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Clean Water Grow: Go or No Go?

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Clean Water Grow™[1]:

"Go or No Go?"

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The $43 billion US wastewater treatment industry is a landscape in which the high costs of capital construction and the need for economies of scale feature prominently. The US Environmental Protection Agency estimates that between 2004 and 2024, over $200 billion will need to be spent upgrading and expanding America's wastewater infrastructure.[2]

One significant challenge in maintaining treatment infrastructure is the build-up of struvite. Struvite accumulates inside treatment facility pipe networks, reducing capacity and increasing operating and maintenance costs. But discharging the components of struvite – the nutrients nitrogen and phosphorous – into the environment also has negative consequences. Concentrated amounts can cause significant harm to aquatic ecosystems.

Clean Water Services (CWS) is the public wastewater utility for Washington County, Oregon USA, providing sewage and stormwater treatment services to more than 500,000 homes and businesses. Responsible for the health and management of a public good – the 83-mile long Tualatin River – CWS is subject to regulations over the temperature and quality of the water it discharges into the natural environment.

This case follows Clean Water Services in its pilot test of a home garden fertilizer product that is linked to the environmental benefits and operational efficiencies gained through an innovative treatment technology. In 2009, CWS implemented a groundbreaking solution to the challenge of struvite; one that also had the potential to turn a waste stream into a revenue stream. An advanced 'nutrient recovery technology' removes the nutrients that form struvite and pollute the environment if discharged, recycling them into an effective, safe to handle garden fertilizer. In mid 2012, the CWS Board gave the green light to produce Clean Water GROW™, its own brand of fertilizer, and test its commercial viability in the local consumer market.

The case educates students on the challenge of finding innovative ways to operate and maintain wastewater infrastructure in the face of population growth and increased pressure on natural systems. It provides detail on the development and commercial pilot of the GROW fertilizer product, and the packaging, pricing and distribution options that were analyzed. It asks students to conduct the crucial steps of analyzing the implications of marketing mix options in terms of break-even quantity and return on investment, and recommending a 'go' or 'no go' decision to the CWS board.

Introduction

As Bill Gafi and Bruce Roll headed out of the boardroom and up the broad spiral staircase of Clean Water Services' Hillsboro headquarters, there was a charge of nervous excitement in the air:

"Well," said Bruce, "seeing that the board didn't shut our idea down completely, I'd say that was a success." "The pilot is going well," replied Bill, "it's helping to show us just how much we don't know."

[2] IBISWorld 2013 'Sewage Treatment Facilities in the US'

The Clean Water Services board was fully supportive of Bill and Bruce's project: it had the potential to reduce operational costs and turn a waste stream into a revenue stream. But Bruce and his in-house team had only six months left to prove that the Clean Water Grow™ product was a financially viable venture — otherwise the board would pull the plug.

Background

Clean Water Services

Clean Water Services (CWS) is the public water utility for Washington County, Oregon (Exhibit 1). Through its four wastewater treatment facilities, 42 pump stations, and 1000-mile pipe network, CWS provides sewage and stormwater treatment services to more than 500,000 homes and businesses.[3] From 2007 to 2012, annual revenues from its treatment services averaged $92 million, approximately 35% of its annual funds. Capital construction projects and operating expenses over that same period accounted for between 35% and 50% of annual spending (Exhibit 2).[4]

As a public utility, CWS treats the residents and businesses it serves as both customers and owners. The company is ultimately accountable to an elected body of commissioners, which makes decisions on the rates CWS is allowed to charge in its bi-monthly utility bill.[5] The 83-mile long Tualatin River is also top of mind for CWS: it is a prominent economic and recreational feature of Washington County, and receives the County's treated wastewater. CWS has a responsibility to state regulators and to its owners to maintain the quality and health of the river.

Bill Gafi had served as CWS' General Manager since 1994, and in 2009 was also made Executive Director of the Clean Water Institute, a newly established non-profit housed within CWS to lead efforts to restore the health of the Tualatin watershed and drive innovation in treatment technology.[6] Bruce Roll, the Institute's lead for watershed management, brought a team together in 2012 to work on a project that would cultivate a direct link between CWS' wastewater treatment business and the gardening activities of Washington County residents.

The Wastewater Treatment Industry

Wastewater treatment companies purify sewage and stormwater to mandated standards and charge a fee or 'rate' to homes and businesses in their service area. In 2013, the United States wastewater treatment industry generated $43 billion in revenues, 87% of which was derived from fees for treatment services.[7]

[3] CWS website
[4] CWS annual report 2011-12
[5] Roll, B., et al, 2008. 'Sustainable Integrated Watershed Management in the Tualatin Basin'.
[6] www.cleanwaterinstitute.org
[7] IBISWorld 2013 'Sewage Treatment Facilities in the US'. Irrigation services and the sale of purified water make up the remaining 10% and 3% of industry revenues, respectively.

The wastewater treatment industry is one in which capital costs are relatively high, requiring large economies of scale relative to the number of customers served. Provision of those services is therefore most efficient when concentrated in a single firm. Thus most treatment companies are structured as public utilities, enjoying a monopoly over a specific geographic region under the control of an elected body. However, the number of private wastewater treatment operators has risen since the 2007-9 recession, as municipalities look for new funding sources and higher scale economies.[8] Responsible for the treatment and management of a public good – water – these utilities are subject to regulations on the quantity and quality of water they discharge into the natural environment.[9]

How wastewater is treated

When a sink is used, a gutter drained, or a toilet flushed, this waste stream is composed of 99% water and 1% waste, by volume.[10] That 1% of waste needs to be treated using primary, secondary, and sometimes tertiary treatment steps and either repurposed or disposed of (Exhibit 3).

Primary treatment involves the separation of anything that is not dissolved in the water. Screens first block sticks, golf balls, and wedding rings before the wastewater flows into settlement tanks, where gravel and other heavy solids fall to the bottom, and greases and oils float to the top. These are removed and the wastewater enters the secondary step, where microorganisms are used in a controlled environment to digest the organic waste matter. Over an average of 20 days, this bio-digestion process converts that matter into solid, pathogen-free 'biosolids' that can be disposed of or repurposed. An example of repurposing these biosolids is using them to improve soil conditions on agricultural lands. After the bio-digester, the organic waste has been removed and the water that remains can be treated further, discharged into a river or other water body, or used to irrigate a golf course or park.[11]

Less than 2% of municipal wastewater utilities in the US have a tertiary system in place.[12] One reason to perform tertiary wastewater treatment is to remove inorganic matter such as nitrates and phosphates – elements needed for the plants we eat to grow – from the wastewater. Discharge of those nutrients into waterways is regulated in some states as they can cause harm to aquatic life.

Challenges Facing the Wastewater Treatment Industry

Regulatory challenges

As regulated monopolies, wastewater utilities are subject to limits on the quality of the water they discharge, the rates they charge to customers, and the sources of funding they can access. These constraints challenge utilities to innovate to find the most cost-effective means of providing needed services, while complying with regulations.

[8] IBISWorld 2013 'Sewage Treatment Facilities in the US'
[9] IBISWorld 2013 'Sewage Treatment Facilities in the US'
[10] Interview with Clean Water Services, August 15, 2013
[11] http://regionalutilities.net/documents/Wastewater%20Explained.pdf
[12] http://www.cleanwaterservices.org/AboutUs/WastewaterAndStormwater/TreatmentProcess.aspx

Operational challenges

The cost of maintaining and expanding treatment infrastructure to accommodate growth is extremely high. The U.S. Environmental Protection Agency estimates that between 2004 and 2024, over $200 billion will need to be spent upgrading and expanding America's wastewater infrastructure.[13]

One significant challenge in maintaining the infrastructure is the build-up of struvite – a compound made up of magnesium, ammonium (a form of nitrogen), and phosphorus. Struvite accumulates inside the pipe networks of a wastewater facility, reducing the capacity of the pipes and forcing hydraulic systems to work longer, increasing operating and maintenance costs.[14] Struvite formation presents a common challenge in wastewater treatment systems that utilize biological treatment techniques and anaerobic bio-digestion (the secondary process noted earlier). Given that maintaining and enhancing infrastructure represents a significant portion of a water utility's operating budget, mitigating struvite-related costs is a key objective.

Environmental challenges

While not consistently regulated across the US, discharging concentrated amounts of nitrogen and phosphorus (two key nutrients used to grow food) can cause significant harm to the natural environment. For example, rivers and lakes can suffer from intense growth in algae populations, called algal blooms. Algae are short-lived, resulting in a high concentration of dead organic matter which starts to decay. As they decompose, the oxygen dissolved in the water is consumed, leading to large die-offs of animals and plants in the affected areas.[15] As an example, the 'Dead Zone' in the Gulf of Mexico is the result of nutrients applied to agricultural lands flowing down the Mississippi River, causing the depletion of oxygen in the water and the significant loss of marine life.[16]

Innovative Solutions at Clean Water Services

Because a monopoly has a captured market, there is often little incentive for innovation. However, in order to overcome the numerous challenges noted earlier, CWS has initiated a range of innovative solutions in service delivery, operational efficiency, and regulatory compliance. These innovations have positioned CWS to successfully serve a growing community within a sensitive natural environment.

At the strategic level, CWS' board and management has adopted the view that CWS is a steward of the overall health of the Tualatin River. This stewardship approach enables CWS to justify expenditures that are not directly related to treating wastewater, but support core functions and ensure regulatory compliance. Examples from CWS' 2011-12 annual report include:

[13] IBISWorld 2013 'Sewage Treatment Facilities in the US'

[14] Fattah, K. 2012. *International Journal of Environmental Science and Development*, Vol. 3, No. 6: page 548.

[15] Lathrop, R. et al. 1998. Phosphorus lading reductions needed to control blue-green algal blooms in Lake Medota," *Canadian Journal of Fisheries and Aquatic Sciences*, 55: 1169-1178.

[16] http://www.nbcnews.com/science/gulf-mexico-dead-zone-size-connecticut-6C10798946

a) Swept more than 12,000 miles of streets, cleaned 13,500 catch basins, and collected 750 dump truck loads of material to keep pollutants out of the river and streams.

b) Coordinated and funded the planting of 15,000 accumulated acres of riparian buffers (streamside vegetation), which prevent sediment and agricultural nutrients from entering the river, as well as creating shade that mitigates temperature increases at waste treatment outflows.

c) Provided a Clean Water Hero Program, a free service to help homeowners create a sustainable stormwater landscape that will reduce polluted runoff from their property.[17]

d) Captured the methane resulting from the bio-digestion process to generate power for its treatment facilities.[18]

On the operational front, CWS worked with the Clean Water Institute to implement a groundbreaking solution to the challenge of struvite — one that also had the potential to turn a waste into a value-added consumer product.

Crystal Green®

In 2009, CWS partnered with a Canadian technology vendor to deploy an advanced technology that could remove phosphorus, magnesium and ammonium from the waste stream, before it could crystallize as struvite and clog up the pipe system (Exhibit 4). The process employed microbes to turn those nutrients into dry, odorless 'prills' or pearls (Exhibit 5). Being reconstituted nutrients that plants need to grow, these pearls represent the key ingredient of an effective, safe to handle garden fertilizer, which has been commercialized as Crystal Green®.[19] CWS was the world's first utility to implement this commercialized nutrient recovery system and has produced over 1,000 tons of Crystal Green® since the technology was implemented (Exhibit 6). In 2012 CWS grew its Crystal Green® capacity to 1,000 tons per year.

The nutrient recovery technology and the resultant Crystal Green® fertilizer poised CWS for numerous benefits:

Operational benefit

Removing the components of struvite improved throughput capacity, reduced treatment costs, and negated the need for hazardous, costly chemicals to combat struvite build-up. An internal study conducted by CWS in 2011 estimated up to $500,000 per year in saved operational costs as a result of this nutrient recovery technology.[20]

Environmental and social benefit

Environmentally, this process also had multiple benefits. It helped CWS to achieve a phosphorus concentration for its discharged water that was among the lowest of any treatment facility in the country, reducing the risk of algal blooms and loss of aquatic life. It

[17] CWS Annual Report 2011-12

[18] http://www.cleanwaterservices.org/content/AboutUs/CWAC/Meeting%20Minutes%2011-19-08.pdf

[19] *Crystal Green* is trade marked by Ostara Inc., the Canadian technology vendor.

[20] Clean Water Institute 2011. 'Green Technology for Clean Water'

also provided a more environmentally sound source of phosphorous. In 2012, 28 million tons of phosphate rock was mined in North America, 90% of which was used to produce fertilizer for the agricultural sector.[21] Repurposing nutrients from the waste stream reduces the reliance on phosphate rock mining as a source of fertilizer materials, substantially improving the environmental effects of the nearly $40 billion dollar U.S. home gardening market. On the social front, it had the potential to alleviate industrial supply constraints in the fertilizer market, and resulting price fluctuations that impact food prices.[22]

Commercial benefit

Crucially, Crystal Green® also had commercial value as a safe, effective garden fertilizer. Since implementation at CWS in 2009, all Crystal Green® was sold back to the technology vendor, who then sold it as an ingredient to downstream fertilizer companies. This revenue stream, combined with the operational benefit, led CWS to estimate a five to seven year payback period on its investment in the nutrient recovery technology. However, there was no way for CWS to know where their Crystal Green® was going, or to tell consumers about the many public benefits it was capturing.

Clean Water Grow™

Knowing that the Crystal Green® CWS produced was essentially sourced from within Washington County, Bruce and Bill grew concerned about where it was ending up:

'We thought that they [the technology vendor] would use the struvite locally, but their interest was in building facilities and they weren't interested in local. I think it's going into turf across the United States', said Bruce. 'In fact, a year after it started up we were like "Wow, we're calling this a great, ecologically sustainable product. Shouldn't we have a product here locally?"'

When the technology vendor declined to develop a local product with CWS, Bruce wasn't fazed: 'Bill and I looked at each other and said "We're going to do it anyway."' The brand name they landed on was Clean Water Grow™ (Exhibit 7).

The Pilot Market Test

In mid-2012, the CWS Board gave Bill and Bruce the green light to produce grow, and pilot the product to test its commercial viability in the local market. There was plenty of work to do, and if the venture couldn't at least break even, it would likely be scrapped altogether. They assembled an in-house team consisting of operations, watershed management, public affairs, and science expertise to develop a marketable consumer fertilizer product.

Strategic objectives

[21] IBIS World 2013. 'Mineral and Phosphate Mining in the US.' Industry Report 21239.
[22] Business Insider 2012. 'A Genius Investor Thinks Billions Of People Are Going To Starve To Death — Here's Why' http://www.businessinsider.com/peak-phosphorus-and-food-production-2012-12?op=1#ixzz2dTR54cMB

The "Grow Team" identified three objectives in selling Clean Water Grow™. The venture would prevent phosphorus, nitrogen and other nutrients from becoming pollutants in the Tualatin River, helping CWS to achieve its social and environmental mandates. The second objective was to recycle those nutrients already within the natural cycle of plants and animals, effectively creating a 'closed loop', zero waste system. Third, the Grow Team wanted to exemplify to other treatment facilities that a waste product could be turned into a useful resource that has commercial value.[23] Finally, if the product did better than break even, the extra revenue for CWS would be an additional benefit.

Product development

By weight, each bag of Grow contained 39% of CWS Crystal Green®. A third party would blend in potassium and other nutrients that help plants to grow to complete the fertilizer product. The blend formulation selected was designed for flowers, shrubs, vegetables, and herbs planted in raised garden beds, hanging baskets, and other containers. Other formulations optimal for use on lawn turf were tested but not pursued during the commercial pilot.

Production

Until the terms of the technology license were reviewed, CWS had to continue selling all of its Crystal Green® to the technology vendor. This arrangement meant that the product went through two other entities – the technology vendor and the blender – before it came back to CWS as a final product (Exhibit 8). It still needed to be packaged as Clean Water Grow™ and shipped for sale.

Packaging and promotion

With essentially no market research, the Grow team decided to conduct a trial of the product with 1.5lb bags. Although the team considered purchasing bags pre-printed with the product messaging, Bill could not justify the $7,500 cost of purchasing the minimum order quantity of 43,000 units.[24] Instead, for the pilot, CWS opted to order 5,000 unlabeled bags for $1,455. This required CWS to design, print, and attach their own labels, a process that added an extra $1.40 to the cost of each bag. The Grow Team also produced 100 20lb bags for CWS staff to test at their own homes and provide feedback on their experience with the product.

To promote the product, a $3.00 discount coupon was sent to Washington County ratepayers as an insert with their bi-monthly utility bill from CWS.

Distribution channels

Two distribution channels were explored during the pilot: retail and online. Local nurseries and garden stores were a priority retail target since they were rooted in the community. In addition, larger home and garden retail chains had already finalized their inventory for the

[23] Interview with Clean Water Services, August 15, 2013
[24] Olson 2013. 'Clean Water Grow Market Analysis'

Spring 2013 growing season. Bruce attended farmers' markets, plant sales, and garden shows to raise consumer awareness and make on-the-spot sales. Bruce also developed an e-commerce portal– www.cleanwatergrow.com – to provide a direct link to consumers and potentially capture a higher margin. The wholesale distributor they partnered with for the pilot charged a service fee of $7 per wholesale order and $2.40 per retail order.[25]

Pricing

The Grow team decided to test the product at a retail price of $12.99 for the 1.5lb bag. The wholesale price they received from the distributor was $7.00 per bag.

Market Feedback

While Bruce was busy attending markets, plant sales, and nurseries on the weekends, local retailers remained skeptical about Clean Water Grow:

'Since the product was new, it was difficult to answer questions regarding its performance. To address this issue we worked directly with a number of garden clubs, nurseries and a local gardening education program to field-test the product.'[26]

Discussions with these product testers found that they valued a fertilizer product that worked, was safe to use, and was locally sourced or produced. As testimonials on the product's performance trickled in, Bruce and his team were able to identify Grow's key features and benefits:

- Slow release: It won't break down too quickly and burn the roots of the plant, or wash away. As a result, the product is highly effective and fewer applications are required, reducing the total amount of fertilizer and the time or labor required.
- Blended for strong root structure and bright color: Contains phosphorous for strong roots, and a 5% magnesium blend that makes colors more vibrant.
- Environmentally sound: Low solubility reduces the risk and impact of nutrient enrichment on streams, rivers, lakes and oceans..
- Made locally: Environmentally conscious, locally sourced ingredients reduce the reliance on nutrients sourced from mining and other less sustainable methods.

As the pilot progressed into 2013, Bruce faced some significant challenges in generating sales. For example, Grow retailed at $12.99 for a 1.5lb bag, while similar sized bags were priced at $6.99-10.99 (Exhibit 9), and most fertilizers offered in the home gardening market were between 3 and 4.5lbs in size. Bruce thought that the smaller 1.5lb package would suit households with a few pots and planter boxes on their balconies, but a larger property with more space to garden would require much more. Further, very few Washington County

[25] Olson 2013. 'Clean Water Grow Market Analysis'
[26] Interview, Clean Water Services, August 16, 2013

residents were aware of the discount coupon, and retailers did not promote it because the $3.00 price reduction came out of their margin.

Further Direction from the Board

By January 2013, Bruce found himself running around town getting Grow into the hands of as many gardeners, nurseries, landscapers, and retailers as possible. During this time, the CWS board invited the Grow team to give an update on the progress of the pilot. The results at that time were nothing to boast about: 642 bags sold in six months (Exhibit 10). The board was willing to continue the pilot to July, however, they wanted a business plan drawn up for Grow before they would approve continuation of the project. Walking out of that meeting, it occurred to Bill that the in-house team did not have the business skills or the staff time needed to complete an analysis of the Grow operation and the home gardening market. He approached the local business school to bring a couple of MBA students onto the team. Their role over the second half of the pilot would be to clarify the market opportunity, production and distribution options, and break-even projections. An excerpt of the student team's analysis follows:

The total market

The total U.S. lawn and garden products market generated $37.5 billion in 2011, $27.2 billion for garden products (flowers, bulbs, vegetables, herbs, etc.) and $10.3 billion for lawn products (Exhibit 11). The rate of population growth and urban development, the volume of house sales, the popularity of home and gardening-related television shows, and the affordability of food are the key drivers of sales in this market, which were on the rise again following the recession, and were expected to rise to $39.1 billion in 2013, and to $45.1 billion by 2016.[27]

Gardening is increasingly seen as a benefit to a person's health, their wallet, and their overall wellbeing. For example, the First Lady Michelle Obama established the White House Garden to promote healthy eating and lifestyles in 2009. [28] The industry has seen renewed gains since the end of the Great Recession, which saw revenues decline over 2008-9.[29]

Garden consumables segment

The packaged lawn and garden consumables market (which includes bags of fertilizer) declined by 0.1% between 2006 and 2011, due largely to the economic downturn. Fertilizer sales accounted for $2.45 billion in sales in 2011, the second most valuable product within that segment. Fertilizer is expected to see the highest growth from 2011 to 2016 (Exhibit 12).[30]

[27] Mintel 2012 'Lawn and Garden Products – US'
[28] Mintel 2012 'Lawn and Garden Products – US'
[29] Mintel 2012 'Lawn and Garden Products – US'
[30] Feedonia Group 2012 'Lawn and Garden Consumables'

Demand for environmentally friendly, organic and/or natural garden consumables has also grown. The number of U.S. households using all-natural fertilizers, weed, or insect controls jumped from 5 million in 2004 to 12 million in 2008.[31]

The DIY (do it yourself) home garden market

Key factors in this segment are the number of single-family homes and changes in household consumer behavior toward healthier lifestyles and home improvement. Between 1998 and 2003 the DIY segment saw 25% growth, measured in constant prices.[32]

Scotts Miracle-Gro Company, one of the largest players in the DIY market, conducted a study in 2007 that identified the most salient consumer segments for this market:

People 55 years of age and older, college graduates, married households, households with annual incomes of $75,000 and over, two-person households and households with no children at home.[33]

During 2011, U.S. consumers with small outdoor spaces (e.g. balconies, window boxes) spent on average $42 more than those with larger outdoor spaces (e.g. a yard) because they need materials that are not readily available: soil, plant containers, etc. Apartment or townhouse dwellers – both those under 35 and those over 55 – were therefore likely to spend more on garden consumables than other home or family types.[34]

The commercial lawn and garden market

In 2010, 92,000 lawn and garden services firms brought in revenues of $23.9 billion in the U.S. However, the blend of nutrients used in the piloted Grow product was not optimal for use on lawns and its slow release feature requires fewer applications, potentially reducing consumer demand for professional gardening services.

The available Washington County home garden fertilizer market

Two garden center companies provided information for the sales analysis. Both reported that the most popular weight for fertilizer sales is between 3-4.5 pound units. Interviews with the retailers provided an estimation of 2400 unit sales of fertilizer per store per year. Web searches revealed 35 garden consumable product retailers in Washington County. The Grow pilot sales data of 600 unit sales across three stores provides an estimate of 200 unit sales per store, or 8.3% of the market.

[31] Gale Group 2013 'Lawn and Garden Services' SIC 0782.
[32] Mintel 2003 'Gardening – US'
[33] Olson 2013. 'Clean Water Grow Market Analysis'
[34] Mintel 2012 'Lawn and Gardening Products – US'

Production and Distribution

Cost structure

For the pilot, CWS produced 4,932 1.5lb units. Variable costs consisted of plastic bags, direct materials and labor, plastic scoops and cardboard boxes. Direct materials and labor cost $7,015. Boxes to pack the 4932 1.5lb bags in cost $589. Plastic scoops for 4932 bags cost $134.

Fixed costs included labor, marketing, e-commerce, overhead labor, and various consultants. Per month, these costs were approximately $7,323. The total costs sunk into R&D for the Grow venture was $57,359.

Distribution

If the technology vendor released control over the marketing and sale of CWS' Crystal Green®, CWS has options on the type of distributor with which to work. During the pilot, $2,478 was paid to hold and/or deliver 4,932 1.5lb bags. The three options analyzed were a master distributor, an independent manufacturer's representative (an IMR), and online sales.

During the pilot, distribution was handled by a wholesaler who paid CWS $7 per unit.

Bruce received interest from a local master distributor about taking over the distribution of Grow. A master distributor typically purchases the product from the producer at a discounted wholesale rate and then sells to other distributors or directly to retailers. The wholesale price CWS received would be reduced from $7 to $5 per unit. The expected payoff for that lower per unit revenue was access to a high percentage of the 35 retail garden supply outlets in Washington County.

Using an IMR would mean Bruce would no longer be needed for sales tasks, reducing fixed costs by $2,300 per month. Variable costs would increase by 5% of the retail price of every bag they sold, as the IMR's commission.

Finally, based on the pilot it was estimated that only 10% of sales would come through online sales. While the margin to CWS was higher for online deliveries, the low sales volumes preclude online sales from consideration as a distribution channel, and were excluded from break-even calculations.

Packaging

The analysis took the cost structure used during the pilot to calculate costs per pound, and used those to estimate costs for a 3.0lb bag. During the pilot, the material and labor costs to attach product labels onto plain bags added $1.40 to the per-unit cost of the product. Even though there is a minimum order quantity on the pre-printed bags, the lower per unit costs would have a significantly positive impact on the break-even point.

Pricing

It is important that, whichever distributor was selected, the retail price of Grow stayed near the average per pound price of competitors' products (Exhibit 9). The retail price is relevant

for the break-even calculations due to the IMR's commission, a variable cost. The master distributor would be willing to pay $5 per bag, rather than the piloted $7.

Calculating Break even

Only the preprinted bags for the 1.5lb and 3.0lb sizes should be considered for the break-even analysis. As a result, the only per unit costs not associated with the different size was the 2.7 cents for the plastic scoop. Obviously, a decision to switch to either the master distributor or IMR would also alter the cost and price structure of the Grow value chain.

Conclusion: will it break even?

As Bruce, Bill and the rest of the Grow team looked ahead to the final July board meeting, they had a lot of questions to find answers to: Which mix of packaging and pricing, and which distributor, should they go for? How many units would they need to sell in order to break even? Was that number within reach of their locally focused base of consumers and their own production capacity? Was it possible to make this a positive revenue earner, even recoup some of the $57,000 that had been initially invested in R&D, product development, and promotional design? The third and final set of analyses was needed in order to determine whether this should be a 'Go' or 'No go.'

Exhibits

Exhibit 1: Tualatin River Basin, Washington County, and CWS Service Area[35]

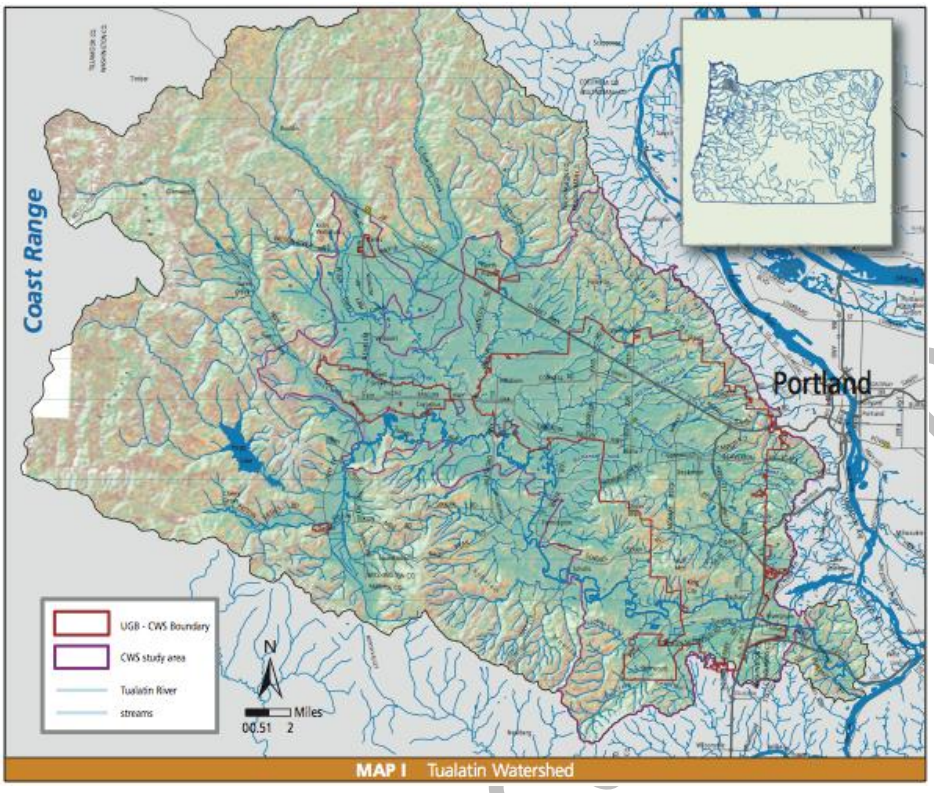


Exhibit 2: CWS sources and uses of funds 2007-201236

Sources of Funds (US$ millions)										
Year	**'07-08**	**%**	**'08-'09**	**%**	**'09-'10**	**%**	**10'-11'**	**%**	**11'-12'**	**%**
Beginning Balances	53.3	25.6	50.7	23	93.4	32.8	176.1	60.9	156	47.2
Service Fees	80.9	38.9	86.3	39.2	93.6	32.9	98.9	34.2	101.5	30.7
Bond Sale Proceeds	55	26.5	55	25	75	26.3	0	0	54.4	16.5
Water Supply Funding	0	0	14.5	6.6	9.4	1	1	0.3	0.4	0.1
Interest & Miscellaneous	18.1	9	6.6	6.2	13.4	7	13.3	5	18	5.5
Total Funds Available	**207.3**	**100**	**213.1**	**100**	**284.8**	**100**	**289.3**	**100**	**330.3**	**100**
Uses of Funds (US$ millions)										
Year	**'07-08**	**%**	**'08-'09**	**%**	**'09-'10**	**%**	**10'-11'**	**%**	**11'-12'**	**%**
Operating Expenses	42.6	20.5	48.1	22	50.2	18	51	18	52.4	15.9
Capital Construction	50.6	24.4	67	30	74.5	26	46.9	16	48.3	14.6
Debt Service	28.2	13.6	28.3	13	29.5	10	34.3	12	35	10.6
Ending Balances	78	37.5	69.1	31	123.1	43	156	54	194.2	58.8
Other Uses of Funds	8.4	4	7.8	4	7.7	3	1.1	0.4	0.4	0.1
Total Funds Used	**207.8**	**100**	**220.3**	**100**	**285**	**100**	**289.3**	**100**	**330.3**	**100**

Exhibit 3: Standard Wastewater Treatment Process37

[35] CWS 2005, Healthy Streams Plan
[36] CWS Annual Reports 2007-2012

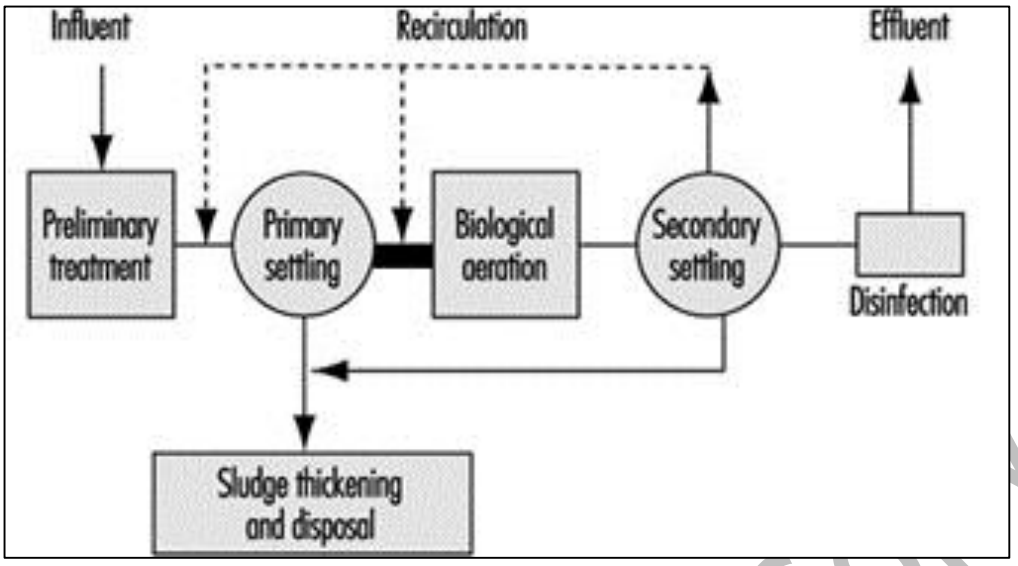


Exhibit 4: CWS' advanced treatment process[38]

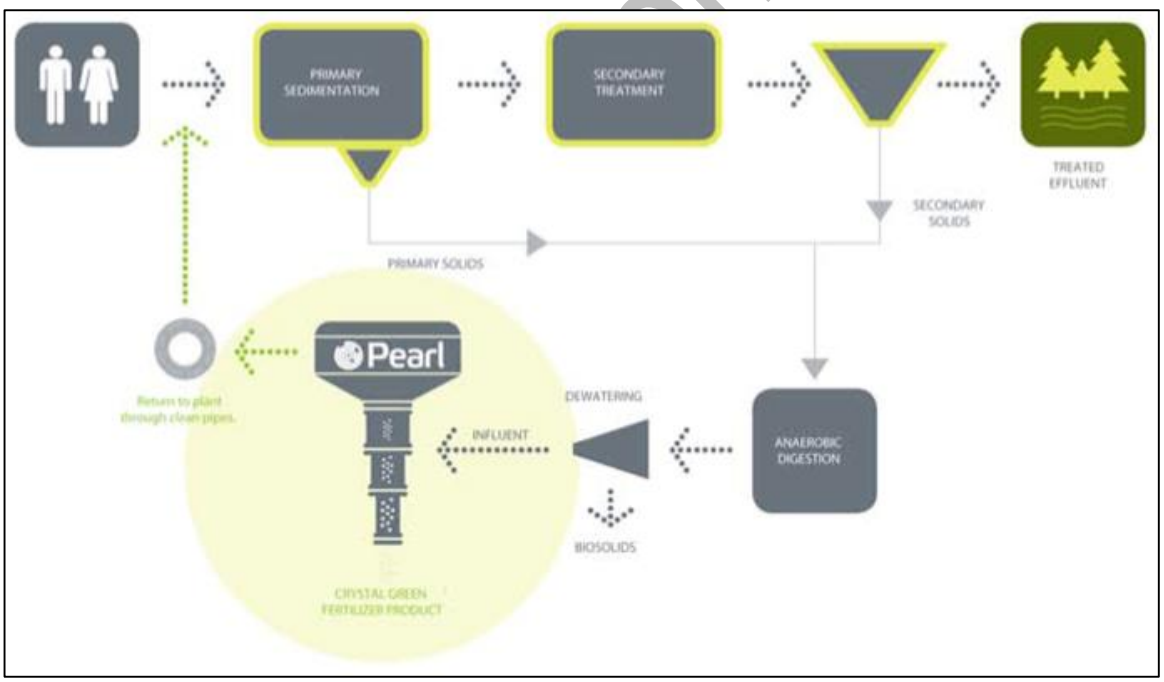


Exhibit 5: Crystal Green® fertilizer pearls[39]

[37] International Labor Organization. 2013. 'Encyclopedia of Occupational Health & Safety'
[38] CWS Presentation 2010
[39] CWS Annual Report 2009-10

Exhibit 6: Crystal Green production at CWS' Durham and Rock Creek facilities (tons)

	2009-10	2010-11	2011-12	2012-13	2013-14 (Est.)
Durham	249	243	206	203	
Rock Creek	0	0	76	115	
Total	249	243	282	318	514
			Total to date	1092	

Exhibit 7: Clean Water Grow™[40]

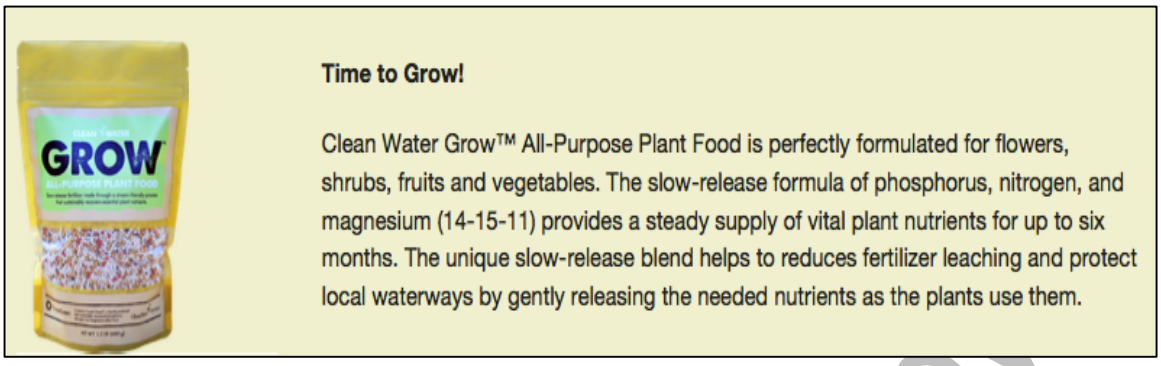
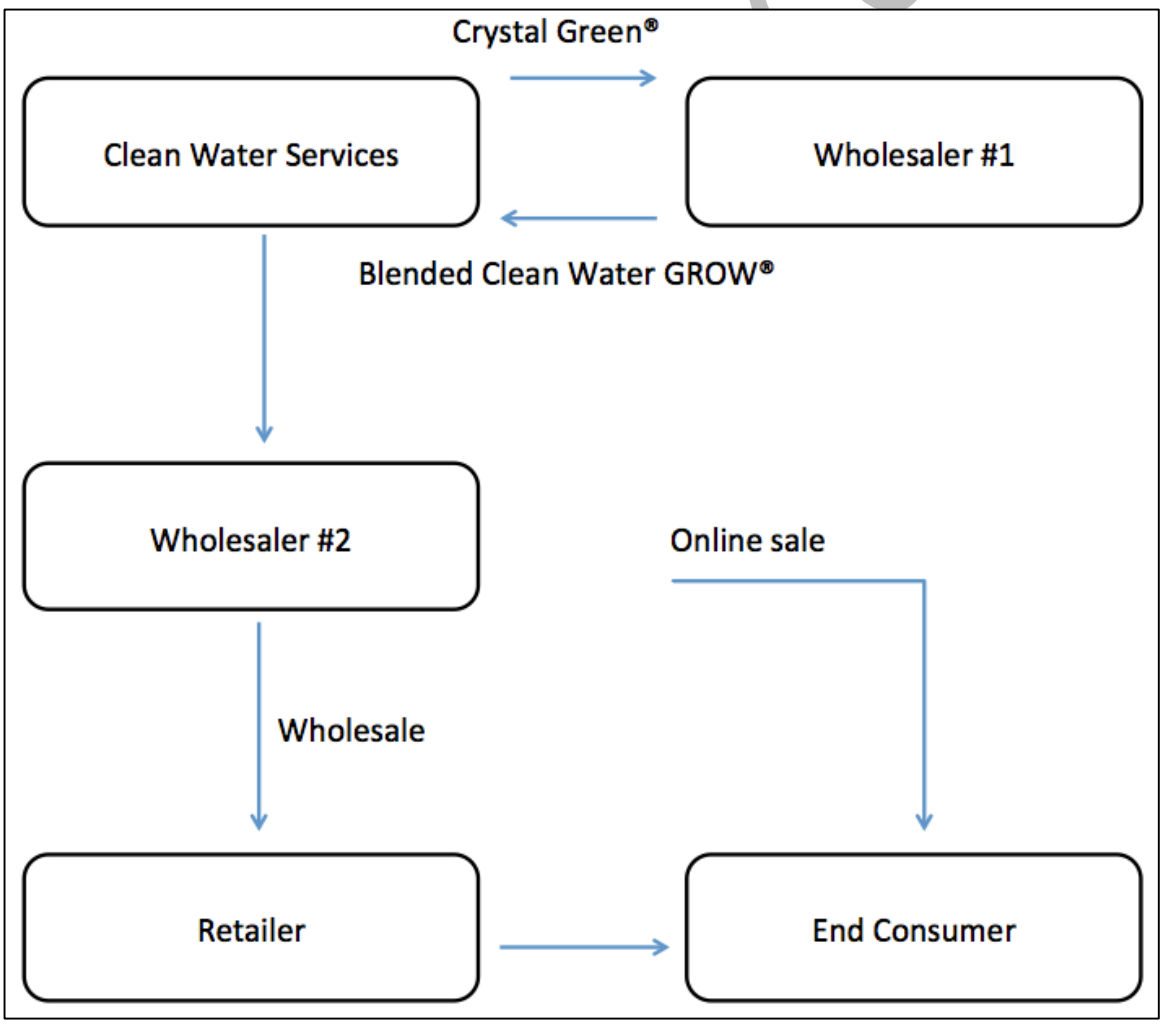


Exhibit 8: Clean Water Grow™ pilot test supply chain[41]



[40] www.cleanwatergrow.com
[41] Olson 2013. 'Clean Water Grow Market Analysis'

Exhibit 9: Price comparisons of environmentally friendly fertilizers[42]

Brand	**Size**	**Average retail price**
Clean Water Grow™	1.5lb	$12.99
Dr. Earth Life Organic All Purpose Fertilizer	4lb	$8.99
EB Stone Organics-Sure Start	4lb	$8.49
Osmocote	1.25lb	$7.99
Tiger Bloom	2.25lb	$16.25

Exhibit 10: Clean Water Grow™ pilot midpoint sales[43]

Outlet	Quantity Sold
Farmington Gardens	576
Ace Hardware	18
Jackson Bottom	45
Online	3
Total	**642**

Exhibit 11: US garden and lawn product industry revenues 2008-11 and projected 2012-16 (US$ millions)[44]

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Garden	29.2	26.3	25.8	27.2	27.2	28.8	29.7	31.4	32.5
Lawn	10.7	9.6	9.7	10.3	10.5	10.3	10.8	11.4	12.6
Total	39.9	35.9	35.5	37.5	37.7	39.1	40.5	42.8	45.1

Exhibit 12: US Garden packaged consumables revenues (US$ millions)[45]

Type	**2006**	**2011**	**2016**
Pesticides	2755	2585	2805
Fertilizer	2495	2455	3050
Seed	800	910	1110
Growing Media	760	810	980
Mulch	430	445	525
Other	245	245	300
Packaged Consumables	**7485**	**7450**	**8770**

[42] Olson 2013. 'Clean Water Grow Market Analysis'
[43] Olson 2013. 'Clean Water Grow Market Analysis'. Note: The Farmington Gardens figure represents the number sold to them, not the number they sold to end users.
[44] Mintel 2012 'Lawn and Garden Products – US'
[45] Feedonia Group 2012. 'Lawn and Garden Consumables' Industry Report