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Achieving Integrated Street Management in the City of Westminster

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Achieving Integrated Street Management
In the City of Westminster

An Interdisciplinary Qualifying Project
Submitted to the faculty of
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in partial fulfillment of the requirements for the
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Acknowledgements

Abstract

The purpose of "Achieving Integrated Street Management in the City of Westminster" was threefold: firstly to gain an understanding of the current street cleansing system; secondly to recommend improvements to that system; and thirdly to develop reporting specifications that would be useful for implementation in future handheld technology.

Executive Summary

Cities have many diverse departments simultaneously operating; that is why it is important to make sure they all work together. Integration is an important factor in a city's overall success. A lack of teamwork and communication can cause overlapping projects and redundant tasking. This project was completed in conjunction with Westminster City Council to further integrate the city's street management system, specifically concentrating on the cleansing departments. Before the integrated street management initiative, many of the different departments were not aware of what their partnering departments were doing. There were variations between the theory and practice of the agencies' actions which caused a loss of efficiency.

The City of Westminster is centered in the heart of London and is home to many of London's most popular attractions. Because of the tourist driven economy, it is important for the council to see that the city stays safe and attractive for the visitors. In order to do this, the city spends forty-five million pounds each year on the appearance of their streets and parks. With this amount of money involved, it is in the best interest of the council to make sure that it is well spent.

Our first objective was to analyze the policies and procedures of the entities in the department of cleansing in Westminster. First, our group gained an understanding of what the departments and agencies are currently supposed to do. Then, we conducted meetings and went on tours with the different agencies, the results and observations of which are documented as the current workings of the agencies in practice. We summarized this document as flow charts for easier study. The level of complexity including steps and agencies involved in solving just a single issue is clear.

Figure 1 - Sharps, Abandoned Bagged Waste and Graffiti

Our second objective was to evaluate the efficiency of the current street programs using three representative issues, abandoned bagged waste, sharps and graffiti (see figure 1). Only three issues were chosen due to the time constraints of this project. We took the information we had gathered, placed it into flow charts, and analyzed it thoroughly in order to find places of improvement.

The issues that were chosen led us to decide which agencies we would be interviewing and researching. We met with the following city entities: City Guardians, Street Environment Managers (SEMs), Anti-Graffiti and Fly-Posting Unit (AGFU), Closed Circuit Television Center (CCTV), Street Management Center (SMC), Environmental Action Line (EAL) and Onyx (cleansing contractor). We

used all of the above entities in making flowcharts showing each issue until resolution which we double checked with the agencies. We were able to break up each issue by the agency and give a description of what role each had in reporting, responding, resolving or recording the issue. We discovered through this process that each agency can fulfill one four roles: reporting, recording, resolving or recording issues (see figure 2). Some entities even fulfill dual roles: AGFU and SEMs are both reporting and responding agencies.
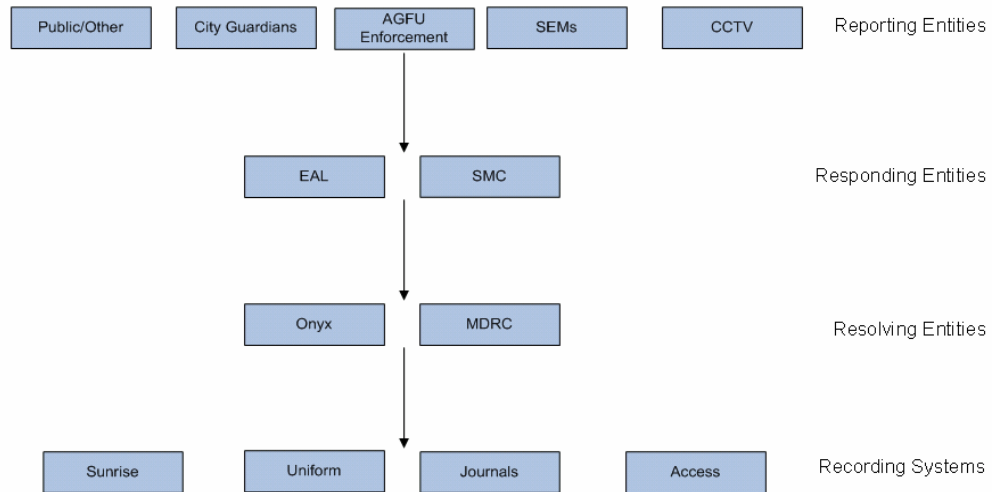

Figure 2 - Broad Outline of Street Cleansing Entities

We analyzed the flow diagrams of how each issue is resolved, and made a note of all the discrepancies or inefficiencies of the current system. Any unnecessary steps and entities are easily identifiable. We honed in on these inefficiencies and recommended changes that would make the system run more smoothly (see figure 3).
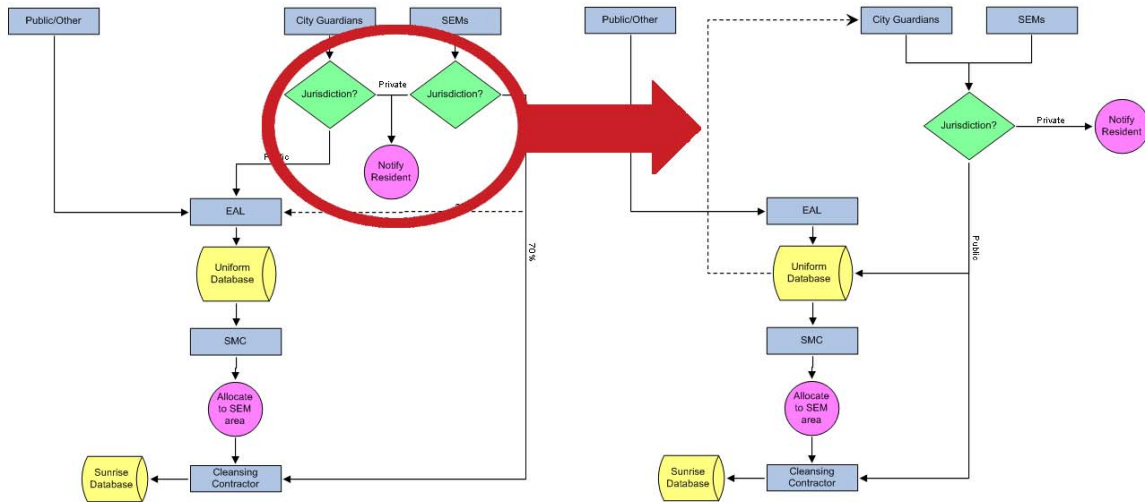
Figure 3 - Sharps Recommendations Flow Chart

In looking at the flowcharts and GIS maps, several of our hypotheses were verified. One case in point was the lack of data capture regarding sharps. For a year, there were only 110 issues reported, while we saw 10 sharps during our evening tour of the West End. Another thing we noticed was the contributions made by each of the reporting agencies. It turns out that the public often contributes around half of the issues reported. The next two most frequent reporters were the SEMs and City Guardians, which was expected. But what we didn't expect was to see that the SEMs often out-reported the City Guardians in the issue of abandoned bagged waste (see figure 4). There are several factors to consider in conjunction with the previous statement: first,

Figure 4 - GIS Map Depicting Abandoned Waste

the City Guardians are on a different reporting system, so all of their reports may not get into the Uniform system. Second, the Guardians often call their local SEM to take care of a waste issue if it needs special attention, since the SEMs have more power and more contacts to get the job done quicker than the Guardians.
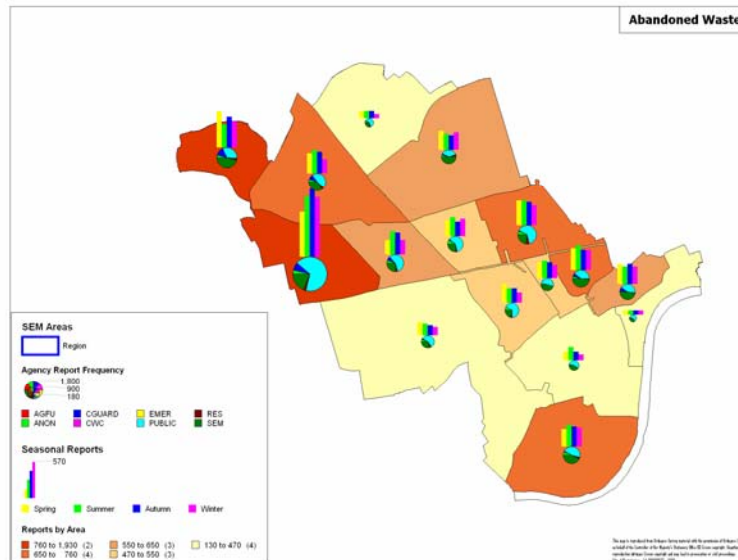
After analyzing the current reporting system, we were left with two items: a detailed analysis of how things work (what information is collected and who it goes to), and some ideas on how to make it work better (with the use of technology). So, we re-worked the flow diagrams to show the flow of each issue if a handheld device was to be implemented (see figure 5). This showed the minimal human contact with the device, as well as the simplified inner workings of the software on the device. The system should be easy-to-use while still gathering all required information.

Along with these flow diagrams, we derived specifications for the device that included not only what the device would be able to do, but also how the user interface should be set up. In addition, detailed analyses of each step of the process, including what parameters were needed for the steps and where the parameters were retrieved. It is this set of specifications that will contribute to the programming of the final device, if the city decides to implement the idea.

Figure 5 - Software Flow Diagram Specifications

Based on these specifications, as well as on the CyberTracker technology (see *Appendix D.2 – Personal Digital Assistants*), we developed a simulation of what the user interface to some future technology may look like (see figure 6). These specifications and screen simulations will help the City of Westminster improve their street cleansing system, thus keeping Westminster safer and cleaner for all to enjoy.

Figure 6 - Screenshots of Handheld Simulation

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1. INTRODUCTION

Urbanization is one of the fastest-growing trends across the globe. In 1950, thirty percent of the world population lived in cities. Fifty years later, that number has grown to forty-seven percent[1]. With a steadily growing urban population, sanitation and safety are of growing concern. Large cities all over the world (see figure 7) are combating these issues with increased budgets and new programs. They spend between 500 million to 1 billion dollars a year on public works alone[2] and design new programs to fight crime and make for a more attractive city.

The city of London is an economic, social, and scholarly capital of the world that deals with the same sanitation and safety issues as other large cities. These issues are a major concern to over seven million full-time residents[4] and approximately thirty million yearly visitors.[5] With London to host the 2012

Size of Urban Population
○ 5 million and over since 1950
● 5 million and over since 2000
◉ 5 million and over in 2015 (projected)
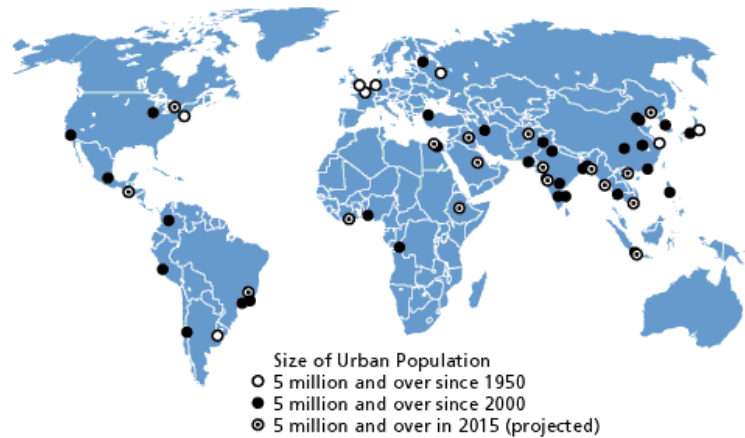
Figure 7 - Major World Cities[3]

Olympic Games, maintaining an attractive and safe atmosphere is of the utmost importance to this beloved and ancient city. However, in the month of September, 2005 alone, over eighty-one thousand crimes were committed in the city. [6] Also, two terrorist attacks occurred in the summer of 2005, where seven hundred people were injured and fifty-two lost their lives in the first of the two on July 7th.[7] With these issues in mind, London is taking further steps towards making the city safer for all.

Despite only having a population of 222,000, the City of Westminster hosts over twenty-eight million visitors a year who flock to visit the Houses of Parliament and many international attractions.[8] Due to the high concentration of important buildings and the large number of people, Westminster is constantly concerned with safety and sanitation. City crews collect seventeen thousand tons of litter

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[1] *Human Population: Fundamentals of Growth Patterns of World Urbanization, 2006*
[2] *The City of New York Adopted Budget Fiscal Year, 2005*
[3] Taken from *Human Population*
[4] *Largest EU City*
[5] *City of Westminster*
[6] *Metropolitan Police Service*
[7] *Overview: What Happened*
[8] *City of Westminster*

from its streets each year[9] and the city spends forty-five million pounds annually on the upkeep of its streets and parks.[10]

There are several agencies that operate in Westminster to help maintain the city. While they all have their specific duties, some overlap in the area of street cleansing. As a result, the city has moved towards integrated street management with the development of a 24-hour Environment Action Line and a Street Management Center. However, because there are many agencies involved, issues are not reported the same way amongst them and responses are not efficiently coordinated.

The goal of this project was threefold. First, we supplied the City of Westminster with a document detailing the current street cleansing system as it relates to three specific cleansing issues: abandoned bagged waste, graffiti, and sharps. Next, we analyzed this information through the use of the documented system explanations and accurate flowcharts, which showed the steps the issue encounters to resolution. This gives the council a better understanding of the complexity involved in solving a single issue and covers our second objective. Thirdly, we produced a method for further integrating their reporting system. This method allows for the development of specifications for reporting a street issue that all agencies can use. The specifications can then be implemented into current and future computer systems and into the various agencies' standard operating procedures.

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[9] *City of Westminster*
[10] *Idem*

2. BACKGROUND

With a population close to that of New York City, London's 7 million citizens experience the same issues with safety and cleanliness. London's officials also have the job of going above and beyond normal standards - not only for its residents, but also for its thirty million visitors.[11] On July 6, 2005, the 2012 Olympics were awarded to London, where the games have not been held since 1948[12]. In hosting the 2012 Olympics, London has become a prime target for terrorists and their attacks. Only one day after the announcement of the location for the 2012 Olympics, 52 people were killed and 700 injured after three explosions rocked London. There were two incidents on underground trains and one on a double-decker bus[13]. An additional five bombs were found exactly two weeks

Figure 8 - Big Ben in Westminster

later on July 21, 2005. A similar procedure was used here: three bombs on underground trains, one on a double-decker bus, and one was also found in a bush[14].

Figure 9 - Memorial

Fortunately, London officials had increased their security after the first attack and found all five devices before anyone was hurt. London also increased security after the NYC attacks on 9/11, which gave their security agencies the power to hold suspected terrorists for a longer period of time, also giving them more access to personal information including bank accounts, email, and phone calls[15]. London also has increased their police department budget in order to keep the city safer. In 2004-2005 the city allotted £2.34B the city raised this by 6% to £2,488.3m in the 2005-2006 year. They also brought the policing staff to 33,750, by adding 229 members of the staff[16].

Overseeing the security agencies and all other aspects of government is the Greater London Authority, GLA. The GLA was created in 1999, to accomplish a more democratic standpoint in controlling all 32 of the boroughs, which still hold the original boundaries as they did when established

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[11] *City of Westminster*
[12] *A Long and Proud Olympic Heritage*
[13] *Overview: What Happened*
[14] *Overview: What Happened*
[15] Shyam Bhatia, *Terrorism Fears Increase in UK*
[16] *The Greater London Authority's Consolidated Budget and Component Budgets for 2005-2006*

in 1965. This democratic attitude called for direct election of both a Mayor and Assembly members whose main jobs are to lead the executive heads of all 32 boroughs of London.

The Mayor sits in an elected administrative position, making executive decisions and setting goals for the rest of the city. Each borough of the City of London is expected to carry out the goals, which are also known as strategies. While each borough may perform the strategies in their own way, they are required to show the Mayor and Assembly how this is being done and evidence of improvement. The Assembly members however, are more in a position of examining decisions rather than making them. The Assembly also investigates issues that are of particular concern to the public. They then publicize their results and can even make suggestions to the Mayor. Much of this type of work is done through investigative committees. The Mayor and Assembly have a checks and balances type of relationship, where the Mayor is in position to make the decisions and the Assembly will question the decisions made. Through this type of relationship, the Mayor and Assembly members are able to work together to form plans for the boroughs that will benefit both the economy of the borough as well as the residents and visitors.

One of the most important boroughs in London is the City of Westminster. While only housing around 220,000 residents, Westminster sees over 28 million visitors a year,[18] which means that nearly 95% of London tourists visit Westminster! The number-one tourist attraction in London is
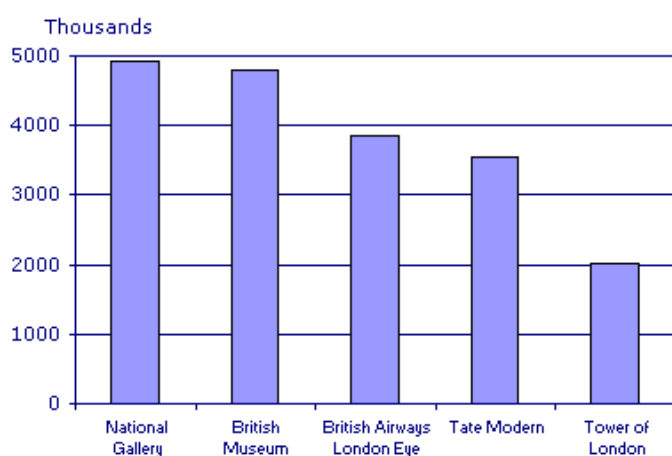
Figure 10 - Visitors to London Attractions[17]

located in Westminster (See figure 10).[19] Famous buildings such as Parliament, Wellington Arch, Buckingham Palace, Westminster Abbey, Leicester Square, Tate Modern and 10 Downing Street are found in this beautiful city. Westminster budgeted £45,232,000 for the upkeep of the city streets and parks in 2005-2006.[20] Nearly 17,000 tons of litter are collected from Westminster streets and per year.[21] The city is also in the developmental stages of a Street Dashboard, which will

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[17] Taken from *Tourism and Leisure*
[18] *City of Westminster*
[19] *Tourism and Leisure*
[20] *City of Westminster*
[21] *Idem*

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provide a real time report of the status of the city's streets and neighborhoods. This is a part of a city-wide process to cross-link departments, providing more efficient city repairs and safety through the use of integrating technology wherever appropriate.

While the members of Westminster City Council are continually trying to improve the efficiency of their integrated street management system, they have already successfully implemented the foundation of the program. Currently, the core management services having a presence on the street are Community Protection, Environment and Leisure, and Transportation. Community Protection is the basis for the City Guardians and the Street Licensing Enforcement Team. Environment and Leisure provides the services needed for all cleansing teams and park authorities. Many types of physical street problems are covered by the Transportation Department, including lighting and the conditions of streets and sidewalks. It is important to realize that an issue can not be resolved by a single department. Each department works together to resolve the issue and takes actions to prevent it from happening again. For example, the City Guardians from the Community Protection Department were originally founded to lessen the fear of crime through a presence in neighborhoods, but are now working with the Environment and Leisure Department to help report physical street issues.

The street management initiative involves some key approaches when dealing with issues. They would first like to focus on the cause of a recurring problem, rather than the immediate resolution. By taking a pro-active approach to an issue, the street management system identifys an origin and attacks the problem before it occurs. This is part of the belief in the "broken window theory" mentioned in *The Tipping Point,* by Malcolm Gladwell. This states that even minor problems such as broken windows, abandoned cars, and graffiti can result in areas becoming more prone to crime[22]. The street management initiative also states that in order for a department to work up to its greatest potential it is necessary to work in conjunction with other departments and agencies. This would create a more efficient reporting system, decreasing the amounts of duplicate reports and ignored issues because information will be shared. In order to be the most efficient, it is also necessary for information from all entities to be captured and stored. With information on file and through the use of GIS mapping, it is easy to spot problem areas or places for improvement.

Along with the approaches outlined by the street management initiative, the council also proposed projects. The establishment of the Street Management Center was one of the first of these projects, which was completed in November of 2005. In the works is a single number and single website that will combine the Environmental Action Line and other agency reporting lines, to create an easier way of reporting street issues. This is planned to be instituted in April of 2006 and will

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[22] *Gladwell*

closely resemble the 311 number implemented in Baltimore, Maryland as discussed in section 2.2.3. The Street Management Dashboard has many phases, the first projected to be completed in September of 2006 and the last in September of 2007.

The realization of completely integrated street management may seem far down the road, however the programs that are currently implemented will help educate the council further in what is working and what is not. During our time here, we discovered where the system is functioning correctly and efficiently, but also helped to uncover issues that should be worked on. This was done through the complete understanding of how the agencies currently work and their collaboration, and the creation of specifications for a more efficient reporting system. The above will help to create the "safe and orderly streets" envisioned by the council.

2.1 Street Issues

Street-related issues are among the top concerns of city beautification. Many departments are established to take care of the streets. For instance, the Anti Graffiti and Fly-Posting Unit (AGFU) may be responsible for graffiti on public roads, while the department of sanitation is responsible for removing litter from the streets. All these street issues fall into categories; those used by the City Guardians use are as follows: Environment, Community, and Crime and Anti-social behavior. Examples of problems are the following:

Category	Examples
Environment	Abandoned vehicles, graffiti, litter, residential waste
Community	Collapsed person, lost property, youth work
Crime and Anti-social Behavior	Begging, drug use and paraphernalia, rough sleepers (homeless)

A full list of the street issues that fall under these categories can be found in *Appendix A – List of Street Issues*.

Each issue within the categories is important for the city to monitor. However, environmental issues are one of the most important because appearance of a city is most likely the first thing you notice upon arrival. A pothole (as seen in figure 11) is just one of the issues that are a nuisance to commuters and pedestrians. In addition, unsightly street problems such as graffiti and litter can turn visitors away. In tourism-driven economies, like that of Westminster, such issues can be potentially detrimental to the city. If a tourist steps out of a taxi and onto a deteriorated, littered sidewalk, that would leave a negative first impression, and as the saying goes, "there's no second chance to make a first impression."

Figure 11 - Fixing Potholes

As said before, London has over thirty million visitors each year and 95% of them visit Westminster. London as a whole receives nine billion pounds from tourist revenue.[23] Therefore, a large portion of Westminster's income is from tourism. If the city does not maintain a healthy and attractive environment, the tourism revenue could diminish significantly. Westminster has made this a priority and has taken extensive measures to ensure the proper maintenance of its streets and parks.

Many cities use websites available to the public to encourage issue reporting. Matrices of the information requested by city for three street issues are found in *Appendix B – Problem Description Matrices*. These show the complexity of the issues and the variations in information required by each city. Too little information is inefficient because further observation by a city employee is needed before repairs can be commenced.

[23] Westminster City Hall

2.2 Street Programs

Since the 1990s, many cities have adopted experimental crime-fighting and street monitoring programs implemented from the ideas of Malcolm Gladwell in his book *The Tipping Point*[25]. Constant monitoring, accountability, and data collection are some of the methods used to achieve cleaner, safer streets. As seen in figure
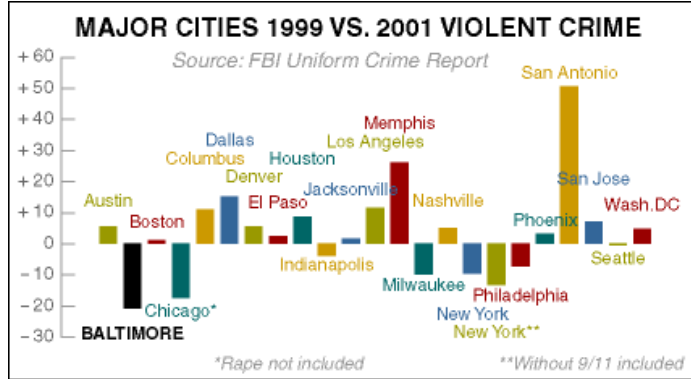
Figure 12 - Major Cities and Violent Crime[24]

12, Baltimore, Chicago, New York and Philadelphia all have significantly reduced violent crime numbers. In the following sections, the city programs responsible for these decreases are discussed.

2.2.1 CompStat in New York City

CompStat is a crime fighting method which originated in New York City in 1994.[27] The former New York Deputy Police Commissioner Jack Maple[28], implemented this system to track crime using a database. It is based on accurate and timely intelligence, effective tactics, rapid deployment of personnel and resources, follow-up, and assessment. Before the introduction of this program, police departments relied on written annual reports and isolated complaints to track city issues, which became an issue itself when dealing with over eight million citizens and over forty-one million
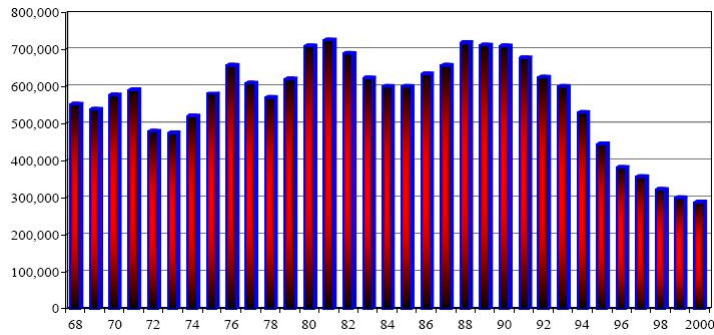
Figure 13 - New York City Yearly Crimes[26]

visitors per year.[29] Now, the officials are able to make decisions based on up-to-date facts produced by each department. At the start of the program, the crime statistics were posted with thumbtacks on a map of the city in order to pinpoint "hotspots". With the evolution of the system and technology, GIS maps were introduced to facilitate tracking.

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[24] Taken from http://www.ci.baltimore.md.us/government/police/ucr020624.html
[25] *Gladwell*
[26] Taken from http://nyc.gov/html/nypd/pdf/pap/cs_success.pdf
[27] *Compstat and CitiStat: Should Worcester Adopt These Management Techniques?*
[28] *Idea of the Week: Computer Mapping for Public Services*
[29] *NYC Statistics*

Since the introduction of the program, the number of total crimes has dropped from over five hundred thousand to under three hundred thousand from 1994 to 2000 as shown in figure 13. The basis of the program is accountability, holding district managers responsible for their response to crime in their area. It allows a clear understanding of the location of crime "hot-spots" which facilitate the proper allocation of resources. At each weekly meeting, presenters are called upon at random so everyone in attendance must be prepared. These meetings with superiors force department heads to notice and react immediately to any surge in crime in their area.
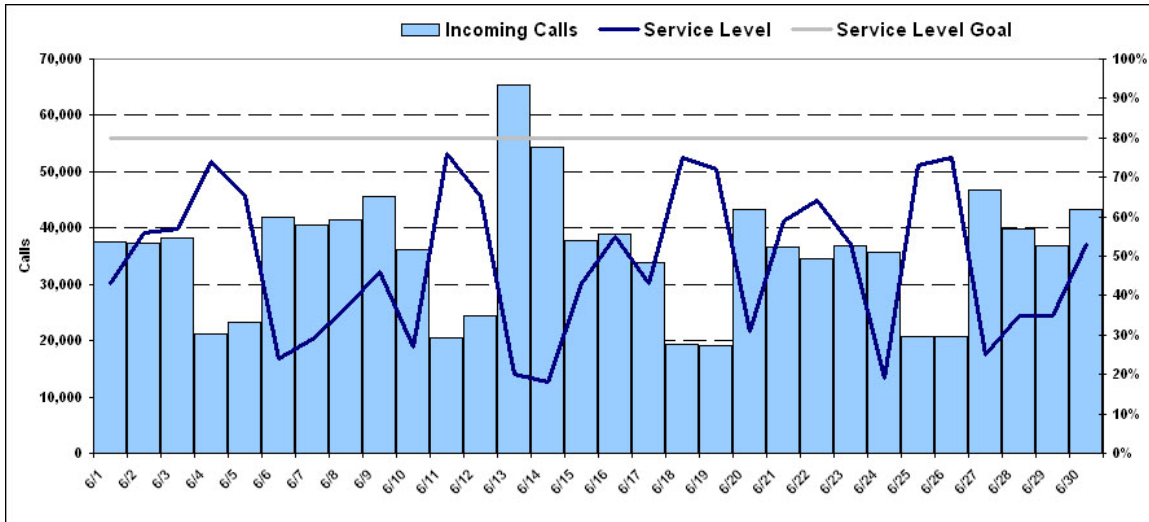
Figure 14 - New York City 311 Call Volume[30]

While New York City has been using technology based programs since 1994 for crime reduction, they have also implemented a system for more effective street repair and improved citizen/government communication. In 2002, Mayor Michael Bloomberg presented the city with a number to call, 311, described as a citizen service center. This single call center is more effective than having multiple centers throughout the city, making for a better program. As seen in figure 14, the call volume often exceeds thirty thousand calls per day. The operators at this center "provide information, take service requests and refer callers to governmental agencies[31]" Also, in order to keep up with the growing technological world, an interactive website for citizens and visitors was created to report issues and keep communication flowing as well.

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[30] Taken from http://www.nyc.gov/html/ops/html/311/311_vol_perf_levels_jun_05.shtml
[31] *How 311 Works*

2.2.2 CAPS and 311 in Chicago

Chicago has two very useful programs to aid in maintaining the safe and beautiful city of almost 3 million citizens[32]: CAPS and 311. CAPS (Chicago Alternative Policing Strategy) was started in 1992 and is headed by Police Superintendent Matt L. Rodriguez[33]. This program allows citizens to act as a neighborhood crime watch to help the police keep a better eye on things. The city is divided into 279 police beats with 8 or 9 officers patrolling each. Officers must patrol the same beat during the same shift for at least a year for the benefits of familiarity.[34]   Through the implementation of this program crime rates have decreased significantly, 16% in the past three years[35]. The future of CAPS is paperless reporting through PDTs (Personal Data

Figure 15 - Officer using a PDT

Terminals, figure 15). This is more efficient and environmentally friendly, and can be used in the patrol officer's vehicle. The data is easily searched and accessible for use in future cases.[36]

The 311 program, instituted in 1999[37], is based on the 911 emergency number. However, instead of reporting emergency situations, citizens can report physical problems. Chicago is working with many other cities to help establish a national 311 hotline. The data obtained through CAPS and 311 is analyzed through a system called ICAM (Information Collection for Automated Mapping). Problem hot spots are identified and shared with police officials so preventative measures can be employed.[38]

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[32] *Top 50 US Cities by Population and Rank*
[33] *What is CAPS?*
[34] *Beat Officers*
[35] *Chicago Law Enforcement Database Cited for Decrease in Crime*
[36] *CAPS at 10: Together With Technology*
[37] *311 Fact Sheet*
[38] *CAPS at 5*

2.2.3 CitiStat in Baltimore

The City of Baltimore, Maryland, expanded the ideas of CompStat in another program also developed by Jack Maple called CitiStat. Mayor Martin O'Malley implemented the program in the city of around six hundred thousand in the year 2000.[39] In April, 2004, the program was given the Innovations in American Government Award and has attracted attention from many US and world cities including Westminster, London. CitiTrak, a 311 call center also available online, is a system that encourages citizens to report many non-emergency city problems such as unwanted animals, potholes, faded street signs, and abandoned vehicles.[40] Motorola, Inc. provided a Customer Service Request
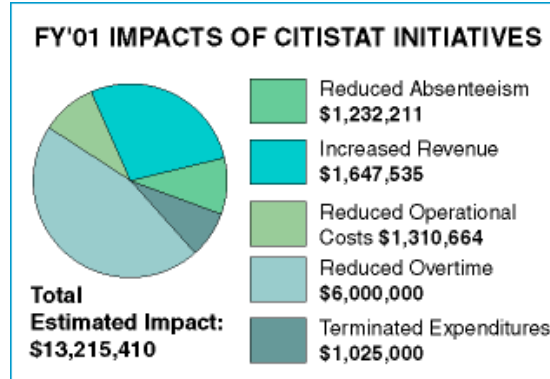
Figure 16 - CitiStat Impact for First Year of Operation

(CSR) system to the city in 2001 in order to process the non-emergency citizen service requests. The program consolidated the 125 to 150 decentralized call-takers into 60 centralized agents, resulting in a significant cost reduction.[41] A 2001 estimate shows that the city has 13 million dollars in cost savings and revenue enhancement as shown in figure 16. Due to CitiStat's accountability system, one major source of cost reduction lies in reduced absenteeism and fewer overtime hours. Other impressive statistics are that employment has increased by ten thousand jobs and violent crime is down twenty-nine percent.[42] In April, 2004, CitiStat reports show that twenty-two percent more abandoned vehicles have been towed and four times as much graffiti has been removed than before the start of the program.[43]

2.2.4 CompStat in Philadelphia

Philadelphia is home to approximately 1.6 million residents. As in any large city, crime is an important statistic to monitor. Since 1998, CompStat has been used to do just that. In addition to the program, the Philadelphia Police Department's website has the capability to accept sanitation and repair reports from citizens online. The reports are sent to the district manager who then sends it to an officer or the repair department for investigation.

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[39] Todd Richissin
[40] Laura Vozzella
[41] Marc L. Songini
[42] *Box 32: Baltimore's CitiStat Programme*
[43] *Baltimore's CitiStat Program*

The GIS maps commonly used in CompStat programs are updated by expert civilians in the Crime Analysis and Mapping Unit that can produce as many as 2,000 maps per week.[44] These maps are mainly based on crime, but also include information on 911 calls along with moving and parking violations. The information is submitted both manually and electronically in a CompStat Process Data Form that is made available to department officials and police district commanders.[45]

Nearly eighty-eight thousand of Philadelphia's citizens live in what is known as Center City Philadelphia. To monitor the daily street issues that arise there, they have established the Center City District (CCD) management team. The CCD maintains a website that allows the public to report various issues that they may come across. CCD also employs community service representatives (CSRs) also known as Ambassadors. The CSRs patrol Center City Philadelphia on foot assisting residents and tourists with any questions they may have. The CSRs also report any code violations they may see to the responsible public agency.[46]

2.3 Street Management in the City of Westminster

Our project has been narrowed down to only deal with the cleansing aspect of Westminster's departments. The four roles that a cleansing agency may take on are the following: to report, respond, resolve, and record as shown in figure 17. We have come to call these the "4 R's". All of the entities have a part in resolving the issue at hand in their own way. It is important for Westminster's cleansing agencies to work together, and therefore, the city has been working towards further improving their integrated street management system.
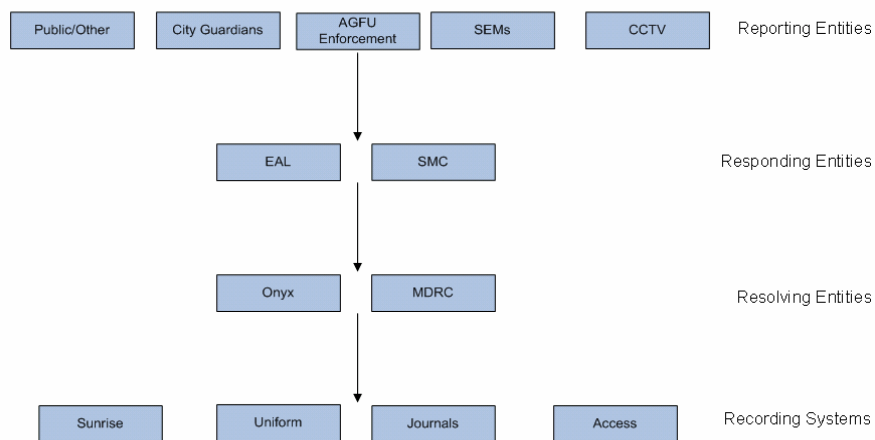
Figure 17 - Broad Outline of Street Cleansing Entities

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[44] *Compstat Process*
[45] *Idem*
[46] *Program Services*

2.3.1 Reporting Entities

Cleansing in Westminster involves partnership of different parts of the council. The City Guardians, Street Environment Managers (SEMs), Closed Circuit Television Center (CCTV), Anti-Graffiti and Fly-Posting Unit (AGFU) Enforcement Officers and the public are the reporters. They are the reporting agencies because they are observing what is happening around them and then report it to a responding agency.

2.3.1.1 City Guardians

The Westminster City Council has also funded programs to maintain safety in the streets. One such example is the City Guardians. The Guardians patrol the streets and parks to create a presence on the streets. They are not, however, deployed throughout the City of Westminster, but are limited to beats that have a higher percentage of anti-social behavior, which are called crime-watch areas. The three main areas in which the Guardians are split up can be seen in figure 18 on the right. The Guardians
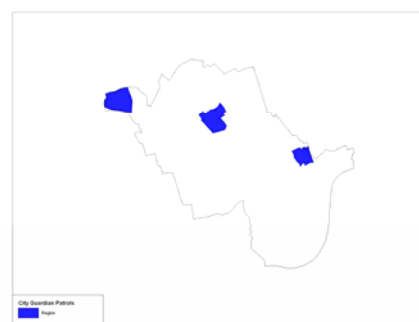
Figure 18 - City Guardian Areas

are assigned to a single beat which they patrol daily in teams of two, over time getting to know the citizens and their concerns. They are required to perform community service to increase their positive presence. A Guardian may visit the elderly or act as role models for young children by doing youth work or coaching a sports team. Another job of the Guardians is to perform environmental audits according to funding and the needs of the community. The results of the audits are analyzed to compare the ward situation over time, making sure problems are being resolved.

Each ward is patrolled by a team of 6-8 individuals and a team leader from 8am – 11pm on average. This team meets every day at 2pm and once per week with city officials. Any issues that could not be resolved during the daily meetings will be moved up to a weekly meeting. If the issue is still not resolved, it will be discussed at the monthly meeting that includes other agencies involved in the crime watch area and top city officials who have the authority to solve the problem. After a 33% increase in staff, there are currently 95 Guardians patrolling 10 wards in Westminster. Strengths of the organization are: diverse staff from different educational backgrounds, knowledge of foreign languages, and familiarity with the street scene. Nine local offices are located throughout Westminster for the workers to take breaks and conduct the meetings. Expectantly, in the future, these offices will be shared with the police to further integrate the agencies in Westminster.

The Guardians are trained for five days on the basics of street issues, how to perform audits, public interaction and how to record data in their notebook and their Microsoft Access database.

Standard operating procedures (SOPs) exist for this program detailing the types of street issues they may encounter, as well as any action to be taken. A six month trial period is required where on the job training is done on the street with another worker or the team leader. Knowledge of the people, environment, collection times, problem areas, and so on are essential to the effectiveness of the Guardian. During the six month trial period they are also expected to attend some additional training classes such as first-aid, rough sleeper training, youth work, etc.

Currently they are equipped with cell phones, high visibility vests, and are continually in contact with many other agencies, as depicted in figure 19, where two Guardians are calling in an environmental issue and recording it in their notebooks. If a Guardian encounters an issue on the street, they may call the Environment Action Line (EAL), highways department, Street Environment Managers (SEMs), Closed Circuit Television (CCTV) Center, or Onyx (street cleansing contractor). For non-emergency issues on the street, their principle contact is the EAL, while for emergencies they contact the police because they have no legal enforcement authority. In addition, they interact with the public to reduce anti-social behavior such as rough sleeping and inform the public of any street dangers. Referral cards are issued to rough sleepers for admittance to

Figure 19- City Guardians

shelters. Members of the public can approach the Guardians on the street for directions, to voice a concern in their neighborhood, or to report a current street issue.

2.3.1.2 Street Environment Managers (SEMs)

A major department concerning the beautification of the city is the Street Environment Management Service. This department divides Westminster into sixteen geographical areas, which can be seen in figure 20 and is responsible for all the streets within those areas. The SEMs carry out over 125,000 street inspections per year.[47] Their system of inspecting sites uses a random sampling method where up to five thousand individual inspections may be made per week and each street is given a

Figure 20 - SEM Areas

grade.[48] The grade scale ranges from an A to a C with an A being a clean, litter free street and a C being a littered street.

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[47] *City of Westminster*
[48] *Idem*

The SEMs were instituted in 1990, with the goal to manage the streets (hence the name). Any City Guardian or Onyx personnel can approach an SEM who can take care of their needs. Just like a manager of a store, the SEMs are the acting authority on the streets, but still report to a higher authority (i.e. the city of Westminster). There are currently 35 SEMs employed, with sixteen on duty during the day, and nine at night.

The training has become more rigorous for new SEMs; however, most of the training still comes from on-the-job experience. They go out for a few weeks with more experienced SEMs, and also take conflict awareness and enforcement-contract management classes. When seminars are available that may help SEMs in the field, they are often attended.

Each SEM is in contact with the Street Management Center, the Metropolitan Police and Onyx via mobile phone. If an SEM needs more information on an incident or person, he need only contact the SMC and they can give him a detailed report of the incident, including all other notes taken on the incident/person by other SEMs, City Guardians, or even other customers. Often, an SEM is dispatched to check up on existing problems. When doing so, they report directly to the SMC to update the issue's status, and they may call the police/Onyx if need be. To report new street issues, the SEMs call the EAL. They may call Onyx directly if an issue requires immediate attention. SEMs may also be in direct contact with the Metropolitan Police and at times even do projects together, as part of the integration process. An example of a project that the Metropolitan Police and an SEM has done together is pictured in figure 21. The picture

Figure 21 - Metro Police and an SEM Hanging Signs

shows them hanging signs together in certain areas of Westminster to deter the riding of bikes on the sidewalk. This involved both departments because it affects public health and safety and a penalty was instituted for those that do not adhere to the law.

2.3.1.3 Closed Circuit Television (CCTV) Center

The CCTV Center is located in the Trocadero, at the heart of Westminster. It serves the city as eyes for the Metropolitan Police, City Guardians and SEMs, keeping a visual on all aspects of the streets for almost three and a half years.

Throughout these years the CCTV Center has been successful in deterring crime from specific problem areas and reducing the fear of crime for the citizens and visitors. In order to be most effective in crime reduction, CCTV Center is in direct contact

Figure 22- Closed Circuit Television Center

with the Metropolitan Police via radios. The police station also can receive a live feed from the CCTV Center when necessary. An example of this is when a crime is taking place and an employee of the CCTV Center has caught it happening. In this case, the police are called and a video of exactly what is happening is sent to the police along with the location. The CCTV Center has also been successful in helping with the upkeep of the City of Westminster's environmental issues by reporting problems that they have seen on the screens to the EAL. A picture of the screens used for observing the streets of Westminster can be found in figure 22.

Currently there are one-hundred thirty hard wired cameras and twenty-five WiFi cameras installed throughout the city, with an affiliation to the CCTV Center. These cameras are mostly located in the West End, due to the intensity of the every day traffic and activity. The aforementioned cameras, however, do not include the thousands of cameras that are installed by businesses and homes for their own protection. The fifteen employees of the CCTV Center have a strenuous and demanding job keeping up with the everyday commotion of the city. They are required to always have four people on duty at one time, during the day and throughout the night. To be sure that the employees are always alert and attentive, there is a mandatory 15 minute break every hour of their shift and an hour meal break. This leaves three employees actively observing the screens and one person on break at all times. When a new employee is hired, they are trained through experience. They watch what other employees are noticing and also look through training manuals that outline what to be looking for. In the future the CCTV Center hopes to implement more WiFi cameras. These cameras are much less expensive compared to the seventeen thousand pounds that they are currently spending on each wired camera.

2.3.1.4 AGFU Enforcement Officers

In order to stay on top of the graffiti that constantly appears, it became evident to the council in 2001 that a separate agency must be established for the sole purpose of reporting and removing graffiti. This agency was called the Anti-Graffiti and Fly-Posting Unit, AGFU. As a part of this new agency, enforcement officers were hired to spot the graffiti on the street. The enforcement officers are the eyes and ears for the teams as they are out on the streets observing, evaluating and reporting this type of anti-social

Figure 23 - Pie Chart of Graffiti Reporting

behavior. They are much like the City Guardians in that they are actively looking for issues to report on the street. However, because they are only focused on graffiti, they are able to report more information. In fact, they report about 90% of the graffiti that is cleared each year.

2.3.1.5 The Public

The public reports the most issues per year because they easily notice any changes or disturbances in their own neighborhoods. Reporting by the public comes in many different forms. By telephone, they directly call the EAL in all cases. They could also come across a City Guardian or SEM in their area and be able to tell them about their complaint and be confident that the information
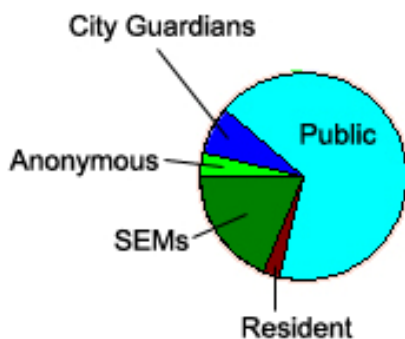
Figure 24 - Pie Chart of Reporting Entities

will be passed along. Currently there is also a website that is set up for the public to use to report issues, which is easily accessed on the City of Westminster website and is directly connected to the council. Faxes and handwritten letters are also used to report complaints or issues.

2.3.2 Responding Entities

The Environment Action Line (EAL) and the Street Management Center (SMC) are the responding agencies. In some cases agencies can play dual roles such as the SEMs and AGFU. They both can report issues, but also do a part in responding, whether it is investigating, or enforcing.

2.3.2.1 The Street Management Center (SMC)

Westminster has developed a central command station as pictured in figure 25, to handle nearly any street based issue reported. The Street Management Center (SMC) project was initiated in July of 2004 and is funded by the Westminster City Council. It is currently staffed with 7 people who manage the flow of information and reports from City Guardians, Street Environment Managers (SEMs), the Environment Action Line (EAL), the cleansing contractor, Onyx and even the

Figure 25 - Street Management Center

Metropolitan Police. The hours of operation are 7:30AM to 11:00PM. These hours correspond with the hours that the Guardians and SEMs patrol. However, if a report is issued while the SMC was closed, the process for responding to a non-emergency issue is the same and the sequence of events will resume in the morning. The City of Westminster can be run from the SMC if need be to ensure business continuity.

The SMC is a monitoring station and does not issue fines. When a problem exists, it is entered onto the Uniform database (which is discussed in *section 2.3.4.1*) where they can red flag the issue in real time, if necessary. The Uniform database is monitored continually during the day and incident reports are allocated to SEMs for investigation, if needed. They can also check to see if an issue has been allocated incorrectly. Other agencies are welcome in to the SMC to look at WiFi images or any other information they may need. This centralization of reporting from the streets will be automated with the development of the Management Dashboard, which allows for easy tracking of the status of Westminster streets and gives the operators the power to intervene and command the street-based staff directly if a problem emerges.[49]

2.3.2.2 Environment Action Line (EAL)

The Environment Action Line (EAL) was established in September 2003, through a contract with the company, Vertex. It was designed as a single phone number that citizens and city agencies can call to report street issues and anti-social behavior. This is the primary reporting method for the City Guardians and SEMs. Today, the EAL is located in downtown Westminster, and deals with almost 150 different street issues. It is open for calling twenty-four hours a day, 365 days a year. There are currently 35 employees working for the EAL. Fifteen are trained to answer phone calls and

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[49] *Integrated Street Management, 3-9*

assist customers during the 8 AM - 6 PM shift. Because of the nature of the call center and its hours of operation, there is another shift called the Out of Hours Solution (OOHS), which cover the hours of 6 PM – 8 AM. Their primary responsibility is to enter reports they receive from citizens, SEMs, City Guardians, or anyone else into the city's Uniform database system. This is the same system the SMC can access, as well as the contractor, Onyx.

Before an issue is officially reported into the Uniform system, the operators must collect certain data and make informed decisions based on that data. For example, the issue may not be explicitly listed in the Uniform system, so they must either find an appropriate category, or decide that the issue is out of the jurisdiction of the EAL, and redirect the customer to the proper department or authority. Also, a duplicate report may come in. The operator must decide whether this report is indeed an exact duplicate, or if it may be a separate issue at the same address. It could also be a repeat offense that same day, just at a different time. Once an issue is reported into Uniform, it is out of their hands.
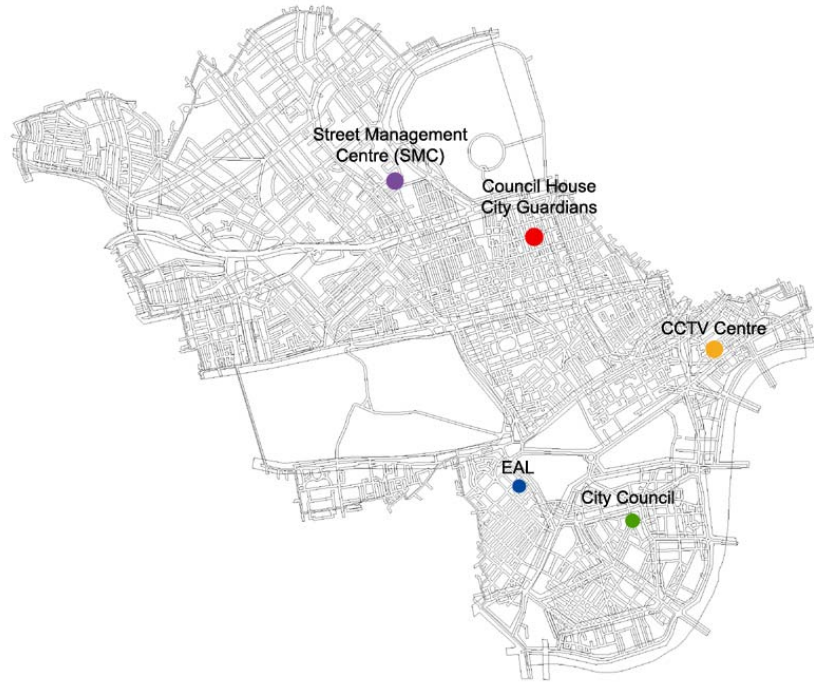
Figure 26 - Locations of Various Agencies Throughout Westminster

The majority of issue reports just go through the EAL and onto the Uniform system, where the SMC has direct access to them. The EAL is kept highly specialized in an effort to keep costs down and maintain a more streamlined approach to resolving the street issues.

2.3.2.3 Anti-Graffiti and Fly-Posting Unit (AGFU)

AGFU is an agency funded by the city for the beautification and of the streets. Founded in July, 2001, as part of the city renewal program, this agency aids in cleaning about four thousand square meters of graffiti per year. Based in City Hall, this agency employs four people who work a regular 37.5 hours per week. AGFU is an agency responsible for assigning work orders, prosecuting offenders, and notifying owners of the problem, not the active team in charge of physically removing the graffiti. One manager, a contract manager and two enforcement officers make up the AGFU

team. The manager is in charge of overseeing the work and aids in prosecution of repeat offenders, while the contract manager does mostly office work while also having a small part in prosecution. The enforcement officers are the eyes for the teams as they are out on the streets observing, evaluating and reporting this type of anti-social behavior. In fact, they report about 90% of the graffiti that is cleared each year. The rest of the reports come directly from the EAL, which receives reports from City Guardians, SEMs, CCTV, or residents.

AGFU receives work orders through Uniform from the EAL and submits them to the correct company. In order to use the prosecution authority that AGFU has been given, it is important to also keep a separate database that describes the tagging and any unique features of the writing or names. This is especially important in the case of an offensive or threatening tag, which is a more serious crime. A database has been created so that an AGFU employee can enter pictures, names and writing styles in order to build a case against a perpetrator for when they are later caught. Another way of deterring the acts of graffiti and also tracking where the enforcement officers will be most efficiently used is through the process of hot spot mapping. This type of mapping shows AGFU, as well as the council, where the problems have increased, decreased or how effective this agency really is.

Like most other agencies within the council, the training is done through on the job training with experienced workers and attending informational classes. The classes are focused toward the enforcement officers who must know how to report graffiti effectively. Future expansion of the agency is not something that would be considered unless the problem in Westminster broadened. As graffiti and fly posting incidents decrease in number, so would the funding making it impossible to expand. Currently, graffiti is not considered a significant problem within the City of Westminster because overall, graffiti is removed promptly before excessive accumulation.

2.3.3 Resolving Entities

The resolving agencies are Onyx (cleansing contractor) and the Municipal District Repair Company, MDRC, the graffiti removal contractor). Each of the contractors are in charge of completing the work order and overall resolving the problem.

2.3.3.1 Cleansing Contractor (Onyx)

In order to keep up with the reports that are submitted by the City Guardians, CCTV center and SEMs, the Westminster City Council has subcontracted a company called Onyx. They have

Figure 27- Onyx Street Cleaner and Equipment

worked to keep the city cleaner for almost seventeen years, renewing the contract three times. For operational purposes, Onyx is split into two groups, North and South, each covering half of the city. To maintain the high number of work orders that Onyx deals with everyday, they recently expanded their staff and added new equipment, like that which is shown in figure 27. They currently employ more than 700 personnel including area managers, environment manager, foremen, beat sweepers and drivers. The area managers and environment managers are in charge of the total processes involved in the cleansing system, while foremen are the supervisors for the beat sweepers and drivers.

Most of the foremen and supervisors have been with Onyx for many years and have worked their way to their current position. It is a job that you learn through experience; hence the training is mostly through being paired with an experienced employee. In addition, there is also a two day induction course, using videos to teach proper techniques for lifting and driving. The foremen are also trained on Sunrise, which is Onyx's database. A report comes into Uniform, is transmitted to Sunrise and finally is emailed to a supervisor's Blackberry mobile device. The job is then sent out through radio to one of the staff and when finished, sent back into Sunrise. However, Sunrise is not capable of transmitting data back into Uniform and the updates must be done manually back into Uniform for completion. This type of work is checked on by the council through weekly reports that are sent out. If there are problems that are not resolved through the weekly meetings, they are brought up in the monthly meetings and dealt with by the area supervisors and council administrators.

Sweepers and drivers make up the main crew that go out and perform street cleansing. Sweepers are a 24-hour crew and are assigned jobs to do at the beginning of their shift - either general cleaning or specific allocated jobs. Each day the sweepers will work an eight hour shift in one of the fifteen beats, going out on the streets at least twice for about two hours at a time, breaking for tea twice and lunch once. When out for the first time, the sweepers do a general clean up of their own beat. The second trip out is always more thorough, cleaning areas that they know carry the most litter

and debris. The drivers are in charge of operating the street sweep machinery and specific clean up jobs that require the spraying attachment, such as dog fouling, human waste or staining on the sidewalks. These drivers also have this same regimen, unless they are assigned a specific job. However, the drivers have a radio that is used when a job has been allocated to that driver from headquarters. The foremen check up on the work being done in the streets and are in charge of carrying the radio that is used to transmit jobs to be allocated to the sweepers and drivers. They are in direct contact with the SEMs and work hand in hand with them for the beautification of the city.

2.3.3.2 Graffiti Contractor (MDRC)

The Municipal District Repair Company is the subcontracted company hired by the council to specifically deal with graffiti. The only Westminster agency in contact with MDRC is AGFU. MDRC is in charge of removing graffiti from most of the public areas throughout Westminster. They however, do not cover waste bins, or property owned by Transport for London (TFL), Royal Mail, and British Telecom. They are given 10 days to resolve the issue after AGFU contacts them, but only 12 hours if the graffiti is considered offensive and tagged critical. If the situation does arise that a tag is considered offensive or threatening, AGFU will contact MDRC immediately rather than call any of the other agencies involved.

2.3.4 Recording Systems

The data is recorded in Uniform, the City of Westminster's database, and tracked through completion. Sunrise is the database used by the cleansing contractor to track work done on their end of the resolution process. The City Guardians first record all observations and actions in a paper notebook on the street and then it is later transferred to an informational Access database.

2.3.4.1 Uniform Database

The central database where all the reports and work orders are stored is the Uniform system. It runs on an Oracle server (located in the City Council building), created and maintained by dedicated council staff. A screen shot of the opening screen can be seen in figure 28. It has a few different points of access: one is Uniform Web, where anyone on the Westminster City Council Intranet (with proper access) can view the Uniform system via a web browser. The second is direct access to the Uniform system via a terminal at the SMC or the EAL. Alternatively, members of the GIS and data analysis teams have direct access to the server on which Uniform is run.

Besides capturing all the information about an issue, Uniform is also capable of determining the location on a GIS layer and which SEM area it is in. The Uniform database has hundreds of linked tables, so virtually any information on an issue can be found. This database is useful to the GIS team and data
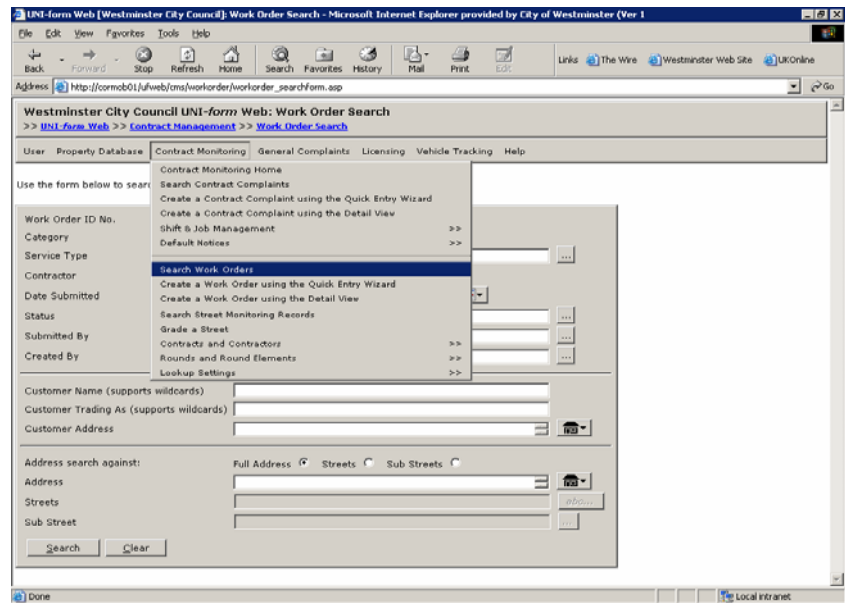
Figure 28 - Screen Shot of Uniform Database

analysis team for creating reports that are seen by the council and the public. These reports are evidence of exactly what the city is doing to keep the streets clean. Also, city officials can use the informative reports to better allocate resources to where the problem areas are.

GPS has recently been implemented in Uniform. The dust carts are GPS-equipped and their current position, as well as past positions can be seen from the Uniform terminal in the SMC. A screen shot is shown below in figure 29 of the "snail trail," which is a trace of a dust cart and where it has been. The SMC operators can see if the carts are on schedule, and if they have made their scheduled rounds. This is a feature that has worked successfully with the dust carts, and may be implemented in the future with other agencies.
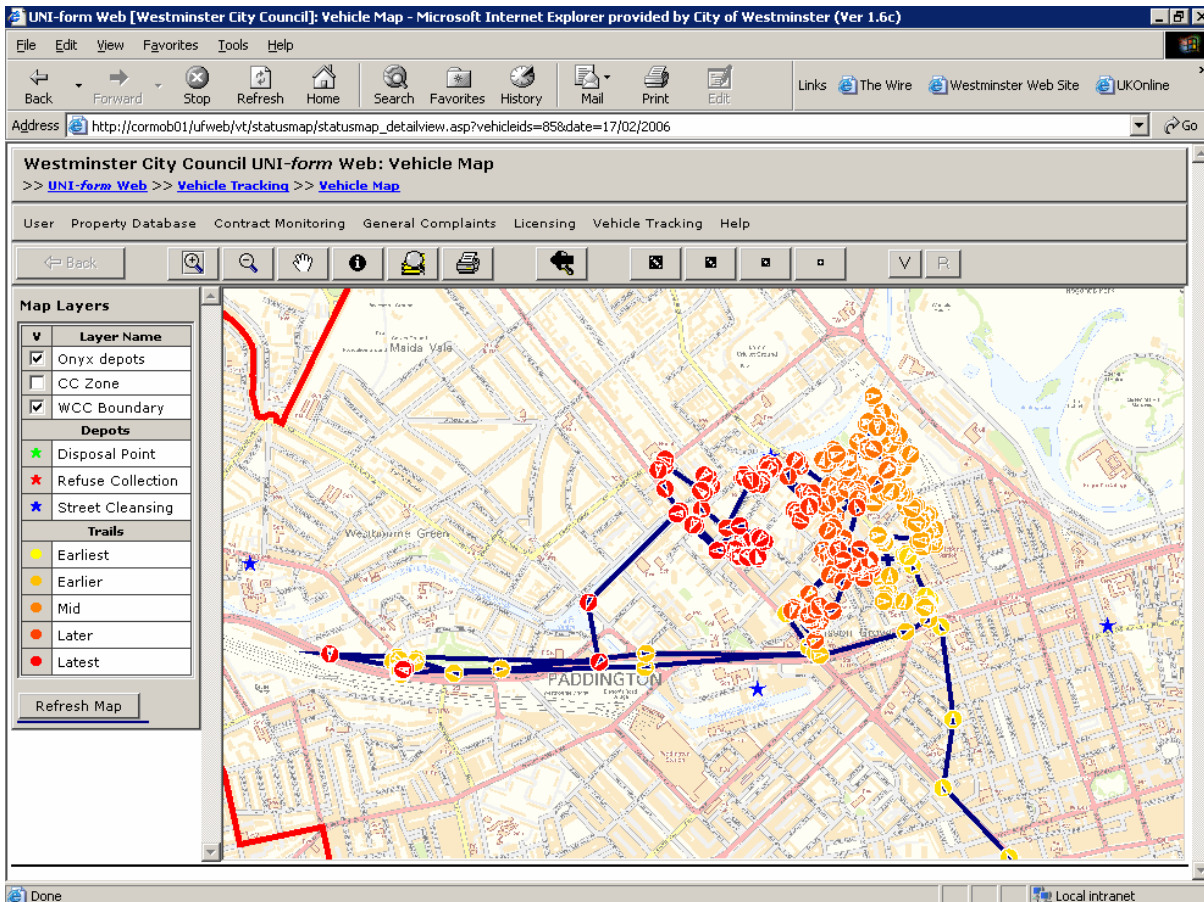
Figure 29 - Screen Shot of GPS Trace

2.3.4.2 Sunrise Database

The cleansing contractor, Onyx, uses an active database called Sunrise to manage the work orders and store information. This is separate from Uniform and maintained by Onyx employees. When jobs are allocated to Onyx through Uniform, they are automatically added to the Sunrise database. However, when the Sunrise database is updated to reflect Onyx's work, the Uniform database is not updated. When an issue is completed by Onyx, an Onyx worker must update the Uniform database manually. The issue status will then be: "completed by contractor." The SMC may then send out an SEM to verify the work has been done, or just might close the issue without checking first. The contractor does produce monthly reports of its activities such as type and number of jobs completed and, for example, the number of needles found by the street workers. Although the Westminster City Council does not access this database, the informational reports are used in city statistics.

2.3.4.3 Guardian Notebooks

The City Guardians capture information by recording all street activities in a small, paper notebook, an example can be seen in figure 30. Each Guardian has their own notebook which they carry with them every day. Each day's entry begins with the date and time shift started written in pen. Throughout the day they include notes about meetings, audits, breaks, name of patrol teammates, etc. They are required to report the names of all streets patrolled each day and any observations, or actions taken. If an estate, resident, or business requests a Guardian's presence or asks for an investigative patrol, the notebook provides the official documentation that these patrols were performed as well as the outcomes. The notebooks are important in the current system because they allow the Guardian to record the information as it happens on the
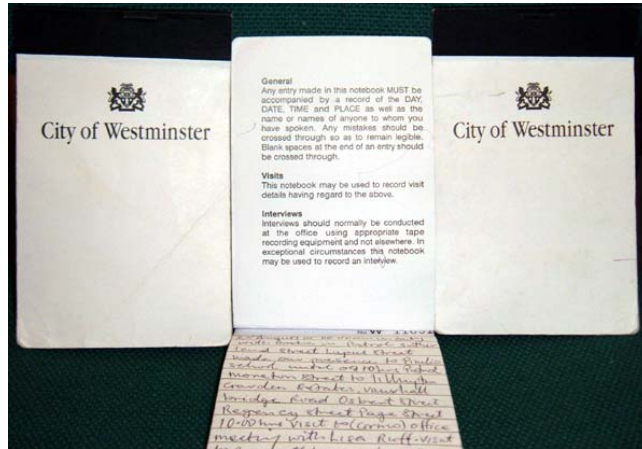
Figure 30 - Picture of City Guardian Notebooks

street. If they were to wait until returning to the office, information may be lost or forgotten. For example, if a street issue is reported to the EAL, at that moment they will record the date, time, and location of the incident as well as an issue reference number provided by the call center for follow up. The notebook also provides evidence regarding the City Guardian activities and interactions with the community. If their activity level or effectiveness is ever called into question, the notebooks serve as their primary recorded defense.

2.3.4.4 Access Database

At the end of each shift, the City Guardian will enter all information written in their notebooks into an informational Access database (figure 31). The database is not sorted well and all of the information from the notebooks may not be recorded here, but it serves as a quick reference to Guardian activities throughout the City of Westminster. If the notebooks were ever lost or damaged, the information would not be lost because of the Access database.

Figure 31 - City Guardian Access Database

3. METHODOLOGY

This project had three goals. First, we supplied the City of Westminster with documents detailing the current street cleansing system as it related to three specific cleansing issues: abandoned bagged waste, graffiti and sharps[50]. Second, we identified any room for improvement in the system and then combined these two goals to produce our third goal: specifications for reporting a street issue.

Our work on this project took place from January 8th to February 24th in the city of Westminster. The city can use our methodology to develop specifications for every street issue that would later lead to the development of reporting software. The methodology will be realized by using the following steps:

1. To analyze the policies and procedures of Westminster's Integrated Street program;
2. To evaluate the efficiency of the current street programs using three representative issues;
3. To develop reporting specifications for each of the three issues.

3.1 Analyzing Policies and Procedures

There are over one hundred street issues that the City of Westminster deals with on a daily basis. Because of the time constraint, we have decided to focus on three of the most common and diverse issues. Abandoned bagged waste is one of the most reported street problems and can involve several agencies. We chose graffiti because it can be found practically anywhere and thus *where* it is found affects the response. Sharps are a significant problem in the West End and pose a potential threat to the health and safety of the public. The agencies that deal with these issues include the CCTV center, City Guardians, the EAL, Onyx, SEMs and the SMC. We compared how each agency deals with the three issues in theory and practice and this comparison revealed the areas in need of improvement.

3.1.1 Analyzing Policies

First, we determined how the system of reporting street issues operates according to official documents found within the Westminster City Council. We reviewed a series of papers provided by Martin Whittles detailing the current state and future plans of the City Guardians, SEMs, AGFU, CCTV Center, Onyx, EAL and the SMC. These helped us to understand the roles of the agencies directly involved with the

Figure 32 - WiFi Camera

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[50] Includes needles, broken glass, and any other potentially harmful objects

aforementioned issues. Elizabeth Hughes of the City Council provided us with a paper on WiFi in London. This detailed the present and future wireless capabilities of devices that could be used on the street, an example of such a WiFi camera can be seen in figure 32. Although we did not focus on the hardware selection for this project, it gave us an idea of what the possibilities are for the future of the system. After reviewing the above documents we produced a summary, complete with flow diagrams, to demonstrate how each agency connects to the other agencies, the responsibilities of each, and where overlap occurs while dealing with the three issues.

3.1.2 Analyzing Procedures

We visited each of the aforementioned agencies and asked them a series of questions concerning each of the three issues to determine how each agency deals with them. The questions were generic enough to apply to all three issues while the information obtained was specific to the agency. The list of questions we used is as follows:

- Do you report the location?
    - Does the location affect to whom you report?
    - Does the location affect if you report it at all?
- What characteristics do you look for?
- Do you consider the history of the incident?
    - Does the history affect to whom you report?
- What other factors do you consider?
    - What actions do you take based on those factors?
    - How do you obtain necessary information about factors?
- How long is the issue in your jurisdiction?

When we visited these agencies we also inquired as to their general operations, history and future. This gave us an understanding of how they work and their role in the city. The information we obtained is as follows:

- Brief overview
    - How it came about
    - Funding
    - Number of employees
    - Hours of operation
    - Locations
    - Future plans
    - Interaction with other agencies
- Description of jobs
    - Hierarchy of positions
        - Internal and external
    - Resource allocation
    - Training
    - Standard Operating Procedures
- Equipment

o   Storing and sharing of information
- Typical work day.

3.2 Evaluating the Efficiency of the Current Programs

We have already fully documented the process of how a particular issue is reported by the various groups and have talked with everyone who is involved in the entire process. We would like each agency to have the proper information at the right time in order to make an informed decision with regards to the issue, thus saving the city time and money.

The first step to this objective was to create detailed flowcharts. They showed every agency involved and their links to other agencies. These flowcharts also followed the issue from start to finish in detail, so we could understand where more information may be needed. The flowcharts were perfected over time by continually showing them to the agencies involved. Once every agency felt that their section in the flowchart was 100% accurate, we moved on to analyzing them.

We used the flowcharts as our guide to identify the inefficiencies. The first thing we looked for was overlapping reporting. Overlapping reporting is a waste of time and money and proves to be ineffective due to the unnecessary duplicate reports entered into the Uniform system. We then began to look for other issues such as unnecessary liaisons, and lack of capturing the report. These became apparent as we looked into the flowcharts and used the results from our first objective.

3.3 Developing Reporting Specifications

In our brief time here, we were only able to research three street issues: abandoned bagged waste, graffiti and sharps. It was necessary that someone else be able to re-trace our steps and determine similar specifications for the other hundred-or-so street issues. Our first two objectives were mainly the outlines to achieving our third objective. Therefore, we feel that if one is to follow the steps that the objectives outline, they will be able to produce specifications for all of the street issues.

Not all information will be vital at every step of the process, so we considered *when* the information will come into play. For example, a Guardian will not have to necessarily know if an issue is a repeat offender because a Guardian is too busy reporting multiple issues to look deeply into each one. In addition, the Guardians do not have the power to issue a citation to a repeat offender. However, based on key information given by the Guardian, someone else can look more deeply into the problem and issue a fine if necessary.

We considered information for street workers that would be helpful to have at the touch of a button. This information included basic items such as collection times and SOPs, but also went so far as to be able to pull up a site history on a location. This would allow the street worker to be warned of any potential dangers that may be on record or to see if the culprit is a repeat offender. This

information would also be helpful in eliminating duplicate reports as we will see later. Each issue had many specifications so, in order to write them clearly, we consulted Dave Pettitt, who works in Westminster's IT department.

We were advised to write the specifications in a mixed format. A flowchart was made that followed the same basic format of our issue-based flow diagrams. Then we created a simulated reporting screen that could work with any current technology. This displayed the basic buttons that one would have to follow to submit a report. Examples of a screen simulation are displayed below in figure 33. However, it was also important to display the inner workings of the system as well. Therefore, we included a table that explained, in text, what each button on the front display did. This entire process is not easily understood without the explanation provided. This type of explanation was exactly what we wrote in the tables.

Figure 33 - Examples of Screen Simulation

4. RESULTS

There are around 150 different types of cleansing issues that are entered into the Uniform database. Due to time constraints here in London, our team will not be able to evaluate each issue. It was important for us to choose issues that were representative of other issues and also unique in their own ways. We chose the following three issues:

1. Abandoned bagged waste;
2. Graffiti;
3. Sharps.

Each issue involves agencies that the other may not but also have some common reporting procedures. In the following section, we will describe what happens from the time the issue is discovered to the time that it is resolved.

4.1 Abandoned bagged waste

Bagged waste that has been left out on the street is one of the most frequently found and reported issues within Westminster. However, it seems to be one of the most complicated issues as well, due to the many factors that one must consider when reporting. Because it is a very common problem and because of the complications involved, we thought that it would be a good choice to reveal any inefficiencies or places for improvements.

4.1.1 City Guardians

When a City Guardian finds abandoned bagged waste while they are walking their beats, the first thing they may look for is the jurisdiction, whether it is on public or private property. If it is found to be on private land, the only thing that can be done is inform the appropriate resident or business unless the waste is a health and safety issue. However, if it is on public property (such as by the road and out for collection), then the next thing they will do is determine if it should be there. In order to determine this, the Guardian must know the local rubbish collection time. Often, the collection time is posted on a nearby lamppost, as seen in figure 34, but in some cases it is not. Guardians are encouraged to learn the collection times by street so they do not waste time patrolling areas for rubbish until it is necessary. Bagged waste is not

Figure 34 - Posted Collection Time

allowed to be out earlier than half an hour before collection time. If it is out before collection time, the Guardian will alert the resident that it is out too soon and to mind the collection time. If the rubbish is out past the collection time, the Guardian must determine if there was a missed collection, an early collection, or the resident put the bags out after the collection.
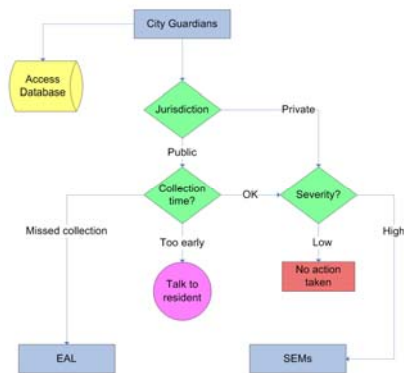
Figure 35 - City Guardians Bagged Waste Flow Diagram

If all waste is still out on the whole street, then there was obviously a problem with the collection (either too early or too late). In this case, the Guardian would call the EAL to relay the information and it would be out of the Guardian's hands. However, if they come around much later in the day and find the problem unresolved, they must report it either to the EAL or the local SEM, detailing the situation.

The next characteristic a Guardian will look for is if the abandoned waste is a recurring problem at the particular location. The only way a Guardian can know this is by either thumbing through their notebooks or simply remembering that this happened here before. If the repeat offense seems worthy of inspection, the Guardian will mention that it is a recurring event when on the line with the EAL, who will then allocate it to a SEM on Uniform. Alternatively, the Guardian can call the SEM directly.

The last factor the Guardians will consider, though it is often the first they notice, is the characteristics of the waste. Regardless of the jurisdiction, if the waste is overbearing foul odor, or poses a health or safety hazard, then it is of high importance and the Guardian may call the local SEM directly so they can check the situation.

4.1.2 SEMs

The SEMs, for the most part, only encounter abandoned bagged waste when a Guardian or the SMC alerts them of a special case. They are usually inspecting the waste for one of two reasons: a repeat offense that needs attention, or characteristics that make the waste a high priority.

In the first case, the SEM will start the investigation by visually inspecting the waste, to see if there are any identifying marks that would indicate to whom the waste belongs. However, if they can not find any identifier, an SEM will not hesitate to open the bag and search through for mailing labels, business cards, and the like, to determine the owner, as shown in figure 36. Finding evidence of the owner is important, as it allows the SEM to approach the owner directly to notify them of their folly. In many instances, a

Figure 36 - SEM Investigating Abandoned Waste

business has exceeded the limit of their allotted waste bin and has placed their waste on public property for someone else to take care of. This is an offense punishable by a fine, which the SEMs are able to issue.
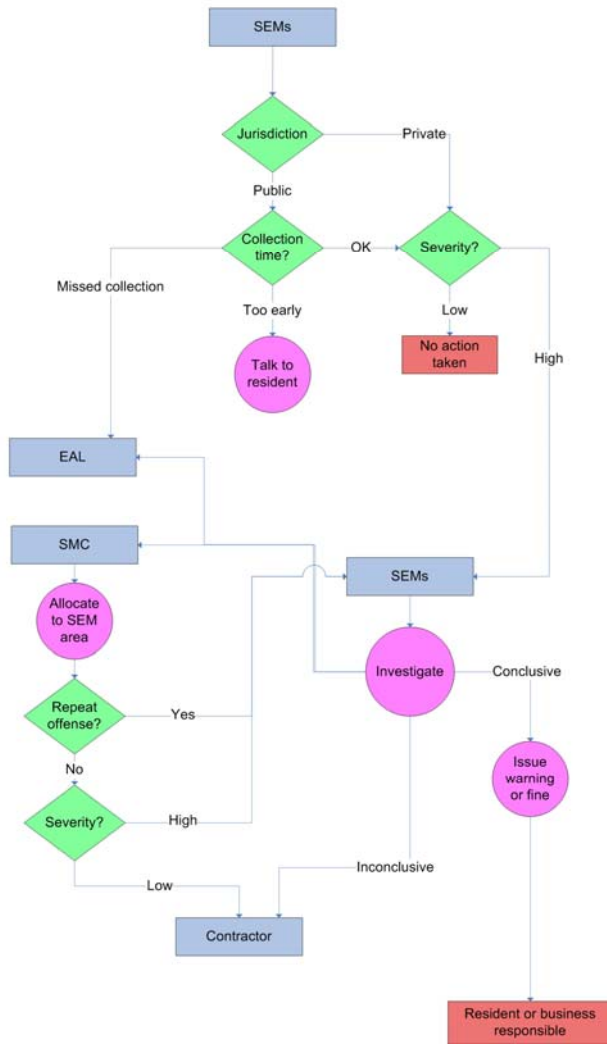
Figure 37 - SEM Abandoned Waste Flow Diagram

In the second case, the SEM can quickly determine what characteristic(s) of the waste makes it high priority and can call the proper authority. In most cases, the SEM will call the local Onyx depot and alert them of the situation (smelly garbage, or toxic garbage that needs to be collected immediately). In every case, the SEM will also try to determine to whom the waste belongs, so as to alert them about proper waste disposal. If, for instance, the bags were leaking, the SEM would tell the owner they would have to double-bag it, avoiding a call to Onyx, or they could call in Onyx to pick up the rubbish at the owner's expense. Some fines or warnings may be issued, so as to deter the offender from further incident.

4.1.3 EAL

While the EAL has only the job of collecting the information from the caller, there is one decision they must make concerning how the incident report is filed. If it appears to be a standard report, then it is submitted and allocated to the proper SEM ward for checking, and simultaneously allocated directly to Onyx to be taken care of. However, if the incident needs special attention, then the operator can submit the report unallocated, thus flagging it for review at the SMC.

4.1.4 SMC

When the SMC notices an unallocated report, the operator will then view the report details to make an informed decision. For example, if the report is of smelly waste, the operator at the SMC could either allocate it to an SEM, directly to Onyx, or both.

4.1.5 Onyx

The job of Onyx is simply to remove the abandoned waste. There is no set time for them to complete this type of job. However, if they take too long, someone (be it an SEM, Guardian or the public) is more likely to report the issue again, thus creating duplications.

Figure 38 - SMC Abandoned Waste Flow Diagram

4.1.6 CCTV Center

When an operator at the CCTV Center spots abandoned bagged waste, he first would look up the collection time in a binder with all the local collection times. A drawback, however, is if there had been a problem with collection times and Onyx had posted this on the Bulletin Board, the CCTV operator would have no access to the information. This type of situation would most likely be caught by an EAL operator because they have access to the Bulletin Board. However, if the message had been overlooked, the problem would get all the way to the SMC before being caught. If the CCTV Center operator sees that the abandoned waste is not supposed to be there, then they would call the EAL to report it.

Below, in

figure 39, we created a detailed flowchart depicting how the issue of abandoned bagged waste is handled from start to finish. You can see all the major players, the key things they look for and when they come into play. It is by analyzing these charts that we began to make recommendations and specifications for a better system.

Abandoned Bagged Waste

CCTV | Public/Other | City Guardians | SEMs

Notebook

Access Database

Jurisdiction → Private

Public

Collection time? — OK → Severity?

Missed collection

Too early

Talk to resident

Low → No action taken

High

EAL

Investigative Results

Uniform database

SMC

SEMs — Investigate

Allocate to SEM area

Missed collection or emergency

Repeat offense? — Yes

No

Conclusive

Severity? — High

Issue warning or fine

Low

Inconclusive

Contractor — Sunrise Database

Issue resolved

Resident or business responsible

Figure 39 - Abandoned Waste Flowchart

36

4.2 Graffiti

Graffiti is an anti-social issue that should be taken care of immediately due to the negative affect it has on the appearance of the city. Westminster is a tourist driven borough, which makes appearance a critically important issue. Also, there can be two kinds of graffiti, one that is just a nuisance, the other, an offensive type of graffiti which can be hurtful to people or make them feel uncomfortable. Neither should be accepted, which is why Westminster has allocated a unique people to deal with the issues, Anti-Graffiti and Fly-posting Unit.

4.2.1 City Guardians, SEMs and the public

City Guardians monitor the graffiti where they patrol every day. In addition, two AGFU employees also report graffiti from the street. An SEM may notice new graffiti but it is not their primary responsibility to report inoffensive graffiti especially if a team of City Guardians patrol the same area. The Guardians make note of the number of tags in an area each day. If a new tag is discovered, the Guardian or SEM first observes the message to determine whether it is offensive and to see if they can identify the artist. An offensive message may be negative with respect to race, sexual preference, religion, sex, or in some other fashion inappropriate. Also, it is noted whether the graffiti is on a public or private surface. Regardless of location, if the graffiti is offensive a call is made directly to the AGFU employees in the Westminster City Hall. This ensures that the problem will be quickly identified and can be called immediately for removal by the graffiti contractor, MDRC. Contrasting the 10 days normally allowed for the removal of reported graffiti, offensive or threatening tags must be removed within 12 hours of the creation of the work order.

If the graffiti is on a privately owned building, the Guardian or SEM will attempt to notify the owner of the situation and strongly encourage them to have the tag removed. If they can not contact the owner, the MDRC will in most cases be called for removal of this graffiti. Regardless, all graffiti is reported to the EAL for removal unless otherwise stated when it is an emergency. An operator at the EAL inquires about the location, size, surface and nature of the tag and enters it into the Uniform database. It is important to identify the type of surface tagged for cleaning purposes.

4.2.2 Anti-Graffiti and Fly-Posting Unit

AGFU actively searches through Uniform looking for new cases of graffiti, then an employee reviews the details and makes an informed decision about who to contact regarding the incident and then creates a work order. If the tagged property is on an item that is considered to be owned by a private contractor, AGFU will call them directly. For example, a bus stop cover is the responsibility of Transport for London (TFL), a phone box is under the coverage of British Telecom and a post box is

covered by Royal Mail. Onyx, which is the cleansing contractor for the City of Westminster, is only responsible for the removal of tags on waste bins. They use a black spray paint to cover any marks. Since electrical boxes are a hot item for tagging, most are coated with a protective, anti-graffiti material. AGFU assumes responsibility for any graffiti that is applied to the box, despite the protective coating. If any graffiti needs to be cleared, they send a work order to the MDRC, which is contracted by the City of Westminster. After the job in completed, AGFU is also responsible for closing the report within Uniform and updating the system on the current status.
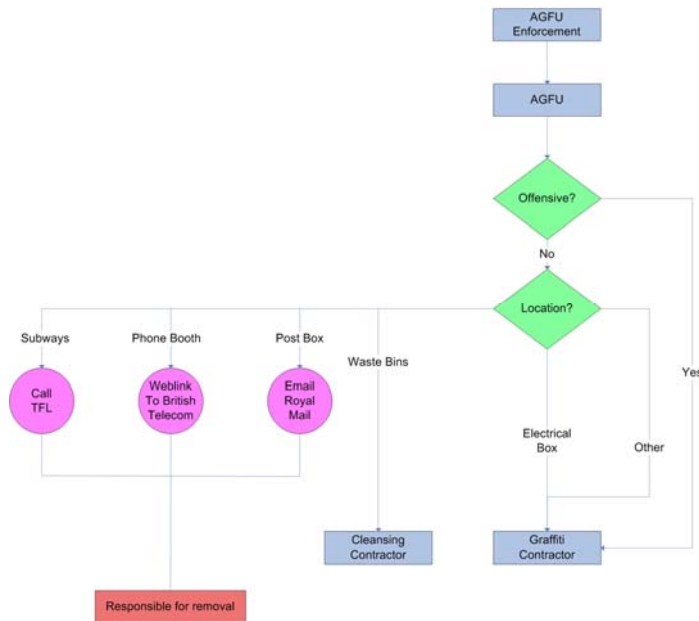
Figure 40 - AGFU Graffiti Flow Diagram

The flow diagram for the resolution of graffiti can be seen below in figure 41. It clearly depicts what the acting entities currently do to remedy the graffiti issue in Westminster. This will be very helpful in determining specifications for this issue that can be later used in handheld technology. And because graffiti issues have only been entered into Uniform since the start of the year, and there will not be sufficient information to map, this chart is the primary source for making recommendations.

Graffiti
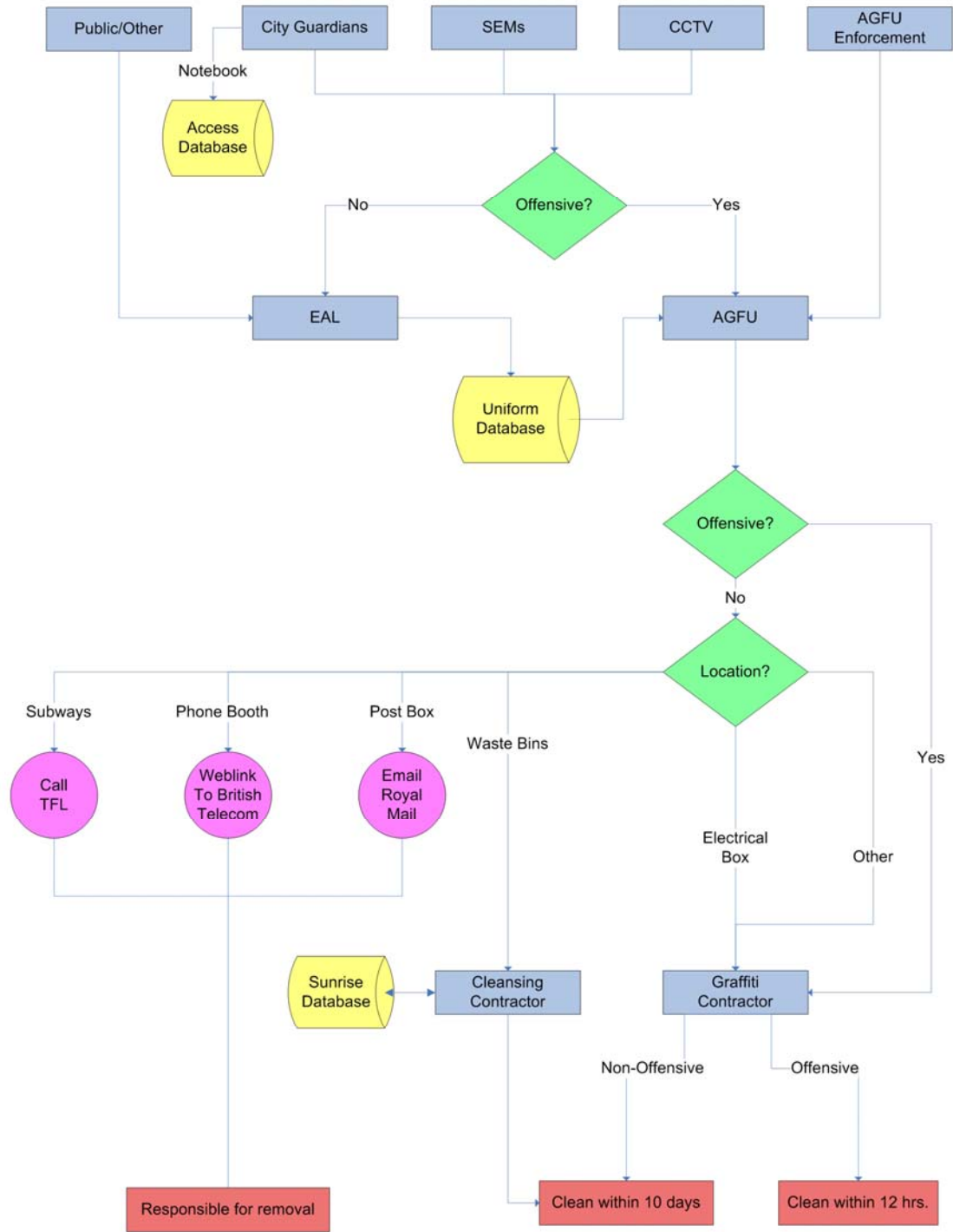
Figure 41 - Graffiti Flowchart

4.3 Sharps

Sharps are considered an emergency issue because they pose a threat to public health and safety. They need to be taken care of immediately and can not be left alone after being found. We chose this issue because sharps seem to be underreported and carry an emergency status.

4.3.1 City Guardians

The City Guardians are the most likely to find a sharp (needle or broken glass) as they patrol the streets the most heavily, and tend to know the problem areas. If the sharp is found in plain view or in such a manner that it is an immediate threat to public health and safety, they report it to the EAL, and must stand there until Onyx arrives to remedy the problem. If Onyx doesn't arrive in a timely fashion, the Guardian will most likely call the SEM to have

Figure 42 - Needles in a Drain in the West End

him call Onyx directly and see what the delay is. If the sharp is not an immediate threat to public, the Guardian might not report this situation. He may also wait until the drain fills up with more sharps, as shown in figure 42, or if it may become blocked, so that the sharps can be removed.
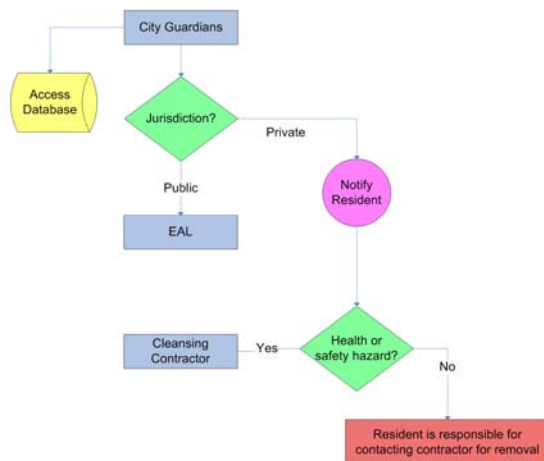
Figure 43 - City Guardian Sharps Flow Diagram

4.3.2 SEMs

When an SEM finds a sharp, he will most likely just call Onyx and then someone from the street cleansing team will come take care of it. As mentioned earlier, the SEM may also be in contact with Onyx to make sure the issue is taken care of.

4.3.3 EAL

While the EAL has only to collect the information from the caller, there is one decision they must make concerning how the incident report is filed. Due to the emergency nature of the sharp, it is always directly allocated to the contractor because Onyx needs to get to the scene as quickly as possible. The City Guardian or SEM would be waiting a long time if it took awhile for Onyx to receive the job.
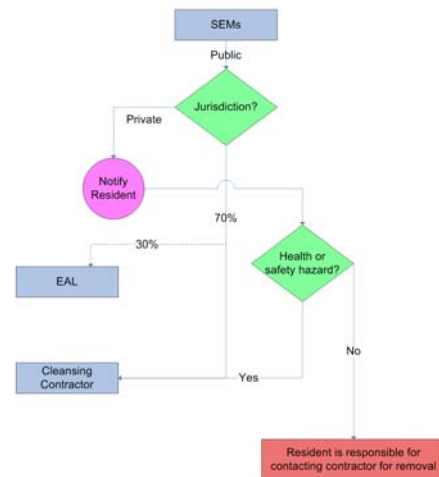
Figure 44 - SEM Sharps Flow Diagram

4.3.4 SMC

If the SMC receives either a call or an unallocated report concerning sharps, they may investigate it. If this is a problem area, it will be duly noted, and any information forwarded to the police. This is a preventative measure to help keep drug use off the streets by finding where the needles are being dumped, and perhaps tracing them back to the user(s).
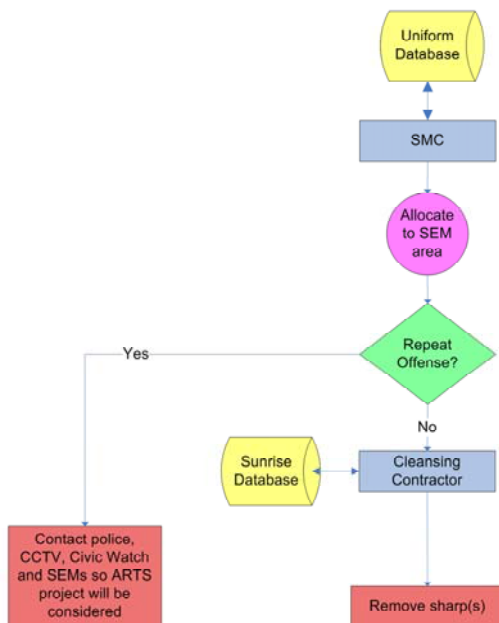
Figure 45 - SMC Sharps Flow Diagram

4.3.5 Onyx

Onyx should arrive as soon as possible to take care of the sharps. The special waste container, as shown in figure 46, is designed specifically for the collection of needles by trained workers. The sharp(s) are returned to the Onyx depot, where they can be counted and disposed of properly. Then the containers are sanitized for future use.

4.3.6 CCTV Center

If a CCTV center operator spots a needle, he calls the EAL in order to report all the information. He may also keep a periodic eye on the sharp, to make sure it's taken care of in a timely fashion. They may also be asked to put problematic, recurring locations on a list of daily sites to view.

Figure 46 - Sharps Disposal Container

Figure 47 below is the flow diagram detailing how sharps are dealt with by the various entities. While this chart seems much simpler than the others, you must take into account the urgent nature of the sharp. So while this diagram aided us in developing recommendations, it had to be supplemented with current Westminster health and safety regulations and policies.
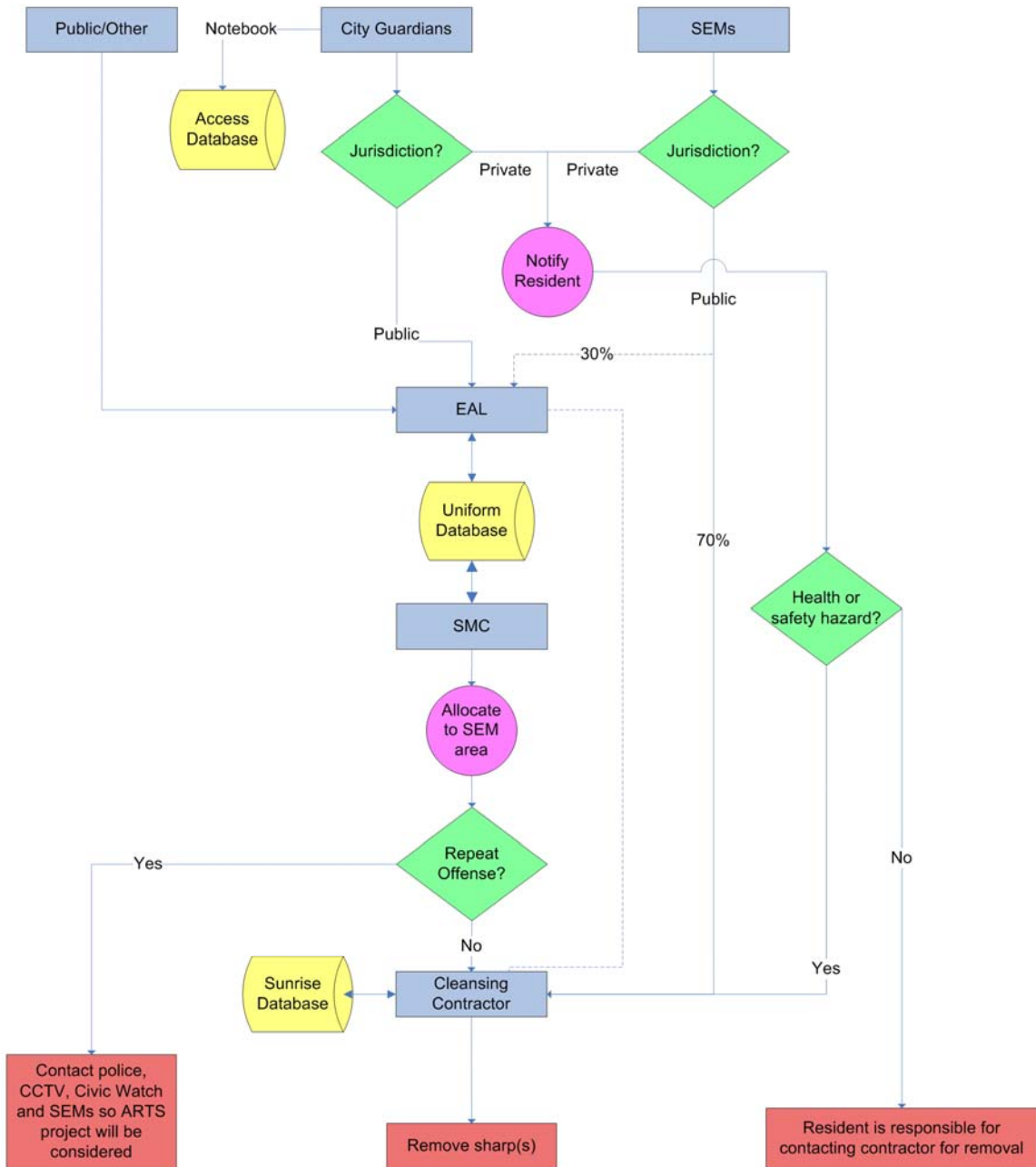
Figure 47 - Sharps Flowchart

5. ANALYSIS

The following section addresses the efficiencies of the current agencies. Also included below are some ideas for future implementations that could create an easier more efficient way of reporting and capturing data. We were able to come up with these ideas through the use of the flow charts and GIS mapping. The flow charts were constructed by using data gathered during our tours of each agency and from department managers. We were able to put them together in such an order that made analysis of each agency easier to read for those continuing with the development of specifications in the future. Through the close examination of these flow charts, our group would like the present the following suggestions.

5.1 Abandoned bagged waste

Abandoned waste is the most common reported street problem within Westminster. There were 10,574 cases in 2005 alone and this issue may be considered one of the most complicated because of the many factors that affect it. There are many questions that one must consider when reporting this issue and this may confuse the process. Due to this complexity, it may be easier for a City Guardian to just call their SEM if there is an issue that needs addressing, rather than go through the EAL to get the problem resolved. Because of such practices, there could be many cases of abandoned waste that are never captured by the Uniform database. This may be seen in figure 48 where it shows that the public does a great deal more reporting than the city personnel on the street. While this may be skewed by having one citizen reporting problems excessively, as in one of the wards on the left side of the map, it also may be due to the lack of reporting through EAL by City Guardians or SEMs. This also shows that the EAL may not be a necessary entity to contact in order to get the problem resolved. If the City Guardian or SEM had a device that could transfer reporting information directly to Uniform, they wouldn't have to go through the EAL in order to have the problem resolved or to have it captured in the database. Figure 49 shows the original flowchart describing the current system of reporting abandoned waste with an updated flowchart showing our recommendations.

It often occurs that an SEM or Guardian has to deal with residents concerning waste issues. Sometimes, these confrontations can get quite heated, and certain residents have a history of not cooperating with city workers. It would be beneficial for a worker to know about possible difficulties before they enter into a serious confrontation.

In addition to behavioral issues of a premise, a history of offenses would also be quite helpful for a Guardian or SEM before they approach a citizen. If a resident has a significant past offense record, it may cause the SEM to act more diplomatic or be more firm when faced with the situation.
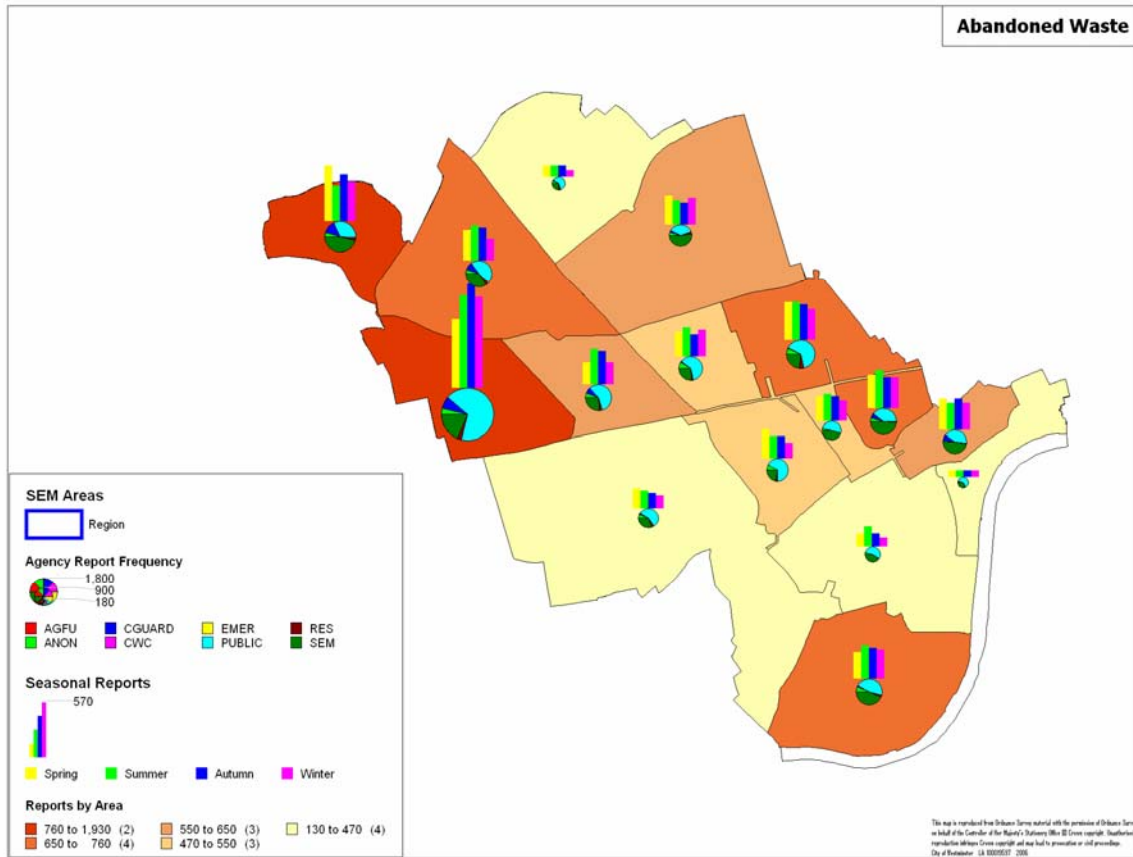
Figure 48 - GIS Map of Abandoned Waste in 2005
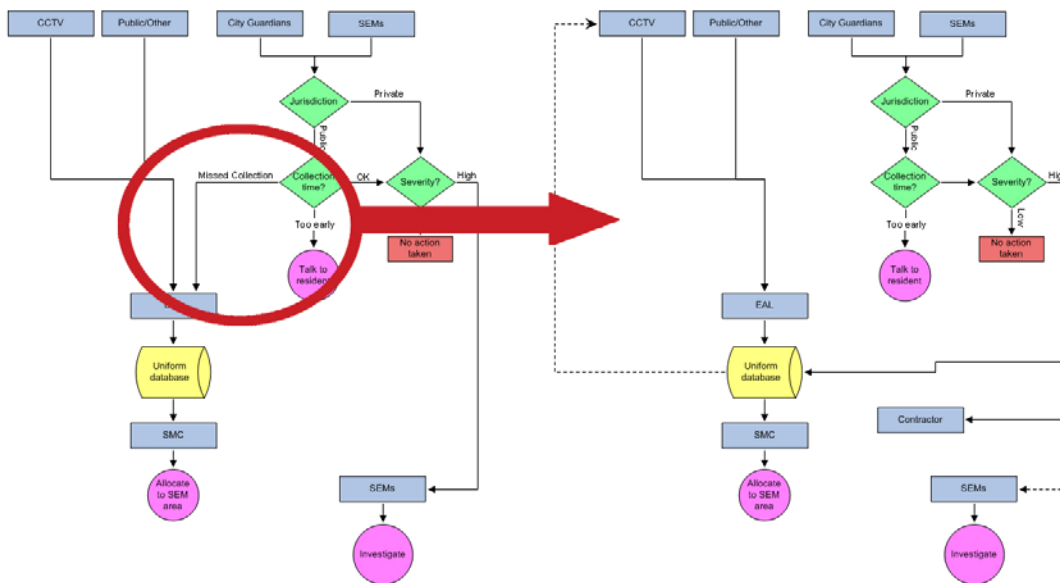
Figure 49 - Abandoned Bagged Waste Recommendation Flow Chart

5.2 Graffiti

In the case of graffiti, EAL's only purpose is to collect information. This information is then passed along to AGFU, which holds the responsibility of sorting, allocating and enforcing. For this particular issue, it may be more efficient to cut EAL out of the loop and direct all reports about graffiti straight to AGFU. This is depicted in Figure 50 where the red circle encloses the inefficiency and then the arrow points to the new diagram that reflects the changes made, noting that the public is still in contact with the EAL.

With the public still reporting graffiti issues to the EAL, the information is still captured in the Uniform database. Even if the other agencies were equipped with handheld devices in the future, they would be directly connected to Uniform, therefore still capturing the information. If AGFU had a device capable of receiving new reports while they're in the field, then they would not have to be in the office polling the system. Also, an automated program could find new reports on Uniform that came from the public and send them to the device in the field as well.
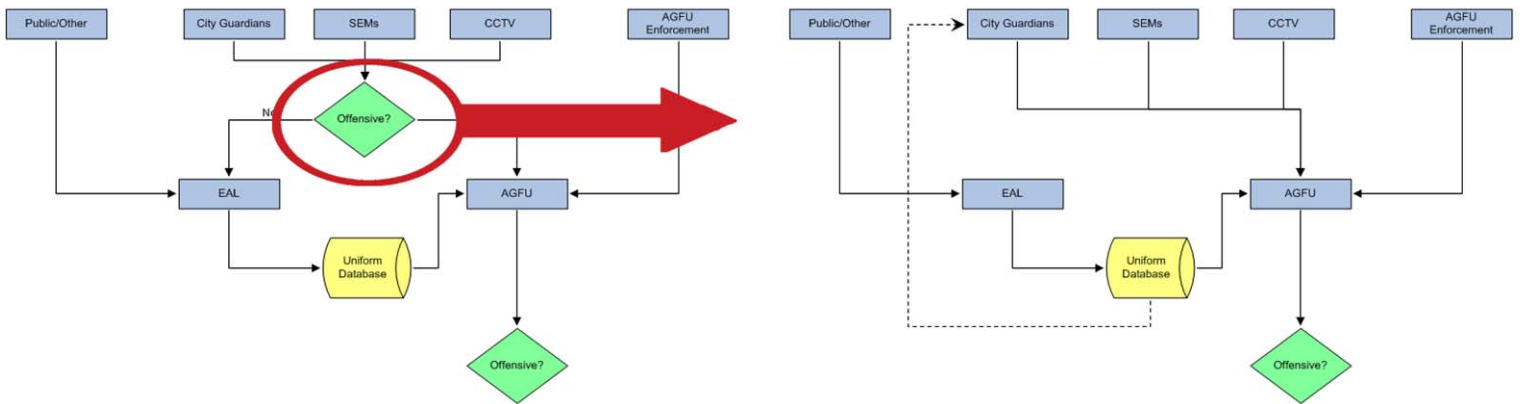
Figure 50 - Graffiti Recommendation Flow Chart

5.3 Sharps

Sharps are an emergency situation that requires a City Guardian/SEM to stay with the problem until it is resolved. While this is a good idea for the public health and safety, it also may deter the City Guardians/SEM from reporting the sharp. They may not want to spend time just waiting for Onyx to take care of the problem, therefore not reporting it at all. It seems that a Guardian/SEM could avoid this wasting of time by carrying a pair of tweezers, heavy gloves and the safety bio-hazard container that Onyx uses to take care of needles. However, a training course must be taken in order to be able to safely handle the sharps without risking being stuck or cut. While the training may seem

more of a hassle due to the time it will take and the money to pay for the course, it could be worth it in the long run by the time it saves by not waiting for Onyx.

Sharps seem to be the most under reported problem only having 110 cases in 2005. Many needles are hidden in back alleys, in drains, or in gratings. In these places the sharps may not cause a direct threat to the public, but they still pose a danger and need to be taken care of as soon as they are seen. On a City Guardian tour of the West End, our team observed approximately ten sharps in one enclosed area. However, the needles were never reported. A way to track the information on incidents not reported, and to discover whether or not it is being reported correctly, is through the use of GIS mapping. As stated

Figure 51 - GIS Map of Reported Sharps in 2005

above, a hesitation to report may be a reason why the GIS map in figure 51, shows so few cases of sharps. Due to the low number of reports, it is hard to analyze the sharps issue in Westminster. The GIS map seen below in figure 53, shows us that the West End is clearly a problem area for sharps. However, it is unable to tell us much else about the issue because having only one or two more incidents in one area would skew the data. A way to avoid the hesitation in reporting is to eliminate the waiting time by taking into consideration the above suggestion about equipping the Guardians and SEMs with proper tools. This modification to the original flowchart is pictured below in Figure 52 and allows the Guardians and SEMs to bypass the EAL, but still capture the information in Uniform through hand held technology. Even if the street worker is not equipped with the proper removal tools, they can still bypass the EAL by submitting a work order to the contractor through Uniform.
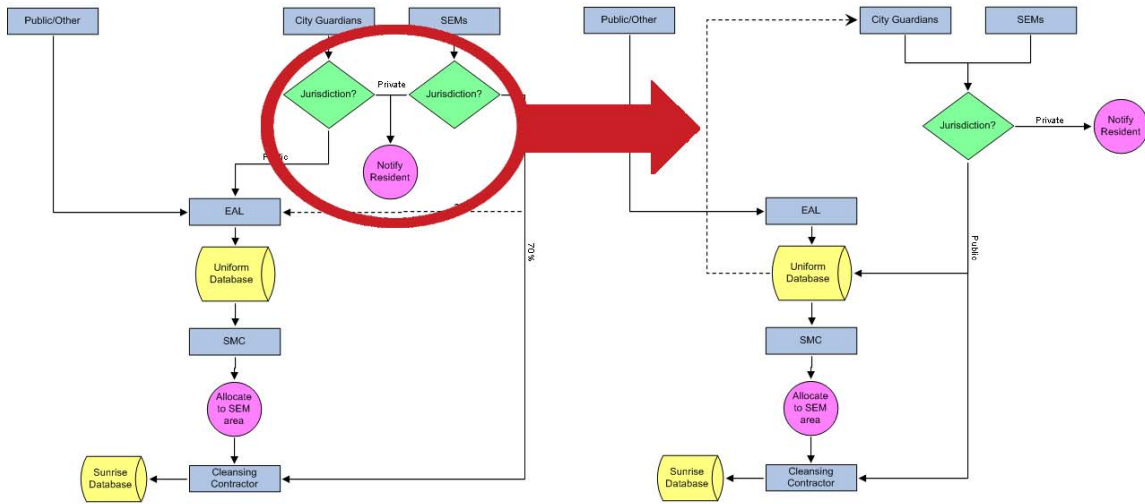
Figure 52 - Sharps Recommendations Flow Chart
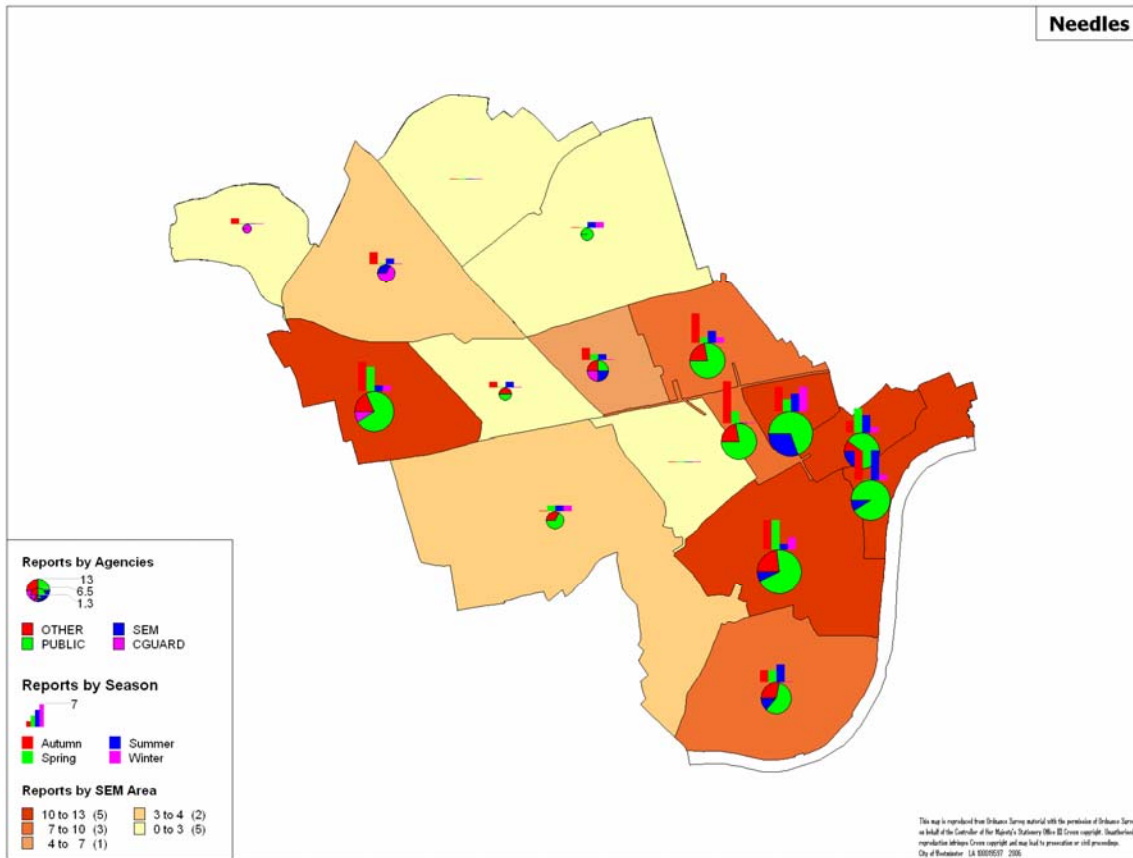
Figure 53 - GIS Map of Sharps from 2005 Showing Various Thermic Layers

5.4 Potential Improvements

In addition to recommended improvements for each issue through the flowchart analysis, we have also investigated duplicate reporting and reports not captured. These are a cause for concern to the council because it does not allow them to clearly review the cities statistics and the efficiency of the system.

5.4.1 Duplicate Reports

Duplicate reporting is when two reporting personnel attempt to create a work order for the same issue. Currently, there is no quantifying process to track the amount of duplications. If a report is being entered in Uniform, on or near the same street as a previously reported issue, a pop-up box appears warning that it may be the same issue. Previously reported is usually considered within a 24 hour span of time but can vary with each issue. However, when a member of the EAL staff receives a call and gets the pop-up, they just tell the customer it has already been reported and will be taken care of soon. They do have the option to add details or the customer's name to the work order but they do not record the fact that there had been duplication. If duplication does get through the EAL workers, it is usually caught by the employees at the SMC. When researching this problem, it was estimated that only three to four duplications are found each week by the SMC.

It would be beneficial to see how many reports are duplicated each week. A suggestion would be programming Uniform to count how many times the pop-up occurs and also giving a SMC employee a tally sheet to quantify the number that had gotten past the EAL. When this is done, you could also see how many reports are duplicated by the different entities on the street. It would be helpful to investigate the amount of times two reporting personnel from the same entity reported the same issue, comparing it to the amount of overlap among the different entities. This would give a good indication as to where the two entities overlap and how to remedy the repetition.

A suggested solution is for the entities to have access to Uniform from the street. This would allow them to see if the issue had already been entered into the system. While implementation of this type of solution may be costly, duplication in itself is a waste of the council's time and money and proves that the system is not working as efficiently as possible. It shows that employees of the city could be used more effectively in different areas in order to discover more issues instead of reporting the same ones.

5.4.2 Reports Not Captured

City Guardian notebooks were obtained from the Westminster City Council House representing the notations of two Guardians. Three books were obtained in total, two books from one

Guardian and one book from another. The first three weeks of entries were reviewed in each notebook, all falling in the year 2005. *Appendix C – Guardian Notebook Analysis* lists the different types of activities recorded during this nine-week focus period. One Guardian's notebook entries were more detailed than the other. This could be that one Guardian either patrols a busier part of Westminster or the other person is not recording all of their activities. This may indicate a potential lack of data capture at the street level. We observed during our City Guardian tours that, especially in poor weather, it is awkward to open the notebook on the street and record the information without a solid surface to write upon. Still, the best way to record observations is immediately in the field so no details are missed or forgotten. The observed notebooks were legible with dates clearly marked. However, one entry was found without a date, falling between the marked dates of 9 September 2005 and 14 September 2005.

After reviewing all recorded activities in the focus period, ten issues were selected in the following categories: abandoned vehicle, noise complaint, graffiti, substance on the pavement, hole in the pavement, faulty telephone booth, and dog fouling. *Appendix C – Guardian Notebook Analysis* contains the reports, locations, dates and details when available for the ten issues. After reviewing the Guardian Access database, only two of the selected issues were found. While a few of the Access database entries had a reference number to track the resolution of the issue, none of the ten issues had a corresponding reference number. If the reference numbers were written it the notebook clearly, it would ease the tracking of reports between the two databases and the notebooks. At times the information in the Access database was difficult to search because of incomplete entries and inconsistencies in reporting categories. While, Uniform was easier to search through, none of these ten issues were found in the database. It may not be necessary for all reports and observations to be called into a responding agency. However, it would be more efficient if all data could be captured even if the work order is not created. This could be accomplished in the future by implementation of technology.

6. CONCLUSIONS AND RECOMMENDATIONS

In order to best utilize technology to assist street workers in the reporting of street issues, specifications must be designed for a functional, usable and efficient device. These factors will ensure a successful system that can be used on the street.

6.1 General Specifications

One of the first factors that must be considered is usability. If the device is not more utilizable and efficient than current methods, it will not be considered. This was seen with the previous attempt at offering handheld devices, which were big and slow. It was much simpler to make a phone call and write in a notebook than to try to use the awkward devices.

A second, closely-related factor is the person using the device. A poorly designed interface can lead to confusion by the user. This may lead to errors in reporting, or cause the user to abandon the technology. A well designed interface, on the other hand, can improve reporting accuracy and cut down on reporting time.

The functionality of the device is perhaps the most important. The device must do things that other, previous technology could not. If there are no apparent improvements, then the purchase of new technology would not be justifiable. So we developed general specifications that would make such a device usable, efficient, and functional.

6.1.1 Functionality

There are two technologies available that would greatly benefit any device used for reporting street issues while on the street. GPS (Global Positioning System), see *Appendix D – Technology Background,* would be the most logical. If the device were equipped with GPS, then the current location of the street worker can be tracked by an agency such as the SMC. Also, GPS data could be used in pinpointing the location of the issue being reported, saving the user the step of entering it by hand and assuring accuracy.

Geographic Information Systems (GIS) go hand-in-hand with GPS, using it and other information to pinpoint objects to locations on a map. Since the City of Westminster already has GIS layers that correspond to everything necessary, mapping issues to a specific location on the street (with the help of GPS) should not be a problem. This way, the user can assign an issue either to a street, a general public area, or a specific building.

In addition to these technologies, there is also certain information that would be helpful, if not necessary, for a street worker to properly report an issue. The easiest example is that a City Guardian

would need to know a particular street's waste collection times before he can decide whether the waste is past collection, before collection, or within the half-hour allotted time.

6.1.2 Usability

The main consideration when designing for usability is knowing who will be using the device: their education level, technological abilities and limitations. Since we may be dealing with users with widely varied education levels and technological comfort, an almost purely graphical approach might prove to be the most effective.

CyberTracker (see *Appendix D – Technology Background*) was highly successful in its quest at easy-to-use data capture. While the purpose of the CyberTracker was different than the technology a Westminster street worker might use, we can still draw some elements from its success to aid us in our design. The first element that was already mentioned was the purely graphical format.

Figure 54 - African Tribesman Using CyberTracker

This made the device so easy to use that a person with no prior experience with handheld devices could operate the device with near perfect proficiency. The clientele that would be using Westminster's proposed device would have sufficiently more experience with technology than the African tribesmen, as pictured in Figure 54. Still, the easier the interface of the new device is, the faster and more accurate the reporting will be.

The two major reporting entities are the City Guardians and SEMs. Thus, we should design the device largely for their comfort level. When considering the City Guardians, their main strength is the diversity of its employees. One may have a high school education, be familiar with the streets of Westminster but have less experience technology. Another may have a higher level of education and be proficient with technology, but may not be as familiar with the street environment. We can expect that those of any skill level, even citizens who are familiar with city issues they see on a day-to-day basis, would be able to report efficiently with the specified system.

Many of the SEMs have worked in city governments before as enforcement officers or have had other related occupations. They may have completed some level of post-high-school study, and on average, tend to be quite familiar with current technologies. The very nature of their job is to manage. Therefore, they may be looked at in the same light as managers of a retail store – having more power in the company.

Since the City Guardians and SEMs have varying skill levels even within each agency, the best decision is to keep the user interface as simple as possible. If the device were too advanced, training

may have to be given to each worker using it, costing the city more money. Several prototype interfaces may be tested before a final one is implemented.

6.1.3 Efficiency

After considering the usability, we must consider the efficiency. This is closely related to the last topic of usability and how the user interface should be designed. However, it also deals with *how* the information is collected, and exactly *which* information should be collected.

First, looking at *how* the information is collected, we saw that right now the two most efficient ways of reporting an issue are by telephone and via pencil/paper. We can see from this that verbally speaking and writing text by hand are the two preferred methods of quick and easy communication. This is a main consideration when designing for efficiency. A user would rather speak or write (with an instrument) than type in text with a keyboard.

With this said, a specification might be to have a "point and click" interface where the user has to make only one decision at a time. If they make the wrong decision, they can navigate back as many steps as they desire to correct the mistake. In addition to increased reporting accuracy, the user also spends less time scanning the page because there is only one item on it.

Conversely, you do not want to have so many screens with so many questions that the user would have to click, wait for the next screen to load, and keep clicking until every possible question is answered. Instead, there should be a logical sequence of information collected that the software can use to determine if more information is needed. This leads us into the next topic of the reporting specifications.

6.2 Reporting Specifications

There is a definite order of events that street workers perform when reporting any issue (see figure 55). This must be taken into consideration and applied to the user interface, as well as for programming the software. Due to the fact that many issues require the same information, the same screens may be used; as opposed to having a different screen for each issue.

This specific information can be gathered from the flow diagrams of the issues in Section 4. However, those diagrams have a focus on street workers' thought processes rather than the actual method for reporting. For this reason, supplementary flow diagrams have been made to simplify the process and show what information needs to be collected and when. This allows the software to make a proper decision which can be seen in the following figures.

In figure 56, the first column, "User Interaction" lists everything the user has to input into the device in order for the software to make the correct decision. The second column is where the software makes its decision based on the information collected in the first column. The third column, the "Action" column, is any action the software would suggest for the user to perform.

Figure 55 - Basic Block Diagram of Issue Reporting

When all is said and done, the worker has traversed a mere three screens to arrive at a result that would previously have taken a few phone calls and perhaps more time. The last column, "Information", is where the data is collected for immediate review by the SMC, or for use in future reports.

6.3 Issue Specifications

Now, we get to the specific issues. Each street problem requires specific information that determines how it gets resolved. We have determined the information for three of these issues: abandoned bagged waste, graffiti and sharps. While these three are representative of most of the other issues, every issue will have to be analyzed to determine what additional information needs to be collected. For our three issues, we offer the following descriptions.

6.3.1 Abandoned Bagged Waste

Below, figure 56, is a flow diagram illustrating how a user would interact with software to effectively report an incident of abandoned bagged waste. Below that is a text table describing in detail each part of the flow diagram. A more detailed flow diagram is in *Appendix E – Advanced Software Flow Diagrams*.

Figure 56 - Abandoned Bagged Waste Flow Diagram for Software Implementation

Abandoned Bagged Waste

Location	Location of waste including: • X,Y coordinates • Street address: (UPRN, or section of street) • Exact location (in drain, taped to wall, etc.)
Jurisdiction	If the waste is on private or public property. This might be able to be determined by GPS, but if not, the user should be able to quite quickly determine that.
Jurisdiction	Determine if it is on public or private property.
Size	The size of the waste (small, medium, large, very large), or perhaps just if it is acceptably sized or not.
Odor	If the waste is particularly smelly or not.
Health and Safety Hazard	If the waste poses a health and safety hazard (leaking, sharps sticking out of it, attractive to animals)
Severity	If it is of high severity, then an SEM must look at it. If not, no action need taken, seeing as it is on someone's private land and they can have waste there if they desire.
Collection Time	If it is on public property, the first thing to be considered is the collection time, and whether the item is out too soon, out too late, or in the right time.
Display Contractor BBS	If it appears to be a missed collection, display any information the contractor may have regarding collection for that street, so the user can see if the contractor already knows about the missed collection or not. Also, alert the user to check the rest of the street to see if the contractor missed the whole street, or maybe this resident put it out too late.
Guardian/SEM	If the user is a City Guardian, then they must alert an SEM at this stage. If the user is an SEM, then they may continue.
Allocate to SEM	If the user is a City Guardian, they simply allocate the job to an SEM, and send along all the details to the Uniform database. An SEM can open the issue and find all the details, and add to it once it is resolved.
Linked to Resident	The user must look through the waste to determine if it is linked to a resident, so disciplinary action can be taken.
Display Offense History	Show the user the past offenses of the resident so he/she can make a more informed decision.
Issue Fine?	The must determine whether the waste warrants a fine or not.
Work Order to Contractor	If the waste cannot be traced to a resident or a missed collection on the part of the contractor, they are obliged to pick it up. The location and nature of the collection are sent to them so they know where to go and what they're looking for,

Issue Fine	Only an SEM can currently issue a fine, and they can do so for illegally dumping their waste outside of allocated collection times, or on other's property (including public property)
Resident to Fix Problem	When it is the fault of the resident, they are obliged (in addition to paying any fines) to fix the problem with their waste. This could include taking it back inside until the proper collection time, re-bagging our double bagging, cleaning the mess or paying to have it done.
Uniform	Record the location, date/time, severity, jurisdiction, linked to resident and resulting actions of the issue.

6.3.2 Graffiti

Below, in figure 57, is a flow diagram illustrating how a user would interact with software to effectively report an incident of graffiti. Again, below that is a text table detailing the flow diagram. A more detailed flow diagram is in *Appendix E – Advanced Software Flow Diagrams*.

Figure 57 - Graffiti flow diagram for Software Implementation

Graffiti

Location	Location of graffiti including: • X,Y coordinates • Street address: (UPRN, or section of street) • Exact location (on wall, on side of building, bus depot, in subway, etc.)
Offensive?	If the graffiti is of graphic and slanderous nature (e.g. racial slur, curse words, lewd art)
Offensive?	Determine whether or not the item is offensive. If it is a racial slur, curse word, or lewd art, it is considered offensive.
Location	Determines the jurisdiction of the graffiti based on where exactly it is located (on a wall, side of building, bus depot, subway, etc.)
Work Order to Graffiti Contractor	A work order is to be sent directly to the graffiti contractor. Preferably by electronic means, but it could also simply give a phone number to call.
Work Order to Cleansing Contractor	Only if the graffiti is located on street furniture that belongs to the contractor, then a work order is to be sent to them via a Uniform work order.
Phone Box Number	The phone box number must be collected in order for British Telecom to properly handle the graffiti there.
Weblink British Telecom	A weblink is used to tell British Telecom what Phone Box Number has been hit with graffiti so they can take care of it.
Phone TFL	Transport for London (TFL) must be notified via phone of any graffiti on a phone booth. If the device is able to make and receive phone calls, then the software may be able to dial the number and take care of it right then. Or it can alert the user of the number to call.
E-mail Royal Mail	If the graffiti is on a post box, then an e-mail is sent to Royal Mail along with the address.
Talk to TFL	If the graffiti is on a bus or a bus depot, the user will talk to TFL and relay the location of the graffiti.
Uniform	Record the location, date/time, jurisdiction, nature, and resulting actions of the issue.

6.3.3 Sharps

Below, in figure 58, is a flow diagram illustrating how a user would interact with software to effectively report an incident of sharps. Below is the text table detailing the flow diagrams. A more detailed flow diagram is in *Appendix E – Advanced Software Flow Diagrams.*
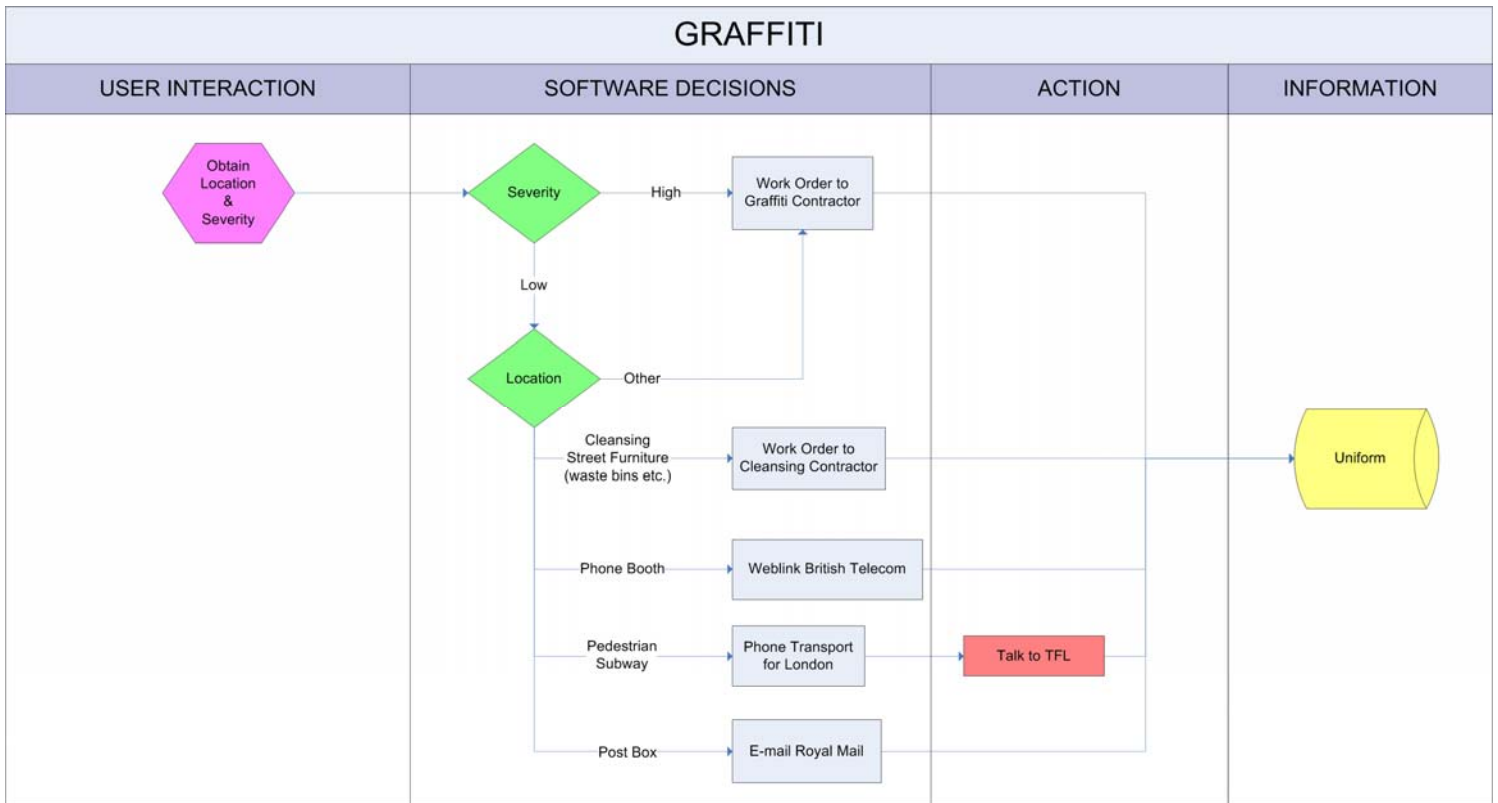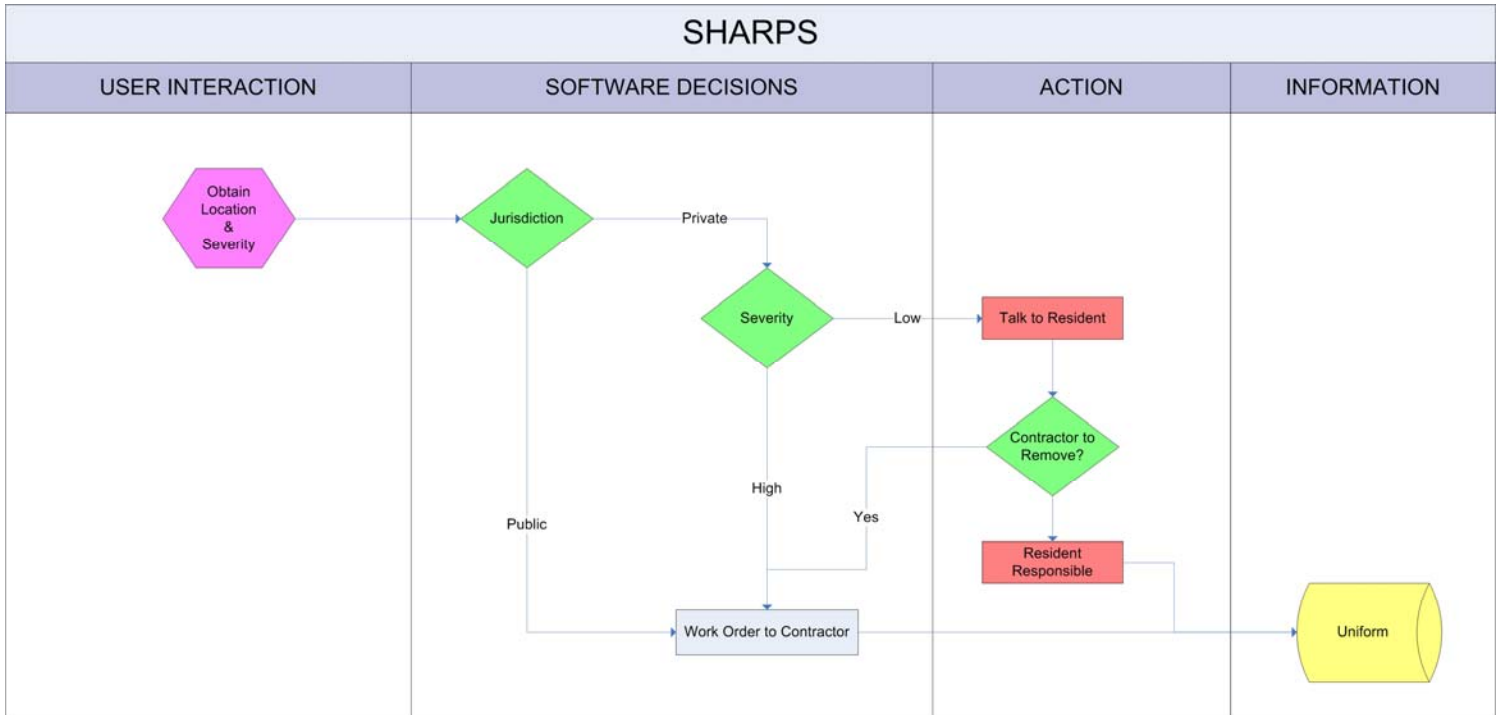

Figure 58 - Sharps Flow Diagram for Software Implementation

Sharps

Location	Location of sharp including:
	• X,Y coordinates
	• Street address: (UPRN, or section of street)
	• Exact location (in drain, taped to wall, etc.)
Jurisdiction	If the sharp is on private or public property. This might be able to be determined by GPS, but if not, the user should be able to quite quickly determine that.
Jurisdiction	Determine if it is on public or private property.
Work Order to Contractor	If it is on publicly-owned property, than it is the duty of the cleansing contractor to remove the sharp(s), so a work order should go directly to the contractor at this point.
Number	The number of sharps to help determine urgency. Perhaps a yes/no approach would be easier (e.g. is there a lot of sharps?)
Health and Safety Hazard	The user must decide whether or not the issue is a health and safety hazard. They are usually trained to do so.
Severity	Determine if it is on public or private property. If it is high severity, then a work order should go again directly to the contractor.
Talk to Resident	The user is advised to talk to the resident to let them know that a sharp was found on their property.
Remove?	Determine if the resident wishes it to be removed. If they do want it removed, they must pay for the removal, because it is on their property and therefore not the responsibility of the city contractor to take care of it. However, the user can still send a report through to the contractor, as long as it is indicated that the resident is responsible for it. When the report is entered into the Uniform database, it will be stated that the contractor was not responsible to remove it.
Resident responsible	If they do not want to remove it, and it is indeed on their property and not a health and safety hazard, then it is their decision as to what to do with it.
Uniform	Record the location, date/time, severity, jurisdiction, and resulting actions of the issue.

6.3.4 Remaining Issues

For whoever is responsible for developing the specifications for the remaining hundred-or-so issues, we have provided this project as a model that may be used to aid them in articulating the details of the issue. A diagram of the order of events is fundamental in determining the issue's specifications. Once the diagram of how the issue is resolved on the street is created, including all the different possibilities, the software-oriented flow diagram may be determined. In addition to this second

flowchart, a list of the exact specifications can be made so the software development team can turn the specifications into software.

6.4 Technology Implementation

These specifications are designed so that they can be implemented in a handheld technology of some sort. We have looked at the general specifications, as well as those specific to a few issues. A screen simulation has been created in *Appendix F – Screen Simulation* to illustrate how software implementation might look on one of these devices. The basic interface is derived from the general specifications for functionality, usability and efficiency. The flow of events (in this case, bagged waste), the issue-specific specifications were considered. These screen shots were taken from a more complete software demo that is fully interactive for the three issues we have been focusing on in the past two months.

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APPENDIX A – List Of Street Issues

This is a list of issues that fall under their respective categories.

ENVIRONMENT
- Abandoned vehicles
- Audits
    - Environmental
    - Highways defects
    - Lighting
    -
- Building Works' Safety Issues
- Commercial waste
- Dog nuisance
    - Fouling
    - Off leash
- Estate Repairs
- Graffiti and Fly-posting
- Health and safety
- Highways defects & Street furniture
- License breaches
    - Advertisement Boards
    - Markets
    - Tables and chairs
- Lighting
- Litter
- Cleansing & fly-tipping
- Noise
- Parks
- Residential Waste

MISCELLANEOUS
- Complaints about CG service
- General Patrolling
- Other
- Training

COMMUNITY
- Accident in street
- Collapsed Person
- Attending meetings/events
- Audits – business
- Community work
- Crime prevention advice
- Education/schools related
- Giving direction
- Locking gates
- Lost property
- Reassurance of the community
- Special events
- Stairwells
- Youth work

CRIME AND ANTI-SOCIAL BEHAVIOR
- Anti-social behavior
- ASBO/ABC related
- Begging
- Busking/street performers
- Crack house closure related
- Crime prevention
- Criminal damage
- Criminal intelligence
- Drug paraphernalia (incl. Sharps)
- Drug use
- Fire incidents (non-accidental)
- Illegal street trading
- Prostitute "business" cards
- Rickshaws
- Rough sleepers (homeless)
- Street/park drinkers
- Vehicle crime and anti-social

APPENDIX B – Problem Description Matrices

STREET LIGHT

	Name	Address	City	Street	Zip	Email	Phone	Fax	Burned-out street light	Streetlight stays on during the day	Streetlight goes on and off	Missing Streetlight	Dim streetlight	Multiple Day Burners	Flood Light Out	Flood Light Day Burning	Flood Light Cycling	Flood Light Missing	Flood Light Dim	Missing Lamp Post	Leaning Lamp Post	Damaged Lamp Post	Missing Light Fixture	Opened Light Fixture	Fixture Light Fixture	Light Shining in Wrong Direction	Broken Glass Cover
Westminster	■	■	■	■	■	■	■																				
New York	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Baltimore	■	■	■					■								■	■										
Chicago				■							■		■							■	■						
Philadelphia							■																				

STREET LIGHT

	Missing Glass Cover	Hanging Glass Cover	Fire Globe Missing	Missing Door on Lamp Post Base	Open door on Lamp Post Base	Damaged Door on Lamp Post Base	Bracket Arm Missing	Bracket Arm Broken	Bracket/Arm Loose	Bracket Arm Bent	Located at or near:	Comments / Other (text box)	All street lights out in block?	Single street light out	How long has light been out?	Have you reported this before?	Pole blocking street?	Color of pole?	Are police on the scene?	Pole cause property damage?	Pole cause personal injury?	Missing Streetlight	Defective Street light	Exposed wires at base
Westminster											■	■												
New York	■	■	■	■							■	■												
Baltimore		■		■							■	■	■	■										
Chicago											■	■	■			■	■	■						
Philadelphia										■												■	■	■

POTHOLES

	Name	Your Address	City	Street	Zip	Email	Phone	Fax	Borough:	Location of Defect	Street:	Side of Street	Cross Street #1	Cross Street #2	Traffic Direction, if known	Nearest house number, if known:	Description of Landmarks:	What shape is the defect?	Approximate dimensions?	Approximate depth?	Which lane is it in?	Where is it in relation to the street?	Is the pothole in an alley?
Westminster	■	■	■	■	■	■	■	■		■	■	■	■	■	■		■						
New York	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Baltimore	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■		
Chicago	■	■	■		■					■	■	■	■	■		■	■	■	■	■	■		
Philadelphia	■	■	■	■	■	■				■													

POTHOLES

	Is the pothole on a curb?	Is the pothole on a footway?	Is the pothole on a street?	Is pothole caving in?	How is street paved?	Is hole barricaded?	Other / Comments	Water in hole?	Describe hole (text box)
Westminster									■
New York									
Baltimore	■	■	■						
Chicago			■	■					
Philadelphia	■	■	■		■	■	■		

STREET SIGN

	Name	Address	City	Street	Zip	Email	Phone	Fax	Date:	Location of Problem:	Enter the house number /street	Side of Street	Cross Street #1	Damage done to sign (pull down)	Traffic Direction	Corner	Comments or Descriptions of Landmarks	Sign type (drop down menu)	Sign structure (pull down menu)	Describe problem (text box)
Westminster	X	X	X	X	X	X	X	X		X										X
New York	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X			
Baltimore	X	X	X	X	X	X			X	X									X	
Chicago	X	X	X			X			X	X	X			X				X	X	
Philadelphia	X	X	X	X	X	X	X			X	X									

STREET SIGN

	Sign Down	Sign Faded	Sign Hanging/Bolt Missing	Sign Missing	Sign Obscured	Sign out of Position/Twisted	Street Sign Missing	Graffiti on Sign	Pole Down	Pole Leaning	Sign&Pole Missing	Sign&Pole Down	Obstructs Roadway	Obstructs Sidewalk	Obstructs Sidewalk	Change sign request	New sign request	Quantity requested	Sign overhead or on a pole	Was there a sign here before?
Westminster																				
New York	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Baltimore			X			X				X						X	X	X	X	X
Chicago																				
Philadelphia						X														

APPENDIX C – GUARDIAN NOTEBOOK ANALYSIS

City Guardian activities by category

General Information:	Reported by Citizen:
Meetings	Public Drinking/Drunkenness
Tea Breaks	Youths Playing in Private Parks or Gardens
Lunch Breaks	Noise Complaint
Patrol Partner	Youth Riding Motorbikes and Creating a Disturbance
Time and Date of Patrol	Youths Smoking in Stairwell
Log of Streets Patrolled	Youths Intimidating the Public
Computer Entrees	Youths Trespassing in Backgardens
	Theft: Purse and Hat
Patrol Duties:	Car Vandalism
Locked Gates	Night Drug Use
Patrolled a School	Dog Fouling Problem
Environmental Audits	
Graffiti Audits	**Community Work and Interaction:**
Stairwell Patrol	Visited Youth Club
	Interacted with Children at Playground
Physical Problems:	Visits to the Elderly
Substance on Pavement	Gave Directions
Broken Glass on Street	Visits to the Drop in Center
Abandoned Vehicles	Gave Information on City Guardian Program
Damaged Gate Lock	Talked with Rough Sleepers and Gave Shelter Information
	Interacted with Local Businesses, Gave City Guardian Card
	Returned Wallet found by Cleansing Worker
	Letter Delivery on Behalf of Neighborhood Center

Incidents Reported

Graffiti Report:	Not Found	Not Found
Jessel House		
Graffiti on Wall Numbers 3 and 4		
10 Sep 2005 - 13 Sep 2005		
Substance on Pavement:	Not Found	Not Found
Slippery Substance on Pavement		
Broken Glass Bottle		
318 Edgware Road		
03 February 2005		
Substance on Pavement:	Not Found	Not Found
Fabric Softener on the Street		
Frampton Street		
Outside Landseer House		
07 February 2005		

Broken Concrete Lid:	Found	Not Found
Big Hole in the Pavement		
362 Edgware Road		
Chicken Cottage		
11 February 2005		
Faulty Telephone Booth:	Not Found	Not Found
Called Customer Services Team		
Frampton Street		
14 February 2005		
Abandoned Car:	Not Found	Not Found
Broken Rear Driver's Side Window		
Owned by Resident, Doesn't Want It		
Youths Push and Play with It		
316GTI Red Rover		
Reg. no. 593LLJ		
Taxed Until 31/03		
46 Tresham Crescent		
19 May 2005		
Abandoned Car:	Not Found	Not Found
Rear Window Driver's Side Vandalised		
Broken Glass in Car		
Broken Glass on Pavement		
Grey Honda Civic		
Reg. no. K144RKR		
Salisbury Street		
23 May 2005		
Dog Fouling Report:	Found	Not Found
Man Informed City Guardians		
Outside Entrance to Library		
Ashbridge Street, Church Street		
04 June 2005		

Appendix D – Technology Background

D.1 Global Positioning System

In the sixties, the United States Navy sponsored two programs called Transit and Timation. Transit was developed by the John Hopkins Applied Physics Laboratory under Dr. Richard Kirschner and was the first operational satellite-based navigation system[51] with seven low-altitude satellites and several ground stations to track the satellites. To determine one's position, one must measure the Doppler shift of the signals transmitted by the satellite.

Transit was made available to civilians in 1967[52] and was quickly implemented by several commercial marine establishments as well as wealthy marine enthusiasts. But in 1996, the US Navy, who had for all that time been in charge of Transit, shut down the operation according to the 1994 Federal Radionavigation Plan.[53] Although Transit certainly served its purpose during those years, it had several drawbacks: it required a long observation time before any calculations could be made, it required a certain velocity to work properly, and had downtime due to limited coverage that lasted hours. Despite all its limitations, Transit was a huge step toward today's global positioning system.

Timation was developed by the Naval Research Laboratory under the direction of Roger Easton in 1964[54], and included two experimental satellites designed to test high-precision clocks and two-dimensional navigation. The first satellite, launched in 1967[55], made use of crystal oscillators as their clocks, which is a technology still used in today's computers. Later models implemented atomic clock standards that are still in use today.

Almost a decade later, in December of 1974, the NAVSTAR program was launched that was a collaboration of the Army and Navy GPS (SECOR and Timation, respectively). NAVSTAR was a three-phase program that included the testing and launching of two generations of satellites, dubbed Block I and Block II satellites (see figure 59). The first Block II was launched in 1989[56], and the twenty-fourth, and last, satellite was launched in March of 1994[57]. The NAVSTAR system is still in use today and is

Figure 59 - NAVSTAR Block II Satellite

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[51] Scott Pace, *GPS History, Chronology and Budgets*, 238
[52] *Idem*
[53] *Idem*
[54] *Ibid*, 239
[55] *Idem*
[56] *Ibid*, 244
[57] *Ibid*, 246

operating jointly by the US departments of transportation and defense.

Today the twenty-four satellites that make up GPS (figure 60) are available to the public via pocket-sized GPS, satellite phones, automobiles, and civilian aircraft/watercraft. GPS is also used in nearly every commercial and military aircraft, watercraft and automobile. The GPS of today is almost instantaneous, and works virtually around the globe. Nearly all professional surveying equipment is GPS-equipped, as are many trucking companies so they can track their shipments and monitor employees' work habits (where they stop, etc.) As this trend continues, it will not be hard to imagine a world where nearly every device has GPS capabilities.

Figure 60 - NAVSTAR Constellation

D.2 Personal Digital Assistants

In 1975, Hewlett-Packard came out with a handheld programmable calculator: the HP 45[58](see figure 61). This is arguably the first personal digital assistant ever manufactured. While its main function was mathematical, it could be programmed in assembly language to do whatever the user wanted, and it was small enough to fit in one's hand.

In 1981, Matsushita and Sharp released "pocket computers" that rivaled the desktop PCs of the day. Some standard features were a BASIC compiler[59], and digital phone, address and date books. By 1983, the market was flooded with "pocket computers" from every electronics manufacturer around. As electronics and computing technology advanced from the '80s into the '90s and past the millennium, so did the PDA. Technology got smaller and

Figure 61 - HP45 Programmable Calculator

therefore manufacturers could fit more memory into a smaller package, and PDAs and computers alike kept getting smaller and more powerful. Today, a PDA of the same size as a small book is quite easily a hundred times more powerful than computers of the 1980s.

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[58] Evan Koblentz, *The Evolution of the PDA*
[59] Beginner's All-purpose Symbolic Instruction Code, a programming language

Figure 62 - HP iPAQ 1955

In addition to memory and computing power, PDAs have integrated more and more features. In 1987, the first PDA was available with DOS operating system[60], allowing for proprietary software development and almost unlimited possibilities. Truly a hand-held personal computer, Panasonic's Personal Partner was perhaps the first of the "new-generation" PDAs. In 1994, IBM in cooperation with BellSouth came out with Simon, a "smartphone" that integrated cellular phone service into a PDA. Today, the HP iPAQ 1955 (see figure 62) Pocket PC costs $300 and has a 300MHz processor, 32MB RAM and 32MB user memory[61]. Or for $650, you can have a similar PDA with cell-phone and camera capabilities.

PDAs can utilize a wide variety of programs. One program is called Cybertracker which, combined with integrated GPS, allows for the survey of wildlife populations in Africa. Using this program, the user can easily enter information by selecting icons from a series of screens. The entire program contains no text, which eliminates all language barriers. The icons can also be easily changed for each culture to represent their own personal drawings of animals. Because there is no other input than following a series of pictures, it has been estimated that this data input process is up to three times faster than writing the information by hand. Because the PDA stores the information until the researchers collect it, an extended battery life is needed. Therefore, a color screen is not recommended. Also, if the PDA uses memory cards, always have a back up in case of battery failure.[62]

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[60] Koblentz

[61] www.shopping.hp.com

[62] Rene Beyers, *Cybertracker versus Arcpad*

D.3 Radio Frequency Tags

A recent improvement on barcode technology has been RF (radio frequency) tags. While the barcodes of yesterday utilize optical scanners that read the carbon in the printed barcode[63], the RF tags of today emit information in radio frequencies that can be read as far away as four or five meters.

Figure 63 - RFID Tag

This relatively new technology has been implemented in malls, stores and libraries as a security measure. The product or item is secured with an RF tag, and there are RF tag readers at all the exits. When the item is purchased, the clerk can remove or turn off the tag with a special device only they carry. If the item is not purchased, however, an alarm will sound when the RF tag in the item passes through the tag readers. The tags are mounted in such a way that only the clerks can disable it.

Recently, the US Social Security Administration has implemented RFID technology in its Woodlawn, Maryland, warehouse. They are typically scanning 20-30 items per *second*, with thirty-six out of forty successful scans.[64] Wal-Mart and the US Department of Defense have also implemented RF scanning technology in their warehouses. The only drawback at this point is the lack of an international RFID standard, says SSA IT specialist Gary Orem.[65]
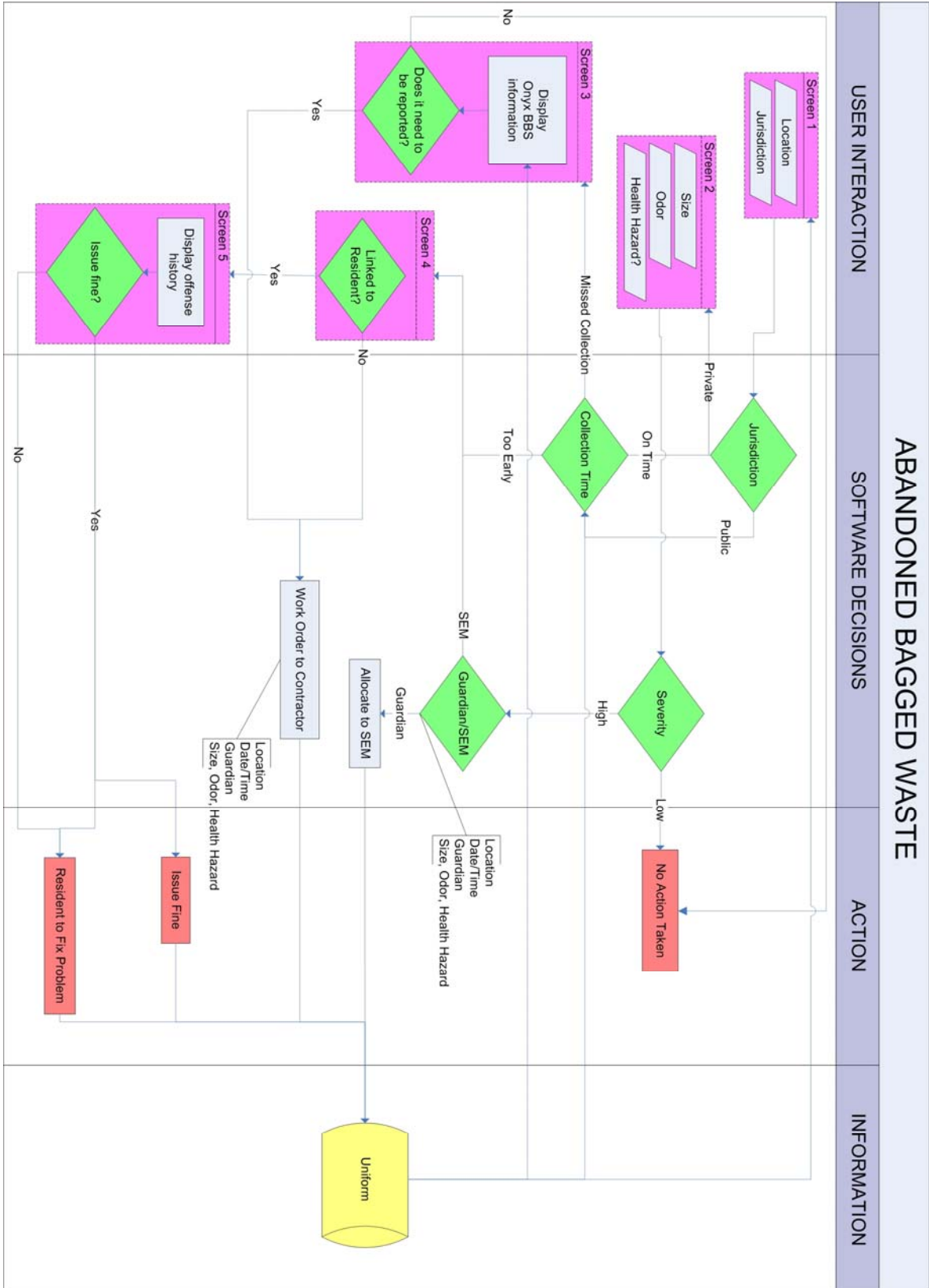
RF technology is becoming increasingly cheaper, though: tags cost as little as US$1, and antennas only US$3 to $4. Almost anything can be RF tagged/scanned, so it will be interesting to see how this new technology develops and becomes integrated in our ever-growing tech-hungry world.
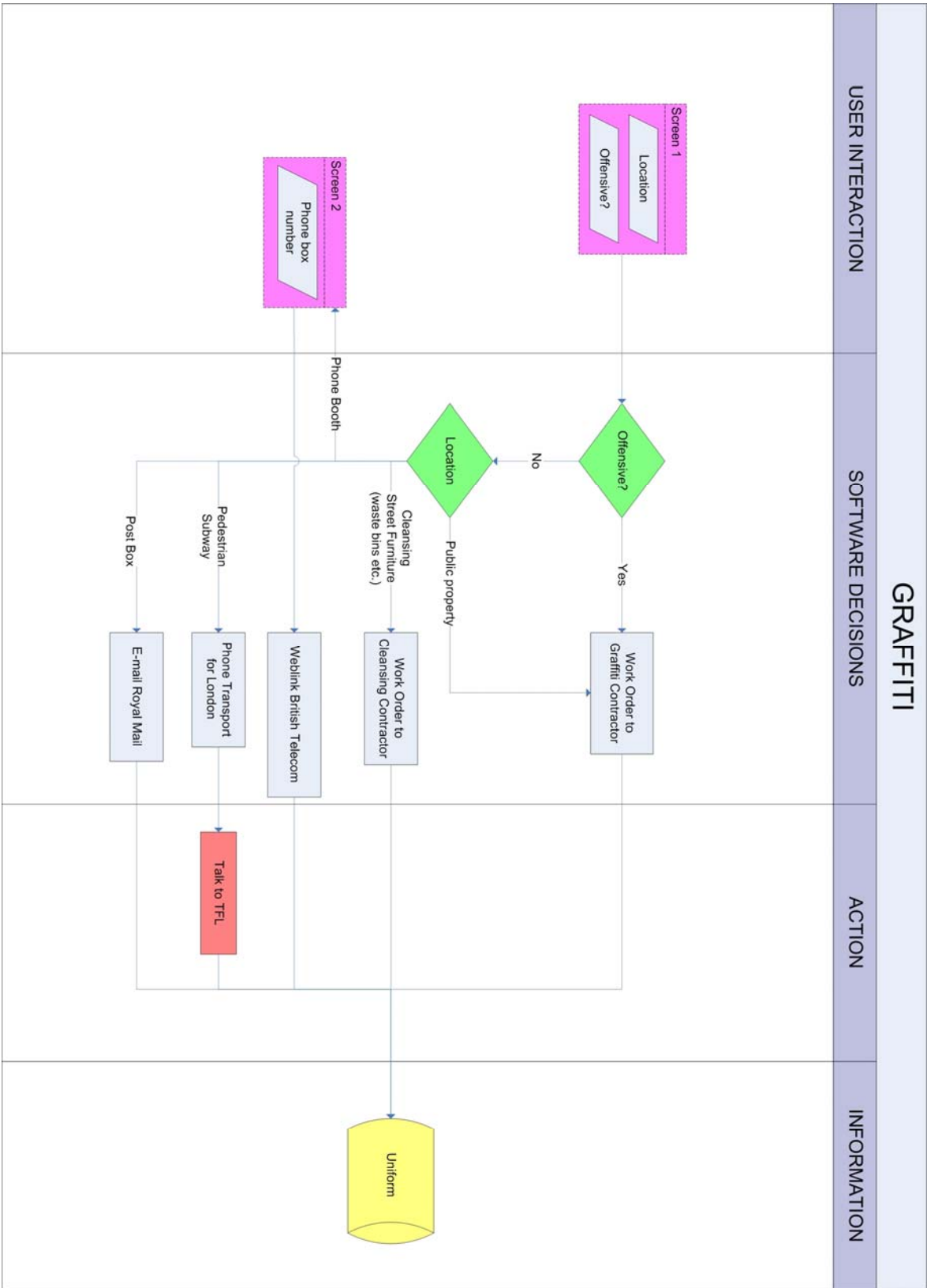
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[63] Marshall Brain, *How UPC Barcodes Work*

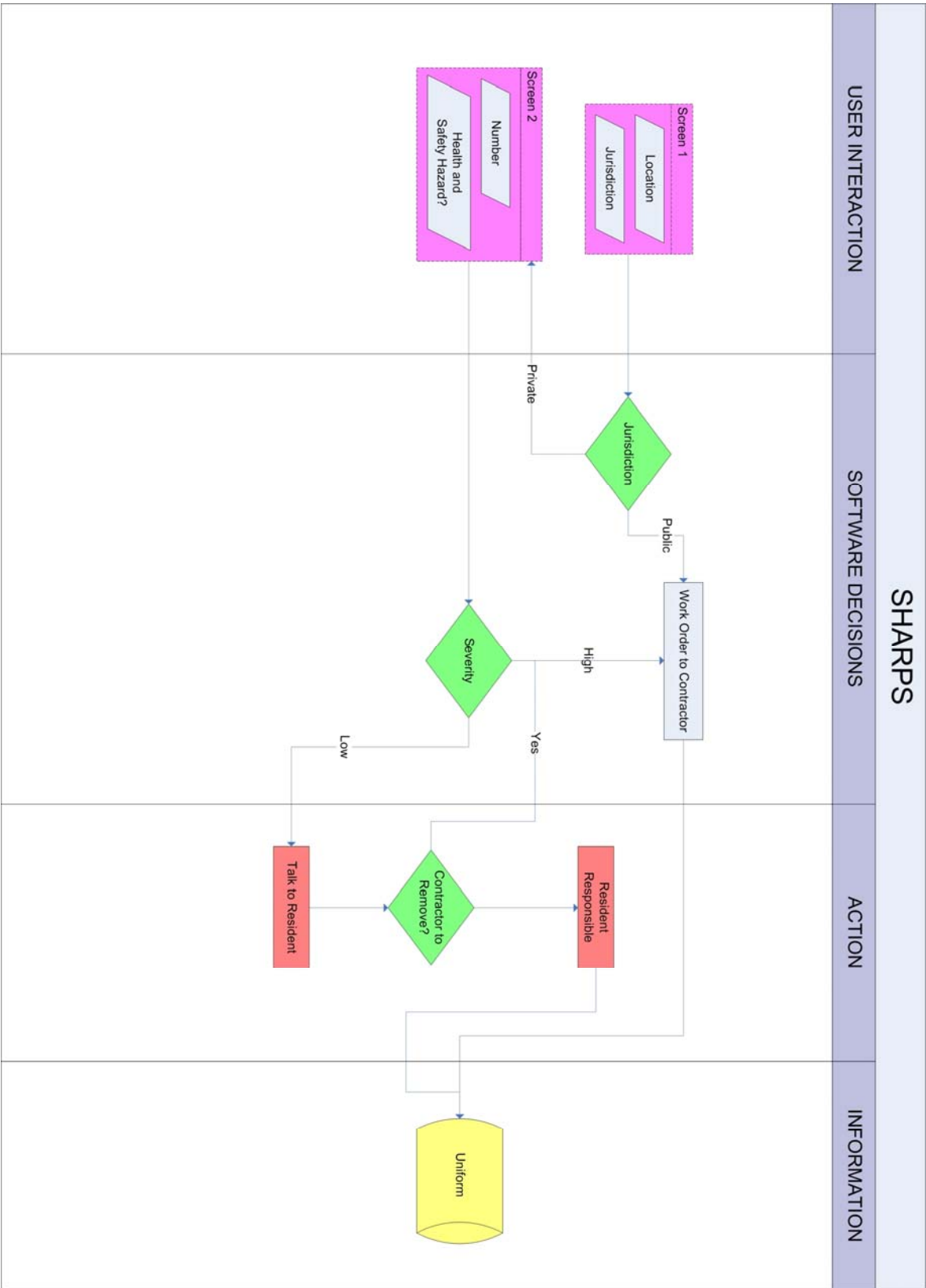[64] Florence Olsen, "Social Security Administration utilizes RFID"

[65] *Idem*

APPENDIX E – ADVANCED SOFTWARE FLOW DIAGRAMS

GRAFFITI

USER INTERACTION | SOFTWARE DECISIONS | ACTION | INFORMATION

Screen 1
- Location
- Offensive?

Screen 2
- Phone box number

Offensive?
- Yes → Work Order to Graffiti Contractor
- No → Location
  - Public property → Work Order to Graffiti Contractor
  - Cleansing Street Furniture (waste bins etc.) → Work Order to Cleansing Contractor
  - Phone Booth → Phone box number (Screen 2)
    - Weblink British Telecom
    - Pedestrian Subway → Phone Transport for London → Talk to TFL
    - Post Box → E-mail Royal Mail

Uniform

75

SHARPS

USER INTERACTION | SOFTWARE DECISIONS | ACTION | INFORMATION

Screen 1
- Location
- Jurisdiction

Screen 2
- Health and Safety Hazard?
- Number

Jurisdiction
- Private
- Public

Work Order to Contractor

Severity
- High
- Low
- Yes

Talk to Resident

Contractor to Remove?

Resident Responsible

Uniform

76

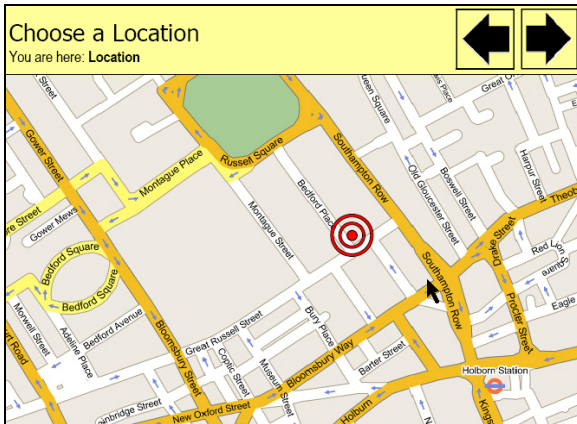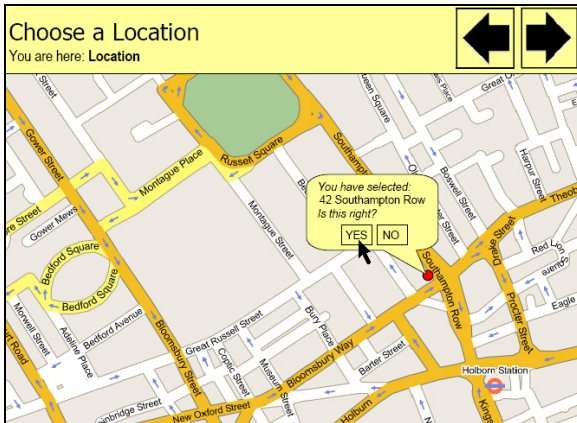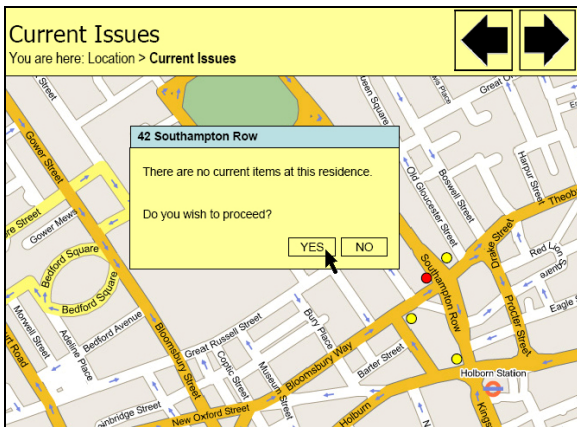## APPENDIX F – Screen Simulation

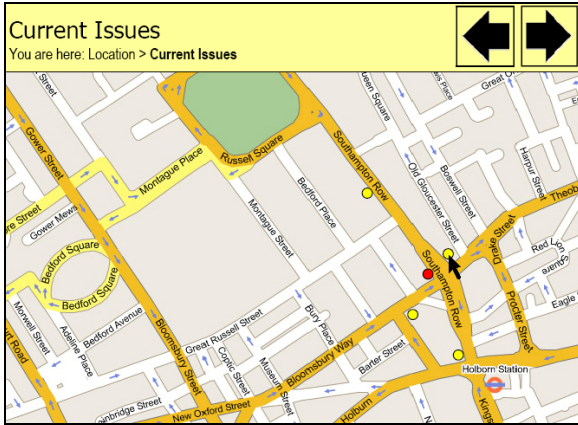GPS Location is automatically shown on screen.

The user may select an alternate location.

Location will be mapped to the closest corresponding UPRN via GIS, and the user is asked to confirm address.
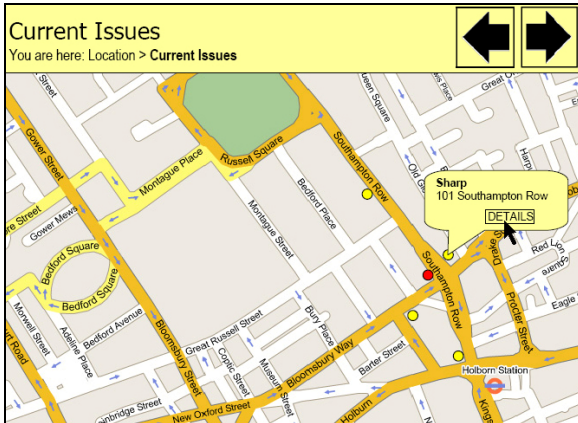

If there are any unresolved issues at the location, the user is immediately notified.

Also, any currently unresolved issues in the vicinity will be shown.

The user may select an issue location to see the details.

If the user desires to know more about the issue, he/she may choose to view full details.

Complete details of the site are given, including an option for seeing all past inicidents at that location.
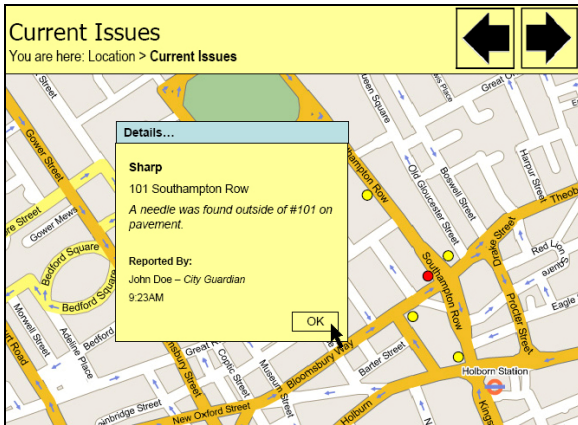
Once the user has decided that the issue to be reported is not duplicated at another location, he/she may proceed.
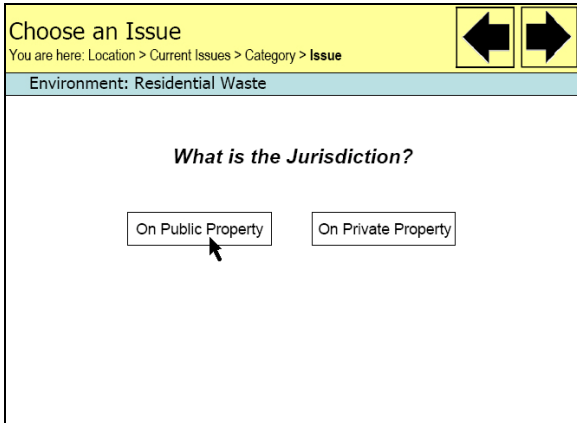
Choose a Category
You are here: Location > Current Issues > **Category**

Environment Community Crime/Anitsocial Behaviour

A broad category is chosen first.

Environment is selected.

Choose an Issue
You are here: Location > Current Issues > Category > **Issue**

Environment

Abandoned Vehicles Audits Building Works' Safety Issues Commercial Waste Dog Nuisance

Estate Repairs Graffiti and Fly-Posting Health and Safety Highways Defects and Street Furniture License Breaches

Lighting Litter Cleansing and Fly-Tipping Parks Residential Waste

An issue is chosen from all the types of issues in the selected category.

Residential Waste is selected.

Choose an Issue
You are here: Location > Current Issues > Category > **Issue**

Environment: Residential Waste

What is the Jurisdiction?

On Public Property   On Private Property

The jurisdiction is decided (public or private property).

Public Property is selected.

The jurisdiction is decided (public or private property).

The software has decided that the issue is past collection, possibly indicating a missed collection, excepting that the resident has placed the waste outside too late.

Any information that may help the user make a better decision will be displayed at this time (like comments from the contractor).

The user selects to submit a work order to the contractor

The item has been submitted to the contractor as a work order.

APPENDIX G - ANNOTATED BIBLIOGRAPHY

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