9/29/2023

Winter Park Fire Station 64

ASHRAE Level II Energy Audit

15 lightyears
Energy Testing | Solar Power | Green Certification

TLC ENGINEERING SOLUTIONS

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Executive Summary

TLC Engineering Solutions (TLC) and 15 Lightyears performed an ASHRAE Level 2 facility energy audit of the Winter Park Fire Station 64 as a part of a contract with the City of Winter Park.

This report is related to the energy-consuming systems only and is intended to fulfill the requirements of an ASHRAE Level 2 Energy Audit, per the guidelines set forth by the ASHRAE document "Procedures for Commercial Building Energy Audits." The purpose was to observe existing conditions and gather information that would enable TLC to render an opinion concerning conditions or deficiencies that could affect efficient use of this facility, and to identify potential areas for improvement. Neither the field visits nor this report is intended to uncover hidden defects or the presence of hazardous materials.

TLC reviewed the drawings (dated December 2016), current utility bills from January 2021 through December 2022, subsequent project documentation, and visited the site in January 2023 to review the mechanical and electrical equipment, the HVAC and lighting controls systems, and observe each space type and its general energy use intensity. During this time, TLC was granted access to the building automation system to view the operation remotely. In the course of its work, TLC obtained extensive photo documentation of the conditions of the facility. Several of the photographs are included in Appendix B of this report, and the reader is encouraged to thoroughly review the photographs and descriptions, as they are intended to support and supplement the observations described herein.

After the time on site, TLC developed energy saving spreadsheets to assist with the analysis of recommended Energy Conservation Measures (ECMs) and Facility Improvement Measures (FIMs). The combination of all the walkthrough and post-walkthrough activities led to the development of the ECM and FIM list. A complete description and analysis of each ECM, as well as a table summarizing estimated cost and savings of each measure, can be found later in this report in the Energy Saving Opportunities section.

Project Information & Contacts

ASHRAE Level II audit of Fire Station 64
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General Facility Description

The Winter Park Fire Station 64 is a one-story civic building of approximately 5,400 square feet. An aerial view of Fire Station 64 is shown below.

Figure 1: Aerial View of Fire Station 64

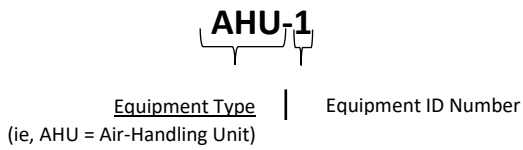
The building holds an apparatus bay on the North side and support spaces on the South side. The apparatus bay is used to house fire vehicles and equipment racks. The support side of the building includes bunk rooms, a workout room, a dining room and kitchen, and a patio area, among other spaces.

Mechanical Systems

Fire Station 64 features mechanical systems including split-system heat pumps, split-system air conditioners, exhaust fans, vehicle fume exhaust fans, and an air curtain. Mechanical system information came from a combination of resources, including information gathered during the audit walk-through of the building and review of the construction documents. The below breakdown of the mechanical systems and areas they serve is TLC's best attempt to consolidate all avenues of information into one master list.

Equipment Naming Convention

The general naming convention used on the mechanical drawings is shown below. Please note, this convention applies to most of the equipment, but not all equipment.



Air Handling Units

Air conditioning for the majority of the building is provided via split-system air conditioners. The units operate at a single set speed and capacity and are energized and de-energized via local wall-mounted thermostats.

Exhaust Fans

Exhaust fans were observed to provide the necessary exhaust for restrooms located within the building. The exhaust fans are ceiling-mounted and operated via the wall switch that controls the restroom lights. Additionally, the Apparatus Bay is provided with a vehicle fume exhaust fan, which allows safe operation of vehicles within the Apparatus Bay.

Building Controls

The building is not currently controlled by a centralized Building Automation System (BAS). All equipment within the building operates as a standalone system. Instead, the split-systems have been outfitted with Ecobee smart thermostats. The thermostats provide remote monitoring and setpoint change capability to the Winter Park Facilities personnel, as well as limited energy analysis such as runtime trending.

Lighting Systems

Interior lighting throughout the facility is predominantly provided via a mixture of lighting technologies. The original fixtures located throughout the facility are linear fluorescent fixtures, The lighting is controlled manually via wall switch. The audit team noted that a number of fixtures in the building had been retrofitted with light-emitting diode (LED) technology.

Plumbing Systems - Domestic Water Fixture

The building is served by one (1) Electric Water Heater. The water heater has a 50-gallon storage capacity and a 4.5 kW electric heating capacity.

Electrical Systems – Generator

Fire Station 64 is equipped with an exterior generator to provide power to the station when needed. There is limited information on this generator as it was not listed in the drawings given to TLC, and the information labels on the equipment piece were worn.

Building Envelope

The building envelope in the crew areas of the station consists of block wall structure with a sloped roof. The Apparatus Bay is a metal building attached to the crew quarters, with a shaded courtyard in between. During the audit walk, no issues were observed with the building envelope with relation to the goals of the auditing procedure.

Key Operating Parameters

The building is currently operated 24/7 due to the nature of the building mission.

Site Visit

The site was audited by TLC engineers and 15 Lightyears personnel in January 2023. A full evaluation of existing energy consuming systems, compliant with ASHRAE Standard 211-2019 was performed. During the audit, TLC personnel were escorted by the City of Winter Park facilities manager, Leif Bouffard. He, as well as any facility staff that were available for comment, were questioned on system operation, condition, and maintenance of the building systems.

Utility Analysis

Historical Utility Data

The building is currently served by electricity and water utilities. Electrical utility consumption values were provided for the months of January 2021 through June 2023. The monthly consumption profile is as expected, where values increase in the warmer months due to cooling needs. No billing statements were provided, but a blended rate for kWh savings was determined based on published rates. Calculation of the blended utility rate takes into account the non-fixed costs associated with electrical utilities use by the facility, including fuel charges, per-kWh cost, demand charges, etc. Table 3 details the components of the blended rate calculation.

Table 1: Annual Baseline Energy Consumption

Utility	Total
Annual Electrical Consumption (kWh)	96,242
Annual Electrical Cost	-

The following graph and table show the total consumption and demand per monthly billing period for electricity.

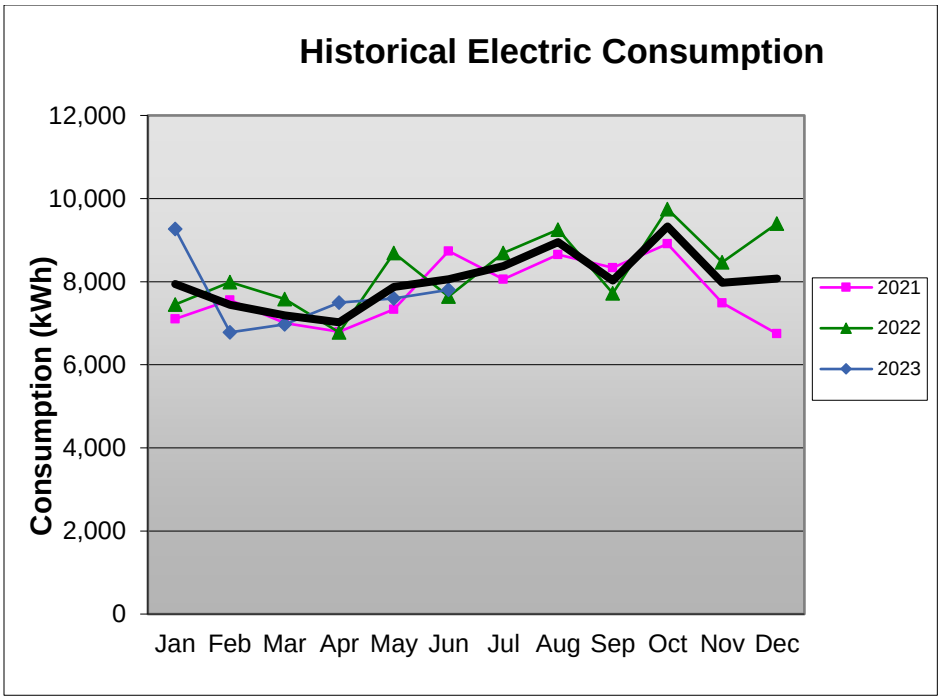


Figure 2: Fire Station 64 Electric Consumption

Table 2: Fire Station 64 Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	7,102	42.12
Feb-21	7,557	45.10
Mar-21	7,003	39.49
Apr-21	6,794	39.70
May-21	7,333	42.73
Jun-21	8,735	45.46
Jul-21	8,055	44.63
Aug-21	8,650	22.80
Sep-21	8,332	21.30
Oct-21	8,909	23.64
Nov-21	7,486	20.32
Dec-21	6,745	25.22
Jan-22	7,452	21.80
Feb-22	7,987	23.63
Mar-22	7,581	20.72
Apr-22	6,779	19.43
May-22	8,687	20.93
Jun-22	7,641	23.72
Jul-22	8,690	23.76
Aug-22	9,252	23.55
Sep-22	7,719	26.03
Oct-22	9,747	26.03
Nov-22	8,464	26.03
Dec-22	9,396	26.03

Date	Consumption (kWh)	Demand (kW)
Jan-23	9,265	26.03
Feb-23	6,780	26.03
Mar-23	6,970	26.03
Apr-23	7,492	26.03
May-23	7,597	26.03
Jun-23	7,804	26.03

Benchmarking

TLC compared energy consumption for Fire Station 64 using common benchmarks to gauge how the site compares to similar ones both regionally and nationally, principally through the use of Energy Star Portfolio Manager. The building's Energy Use Intensity (EUI), which is used by energy engineers to determine overall energy consumption to a common unit of measure, was compared to other similar buildings throughout the United States. The Energy Use Intensity measures annual consumption of electricity per square foot, in kBTU/sf/year.

These benchmark tools were developed by the Department of Energy and are based on feedback from building operators all over the country. Using the utility billing information and observing the system operation allows the energy profiles to be broken down to greater detail. The facility was modeled in Portfolio Manager as a public safety (fire/police) building.

The historical energy consumption was entered into Portfolio Manager. Based on most recent 24-months of utility data, the chart below compares Winter Park Fire Station 64 to the average energy use intensity (EUI) of similar buildings in Energy Star's database.

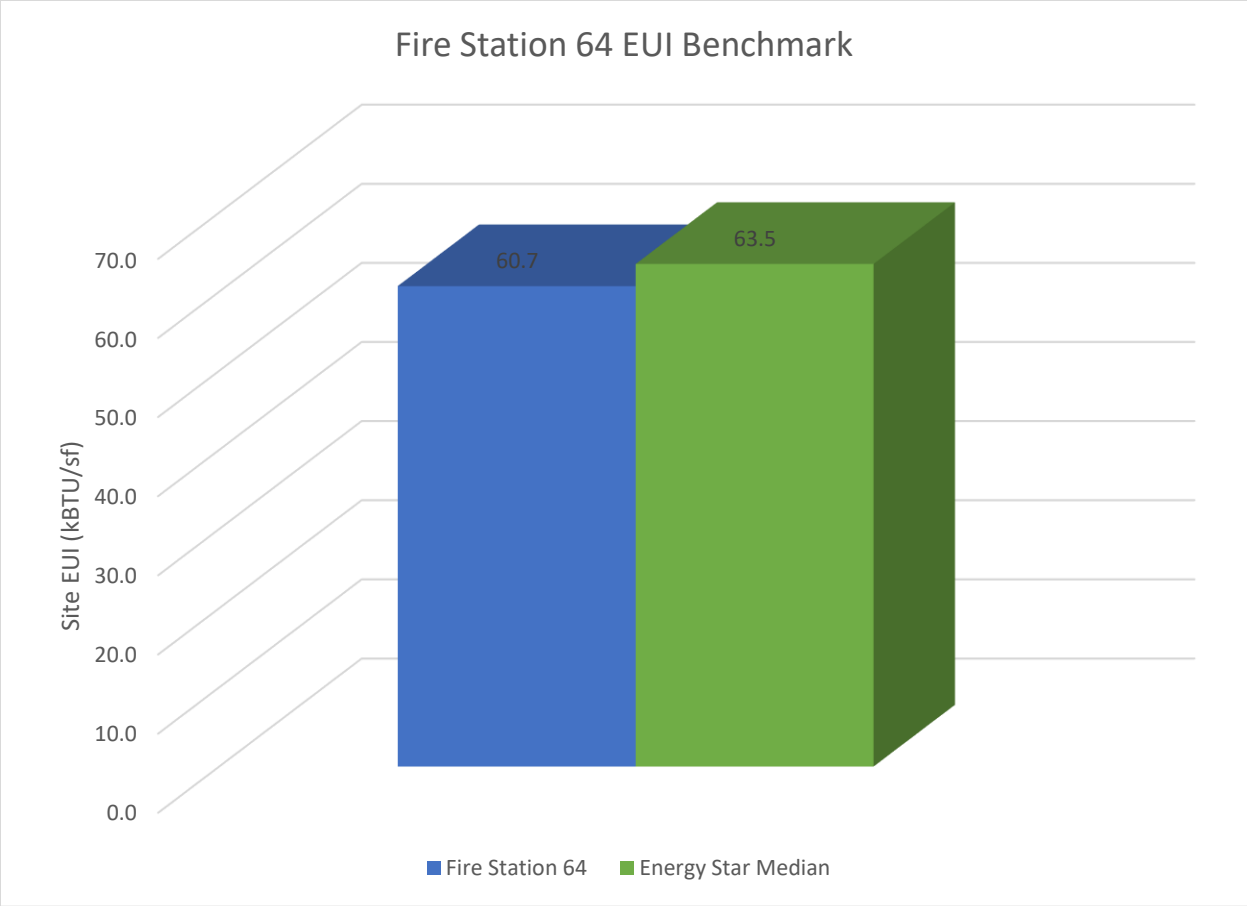


Figure 3: Fire Station 64 Energy Performance Comparison

Based on most recent 24 months of utility data, a comparison can be drawn between Fire Station 64 and the average energy use intensity (EUI) of similar buildings throughout the United States. The median EUI for an public safety building in the United States is 63.5 kBTU/sf, and the calculated EUI of Fire Station 62 is 60.7 kBTU/sf. It is worth noting that the median value reported by Energy Star is dependent on the annual responses from building surveys, and that the occupant load and climate conditions of buildings of the same type can vary significantly. The energy conservation measures detailed in this report will serve to decrease the EUI of the fire station building through efficiency increases.

Utility Rate Analysis

The building is provided with electricity by the City of Winter Park (CoWP), following their Rate Schedule GSD-1, General Service – Demand. The utility rate charges shown below were used to calculate the costs associated with the provided consumption and demand. Energy savings calculated for this building have been assigned a blended rate of $0.1061/kWh, which is the calculated blended rate not including fixed customer charges.

Table 3: Utility Rate Schedule

Description	Charge
Demand Charge	$5.05 per kW of billing demand
Energy Charge	$0.04216 per kWh

Fuel Cost Recovery Factor	$0.02281 per kWh
Gross Receipts Tax	2.5641%
Franchise Fee	6.00%
Electric Utility Tax	10.00%
EL State Sales Tax (Commercial Only)	7.45% (First $5,000)
EL State Sales Tax (Commercial Only)	6.95% (Over $5,000)

Average Rates

As noted above, a blended cost per kWh has been calculated from the rate schedule. Savings for this building have been calculated using the blended rate. The following table details the average rate over the period of analysis. As a result, savings for this building have been calculated using assumed rates for lighting and water. Water rates are based off the utility rate tables from the City of Winter Park under the assumption of a 2" water meter for combined water and sewer under Block 3 pricing. This table outlining these water rates is attached as Appendix D. The following table details the average rate over the period of analysis.

Table 4: Average Utility Rate

Utility	Average
Electricity	$0.1061/kWh
Water	$10.08/kgal

Energy Saving Opportunities

The operation and condition of equipment at Fire Station 64 building was observed to offer a few different avenues for improvement. This is to be expected given the age of the equipment itself and how long it has been in service. Improvements can be made by replacing the aging equipment. The following table summarizes the recommended ECMs for this facility that should be considered for future projects. In addition, the table distinguishes between measures specifically intended to save energy (ECMs) and facility improvement measures (FIM) that benefit the overall operation of the facility but may not provide significant energy savings.

Table 5: ECM/FIM Summary

Energy Savings Measure	FIM/ECM	ECM Category	Annual kGal Savings	Annual $ Savings	Cost $	Payback (years)
Plumbing Retrofit	ECM	Low Cost	1.9	$19	$90	5
DHW Retrofit	FIM	Capital Improvement	--	--	$1,855	--
Lighting Retrofit	FIM	Capital Improvement	--	--	$145	--
Total			**1.9**	**$19**	**$90**	**5**

*ROI calculations exclude capital improvement items, as they are intended more for facility improvement than for energy savings.

The cost and paybacks shown in the table above are estimates based on the information gathered during the auditing process. TLC utilized RSMeans 2023, as well as engineering best practices, to estimate the cost of these suggested measures. Final pricing will vary based on contractors' estimation and final equipment selections. Final payback periods are also dependent on contractor pricing and the facility's negotiated utility price.

PLUMBING FIXTURE RETROFIT

General Description

This measure proposes to replace existing plumbing fixtures, such as toilets, urinals, sinks, and showers, with low-flow fixtures. Toilets and urinals are rated based on the amount of water per flush, while showers and sinks are rated on their flow rate during use. Over time, building codes have changed to mandate lower flow fixtures than were previously allowed. Advances in technology allow for new low-flow fixtures to provide similar performance while using a fraction of the water.

The existing fixtures will be replaced, including all wear parts, with new low-flow equivalents. Replacing wear components puts the entire assembly back to its original condition and eliminates any potential for existing degradation to affect the new fixtures. While existing low flow fixtures may be excluded from this measure, including the replacement of their wear components will lead to standardized parts as well as resetting the expected lifespan of the fixtures, both of which reduce maintenance costs.

Site Specifics

There are five sinks in the facility with standard existing flow rates of around 1.5 gallons per minute. Adding low flow aerators and sensors on sinks will reduce the gallons per minute flow rate and potentially the number of minutes used per day in order to save water. New lower flow toilets will produce water

savings by using less water per flush. Additionally, energy savings should also be produced in addition to these savings by using less hot water for the sinks.

Facility Improvement Measures

TLC identified additional Facility Improvement Measures (FIM) that do not provide energy savings but should be addressed. By implementing the recommended FIM, the facility will experience improved equipment reliability, increased thermal comfort for occupants, and be able to operate as originally designed. While it is possible that these measures may decrease energy consumption, this has not been quantified as their purpose is focused on performance and reliability.

DHW Retrofit

Domestic hot water for the facility is provided by an electric water heater manufactured in 2002. This water heater is at the end of its useful life and a scheduled replacement is recommended to preemptively avoid any unplanned maintenance to the facility.

Lighting Retrofit

There are a small number of fixtures in the facility that have not yet been upgraded to LED technology. Because of the small quantity of fixtures and scope of this task, savings for this retrofit have not been factored into project payback.

Calculation Methodology – Spreadsheet System Models

Savings for this report were evaluated using spreadsheet building models for the lighting and HVAC systems. The methodologies used for each measure are described separately in this section. Industry Standard methods of evaluation were used and are detailed in this section. Additionally, assumptions made to calculate the energy savings are detailed.

Plumbing Retrofits

Savings for this measure are based on a reduction in the water consumption by the replacement of sink faucets with more efficient fixtures with lower gallons per minute flow rate. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: Plumbing Retrofits Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Number of people	Entire building	5	Engineering judgement
Minutes of sink use/person/day	Entire building	1.5	Engineering judgement
Existing Sink Flow Rate	Entire building	1.20 GPM	Engineering judgement
Proposed Sink Flow Rate	Entire building	0.5 GPM	Engineering judgement

Calculations:

Savings for this measure were comprised of water savings. The water savings were the difference in the existing and proposed annual water consumption based on assumed annual usage and flow rate of the

fixture in GPM (gallons per minute) or GPF (gallons per flush). The water usage for existing and proposed fixtures were calculated using the following formulas for sinks and toilets respectively.

$$Water\ Usage = Number\ of\ people \times GPM \times Minutes\ of\ use\ per\ day \times 365\ days/year$$

Appendix A – Mechanical Equipment

The following table shows a listing of all recorded major equipment in the building.

Building	Type	Equip	Location Served	Tag	Qty	Capacity	Units	Make	Model	Serial Number	Year
Fire Station 64	EWH	Electric Water Heater - 50 Gallons			1	4992.0	kWh/yr	RUUD	PE52-2 C	RU 0502B23777	2002
Fire Station 64	CU	Split System Heat Pump			1	4.0	Tons	Goodman	GSZ140481KF	1908727091	2019
Fire Station 64	CU	Split System Air Conditioner			1	4.0	Tons	Goodman	GSX160481FG	1706531660	2017
Fire Station 64	Generator	Generator			1						
Fire Station 64	AC	Air Curtain			1			Mars			
Fire Station 64	EF	Vehicle Fume Exhaust			1						

Appendix B – Site Walkthrough Photos

C-1: Interior Lighting

C-2: Shower and Sink Fixtures

C-3: Kitchen and Dining Area

C-4: Thermostat

C-5: Electric Water Heater

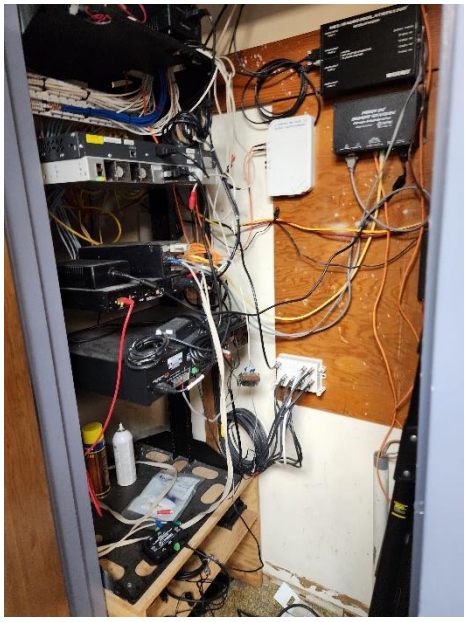
C-6: Apparatus Bay

C-7: Vehicle Fume Exhaust Fan

C-8: Air Curtain

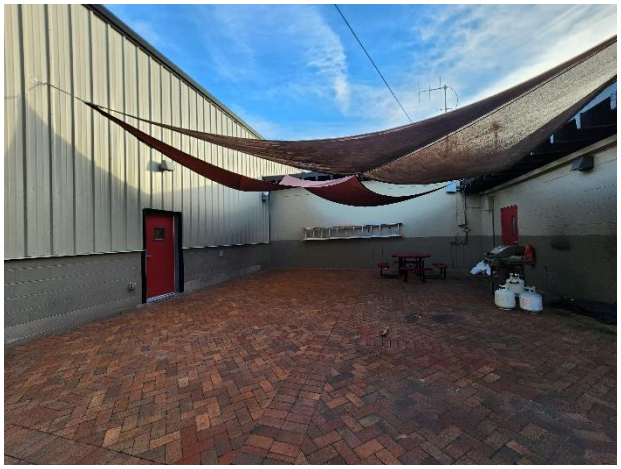
C-9: Washer/Dryer Machines

C-10: Restroom Fixtures



C-11: Tech Room

C-12: Exterior Lighting



C-13: Patio Space

C-14: Split System Heat Pump and Split System Air Conditioner

C-15: Generator

Appendix D – Water Rates for City of Winter Park

COUNTY

WATER & SEWER (COMMERCIAL & PUBLIC AUTHORITY)

Effective 10/01/2022

DEPOSIT REQUIREMENTS

	3/4" Mtr	1" Mtr	1 1/2" Mtr	2" Mtr	3" Mtr	4" Mtr	6" Mtr	8" Mtr	10" Mtr
Water Service	75.00	100.00	130.00	165.00	270.00	375.00	690.00	Avg x 3	Avg x 3
Water & Sewer Service	145.00	165.00	195.00	570.00	675.00	780.00	1,140.00	Avg x 3	Avg x 3

WATER RATES

Meter Size	Availability (Base)	Block 1		Block 2		Block 3		Block 4		Block 5	
		(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)
3/4"	11.87	(4) 1 to 4	1.68	(4) 5 to 8	2.48	(4) 9 to 12	3.55	(8) 13 to 20	4.72	21 & Greater	6.07
1"	29.70	(10) 1 to 10	1.68	(10) 11 to 20	2.48	(10) 21 o 30	3.55	(20) 31 to 50	4.72	51 & Greater	6.07
1 1/2"	59.39	(20) 1 to 20	1.68	(20) 21 to 40	2.48	(20) 41 to 60	3.55	(40) 61 to 100	4.72	101 & Greater	6.07
2"	95.03	(32) 1 to 32	1.68	(32) 33 to 64	2.48	(32) 65 to 96	3.55	(64) 97 to 160	4.72	161 & Greater	6.07
3"	190.05	(64) 1 to 64	1.68	(64) 65 to 128	2.48	(64) 129 to 192	3.55	(128) 193 to 320	4.72	321 & Greater	6.07
4"	296.96	(100) 1 to 100	1.68	(100) 101 to 200	2.48	(100) 201 to 300	3.55	(200) 301 to 500	4.72	501 & Greater	6.07
6"	593.91	(200) 1 to 200	1.68	(200) 201 to 400	2.48	(200) 401 to 600	3.55	(400) 601 to 1,000	4.72	1,001 & Greater	6.07
8"	950.24	(320) 1 to 320	1.68	(320) 321 to 640	2.48	(320) 641 to 960	3.55	(640) 961 to 1,600	4.72	1,601 & Greater	6.07
10"	1,365.98	(460) 1 to 460	1.68	(460) 461 to 920	2.48	(460) 921 to 1,380	3.55	(920) 1,381 to 2,300	4.72	2,301 & Greater	6.07

SEWER RATES

	Availability Charge (Base)		3/4" Mtr	1" Mtr	1 1/2" Mtr	2" Mtr	3" Mtr	4" Mtr	6" Mtr	8" Mtr	10" Mtr
			14.03	35.07	70.14	112.21	224.43	350.67	701.33	1,122.13	1,613.08
	(1,000 gallons)	($$ per 1,000)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)
6.53	1	6.53	20.56	41.60	76.67	118.74	230.96	357.20	707.86	1,128.66	1,619.61
	2	13.06	27.09	48.13	83.20	125.27	237.49	363.73	714.39	1,135.19	1,626.14
	3	19.59	33.62	54.66	89.73	131.80	244.02	370.26	720.92	1,141.72	1,632.67
	4	26.12	40.15	61.19	96.26	138.33	250.55	376.79	727.45	1,148.25	1,639.20
	5	32.65	46.68	67.72	102.79	144.86	257.08	383.32	733.98	1,154.78	1,645.73
	6	39.18	53.21	74.25	109.32	151.39	263.61	389.85	740.51	1,161.31	1,652.26
	7	45.71	59.74	80.78	115.85	157.92	270.14	396.38	747.04	1,167.84	1,658.79
	8	52.24	66.27	87.31	122.38	164.45	276.67	402.91	753.57	1,174.37	1,665.32
	9	58.77	72.80	93.84	128.91	170.98	283.20	409.44	760.10	1,180.90	1,671.85
	10	65.30	79.33	100.37	135.44	177.51	289.73	415.97	766.63	1,187.43	1,678.38
	11	71.83	85.86	106.90	141.97	184.04	296.26	422.50	773.16	1,193.96	1,684.91
	12	78.36	92.39	113.43	148.50	190.57	302.79	429.03	779.69	1,200.49	1,691.44