



Kirkwood Community College

and

Al Quds College
Luminus Education

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I. Executive Summary

Rangers Sustainable Water Solutions is a collaboration between six United States members and eight Jordanian members. All with different backgrounds, but one common goal. To achieve a sustainable solution centered in the hospitality industry. Our Solution is two fold: the Grey Water System and The Trolley will both be laid out in detail throughout the business plan. These two systems work together in harmony to help reduce water waste, encourage plastic bottle and water recycling, all while generating reusable energy through water powered turbines.

Our goal as a company is to be in a variety of markets, both large and small scale. These markets include large and economy hotels, conference centers, arenas, airports, schools and restaurants. Rangers Sustainable Water Solutions numerous systems provide not only a wide variety of products, help save our clients money, but also appeal to a wide range of markets.

Through SWOT analysis and testing of these products we concluded that consumers and businesses are not only interested in the products themselves, but that having green initiative practices established is important to businesses and consumers. The Grey Water System is unique to the market and has a small competitive set. The competitive set consists of industrial companies that produce energy using turbines for a whole city. The Grey Water System is also used in many cities around the United States. All these sources are stated in the resources section.

Financing for both the Grey Water System and The Trolley will come from investors and entrepreneurs interested in supporting local sustainable business practices. Strategic marketing of both of these products will help secure additional financing. This product specific marketing is key to the success and implementation of the Grey Water System and The Trolley.

II. Project Description

We at Rangers Sustainable Water Solutions have designed an innovative Grey Water System that recycles grey water from sinks, showers and laundry machines. This system is designed to be implemented in larger hotels, conference centers, arenas and larger restaurants. Before the grey water reaches the filtration phase the water must pass through a series of turbines located inside the pipes leading from the sinks, showers and laundry to the basement. These turbines generate energy as the water moves through them. This energy would then be bought back by the energy company. Thus saving money on the company's electric bills. The grey water then flows through a dual filtration process of charcoal and granite. This filtered water will then be utilized in laundry operations, toilets and outdoor lawn care. This large scale system is designed ideally for new hotels, although can be retrofitted into a preexisting establishment. For smaller operations that cannot feasibly implement the full scale Grey Water System we at Sustainable Water Solutions have created a smaller model. This model focuses on restaurants, event centers and economy hotels who want to start making an impact in their community, but do not have the funds or do not create enough grey water to be properly recycled using the Grey Water System.

This smaller scale system is called The Trolley. Just as the name states it is a trolley that can either be wheeled around during cleanup or can be placed in as a stationary object in a

hotel or visible area. The goal of The Trolley is, like the Grey Water System, to recycle used grey water. The main source of water for The Trolley is from used plastic water bottles. The remaining contents of the water bottles is emptied into The Trolley, where it passes through a similar filtration system as the Grey Water System and can then be used to water plants and other vegetation inside or outside surrounding the building. The Trolley also has a spot to place the plastic bottles, to later be recycled. These two sustainable systems work hand in hand in one establishment or can be utilized as separate units.

III. Team Mission Statement

We at Rangers Sustainable Water Solutions pride ourselves on collaborating as a bi-national team in order to improve our community and our world. Through the implementation of unique sustainable solutions that reduce water waste and improve plastic bottle recycling. Sustainable Water Solutions strives to teach our friends, communities and future generations about the importance of sustainable water practices by showing that it can be economical, easy and fun.

IV. Team Philosophy and Vision

Rangers Sustainable Water Solutions value most of all, our customers by continually working to improve our existing products while brainstorming ideas for new, innovative and creative projects that would lead to better water quality. We excel at working through challenges as a collaborative team and enjoy having fun while learning. Sustainable Water Solutions envisions our solution to be implemented in both large or small scale businesses to promote a greener world, help fight against global warming, pollution and better water waste practices. Rangers Sustainable Water Solutions is constantly thinking of ways to improve our water not only for today, but for tomorrow. Through expanding our types of products and materials used we plan to improve the continued success of our business for years to come.

1. Project Goals

The Grey Water System strives to show customers the long term global and economical benefits of a water recycling systems. By providing statistics on the filtration process, amount of water saved and reused, as well as the monetary impact on the customer's business. The Trolley system also allows the public to view our customer's water recycling initiatives, while engaging them in helping the business and their communities recycle plastic and water. This physical representation of the large scale Grey Water System allows our customer's to get involved with the community and the future generation. Our aim at Sustainable Water Solutions is to let future generations know we care today and are willing to go the extra mile for their future.

2. Target Market

Sustainable Water Solutions target market for The Trolley will be restaurants, small (economy) hotels, event centers and country clubs as well as utilizing it in public spaces to reach our target markets' customers as well. The Grey Water System's target market is larger

hotels, conference centers, arenas and larger restaurants with plans to expand into airports and schools. Each of these systems is best utilized where there are a variety of grey water sources.

3. Project Purpose

To allow consumers to get in engaged in sustainable practices as well as to produce a product that exemplifies sustainability, collaboration and ingenuity. Rangers Sustainable Water Solutions want guests of the businesses utilizing our products to understand how the system works and the function it serves for the business and its community. We hope consumers are more willing to book a hotel room at “green” hotel and seek out the companies that support our Grey Water and Trolley systems. These products are important to us and we strive to show how much we care about them with our clients and consumers of the products.

V. Team/Project Description

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| Team Name | Rangers - Sustainable Water Solutions |
| Team Mission Statement | To serve our community by recycling and treating grey water in a safe, reliable, efficient and environmentally responsible manner, while providing excellent service to our customers. |
| Target Market | Hotels, restaurants, conference and event centers, arenas, country clubs and potentially even schools and airports. |
| Industry/ Competitors | The Trolley and Grey Water System are both a unique concept. Grey water systems such as this have primarily been put in place in cities on a much larger commercial/industrial scale than our Grey Water System. Lucid Energy, Rice Midstream Partners, TAQA and Pelamis Wave Power are some of the industrial competitors we have based our designs and figures off of. The Trolley though much like any other recycling receptacle is unique in that it holds 20 Liters of water as well as recyclables. |
| Ownership | A collaborative partnership consisting of a hierarchy of team leaders, managers, researchers, recorders, technology experts and journalists. |
| Product/ Service Idea | The Grey Water System is a series of pipes installed into a hotel, or any of the other above mentioned properties, that collect used water from kitchen and hotel room sinks, showers and laundry machines. This water is then funneled to the basement by one 6” pipe, where it passes through a series of two charcoal and granite filtration tanks. Once filtered the water is sent out to toilets, washer machines and lawn care to be reused. The Trolley collects plastic water bottles to be recycled, as well as the water remaining in the bottles to be processed through a charcoal filtration |

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| | system. Later this filtered water will be used to water plants within the establishment and surroundings. |
| Special Benefits | <ul style="list-style-type: none"> • Customers interested in “Going Green” • Environmentally friendly • Saves money for the company • Can work both on large and/or small scale • Teaches future generations about the importance of conservation and recycling • Does not require any extra labor for installation |
| Unique Features | No extra energy is consumed due to the natural flow of water through the pipes, which creates overhead pressure and speed. This allows the turbines to generate energy from the water. |
| Limits and Liabilities | <ul style="list-style-type: none"> • The filtered grey water is not suitable for drinking • Requires overhead speed to generate optimal energy outputs, which works best in larger hotels or taller buildings with a greater grey water output |

VI. SWOT Analysis

| | Strengths | Weaknesses | Opportunities | Threats |
|----------------------------------|--|---|---|---|
| Product/ Service Offering | Unique Innovative | Solar and wind power might generate more electricity | Green hotels | Traditional renewable energy sources |
| Brand/ Marketing | Taking advantage of the scarcity of water in Jordan and the willingness of hotels to protect the environment | might have trouble convincing business owners to make major renovations to current infrastructure | New hotels/restaurants could use the Grey Water System from the very start of construction to avoid renovations. Preexisting hotels and restaurants have the option of The Trolley if funds weren't available for renovations | Marketing/ advertising from other businesses implying they also have this technology. Such as: “We too are green.” “Come stay here at our sustainable hotel.” |
| Finance | Can be funded. All materials are used in normal building | Not a lot of starting capital. Will need to procure | Parts and construction are relatively low cost. | Companies that produce the materials we need might take |

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| | construction and are easy to find. Charcoal and granite are a very common and inexpensive method of filtration. | investors to start up the business as well as potential new hotels to implement our system | 2", 4" and 6" diameter PVC pipe, stainless steel or even hard plastic for the turbine, a energy container such as a battery for the turbine and charcoal and granite for the filtration | this as an opportunity to raise prices |
| Operations/ Management | Utilization of task force teams with a greater knowledge and understanding of construction and materials. Strong leadership and collaborative skills are the backbone of our business model. | Relatively new team and unexperienced in the field | Great chance to get into the market and learn. Teach the public and other businesses about sustainability and that it doesn't have to be expensive. | More experienced entrepreneurs might not let us thrive |
| Market | Still really small, so we have a competitive edge. Making us unique in this field | Not enough knowledge in the market to get going | Environmentally friendly innovations are always welcome | Other companies looking to expand their "green" markets |

VII. Our Surveys Found

1. For the consumer:

- People seeking "green hotels" will book a room at a hotel with our Grey Water System
- Environmentally friendly guests will rather go to a hotel that uses grey water than a hotel that does not have green practices
- Green practices are on the rise
- Guests want to understand how the filtration process works and if it is safe
- Guests want to know what the Grey Water System is and what it's used for

- Guests get more satisfaction knowing they are helping fight water waste

2. For the business:

- Businesses with a lot of water waste looking to reduce costs without incurring many additional expenses along the way
- Businesses that are interested in sustainable practices
- New hotels/conference centers looking for a competitive edge on other nearby facilities
- Any big or small hotel willing to start going “Green”.

VIII. Components & Financial Plan

Grey Water System

Size and prices were based on The Hotel at Kirkwood Center, which is a 71 room hotel. The Hotel at Kirkwood is part of Kirkwood Community College, located in Cedar Rapids, IA. Budgeted prices were based off of retail averages with a discount of 25% for average bulk or wholesale pricing.

- **Holding Tank:** Holds 4000 gallons (15141.65 Liters) of water. Budgeted cost: \$6000 for a hard plastic tank.
- **Piping:**
 - 2” PVC pipes lead from the sinks and showers of each room. Roughly 10’ of piping per 2 rooms. Budgeted cost: \$300
 - 4” PVC pipes run along the bottom of each floor collecting water from all the rooms on that floor. Budgeted cost: \$6,900
 - 6” PVC pipe joins each of the floors together and funnels all the water to the basement. Budgeted cost: \$1750
 - an additional \$750 is budgeted for caps and cuffs for PVC pipe transitions
- **Filtration Tanks:** each hold 2000 gallons of water (7570.82 Liters). Budgeted cost: \$1300 for each and a total budgeted cost of \$2600
- **Filtration Method:** uses both charcoal and granite, which is one of the most commonly used methods of water filtration as well as least expensive. Both charcoal and granite prices may vary dependent on job site location
- **Turbines:** placed along the pipes as the water flows from the tower of the hotel to the basement where the holding tanks and filtration tanks are located. One turbine can be placed every 3 meters if desired up to 100 meters. Budgeted cost per turbine: \$2000 including battery for energy collection
- **Water Savings:** savings could be as much as 14,000 liters (roughly 3700 gallons) per day and upwards of 5,000,000 liters (1,320,900 gallons) annually

The Trolley

A full scale prototype was produced and tested in Amman, Jordan

- The Trolley was made with a steel frame that is 3' in height, 4' wide and 2.5' deep. The budgeted cost of steel: \$150
- Contains a 20 Liter (5.28 Gallon) water holding tank. budgeted cost: \$50
- Charcoal filtration system budgeted cost: \$5 per filter. Filter would be changed every 10,000-15,000 gallons, depending on the brand and quality of the filter
- Hose attached to filtration process that allows for watering of plants and other lawn care. budgeted cost: \$20
- Wood paneling and stain budgeted cost: \$50

Financing

To obtain financing for start up through investors who support green and sustainable energy. Those investors may include companies that produce the turbines and/or local entrepreneurs looking to support sustainable growth in the area. Most of our financing will come directly from the hotels who plan to implement our Grey Water System into their new hotel construction projects. By achieving a chain or brand recognition we would become pre-approved from that brand for other new hotel construction projects. The Trolley financing would be obtained through our own capital start up as well as a loan from the bank.

IX. Operational Plan

The Trolley would require a factory and skilled workers to manufacture the final product. The set of skilled workers required would include welders, craftsman and general laborers. While initial cost of The Trolley would be greater than the Grey Water System, because it requires a physical space, but it has a wider reach in smaller markets. The Trolley will be utilized as a form of advertisement to show businesses the benefits of recycling not only plastic, but recycling their grey water as well. The Trolley, once manufactured by skilled craftsman, will not take more than a day to produce. As the business becomes more successful Rangers Sustainable Water Solutions will assess what modifications must be made to production.

The Grey Water System is fairly self-sufficient. Once construction on the hotel or space is complete the flow of water does the rest. The charcoal and granite filtration will need to be checked on a regular basis to ensure that it is filtering properly and efficiently. The charcoal and granite will need to be changed about once or twice a year, dependent on the quantity of grey water passing through the filters. The energy collected from the turbines, inside the water pipes, will be stored in a battery pack to be bought back into the grid by the electric company or attached directly into the hotels on grid. This is a case by case scenario. Different cities, counties and states have different regulations in regards to renewable energy.

X. Marketing Plan

1. Target Market

Consists of new Hotels, restaurants, conference and event centers, arenas, country clubs as well as the potential to expand into schools and airports.

2. Brand Development

We at Rangers Sustainable Water Solutions make sure water is the focus of everything we do. Through the different products we offer we want to show our consumers that reducing water waste, recycling grey water and reusing it is easy and affordable. Through the engagement of the community and the consumer, with help from word of mouth, we believe Rangers Sustainable Water Solutions will be in 10% of new hotels across multiple chains with an expected increase of 5% annually.

3. Marketing Plan Development

Rangers Sustainable Water Solutions gears its marketing toward new property development. There are roughly 300,000 plus hotels around the world (2017 statistic), increasing at a rate of 3% annually, which comes out to at least 9,000 new hotels that can be marketed to. Sustainable Water Solutions plans to focus our efforts on the larger chains hotels and conference centers that use a lot of water. Once one hotel in a chain buys into Sustainable Water Solutions it is much easier to get approved for another hotel within that chain. The Marriott Brand has over 20 different hotel brands under their name. Each of these brands could potentially implement our Grey Water Solution. This same thought process applies to The Trolley as well. Implementation within a hotel brand chain is the primary focus. The Trolley will be marketed toward preexisting hotels and restaurants.

4. Marketing Budget

More and more hotels are getting tax cuts and incentives for different levels of “green construction.” Rangers Sustainable Water Solutions is a cost effective way for a hotel to achieve such certifications. As stated previously: with little overhead to new property development the benefits greatly outweigh the costs for the company looking to implement our system. Our marketing budget gears toward product placement through showing consumers our product and how it works. Marketing The Trolley at tradeshow and restaurant conventions is one way we will sell this product. This would cost around \$3000 per show for rental of the space as well as the travel cost for our marketing staff. Getting approved by a brand or chain is our focus, which may cost us in meals and travel time for staff, which could be anywhere from \$500 to \$2000 a trip dependant on the length of stay. All of the tradeshow would be scheduled out for the year and budgeted accordingly.

5. Implementation

Through strategic product placement of The Trolley in chain restaurants and hotels as well as with well presented trade show exhibits. Placing staff in meetings for new construction or potentially new hotels to get in on the ground floor, so to speak.

Resources Page

Jackie Bohr - General Manager, The Hotel at Kirkwood Center

Rick Fosse - Civil Engineering Professor, University of Iowa

Kristie McKibben - Assistant Professor, Mechanical Engineering at Kirkwood Community College

Greg Krawiec - Assistant Professor, Hotel Program Coordinator of Hospitality Arts at Kirkwood Community College

Turbine Costing Sources

<http://www.powerspout.com/pump/>

<https://www.homepower.com/articles/microhydro-power/equipment-products/hydro-electric-turbine-buyers-guide>

<http://www.aurorapower.net/products/categoryid/4/list/1/level/a/productid/209.aspx>

Pipe Costing Source

www.homedepot.com

www.farmandfleet.com

Turbine Functions and Energy Generation Sources

<http://lucidenergy.com/how-it-works/>

<https://pdfs.semanticscholar.org/5e60/4c633070f20366b868a7c8beeb835564dc43.pdf>

<https://codes.iccsafe.org/public/document/FPC2017/chapter-6-water-supply-and-distribution>

<http://www.bsc.ca.gov/>

<https://new.usgbc.org/leed>

Grey Water Filtration Sources

<https://greywateraction.org/greywater-faq/>

<http://www.mwi.gov.jo/sites/en-us/Hot%20Issues/Strategic%20Documents%20of%20%20The%20Water%20Sector/Water%20Substitution%20and%20Reuse%20Policy%2025.2.2016.pdf>

<https://www.sciencedirect.com/science/article/pii/S0011916407002081>

<http://reusegraywater.com/faqs/>

https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/pdfs/Greywater_Filtration_sustainable_water_11_2011.pdf

<http://www.umich.edu/~ipolicy/Policy%20Papers/water.pdf>

<http://www.greenlodgingnews.com/>

<https://www.ahla.com/resources/green-guidelines-index>

XI. Our Team

Cassie Pantel - USA Director - Hotel Management
Dina Khamash - Jordanian Director - Hospitality
Tami Price - USA Manager and Recorder - Liberal Arts
Aws Zaza - Jordanian Manager - Hospitality
Ra'ed Al Adham - Jordanian Recorder - Hospitality
Zoe Martin - USA Social Media and Technology Specialist - Liberal Arts
Laith Abdallah - Jordanian Social Media and Technology Specialist - Hospitality
Hilary Henry - USA Marketing and Research - Graphic Communications
Maggie Mahurin - USA Researcher - Culinary Arts
Lama Samara - Jordanian Researcher - Hospitality
Taynma Samawi - Jordanian Researcher - Hospitality
Bethany Underwood - USA Journalist and Researcher - Social Work
Eman Al Jadi - Jordanian Journalist - Hospitality
Abdulrahman Maragha - Marketing

XII. Our Task Teams

Thomas Clark - USA - prototype design and coordinator
Jake Smith - USA - prototype design
Grant Lack - USA - prototype design
Monir Taher - Jordan - task team leader
Aseel Qattash - Jordan
Ward Jaradat - Jordan
Issa Wadi - Jordan
Suhaib Al Jbour - Jordan
Amjad Abd Al Jaleel - Jordan
Azal Hamad - Jordan
Rehan Omar - Jordan
Yousef Alsadi - Jordan
Mohammad Al Taher - Jordan
Mohammad Al Sheebe

XIII. Facilitators

Sondra Smith - USA Facilitator
Mohammad Salameh - Jordanian Facilitator