Recology
WASTE ZERO

Recycle Central® Material Recovery Facility Upgrade Proposal

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Background

Recology was one of the first companies in Northern California to implement curbside recycling collection for residential and commercial customers as well as one of the first to convert to commingled ("single-stream") recycling. For over a decade, Recology has operated the Recycle Central® Material Recovery Facility (MRF) at Pier 96 and the facility is a corner stone to our resource recovery efforts. Designed and constructed by Recology in partnership with the City, the Recycle Central® MRF began processing commingled recyclables in 2002, utilizing the most advanced, state-of-the art sorting technology available at the time. While Recycle Central has performed well over the past 13 years, changes in the recycling stream, packaging design, and increased tonnage due to the mandatory recycling ordinance and other efforts have resulted in a need for facility improvements. As a critical part of achieving our zero waste goal, Recycle Central® urgently requires enhancements to the current sorting system in order to keep pace with the evolving demands in recycling processing and to maximize diversion of the increasing tonnage.

Current Facility Improvement Opportunities

Recycle Central® receives on average 480 tons of commingled small generator and mixed commercial material per day. According to the latest material characterization study, the two most prevalent unrecovered recyclable materials are paper and plastic (including film plastic). The loss of potentially divertible material is due to the inability of the current system to adequately recover and divert new and challenging materials within the commingled composition, such as smaller cardboard, a reduction in paper size in general, and increased volume of rigid plastics. In an effort to increase diversion, Recology sends approximately 100 tons of residual material per week to a Secondary MRF in Los Angeles for additional sorting. While this represents only a portion of the total generated, the reprocessing of the residue has proven to be successful in recovering approximately 60% of the material, indicating that the recovery rate can be increased considerably by enhancing our current system.

Currently, the inbound volume of recyclables has surpassed the system's designed capacity, which impacts the current system's sorting ability. The proposed upgrades would address this issue by integrating advanced sorting technologies that are currently utilized in the most modern MRFs. The current system's performance would be improved with a longer presort and additional sorting equipment. These enhancements would increase capacity while improving the efficiency and accuracy of material separation. Accurate sorting is critical in ensuring recovered recyclables have viable end markets, especially during challenging market conditions when stringent quality standards are imposed. This ensures that Recology's shipments are accepted and our diversion rates are not adversely impacted.

In addition to improving the diversion of materials that are currently accepted at the MRF, the proposed upgrades would also provide for expanded recovery of commodities such as textiles, film plastics, wood and metal. These materials represent a significant percentage of the disposed material stream and an expanded recovery effort is necessary to continue making strides toward our zero waste goal.

Proposed Equipment Enhancements

In order to modernize Recycle Central, two crucial system enhancements would need to be installed. The first step would be to upgrade the front-end of the system. This would add much needed capacity, improve the equipment utilized for separation by dimension, and enable improvements to the back-end to increase separation by material type. The installation of the proposed back-end system would capture a significant percentage of recyclables currently found in the residue, and would obviate the need to send residues elsewhere for further processing. Together, these enhancements would create a more comprehensive recovery system that increases facility capacity and recovery rate, and provide the ability to target new materials.

The enhancements are designed to be completed without requiring facility downtime. The proposed front-end upgrade would be installed next to the current curbside recycling sort lines, enabling uninterrupted processing of inbound materials during construction. This system would not alter the processing capability of the current curbside recycling sort lines and they could be utilized as back-ups or provide additional capacity to meet the growing need for processing. The proposed back-end upgrade would be seamlessly integrated and programmed to work in concert with the existing system.

For the purpose of illustrating the impact of the proposed improvements, we have highlighted in comparative format the current challenges and proposed enhancements of the different elements of our proposal below.

Drum Feeder

- *Current*: The material is currently loaded onto the presort conveyor by a loading operator. This methodology relies entirely upon the loading operator's ability to provide a consistent flow of material onto the sort line. The reliance on manual loading often results in an uneven distribution of material, which significantly lowers system throughput. The inconsistent burden depth not only lowers sorter productivity upstream, but also decreases the efficiency of mechanical sorting downstream by overwhelming the screens and optical sorters.

- *Proposed*: The proposed system would add a drum feeder, which would maximize efficiency and throughput by ensuring a consistent metered flow of material onto the sort line. This is expected to improve sorting efficiency by 8-12% of all downstream components. The reduction in the burden depth of materials enables sorters to more effectively remove contaminants upstream and prevent the overloading of the mechanical sorting equipment. The drum feeder can also be charged with 15-20 minutes worth of material, allowing the loader to perform other critical material handling duties during processing.

Extended Presort Conveyor

- *Current*: Over the past decade, there has been a continual decline in the once dominant materials including newspaper, glass and metal cans. Due to the change in the composition of the recycling stream, many of the materials that arrive on the sort line require manual sorting because the current system was not designed to sort them. The existing presort has capacity for only four sorters per line, which is undersized for managing the diversity and high volume of material. The short presort also limits the number of commodities that can be sorted. The sorters are primarily focused on removing trash and the high volume of Old Corrugated Cardboard (OCC), and therefore do not have enough time or space to recover other prevalent materials such as film plastics and textiles. These two items are especially problematic for the recycling system because they get wrapped around the shafts of the sorting equipment and jam the machine, which leads to loss in productivity. Moreover, according to the most recent material characterization study, textiles represent 4% and film plastics represent 5% of the recycling and trash streams. The ability to recover these would significantly decrease the tonnage sent to landfill.

  A summary of the current sorting stations is as follows:

	Trash	OCC	Wood/Metal/Bulky Rigid Plastic
Station 1	X	X	No dedicated bunkers; commodities sorted into carts and manually removed into bunkers and balers.
Station 2	X	X	

- *Proposed*: The proposed system would extend the presort conveyor to include seven sort stations with the ability to accommodate fourteen total sorters. The sorters can better target a variety of potentially divertible materials such as film plastic, textiles, wood, metal and bulky rigid plastics. The extended presort not only allows for maximum system capability to manually remove a wide range of material types to maximize diversion, but also protects downstream components and establishes consistent recovery efficiency by the critical processing equipment. Additionally, the extended presort conveyor would enable Recology to adapt to changes in the recycling stream by adjusting the commodity sorts

based on material prevalence. The seven stations can be re-allocated to pull other materials that may become divertable in the future.

A summary of the proposed sorting stations is as follows:

	Trash	Textiles	Film Plastic	Wood	Metal	Bulky Rigids
Station 1	X	X	X			
Station 2	X	X	X			
Station 3	X	X	X	X		
Station 4	X		X	X		
Station 5	X		X		X	
Station 6	X		X		X	
Station 7	X		X			X

Film Vacuum System

- *Current*: Film plastic is not being manually sorted at the facility as a commodity, but as a contaminant. It comprises 5% of total recycling and trash streams. Since the material is lightweight, more pieces need to be handled in order to sort a ton. Without an efficient overhead film suction system, it would be difficult to expand the recycling program to include film plastic as a commodity.

- *Proposed*: The proposed film vacuum system would collect and transfer the manually sorted film plastic. This would help increase the collection capacity of the material as a majority of the sorters would have access to the vacuum, making it feasible to accept a higher quantity of film plastic at the facility. This is the current industry standard for the most effective method of manually removing film from the material stream.

Old Corrugated Cardboard (OCC) Screen

- *Current*: Due to the popularity of online shopping in recent years, there has been a surge in the volume of OCC received at the facility. OCC is one of the most prevalent materials, representing approximately 20% of the overall recycling stream. It is currently sorted manually, which ties up valuable time that can be dedicated to sorting other potentially divertable materials. In addition, the undersized presort hinders the facility's ability to effectively remove the high volume of OCC, resulting in a limited percentage of material recovered. The remaining OCC of various shapes and sizes continues downstream which inhibits the performance of the mechanical separation system, known as a "blinding effect".

- *Proposed*: The proposed system would add an OCC Screen, which efficiently separates large cardboard from paper, containers and other materials. By automating recovery of OCC, the sorters can focus on other materials that adversely affect the system's recovery capability

downstream. The mechanical sorting of the OCC will also significantly improve the accuracy of the paper and plastic separation, and achieve low losses of flattened OCC to the mixed paper line and three dimensional OCC to the plastic/container line. The OCC screen can also integrate size modifications to adapt to the ever changing OCC size distribution (smaller boxes, and increased volume) received in inbound recyclables.

Fiber Screen

- *Current*: Based on the material characterization, approximately 40% of the residual is divertable mixed paper. This fiber is not being recovered because the existing screens are shorter, narrower, and not as easily adjustable as the newer industry standard. Because of the narrow and short size of the screens, they must be run at a low angle, resulting in a high loss of containers into the fiber line, instead of being recovered as separate commodities. Additionally, the current technology in the fiber screens are inefficient in their ability to "grab" fiber and move it up the screen quickly, resulting in a high loss of fiber to the container line.

- *Proposed*: The proposed system would replace the antiquated fiber screens with four new screens equipped with the most advanced technology for maximum throughput and recovery. The screens will be wider and longer to ensure a low burden depth and significantly improve the mechanical separation by shape and size. In addition, the screens would be equipped with the latest technology, which not only maximizes the recovery of fiber, but also ensures a more accurate dimensional separation between two dimensional fiber and three dimensional containers, yielding higher recovery.

Glass Cleaning Screen

- *Current*: The current glass cleaning screen is undersized for the volume that is being processed at the facility. This causes a blinding effect at the screen, which results in a consistent loss of glass in different locations within the system where they cannot be recovered. This glass represents a significant amount of diversion by weight. Furthermore, the glass that travels downstream leads to contamination of fiber and containers, which obstructs the ability of optical sorters to accurately sort the commodity by type.

- *Proposed*: The proposed glass cleaning screen would be added to the existing unit. It would be larger than the current unit to accommodate a greater volume of inbound material and be more compatible with the diverse packaging designs on the current market. It would also effectively remove all glass and small pieces of material, known as "fines", from fiber

and containers at maximum efficiency to ensure minimal contamination downstream. The additional unit would further recover glass fractions and reduce outbound residue.

Optical Sorters

- *Current*: Optical sorters are efficient, automated sorting equipment that can recognize materials based on their color, size, shape, structural properties, and chemical composition. The facility is equipped with two optical sorting units. The first unit recovers PET plastics and the second recovers HDPE plastics from the materials passing through them. The remaining #3-7 mixed plastics are sorted manually. In recent years, there has been an increase in single-serve #1-7 containers, which do not have a uniform size or shape (like a PET water bottle) that a sorter can effectively target on a consistent basis. With an estimated 15 tons per day of lightweight mixed plastics being processed at the facility, it is difficult to yield a high recovery rate with reliance on manual sorting. This is evident in the characterization study, where approximately 7% of the residue is divertible #1-7 plastic. As the optical sorters target and eject based upon material type, a small #5 plastic bottle, for example, is a simple item for the unit to recover. As consumer behavior changes and more types of plastics enter the recycling stream, the need to automate recovery of these materials is critical to diversion.

- *Proposed*: The proposed upgrade would add two additional optical sorters to the system. One of the units would introduce select residual back into the system for reprocessing. The second unit would automate the sorting of #3-7 plastics. Because the second optical maximizes the recovery of #3-7 mixed plastics, it also decreases the volume of material that re-enters the system for reprocessing. This reduces the risk of overloading the first two optical sorters. The addition of the two optical sorters would equip the facility with the ability to significantly reduce mechanical yield loss of high value recyclables from the residue stream. Also, these optical units allow for flexibility and adaptability to precisely target specific commodities at two critical locations within the system to maximize recovery.

Impact of Proposed Enhancements

This proposed front-end system upgrade would increase the current system's capacity to 45 tons per hour, while recovering 90% of inbound recycling material based upon the material composition provided in the latest characterization study. The potential increase in recovery equates up to 8,800 tons annually excluding the additional tons of textiles and film plastics that could be recovered with future programmatic changes. The front-end upgrade is designed to meet the capacity and processing needs for the next decade. In today's challenging processing environment, the reliance on optical sorters on the back-end has become critical to a MRF's

ability to continuously adapt to an ever changing inbound material stream. Optical sorters can precisely recover and divert based upon material type, dimension, density and size. This results in a higher recycling processing efficiency, giving the system a more consistent overall performance. The implementation of the two new optical units would provide recyclables more than one chance to be recovered. As more diverse materials continue to enter the MRF, upgrades to the current system are crucial to enable increased throughput capacity and recovery.

Project Funding

The complete project costs $11.3 million. The project will span across two rate years and therefore we request approval to apply the Tier 3 & 4 Zero Waste Incentives for Rate Year 2015 and potentially Rate Year 2016 toward this project. For Rate Year 2015, we propose withdrawing the entire amount of available Tier 3 & 4 Zero Waste Incentive funds upon approval of the project in order to ensure the timely acquisition and delivery of the equipment necessary. Under the term of the quotes, the primary vendor is requesting 70% of the project costs up front. We plan on using these funds for the purposes of fulfilling this obligation. With the Rate Year 2015 funds, we anticipate completing the facility modifications necessary for the installation of pier enhancements and the back-end system upgrade. In the event Recology does not meet the Tier 3 & 4 goals during Rate Year 2016, we propose that those funds be used for second phase of construction. In the event Recology does meet the Tier 3 & 4 goals for Rate Year 2016, the Company will fund this phase of construction. The remaining project costs will be funded by Recology. Please note in the event that the actual project costs are less than the Zero Waste Incentive funds provided for this proposal, the amounts will be returned to the Zero Waste Incentive account. No pricing contingency has been established for any of the quotes and any unforeseen construction cost will be covered by Recology.

Cost Summary

Please see a summary of the proposed enhancements in the table below.

Item	Total	Notes
Front-End System Upgrade	$7,925,770	A
Back-End System Upgrade	$2,722,435	A
Electrical Work	$219,539	A
Automatic Fire Sprinklers	$196,531	A
Enterprise Programming	$36,960	A
Recology Project Management Coordination and Labor	$198,686	B
Total Project Costs	**$11,299,921**	

Phase 1 – RY 2015 Funded	$6,236,246	C
Phase 2 – Recology or RY 2016 Funded	$3,193,584	D
Phase 2 – Recology Funded	$1,870,091	E

Notes:

A Please see quotes provided by third-party vendors.
B Please see estimated Recology Project Management Coordination and Labor cost detail.
C Phase 1 of construction is anticipated to include facility modifications necessary for the installation of pier enhancements and the front-end system upgrade. We propose using the currently available Tier 3 & 4 Zero Waste Incentive funds for the purposes of funding this phase of construction.
D Phase 2 of construction is anticipated to include facility modifications necessary for the installation of pier enhancements and the back-end system upgrade. In the event Recology does not meet the 3 & 4 Tier goals during Rate Year 2016, we propose that those funds be used for this phase of construction. In the event Recology does meet the Tier 3 & 4 goals for Rate Year 2016, the Company will fund this phase of construction.
E Remaining project costs will be funded by Recology. Please note in the event that the actual project costs are less than the Zero Waste Incentive funds provided for this proposal, the amounts will be returned to the Zero Waste Incentive Account.

Project Timeline

The Company anticipates the facility enhancements will take approximately one year to complete. Please see a summary of the proposed timeline below:

Milestone	Date
Project approval by SFE & SFPW	December 2015
Order equipment	December 2015
Electrical work	January 2015
Fire suppression system	January 2015
Front-end construction begins	February 2016
Back-end construction begins	March 2016
Front-end construction completed	July 2016
Back-end construction completed	September 2016
Begin processing	October 2016