PGCC – Waste Management Benchmarking Study (October-November 2019)

This study was completed by third year Trent University students taking ERST3081 (Local Waste Management) instructed by Laurie Westaway

Final Report by Laurie Westaway

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Special Thanks to Patty McDonald and Michael Gillan for their unwavering support.

Thanks also to and all admin, facilities and custodial staff at the Peterborough Golf and Country Club!

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Executive Summary

During the fall of 2019, Trent students enrolled in a waste management course assisted the Peterborough Golf and Country Club (PGCC) to undertake a waste benchmark study to evaluate current and future options for waste management. This report outlines the findings.

Currently the PGCC is legally not required to complete a waste audit or an annual waste reduction plan as outlined in the Ontario Protection Act regulations 102/94 and 103/94. However, a member pursued the idea and it was supported by administration.

PGCC offers 85 locations to dispose of garbage and 11 locations to recycle (4 in staff offices). Waste bins were found in good condition but with limited or no signage. For the month of October monitoring of centralized collection areas showed significant capacity with garbage at 1/4 full per pick-up, cardboard at 1/2 full, and recycling at 1/5 full.

The waste system in place costs approximately $20,000 a year and is based on collecting centralized bins at full capacity. Garbage and soiled linens are collected twice weekly and recycling, cardboard, and LCBO/Beer Store/Water deposit returns are collected weekly. Additionally, towels are washed onsite and grease is removed from the facility as needed for no charge.

A waste audit completed during the week of October 21-25, 2019 provided waste composition details (see Figure 4), estimated daily generation amounts (257kg/day at 30% operating level), and provided an overall performance of the facility (see Figure 5). Based on the waste audit, which represents a snapshot in time, it was estimated that 9% of materials are reused, 15% recycled, and 76% are landfilled. The majority of the landfilled material is composed of organics (80%) generated from the kitchen.

Three key activities are recommended:

- Set a waste management Goal or Target – set a true diversion goal (percentage by year) and develop associated green policy to support the goal based on tracking and improving infrastructure.
- Improve collection systems
  - Reduce private hauler garbage and recycling collection (smaller bin or less frequent servicing)
  - Waste collection areas – Install new bins, in fewer locations, with consistent configuration (recycling and garbage at all stations) and colouring of bins (blue and black).
- Build waste awareness by increased education and promotion activities – implement signage and provide ongoing communications regarding waste opportunities and outcomes to membership.

1. Background

The Peterborough Golf and Country Club (PGCC), is located on the North East side of the City of Peterborough in the Province of Ontario.

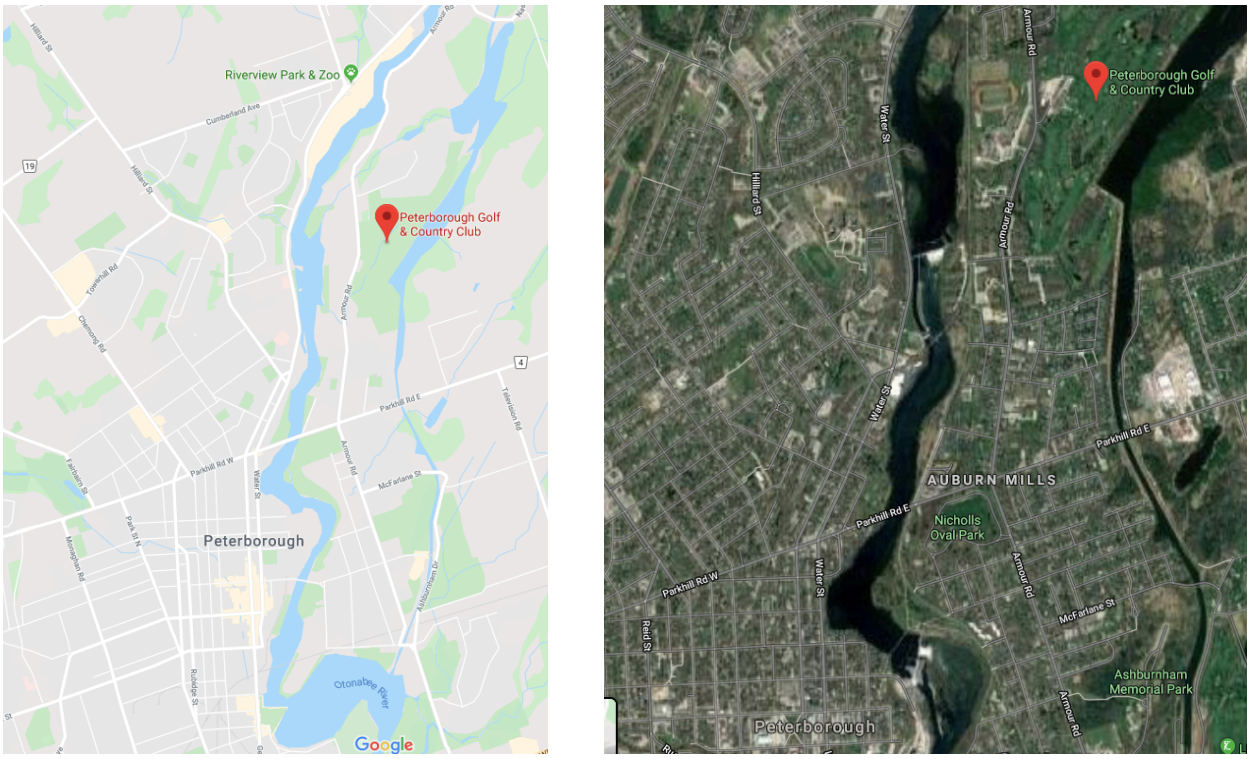


Figure 1: Map and Satellite images PGCC

The PGCC, is the oldest golf course in North America. Opening on Victoria Day weekend of 1897, the club is home to approximately one thousand active members. Being a members-only club, the course offers diverse events and activities monthly. This includes the organization of golf leagues for all levels of play, as well as a curling arena where members can participate in weekly curling competitions. In addition, they host banquets and formal events.

PGCC has never completed a comprehensive waste audit.

2. Introduction

In September 2019, Trent students, enrolled in the Local Waste Management course, undertook benchmark study to assist PGCC in evaluating waste management initiatives and provide suggestions on ways to improve. This report serves as an amalgamation of the research completed.

As per Ontario Environmental Protection Act Regulations 102/94 and 103/94, the following facilities must have a source-separation recycling program and complete an annual waste audit.

- Office buildings: 107,000 square feet+ (10,000 m2 or greater)

- Construction or demolition projects: 21,500 square feet+ (2,000 m2 or greater)
- Restaurants: Annual gross sales $3 million+

Presently an annual waste audit and reduction plan are not legally required for the PGCC. However, this may change in the future with the implementation of the new "Waste Free Ontario Act 2016".

This project was proposed and lead by a member of PGCC and supported by administration.

3. Current Collection System

PGCC offers waste management opportunities throughout the facility - for staff, members, and visitors alike.

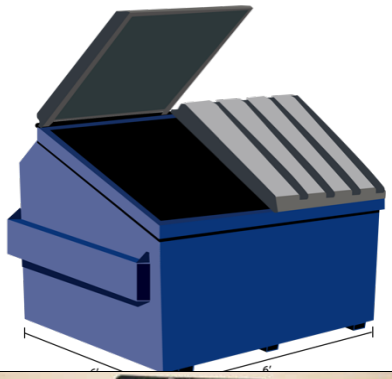
Waste is collected for:

1. Garbage/Landfill
2. Recycling – Containers and Fibres (single-stream)
3. Recycling – Cardboard and Confidential Papers
4. Grease Trappings
5. Reuse – Linens, Aprons, and Towels
6. Deposit Return – LCBO, Beer Store, and Large Water Bottles
7. Special Collections including: Battery Bucket and "unofficial" reuse area in the women's locker room.

Additional, PGCC grasscyles, manages scrap metals informally and has a contract associated with handling hazardous chemicals. This study, however, focuses on solid non-hazardous waste.

Within the main building, waste stations are cleared daily by custodial and/or food services staff. The maintenance staff are responsible for clearing the golf course of waste (in peak season) and emptying waste bins within the maintenance building.

Waste materials are then taken/handled in the following areas:

1. Garbage/Landfill is collected in an 8YD bin located on the lower parking lot beside the maintenance building.	
2. Recycling is stored in a fenced area behind the curling rink. There are 6 blue 95-gallon carts.	
3. Cardboard is collected in 6YD bin located beside the garbage/landfill bin.	
4. Grease Trappings are collected in a 1 YD bin located near the garbage/landfill and cardboard bins in the lower parking lot.	
5. Reuse – Linens and towels are collected daily from the change rooms and twice weekly from the kitchen. Most towels are laundered onsite, linens are washed offsite by a contractor.	

6. Deposit Return – are stored in the loading bay at the north side of the main club. It includes empty cans and bottles to the Beer Store/LCBO and large refillable water bottles. Bags of beer cans are sorted from the golf course waste bins by maintenance staff returned during peak season.	 

Recycling, landfill/garbage, and cardboard are removed by Waste Services Canada. Grease is removed by Rothsay.

3.1 Collection Costs

Annually, PGCC spends approximately $20,000 on waste collection and administration (there is a $500 annual admin fee). The following table is a break-down of collection costs.

Waste Stream	**Schedule**	**Total cost/week**
Garbage/Landfill	2 times per week	$131 per pick-up ($262/week)
Cardboard	1 time per week	$52 per week
Recycling	1 time per week	$51 per week ($8.5 per cart)
Linens	2 times per week	Cost not provided – monthly delivery of laundered linens
Grease	As needed	No Cost

3.2 Collection Bins – Locations

PGCC currently offers an estimated 85 locations to collect waste. Pictures below show some examples of bins found throughout PGCC. Maps of bin locations can be found in

Appendix A.

Figure 2: Waste Collection

Table 1: Waste Collection Units

Area	Garbage	Recycling	Other
Banquet Rooms / Upper – Lower Lounge / Bars	11 bins	2 tall blue box 2 LCBO/Beer Areas	
Kitchen	4 bins (3x32 gallons, 1x14gallons) Breakage Bin	Carboard “area” 2 blue boxes (no signage) 2 Grease Pails	3 stations for used linens, towels, and aprons
Washrooms / Locker Rooms	6 bins (9 feminine product disposal units)	1 small blue box	Reuse area in women’s locker room

Area	Garbage	Recycling	Other
Offices / Staff Areas/ Pro Shop / Main Hall / Curling Rink	19 bins	4 recycling bins	3 water stations Battery bucket (in upper level office)
Maintenance Building	8-10 bins	none	Towel Reuse
On-Course / Washrooms	35 bins	none	3 water stations
Total	**~85 bins (assorted sizes)**	**11 blue boxes (assorted sizes)**	

Waste collection bins were generally found to be in good condition however, there is a significant emphasis on landfilling/garbage waste and limited signage on all bins.

3.2 Waste Capacity

For the month of October, students monitored the fullness of all waste receptacles to evaluate waste capacity at the facility. Bins visits occurred the night prior to collection. The following table outlines the findings.

Table 2: Bin Utilization October 2019

Bin	Size	Average "fullness"
Garbage/Landfill	8YD	< ¼
Cardboard	6YD	Between ¼ and ½ full
Recycling Carts	6x95gallons	1 ¼ full / 6 carts

Based on the results in Table 2, there is lots of capacity observed in the bins (i.e. they are not full). PGCC pays for collection based on full bins. Therefore, it would be beneficial to adjust service levels during times of the year that the facility is less busy (October, November, January-March). Savings on collection costs would result.

3.3 Waste Audit

To get a snapshot into the amount and type of waste generated at PGCC (i.e. to determine the waste composition), a waste audit was conducted. A waste audit quantifies the waste produced, explains the designated streams of waste, and addresses how waste is managed.

The waste audit occurred during the month of October, which is not considered the busiest season. Staff suggested the facility was running at 30% operating capacity at the time. This

influences the overall data. It should be noted that total generation numbers may vary for other times of the year, such as during the peak golf season usually extending from June to August.

There were three considerations in the analysis of the waste audit data.

1. Total overall waste composition for all streams
2. Opportunities to improve recycling activities
3. Future opportunities to divert more waste

The audit sampled all waste streams (garbage/landfill, recycling-containers / fibres / papers / cardboard, and reuse – linen and towels) over five days from October 21-25, 2019.

Figure 3: Waste Audit Set-Up

Waste was collected and then sorted in the lower maintenance building/garage. Waste that was generated from the different areas within the facility was organized and handled separately. The waste collected was sorted into 33 categories by functional area and by stream (see list of audit categories in Appendix B). Students sorted a total of 361.53kgs of materials over the 5-day period. The following figures and tables summarize the results which have been standardized to daily generation of approximately 257kg/day (at 30% operating levels).

The following graphs represents the composition of material types found in the waste (all streams), the waste performance, and total generation by area.

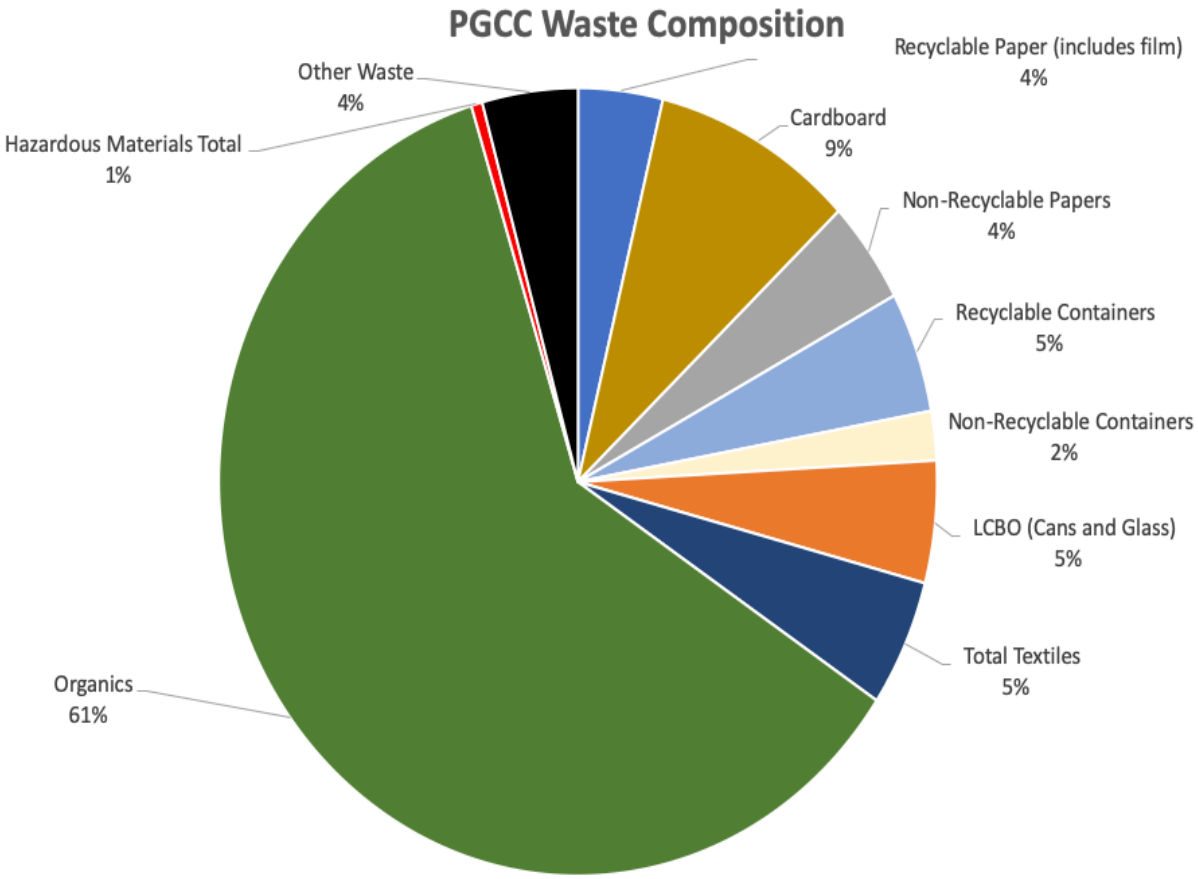


Figure 4: All Waste Stream Composition

Figure 4 above shows that PGCC waste is heavily composed of organic materials (61%). Recycling makes up 23%, and other waste represents 16%.

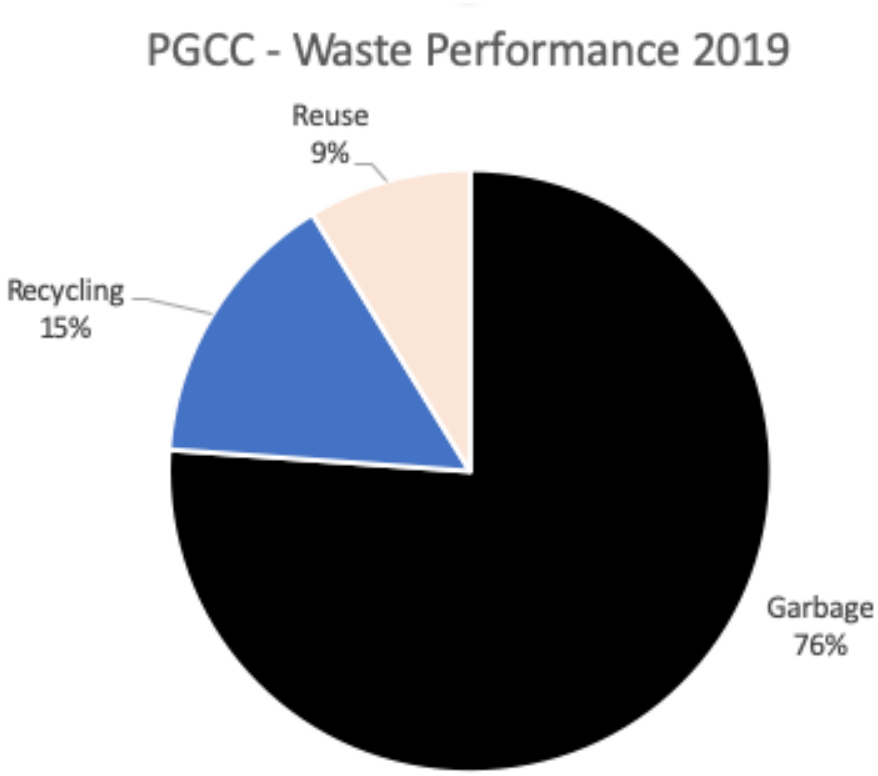


Figure 5: Current Waste Management System Performance

Figure 5 shows that the current waste management system reuses 9% of materials and diverts/recycles 15%. This leaves 76% of waste generated being sent to landfill.

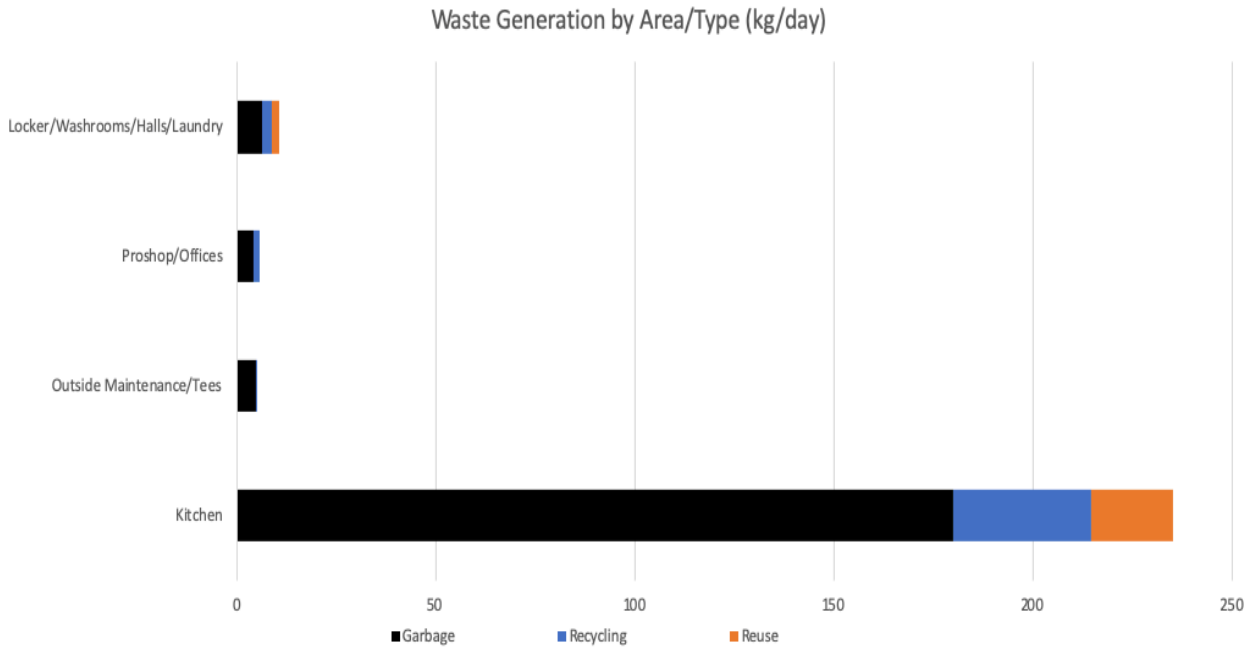


Figure 6: Waste Generation by Area/Type

Based on standardizing the generation numbers, daily amounts per area are shown in Figure 6. The kitchen demonstrates high levels of reuse and recycling but also is the area that generates the highest amount of garbage and specifically organic waste, which is heavy.

Not dissimilar to current municipal residential waste trends, avoidable/edible food was of significant concern. Of particular note, 27% of the materials audited in the organics stream were considered “avoidable/edible/donate-able” (see Table 3 below and Section 5.5).

Table 3: Organics by Function Area

Funtional Area	Unavoidable Food Waste	Avoidable Food Waste*	Leaf and Yard	All Organics
Common Areas (Halls)	0.10	0.41	0.24	0.75
Inside Maintenance	0.01	0.06	-	0.07
Kitchen	112.63	40.18	0.46	153.27
Laundry	-	-	-	-
On Course (Tees)	-	0.14	0.05	0.19
Outside Maintenance	-	0.03	0.01	0.05
Proshop/Offices	0.43	0.93	0.34	1.70
Wash/Changerooms	0.03	0.04	-	0.07
Grand Total	**113.20**	**41.79**	**1.10**	156.09

* Avoidable Food waste (see pictures) - may not be "donateable" due to health and safety requirements

Materials in Garbage

As Figure 7 shows, recycling makes up 5.37% of materials ending up in the garbage/landfill. This is equal to an estimated 10.49kgs per day or 3.82 tonnes per year. As mentioned above, organics makes up ~80% of the garbage/landfill materials at 156.07 kg/day or ~60 tonnes per year or when discussing greenhouse gasses, ~96 tonnes of C02 equivalent[1].

[1] Based on calculations presents in OWMA paper on diverting organics from landfill https://www.owma.org/cpages/climate-change

Figure 7: Materials in Garbage/Landfill

PGCC offers no opportunity to recycle in washrooms/changerooms/laundry/maintenance room, in the staff room, on the course (tees) or in the lower maintenance building. Therefore, all the recycling generated from those areas ends up in the garbage/landfill.

Garbage/Contamination in Recycling

One of the largest concerns raised within waste management is the amount of "garbage", meaning non-recyclable materials, that end up in the blue box system. When garbage is placed into recycling systems it is collected, transported, sorted, and then taken eventually (and at significant cost) to a landfill. Therefore, it is important to make sure garbage is not added to the recycling system.

As seen in Figure 8, the waste audit showed that 4.77% of the materials placed in the PGCC recycling is "garbage". Although most waste management haulers would accept this amount of contamination, most recycling markets are requiring less than 0.1% contamination and the cost for collecting recycling with high amounts of "garbage" may increase in the future. Therefore, it is beneficial to ensure that no garbage is in the recycling.

Figure 8: Garbage (contamination) in Recycling

Audit Issues

Issues surrounding the sampling from the audit, which may have affected the composition, included:

- Timing. The audit was completed at the end of October which was a low-generation period of the year.
- All Waste. There was some concern that sampling from the facility may not have included all functional areas.

3.4 Awareness of Waste

Throughout PGCC, waste messaging or marketing to members, staff and visitors was limited with little or no signage on waste bins. This makes managing waste confusing, lessening both its impact and its usefulness, especially with respect to recycling. Waste management information needs to be simple, specific, and repeated regularly to ensure that relevant, actionable messaging are forefront in people's minds.

Unfortunately, a survey of staff and members was not completed during the study period to assess current waste management interest and awareness, as well future suggested improvements.

4. Other Facilities – Case Studies

Two facilities were reviewed for their waste management activities to compare and contrast to PGCC, this included:

1. Copetown Woods Golf Club near Hamilton - a leader in environmental sustainability
2. Kawartha Golf and Country Club

4.1 Copetown Woods Golf Club

Contact: Pete Sinuita, Golf Course Superintendent. Email: psinuita@copetownwoods.com or call 905-627-4653 (Note: Aaron talked to on October 22, 2019)

Course Details

- Opened in 2003, 18-hole golf course located west of Hamilton Ontario
- Includes a clubhouse that is a gathering space for golfers and frequently used for events
- Founded on a green philosophy, promoting a sustainable culture. Operates under strict green guidelines
- The property was originally a broccoli farm owned by Gord and Neil Forth.
- Audubon member – globally recognized international education and certification program that assist golf courses to practice environmental sustainability
- Educating the younger generation of employees on waste management and how to do it, was a surprisingly difficult process and requires ongoing effort

Waste Management

Garbage

- Prior to Green Guidelines program produced 6 cubic yards of garbage per week
- Currently produce a few bags a week
- Has a 4-yard dumpster (a small size in relative terms) which costs $120.00 for collection - collected once a month or as needed.
- Garbage receptacles are set up with recycling, organics, and LCBO, at both the clubhouse and maintenance facility. Receptacles are made from repurposed painted steel drums and include a list of what items goes in and which items stay out of the bins.
- The only items allowed into the garbage receptacles are non-recyclable items such as, chip bags, candy wrappers, black plastics, Saran wrap, etc

Recycling

- Strict diversion program including plastics, glass and paper, diverting approximately 143 cubic yards from the landfill annually
- Produces approximately 480 clear bags of recycling each year (~9 bags/week) – stored in a trailer until private hauler collects
- Separate LCBO collection barrel

Composting

- Most successful and important element to their waste management system

- Approximately 90 pounds of green waste input every day (12 tonnes of material every year)
- Compost managed on-site and consists of a large passive aerobic pile about 10 feet wide, 5 feet high, and 80 feet long, hidden behind number 12 fairway in the woods
- Maintenance employees collects grass clippings and food waste at the end of each day and adds to the existing pile
- Pile requires turning using a skid steer 3 to 4 times a year
- System produces a batch of fertilizer every 3 years used on the course and in flower beds and gardens
- This includes grass clippings, cardboard, leaves and food waste
- Additionally, facility uses biodegradable products when available throughout the course to add to the pile. Produce are more costly but are purchased in bulk
    - Includes coffee cups, straws, napkins and lids
- Kitchen organic waste are collected in heavy duty 10-gallon composting containers (14 total at $60/unit)

Hazardous Materials

- Pesticides are minimally used and used containers are taken to a local agricultural co-op for recycling
- Batteries are taken to the municipal community recycling centre

Summary

- Copetown Woods saved approximately $3,500 annually through landfill mitigation, recycling and composting
- Being an environmentally-friendly golf course has brought attention, events and golfers who are environmentally conscious to the facility

4.2 Kawartha Golf and Country Club

Contact: Jennifer Pendrith, Superintendent email: jpendrith@kawarthagolf.ca or call (705) 743-3737 ext. 232 (Shikhar talked to Jackie Currotte November 2019)

Course Details

- Established in 1938 as an 18-hole golf course spread across 40,000 sq. feet of area, located on Clonsilla Avenue, Peterborough, Ontario.
- Facility includes: clubhouse, banquet areas, maintenance buildings, pro-shop, kitchen, for restaurant and buffet use, and the office area

Waste Management

- Total budget for waste management is $5,700.
- Peak season collection contributes to 65% of the total expenditure for waste collection (May to August) spending $3,700. During this time, pick up is every week.
- Less active months (March – May & October – December) frequency of waste collection is reduced to one pick-up by-weekly or once per month.
- No waste collection occurs in January and February.

Garbage

- Garbage/Landfill is collected in a 6YD bin
- Majority of garbage produced comes from kitchen including items such as plastic wraps, food waste and contaminated containers.
- Garbage produced in clubhouse and office includes low quality plastics like wrappers, chip bags and packaging, as well as paper towels.

Recycling

- Collected in several recycling carts/totes – separated into containers and papers/fibres
- Pesticide containers are washed and cleaned three times before added to recycling.
- Staff are trained according to their department, on how to divert waste generated.
- Deposit containers are provided throughout the golf course to encourage golfers to properly dispose of empty alcoholic beverage containers.

Hazardous Waste

- Unusable pesticides and fertilizers, batteries, vehicle maintenance equipment, electronic waste including, printers, screens and computers, are disposed of separately.

Summary

- There are several areas that generate waste throughout the operational and non-operational time of the year.
- The lack of a composting program means organic waste gets disposed in the garbage and makes its way to the landfill.
- Changing collection frequency according to time of the year has reduced the expenditure on collection by an estimated $6,300 per year.

5. Future Opportunities

Based on the research conducted, three primary recommendations were identified for PGCC.

Primary Recommendations

1. Set a diversion target/goal and rework associated policies (see for sample green procurement policy)
2. Improve Collection Systems and Signage
3. Increase Awareness through Promotion and Education

5.1 Diversion Goal and Tracking

No target or goal for waste or sustainability exists at PGCC. Given the results of the 2019 waste audits, it may be beneficial to implement policy and include a total generation goal (total tonnes per year or cost savings) and a diversion/recycling goal (with consideration of contamination/garbage found in the recycling). This will require ongoing monitoring and future waste audits.

Additionally, a green procurement policy may allow PGCC to direct all activities and purchases to be reviewed based on their environmental impact. Although this may not have an impact on waste generated, it will have an overall impact with respect to sustainable practices and market influences. This includes all products and services utilized. A sample policy is available in

.

5.2 Improve Collection Systems

The waste audit identified garbage/contamination in the recycling streams and divertible materials in the garbage/landfill stream. To improve capture of recyclable materials it is recommended that PGCC make improvements in collection areas by installing multi-unit bins.

In some instances, in may be beneficial to reduce the number of bins, for example systems in each individual office could be removed and staff directed to manage waste in centralized areas with more diversion opportunities. This saves on custodial collection time (and cost) and could provide additional waste management options (for example a Backyard composting system for staff). The same could occur on the golf course – removing single garbage units at every hole and offering multi-bins at 3+ strategic locations (marked on the score card map – perhaps teamed with water stations) throughout the course (see Figure 9). Again, this would reduce the amount of time required to collect these materials by maintenance staff and offer more options for waste management.

Figure 9: Examples of Outdoor Waste Systems – Buschsystems.com

Standardized bin systems make it easy for waste producers to manage waste as it happens, while promoting effective waste separation. The lack of continuity across the facility results in increased confusion about how waste should be handled. This confusion increases missed recycling opportunities and contributes to higher levels of contamination (garbage in recycling).

When replacing single unit waste bins that allow for garbage disposal only, choose a bin with a design that makes management more thoughtful, as this will increase diversion and decrease in contamination. In order to promote the importance of waste management, garbage bins should always be teamed with recycling. Currently PGCC offers 10 garbage bins for every recycling bin.

Further, it is suggested that for "public" recycling – PGCC should separate containers and papers/fibres as this is consistent with the system in place for residential recycling in the City of Peterborough even though Waste Connections collects recycling co-mingled.

There are numerous benefits to launching standardized bin signage such as: consistency in messaging which reduces confusion and increases appropriate material collection. Also using bins with specific colours (black for garbage, blue for recycling, green for organics) provide clear recognition to decreases chances of contamination.

In Summary, it is recommended that collection areas should include:

- **Standardized configuration of bins –** All inside buildings collection areas should be in the same configuration to maximize ease of access and streamline participant decision timing.
- **Clear images of selection of items that are accepted** - Anywhere between five to eight pictures/words of items can be placed on bins to help understand what is accepted in each stream.
- **Colour Coding all streams –** standardized colouring of bins will increase recognition of appropriate waste management activities without any requirement to read. Typical colour palettes associated with waste streams include: Black for garbage/landfill, blue for recycling containers, grey/blue for recycling papers, and green for organics.
- **Images of unacceptable items that should go into the garbage stream** - Any common items that are not accepted in recycling or organics should be shown.
- **Contamination mitigation opportunities** – Adding a "Not sure" bin (see Figure 10) may assist in identifying materials that challenge waste management systems.

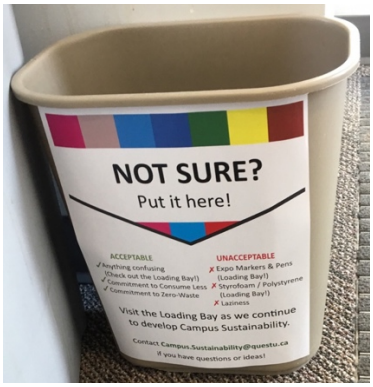


Figure 10: Not Sure – Put it here Bin - Quest University, BC

5.3 Increase Education and Promotion

One of the major challenges for people to participate in waste systems is that they do not know what to do with specific materials, and where to dispose them. It is valuable to constantly and repetitively message waste.

The following is a priority list for education and promotional activities.

Primary

- Collection Bin Signage
- Staff Training

Secondary

- Posters and Advertisements and emails to members
- Special Events Contracts

Additional suggestions are provided for planning and strategic consideration below.

Future Recommendations

4. Eliminate/Reduce use of Paper Towels
5. Monitor “donate-able” food
6. Monitor options for Organics management on-site
7. Limit pesticide use

5.4 Paper Towels

PGCC generates an estimated 10-30kg per day of paper towel, this amounts to ~6.7 tonnes per year. Custodial staff suggested during high event times a minimum of 3 regular garbage bags full of paper towel per day is generated (an estimated 0.5 yd^3 /day). As seen in Figure 11, paper towels are generated throughout the facility with the majority from the kitchen (keeping in mind soiled towels and timing of audit).

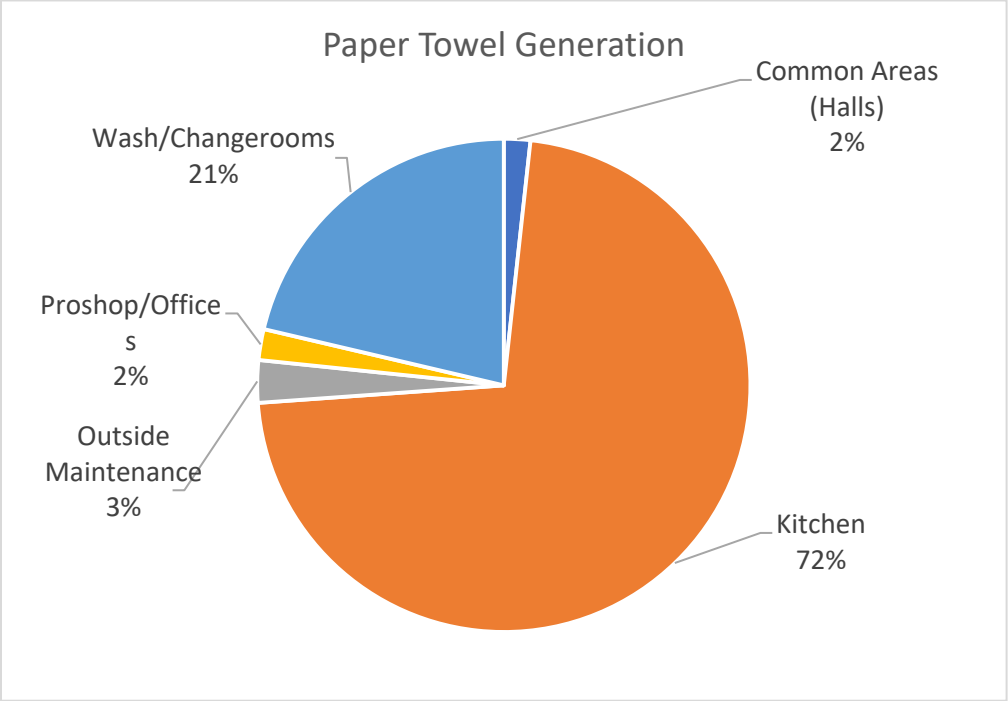


Figure 11: Percentage of total weight of paper towel generated by functional area

Recent life-cycle analysis have shown that super-efficient hand air dryers (for example Xlerator and Dyson Airblade @~$600 each) are better for the environment when compared to paper towel. Replacing paper towels in only the washroom/change rooms with air dryers would reduce waste by approximately 2 tonnes per year. This should only be done in combination with a member awareness campaign as many people prefer to use paper, so the change and benefits must be clearly communicated. Considering the volume of paper towels, it is estimated that replacing paper towels at PGCC in the washrooms may save an estimated $220 per year on waste disposal. However, increased energy use should also be considered.

If replacing paper towels is not favourable. It is recommended to use paper towels with a high post-consumer content (see green procurement policy in). For staff areas, it is recommended that paper towels replaced and incorporated into the reuse/washing of towels, keeping in mind health and safety considerations (especially in the kitchen).

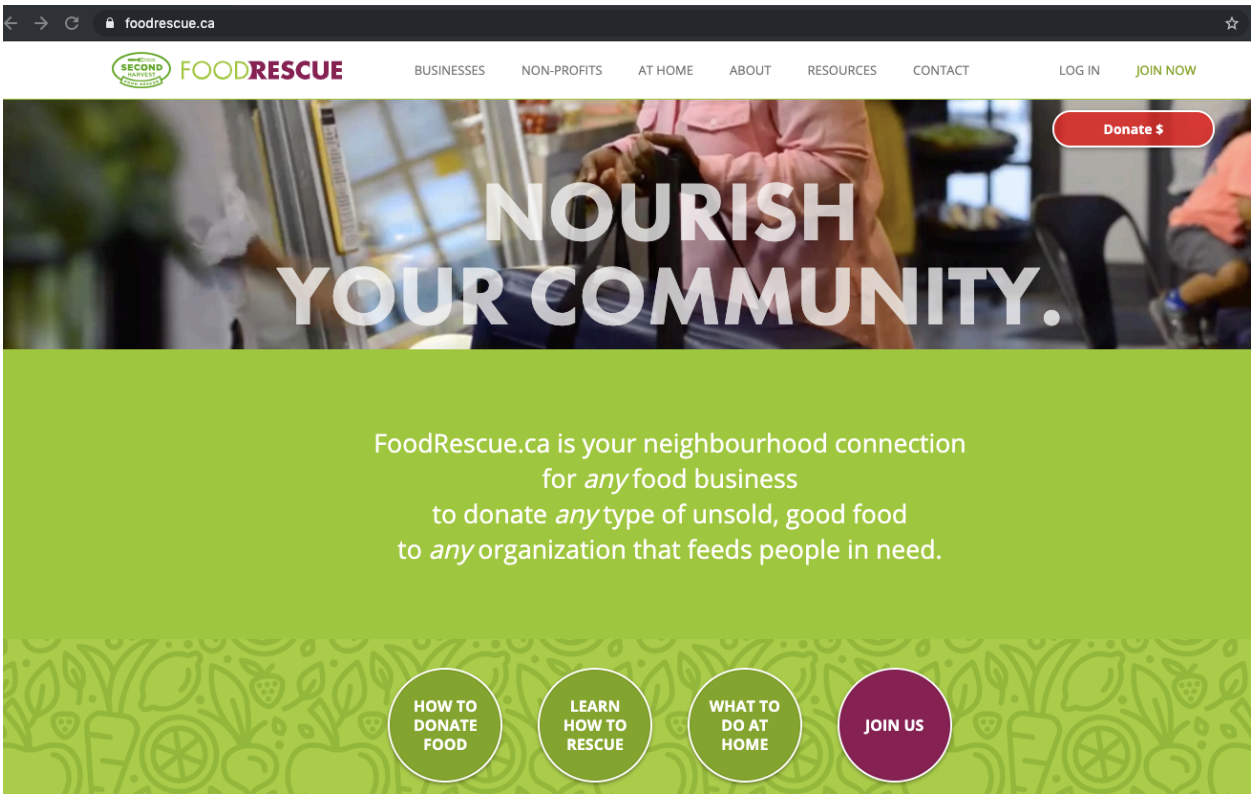
5.5 Donate-able Food

As seen in Figure 12, the audit identified 27% avoidable, edible, or donate-able food. PGCC offers left-over wrapped edible food to employees throughout the year. No doubt, this reduces the amount of food waste that is sent to garbage/landfill.

It is suggested that PGCC begin to track “donate-able” food, in accordance to health and food management requirements, to determine additional opportunities to manage this waste.

Figure 12: Wrapped Meat, Buns, Sandwich, Wraps, Muffins and Tacos found in Garbage

If there is enough edible food uneaten by staff, then PGCC may contact foodrescue.ca for additional opportunities to divert this material from garbage/landfill by offering it to approved community service providers.



5.6 Organics Management

The largest opportunity for diversion at PGCC is in managing organics (80% of waste). This includes expired food, uneaten cuisine, food-preparation scraps, and leaf and yard materials. If these materials were removed from the existing garbage/landfill an estimated $2,700 per year[2] would be available to pay for an alternative organics system.

[2] Based on 60 tonnes of materials, 166 yards of organics and 20 collections of an 8 yd bin at $131 per pick-up

Currently no private disposal company in Peterborough is offering organics collection. It is very unlikely that any service will develop until local municipal collection of this waste stream is established (2025?). Therefore, if interested, it is recommended that PGCC seek to manage these nutrient-rich materials onsite.

As outlined above, Copetown Wood's Golf Club utilizes an open-pile outdoor composting system which has reduced 12 tonnes of materials per year and saved $3,500 in waste disposal costs. It is worth further investigation to determine the amount of staff time and equipment required to manage the system and any additional challenges and benefits faced with ongoing monitoring of an outdoor pile of organic waste.

A more expensive, but cleaner and accessible form of managing organics would be a bio-digester such as the Powerknot LFC pictured Figure 13. The LFC is a fully enclosed automatic system that allows ongoing "feeding" of organic materials (20kg plus per day) and acts similarly to a "stomach" digesting the materials 24 hours a day and is an appliance within the kitchen were the waste is generated. The enclosed unit reduces noise and odor issues typically associated with managing organics. Once the cycle is complete the finished "digestate" is released into the sewer system. These units typically have a pay-back period of between 2-5 years.

Figure 13: Example - indoor digester/composter www.powerknot.com[3]

[3] This system has been adopted in several institutions across Canada (including the Federal Department of Defence). This is just an example of this type of system. More research into the costs, installation, electronics, and outputs need to be completed before a true comparison and business case is developed.

5.7 Limit Pesticide Use

Although outside the original area of study, research was completed on pesticide use for PGCC as it related to utilizing compost/organics onsite. Suggestions regarding optimizing turf management to reduce pesticide use can be found in Appendix D. Disposal of pesticides and pesticide packaging can be done through the company Product Care Recycling. The nearest Product Care Recycling location is only 7.2 km from the club, at 400 Pido Road, Peterborough, Ontario. Additionally, pesticides and pesticide containers can be recycled free of charge through the Clean Farms program, the depot is located at 2134 Little Britain Road, Lindsay, Ontario.

6. Financial Considerations

The following is a list of considerations regarding the budgetary implications of the recommendations of this study (please note these are rough estimates and may not include all associated costs to consider).

Recommendation / Estimated Impact	**Implementation Notes**	**Capital Costs**	**Annual Operating Costs**
1. Set Goal/Target – Update associated policy and annual reporting IMPACT: Awareness 1-2% less garbage	50 Staff hours ($50/hour) (meetings, policy and report writing, communications, etc.) Waste Audit (every 5 years) total cost $5,000	$2,500	$500 $1,000
2. Improve existing collection systems, implement new public/staff bins IMPACT: Bins increases recycling by 2-4%	Reduce/Replace bins - dual garbage/containers recycling ($1,200 each) – 4 on-course and 3 inside facility Signage revamping (signage with bins – revamp annually @$50 per unit) Staff time @ 0.5 hr/bin @$50/hour)	$8,400	$840 (10 year replacement reserve) $350 $175
3. Enhance education and promotion activities IMPACT: Included in #2	Staff Training @ 0.25hr/staff (@$50/hour) – 20 per year estimated Communication to members @0.25 hr/month @$50/hour		$250 $150

Recommendation / Estimated Impact	Implementation Notes	Capital Costs	Annual Operating Costs
Total Primary Recommendations		**$10,900**	**$3,265**

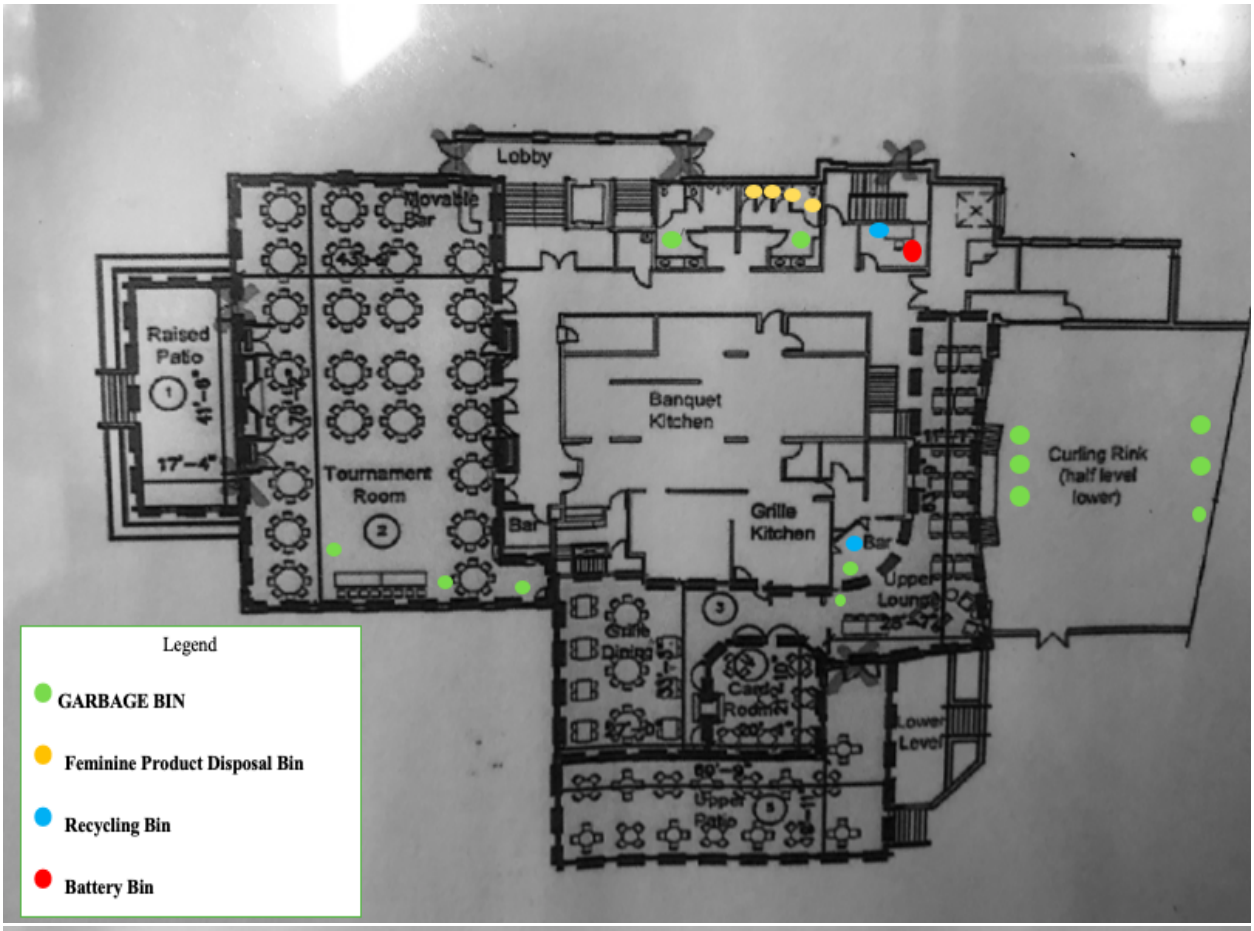
***** Instigating improved collection can offset garbage collection and disposal costs.

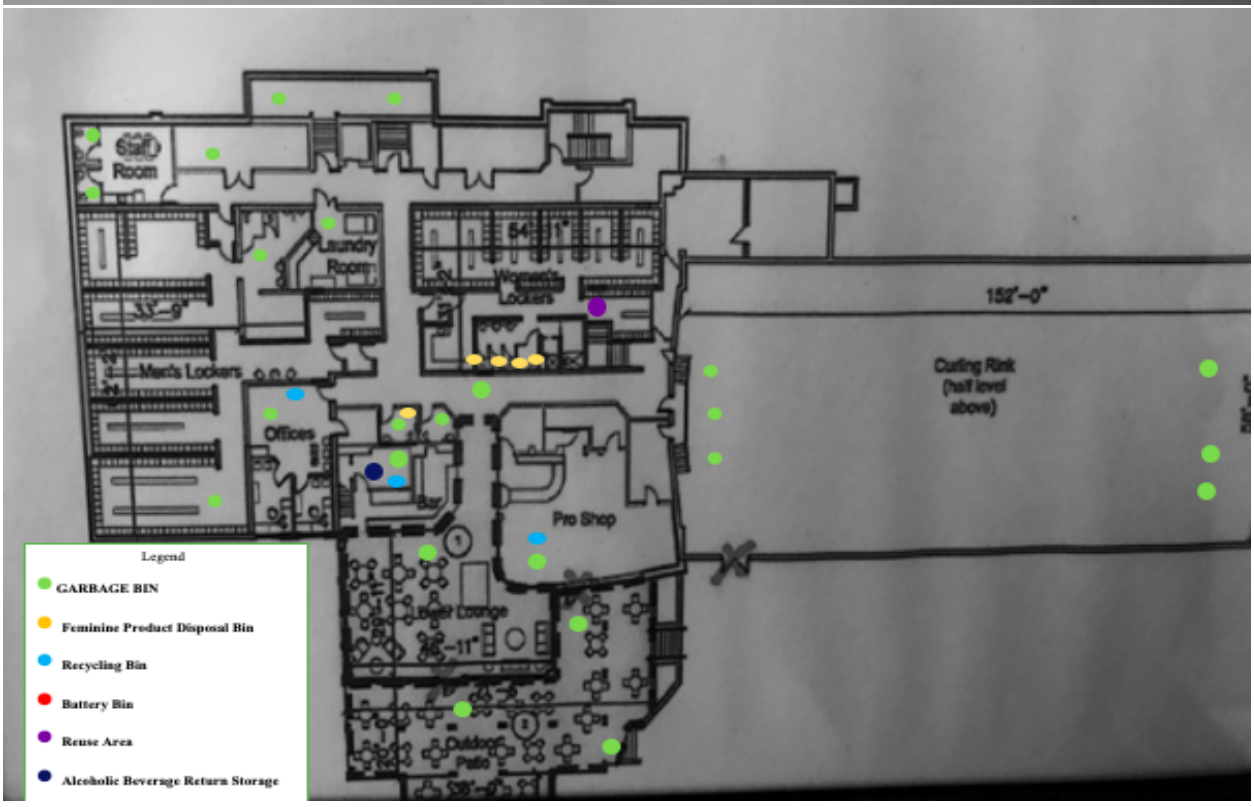
7. Additional Research

Although this study was comprehensive given the time and resources available, additional research has been identified to further understand the entire waste management system at PGCC, including:

- Comprehensive two-season waste audits to analyze ebb and flow of materials (all streams of waste)
- Surveying of staff and members to determine the impact of waste management messaging and compare waste audit results

Appendix A: Maps of Waste Bins (may change seasonally)






Two in barn
One big bin at driving range
Three water filling station
Four two restroom cabins, each with two bins
Nineteen big bins
Nine small bins

Appendix B: List of Waste Audit Sort Categories

List of Sort Categories
Gable Top/Aseptic Containers (juice boxes, milk cartons)
Polycoat Beverage Cups (coffee cups)
Corrugated Cardboard (OCC)
Boxboard/Cores/Molded Pulp
Magazines/Catalogues
Printed Paper
Paper Towel/Tissue
Non-Recyclable Paper
#1 PET Plastic
#2 HDPE Plastic
#3 Containers Plastic
#4/5 PP Containers Plastic
#6 Polystyrene
Flexible Film Plastic (milk bags/bread bags)
Non-Recyclable Plastic
Aluminum (Food and Beverage)
Aluminum (alcoholic)
Aluminum Foil
Steel Cans/Containers
Other Metals
Food and Beverage Glass (non-alcohol)
Other Non-Recyclable Glass (ceramics, glasses, plates)
Alcohol Glass
Total Hazardous
Leaf and Yard
Avoidable Food Waste (edibles)
Unavoidable Food Waste (non-edible)
Table Clothes
Napkins
Aprons
Towels
Textile (REUSE)
Other Wastes (floor sweepings etc.)

Appendix C: Draft Green Procurement Policy

Draft- ENVIRONMENTAL PROCUREMENT POLICY- 2020

Peterborough Golf and Country Club

Green Procurement Policy 2020
Peterborough Golf and Country Club

Green Procurement

The integration of environmental considerations includes planning, acquisition, use and disposal. In addition, the value of money considers cost, performance, availability, quality and environmental performance. Furthermore, it requires an understanding of the whole lifecycle of goods and services from resource extraction to manufacturer to disposal, as well as total cost of ownership, relevant risks, economic costs, benefits and negative impacts to society.

The policy supports environmental targets which include:

- Climate change
- Protection of:
    - Biodiversity
    - Natural areas
    - Air
    - Soil
    - Water

The purpose of this policy is to provide clear guidance on the procurement of goods and services by authorized staff to ensure both fairness and transparency as well as accountability for decisions.

The purpose of this policy is to understand the life cycle of a product including:

- Raw materials used
- Toxicity of product
- Manufacturing processes
- If it contains recycled materials
- Total amount of packaging
- Energy or water efficient
- Potential for reuse or recycling
- Disposal options
- Fair trade
- Maintenance required

Challenges

The challenges of the green procurement policy come from costs and change management. To have a successful policy the organization must understand member and guest needs, as well as the ability to gather and integrate information from staff, managers, suppliers and third parties, as well as effectively communicate considerations to all stakeholders.

Access and availability

Implementation of a green procurement policy is halted if alternative options are not available. Local distributors may not stock green products due to lack of sales or may not have the knowledge and expertise to recommend them. Contracts with vendors and suppliers may force PGCC to use certain products.

Increasing market demand following a green procurement policy, and by teaming up with other organizations engaging in joint purchasing, can influence suppliers greatly. Joint training for staff and suppliers can be educational for all involved.

Collaboration is the key element in getting all stakeholders to implement green procurement processes.

Change management

Previous vendors that companies bought from may honour long-standing relationships and delay the process of change. Communication with stakeholders, training, joining with an external organization and providing concrete examples and case studies can be strategies to encourage progress. Understanding repercussions for reputations and delays in innovation can be important in getting stakeholders more involved.

Objectives

The objectives of the procurement policy are to use and purchase environmentally and socially responsible materials. Authorised purchasing must support a commitment to environmental responsibility. Therefore, it is the purchaser's responsibility to ensure the products life cycle is safe for environmental and human health.
The objective of the policy is to advance the protection of the environment and support sustainable development. This is done by integrating environmental performance considerations into the procurement decision-making process and purchasing.

Green Procurement checklist:

- Encourage sustainable use of resources
- Reduce impact on the environment and ecological footprint
- Eliminate unnecessary purchasing
- Reduce waste to landfills
- Improve environmental health
- Improve human health
- Support sustainable long-term markets for recyclable materials
- Contribute to community towards sustainability
- Suppliers with environmentally preferred technologies and practices
- Collaborate with suppliers on green initiatives
- Improve energy and water efficiency
- Reduce hazardous and toxic waste

Environmentally preferable goods and services are those that have a lesser or reduced impact on the environment over the life cycle of the good or service, when compared with competing goods or services serving the same purpose.

Green Procurement Principles:

MINIMISE	MAXIMISE
Unnecessary purchasing	Energy and water efficiency
Waste	Value for money
Toxicity	Fair trade opportunities
Habitat destruction	Environmentally preferred products
Soil degradation	Education for Sustainable opportunities
Greenhouse gas emissions	Safety

Green Procurement Guidelines explained:

Table 1: Guide for sustainable procedures, sample checklist in Table 2.

Biodegradable: An item can break down into natural materials in the environment without causing any harm.	**Environmentally sustainable design:** To reduce or eliminate negative environmental impacts through thoughtful and well-planned designs.	**ISO 14001 Compliant:** Increased demand for services and products through a marketing advantage and to lower business costs through reducing resource consumption and waste production.
Bulk purchasing: The unit price is lower than the usual. In addition, it limits product packaging, and cuts down on transportation	**Fair trade certification:** Considers the producers first.	**Locally manufactured or grown:** Supports the local economy.
Carbon neutral: Net zero carbon footprint.	**Genetically Modified Organism free:** Avoid products that have had genetic material altered from genetic engineering techniques	**Low toxicity:** Avoid ingredients in packaging or products that are harmful for people and disposal.
Carcinogen free: Products that contain healthy, safe and natural ingredients	**Forest Stewardship Council certification:** Products come from responsibly managed forests that provide environmental, social and economic benefits.	**Renewable materials/energy:** Products and suppliers that offer open or closed-loop methods.

Compostable: Can decompose naturally and not end up in landfills.	**Free Range Farmers Associations** Ensures the humane treatment of farm animals and a safe and healthy food supply for all Canadians.	**Organic certification** Certification process for producers of organic food and other organic agricultural products.
Durable: Avoids single-use products.	**Green powered accredited:** Individuals and businesses support renewable energy generation.	**Low volatile organic compound:** Avoid harmful chemicals found in paint and various other products.
Energy efficient: High energy star rating that saves money and protects the environment such as electricity and water.	**Heavy metal free:** (Eg. No lead or mercury)	**Recyclable:** In consumable and packaging
Reusable: Avoids single-use products.	**Refurbished:** Restore product to natural state.	**Extender producer responsibility:** Add all environmental costs of a products life cycle.

Implementation:

At 6 months:

- Nominate a member or group to coordinate the development of this policy
- Establish staff education or training for the implementation
    - Seminars from vendors, external partners and organizations
- Ensure all staff has access to information on environmentally friendly products
    - Regular internal communication among staff about policy and external communication with suppliers, vendors and partners
- Promote environmental purchasing to the community
    - Ensure local suppliers have environmental products, services and practices
- Require contactors and consultants to comply with this policy
- Establish a green percentage spent
    - Purchase policy should have milestones, timelines and an action plan
- Set targets
    - At each level such as supply chain, manufacture and disposal, set a target.
    - For instance, reduce packaging by 20% or choose paper over plastic products

At 2 years:

- Review purchasing specifications, tender documentation, and contracts for compliance with policy
- Develop program to support the application of this policy

Expected results of this policy include:

ENVIRONMENT OBJECTIVES:

- Reducing greenhouse gas emissions and air contaminants
- Improving energy and water efficiency
- Reducing ozone depleting substances
- Reducing waste and supporting reuse and recycling
- Reducing hazardous waste
- Reducing toxic and hazardous chemicals and substances
- Supporting biodiversity

ECONOMIC OBJECTIVES

- Reducing the cost for and strengthening greener markets and industries based on the acquisition of environmentally preferable goods and services
- Support a healthier working environment for employees and members through the purchase of environmentally preferable goods and services
- Result in a more environmentally responsible planning, acquisition, use and disposal practices

POLICY REQUIREMENTS

1. General Manager is required to ensure that the objectives of green procurement are realized while maintaining compliance with all legislative, regulatory and policy obligations

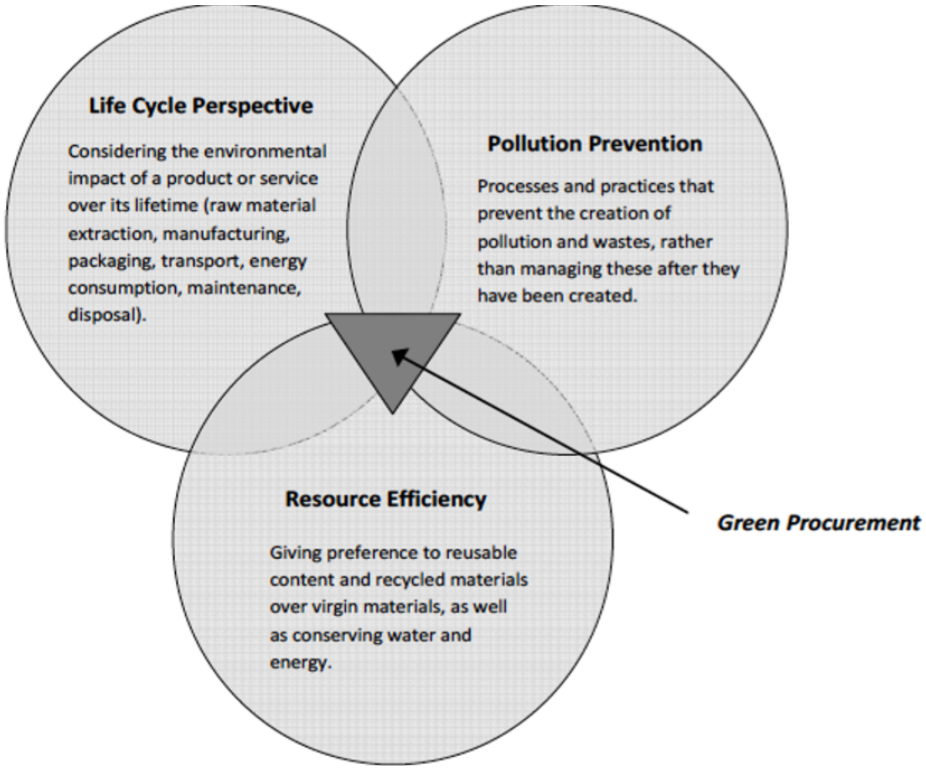


Figure 1. The 3 main factors of the green procurement policy.

TABLE 2.

1. THINK BEFORE YOU BUY

- ☐ Is the product really needed?
- ☐ Can this product be borrowed from another institution?
- ☐ Is this product in storage?

2. DESIRABLE ATTRIBUTES

FINANCIAL

Criteria	YES	NO	More Information Required	Not Applicable
Suitable cost	☐	☐	☐	☐
Cost Benefit	☐	☐	☐	☐

ENVIRONMENTAL

Criteria	YES	NO	More Information Required	Not Applicable
Environmentally Sustainable Design principles used	☐	☐	☐	☐
Reusable product	☐	☐	☐	☐
Refurbished product	☐	☐	☐	☐
Minimal packaging	☐	☐	☐	☐
Extender producer responsibility available	☐	☐	☐	☐
Recyclable packaging	☐	☐	☐	☐
Product contains recycled content	☐	☐	☐	☐
Recycling method known	☐	☐	☐	☐
Energy efficient- high star rating	☐	☐	☐	☐
Water Efficient	☐	☐	☐	☐
Fuel Efficient	☐	☐	☐	☐
Contains minimal or no toxic chemicals	☐	☐	☐	☐
Compostable	☐	☐	☐	☐
Carbon Neutral	☐	☐	☐	☐

SOCIAL

Criteria	YES	NO	More Information Required	Not Applicable
Product is heavy metal free	☐	☐	☐	☐
Material safety data sheets for high risk products	☐	☐	☐	☐
Ecolabel certification	☐	☐	☐	☐
Durable	☐	☐	☐	☐
Locally produced/manufactured	☐	☐	☐	☐
Made in country	☐	☐	☐	☐
Forest Stewardship Council certification	☐	☐	☐	☐
Free Range farmers	☐	☐	☐	☐
Bulk purchasing possible	☐	☐	☐	☐

SUPPLIER

Criteria	YES	NO	More Information Required	Not Applicable
Supplier signed to reduce packaging	☐	☐	☐	☐
Supplier has internationally certified environmental management system (ISO 14000)	☐	☐	☐	☐
Supplier demonstrates commitment to environmental sustainability	☐	☐	☐	☐
Supplier has extended producer responsibility scheme	☐	☐	☐	☐
Ecolabel certification	☐	☐	☐	☐
Green powered accredited	☐	☐	☐	☐
Genetically modified organism free	☐	☐	☐	☐
Fair trade certification	☐	☐	☐	☐

ECO-LABELS IN CANADA

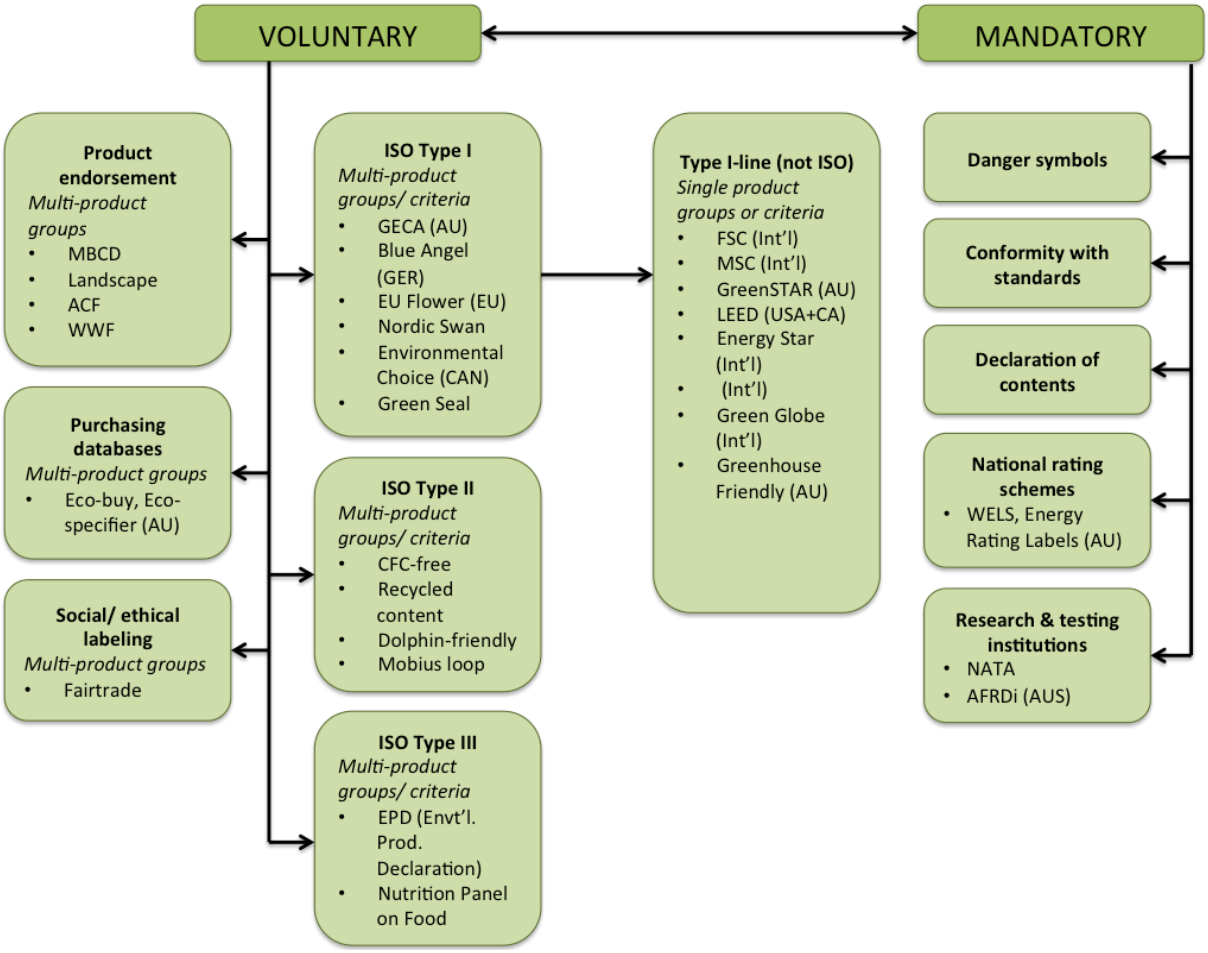
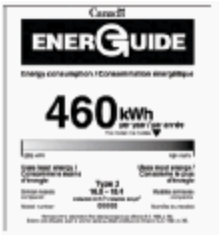


Figure 2. The voluntary and mandatory labels established globally.

Eco-labels continued

Eco-labels indicate that products meet a set of environmental standards. This saves effort evaluating the product and developing independent criteria. It is possible to demand that a product meets the standard which the label sets.

Table 3. Government of Canada. (2019). Common environmental labels and claims in Canada. Retrieved from: <https://ic.gc.ca/eic/site/oca-bc.nsf/eng/ca02523.html>

Label	Logo	Description
ECOLOGO		Independently certified to meet strict environmental standards that reflect their entire life cycle.
ENERGY STAR		Marks products that are energy efficient. ENERGY STAR-qualified products include major appliances, heating, cooling and ventilation equipment, lighting products, electronics, office equipment, windows, doors and skylights.
ENERGUIDE		Product's estimated annual energy consumption and compares it to the energy performance of similar products.
FOREST STEWARDSHIP COUNCIL		Wood and paper that comes from sustainably managed forests.
SUSTAINABLE FORESTRY INITIATIVE		Wood and paper that comes from sustainably managed forests.
CSA GROUP		Wood and paper that comes from sustainably managed forests.

B CORP LOGO		Indicates a business that has met rigorous standards of social and environmental performance, accountability and transparency.
FAIRTRADE CANADA LOGO		Set standards to ensure that certified products are produced in a socially and economically fair, and environmentally responsible manner.
MARINE STEWARDSHIP COUNCIL CERIFICATION LOGO		Label come from fisheries certified to have met the MSC standard for sustainable fishing.
CANADA ORGANIC LOGO		For organic production from growing to marketing and contain at least 95 percent organic ingredients and no GMOs.
MOBIUS LOOP		Indicates that a product or packaging is recyclable, contains recycled content, or both.
PLASTIC INDUSTRY SYMBOLS		This symbol is part of a resin coding system produced by the Society of the Plastics Industry (SPI) that identifies the different resins found in plastic bottles and rigid containers.
OTHER	n/a	Manufacturers, importers, distributors or anyone who promotes a product or service may decide to make environmental claims about it. These claims are usually based on a single attribute such

		as if a product is biodegradable or recyclable. This may exclude the environmental impact of the product's entire life cycle, and may not be independently tested or certified

Procurement Steps

Activities to support green procurement to meet a need may be incorporated during each stage of the procurement process.

Table 4. Green hospital procurement policy and procedure manual, and implementation guide. (2016). Retrieved from: <https://greenhealthcare.ca/wp-content/uploads/2016/02/GreenProcurement-PolicyandProcedureManual-DRAFT.pdf>

Procurement Step	Focus Area	Green Focus Area
1. Assess need and opportunity	Focus analysis primarily on materials and logistics costs	• Assess need and whether it is necessary • Direct and indirect environmental costs (e.g., energy consumption, disposal, packaging waste, water)
2. Assess supply chain	Map and organize current process and identify process opportunities	• Specification review and design considers the industry's environmentally sound products and services
3. Assess supply market	Identify potential sources of supply and perform supplier assessments and comparisons	• Include suppliers who specialize in more efficient and sustainable products and practices
4. Develop sourcing strategy	Determine desired outcomes and brainstorm process enhancement such as policies and training	• Sustainability considerations and criteria (e.g., energy, disposal, water usage costs may be solicited from suppliers for analysis)
5. Implement strategy	Develop and implement supplier solicitation	• Quantify the cost or benefits of

Procurement Step	Focus Area	Green Focus Area
	strategy, conduct supplier negotiation and award contract	sustainability attributes (e.g., energy consumption)
6. Institutionalize strategy	Transition to new process, develop supplier relationships, implement operation changes and monitor or report performance	• Sustainability measures closely tracked

Examples of Sustainability to consider:

- Cleaners and disinfectants
    - The chemicals in many cleaners are common pollutants that contribute to smog, reduce the quality of drinking water and are toxic to animals such as volatile organic compounds including phosphorus, nitrogen, and ammonia.
- Electronic equipment
    - Electronics contain many toxic substances including metals and plastics. Recycling and reclamation of valuable materials from batteries and electronic equipment has infamously polluted third world countries.
- Pesticides
    - Can be toxic or damaging of the surrounding environment.
- Plastics
    - Polystyrene, including Styrofoam, and vinyl, polyvinyl chloride or PVC, are two materials that are toxic to manufacture, are difficult to recycle, do not biodegrade, and result in toxic combustion products when incinerated.

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Appendix D: Pesticide Reduction

Addition of Organic Turf Management Practices to Reduce Pesticide Use.

The regulations in Canada concerning extended producer responsibility strictly govern the manner in which pesticides and pesticide containers are disposed of. Unfortunately, the collection programs do not include the cardboard boxes in which pesticide containers are packaged, otherwise the system would effectively be a zero-waste system.

There are alternative pesticide types which can be used to control pest species, such as powder or dust chemicals rather than liquids and solvents. In saying that, they often require different equipment in order to apply pesticides to the turf, and simply produce different types of waste rather than reducing waste generation. Therefore, the most realistic way to reduce pesticide-related waste at the PGCC is to reduce the demand for pesticide application.

Integrated Pest Management "uses all necessary techniques to suppress pests effectively, economically, and in an environmentally sound manner" (IPM Council of Canada, 2018). Perhaps the most environmentally friendly manner of suppressing pest species is through organic practices. Organic pest control is the process of managing pests through natural, non-chemical methods. Currently a popular trend on small farms, golf courses, and their customers, are beginning to show interest in organic pest control in light of recent studies showing the health risks associated with pesticide exposure (Feldman, n.d.). However, due to the large financial and temporal investment required to develop successful, fully organic turf management plans, golf courses are often unable to abandon pesticides entirely (Moeller & Lowe, 2016). Although, incorporating select organic pest control practices can result in quick, effective pest control while saving money and decreasing negative effects on the environment and on human health.

A common example for organic turf management is the use of an aerator, which relieves soil compaction allowing for air and water to easily infiltrate the soil profile. Unfortunately, aeration can temporarily impact the quality of the turf, but the long-term benefits outweigh the short-term effects. Recent studies by the United States Golf Association have indicated a 25% decrease in fungicide demands on golf courses by applying monthly aeration to their turf, as well as an increase in turf quality and more consistent playing conditions (USGA, 2016).

As stated earlier, approximately 62% of the pesticides used at the PGCC are attributed to iprodione – a fungicide. Therefore, regular aeration could significantly decrease the need for pesticides as well as the generation of pesticide-related waste at the club. Aeration can be paired with other cost-effective organic practices, such as topdressing with various substances.

One substance included in this is compost. Compost is a high organic matter and microbe-rich substance, which can effectively be used for topdressing. Applying a thin layer of compost before or after monthly aeration can help improve soil structure and reduce weeds, therefore

reducing the need for fertilizers and pesticides (Agresource, n.d.). As stated earlier, the club currently employs a grasscycling program, mitigating the need for fertilizers. Our waste audit revealed the majority of the garbage generated by the club was composed of food waste (approx. 80%), suggesting that a composter could also be a rewarding option for the club. The implementation of a compost topdressing program would turn food waste into a valuable commodity, decreasing the volume of waste sent to the landfill and mitigating the need for pesticides.

In order for this to be completed, special considerations must be made to the quality of the compost. Staff must ensure that organic materials are heated to temperatures high enough to kill seeds and unwanted pathogens. Monitoring of pH levels and soluble salts in the finished product is recommended to ensure the compost will not detriment turf health.

Other simple solutions to consider are associated with mowing and seeding practices. The height of a mower blade can have a significant impact on turf health, as does how sharp the mower blade is kept. A mower blade set too low can damage the root system of turf and limit photosynthetic growth. Additionally, a dull mower blade can contribute to the spread of fungal disease throughout the golf course. Maintaining a sharp mower blade and ensuring staff are not cutting grass too short can improve turf health without the use of pesticides (Feldman, n.d.).

Finally, proper selection of grass seeds can have significant effect on turf quality. Seeds vary in a variety of parameters, including their resistance to pests and changing climatic conditions. Selecting the proper seed type can increase turf resilience to the intrusion of pest species and decrease reliance on pesticides. Overseeding can actually be a beneficial practice as well, since an abundance of grass seeds can outcompete weed species trying to take root (Feldman, n.d.). The inclusion of any or all of the above organic practices can successfully improve turf quality without the use of pesticides, therefore reducing pesticide-related waste generation, and potentially saving money for the club.

Furthermore, the disposal of pesticides and pesticide packaging can be done through the company Product Care Recycling. This not-for-profit company offers free recycling of pesticides and the containers they are stored in at many locations across Canada. The products must come in their original container, the container cannot exceed 30 L, and the product must be registered under the Pest Control Products Act. The nearest Product Care Recycling location is only 7.2 km from the club, at 400 Pido Road, Peterborough, Ontario. Additionally, pesticides and pesticide containers can be recycled free of charge through the Clean Farms program, with the nearest location located at 2134 Little Britain Road, Lindsay, Ontario.