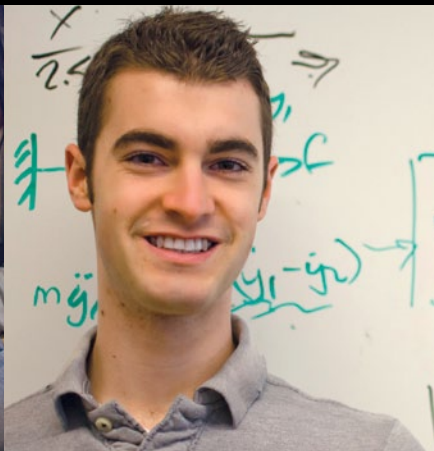


SEATTLE UNIVERSITY

Founded 1891



JUNE 7, 2013 // SULLIVAN HALL

SEATTLE UNIVERSITY PROJECT CENTER

PROJECTS DAY 2013



REAL PROJECTS REAL WORLD

Seattle University Project Center is pleased to partner with businesses, government agencies and nonprofit organizations regionally and nationally to bring real projects to our students. Student teams from the College of Science and Engineering and Albers School of Business and Economics work on projects in the fields of computer science and software engineering, electrical and computer engineering, mechanical engineering, civil and environmental engineering, as well as marketing, management, financial analysis, economics, international business, sustainable business and new business ventures. Our students graduate with real-world experience in their fields along with invaluable teamwork and communication skills that place them ahead of their peers. Companies benefit from fresh student perspectives, community outreach, academic partnerships and targeted recruitment.

WELCOME MESSAGES



Welcome to Projects Day 2013! We are glad that you are here to join the celebration. Today, you'll see for yourself what employers already know: our graduates have a strong understanding of fundamental principles and are excellent communicators. We are able to achieve these enviable results here at Seattle University because we keep our class sizes small, we give our students lots of rigorous homework, and we ask them to make presentations often. And then we cap it off with the Project Center experience, where our seniors work in teams, engage with external organizations, and apply the engineering skills they've learned to "real world" projects. It's clear that companies like what they see in Seattle University engineering and computer science students, because many of our graduates take full-time positions with the companies that sponsored their senior projects.

We are proud of our students and what they have accomplished. I encourage you to look through this program, identify some projects of interest, and attend the team presentations. If you have a question, fire away! I'm confident you'll be impressed with the ability of our graduates to think on their feet and talk about technical issues.

The Project Center is one of the jewels in the crown of the College of Science and Engineering. I want to thank the project mentors and the faculty advisors who have worked with the teams throughout the academic year. Most especially, I want to acknowledge the corporate sponsors who make it possible for us to provide our students with this terrific educational experience. Thanks to generous corporate support, we've created a strong tradition of excellence that will continue to serve our students, our corporate sponsors, and the workforce needs of the State of Washington.

Michael J. Quinn, Ph.D.
Dean, College of Science and Engineering



On behalf of the Albers School of Business and Economics, I want to welcome you to Seattle University's Projects Day 2013.

Like Science and Engineering students, Albers business students undertake real world projects as part of their programs. Their experiential learning comes in the form of consulting, market research, and various other business projects for organizations such as Costco Wholesale, REI, McKinstry, and many more. Sponsors want to solve problems, identify new processes, and target opportunities for growth. Albers MBA students, working in teams with faculty oversight, deliver top-notch findings and recommendations to the company.

While these projects have been part of the Albers MBA curriculum for many years, the Albers connection to the Project Center began in 2008 when the two schools agreed to collaborate as one central point for building partnerships linking Seattle University with businesses, government agencies, and nonprofit organizations throughout the Puget Sound region. We look forward to continuing cooperation between the schools and our community partners.

The business projects you will be seeing were undertaken in our International Business and New Ventures and Consulting classes. These projects represent over 23 that have been completed at Albers during this academic year.

Thank you for your support for these projects. Enjoy learning about them and getting to know the students involved.

Joseph M. Phillips, Ph.D.
Dean, Albers School of Business and Economics

SCHEDULE



12:15 – 1:00 PM

Check-in and Registration
Sullivan Hall, SU Law School

1:00 – 1:15 PM

Welcome to Projects Day 2013
Sullivan Hall, SU Law School

PRESENTATION SESSION 1 // 1:15 – 2:15 PM // SULLIVAN HALL, SU LAW SCHOOL

ROOM C5

CEE 13.6 KING STREET COOPERATIVE PRESCHOOL King Street Cooperative Preschool
Playscape Design

CEE 13.2 SEATTLE CITY LIGHT Diablo Dam Incline Lift Foundation Evaluation
and Retrofit

CEE 13.3 SEATTLE CITY LIGHT Seismic Evaluation of the Bothell Substation
Control Building

ROOM C6

ME 13.1 THE BOEING COMPANY Boeing Overhead Stowage Bin

ME 13.2 FLOW INTERNATIONAL Fixturing System for Water Jet Machines

ME 13.3 KENWORTH TRUCK COMPANY Kenworth Hybrid Truck Cooling

ROOM 109

CSSE 13.1 ALSTOM GRID Phasor View

CSSE 13.2 MICROSOFT STUDIOS OMG Digital Asset Repository

CSSE 13.3 PHILIPS HEALTHCARE Philips UltraSight: Ultrasound Video Transmission
to Tablets

ROOM 110

ECE 13.1 HONEYWELL Portable Data Loader

ECE 13.2 MC ELECTRIC VEHICLES Xebra Zap Car Improvement

ECE 13.3 PACCAR Onboard Computer/Communication Solutions for
Wind Measurement

2:15 – 2:30 PM

Break

PRESENTATION SESSION 2 // 2:30 – 3:30 PM // SULLIVAN HALL, SU LAW SCHOOL

ROOM C5

CEE 13.4 SEATTLE CITY LIGHT South Substation Control Building Seismic Assessment

CEE 13.1 HERRERA ENVIRONMENTAL CONSULTANTS, INC. Stormwater Runoff Treatment

CEE 13.5 SEATTLE PUBLIC UTILITIES Reduction of Flooding and Combined Sewer Overflows Using Real-Time Control

ROOM C6

ME 13.4 PATTERSON BIKE TRANSMISSION, ROSEBUD REBUILDS Bicycle Transmission Compatibility

ME 13.5 PATH Personal Monitor 2.5

ME 13.6 TSI INCORPORATED AND THE NATIONAL INSTITUTION FOR OCCUPATIONAL SAFETY AND HEALTH Near Real-time Silica Detection by Laser-Induced Breakdown Spectroscopy to Improve Miner Safety

ROOM 105

MBA PROJECT 13.1 PUTNAM PRICE Energy Performance Study

MBA PROJECT 13.2 PORT OF SEATTLE Sustainable Purchasing Program

MBA PROJECT 13.3 TOM BANGASSER Union Street Business Association

ROOM 109

CSSE 13.4 SNOHOMISH COUNTY PUBLIC UTILITY DISTRICT Business Intelligence for Regional Dialogue Slice (BIRDS)

MSE 13.1 RECREATIONAL EQUIPMENT INC. Price Change Management System

MSE 13.2 SCOUT ANALYTICS User Identification Service

ROOM 110

ECE 13.4 SEATTLE UNIVERSITY International Aerial Robotics Competition: Autonomous Aerial Robot

ECE 13.5 SEATTLE UNIVERSITY Small Hydro Electrical Generation Using a Waterwheel as the Prime Mover

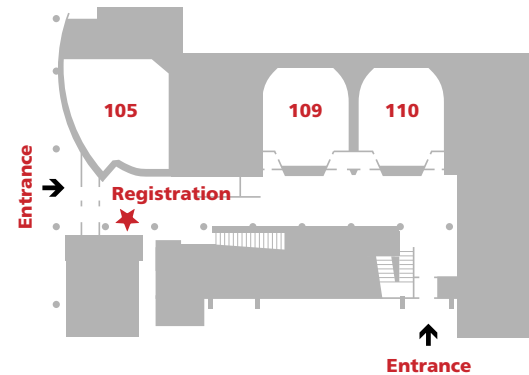
ECE 13.6 SNC LAVALIN THERMAL POWER Protective Relay Communications Verification and Logic Diagram Standardization

3:30 – 5:00 PM

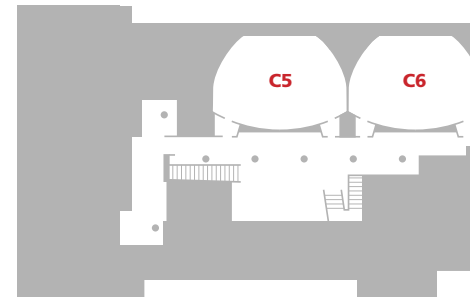
Projects Poster Session and Reception
Sullivan Hall, SU Law School

SULLIVAN HALL MAP

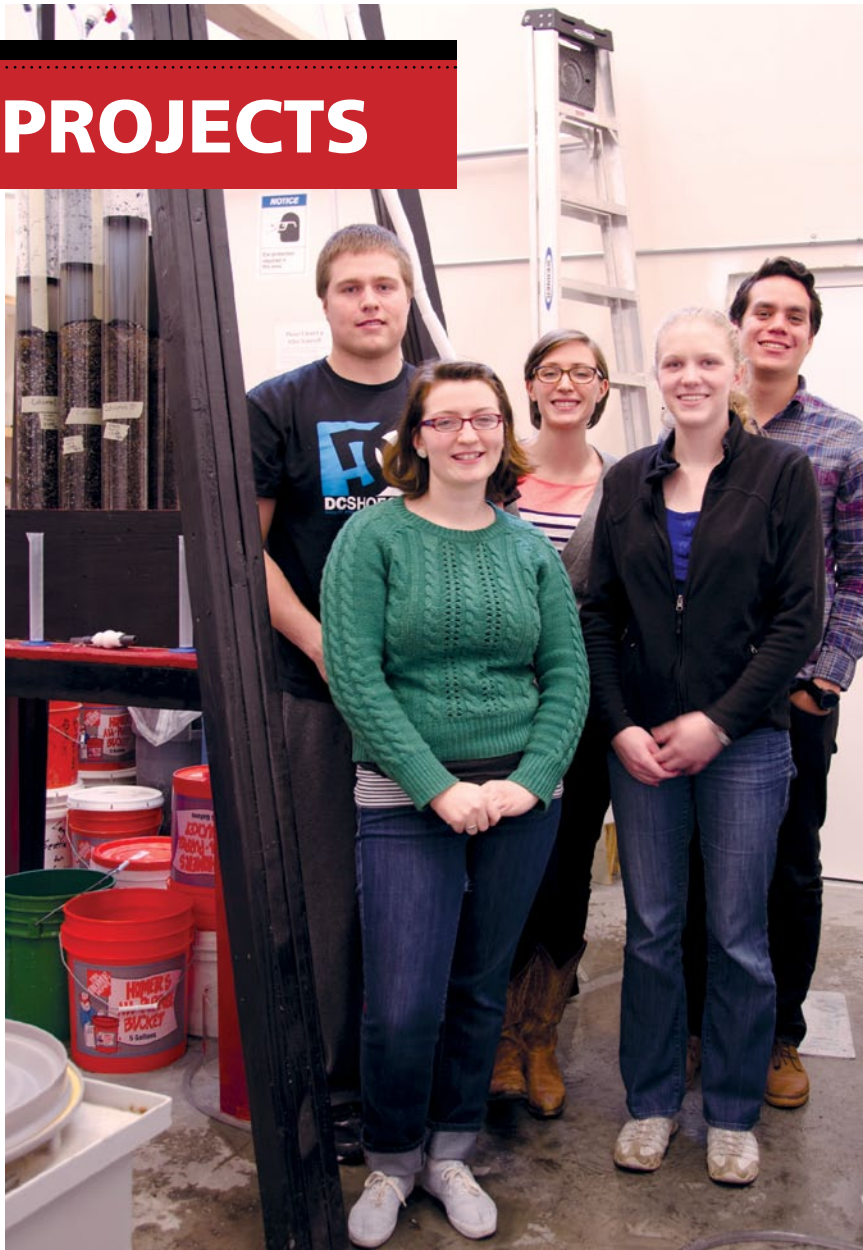
MAIN LEVEL



LOWER LEVEL



PROJECTS



CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 13.1 // STORMWATER RUNOFF TREATMENT

SPONSOR: HERRERA ENVIRONMENTAL CONSULTANTS, INC.

SPONSOR LIAISON: Dylan Ahearn, John Lenth

FACULTY ADVISOR: Prof. Carlos Herrera, PE

STUDENTS: Alyssa Ardourel, Maeve Cullen, Brandon Kizer, Alan Pani, Erin Shankel

In the Puget Sound region, urban development and associated increases in pollution-generating impervious surfaces have caused contaminant levels in stormwater runoff to rise, leading to impaired water quality in many receiving waters. To address this concern, the Washington State Department of Ecology (Ecology) establishes limits (benchmarks) on pollutant levels in stormwater runoff that can be discharged from industrial sites through the issuance of a National Pollutant Discharge Elimination System (NPDES) permit. In 2009, Ecology promulgated stricter benchmarks for some pollutants as part of a reissuance of the NPDES permit for industrial facilities. However, current Best Management Practices do not provide adequate treatment to reliably meet these new benchmarks. To address this need, Herrera Environmental Consultants, Inc. (Herrera) is exploring new stormwater filtration media and system designs for use at industrial sites. At the request of Herrera, Team CEE 13.1 designed a bench scale stormwater filtration system for testing a proprietary media mix developed by Herrera. The team also developed an experimental methodology for evaluating the performance of the media with this system under different hydrologic loading rates. Using the experimental results and existing design manuals, the team created a commercially viable stormwater filtration system that can be used at industrial sites to meet the new benchmarks.

CEE 13.2 // DIABLO DAM INCLINE LIFT FOUNDATION EVALUATION AND RETROFIT

SPONSOR: SEATTLE CITY LIGHT

SPONSOR LIAISON: Dan O'Sullivan, PE

FACULTY ADVISOR: Prof. Carla Keel, PE, SE

STUDENT: Ryan Blair, Nicholas Bleich, Tim Thorpe, Maxx Toyama

In 1927, the Diablo Incline Lift was constructed to extend a railroad to the mountainous construction site at Diablo Dam. During construction, building materials were hoisted up 340 feet at a 34° slope. The lift served as the only access to the site until the construction of Highway 20 in 1972. After completion of the dam, the Diablo Incline Lift remained an integral part of the Skagit Hydroelectric Project Tours, and was ridden by thousands of tourists until September 11, 2001 when it was

decommissioned due to security concerns. Seattle City Light (SCL) wishes to bring it back into service to provide redundant access to Diablo Dam in case Highway 20 becomes impassable due to landslides.

SCL requested CEE 13.2 to conduct a structural analysis of the foundation and cable anchors, and develop options for reactivating the lift. The concrete foundation of the incline lift is showing signs of weathering, and the structural integrity is unknown. Deliverables included results of the analysis, construction schedules, cost estimates and AutoCAD drawings. The proposed design meets the standards of the American Society of Civil Engineers (ASCE) 7-10 and the American Concrete Institution (ACI) 318-11, and complies with environmental and historic considerations.

CEE 13.3 // SEISMIC EVALUATION OF THE BOTHELL SUBSTATION CONTROL BUILDING
SPONSOR: SEATTLE CITY LIGHT

SPONSOR LIAISON: Owen Kohashi, PE, SE

FACULTY ADVISOR: Prof. Katherine Kuder, PE

STUDENTS: Kevin Aguilar, Philip Harezlak, Chris Padin

The Bothell Substation Control Building is a two-story reinforced concrete building constructed in 1950. The building, located in Mill Creek, WA, is one of fourteen substations owned and operated by Seattle City Light (SCL) and is responsible for distributing power throughout Seattle. As part of SCL's Seismic Hazard Program, the Control Building was identified as a critical structure with seismic vulnerabilities. SCL selected CEE Design Team 13.3 to conduct a detailed seismic evaluation of the Control Building. The design team analyzed the building according to industry standard procedures using ASCE 31 and 41. The team's key project tasks included identifying deficiencies, designing mitigations to address these deficiencies and developing a cost estimate to implement the mitigations. The final project deliverable was a detailed report of the findings, including calculations and drawings of the proposed mitigations.

CEE 13.4 // SOUTH SUBSTATION CONTROL BUILDING SEISMIC ASSESSMENT
SPONSOR: SEATTLE CITY LIGHT

SPONSOR LIAISON: Robert Cochran, PE, SE

FACULTY ADVISOR: Prof. Jhon Paul Smith, PE

STUDENTS: Amethyst Hecker-Johnson, Leslie-Ann Jorge, Robert Miller, Sean Morris

To ensure continued supply of power to the greater Seattle Area, Seattle City Light (SCL) initiated a program to assess the seismic performance of several of its

substations. The South Substation control building was constructed in 1937 before formal seismic provisions existed, leaving the seismic performance of the structure unknown. Major damage to the substation's control building could lead to extensive power outages in the south Seattle region.

Senior Design Team CEE 13.4 completed a seismic assessment for the control building of SCL's South Substation. The goal of the proposed rehabilitation strategies was to minimize the risk to structural and nonstructural building components that could compromise the functionality of the building after an earthquake. The assessment of critical structural and non-structural elements was carried out based on the American Society of Civil Engineers Standard for Seismic Evaluation of Existing Buildings (ASCE 31-03). A report containing a list of deficiencies, mitigation strategies, and cost estimates was submitted to SCL.

CEE 13.5 // REDUCTION OF FLOODING AND COMBINED SEWER OVERFLOWS USING REAL-TIME CONTROL
SPONSOR: SEATTLE PUBLIC UTILITIES

SPONSOR LIAISONS: Ben Marre, PE, George Schneider, PE

FACULTY ADVISOR: Prof. David Jacobs, PE

STUDENTS: Caitlyn Echterling, David Farr, Andrew McEwan, Lauren Oumaye

Seattle's Madison Valley is susceptible to flooding during extreme storm events and combined sewer overflows during moderate storm events. To address flooding within the valley, Seattle Public Utilities (SPU) constructed two large stormwater detention facilities. SPU asked Team CEE 13.5 to assess the feasibility of using the flood control facilities to address combined sewer overflows (CSO), which discharge untreated sewage and stormwater into Seattle's waterways. The project entailed the development and evaluation of different scenarios to reduce CSO events without compromising the facilities' primary purpose of flood control. The team assessed possible inputs for real-time control; including weather forecasts, real-time rain gauges, and depth of flow within the downstream pipes. The team developed a flow-control algorithm that would allow the facilities to adjust flow through the system based on the above real-time inputs. Finally, the team developed two physical designs of the flow-control gate and related components that would be implemented to replace the current passive gate control system.

CEE 13.6 // KING STREET COOPERATIVE PRESCHOOL PLAYSCAPE DESIGN

SPONSOR: KING STREET COOPERATIVE PRESCHOOL

SPONSOR LIAISONS: Jana Robins, Rickey Teh, NCARB, LEED AP

FACULTY ADVISOR: Prof. Debra Chinn, PE

STUDENTS: My Du, John Longbotham, Ian Pumo, Justin Reeves

King Street Cooperative Preschool (KSCP) provides early childhood education within shared space at St. Peter's Episcopal Church in Seattle's Central District. There is an outdoor play area that students use daily, rain or shine. The area is steeply graded with many rail-tie terraces at heights of one to three feet and has two 30-year-old wooden play structures. Safety is compromised by the steep terraces and poor sight lines, and there is inadequate storage space. KSCP requested that Team CEE 13.6 create a "playscape" design that integrates natural landscaping and new play structures. KSCP hoped to mitigate the issues of safety and storage while creating a natural environment with features to facilitate student development through interactive play. The design team created a master plan that provides design drawings and specifications for demolition, re-grading and new construction, as well as cost estimates and permitting recommendations. This master plan also included a schedule for construction phasing that accounts for KSCP's limited funding and reliance on volunteer-based labor.



COMPUTER SCIENCE

CSSE 13.1 // PHASOR VIEW

SPONSOR: ALSTOM GRID

SPONSOR LIAISONS: Manu Parashar, Gang Zheng

FACULTY ADVISOR: Prof. Eric Larson

STUDENTS: Russell Asher, Eric Hu, Huynh Nguyen, Ken Nicks

Alstom develops power grid software that allows engineers to monitor data coming from the power grids in the U.S. Alstom needed a tool to visualize the massive quantity of data collected from the power grid. Our team has developed a charting tool package called Phasor View that can provide the visual interpretation engineers need to easily view the data. Phasor View is able to do basic charting operations such as plotting multiple graphs and panning around each graph. It can also perform advanced operations essential to the visual precision that Alstom needs, such as zooming, smart axis recalibration, range selection, and data grouping. The tool is designed as a control that can be easily integrated into different applications.

CSSE 13.2 // OMG DIGITAL ASSET REPOSITORY

SPONSOR: MICROSOFT STUDIOS

SPONSOR LIASONS: Kent Foster, Jason Mangold, Stephane Morichere-Matte, Jonas Norberg

FACULTY ADVISOR: Prof. Richard LeBlanc

STUDENTS: Marsha Cherrisa, Joanna Hatter, Ivan Lee, Chris Whitten

Microsoft Studios needs their Game Designers to be able to quickly prototype new games through reuse of media files from previous game developments. Team CSSE 13.2 built a rich-media file storage solution in Microsoft's cloud-ecosystem called Windows Azure for the designers to quickly search and store media files from any computer with a connection to the World Wide Web. To promote ease-of-use and asset visualization, the team constructed the application from scratch using modern web technologies such as HTML5, JavaScript, and Node.js. The team designed the system in Windows Azure to assure mechanics are in place to dynamically reallocate any space needed in the future without any administration or maintenance.

CSSE 13.3 // PHILIPS ULTRASIGHT: ULTRASOUND VIDEO TRANSMISSION TO TABLETS

SPONSOR: PHILIPS HEALTHCARE

SPONSOR LIAISON: Rob Trahms

FACULTY ADVISOR: Prof. Jeff Gilles

STUDENTS: Feras Aldahlawi, Victor Cornet, Nichole Minas, Ray Powers, Tsung-Han Wu

Philips Healthcare, a leader in ultrasound imaging, designs ultrasound systems used all over the world. Team 13.3 was asked to develop a system to allow ultrasound scans to be remotely displayed in real-time on doctors' tablets. The team created a telepresence solution using modern mobile technologies, imagery acquisition, video encoding, and transmission over a secure wireless network. The product improves doctors' efficiency because it reduces the travel time between patients, thus maximizing the number of patients a doctor can ultimately visit. It also gives Philips a competitive advantage by adding telepresence technology to current and future products.

CSSE 13.4 // BUSINESS INTELLIGENCE FOR REGIONAL DIALOGUE SLICE (BIRDS)

SPONSOR: SNOHOMISH COUNTY PUBLIC UTILITY DISTRICT

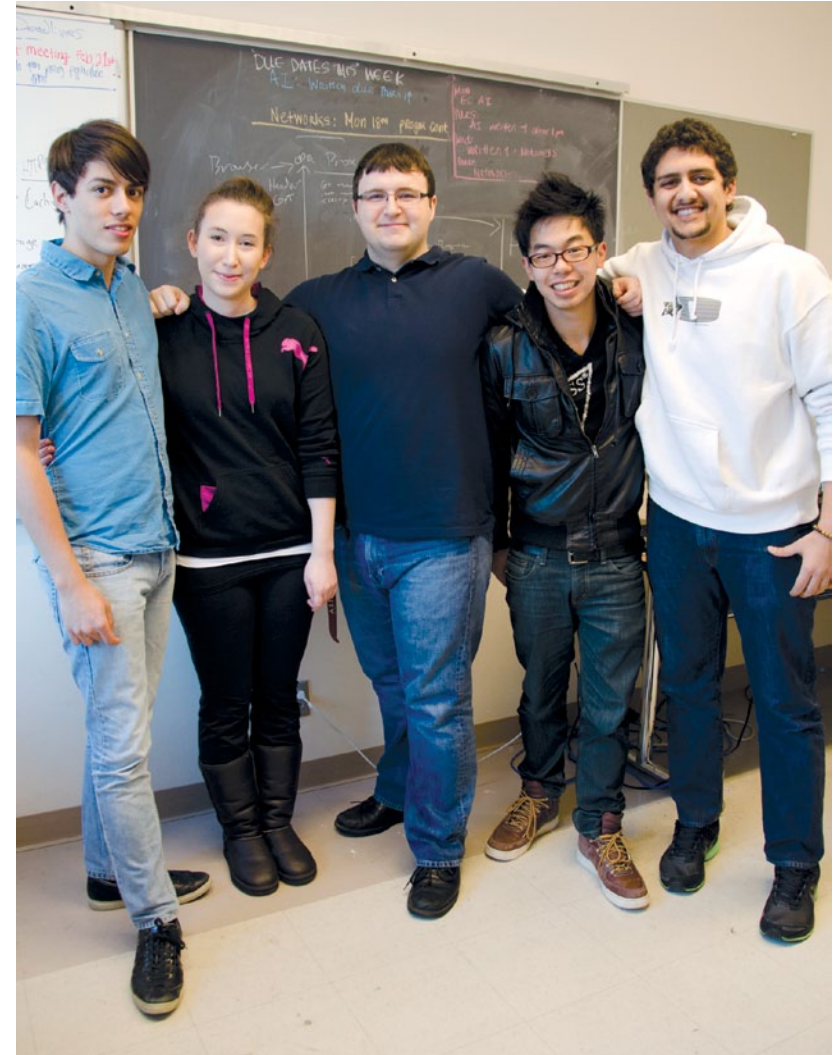
SPONSOR LIAISON: Doris Payne

FACULTY ADVISOR: Prof. Jeff Gilles

STUDENTS: Ho-Ching Chu, Alexandra Gaspar, Josh Gummersall, Ken Ordon, Cong Trinh

Snohomish County Public Utility District (PUD) provides electrical power to its customers, with the majority of the power purchased from the Bonneville Power Administration (BPA). BPA produces power by operating six hydro projects (i.e., dams) on the Columbia River. This power is then sold to multiple PUDs with Snohomish being just one client. Each PUD has to generate a schedule of the amount of power they are requesting from the BPA projects. The Snohomish PUD tracks the usage of their virtual piece of the river using hydro scheduling to see if they can meet their customer needs with their specific allocation from the BPA. Currently, Snohomish has an abundance of hydro scheduling data (such as actual power used versus projected requirements) but it is not organized in a manner conducive to analysis or presentation.

The team's overall goal was to provide a method to move this growing data into a data mart that would be easily analyzed by a variety of tools. The team wrote an ETL process to move the data into a dimensional model that would allow flexible analysis along multiple dimensions. This model will analyze historical trends to help make better future power-buying predictions. The team then provided analytical viewing of the data through various Microsoft analysis tools such as Power Pivot. This new design allows Snohomish PUD to generate reports regarding simulated and real data, aiding their future decisions when making power requests.



MECHANICAL ENGINEERING

ME 13.1 // BOEING OVERHEAD STOWAGE BIN

SPONSOR: THE BOEING COMPANY

SPONSOR LIAISON: Chris Schwitters

FACULTY ADVISOR: Prof. Bob Cornwell, PE

STUDENTS: Owen Bley-Male, Michael Boushy, Steven Culp, Steve Konkel

The Boeing Company is the world's largest producer of commercial aircrafts. The company is currently working on a next generation passenger jet, and would like to improve the design of their overhead stowage bin mechanics. The company asked team ME 13.1 to design a new system that is able to assist the user by reducing the force required to close the bin. The team designed a device that separates the rotation and translation components of the closing motion, and provides lifting assistance for translation. The new bin significantly reduces the amount of force needed to close the bin when it is full of luggage.



ME 13.2 // FIXTURING SYSTEM FOR WATER JET MACHINES

SPONSOR: FLOW INTERNATIONAL

SPONSOR LIAISON: Victoria Templora

FACULTY ADVISOR: Prof. Frank Shih

STUDENTS: Max Cerami, Greg Evansco, Vince Meng, Bram Rusk

FLOW International produces water jet machines that can cut complex shapes from any material, with a thickness of up to two feet. The water jet machines currently do not have a suitable fixturing system. The fixturing system would reduce vibration and allow the machines to cut materials at their designed accuracy. The company tasked the team to design a fixturing system that can be included with the machine. This will allow their customers to have a reliable way to improve the quality of cut parts. The team designed a fixturing system that is simple, easily replaceable, and can be fabricated by FLOW water jet machines. The system is also made of a non-corrosive material to improve its service life in the wet environment.

ME 13.3 // KENWORTH HYBRID TRUCK COOLING

SPONSOR: KENWORTH TRUCK COMPANY

SPONSOR LIAISON(S): John Duffy, Alec Wong

FACULTY ADVISOR: Prof. Yen-Lin Han

STUDENTS: Laura Bower, Ellison Iseri, Ty-Aaryn Kuaiwa, Charles White

As a leader in innovating and manufacturing of heavy-duty commercial trucks, Kenworth has developed a micro-turbine combustion/electricity hybrid system that includes a generator inverter, motor inverter, battery packs, accessories, and an electric motor. In addition to the cooling requirement of the micro-turbine, these electronic components alone demand 6 to 7 kW of cooling power. Currently, the entire cooling system adds over 500 lbs, which significantly compromise the fuel economy and increases the cost to a truck. Kenworth commissioned Team ME 13.3 to investigate alternative cooling methods that can improve the effectiveness of the cooling system by reducing its weight, cost, and size. The team proposed and developed a prototype heat exchanger using phase changing materials (PCM) to provide adequate cooling while collecting the waste heat for other uses. Recommendations for incorporating PCM heat exchangers in Kenworth hybrid trucks were provided to the company.

ME 13.4 // BICYCLE TRANSMISSION COMPATIBILITY

SPONSOR: PATTERSON BIKE TRANSMISSION, ROSEBUD REBUILDS

SPONSOR LIAISON: Chris Cameron, Sam Patterson

FACULTY ADVISOR: Prof. Mike Larson

STUDENTS: Arkadius Ciesilk, Todd Graveson, Andrew Duffy Stiens, Kyle Vanderstoep

There are three major bicycle drivetrain manufacturers: SRAM, Shimano, and Campagnolo. Each produce shifters and derailleurs that are not compatible with their competitor's products. The team was tasked with the design and construction of a test device that will determine the amount of cable pulled by each company's shifter, and the amount of cable movement required by each company's derailleur to shift gears. The team designed and constructed two prototype test devices that produce reliable and repeatable shifter and derailleur data. This device is capable of collecting data while installed on a typical bicycle, with output sent directly to an analysis program on a tablet or notebook computer. Output from this device was used to create a replacement part for a SRAM shifter, allowing this shifter to actuate a Shimano derailleur. The team also developed plans to extend this method to achieve compatibility across the remaining shifters and derailleurs. All design documents for the testing device, the replacement parts in shifters, and the data processing program will be made freely available to the bicycling community.

ME 13.5 // PERSONAL MONITOR 2.5

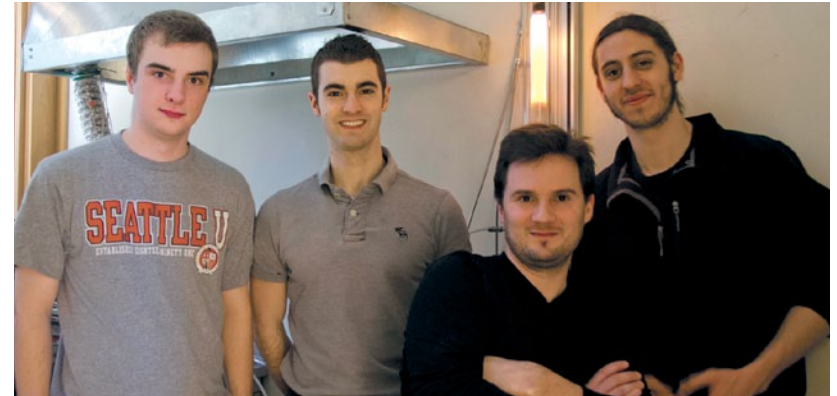
SPONSOR: PATH

SPONSOR LIAISON: Andy Beddoe

FACULTY ADVISOR: Prof. Greg Mason, PE

STUDENTS: Alonso Hotrum, Nicholas Hryciuk, Miguel Moreno, Riley Smith

Indoor air pollution is a worldwide issue that causes 1.9 million deaths annually. In developing countries, combustion particulates from open-flame cook stoves are believed to account for much of the indoor air pollution. Open-flame stoves are prevalent due to their low cost and versatility as both a cooking appliance and as a source of indoor heat. The goal of team ME 13.5 was to develop a low cost system that can be used to monitor indoor air pollution stemming from cook stoves. Testing and research conducted by ME 13.5 revealed that nearly 90% of the combustion particles from cook stoves, independent of fuel source, have a diameter below 1.0 μm . To detect these particles in low concentrations, the team designed a prototype monitoring system based on a typical household smoke detector. The team then determined the feasibility of fabricating a low cost version that can be used for research on cook stove combustion. The laser, detector and data acquisition hardware are combined in a package smaller than a household smoke detector.



ME 13.6 // NEAR REAL-TIME SILICA DETECTION BY LASER-INDUCED BREAKDOWN SPECTROSCOPY TO IMPROVE MINER SAFETY

SPONSOR: TSI INCORPORATED AND THE NATIONAL INSTITUTION FOR OCCUPATIONAL SAFETY AND HEALTH

SPONSOR LIAISON: Gregg Lithgow (TSI), Steve Buckley (TSI), Arthur Miller (NIOSH)

FACULTY ADVISOR: Prof. Christopher Stipe

STUDENTS: Aaron Baker, Sam Butler, Alyssa Philipps, Tim Venable

TSI Inc., an industry leader in design and manufacture of measurement instruments for fluid flow and particulate matter characterization, is expanding its product line to chemical analysis instruments using the Laser-Induced Breakdown Spectroscopy (LIBS) technique. LIBS uses a high-powered laser to generate a plasma on the surface of a sample. Light emission from the plasma is characterized with a spectrometer from which the elemental composition of the sample is determined. The National Institute of Occupational Safety and Health (NIOSH) is exploring new measurement techniques to monitor airborne silica in underground coal mines. Excessive silica exposure causes silicosis, an incurable lung disease. Current monitoring techniques take several weeks to return laboratory results. TSI and NIOSH requested team ME 13.6 design, prototype, and test a portable instrument to monitor airborne silica. The instrument works by depositing airborne particles onto a filter tape. Approximately every 5 minutes, the filter tape collects and transports silica particles to be later examined by LIBS. The instrument has a limit of quantification around 0.5 $\mu\text{g}/\text{cm}^3$ and uses a passively q-switched laser, single channel spectrometer, pneumatic-intake plenum, and reel-to-reel translation system.

ELECTRICAL AND COMPUTER ENGINEERING

ECE 13.1 // PORTABLE DATA LOADER

SPONSOR: HONEYWELL

SPONSOR LIAISON(S): Sharon Eaglestone, Roger Harper, Sandra Howe-Ryberg, Gary Kersten, Kendall McAdams

FACULTY ADVISOR: Prof. Alvin Moser, PE

STUDENTS: Karim Farraj, Steven Kirbach, Caitlin Ryberg, John Soklaski

Honeywell Aerospace is currently working on a project to improve the data load process to their onboard airplane flight recorders. The goal is to implement a portable data loader (PDL) that loads software parts to the airborne computers through an Ethernet cable. The portable data loader is based on Honeywell's existing extended Hand Held Download Unit (eHDDL). The team is extending the eHDDL's capabilities to implement the ARINC 615A specifications; the three main components that the team is developing are the graphical user interface, the protocol layer for interfacing with the airplane, and a cable prototype to connect the PDL to the airplane. By completing this project, the team has provided Honeywell with a Portable Data Loader that has increased usability due to the small handheld size and the ability to use modern media devices. This development for Honeywell will assist airplane maintenance crews in updating the software parts more quickly and easily than with the current solution.

ECE 13.2 // XEBRA ZAP CAR IMPROVEMENT

SPONSOR: MC ELECTRIC VEHICLES

SPONSOR LIAISON: Jim Johnson

FACULTY ADVISOR: Prof. Robert Heeren

STUDENTS: Hamza Bennani, Melanie Burkhardt, Dustin Foster, Timothy Matthews

MC Electric Vehicles donated two electric Zap Xebra cars to Seattle University to be used in a senior project; one is mechanically sound and was used to make the final working vehicle. The other vehicle is electrically sound and was used for parts. The purpose of the project is to create a running vehicle between the two donated cars and improve upon the design of the vehicle. The final working vehicle will then be donated to Seattle University to use in whatever way the University would like. The vehicle was restored to a working condition and improved by using a Lithium battery system rather than a lead acid battery system. This reduced the weight of the vehicle by approximately 300 pounds, which increased the range of the vehicle. Furthermore, the life cycle for battery replacement increased from a range of one to two years, to a range of five to six years, reducing the overall cost of maintenance.



ECE 13.3 // ONBOARD COMPUTER/COMMUNICATION SOLUTIONS FOR WIND MEASUREMENT

SPONSOR: PACCAR

SPONSOR LIAISON: Mark Fredrickson

FACULTY ADVISOR: Prof. Paul Neudorfer

STUDENTS: Sam Atkinson, Marvin Karugarama, Michael Lindberg, Anh Ta

PACCAR designs and builds customized trucks for customers worldwide. The company is currently investigating means to improve the fuel efficiency of their trucks by minimizing the influence of wind drag. Accurate wind measurements will allow for vehicles to be operated at optimum speeds that improve fuel efficiency. The company asked the team to design and build a wind measurement system that can be mounted on a truck. The team designed a system using wind speed sensors and a wind vane for measuring wind speed and direction. The sensors are controlled using a FEZ Cobra II electronic control unit, which communicates with the other electronics on the truck through the vehicle's CAN bus.

**ECE 13.4 // INTERNATIONAL AERIAL ROBOTICS COMPETITION:
AUTONOMOUS AERIAL ROBOT**

SPONSOR: SEATTLE UNIVERSITY

SPONSOR LIAISON: Prof. Alvin Moser, PE

FACULTY ADVISOR: Prof. Kevin Lybarger

STUDENTS: Hesham Alsaedi, Hieu Le, Stuart Pflugrath, Christopher Reeder

The International Aerial Robotics Competition's (IARC) goal is to encourage universities throughout the world to engage in unmanned aerial robotics research. This year, IARC's mission consists of designing and building an aerial robot capable of completing a number of tasks, including autonomous navigation of an office building, retrieval of a flash drive, and recognition of signs. The team will participate in the IARC and is designing a quad-copter that is capable of meeting the competition objectives. The team's quad copter design incorporates laser and ultrasonic rangefinders, as well as image processing, mapping, and localization algorithms, which enables the quad copter to navigate into a room and locate and retrieve a flash drive.



**ECE 13.5 // SMALL HYDRO ELECTRICAL GENERATION USING A WATERWHEEL AS
THE PRIME MOVER**

SPONSOR: SEATTLE UNIVERSITY

SPONSOR LIAISON: Mark Beggs, Meghan Reha, Renee Vandermause

FACULTY ADVISOR: Prof. Steve Szablya, PE

STUDENTS: Nowell Ancheta, Jeremy Deibell, Colin O'Brien, Andrew Sprenger

Seattle University has sponsored several senior design projects focused on humanitarian work in Zambia. In 2009, a design team created a water wheel that was used to pump water from the Zambezi River. Seattle University has asked the team to modify the existing water wheel to generate electricity using its rotational energy. The electrical power generated will be used to charge batteries for various applications. Extensive testing of a permanent magnet motor was conducted to determine its feasibility as a generator, the resulting power characteristics, and an electric model. Testing also determined the optimal generation speed, transmission design, and load profile for the system. The design was constrained to parts obtainable in Zambia, so team members as well as major design contributors, could implement the design in Zambia shortly after graduation.

**ECE 13.6 // PROTECTIVE RELAY COMMUNICATIONS VERIFICATION AND LOGIC
DIAGRAM STANDARDIZATION**

SPONSOR: SNC LAVALIN THERMAL POWER

SPONSOR LIAISONS: Bryan Brennan, John Millikin, Bob Wilson

FACULTY ADVISOR: Prof. Henry Louie

STUDENTS: Aaron Fitch, Chuong Ho, Tristan Lafferty

SNC Lavalin specializes in the design, construction and commissioning of thermal power plants and substations. Protective relays are the devices that monitor and protect the equipment in these facilities from damaging short-circuits and other abnormal conditions. It is therefore critical that they operate appropriately. IEC 61850 is a new Ethernet communications standard that simplifies and streamlines the communication between relays, even those from different manufacturers. Before SNC Lavalin adopts this standard, they need to know the feasibility and practicality of using IEC 61850. Team ECE 13.6 designed a test system and programmed several relays from various manufacturers to investigate and validate IEC 61850 as a practical standard for inter-relay communication. The design team provided SNC Lavalin with extensive test results, including relay response times.

MASTER OF SOFTWARE ENGINEERING

MSE 13.1 // PRICE CHANGE MANAGEMENT SYSTEM

SPONSOR: RECREATIONAL EQUIPMENT INC.

SPONSOR LIAISON(S): Aaron Abrams, Shawn Christie, George DeRuyter, Carrie Larsen, Kevin Peterson, David Robb, Julie Tieman

FACULTY ADVISOR: Prof. Roshanak Roshandel

STUDENTS: Sharada Hosur, Thaison Nguyen, Padmini Vedula

Price Change Management System (PCMS) is a software application to help REI perform their routine price changes efficiently. REI's competitive pricing tends to change on a weekly basis, especially during special events or holiday sales. Currently, the price change process is manually performed and is labor-intensive resulting in an overhead to the store management. PCMS is a tool aimed at (1) increasing the speed and accuracy of the price change process, (2) using fewer employees, and (3) providing real-time reporting. The application is accessed through a web browser on a mobile browser (Mobile Selling Assistant - iPod touch), where the employees can view price change tasks assigned to them, and implement and update the changes. It is also accessible through a desktop browser, where the managers can view price change reports and assign tasks and track progress.

MSE 13.2 // USER IDENTIFICATION SERVICE

SPONSOR: SCOUT ANALYTICS

SPONSOR LIAISON: Mario Angelier, Bill Frenchu, Will Rau

FACULTY ADVISOR: Prof. Adair Dingle

STUDENTS: Ayman Almadhoun, Dhaval Maru, Mark Schaake, Ishita Thakur

Scout Analytics provides a managed revenue intelligence service that enables information services, media publishing and software-as-a-service (SaaS) companies to maximize their online revenue and profits. The company is currently leading solutions that enable SaaS companies to leverage usage data to minimize churn and maximize customer lifetime value. Scout Analytics asked the SU team to build a Web API service to resolve IP Address and Domain into meaningful firmographics. Using the Agile development methodology, the team constructed an extensible architecture, a streamlined design model and effective quality firmographics to handle data from different sources. User Identification Service serves to minimize manual workflow to flag/suspect an entity as "ISP / NotISP / Duplicate" with additional Cache and Configuration management features.

MASTER OF BUSINESS ADMINISTRATION

MBA PROJECT 13.1 // ENERGY PERFORMANCE STUDY

SPONSOR: PUTNAM PRICE

FACULTY ADVISOR: Dr. April Atwood

STUDENTS: Kari Lio and Sucharita Kar

Commercial buildings consume large amounts of energy, incurring significant economic cost and causing long-term environmental effects. Energy efficiency data is therefore a valuable comparative indicator for the property market. In the past few years, policies have been enacted to encourage building owners to measure, report and benchmark energy usage. Benefits of energy benchmarking for buildings include potential increases in property value and rental prices, cost savings due to lower energy use, increase in energy efficient investments and reduced CO2 emissions. In this study we have identified the necessary steps to move from label disclosure to fully informed buyers and renters, focusing on how accessible, accurate, understandable and comparative energy data can be used by players in the property market when making investment decisions.

MBA PROJECT 13.2 // SUSTAINABLE PURCHASING PROGRAM

SPONSOR: PORT OF SEATTLE

FACULTY ADVISOR: Professor Robert Spencer

STUDENTS: Alexander Klemm, Swapna Ananth

Port of Seattle is a port district that runs Seattle's seaport and airport. Port asked our team to review their policy for sustainable procurement of goods and services that was established in 2009. The team studied the current policies of the Port purchases through their internal documents, in-depth interviews with employees responsible for procurement and also by benchmarking Port's practices with that of other industry's sustainable procurement practices. The team identified two biggest improvements to their policy. The first being increasing the usage of existing databases to include greener options along with training adds immense value to procurement personnel. The second biggest impact the team was able to bring to Port is to identify how they can adopt the current metrics used in other industries engaging in sustainable purchasing and also help Port to track the savings generated through such measures.

**MBA PROJECT 13.3: // UNION STREET BUSINESS ASSOCIATION
SPONSOR: TOM BANGASSER**

FACULTY ADVISOR: Professor Robert Spencer

STUDENTS: Steve Monahan, Greg Buchanan, Jason Lee

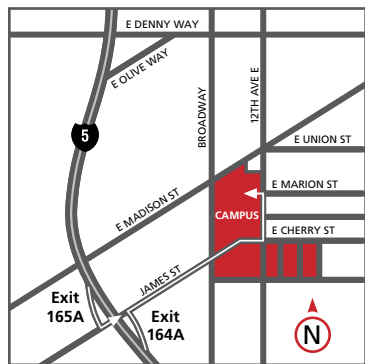
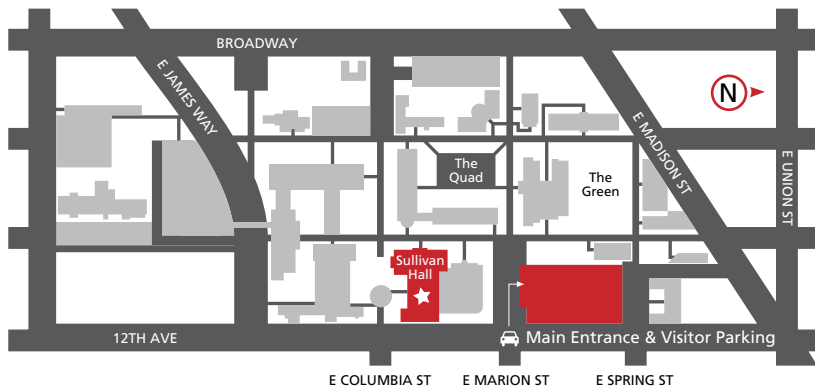
The Union Street Business Association (USBA) is a local non-profit neighborhood business association that formed to promote community development in the 23rd and East Union St. neighborhood (Union St 98122). This multi-cultural neighborhood, in Seattle's Central District, is poised for revitalization, yet concern exists about losing the neighborhood's identity. To avoid this loss, the USBA is seeking community participation in this revitalization. To assist the USBA, the team was tasked with facilitating two community meetings, as well as developing a working draft of a neighborhood "vision" and strategic plan. The team worked with members of the USBA to host two community meetings. The first meeting was to engage this multi-cultural neighborhood and provide a forum for concerns and desires around the area's upcoming development. The second meeting was to report back the range of views in the neighborhood, as well as some 'commonalities' that represent potential initiatives for neighbors to pursue through the USBA. The team also worked with members of the USBA to create a neighborhood "vision" and working draft of a strategic plan that incorporated community 'views' and desires to participate in this area's revitalization.

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- Take exit 165A to James Street
- Left onto James Street
- Left onto 12th Avenue
- Left onto East Marion Street

FROM THE SOUTH

- Head north on 1-5
- Take exit 164A to James Street
- Right onto James Street
- Left onto 12th Avenue
- Left onto East Marion Street



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