

## **Continuous Improvement Fund**

**Final Report on:**  
**ONP Quality Improvements (CIF Project #140) and**  
**Automated OCC/OBB Baling System (CIF Project #142)**  
**at the Niagara Region MRF**

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# 1. Project Background and Objectives

## 1.1 Niagara MRF Overview

The Region of Niagara owns a 2-stream Material Recovery Facility (MRF), located at 4935 Kent Avenue in Niagara Falls, Ontario. The facility has two separate processing lines; one for containers and one for fibres. This report summarizes two (2) improvement initiatives associated with the fibre line only; CIF Project #140 (ONP Quality Upgrades) and CIF Project #142 (Automated OCC/OBB Baling System). These two improvement initiatives involve interrelated processing equipment and thus the two separate CIF funding projects are discussed together herein.

Prior to the implementation of the improvement initiatives, the Niagara MRF's fibre line involved the following general equipment and operation:

- In-floor feed conveyor on the tip floor;
- Pre-sort conveyor with several sort stations and bunkers below for residue, plastic film, other contaminants removal/storage;
- OCC screen to separate OCC/OBB (the screen's "overs") from other fibre grades (the screen's "unders");
- OCC screen overs (OCC/OBB) is discharged directly from the OCC screen into a push-through bunker; one of five available bunkers for fibre storage;
- OCC screen unders (other fibre grades) are conveyed from beneath the OCC screen to a gravity splitter then onto two parallel fibre sort lines where various fibre grades can be positively sorted into the four remaining push-through bunkers while #8 ONP is negative sorted to an ONP holding area on the MRF floor;
- Fibre grades in the push-through bunkers are directed to the baler feed conveyor using a front-end or skid steer loader;
- #8 ONP is loose-loaded into open top trailers using a front-end loader.

## 1.2 CIF Project #140: ONP Quality Upgrades

The intention of this project is to improve the quality of the ONP stream by increasing the number of discs used in the OCC screen. Prior to this initiative, many small pieces of OCC/OBB were observed to fall through the OCC screen and despite downstream manual sorting efforts to remove these "outthrows" from the ONP, many pieces are missed thus lowering the quality of the negative sorted ONP. By increasing the number of discs and thus reducing the spacing between discs it is expected that fewer outthrows will fall through the screen, in turn improving the quality of the ONP.

With the proposed decrease in the OCC screen disc spacing it is anticipated that some ONP will travel over the OCC screen rather than fall through the screen. To capture this ONP (as opposed to it being baled with the rest of the OCC screen overs) a sorting conveyor is proposed for the OCC screen overs. Positively sorted ONP from this sort conveyor will be directed via several new conveyors to the ONP holding area on the MRF floor.

A description of the conveyors and other equipment associated with this improvement initiative is provided in Section 1.4 below. Additional details regarding the business case for this initiative and the post-installation monitoring results are provided in Section 3.

### 1.3 CIF Project #142: Automated OCC/OBB Baling System

As described in Section 1.1, the MRF utilizes a front-end loader and/or a skid steer loader to push fibre grades from their bunkers onto the baler feed conveyor. The MRF has only one baler, which is used for baling containers and fibres. It is proposed to improve efficiencies at the MRF by i) installing a second Baler, which will be dedicated to the fibre line and ii) installing bunker conveyors (or walking floors) in four of the five push-through bunkers, which will allow fibre storage and automated feeding of the fibre grades to either baler.

The current (prior to implementing the improvement) operations at the MRF requires that most of the fibre baling and loader feeding of the baler feed conveyor occurs on an overtime shift because there is only one baler and it is mostly occupied baling containers during the regular shift. The available fibre storage bunkers provide sufficient storage to allow baling to occur on the overtime shift. The one exception is the OCC storage bunker which fills quickly due to the volume of material and thus must be baled throughout the regular shift and into the overtime shift. This is disruptive to the container baling operation.

As described in Section 1.2, a sorting conveyor is proposed for the OCC screen overs to allow positive capture of ONP that travels over the OCC screen. The remaining OCC/OBB will be negative sorted via a manual diverter into either of two existing bunkers. These two bunkers and two other existing bunkers will be equipped with reversing bunker conveyors which can discharge onto the existing baler reclaim conveyor at the west end of the bunkers or onto a new baler reclaim conveyor at the east end of the bunkers. The new baler reclaim conveyor will feed a new dedicated fibre baler.

A description of the conveyors and other equipment associated with this improvement initiative is provided in Section 1.4 below. Additional details regarding the business case for this initiative and the post-installation monitoring results are provided in Section 3.

### 1.4 Processing Equipment for the ONP Quality Upgrades and the Automated OCC/OBB Baling Systems

#### 1.4.1 Proposed Equipment Installation

Sections 1.2 and 1.3 describe in general the two proposed improvement initiatives. The interrelated conveyors and other equipment that were proposed for the two initiatives together are shown in Appendix 1 as “**Alternative A**” and include the following:

- 1500 wide OCC/OBB sort conveyor following the OCC screen;
- New sort platform with 2 pairs of sort stations for positive sorting of ONP from the OCC screen overs;
- 900 wide ONP shuttle conveyors (2) and 900 wide ONP transfer conveyor, to direct positive sorted ONP to the ONP holding area on the MRF floor;
- Manual diverter to divert negative sorted OCC/OBB into either of two bunkers;
- 1800 wide reversing bunker conveyors (4);

- 1500 wide OCC/OBB transfer conveyor in pit (roller chain conveyor), to direct material from the bunker conveyors to the new baler feed conveyor;
- 1500 wide baler feed conveyor in pit (roller chain conveyor);
- 2-ram dedicated fibre baler, capable of baling OCC at a rate in excess of 14 tonnes/hr and, if desired, ONP at a rate in excess of 21 tonnes/hr (ONP can be fed into the baler feed conveyor directly from the floor).

#### 1.4.2 Actual Equipment Installation

At the time of preparing the RFP to procure the proposed equipment shown in the Alternative A drawing, there was concern that the total capital cost of the equipment might exceed the Region of Niagara's available budget. Consequently a second concept was proposed which would achieve most of the objectives of Alternative A but at a lower capital cost. This concept is shown as "**Alternative B**" in Appendix A and differs from Alternative A as follows:

- 900 (3) and 1200 (1) wide slider bed conveyors are utilized in the four bunkers instead of the 1800 wide bunker conveyors;
- With no bunker conveyors, a 1500 wide reversing slider bed conveyor for OCC/OBB transfer to the new baler feed conveyor is utilized instead of the 1500 wide in-pit, roller chain conveyor;
- With no bunker conveyors, the manual diverter to divert negative sorted OCC/OBB into multiple bunkers was not utilized.

The Alternative B conveyor substitutions and elimination of a conveyor pit were certainly expected to reduce the capital cost, however Alternative B has the downside of having no fibre storage (on the bunker conveyors) thus requiring continuous fibre baling.

A system without fibre products storage and requiring continuous baling is less efficient than a system with storage because the entire fibre processing line operation would have to be stopped in the event the new fibre baler is temporarily down and the container baler is either temporarily down or occupied baling containers. To partly mitigate this issue, the OCC/OBB transfer conveyor which feeds the new baler feed conveyor was specified to be reversing in Alternative B. In the event the balers are temporarily unavailable, the OCC/OBB can be directed into a spare push-through bunker (bunker #7 on the drawings) by using the transfer conveyor in reverse mode. This allows the fibre line to continue running for as long as there is storage capacity in the bunker #7. Under such circumstances a loader is required to push the stored material onto the baler feed conveyor.

Niagara issued an RFP requesting pricing for Alternative A and Alternative B, and as expected Alternative B prices were lower. The lowest priced, technically acceptable proposal (Integrated Municipal Services with CP Manufacturing as the process equipment provider) had an Alternative A price that exceeded Niagara's project budget however their Alternative B price was within Niagara's project budget. Niagara therefore awarded the work to IMS/CP on the basis of Alternative B. The baler (Nexgen) was awarded separately by Niagara to Baleforce although IMS was required under its contract to coordinate installation of the baler with the installation of the remaining Alternative B equipment.

It should be noted that the Alternative B layout does not prevent Niagara from converting the system to Alternative A in the future if desired and if budget for the conversion can be made available. The relatively straight-forward conversion would require removal of the above-noted

900 and 1200 wide slider bed conveyors from within the bunkers and the 1500 wide reversing slider bed OCC/OBB transfer conveyor and installation of bunker conveyors and an in-pit OCC/OBB roller chain style transfer conveyor.

Table 1.1 provides a summary of the estimated capital costs (at the time of funding requests to the CIF) versus the actual capital costs (for Alternative B). Although the RFP did not attempt to differentiate between the two CIF projects, a sufficiently detailed price breakdown was provided by IMS/CP to determine the *approximate* apportioning shown in Table 1.1.

**Table 1.1 - Budgeted Versus Actual Capital Costs (Installed)**

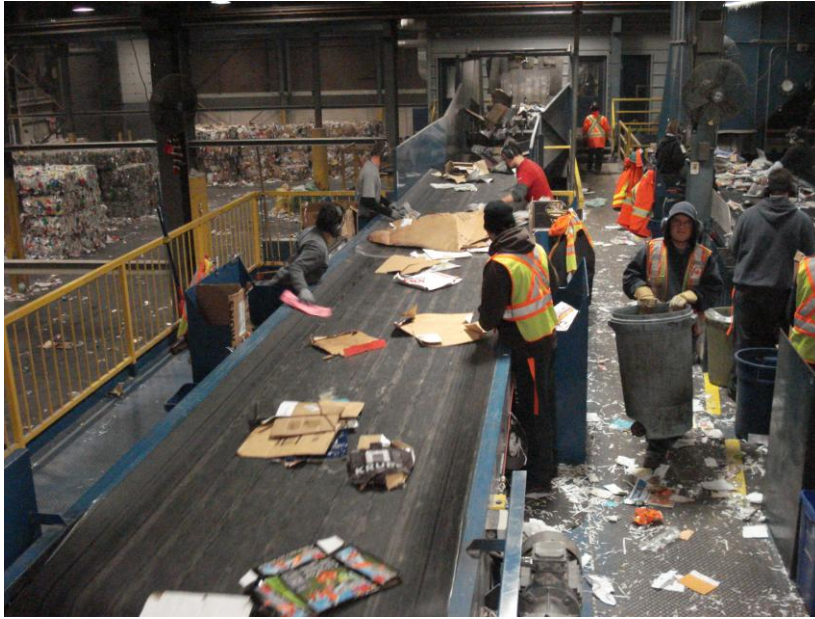
Improvement Initiative	Estimated Capital Cost (\$)	Requested CIF Funding Level (\$)	Actual Capital Cost Alternative B (\$)
ONP Quality Upgrades	300,000	150,000	230,500
Automated OCC/OBB Baling System	750,000	375,000	1,000,000
Totals	1,050,000	525,000	1,230,500

## 2. Equipment Installation and Commissioning

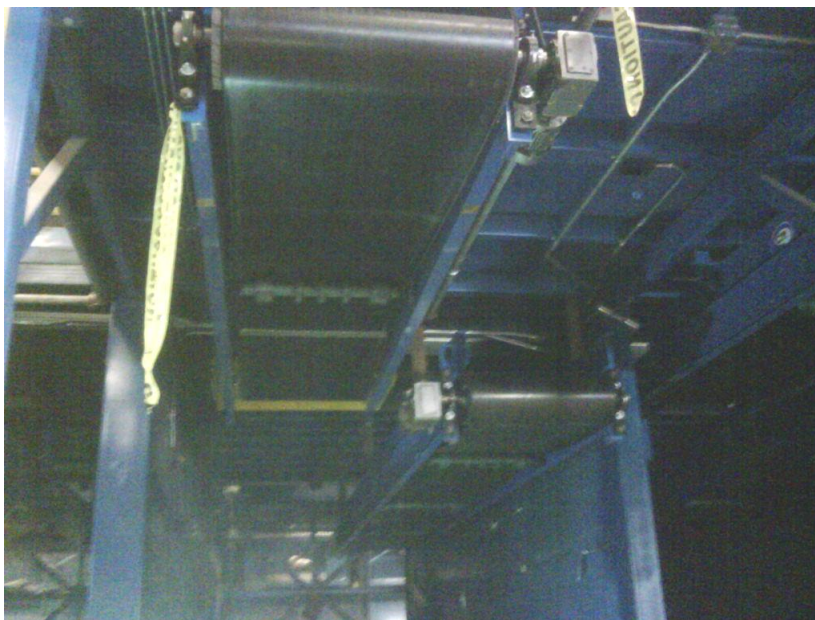
### 2.1 ONP Quality Upgrades

The Alternative B system, which includes the ONP Quality Upgrades equipment, was awarded to IMS/CP. The system was installed in the spring and early summer of 2010 and successfully commissioned in July 2010.

Figure 2.1 shows the 1500 wide OCC/OBB sort conveyor, sort stations and platform downstream of the OCC screen (seen in the distance). Figure 2.2 shows two of the 900 wide slider bed conveyors in one of the bunkers (during installation).



**Figure 2.1 - Sort Conveyor Downstream of OCC Screen**



**Figure 2.2 - Slider Bed Conveyors**

Commissioning of the Alternative B equipment did not involve specific performance requirements related to improvements in ONP quality because this was not a specified requirement that vendors were to meet (rather, it was a Niagara initiative related to increasing the number of discs on the OCC screen and downstream manual sorting). The system's commissioning generally involved the following:

- 3 days' continuous running of the conveyor system to ensure the equipment runs without overloads and trip-outs and properly conveys and transfers materials through the system;
- Check out of motor electrical draws to ensure within manufacturer's specifications;
- Check out of all control functions/operations such as conveyor interlocks and starting/stopping sequences, emergency stops, pull cord stops, VFD settings and adjustments, conveyor operating modes (forward/reverse), etc.

Appendix B contains the contractor's commissioning report for the Alternative B installation. Commissioning of this system was witnessed by GENIVAR and confirmed to meet the requirements of the RFP.

## 2.2 Automated OCC/OBB Baling System

The Alternative B system, which includes the Automated OCC/OBB Baling System equipment, was awarded to IMS/CP with the baler awarded separately to Baleforce. The system was installed in the spring and early summer of 2010 and successfully commissioned in July and August 2010.

Figure 2.3 shows the inclined section of the baler feed conveyor dropping into the Nexgen 2-ram baler with the baler hydraulics and control panel in the foreground.



**Figure 2.3 - New Baler Feed Conveyor and 2-Ram Baler**

Appendix B contains the commissioning report for the Alternative B installation and the 2-ram baler installation. Commissioning of this system was witnessed by GENIVAR and confirmed to meet the requirements of the RFP.

Commissioning of the baler required prove out of many specified performance requirements including, most fundamentally, throughput rates and minimum densities for OCC and ONP bales. The GENIVAR commissioning report in Appendix B contains all of the performance specifications, an indication of whether these were met and explanatory comments.

## 3. Monitoring and Reporting

### 3.1 ONP Quality Upgrades

#### 3.1.1 Original Project Business Case and Baseline Data

##### Business Case

This improvement initiative involves installation of additional discs on the OCC screen with the objective of reducing the amount of OCC/OBB going through the screen which, despite downstream manual sorting efforts, contaminates the negative sorted ONP. The business case for the ONP Quality Upgrades project depends very much on product pricing and quality premiums offered to Niagara by their ONP market (AbiBowater) as discussed below.

AbiBowater agreed to pay Niagara a combination of market premium and freight allowance for its ONP of \$14.89 CDN per tonne (at the time of the CIF funding application in early 2009 and reflective of the exchange rate then) as long as the ONP contains no more than 5% outthrows. This combination premium/freight allowance is still being offered as of this writing in April 2011 (adjusted for the current exchange rate).

At the time of the CIF application Niagara anticipated processing approximately 40,540 tonnes/yr of fibres (including 19,000 tonnes/yr of fibres from the Waterloo contract that was awarded to Niagara in April 2009). Niagara estimates that 75% of its fibres (30,410 tonnes/yr) is ONP that is shipped to AbiBowater. Thus the estimated available premium for ONP (if at maximum 5% outthrows) is 30,410 tonnes/yr x \$14.89/tonne = \$452,805/yr.

Table 3.1 provides a summary of the estimated AbiBowater premium and the operating costs associated with the ONP Quality Upgrades system to realize this premium. These are the savings shown in the original CIF application. The operating costs are primarily for the additional sorters required for positive capture of ONP that travels over the OCC screen.

**Table 3.1 - Estimated Annual Savings of ONP Quality Upgrades System**

Item	Estimated Savings (\$/yr)
AbiBowater premium (30,410 tonnes/yr x \$14.89/tonne)	452,805
Additional ONP sorters (full time)	(80,000)
Additional ONP sorters (part time)	(40,000)
Additional maintenance associated with conveyors	(2,500)
Net Savings	330,305

##### Baseline Data

As this project's business case depends entirely on the AbiBowater premium, which requires that Niagara achieve the 5% outthrows level, baseline data for this improvement initiative is based on audit data of outthrows levels in the ONP prior to the improvement initiative.

At the time of the CIF funding application, Niagara had its own audit data for 2008 (some 41 audits over the entire year) that showed outthrows levels in the ONP to be between 8% and 9%.

However, the current arrangement between Niagara and AbiBowater is that the average of the two party's audit data is used to determine whether Niagara qualifies for the market premium. Data showing both Niagara and Abitibi audit results prior to when the improvement initiative was put into place is therefore proposed as the baseline data (see Appendix C). The AbiBowater audit data (24 audits from December 2009 to May 2010) show an average outthrows level of 12.75% while the Niagara audits for the same period show an average outthrows level of 10.94%. Possible reasons for the difference in outthrows levels between Niagara's 2008 audit data and the baseline data provided in Appendix C are discussed in Section 3.1.2.

### 3.1.2 Post-Installation Monitoring

#### Auditing Protocol

Niagara proposes to conduct four (4) weekly audits of the ONP stream to determine outthrows levels post system installation and to satisfy CIF reporting requirements. Although extensive AbiBowater and Niagara audit data is available post system installation, Niagara has been operating the fibre line with more sorters than originally contemplated (reasons are discussed below – see “Markets Feedback and Additional Labour Requirements”) and thus not in a directly comparable fashion to the baseline situation. The proposed four (4) weekly Niagara audits will utilize the same number of sorters as originally contemplated in the CIF application to allow comparison with the baseline.

The results of the 4 weekly audits are provided in Appendix C (entitled “Special Paper Audit Results 2011”). These audits show an average outthrows level of 13.8%; higher than prior to the improvement initiative being put into place but of course involving 8 fewer sorters and also involving changing feedstock conditions as describe later in this section.

#### Annual Operating Cost Savings Data

The Niagara MRF operator has assembled data that can be directly compared to the baseline data. A summary of the comparison is provided in Section 3.1.3.

#### Markets Feedback and Additional Labour Requirements

In the roughly 24 months since this improvement initiative was conceived and the application for funding sent to the CIF, there have been various challenges affecting the performance of the installed improvements, necessitating use of additional labour (sorters). Most fundamentally these challenges relate to changing feedstock and changing fibre market requirements.

As indicated earlier, the objective of this project is to improve ONP quality by increasing the number of discs used in the OCC screen. By increasing the number of discs and thus reducing the spacing between discs it is expected that fewer outthrows will fall through the screen thus improving ONP quality. With the proposed decrease in the OCC screen disc spacing it is anticipated that more ONP will travel over the OCC screen than before and to capture this ONP a sorting conveyor is proposed for the OCC screen overs.

The key to the success of this concept is to strike the right balance between addition of OCC screen discs and the resulting screen performance in terms of minimizing the amount of OCC/OBB falling through the screen and at the same time minimizing the amount of ONP travelling over the screen. If the screen disc spacing is too restrictive, too much ONP will travel over the screen. If not restrictive enough, too much OCC/OBB will fall through the screen. The Niagara MRF operator tweaked the disc additions several times in an attempt to achieve an ideal balance.

Norampac is the Region's current market for its hardpack (OCC/OBB). Following the improvements initiative there was an increase in ONP in the hardpack, as predicted and despite the use of sorters on the OCC screen overs line. Initially Norampac did not have an issue with the increase in ONP however they have now imposed restrictions on how much ONP can be in the hardpack. To meet these restrictions, Niagara has had to slow down the OCC screen and remove some of the extra discs from the OCC screen that were added as part of the improvement initiative (thus increasing the amount of hardpack on the ONP lines). This in combination with the AbiBowater quality concerns discussed below has required Niagara to add 4 more sorters on the fibre lines than originally anticipated in the CIF application.

AbiBowater is the Region's current market for its ONP. AbiBowater, having conducted their own audits of the ONP has concluded that the 5% outthrows level is not being achieved despite the improvements initiative. In an attempt to obtain the offered pricing premium Niagara has added 4 sorters to the ONP lines. Despite the additional sorters, the 5% outthrows target is not being met. AbiBowater is paying the premiums but applying downgrades commensurate with the extent that the outthrows exceeds 5% (the downgrade amounts are shown in Table 3.3).

Several factors are believed to contribute to the higher outthrows levels despite the improvements initiative installed:

- The Waterloo contract has nearly doubled the amount of fibre the Niagara MRF manages (approximately 21,000 tonnes/yr to 40,000 tonnes/yr). The Waterloo material contains a high percentage of large OCC (from commercial sources), which makes it challenging for the sorters in the pre-sort room to find and pull ONP prohibitives. Consequently fibre sorters downstream of the OCC screen have to pull more prohibitives than anticipated in turn causing them to miss outthrows. [Note: the Waterloo contract commenced in April 2009. Niagara submitted its funding application to the CIF prior to this date and based on outthrows levels, as determined using 2008 audit data, in the 8%-9% range.]
- Niagara is now accepting Haldimand County fibres. This material is primarily rural-based, containing relatively high amounts of OCC/OBB (roughly 60% hardpack). This again contributes to the outthrows issue.
- A recent study conducted by Kelleher Environmental on behalf of Toronto's Solid Waste Management Services, analyzed the effects of various lifestyle trends on printed paper and packaging to determine how those trends could impact the future volume of printed paper and packaging waste with regards to Toronto's blue bin program. The study suggests that ONP quantities are on the decline as a result of increasing internet use. This would consequently increase the percentage of hardpack in the fibre stream in turn increasing the percentage outthrows in the ONP.

#### Maintenance Requirements for this System

See discussion in Section 3.1.3 below.

#### Problematic Materials

There have been no problematic materials for the ONP Quality Upgrades system in terms of the system's ability to manage (convey) the materials. However, changing feedstock composition has created problems in terms of meeting outthrows levels (see discussion under "Markets Feedback and Additional Labour Requirements" above).

#### Health and Safety Aspects

There have been no negative health and safety aspects associated with this system.

### 3.1.3 Data Comparison (Pre- and Post-Installation)

The Niagara MRF operator has assembled data that can be directly compared to the baseline data. A summary of the comparison is provided in Table 3.2 below.

**Table 3.2 - Operating Cost Savings Comparison (Pre- and Post-Installation) of ONP Quality Upgrades System**

Item	Estimated Savings (\$/yr)	Actual Savings (\$/yr)
AbiBowater premium (30,410 tonnes/yr x \$14.89/tonne (Estimated Savings column) and \$14.21/tonne (Actual Savings column))	452,805	432,126
Additional ONP sorters (full time)	(80,000)	(260,000)
Additional ONP sorters (part time)	(40,000)	-
Additional maintenance	(2,500)	(7,000)
Net Savings	330,305	165,126

The AbiBowater premium shown in the “Actual Savings” column of Table 3.2 is in fact an estimate based on the premiums paid from July 2010 – February 2011 and applied to the same tonnage as was used in the original CIF application. In this way it is directly comparable to the estimated savings in the original application.

The premium amount of \$14.21/tonne is less than the offered premium of \$14.89/tonne due to downgrades imposed by AbiBowater as a consequence of Niagara not achieving the 5% outthrows level. Table 3.3 provides a summary of the actual premiums paid and downgrades applied since the improvements initiative was commissioned and develops the lower premium amount of \$14.21/tonne. The lower premium is an average amount calculated using the July 2010 – February 2011 data.

The MRF Operator confirmed that 4 sorters carries a cost of approximately \$130,000 annually (slightly higher than the amount shown in the original CIF application). The \$260,000 shown for sorters allows for the 4 *additional* sorters (total of 8) discussed in Section 3.1.2.

The MRF Operator reviewed labour and maintenance requirements with his maintenance staff to derive the estimated maintenance cost of \$7,000/yr, which is mostly labour costs. Records of the \$7,000 expenditure are not available because the maintenance costs at the MRF are not broken down on an equipment item by equipment item basis.

For the requested CIF funding level of \$150,000, the simple payback for this system is 0.45 years based on the estimated savings of \$330,305/yr. The simple payback is 0.91 years based on the actual savings of \$165,126/yr.

**Table 3.3 - Summary of Actual Premiums Paid by AbiBowater Including Downgrades**

Date	Tonnes Shipped	Premium at \$14.89/t	Downgraded Tonnes	Premium Loss at \$14.89/t	Net Premium
July 2010	3,042	45,295	0	0	45,295
August 2010	2,886	42,973	130	1,936	41,037
September 2010	2,340	34,843	124	1,846	32,997
October 2010	3,446	51,311	158	2,353	48,958
November 2010	3,731	55,555	138	2,055	53,500
December 2010	2,418	36,004	108	1,608	34,396
January 2011	3,340	49,733	258	3,842	45,891
February 2011	2,644	39,369	180	2,680	36,689
Totals	23,847	355,083	1,096	16,320	338,763
Net Premium Including Downgrades (\$/tonne):					14.21

## 3.2 Automated OCC/OBB Baling System

### 3.2.1 Original Project Business Case and Baseline Data

#### Business Case

This improvement initiative involves installation of an automated (via conveyors) baler feed system. The business case for the project is based on eliminating the operating costs associated with the former loader operation to feed the baler and, by installing a dedicated fibre baler, the elimination of overtime costs for baler operation that formerly had to be conducted on an overtime shift.

Table 3.4 provides a breakdown of the estimated operating cost savings associated with the automated baling system. Although there will be operating costs associated with the new equipment (especially the baler), it is expected that these will be offset by the avoided operating costs associated with the overtime operation of the existing, older baler.

#### Baseline Data

Baseline data for this improvement initiative are the operating cost savings shown in Table 3.4, which were based on the MRF operator's records of baling and loader overtime hours, maintenance and operator overtime fees.

**Table 3.4 - Estimated Operating Cost Savings for Automated Baling System**

Item	Estimated Savings (\$/yr)
Savings in overtime labour costs (baling)	15,000
Skid Steer Loader: Loader (2,028 hours annually)	34,000
Skid Steer Loader (fuel)	6,000
Skid Steer Loader (maintenance)	7,000
Skid Steer Loader (tires)	5,000
Capital / Lease (avoided cost of loader)	20,000
<b>Total Annual Operating Cost Savings</b>	<b>87,000</b>

### 3.2.2 Post-Installation Monitoring

#### Auditing Protocol

Due to the nature of the automated baling system project, monitoring of the project does not lend itself to specific monitoring audits or events (days). Rather, actual on-going data that can be directly compared to the baseline data (estimated annual savings) shown in Section 3.2.1 is required.

#### Annual Operating Cost Savings Data

With the installation of conveyors to direct feed fibres to the new baler, the skid steer loader is no longer required to manage fibre material in the bunkers. This was confirmed by the MRF operator. Thus the avoided costs associated with the skid steer loader (overtime labour, fuel, maintenance, lease payments) shown in Table 3.4 have unfolded as predicted. As there is no overtime labour applicable nor any direct costs associated with the un-used skid steer, there are no records of the savings.

#### Markets Feedback

The MRF operator has received no complaints from the fibre markets that take the baled hardpack concerning the quality of bales produced. Issues regarding the actual fibre products quality are discussed in Section 3.1 under the ONP Quality Upgrades initiative.

#### Additional Labour Requirements

There have not been any additional labour requirements beyond those anticipated for this project. The new baler is fully-automated and does not require dedicated baler operator attention. The need to use the plant loader to push material in Bunker #7 onto the baler feed conveyor, as a consequence of the new baler being down temporarily, is very infrequent and has not required overtime shifts to do so (i.e., can be done using loader operator available time on the regular shift).

#### Maintenance Requirements for this System

As discussed in Section 3.2.1 maintenance costs for the new baler are considered comparable to what would have been required of the plant's original baler as a consequence of operating on the overtime shift.

### Problematic Materials

There have been no problematic materials for the automated OCC/OBB baling system. The Nexgen 2-ram baler can easily manage the largest pieces of OCC it encounters.

### Health and Safety Aspects

Implementation of the automated baling system has virtually eliminated loader operation in the fibre bunkers (with the exception of occasional loader operation in Bunker #7). This has had a very positive impact on the plant air quality both at floor (bunker) level and for sorters on the fibre lines above the bunkers.

There have been no negative health and safety aspects associated with this system.

## 3.2.3 Data Comparison (Pre- and Post-Installation)

With the installation of conveyors to direct feed fibres to the new baler, the skid steer loader is no longer required to manage material in the fibre bunkers. Thus the estimated avoided costs associated with the skid steer loader (overtime labour, fuel, maintenance, lease payments) shown in Table 3.4 have unfolded as predicted. As there is no overtime labour applicable nor any direct costs associated with the un-used skid steer, there are no records of the actual savings. For CIF reporting purposes a comparison of the estimated and actual cost savings (which are identical) is provided in Table 3.5 below.

**Table 3.5 - Operating Cost Savings Comparison (Pre- and Post-Installation) of Automated Baling System**

Item	Estimated Savings (\$/yr)	Actual Savings (\$/yr)
Savings in overtime labour costs (baling)	15,000	15,000
Skid Steer Loader: Loader (2,028 hours annually)	34,000	34,000
Skid Steer Loader (fuel)	6,000	6,000
Skid Steer Loader (maintenance)	7,000	7,000
Skid Steer Loader (tires)	5,000	5,000
Capital / Lease	20,000	20,000
<b>Total Annual Operating Cost Savings</b>	<b>87,000</b>	<b>87,000</b>

Based on a requested CIF funding level of \$375,000, the simple payback for this system was 4.3 years based on estimated savings of \$87,000/yr. The simple payback is therefore 4.3 years based on the actual savings as well.

## 4. Project Findings and Lessons Learned

### 4.1 ONP Quality Upgrades

The objective of this project is to improve ONP quality by increasing the number of discs used in the OCC screen. By increasing the number of discs and thus reducing the spacing between discs it is expected that fewer outthrows will fall through the screen thus improving ONP quality. With the proposed decrease in the OCC screen disc spacing it is anticipated that more ONP will travel over the OCC screen than before and to capture this ONP a sorting conveyor is proposed for the OCC screen overs.

The key to the success of this concept is to strike the right balance between addition of OCC screen discs and the resulting screen performance in terms of minimizing the amount of OCC/OBB falling through the screen and at the same time minimizing the amount of ONP travelling over the screen. If the screen disc spacing is too restrictive too much ONP will travel over the screen. If not restrictive enough, too much OCC/OBB will fall through the screen. The Niagara MRF operator tweaked the disc additions several times in an attempt to achieve an ideal balance.

There are several lessons learned from this project, the first two listed below being fundamentally related:

- 1) It can be challenging to strike the perfect balance of limiting smaller pieces of OCC/OBB from falling through an OCC screen while at the same time limiting the amount of ONP that travels over the OCC screen. Niagara has attempted to achieve with its OCC screen what perhaps is better suited to a newspaper screen. The Niagara MRF is not equipped with a newspaper screen and retrofitting one (or more) into the process will certainly be more costly than the ONP Quality Upgrades project, so from this perspective the relatively inexpensive improvement initiative was worthwhile testing.
- 2) As a follow on to item #1 above, even if the perfect balance of limiting smaller pieces of OCC/OBB from falling through an OCC screen while at the same time limiting the amount of ONP that travels over the OCC screen had been achieved, it is likely that ever-changing market conditions and/or changing feedstock composition (both having occurred in Niagara) will render OCC screen adjustments ineffective.
- 3) The changing fibre composition (trending lower percentage of ONP as a result of increasing internet use for acquiring news) and the volatility of fibre market specifications and pricing is making it very difficult for MRFs to keep pace in terms of their process design and processing capabilities.
- 4) Although not discussed thus far in this report, another lesson learned relates to the use of sorting conveyors with “chevron” style rubber cleats. This type of belting was proposed by CP because the sort conveyor (downstream of the OCC screen) has an 11° inclined section (see Elevation view in the Alternative B drawing in Appendix A) and CP was concerned that fibre would not convey properly up the incline without use of rubber chevron cleats. This type of belting proved to be very difficult for sorting as sorters tend to “sweep” fibre off of the fast moving sort conveyor rather than “pluck” and the chevrons inhibit the sweeping action. The belt was replaced with a smooth surface belt and the sorting issue was eliminated. The smooth belt has no difficulty conveying the fibres up the 11° incline.

## 4.2 Automated OCC/OBB Baling System

This improvement initiative has unfolded more or less as originally contemplated as the system's benefits have been realized. The fundamental lessons learned from this project are:

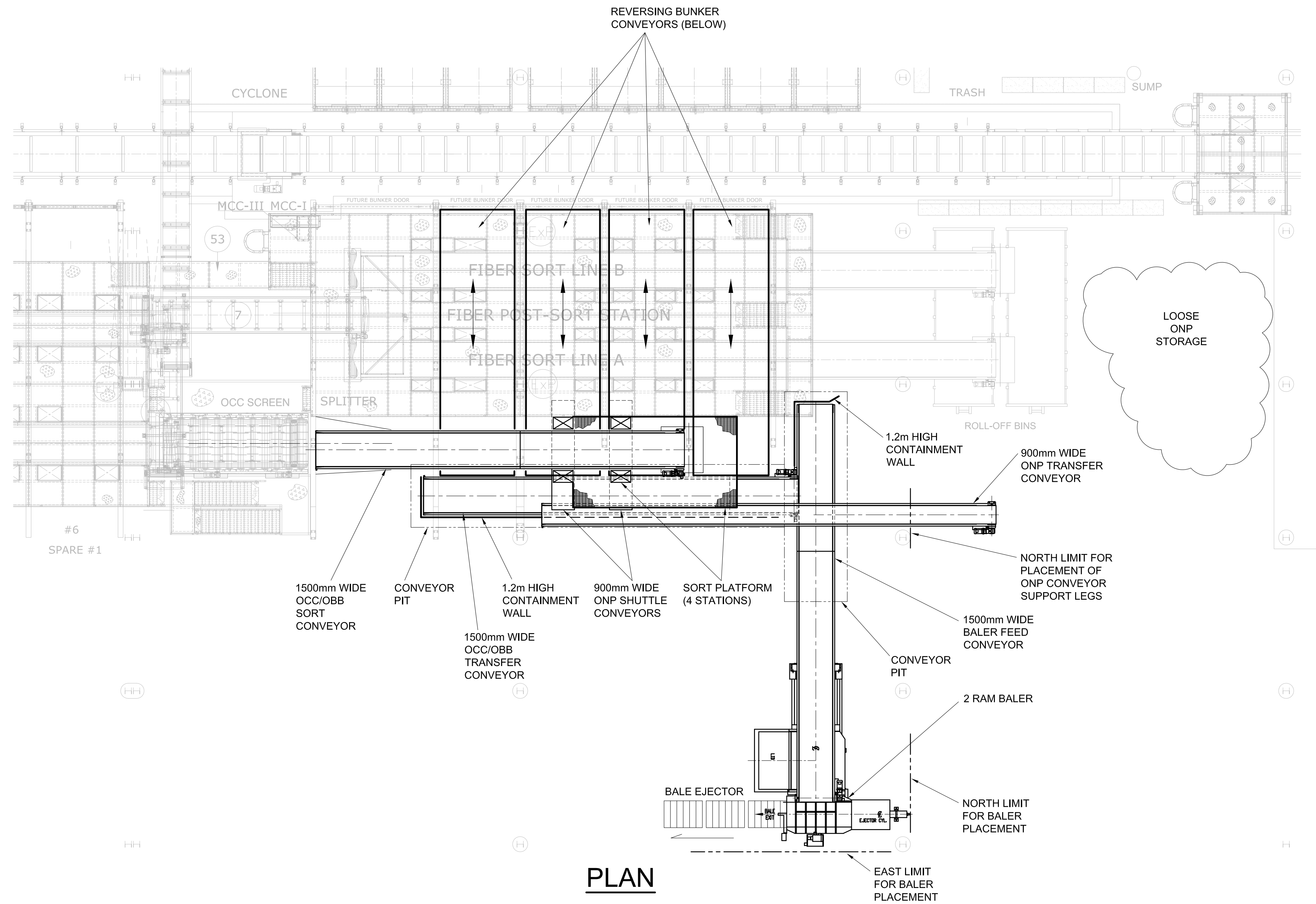
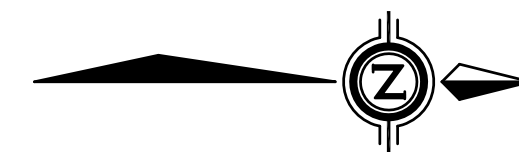
- 1) Automated baling capabilities, as opposed to relying on loaders and manpower to feed a baler, should be cost-effective especially if overtime labour rates apply.
- 2) Automated baling capabilities, as opposed to relying on loaders and manpower to feed a baler, will result in better plant air quality.
- 3) It is strongly recommended that a system such as installed at Niagara that does not utilize walking floors or bunker conveyors (and hence some intermediate storage on the walking floors or bunker conveyors) incorporate some means of storage elsewhere, otherwise temporary baler shutdowns will require shut down of the entire line. The storage was achieved at Niagara by retaining one of the fibre storage bunkers and having the ability, using a reversing conveyor, to convey into it as required.
- 4) It is preferable with any initiative similar to that described herein, where an alternative design was adopted due to budget concerns with the preferred design, that the design does not preclude a future conversion to the original concept. In the Niagara case, the preferred system (with bunker conveyors) proved too costly and exceeded Niagara's established budget. The alternative system (with slider bed conveyors) was designed to readily allow for later conversion to the bunker conveyor approach if desired.

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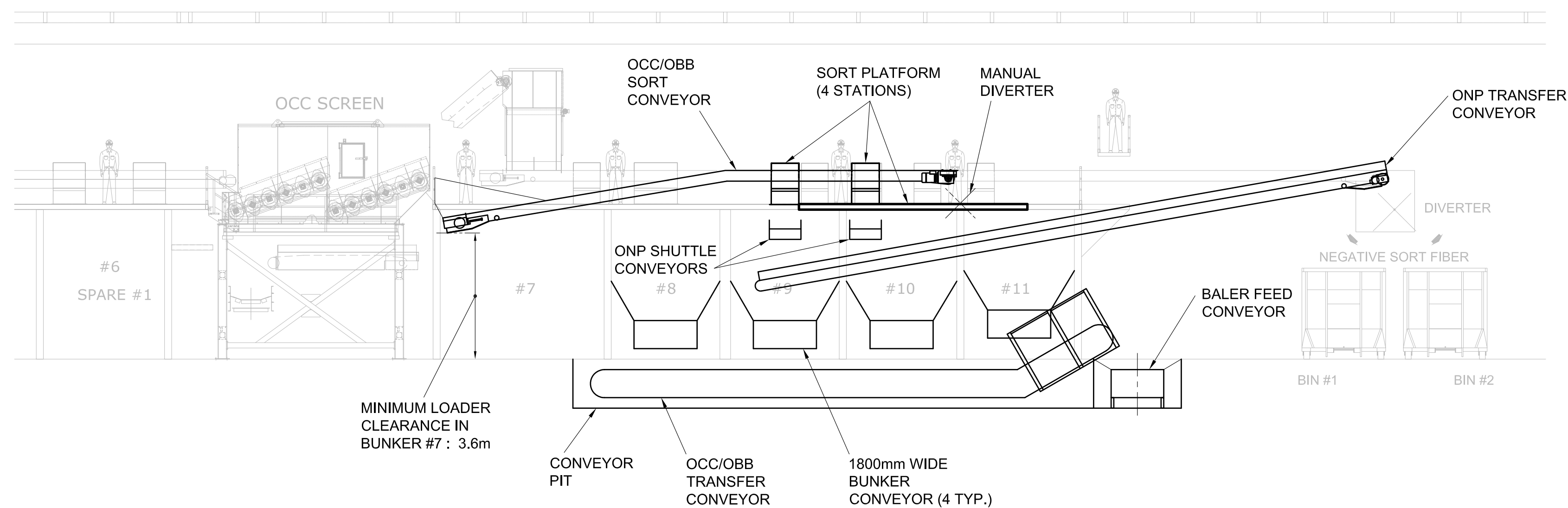
## Appendix A

### Plan and Elevation Views of the Process

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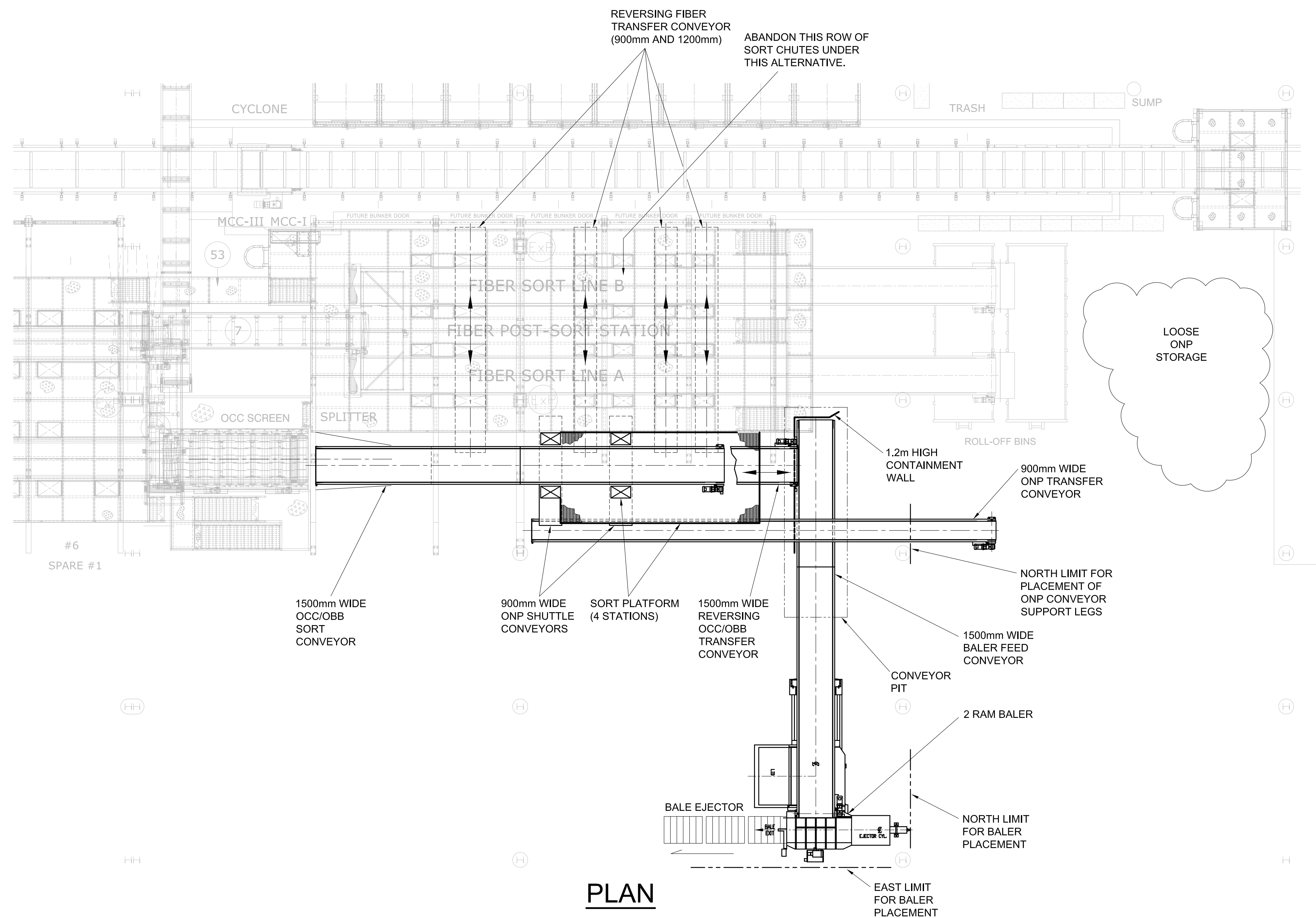
**PLAN**



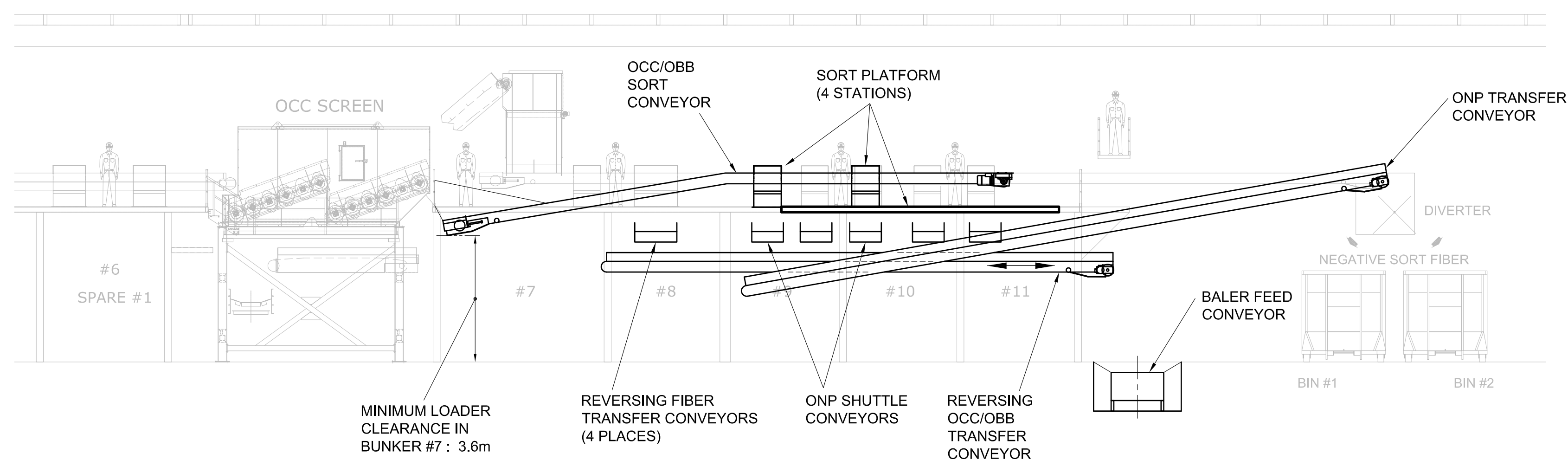
**ELEVATION**

SCALE: 1=100

REGIONAL MUNICIPALITY OF NIAGARA MRF  
ONP QUALITY IMPROVEMENT AND  
AUTOMATED OCC/OBB BALING  
ALTERNATIVE A : BUNKER CONVEYORS FOR OCC/OBB STORAGE/TRANSFER



**PLAN**



**ELEVATION**

SCALE: 1=100

REGIONAL MUNICIPALITY OF NIAGARA MRF  
ONP QUALITY IMPROVEMENT AND  
AUTOMATED OCC/OBB BALING  
ALTERNATIVE B : SLIDER BED CONVEYORS IN LIEU OF BUNKER CONVEYORS

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## Appendix B

### Commissioning Reports

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Acceptance Testing Report

Rev 2      14-Jul-10

Acceptance Testing was completed during the NR operating days of June 28, 29 and 30th from 6:00 am to 2:30 pm each day

1	Acceptance Testing	Total hours of operation	Capacity (bales at 1,400 lbs each)	
24-Jun	Checked electrical load (amp draw) on all conveyors			
28-Jun	System down for 1 1/2 hours due to problems with the new baler	6.5	110 Bales	10.74 t/hr
29-Jun	System ran for 8 hours with no downtime	7.5	141 Bales	11.94 t/hr
	Checked electrical load (amp draw) on all conveyors			
30-Jun	System ran for 8 hours with no downtime	7.5	140 Bales	11.85 t/hr
	Tested C205 E Stop pull cords, C205 and all fibre conveyors stopped, C219 (baler feed conveyor) continued to run, witnessed by Wally.			
	Tested (2) E Stop buttons for C219, All fibre conveyors stopped including C219, witnessed by Wally. (No confirmation on baler operation)			
	Checked electrical load (amp draw) on all conveyors at various speeds			
	Checked conveyor belt operating speeds and speed range			
1-Jul	System ran for 8 hours with no downtime reported	7.5	148 Bales	12.53 t/hr
2-Jul	System ran for 8 hours with no downtime reported, C218 would not reverse	7.5	160 Bales	13.54 t/hr
6-Jul	Modified CP program to restore C218 reverse function, accidentally removed the evening of June 30			
8-Jul	Modified CP program to improve operational control of C218 and enhanced touch screen E Stop notification			
	City of Niagara Falls (bldg & Fire Departments) final inspection			
	CP improve C218 control button and enhance touch screen graphics for E Stops			
13-Jul	Check E Stops for C219 with Norm Kraft, when activated these (2) E Stop buttons stop all equipment including the baler			
	Check speed for C219 conveyor at 30, 60 and 90 hz.			
	Review touch screen enhancements with Norm and Darrel			
	Checked operation of potentiometer on JB1 (control panel for C219), VFD set up is correct, however potentiometer adjust only use 25% of the range. VFD speed is still easily set as currently installed.			
	C219 conveyor speed set at 80 hz, monitoring of the delay timer will be required and may need adjustment to suit.			
	Set up for C219 conveyor speeds to be reviewed during training session.			
14-Jul	Revised HP for M7 and FLA for all 7.5 Hp motors except M219			

Acceptance Testing Successfully Completed during the Period, June 28th to June 30th, (exceeded the minimum requirements for duration).

2 Operational Data Observed

Conveyor Identification		Electrical Data								
Conv #	Direction	HP	FLA	Conveyors Under Operating Condition					No Load 30-Jun	
				VFD Setting	24-Jun	VFD Setting	29-Jun	VFD Setting		30-Jun
M1		1.5	1.75	80	1.0	80	-1.0	80	1.0	-
M2A		7.5	8.50	87	9.2 - 9.9	87	6.6 - 8.1	85	6.6 - 7.9	-
M2B		5.0	5.60	-	3.5 - 4.5	-	3.5 - 4.0	-	3.3 - 3.8	-
M3		5.0	5.60	80	7.7	80	7.9 - 8.1	85	7.9 - 8.0	-
M4/1		7.5	8.50	84	2.9	84	2.4 - 4.0	85	2.2- 3.0	-
M4/2		7.5	8.50	87	2.2	87	2.1 - 2.6	87	2.1 - 2.2	-
M5		2.0	2.45	-	2.0	-	2.0	-	1.9	-
M6		2.0	2.45	-	2.2	-	2.3	-	2.2	-
M7		7.5	8.50	-	4.4	-	4.4 - 4.7	-	4.2 - 4.4	-
M8		0.5	0.76	-	0.5	-	0.5	-	0.5	-
M9		5.0	5.60	90	4.2	90	4.4 - 4.5	91	4.4	-
M10		5.0	5.60	90	3.6	90	3.8	91	3.7 - 3.8	-

Conveyor 219 (baler feed), Time Settings

Approx VFD Setting	Timed using stop watch		Actual Speed (FPM)
	Belt Time (sec)	Belt Length (ft)	
27	340.00	112.50	20
42	227.00	112.50	30
57	170.00	112.50	40
70	135.00	112.50	50
84	113.00	112.50	60

New Conveyors		Electrical Data								Belt Speed Data				
Conv #	Direction	HP	FLA	Conveyors Under Operating Condition					No Load 30-Jun	VFD Setting 30 Jun & Jul 13	Timed using stop watch		Actual Speed (FPM)	Specified Speed (FPM)
				VFD Setting	24-Jun	VFD Setting	29-Jun	VFD Setting			30-Jun	Belt Time (sec)		
M205	-	7.5	8.50	60	5.9 - 6.2	60	5.8 - 6.0	62	5.8 - 5.9	5.9 - 6.0	-	-	-	
M205	-	-	-	-	-	-	-	-	-	5.6 - 5.7	30	37.91	112.00	177
M205	-	-	-	-	-	-	-	-	-	5.9	60	18.18	112.00	370
M205	-	-	-	-	-	-	-	-	-	6.1	90	12.69	112.00	530
M206	-	2.0	2.45	-	1.9	-	1.9	-	1.9	2.0	-	10.06	29.33	175
M207	-	2.0	2.45	-	1.9	-	1.9	-	1.8	2.0	-	10.10	29.33	174
M208	-	5.0	5.60	-	4.0	-	3.8 - 4.0	-	3.8 - 4.0	4.2	-	43.25	123.33	171
M214	-	3.0	3.40	-	2.4	-	2.4	-	2.4	2.7	-	17.15	55.33	194
M215	-	3.0	3.40	-	2.3	-	2.3	-	2.3	2.4	-	17.15	55.33	194
M216	-	3.0	3.40	-	2.4	-	2.4	-	2.4	2.6	-	17.15	55.33	194
M217	-	3.0	3.40	-	2.4	-	2.3	-	2.3	2.6	-	17.07	55.33	195
M218	Forward	7.5	8.30	30	5.2	30	5.2	30	5.3	5.3	30	57.08	98.58	104
M218	Reverse	-	-	30	-	30	-	30	-	5.3	30	57.12	98.58	104
M218	Forward	-	-	60	-	-	-	-	-	5.4 - 5.5	60	28.55	98.58	207
M218	Reverse	-	-	60	-	-	-	-	-	5.4	60	28.62	98.58	207
M218	Forward	-	-	90	-	-	-	-	-	4.6 - 4.7	90	19.18	98.58	308
M218	Reverse	-	-	90	-	-	-	-	-	4.7	90	19.31	98.58	306
M219		10.0	10.30	90	0.0	-	0.0	-	0.0	0.0	30 (0.5 p meter)	313.00	112.50	22
M219		-	-	-	-	-	-	-	-	-	60 (1.0 p meter)	161.00	112.50	42
M219		-	-	-	-	-	-	-	-	-	90 (<2.0 p meter)	104.00	112.50	65
M219	Delay Timer	10.0	10.30	23 Seconds	-	23 Seconds	-	23 Seconds	-	-	23 Seconds	-	-	-

Overload Setting for motors is 1.03125 x FLA

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
1	Minimum charge box opening to be 42" x 86" at the shear. Chamber depth to be a minimum of 27".	Meets spec as modified by vendor's exception (noted at right).	Charge box opening is 84" long x 57 ¾" wide and not 86" long. Feed hopper is 84" lg x 57 ¾" at a height of 98" high. Any hopper flare should be done on the transition chute between the infeed conveyor head pulley and our 98" high hopper. As mentioned earlier designing the transition hopper between the baler and the conveyor will help eliminate the possibility of bridging OCC in the hopper and above the ram.
2	Feed hopper opening to be approximately 65" x 94".		
3	Baler to function automatically without a full time operator. Provide an automatic cycling eye to start and stop baling.	Yes although minor issues noted.	Hopper access door design allows paper to lodge into a clearance gap at bottom of the door causing the cycle eye to be blocked, resulting in false cycling of the baler (occurred on two occasions during the test). Baleforce to investigate/implement corrective measures.
4	Baler must be capable of baling ONP at a rate in excess of 21 tonnes per hour and OCC at a rate in excess of 14 tonnes per hour. Proponents must provide in their submissions reference facilities with the baler proposed baling similar materials at the rate specified in this Request for Proposal, for Regional staff to visit. The baler will be performance tested upon completion of installation to verify the baler is capable of achieving the above throughputs. Note: The Region is proposing to use a 1500 mm (60") wide baler feed conveyor outfitted with VFD to allow speed variation from approximately 50-60 feet/minute.	The Baler was tested and performed at a rate of approximately 20 t/hr baling a mix of OCC/OBB. There was no ONP available for the test but based on the baling rate of the OCC/OBB mix, the baler should have no problem exceeding the 21 t/hr rate specified for ONP.	In excess of 35 bales tested. Cycle time tested for each bale (yielded average of 120 seconds/bale, including 20% "inefficiency" factor). Results in 30 bales/hr and at assumed weight of 1,452 lbs/bale (reported by Norm Kraft) = production rate of 19.8 tonnes/hr.  2 bales out of the 35 total had wire tier malfunctions (5.7%). This performance should be monitored and could potentially be considered a deficiency. Follow up with Baleforce is suggested.

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
5	Bale densities to be a minimum of 36 Lbs./cu. ft. for ONP and 32 lbs./cu. ft. for OCC.	Yes. Typical bale dimensions were: 60"x44"x30" or 45.8 ft3. Typical bale weights were 1,452 lbs/bale (from Norm Kraft records prior to actual commissioning), thus density = 31.7 lb/ft3 for OCC.	The Nexgen 2R-310W-84 will produce bale densities of up to 36 lbs/cu. ft. for ONP and up to 32lbs/cu.ft for OCC/OBB. Due to moisture content and material variances it is impossible to guarantee you your requested densities 100% of the time. A 36-pound per cubic foot density would produce an 1800 lb bale minimum. Averaging 42 bales on a 40 ft container, your shipping weight would be over 75,000 lbs.
6	Baler must be equipped with a bale separation and bale release door.	Yes	
7	Provide an automatic vertical jam breaker to clear chamber jams at the shear.	NA	The Region opted out on this option.
8	Wire tier to be equal to the L&P model 340 with 1,000 pound wire stem feed system suitable for 11 GA. galvanized high tensile baling wire.	Yes, comparable "Accent" tier provided	Vibration isolation required for panel and remains an outstanding issue. Follow-up: Issue was addressed by Niagara Recycling. We understand Baleforce has agreed to pay (Norm to send invoice to Baleforce for corrective work done).
9	Main ram face PSI to be a minimum of 235.	Meets spec as modified by vendor's exception (noted at right).	The main ram face psi of our machine is 188. The advanced design of our baler with full penetration cylinder allows us to maximize bale density with each stroke. On a competitors standard baler that only penetrates into the bale chamber 60% they do not achieve full density on the first couple of cycles of material therefore loosing out on density. We penetrate 90% into the bale chamber or to within 5" of the back wall.
10	Ejection cylinder ram face PSI to be a minimum of 100.	Yes	

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
11	Voltage 575/3/60 with a "Soft-Start" main motor starter.	Yes	
12	Control panel to be pedestal mounted with vibration isolators.	Yes, comparable floor mounted system provided.	N/A as Region choose to mount Controls on Floor instead of on the machine
13	Control panel to be equipped with a touch screen interface with built in operational controls and diagnostics centre to aid in troubleshooting.	Yes	
14	Provide contacts in the controls system to allow incorporation of additional emergency stops buttons.	Yes	
15	Provide contacts in the baler controls system to allow for system integration control of the baler feed conveyor and baler reclaim conveyor. Note: these two conveyors including their starters and controls will be supplied and installed by the contractor that is retained to provide the ONP Quality Improvements and Automated OCC/OBB Baling equipment as discussed above.	Yes	
16	Hydraulic oil reservoir to be equipped with a thermostatically controlled oil heater and an air to oil cooler.	Yes	
17	Power pack to have hot oil shut-off and low oil level shut off.	Yes	
18	Reservoir to have suction strainer and inline oil filtration system. Filtration system to filter oil at a rate of 10 times per hour. All oil filter systems must be equipped with visual indicators signaling when filter replacement is required.	Meets spec as modified by vendor's exception (noted at right). Oil filter condition monitored by touch screen.	We offer a kidney loop filtration system that filters the oil 8 times per hour.
19	Hydraulic oil reservoirs are to be baffled and equipped with filtered breather caps complete with indicators signaling when filter replacement is required.	No. Indicators not provided	Baleforce has agreed to provide and is in the process of having parts fabricated (per Jim Guest email of Aug 26).

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
20	Hydraulic oil reservoirs are to be equipped with spigot on the side to provide easy access to hydraulic oil for quality testing purposes.	Yes	
21	Baler to include hydraulic oil. Oil must be filtered before being fed into the reservoir.	Yes	
22	Baler to be equipped with shear blades on shear beam and main ram.	Yes	
23	Proponent responsible to take out wiring permit required by the Electrical Safety Authority (ESA).	Yes	
24	Electrical installation must be carried out by a licensed electrician permitted to work in the Province of Ontario.	Yes	
25	Proponent will be responsible for successful ESA inspection prior to start-up and all cost associated with the inspection and corrective actions required.	Yes	
26	Proponent will be responsible to provide Pre-Start Health and Safety Review prior to start-up and all cost associated with the review and corrective actions required.	Yes	Inspection to be done on Monday August 9th, 2010
27	Baler installers must be factory trained and authorized. Baler will be installed as part of the "ONP Quality Improvements and Automated OCC/OBB Baling" project described earlier and the successful Proponent must coordinate shipment, installation and performance testing with the contractor selected to provide the ONP Quality Improvements and Automated OCC/OBB Baling equipment.	Yes	

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
28	A 3-day training session (minimum 7 hours on site each day actively training) must be included in the submission price. Training to include proper baler operation, safety, and preventative maintenance. Training will not likely run concurrent with the installation.	Yes	
29	Three (3) bound copies of the baler owner's manual must be provided along with a detailed preventative maintenance manual outlining all points of inspection and inspection frequency. The preventative maintenance manual must include user forms that clearly specify all required points of inspection and frequency of inspection. These forms are to be formatted with a technician and management sign-off area. The forms should also indicate and describe three (3) levels of fitness (good, monitor, immediate attention required) for each point of inspection to ensure that proper follow-up is prompted. All manuals, preventative maintenance manuals & forms must also be provided in electronic format satisfactory to the Region (Microsoft Office compatible).	The "preventative maintenance" section in the manuals did not meet the requirements specified in the RFP. We will provide an electronic template to BaleForce to use and resubmit.	A couple of additional deficiencies as noted in email of Aug 12 from Dave Smith to Jim Guest.
30	Detailed drawings and record drawings must be provided in CAD 2009 format.	Yes	
31	Proponent to include one return visit (minimum 7 hours on site) by a factory authorized service technician three (3) months after the baler goes into production. This visit to include all necessary adjustments, parts and a complete report. Visit must also include all associated expenses such as travel, labour and any other miscellaneous costs.	Not yet scheduled at this point.	Jim Guest and Norm Kraft to schedule return visit.
32	Provide a suggested spare parts list including quantities and pricing.	Yes	
33	Proponent must be capable of providing local factory qualified service technicians and a parts inventory located within 3 hours of the Niagara Regional MRF. These services must be located within Ontario.	Yes	

### Niagara Region 2-Ram Baler Commissioning Summary

	Specification	Installation Meets Spec? (Yes / No)	Comments
34	Proponents to indicate in their submission any foundation or floor embedment requirements for their baler giving consideration to the geotechnical information supplied by the Region (to be included in an addendum to the Request for Proposal). Any foundation or embedment requirements shall be supplied and installed by the baler Proponent.	Yes	
35	The Proponent's submission is to include manufacturer's specification sheets and any other literature, drawings, etc. to demonstrate the above specifications are fully met and to demonstrate dimensional data for the baler (footprint, feed hopper height, weight, etc.). Manufacturer's specification sheets and any other literature etc., must be provided in electronic format satisfactory to the Region (Microsoft Office compatible). Drawings must be provided in CAD 2009 format.	Yes	
36	Provide a separate price for an optional steel shield/guard along both sides of the bale eject platform to prevent personnel and/or loaders from accidentally entering the path of a bale being discharged and to assist in preventing injury to personnel in the event of a bale burst at the eject platform. Proponent to include in their submission details of the proposed shield/guard for Region staff evaluation.	NA	N/A Niagara decided to build it themselves
37	Proponents are requested to provide any other items that they deem of value to the Region as options for the Region's consideration. Provide optional price and details for Region staff evaluation.	NA	
38	All hydraulic lines leading to the main and ejection cylinders must be terminated with hoses in order to prevent leaking due to vibration during the baling process.	Yes	

Proposal exception taken by Baleforce and accepted by Niagara

Deficiency or other matter that remains outstanding

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## Appendix C

### Monitoring Data

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Date	Supplier	pass#	%Prohibitives	%Outthrows	Coated	Other Papers	Moisture%	Sample Weight		%glass	% Proh + Outthrows
			%	%	%	%	%	kg	lb		
December 9, 2009	NIAGARA	6212812	0.94	13.98	11.82	11.50	8.7	94.6	208.9	0.000	14.92
December 18, 2009	Niagara	6212881	0.62	11.29	12.14	8.57	12.2	112.0	247.0	0.000	11.91
December 18, 2009	Niagara	6212886	0.70	12.82	8.79	7.74	8.3	95.6	210.8	0.000	13.52
December 22, 2009	Niagara	6245796	0.97	16.03	11.62	7.14	8.9	102.4	225.8	0.170	17.00
January 4, 2010	Niagara	6245800	0.85	14.29	10.45	4.05	7.3	93.8	206.8	0.000	15.14
January 7, 2010	Niagara	6314745	2.06	14.09	7.63	7.26	9.2	73.4	161.9	0.000	16.15
January 11, 2010	Niagara	6314765	2.03	17.00	11.79	6.84	8.6	84.8	187.0	0.240	19.03
January 14, 2010	Niagara	6385531	1.88	13.99	13.14	13.95	12.4	110.4	243.4	0.170	15.87
January 19, 2010	Niagara	6386797	0.66	7.42	12.60	6.30	11.2	73.0	161.0	0.000	8.08
February 11, 2010	Niagara	6462856	2.57	22.56	4.44	12.02	8.7	117.4	258.9	0.000	25.13
February 18, 2010	Niagara	6522883	0.54	10.89	11.29	6.05	9.5	99.2	218.7	0.000	11.43
February 19, 2010	Niagara	6523206	1.38	14.25	16.43	10.39	10.2	82.8	182.6	0.270	15.63
February 26, 2010	Niagara	6548481	0.78	14.49	16.45	18.36	9.6	87.0	191.8	0.000	15.27
March 16, 2010	niagara	6599622	1.01	10.59	13.05	12.31	8.4	81.2	179.1	0.000	11.60
May 14, 2010	Niagara	6830029	2.18	15.71	10.46	8.68		96.8	213.4	0.150	17.89
May 14, 2010	Niagara	6830279	2.20	10.02	13.01	12.37	9.4	93.8	206.8	0.480	12.22
May 17, 2010	Niagara	6851086	0.88	10.78	10.40	12.66	11.4	79.8	176.0	0.000	11.66
May 18, 2010	Niagara	6851344	1.19	12.56	14.49	13.53	10.7	82.8	182.6	0.020	13.75
May 19, 2010	Niagara	6851893	1.68	13.35	12.09	11.56		79.4	175.1	0.090	15.03
May 25, 2010	Niagara	1	1.86	10.87	13.41	11.85	10.2	101.4	223.6	0.900	12.73
May 25, 2010	Niagara	1	1.87	8.09	10.49	11.54	9.3	57.2	126.1	0.050	9.96
May 26, 2010	Niagara	1	1.36	11.65	12.78	13.16		53.2	117.3	0.000	13.01
May 26, 2010	Niagara	1	1.13	8.50	11.17	16.99		82.4	181.7	0.120	9.63
May 28, 2010	Niagara	6854443	1.56	10.70	15.60	13.91	9.8	130.8	288.4	0.040	12.26
June 21, 2010	Niagara	552428	3.57	9.93	7.99	2.95	15.4	115.5	254.0	0.110	13.50
June 21, 2010	Niagara	552433	1.82	15.10	8.90	7.54	9.2	71.6	157.9	0.100	16.92
July 13 2010	Niagara	565498	2.44	12.69	10.15	13.53	10.9	94.6	208.6	0.040	15.13
July 13 2010	Niagara	565502	1.15	11.24	9.27	8.71	12.2	71.2	157.0	0.140	12.39
Aug 10 2010	Niagara	7111618	1.96	8.56	9.30	3.90	8.4	77.8	171.6	0.000	10.52
<b>Aug 10 2010</b>	<b>Niagara</b>	<b>7111098</b>	<b>1.00</b>	<b>9.90</b>	<b>9.70</b>	<b>4.00</b>	<b>9.0</b>	<b>64.0</b>	<b>141.1</b>	<b>0.000</b>	<b>10.90</b>
Aug 13 2010	Niagara	7113273	0.80	6.20	10.00	1.00		140.3	309.4	0.000	7.00
Aug19 2010	Niagara	7114137	1.73	7.19	11.36	0.58		139.1	306.0	0.000	8.92
Aug19 2010	Niagara	7114160	1.16	8.54	15.13	1.38		138.2	304.0	0.000	9.70
August 26, 2010	niagara	7206252	1.47	7.00	2.86	1.38	9.0	148.8	328.1	0.000	8.47
August 26, 2010	niagara	7206253	1.05	7.51	2.45	1.91	8.9	141.6	312.2	0.000	8.56
August 26, 2010	niagara	7205921	0.47	5.73	5.07	1.60	8.8	167.8	369.9	0.050	6.20
Running Avgs	2008	41	1.02	8.63	9.21	6.15	10.78	126.22	278.30	0.00	9.65
Running Avgs	2009	54	1.10	9.67	6.41	3.19	9.63	113.16	249.54	0.01	10.78
Running Avgs	2010	32	1.51	11.29	10.73	8.51	9.91	97.85	215.68	0.09	12.80
Avg post Dec 9, 2009	Abitibi Audits		1.43	11.54	10.77	8.53	9.86	98.21	216.51	0.09	12.97
Avg pre-baler	Abitibi Audits		1.37	12.75	11.90	10.78	9.70	90.22	198.94	0.11	14.12
Avg post-baler	Abitibi Audits		1.55	9.13	8.52	4.04	10.20	114.21	251.65	0.04	10.68
Avg post Dec 9, 2009	Niagara Audits		2.81	8.1							10.91
Avg pre-baler	Niagara Audits		4.55	10.94							15.49
Avg post-baler	Niagara Audits		2.66	7.77							10.43

### Special Paper Audit Results 2011

These audits were conducted between January 28<sup>th</sup> and February 16<sup>th</sup>, 2011. Niagara Recycling staff removed sorters from the line to collect a post sort paper sample. These samples had 22 sorters on the line versus 29 sorters at normal production.

The sample sizes were over 250 lbs. The categories that were sorted are on the tab titled *Categories*

We counted individual pieces of small and large cardboard and boxboard, numbers were averaged on the tab titled *Pieces*

Below is the summary of the 4 audit results (data was graphed on the tab titled *Graph*):

Date	#	Fine Paper		ONP		OCC Small		OCC Large		OBB Small		OBB Large		Prohib		Magazines		Hard Cover Books		Plastic Film		Garbage		Total
		lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	lb	%	
January 28, 2011	SA	22.5	8.5	161.5	60.9	6.0	2.3	3.5	1.3	14.0	5.3	2.5	0.9	3.5	1.3	43.5	16.4	0.0	0.0	0.5	0.2	7.5	2.8	265.0
February 2, 2011	SA	13.0	5.2	156.0	62.0	7.0	2.8	4.5	1.8	19.5	7.8	6.0	2.4	2.5	1.0	37.0	14.7	1.0	0.4	1.0	0.4	4.0	1.6	251.5
February 10, 2011	SA	21.0	8.1	150.5	57.9	4.0	1.5	12.0	4.6	19.0	7.3	10.0	3.8	3.0	1.2	30.0	11.5	3.0	1.2	0.5	0.2	7.0	2.7	260.0
February 16, 2011	SA	22.0	8.5	170.0	65.8	5.5	2.1	0.0	0.0	20.5	7.9	4.0	1.5	6.0	2.3	23.5	9.1	0.0	0.0	0.5	0.2	6.5	2.5	258.5
<b>Total</b>		<b>78.5</b>	<b>7.6</b>	<b>638.0</b>	<b>61.6</b>	<b>22.5</b>	<b>2.2</b>	<b>20.0</b>	<b>1.9</b>	<b>73.0</b>	<b>7.1</b>	<b>22.5</b>	<b>2.2</b>	<b>15.0</b>	<b>1.4</b>	<b>134.0</b>	<b>12.9</b>	<b>4.0</b>	<b>0.4</b>	<b>2.5</b>	<b>0.2</b>	<b>25.0</b>	<b>2.4</b>	<b>1035.0</b>

Total Outthrows % (OCC, OBB, hard cover books): 13.7

Total Prohibitives %: 1.4