

## **THE TAGRO® STORY – HOW THE CITY OF TACOMA, WASHINGTON WENT BEYOND PUBLIC ACCEPTANCE TO ACHIEVE THE BIOSOLIDS PROGRAM WORDS WE’D ALL LIKE TO HEAR: “SOLD OUT”**

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### **ABSTRACT**

In recent years, public sensitivity to the beneficial reuse of biosolids has grown substantially and the pressure to produce a stable Class A material with low odor potential has increased correspondingly.

The City of Tacoma has answered this challenge in a manner that has blazed a trail for others to follow – the City combined a robust digestion technology with a sustained product and market development effort, not for “public acceptance” but to create market demand. “Acceptance” is often taken as public tolerance; “Success” as having someone use biosolids at no cost. In contrast, market “demand” means that someone gladly buys your product because they see hard value in it. Tacoma’s sustained marketing and product improvement effort has built demand for its biosolids-based family of gardening products to the point where it now outstrips supply. Call it the ultimate measure of acceptance, more simply described as “sold out”.

The “Tacoma Model” of technology improvement and product and market development should prove useful for other agencies as they make the commitment to a market-driven program and assess their own options for employing technology and adopting a responsible and responsive marketing approach – an approach Tacoma has demonstrated leads to a valued line of virtually odorless, Class A biosolids products and “sold out” success.

### **KEYWORDS**

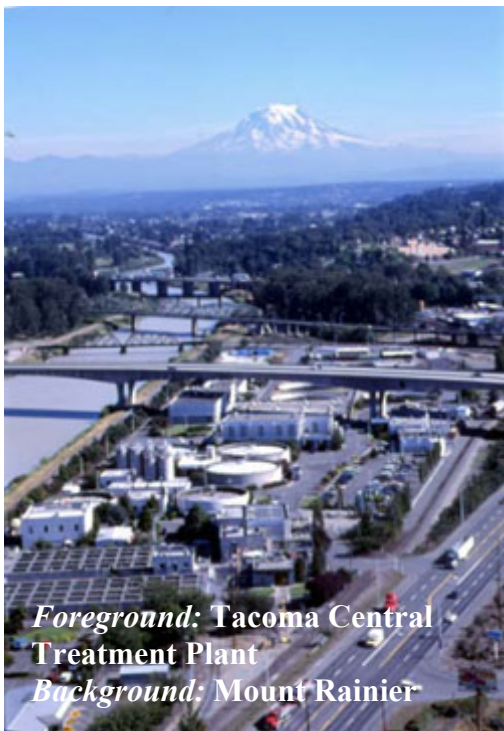
Biosolids, Class A, low odor, marketing, product development, sustainability, Dual Digestion

### **INTRODUCTION**

The City of Tacoma, Washington is currently the third largest city in the state of Washington. The Tacoma Public Works Department, Environmental Services Division is responsible for providing wastewater, surface water, and solid waste services to the residents of Tacoma, as well as to several areas outside Tacoma’s city limits. The Wastewater Utility conveys flows from the greater Tacoma area through a separate system of approximately 700 miles of sewer pipe and 50 pump stations (the surface water collection system has a separate 400 mile network of pipes). The Wastewater Utility serves a total equivalent population (residential and commercial) of approximately 258,000. Projections estimate the Utility’s current service area will increase to a population of approximately 330,000 by the year 2020.

## Central Treatment Facility

Wastewater flow is conveyed to two separate wastewater treatment facilities, the Central Treatment Plant (CTP) and the North End Treatment Plant (NETP). The larger of the two is the CTP, which treats over 80 percent of the average dry weather flow generated within the Utility's service area.



The CTP currently has a permitted maximum monthly flow (average flow for the maximum month) of 38 million gallons per day (mgd) and a permitted peak hydraulic capacity of 78 mgd. After the completion of an Upgrade and Expansion Project, which is currently underway, the CTP will have a permitted maximum monthly flow (average flow for the maximum month) of 60 mgd and a permitted peak hydraulic capacity of 150 mgd.

The CTP treatment process consists of influent pumping, screening, grit removal, primary sedimentation, High Purity Oxygen Activated Sludge secondary treatment, secondary clarification, disinfection, and effluent pumping to a bay of Puget Sound.

Primary and secondary solids generated by wastewater treatment are processed to form a well stabilized, Class A, Exceptional Quality Biosolids using a Dual Digestion System (DDS).

Dual Digestion is a two-step, aerobic and anaerobic process:

- The first step in DDS is short residence time Autothermal Thermophilic Aerobic Digestion (ATAD). ATAD achieves Class A pasteurization in small aerobic digesters operating at > 55° C., with 1 day detention time. Heating (auto-thermally), pre-conditioning, and Class A pasteurization occur in this step.
- The second step in DDS as practiced today by Tacoma is Temperature Phased Anaerobic Digestion (TPAD) where thorough volatile solids destruction and stabilization take place. Thorough anaerobic digestion is facilitated by the pre-conditioning achieved in the aerobic step. The pasteurized, pre-conditioned biosolids are digested in a series of three anaerobic phases descending in temperature from thermophilic to high mesophilic to low mesophilic.

The process also produces methane, which is used to heat the entire treatment plant. Only a small amount of methane is required for preheating biosolids to 30° C. The remainder of the heat required to heat to thermophilic temperatures is generated in the exothermic aerobic digestion step.

The biosolids produced by Tacoma’s DDS represent a highly stable, extremely low odor, Class A “product intermediate” rich in essential plant nutrients. It is this product intermediate that forms the base for conversion to a family of valuable landscaping and gardening products, which the City has developed and trademarked as TAGRO<sup>®</sup>, or “TAGRO” short for “Tacoma Grow”.

## PROCESSING AND TECHNOLOGY IMPROVEMENTS

### Odor is the Key

Throughout its history, the biosolids industry has focused on finding ways to *dispose* of solid waste. *Creating products* – and considering aesthetic issues that come into play when creating products, such as odor – is a relatively new pursuit.

But for the City of Tacoma, odor has always been the enemy. Perhaps borne out its industrial history as a paper mill town, the plant staff has always been convinced that people don’t want a product that smells bad. When taking aesthetics into consideration, the staff has found that eliminating odor stands out as the “make or break” issue. Pasteurization makes biosolids a less objectionable *waste*, eliminating odors makes it a *product*. “Odor control isn’t just good manners, it’s good business.”

### A history of continuous improvement

As a result, the staff has spent years looking for a better way to produce Class A biosolids that they can be proud of and that customers want to use in their backyards.

Tacoma’s starting point was not much different than that of many agencies. In 1989, following the installation of dual digestion, the first improvement was to start a Class A liquid program. While pasteurization represented a significant step forward, this prototype product was often offensive. Deliveries had to be scheduled to avoid warm weather and holidays to prevent losing customers and irritating neighbors because of the smell. At this point, there was no charge for the liquid, but rapid urbanization was reducing the number of easily accessible farm fields within a reasonable delivery distance from the plant.

The second, anaerobic step of the initial DDS configuration involved a single-phase of thermophilic digestion at a temperature of 130 degrees F for 21 days. In 1993, two-phase anaerobic digestion was implemented in an effort to reduce product odor for customers. In the second phase, temperatures were reduced to 115 degrees F. This temperature was naturally achieved by not supplying heat to the second phase and letting heat losses reduce the temperature.

Encouraged by the results, heat exchange was employed to further reduce the second phase temperature to 100 degrees F. This resulted in a further reduction in offensive odors. The big “breakout” occurred when a third phase was set up to operate at in the low-mesophilic range – 90 degrees F. Using this three-phase approach virtually eliminated odors. Overall anaerobic detention time was maintained at 21 days – three temperature phases of 7 days each. The overall solids flowsheet is shown in figure 1.



Figure 1 Tacoma DDS solids processing

The highly stable, extremely low odor, Class A digested solids are then belt filterpressed to form a biosolids product intermediate rich in essential plant nutrients that is used to make the TAGRO® family of products.

## THE MARKETING MODEL

### Sustained Commitment

Tacoma’s program has demonstrated that the answer lies more in the principles of responsible and responsive marketing, rather than in responsible waste management and public acceptance.

This starts with a *sustained commitment*, and frequently a change in culture, from the Director down to each member of the facility staff to – “*make a product to specifications for sale*” not “prepare a waste for disposal”.

This commitment and cultural change involve a commitment to *sustained continuous improvement*. Tacoma has shown that successful marketing programs are “evolutionary”. They are developed and implemented over a time frame measured in years not weeks or months; and the greater benefits of continuous improvement are realized as a cumulative effect of years of effort.

Continuous improvement can take a variety of forms – for example cost reduction, better working conditions for employees, improved customer service, or fast order turnaround; but, the principal form it takes in a market-driven program is product improvement.

### Market-Back Focus

And, to set the specifications for the product and make product improvements, you have to “begin with the end in mind” – that is, have a “market-back” focus.



Preparing biosolids for sale is a regulated activity, of course, so this market-back focus will start with reliably meeting Part 503 Class A or B standards. Presumably, as part of a facility’s commitment to continuous improvement, a specification for Class A, pasteurized product would be in order, and based on Tacoma’s experience, minimum essential specifications would include “virtually odorless”.

Arguably, Tacoma has shown that if your initial program can have only one of these two key

attributes, you may be better served to deliver on a “virtually odorless” Class B; but once your continuous improvement efforts have developed a virtually odorless, pasteurized product, you will have reached a universally attractive “biosolids product intermediate” point.

This is a starting point, not an end-point. From this point, a market-back focus will lead an agency as they identify and develop the attributes that are important in its own local marketing area. As such, the Tacoma marketing experience is not a blueprint to be followed blindly. Rather, it is a set of “how to” principles that when applied in a sustained, committed manner by an agency will guide

them down their own path to “sold out” success under the specific circumstances of their facility and their market.

So, when reviewing Tacoma’s history of successful market development, an agency will profit most by extracting the generic, “how to” lessons learned rather than mimicking the specific actions Tacoma found to be successful as they adapted to their market.

## **Brand Management**

A market-back focus will guide an agency in the identification and development of valued products tailored to its marketplace, but even good products don’t sell themselves. Tacoma has shown that a proactive, sustained selling effort is required, with attentiveness to the principles of brand management. It starts with a brand image or logo –



And involves the principles of “Marketing 101” – The key to effective brand management is to think and act like a responsible, responsive business that pays attention to the “six Ps” –

Product (specifications, mix)

Positioning (target market with needs and values, brand recognition and perception)

Packaging (in the broad sense, including technical support and customer service)

Promotion (advertising, public relations)

Pricing (profitability, demand allocation)

Placement (distribution channels, logistics)

And, in support of sustained continuous improvement – Research (Product and Market).

It is important to note what we are not talking about, here. Tacoma’s brand management and selling efforts are not based on “slick advertising” or “deceptive marketing”. Product improvements validated by real world customers who endorse your products by repeat buying come first. Talking about it comes second...but you do need to talk about it.

## PRODUCT AND MARKET DEVELOPMENT

### A Brief History

Following the adoption of Dual Digestion in 1989, Tacoma took an industry leadership role in developing products out of biosolids by introducing TAGRO Mix along with its Class A liquid product. This became the primary offering for over a decade, during the sustained effort to reduce odors.

The TAGRO Mix production process is depicted in Figures 2, 3, 4, and 5.

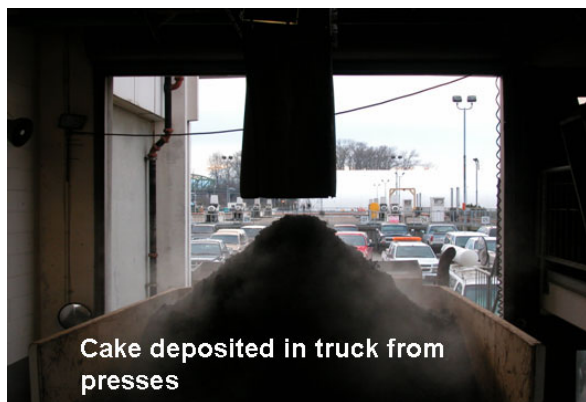


Figure 2 TAGRO Mix Production – Step 1

TAGRO Mix was created to fill a market need for landscape (particularly lawn installation) products for housing developments that were springing up in formerly rural Pierce County. The formula was derived in conjunction with key customers. The approach was to ask the customer what the ideal product should look, act, feel and smell like and then to go build that product. Prototypes were trial evaluated with customers and refined based on feed back gathered from these early users of the product.



Figure 3 TAGRO Mix Production – Step 2

Tacoma’s approach for the first ten years of the TAGRO program was to provide a public service. There was a charge for loading and delivery of TAGRO Mix but beyond that the product was routinely given away. In late 2002 the program took on a business focus with the ultimate goal of becoming a profit center rather than a cost center. The policy became to charge for all services. “Cost plus” became the mantra and “give-aways” were greatly reduced and targeted to promote future product sales rather than just move tons.



TAGRO Mix Production – Step 3  
Figure 6 compares this split for the years 1997 and 2004.



Figure 5 TAGRO Mix Production – Step 4

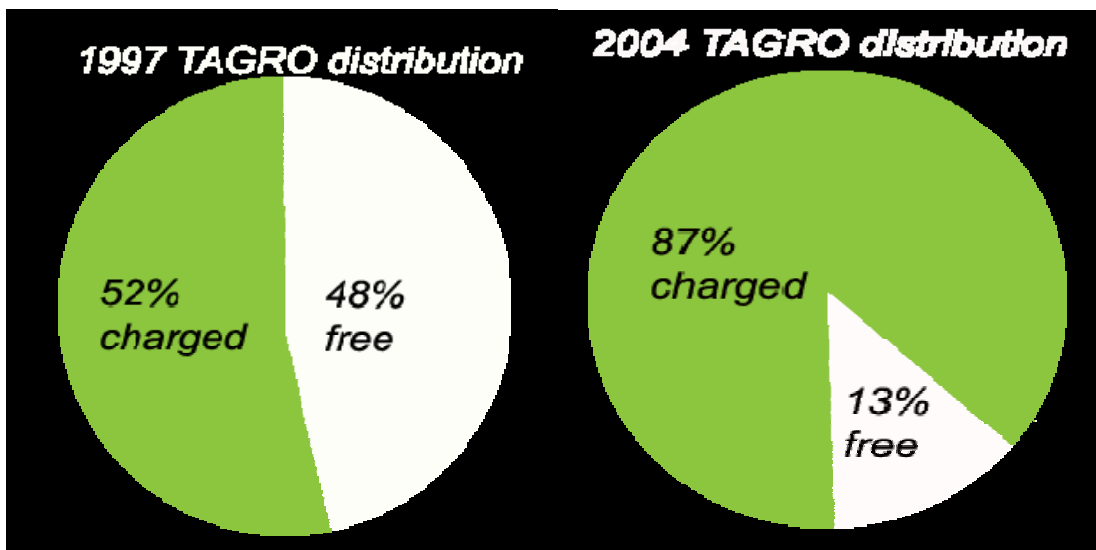


Figure 6 Proportion of TAGRO volume sold versus given away, 1997 vs. 2004

When Tacoma introduced three-phase TPAD as the second step of Dual Digestion with a low mesophilic (90° F) finishing temperature, the virtually odor free product intermediate that resulted opened the door for a new generation of products. Eliminating the odor, coupled with the market knowledge gained in over a decade of experience with TAGRO Mix allowed Tacoma to quickly and successfully produce two new products: a potting soil for indoor and outdoor use, and an odor-free mulch. Both of these products were introduced in 2003. These products were prepared to specifications that experience had shown would add value using raw materials (blending agents) that were readily available byproducts in Tacoma’s market area – sawdust and bark.

Customer response was swift. In April 2004, sales were up 57% versus April 2003. By 2004, Tacoma literally couldn’t keep up with demand for TAGRO Mulch – by that summer there was a waiting list of 100 customers for what had become the most popular product in the mix. And the liquid customers who had previously complained about what had been the smelliest product in the TAGRO family were praising Tacoma instead for the absence of odor.

Total revenue represents an index of the value that is created for a family of products. In the case of TAGRO, steady revenue growth mirrors the sustained effort at continual improvement, with a “bump” when this effort culminated in a second generation of products in 2003. Figure 7 shows this revenue growth over the last decade.

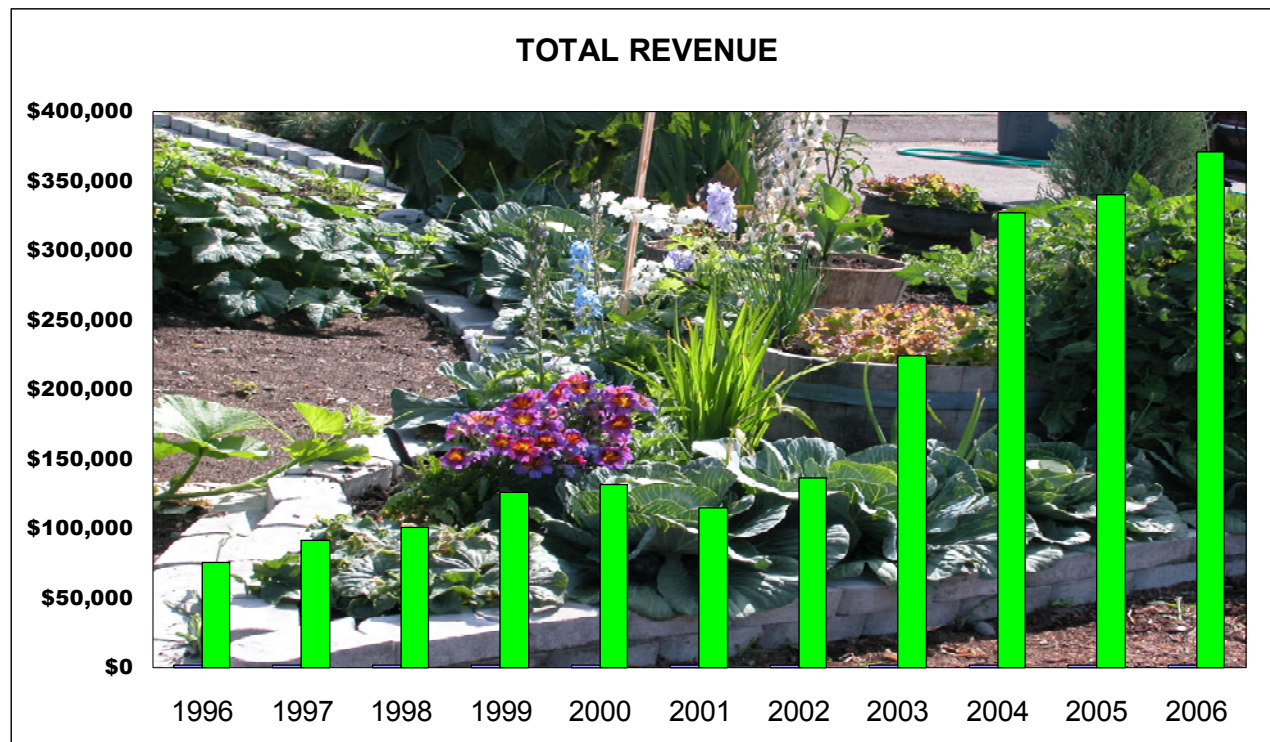


Figure 7 TAGRO Revenue – 1996 to 2006

### Application of the Marketing Model

It’s important to emphasize the lessons learned from the rapid success of Tacoma’s second generation of products.

This success can be traced directly to over a decade plus of responsible marketing and application of a market-back focus:

- Building brand name recognition, credibility and acceptance over a decade plus of responsible marketing of TAGRO Mix (the stigma of products mired in their waste origins had been left behind);
- Appreciating what underlying customer values were being served – customers wanted
  - Prize-winning vegetables
  - Lush, green lawns
  - Colorful flowers
- Understanding what was needed to develop value-adding formulas and specifications –

- Odor profile modification – creating a favorable aroma not just a virtually odorless product;



- Texture, feel, handling and appearance – the new products have the look, feel and handling customers have come to expect from premium gardening products;

- Applying previously developed and honed promotional tools to support introduction of the new products. Here’s a recent illustration of Product Mix, Positioning, and Promotion coming together based on customer validated performance:

## How does your garden grow?

With TAGRO premium soil products, it will grow faster, greener, better.



The City of Tacoma’s TAGRO Mix, TAGRO Potting Soil and TAGRO Mulch can serve all of your gardening needs—indoors and outdoors.

Short for “Tacoma Grow,” our award-winning, environmentally friendly products will give you **better results** with your lawn and garden—even while you help to reuse community resources and protect our environment.

Proven **safe and effective**—and awarded the U.S. Environmental Protection Agency’s highest rating for use in landscaping, vegetable gardens and indoor container gardens—**all-natural** TAGRO products are made from a blend of pasteurized wastewater byproducts called biosolids and other **weed-free** gardening components.

By the bucket or truckload, TAGRO customers say their **gardens grow faster, lawns grow thicker and trees grow taller.**

## THE MEASURE OF SUCCESS

With odors being a central issue, an appropriate subtitle might be “the sweet smell of success”. The culmination of years of sustained, improvement minded effort, “sold out” status can be attributed to one, simple fact – Customers love TAGRO:

- Fanatical, loyal core of repeat customers
- Fully 1/3 of Tacoma City citizens use TAGRO
- 93% rate products as good or excellent

### Awards

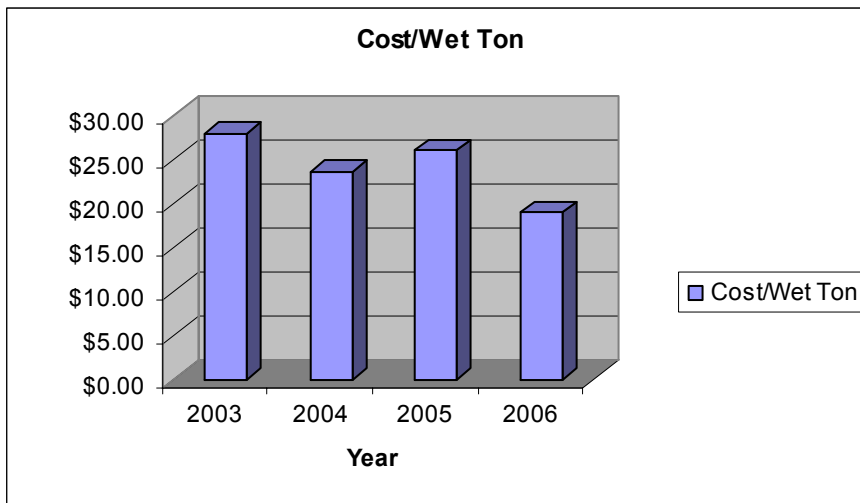
The City of Tacoma’s biosolids-based TAGRO line of popular gardening products earned a first-place 2004 National Clean Water Act Recognition Award from the Environmental Protection Agency (EPA). The EPA recognized TAGRO in the Technology Innovation or Development Activities category based on the City’s introduction of the two new products in 2003—mulch and potting soil—and on changes the City made to its biosolids production process to adopt DDS with TPAD, a move which both overcame odor problems and enabled expanding the markets for biosolids products. This was TAGRO’s second national first-place award.

These national awards are prestigious honors, but from a marketing standpoint, the awards received by TAGRO’s customers are both more gratifying and rewarding: Vegetables and flowers grown in TAGRO have earned more than 120 ribbons at the Puyallup Fair since 1992.

Of course, any award pales compared with the simplest of compliments:

### Sold Out

The TAGRO product line is profitably “sold out” in the sense that all material is sold profitably on an FOB basis. That is, customers see enough value to pay for the TAGRO product plus a freight allowance to deliver it to them. The revenue from these sales substantially offsets the cost of biosolids handling, TAGRO production and transportation such that Tacoma has one of the lowest net costs for biosolids disposition in the Country. Most encouraging is the trend – thanks to continual improvement, in an era of inflation and rising cost, Tacoma’s net cost of biosolids disposition has a solid downward slope. Figure 4 shows net cost on a \$/wet ton basis. Biosolids are assumed to have zero raw material cost at the discharge of the dewatering equipment. This makes the net cost number comparable with the cost of biosolids disposition for other facilities, without regard to the method of disposition employed, be it sales, disposal, or giveaway.



## Figure 8 Net Cost of Tacoma Biosolids Program - \$/wet ton (Cost including freight, less Revenue)

As the product mix continues to shift toward the newer, higher value products, the downward trend is expected to continue.

All products are manufactured to their specifications with a net positive margin. The net negative cost is associated with the cost of transportation, which does not cover the freight allowance for all products. This high cost center represents an area for future improvement.

### **OPPORTUNITIES**

Continuous improvement never rests on its laurels. Tacoma has identified several program improvement objectives that will receive attention in the next wave of effort:

- Promote the Potting Soil
- Increase the trucking price
- Develop premix that can be converted to any product quickly
- Develop new markets (commercial)

These objectives will sweeten the product mix by emphasizing the highest value product – potting soil, bring the price of trucking in line with its cost, improve order turnaround time, and expand the market base.

With these and as yet unidentified future improvements, Tacoma hopes to serve its ratepayers, its customers, its community, and the environment indefinitely into the future.

For more information on Tacoma's TAGRO program, visit the TAGRO website or contact TAGRO at:

- [www.tagro.com](http://www.tagro.com)
- [tagro@cityoftacoma.org](mailto:tagro@cityoftacoma.org)

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