad has worked as a teacher's assistant for multiple classes, including CeEn 113 Engineering Measurements. He is skilled working with total stations and GPS materials, specifically ArcGIS software.
- *Martin Seneca* -- Martin is familiar with engineering software. He is skilled with Microsoft Excel and visual basic programming.

Organizational Structure

BMK Engineers work well as a team because we have similar backgrounds. We have taken classes together and know how to make this team function as efficiently as possible. We are confident in our abilities to meet deadlines and exemplify each team member's strength to best meet the requirements of this project. Martin Seneca's familiarity with engineering software will assist us while we collect and analyze data. Kaylee Bateman has experience working in close contact with

professional engineers, which will help coordinate the project. Brad Fellows is experienced working on site. Each member has unique skills that will assist the team during the project.

Outside Affiliations

- *Spencer McDonald* -- Mr. McDonald is a graduate student in Civil Engineering at BYU. He is the team's mentor for the project. He can provide us with guidance and will be of assistance with any questions we have throughout the project.
- *Dr. Grant Schultz* -- Dr. Schultz is a Professional Engineer and has a PhD. in Transportation Engineering. He currently teaches CeEn 361, Transportation Engineering at Brigham Young University. He can be of assistance with any questions we have during our analysis of the intersection.
- *Stephen Sowby* -- Mr. Sowby is a licensed professional engineer in Utah. He has spent his entire life as a project engineer. He can be of assistance with any questions we have concerning project design and completion.

Conclusion

At BMK Engineering, we are committed to providing the client with professional engineering. Our education and work experience have provided us with the skills required to complete this project in a timely and professional manner. We aim to excel in our responsibilities and look forward to collaborating with the city of Orem to complete this project.

Appendix

MARTIN T. SENECA

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EXPERIENCE

Engineer in Training

May/2016 – Present

Acute Engineering, Orem, UT

- Conducted independent research of engineering code and standards to solve complex construction and engineering issues
- Engineered custom and production homes at a revenue rate of \$270 per hour

West Point Cadet Platoon Sergeant

May/2012 – Jun/2012

United States Military Academy, West Point, NY

- Led a platoon of cavalry scouts from the 10th Mountain Division in order to provide counter-terror training for 300+ cadets
- Solved logistical and equipment issues between training site managers and training teams for 15+ sessions

Sales Representative

Apr/2015 – Aug/2015

Moxie Pest Control, Centreville, VA

- Generated \$88,000+ in company revenue
- Managed 30+ sales areas throughout Northern Virginia
- Participated in daily sales training and assessed junior sales representatives

Volunteer Missionary

Jul/2012 – Aug/2014

The Church of Jesus Christ of Latter Day Saints, Taipei, Taiwan

- Presented 20+ training sessions to groups of missionaries ranging from 24-120 to help them teach more effectively
- Conducted 20+ personal assessments of individual missionaries proselyting and performance
- Organized two separate meetings involving global level church leaders and 180 missionaries
- Worked 85+ hours per week

EDUCATION

Major: Civil and Environmental Engineering, Brigham Young University, Provo, UT

GPA: 3.85

Graduation Date: April 2017

Member of American Society of Civil Engineers

Member of Tau Beta Pi

SKILLS/ ACCOMPLISHMENTS

- Chinese Fluency: Completed weekly and monthly translation projects for a period of six months as a volunteer missionary
- First place in BYU Global Management Student Association case competition
- Microsoft Office proficiency
- Eagle Scout

Brad T. Fellows

(713) 562-1825 * bradtfellows@gmail.com * 9410 Floral Park Ct. Houston, TX 77095

Education

Bachelor of Science in Civil & Environmental Engineering *Brigham Young University, Provo, UT*
Relevant Course Work: Chemical Engineering, Surveying, Computer Programming

Professional Experience

Metals, Woods, & Composites Teaching Assistant

Brigham Young University Provo, UT
Aug. 2016 – present

- Conducted several lab sections throughout the week for approximately 20 students
- Responsible for grading of approximately 450 lab and homework assignments

E.I.T. (Internship)

Acute Engineering Provo, UT
Dec. 2015 – Aug. 2016

- Perform detailed structural analysis for residential engineering projects
- Prepare Engineering Addendums & B.O. Letters for clients to assist with engineering projects
- Collaborate with drafters to prepare engineering drawings/blueprints for clients

Surveying Teaching Assistant

Brigham Young University Provo, UT
Aug. 2015 – Dec. 2015

- Conducted several lab sections throughout the week for approximately 50 students
- Responsible for grading of approximately 1400 lab and homework assignments
- Collaborated with colleagues weekly by planning new methods to improve the fluidity of the class and labs

Chemical Engineering Teaching Assistant

Brigham Young University Provo, UT
Dec. 2013 – May 2015

- Instructed all labs for 200-300 students
- Directed the grading of approximately a range of 4000-5000 lab and homework assignments
- Assisted in the development and refinement of various lab work to satisfy the requirements necessary for the students competence in the respective class

Sales Manager

Stampede Pest Control Houston, TX
Jul. 2012 – Aug. 2013

- Managed sales representative team of ten for five months
- Coordinated the production of all sales representatives which increased company sales accounts by 20%
- Provided technical pest control services to clients for the exterior and interior of homes and businesses

Volunteer Experience

- Served as a volunteer representative for 2 years
 - Lead and instructed groups ranging from 10 to 200 people to properly plan and schedule their work
- Orchestrated the work of 20-25 men at 3 different locations for food donations for a local Houston food pantry
- Taught 25-30 children between ages 3-4 years-old for one year

Skills & Accomplishments

- Proficiency in Microsoft Office, Visual Basic, ArcGIS software, AutoCAD, MathCAD, HTML, Autodesk Revit
- Skilled in the proper use and safety of surveying equipment (e.g. Total Stations, GPS, Levels, etc.)
- Eagle Scout in the Boy Scout of America, Troop 1830 Cypress, Texas.
- Member of ASCE BYU Provo Chapter

KAYLEE BATEMAN

15 E 200 N Orem, Utah 84057 | (208)390-4544 | kayleedeebateman@gmail.com

EDUCATION

Bachelor in Civil and Environmental Engineering

Jan 2014-Present

Brigham Young University

- Cumulative GPA: 3.47
- Member of American Society of Civil Engineers
- Attended engineering study abroad in China with the BYU Engineering Department

WORK EXPERIENCE

Research Assistance

Oct 2016-Present

Dr. Fernando Fonseca

Provo, UT

- Developed a grout mixture with a specified strength
- Worked closely among other students and the professor, collecting and analyzing data

Civil Engineering Intern

May-Aug 2016

Engineering System Solutions (ES²)

Idaho Falls, ID

- Created concrete design spreadsheets for concrete shear, column interaction diagrams/loadings and beam moment analysis
- Utilized proprietary software from ES2 to check company designs with reinforced concrete
- Worked and coordinated with other project engineers to review projects for construction

Piano Tutor

Jan 2012-Jan 2014

Private

Idaho Falls, ID

- Provided private lessons for intermediate pianists

Sale's Associate

Jul 2012-May 2013

Real Deal's

Idaho Falls, ID

- Stocked inventory, operated cash register, sold goods

VOLUNTEER EXPERIENCE

Mentor

Aug 2016-Present

WE@BYU

Provo, UT

- Helped incoming female freshmen in engineering navigate their first semester at BYU
- Helped them have correct schedules with good professors and challenging workloads
- Helped mentees find resources that will lead them to success

Volunteer Teacher's Assistant

Aug-Dec 2013

Westerstede Elementary

Westerstede, Germany

- Helped German elementary children learn English
- Assisted the teacher with teaching and student behavior

ADDITIONAL

- Proficient in Smath and Excel
- Volunteer work in Germany, Guatemala, and Morocco