

Envirologic Engineering

Madison Avenue Outfall Rehabilitation &
Quality Improvements

Stormwater

Status Report

April 14th, 2009

To: Dr. Thornton

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Summary of Problems and Objectives

Envirologic Engineering will create preliminary design plans and a presentation to give to the City of Loveland and present at the Engineering Days Competition regarding the Madison Avenue Outfall Rehabilitation and Stormwater Quality Improvements. Currently, there is no end-of-pipe stormwater treatment before this outfall discharges to the Big Thompson River. Also, the current outfall that is in place has undergone significant erosion and is very unstable. For this improvement project there are three main objectives that must be met:

- Rehabilitate or replace the failing drop structure from the end of the Madison Avenue Outfall storm sewer to the Big Thompson River.
- Provide end-of-system treatment to improve stormwater quality entering the Big Thompson River. The outfall stormwater quality should meet the National Pollution Discharge Elimination System (NPDES) Phase II standards.
- Create a constructed wetland area to treat the stormwater, which can also be used as a wildlife sanctuary and nature walk with an option for educational information posted regarding stormwater treatment.
 - In an attempt to create an aesthetically pleasing constructed wetland, Envirologic Engineering foresees the need of a sediment and trash rack as a necessity to the completion of this objective. This was not stated as a main objective, however is completely necessary for meeting the third objective.

Envirologic Engineering is tasked with providing conceptual preliminary design plans to meet these three main objectives and present the final findings and preliminary design specifications to the City of Loveland by May 1st, 2009.



Summary of Progress

The Envirologic Team has been working steadily on several of the tasks and phases of this project. Each of the different team members has been assigned a specific element of the project to focus throughout the duration of the design process. Sierra is tasked with the hydraulics of the design and analyzing the available data for the tributary hydrology. Sierra has also been responsible for creating the new site layout in GIS. Bobby is focused on the outfall placement and design that leads to the Big Thompson River. Taylor has focused on regulations and laws with Nichole in addition to wetland design specifications and determining the Water Quality Capture Volume (WQCV). Nichole has been responsible for researching, pricing, sizing and choosing a water quality trash vault to capture sediment and trash before entering the wetland area. Nichole has also assisted in the other areas of the design giving input and ensuring that overall objectives for the site are met and in compliance with regulations. The Envirologic Engineering Team meets on a weekly basis to discuss complications faced in the design process, different solution ideas, possible alternatives and overall design specifics. The team has begun to prepare the written final report to be presented to the City of Loveland which will include all of the information regarding the preliminary design developed for this project. The following is a list (with the correlating Phase and Task) of the completed tasks given in the Statement of Work (SOW) and the tasks that are currently being completed. Each of these tasks can correlate to the Project Timeline shown in Figure 1.

- **Phase 1 – Task 1:** Conduct site research using historical documents, mapping and research
 - Completed
- **Phase 1 – Task 2:** Establish list of all foreseen site constraints and issues to be addressed
 - Completed
- **Phase 1 – Task 3:** Research hydrologic , environmental, and water quality properties of the area
 - Completed: Information has been collected regarding typical constituents and concentrations for stormwater quality. Envirologic is not conducting a hydrologic study for the City of Loveland, so therefore will base the preliminary designs off of data given to the team and nothing else. The data provided by the city has been analyzed and a 10-yr storm design flow has been determined to be about 200 cfs. From this a treated flow of 30% or 60 cfs has been chosen to divert through a trash vault to capture sediment and trash from the first flush of each storm event.
- **Phase 1 – Task 4:** Conduct site survey for site variables
 - Completed: Soil samples will not be collected from this site as they have been deemed unnecessary by both Envirologic Engineering and the City of Loveland. Instead, the soil data has been collected from NRCF website. At this time there is no other foreseen data that needs to be collected from the site at this time. There is also a constant groundwater flow in one of the pipes that is unknown, however this is not deemed as being necessary to obtain.
- **Phase 2 – Task 1:** Research standards and usual design for all project components
 - Completed: Sierra was assigned with researching solutions for the hydraulic piping materials to be used to convey diverted water to the trash vault and from the detention pond to the outfall. Bobby has researched possible outfalls and placement for a new outfall. Taylor researched everything that pertains to how a wetland is constructed, possible vegetation, ideal slopes, and suitability in cold weather climates. The main source of information used in the preliminary design was the Urban



Drainage and Flood Control manual. Nichole has conducted research for BMP trash vaults to be placed on site. She has also researched flow splitters and sizing to be placed in current manholes to divert flow to the trash vault.

- **Phase 2 – Task 2: Research successful design of similar system**
 - Abandoned: Taylor conducted minimal research on other constructed wetland projects in the area, however was not finding the information useful. Due to this reason, this task has been abandoned and will not be completed in order to maximize the efficiency of the time spent conducting research by the team members.
- **Phase 2 – Task 3: Research materials to be used in the stormwater system**
 - Completed: The materials available for use throughout several areas of the preliminary design plans have been researched and chosen based on durability, lifespan and cost.
- **Phase 2 – Task 4: Research all laws and regulations pertinent to the system**
 - Completed: Taylor has finished conducting research necessary regarding the NPDES Phase II requirements and created a formal write-up to be included in the final report. Nichole has researched how to obtain a 404 permit from the U.S. Corps of Engineers and has compiled necessary information for the City of Loveland in what will need to be done to obtain that permit.
- **Phase 3 – Task 1: Analyze possible outfall and wetland locations, and transmission pathways**
 - Completed: All members of the Envirologic Engineering Team have worked together to compile different alternative ideas for the location of the wetland, the location of the outfall structure, the transmission system of getting water from the pipe to the wetland, and locations for trash vaults. After careful consideration final locations have been determined. This was strongly based on client input.
- **Phase 3 – Task 2: Analyze system components**
 - Completed: The project has been broken down into separate sections in order to maximize the team's efficiency in analyzing the different system components for this project. After speaking with the client about the system components that were established as alternatives, the team adjusted to meet the needs of the client and has chosen specific components and properties to meet those needs.
- **Phase 3 – Task 3: Analyze possible methods for safe decommission of old system**
 - Completed: The decommission plan created by Envirologic Engineering is focused on making the area safe for community members and maintenance crews. The decommission plan will be presented to the City of Loveland in the final report. It is still fairly conceptual, however a complicated decommission plan is not necessary for the site.
- **Phase 3 – Task 4: Recommendation of Alternatives**
 - Completed: The Envirologic Engineering Team met with Chris Carlson, the client contact on March 5th to discuss the alternatives created at that point. From this meeting, the Envirologic Team was able to adjust the presented alternatives and combine certain aspects begin the preliminary design phase.



- **Phase 4 – Task 1:** Meet with City of Loveland

- Completed: On March 5th Enviologic Engineering met with the City of Loveland to review the alternatives formulated by the Enviologic Team. The client provided helpful insight into more specific desires to alter the outcome of the alternatives. Based on the feed-back received from the City of Loveland, the Enviologic Team reevaluated the alternatives and chose a design plan to meet the needs of the client.

- **Phase 4 – Task 2:** Expand and detail final recommendation

- Completed: Enviologic Engineering has finalized the preliminary design plans for this project. The final recommendation is completed, and details are being finalized and explained in detail for the final report and presentation.

- **Phase 5 – Task 1:** Creation of presentation materials

- **In Progress:** Enviologic Engineering will have the poster presentation for the Engineering Days competition completed for April 17th. The PowerPoint presentation to be given to other engineering students and faculty has been started, and will be completed by Tuesday April 21st so that the Enviologic Engineering Team will be prepared to present on Thursday April 23rd.

- **Phase 5 – Task 2:** Report and deliverable submittal

- **In Progress:** Enviologic Engineering has begun to compile all the information need to present to the client in the final report. The cost estimate is completed, along with the introduction, considerations, regulations, criteria, and explanation of alternatives. The deliverables are still being completed along with the explanation of decommission plans. The final report will be completed and submitted to CSU and the client on May 1st, 2009.

Planned Activities

The Enviologic Engineering Team plans to compete this Friday April 17th at the Engineering Days Competition. This week the team plans on practicing for the presentations Wednesday night and Thursday night in order to represent the Department and CSU to the best of our abilities. Following that, the Enviologic Team will be completing the PowerPoint Presentation this coming weekend and Submitting the presentation on Tuesday April 21st.

Project Schedule

The initial project schedule presented to the City of Loveland for the preliminary design process is presented below in Figure 1. So far the Enviologic Team has completed Phases 1,2, 3, and 4 which is on track with the projected timeline and milestones shown in Figure 1. The team is not as far into Phase 5 as initially projected, however this is not seen as an issue since the team has a clear understanding of what needs to be completed. Milestone 4 (M4) will be met since we will be ready to compete at the Engineering Days Competition. There is still work that will need to be completed to meet milestone 5 (M5) on time, however the Enviologic Engineering Team is confident that we will finish the project in the given timeline.

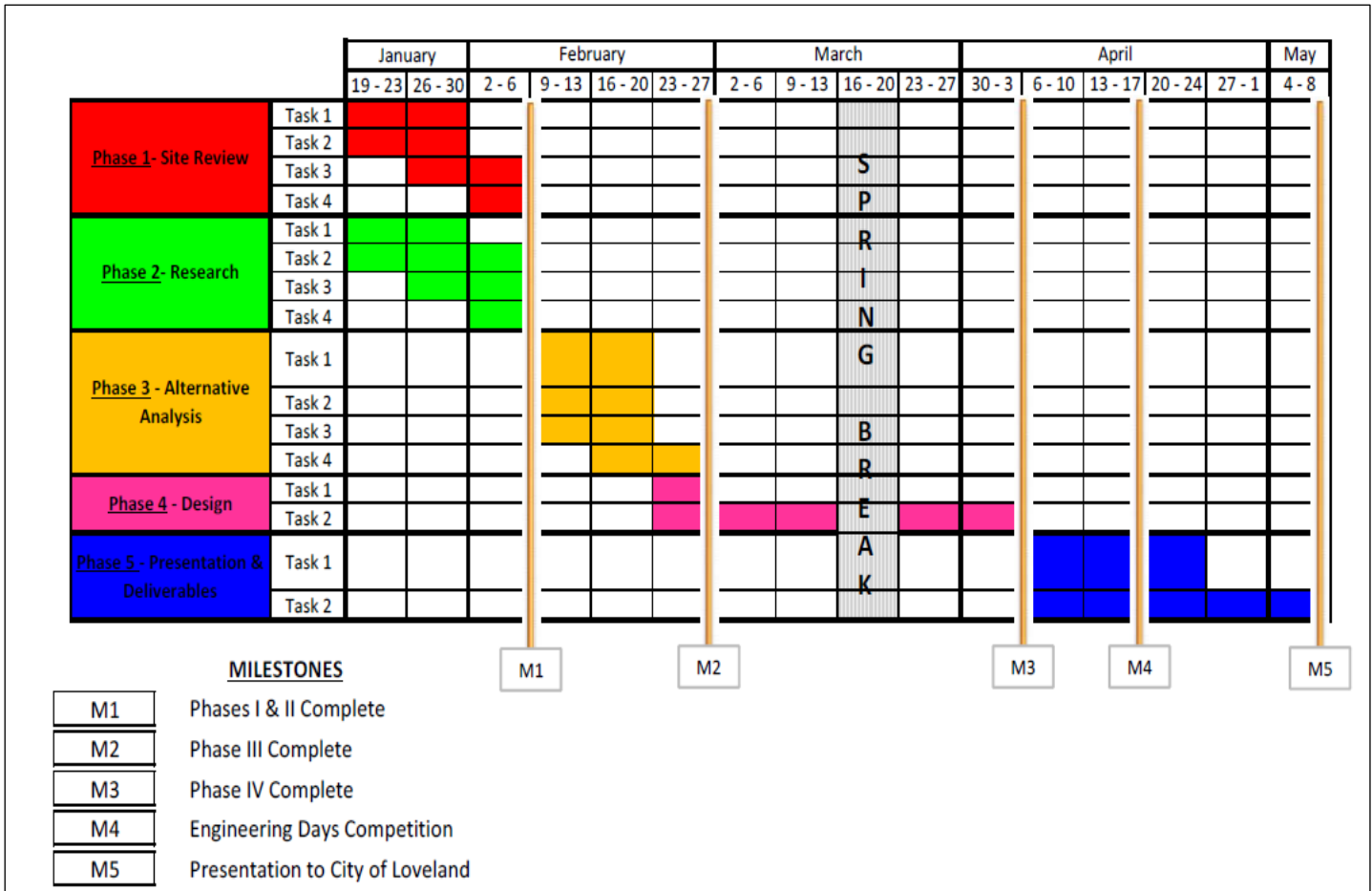


Figure 1: Project Timeline



Project Budget

The project budget for the entire preliminary design process is shown below in Figure 2 and Table 1 below. Both the allotted time for each task (Time) and the time actually spent on each task thus far (Current Total) are shown. The Envirologic Team is currently on target with the timeline and budget. Envirologi Engineering is very close to being over budget at this point and most likely will be at completion of this project. This is due largely to the fact that when initially creating a budget for this project, the Envirologic Team did not consider time for meetings conducted by the team to stay updated and on-track with progress. For this reason, a separate line has been added to the budget for consideration.

Table 1: Project Phases and Progress Summaries

		Time (hours)	Current Total (hours)
Phase 1	Task 1 - Research of historical data	9.5	1.5
	Task 2 - Establish site constraints	7	9.75
	Task 3 - Research required project properties	7	14
	Task 4 - Site inspection and data collection	9.5	13.75
	Total:	33	39
Phase 2	Task 1 - Research project components	22	14
	Task 2 - Research similar successful designs	17	24.5
	Task 3 - Research project materials	17	2.25
	Task 4 - Research laws and regulations	7	2.25
	Total:	63	43
Phase 3	Task 1 - Analyze possible stormwater pathways	17	4.25
	Task 2 - Analyze system components	17	25
	Task 3 - Analyze decommission of old system	12	49
	Task 4 - Recommend alternative	7	0
	Total:	53	78.25
Phase 4	Task 1 - Meet with City of Loveland	12	9
	Task 2 - Expand and detail final recommendation	92	129
	Total:	104	138
Phase 5	Task 1 - Creation of presentation materials	32	30
	Task 2 - Report and deliverable submittal	57	35
	Total:	89	65
Meetings			62
Total:		342	336.25



Below, Figure 2 gives a graphical representation of the projected hours to be spent on the preliminary design process for this project in blue, along with the actual amount of hours worked by the Envirologic Team to date. As can be seen the Envirologic Engineering has not used the total budget for the entire project at this point, however is beyond the working hours initially projected by about 50 hours. This can be contributed to the meeting times that were not accounted for in the initially budget.

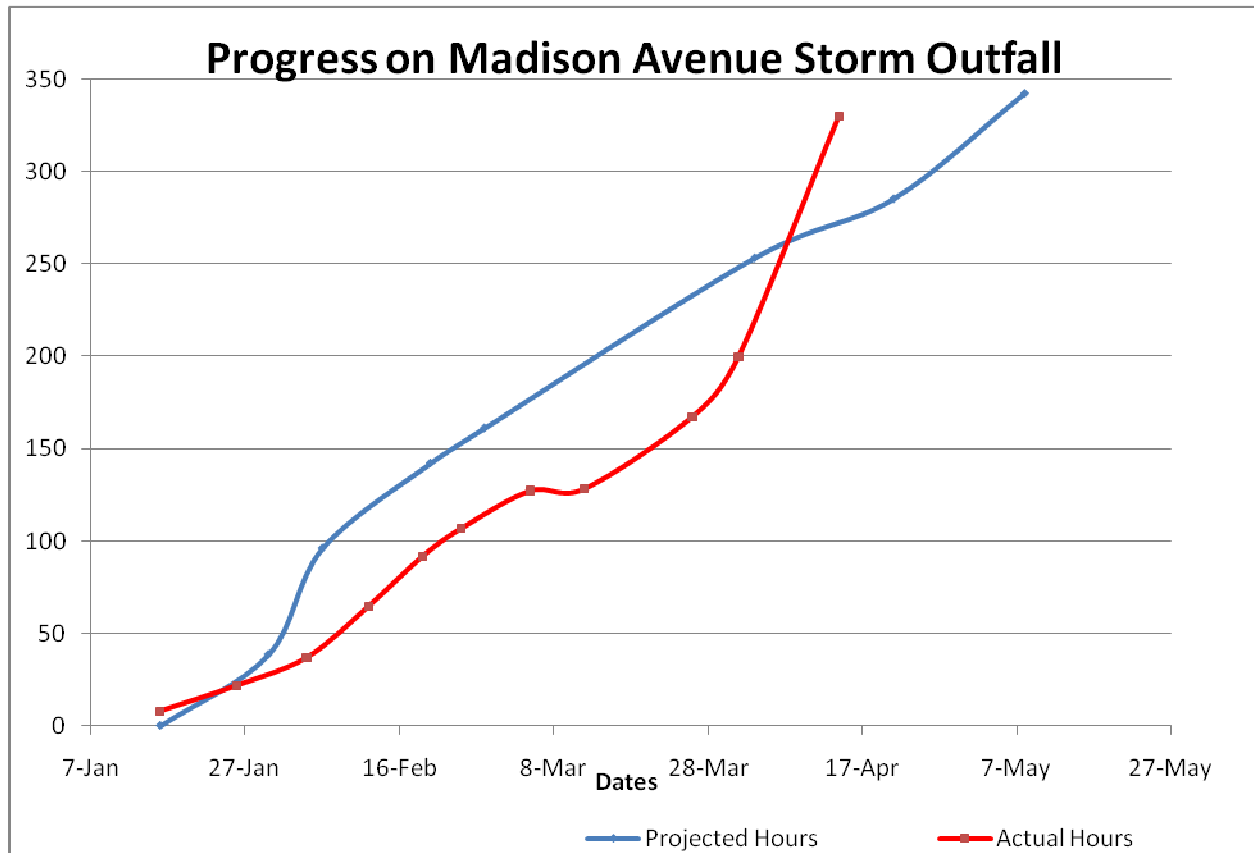


Figure 2: Progress on Madison Avenue Storm Sewer Outfall

Impediments and Difficulties

At this time the only difficulty is finding enough time to sleep and not getting overwhelmed with all of our other classes.