



Tower Renewal Office



Raising the Performance of Toronto's Apartment Buildings



Final Report

November, 2013

Table of Contents

1.0	<i>Executive Summary</i>	3
2.0	<i>Program Goals</i>	5
3.0	<i>Study Participants</i>	6
4.0	<i>Utility Data</i>	7
4.1	<i>Data Collection</i>	7
4.2	<i>Data Verification</i>	7
4.3	<i>Data Analysis</i>	8
5.0	<i>Building Performance Assessment Reports</i>	10
6.0	<i>Site Walk-Throughs</i>	12
6.1	<i>Description of Walk-Through</i>	12
6.2	<i>Condition of Building Systems</i>	16
7.0	<i>STEP Checklists</i>	19
7.1	<i>Energy STEP Checklist</i>	21
7.2	<i>Water STEP Checklist</i>	23
7.3	<i>Waste STEP Checklist</i>	24
7.4	<i>Modifying the STEP Checklists</i>	26
8.0	<i>STEP Toolkits</i>	27
9.0	<i>Conservation Measures</i>	27
10.0	<i>Database</i>	28
11.0	<i>Utility Savings Potential</i>	30
12.0	<i>Workshop Findings</i>	32
13.0	<i>Conclusions and Recommendations</i>	35
14.0	<i>Appendix Contents</i>	37

1.0 Executive Summary

In July, 2010, Toronto City Council approved the city-wide implementation of Tower Renewal, a program to drive broad environmental, social, economic and cultural change by improving the city's high-rise apartment buildings and the communities that surround them. The Tower Renewal STEP Program was developed to support the goals of Tower Renewal. STEP provides a framework for use by apartment building owners, other interested parties and city staff to guide and monitor integrated performance improvement for apartment buildings and communities over time. This project was initiated to test, evaluate and refine STEP in order to increase participation in and the impact of Tower Renewal.

The results of the project have met this purpose, and also served to affirm the interest in and the value of the STEP Program in filling an important gap in the market. The initial target was to engage 30 participating buildings, but the level of interest was such that more than 45 buildings belonging to thirteen different owners volunteered to commit their time and their buildings to support the work. Extensive thoughtful and detailed feedback was received to inform a wide range of improvements to content, wording and format of STEP checklists and toolkits. Information collected from the participating buildings has contributed to a substantial, well-structured database which provides a solid understanding of the general state of apartment building performance today, and will allow performance changes to be tracked over time.

A workshop held on September 9th, 2013, was remarkable in the number and seniority of individuals that not only attended the event, but also freely contributed their opinions, knowledge and case studies of high performing buildings and case studies. In addition to the property owners and managers that participated in this project, utility companies, industry associations, CMHC, other interested property owners and related city departments were all represented at the workshop. The input and information received helped frame the final recommendations of this report. Importantly, every workshop evaluation form completed stated that participants were very interested or somewhat interested in continuing with STEP.

Another important outcome of this project has been to confirm the great potential for energy, water and waste diversion improvements in the city's high rise apartment buildings, and the usefulness of the STEP benchmarking and assessment process in helping owners identify specific opportunities in their individual buildings and implement the necessary improvements.

The conclusions and recommendations presented in this report confirm the magnitude of savings potential based on the Building Performance Assessments of the participating buildings, and that the majority of the buildings are in generally good physical condition. There is a high level of interest and activity in tackling performance improvements, with most owners

expressing interest in tracking their energy and water use and costs (less so for waste). Most improvements being made are specific measures such as low-flow toilets and boiler controls. More strategic approaches such as adoption of energy targets and conducting energy and water audits are less common, and present an opportunity for best practices and training. Few formal resident engagement and education programs are reported. These would also provide significant opportunities to realize performance improvements.

Performance benchmarking is indicated as a valuable tool that provides new insights to owners on the relative performance of their buildings leading to target-setting. The benchmarking reports support owners in quantifying potential savings and to develop the business case for improvements. There is also value found in the specific strategies and measures contained in the STEP Checklists and Toolkits.. Recommended improvements in this area include finding or creating additional toolkit items to support project implementation, striving to develop easier ways for reliable and complete utility data to be provided for undertaking benchmarking, improving information availability on waste collection and consideration to including a site walk through evaluation template.

The Tower Renewal Program will benefit from the STEP Program as it is a useful device for evaluating and tracking over time the condition and operating performance of the sector in a systematic way, while enabling owners of varying size and sophistication to identify and implement improvements. The stage is set for wide-scale, long-term adoption of STEP across the City, and for unlocking real and substantial economic, environmental and social progress within this sector.

2.0 Program Goals

Study Objectives

- Optimization of the quantity and quality of information gathered
 - Evaluate if the information requested is reliable, accessible and meaningful to encourage high participation rates
- Ensuring a complete database of building information
 - Create a database for the City for buildings in the project and for the City's ongoing use to analyze and compare building conditions across Toronto
- Supporting the adoption and implementation of improvement plans
 - An evaluation of how the STEP assessment can be enhanced for greater impact in the development of improvement action plans

Study Deliverables

- Select a minimum of 30 field test locations from at least five property owners located throughout the City
- Undertake building assessments of participating locations to determine current conditions through the application of tools & checklists
- Evaluate and recommend improvements to the STEP framework that are found to be desirable or necessary from the previous version
- Collect energy, water and waste data from the participating buildings for a minimum of 24 months
- Undertake benchmarking analysis from the collected utility and waste information
- Create Building Performance Assessment reports for each property owner and the apartment buildings in this study
- Identify best performance range from a best-in-class category as well as identify building-specific adjustments to apply to buildings regarding building characteristics
- Identify information gaps that STEP requests may lead to inaccurate or misleading building evaluations
- Outline an approach to address issues of missing data including application of estimates, minimizing errors and maintaining validity of reports
- Determine and document current and future plans at assessed buildings and how they could result in higher participation in the STEP programs
- Assess the STEP program's ease of use and value in participating as well as determine ways the program can be modified or enhanced to add value & better achieve Tower Renewal objectives
- Analyze and provide examples and case studies of current best practices to substantiate program modifications

- Report on the expected value of test locations undertaking monitoring and verification as part of the program
- Conduct a literature review and high-level assessment of the state of apartment stock in the City with reference to building systems and needs for capital repairs
- Analyze the STEP framework participation goals based on a range of resource options (low to high level of resources)
- Undertake a participant workshop and document the feedback of participants
- Create and populate a database for storing, tracking, and analyzing apartment building information, including utility data, STEP checklist responses and building physical state of repair

3.0 Study Participants

The recruitment process began with a collection of property management organizations that owned and/or managed multiple sites. This was done with the intention of extending the outreach of the STEP program to buildings across the City and maximizing the efficiency of outreach by including a number of locations from each landlord in the project. The list of organizations came from a few sources including: previously-established Tower Renewal contacts, previously-established Enerlife contacts as well as web searches for other organizations targeted by the City for participation in the program.

The established property contacts as well as those found through web searches were contacted by Enerlife by phone to determine the interest in participating in the project. The targeted participation of 30 buildings and 5 owner groups was surpassed with the resulting participation of 46 buildings represented by 14 property management organizations. The breakdown of participation is as follows:

Property Owner #1:	4 buildings
Property Owner #2:	4 buildings
Property Owner #3:	5 buildings
Property Owner #4:	7 buildings
Property Owner #5:	2 buildings
Property Owner #6:	6 buildings
Property Owner #7:	1 building
Property Owner #8:	1 building
Property Owner #9:	1 building
Property Owner #10:	3 buildings
Property Owner #11:	1 building
Property Owner #12:	4 buildings
Property Owner #13:	5 buildings
Property Owner # 14:	2 buildings

4.0 Utility Data

4.1 Data Collection

Once property owners were engaged, the next step was to collect building profile and utility data. Most property management organizations already collect billing information since utilities are a high percentage of operational costs. Each organization was asked to send at least two years of electricity, natural gas and any other heating fuels, water, and waste data in an Excel workbook. The specific data requested included meter reading dates, unadjusted electricity consumption and adjusted gas consumption, as well as energy, water, waste water and total invoice costs.

If landlords did not have this data in Excel, Enerlife requested it in whatever other format it had been filed in, such as system generated reports or scanned bills. One property owner had not been collecting this information in any format, so a utility release letter was signed which allowed access to billing information from Toronto Hydro and Enbridge utilities.

The building characteristic form developed by Enerlife was also completed by the property owners and provided the following information:

- Total building area and any underground parking garage area
- Percentage of units separately metered
- Energy source (natural gas or electricity) for heating and domestic hot water systems
- Cooling system type (central air conditioning or window A/C window units by percentage)
- Preheated ventilation system installed

This form is essential in the benchmarking and targeting analysis provided in the Building Performance Assessments. The importance of the building profile is that it takes the targeting analysis a step beyond simple benchmarking of sites, to identify and adjust for specific building systems or energy sources that might cause some buildings to functionally use more energy or less energy than other similar buildings.

Once this information was collected, it was entered with the benchmarked utility data to calculate performance targets for each building.

4.2 Data Verification

One of the main data collection obstacles was reliability of energy and water data. Common issues include missing billing months, records stating billing dates instead of reading dates, multiple months combined into a single bill and jointly-metered sites. The centerpiece of utility

analysis is weather regression where energy per day is compared to temperature per day in each billing period. Using this regression method of the billing information, billings errors can easily be identified.

There are many common types of billing errors and each with a solution to ensure greater accuracy in reporting. Missing months were either requested from the property owners or estimated based on energy trends for the year if original data was not available. Multiple months of combined billing could also be separated using this same method. Reading dates were always used to ensure the actual energy used during the period is being compared to the actual temperature. When billing dates had been entered, it was usually found by an inconsistent relationship to weather and the owner would need to be contacted to provide the reading dates from actual bills. Jointly metered sites were split by the percentage of total building area which is the only realistic way to split the energy. Although this approach creates two separate reports for the buildings, it causes an error in data veracity as two identical buildings can have distinct operational or equipment issues that result in performance differences.

Another obstacle experienced in the data collection was that 34% of property management companies indicated in the STEP Checklist that they do not track waste, recycling and organics. The tracking and reporting of recycling and organics by the City and private haulers is inconsistent, so to overcome this issue, the amount of waste was calculated based on bin size, number of bins and frequency of pick-ups.

To improve the reliability of and access to the crucial building utility information, Enerlife recommends streamlining the process by using data release forms built into the energy, water and waste STEP checklists and uploaded into toolkits. This will reduce the margin of error by multiple property managers collecting information in different methods and be a considerable help in data validity and reliability. Working towards consistent reporting standards would be helpful.

4.3 Data Analysis

A weather regression analysis was performed on the data using Enerlife's online Energy Management System using the bill data, weather data, and meter parameters such as balance temperature. The objective of the analysis is to separate energy components into base, cooling and heating, as well as calculate the annual energy change which was included in the Building Performance Assessment Reports. When comparing two years, the weather must be normalized (Degree-day-based analysis of energy use to account for the effects of weather) to create an 'apples to apples' comparison.

Weather is important for the normalization of energy data. If one winter is colder than another, normalization brings the data for both on a comparable level so that the energy efficiency in both winters can be compared. The weather information was collected from the internet at http://www.climate.weatheroffice.ec.gc.ca/climateData/canada_e.html and stored in the online system. For the purposes of this program, the weather station chosen was Toronto Pearson Airport. This is the largest and most reliable weather station in the Greater Toronto Area.

Once the weather regression has been performed, the next step is to enter the energy components of base electricity, cooling electricity, base thermal, heating thermal, water and waste into the Target Finder tool. The Target Finder tool calculates the total energy and water savings potential as the difference between the actual benchmarked energy and the target energy compared to the top quartile performance standards. This is based on the assumption that the top quartile performance is feasible for any building. There are currently no weather-based water adjustments. In addition to weather considerations, energy adjustments are made as part of the Target Finder tool for:

- **Percentage of Metered Suites** – reduces the base electricity target to account for energy being used in the building and not recorded on the main meter as it would be in a building with no metered suites.
- **Percentage of Suites with Window A/C Units** – similar to the percentage of metered suites, the electric cooling target will be increased or decreased depending on what percentage of the units are using cooling electricity. The highest cooling target is set for buildings with 100% of suites using Window-installed units, and then is lowered in increments of 25%.
- **Energy Source** – if the source of building heating or domestic hot water is electricity instead of natural gas, then the heating and/or base thermal targets are reduced and the heating and/or base electricity targets are increased. In addition, the electric heating target is lower than the equivalent natural gas heating target since the consumption billed for electricity used by the building does not include boiler efficiency losses associated with onsite heating plants.
- **Central Cooling** – most apartment buildings (87% of the project participants) do not have central cooling systems. The use of central cooling will prevent a building from reaching more aggressive targets than those buildings that do not use these systems. If an apartment building uses central cooling, the cooling electricity target is increased to provide a target for an efficient central cooled building.

5.0 Building Performance Assessment Reports

The Building Performance Assessment (BPA) Report uses a utility analysis that shows a property owner how its buildings compare over time and to other multi-residential buildings. The BPA contains a summary benchmark page for each organization showing the performance of all buildings in that owner's portfolio for energy, water and waste benchmarks. The report also provides site-specific performance targets for individual buildings.

The purpose of the Building Performance Assessment Reports is clear – use external benchmarking to show the building owner how much energy, water and waste each building in the portfolio is using, and how much it could be using if running efficiently, in order to uncover specific ways to make savings. High-level benchmarking gives the property owners a general understanding of how their buildings compare with other buildings across the City. Although there are differences in how apartment buildings use energy, comparison is possible because all buildings have the same main systems: lighting, fans, heating, cooling and domestic hot water systems. Individual adjustments for differences such as metered suites are factored into the more detailed building-specific analysis on the individual building report pages.

The analysis of the individual buildings shows where performance improvement actions could be focused. Components of analysis (such base thermal, cooling electricity or water) with high percentage and cost savings provide an indication of building systems that should be further investigated on site.

To the building owner, the benefit of benchmarking is that it informs owners of what systems can be targeted for energy, water or waste improvement projects and what the expected annual savings would be. The Building Performance Reports can also be used to help to determine the paybacks and return on investments when considering these projects.

For example, if the Building Performance Report shows that a building has an extremely high value in 'Base Thermal', then this would indicate that the Domestic Hot Water system is the area of concern. With this information, the building owner could begin an investigation into the system's inefficiencies and possible solutions. A summary of typical conservation measures that can be linked to the energy analysis can be found in Table 5.0.a below. The report also provides the building owner with a good understanding of the potential level of savings achievable once the problem has been corrected.

Table 5.0.a: Typical Measures of Energy Components

Energy Component	Typical Measures
Base Electricity	Lighting retrofits and controls, Energy Star appliances, ventilation rebalancing and controls, VFDs
Heating Electricity	Snow melting and pipe tracing controls, minimize tenant electric heat, convert from electric heat to natural gas
Cooling Electricity	Energy Star rated window units, central cooling plant retrofits and controls
Base Thermal	DHW controls, tank and piping insulation, low-flow showerheads, washing machine replacement
Heating Thermal	Ventilation controls, check and seal air losses, heating system control optimization, high-efficiency boilers
Water	Plumbing fixture replacements, check for leaks, irrigation and cooling tower controls

The first page of the Building Performance Report shows the benchmarking placements of all buildings for an organization. There is a second page for each building within the portfolio that goes into further detail of performance areas that the building could improve, as well as the percentage change from the previous year. A sample of the report can be found in Appendix F.

The top of the page displays systems and energy sources that were adjusted for and then, under that, is the total actual performance and the target of where the building should be if running efficiently. Below the total is the breakdown between energy components of base electricity, heating electricity, cooling electricity, base thermal and heating thermal. There is a description of base energy in the note below the table, for anyone not familiar with the term. The actual components and target components are shown in the table, calculated and adjusted as described in section 4.3 of this report. The percentage difference and annual cost savings (using default energy rates) are included to show how the building is performing compared to the target.

The next tables show the totals and targets for both water and waste. Similar to energy, they list the percentage savings and a cost savings for water only. Year-over-year comparisons for

energy, water and waste are also provided showing normalized performance in the most recent calendar year and in the previous year.

The Building Performance Report has undergone some minor, mostly visual, changes from the one previously developed by the Tower Renewal Office. The new version also shows all buildings within the portfolio that are being benchmarked instead of just a single building as in the original version.

6.0 Site Walk-Throughs

The site walk-through focused on gathering key information about major systems in the buildings, which is outlined in more detail in the table below. However its primary purpose was to inventory building systems, document physical condition of equipment, and record any service level deficiencies such as space temperatures, drafts or domestic hot water supply.

It takes about one to two hours for a trained technician to complete and transcribe the site walk-through so that it can be added to the database. The potential benefit to the building owner is a systematic, standardized documentation of the building which can be readily updated over time. The completed survey complements the Building Performance Assessment Report, and will make the connection between potential savings and the measures necessary to achieve them. The updated STEP Checklists now include Energy and Water Saving Measures to help owners close the loop between potential and action.

For the Tower Renewal Office the database can enable trending of the physical condition of building systems and equipment, identification of common factors associated with high performing and inefficient buildings, and targets for case studies.

6.1 Description of Walk-Through

The site walk-through template is designed with the intention that it would be used as a tool that can be self-administered by the property manager or a representative from the Tower Renewal Office. For example, the parking garage template asks pointed questions, such as “how are the fans (ventilation) controlled?” A drop down menu provides options, such as 24hrs/7days, timer, CO sensors, or other.

The walk-through can be done by anyone with basic understanding of building systems and good observational skills, accompanied by a representative of the building to provide access to the areas listed in Table 6.1.a, and to share their experience operating the building.

The site walk-through process has been substantially streamlined over the course of this project. At the start of the project, a site walk-through took approximately two hours to complete and one hour to transcribe into the database. The total time required has been reduced to approximately one to one-and-a-half hours, depending on the complexity of the building. Sites with multiple buildings of similar design are also completed more quickly since the information is repetitive. The list of information gathered during the walk-throughs is listed in Table 6.1.a.

As one of the long-term goals of the Tower Renewal Office is to track the condition of apartment buildings across Toronto, there is still a need to gather this information but not at the level of detail as listed below. The information that should be gathered and used by the City includes:

- The irrigation system, and if there is central laundry, to help understand water use
- Pipe tracing and ramp heating to help understand electric heat in buildings
- Condition of systems including parking garage, boilers, chillers, balcony doors, windows and window frames

The building owners on the other hand, would want to use this walk-through to gain specific information about systems that had been identified in BPA Report as potential energy savings areas. If the report demonstrated high savings potential in heating, then the landlord would be reviewing the boilers and envelope information on the site walk-through to locate inefficient areas.

Table 6.1.a: Information gathered during site visits

Building Location	Information gathered
Building Exterior	% of window area Re-cladding Exterior lighting Irrigation system Waste/recycling/organics collection area(s)
Parking Garage	General condition Pipe tracing Lighting type and controls Ventilation controls Ramp heating
Boiler Room	Heating boilers (number, type, rated capacity, condition, etc.) DHW boilers (number, type, temperature, condition, etc.) DHW storage tanks (number, type, size, etc.) Heating boilers pumps (type, etc.) DHW pumps (type, etc.) Pipe insulation Booster pumps Building automation system
Chiller Room (if applicable)	Chillers (number, type, rated capacity, condition, etc.) Chiller water pumps (type, etc.) Condenser water pumps (number, type, etc.)
Common Areas	Laundry room (number of washers and dryers, Energy Star, etc.) Stairwell (lighting) Corridors (lighting) Lobby (lighting) Issues with odours, over-heating, whistling in building, etc.
One Typical Suite	Temperature control Appliances (Energy Star rated) Fixture lighting (hardwired only) Water fixtures Windows (type, weather stripping, condition, etc.) Balcony door (number, condition, etc.)
Roof	Air leakages in penthouse Supply air units (number, size, etc.) Ventilation air units (number, size, etc.) Cooling tower (in applicable)

As described in the deliverables, the intent of this project was to undertake building assessments and performance analysis of at least 30 field test locations from a minimum of 5 property owners in order to improve the participation and interest in the STEP program. Due to the significant level of interest from the landlords, walk-throughs were conducted at 38 field test locations are listed below in Table 6.1.b.

Table 6.1.b: List of Owners, Buildings and Dates of All Site Visits

Sites that participated in just the benchmarking and Building Performance Assessment Reports aspects of the program did not receive a site visit are not included in the list below.

Property Owner *	Building ID	Date Completed
Property Owner #1	108719	02-Apr-13
	108729	02-Apr-13
	109030	02-Apr-13
	109049	02-Apr-13
Property Owner #2	103219	01-Aug-13
	103489	20-Aug-13
	103218	01-Aug-13
	103217	01-Aug-13
Property Owner #3	103269	26-Apr-13
	103279	26-Apr-13
	103289	26-Apr-13
	103299	26-Apr-13
	103309	26-Apr-13
Property Owner #4	102559	06-May-13
	111219	06-May-13
	111239	06-May-13
	107519	03-May-13
	107529	03-May-13
	110039	25-Apr-13
	106045	25-Apr-13
Property Owner #6	103849	07-Jun-13
	104579	11-Jun-13
	104578	11-Jun-13
	100995	18-Jun-13
	100094	03-Jul-13
	112959	13-Jul-13

Property Owner #7	108489	15-Aug-13
Property Owner #9	111649	27-Mar-13
Property Owner #10	103589	26-Mar-13
	103259	08-Apr-13
	111739	08-Apr-13
Property Owner #11	106559	23-Apr-13
Property Owner #12	105569	30-Apr-13
Property Owner #13	105729	13-May-13
	105519	21-May-13
	109569	22-May-13
	103759	24-Apr-13
	103769	24-Apr-13

* Due to scheduling constraints, site assessments were not conducted for one property owner group.

6.2 Condition of Building Systems

The Table 6.2.a below contains a summary of all systems that were rated for their physical conditions. The 5-scale rating ranges from 'Excellent' to 'Expired'. An 'Excellent' rating indicates new equipment in perfect working order usually installed within the last two to three years. The 'Good' condition indicates equipment that has no noticeable damage or maintenance issues but is over three years old. 'Fair' condition indicates older equipment in generally good working order, but approaching end-of-life. 'Poor' is applied to equipment approaching end-of-life and with significant operating and efficiency problems such as unavailability of spare parts. 'Expired' indicates equipment that is beyond end-of-life, no longer running or damaged to the point that it would be unsafe to run. 'Unknown' was equipment that could not be identified, accessed or completed by the on-site assessor.

Of all the sites visited, 66% of surveyed equipment was found to be in excellent or good condition with heating boilers, suites lighting, and domestic hot water systems being the highest ranked. Building elements that were more frequently found to score lower in terms of physical condition were stairwell lighting, water fixtures, suite doors and elevator penthouses. Domestic Hot Water Boilers and Tanks had the highest incidence of a rating of fair or worse. No building elements were found to be at the expired level.

Table 6.2.a: Summary of Condition of Building Systems

	Heating Boilers	DHW Boilers	DHW Storage Tanks	Heating Boiler Pumps	Elevator Penthouse	Exterior Lighting	Laundry Equipment
Excellent	45%	37%	37%	24%	8%	16%	11%
Good	18%	18%	26%	39%	16%	66%	63%
Fair	5%	16%	13%	8%	0%	11%	5%
Poor	3%	0%	3%	0%	0%	0%	0%
Expired	0%	0%	0%	0%	0%	0%	0%
Unknown	29%	29%	21%	29%	76%	8%	21%

	Stairwells - Lighting	Corridors - Lighting	Lobby - Lighting	Suites - Lighting	Suites - Water Fixtures	Suites - Windows	Suites - Doors
Excellent	0%	11%	13%	47%	3%	11%	3%
Good	79%	61%	55%	34%	50%	61%	76%
Fair	5%	3%	0%	3%	3%	13%	3%
Poor	3%	0%	0%	5%	3%	5%	3%
Expired	0%	0%	0%	0%	0%	0%	0%
Unknown	13%	26%	32%	11%	42%	11%	16%

Tenant Appliances

During the site review, the type of tenant appliances was noted as either Energy Star rated or not. This was intended to find the level of efficiency of appliances installed in the current building stock. Any appliances that had an Energy Star label on the front were listed as such. Table 6.2.b displayed below shows that most of the refrigerators in this group were Energy Star rated with slightly less than one- third of the buildings containing Energy Star rated equipment. There was no significant data on dishwashers as over 80% of the apartments assessed did not have a dishwasher installed.

Table 6.2.b: Tenant Appliances Energy Efficiency

	Energy Star Rated Appliances			
	Refrigerators		Dishwashers	
	Number	%	Number	%
Yes	27	71%	4	11%
No	11	29%	3	8%
Unknown or N/A	0	0%	31	82%

Operations of Equipment: Ventilation Systems

The state of repair questions were also accompanied by state of operations questions about the buildings. Many buildings could be performing at a better level compared to others if they adjusted the operations of their equipment. Of the main supply fans, only 4 buildings of the 38 had timer controls installed on their main supply systems and none had the corresponding timers on the exhaust fans. A little over half of buildings visited run fans continuously throughout the year. The summary table is provided below.

Table 6.2.c: Summary of Ventilation Controls

	Building Ventilation Controls			
	Supply Fans		Exhaust Fans	
	Number	%	Number	%
Timer	4	11%	0	0%
Continuous	21	55%	22	58%
Unknown or N/A	13	34%	16	42%

The exhaust fans in parking garages were also reviewed and found 58% of landlords controlling the fans with either a Carbon Monoxide sensor or a timer that shuts down the fans throughout the day. A third of buildings still run the fan at all hours of the day, meaning they are using more electricity than others with a control method.

Table 6.2.d: Summary of Garage Fan Controls

	Parking Garage Fan Controls	
	Number	%
Co Sensor	9	24%
Timer	13	34%
Continuous	13	34%
Unknown or N/A	3	8%

Penthouse Air Leakage

Another important aspect of buildings is the amount of leakage through the elevator penthouse through holes in the floor of the small room. This causes a negative pressure in the building and brings in air through the ground floor which moves up through the building and out the room as wasted energy and is fairly common among older apartment buildings. Surprisingly, only one building in the group had this issue. There are situational possibilities that could have prevented air leakage from being found in the field test locations. Sometimes the leakage is

obscure, and takes a more in-depth review of the room to uncover this issue. It is also more common and easier to find air leakage during the coldest months of the year due to the greater difference in air pressure. Site visits for this project were done in the spring and summer months.

Table 6.2.e: Summary of Penthouse Air Leakage

	Penthouse Air Leakage	
	Number	%
Yes	1	3%
No	33	87%
Unknown or N/A	4	11%

7.0 STEP Checklists

The site visit included an interview with the property manager or property representative by an Enerlife employee to complete the STEP checklists for energy, water, and waste. A program goal is that the STEP checklists would be completed by the property owner and/or manager, ideally without the assistance of the Tower Renewal Office, and submitted on an annual basis. To this end, observations were taken by the interviewer to capture the property manager's perception and understanding of the questions being asked.

There are a number of uses for the energy, water, and waste STEP checklists and related toolkits:

For the Tower Renewal Office: The checklists provide the City with an understanding of the current state of this building stock, both in performance and condition, and can be used by the property owners and managers to improve the energy, water, and waste performance of their apartment buildings. The STEP checklists should also be aligned with the Federation of Rental Property Owners (FRPOs) Certified Rental Building program and BOMAs BEST MURB program. This will reduce any confusion in the industry of why there are multiple checklists and which one(s) should be completed.

For building owners: The landlords gain a no-cost method of systematically working through a process of actions that can be followed to achieve high levels of efficiency in one or more of STEP component areas: energy, water and waste. Once performance improvement targets (such as those in the BPA report) have been met, checklists can help the organization by

identifying areas to focus actions to achieve further improvements or prepare for third-party certification through programs such as CRB or BOMA BEST certification.

Further, the STEP program also provides benchmarking of energy, water and waste performance of apartments across the owner group portfolio relative to a large number of other apartments owned by different property owners. Many organizations already benchmark their sites internally, but to benchmark outside of the organization provides owners with a broader sense of possible performance. Property owners can also become aware of operating practices and conservation measures which might not have been attempted yet.

For site staff: Site staff generally showed a great deal of interest in and knowledge about many of the Checklist questions which related to site-level responsibilities and control. Other questions (such as policy, tracking and research) were beyond their knowledge or control. The language of the revised STEP checklists has been made more amenable to questions they can answer, and the checklists serve to flag good management and operational practices which they can follow. The main benefit was that they have an opportunity to learn and be involved with these practices that would otherwise have no access to.

There were many changes to the original STEP Checklist based on the observations of answers as well as feedback from the industry participants. The first was to adjust the structure of the questions from:

- Step 1 Learning and Planning
- Step 2 Implementation
- Step 3 High Performance
- Step 4 Leadership

to:

- Step 1 Planning
- Step 2 Implementation
- Step 3 Measurement & Verification
- Step 4 High Performance

The other changes made to individual checklists were a result of observations, feedback, and information gaps from the energy, water, and waste STEP checklist interviews. The feedback from property managers has been paraphrased.

7.1 Energy STEP Checklist

Observations:

- Some property managers are not familiar with some of the terms in the energy checklist, such as energy audit, BAS, and walkability audit.
- To date, none of the property managers have heard of or undertaken a walkability audit.
- The common response to questions about the BAS is the boiler is monitored and controlled off-site by a third party. The property manager is not supposed to touch the boiler controls; instead the property manager or operator takes daily readings and sends this information to their third party contractor. Typically, the third party contractor only controls the boiler, not ventilation or cooling.
- Energy consumption and costs are typically tracked by the head office and the results are not shared with the property manager unless costs exceed the budgeted amount.
- Capital plans and payback periods are not shared with the property manager, if they exist.
- The Building Operating Plan is understood by property managers as the manufacturer's equipment manual, not a customized plan created specifically for the apartment's systems.
- Typically, residents are not educated about energy conservation behaviours. If resident energy education occurs it is done through the tenant welcome package.
- The sustainable transportation question is asked twice – once in Step 2 and 3 – it should only be asked once or made more progressive (e.g., bicycle storage in Step 2 and auto and/or bike share program in Step 4).
- To date, none of the property managers are aware of energy use intensity targets.
- To date, none of the property managers are aware of GHG emission reporting.
- Property managers are confused by the climate change adaptation question and ask for clarification. The example provided by Enerlife is a cooling room provided during extreme heat events or information on a nearby cooling centre.
- Regarding alternative energy, one site had solar hot water panels and another had PV panels currently being installed. One organization has also undertaken alternative energy studies for all of their buildings; however, according to the study, the four apartments participating in the study were not ideal candidates.

Feedback from the property managers:

- The energy STEP checklist uses “big words”.
- What is an energy audit?
- Never heard of a walkability audit before this meeting.
- Head office can answer your questions pertaining to capital plans, tracking energy consumption and costs, payback periods, and incentives. That information isn’t shared with me.
- Head office will be able to answer the question pertaining to GHG emission reporting. I don’t think we do that. Why would we?
- What do you mean by climate change adaptation initiatives?
- Would really love to hear about the other property owners that have put in solar panels. I want to know exactly what they did and how it worked. I’m totally open to renewable energy in my buildings.

Information Gaps:

- Corporate standard for energy efficiency.
- CRB certified?
- BOMA certified?
- LEED EB certified? (LEED for existing buildings)
- % of units separately metered.
- ENERGY STAR rated appliances.
- Funding opportunities for energy upgrades, retrofits, or renewable energy.
- Re-write BAS question to reflect current practices in multi-res apartments. At minimum, heating and ventilation should be monitored and controlled. For example, lighting does not need to be included in a BAS system for apartment buildings as outdoor lighting can be controlled by timers or photo sensors.
- Move automobile and bicycle share programs to Step 4 Leadership.
- EV plug-in parking spot.
- Property manager and operator training on an annual basis, or when new equipment is installed. Specifically for energy systems.
- None of the questions pertain to the building envelope (e.g., re-cladding, new windows, and new roof - such as green or white). Add a question that refers to R-values, etc.
- Roll-out of resident education program (in addition to welcome package).
- On-going energy consumption and cost tracking (shared with property manager/operator).
- Include a retro- or ongoing commissioning for major energy systems question.

7.2 Water STEP Checklist

Observations:

- To date, three organizations have undertaken water audits in the last three years.
- Many of the property managers want to answer yes to installing low-flow water fixtures. The question is not clear and the meaning of “low-flow” water fixtures is left up to interpretation.
- Not all apartments have irrigation system, so there should be an “N/A” box.
- Asking property managers to estimate the % of permeable area is confusing and many people aren’t sure and want to refer to drawings that are not at hand.
- When asked “Develop a maintenance procedure manual and standard practice for water consuming equipment” most, if not all, property managers ask the interviewer to explain the question. This question should be replaced with a question regarding cooling tower management.
- Like energy conservation, only some property owners educate their residents about water conservation in the resident welcome package.
- None of the property managers have considered replacing turf grass with natural vegetation. Although, one property owners has buildings in the Vancouver area and they are required to convert their grass into natural vegetation, but they have not considered that for their Toronto area buildings.
- To date, none of the buildings use automatic controls for water fixtures. This might not be the right applicable for these types of fixtures.
- Head offices determine the type (manufacture, model) of water fixtures purchased for the buildings. Typically, the type of water fixtures is standardized across the portfolio, but buildings are at different stages of retrofits.
- A more detailed question regarding pool maintenance would be advantageous. All of the property managers have said they have no issues with their pools.
- To date, none of the buildings have implemented rainwater collection, grey water use, and a green roof.
- Some property owners have standards for water fixtures. One specifically also has a water efficiency corporate policy.

Feedback from property managers:

- Water audits were done before the water fixtures were replaced.
- I don’t know if my washing machines are water efficient. They are managed by a third party vendor.

- What is a water efficient washing machine?
- Head office decides when to change the faucets and toilets and what they are going to be. We order from a booklet of pre-approved fixtures.
- Natural grasses and bushes don't look nice. I prefer grass.
- Head office gets the water bills. I never see them. If our costs went up, we'd know about it.
- Water use is monitored off-site. If there is an increase in water consumption they will tell us.

Information Gaps:

- Provide a template for conducting a water audit (excluding cooling towers)
- Define what low-flow water fixtures are.
- Add showerhead to low-flow water fixture question
- Remove "template designs for an operations manual"
- Remove permeable area question as this is a pure guesstimate on behalf of the property managers and can be estimated from Google maps or from buildings drawings, if available.
- Include a not applicable box for buildings without an irrigation system.
- The question pertaining to the replacing fixtures is confusing. Possibly to add capital budget planning for water fixtures. De-commissioning or replacing the irrigation system.
- Remove automated water fixture question.
- Corporate standard for water efficiency.

7.3 Waste STEP Checklist

Observations:

- Every property manager can tell you the number and size of recycling, waste and organic bins and when they are picked up.
- According to all property managers bins have signage on them. Only one observed to be missing.
- To date, none of the apartments have undergone a waste audit.
- The majority of property managers believe they are meeting the City of Toronto standards for the number of recycling containers.
- Only one organization has met with the Solid Waste Management Division.
- To date, none of the property managers have held a meeting, conducted a survey, or have a waste ambassador.

- None of the buildings have implemented hazardous waste collection.
- None of the property managers are aware of waste diversion targets.
- Waste invoices go directly to head office and the information is not shared with the property manager.
- The question relating to the purchasing durable goods is confusing for property managers.

Feedback from property managers:

- What is a waste audit?
- I need to do more about waste. I've ignored it for too long.
- Residents do not have the time or would not want to join a meeting, complete a survey, or be a waste champion. They are too busy and wouldn't be interested.
- I have to look into the bins, because the city won't pick up the recycling if it is full of waste.
- I didn't know the city would come to my building and provide an assessment on waste strategies. Is it free?
- Send me information on the e-waste, batteries, etc. programs.
- If the office has a waste target, I don't know about it.
- Our office as a waste specialist that looks into all that stuff for us. They make sure we have enough recycling bins.
- We give all new residents an in-suite recycling bag.

Information Gaps:

- Develop and execute waste education plan, instead of meeting, survey, and ambassador approach.
- Implement no- or low-cost waste diversion strategies identified in the waste audit to remove barriers to residents recycling.
- Provide residents (new and existing) with in-suite recycling bags.
- On-going waste generation and cost tracking (shared with property manager/operator).
- Implement organics collection and provide residents with in-suite organic containers, information on what goes into the organics bins, and how to keep it clean (e.g., how to line the container or biodegradable bags).
- Implement monthly battery, electronics, and light bulb collection day(s). Investigate permanent hazardous waste program options (identify space, information, etc.).
- Conduct annual waste audit.
- Set a corporate policy on waste diversion.

7.4 Modifying the STEP Checklists

Based on the feedback from the first 33 buildings, the STEP checklist was reviewed and modified based on participant feedback as well as general observations made during the interview and information gaps. The feedback was summarized in the previous subsections of Section 7.

Overall, the new checklists avoided many of the common issues of the first version such as:

- Definitions were needed for terms that were not understood
- Very few questions could not be easily answered
- Clearer language and more direct questions helped with understanding of what was being asked
- A higher number of checks in Sections 1 & 2 and less in 3 & 4 indicated there is a good progression from “Planning” to “Leadership”

Energy STEP Checklist

Feedback & Observations:

- Energy targets have generally not been adopted by property owners and staff
- The building operating plan was usually checked, but the subcategories were not
- General questions such as “evaluate,” “identify,” and “find out” typically received more affirmative responses than specific questions such as having an energy audit or operating plan
- Most properties had capital plans and had implemented retrofits with good paybacks
- While most had some form of tenant education strategy, very few had formal resident education programs

Water STEP Checklist

Feedback & observations:

- Many questions did not apply for the typical apartment building such as having a pool, irrigation system, stormwater/rainwater collection, or a cooling tower
- Most respondents had implemented capital measures such as low flow toilets and aerators
- Few had conducted a water conservation audit

Waste STEP Checklist

Feedback & observations:

- The highest affirmative responses were to questions where site staff had control such as improving access, keeping clean, and assessing recycling
- Few respondents had engaged in research, formal 3R programs or resident education
- Only about half of respondents formally track waste volumes and monitor invoices

8.0 STEP Toolkits

The STEP Toolkits which are part of the program framework to assist property owners in completing the checklists were reviewed. One of the most beneficial changes was to link toolkit material directly to the checklist question it related to. The links to toolkit were embedded in checklist through a hyperlink to ensure it could be easily found.

The criteria that were used to evaluate the toolkit material included usability, relevance to apartments and geographical location, and that it was current information. The modifications to the Toolkits can be found as links through the STEP checklists. Some additional information such as Energy and Water saving measures and data release forms will be new links available in the Toolkits.

Some, such as utility incentive links, were not possible to link directly to a step and were moved to a general link to the Toolkit at the top of the checklist.

9.0 Conservation Measures

The conservations measures were designed to assist the property managers/owners with next steps once they have received the Building Performance Assessment Reports and will be accessed through the checklists.

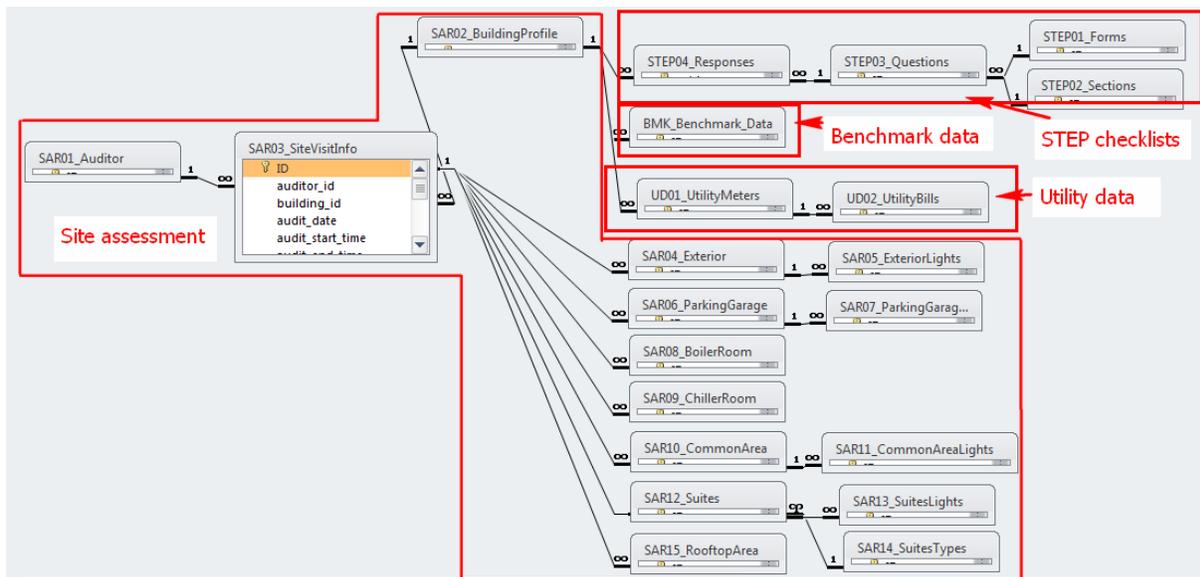
The measures are lists of actions resulting from BPA Report indicators. For example, a building that indicates a high percentage and dollar savings in base electricity would receive the portion of the list of measures within that energy component from the conservation measures list. The building would be prompted to look into actions such as 'Have daylight sensors or a timer been installed on outdoor lighting?' or 'Have refrigerators, dishwasher, microwave, washing machine, and dryer been replaced with ENERGY STAR rated appliances?'. An example of this

was previously described and displayed in Table 5.0.a. These conservation measures will provide the next step to actually making energy savings instead of leaving landlords stuck at knowing they are not performing at optimal levels but not knowing what to do about it.

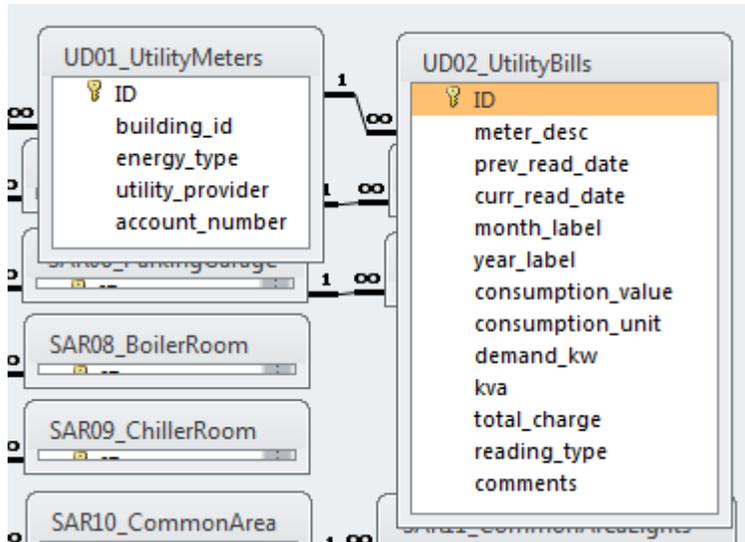
The lists were made from findings from site visits as well as current practices and standards in high-performance buildings. There is no waste conservation measures list at this time since waste reduction or diversion is more closely tied to tenant behaviour and physical attributes of the building. The Energy and Water Conservation Measures lists can be found in the Appendix D and E.

10.0 Database

The database structure includes four sections, as shown below.



- 1) Site assessment information that includes the data collected during site visits.
- 2) Utility data includes the data for the participating buildings exported from Enerlife's online system. This section has two tables with information related to utility accounts and individual bills – for details see the screenshot #2 below.



- 3) Benchmark data includes tables with energy and water use intensities for 2011 and 2012, exported from benchmark reports generated by Enerlife's online system. Currently, the database contains data only for the buildings in the study. Please see screenshot #3 for the content of the table.

Field Name	Data Type	
Water_m3_per_m2_2011	Number	Water consumption for 2011, m3/m2
Water_m3_per_m2_2012	Number	Water consumption for 2012, m3/m2
Water_pct_change_from_2011	Calculated	Water consumption, % change from 2011
Waste_yd3_per_unit_2011	Number	Waste generation for 2011, yd3/unit
Waste_yd3_per_unit_2012	Number	Waste generation for 2012, yd3/unit
Waste_pct_change_from_2011	Calculated	Waste generation, % change from 2011

- 4) STEP Checklists section includes questions and participants' response. Please see screenshot #4 for a fragment of a summary compiled from tables in this section. The summary is sortable and filterable. This section includes Energy, Water and Waste checklists.

STEP_Form	Section	Question	Question_Id	Response
40i Energy	Step 1 Learning and Planning	Identify equipment energy use levels	ENRGY-STP1-01	Yes
40i Energy	Step 1 Learning and Planning	Conduct an energy audit that includes	ENRGY-STP1-02	No
40i Energy	Step 1 Learning and Planning	Evaluate strategies for resident educa	ENRGY-STP1-03	Yes
40i Energy	Step 1 Learning and Planning	Find out how tenants in your building	ENRGY-STP1-04	No
40i Energy	Step 1 Learning and Planning	- Automobile share program	ENRGY-STP1-04A	No
40i Energy	Step 1 Learning and Planning	- Bicycle share program	ENRGY-STP1-04B	No
40i Energy	Step 1 Learning and Planning	- Indoor bicycle storage	ENRGY-STP1-04C	No
40i Energy	Step 1 Learning and Planning	- Car pooling	ENRGY-STP1-04D	No
40i Energy	Step 1 Learning and Planning	- Outdoor bicycle racks	ENRGY-STP1-04E	No
40i Energy	Step 1 Learning and Planning	- Incentives for energy efficient vehicle	ENRGY-STP1-04F	No
40i Energy	Step 1 Learning and Planning	Identify walkability issues in the neigh	ENRGY-STP1-05	No
40i Energy	Step 2 Implementation	Create a capital plan for major retrofi	ENRGY-STP2-01	Yes
40i Energy	Step 2 Implementation	Conduct efficiency measures that hav	ENRGY-STP2-02	Yes
40i Energy	Step 2 Implementation	Develop (or update) a building operati	ENRGY-STP2-03	No
40i Energy	Step 2 Implementation	Incorporate checks/measures to ensu	ENRGY-STP2-04	No
40i Energy	Step 2 Implementation	Provide training for management staff	ENRGY-STP2-05	Yes
40i Energy	Step 2 Implementation	Measure/observe/track financial cost	ENRGY-STP2-06	Yes
40i Energy	Step 2 Implementation	Implement a resident education/enge	ENRGY-STP2-07	No

11.0 Utility Savings Potential

The savings potential for the entire database, taken from the summary of the Building Assessment Reports, demonstrates the full savings potential of the 46 buildings used in the targeting analysis. The energy consumption savings projected are based on common best practice. Higher savings could be achieved through employing very high efficiency equipment or building operating practices.

The electricity savings potential as displayed in Table 11.0.a shows a total of 11,474 megawatt hours from the 46 buildings. Nearly a third of the buildings have a reduction potential of over 30% worth over half of the savings potential.

Table 11.0.a: Electricity Savings Potential

Total Savings Potential		
Range	Number of Buildings	Total Electricity (kWh)
Over 30%	15	5,671,835
20% - 30 %	6	2,063,465
10% - 20%	12	2,580,383
Under 10%	13	1,159,014
No savings	0	0
TOTAL:	46	11,474,697

Similar to the electrical savings summary, a large portion of the buildings have a gas savings percentage over 30% and accounts for nearly half of the total potential. The total 2.7 million cubic meters of natural gas savings can be found in the Table 11.0.b below.

Table 11.0.b: Natural Gas Savings Potential

Total Savings Potential			
Range	Number of Buildings	Total Natural Gas (m3)	Equivalent Kilowatt Hours (ekWh)
Over 30%	12	1,261,015	13,051,506
20% - 30 %	8	586,858	6,073,977
10% - 20%	7	522,316	5,405,972
Under 10%	16	350,600	3,628,714
No savings	3	0	0
TOTAL:	46	2,720,789	28,160,170

Contrary to the electricity and gas potential, many apartment buildings have little to no water savings potential. Of the 46 total buildings, 13 (or 28%) of the buildings have less than 10% savings potential. There is also the group with the high savings potential of over 30% which is similar to the previous and accounts for 70% of the total 503,327 cubic meters of water potential. The distribution can be seen in Table 11.0c below.

Table 11.0.c: Water Savings Potential

Total Savings Potential		
Range	Number of Buildings	Total Water (m3)
Over 30%	15	353,247
20% - 30 %	7	87,754
10% - 20%	9	58,216
Under 10%	4	4,110
No savings	11	0
TOTAL:	46	503,327

12.0 Workshop Findings

The Tower Renewal Participant Workshop was held on September 9th, 2013 at the North York Civic Centre. Based on the attendance levels and workshop evaluations, the event was an enormous success and could continue to be a valuable offering from the Tower Renewal Office.

The following agenda formed the content for the workshop:

8:30 - 8:50 am	Sign-in and conversation
8:50 - 9:10 am	Understanding Tower Renewal and what we do
9:10 - 9:55 am	How do your buildings compare to others and what's your target?
9:55 - 10:15 am	Tools that will help you achieve your targets
10:15 - 10:50 am	Case Study on Energy Efficiency
11:00 - 11:35 am	Case Study on Waste Reduction
11:35 - 11:55 am	Case Study on Community Building, Operations & Safety
11:55 - 12:45pm	Lunch & Panel discussion

All participating organizations were invited and the workshop was attended by one or more members from each property management group except two organizations.

Workshop feedback:

A feedback form was distributed to all attendees at the workshop. Some of the reported most interesting features included the case studies, detailed information, and the external benchmarking report. The highest priority areas (of property owners/managers) included energy and waste followed by water and safety with operations being a close split between high and medium and community building more of a medium to low importance option.

The immediate next steps consisted of site-level planning such as a team meeting or reaching out to senior management about priority items. There were also several comments about looking into waste/recycling/organics programs right away.

Another question looked at the ways the City could help the organizations to move forward on improvement actions. Responses included suggestions such as: more workshops, involve senior management, and hear from other sites at the top of the performance graphs.

Overall, with one of the main goals of this program being higher and longer terms of participation rates, not a single property owner/manager responded that they were not interested in further participation. Of those that responded, 76% indicated that they were 'very interested' to continue with the program and the other 24% were 'somewhat interested'.

The following is a summary of the responses:

Number of building owners/managers that responded: 17

Number of building owners/ managers that didn't respond: 5

Number of other event attendees that responded: 5

Q#1 - What did you find most interesting about the workshop?

'The case studies were excellent examples of effective implementation'

'Concise information (to the point, not flowery, not redundant), a variety of topics covered in a very short time; very useful case studies'

'The comparison of our actual buildings to the median (re BPA)'

Q#2 – What areas are your greatest priorities?

Importance Level	Energy	Waste	Water	Community Building	Safety	Operations
High	13	15	10	4	9	8
Medium	4	2	4	8	5	7
Low	0	0	3	5	3	1

Q#3 – What are your immediate next steps?

'A team meeting to identify priorities, budget for implementation, and aim towards low-hanging fruit'

'Discussion with my management regarding our priorities and completing existing projects'

'Implement organics and improve recycling program'

Q#4 – What would be most useful from Tower Renewal Office to help move forward with action?

'These types of workshops are helpful'

'Follow-up and future correspondence to upper management and owners (decision makers)'

'Benchmarking with other similar building and hearing from companies that have more efficient buildings'

Q#5 – How interested are you in continuing with the STEP program?

	# of responses	% of total
Very Interested	13	76%
Somewhat Interested	4	24%
Not Very Interested	0	0%
Total:	17	100%

Additional comments:

'Surprisingly high quality workshop, very useful, excellent use of time, excellent format, looking forward to follow-ups'

'Great session, look forward to participating or even hosting one in the near future. Congratulations!'

'Create a central TR database or discussion board containing all 1200 buildings, sharing anything useful among all participants. The content can be centrally provided and user contributed.'

13.0 Conclusions and Recommendations

- 1) Based on the Energy Performance Assessments conducted for this project, there is the potential for most Toronto apartment buildings to save over 20% of their energy use. In Enerlife's experience, properly applying basic technology and operational improvements (low to no cost measures) will account for a large part of the savings.
- 2) STEP fills a gap in the market by providing a valuable tool for identifying opportunities in individual buildings and working systematically towards achieving improvements
- 3) There is strong interest among participating landlords in continuing with STEP, which would also enable ongoing tracking of the performance and condition of the building stock, as indicated by:
 - The readiness of building owners to contribute their buildings and time
 - The findings from the interviews that there is no comparable source of performance evaluation and support available to Toronto's apartment owners
 - The attendance at and feedback from the workshop where all participants were very or somewhat interested in continuing with STEP
- 4) There is strong interest among utility companies, industry associations and CMHC in working with the city to help with the implementation of STEP
- 5) The focus of ongoing engagement should be on:
 - benchmarking and evaluation so that owners can assess their potential for making improvements and saving money, and
 - delivering specific knowledge about how to access resources and make improvements in individual buildings
- 6) Based on the buildings participating in this project, the condition of the building stock is generally good
- 7) There is a great deal of interest and activity among apartment landlords in tackling energy, water and waste reduction, with the associated operating cost savings
- 8) Most activity relates to specific measures such as low flow toilets and boiler controls. More strategic, comprehensive approaches, including energy targets, energy audits and water audits are less common.

- 9) The usefulness of the STEP Checklists to the three main stakeholders – building owners, site staff, and the Tower Renewal Office – was largely confirmed. For future enhancement of the Checklist, consultation with representative site staff is recommended to help highlight the questions which are particularly useful to them, and the resources they need to help make improvements.
- 10) The majority of owners track energy and water use and costs. Tracking of waste, recycling and organics is less common.
- 11) Consistent, standardized reporting protocols for energy, water and waste would be helpful for scaling up the reach and reliability of STEP, including incorporation of release forms in the Checklists and Toolkit to enable direct data transfer from utility companies and haulers
- 12) Few formal resident engagement and education programs are reported
- 13) Inclusion of the Site Walk-through survey template and database in the STEP process is recommended in order to provide standardized documentation for owners, and to enable the Tower Renewal Office to make connections between the identified conservation potential and building systems, and to track the condition of the building stock over time

14.0 Appendix Contents

- A - Energy STEP Checklist
- A2 – Energy Definitions
- B – Water STEP Checklist
- B2 – Water Definitions
- C – Waste STEP Checklist
- C2 – Waste Definitions
- D – Energy Conservation Measures
- E – Water Conservation Measures
- F – Building Performance Assessment Report
- G – Workshop Evaluation

www.enerlife.com