

# **FUEL EFFICIENCY REVIEW FOR BALTIMORE CITY**

**Prepared for:  
the Baltimore Efficiency and  
Economy Foundation**



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# Table of Contents

**Study Methodology**..... **iii**  
**General Discussion** ..... **iii**  
**Findings**..... **vi**  
    *General* ..... *vi*  
    *Fuel Site Staffing*..... *viii*  
    *Automation* ..... *x*  
    *Fuel Consumption* ..... *xi*  
    *Fuel Site Capacity* ..... *xiii*  
    *Fuel Site Availability* ..... *xv*  
    *Fuel Site Queuing*..... *xvi*  
    *Fuel Shortages*..... *xvii*  
**Recommendations**..... **xviii**

## Appendices

- Appendix A – Map of Fueling Sites
- Appendix B – Automation Summary

## Introduction

In October 2001, The Baltimore Efficiency & Economy Foundation (B.E.E.F.), engaged the Fleet Management Services Group of MAXIMUS, Inc. to conduct a high level assessment of Baltimore City's fueling program. Specifically, we set forth to determine if the City was providing fuel for its vehicles and equipment in the most cost effective and efficient manner possible.

B.E.E.F. is an independent non-profit organization that undertakes research studies on various aspects of management, operations, tax and fiscal policy in Baltimore City government. The Foundation is committed to objectively conducting and facilitating reviews in order to help local government operate more efficiently and economically.

At issue is the current number of fueling sites under the auspices of Baltimore City and whether there might be a more economical approach to providing fuel to City support vehicles such as through commercial vendors or modifying the number of City fuel sites.

## ***Study Methodology***

We evaluated Baltimore City's fueling operation using the following:

1. A review of documentary material provided by the City through B.E.E.F. on fueling stations, costs, and services;
2. Interviews with the Fuel Services staff;
3. Interviews of the major fuel users; and
4. Analysis of the documentary information that included fuel site locations, tank capacities, hours of operation, and so forth, in conjunction with the information developed during the interviews.

Additionally, we used knowledge that we have gained from performing similar, but more detailed reviews for cities across the country to identify opportunities for improvement and to formulate general recommendations for a more cost effective and efficient operation.

Readers of this report are reminded that due to the limited resources available to B.E.E.F., this study is a high level look to determine if there are opportunities to improve the overall efficiency of the City's approach to fueling of its fleet. It is intended to identify opportunities that require additional analysis, not to provide the detailed answers to all of the questions or alternatives that the report might generate.

## ***General Discussion***

The cost-effective provision of fuel is critical to the operation of any fleet. Generally, there are two ways to meet fueling needs: 1) use owned fueling facilities or 2) use commercial fueling facilities.

Owned or *in-house* fuel facilities are favored when the facilities are conveniently located for the fueling of equipment and when the volume of throughput is sufficient to make them economical. Most municipalities are also concerned

about emergency situations when commercial stations may not be open. For example, many commercial stations are not open around the clock and even those that are frequently do not have a source for emergency power in the event of commercial power failure. So even those cities that choose commercial vendors as their primary source for fuel usually continue to operate several conveniently placed in-house facilities for strategic purposes.

The initial investment required for in-house fuel facilities is significant. The fuel site, site improvements, the tanks, the tank monitoring equipment, the dispensing equipment, emergency power source, and so forth cause the typical investment to be well into the hundreds of thousands of dollars. This cost is recovered over the life of these assets as part of the markup added to the cost of each gallon of fuel that is pumped. In addition to the capital cost, is the ongoing operational cost associated with each fuel site. These include the monitoring of the tanks and dispensers, maintenance and repairs, advertising and awarding of contracts to vendors, ordering and delivery of fuel and other site related supplies, station attendants (if used), site security, administrative costs associated with recording the usage of the fuel, maintaining the records on the tanks, reconciling the quantity of the product in the tank to that which was delivered and that which has been dispensed, any site clean-up that may be required as a result of spillage or leakage, payment of fines if legal requirements are not properly met, and so forth. Obviously, the more gallons of product that are pumped, the more gallons there are over which to spread these costs. Aside from the actual cost of a gallon of product, clearly, the more gallons of fuel that are pumped, the lower the total cost per gallon of product.

The other key to economical operation of a fuel site is the cost of a gallon of bulk fuel. The bidding process and the particular index to which the contract price is tied are two factors that drive the cost of a gallon of product. The most inexpensive way for fuel wholesalers to deliver fuel is by the tanker truck load (typically around 8,000 gallons) and to be able to *drop* the load as opposed to *pumping* the load. Loads can usually be dropped into underground storage tanks and usually have to be pumped into above ground storage tanks. Underground storage tanks usually have greater capacities than above ground tanks and typically have a higher first-cost than above ground facilities. Most commercial fueling stations use underground storage tanks.

In the late 1980's the Federal Environmental Protection Agency (EPA) promulgated new standards for underground storage tanks. The requirements took effect for all new facilities, and existing facilities had up to ten years to come into compliance. By December 1998, all operating fueling facilities were to be in full compliance with the EPA regulations. In the years and months immediately preceding December 1998, there was a flurry of activity as both commercially and privately owned (including governmentally owned) fueling facilities were brought into compliance. Many municipalities moved to a greater use of above ground storage tanks because the typical site cost was less, installation could be done quicker, and the perceived liability associated with above ground tanks was less than that associated with underground tanks.

Tanks, piping, tank product, and possible ground contamination are monitored by automatic tank monitoring equipment. In addition to the on-site monitoring, most organizations with more than one fueling facility set up a centralized monitoring point and the on-site monitoring equipment is programmed to transmit any alarm condition to this central point. This permits around-the-clock monitoring of the fueling sites. There are also commercial firms that can be contracted to monitor these alarms.

The other form of electronics that is typically used at in-house fueling facilities provides security for the dispensing of the product and collects data on the type and quantity of product pumped. This equipment is usually programmed to collect data on the vehicle or piece of equipment into which the product is pumped. In addition to the identity of the piece of equipment being fueled, usage data (miles or hours) is usually collected and some organizations want to know who is doing the fueling. These systems use a variety of input devices including punched cards, cards with magnetic stripes like credit cards, keys, electronic keys with computer chips embedded in them, key pads for manual input of data, and so forth. In the last half-dozen years, a new generation of this equipment has been introduced. These systems use electromagnetic or radio-frequency coupling devices and the vehicles communicate directly with the dispensers thereby eliminating the need for any human intervention. These systems ensure the accuracy of the data entries (odometer readings and the like), eliminate lost cards and keys, eliminate the trading or substitution of cards or keys, ensure that only the correct product is pumped into the receiving vehicle, prevent vehicles without the appropriate devices from receiving fuel (eliminates pilferage), can be used to capture other data regarding the vehicle, can be programmed to send messages to the vehicle operator (for example, this vehicle is due for preventive maintenance), can be programmed to not permit a vehicle to be started until the dispensing nozzle has been removed from the filler neck, and so forth. As with the tank monitoring equipment, systems of this sort typically use telephone lines and modems to transmit and receive data from a centralized computer. Most organizations interface the fuel dispensing system with the fleet management information system (FMIS) so that the FMIS has up-to-date usage information about the fleet and the FMIS can generate notices such as the notification that a vehicle is due for preventive maintenance.

There are two approaches in widespread usage for the procurement of fuel from commercial vendors. The first is to contract with a single supplier; an Exxon, Shell, or Amoco for example. The second is to use a commercial fuel management program where a firm has contracts with almost all of the fuel vendors and provides a universal fueling card to its subscribers. Contract proposals from single suppliers usually offer a discount off of pump price of up to a few cents per gallon. However, only that supplier's stations may be used. The universal fueling card vendors usually do not offer discounts but provide the convenience of being able to use almost any commercial fuel station that accepts credit cards.

One of the difficulties cities find with use of commercial fueling stations is the accessibility of city owned equipment. Most commercial stations, particularly

those located within major metropolitan areas, are designed primarily for cars, vans, and light trucks with only the occasional fueling of larger vehicles. Turning radii, spacing between fueling islands, and vertical distance to canopies are not meant for a steady flow of refuse collection vehicles, tandem dump trucks with trailers or plow blades attached, aerial bucket trucks, large fire apparatus, and the like. Also, whereas the station operators appreciate a city's business and the considerable volume of fuel some of these vehicles hold, they do not appreciate having several dispensers blocked from use by others due to the size of the city's vehicles.

Some cities would rather not have their employees waiting in line at a commercial station and some know that their employees frequent the quick food shops while at commercial stations and find that offensive. On the other hand, these same cities quickly acknowledge that their employees would be visiting other convenience stores for their coffee and snacks if they were not visiting the ones at the fuel stations.

## *Findings*

### **General**

The fuel program for the City of Baltimore is centralized and managed by the Fuel Systems Division, a part of the Bureau of General Services of the Public Works Department. The Bureau of General Services is responsible for maintaining public buildings and the City's fleet of vehicles and equipment. There are approximately 6,500 pieces of fuel consuming equipment in the City's fleet. The Fuel Systems Division supports the fleet by procuring and supplying fuel to those units, maintaining the fueling equipment at the fueling sites, and managing fuel consumption, procedures, and records.

The City maintains 21 fuel sites and 3 mobile fueling trucks that are currently operational. All City vehicles and pieces of equipment are fueled at these sites with only a few exceptions. The fueling sites and their locations are listed in the following table:

Facility	Address
Back River Waste Station #70	8201 Eastern Blvd
Carroll Park Station #50	2100 Washington Blvd
Clifton Park Station #51	2710 St. Lo Dr
Convention Center #14	1 West Pratt St
Druid Hill Park Station #54	2600 Madison Ave
Education Station #11	1120 East 20th Street
Gwynns Falls Park Station #52	2905 Hillsdale Rd
Liberty Dam Station #41	5685 Oakland Mills Rd
Liberty Engine #40	3609 Liberty Heights Ave
Loch Raven Dam #42	9800 Loch Raven Dr
Mid Town Towing Station #1	405-425 Front Street

Montebello Filter Station #44	3901 Hillen Rd
Motor Equipment Division Station #6	101 Dickman Street
Northeast Substation Station #8	4325 York Road 21213
Northeast Yard Station #2	6101 Bowleys Lane
Northwest Substation Station #3	4410 Lewin Avenue
Northwest Yard Station #10	2840 Sisson Street
Patapsco Waste Station #9	3501 Asiatic Ave
Patterson Park Station #53	2601 E. Baltimore St
Pretty Boy Dam Station #43	18514 Pretty Boy Dam Rd
Western Yard Station #30	701 Reedbird Ave
Hwys Station #33 (Trk #3517)	6400 Pulaski Hwy
Solid Waste Station #31 (Trk #3266)	Quarantile Landfill
Water Station #27 (Trk #2692)	2947 Washington Blvd

A map of the fueling sites, provided by the City, is included in Appendix A.

The City has recently had a consulting firm conduct an evaluation of the physical condition of the fueling stations. This study, completed in November 2000, involved physical inspections of each fueling site. These inspections included the tanks, pumps, monitoring systems, and leak detection systems at each location with recommendations to improve the sites as appropriate. Action on some of these recommendations has been initiated.

Fuel is purchased from commercial wholesale providers through existing multi-year contracts. The contracts are competitively bid and the vendor that can meet the requirements set forth in the bid document at the lowest cost to the City is awarded the contract as the primary vendor.

Additionally, the City has a contract with Amoco that provided Amoco credit cards to City employees when they need to travel outside the City limits. Following a major snowstorm that hit the Baltimore area several years ago, the City sought a relationship with a fuel credit card company. The concern was that City vehicles such as plows would have to leave their routes to fuel at a limited number of City-owned fueling sites. It was believed that the use of the commercial fueling stations would allow the vehicles to remain near their routes for refueling. Also, it was felt that Amoco did not have a sufficient number of conveniently located stations to meet the possible needs of the City in such an emergency. (The snowstorm and related fueling concerns occurred before current management so details regarding the storm, the frequency that plows had to leave their routes to refuel, and the like, were not available to us). As a result, the City decided to contract with a commercial fueling card company for use as an emergency backup. Companies in this business have contracts with most of the commercial fueling vendors so a City vehicle operator with one of their credit cards should be able to fuel a vehicle at just about any commercial station.

To provide the City with some experience with commercial fueling cards, the Sheriff's Department was selected for participation using the Wright Express

Fueling Program. Because of the small number of drivers in the Sheriff's Department, it was felt that it would be easier to monitor, manage, and track this program. The Wright Express credit card is accepted by a wide variety of fueling stations. This program allows the Sheriff's Department to purchase fuel and motor oil at any station that accepts the Wright Express card throughout the United States. It is our understanding that the Wright Express program is not being used by any other organization in the City and that the City continues to maintain its contract with Amoco.

The Sheriff's department has found the commercial fueling card program to be quite satisfactory. The department had experienced some difficulties fueling at City facilities due to the limited hours of operation at many of the City's sites and delays in getting fuel due to lines when the sites were open. The Sheriff's Department also pointed out that they travel all over the state and surrounding jurisdictions to serve warrants and subpoenas and to pick up witnesses and prisoners for transporting to the City. Having the fuel card makes it easier for them to refuel without planning ahead for such trips. However, they acknowledge that the cost of fuel is probably somewhat higher than it would be from City fueling facilities. The Sheriff's department agreed that if the City's fueling facilities were more accessible (open more hours and without significant waiting time), they should use the City's fueling facilities when traveling in the vicinity of the City and only use the fueling cards when making long trips or in emergencies.

## **Fuel Site Staffing**

Currently most of the City's fueling sites have fuel attendants assigned to the sites to assist in the fueling operations. These employees also fulfill other duties not related to fueling, as time permits. The City provided the following table when we asked how many fuel attendants were on the payroll.



SITE NAME	ATTENDANTS	
	NUMBER	MAN HRS/WEEK
Mid-Town Towing	9	168
Northwest Substation	1	48
Motor Equipment Division	1	40
Northeast Substation	2	80
Patapsco WWTP	1	40
Back River WWTP	1	40
Druid Hill Park	1	40
Education	1	20
Liberty Dam	0	5
Loch Raven Dam	0	5
Prettyboy Dam	0	5
Northeast Waste Yard	1	48
Northwest Waste Yard	1	40
Western Yard	1	48
Clifton Park	1	20
Patterson Park	1	15
Carroll Park	1	15
Gwynns Falls Park	0	7
Liberty Engine #40	1	28
Montebello Filters	0	5
Convention Center	1	14
Water Mobil Truck #2692	1	20
Highways Mobil Truck #3517	1	20
Solid Waste Mobil Truck #3266	1	28
Fuel Systems Mobil Truck #20	1	15
Fuel Systems Mobil Truck #26	1	10
Fuel System - Central Office -Data Entry	2	80

The fuel attendants' primary fuel dispensing responsibilities include the following (as taken from position descriptions):

- The attendant will be on the pump island at all times when a vehicle is refueling or waiting to be refueled. The attendant will assist operators when requested. The attendant will check fluids when requested and as time permits.
- The attendant will see that a fully charged A-B-C type fire extinguisher is readily available for use at the pump island.
- The attendant will spot check the following items:
  - Vehicle fuel card matches vehicle number;
  - Employee operator card and City ID matches.
- The attendant will perform the following master card actions:
  - Manual fuel issues;

- Receipt of fuel for inventory;
  - Entry of dipstick and totalizer readings; and
  - Transfers to mobile stations.
- The attendant will be responsible for keeping the area around the pump island and yard clean of trash and debris.
  - The attendant must ensure that fuel is deposited into only acceptable vehicles and containers.
  - The attendant may be required to monitor fuel tank levels.
  - The attendant may be required to complete manual usage logs and reports.

The lack of automation at the fuel sites and the apparent lack of reliability of some of the systems have made continued staffing of most of the City's fueling sites a necessity. We also learned through our interviews that there is a genuine concern that some City employees might be tempted to misappropriate City fuel if an attendant was not present. This concern notwithstanding, with any of the current robust computer automated fuel management systems available today, there is no longer a need to staff fueling sites. In fact, self-service fueling stations for government organizations – city, county, and state – is the norm.

City representatives point out that these attendants check oil levels in vehicles and add oil as needed. Also, they assist with flat tires and handle minor problems experienced by City drivers.

## **Automation**

At present, there are 21 active fueling sites and 3 fueling trucks being used to fuel the City's fleet. Seven of the fueling sites have underground fuel storage tanks and fourteen have above ground fuel storage tanks. (Appendix B contains a table that summarizes some of the data from the November 2000 report by E2CR, Inc. and some of the data we have received from the City). At the time of the E2CR study, two of the underground fuel storage tanks did not have tank-monitoring equipment and only one of the above ground storage tanks had tank-monitoring equipment. None of the sites are remotely monitored. If a site that is closed was to experience an alarm condition (product is detected in the interstitial space between the inner and outer wall of a tank or piping for example), awareness of the alarm condition and therefore the ability to respond to the alarm condition, would not occur until the site is next opened.

At present, nine of the fuel sites use an automated fuel dispensing system. The system uses cards with magnetic strips in connection with a keypad at equipped sites to enable fueling and gather data. Two cards are required to obtain fuel, one associated with the piece of equipment receiving fuel and the other associated with the employee doing the fueling. The keypad is used to enter a PIN (needed to validate that you are the owner of the employee card) and to enter the odometer or hour meter reading. The division is in the process of

upgrading other sites and desires to have all of the fuel sites automated at some future date.

It would cost between \$10 and \$12 thousand to automate the fueling dispensers at a small site (one to four hoses on one or two dispensers). Larger sites would be incrementally more costly. E.J. Ward, the firm that currently provides the dispenser automation for the City, also offers automated tank monitoring. The installed cost for above ground tank monitoring equipment (assuming that dispenser monitoring equipment is already installed) is about \$2,500 for a single tank and an additional \$1,000 for each additional tank at the same site. This cost assumes that there is not a requirement to trench in conduit. The cost for underground tanks is about the same as the above ground tanks for the hardware. However, additional costs are incurred in trenching in the various monitoring devices.

The central monitoring equipment consists of a computer (personal computer) with modem. The central PC polls each fueling site on a scheduled basis. These contacts provide an opportunity to up and download information about product level in the tank, monitor status, and fueling transactions. Any fueling site that experiences an alarm, automatically dials the central monitoring PC, which sounds the alarm.

## Fuel Consumption

The City's fleet consumes, on average, 320,000 gallons of fuel per month. 209,000 gallons or about 2/3rds is unleaded while the balance is diesel.

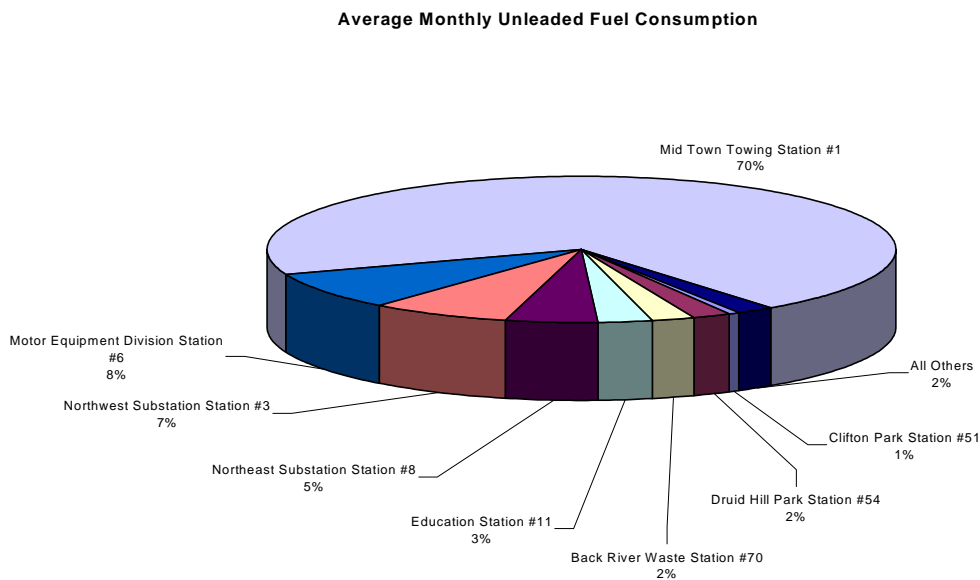
The average monthly consumption of fuel by type and location is provided in the following table:

Facility	Average Monthly Unleaded Fuel Consumption (gallons)		Average Monthly Diesel Fuel Consumption (gallons)	
	Consumption (gallons)	% of Total	Consumption (gallons)	% of Total
Back River Waste Station #70	4,746	2.3%	1,243	1.1%
Carroll Park Station #50	279	0.1%	240	0.2%
Clifton Park Station #51	1,135	0.5%	1,552	1.4%
Convention Center #14			950	0.9%
Druid Hill Park Station #54	3,859	1.8%	2,076	1.9%
Education Station #11	5,997	2.9%	3,708	3.3%
Gwynns Falls Park Station #52	808	0.4%	578	0.5%
Liberty Dam Station #41	884	0.4%	270	0.2%
Liberty Engine #40	136	0.1%	1,611	1.4%
Loch Raven Dam #42	431	0.2%	243	0.2%
Mid Town Towing Station #1	147,074	70.3%	40,534	36.4%
Montebello Filter Station #44	143	0.1%	71	0.1%
Motor Equipment Division Station #6	16,994	8.1%	10,855	9.8%

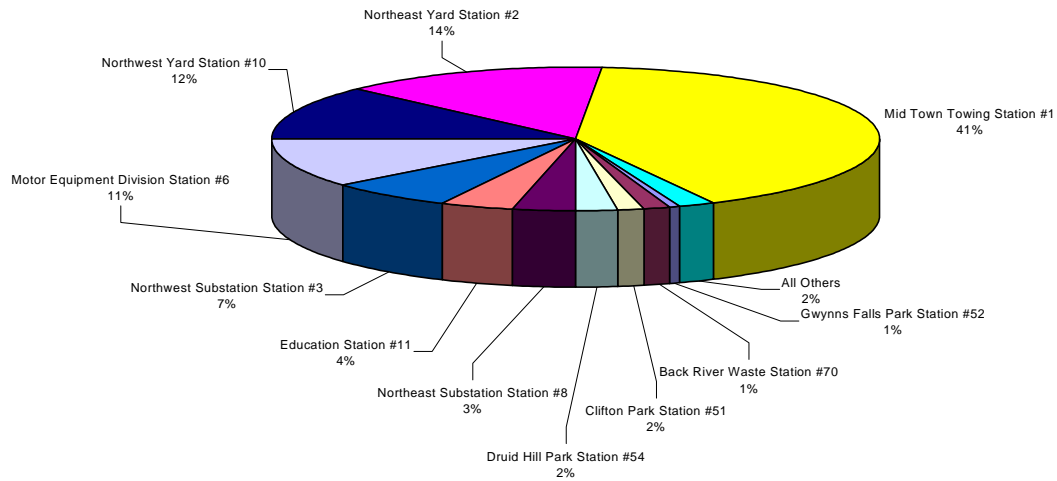
Northeast Substation Station #8	9,617	4.6%	3,350	3.0%
Northeast Yard Station #2			13,684	12.3%
Northwest Substation Station #3	15,549	7.4%	6,669	6.0%
Northwest Yard Station #10			12,065	10.8%
Patapsco Waste Station #9	570	0.3%	274	0.2%
Patterson Park Station #53	497	0.2%	413	0.4%
Pretty Boy Dam Station #43	458	0.2%	215	0.2%
Western Yard Station #30			10,701	9.6%

The Mid Town Towing Station #1 is by far the most heavily used fuel site. During a recent twelve-month period, over 70 percent of all unleaded fuel that was dispensed from City fueling sites was from this location. During the same period, 34 percent of all diesel fuel was dispensed from this location. This site is the most heavily used because it is open 24 hours a day, seven days a week, and it has enough capacity that it is unlikely to be out of fuel. Users indicated that even though it may not be as convenient as other sites, because they had experienced instances when the smaller sites were out of fuel they would travel to Mid Town. After this had occurred a few times, they were more apt to simply travel to Mid Town to get all of their fuel because it usually had fuel and was open.

The following charts show the percentage of fuel dispensed by location. The fuel stations that had less than 1 percent were grouped together and labeled as *All Others*.



### Average Monthly Diesel Fuel Consumption



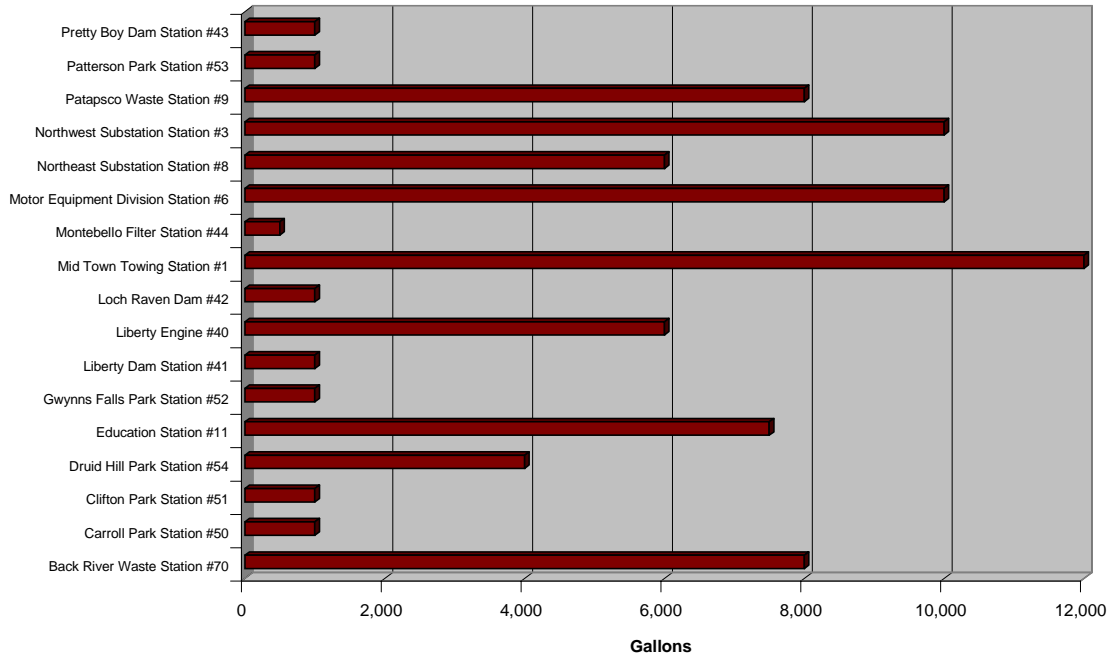
## Fuel Site Capacity

Baltimore City has a total fuel capacity (fueling stations and mobile fueling vehicles) of 168,885 gallons. Diesel fuel tanks represent 53 percent of the capacity. A breakdown by fuel type is provided in the following table:

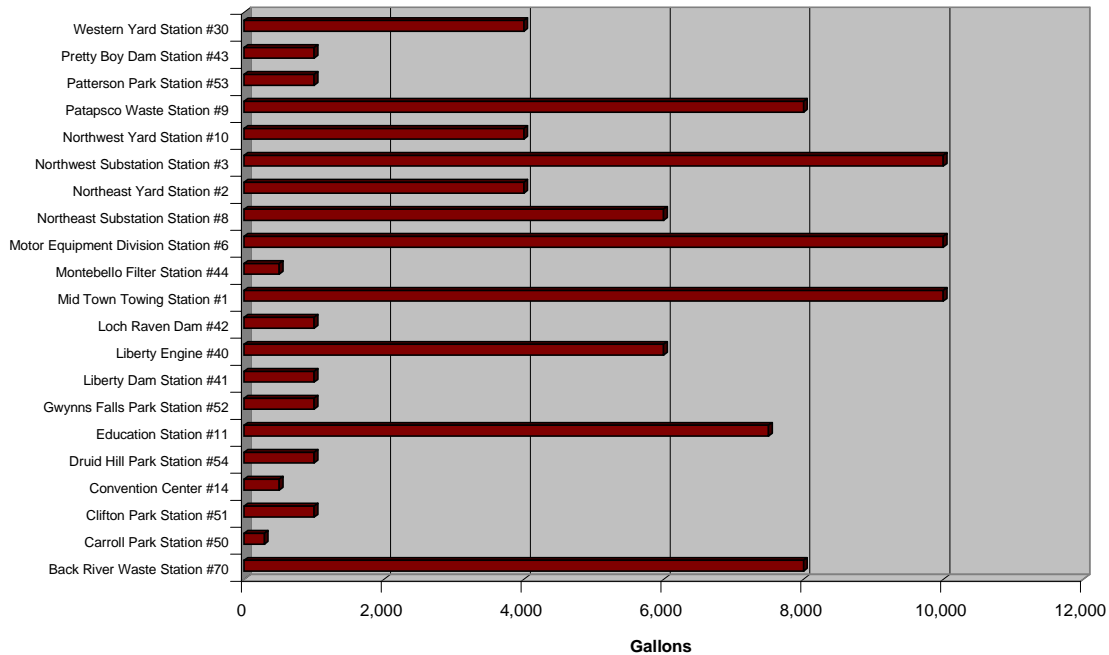
Type	Fuel Sites	Fuel Trucks	Total
Unleaded	79,000 gallons	280 gallons	79,315 gallons
Diesel	85,790 gallons	3,780 gallons	89,570 gallons

Unleaded and diesel fuel tank capacities for each fueling site are shown in the following graphs.

**Unleaded Fuel Tank Capacity by Location**



**Diesel Fuel Tank Capacity by Location**



Most cities like to have at least a two week’s supply of fuel on hand at all times for protection in the event of an emergency. In order to ensure a two weeks supply, and assuming that at any given time, all of the City’s tanks are approximately half full, the City would need to have capacity for approximately 320,000 gallons of fuel versus the present capacity of 169,000 gallons. 209,000 gallons of capacity should be unleaded (current capacity is 79,000 gallons) and 111,000 gallons of capacity should be diesel (current capacity is 89,000 gallons).

## Fuel Site Availability

Only two of the regular fueling sites are available twenty-four hours a day, seven days a week. The Mid Town Station #1 is the most heavily used partly because it is open around the clock. Fuel consumption data for the other twenty-four hour facility, Liberty Engine #40, was not made available to us. A listing of the fuel stations and their hours of operation is provided in the following table:

Facility	Hours of Operation	Days Open
Back River Waste Station #70	7:00 am – 2:30 pm	M-F
Carroll Park Station #50	7:00 am - 3:30 pm	M-F
Clifton Park Station #51	7:00 am - 3:00 pm	M-F
Convention Center #14	7:00 am –11:00 pm	M-F
Druid Hill Park Station #54	7:00 am - 3:30 pm	M-F

Education Station #11	7:00 am – 3:00 pm	M-F
Gwynns Falls Park Station #52	7:00 am – 3:30 pm	M-F
Liberty Dam Station #41	7:00 am – 3:00 pm	M-F
Liberty Engine #40	24 hrs	All
Loch Raven Dam #42	7:00 am – 3:00 pm	M-F
Mid Town Towing Station #1	24 hrs	All
Montebello Filter Station #44	7:00 am – 3:00 pm	M-F
Motor Equipment Division Station #6	7:00 am – 3:30 pm	M-F
Northeast Substation Station #8	7:00 am – 3:00 pm	M-F
Northeast Yard Station #2	9:00 am – 2:00 pm	M-Sa
Northwest Substation Station #3	7:00 am – 11:00 pm	M-F
Northwest Yard Station #10	7:00 am – 3:00 pm	M-F
Patapsco Waste Station #9	7:00 am – 3:00 pm	M-F
Patterson Park Station #53	7:00 am – 3:30 pm	M-F
Pretty Boy Dam Station #43	7:00 am – 3:00 pm	M-F
Western Yard Station #30	7:00 am – 3:00 pm	M-Sa

Most of the fuel site hours reflect the normal working hours of the Public Works Department employees at these facilities, *i.e.*, the normal “open” hours of these yards.

Some of the user departments indicated that the limited times that they could fuel and the limited number of stations open after 3:00 pm presented significant obstacles to their operations. Most notably, this was the case for emergency operations of the Police, Fire, and Sheriff’s Departments. However, due to the wide array of services that Baltimore City provides to its residents, we suspect that the limited fueling times also affect other departments, divisions, and agencies as well.

## Fuel Site Queuing

Another operational issue with the City fueling sites is the lines of vehicles and equipment that sometimes form while waiting to obtain fuel. This is primarily a concern at the central downtown fueling station – Mid Town Station #1. Because this is the only fueling site that is available at all hours, including weekends, and has come to be recognized as the fueling site most likely to have fuel, operators often experience delays while waiting to fuel their units.

Not only does this queuing of vehicles and equipment result in lost productive time, but also in many cases emergency vehicles have to travel out of their assigned districts and consequently must be taken *out-of-service* for the time it takes to travel to and from the fuel site and the time spent waiting and then fueling their vehicles.

What exacerbates this situation is the absence of a fueling priority procedure. Fueling is simply performed on a first come, first serve basis. Therefore, an ambulance may be out-of-service for a prolonged period of time because the operator is sitting in line behind a tractor, street sweeper, non-emergency sedans, or other pieces of equipment waiting to fuel.



# Fuel Shortages

Users advised and Fuel Systems confirmed that there have been many times when City fuel stations have run out of fuel. This presents an obvious obstacle for user departments in performing the tasks and providing the services that they are charged with. The primary cause for this is the lack of adequate fuel tank storage capacity.

In order to determine the adequacy of fuel storage capacity versus fuel consumption we performed a tank replenishment analysis. This is an analysis of the number of gallons of fuel dispensed in a year divided by the fuel tank storage capacity. An acceptable fuel tank replenishment rate is between 15 and 50. This means that the tanks are completely replenished between 15 and 50 times per year. A small replenishment means that the tank is too large or that very little fuel is dispensed from that site. A large replenishment number means that the tank capacity is inadequate and requires too many fuel drops to maintain an acceptable fuel storage level.

The results of our fuel tank replenishment analysis are provided in the table below:

Facility	Unleaded Tank Capacity	Diesel Tank Capacity	Unleaded Replenishment Rate	Diesel Replenishment Rate
Back River Waste Station #70	8,000	8,000	7.1	1.9
Carroll Park Station #50	1,000	290	3.3	9.9
Clifton Park Station #51	1,000	1000	13.6	18.6
Convention Center #14		500		2.1
Druid Hill Park Station #54	4,000	1,000	11.6	24.9
Education Station #11	7,500	7,500	9.6	5.9
Gwynns Falls Park Station #52	1,000	1,000	9.7	6.9
Liberty Dam Station #41	1,000	1,000	10.6	3.2
Liberty Engine #40	6,000	6,000		
Loch Raven Dam #42	1,000	1,000	5.2	2.9
Mid Town Towing Station #1	12,000	10,000	147.1	48.6
Montebello Filter Station #44	500	500	3.4	1.7
Motor Equipment Division Station #6	10,000	10,000	20.4	13.0
Northeast Substation Station #8	6,000	6,000	19.2	6.7
Northeast Yard Station #2		4,000		41.2
Northwest Substation Station #3	10,000	10,000	18.7	8.0
Northwest Yard Station #10		4,000		36.2
Patapsco Waste Station #9	8,000	8,000	0.9	0.4
Patterson Park Station #53	1,000	1,000	6.0	5.0
Pretty Boy Dam Station #43	1,000	1,000	5.5	2.6
Western Yard Station #30		4,000		32.1

The analysis indicates that many of the fuel sites are either underutilized or have excess fuel storage capacity. The only site that has a higher than normal replenishment rate is the Mid Town Station for unleaded fuel. With the current number of vehicles and pieces of equipment fueling at this location, the unleaded fuel storage tank capacity is inadequate. The diesel fuel storage capacity is at the high limit of the acceptable range.

A few sites such as the Pretty Boy Dam Station #43, the Loch Raven Dam #42, the Montebello Filter Station #44, and the Liberty Dam Station #41 have limited users and lower use because of their isolated locations. We have not visited these sites nor have we reviewed the types of equipment that are being fueled at these facilities. If the equipment can easily be taken away from the sites, it may be possible to fuel at either commercial facilities or at County owned facilities which could be less expensive than continuing to maintain low volume fueling sites. These sites should be reviewed in greater detail to make this determination.

## ***Recommendations***

There is no-doubt in our minds that the in-house fueling of the City's fleet should be more economical than using commercial fueling facilities. However, if it were not for the sunk cost in the investment the City already has in its existing fueling facilities, we doubt that the current approach could be shown to be economical. This is because the City has too many limited capacity, poorly utilized fueling sites and an inadequate number of conveniently located high capacity sites with around-the-clock accessibility. The limited capacity and poorly utilized sites should not be shutdown arbitrarily without further study. The reason for this is that the City already has a sizeable investment in these sites and to abandon them without understanding better why they are underutilized could be a further waste of the City's scarce resources.

The City needs to find a way to eliminate the need for attendants at the fueling sites. The first step is to complete the automation of the tank monitors by establishing a centralized location for the monitoring of and responding to all fuel tank alarms. This might be the Mid Town Towing Station #1 since it is open around-the-clock or it might be another centralized City location that handles City emergencies on an around-the-clock basis. Secondly, any of the fueling stations that have even modest throughput should have their dispensers automated with the card reading system. Those sites that are automated do not need attendants and the attendants should be given other job assignments within the City. A restricted phone should be available at each fueling site for operators who are experiencing problems to report the problem and get help without having to have an attendant standing by. The resulting model could be to have full time coverage with fuel attendants at the Mid Town Towing Station for the purpose of monitoring all fuel site activities. An additional employee who works more conventional hours would be responsible for visiting each fueling site at least once per day to inspect, request repairs, and re-supply as necessary.

Discussions with representatives of the major City fuel users indicated that five strategically located fueling centers with adequate fuel storage capacity and a sufficient number of dispensing islands, and that were open around-the-clock would provide sufficient fuel supply and availability to meet the City's fueling needs. The five locations

discussed were Mid Town, Northwest, Eastern (Pulaski Highway), Northeast, and South (Central Garage). Fueling facilities are either currently in existence or have been located at each of these sites in the recent past. Modifications to most of these sites would be required before other fueling facilities could be removed from service. We did not visit these locations and therefore cannot report on the adequacy of them to support these new or additional fueling operations. Our recommendation is based on the suggestions of City representatives who are familiar with these sites but may not have total knowledge of constraints such as zoning requirements or other City plans for the properties. There may be a few other fueling sites that the City would want to retain due to the unique nature of the fleet that is being fueled at the locations.

As noted in the *findings*, some of the fuel sites such as Pretty Boy Dam Station #43, the Loch Raven Dam #42, the Montebello Filter Station #44, and the Liberty Dam Station #41 may still be required notwithstanding their low consumption. The Liberty Engine Station provides emergency reserves for the Fire Department. The fueling sites at the reservoirs are in isolated locations a significant distance from existing and proposed City fueling sites. There may be an opportunity to either use commercial fuel vendors for equipment at the reservoirs or to enter into an agreement with another jurisdiction (such as Baltimore County) to provide fuel for the City's vehicles at these locations.

The universal fueling card program that the Sheriff's Department is currently using is working well for them. Because of the nature of the organization, the fueling cards are not likely to experience some of the misuse that many cities experience with fueling cards. The Sheriff's Department has told us that if the City's fueling sites were more accessible and without significant queues, they would use them instead of the universal cards because fuel would be less expensive from the City's fueling sites.

Clearly, a more detailed study is needed in order to determine the appropriateness of the suggested fueling sites and then to determine appropriate sizes for tanks for each of the products, an appropriate number of fueling islands, dispensers, and so forth.

