

## RESIDENTIAL RAIN WATER HARVESTING

I PRO 344



### WALKING ON WATER

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**Motto**

"Problems cannot be solved at the same level of awareness that created them." *Albert Einstein*

## **1.0 EXECUTIVE SUMMARY**

**IPRO 344** is a team that is broadly focused on solving the issue of water shortage in the world, but specifically focused on decreasing the “Water footprint” being left by society by decreasing the amount of fresh drinkable water used for purposes that don’t require clean water, like watering lawns, washing cars, flushing toilets and more. This report details the methods used to arrive at the final product, Walking on Water (W.O.W). The team set its Goals and Objectives and then began to research. With the support of Pentair Water Company, one of the leading suppliers of water technologies, IPRO dove head first into this project. The team was organized into two parts design and marketing both assigned essential tasks that would tie into each other. The team worked feverishly and the end result was an innovative system that addressed many of the needs of the consumer and had the potential to begin the Rainwater harvesting revolution.

## **2.0 PURPOSE/OBJECTIVES**

The purpose of this IPRO is to address the issue the “water foot print” that is being left by society today. There are predictions that a water shortage is in the midst and with the staggering statistics about everyday water usage, global resources and water supplies it is undeniable that something needs to be done. The objective of this IPRO is to create a system that address all the constraints of current rainwater harvesting systems, and also create a desire in the public to actually harvest the rainwater. The ultimate goal is to make a major impact in the “Green” movement and supply people with this alternative “grey water” supply to offset the use of potable water for non-potable uses such as water lawns, washing cars, and eventually with advances in technology and legislation, flushing toilets.

The sponsor for this project is Pentair Water.” Pentair provides the world with leading water solutions and technical products.” From pumps, to water pressure, to pool and spa products, Pentair strives to improve life daily. For this project they have expressed a sincere interest in the group creating a system that would be different than the pre-existing ones, and that would spark an interest in the public.

There were several factors that would affect the final product of the IPRO, like “Who would this product best benefit?” and “What would make it different than the preexisting systems?”. The problems involved with the “Who” aspect of this project were that some people lived in apartments and had no area to harvest rain water, and city codes and roof restrictions would be a problem for high rise buildings. So the team decided to target Residential/Single family homes. Now, as far preexisting technologies there are

over 500 systems in existence and this IPRO was determined to address most if not all of issues involve with these systems. There were several problems presenting an issue with the current systems. Most of them use large cisterns (rain barrels), that hold the water, that are eyes sores, or people had no place to put them. Some systems were very expensive, and others required too much maintenance. Armed with these parameters IPRO 344 began their project.

### **3.0 ORGANIZATION AND APPROACH**

In order to achieve the goals of the project the group had to work together and also work in sub-teams. At the beginning of the project everyone was involved in the initial research phase. Finding out about Pentair Water Company, what they specialize in, and what they required of the group was the first task. Next was finding out information about Rain water harvesting, and what systems already existed, what was wrong with those systems and what the team could do differently. The first few weeks consisted of research and group brain storming. The group also met with Pentair to present ideas and get feedback. After much deliberation and research it was decided that the team would go with the idea of “Walking on Water” and upon this decision the team was broken up into sub-teams. Half of the team was geared towards design, and the other half was geared toward marketing. The major research topics throughout the entire project were rainwater harvesting, water shortage statistic, average rain fall, pre-existing systems, Pentair Water, Materials/cost for the product, Shock marketing statistics, and consumer feedback. The major outlets used for research were internet sites, field testing of the product, and customer surveys, and the reason that the team chose these outlets was because several of the current existing products are fairly new and methods and statistic were more readily available on the internet. The group also chose to use surveys to find out the public’s current interest and gauge an audience for the product and what they required.

### **4.0 ANALYSIS AND FINDINGS**

Through all of the research the team found out about the pre-existing products. The first few products found were all large cisterns sitting on the side of the house, or buried in the backyard. These were eye sores, left spots on the lawn if the person decided to remove it, and required mass digging in the ground to install. Another Product called “The pillow” and it was essentially a bag, or pillow if you will, that held the water collect. The team liked this design because it could be folded up and put away and it was simple to use, but the same issues as the previous designs still existed. Finally he team found a product called “The Hog” was a modular set of cisterns, 2ft wide by 1ft thick by 5 feet tall, that attached to a fence or the side of the house/garage that used gravity as a way to empty them. They were smaller, didn’t mess up the lawn and could be put away. The team liked this idea but the problem of aesthetics still persisted. The team combined all the pro’s and con’s of the products found, and came up with the idea of “Walking on Water.” It would be modular like the hog, but smaller and cube shaped. Also it would be

like the normal cisterns in the fact that it could be buried but the hole would be substantially smaller, and the average person could dig it themselves without destroying the yard. The thing that set the product apart from the others was that it had a permeable surface that a person could walk on. It was aesthetically pleasing because it blended in with the yard and created a walk way. The team came across “Permapave”, while researching, which is a company that manufactures permeable pavers that fit the exact needs of the product.

The idea was presented to Pentair and representatives were thoroughly impressed and were curious to see the finished product. Pentair, interested in helping the team with some of their constraints, set up a phone conference with their associates in Australia who were already implementing the practice of rain water harvesting. The results of the conference helped the group find out that there is actually a \$30 rebate in the state of Illinois for people who buy rain barrels. Also the team found out about “The water switch” , a mechanism that tell how much water is in a cistern switches the system on when there is water present and off when it is not, which is a key element in what sparked the water harvesting revolution in Australia.

The design of W.O.W (walking on water) is highly innovative in the fact that there isn’t another product like for the specific use of rain water harvesting on the market right now. The team successfully designed, built and field tested a trial version of the W.O.W. That field test showed the team some of the flaws in the design, and another improved module design was built.

## **5.0 CONCLUSIONS AND RECCOMENDATIONS**

In closing the team was successful in achieving their goal of creating the technology desired. The team discovered that the amount of water that could be captured form roof collection and store in the cisterns could offset the amount of potable water used for non-potable uses, and if used by the masses it could successfully decrease the water footprint helping to conserve the freshwater resources.

The group recommends that the next IPRO should meet again with Pentair and look into and begin targeting middle market vendors like an “Ace’s Hardware, or other stores that are not main stream suppliers to implement fields test for the product. It would create a demand for the product while preventing Pentair from loosing profit, because smaller stores don’t require as much of the product to give it shelf space. The next group should also continue to research the topic of rainwater harvesting and systems that exist, because with rapid advances in technology a new innovation could surface that could help the product.

## **6.0 Appendices**

### **A. Background Information:**

There is evidence that people have been harvesting rainwater since 4000BC. The Roman Empire developed an intricate infrastructure to direct water to be used for irrigation and sanitary purposes. For the most part, modern society has abandoned the practice of harvesting rainwater because water sources have been plentiful and inexpensive. Residents have become accustomed to turning on the tap and receiving potable water from their Municipal Authority or a free standing well. Essentially rainwater is undervalued and as such has not been given the priority it deserves. This circumstance is rapidly changing as fresh water is becoming more difficult to acquire. Municipalities are raising the price of water, adding regulations to restrict its use and promoting the rapid growth of investment in 'green' lifestyle solutions. These actions are increasing public awareness of the need to reduce our "water footprint" and a willingness to invest in conservation systems. In urban settings, two-thirds of the water provided by municipalities goes to residential properties. In a typical single family home, 70 percent of the water used annually is used in toilets and outside the home for lawn irrigation, gardens, washing cars, swimming pools etc. These applications could successfully utilize non-potable water, if a reliable source existed for capturing and recycling it in a convenient and affordable way.

### **B. Budget (Actual expenses)**

<b>Name</b>	<b>Price</b>	<b>I PRO #</b>
s. murray	15	344
d. maccloat	15	344
d. macloat	24	344
m. al-sabah	22	344
m. munir	46.63	344
m. munir	5.27	344
a. newman, m. al-sabah, s. murray	5 round trips to WI. appox 200 miles round trip	344
total minus travel		<b>127.9</b>

## C. Team Members

Team Member	Skills	Expectations
Sean Murray [REDACTED] <a href="mailto:smurray2@iit.edu">smurray2@iit.edu</a>	-Architecture -Problem solving -Graphic design	To have a learning experience that involves design
Declain McCloat [REDACTED] <a href="mailto:dmcclat@iit.edu">dmcclat@iit.edu</a>	-Architecture -Creative -Finding the middle ground	To continue learning team management skills
Michael Gubser [REDACTED] <a href="mailto:mgubser@iit.edu">mgubser@iit.edu</a>	-Architecture -Problem solving -Creative	To create a functional product that can be sold
Mohammad Al-Sabah [REDACTED] <a href="mailto:malsaba@iit.edu">malsaba@iit.edu</a>	-Architecture -Rhino -Model making	A great final presentation
Adam Newman [REDACTED] <a href="mailto:anewman2@iit.edu">anewman2@iit.edu</a>	-Architecture -Auto CAD -Adobe Suite	A presentation that teaches consumers how to harvest rainwater
Alysa Kirkpatrick [REDACTED] <a href="mailto:akirkpa1@iit.edu">akirkpa1@iit.edu</a>	-Architecture -Inventing new ideas -Display of artistic ability	To create a product that generates an interest in rainwater harvesting
Juan Martinez [REDACTED] <a href="mailto:jmarti21@iit.edu">jmarti21@iit.edu</a>	-Psychology -Creative -Has unorthodox / outside of the box ideas	How to test prototype designs
Muqadas Munir [REDACTED] <a href="mailto:mmunir@iit.edu">mmunir@iit.edu</a>	-Business -Thinking outside of the box -Time management	To create a tangible final product
Shuana Martin [REDACTED] <a href="mailto:smarti5@iit.edu">smarti5@iit.edu</a>	-Biology -Creative -Problem solving	To make a project that has the potential impact on society