Design Proposal

Storm Water Management for Hoover Creek Watershed

Prepared for

The National Park Service - Herbert Hoover National Historic Site
And
Sherry Middlemis-Brown, MWR Biologist

Aaron Gwinnup, Project Manager
Matthew Corcoran
Hannah Fleck
Jon Lamb
Matthew Moore

March 1, 2010

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To: Prof. Larry J. Weber, Prof. A. Jacob Odgaard

From: Aaron Gwinnup

RE: Design Proposal Submittal

Date: March 1, 2010

Dear Professors Weber and Odgaard,

We at EPIC Engineering propose to design storm water runoff attenuation strategies for the National Park Service – Herbert Hoover National Historic Site as requested in RFP: 53:084-S2010 Project: "Storm Water Management Hoover Creek".

Attached is a detailed design proposal document providing the following information:

- Background Information
- Project Objectives
- Challenges and Concerns
- Specific Task Descriptions
- Management Plan and Resource Allocation Guide
- Explanation of EPIC Qualifications
- Project Budget and Gantt Schedule

We are excited to offer our design services for this project. If you require any further information, please do not hesitate to ask. Thank you for your interest in EPIC Engineering.

Sincerely,

Aaron Gwinnup
Project Manager
EPIC Engineering

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Executive Summary

The Herbert Hoover National Historic Site is located in West Branch, Iowa. The site is the preserved location of President Herbert Hoover's boyhood home, as well as President and Mrs. Hoover's burial site and memorial. The grounds contain an 80+ acre restored tallgrass prairie, wooded lawns, and developed areas with buildings and parking lots. The focus of our study revolves around slowing precipitation runoff in the watershed of Hoover Creek, which runs through the park.

The traditional method of collecting runoff and sending it to storm drains, then to the creek quickly is no longer desired. Flash flooding is occurring on a yearly basis and is threatening many of the buildings on site. Recent changes in the hydrodynamics of the watershed have exacerbated flooding issues by increasing peak stream flow and reducing the time in which the peak occurs. These changes include development associated with the Historic Site, but also a recent housing development upstream from the park, and surface runoff from the surrounding streets and buildings of West Branch. In addition there is runoff from the prairie that is expedited by previously existing buried drainage tiles.

The Client (Sherry Middlemis-Brown of the National Park Service) would like EPIC Engineering to develop a plan that will refocus the current storm water management plan. The Client has expressed an interest in pursuing a more modern, progressive storm water management plan that would focus on runoff rate attenuation, and enhanced soil infiltration. Attenuation and infiltration can be achieved by creating areas which are designed to absorb water such as rain gardens and bio-swales, paving with pervious surfaces, installing rainwater collection-and-reuse systems and retrofitting green roofs. The Client wants to ensure that the entire site retains its "dignified setting" for the former president, which also means disturbing the site as little as possible.

EPIC engineering will evaluate the site by assessing runoff volume using the Rational Method, mapping and modeling the watershed using Geographic Information Systems (GIS) and researching existing soil conditions for achievable infiltration rates, as well as investigate existing causes of flashy runoff. EPIC Engineering will ultimately deliver three design alternative packages consisting of combinations of solution strategies. This proposal includes the details of how the EPIC engineers will develop these strategies, including task descriptions, effort allocation plans, design budget projections and more.

The team at EPIC Engineering appreciates the opportunity to provide solutions for this project. We believe that with the right storm water management plan the Herbert Hoover National Historic Site can not only be less flood prone, but also can be a demonstration site for progressive rainwater collection and management.

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Introduction and Background

Introduction

EPIC Engineering is submitting a proposal in response to the Request for Proposals: "Project: 53:084-S2010 Storm Water Management Hoover Creek". This proposal indicates how EPIC Engineering intends to meet the objectives set forth, and provides a project design budget and critical path schedule for producing recommendations. Ultimately EPIC will produce three alternative design packages, each consisting of a multi-faceted approach to slow precipitation runoff and enhance soil infiltration. The final recommendations will be submitted for consideration by the National Park Service representatives including Sherry Middlemis-Brown (hereafter referred to as "the Client"). Engineering is focused on utilizing Low Impact Development Techniques to promote infiltration of storm water, and reduce surface runoff into Hoover Creek.

In addition to the three package options, the Client will receive the cumulative information generated in the process of investigating the feasibility and effects of these designs. This information will be of use to the Client in producing internal paperwork and proposals for funding, which require an exploration of solution alternatives.

EPIC Engineering Background

EPIC Engineering is comprised of five civil and environmental engineering students from the University of Iowa. Aaron Gwinnup, the project manager, has an abundance of experience in water quality, pollution mitigation and project management. He is flanked by Matthew Corcoran, Hannah Fleck, Jon Lamb, and Matthew Moore. Matthew Corcoran has experience in traffic engineering and site construction. Hannah is focused on Urban and Regional Planning, as well as a background in water and sanitation issues. Jon is focused on structures and has experience in site construction. Matthew Moore is studying water resources engineering and has

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a background in flood modeling. EPIC uses its diverse background to tackle projects from all sides and reach the "Pinnacle of Design".

Site Background

The Herbert Hoover National Historical Site is home to the birthplace of Herbert Hoover, the Herbert Hoover Presidential Library and Museum, the gravesite of the President and Mrs. Hoover, over 80 acres of restored tall grass prairie, and many other historical buildings. Hoover Creek runs through the northern half of the park, and is plagued with problems such as poor water quality, flash flooding, and erosion. The Client has plans in various stages of execution to solve these problems including a major stream rehabilitation project which is scheduled to be conducted in 2013.

The Client has released a Request for Proposals in order to develop a plan for attenuating runoff from the park surfaces. The park has developed areas such as roads, parking lots and buildings, as well as different types of planted surfaces such as lawns, prairie, and extensive landscaping. The goal of the project is to slow rainwater down in its progress to Hoover Creek, as well as to mitigate contamination and promote infiltration of rainwater into the groundwater system. The Client requires that any and all designs comply with National Park Service policies and procedures, as well as the National Historic Preservation Act. These regulations prevent unnecessary disturbance of the historic and archeological integrity of the site.

The existing storm water management system includes drainage ditches, drop boxes, storm sewers, sump pumps and downspouts on the buildings, as well as overland flow across lawns. Most of the runoff currently runs directly into Hoover Creek via several existing drainage lines and small diameter storm sewers (none greater than 18" diameter). The representatives of the Hoover site would like to pursue a more progressive method of runoff management. The guiding paradigm is that rainwater should be retained where it falls, percolating into the soil instead of running as quickly as possible to Hoover Creek where flash flooding has caused severe damage to the riparian zone adjacent to the creek. Several buildings on the site have

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flooded numerous times recently as well, reducing the rate of peak flow in the creek would reduce the risk and damage to these structures.

Design Objectives

The EPIC Engineers identified a specific list of design objectives. The overall objective was to employ "Low Impact Development" techniques to attenuate the surface runoff of storm water into Hoover Creek. This includes retrofits to the existing infrastructure and the incorporation of Best Management Practices ("BMPs"), as identified in the Iowa Storm Water Management Manual. These techniques would also help reduce flash flooding and improve water quality in the stream. They would encourage retention and infiltration of storm water, and the techniques and structures would also complement the 2013 stream rehabilitation project.

One Park Service staff member (Michael Edwards) indicated during a walking tour several areas that could use improvement. Mr. Edwards pointed out that most building downspouts go directly to the storm drains, which lead to Hoover Creek. Many houses in the "Core", which is a historic streetscape lined with period houses, have downspouts which drain directly onto the ground at the base of each house, or to existing storm drains.

The Client would like an assessment of the crushed-rock streets that transect the Core for potential resurfacing projects. Improved streets would be both permeable and accessible to visitors with disabilities. Many of the gravel streets have pre-existing storm drains and embedded drainage tile that accelerate runoff. Mr. Edwards indicated that rain gardens were preferred over bio-retention cells in this area due to the manicured nature of the area.

Another area mentioned by the National Park Service staff was an open area of bluegrass lawn southwest of the Presidential Library that is used for "HooverFest" activities every year. Water drains off of the nearby tallgrass prairie, through an existing basin-shaped depression, then runs through a culvert and out onto the lawn. Although the surface is graded to drain very

quickly, the staff would like to slow the rate of runoff to the lawn. To that end, they would like to explore the concept of a adding a weir to the culvert inlet to control flow from the natural basin.

Numerous other areas where runoff is concentrated then released as overland flow were also mentioned. All designs must revolve around the concept of a "dignified setting" which is the guiding principle at a presidential memorial site. The EPIC Engineers believe that this can be achieved with well designed retention areas, rain gardens, and other naturalistic landscaping features.

Challenges and Concerns

The major challenges for this project will be creating designs that not only meet all of the Client's requests, but also abide by all policies and regulations that have domain over this special site. In addition to any relevant building codes and standard practices, many considerations for historical and archaeological integrity must be made. The design team will compile a list of the relevant regulations and compare each design to the pertinent policies before recommendation.

Another challenge lies in applying recent runoff management techniques while maintaining the integrity of the site. The staff stressed that the design should include minimal unnecessary disturbance of virgin soil; areas of the site that have been previously altered are considered less critical. Developing strategies to promote the infiltration of water into the soil while minimizing new soil disturbance may pose a significant challenge.

Because the park is a National Historic Site, the location of a US presidential museum, and the location of Herbert and Lou Hoover's graves, there is a standing requirement that all modifications and designs maintain and provide a "dignified setting", especially in the close proximity of the museum and gravesite areas. All design efforts must concentrate on aesthetics as well as functionality, but aesthetics muse predominate at this location.

The same principles will apply during the construction phase of any recommendations because the park will remain open as usual. Contractors must "minimize their presence" at all times and maintain a clean, presentable appearance for visiting guests and park users.

Construction oversight will focus on timely progress as well as tidy execution, and presentable appearance.

Design Tasks

The following section is a list of individual tasks that the team expects to conduct during the design process. Each task is briefly described herein, tables indicating expected effort allocation and costing information for each task is presented in the sections following the descriptions.

Data Collection and Research

Runoff Volume Assessment

The primary mathematical tool for hydrological analysis of runoff is known as the "Rational Method". The Rational Method uses the general equation Q = CiA, where Q is the runoff in acre-in/hr or cubic feet per second ("cfs"), C is a runoff coefficient for a given surface material and condition, "i" is the rainfall intensity in in/hr, and A is the area in acres. The factor requiring investigation is the runoff coefficient. This coefficient is a function of the soil type, surface cover and condition, and drainage basin slope. Lawns and forests have a low runoff coefficient of about 0.05-0.35, meaning that 65% to 95% of the rainfall will infiltrate into the soil, leaving the remainder to run off. Roofs and concrete have much higher runoff coefficients of about 0.7-0.95, meaning that nearly all of the rainfall will run off into the stream.

Another method for estimating runoff is the NRCS TR-55 method. This method is more complicated than the Rational Method and uses several equations to estimate the peak runoff. The factor most affecting runoff using the TR-55 method is the Curve Number (CN). The CN is a function of land use and hydrologic soil group. As with the Rational Method runoff coefficient, a higher number indicates more runoff and a lower number indicates more infiltration. For instance, in Soil Group B, which describes most Iowa soils, the CN for paved

parking lots and roofs is typically 98, whereas the CN for forest ground surfaces ranges between 30 and 83 depending upon condition.

Each area and surface in the park will be assessed for its runoff contribution, and categorized by volume, directness (overland flow versus storm drains that discharge into the creek), and existing infiltration capacity and rate. This analysis will provide a guide as to where further efforts should be focused.

Mapping and Modeling

To estimate the area of each surface type, we can use Geographic Information Systems (GIS). GIS can also be used in conjunction with the US Army Corps of Engineers Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS). A version of HEC-HMS is available with an ArcGIS extension known as HEC-GeoHMS. This package also includes Arc Hydro tools, which can be used to delineate the Hoover Creek watershed.

The GIS extension uses surface topography, land use, and land cover data, as well as soil type data, stream gage information, and the watershed information created by Arc Hydro tools. Models are created for input into HEC-HMS, which then uses precipitation data to model a storm event and the resulting runoff. All of the required data are available from government sources, the Iowa DNR and particularly the USGS.

Soil Properties Investigation

Various information sources will be employed to determine the rainfall "infiltration rates" expected at the site. The parameters that best characterize this property are the nature of the ground surface cover (the plants and immediate soil surface), and two values known as "hydraulic conductivity" and "porosity". The hydraulic conductivity and porosity of a soil column are the critical parts of the basic "Darcy" rainfall infiltration rate function, $Qz = \frac{Ak\Delta H}{nl}$, where Qz is the downward volumetric seepage rate, A is the area of interest perpendicular to the direction of flow, Δ H / l is the change in hydraulic head divided by the seepage depth, n is the soil porosity, and k is the hydraulic conductivity.

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While these soil parameters can actually change rapidly from location to adjacent location, average values for a given site can be obtained from previous studies by others. Highly specific values would likely need to be empirically based, requiring extensive on-site testing, however average values and known patterns can be obtained from sources such as the NRCS and USDA databases. Another information source that the team plans to utilize is an Iowa Department of Agriculture, Soil Conservation Division representative, Wayne Petersen. Wayne is a local expert in runoff attenuation using BMPs, he is familiar with Iowa hydrology, and the Herbert Hoover site in particular. He is also a contact previously approved by the Client.

Official Requirements

The EPIC design team will investigate all official requirements of conducting the site work recommended. All recommendations and activities on site must comply with the National Historic Preservation Act and the Secretary's Standards for Historic preservation. The National Park Service is the ultimate authority in this location, and dictates the standards and constraints appropriate to each of its park units. The Park Service enforces building codes, standard methods, archeological requirements, etc. and has at least one representative employed full-time on site for this purpose. All recommendations will be filtered through the standard design review process to ensure strict compliance with all requirements.

In addition, all other pertinent authorities will be consulted to ensure that all official requirements and permits are cleared in advance. These authorities may include the City of West Branch, the Cedar County Seat in Tipton, the State of Iowa Department of Natural Resources, the US Environmental Protection Agency, the US Army Corps of Engineers, the National Archives Administration (which oversees the Museum building), and the Friends of Herbert Hoover Coalition (which oversees one historical house on the park grounds).

Design Alternatives

Detention Basins

A storm water detention basin is an example of a Best Management Practice used to attenuate runoff from a storm event. A detention basin fills with water during rainfall, and a small outlet ("weir") at the bottom of the basin controls the outflow rate of runoff. This is advantageous in that the runoff has a gradual rise and fall as opposed to the sharp peak of uncontrolled, "flashy" runoff. The gradual nature of the runoff hydrograph (chart of streamflow versus time) reduces flashiness of streams, which in turn mitigates erosion.

A large detention basin is currently planned at the upstream end of Hoover Creek to protect to as much as 1050 cfs of runoff flow rate. Other areas within the park have been identified as being potentially feasible sites for smaller detention basins. EPIC will assess each of these areas for cost to benefit appropriateness.

Rain Gardens

Various areas in the park will be evaluated for the implementation of a rain garden. Rain gardens are landscaped bowl-like areas that have permeable soil which facilitates slow percolation of water. A rain garden is typically planted with native species that can survive with little maintenance, and are constructed in areas where the water will naturally flow to them. If they are constructed near a building, they need to be sited at least ten feet away from the building's foundation to avoid structural issues.

Soil is a key component to the success of a rain garden, therefore soil tests will be performed to determine if the soil needs to be engineered and augmented. The size of each rain garden is determined by how much runoff will be expected to flow to it, and how quickly. The buildings at the Herbert Hoover Historical Society will be researched and dimensioned in order to quantify the amount of runoff coming from their rooftops and impervious surfaces.

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Bio-swales

There are several areas in the park that might be amenable to bio-swales. The ditches along the main road-side are potentially good locations. A bio-swale is a drainage course with gently sloped sides that are filled with vegetation, compost or riprap. Water is able to infiltrate into the soil and be absorbed up by native plant root systems instead of running off into any nearby creek or storm water collection system. Bio-swales are also designed to remove silt and sand from rapid storm water runoff. Specific sites on the park's grounds will be evaluated for current runoff conditions and the potential reduction after a bio-swale is constructed. Plant material, soil and topography are considerations that will be taken into account.

Green Rooftops

As an alternative to direct soil infiltration, the visitor's center and museum library will be evaluated for the possibility of adding a green roof. A green roof is a building partially or completely covered in vegetation and planting medium. A green roof will capture the rainfall and slow its progress to the ground. Green roofs also protect the roof from extreme climates by providing a durable buffer zone. Green roofs provide increased insulation and create a habitat for wildlife, yet most important for this project, they absorb rainwater. The buildings will be evaluated for current runoff and post-implementation runoff. Also maintenance and economic feasibility will be included in the analysis. Green roofs are a progressive rainwater management strategy and it is believed that the Herbert Hoover Site may make a good demonstration facility for this technology.

Rainwater Collection System

Rainwater can also be diverted from the gutters into a collection system that will store the water for irrigation use or stream release when the threat of flooding has passed. The buildings will be evaluated for the retrofit of a collection system that will maximize the amount of water captured. Above or below ground storage systems could be constructed and the feasibility of both will be considered. Cost estimation will be provided along with various storage capacity options.

Pervious Pavement

Concrete and asphalt pavement areas contribute highly to flashy, concentrated runoff events because so little rainwater is allowed to infiltrate into the underlying soil. One emerging technique for reducing this effect is the use of "pervious" paving products. Such products have porous interstices incorporated into the material which allow rainfall to seep into the underlying soil instead of running into storm sewers, which rapidly deliver high volumes of water directly to the nearby creek.

While there may be concerns about the increased maintenance required and appropriateness of these surfaces for harsh winter conditions such as are common in Iowa, there are many different types of pervious pavements with different properties. This option may or may not be optimal for high traffic areas such as main streets, but less used areas such as parking lots and walkways may provide opportunities to greatly reduce flashy runoff during rainstorms. The EPIC team will quantify the impact that these surfaces could have in reducing the rapid runoff events in the park.

Assess Impact of Existing Drainage Tile

Part of the park area is now a restored tallgrass prairie, however it was previously farmland planted in row-crops. It was discovered by Mr. Edwards that there are at least three drainage tile lines still functioning, and expediting drainage from the affected areas. EPIC will investigate the possibility of eliminating these tile lines, or rendering them ineffective. This strategy should help the native plants in that area in sequestering infiltrated rainwater, instead of delivering it so rapidly downhill.

Retrain Hoover Creek Instead of Relocating It

River and stream "training" using "submerged vanes" is a concept developed by one of the project Faculty Advisors, Professor Jacob Odgaard. Professor Odgaard has shown through decades of research and experience that conventional stream erosion control methods (such as rip-rap installation and channel reconstruction, as is planned for Hoover Creek) can be avoided and improved upon. The concept is called "river training" and requires the installation of small,

unobtrusive "vanes" or vertical fins in the stream bed. During normal or "design flow" conditions, the vanes do not penetrate the surface of the water, and would be mostly unnoticeable to the public. By slightly altering the manner in which the stream flow scours the bed and re-deposits sediment, the channel can be trained to maintain a desired location and shape.

This option, if feasible for this site, would likely be far less invasive, less expensive and ultimately more desirable (based on the goals and criteria stated by the Client) than the current plan to entirely relocate a large portion of Hoover Creek away from the Hoover Museum and Library. The Client currently plans to move the creek because it is slowly eroding toward the museum, in time this could jeopardize the structure if unchecked. EPIC will evaluate the feasibility of implementing this alternative solution.

Final Design Documentation

At the end of the design process EPIC Engineering will provide to the Client, at a minimum, the following products:

- Overall runoff attenuation impact and cost information for each alternative listed, as well as basic design information, aesthetics, security, and maintenance requirements of each alternative
- Evaluation metrics for selecting appropriate elements of the final design, where each alternative would be evaluated for the financial feasibility and achievement of design objectives
- A general plan with utility easement locations
- A storm water drainage plan for the park
- An access management plan for the construction of design elements
- Preliminary site plans and conceptual drawings of designs
- A general construction contract outline and schedule, as well as an overall project schedule

- A summary of the recommended set of alternatives including overall cost and expected runoff attenuation impact

The design products listed will be provided to the Client and the Faculty Advisors no later than 4:00 p.m., Central Time, May 7, 2010, and a presentation of the final design products will be conducted by the EPIC team on May 4th or 5th, 2010. Any additional, new design requirements requested by the Client or Faculty Advisors not included above, in the official Request for Proposals, or agreed to prior to design proposal acceptance will be subject to re-negotiation via standard change-order procedures and may affect the ultimate design cost and / or design completion timeframe.

Effort Allocation and Design Budget

Below are two tables that outline the expected labor duration for each of the design tasks, and the engineer to which each task is likely to be assigned. The four main categories of tasks are sub-totaled in Table 1, which also indicates which engineer is likely to complete each task. The sub-totaled quantities of billable time are used to calculate cost categories in the project budget summary, Table 2.

The design tasks listed in Table 1 under "Design Alternatives" include the processes of assessing the feasibility of each task in each relevant location, sizing and forming a preliminary design for each feasible option, and developing ancillary information for each task. The ancillary information includes estimates of construction cost and supervision, overall impact of each option on the final hydrograph of Hoover Creek, and extent of compliance with the Client's stated goals. These details will ultimately be used as metrics to evaluate the strategies for the final recommendation.

Table 1. Expected effort allocation by task and engineer

Project Budget by Task

Task Description	Matthew Corcoran	Hannah Fleck	Aaron Gwinnup	Jon Lamb	Matthew Moore	**Task hours**
Data Collection:						
Runoff Quantification	5		5		10	20
Watershed Hydrology	10	10	5	10	10	45
Soil Properties	5	5	5			15
Impermeable areas		20		10		30
Existing Drainage	10				10	20
Buried Utilities			10	10		20
Official Requirements:						
Permitting Processes			20			20
Historical Clearance			10			10
Design Alternatives:						
Rain Gardens		35	10			45
Detention Basins	20				20	40
Bio-Swales			10		10	20
Green Roof Options		10		20		30
Pervious Pavement	20					20
Rainwater Collection		10		15		25
Drain tile removal	10		10			20
Creek Retraining			10		10	20
Presentation Items:						
Develop GIS Maps					10	10
Evaluation Metrics	10		10			20
Write Report	10	10	20	10	10	60
Make PowerPoint			10			10
Per-Engineer sub-total	100	110	135	75	90	
TOTAL BILLABLE HOURS						600

Table 2. Project budget summary by task, labor sub-total, cost of category, and percent of total cost

Overall Budget Summary

	Task Hours	Cost	Percent of Total
Direct Labor Categories:			
Data Collection	150	$7,500	14.9%
Official Requirements	30	$1,500	2.98%
Design Alternatives	220	$11,000	21.8%
Presentation Items	100	$5,000	9.93%
Other Direct Costs:			
Printing		$1000	1.98%
Travel		$150	0.30%
TOTAL DIRECT COSTS		**$26,150**	51.9%
Total Indirect Costs		$20,920	41.5%
SUB-TOTAL		**$47,070**	
Profit Margin		$3,295	6.54%
OVERALL DESIGN COST		**$50,365**	100%

Cost per task is based on an hourly rate of $50, which includes engineer salary, benefits, and direct labor costs. Indirect costs and profit are added as a percent of direct costs and are also indicated in Table 2. Indirect costs are the overhead costs of maintaining a design firm; details of these individual costs and the manner in which EPIC Engineering strives to keep overhead reasonable and competitive are available upon request.

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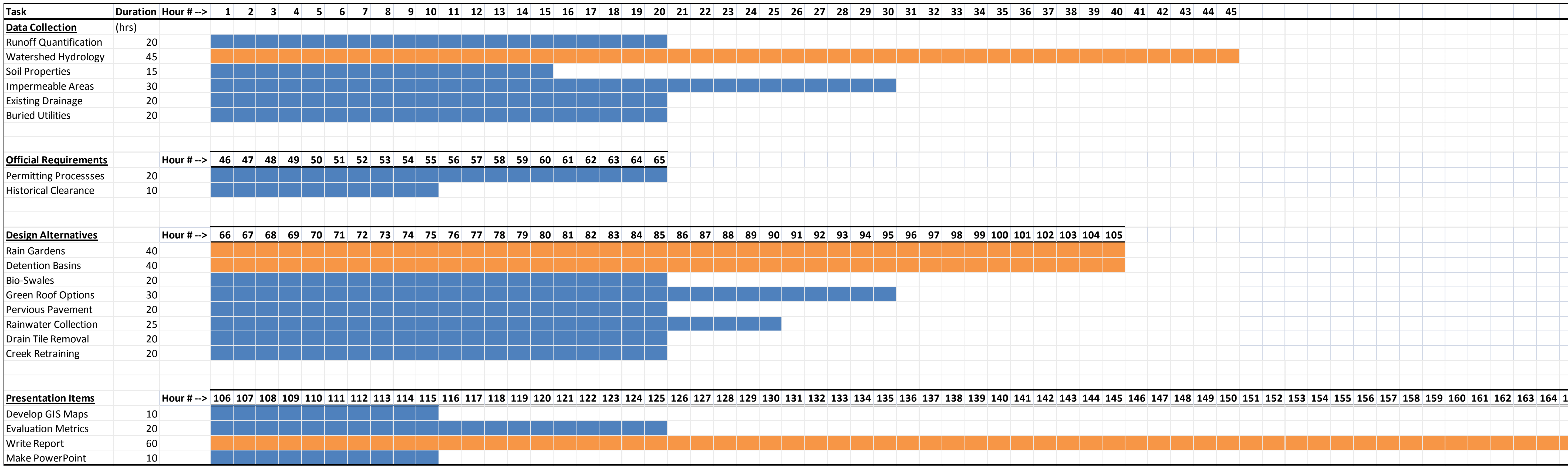
Gantt Schedule



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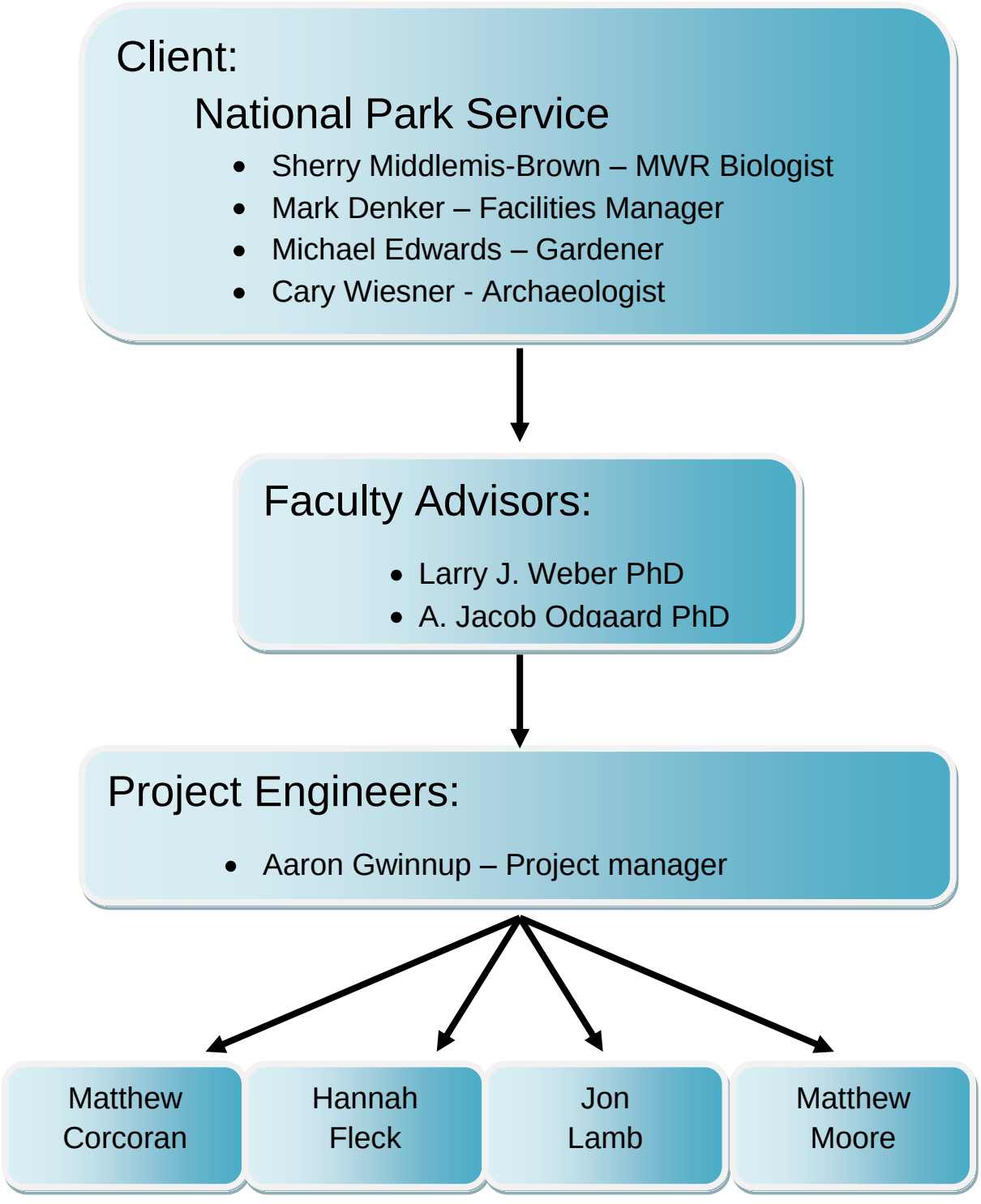
Management and Organization



Team Qualifications for This Project

The design team of EPIC engineering is fully qualified* to design runoff attenuation solutions for Iowa landscapes. Each member has specific skills, experience, and training for solving civil engineering problems and the team as a whole has over 17 years of combined engineering student experience. The short biographical paragraphs below, and the project resumes that follow illustrate the wide range of expertise that the team offers, from transportation and structural design to hydrological modeling, rain garden planning, and overall project management. The team also has access to the highest quality facilities and resources:

- A fully equipped CAD and print studio with two high resolution color plotters (3225SC)
- The nation's oldest and most experienced hydraulic research laboratory (IIHR)
- The first and most experienced phytoremediation laboratory in the world (WM Keck)

EPIC Engineering is experienced, equipped, and ready to meet your design needs.

EPIC Engineer Bios

Aaron Gwinnup – Project Manager / Sustainable Systems Specialist:

Aaron Gwinnup was born in Iowa City, Iowa, and raised on a small farm nearby. He initially followed in his father's footsteps as a carpenter, then founded a small construction company specializing in historic restoration. After nine years of self employment he sold his company and enrolled in Kirkwood Community College. He is now a senior / graduate student in the combined BS / MS environmental engineering program at the University of Iowa where he is focused on sustainable systems and economics. He is an avid gardener who has extensive experience in prairie restoration and native plant propagation.

Hannah Fleck – Urban Planning and Water Resources Specialist

Hannah Fleck was born and raised in Solon, Iowa. She has made Iowa City her home for the past seven years. She is currently attending the University of Iowa, College of Engineering, in pursuit of an environmental engineering undergraduate degree. She is doing a combined Master's degree with the Urban and Regional Planning Program. Her love of the outdoors has inspired her to pursue a career in which she can actively protect and preserve our precious resources. She hopes to have a career in storm water management with a focus on natural solutions to remediation and control.

**Disclaimer and disclosure: No team member of EPIC Engineering is a licensed engineer, PE, or EIT

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Jon Lamb – Structural Engineering Specialist

Jon Lamb was born and raised in Iowa. He holds a B.S. in Applied Physics from the University of Northern Iowa. He is in his final semester of civil engineering at the University of Iowa. His elected focus area is structures but his interest range is wide. Someday he hopes to be completely worn out because he has spent his life in pursuit of achievements and adventures. He will be moving to Seattle, Washington after graduation to work in the civil engineering field and to explore the mountainous coastal region.

Matthew Corcoran – Transportation Materials and Civil Design Specialist:

Matt Corcoran grew up outside of Fairbank, Iowa. He is attending the University of Iowa to complete a B.S in civil engineering. His natural curiosity in how things work and his affinity for designing and building things motivated him to pursue civil engineering. Matt hopes to have a career in the public or private sector managing projects.

Matthew Moore – Hydrological Modeling Specialist

Matthew Moore was born and raised in Ottumwa, Iowa. He has lived in Iowa City since 2000. He is currently a senior in Civil Engineering with a focus on water resources. He is also pursuing his graduate degree as part of the combined BS/MS program offered by the College of Engineering. He has worked for the Iowa Flood Center since July 2009. His research focuses on numerical modeling and flood simulations. While his focus has been primarily on river hydraulics, he would like to also learn about ocean engineering.

Conclusion

In conclusion, EPIC Engineering is equipped and ready to provide the required design services for The Herbert Hoover National Historic Site. The design team would like to thank the National Park Service and the Faculty Advisors for considering EPIC Engineering for this project. Please contact us if any further information or services are required.

Appendix A – Team Resumes

The following five pages contain the complete resume of each EPIC Engineering team member, tailored to the specific requirements of this design project.

Matthew J. Corcoran

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Education

The University of Iowa, College of Engineering, Iowa City, Iowa — August 2005 – Present
- Major: Civil and Environmental Engineering
- Focus area: Civil Engineering Practice

Work Experience

Engineering Coop, Iowa Department of Transportation, Cedar Rapids, IA — May 2009 – December 2009
- Performed construction inspection.
- Tested materials for specifications
- Inspected a bridge replacement project from start to finish.

Family Farm, Fairbank, IA — 2000-2005
- Restored pasture to a more natural setting
- Flood mitigation and erosion control
- Planted trees and controlled weeds
- Armored banks with rock
- Gave consultation to farmers to reduce flash flooding

Engineering Course Experience

Design Group Member, Design of Transportation Systems — Spring 2009
- Used the AASHTO Green Book for geometric design
- Redesigned the Melrose/US 218 intersection in Iowa City, IA
- Generated three design alternatives
- Laid out the designs using AutoCAD

Computer Skills
- Engineering Software: AutoCAD, Matlab
- Office Software: MS Excel, MS PowerPoint, MS Word

Hannah A. Fleck

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Iowa City, IA 52240 hannah-fleck@uiowa.edu

Education

The University of Iowa, College of Engineering, Iowa City, Iowa — Fall 2007 – Present
- Major: Civil and Environmental Engineering
- Focus area: Urban and Regional Planning (BS/MS program)

Kirkwood Community College, Cedar Rapids, Iowa — Fall 2005- Spring 2007
- Major: Associates of Liberal Arts

Work Experience

ECO Iowa City Intern City of Iowa City — June 2009 – present
- Facilitated outreach events including electronic waste collection, educational events and film festivals
- Communicated with public on environmental issues including storm water management, smart waste disposal, local foods and energy conservation
- Attended rainscaping, rain garden and bioretention cell design workshop

Research Assistant University of Iowa, Dr. Bill Eichinger — Summer 2009
- Developed technology that measures the size, velocity and shape of raindrops
- Improved previous design to be more lightweight and user friendly
- Assisted in research related to remote sensing of the atmosphere

Teaching Assistant Civil Engineering Practice, Dr. Bill Eichinger — Fall 2008/2009
- Troubleshoot AutoCAD features for floor plans, site plans, and other drawings
- Assisted 10-15 students per week on homework assignments related to civil engineering practice
- Communicated with the professor and students about assignments and grading criteria

Engineering Course Experience

Design Project, Water Resources Design — Fall 2009
- Evaluated storm water collection system in MacGregor, IA
- Provided recommendation for improvements to current design

Design Group Member, Environmental Engineering Design — Fall 2009
- Performed design calculations for wastewater treatment facilities including primary sedimentation, activated sludge, and economic feasibility
- Wrote and submit a professional design proposal
- Researched and designed wetland for secondary treatment of waste water

Design Group Member, Principles of Hydraulics and Hydrology — Spring 2009
- Used laboratory data to design a weir section for Ralston Creek using Manning's formula and field observations

Study Abroad Experience

Winterim India, Karnataka, India — Winter 2009-2010
- Participated in class lectures and discussions on water, sanitation and health
- Prepared a research proposal to potentially implement in India
- 3-week cultural submersion with emphasis on health and sanitation

Engineering Leadership

- Mentor, WISE (Women In Science and Engineering) — Fall 2008-Spring 2009

Jon C. Lamb

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Coralville, IA 52241 jon-lamb@uiowa.edu

Education

The University of Iowa, College of Engineering, Iowa City, Iowa Fall 2007 – Present
- Major: Civil and Environmental Engineering
- Focus area: Structures

University of Northern Iowa, Cedar Falls, Iowa Graduated May 2007
- Bachelor of Science: Applied Physics, Minor in Mathematics

Work Experience

Engineering Co-op, Iowa Department of Transportation December 2009 – August 2009
- Worked with engineers and inspectors in the DOT construction office
- Managed the construction of bridges, box culverts, pipes and pavement slabs
- Inspected steel layout, form sizes and slopes for box culverts and bridges
- Gained experience with survey equipment and techniques

Engineering Intern, Leuven Measuring Systems February 2008 – December 2009
- Used Virtual Lab and AutoCAD software
- Designed template models for V-line engine simulations
- Provided quality control for motion in Virtual Lab
- Updated documentation used to execute Virtual Lab simulations
- Analyzed results for upgrades in products to ensure improvement in performance

Physics Research Assistant, University of Northern Iowa May 2006 – May 2007
- Designed and constructed a suspended dampening system for a 1200 lb. Ultra High Vacuum chamber
- Designed and constructed electronics for an STM tip making device
- Maintained and made improvements to UHV chamber capable of pressure of 10^{-12} Torr
- Repaired and implemented rotary pump and turbo pumps for UHV chamber
- Reconstructed heating feedback system for UHV chamber

Engineering Course Experience

Design Project, Bridge Design Fall 2009
- Designed a 3 span bridge for Johnson County, IA
- Developed a structural analysis for minimization of materials used

Design Project, Water Resources Design Fall 2009
- Designed detention basins
- Researched and designed culverts for flood prevention

Design Project, Reinforced Concrete Design Fall 2008
- Calculated vertical and horizontal loads to be resisted by concrete beams
- Analyzed equations to minimize steel reinforcement in concrete
- Accounted for seismic loading with safety factors

Volunteer Experience

Habitat for Humanity, Iowa City, IA August 2007- present
- Construction Volunteer

Mission Trip, Indonesia Summer 2007
- Assisted in the prevention of Malaria

Scholarships/Honors:
- Received a SOAR award for projects in physics research
- Recipient of the Physics Alumni Scholarship

Aaron L Gwinnup

812 Church Street (319) 594-1139
Iowa City, IA 52245-6008 agwinnup@engineering.uiowa.edu

Education

The University of Iowa, College of Engineering, Iowa City, Iowa Summer 2006 – Present
- Major: Civil and Environmental Engineering (BS/MS Program)
- Focus area: Sustainable Systems and Economics

Work Experience

Research Assistant University of Iowa, Dr. Jerald Schnoor et al July 2008 – Present
- Assessed the impact of the 2008 Midwestern flood on Gulf of Mexico hypoxia (NSF grant)
- Assisted LUMCON with hypoxic zone mapping onboard the R/V Pelican
- Gathered and processed water quality data, interpreted using USGS modeling software
- First author on two publications (presentation and poster)

Research Assistant University of Iowa, Dr. Jerald Schnoor February 2008 – December 2009
- Conducted phytoremediation experiments using plants to detoxify soil and water
- Extracted DNA / RNA from soil and plant tissue for microbial identification and analysis
- Laboratory procedures and equipment used: PCR, rt-PCR, Gel Electrophoresis, FTIR, HPLC

Environmental Engineer Intern Iowa DNR May 2007 – August 2007
- IDNR Pollution Prevention Intern at John Deere Engine Works, Waterloo, IA
- Assessed the process waste stream and recommended strategies for reduction
- Designed plastic recycling program that yields $5000 profit and prevents 50+ tons of waste each year
- Assessed onsite wastewater treatment system and designed improvements to save $75,000 per year

Owner Cornerstone Restoration Contractors Inc., Iowa City August 1994 –August 2003
- Chief designer, estimator, salesperson, lead contractor, foreman
- Supervised the completion of over 450 residential and commercial projects
- Wrote over 20 letters of inspection
- Managed, on average, 6 office and production staff, as well as all subcontractors

Engineering Course Experience

Design Project, Water Resources Design Fall 2009
- Evaluated capacity of storm water collection system in MacGregor, Iowa
- Performed runoff analysis using rational method
- Assisted LUMCON with hypoxic zone mapping onboard the R/V Pelican

Design Group Member, Environmental Engineering Design Fall 2009
- Researched and designed portions of wastewater treatment plant
- Collaborated with group members to submit and present design proposal

Computer Skills
- Skilled with AutoCAD, Matlab, SAS, GIS, C programming language, and specialty modeling software
- Skilled with all standard office software (Word, Excel, PowerPoint, Access, etc.)

Volunteer Experience

Iowa DNR – IOWATER October 2005 – Present
- Monitored several local ponds and streams for pollutants, pH, turbidity, BMI, bacteria, etc.
- Logged results with DNR online database for use in tracking statewide water quality

Awards / Recognition
- 2008 US-EPA P3 Sustainability Award and $75,000 grant for handheld chlorine generation device (for use in drinking water disinfection in remote, impoverished communities)

Matthew R. Moore

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Coralville, IA 52241 matthew-moore@uiowa.edu

Education

The University of Iowa, College of Engineering, Iowa City, Iowa Fall 2006 – Present
- Major: Civil and Environmental Engineering
- Focus area: Water Resources (BS/MS program)

Kirkwood Community College, Cedar Rapids, Iowa Fall 2001- Spring 2004
- Major: Associates of Science Degree

Work Experience

Undergraduate Research Assistant, IIHR/Iowa Flood Center July 2009 – present
- Collected and processed field data
- Used Geographic Information Systems to process data and create visual aids
- Simulated flood events using MIKE Zero software package
- Created flood inundation maps for Charles City and Ames, IA

Engineering Course Experience

Design Project, Water Resources Design Fall 2009
- Evaluated capacity of an existing storm waater collection system in MacGregor, Iowa
- Performed runoff analysis using rational method
- Estimated channel capacity using Manning's equation

Design Group Member, Environmental Engineering Design Fall 2009
- Performed design calculations for wastewater treatment facilities including primary sedimentation, activated sludge, and economic feasibility
- Wrote and presented a professional design proposal
- Researched and designed a combined sewer overflow treatment facility for Fort Madison, IA

Design Group Member, Principles of Hydraulics and Hydrology Spring 2009
- Used HEC-HMS and HEC-RAC to simulate a storm event
- Estimated flood inundation extents for Ralston Creek in Iowa City, IA
- Used laboratory data to study backwater effects of a weir installation using the direct-step method

Computer Skills
- Engineering Software: Matlab, Hypack, AutoCAD, Mathematica, ArcGIS, MIKE FLOOD, HEC-RAS, HEC-HMS, HEC-SSP
- Operating Systems: Windows, Linux, OSX
- Other: MS Excel, MS Access, MS PowerPoint, MS Word, Star Office, Minitab

Appendix B – Acknowledgements

The EPIC Engineering design team intends to request assistance from the following individuals during the course of project design:

- The Client, including:
  - The National Park Service in general
  - Sherry Middlemis-Brown, MWR Biologist, Herbert Hoover National Historic Site
  - Mark Denker, Facilities Manager, Herbert Hoover National Historic Site
  - Cary Wiesner, Historical Specialist, Herbert Hoover National Historic Site
  - Michael Edwards, Site Gardener, Herbert Hoover National Historic Site
- The Faculty Advisors assigned to this project:
  - Larry Weber PhD
  - Jacob Odgaard PhD
- Wane Petersen – Iowa Division of Soil Conservation
  - Wayne is familiar with the site and has worked previously with the Client
- The City of West Branch, Building Inspection Department
  - The Department will be contacted to request existing information about drainage, storm sewerage, survey information, building information and / or utilities information.
- Any other parties not previously mentioned that the team discovers to have helpful information will be subject to the express permission of the Client and the Faculty Advisors.

The contributions of each party to the design process will be duly acknowledged in the final design report.

Sources

Photograph on cover page is from the National Park Service website:

http://www.nps.gov/heho/photosmultimedia/birthplace.htm

Biographical engineer photos were taken by Matthew Moore

Appendix C – Request for Proposals

53:084 Project Design and Management in Civil Engineering Spring 2010

Storm Water Management Hoover Creek

Request for Proposal

Brief Description: ***Urban property generating stormwater runoff contributes to water quality degradation. Stormwater runoff from roofs, driveways, or yards carries pollutants directly to receiving waters without treatment. Runoff also causes frequent and substantial changes in stream hydrographs. Resulting flashy-flows cause stream corridor erosion, contributing suspended solids to the water column, and can cause flooding.***

The Historic Core at Herbert Hoover National Historic Site contains nine residential lots with houses, yards, garages, driveways, and sheds. Additionally, there are buildings and paved areas associated with visitor use and park operations. The Presidential Library-Museum has a very large footprint and associated impermeable surface area. Water falling on these impermeable or poorly infiltrating surfaces must have someplace to go where it will not pose a threat to visitor and employee health or safety and will not impede park operations. At this time, much of that water goes directly to Hoover Creek.

Current stormwater management in the park includes ditches, drop boxes, stormwater sewer systems, sump pumps, eave gutters, and other techniques designed to move water downstream. The progressive thinking in Iowa is that precipitation should be retained where it falls, infiltrate into the soils, and join the groundwater hydrology.

The objective of this project is to use Low Impact Development Techniques to eliminate or greatly reduce the direct input of stormwater into Hoover Creek. The project will require retrofits to an existing infrastructure and should incorporate best management practices that represent innovative leadership in land and water stewardship. The techniques should reduce flashiness of the stream and improve water quality. They would encourage a ground water hydrologic system, rather than a surface water system. These techniques and structures should complement the stream rehabilitation project expected to be completed in 2013.

Limitations and Restrictions

Herbert Hoover National Historic Site is a National Park Service facility. The park must comply with National Historic Preservation Act, Secretary's Standards for Preservation, National Park Service Policies, and numerous other policies and regulations. Complying with the National Historic Preservation Act limits some actions that may be technically sound, but would alter the archeology, historic structures, or cultural landscape of the park. The park staff will be happy to provide guidance or feedback on feasible techniques to accomplish goals. The park will use the conceptual designs developed by the students to request funding to implement these techniques. Students will gain an understanding of the limitations and restrictions that a federal resource preservation bureau must follow.

Materials Available

The park can provide shape files, maps, elevations, and other information to assist the students. For more information about the park, see www.nps.gov/heho. Park staff will provide orientation at the park and feedback at various milestones in the planning process.

General Requirements

1. PROJECT PROBLEM STATEMENTS

1.1 Proposals will be due on or before 12:30 p.m., Central Time, March 1, 2010, delivered to Room 4105 Seaman's Center, The University of Iowa. Three complete copies of each proposal must be submitted.

Project Managers, assisted by Team Members as needed, will present the proposals on March 3, 2010, beginning at 6:00 p.m. in room 1505 SC. A 10-minute presentation will be allowed followed by a 5 minute question and answer session. An electronic copy of the proposal presentation must be submitted immediately following the presentation.

Final Report presentations will be made May 4th and 5th, 2010, in 1505 SC beginning at 6:00 pm. A 20 minute presentation will be allowed followed by a 10 minute question and answer session.

Final Design Reports will be due on or before 4:00 p.m., Central Time, May 7, 2010, delivered to Room 4105 Seaman's Center, The University of Iowa. Four complete copies of each Final Design Report must be submitted along with an electronic copy of the final project presentation.

2. DESIGN REQUIREMENTS

2.1 Conduct a kickoff meeting and solicit client input, gather available data and information, and perform field reconnaissance. Additional progress-review meetings will be conducted on a regular basis. Weekly progress reports are required and are to be submitted electronically by 4:00 pm each Friday. Progress reports must include, at a minimum, activities for the current week, expected work for the upcoming week, work hours performed during the current week and cumulative project hours. In addition, a complete hardcopy record of the project reports must be maintained by the project manager and available during consultations with the faculty lead.

2.2 Ensure that the designs meet the requirements of the Client as well as those of any applicable resource and/or regulatory agency. Agencies to consider are the Iowa Department of Natural Resources (IADNR); the Environmental Protection Agency (EPA); Local City Administration; amongst others. Ensure that all requirements are met to obtain all necessary permits for this project.

2.3 Prepare a set of at least three design alternatives. Develop selection criteria for choosing an appropriate design for final design and implementation. Provide a complete impact assessment of the alternative designs, that describes the benefits and costs, and ease of use and operation. Secondary and tertiary effects such as aesthetics and security should also be considered.

2.4 A general plan with easement locations for utilities at the project.

2.5 A plan for stormwater drainage which may or may not include additional storm sewer, for the project. The expectation is that stormwater management best management practices (BMP's) for water quality will be designed into the concept plan based from criteria outlined in the Iowa Stormwater Management Manual.

2.6 An access management plan for the construction phase of the project.

2.7 Prepare preliminary site plans and conceptual drawings of recommended project.

2.8 Prepare cost estimates for alternatives and recommended design.

2.9 Develop construction contract breakdown based on types of work and schedule requirements.

2.10 Prepare overall project schedule.

3. PROPOSAL REQUIREMENTS

3.1 The proposal as submitted to the Client must contain the following information:

3.1.1 A cover page with the name of the engineering firm and the names of the design team members.

3.1.2 An executive summary of the proposal.

3.1.4 A statement of the design objectives and the major problems likely to be encountered in the design process.

3.1.5 A list of the work tasks to be accomplished during the design-data collection, design, evaluation, report preparation, and presentation segments of the projects, together with a brief description of each task.

3.1.6 A critical path diagram and/or Gantt chart identifying the procedure and time schedule of the project tasks.

3.1.7 A table assigning work tasks to specific team members.

3.1.8 A detailed budget for the design study, by task, estimating work hours and cost.

3.1.9 A budget summary listing the total expected personnel, direct, and indirect costs associated with the project.

3.1.10 A short management plan and organization chart.

3.1.11 Brief (1 page) resumes for each project team member in a standard format.

3.2 Any external consultants used on the project must have the approval of the Client or the Client's designated representative, with the exception of Faculty Consultants. When Faculty Consultants are used, their contribution must be appropriately acknowledged. It is estimated that 3 - 4 person months of time will be required to perform this project.

3.3 Due respect for the English language and/or its American derivative must be shown in the proposal and all reports to the Client.

Project Point of Contact:

Prof. Odgaard

Sherry Middlemis-Brown, MWR Biologist
Herbert Hoover National Historic Site
P.O. Box 607, West Branch, IA 52358
(319) 643-7858

Sherry_Middlemis-Brown@nps.gov