**Project Schedule and Cost**

# **Introduction:**

 This deliverable is an overview of tasks and costs of our project. It will feature time estimations to complete each task while considering risks that could delay our project, a Gantt chart detailing our project from start to finish and its milestones, and an estimation of cost for the materials needed to complete our prototypes. This document displays how our project will be completed before the deadline of March 27th, and how our project plans to spend our budget.

# **List of Tasks**

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| **Tasks** | **Estimated Task Duration** | **Who is responsible for the task** |
| Develop Guidelines for Prototype 1 | 1 day | Omar, Edwin |
| Prototype 1 | 1 day | Nic, Huang |
|  Simple Analysis of Critical Components or Systems for Prototype 1  | 2 days | Shadman, Josh |
| Consider Improvements for Prototype 2 | 1 day | Shadman, Huang |
| Purchase Material for Prototype 2 | 1 day | Josh, Edwin |
| Prototype 2 | 4 days | Omar, Edwin |
| Analytical, Numerical or Experimental Model for Prototype 2  | 2 days | Nic, Shadman |
| Consider Improvements for Prototype 3 | 1 day | Nic, Huang |
| Purchase Material for Prototype 3 | 2 days | Nic, Huang  |
| Prototype 3 | 5 days | Edwin, Omar |
| Analytical, Numerical or Experimental Model for Prototype 3 | 3 days | Shadman, Josh |
| Prepare for Final Project Presentations | 3 days | All |
| Final Project Report | TBD | All |

**Explanation of tasks:**

 In order to make a list of all the tasks from now until the end of the semester, we examined the remaining deliverables and listed tasks that we expect would be required in order to complete the future deliverables. For each prototype deliverable there would be four major tasks (excluding the first prototype) in order to fulfill the requirement for each deliverable. The four major tasks are: Developing improvements for the prototype, purchasing the required material for the prototype, making the prototype, and evaluating our prototype. We decided that the last two deliverables would require everyone's contribution. We estimated the duration of each task taking consideration of the time given before each deadline and then divided each task by the time it takes to complete each task. For example, we estimated that the creation of the prototype would take the longest in each deliverable, the analysis of the prototype would take the second longest, and purchasing materials and improving the prototype would take the least amount of time. We then allocated the time by days depending on the number of days given to submit the deliverable. We have given enough time to perform each task even if there are delays. Group members were able to assign their own tasks, the more committed and responsible team member’s names were more recurring. As mentioned above the last two tasks will be completed by everyone as it requires everyone’s skill to complete.

# **Gantt Diagram**

* See attached Microsoft Project Worksheet

# **Risks and Contingency Plans**

* Purchase delays

 There could be shipping delays, it might be several days late, which would delay the entire project. One method to avoid this situation is ordering the materials as soon as possible. Even if all the material is shipped on time the material might be damaged during shipment. We could mitigate this risk by buying extra material as a precaution or buying replacements. Another method is to find local sellers for the material/equipment necessary. However, the second method runs a risk of the product going out of stock. To mitigate these risks we will list possible places from cheapest to highest price to obtain our items in a timely and cost efficient manner.

* Material Failure

 There could be problems with the purchased material. The roots of the plants might be grow too large for the system, which would stop the water flow to the rest of the plants through the pipe. This example would be a system failure and we would need to identify whether this problem occurs often or not. To reduce this risk we have to research our materials carefully before purchase, and find solutions to maintaining our plants roots while it is growing in the system.

* Operation Failure

 The air pump is requires manual labour to operate. Failure to operate the air pump equates to failure of the system. A sign-up sheet to take care of the experimental plants will reduce this risk. And having another person double check the status of the system will further reduce this risk.

* Testing Errors

 There are a few critical conditions our system must satisfy to function properly according to our client’s needs. The system must be stable, endure temperatures from -5oC to 45oC, endure dry and sunny environments, and be easy to use. Failure to fulfill these requirements will cause major setbacks for our project. To mitigate these risks we must have plans available for the worst case scenarios. If the prototype were to fail we will be able to implement a solution immediately.

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# **Estimated Prototype Costs**

 Listed below are key components for each prototype that will be purchased and their respective prices.

Prototype 1

 Since prototype 1 is only a basic proof of concept we have decided to use items that are readily available and that are either free or cheap. Our allocated budget for this prototype is $0.00 - $5.00. Some items include, a garden hose, duct tape, and a bicycle pump. We will also be using equipment that are available through uOttawa’s facilities including the maker’s lab, and MTC.

Prototype 2

 Since prototype 2 will feature the most critical components of our system to determine whether the idea is feasible or not. In addition to the materials and equipment provided in prototype 1 we have a budget of $20.00 - $30.00.

* Basic Air pump: about $ 30.00

 The air pump we have chosen is made out of PVC pipes and we will build it ourselves. It is a simple design that is efficient and cost effective. This air pump is simple enough for the user to build. This air pump allows the hydroponic system to run without electricity and requires less physical labour than other alternatives.

Total Cost: $ 30.00

Prototype 3

 Prototype 3 is the most important because it features a full size functional model of our hydroponic system. In addition to the materials and equipment provided from prototype 1 and 2 we have allocated 70-80$ for building supplies. This step will take the longest due to the fact that it will be our final product and will need to be able to grow vegetation. Depending on how well our prototype 2 goes we might be able to use the subsystem we created to save us some time and money.

* PVC (Polyvinyl Chloride) check valves: $ 10.84 + tax <http://www.homedepot.com/p/Everbilt-1-25-in-and-1-5-in-ABS-In-Line-Sump-Pump-Check-Valve-THD1020/205616001>

 The Everbilt 1.25 in. and 1.5 in. ABS In-Line Sump Pump Check Valve was chosen because it is known to be fail safe and durable. It is made out of PVC, and has two stainless steel clamps that properly seals the pipes and will not rust. It can accommodate both 1.25 and 1.5 inch, which will give us more options for pipe sizes. This particular check valve is known to be successful despite its low cost.

* 10 ft of piping : $ 15.25 + tax <http://www.homedepot.com/p/1-1-2-in-x-10-ft-330-PSI-Schedule-40-PVC-DWV-Plain-End-Pipe-531111/100135041>

 The 10 ft of piping is required because it is necessary to determine whether the water and nutrient solution will flow through the system and if it is distributed to each plant properly. We have allocated $15.25 on this material because it is a cheaper alternative to others on the market and 10 ft reduces the risk of having damaged piping.

* Water reservoir/tank: $ 13.67 + tax

<http://www.walmart.ca/en/ip/hybrid-plastic-128l-tote/6000192076677>

 We have chosen to use Walmart’s Hybrid Plastic 128 L Tote as our water reservoir. We required a large enough reservoir that could distribute water evenly to each plant in our system. This reservoir was chosen based on its capacity and its low cost.

* O-rings: $ 6.99 + tax

www.canadiantire.ca/en/pdp/dorman-help-o-ring-assortment-16-pk-0245506p.html#srp

 We have chosen Canadian Tire’s Dorman Help! O-Ring Assortment, 16-pk. We need atleast 4 O-rings for our prototype. These O-rings were chosen because we would have an extra 12 O-rings in case of any mishaps. Also with the assortment of different sizes we ensure that at least one set will fit our prototype.

Total Cost: $ 46.75 + tax

# **Conclusion**

 As this is an estimate, unforeseen circumstances could occur and we would have to adjust our schedule accordingly. To have a more accurate estimation we will record the amount of time it takes to complete each task as we are completing them. Also our group has never done these assignments before so we are unable to base our estimations on previous work. After careful examination of our schedule it can be seen that the time allocated for each task is realistic and the completion of the project is achievable by our estimations. We have given enough time in case of delays by evaluating the risks and contingency that could happen. In addition, the estimated cost for all three prototypes falls under our budget. Therefore, under our estimations we are able to complete each deliverable by their respective deadlines.