Comprehensive Solid Waste Management Plan

City of Temple
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SCS ENGINEERS

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Provide solid waste services, programs and policies that promote and maintain a high level of public health and environmental protection																				
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20 Year Solid Waste Management Implementation Plan																				
Action Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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Consider requiring recycling at multi-family complexes																				
Promote landfill diversion to CII establishments																				

*The WMT team and the City of Temple Solid Waste department will be continuously monitoring the condition and capacity of the landfill, but will conduct comprehensive studies in the frequency noted in this exhibit.

1.0 INTRODUCTION

The City of Temple Solid Waste Division (SWD) operates an integrated solid waste management system. The SWD collects trash, recyclables, bulk items and brush (solid waste) from approximately 27,000 households and 2,600 commercial, institutional and industrial customers. The SWD partners with private companies for the post-collection management of these materials.

The SWD recognizes that increasing population, new single- and multi-family home developments, and growth in commercial establishments will require additional services, resources, and infrastructure to continue the same level of service. SWD initiated a strategic planning process to address future solid waste management needs, as well as to optimize the performance and efficiency of existing waste management services and facilities. To assist with the development of a 20-year integrated waste management plan (Plan), the SWD contracted SCS Engineers.

The strategic planning process consisted of the following:

- Inventorying the existing solid waste system and assessing its strengths and weaknesses;
- Developing projections on the quantities of materials generated over a 20-year planning period[1] and relating that to existing and future solid waste infrastructure; and
- Identifying various options to address the City's future solid waste issues.

1.1 OVERVIEW OF EXISTING SOLID WASTE MANAGEMENT SYSTEM

The management of solid waste in the City is the responsibility of the SWD. It is unlawful for any person, firm or corporation to collect solid waste in Temple without a contract with the City. The contract specifies the type and level of collection service and rates that a customer pays. The City Council regulates all collection rates by resolution.

For residential trash customers, the SWD uses a combination of 96-gallon rollout carts for curbside collection and 300-gallon, communal containers for alley service. SWD provides residential trash collection once a week on Monday, Tuesday, Thursday, and Friday. Additionally, the SWD collects recyclables from residents on a weekly basis; however, this occurs on a different day than trash collection. Residents receive a green, 96-gallon recycling cart and can recycle the following materials:

- Aluminum and steel cans;
- Boxes (cereal, cookies, crackers, etc. - without plastic liners);
- Junk mail;
- Magazines;
- Corrugated cardboard boxes;
- Newspapers;
- Office paper;
- Telephone directories;
- Detergent boxes;
- Plastic beverage containers (empty);

[1] The Baseline Year for the planning period is 2019.

- Soda bottles;
- Water bottles;
- Milk jugs; and
- Plastic detergent bottles (rinsed and clean).

Residential services also include curbside brush and bulk item collection, which occurs twice per month. The SWD delivers bulk items to the City of Temple Landfill (Landfill) for disposal. The City owns the Landfill and contracts with Waste Management of Texas (WMT) for operations. The Landfill is adjacent to the City's Solid Waste Operations Depot (Depot).

SWD delivers brush to the Brazos River Authority for processing into compost. The compost facility, operated by Tri-Gro, accepts biosolids from the Temple-Belton Regional Wastewater System. Private companies may collect brush, but must register their businesses with the City.

The SWD also services commercial, institutional, and industrial (CII) establishments using the following receptacles:

- Communal containers;
- 2-, 3-, 4-, 6-, and 8-cubic yard dumpsters; and
- 20-, 30-, and 40-cubic yard roll-off containers.

SWD also collects certain recyclables, such as cardboard, from CII customers.

The City has two centers where residents and businesses can take recyclable materials:

- **Recycle Center #1 - 3015 Bullseye Lane**
  South side of East Avenue H and Little Flock Road - West of the Landfill
  Drop-off Hours: 24/7 (not attended)

- **Recycle Center #2 - 602 Jack Baskin Drive**
  Northeast corner of Avenue H and South 31st Street - Behind the Gober Party House
  Drop-off Hours: 24/7 (not attended)

Materials accepted at the recycling centers include:

- Aluminum cans;
- Cardboard;
- Glass bottles and jars only - all colors;
- Magazines;
- Newspapers;
- Plastics #1 and #2 clear/opaque (Examples: water/soda bottles and milk jugs); and
- White office paper.

SWD delivers recyclables from the curbside recycling program and recycling centers to a recycling facility located off Martin Luther King Drive for consolidation (Recycling Facility). The City operates the Recycling Facility and contracts with Balcones Resources (Balcones) for transportation, processing and marketing recyclables.

SWD annually hosts a household hazardous waste (HHW) and electronics (E-Waste) collection event where residents can bring these materials for no fee. Residents can also bring tires to these events, but they must pay a fee.

The SWD is supported by Temple Code Enforcement to confirm that solid waste laws are properly enforced, especially illegal dumping.

1.2 VISION AND GOALS

1.2.1 Vision

The City of Temple's vision for the 2020-2040 planning period supports a solid waste management system within the City that:

- Provides the citizens, industries, and commercial customers of the City of Temple with solid waste services that are safe, reliable, efficient, and environmentally sustainable while valuing the health, safety, and quality of life of every citizen and visitor of the City[2].
- Provides opportunities for solid waste reduction, reuse, recycling and composting with the use of appropriate incentives, disincentives, and policies to motivate residents, institutions, and businesses. Continually seeks measures to enhance these opportunities.
- Ensures the availability of economical, solid waste disposal capacity, which extends beyond the 20-year planning period addressed in this Plan.
- Maintains an efficient system for the collection of solid waste streams, and continually seeks to enhance the cost-effectiveness of this system.
- Offers a convenient method for residents to recycle a wide variety of marketable materials.
- Encourages the development of sustainable solid waste management practices.
- Provides for increasing the beneficial use of brush.
- Effectively communicates information regarding opportunities for all residents to reduce and recycle solid waste.
- Provides for a secure and equitable funding system that supports the costs of current and future solid waste management programs, as outlined in this Plan.

1.2.2 Goals and Objectives

The intent of this Plan is to establish the foundation for cost-effective, long-term management of solid waste that aligns with the City of Temple's vision. The following describes the Plan's goals and objectives:

[2] Adapted from the City of Temple Solid Waste Mission Statement.

Goal #1: Continue to provide cost-effective solid waste services, programs and policies that promote and maintain a high level of public health and environmental protection.

Objectives:

- Manage solid waste in a manner that promotes cost-effective collection, recycling, diversion, and ultimate disposal.
- Upgrade the solid waste facilities to improve efficiency and safety of operations.
- Maintain sufficient funding mechanisms to support solid waste programs.
- Evaluate new technologies and processes with the aim of improving current programs and services and enhancing efficiency of solid waste operations.
- Review and update ordinances that address solid waste services to address the new and enhanced solid waste programs.

Goal #2: Provide for efficient collection and management of solid waste.

Objectives:

- Perform a detailed route optimization that will recommend changes to improve collection operations.
- Evaluate various options for improving and expanding curbside collection of recyclables.
- Ensure convenient access to collection or drop-off services for residents and businesses.
- Develop a new facility that will safely allow the City to process and transport recyclable materials from the community, and accommodate growth during the planning period.

Goal #3: Facilitate the long-term, cost-effective disposal of solid waste.

Objectives:

- Continue monitoring the site life and capacity of the Landfill.
- Develop a long-term alternative disposal plan if the capacity or site life becomes an issue.
- Promote the enforcement of State solid waste laws and regulations, and local ordinances.
- Make measurable and steady progress towards reducing illegal dumping and littering, including increased enforcement of existing ordinances and State laws.

Goal #4: Encourage and expand landfill diversion.

Objectives:

- Increase public awareness of solid waste issues by continuing and expanding educational opportunities within the City to promote waste reduction and recycling options.

- Implement recommended changes to the recycling collection system that have the potential to increase participation and recovery of recyclable materials.

1.3 KEY ISSUES

At the outset of the planning effort, SCS and the City met to review current solid waste programs and activities. In addition, SCS spent several days in Temple on collection routes and communicating with collection staff. Table 1 summarizes some of issues that are barriers to achieving the vision, goals and objectives for managing solid waste in the City.

Table 1. Key Issues

Service	Issues
Collection	Unbalanced routes Collection efficiency in older areas is reduced Inefficient collection Improper use of communal containers Fast-fuel compressed natural gas (CNG) requires vehicles to be refilled during routes
Recycling	Low recycling rate Capacity at the City's Recycling Facility Maintaining unstaffed drop-off facilities
Brush	Some brush is still being landfill disposed
Solid Waste Facilities	Recycling Facility and solid waste offices are inadequate for current and future staff and equipment
Business Processes	Equipment operators are not consulted on equipment purchases Implementation of the routing software Laws for uncontained solid waste and illegal dumping are not being enforced

2.0 NATURAL AND HUMAN ENVIRONMENT

The natural and human environment can influence the solid waste system and the strategies a community considers to manage waste in an environmentally sustainable and socially acceptable manner. For example, changes in population and commercial development may affect the amount and type of solid waste a community generates and therefore influence the type of waste facilities that

are necessary. Local geographic conditions, such as aquifers and topography, can limit where solid waste facilities can be located. This section of the Plan describes Temple's current natural, land use, demographic, and economic characteristics.

2.1 PHYSICAL INFRASTRUCTURE AND NATURAL CONDITIONS

Temple is located in Central Texas and is the second largest city in Bell County (Killeen is the largest city). Temple is a principal city in the Killeen-Temple-Fort Hood metropolitan area. Located 60 miles north of Austin and 30 miles south of Waco on Interstate 35 (I-35), the City is well-connected to the international markets of Mexico via Laredo and three of the largest metro areas in Texas: Austin, San Antonio, and Dallas/Ft. Worth.

According to the United States Census Bureau, Temple comprises a total area of 74.9 square miles, of which 70.1 square miles are land with water covering the remaining 4.8 square miles. The geography of the region is mixed; the Blackland Prairie region to the east of the City is highly agricultural, and toward the west of the City are limestone-layered hills.

In Temple, the summers are hot and muggy, the winters are cold and windy, and it is typically partly cloudy. Over the course of the year, the temperature typically varies from 38°F to 96°F and is rarely below 26°F or above 101°F. Temple receives an average of approximately 37 inches of precipitation each year, with May and June being the wettest months.

2.2 DEMOGRAPHIC CHARACTERISTICS

2.2.1 Population

Temple's Baseline Year (2019) population was 82,259. Temple is the 51st largest city in Texas and the 450th largest city in the United States. Temple is currently growing at a rate of 1.84 percent annually and its population has increased by 19.68 percent since the 2010 census. **Table 2** shows the projected population for the next 20 years if the annual growth rate remains at 1.84 percent.

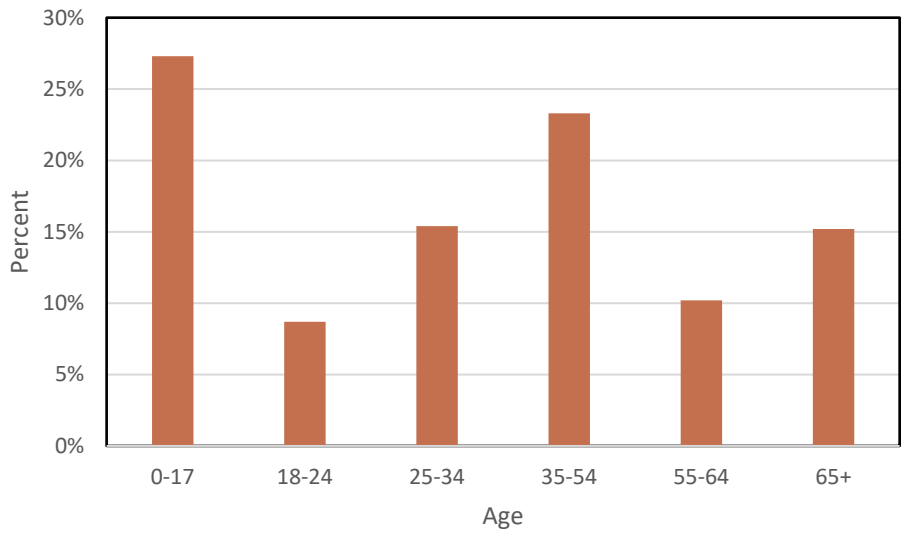
Table 2. Temple Population Projections

Year	Population
2020	83,773
2021	85,314
2022	86,884
2023	88,482
2024	90,110
2025	91,769
2026	93,457
2027	95,177
2028	96,928
2029	98,711
2030	100,528
2031	102,377
2032	104,261
2033	106,180
2034	108,133
2035	110,123
2036	112,149
2037	114,213
2038	116,314
2039	118,454
2040	120,634

The median age in Temple is 34.2 years, which is slightly higher than the County and State averages of 29.2 and 32.3 respectively.

The age distribution of Temple residents generally parallels that of the State of Texas. However, in comparison to the other Texas cities, Temple has the largest percentage (15.1 percent) of people 65 years and older. Because of its well-known medical facilities, an increasing number of retirees are choosing to live in Temple. **Exhibit 2** illustrates the age distribution in Temple during the Baseline Year.

Exhibit 2. Temple Age Distribution



For every 100 females, there are 92.4 males. Temple has a population density of 1,122 people per square mile.

2.2.2 Households

For planning purposes, the term "household" is defined as people living under the same roof. There are many different types of households. A couple with no children is one type of household. A couple with children is another. A single person living alone or having a roommate are two other types of households. Homes that include extended or multi-generational families living together would also be considered a single household.

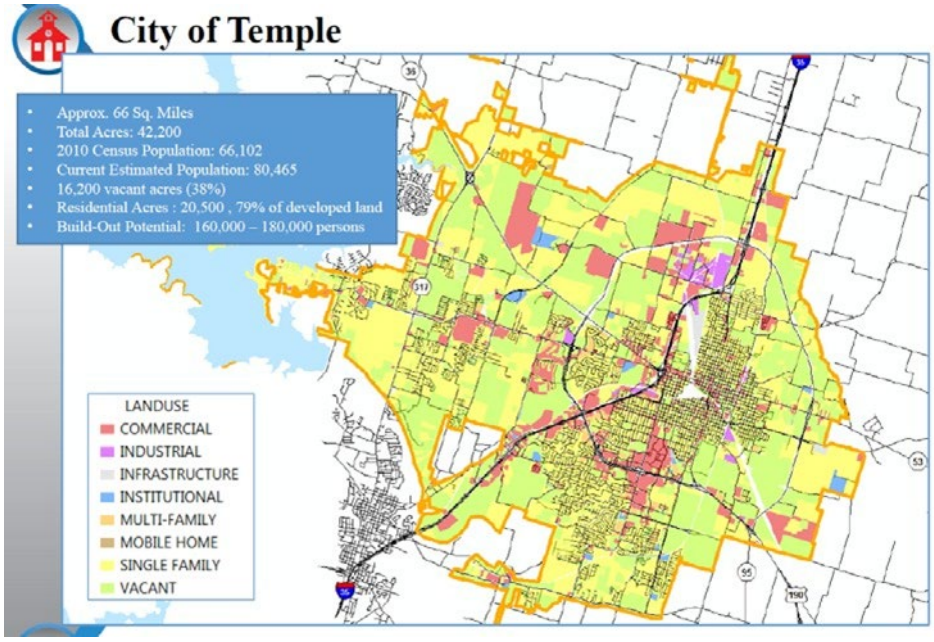
During the Baseline Year, there were 26,926 households in Temple, with an average household size of 2.66 people. Approximately 54 percent of households are owner occupied, and the rest are rental units.

These numbers are important to consider when designing solid waste collection programs for residential customers. The SWD can use the number of households and family size to forecast the quantity of solid waste customers will generate.

2.2.3 Land Use

Much of the City's growth over the past several decades occurred on the south and west sides, where numerous new subdivisions have emerged and further construction continues. As shown in **Exhibit 3**, the most densely developed areas are located along the major corridors, especially I-35. Approximately 38 percent of the City of Temple is undeveloped or vacant area that could be developed in the future. Other potential growth areas are located around the existing developed areas of the City.

Exhibit 3. Land Use



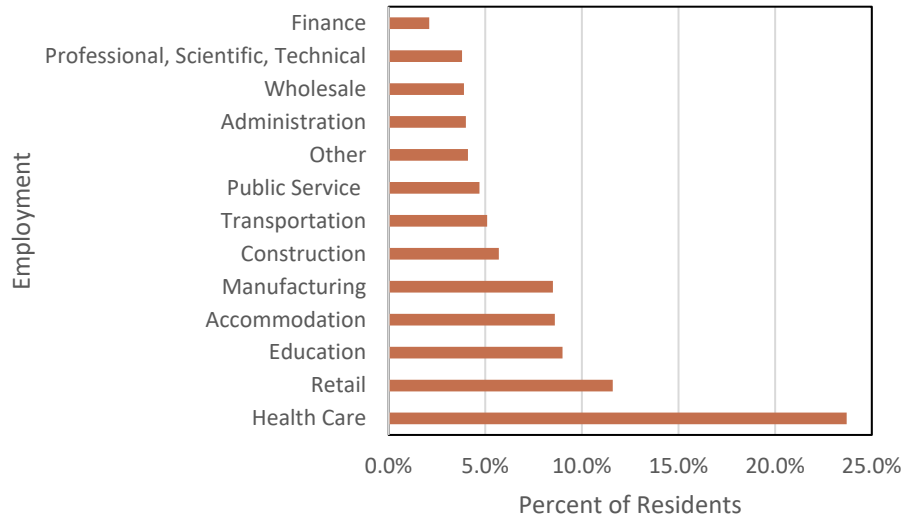
Source: City Limit and Service Area Population Forecast Report conducted by Templeton Demographics.

2.3 ECONOMIC CHARACTERISTICS

Temple is known as a regional medical center, with three major hospitals: The Baylor Scott & White Medical Center, Baylor Scott & White McLane Children's Medical Center, and Olin E. Teague Veterans' Medical Center. Baylor Scott & White Health is the largest employer in the City with about 11,000 employees.

According to the U.S. Census Bureau, 62 percent of Temple residents who are over 16 are employed on either a part-time of fulltime basis. **Exhibit 4** presents the percentage of Temple residents employed by each industry in the City.

Exhibit 4. Temple Employment Industries



2.4 SOLID WASTE GENERATION AND COMPOSITION

Temple's planning process assessed the quantities, composition, and projected changes to the City's solid waste stream. This information helps identify solid waste diversion and recycling potential, measure existing program and policy effectiveness, highlight market needs, and estimate capacity for current and future processing and disposal infrastructure.

2.4.1 Solid Waste Generation

Solid waste generation is the total quantity of materials disposed and diverted from a landfill through reduction, reuse, recycling, composting and converting to energy. During the Baseline Year, the following tons of materials were disposed, diverted and generated in the City:

Disposed	102,541
Materials recycled	6,597
HHW/E-Waste recovered	29
Brush/Biosolids composted	6,459
Total Generated	115,626

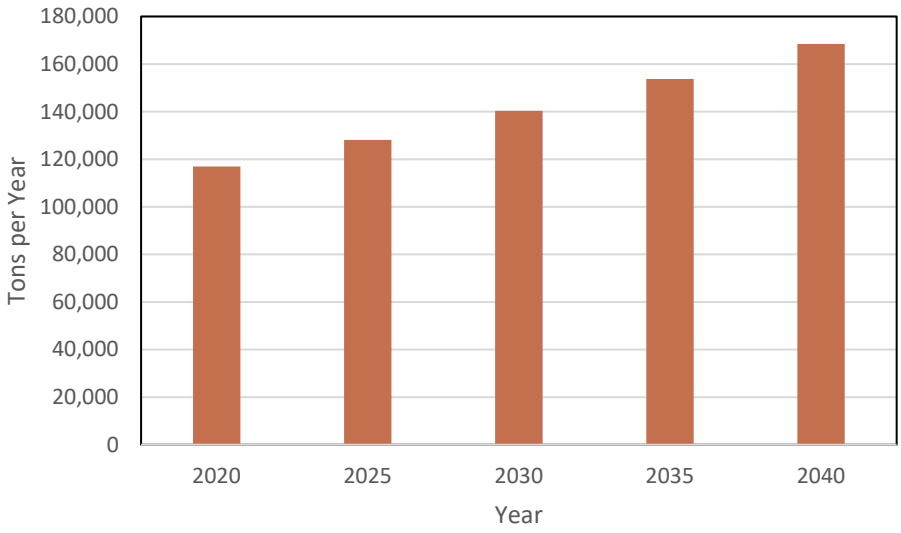
The per capita solid waste generation rate measures the population's effect on waste generation, creating a normalized comparison. The equation below shows how the per capita waste generation rate is calculated.

$$\frac{Annual\ Waste\ Intake\ (tons) \times 2{,}000\ lb/ton}{Population} \times \frac{year}{365\ days} = per\ capita\ waste\ generation\ \frac{lb}{person/day}$$

Based on available data, the estimated per capita solid waste generation rate for Temple during the Baseline Year was 7.7 pounds per capita per day. The State of Texas per capita generation rate for 2016[3] was 6.8 pounds per person per day.

SCS Engineers based solid waste generation projections on the Baseline Year per capita generation rate of 7.7 lbs/capita/day per day or 1.4 tons/capita/year, and the population projections presented in **Table 2**. **Exhibit 5** presents the results of this waste generation forecast.

Exhibit 5. Estimated Waste Generation

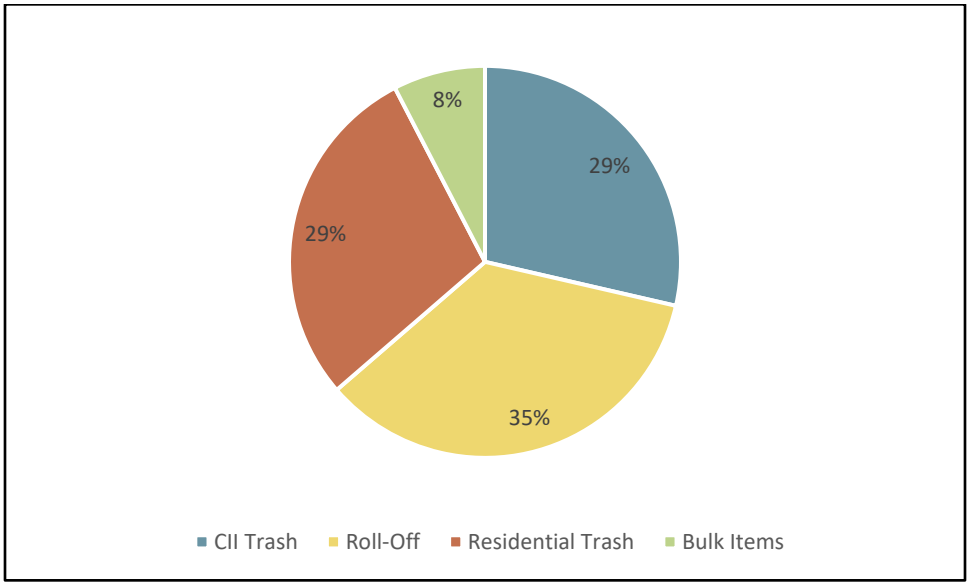


2.4.2 Disposal

During the Baseline Year, SWD delivered 102,541 tons of solid waste to the Landfill. **Exhibit 6** shows a breakdown of tonnage disposed by collection program.

[3] 2016 was the last year that the State provided this information.

Exhibit 6. Baseline Year Solid Waste Disposed by Source



As shown in **Exhibit 6**, SWD roll-off customers account for 35 percent of the 102,541 tons of solid waste disposed at the Landfill during the Baseline Year; this is followed by trash generated by commercial and residential customers, both at 29 percent. Bulk items account for 8 percent of solid waste delivered to the Landfill.

2.4.3 Landfill Diversion

Landfill diversion in Temple consists of recycling, composting brush and biosolids, and recovering HHW and E-Waste. During the Baseline Year, Temple diverted the following tonnages from the Landfill:

Curbside Recycling	3,331
Drop-Off Recyclables	3,266
Brush Composting	3,189
Biosolids Composting	3,270
HHW and E-Waste Recovery	29
TOTAL	13,085

A diversion rate indicates the quantity of generated solid waste diverted from a landfill through reduction, reuse, recycling, composting and/or converting to energy. For this Plan, data was not available on reuse and therefore was not included in the calculations of the diversion rate. In addition, the City of Temple does not convert any solid waste into energy.

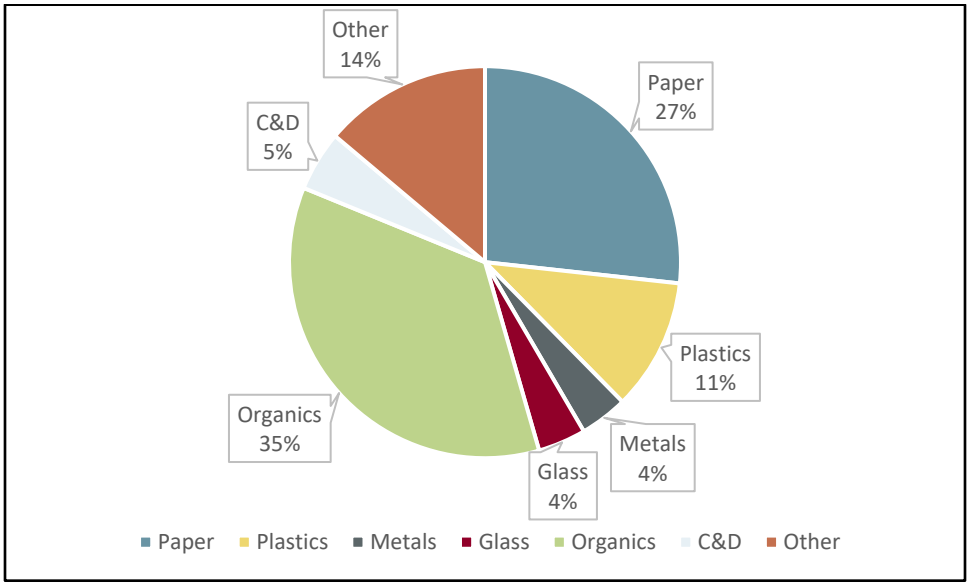
Based on available data, Temple diverted an estimated 12 percent of solid waste from the Landfill during the Baseline Year. Recycling studies performed by Texas Commission of Environmental Quality (TCEQ) and Texas Recycling Development Initiative (TRDI) indicate average, statewide landfill diversion rates range from 18 to 22 percent.

2.4.4 Solid Waste Composition

Solid waste composition information provides useful data to evaluate existing landfill diversion programs and assess the requirements/impacts of new programs to divert solid waste from landfills.

To provide perspective on the waste composition in Temple, SCS reviewed recent waste composition studies prepared in Texas. SCS Engineers estimated the composition of Temples' solid waste stream based on data from solid waste composition studies conducted in Austin, Dallas, and Ft. Worth.[4] **Exhibit 7** shows the overall solid waste composition.

Exhibit 7. Overall Waste Composition



Using the averaged, waste composition data and the disposal data from Temple, SCS Engineers estimated the types and quantities of waste disposed in Temple during the Baseline Year **(Table 3)**.

Table 3. Composition of Temple Disposed Waste Stream

Material	Percent	Tonnage
Paper	26%	26,661
Plastics	11%	11,280
Metals	4%	4,102
Glass	4%	4,102
Organics	36%	36,915
C&D	5%	5,127
Other	14%	14,356
TOTAL	**100%**	**102,543**

[4] Data was obtained from 2017 TCEQ Study on the Economic Impacts of Recycling; City of Ft. Worth 2017 Solid Waste Management Vision; City of Dallas 2013 Solid Waste Management Vision.

3.0 ADMINISTRATIVE MANAGEMENT

SWD is part of the Public Works Department and is responsible for the collection and transportation of solid waste from residential, multi-family and CII customers. In addition, the SWD manages programs and facilities to divert solid waste from landfills.

SWD's mission is to:

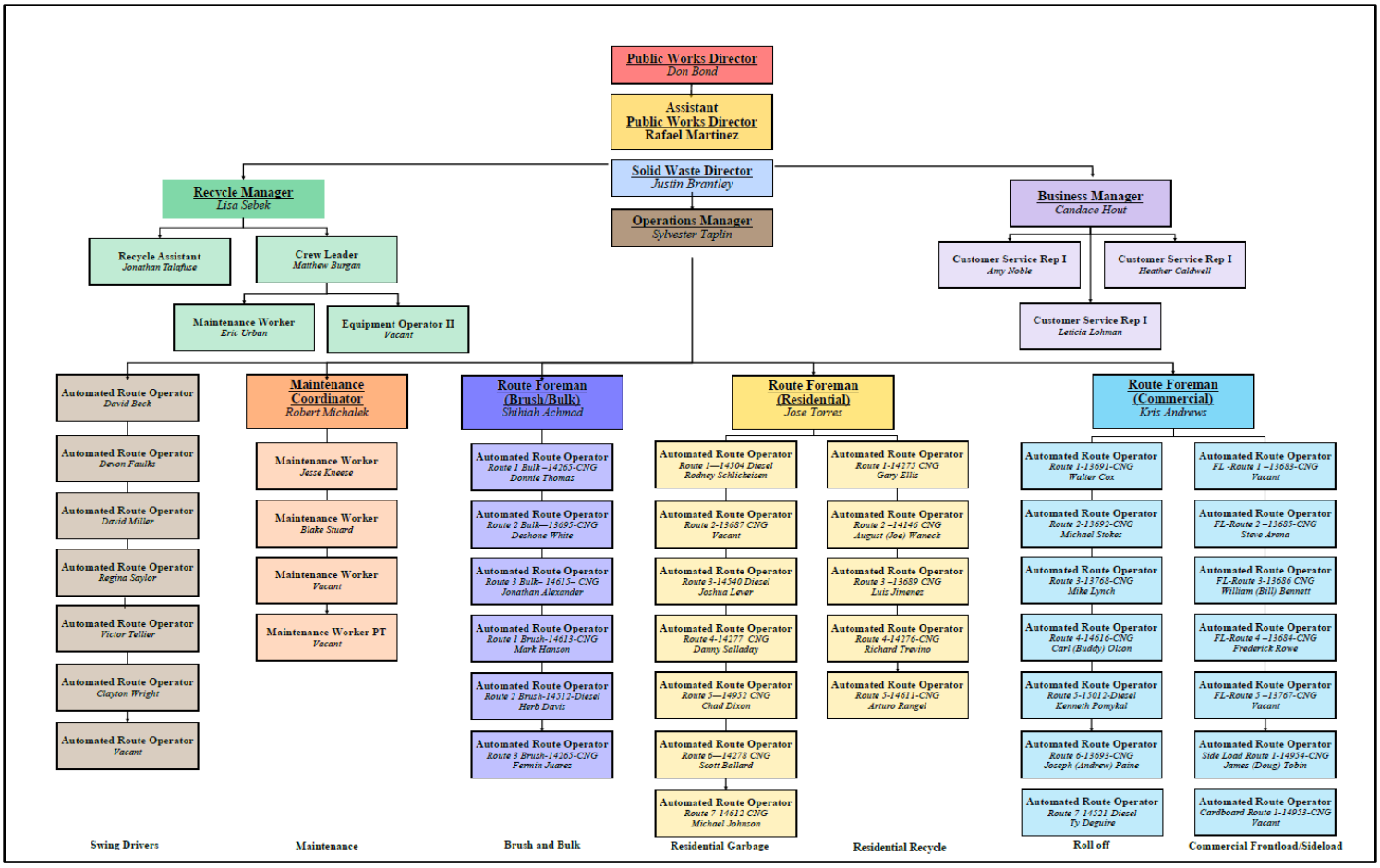
- Educate and equip each citizen with the tools to reduce their environmental impact through recycling, reducing, reusing and composting;
- Value and respect employees; and
- Continuously plan for the future.

SWD has five core service areas:

- Residential collection;
- CII collection;
- Recycling;
- Maintenance; and
- Customer service.

Exhibit 8 provides the organizational structure for SWD.

Exhibit 8. Organizational Structure



SWD is overseen by a solid waste director and employs 53 full-time and two temporary staff. Of the 53 full-time staff, 41 are equipment operators tasked with the collection of residential and CII waste, recyclables, brush and bulk items; nine are directors, managers, crew leaders, coordinators and foremen; and three are customer service representatives.

SWD currently has three route foreman that supervise the route operators performing collection services for the City. Each foreman supervises approximately 10 – 14 operators. The current ratio of foreman to operators is larger than the typical municipal solid waste collection systems that SCS has observed in recent years. Based on similar sized cites that provide similar services SCS recommends the SWD use a ratio of 8 – 10 Supervisors to Operator as a goal to determine when to add a route foreman.

3.1 FEDERAL, STATE AND REGIONAL GOVERNANCE

3.1.1 Federal Level

There are a number of federal rules, regulations, statutes, and policies governing solid waste management. The primary federal legislation governing solid waste management is the Resource Conservation and Recovery Act (RCRA), which the United States enacted in 1976. RCRA was the enabling legislation for the federal regulations governing solid waste landfills, commonly referred to as the Subtitle D rules, found in Title 40, Part 258 Criteria for solid waste landfills. Development, implementation and enforcement of the federal rules is the responsibility of the U.S. Environmental Protection Agency (USEPA). In addition to rules governing landfills, the USEPA has implemented requirements that address landfill air emissions as provided for in the 1990 Clean Air Act, including New Source Performance Standards and New Emission Guidelines for solid waste landfills. Currently, no federal rules, regulations, statutes or policies exist that govern landfill diversion activities, such as recycling and composting.

3.1.2 State Level

The Texas Solid Waste Disposal Act of 1969 formed the basis for MSW management and regulation in Texas by predecessor agencies to the Texas Commission on Environmental Quality (TCEQ). TCEQ's role in MSW management encompasses permitting, compliance inspections and enforcement, as well as planning. The Comprehensive MSW Management, Resource Conservation and Recovery Act of 1983 assigned local governments the responsibility of providing solid waste services to persons within their jurisdictions. Following USEPA's promulgation of the Subtitle D rules in 1991, TCEQ revised its rules to incorporate them into state requirements.

Rules governing landfills, as well as solid waste collection and transportation, storage, processing and transfer, are found in 30 Texas Administrative Code (TAC) Chapter 330. Rules for composting and mulching in Texas are in 30 TAC 332 and 30 TAC 328, respectively. Rules for waste minimization and recycling are in 30 TAC 328. Also, as noted above, TCEQ's guidance for developing local solid waste plans can be found in Subchapter O of 30 TAC Chapter 330, or more specifically at 30 TAC §330.635(b).

Whereas authority for authorizing new or expanded solid waste facilities is vested in the TCEQ's solid Permits Section of the Waste Permits Division in Austin, local inspections for regulatory compliance purposes are carried out by staff located in TCEQ's 16 regional offices. Bell County is in Region 9.

The implementation of the state Subtitle D rules affected virtually all regions of Texas by requiring (1) the upgrading of landfills that remained open after the effective date of the rules and (2) the closure of a significant number of disposal sites that were not upgraded. Being designed to protect human health and the environment, TCEQ's Chapter 330 rules influence a broad range of landfill considerations, including the following: location restrictions, operating and design standards, groundwater and gas monitoring, and closure and post-closure requirements.

3.1.3 Regional Level

Bell County is part of the Central Texas County of Governments (CTCOG). CTCOG helps local communities work cooperatively to improve the conditions and well-being of Central Texans. CTCOG includes the following counties: Bell, Coryell, Hamilton, Lampasas, Milam, Mills, and San Saba; and

the cities, school districts, and special districts within each county. CTCOG is the state designated regional planning agency for solid waste management. In this role, CTCOG managed the development of the Regional Solid Waste Management Plan (RSWMP), 2002 – 2022. The goals and objectives outlined in the RSWMP are intended to provide guidance for the continued development and enhancement of solid waste practices of the region.

3.1.4 Local Level

The City is incorporated as a home rule city and political subdivision of the State of Texas. The City has such powers, rights and duties as are provided in the City charter and under the Texas constitution and state law.

The City has a "council-manager" form of government where the elected city council enacts local legislation, adopt budgets, determine policies, and appoints a city manager, who shall serve as the chief executive officer of the City. The city manager is responsible to the city council for the execution of the laws and the administration of the government of the City.

The City Council has the right to adopt and prescribe rules and regulations for the handling and disposition of all solid waste within the City, and has the right to fix charges and compensation the City receives to remove of solid waste, and provide rules and regulations for its collection and disposal.

The City's rules, regulations, policies, and rate provisions affecting solid waste within the city limits are contained in Chapter 15 of the City of Temple Code of Ordinances (the Waste Code). The Waste Code establishes regulations governing the accumulation, storage, and disposal of solid waste for residential and CII generators.

Specific provisions of the Waste Code that impact some of the analyses associated with this Plan are as follows:

- The Director of Solid Waste Services shall place appropriate-sized containers in such a manner that they will serve three or more residential accounts.
- Homeowners are encouraged to practice backyard composting and the *Don't Bag It* programs for brush.
- Residents with rollout carts must position the cart against the curb and a clearance of six feet on both sides, two feet to the rear and 14 feet above. If there is no curb, residents must place rollout carts on the pavement or roadway as close as safely possible to the right of way with the wheels and handle facing away from the road.
- If SWD does not collect rollout carts because residents did not place them at the curb or collection point, SWD records the as "missing carts." Customers with "missing carts" can request SWD to return and service the cart for an additional fee.
- If any SWD customer fails or refuses to pay solid waste charges, the Waste Code authorizes the City to cut off and disconnect the water and wastewater services to their home or business. The Waste Code also authorizes SWD to discontinue solid waste collection until the customer has fully paid fees.

- The Director of SWD or their designee has the right to inspect customer containers to determine whether the correct recyclable materials are being properly contained. Contamination of a recycling container with any of the materials not approved for recycling may result in confiscation of a customer's recycling container.

3.2 KEY OBSERVATIONS AND RECOMMENDATIONS

SCS did not identify areas in SWD organizational structure or federal/regional that the Plan should address with the exception of additional personnel needed as the City grows. Section 4.4 includes recommendations regarding the need for additional staffing. However, SCS suggests the City consider amending the Waste Code to address uncontained set outs and illegal disposal of solid waste.

As part of the planning process, SCS observed the time required for SWD crews to service the 96-gallon solid waste carts. Although the time study was not comprehensive, SCS observed that cart pull times were about two seconds slower than industry standard, which would add up to about 16 hours a week in additional time. In addition, uncontained setouts at both 96-gallon rollout carts and communal containers contribute to litter and attract vermin.

Therefore, the SWD may pursue amending the Waste Code to include the following provisions:

- Establish a penalty system that discourages uncontained setouts for rollout carts and communal containers. Perhaps this system would allow one warning before the customer receives a fine.

- Explicitly define penalties for illegal dumping and uncontained setouts. Texas Health and Safety Code (THSC) 341 and 343 authorizes local governments to enforce illegal dumping through a system of fines and jail time or threat of same.

- Authorize the SWD to hire at least one, trained code enforcement person. The Texas Illegal Dumping Resource Center provides tailored, training and resources to local governments in Texas that are interested in establishing or improving their illegal dumping enforcement.

- Authorize SWD to cite customers for uncontained setouts. In this system, SWD drivers would notify their supervisor when they observe uncontained setouts. In turn, the route supervisor would document the observation and ensure follow-up. The supervisor would issue a warning. After the warning, the next violation would result in a penalty included on the resident's water bill.

The City could publicize the new regulations and procedures to prevent uncontained setouts through the City's newsletter and website, as well as flyers distributed with water bills

4.0 SOLID WASTE COLLECTION

SCS assessed the efficiency of the City of Temple's solid waste collection operations. The assessment included three days of field operation observation, interviews, and reviews of equipment and maintenance records. SCS also processed and summarized performance indicators for Temple's solid waste collection data generated by *RouteWare*, the onboard computer system used by the City.

4.1 RESIDENTIAL COLLECTION

SWD collects residential trash from all single-family and multi-family complexes in Temple. SWD services single-family and multi-family customers on Monday, Tuesday, Thursday and Friday, using 10-hour shifts. The SWD uses a combination of 96-gallon, rollout carts for curbside trash collection, and communal containers for trash collection in alleys and at multi-family complexes. The two different types of residential collection systems exist because newer residential neighborhoods do not have alleys and the City has moved to standardize its collections using 96-gallon, rollout carts.

SWD collects recyclables from residential customers with 96-gallon, rollout carts, but does not collect recyclables from all alley or multi-family customers. SWD offers 96-gallon curbside recycling to customers using 300-gallon containers. SWD uses green, 96-gallon rollout carts for curbside recycling. SWD collects trash and recyclables once a week; however, SWD does not collect these two materials on the same day. Recycling is collected three service days later than trash, e.g., Monday trash areas have recycling on Thursday, Tuesday trash has recycling on Friday.

SWD collects bulk items and brush from residential accounts twice a month. Residents can also dispose bulk items at the Landfill once a month. The Landfill does not charge Temple single-family residents if they provide a current water bill, but residents from multi-family complexes must pay.

Exhibit 9 shows the color-coded collection service areas and Table 4 provides collection days and frequency by color-coded service area.

Exhibit 9. Collection Service Areas

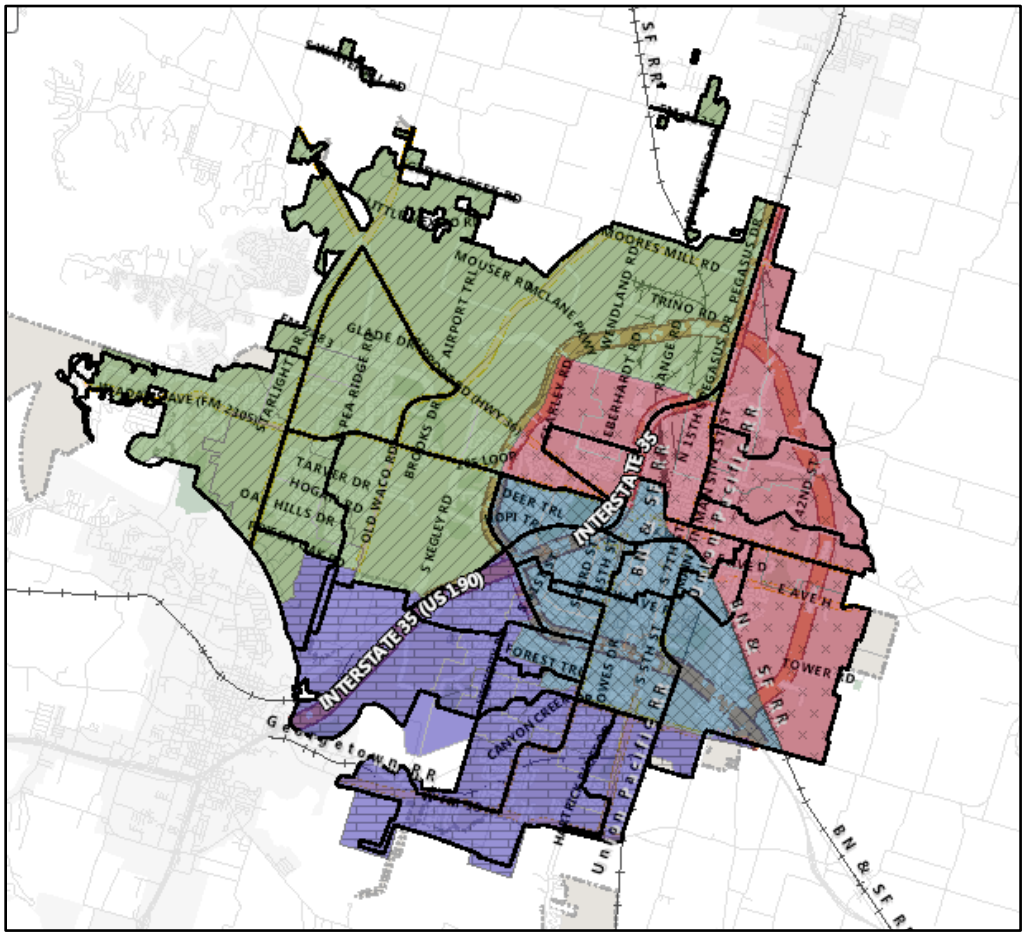
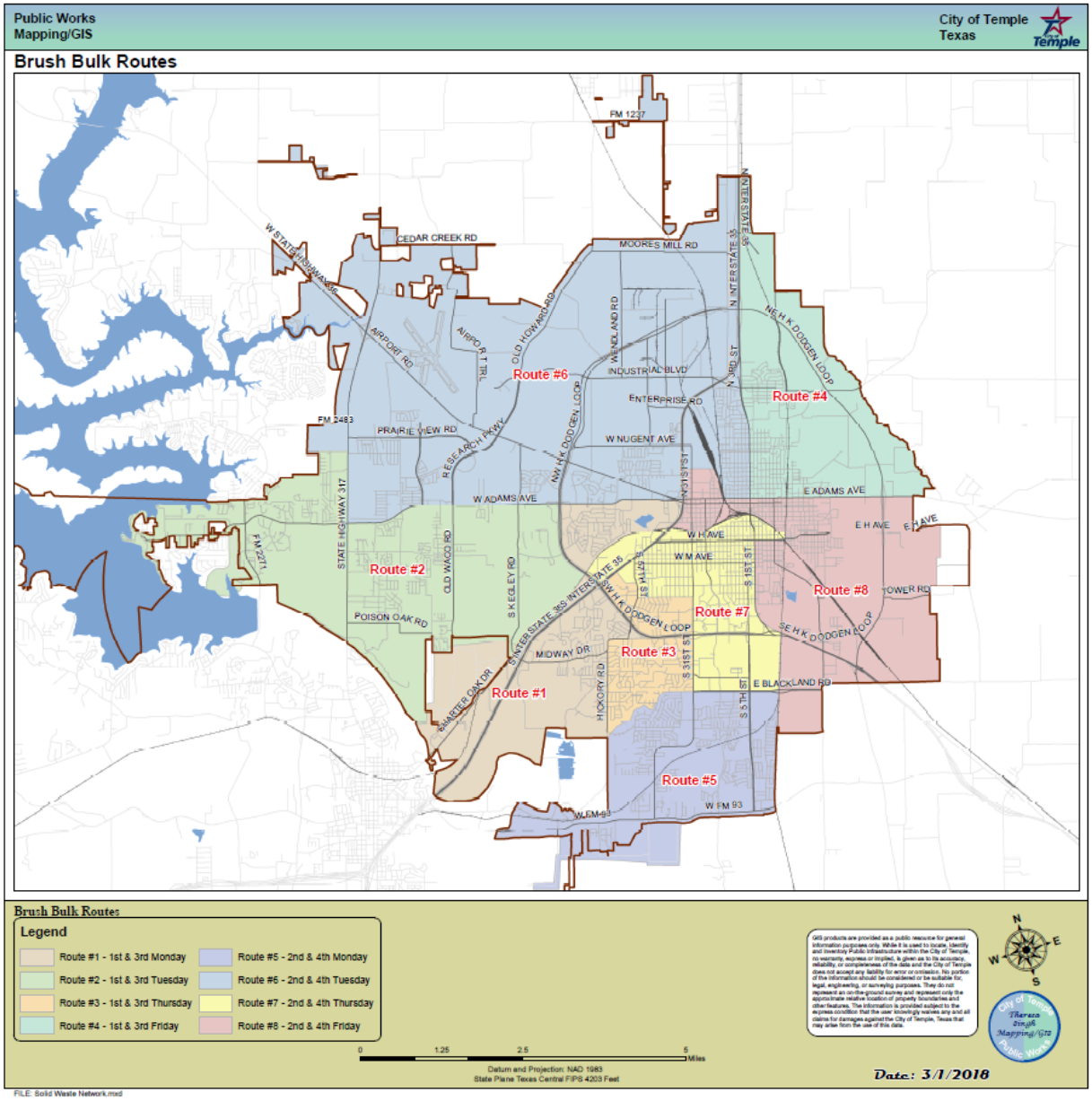


Table 4. Residential Collection Schedule

Service Area	Trash	Recycling
Red	Friday	Tuesday
Green	Tuesday	Friday
Blue	Monday	Thursday
Purple	Thursday	Monday

Customers can request a special pick-up for solid waste on a non-collection day. SWD considers these collections "out of cycle" and charges residents a fee of $65 per 6 cubic yards material. SWD adds this fee to the residents' City of Temple Utility bill.

Exhibit 10. Brush Bulk Schedule



4.2 CII COLLECTION

The SWD is the only entity authorized to collect solid waste from commercial, institutional and industrial (CII) establishments. During the Baseline Year, the SWD serviced approximately 2,600 CII accounts. SWD collects trash and recyclables from CII customers using the following equipment:

- Automated side loaders with communal carts;
- Automated side loaders with 2-4 cubic yard dumpsters;
- Front-end loaders with 4-8 cubic yard dumpsters; and

- Roll-Off with 20, 30 and 40-cubic yard containers.[5]

SWD currently offers special pickup of bulk items and brush from CII customers for a fee.

SWD services CII customers six days a week, using ten-hour shifts. On a daily basis, SWD operates one automated side loader route, five front-end loader route and eight roll-off routes for trash. SWD also collects certain recyclables, such as cardboard, from CII customers. SWD operates one recycling route per day.

Each CII customer contracts directly with SWD for trash and/or recycling services. SWD bills customers based on the number of containers assigned to the account and frequency of collection during the week.

4.3 FLEET AND MAINTENANCE

4.3.1 Fleet

The SWD owns various types of vehicles and equipment to service residential and CII customers, including:

- Pickup trucks;
- Automated side loaders;
- Roll-offs;
- Front-end loaders
- Knuckle booms;
- Crow's nest; and

Prior to 2019, approximately 80 percent of SWD fleet was comprised of compressed natural gas (CNG) vehicles. Recent vehicle purchases were all diesel, which reduces the percentage of the trucks fueled by CNG. SWD's goal is to have a 60/40 split between CNG and diesel vehicles, which will provide SWD flexibility in the event of disruption in the CNG or diesel fuel supplies. The SWD uses a fast-fill system at a CNG station across the bridge from their Depot.

Table 5 provides the average age of daily dispatched vehicles, number of vehicles dispatched daily, number of spare vehicles, and percent of vehicles for each SWD service area during the Baseline Year.

[5] Residential customers can also rent roll-off containers

Table 5. Fleet Inventory

Vehicle Type	Average Age of Daily Dispatched Vehicles (Years)	Vehicles Dispatched Daily	Spare Vehicles	Spare %
Residential Trash	3	7	2 (4 total shared with recycling)	29%
Residential Recycling	3	5	2 (4 total shared with solid waste)	40%
Residential Bulk	6	3	1.5 (3 total shared with brush)	50%
Residential Brush	6	3	1.5 (3 total shared with bulk items)	50%
Commercial Solid Waste Front Load	7	5	2 shared with recycling front load	33%
Commercial Cardboard Front Load	7	1	2 shared with solid waste front load	33%
Commercial Side Load	3	1	2	40%
Roll-Off	4	7	3	43%

Table 5 shows SWD exceeds the minimum acceptable spare factor of 15 to 20 percent by having spares ranging from 29 to 50 percent. However, the spares are reportedly in poor condition. The residential trash and recycling vehicles average three years old, but six of these vehicles are the oldest daily dispatched vehicle. SWD's goal is to maintain the industry standard of a seven-year replacement cycle.

4.3.2 Maintenance

City of Temple Fleet Services, located at the Temple Service Center, maintains the SWD fleet. Fleet Services is responsible for maintaining the City's 600 plus vehicles including SWD vehicles and equipment.

Fleet Services is within Public Works and is responsible for vehicle specification, inspection and maintenance. Additionally, Fleet Services provides service calls, administers the fuels program, coordinates paint and body repairs, modifies and fabricates equipment, and rents additional equipment as needed. The following provides additional information on these services:

- Fleet Maintenance – Provides mechanical repairs, preventive maintenance, state inspections, lubrication, fueling services, and has an on call mechanic for field service calls. They also

provide and coordinate service with contract vendors for work on heavy equipment to include specialty work, welding and fabrication.

- **Paint & Body Repair** – Coordinates vehicle collision repairs with outside vendors.
- **Fleet Operation & Assignment** – Prepares equipment specifications and replacement schedules. Fleet also coordinates vehicle purchases and vehicle assignment with SWD, as well as vehicle change outs, new vehicle preparation and disposal of retired vehicles.

4.4 KEY OBSERVATIONS AND RECOMMENDATIONS

4.4.1 Overview

A fundamental goal of SWD is to improve efficiency and reduce costs, while maintaining high quality, customer service. Therefore, the planning process included a series of technical memorandums that evaluated the feasibility and systematic impact of options to increase efficiency and reduce costs associated with solid waste collection, without compromising service quality.

Based on the technical memorandums and input from SWD staff, the potential solutions that may present the greatest opportunity to reduce demand on labor, equipment and financial resources and achieve high levels of customer satisfaction during the next five years include:

- Balance residential collection routes;
- Collect recyclables on the same day as trash;
- Modify bulk item collection program;
- Install slow-fill CNG system;
- Consider deploying rollout carts through the City; and
- Institute an equipment replacement schedule.

The following subsections discuss each of these items.

4.4.2 Balance Routes

Both residential trash and recycling collection programs include routes that are over-burdened and uneven. SWD operates seven routes a day or 28 routes a week for residential trash collection. Time spent on the routes for residential trash collection range from an average of ten to eleven hours per day. The City employs a "helper" system, where drivers with shorter routes help drivers with longer routes before they can leave for the day. Even with the "helper" system, 21 of the 28 routes each week regularly exceed ten hours. The residential trash collection currently requires an additional route. Based on projected population growth, the SWD will most likely require a second additional daily route within one to two years.

Recycling routes currently range from an average of nine to ten hours, and crews do not typically incur overtime. However, as will be discussed, participation in the curbside recycling program is relatively low and the time required to service these routes will increase as more residents participate.

On average, the brush routes range from slightly over eight and to less than ten hours. Thus, the brush routes are not balanced given the varying and seasonal nature of brush collection. The bulk item routes have slightly more variation, with 7.9 to 9.5 hours to complete the route.

The CII trash routes represent a full daily workload with an average 132 stops per route, but they vary significantly in time from seven to over eleven hours. The significant variances in route times indicate the need to re-balance the routes to have an even workload. The commercial roll-off crews also exceed their scheduled workday, with the average route time being over ten hours in an 8-hour day.

Efficiency on residential and CII trash, recycling, bulk item, and roll-off routes would improve if SWD balances these routes. Balancing the routes would also reduce overtime.

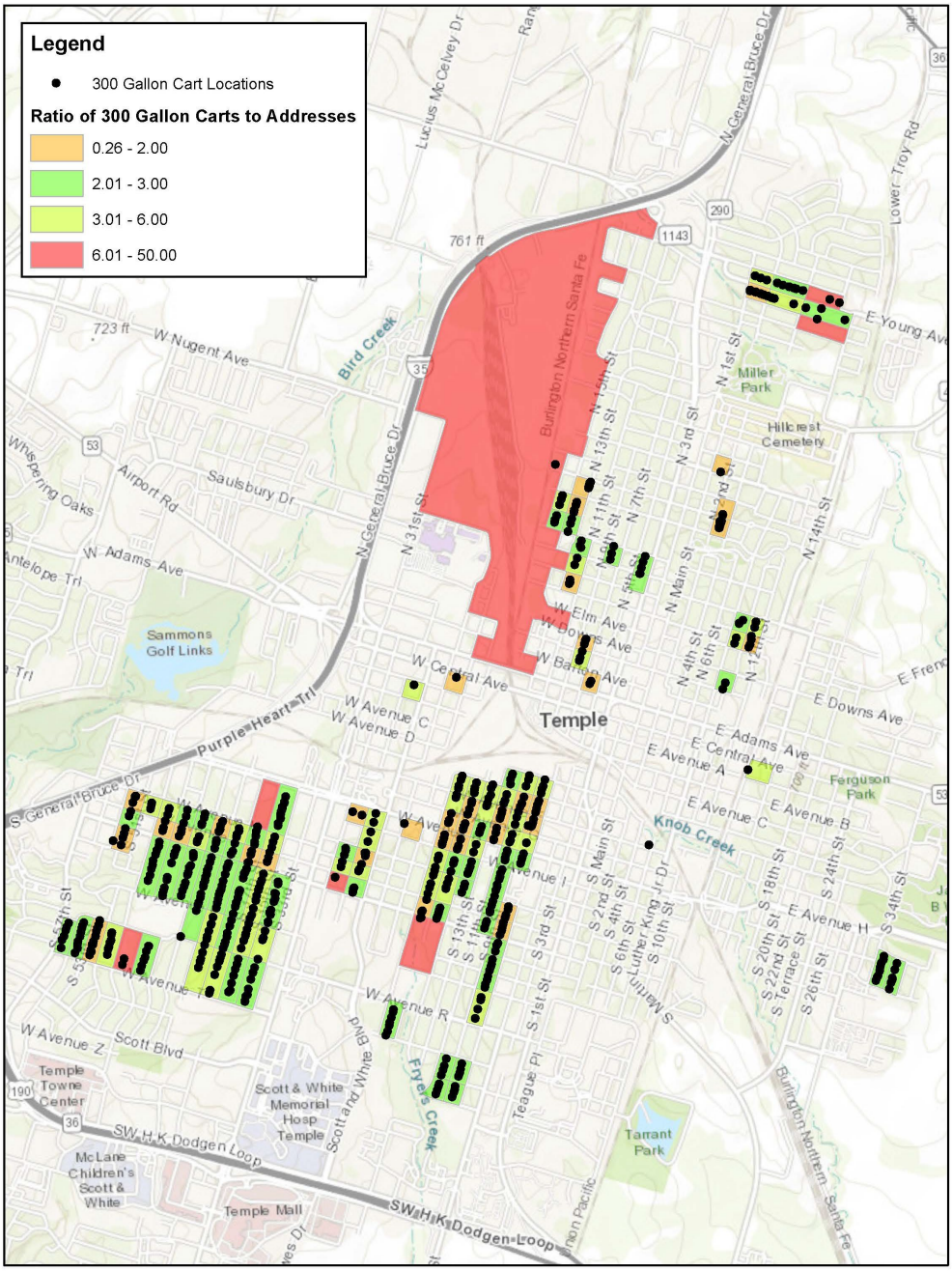
4.4.3 Collect Recyclables on the Same Day as Trash

SWD provides curbside recycling service on a weekly basis, but recycling service is a different day than trash collection. Many communities with rollout carts collect recyclables every other week and according to U.S. EPA website that provides tools for local governments, this could reduce collection costs by approximately 25 percent. By collecting recycling every other week, but on the same day as trash, the City could make recycling more convenient for customers. This convenience will most likely yield an increase in participation and the quantity of recyclables diverted from the Landfill. Section 5.5.3 of this Plan provides more detail on how the SWD could collect curbside recyclables every other week, but on the same day as trash.

4.4.4 Monitor Container Ratio in Residential Alley Collection

For areas where communal containers are used, the SWD has a policy of assigning one communal container for every three households. As part of the planning process, SCS Engineers conducted a geospatial analysis of 563 of the communal containers adjacent to customer addresses within the same block. Exhibit 9 shows that throughout the majority of the City, the ratio of households to containers is 2.01 to 3.00.

Exhibit 9. Ratio of Residential Customer to 300-Gallon Containers



Based on the geospatial analysis, the City has an average ratio of 2.8 customers per communal container. Based on these statistics, the SWD will not modify the current distribution of communal containers. The SWD will continue to monitor this ratio as population increases and as they place new containers.

4.4.5 Modify Brush and Bulk Item Collection Program

A number of initiatives could decrease the costs of bulk item and brush services by either reducing service levels or improving efficiency. Reducing the service could include limiting the setout volumes to less than three cubic yards. If a set-out exceed three cubic yards, SWD would charge customers based on the set out size. Another approach is to limit service based on the time required to remove the material. Some communities provide 15 minutes of complimentary service several times a year and then charge by the incremental time required to complete the service. SWD could also only offer the brush and bulk item service once a month or even less for bulk items, such as two to four times per year.

SWD could further improve efficiency by changing the service to a request-based system, where customers schedule appoints via telephone or the SWD website.

4.4.6 Convert to a Slow-Fill CNG System

The SWD has a mixed fleet of diesel and CNG-fueled trucks. SWD currently uses a fast-fill system to fuel CNG trucks, which adds a half hour fill time to each route. Drivers typically fill their CNG vehicles twice daily, which takes 15 to 30 minutes. A fast-fill CNG system only fills 75 percent of a truck's tank, and CNG trucks cannot go below one-quarter tank before problems with low fuel pressure occur. As such, drivers can only fill 50 percent of the tank each time. The CNG trucks cannot run a full day without filling up; they must fill up after the first trip to the Landfill, and then again at the end of the day.

Therefore, SWD will establish a budget of approximately $1,200,000 to add slow-fill capabilities at the operations center where the CNG trucks can have their tanks slow-filled overnight. This will improve collection efficiency by reducing the number of times per day drivers must fill their vehicle. This improved efficiency will decrease overtime and could delay the need to add routes in the future.

4.4.7 Consider Deploying Rollout Carts throughout the City

Approximately 90 percent of SWD residential customers use 96-gallon carts. The remaining residential customers use communal containers that are located in alleyways and other special access situations. Communal containers serve an average of 2.8 households

The time required for SWD to service a communal container is only about 3.1 seconds more than servicing a 96-gallon cart for one customer. Thus, the communal containers are more efficient for SWD to service as they are collected from almost three times the number of customers than the 96-gallon carts, but only requires a quarter more time. However, the communal container system increases maintenance costs and fosters illegal dumping. Thus, as part of the planning process, SCS evaluated replacing the communal containers with 96-gallon carts. This evaluation identified the following benefits associated with deploying 96-gallon carts throughout the City:

- Routes would be on paved roads, versus the unpaved alleys, reducing vehicle wear.
- The communal containers require additional time for maintaining the automated arm and grabbers.
- 96-gallon, rollout carts are easier to maintain and replace.

- Illegal dumping outside of the communal containers is common and often requires the driver to get out of the truck resulting in increased time on routes. It is difficult to mitigate illegal dumping at communal containers since SWD cannot assign them to a specific household.

- Less unacceptable bulk items disposed with household trash due to the physical constraints of the 96-gallon carts.

- Reduction in route times since drivers would not be required to navigate as many obstacles, such as fences, wires, overgrown trees and vegetation.

- More effective education and enforcement due to standardized residential collection service throughout the City.

- All residential customers would have access to curbside recycling.

The evaluation also identified potential disadvantages and barriers to implementing a City cart system:

- Additional capital required for new carts.

- Converting the entire City to carts would change a well-established system of collection and would require a public relations campaign to gain acceptance.

- Requires coordinated transition of the management of CII trash for those served with communal carts.

- Some resistance due to homeowners having to store the carts either beside their home or in their garage.

- Potential for increased blowing litter from carts tipping in high winds, which is common in this area of the country.

- On a household served per stop basis, the communal containers are twice more efficient than the 96-gallon carts, possibly requiring an extra ten or more hours a week to serve them as 96-gallon carts.

- SWD would need to rebalance the current 96-gallon routes to eliminate overtime.

- Converting the City to all carts would increase overtime unless SWD adds more routes.

Once the SWD has a stable collection system not burdened by overtime, they may be in a position to replace the communal containers. The benefits to SWD, illegal dumping and standardizing the collection system makes this transition to a future goal. However, it is not critical in the near term.

4.4.8 Improve Business Processes

There are business process improvements that could benefit collection operations and efficiency. Fleet Maintenance is responsible for purchasing collection vehicles. SWD truck purchases could be

managed by a committee that includes both fleet and SWD managers to make sure vehicle purchases address the route conditions.

The implementation of *Routeware* is progressing and it is contributing to SWD acquiring and analyzing data. However, a clear definition does not exist on the specific issues *Routeware* is trying to improve. By defining the issues first, SWD can adapt *Routeware* to generate data that facilitates resolving the issue.

4.4.9 Reduce Fleet Maintenance Turn-Around Time

SWD crews identified maintenance turnaround time as a significant impact to productivity with not having trucks available at times. Potential solutions include:

- Expand capacity at Fleet Maintenance;
- Establish an internal light maintenance capability within SWD for oil/fluid changes, tire changes, minor hydraulics repairs, and potentially minor welding; and
- Outsource vehicle maintenance.

City staff indicated that they were working to expand capacity at the Fleet Maintenance operations, which had been experiencing personnel shortages. SWD will consider the other options if expanding capacity does not resolve the problems.

SWD will be adding a maintenance building to the new SWD facilities as discussed in Section 5. As such, SCS recommends adding a new position to the department that is responsible for the maintenance items performed within the SWD.

4.4.10 Institute an Equipment Replacement Schedule

SWD purchases and maintains a fleet of collection vehicles that collect the City's residential and CII customers' solid waste. SWD operates and maintains the fleet as well. Approximately 80 percent are CNG fueled truck with the remainder diesel trucks. The current inventory of vehicles includes Front load, Side load and roll-off trucks.

The SWD currently has as a goal to replace truck and equipment within seven years of purchase. Therefore, SCS created the proposed equipment replacement plan to align with that goal. Table 6 presents this plan, which includes equipment purchases over a ten-year period beginning in FY 2020-2021.

Table 6. SWD Equipment Replacement Schedule

UNITS NEEDED

	-	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	Year10
	2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Department: Solid Waste Admin Overhead - 2310-540											
Light Duty	-	-	-	-	-	-	1	-	-	-	-
Department: Solid Waste Brush/Bulk - 2320-540											
B&B Frontline	-	-	1	1	1	3	-	-	-	1	1
B&B Backup	-	-	1	1	-	-	1	-	-	1	1
Department: Solid Waste Residential - 2320-540											
Residential Backup	-	-	1	-	-	-	-	-	-	1	-
Residential Frontline	-	-	1	4	4	2	2	-	-	1	4
Light Duty	-	-	2	1	1	-	1	-	-	2	1
Department: Solid Waste FrontLoad - 2320-540											
Residential Backup	-	-	-	-	-	-	-	-	-	-	-
Residential Frontline	-	2	2	-	-	-	1	-	2	2	-
Light Duty	-	-	-	-	-	-	1	-	-	-	-
Other	1	-	-	-	-	-	1	-	-	-	-
Department: Solid Waste Sideload - 2320-540											
Sideload Backup	-	-	-	-	-	-	-	-	-	-	-
Sideload Frontline	-	-	-	-	-	-	1	-	-	-	-
Light Duty	-	-	-	-	-	-	1	-	-	-	-
Department: Solid Waste Rolloff - 2320-540											
Rolloff Frontline	-	5	-	-	1	1	1	-	5	-	-
Rolloff Backup	-	-	-	-	-	-	-	-	-	-	-
Department: Solid Waste Recycling - 2320-540											
Recycle Equipment	-	1	-	-	-	-	-	-	1	-	-
Light Duty	-	1	-	-	-	-	-	-	1	-	-
Department: Solid Waste Recycling Processing - 2320-540											
Recycle Equipment	-	-			-	-	-	4	-	-	-
Purchased Equipment in 2020											
Residential Truck	3	-	-	-	-	-	-	2	1	-	-
Roll-off Truck	3	-	-	-	-	-	-	3	-	-	-
Frontload	3	-	-	-	-	-	-	3	-	-	-
TOTAL EQ. PURCHASED	10	9	8	7	7	10	11	8	10	8	7
NEW EQUIPMENT TO BE PURCHASED	0	1	0	2	3	0	0	0	0	0	0
TOTAL HEAVY DUTY	50	51	51	53	56	56	56	56	56	56	56
TOTAL LIGHT DUTY	10	10	10	10	10	10	10	10	10	10	10

Table 6. SWD Equipment Replacement Schedule (cont.)

COST PER UNIT

	-	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	Year10
	2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Department: Solid Waste Admin Overhead - 2310-540											
Light Duty	-	-	-	-	-	-	$26,812	-	-	-	-
Department: Solid Waste Brush/Bulk - 2320-540											
B&B Frontline	-	-	$261,287	$253,472	$196,670	$753,005	-	-	-	$300,136	$291,160
B&B Backup	-	-	$214,446	$160,901	-	-	$271,447	-	-	$246,331	$184,825
Department: Solid Waste Residential - 2320-540											
Residential Backup			$320,783	-	-	-	-	-	-	$368,479	-
Residential Frontline	-	-	$339,828	$1,392,466	$1,136,849	$727,943	$561,604	-	-	$390,355	$1,599,505
Light Duty	-	-	$46,025	$33,789	$34,655	-	$21,958	-	-	$52,869	$38,813
Department: Solid Waste FrontLoad - 2320-540											
Residential Backup	-	-	-	-	-	-	-	-	-	-	-
Residential Frontline	-	$312,717	$637,943	-	-	-	$364,768	-	$359,214	$732,796	-
Light Duty	-	-	-	-	-	-	$75,241	-	-	-	-
Other	$306,585	-	-	-	-	-	$345,265	-	-	-	-
Department: Solid Waste Sideload - 2320-540											
Sideload Backup	-	-	-	-	-	-	-	-	-	-	-
Sideload Frontline	-	-	-	-	-	-	$208,465	-	-	-	-
Light Duty	-	-	-	-	-	-	$67,922	-	-	-	-
Department: Solid Waste Rolloff - 2320-540											
Rolloff Frontline	-	$1,056,817	-	-	$155,941	$206,431	$183,638	-	$1,213,950	-	-
Rolloff Backup	-	-	-	-	-	-	-	-	-	-	-
Department: Solid Waste Recycling - 2320-540											
Recycle Equipment		$47,498	-	-	-	-	-	-	$54,561		
Light Duty	-	$21,573	-	-	-	-	-	-	$24,781	-	-
Department: Solid Waste Recycling Processing - 2320-540											
Recycle Equipment					$182,807						
Purchased Equipment in 2020											
Residential Truck	$1,008,686	-	-	-	-	-	-	$772,442	$393,945	-	-
Roll-off Truck	$489,195	-	-	-	-	-	-	$561,931	-	-	-
Frontload	$971,711	-	-	-	-	-	-	$1,116,190	-	-	-
TOTAL LIGHT DUTY	**$0**	**$21,573**	**$46,025**	**$33,789**	**$34,655**	**$0**	**$191,933**	**$0**	**$24,781**	**$52,869**	**$38,813**
TOTAL HEAVY DUTY	**$2,776,177**	**$1,417,032**	**$1,774,286**	**$1,806,839**	**$1,489,460**	**$1,870,187**	**$1,935,186**	**$2,450,563**	**$2,021,670**	**$2,038,097**	**$2,075,490**
TOTAL	**$2,776,177**	**$1,438,606**	**$1,820,311**	**$1,840,628**	**$1,524,115**	**$1,870,187**	**$2,127,119**	**$2,450,563**	**$2,046,451**	**$2,090,966**	**$2,114,303**

Notes:

[1] The cost for 2020 equipment purchased were estimates.

[2] This plan is based on 7-year replacement cycle with 2% annual inflation rate considered. Based on maintaining vehicles fleet of 49 frontline and ten backups.

[3] Year 5 total equipment purchases were significantly higher than the other years. Therefore, five trucks were purchased in Year 4, a year early, to even out purchases.

5.0 LANDFILL DIVERSION

5.1 RECYCLING

The SWD collects recyclables from 96-gallon cart customers on a weekly basis. Alley customers and multi-family complexes do not receive curbside recycling service unless they request a green 96-gallon container.

Recycling customers receive a green 96-gallon, recycling cart and can recycle the following materials:

- Aluminum and steel cans;
- Fiber board (boxes cereal, cookies, crackers);
- Junk mail;
- Magazines;
- Corrugated cardboard;
- Newspapers;
- Office paper;
- Telephone directories;
- Plastic beverage containers; and
- Plastic detergent bottles.

SWD collects recyclables once a week; however, the collection day differs from trash collection. SWD also collects certain source-separated materials, such as cardboard, from CII customers.

The City has two locations where all residents and CII establishments can take recyclable materials:

- Recycle Center #1 - 3015 Bullseye Lane
  South side of East Avenue H and Little Flock Road - West of the Landfill
  Available for drop-off 24/7 (not attended)

- Recycle Center #2 - 602 Jack Baskin Drive
  Northeast corner of Avenue H and South 31st Street - Behind the Gober Party House
  Available for drop-off 24/7 (not attended)

Materials accepted at the recycling centers include:

- Aluminum cans;
- Corrugated cardboard;
- Glass (bottles and jars only - all colors);
- Magazines;
- Newspapers;;
- Plastics beverage containers; and
- Office paper.

The City leases a building for consolidating and loading (trans loading) recyclables from the curbside recycling collection vehicles into transfer trailers, which then transport them to a MRF. The City refers to the building as the Recycling Facility; it is located at 1739 South Martin Luther King Drive.

The City entered into a two-year agreement with Balcones in April 2017, to transfer recyclables from the Recycling Facility to their Austin MRF. The agreement has three, one-year extensions.

Balcones' specific responsibilities include:

- Transporting Temple's single-stream recyclable materials from the Recycling Facility to their MRF;
- Providing trailers/drivers for transportation;
- Processing Temple's single-stream recyclable materials at their MRF;
- Marketing all Temple single-stream recyclable materials for sale;
- Researching and investigating new markets for single-stream recyclable materials; and
- Brokering other recyclable materials collected by the City from the two recycling sites or material that SWD directly collects from CII customers.

SWD responsibilities as they relate to the Recycling Facility are as follows:

- Delivering single-stream and other recyclables to the Recycling Facility;
- Accepting other recyclables from sources such as businesses and other communities;
- Managing, operating, and maintaining of the Recycling Facility; and
- Loading single stream and other recyclables onto vehicles for transportation.

The City pays Balcones a processing fee of $75.00 per ton for single-stream recyclable materials transported by Balcones to their MRF. The Agreement includes a revenue-share provision, whereby Balcones shares 65 percent of the revenue received from the sale of certain single-stream recyclable materials with the City. Balcones does not share revenue with the City for mixed plastics (#3-7), scrap metal or glass. Balcones calculates revenue share on a per ton basis.

Balcones directly brokers for other recyclable materials from the Recycling Facility. Balcones pays the City for fiber. The rate is $5.00 per ton over the grade index as published in the *Pulp & Paper Week, high-side Southwest Region.* The City pays Balcones $8.00 per ton to broker the drop-off recyclables directly from the Recycling Facility.

The Agreement provides Balcones with the authority to inspect and reject incoming loads of single-stream recyclables at their Austin MRF. Balcones may designate a load unacceptable for the following reasons:

- A load of single-stream recyclable materials contains more than 35 percent of non-recyclable materials by weight;
- A load of single-stream recyclable materials presents a substantial danger to the public or employee health or safety; or
- A load contains hazardous materials[6].

If Balcones designates a load unacceptable, they transport and dispose of the load at a facility agreed to by the City and Balcones. Balcones invoices the City for transportation and disposal costs.

If a load contains more than 25 percent, but less than 35 percent of non- recyclable materials by weight, Balcones can charge the City an additional processing fee of $80.00 per ton on a pro-rata basis for that load only. To document contamination, Balcones takes a photograph of the load and the non-recyclable materials included in the load, and attaches the photograph to the weight ticket.

Balcones did not reject any loads during the Baseline Year. The average contamination rate for City's single-stream recyclables in the Baseline Year was 21.6 percent.

The Recycling Facility processes recyclable materials from local businesses and surrounding communities including Killeen, Belton, Troy and Salado. It is not possible for the Recycling Facility to quantify the recyclables delivered by other communities, but the operator does not believe it is a very high percentage. These tonnages are included in "drop-off recyclables."

During the Baseline Year, the Recycling Facility received the following tonnages:

Curbside Recycling	3,331
Drop-Off Recyclables	3,266
TOTAL	6,597

5.2 BRUSH AND BIOSOLIDS

SWD includes the collection of brush, tree trimmings, (collectively referred to as brush) in residential services. Yard trimmings are collected with bulk items and are not included with the brush. SWD collects brush twice per month, and not on the same day as trash. Residents may request a special pick-up of brush, but SWD will charge a special pickup fee.

[6] Hazardous materials means any pollutant, contaminant, hazardous or toxic substance, constituent or material, including, without limitation, petroleum products and their derivatives, or other substances, regulated under or pursuant to any environmental laws.

Private (professional/commercial) tree trimmers must register their businesses with the City and will be required to haul their cuttings to the landfill or other site designated by the Director of the SWD.

SWD delivers brush to the Brazos River Authority for processing into compost. During FY 2020, SWD transported 3,189 tons of brush to the Brazos River Compost Facility (Compost Facility). The Compost Facility is located at 2405 E. 6th Avenue, Belton, TX 76513.

Tri-Gro operates the Compost Facility and has a cooperative agreement with the cities of Temple and Belton. The cities entered this agreement with Tri-Go in 1990. Beyond brush, Tri-Go accepts biosolids from the Temple-Belton Regional Wastewater System. During the Baseline Year, the Compost Facility received 4,671 tons of biosolids of which 70 percent or 3,270 tons was from Temple. Tri-Gro combines the biosolids with brush to produce compost. Tri-Gro sells the compost at the Compost Facility.

To divert brush from the Landfill, SWD encourages backyard composting through its *Don't Bag It Lawn Care Plan* campaign. As part of this campaign, the SWD provides extensive information on the City's website about maintaining and mowing lawns.

5.3 HOUSEHOLD HAZARD WASTE/ELECTRONICS/TIRES

The SWD annually hosts a household hazardous waste (HHW) and electronics (E-waste) collection event where residents can bring the following materials for no fee:

- Flammables
- Corrosives
- Oxidizers
- Pesticides
- Herbicides
- Fertilizers
- CFLs
- Mercury equipment
- Automotive fluids
- Oil filters
- Antifreeze
- Batteries
- Aerosols
- Propane
- Computers
- Laptops & servers
- Cell phones
- Office phones
- Ink & toner cartridges
- Paint/paint products

SWD does not accept televisions or CRT monitors. SWD contracts with a private company to operate the event and manage the HHW and E-waste received. During the Baseline Year, the collection event diverted 29 tons of HHW and E-waste from the Landfill.

During the annual event, the SWD also accepts passenger car and pick-up truck tires for the following fees:

- 0-4 tires — No fee
- 5-12 tires — $3.00 per tire
- Any tire over 22 inches — $5.00 per tire

SWD transports the tires to the Landfill.

5.4 LANDFILL DIVERSION RATES

During the Baseline Year, SWD programs diverted the following tonnages from the Landfill:

Single-stream curbside recyclable material	3,331
Drop-off recyclables	3,266
Brush	3,189
Biosolids	3,270
HHW/E-waste	29
TOTAL	13,085

A diversion rate indicates the quantity of generated waste reused, recycled, composted, or otherwise diverted from a landfill. For this study, data was not available on reuse and therefore was not included in the calculation of the diversion rate. Based on available data, SCS estimated Temple achieving diversion rate of eleven to twelve percent during the Baseline Year. Other recycling studies performed by TCEQ and TRDI indicate statewide landfill diversion rates ranging from 18 to 22 percent.

5.5 LANDFILL DIVERSION ISSUES AND OPPORTUNITIES

To increase landfill diversion in Temple, the SWD will implement the following:

- Develop a new facility to trans-load recyclables;
- Reduce contamination in single-stream recyclables;
- Collect recyclables the same day as trash;
- Promote landfill diversion to CII customers;
- Consider requiring recycling at multi-family complexes; and
- Educate residents and businesses about reducing food waste.

5.5.1 Develop New Facility to Trans-Load Recyclables

As discussed, SWD delivers recyclables from curbside recycling and recycling sites to the Recycling Facility. The current building is approximately 29,000 – 30,000 square feet, and is a very old wooden structure with severely weathered metal-panel walls and numerous interior columns with inadequate interior height in many locations. The surrounding roads and staging areas are unpaved. The Recycling Facility frequently runs out of space to store recyclables before they can be loaded into transfer trailers. Because the City leases the building, the City cannot improve these infrastructure conditions and this limits SWD from accepting additional quantities of recyclables. **Exhibit 10** is an aerial view of the Recycling Facility.

Exhibit 10. Aerial of Existing Recycling Facility

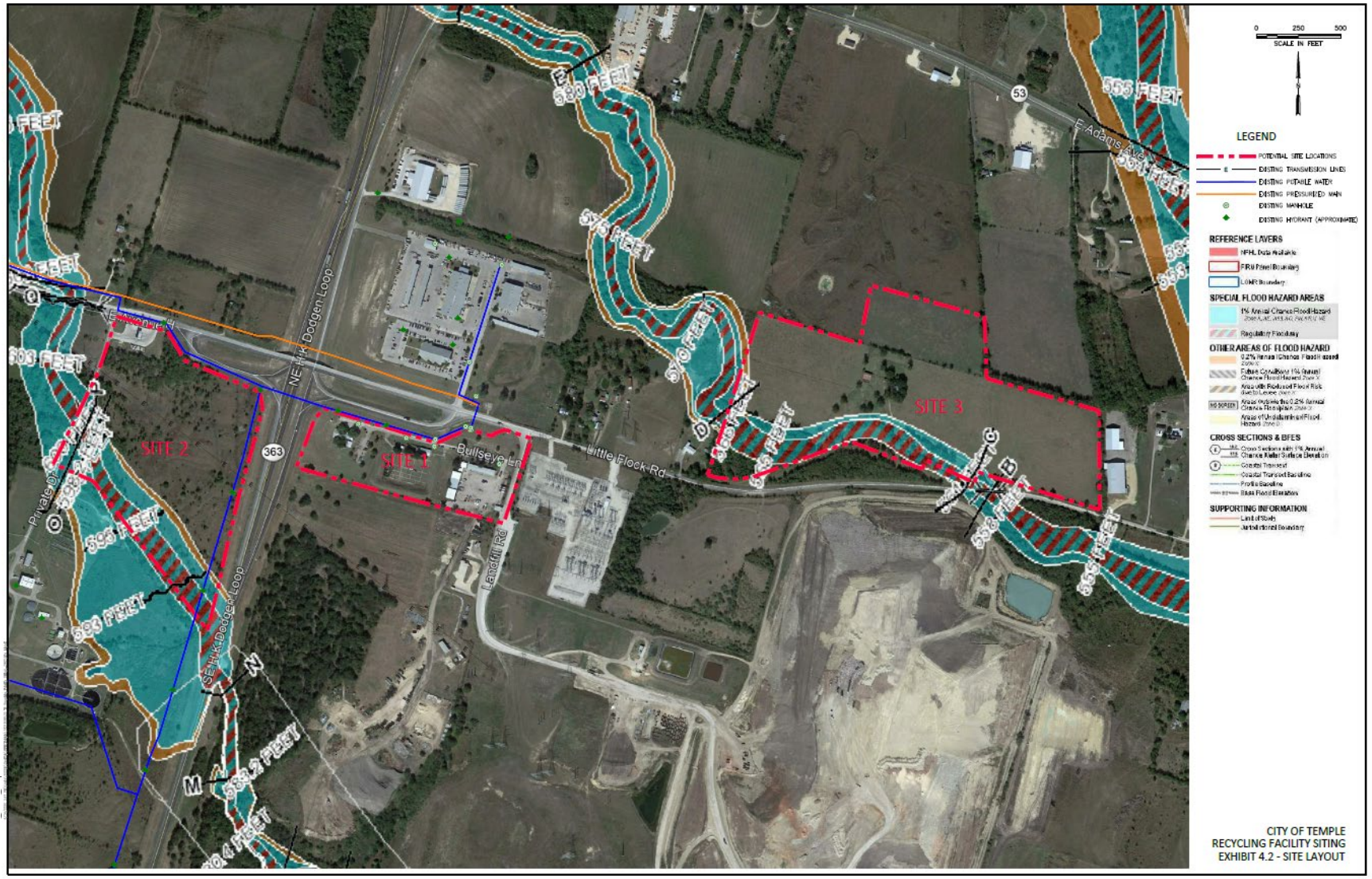
Therefore, the City will move the current trans-load operations to a new City-owned and operated facility. The City will contract for the transportation, processing and marketing of recyclables. This Plan refers to the City-owned facility as the New Recycling Transfer Facility, which will include the following:

- A new building to accommodate the current recycling trans-load operations and limited material processing, storage and distribution;
- New SWD offices to replace the existing offices and facilities; and
- A vehicle and container maintenance building, staging and storage areas to consolidate the City's solid waste facilities at one location and parking for trucks storage area for containers, and brush drop-off area along with maintenance and office buildings. .

The total square footage of the New Recycling Transfer Facility will be approximately 22,000 square feet, which is smaller than the existing facility. However, it will provide more area for storage and processing due to the improved efficiency of the loading system and elimination of other restrictions such as columns and low ceilings. **Concept Site Drawing** is a conceptual site plan for the New Recycling Transfer facility

The SWD evaluated three prospective properties for the New Recycling Transfer Facility. **Exhibit 11** shows the locations of the three prospective sites.

Exhibit 11. Prospective Recycling Transfer Facility Sites



The SWD used the following criteria to assess the potential sites:

- Total acreage;
- Site shape, usable area, and topography;;
- Other siting issues;
- Site ownership;
- Proximity to utilities;;
- Adequacy of existing roadways and site accessibility; and
- Floodplain and drainage.

Table 7 compares the three sites based on these criteria.

Table 7. Site Comparisons

Site	Acreage Total/(Usable)	Shape and Usable Area	Utilities	Roadway Access	Floodplain	Other Issues
1	12/(10)	Limited Size	Yes	Adequate	No	Landfill Existing Structures
2	27/(18)	Good	Yes	Good	Partial	Transmission Lines
3	0/(30)	Good Outside Floodplain	No	Limited	Yes	Roadway Site Distance

Based on a comparative analysis of the three candidate locations, the City identified the CNG station location (Site 2) as the most viable location. Site 2 has sufficient acreage to develop the New Recycling Transfer Facility, which includes an SWD office building and maintenance facility. The site does have an existing transmission line and some floodplain area, but there is sufficient area outside of these restrictions to develop the proposed facilities and allow for future expansion.

Table 8 provides a conceptual-level cost estimate for the New Recycling Transfer Facility. The estimated costs include site work, utilities and building improvements. An equipment budget is also included in the estimate. The cost estimate assumes the City currently owns the property, and can develop the site for the intended use. The estimates are in 2020 dollars and do not include inflation considerations for constructing the project in the future.

Table 8. New Recycling Transfer Facility Cost Estimates

Expenditure	Considerations	Cost
Property	Assumes property provided at no cost to the City project.	$0
Mobilization		$200,000
Site Preparation		$50,000
Earthwork		$80,000
Utilities	Water and sewer services and electric	$80,000
Pavement Concrete	Parking, access road and truck lanes	$450,000
Asphalt Concrete	Truck and container area	$140,000
Rec Building	basis 21,875 SF @ $100/SF	$2,187,500
Fire Protection	$13/SF for fire protection	$284,400
Offices	6400 SF single story office structure @ $165/SF	$1,056,000
Retaining Walls	Partial depth tunnel	$100,000
Equipment	Baler and shredder	$150,000
Maintenance Building	Maintenance and paint booth, office and breakroom	$700,000
Engineering/Testing		$250,000
Contingency (15%)		$859,185
	TOTAL	$6,587,085

5.5.2 Reduce Contamination in Single-Stream Recyclables

The contamination rate in the City's curbside recyclables during the Baseline Year was 21.6 percent. This is below both of the thresholds where Balcones can charge the City additional fees:

- At 25 percent contamination by volume, the City must pay an additional $80 per ton for processing; and
- At 35 percent contamination by volume, the City must pay the cost of transporting and disposing the contaminated load.

As a comparison, the State of Texas average contamination in recyclables was thirteen percent in 2013. Since 2018, numerous recycling processors have increased tipping fees, reduced the type of recyclables accepted, or stopped accepting commingled recyclables due to China's new policies on contamination in imported recyclables. Because of this situation with China, many U.S. recycling processors are requiring contamination rates of less than fifteen percent.

While the current Balcones contract establishes contamination thresholds at 25 and 35 percent, these thresholds will most likely decrease in future contracts. Thus, it would be highly valuable if not essential, for the City to reduce contamination rates.

In most cities, contamination rates vary substantially from neighborhood to neighborhood, and even by recycling collection route. Therefore, SWD may work with drivers to determine if there are certain

routes where, on a regular basis, contamination is a persistent problem. As part of an effort to stave off contamination in the curbside carts, a program compliance technician may assist with educating customers to ensure carts are prepared correctly.

The SWD will also initiate a comprehensive campaign to educate residents on what can and cannot be recycled. This may include the following activities:

- Conducting a characterization study of contaminants to identify the most problematic materials;
- Establishing a contamination reduction goal;
- Placing highly-graphic labels on recycling cart that show what can and cannot be recycled;
- Sending letters to residents that explain the recycling program;
- Including a flyer with water bills explaining the recycling program;
- Purchasing ads in local media; and
- Highlighting the program and how to participate on social media.

Beyond reducing contamination, the campaign will most likely increase participation in the City's recycling program.

5.5.3 Collect Recyclables the Same Day as Trash

SWD collects single-stream recyclables once per week from residential customers with 96-gallon carts. However, SWD collects recyclables on different days than trash. The inconvenience for customers to pull the container to the curb for an additional day in the week most likely reduces customer participation.

SWD will consider increasing convenience by combining trash and recycling pickup on the same day, but reducing the service frequency by switching to every-other-week recycling collection. Beyond increasing convenience, this will significantly reduce collection costs. Every other week collection may reduce the daily dispatch from five vehicles to three vehicles per day. The SWD will need to conduct further analysis of recycling volumes by route during a re-route to assess the viability of this approach.

SWD should implement a comprehensive education and outreach campaign if the collection schedule for recyclables changes. This campaign may include sending letters explaining the need for the change, with magnets showing collection days. If residents set out recycling carts on the wrong day, the SWD will still remove the recyclables but leave a notice about the correct collection day. The SWD will notify the resident three times before the recyclables are not collected.

5.5.4 Promote Landfill Diversion to CII Customers

SWD provides recycling services to their CII customers. To increase the number of CII establishments who participate in the recycling collection program, SWD will work with the Temple Chamber of Commerce to promote recycling among their members. The Chamber of Commerce and SWD will implement a targeted and sustained program to encourage solid waste reduction, reuse and recycling. SWD may also provide technical assistance to CII establishments by calculating potential savings from decreasing the number of trash containers at their site by diverting some materials to recycling.

SWD will also consider promoting the Resource Exchange Network for Eliminating Waste (RENEW) to CII establishments. RENEW is a free materials-exchange network established by the Texas Legislature in 1987 to promote the reuse and/or recycling of business solid waste. The network is a marketing channel for industries, businesses, and governmental units who wish to sell surplus materials, byproducts, and wastes to those who will reclaim or reuse them. Since 1989, more than 500 exchanges have resulted in over one billion pounds of material for reuse or recycling. These efforts also saved facilities more than $27 million dollars in disposal costs and earned over $15 million dollars from the sale of recyclable materials.

If RENEW is pursued, the SWD would work with the Temple Chamber of Commerce to encourage CII establishments to use RENEW to connect with businesses in the region that are currently offering materials that may have value and/or use. For example, a company in Texas is currently looking for solvent with contamination-free ink, paint, or oil. North American Industry Classification System (NAICS) code 323111 represents commercial printing and there are several printing companies in Temple. Thus, the SWD could reach out to these printing companies and help them access the RENEW database. The SWD could work with RENEW participants to estimate potential savings and share these success stories with similar types of businesses.

5.5.5 Consider an Ordinance to Provide Recycling at Multi-Family Complexes

Currently, SWD does not collect recyclables from multi-family complexes. Thus, the only opportunity for these residents to recycle is at the two recycling sites. To increase landfill diversion in the City and make recycling more convenient for multi-family residents, the City may consider introducing an ordinance that requires all apartment complexes in Temple to provide recycling to their occupants.

Challenges to be considered in implementing recycling for multi-family complexes include costs of recycling, current limitations on markets for recoverable materials, space limitations for recycling containers at these complexes, resistance from owners of these complexes, and turnover of residents at these complexes.

San Antonio's City Council passed an ordinance in 2010 to implement a multi-family recycling program. The multi-family recycling program/ordinance was a strategy from San Antonio's 2010 solid waste management plan. The San Antonio ordinance requires owners/managers of multi-family properties to prepare a recycling plan and arrange for on-site collection of recyclables. The ordinance allows owners/managers to self-haul recyclables, but they must submit an annual report that includes the quantity of recyclables transported and where they delivered recyclables. The recycling facility must certify the quantity of recyclables received.

San Antonio implemented the multi-family recycling program in 2012, and the program has consistently exceeded the 97 percent compliance goal. The San Antonio waste management department has two full-time inspectors dedicated to the multi-family recycling program. If an owner/manager is not in compliance, the City could fine them up to $2,000 per day. However, the compliance officers provide extensive support to establish a recycling program before issuing a fine.

If Temple pursues the development of a multi-family recycling ordinance, the City would need to create an inventory of the multi-family properties in the City and create a database of the owners/mangers and number of units. After Temple creates the database, the City would need to survey multi-family

occupants to assess their desire to have on-site recycling, especially if it increases the rent. The City would also need to conduct workshops with owners/managers to ensure participates understand the program.

5.5.6 Educate Residents and Businesses about Reducing Food Waste

According to the U.S. Department of Agriculture, every American throws away 219 pounds of food annually. For Temple, this means over 9,000 tons of food were disposed during the Baseline Year. To increase awareness about wasted food and food recovery, the SWD will educate residents and businesses about reducing food waste. Possible education programs include:

- **Promote the USEPA "Food Recovery Challenge"** - The "Food Recovery Challenge" encourages universities, businesses, and other community organizations to make their food management systems more sustainable. Participants are required to set baseline goals, and annually report the amount of food waste diverted into the USEPA's data management system. The USEPA then takes the amount of food that has been saved and translates that into measures such as "cars off the road" or reductions in greenhouse gases. This helps participants share what they have accomplished and encourages others to get involved. Each year the USEPA awards participating organizations in the categories of source reduction, leadership, innovation, education, and outreach. Winners of the "Food Recovery Challenge" awards are recognized on the USEPA's various social media platforms.

- **Link the SWD website to the "I Value Food" website page** - The "I Value Food" campaign aims to raise awareness about food waste in the United States. The campaign's website offers tools and tips on how to help end food waste and features useful articles such as "Creative Ways to Use Leftovers," or "Cooking for One with Zero Waste." The campaign's website also offers a quiz to help see how much food individuals and families really waste every day. "I Value Food" will soon launch an online challenge and toolkit for reducing food waste at home, adapted from the USEPA's "Food Too Good to Waste" program. Through various social media platforms, "I Value Food" shares ways to reduce food waste.

- **Incorporate "Save the Food" into classroom presentations** - The Food and Agricultural Organization of the United Nations designed "Save the Food," to raise awareness among children, teachers, staff and their related families on food loss and waste issues and introduce good practices conducive to food waste reduction. An education package named "Do Good: Save Food!" consists of different modules that can be used by SWD or teachers to plan lessons and activities on the issue. The content is adaptable and interactively designed to enable educators to select and implement components they consider to be most pertinent to the cause, depending on the needs related to time availability, knowledge and age of the students, curriculum context, etc.

6.0 FINAL WASTE MANAGEMENT

6.1 LANDFILL

SWD disposes trash and bulk items at the Landfill, which the City of Temple owns. The City opened the Landfill in 1979 and it operates under TCEQ Permit No. MSW-692B. In 2019, the permit was revised to significantly expand the Landfill. Based on the current design and permit, the estimated remaining operating life of the Landfill at the Baseline Year disposal rate of 459,202 tons per year is approximately 61 years.

As previously discussed, the City lies within the region covered by the CTCOG. As noted in the TCEQ's most recent Annual Report on Municipal Solid Waste in Texas, the Landfill is one of two municipal solid waste (MSW) landfills within the CTCOG. The other landfill, Fort Hood Landfill, serves only the U.S. Army. In addition to serving the disposal needs of the City, the Landfill serves as a regional disposal site and receives solid waste from the following counties: Bell, Hamilton, Milam, Mills, Lampasas, San Saba, and Coryell.

The City entered into a contract with Waste Management of Texas, Inc. (WMT) in 1993 for the operation of the Landfill. The City amended this contract on March 16, 2011 to include various provisions including the following:

- The contract term is 30 years or the useful life of the Landfill, whichever is shorter.
- If the Landfill has reached its useful life, WMT will close and fence the Landfill, and meet all post-closure State and Federal requirements for post-closure monitoring and maintenance.
- WMT will operate the Landfill in compliance with the TCEQ permit and in a manner comparable to other first class publicly or privately operating landfills in the State of Texas or the United States.
- The permit for the Landfill includes various requirements addressing landfill design, operation, environmental monitoring and reporting. SCS review of the TCEQ website did not indicated any non-compliance with permit requirements.
- WMT will not accept solid waste from outside of the CTCOG region without the written consent of the City.
- WMT may not accept more than 325,000 tons of solid waste that originates outside the City limits in any single contract year without prior written consent of the City. According to WMT's January 2019 report, for the period 2010 to 2018, the total solid waste tonnage from outside of Temple ranged from 240,121 to 277,440 tons per year. Over this period, solid waste tonnage from outside Temple represented approximately 66 percent of the waste received at the Landfill.
- WMT must differentiate tipping fees from solid waste generated within the City and outside the City limits.

- The tipping fee WMT charges the City will be $0.25/ton less that the lowest rate per ton charged by WMT to any other user of the Landfill.

WMT also operates a landfill gas (LFG) collection and control system at the Landfill. According to a January 2019 WMT report and the annual report to the TCEQ, the rate of LFG collected and flared is greater than 2,000 standard cubic feet per minute (SCFM).

In August 2019, WMT submitted air-quality permit applications to the TCEQ for the following facilities at the Landfill:

- A future landfill gas/renewable natural gas (RNG) treatment and processing facility – The RNG will include a LFG incinerator to combust landfill gas from the treatment facility;
- A 2,500 SCFM back-up to flare LFG; and
- A 1,000 SCFM utility flare to reduce the amount of LFG required to operate the flares.

6.2 KEY OBSERVATIONS AND RECOMMENDATIONS

6.2.1 WMT Contract

Overall, the City has been satisfied with Landfill operating services provided by WMT. The City's current concerns, which WMT is currently addressing, include:

- Wait times for SWD vehicles at the Landfill particularly at the beginning of the day (when vehicles queue up at the gate prior to the Landfill opening) and at the end of the day (when WM starts to narrow the working face with application of daily cover); and
- The wheel wash is not particularly effective resulting in mud on the roads during wet weather operations.

In addition, the current contract only allows City residents from single-family homes to deliver bulk items to the Landfill once a month at no charge. Residents moving out of multi-family complexes often set bulk items outside of the dumpster when moving out of their apartment because multiple people depart their unit at the end of the month, and the dumpsters fill up. In addition, lack of capacity to dispose of bulk items in dumpsters can lead to the illegal dumping.

Therefore, SWD will evaluate modifying the WMT contract to allow residents from multi-family units to deliver bulk items to the Landfill at no charge.

6.2.2 Transportation from Collection Routes

The Landfill is adjacent to the SWD Depot. This contributes significantly to the efficiency of the SWD's collection system since SWD vehicles begin and end their days within a quarter mile of the Landfill scalehouse. As such, SWD can efficiently transport trash and bulk items to the Landfill from most collection routes. However, in view of the SWD's large service area, crews collecting trash and bulk

items from the western portions of the City require more time travelling to and from routes. The additional travel time does not currently warrant the SWD developing a transfer station, but the western part of the City is a growing area.

SCS does recommend SWD monitoring the time crews spend on these routes and periodically conduct a cost/benefit analysis on developing a transfer station in the western part of the City. Transfer stations allow municipalities to consolidate materials from multiple collection vehicles into larger, high-volume transfer vehicles for more economical transport to distant disposal sites. In addition, a transfer station may increase the efficiency of SWD's system by enabling individual collection vehicles to service more customers by decreasing the amount of time spent off route.

When identifying a location for a transfer station, the SWD would need to consider:

- Acreage;
- Proximity to the Depot and routes;
- Local traffic patterns;
- Availability of utilities;
- Zoning at the site is consistent with the proposed use, and;
- Compliance with TCEQ's requirements for siting a transfer station.

6.2.3 Long-Term Final Management

The Landfill received 388,682 tons of solid waste in 2010, which increased to 459,202 tons by 2019. This represents an average annual increase of approximately 1.8 percent. As discussed, the Landfill has over 61 years of remaining capacity if solid waste receipts remain at 459,202 tons per year. If the MSW receipts continue to increase annually by 1.8 percent, the Landfill could reach capacity in approximately 25 years.

The estimated 25 years of remaining capacity does not require immediate action by the City to assure long-term final management of City solid waste. However, the City should still proactively monitor capacity since siting, permitting and constructing a new landfill could easily be a seven to ten-year endeavor. In addition, the Brazos Valley COG is adjacent to the CTCOG, and only has one MSW landfill (Twin Oaks Landfill). The Twin Oaks Landfill received approximately 412,000 tons of solid waste in 2019 and similar to the Temple Landfill, has approximately 61 years of capacity. If the Twin Oaks Landfill unexpectedly reached capacity sooner, demand could shift to the Temple Landfill.

Beyond developing a new landfill, the City could consider replacing the Landfill with a transfer station to access final management facilities. Siting, permitting, designing, and constructing a transfer station typically requires three to five years.

The City could also consider developing alternative technology to converting waste into energy for the final management of solid waste after the Landfill reaches capacity. Communities throughout the world use multiple types of alternative technologies to convert solid waste into energy, including anaerobic digestion (AD), thermal waste-to-energy (WTE), gasification/pyrolysis, plasma arc, and plastics-to-fuel. AD and thermal WTE are the two that communities in the US currently use to convert waste into energy. These technologies are often complementary of existing landfill diversion programs and provide other opportunities to increase recycling and composting.

Alternative technologies are currently not common in southwestern U.S due to relatively low tipping fees charged by landfills and the inexpensive price of energy available to consumers. However, the paradigm of relatively inexpensive landfills and energy may shift in the next 25 to 60 years, increasing the viability of alternative technologies in the region.

7.0 5-YEAR ACTION PLAN

7.1 GOALS AND ACTION ITEMS

At the outset of the strategic planning process, the SWD identified the following goals for MSW management in the City:

Goal #1: Continue to provide cost-effective solid waste services, programs and projects that promote and maintain a high level of public health and environmental protection.

Goal #2: Provide for efficient collection and management of solid waste.

Goal #3: Facilitate cost effective, long-term solid waste disposal.

Goal #4: Encourage and expand landfill diversion.

Exhibit 12 presents how the actions in the Plan will help the City realize these goals during the next five years.

Exhibit 12. Goals and Action Items

Provide solid waste services, programs and policies that promote and maintain a high level of public health and environmental protection

- Amend Waste Code to reduce uncontained setouts of trash and recyclables
- Cease charging multi-family residents for the delivery of bulk items to the Landfill
- Educate residents and businesses about reducing food waste
- Continue to proactively monitor remaining disposal capacity at the City's landfill

Provide for efficient collection and management of solid waste

- Amend Waste Code to reduce uncontained setouts of trash and recyclables
- Balance SWD collection routes
- Collect recyclables the same day as trash
- Monitor container ratio in residential alley collection
- Modify brush and bulk item collection program
- Develop a new slow-fill CNG system
- Consider deploying roll-out carts throughout the City
- Improve business processes
- Expand capacity at fleet maintenance
- Purchase new vehicles
- Evaluate transfer station for western portion of the City

Facilitate cost-effective, long-term disposal of solid waste

- Annually review performance of WMT operations of the Landfill
- Continue to monitor remaining capacity at the Landfill
- Evaluate the development of a transfer station or alternative waste management technologies

Encourage and expand landfill diversion

- Develop a new recycling transfer facility
- Reduce contamination in single-stream recyclables
- Collect recyclables on same day as trash
- Promote landfill diversion to CII establishments
- Consider requiring recycling at multi-family complexes
- Educate residents and businesses on reducing food waste

Table 9 presents a tentative schedule for implementing these action items during the next five years. Action items highlighted in red would occur annually after the City initially implements them. SWD would annually work with City to establish a budget for these action items. The exception to this is the new recycling transfer facility, slow-fill CNG conversion and vehicle replacement schedule. These expenditures require capital improvement funds that the City would begin allocating in FY 2021 and distribute over the next five years. Section 7.2 provides details on these expenditures.

Table 9. Implementation Schedule[7]

Year	Action Item
2021	Develop new recycling transfer facility
	Amend Waste Code to reduce uncontained setouts of trash and recyclable
	Balance SWD collection routes
	Purchase new vehicles
	Expand fleet maintenance
	Review performance of WMT operations of the Landfill
	Monitor capacity at the Landfill
	Improve business processes
	Reduce contamination in single-stream recyclables
2022	Construct new SWD offices
	Monitor container ratio in residential alley collection
	Modify brush and bulk item collection program
	Increase awareness about food waste recovery
	Collect recyclables and trash on same day
2023	Construct Maintenance Facility/Parking and Staging Areas
	Cease charging multi-family residents for the delivery of bulk items to the Landfill
	Consider deploying roll-out carts throughout the City
2024	Develop new CNG-Fill Station
	Evaluate transfer station for western portion of the City

[7] Action items highlighted in red will occur annually after the City initially implements them

Year	Action Item
2025	Consider requiring recycling at multi-family complexes
	Upgrade recycling drop-off sites

7.2 CAPITAL IMPROVEMENTS BUDGET

SWD has established a budget of $6,530,000 for the estimated capital cost to develop the following new solid waste facilities:

- New Recycling Transfer Facility;
- New Solid Waste Offices;;
- New Maintenance Building
- Parking for Employees and Equipment; and
- Brush Staging Area.

SWD has also established a budget of $1,200,000 to develop slow-fill capabilities. This will improve collection efficiency and potentially delay the need to add routes in the future.

SWD currently has a goal to replace vehicles within seven years of purchase. However, SWD uses a large number of vehicles that exceed the seven-year period. Based on current and planned routes, SWD requires a fleet of approximately 56 collection vehicles. This includes 20 to 30 percent backup vehicles. The planned annual expenditures for trucks over the ten year period range from $1,400,000 to $2,460,000. The annual number of vehicle purchases range generally from 7 to 11, with year 1 and 8 showing 10. The average for the 10-year period is approximately 10 vehicle purchases per year refer to pages 36 and 37 for Equipment Replacement Schedule.

Table 10 shows the annual estimated budget for capital improvement expenditures for Years 1-5. The SWD will annually review these budgets and adjust accordingly.

Table 10. 5-Year Capital Improvement Budget

Expenditure	2021	2022	2023	2024	2025
New Recycling Transfer Facility with Site Improvements	$4,300,000				
New Solid Waste Offices		$1,200,000			
Maintenance Facility/Parking and Staging Areas			$1,000,000		
CNG Fill Station Upgrade				$1,100,000	
Citizen Collection Station Upgrade					$500,000
Vehicles	$1,357,900	$1,129,200	$1,023,200	$722,600	$1,207,200
TOTAL	**$5,657,900**	**$2,329,200**	**$2,023,200**	**$1,822,600**	**$1,707,200**

Appendix A
Technical Memorandums

- Task 2 Memorandum – Waste Quantities and Projections
- Task 3 Memorandum - Solid Waste System Operations Review
- TM 3B – Route Optimization – System Modeling
- Task 4 Technical Memorandum – Recycling Transfer Facility Siting and Conceptual Design
- Task 6 Technical Memorandum – Assessment of Future Solid Waste Management Alternatives and Capital Improvements

Task 2 Technical Memorandum: Waste Quantities and Projections

City of Temple
2 N Main Street
Temple, Texas 76501

SCS ENGINEERS

File No. 16219089.00 | March 12, 2021

1901 Central Drive
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2.0 POPULATION AND WASTE PROJECTIONS

2.1 POPULATION PROJECTIONS

The City of Temple has an estimated population of 82,529 based on the 2019 City Limit and Services Area Population Forecast. Temple is expected to experience continued steady growth through the 20-year planning period. Projected population annual growth for the City of Temple Is included in Exhibit 2.1.1.

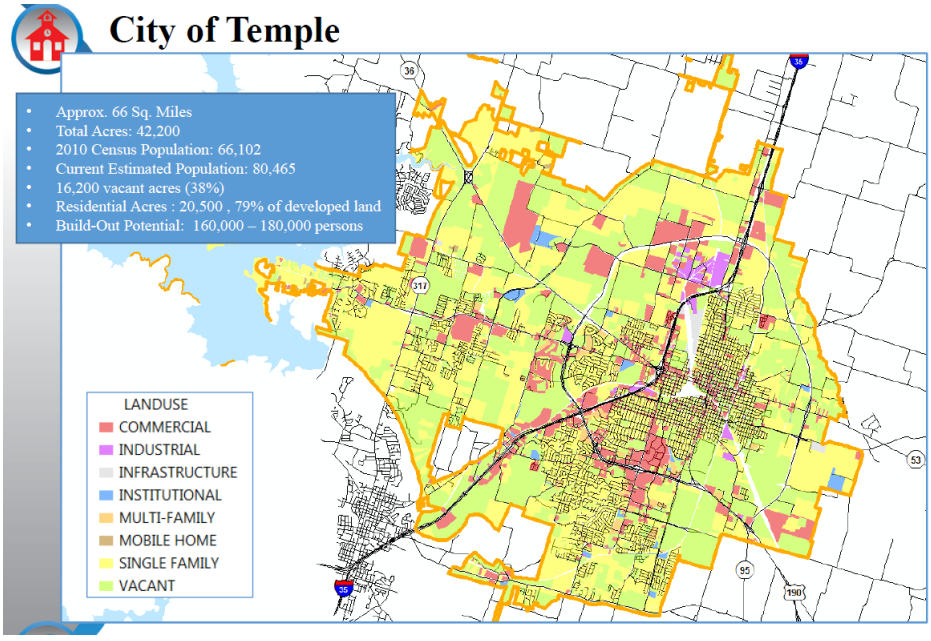
Exhibit 2.1.1 Temple Population Projections[1]

Year	Population Projection
2019	82,529
2020	84,445
2021	86,882
2022	89,403
2023	91,452
2024	93,224
2025	95,142
2026	96,587
2027	97,972
2028	99,454

Year	Population Projection
2029	100,603
2030	102,028
2031	103,176
2032	104,325
2033	105,761
2034	106,910
2035	108,334
2036	109,483
2037	110,632
2038	112,056

[1] Population projections based on City of Limit and Service Area Population Forecast conducted by Templeton Demographics.

Exhibit 2.1.2 Temple Growth Trends



Source: City Limit and Service Area Population Forecast Report conducted by Templeton Demographics.

Approximately 38% of the City of Temple is undeveloped or vacant area that could be developed in the future. Current growth trends are in western regions toward Lake Belton. Other potential growth areas are located around the existing developed areas of the City.

2.2 WASTE QUANTITY PROJECTIONS

SCS estimates a 2019 total solid waste generation tonnage for the City of Temple of 111,538 tons based upon the amount of waste collected, disposed and received and transferred at the City's recycling facility. This total includes the residential, commercial and roll-off and bulk waste collected and landfilled as well as recyclables collected in the City's curbside collection program. In addition to curbside recyclables, the City processes additional recyclable materials from local businesses and surrounding communities including Killeen, Belton, Troy and Salado. These additional material quantities vary, but are estimated to be approximately 3266 tons of materials in 2019. The estimated diversion rate for the City of Temple is approximately 8%. This information is shown in Exhibits 2.2.1 and 2.2.2.

Exhibit 2.2.1 Types and Amounts of MSW in Temple in 2019

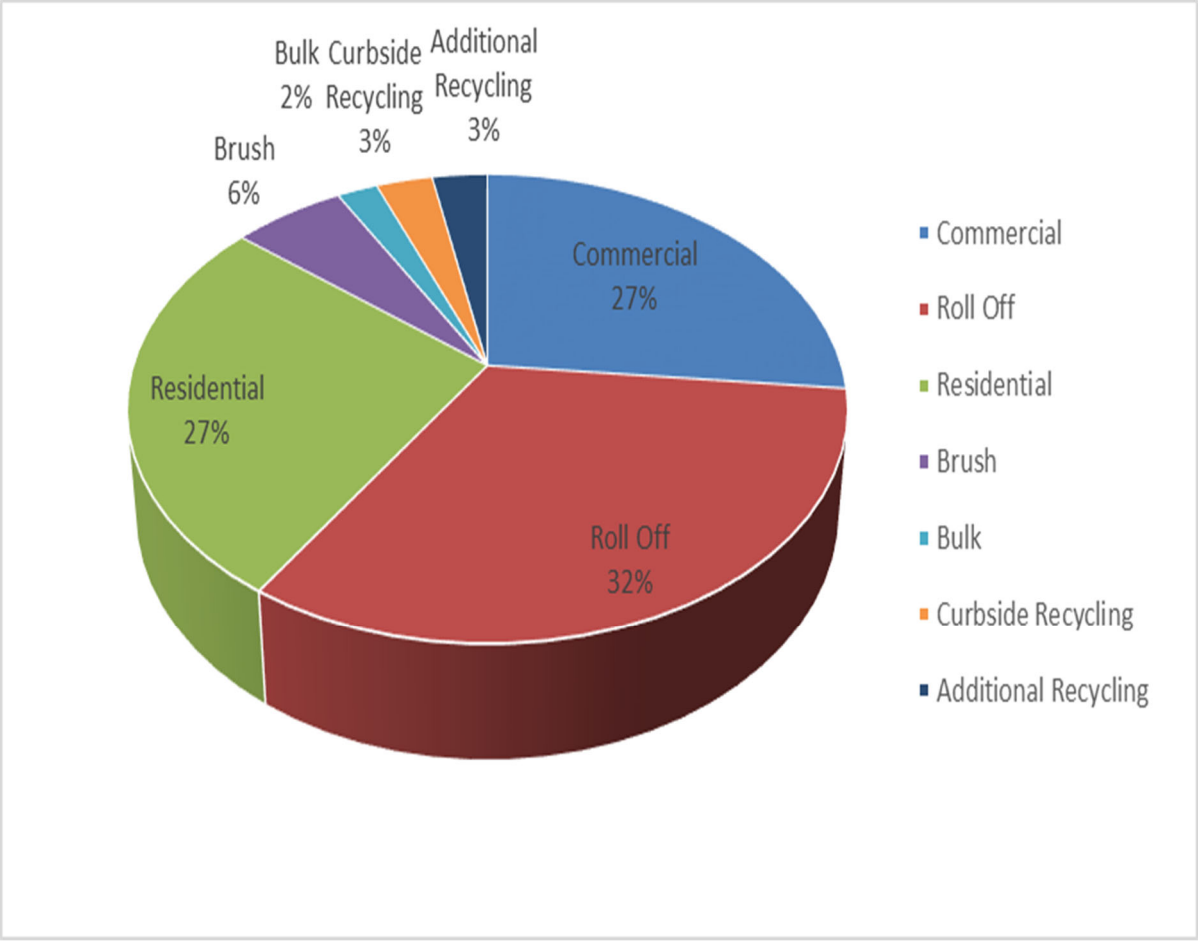


Exhibit 2.2.2 Types and Amounts of MSW generated by City of Temple 2019

Waste Type	Tons	% Tons
Landfilled		
Commercial	29,330	29%
Roll Off	35,950	35%
Residential	29,461	29%
Bulky Waste	7,800	8%
Total Landfilled	***102,541***	***100%***
Diverted		
Brush	2,400	27%
Curbside Recycling	3,331	37%
Additional Recycling	3,266	36%
Total Diverted	***8,997***	***8%***
TOTAL	***111,538***	**-**

Notes: Landfilled totals are based on most recent tonnages provided by the City of Temple for 2019. Recycling totals are estimated based on recent tonnages for FY 2019 through January. Brush and bulky tonnages are estimated based on load counts. Diversion rate includes some recyclables that are generated outside the City of Temple.

The annual amount of solid waste managed by the City in 2019 was used to develop waste quantity projections for the 20 year planning period. These projections are based on the projected population increases presented in 2.2.3 and do not account for changes in waste generation due to individual behavior and other factors that could affect future per-capita waste generation rates.

Exhibit 2.2.3 Temple Waste Quantity Projections based on Population growth

Year	Waste Generation Projection
2019	111,538
2020	114,128
2021	117,421
2022	120,829
2023	123,598
2024	125,993
2025	128,585
2026	130,538
2027	133,018
2028	134,413

Year	Waste Generation Projection
2029	135,965
2030	137,891
2031	139,443
2032	140,996
2033	142,937
2034	144,489
2035	146,414
2036	147,967
2037	149,520
2038	151,444

The TCEQ publishes an annual summary of solid waste in Texas titled: Municipal Solid Waste in Texas, a Year in Review. The 2018 addition was used to summarize the statewide totals for MSW and are presented in Exhibit 2.2.4. The total estimated diversion rate for the state in 2018 was approximately

4%. Other recycling studies performed by TCEQ and TRDI indicate statewide waste diversion rates ranging from 18% -22%.

Exhibit 2.2.4 Types and Amounts of MSW Landfilled and Diverted

Waste Type	Tons	% Tons
Landfilled		
Municipal	23,784,657	63%
Brush	381,125	1%
C&D	8,631,842	23%
Contaminated Soil	776,424	2%
Sludge	1,340,063	4%
Class 2 and 3 NHIIW(4)	1,836,063	5%
Other	1,092,728	3%
Total Landfilled	***37,842,883***	***100%***
Diverted		
Yard Waste or Brush	638,945	36%
Metal	37,611	2%
Plastics	23,176	1%
Construction/Demolition	544,467	31%
Paper/Cardboard	203,133	11%
Other	322,091	18%
Total Diverted	***1,769,423***	***4%***
TOTAL	**39,612,306**	**-**

In order to provide a general breakdown of the City's waste stream, since a detailed waste-sort was not conducted as part of this effort, SCS used data from USEPA, TCEQ, and other SCS studies. This information is shown in Exhibits 2.2.5-2.2.6

Exhibit 2.2.5 U.S. Waste Generated Composition (USEPA 2017)

Material	U.S. EPA 2017	
	Waste Generated	Recycle Generated
Paper	28.54%	65.75%
Glass	4.61%	4.51%
Metals		
Ferrous	6.76%	9.18%
Aluminum	1.36%	0.92%
Other Non-Ferrous	0.84%	2.29%
Total Metal	*8.97%*	12.40%
Plastics	12.42%	4.41%
Rubber and Leather	3.11%	2.49%
Textiles	5.25%	3.83%
Wood	6.36%	4.47%
Other Materials	1.92%	2.16%
Other Wastes		
Food	13.91%	-
Yard Trimmings	13.37%	-
Inorganic Waste	1.54%	-
Total Other Wastes	*28.82%*	-
TOTAL	**100.00%**	**100.00%**

Exhibit 2.2.6 Estimated Average Single-Family Waste Composition (SCS Study from 13 Municipalities)

	Material Components	Average Residential Composition	Projected Residential Tonnage (Temple)
Recyclable Curbside	Corrugated Cardboard	2.5%	2,788
	Newspaper/Print	2.5%	2,788
	Office/Mixed Paper	10.8%	12,046
	PET Bottles	1.8%	2,008
	HDPE Bottles	1.0%	1,115
	Other Plastic Containers	1.8%	2,008
	Ferrous Metal	2.3%	2,565
	Aluminum	1.1%	1,227
	Other Non-Ferrous Metal	0.5%	558
	Glass Bottles/Jar	3.3%	3,681
	Subtotal Recyclable Curbside	**27.6%**	**30,784**
Other Recyclable	Gable Top Cartons/Aseptic	0.7%	780
	Scrap Metal	1.5%	1,673
	Plastic Shopping Bags	1.0%	1,115
	Textiles/Carpet	5.1%	5,688
	Electronics	1.2%	1,338
	C&D	3.9%	4,350
	HHW	0.2%	233
	Subtotal Other Recyclable	**13.8%**	**15,392**
Compostable	Food	15.8%	17,623
	Yard Waste	5.4%	6,023
	Other Paper	10.6%	11,823
	Subtotal Compostable	**31.8%**	**35,469**
Total Recyclable		**73.2%**	**81,646**
Total Non-Divertible		**26.8%**	**29,892**
	TOTAL	**100.0%**	**111,538**

Exhibit 2.2.6 presents a potential maximum for recyclable materials within a typical municipal solid waste stream based on waste composition studies conducted by SCS at other cities in the U.S.. Although the amounts included are well beyond practical diversion rates at this time, they can be utilized to develop strategies and programs to increase waste diversion at the appropriate time.

Task 3 Solid Waste System Operations Review

City of Temple
2 N Main Street
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SCS ENGINEERS

File No. 16219089.00 | March 12, 2021

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1.0 INTRODUCTION

This technical memorandum provides an assessment of the efficiency of the City of Temple's municipal solid waste collection operations, including residential, commercial, multi-family, bulky waste, yard waste, roll-off, and recycling collection. The memorandum overviews the field observations that were conducted over a three-day period from February 3-5, 2020. Collections performance indicators were processed and summarized from the data collected by the RouteWare onboard computer system utilized by the City. Collection equipment and maintenance were reviewed. This analysis was prepared in association with Route Optimization Consultants (ROC).

2.0 EXECUTIVE SUMMARY

The City provides eight solid waste services for residences and commercial businesses: residential garbage, recycling, bulky, and brush; commercial garbage and cardboard; and roll off garbage. Although the residential curbside garbage routes are full workdays, the residential routes appear to be significantly uneven in workload having a range of 8.9 to 10.8 average hours. The commercial front load routes represent a full daily workload based on having an average 132 stops per route with times in Routeware show them as being an average 10.1 hour days. The City should consider instituting a more dynamic routing that allows for adding and removing brush routes each day to better utilize staff and equipment resources. With also considering growth of more than 500 homes a year, the City would benefit from a re-route to balance the residential routes.

Without having the systems or processes in place to update routes more often, the City has adapted business processes that lead to inefficiencies. The City uses a helper system to have crews on light routes help out with crews on heavy routes. The workday of shorter routes have additional unproductive time added to them while they are waiting to be allocated to or driving to a longer route to help out. By having equal and full workdays on every route, the City would avoid the inefficiencies of the helper system.

Residential garbage uses 96 gallon and 300 gallon carts. The 300 gallon carts are typically more efficient than a 96 gallon cart when the 300 gallon cart serves three homes, but it was observed that many 300 gallon carts may serve fewer than three homes. Although the time study was not comprehensive, it was also observed that cart pull times were about 2 seconds slower than typical times, which would add up to about 16 hours a week in additional time.

The curbside recycling service is collected weekly by five trucks per day, four days per week, on different days of garbage collection. By collecting recycling every other week, but on the same day as garbage collection, the City would not only make it easier for the customers, but also significantly reduce collection costs by halving the service level.

There are a number of initiatives that could reduce the costs of brush and bulky services by either improving efficiency or reducing service levels. Reducing the service could include limiting the set-outs to not be more than two cubic yards and/or to only offer the brush and bulky service once a month or even less for bulky, such as 2-4 times per year. Efficiency could be improved by changing the service to a call-in system. Another option, which would not impact the customers, would be to start a "bird dog" system where the garbage, recycling, commercial and roll-off trucks create a work order dispatched to the brush or bulky driver for collection.

The City has a mixed fleet of diesel and CNG fueled trucks. The City only utilizes fast-fill for the CNG trucks, which adds a half hour fill time to each route, typically filling up two times per day with CNG. Slow fill would be a capital investment, but would increase collection efficiency. SCS believes the 60/40 ratio between the CNG/Diesel trucks is reasonable and provides the City added flexibility in terms of performance and fuel usage.

There are business process improvements that could benefit collection operations and efficiency. For example, the crews noted issues with less than ideal equipment being purchased, as a result of the collections staff not playing a significant role in purchasing. By having truck purchases managed by committee, including both Fleet and Solid Waste managers, this issue may be resolved. The Routeware implementation, although in progress and making great strides, lacks a clear definition of what the business processes are that the system will help facilitate. The result is issues with getting the route data accurate, which leads to a distrust in the accuracy of performance indicators. By defining the business processes first, the City can make Routeware adapt to and facilitate their processes.

Maintenance turnaround time was identified as a significant impact to productivity with not having trucks available at times, but City staff indicated that they were working to expand capacity at the Fleet Maintenance operations, which had been experiencing personnel shortages.

Code enforcement is a business process that has lost follow-through. Code enforcers do not typically enforce and drivers have stopped issuing notices. Although not enforcing the code does not decrease collection efficiency, it leads to uncontained set-outs that decrease efficiency.

The overall diversion rate for the City is approximately 8%. This includes all recyclable materials received and processed by the City as well as brush diverted through the brush pickups.

Opportunities to increase the efficiency of the City of Temple recycling operations and waste diversion rates include:

- Increased participation and diversion through the curbside collection program. This may involve changes to the collection program such as collecting recycling containers on the same day as garbage containers.
- Increased recycling tonnage through commercial materials recycling program.
- Increased diversion of yard waste and brush by instituting a chipping and mulching operation
- Consolidate recycling drop-off operations into one facility that has expanded material options for citizens.

Landfill Location. The location of the landfill adjacent to the City's Solid Waste Operations Center contributes significantly to the efficiency of the City's hauling operations since the collection vehicles begin and end their days within a quarter mile to the landfill scalehouse. As such, a direct haul to the landfill can be accomplished efficiently by most of the City's haul routes, although, in view of the City's large service area, routes serving the western portions of the City require more extensive travel.

Landfill Operations. Overall, the City has been satisfied with Landfill operating services provided by WMT. The City's current concern that are being addressed by WMT include the following:

- Wait times at the landfill particularly at the beginning of the day (when trucks are lines up at the gate at time of opening) and at the end of the day (when WM starts to narrow the working face with application of daily cover).
- The wheel wash is not particularly effective resulting in mud on the roads during wet weather operations.

3.0 OVERVIEW OF COLLECTION OPERATIONS

The City provides eight solid waste services for residences and commercial businesses: residential garbage, recycling, bulky, and brush; commercial garbage and cardboard; and roll off garbage. Exhibit 1 provides a summary of the collection routes, schedule and vehicles by service.

Stop times were assessed by accompanying a residential garbage driver, a brush collector, and a commercial side load dumpster route. A summary of the average stop times to pull the container and wait times at the disposal facilities is provided in Exhibit 2. The stop times do not include any travel time and is just the time from when the wheels stop moving until they move again after the collection or dump has been made.

Route performance indicators of the average miles travelled per route, the hours to complete the route and just for providing service, tons collected, and stop times per hour or second per stop are provided in Exhibit 3. The brush and bulky routes do not record the number of actual stops, which is a typical performance indicator for these types of random collections. Based on time alone, with the minimum average brush route being 8.3 hours and the maximum being 9.6 hours, the brush routes are fairly balanced given the varying and seasonal nature of brush collection. The bulky routes have slightly more variation, with 7.9 to 9.5 hours to complete the route. **The City should consider instituting a more dynamic routing that allows for adding and removing brush and bulky routes each day to better utilize staff and equipment resources.**

The commercial front load routes represent a full daily workload with an average 132 stops per route, but they vary significantly in time from a minimum of 7 hours to a maximum of 11.1 hours. The significant variances in route times, indicate the need to re-balance the routes to have an even workload.

The residential garbage routes also appear to be significantly uneven in workload having a range of 8.9 to 10.8 average hours. With 15 residential garbage routes running into overtime, there is a pressing need to re-balance the routes and potentially add a route each day. The average time for residential recycling is 9.4 hours and don't appear to have overtime issues. The data from Routeware for stops per route looks suspect having one route at 2,087 stops, which is not feasible. The roll off trucks appear to also exceed their daily workday with the average time being 8.3 hours in an 8 hour day.

Exhibit 1. Current Route Specifications

Item	Data
Route Counts by Material and Collection Schedule:	Residential Garbage: 7 routes, 4 spare trucks shared with rec, 4 days per week, 1x/week collection. Residential Recycling: 5 routes, 4 spares shared with garbage, 1x/week Residential Bulky: 3 routes (3 spares shared with brush), knuckleboom, 2x/month Residential Brush: 3 routes (3 spares shared with bulky) , 2x/month, 1 crows nest truck and 2 step side knuckleboom trucks Commercial Garbage Front Load: 5 routes, 6 days per week (Mon, 5 routes; Tue, 3 routes, Wed-Thu-Fri, 4 routes, Sat, 2 routes, up to 6x/week) Commercial Garbage Automated Side Load (ASL) Dumpster: 2-3-4cy, 1 route, 5 days per week, 2 spares – in areas with commercial alleys Commercial Front Load Cardboard: 1 route, 5 days per week, 2-3-4-6-8 cubic yard, Front Load spares- 2 spares, up to 3x/week most stops 45% Roll off: 20-30-40 cubic yard and customer- supplied compactors, 7 routes, 5 days per week
Time Workday Begins, i.e. punch in:	7 am for all routes except commercial, Commercial: 3am Front End Load (FEL) and ASL garbage, Roll-off at 6am 4 trucks and 7am 3 trucks
Earliest Time for First Pickup in Morning:	Apartments 7 am Downtown, 6 am
Total Daily Break (minutes):	2 x 15 minutes
Lunch Time (minutes): Paid or not?	30 minutes unpaid, most don't take it (see Routeware)
Count of Back-door/Handicap Customers:	See Routeware, (one route Rt2 Fri has 60 handicaps)

Exhibit 1. Current Route Specifications

Item	Data
Time windows?	Commercial – many restaurants must be handled before a certain time in morning All FEL routes have time windows build into
Maximum Quantity per Vehicle (tons):	Residential, scorpions are 30cy, 12 tons, older Heils are 6-7 cy Commercial = 10 to 16 tons Brush/bulky = stepside 3.5 tons, crows nest 5 tons
Disposal/Transfer Facility and Location:	City of Temple Landfill BRA - brush
Pre-trip Morning Preparation Time at Depot (minutes):	15 minutes
Post-trip Time at the End of the Day, If Any (minutes):	10 minutes

Exhibit 2. Stop Times for Collection & Disposal (excludes travel time)

Service	Time
Residential Garbage, Average All (seconds)	17.6
Residential Garbage, Average Handicap (seconds)	66.7
Residential Garbage, Average 300g (seconds)	16.5
Residential Garbage, Average 96g (seconds)	13.9
Residential Garbage, Average 300g, 2nd Dump (seconds)	15.9
Residential Garbage, Average 96g, 2nd Dump (seconds)	12.8
Commercial Side Load Dumpster, Average (seconds)	67

Exhibit 2. Stop Times for Collection & Disposal (excludes travel time)

Service	Time
Brush, Average (seconds)	276
Bulky, Average (seconds)	157
BRA Dump Wait, Average of 2 Records (minutes)	13
Landfill Dump Wait, 1 Record (minutes)	26

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
Brush-1S-1	66	20	849	8.8	4.8	4.0	2.9	213	16.9
Brush-2E-2	100	35	3,378	9.6	5.1	4.5	6.6	751	4.8
Brush-3N-4	52	16	785	8.7	4.9	3.8	9.3	206	17.4
Brush-3S-4	67	14	800	9.1	5.1	4.1	7.5	197	18.3
Brush-4N-5	53	10	982	8.5	4.2	4.3	12.7	227	15.8
Brush-4S-5	75	28	1,118	8.7	4.4	4.3	8.0	261	13.8
Brush-5E-1	78	17	2,463	9.2	5.2	4.0	15.9	621	5.8
Brush-5W-1	72	32	2,389	8.6	4.0	4.7	6.9	513	7.0
Brush-6E-2	73	29	2,323	8.3	4.1	4.3	13.6	546	6.6
Brush-6W-2	102	29	2,758	9.5	6.1	3.4	6.9	813	4.4
Brush-7W-4	71	12	1,264	9.4	6.1	3.3	13.7	382	9.4
Brush-8E-5	67	16	1,233	8.6	4.6	3.9	10.8	315	11.4
Brush-8W-5	66	16	637	8.8	5.9	2.9	11.8	223	16.2

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
Brush Minimum	52	10	637	8.3	4.0	2.9	2.9	197	4.4
Brush Maximum	102	35	3378	9.6	6.1	4.7	15.9	813	18.3
Brush Average	72	21	1614	8.9	5.0	3.9	9.7	405	11.4
Brush Total	942	274	20979	115.7	64.4	51.3	126.7	5268	147.9
Bulk-1S-1	71	18	836	8.8	4.7	4.1	6.7	203	17.7
Bulk-3S-4	59	13	800	8.3	4.8	3.5	5.5	228	15.8
Bulk-4S-5	53	23	1,128	7.9	3.8	4.2	6.8	272	13.3
Bulk-5W-1	61	18	2,228	8.7	4.2	4.5	5.6	495	7.3
Bulk-6W-2	64	25	2,645	8.6	3.8	4.8	4.1	554	6.5
Bulk-7W-4	45	11	1,177	9.5	4.6	5.0	7.9	238	15.2
Bulk-8W-5	38	10	641	9.2	5.7	3.5	7.0	184	19.5
Bulk Minimum	38	10	641	7.9	3.8	3.5	4.1	184	6.5
Bulk Maximum	71	25	2645	9.5	5.7	5.0	7.9	554	19.5
Bulk Average	56	17	1351	8.7	4.5	4.2	6.2	311	13.6

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
Bulk Total	392	119	9455	61.1	31.6	29.5	43.5	2174	95.2
FEL-1-3	79	60	134	10.4	1.9	8.5	18.3	16	228.1
FEL-1-5	79	64	153	10.9	2.0	8.9	17.1	17	209.5
FEL-2-1	46	29	135	9.9	3.5	6.4	23.9	21	170.9
FEL-2-2	77	55	119	10.6	2.6	8.0	15.2	15	242.4
FEL-2-4	88	71	123	10.5	2.0	8.5	12.5	14	248.9
FEL-2-5	66	53	139	8.4	1.9	6.5	16.1	21	167.7
FEL-3-1	98	73	136	11.1	3.3	7.8	22.0	17	206.9
FEL-3-2	92	76	135	10.0	2.8	7.3	18.2	19	193.7
FEL-3-3	96	76	134	10.4	2.7	7.7	19.1	17	206.5
FEL-3-5	94	75	146	10.7	2.5	8.2	20.7	18	202.8
FEL-4-1	104	89	146	10.6	1.8	9.6	11.0	15	237.6
FEL-4-3	94	82	145	10.4	1.7	8.7	14.4	17	215.1
FEL-4-4	111	99	131	10.4	1.1	9.3	14.1	14	255.6

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
FEL-S1-N-6	60	43	71	7.0	1.7	5.3	11.7	14	266.4
Front Load Minimum	46	29	71	7.0	1.1	5.3	11.0	14	167.7
Front Load Maximum	111	99	153	11.1	3.5	9.6	23.9	21	266.4
Front Load Average	85	67	132	10.1	2.3	7.9	16.7	17	218.0
Front Load Total	1828	1137	17757	247.4	87.5	161.2	310.7	3881	3221.4
GARB-1 C-1	66	24	822	10.2	4.4	5.8	17.7	141	25.5
GARB-1 NE-5	54	22	1,055	10.2	4.6	5.6	18.6	189	19.1
GARB-1 NW-2	76	22	903	10.6	5.2	5.3	15.1	169	21.3
GARB-1 S-4	83	48	1,221	10.8	3.2	7.7	9.0	159	22.6
GARB-2 C-1	46	20	802	9.2	3.2	6.0	11.7	135	26.8
GARB-2 NE-5	37	24	1,329	9.8	2.5	7.2	10.9	183	19.6
GARB-2 NW-2	77	17	1,405	10.5	3.9	6.6	15.6	213	16.9

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
GARB-2 S-4	43	17	1,295	10.5	4.1	6.4	14.6	203	17.7
GARB-3 C-1	48	31	861	9.6	2.7	6.9	11.5	125	28.7
GARB-3 NE-5	52	37	839	10.0	2.3	7.7	11.9	109	33.2
GARB-4 C-1	41	16	433	8.9	4.9	4.0	17.9	107	33.6
GARB-4 NE-5	49	21	762	9.6	3.7	5.9	17.0	129	28.0
GARB-4 NW-2	86	36	1,120	10.4	3.2	7.2	14.3	156	23.1
GARB-4 S-4	65	38	1,076	10.3	2.2	8.2	13.1	132	27.3
GARB-5 C-1	60	42	1,153	10.1	1.8	8.2	11.1	140	25.7
GARB-5 NE-5	68	38	1,218	10.3	2.4	7.9	16.6	154	23.4
GARB-5 NW-2	79	40	1,406	10.5	2.6	7.9	17.7	177	20.3
GARB-5 S-4	69	44	1,808	10.7	2.0	8.7	18.1	208	17.3
GARB-6 C-1	39	20	668	9.6	3.0	6.6	17.8	101	35.5
GARB-6 NE-5	47	30	1,322	9.7	3.2	6.5	17.3	202	17.8
GARB-6 NW-2	96	36	1,457	10.6	3.5	7.1	11.5	205	17.6

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
GARB-6 S-4	53	21	816	9.9	4.1	5.8	12.4	140	25.7
GARB-7 C-1	63	44	1,419	9.9	2.6	7.3	16.5	195	18.5
GARB-7 NE-5	56	35	1,079	9.9	3.2	6.7	15.5	160	22.5
GARB-7 NW-2	121	69	2,087	10.6	3.6	7.0	12.8	297	12.1
GARB-7 S-4	80	46	1,713	9.8	3.0	6.8	13.0	252	14.3
Garbage Minimum	37	16	433	8.9	1.8	4.0	9.0	101	12.1
Garbage Maximum	121	69	2,087	10.8	5.2	8.7	18.6	297	35.5
Garbage Average	64	32	1,157	10.1	3.3	6.8	14.6	169	22.8
Garbage Total	1657	839	30,069	262.3	85.1	177.2	379.3	4,382	593.9
REC-2 C-4	50	32	1,186	8.8	2.4	6.4	4.3	186	19.3
REC-2 NE-2	47	34	1,493	9.1	2.2	6.9	3.7	217	16.6
REC-2 NW-5	104	72	2,263	10.0	2.5	7.5	3.1	301	12.0
REC-2 S-1	52	7	2,284	9.9	8.2	1.7	5.5	1,342	2.7

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
REC-4 NW-5	67	32	1,693	9.6	3.4	6.2	4.5	271	13.3
REC-5 C-4	48	20	1,399	8.6	4.3	4.2	2.3	331	10.9
REC-5 NW-5	65	29	1,706	9.6	3.2	6.4	4.4	267	13.5
Recycling Minimum	47	7	1186	8.6	2.2	1.7	2.3	186	2.7
Recycling Maximum	104	72	2284	10.0	8.2	7.5	5.5	1342	19.3
Recycling Average	62	32	1718	9.4	3.8	5.6	4.0	417	12.6
Recycling Total	432	226	12024	65.6	26.3	39.3	27.9	2916	88.2
Rolloff 1-2	118	0	15	8.2	8.2	0.0	4.4	1.8	1990
Rolloff 2-1	106	0	18	8.7	8.7	0.0	26.8	2.1	1734
Rolloff 2-2	119	0	18	8.7	8.6	0.0	8.7	2.0	1763
Rolloff 2-3	117	0	18	8.8	8.7	0.0	24.5	2.0	1792
Rolloff 2-4	119	0	18	8.6	8.6	0.0	16.4	2.1	1756

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
Rolloff 2-5	103	0	15	8.6	8.6	0.0	25.2	1.7	2094
Rolloff 3-1	85	0	12	8.2	8.2	0.0	13.8	1.5	2465
Rolloff 3-2	94	0	3	7.9	7.9	0.0	2.2	0.4	9677
Rolloff 3-3	82	0	9	7.8	7.8	0.0	13.9	1.1	3137
Rolloff 3-4	91	0	6	8.0	8.0	0.0	7.2	0.7	4899
Rolloff 3-5	88	0	9	8.4	8.4	0.0	13.0	1.0	3433
Rolloff 4-1	101	0	12	8.2	8.2	0.0	9.4	1.5	2453
Rolloff 4-2	84	0	12	8.1	8.1	0.0	14.4	1.4	2487
Rolloff 4-3	101	0	9	8.5	8.5	0.0	9.4	1.0	3508
Rolloff 4-4	92	0	12	8.3	8.3	0.0	13.6	1.4	2551
Rolloff 4-5	115	0	15	8.4	8.4	0.0	14.5	1.7	2072
Rolloff 5-1	124	0	9	8.2	8.2	0.0	10.0	0.9	4204
Rolloff 5-2	124	0	18	8.4	8.4	0.0	11.5	2.1	1677
Rolloff 5-3	126	0	18	8.4	8.4	0.0	15.6	2.1	1724

Exhibit 3. Route Statistics from Routeware, 11/1/19 – 3/6/20

Route Name	Route Miles (average)	Route Service Miles (average)	Stops	Route Hours	Non-service Hours	Service Hours	Tons (average)	Stops Per Service Hour	Seconds per Stop
Rolloff 5-4	126	0	21	8.2	8.2	0.0	19.9	2.3	1552
Rolloff 5-5	133	0	18	8.4	8.4	0.0	14.9	2.1	1684
Rolloff 6-1	132	0	9	8.1	8.1	0.0	2.4	1.1	3222
Rolloff 6-2	137	0	18	8.4	8.4	0.0	9.8	2.1	1683
Rolloff 6-3	145	0	15	8.5	8.5	0.0	8.6	1.6	2188
Rolloff 6-4	117	0	12	8.3	8.3	0.0	6.7	1.2	2965
Rolloff 6-5	125	0	3	8.2	8.2	0.0	2.4	0.4	9806
Rolloff 7-1	79	0	12	8.4	8.4	0.0	6.2	1.4	2534
Rolloff Minimum	79	0	3	7.8	7.8	0.0	2.2	0.4	1552
Rolloff Maximum	145	0	21	8.8	8.7	0.0	26.8	2.3	9806
Rolloff Average	111	0	13	8.3	8.3	0.0	12.1	1.5	3002
Rolloff Total	2985	0	354	224.9	224.8	0.1	325.5	41	81048

Notes: In order to remove incomplete data, the following records were omitted: total time greater than 12 hours and less than 5 hours; and less than 10 miles, Rolloff statistics show the Average Stops (not maximum) and the Stops per Hour (not per service hour).

4.0 EQUIPMENT & MAINTENANCE

The various types of collection services and their utilized equipment are provided with their average age, count of vehicles dispatched per day, and their spares is provided in Exhibit 4. The City exceeds the minimum acceptable spare factor of 15 to 20% by having spares ranging from 29% to 50%. However, the spares are reportedly in poor condition. The residential garbage and recycling trucks average three years old with six being the oldest daily dispatched truck. The City tries to maintain the industry standard of a seven year replacement cycle.

Exhibit 4. Truck Types Dispatched, Age and Spares

Truck Type	Average Age of Daily Dispatched Trucks (2019 data)	Trucks Dispatched Daily	Spare Trucks	Spare %
Residential Garbage	3 years	7	2 (4 total shared with recycling)	29%
Residential Recycling	3 years	5	2 (4 total shared with garbage)	40%
Residential Bulky	6 years	3	1.5 (3 total shared with Brush)	50%
Residential Brush	6 years	3	1.5 (3 total shared with Bulky)	50%
Commercial Garbage Front Load	7 years	5	2 shared with Garbage Front Load	33%
Commercial Front Load Cardboard	7 years	1	2 shared with Garbage Front Load	33%
Commercial Side Load Dumpster	3 years (average with Residential garbage/Recycling)	5	2	40%
Roll off	4 years	7	3	43%

The crews identified maintenance turnaround time as a significant impact to productivity with not having trucks available at times. Potential solutions would be to: (a) expand capacity at the Fleet

Maintenance operations; (b) establish an internal light maintenance capability at Solid Waste for oil/fluid changes, tire changes, minor hydraulics repairs, and potentially minor welding; or (c) outsource vehicle maintenance altogether. The City staff indicated that they were working to expand capacity at the Fleet Maintenance operations, which had been experiencing personnel shortages.

5.0 COLLECTIONS EFFICIENCY

5.1 RESIDENTIAL ALLEY OBSTRUCTIONS AND MANEUVER RESTRICTIONS

The City is comprised of an older downtown area with many alleys and sprawling housing developments and retail areas in the surrounding areas. Alleys are so extensive in sections that Monday collects from streets that are almost half alleys. The older areas and especially the alleys reduce collection efficiency by requiring slower movement and maneuvering from:

- Trees overhanging and low hanging wires.
- Narrow lanes between gas and water lines opposed by fences and 300g carts on the opposite side of the lane.
- Backdown and back out streets, especially on Friday, require the trucks to make a less safe maneuver to access automated carts on both sides of a dead-end street lacking room to turn around.
- Drivers need to get out of truck to move debris and illegal dumping that is sometimes left in the alley.

5.2 CART SERVICE ISSUES AND PRODUCTIVITY

The City uses a combination of 95 gallon and 300 gallon wheeled plastic carts for residential collection. Commercial locations are also collected by 300 gallon carts. The carts improve efficiency, but have drawbacks too. The 300 gallon carts pose additional challenges in maneuvering the tight alleyways. The 300 gallon carts also have a pervasive problem of having the lid left open and partially filling with rainwater, unduly increasing weight on the truck.

The 300 gallon carts are intended to serve three homes, but it was observed that many serve fewer than three homes. Reportedly, carts are added if citizens complain about inadequate capacity and overflowing garbage, which may potentially be caused by illegal dumping. The carts don't have a single owner that would wheel the cart to the side of the house each day. Being stationed in the alleys, the 300 gallon carts are accessible for the general public to dispose of waste.

5.3 RESIDENTIAL CURBSIDE EFFICIENCY

Stop times (excluding travel time) averaged 12.8 to 13.9 seconds per stop for 96 gallon carts, which are slower than typical automated side load cart times of 10 to 12 seconds. Stop times for 300 gallon carts averaged 15.9 to 16.5 seconds. Although this does not appear to be a significant difference, it adds up when considering the large number of stops that have an extra two seconds. Considering 28,748 stops at two seconds equates to 16 hours a week in extra time or roughly half a route per day (over 4 days). There was a mention that the arm times may have been calibrated to be a little slower to reduce wear, tear and subsequent maintenance. If they are slower from

precautionary calibration, this should be reconsidered versus the cost of requiring an extra half a route per day, which exceeds $100,000 a year.

The City uses a "helper" system. Drivers with shorter routes help drivers with longer routes before they can leave for the day. Helper systems are not as efficient as maximizing the workday in each individual route (and having adequate spare trucks and drivers). **Helper systems lead to inefficiencies. The workday of shorter routes have additional unproductive time added while they are waiting to be allocated to or driving to a longer route to help out.** The route drivers loose "flow" when that have to wait and be re-allocated versus having a full and pre-defined workday for one route that they can focus on completing.

According to City staff, Tuesday and Thursday are "heavy" days. However, the Routeware data does not demonstrate this in weight collected, but does in time to complete the routes. As seen in **Error! Reference source not found.**, the average hours on Tuesday and Thursday are 10.5 and 10.4 hours versus 9.6 and 9.9 hours on Monday and Friday. However, there are 7 routes on Monday/Friday and only 6 routes on Tuesday/Thursday in the Routeware data, which is suspicious that data may be missing. The stops per hour of 203 and 182 is decent especially considering the use of 300 gallon carts that take longer to pull. However, Monday and Friday at 135 and 161 stops per hour appears low, but could be related to incomplete data. What does not match the theme of Tuesday and Thursday being "heavy" days is the tons collected. Monday and Friday collect 104.1 and 107.8 tons, respectively, whereas, Tuesday/Thursday collect 87.1 and 80.2 tons. These contrasts may indicate data issues. In either case of imbalanced time or tons per collection day, it appears that the collection days are not balanced. Similarly, the individual routes are not balanced, even if only looking at stop counts ranging from 433 to 2087. The City would benefit from balancing the routes, maximizing the workday for each route and making the collection days even. As part of a re-route, the City should rectify any data issues in order to base the routes on accurate data.

Exhibit 5. Route Statistics by Collection Day

Collection Day	Route Miles (avg)	Route Service Miles (avg)	Stops (max)	Route Hours	Non-service Hours	Service Hours	Tons (avg)	Stop/ Service (hr)	2nd/ Stop	Count of Routes
Monday Average	52	28	880	9.6	3.2	6.4	14.9	135	27.7	
Monday Total	364	197	6,158	67.5	22.7	44.8	104.1		194.2	7
Tuesday Average	89	36	1,396	10.5	3.7	6.9	14.5	203	18.5	
Tuesday Total	536	219	8,378	63.1	21.9	41.2	87.1		111.3	6
Thursday Average	66	36	1,322	10.4	3.1	7.3	13.4	182	20.8	

Exhibit 5. Route Statistics by Collection Day

Collection Day	Route Miles (avg)	Route Service Miles (avg)	Stops (max)	Route Hours	Non-service Hours	Service Hours	Tons (avg)	Stop/ Service (hr)	2nd/ Stop	Count of Routes
Thursday Total	394	215	7,929	62.1	18.6	43.5	80.2		124.9	6
Friday Average	52	30	1,086	9.9	3.1	6.8	15.4	161	23.4	
Friday Total	363	208	7,604	69.5	21.8	47.7	107.8		163.5	7
Garbage Minimum	37	16	433	8.9	1.8	4.0	9.0	101	12.1	
Garbage Maximum	121	69	2,087	10.8	5.2	8.7	18.6	297	35.5	
Garbage Average	64	32	1,157	10.1	3.3	6.8	14.6	169	22.8	
Garbage Total	1657	839	30,069	262.3	85.1	177.2	379.3	4,382	593.9	26

Source: Routeware, 11/1/19 – 3/6/20.

Based on our review, the routes appear designed to maximize the benefits of their location having the Eastern part of the City accommodating three dumps per day. However, the information we reviewed in Routeware did not fully support this observation. With the Eastern section of the City being in close proximity to the landfill and having a 10-hour day makes it possible to design the routes to have 3 dumps each day. This can improve productivity allowing the routes to get closer to 1,200 stops per day. In order to accomplish this, the distribution of 300 gallon containers in the East will need to be factored in as a limiting factor for the re-route, in addition to, the extent of alley collection in those Eastern areas.

By re-routing to make the collection days even on time to complete, the City can increase efficiency by having full workdays for every route and every day. When routes are not even, the shorter routes tend to take longer to collect the customers than a maximized workday. This phenomenon may be the result of drivers either consciously or not being less hurried during collections, driving to/from facilities and taking breaks or lunch. The drivers should not have routes that are excessive and require overtime on especially heavy days. Similarly, drivers should not have routes that take much less than the full workday to complete. A good target is to utilize routes that are based on the heaviest 3 months of the year and take 0.5 to 1 hour less than the full workday.

Staff do not take breaks and occasionally take unpaid lunches.

The disposal facility has hours from 7:00am to 5:00pm in the winter and from 7:00am to 5:30pm in summer. On Tuesday, a heavy day, trucks often get finished after the landfill closes and have to dump on Wednesday morning. This may be rectified by re-distributing the workload from Tuesday to lighter days during a future re-route.

According to staff, many routes have 15 to 20 handicap customers and some as many as 60. Given that a handicap collection takes up to 67 seconds, the cost for servicing handicaps is five times that of regular automated curbside service. It is suspected that there are many handicaps that are legacy customers and are no longer qualified to receive this extra service. An audit of the handicaps should be conducted to remove the legacy handicap customers that are no longer qualified to receive the service.

5.4 GROWTH

Temple has an estimated 2020 population of 79,110 and has 26,926 households with an annual growth rate of 1.84% (source: World Population Review website, May 22, 2020, https://worldpopulationreview.com/us-cities/temple-tx-population/). The household count of 26,926 is much less than the 30,069 stops in Routeware, with the reasons for the disparity being unknown. Assuming that the growth rate remains constant, the City will add 2,570 households in the next five years. The City is already at capacity with 7 residential curbside garbage routes per day and will need to add a route within this timeframe. A re-route may "buy some time" to delay the expansion, but it is inevitable barring a reduction in the population growth.

Exhibit 6. Population and Household Growth

Year	2020	2021	2022	2023	2024	2025
Population	79,110	80,566	82,048	83,558	85,095	86,661
Households	26,926	27,421	27,926	28,440	28,963	29,496
Growth Rate	1.84%	1.84%	1.84%	1.84%	1.84%	1.84%
Cumulative Projected Annual Increase in Households		495	1,000	1,514	2,037	2,570

5.5 CNG FUELING DELAYS

Before the City's last vehicle purchase, which included 9 trucks (3 residential, 3 FEL, and 3 rolloff trucks), their collection fleet was approximately 80% CNG vehicles. The new truck purchases were all diesel, which reduces the percentage of the trucks fueled by CNG. The City's goal is to have a 60/40 split between CNG/Diesel, which provides the City flexibility in the event of disruption in the diesel or CNG fuel supplies.

The City uses a fast fill system at a CNG station across the bridge from their Depot. The City has considered developing its own slow-fill station, but funding for this has not been appropriated yet.

Using the fast-fill adds a half hour fill time to each route. Drivers typically have to fill up two times per day with CNG, which takes 15 to 30 minutes. Fast fill only fills up 75% of the tank capacity, and the trucks cannot go below one quarter tank before problems with low fuel pressure occurs. As such, then can only do 1/2 tank. The CNG trucks cannot run a full day without filling up. Fill up after first dump and then at the end of the day. The CNG trucks cost the City $40,000 per truck more than the diesel equivalent. The trucks achieve 100 to 140 miles/day (commercial). 90 miles/day residential (Tuesday). Other days may be less. Capacity of trucks is the same.

The Rolloff trucks using CNG are slow moving. Torque numbers are low. Diesels are much better, according to the City.

SCS believes the 60/40 ratio between the CNG/Diesel trucks is reasonable and provides the City added flexibility in terms of performance and fuel usage.

5.6 RECYCLING

The curbside recycling service is collected weekly by five trucks per day, four days per week, on different days of garbage collection. The inconvenience for customers to pull the container to the curb for an additional day in the week has been known to reduce participation. **The City should consider increasing convenience, but reducing service frequency.** By collecting every other week, but on the same day as garbage collection, the City would not only make it easier for the customers, but also significantly reduce collection costs. Every other week collection may reduce the daily dispatch from five vehicles to three vehicles per day. Further analysis of recycling volumes by route would need to be conducted during a re-route to assess the viability of this approach.

Alley customers and apartments do not receive the recycling service. To increase participation when there is the physical location to store the carts, the City may want to consider providing carts to multi-family buildings and allow citizens to place recycling carts in the front of the building for collection if they wish to participate.

5.7 COMMERCIAL ASL AND FEL

The City provides commercial waste services with three types of collection methods:

- ASL with 300 gallon carts (largely mixed in the residential cart collection).
- ASL with 2-4 cubic yard dumpsters.
- FEL with 4-8 cubic yard dumpsters.

In a limited sample of ASL's, the average stop time, including cycling, was 67 seconds. This is comparable to the industry thumb rule of 60 seconds for a FEL. From a logistics standpoint, FEL and ASL are similar in time, but FEL allows for much larger sized dumpsters up to 8 cubic yards versus ASL carts are limited to 300 gallons or ASL dumpsters are limited to 3 or 4 cubic yards.

The FEL routes are heavy, averaging 10.1 hours and a maximum of 11.1 hours (on average to complete). The City was in the process of hiring a new driver to add a FEL route to make it 6 routes and give the overburdened system some slack. There is not a lot of un-utilized capacity on the FEL, except route FEL-2-5 that averages 8.4 hours. The rest of the routes run at or over 10 hours with 72% of the routes averaging in overtime. With an average stop count of 132, these are full workday routes. The City is able to achieve such good efficiencies due to the close proximity to the landfill.

5.8 ROLL OFF

The City provides full service for roll off containers operating seven routes, five days per week. Container sizes include 20, 30, 40 cubic yards, plus customer-supplied compactors. Service includes container delivery, dump and return, dump and deliver, dump and leave at yard.

Given that the entire service area is within 10 miles of the landfill with the inner City being within 5 miles of the landfill , you would expect to see the roll-off routes being more consistent on productivity rates. In Exhibit 3, the average stops per hour ranges from 0.4 on route 3-2 versus 2.3 on route 5-4. The average miles also ranges from 79 to 145. However, if the City tries to maintain drivers servicing a certain sector of the City, the varying productivity rates, to some extent, would be expected. This may also be a symptom of the inability to modify and update routes, as the City lacks the ability to map the roll off stops to create routes on the fly. Some routes look suspect when they have a low mileage and low stops per hour rate. Route 3-2, 3-3, 3-4, 3-5, and 4-3 all have about 1 stop per hour and less than 101 miles, whereas, the remainder of the routes average 1.7 stops per hour and 117 miles (excluding route 7-1 that is an outlier). Productivity can be affected where routes have longer distance dump and returns. By enabling the roll-off route manager to better view the performance and map the workload, the routes should be able to be slightly improved.

5.9 BULKY/BRUSH

The City provides un-contained waste collection services for brush and bulky items. The residential bulky collection consists of three routes using a knuckleboom, collecting twice per month. The residential brush service also consists of three routes, twice a month service, utilizing one crows-nest knuckleboom truck and two stepside knuckleboom trucks. Both services are not upon request. The trucks scour the City looking for set-outs.

March to May are regarded as the peak season for brush. Bulky is peak from November to April.

Bulky does not collect: tires, paint, C&D, and garbage. However, C&D and garbage were observed being collected. As noted in the Code Enforcement section, drivers reportedly do not provide notices and skip non-compliant setouts. They collect them without notice to customer.

Bulky is also free to dump once a month at the landfill with a water bill, but apartment dwellers must pay. Brush is free to bring to special area behind the depot. Brush only collects wood, no leaves.

There are a number of initiatives that could reduce the costs of these services by either improving efficiency or reducing service levels. Of course, the largest cost reduction would come from eliminating either service altogether. Reducing the service could include limiting the set-outs to not be more than two cubic yards. The City does have an existing provision in its ordinances, in Section 15-9(d) that requires a special pickup fee for mixed bulky and brush or materials that are not normally collected. Better utilizing that existing ordinance could reduce the piles of mixed brush, bulky, and garbage that were observed. Another consideration would be to only offer the brush and bulky service once a month or even less for bulky, such as 2-4 times per year.

Efficiency could be improved by changing the service to a call-in system. Another option that would not impact the customers, would be to start a “bird dog” system where the garbage, recycling, commercial and roll-off trucks utilize a system, such as Routeware or a GIS mobile app, to mark a service event and create a work order that would be then dispatched to the brush or bulky driver for collection later that day or the next day. A combination of the call-in system and bird dog system

work well where the customer is told that they must call in, but the other drivers still bird dog the set-outs that were not called in.

5.10 BUSINESS PROCESSES

5.10.1 Equipment Purchasing

There is an issue impacting the crews' efficiency from purchasing the wrong equipment. This is an internal business process for purchasing new equipment. Fleet Maintenance is responsible for purchasing, but does not highly involve collection operations managers in the process. **A solution would be to have truck purchases managed by committee including both Fleet and Solid Waste managers or another means of having Solid Waste managers responsible for identifying the equipment specifications for purchases.**

5.10.2 Routeware Implementation Challenges

The City is in process of implementing Routeware onboard computer system for tracking collections and the performance of collections. The implementation is underway, being consistently improved and issues are to be expected. RouteWare implementation issues are related to equipment, training, and data. Wire connections reportedly get loose or wires are bad.

This mobile workforce management system implementation provides an important opportunity for the City to improve its business processes. Proper implementation entails identifying the City's old business processes and then identifying how to optimize those business processes. Then, identifying how to configure Routeware to support the new business processes. It was observed that the City may be hindered by trying to adapt their business processes to the functionality in Routeware, instead of the other way around.

The biggest issue with the Routeware implementation is with the data. The City services 96 gallon carts for one home and 300 gallon carts for 3 homes, but the data input into Routeware and its reporting does not distinguish between a customer or a cart and the size of cart. The reports show "stops," which would typically be a cart, but with routes having 2,087 stops, it is suspected of being customers. The process for tracking route performance needs to be standardized, which in turn, requires the process for managing customer databases need to be solidified. Otherwise, the Routeware implementation will be continually plagued by uncertainties of whether the performance indicators are accurate.

There is missing stop data, such as businesses and other addresses that are not included in Routeware as stops nor included in route sequences. The sequences of stops displayed in Routeware are not always matching the actual sequence, which causes the service to not show as completed. As previously noted, the number of stops per route does not look accurate with routes exceeding 1,500 stops. Although Routeware's operational features, such as service verification and vehicle location tracking, are useful, the underlying route and customer data needs to be the foundation of tracking route key performance indicators. The City is working to address these issues during the implementation.

The route times were also suspect. Between 11/1/19 – 3/6/20 for 121 days, the trucks reported routes taking from 12 to 24.5 hours and 94 routes taking less than 5 hours (and more than 0 hours).

Drivers expressed concern over potential safety issues, due to distractions of using the system while driving. This issue should be rectified to a great extent with experience using the system and proper training and policies/procedures on when and how to use the application and when to not let it be a distraction.

To support the Routeware implementation, it is recommended to detail the business processes for all of the mobile workforce solutions involving Routeware. By first understanding what your ideal approach is for each of these segments of collection operations, the City can finalize the implementation and ease the challenges of maintaining the new systems.

Exhibit 7. Business Processes Impacted by Routeware

Business Process	Definition
Route Distribution Planning	A system that defines the schedule for the stops and assigns the stops to a route, but does not define the sequence that the stop should be serviced. The schedule is the day or time window of service. The route boundary is the geographic extent of the route assigned by the Route Distribution system. A route boundary may be condensed and all stops are required to be contiguous, such as in a waste collection route or meter reading route, to reduce travel time between stops or customers (and make it easier for the crews to remember). A route boundary or zones may be spread out over the entire City, such as for cart deliveries. System types include: high density and point-to-point route optimization software; GIS; route management systems; and dispatching software. In practice, high density route optimization software typically only gets used for Route Distribution Planning.
Route Sequencing	A system that defines the sequence that every stop should be serviced in a route. A sequence refers to the order that the stops are visited in the route. In cases of high density routing, like waste collection routing, the sequence would seem very important. In reality, the drivers have a multitude of preferences and safety issues that the route optimization software does not know. Thus, the sequence for waste routing is not critical, but the distribution (schedule and boundary) is critical. However, for cart deliveries, the optimized sequence is critical and the boundary is not as important. System types include: high density and point-to-point route optimization software or add-on modules for point-to-point routing with ERP and asset management systems.
Route Update Notification	A system to notify the route managers that there are new stops or work orders to be added to routes. This may occur as a periodic event (such as, annual to daily) or dynamically in real time.

Exhibit 7. Business Processes Impacted by Routeware

Business Process	Definition
Work Order Management	A system to generate work orders, log associated usage of resources, transfer information to billing/customer service, and track their completion.
Route/Work Order Mapping	A system to display points on a map of the locations for work orders or stops.
Dispatching	A system to manage the assignment of staff, crews and equipment to routes and work orders. Rules may be applied to the system to automatically assign work orders to a crew or the assignment may be done via a route optimization software. Rules that may be used include zones, first come first serve, priority by type, etc. Either by rule or route optimization, the dispatcher using the software will review and modify the assignments, as needed.
Route Navigation	A system to provide turn by turn directions to each stop or work order. Systems use GPS and either installed software or web-based applications to provide the directions.
Route Status Monitoring	A system to visually display on map the location of crews on a route. The system may also include the ability to see when a stop has been visited by a crew. If route sequencing is employed, the system may also allow for predicting when the stop will be serviced in the future. If Infield Data Collection is employed the system may be able to provide verification of when the stop has been serviced or the work was completed. Systems are typically referred to as automatic vehicle location (AVL), which use GPS to automatically determine the geographic location of a vehicle and transmits this information back to a central server using SMS, GPRS, satellite or terrestrial radio.
Infield Data Collection	A system to collect data in the field regarding work order or service that was conducted, verifying the service was conducted, issues with completing the service, or other data relevant to the field work.
Container Inventory Management & Asset Tracking	A system to manage inventories of carts, dumpsters, roll off boxes, compactors, and other waste collection equipment. Container location is also tracked, which meet the GASB 34 requirements. Tracking of maintenance histories may also be included.

Exhibit 7. Business Processes Impacted by Routeware

Business Process	Definition
Route Performance Reporting	A system to capture, compile and report on the productivity of routes and the crews. Travel times, service times, disposal times, pre-post trip times, and break times may all be collected. Other data to be collected may include weights, equipment, materials, and costs. The system may be a standalone database that has data manually entered after the route is complete or it may be a component of a route management or mobile workforce management system. This may also include cost reporting, whether that be the more extensive activity based costing or more simplified route costing only based on the in-field costs and excluding administrative and maintenance costs.
Historical Route Analytics	A system to compile, analyze, and report on the proximity, travel path, time, and distance that a route was run on a given day or as an average over a time period. This system is typically a functionality of an AVL system used for Route Status Monitoring.
Logistical Feasibility Analysis	A system that allows for analyzing what if scenarios related to crews, routes and facilities. This system is typically a functionality of a route optimization software used for Route Distribution Planning. Mobile workforce management systems also provide some logistical analyses related to crew productivity.

5.10.3 Route Updates

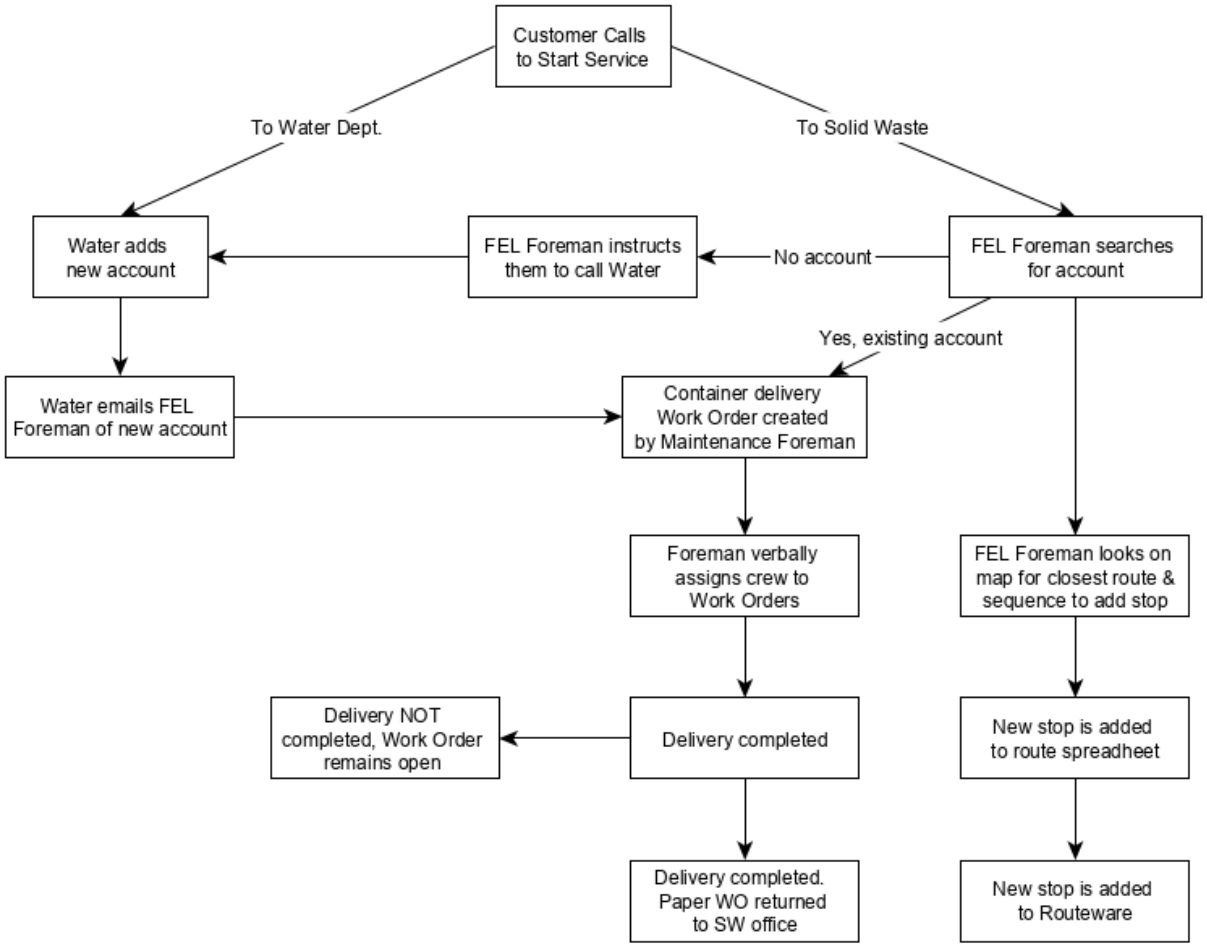
The process for updating routes is complicated and it needs to be facilitated and made easier. The respective Foremen are responsible for updating the routes for all services. There is no established review process or requirement for rebalancing the residential routes when certain routes get too heavy. Instead, the excess workload is shared by the Foremen (using the "helper" system) by spreading the excess workload amongst the easier routes after they are completed. As previously noted, sharing routes leads to inefficiencies and the inability to measure productivity as it is complicated to assess whether a route has been shared.

The process to update a route goes across multiple City departments and systems. For example, the process to update a Commercial FEL route starts with a new customer call to the Water Department. Water adds the account and transfers them to Solid Waste or the opposite happens. The new customer calls Solid Waste and after adding service is transferred to Water to add the account. Customer decides on the frequency, container size, and day preferences. The FEL Foreman (Chris) checks the location for service constraints and notifies the Maintenance Foreman to deliver container. The Foreman tries to fit the stop into the closest route and sequence into Excel and then into Routeware. The Foreman does not have the ability to look at all of the routes on a map and see what impact adding that stop will have to the other routes. In the case of roll-off, the routes are

much more dynamic and the impact of shifting work from one route to the next is not really known using the tools that they have access to.

As seen in Exhibit 8, the process to add a new FEL customer is limited. The Foreman does not have a system to facilitate the process. Further, not all of the process to manage the work order for delivering a container and adding them to a route is documented. After they are added to the route, there is no master route database, such as in GIS, except Routeware itself.

Exhibit 8. New FEL Customer Process



If the foremen have the ability to easily get performance data about their routes and easily create or update the routes, they will be enabled to improve efficiency even further and make the workloads equal for their crews. In general, the planned routes for residential garbage and commercial are all heavy, but they are not all even. The routes are good. There is little slack in the system, but they always can make them a little more efficient and more equitable amongst the crews. Routeware should help to address the performance monitoring, but the City needs to implement that system by defining how it will be used in streamlining the City's business processes for route management. The City would also benefit by standardizing g the process to digitally receive new customers and have them added to the database without manual involvement and double data entry.

5.10.4 Code Enforcement Shortcomings

The business processes for code enforcement are reportedly not followed by the code enforcers, which has resulted in the crews abandoning the effort. Setout requirements are not strongly enforced. Drivers do not believe that code violations will be addressed by Code Enforcement. Drivers noted that Code Enforcement sends issue back to Solid Waste with instructions to "just go collect it." This has caused the drivers to become complacent in issuing warning tags to residents for illegal and improper set-outs. This issue may be addressed by strengthening the ordinances, such as enabling Solid Waste foreman to issue fines. The City should define a business process for notifications of non-compliance of customers, warnings for continued non-compliance, escalation to fines and other legal action, and customer communications during this process.

6.0 RECYCLING OPERATIONS

Based on FY 2019 data and estimated amounts, the City of Temple recycles approximately 8990 tons of materials annually through a variety of programs that are provided to residences and businesses as well as surrounding communities. Recycling programs include:

- Residential curbside collection of single stream recyclables
- Commercial recycling of selected materials (paper, OCC, metals)
- Acceptance of mixed recyclables from surrounding communities for transfer to MRF
- Brush curbside collection along with bulky waste twice a month

The City provides curbside collection of recycled materials including: various types of paper, plastic containers, glass bottles, aluminum and steel cans and cardboard.

The curbside recycling program diverts approximately 3300 tons per year of recycled materials from residences. Collection frequency is weekly.

The City also operates two drop-off facilities and a recycling center that receives and processes materials. The facilities accept some of the materials collected in curbside program;

- Aluminum Cans
- Cardboard
- Glass bottles and jars only - all colors
- Magazines
- Newspapers
- Plastics #1 and #2 clear/opaque (Examples: water/soda bottles and milk jugs)
- White Office Paper

The drop off centers do not have an attendant and are serviced by City collection crews. Approximate tonnage collected at the two facilities is approximately 800 to 1000 tons per year.

The City of Temple's recycling facility is located at 1739 S Martin Luther King Drive in Temple. The City is responsible to operate and maintain the facility according to the City's contract with Balcones resources. The recycling facility receives and transfers the recyclable materials collected in the City's curbside program along with other mixed single stream materials collected by the City at the two

drop-off locations. The facility also receives mixed recyclable materials from surrounding cities including Killeen, Belton, Troy and Salado. The approximate annual totals for all materials received and processed at the recycling facility is approximately 6600 tons per year. The City transfers the mixed recyclable materials along with the City's materials to the Balcones Material Recovery Facility in Austin. In addition to the single-stream recyclables the Temple Recycling Facility also receives paper, cardboard and metals from specific businesses as well as the City of Killeen Recycling Center. These materials are processed, baled and shipped from the recycling facility.

The City of Temple contracts with Balcones Resources to process and market the recyclable materials collected by the City. The most recent agreement was executed in April 2017. Both the City and Balcones have indicated their mutual intent to extend the agreement one year in accordance with the terms of the agreement to September 2021. The agreement requires the City to operate and maintain the recycling facility and requires Balcones to provide processing equipment and transport the materials to Balcones facility in Austin. Based on our review of the facility operation and interviews with City staff the current operation is not efficient and often results in excess materials being stored for days awaiting loading and transfer. The existing conveyor loading process is also limited and periodically breaks down requiring repair and increasing material backups.

SCS understands that the City will be constructing a new recycling facility that will be operated and maintained by the City as well as potentially taking responsibility for the transfer of materials through a contract hauler. This new operation will allow the City to process and transport more materials both single stream and source separated materials as they seek to improve waste diversion rates. Details on this new facility are addressed in TM4. Prior to development of the new facility SCS recommends discussions with Balcones and amending the agreement to address these changes to the recycling processes.

The City collects brush twice a month from residences with the brush and bulk pickup program. This effort results in the diversion of approximately 2000 to 3000 tons per year of brush to the Brazos River Authority Composting program.

The overall diversion rate for the City is approximately 8%. This includes all recyclable materials received and processed by the City as well as brush diverted through the brush pickups.

Statewide diversion is 4-7% according to the TCEQ annual report on solid waste in Texas.

The 2017 TCEQ Study on Recycling in Texas determined a total diversion rate for all recycled materials was 22.7%. A separate TRDI Study determined a statewide recycling rate of 18.7% in 2013. This study excluded biosolids from the total.

Diversion rates for other mid-sized City's in Texas with curbside programs typically range from 10 to 20% depending on the types of programs and extent of green waste diversion.

There are several options available to the City for consideration that would potentially increase the recycling and waste diversion rates in the future.

Opportunities to increase the efficiency of the City of Temple recycling operations and waste diversion rates include:

- Increased participation and diversion through the curbside collection program. This may involve changes to the collection program such as collecting recycling containers on the same day as garbage containers.
- Increased recycling tonnage through commercial materials recycling program.
- Increased diversion of yard waste and brush by instituting a chipping and mulching operation
- Consolidate recycling drop-off operations into one facility that has expanded options for citizens including:
    - Ewaste
    - Brush (Separate Area)
    - White Goods
    - Expanded List of Recyclables
    - Used Oil

Section 5 discusses potential changes to collection that may affect the recycling and waste diversion rate

7.0 DISPOSAL PRACTICES

7.1 BACKGROUND.

The City of Temple landfill, which opened in 1979, operates under TCEQ Permit No. 692B. The permit was revised in 2019 to significantly expand the landfill. As it is currently designed and permitted, the estimated remaining operating life of the landfill at the current rate of disposal (i.e., 459,202 tons/year) is approximately 61 years (as of May of 2020), as indicated in the most recent report to the TCEQ, Since 2010, the landfill total tonnage has varied from 359,162 to 459,202. Over this 10-year period, the incoming landfill tonnage has increased 18%.

The City of Temple lies within the region covered by the Central Texas Council of Governments (CenTexCOG), which includes the following counties: Bell, Coryell, Hamilton, Lampasas, Milam, Mills, and San Saba. As noted in the Texas Commission on Environmental Quality's (TCEQ's) most recent Annual Report on Municipal Solid Waste in Texas, the City's Landfill is one of two municipal solid waste (MSW) landfills within the CenTex Region. The other landfill, the Fort Hood Landfill serves only the U.S. Army. In addition to serving the disposal needs of the City of Temple, the City's landfill serves as regional landfill, providing service for the following counties: Bell, Hamilton, McLennan, Milam, Mills Lampasas, San Saba, Coryell, and Falls.

Contract Landfill Operations. The City entered into a contract with Waste Management of Texas, Inc. (WMT) in 1993 for the operation of the landfill. This contract was amended on March 16, 2011 to include various provisions including the following[1]:

1. References are provided to those sections of the Contract addressing the listed provisions.

- "…a term of thirty years of the Useful Life of the Landfill, whichever is shorter…" with 10-year options. WMT to retain "…the post-closure rights and obligations…which survive termination of this Agreement." (Section 1.5)

- Lease payments that include a base lease payment and surcharges based on the tonnage of waste received. (Section 1.6)

- WMT will "…operate the Landfill in compliance with the TCEQ permit…in a manner comparable to other first class publicly or privately operating landfills in the State of Texas or the United States…" (Ref. Section 2.1) WMT will "…maintain sufficient and suitable equipment onsite at all times to perform its duties under this Agreement effectively and efficiently." (Ref. Section 2.7.4)

  The permit for the landfill includes various requirements addressing landfill design, operation, environmental monitoring and reporting. Our review of the TCEQ website did not indicated any non-compliance with permit requirements.

- WMT will not accept solid waste from outside of the CTCOG region without the written consent of the City (Ref. Section 2.1.1.)

  According to WMT's January 2019 report the waste tonnage from outside the CTCOG region was less than 1%.

- WMT "…may not accept for disposal …more than 325,000 tons of solid waste, which originates outside the City limits in any single contract year without prior written consent of the City." (Ref. Section 2.1.2)

  According to WMT's January 2019 report, for the period 2010 to 2018, the total waste tonnage from outside of Temple ranged from 240,121 to 277,440 tons per year. Over this period, waste tonnage from outside Temple represented approximately 66% of the waste received at the landfill.

- Tipping fees for waste generated within the City are differentiated from waste generated from outside the City limits. (Ref. Section 2.6.1)

- Tipping fees for charged to the City as a user of the landfill will be $0.25/ton less that the lowest rate per ton charged by WMT to any other user of the Landfill. (Ref. Section 2.6.1.1) Other contract terms address tipping fees for specific types of waste (e.g., Enforcement Waste). (Ref. Section 2.6.1.3, and 2.6.2).

- WMT's payments to the City for treating leachate from the Landfill. (Ref. Section 2.7.2)

- "When the lease expires or is terminated, WMT will close and fence the Landfill… and meet all post-closure State and Federal requirements for post-closure… monitoring and maintenance.". (Ref. Section 2.9)

- The contract with WMT addresses various other waste management provisions including, but not limited to the following:

    - Brush pickup (Ref. Section 2.7.6)

- Household hazardous waste collection event (Ref. Section 2.7.7)
- Truck washing system (Ref. Section 2.7.8)
- Hours and days of operation of the Landfill (Ref. Section 2.10 and 2.11)
- Monthly and annual reports to the City (Ref. Section 2.13)

- "Methane gas or other gases produced as a result of disposal of solid waste at the Landfill ("Landfill Gases") shall be and remain the property of…" WMT. (Section 1.12)
  WMT operates a landfill gas collection and control system at the landfill. According to a January 2019 WMT report and the annual report to the TCEQ, the rate of LFG collected and flared is greater than 2,000 standard cubic feet per minute (SCFM).

  In August 2019, WMT submitted air quality permit applications to the TCEQ for the following facilities at the landfill:

  - A landfill gas/renewable natural gas (RNG) treatment and processing facility – The RNG will include a waste gas incinerator to combust waste gas from the treatment facility. Also installed will be a backup 2,500 scfm tail gas flare.
  - A 1,000 scfm utility flare to provide a better turndown ability.

TCEQ issued the air quality authorization on September 30, 2019. The status of the associated revisions to the TCEQ MSW Permit No. 692B and the design of the RNG facilities is not publicly available, and therefore not part of this report.

Landfill Location. The location of the landfill adjacent to the City's Solid Waste Operations Center contributes significantly to the efficiency of the City's hauling operations since the collection vehicles begin and end their days within a quarter mile to the landfill scalehouse. As such, a direct haul to the landfill can be accomplished efficiently by most of the City's haul routes, although, in view of the City's large service area, routes serving the western portions of the City require more extensive travel.

Landfill Operations. Overall, the City has been satisfied with Landfill operating services provided by WMT. The City's current concern that are being addressed by WMT include the following:

- Wait times at the landfill particularly at the beginning of the day (when trucks are lines up at the gate at time of opening) and at the end of the day (when WM starts to narrow the working face with application of daily cover).
- The wheel wash is not particularly effective resulting in mud on the roads during wet weather operations.

March 12, 2021

MEMORANDUM

TO: Justin Brantley

FROM: Bob Gardner, SCS Engineers
Jeffrey Arrington, SCS Engineers
Kevin Callen, Route Optimization Consultants

SUBJECT: Temple Route Optimization System Modeling for Residential Garbage Routes

The City of Temple Texas (Temple) contracted SCS Engineers to evaluate the current residential curbside garbage and recycling routes. This memo overviews the productivity statistics of the routes and recommends system changes for the garbage routes. The conclusion is that the City needs to add an additional daily garbage route, but the recycling routes maintain the five routes but make them even workloads. Balancing the collection days is recommended, but not critical unless future annexation growth will exacerbate the imbalance.

MODELING THE BASELINE

In order to model the baseline, scale tickets and Routeware route logs were used to calculate route times, productivity rates, miles and weights. In addition, it was observed that the period after Covid-19, the tons collected and route times increased by an average 19 minutes (3%) and 2.4 tons (15%), as seen in **Error! Reference source not found.**. This increase has further exacerbated the lack of excess capacity with the average route taking 10.8 hours since Covid-19.

Exhibit 1. Daily Average Route Statistics Before and After Covid-19

Day	Date Range	Period	Statistic	Total Hours	Containers	Average Dumps	Average Tons per Route	Miles via Routeware
Mon	8/1/19 – 7/28/20	All Year	Avg.	10.4	830	2.0	17.3	52
Tue	8/1/19 – 7/28/20	All Year	Avg.	11.0	1106	1.7	15.9	89
Thu	8/1/19 – 7/28/20	All Year	Avg.	10.1	1107	1.8	16.3	65
Fri	8/1/19 – 7/28/20	All Year	Avg.	10.9	959	2.2	17.8	52
All	*8/1/19 – 7/28/20*	*All Year*	Avg.	10.6	*1000*	*1.9*	*16.8*	*64*
Mon	8/1/19 – 3/31/20	Pre-Covid-19	Avg.	10.4	830	1.9	16.6	52
Tue	8/1/19 – 3/31/20	Pre-Covid-19	Avg.	11.0	1106	1.6	15.2	89
Thu	8/1/19 – 3/31/20	Pre-Covid-19	Avg.	9.9	1107	1.7	15.3	65

Exhibit 1. Daily Average Route Statistics Before and After Covid-19

Day	Date Range	Period	Statistic	Total Hours	Containers	Average Dumps	Average Tons per Route	Miles via Routeware
Fri	8/1/19 – 3/31/20	Pre-Covid-19	Avg.	10.8	959	2.2	17.3	52
All	*8/1/19 – 3/31/20*	*Pre-Covid-19*	Avg.	10.5	*1000*	*1.9*	*16.1*	*64*
Mon	4/1/20 – 7/28/20	During Covid-19	Avg.	10.5	830	2.1	18.9	52
Tue	4/1/20 – 7/28/20	During Covid-19	Avg.	11.0	1106	1.8	18.0	89
Thu	4/1/20 – 7/28/20	During Covid-19	Avg.	10.6	1107	2.0	18.4	65
Fri	4/1/20 – 7/28/20	During Covid-19	Avg.	11.3	959	2.2	18.8	52
All	*4/1/20 – 7/28/20*	*During Covid-19*	Avg.	10.8	*1000*	*2.0*	*18.5*	*64*

In Exhibit 2, the various types of containers are averaged per route by collection day. The routes average 43 of the 300 gallon carts and 956 of the 95 gallon carts. These are large routes without even factoring in handicap collection and that the 300 gallon carts are 2-3 seconds slower to collect. It is assumed that the dumpsters are not usable datapoints and are inaccurate as the residential cart routes do not collect side load dumpsters. By using the assumed policy objective to have 3 homes per 300 gallon cart, the number of homes collected per route is formidable with Thursday being an estimated 1,164 homes versus the lowest day of Friday having 1,016.

Exhibit 2. Garbage Carts, Dumpsters and Estimated Homes Collected per Day

Day	Region	Average 300g Carts per Route	Average 95g Carts per Route	Average 2cy Dumpsters per Route	Average 3cy Dumpsters per Route	Average 4cy Dumpsters per Route	Total Containers	Estimated Average Homes per Route Based on Carts
Mon	Center	110	715	0	4	0	5806	1045
Tue	Northwest	1	1104	0	0	0	7739	1108
Thu	South	28	1079	0	0	0	7752	1164
Fri	Northeast	31	924	0	2	1	6709	1016
All	All	43	956	0	2	0	28006	1083

The baseline recycling route statistics is provided in Exhibit 3. Since April attributed to Covid-19, the time to complete the routes has increased by an average 0.9 hours per route and the tons collected increased by 0.3 tons per day per route. This represents an increase of 10% in time and 8% in weight.

Exhibit 3. Baseline Recycling Route Statistics, Before and After Covid-19

Day	Area	Date Range	Period	Stat.	Total Hours	Hours via Routware	Containers	Dumps	Tons via Scale	Average Tons per Dump	Miles via Route ware
Mon	Center	8/1/19 - 7/28/20	All Year	Avg.	9.0	11.0	1701	1.8	5.3	4.3	60
Tue	Northwest	8/1/19 - 7/28/20	All Year	Avg.	9.1	10.0	1515	1.8	4.5	3.5	53
Thu	South	8/1/19 - 7/28/20	All Year	Avg.	9.2	9.7	1418	1.7	3.7	3.2	51
Fri	Northeast	8/1/19 - 7/28/20	All Year	Avg.	9.8	11.0	1787	1.6	4.6	4.4	78
All	*All*	*8/1/19 - 7/28/20*	*All Year*	*Avg.*	*9.3*	*10.4*	*1605*	*1.7*	*4.5*	*3.8*	*61*
Mon	Center	8/1/19 - 3/31/20	Pre-Covid19	Avg.	8.6	11.0	1701	1.8	5.2	4.3	60
Tue	Northwest	8/1/19 - 3/31/20	Pre-Covid19	Avg.	8.9	10.0	1515	1.8	4.3	3.4	53
Thu	South	8/1/19 - 3/31/20	Pre-Covid19	Avg.	9.2	9.7	1418	1.7	3.6	3.0	51
Fri	Northeast	8/1/19 - 3/31/20	Pre-Covid19	Avg.	9.7	11.0	1787	1.6	4.4	4.2	78
All	*All*	*8/1/19 - 3/31/20*	*Pre-Covid19*	*Avg.*	*9.1*	*10.4*	*1605*	*1.7*	*4.4*	*3.7*	*61*
Mon	Center	4/1/20 - 7/28/20	During Covid19	Avg.	10.1	11.4	1701	1.9	5.3	4.2	60
Tue	Northwest	4/1/20 - 7/28/20	During Covid19	Avg.	10.0	9.5	1515	1.8	4.7	3.6	53
Thu	South	4/1/20 - 7/28/20	During Covid19	Avg.	9.6	9.7	1418	1.6	4.0	3.6	51
Fri	Northeast	4/1/20 - 7/28/20	During Covid19	Avg.	10.5	11.4	1787	1.6	5.0	4.7	78
All	*All*	*4/1/20 - 7/28/20*	*During Covid19*	Avg.	*10.0*	*10.4*	*1605*	*1.7*	*4.7*	*4.0*	*61*

With the average route time of 10.0 hours according to the scale data and 10.4 hours in RouteWare, the routes are at capacity and an additional; route should be added. Given that there will be a delay on adding a truck to the fleet, an alternative option could be to add a half day or full day route using a spare truck on the heavier days or all days.

As seen below in Exhibit 4, 13 of the 28 garbage routes already run 3 dumps, but not consistently. Six of the routes are very light collecting less than 16 tons on average. This route imbalance may be alleviated during the re-route. Some of the recycling routes appear to take longer than would be

expected, such as REC-1 C-4, which only collects an average of 2.6 tons but takes 8.8 hours. During the route development phase, the routes can be balanced to take the same amount of time and having comparable workloads.

Exhibit 4. Hours, Dumps and Tons by Garbage and Recycling Route

Route	Average Hours via Scale	Average Number of Dumps	Tons via Scale Data
GARB-1 C-1	10.0	2.5	21.0
GARB-2 C-1	9.5	2.3	18.6
GARB-3 C-1	9.8	1.9	15.1
GARB-4 C-1	9.2	2.0	19.9
GARB-5 C-1	10.1	2.0	18.0
GARB-6 C-1	8.6	1.9	18.1
GARB-7 C-1	9.7	2.3	21.2
GARB-1 NW-2	10.1	1.9	19.8
GARB-2 NW-2	10.1	2.7	24.4
GARB-3 NW-2	8.7	1.6	14.5
GARB-4 NW-2	8.1	1.4	13.9
GARB-5 NW-2	9.7	2.2	20.8
GARB-6 NW-2	7.9	1.3	13.2
GARB-7 NW-2	10.1	1.8	19.1
GARB-1 S-4	10.5	1.9	18.0
GARB-2 S-4	9.5	2.5	20.1
GARB-3 S-4	9.3	1.8	18.4
GARB-4 S-4	9.5	1.8	14.5
GARB-5 S-4	10.3	2.8	28.4
GARB-6 S-4	9.2	1.5	12.9
GARB-7 S-4	9.8	1.8	16.5
GARB-1 NE-5	10.2	2.1	19.2
GARB-2 NE-5	10.2	2.5	18.3
GARB-3 NE-5	10.3	2.0	17.9
GARB-4 NE-5	10.1	2.2	17.7
GARB-5 NE-5	10.1	2.4	21.3
GARB-6 NE-5	10.5	2.1	17.7
GARB-7 NE-5	10.0	2.3	19.8
REC-1 S-1	8.6	1.2	4.9
REC-2 S-1	8.1	1.3	4.0
REC-3 S-1	8.3	1.5	4.3
REC-4 S-1	9.7	1.5	5.5
REC-5 S-1	9.4	1.3	5.2
REC-1 NE-2	8.3	1.3	3.0
REC-2 NE-2	8.7	1.5	3.9
REC-3 NE-2	8.6	1.3	4.3
REC-4 NE-2	8.6	1.2	4.8
REC-5 NE-2	9.0	1.2	5.0
REC-1 C-4	8.8	1.2	2.6
REC-2 C-4	8.1	1.1	4.0
REC-3 C-4	8.5	1.1	3.4
REC-4 C-4	8.3	1.2	3.9
REC-5 C-4	7.7	1.1	3.3
REC-1 NW-5	9.8	1.0	4.4
REC-2 NW-5	9.7	1.0	3.6
REC-3 NW-5	8.3	1.1	4.0
REC-4 NW-5	8.6	1.2	5.4
REC-5 NW-5	9.4	1.2	5.4

PROPOSED NEW ROUTES AND COLLECTION DAYS

Temple is adding about 500-800 homes a year, plus the City has been annexing hundreds of acres with planned developments, which will further accelerate the growth. Given these factors of increased set-outs, growth, and already being at capacity, the City needs to add a route to go from 7 routes to 8 routes per day, as seen in Exhibit 5.

Exhibit 5. Proposed New Garbage Route and Collection Day Changes

Day	Total Hours (scale tickets)	Current Routes per Day	Current Hours per Route	Current Total Containers	Proposed New Routes per Day	Estimated Total Hours, New Routes	Hours per New Route	Estimated Hours per New Route With Minor Changes to Days	Estimated Total Containers With Day Changes	Estimated Containers That Changed Collection Days
Mon	70	7	10.0	5,808	8	72	9.0	9.4	6,096	288
Tue	77	7	11.0	7,741	8	80	10.0	9.6	7,453	-288
Thu	71	7	10.1	7,752	8	73	9.2	9.2	7,752	0
Fri	75	7	10.8	6,711	8	78	9.7	9.7	6,711	0
All	293	28	10.5	28,012	32	303	9.5	9.5	28,012	

Note: * Total of containers added or removed from collection days.

The collection days are not extensively out of balance on time, but could use modest refinements to delay the time until an additional route is required. The current aggregated hours per day to complete the routes range from 70 to 77 hours. By adding 3 hours (288 homes) from Tuesday to Monday, the new routes on an average day should not exceed the 10 hour workday after the 8th truck is added.

There are a few of issues with this collection day assessment. First, the amount of variance between days is not great and doesn't make it a critical to change the collection days at this time. Secondly, if the days are changed significantly, they should be overcompensated to factor in the areas of future growth and annexation. The proposed change herein is not a significant change. At the time of this memo being produced, we have not been able to get data from the City about the growth areas, but are communicating with the GIS staff for the data. Thirdly, the times are difficult to quantify as not all of the times are captured in the scale tickets or RouteWare. Dumps are occurring the next day on both waste and recycling routes. CNG fills may take place afterwards. These times were added to the total times, but there is variances in these occurrences that are not captured.

FORECAST OF RESIDENTIAL ROUTE PLANNING

The recommended path forward is a two phase approach to be completed in the next two years.

Phase One - 2020 Minor Re-route

- Add one garbage route to make 8 routes.
- Modify the collection days to move about 3 hours of work from Tuesday to Monday. This should provide additional time until a 9th truck is needed.

- Evaluate the vehicle automated arm and packer to assess whether it is calibrated to the manufacturers standards and not the cause of routes taking longer than expected.
- Add a half day route to the heavy days for recycling, if equipment and staff are available.

2021-2022: Major Re-route and System Changes

- Change recycling to be the same day as garbage. This will both increase recycling participation and allow for making the collection days more even for both garbage and recycling. Currently garbage is heavy on Tuesday and Thursday and recycling is heavy on Monday and Friday, both of which have different collection days.
- Add an additional recycling route to make 6 routes.
- Add an additional garbage route to make 9 routes.
- Completely change the collection days to make garbage and recycling days to have even workloads, while planning for growth.
- Potentially replace 300g carts with 95g carts, which needs further investigation into its feasibility to provide a net improvement to collection operations.

SWITCHING TO SLOW FILL CNG

Would switching to slow fill CNG reduce the need to add a route? Using 30 minutes per fill, the City would save 18 hours or 4% of the total weekly time with 7 daily garbage and recycling routes (i.e., 10 hours for garbage, 8 hours for recycling). The 7 routes represents the planned target of having half of the fleet using CNG. The savings would be approximately one day's route for both garbage and recycling, which may extend the time to go to 9 garbage routes. At the current growth rate of about 500 homes being added per year and an unknown number of homes being added via annexation, it is reasonable to say that the City will need to go to 9 routes in five years, if not sooner with annexation. Reducing the weekly garbage workload by 10 hours will provide the equivalent of 1 additional year at current growth rates.

Exhibit 6. Time Savings Using Slow Fill for CNG Trucks

Day	Fills per Day	Hours per Fast Fill	CNG Truck Routes**	Total Weekly Hours Saved
Mon	1	0.5	7	3.5
Tue	2*	0.5	7	5.5
Thu	2*	0.5	7	5.5
Fri	1	0.5	7	3.5
All	6	0.5	28	18

Notes: * only garbage has 2 fills; ** based on 50% of residential curbside garbage and recycling routes using CNG trucks.

Would switching to slow fill CNG allow for 3 dumps per day with the additional 30-60 minutes in time? The City has an ideal proximity of the landfill being adjacent the depot. In a normal collection environment with homogenous set-outs (all 95 gallon carts), the City could be expected to have most of the routes, except for Tuesday, being 3 dumps and servicing up to 1200 homes. However, the garbage routes run out of time well before they run out of capacity. They are collecting an average of 18.5 tons, but could be doing closer to 25 or more tons with three dumps per route. The additional time could be used to maximize the second dump, but would not add enough time to conduct a third dump.

Task 4 Technical Memorandum: Recycling Transfer Facility Siting and Conceptual Design

City of Temple
2 N Main Street
Temple, TX 76501

SCS ENGINEERS

File No. 01219106.00 | March 12, 2021

1901 Central Dr # 550
Bedford, Texas 76021
817-571-2288

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Exhibits

Appendices

EXECUTIVE SUMMARY

Based on a preliminary analysis of three candidate locations for the recycling transfer facility and discussions with the City, the CNG station location (Site 2) was identified as the most viable location for siting for the new solid waste recycling transfer facility, offices, and maintenance buildings. This site has sufficient land area to develop the recycling transfer facility, office building, maintenance and other needs. The site does have an existing transmission line and some floodplain area, but there is sufficient area outside of these restricted areas to develop the proposed facilities and allow for future expansion. SCS recommends that Site 2 be utilized to construct the new solid waste transfer facility, offices, and support facilities.

A budget of $6,530,000 is recommended for estimated capital cost to develop the following new solid waste facilities including:

- New Recycling Transfer Facility
- New Solid Waste Offices
- New Maintenance Building
- Parking for Employees and Equipment
- Brush Staging Area

A set of conceptual plans for the new solid waste facilities including recycling transfer building, solid waste offices and maintenance building, and associated access drives and parking and staging areas are included in the Appendix.

1.0 INTRODUCTION

This Task 4 technical memorandum presents the following: 1) an evaluation of the potential sites for the new recycling transfer facility that will replace the existing transfer building operation located near the center of town in an older warehouse structure and 2) a conceptual design of the new facility that will be presented along with a proposed budget for the capital improvements and estimated annual operating costs for the facility.

The recycling transfer and processing operations for the City are located off Martin Luther King Drive near downtown. The current building that is being used by the City under a lease agreement is approximately 29,000 – 30,000 square feet. The building is a very old wooden structure with severely weathered metal-paneled walls and numerous interior columns with inadequate interior height in many locations. Current operations at this facility include receipt and transfer of the single stream recyclables collected by the City. The facility also receives other materials such as cardboard and paper that are baled and stored for transport. The surrounding drives and staging areas are unpaved. The City will be moving the current recycling, transfer, and limited processing operations performed at this location to a new City owned and operated facility. Exhibit 4.1 is an aerial view of the current site and building. This Technical Memorandum summarizes the initial phase of that effort consisting of site selection and conceptual design.

Exhibit 4.1 City of Temple Recycling Transfer Facility Site

2.0 RECYCLING TRANSFER FACILITY SITE EVALUATION

The site evaluation included consideration of three prospective transfer facility sites, which were recommended by the City. The locations of the three prospective sites are shown in Exhibit 4.2. Our review considered the following criteria in assessing these sites:

1. Total acreage
2. Site shape and usable area and topography
3. Other siting issues
4. Site ownership
5. Proximity to utilities
6. Adequacy of existing roadways and site accessibility
7. Floodplain and drainage

All of the sites have sufficient available acreage for a new recycling facility and adjacent office and support facilities. These facilities will require approximately 10 to 12 acres depending on the shape of the site. However, the existing site (Site 1) is limited in size and would require some design modifications to accommodate the available area. Parking and staging areas would also be limited at the current site and removal of many of the existing structures will be required. Site 1 is adjacent to a closed MSW landfill that will limit the types of activities that can be done over the landfill and would require mitigation and TCEQ approval, if pursued. While Site 2 is compromised somewhat by the electric transmission lines that cross the site and floodplain located southwest of the transmission lines, there is adequate developable area outside these features. SCS is considering the developable area to be portions of the site that are located outside mapped floodplain and major utility easements or is cut off from the primary developable areas due to these constraints. Exhibits 4.3-4.5 provide approximate site boundaries, floodplain and existing utilities information.

All three sites are within close proximity to each other within a mile of the existing solid waste offices on Bullseye Lane. Each site has direct access to E Ave H or Little Flock Road and are close to the Loop 363. Sites 1 and 2 have the best access to existing utilities including water and sewer service. Site 3 is located well east of the current limits of City water and sewer services. If this site were to be utilized, offsite water and sewer lines would need to be provided. Both water and sewer services are in close proximity to Site 2 at the CNG filling station.

A portion of Sites 2 and 3 is located in an area designated by the Federal Emergency Management Agency as floodplain. Preliminary review of the surface elevations as compared to the 100-year flood elevations for Site 3 and Site 2 suggest that there is sufficient area outside the floodplain on both sites to permit development of the proposed recycling transfer facility and future expansion. However, Site 3 access is severely limited due to the extensive floodplain and creek channel that exists along most of the frontage to Little Flock Road.

Roadway access to each of the sites is generally adequate for the anticipated truck traffic with the possible exception of Site 3. Based on preliminary review by an SCS engineer of the existing roadway conditions including pavement condition of the access to Site 3, Little Flock Road would need to be upgraded east of the landfill entrance to accommodate the future truck traffic. Also, visibility at the anticipated site entrance is limited and may need to be evaluated for potential traffic safety. Access to Site 1 would be the same as the current access from Bullseye Lane. Access to Site 2 would be from the existing road that leads to the other City facilities.

Cost to develop the proposed facilities was also a consideration as extension of utilities and roadway improvements would add to the site development costs. Topographic features and drainage considerations were not evaluated in detail. However, all sites appear to be usable with traditional surface drainage improvements. A summary of these considerations is included in the following Exhibit 4.6 on page 8. As previously stated approximately 10 to 12 acres of developable acreage are needed to accommodate buildings, access roads, parking and staging areas. This is based on the conceptual layout prepared for the solid waste facilities and presented on Drawing A1 contained in the Appendix.

Based on a preliminary analysis of three candidate locations for the recycling transfer facility and discussions with the City, the CNG station location (Site 2) was identified as the most viable location for siting the new recycling transfer facility and office building. This site has sufficient land area to develop the recycling transfer facility, office building and maintenance building as well as other needs. The site does have an existing transmission line and some floodplain area, but there is sufficient area outside of these restricted areas to develop the proposed facilities and allow for future expansion. SCS recommends that Site 2 be utilized to construct the new solid waste transfer facility, offices and support facilities.

SITE 1

SITE 2

SITE 3

E Adams Ave

NE H K Dodgen Loop

SE H K Dodgen Loop

Bullseye Ln

Little Flock Rd

Landfill Rd

Private Dr

53

363

0 250 500

SCALE IN FEET

N

LEGEND

- POTENTIAL SITE LOCATIONS
- E — EXISTING TRANSMISSION LINES
- EXISTING POTABLE WATER
- EXISTING PRESSURIZED MAIN
- EXISTING MANHOLE
- EXISTING HYDRANT (APPROXIMATE)

REFERENCE LAYERS

- NFHL Data Available
- FIRM Panel Boundary
- LOMR Boundary

SPECIAL FLOOD HAZARD AREAS

- 1% Annual Chance Flood Hazard Zone A, AE, A99, AO, AH, AR, V, VE
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee Zone X
- NO SCREEN — Areas Outside the 0.2% Annual Chance Floodplain Zone X
- Areas of Undetermined Flood Hazard Zone D

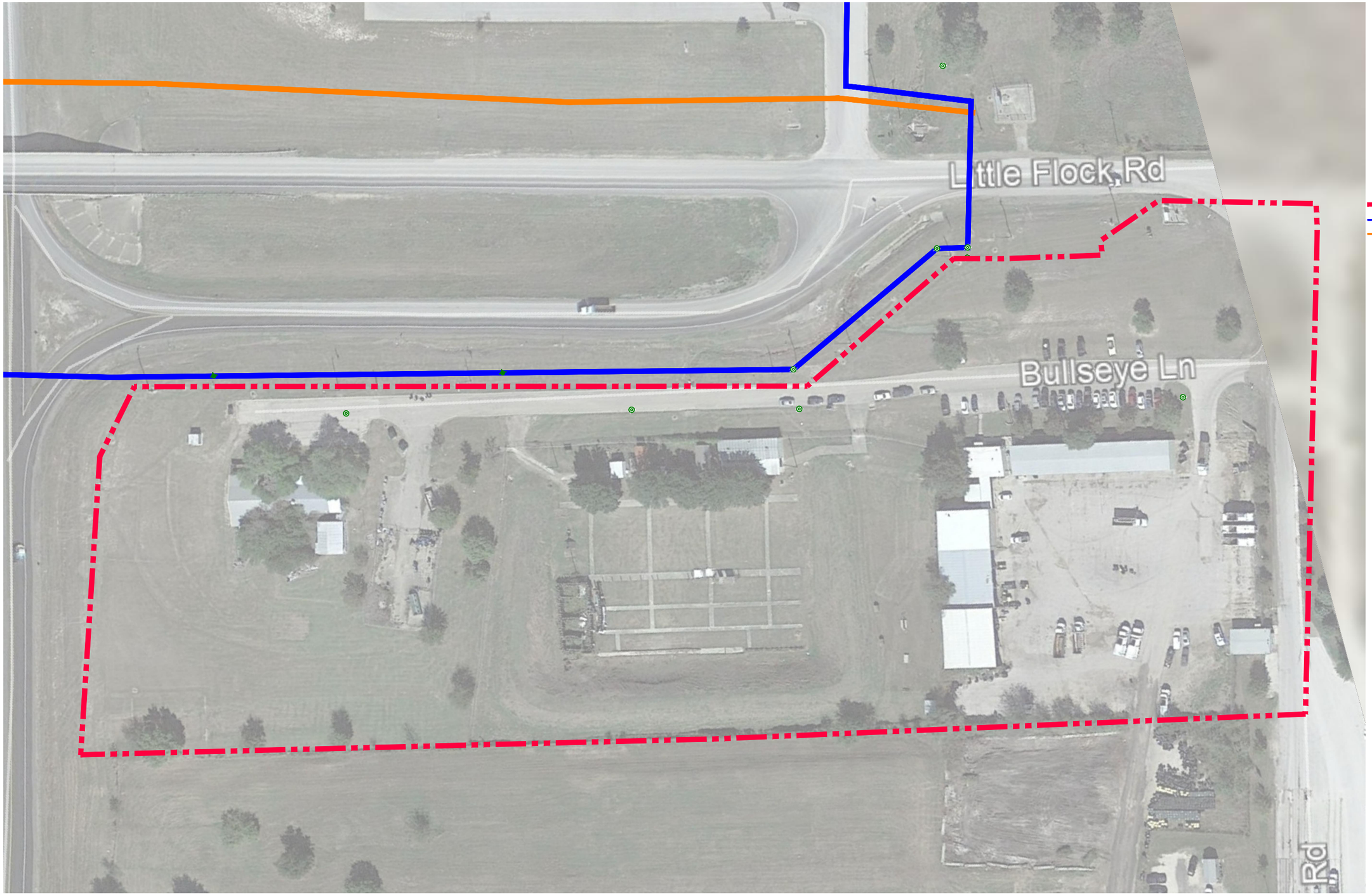
CROSS SECTIONS & BFES

- 18.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- 513 — Base Flood Elevation

SUPPORTING INFORMATION

- Limit of Study
- Jurisdictional Boundary

CITY OF TEMPLE
RECYCLING FACILITY SITING
EXHIBIT 4.2 - SITE LAYOUT

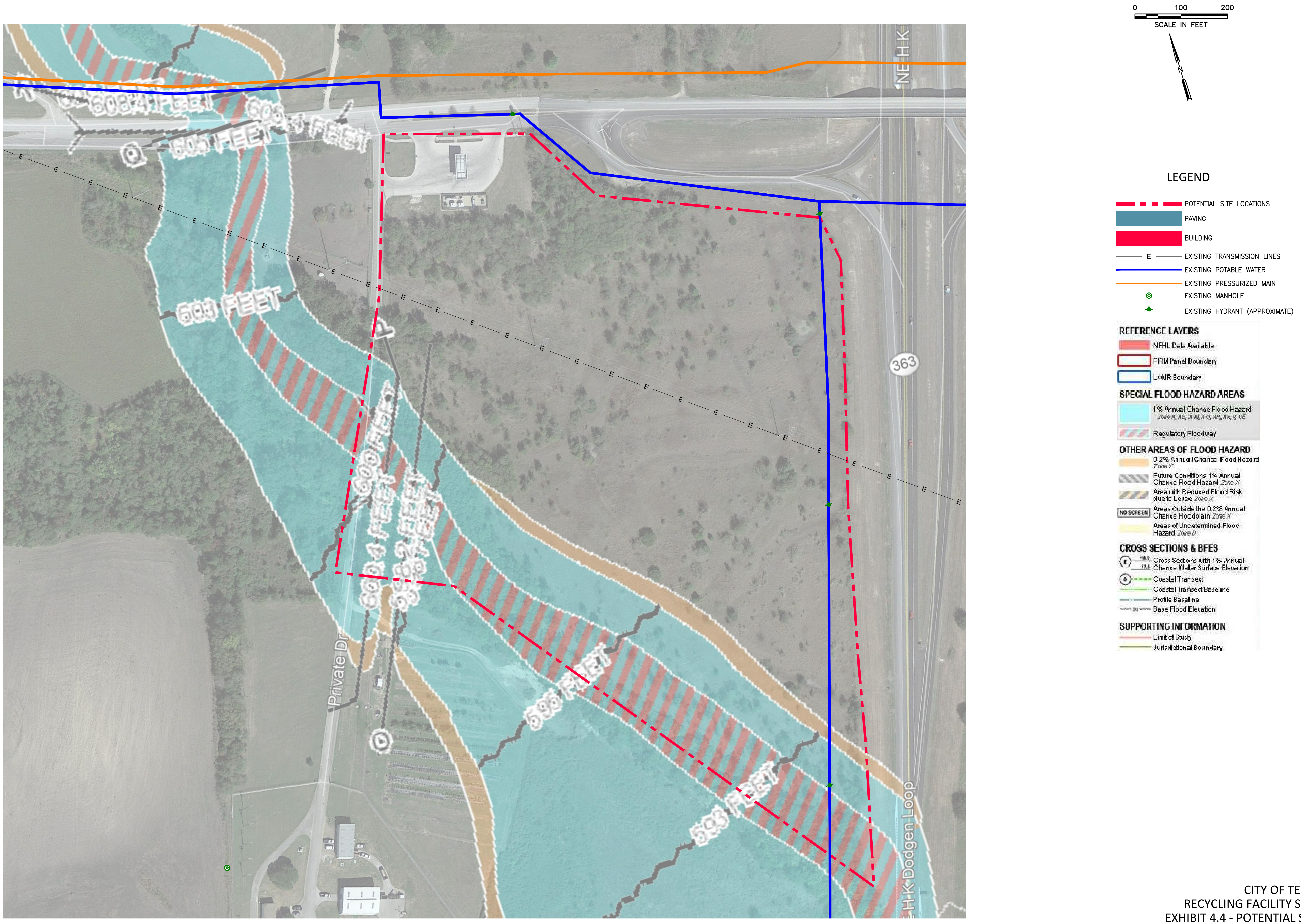


0 50 100
SCALE IN FEET

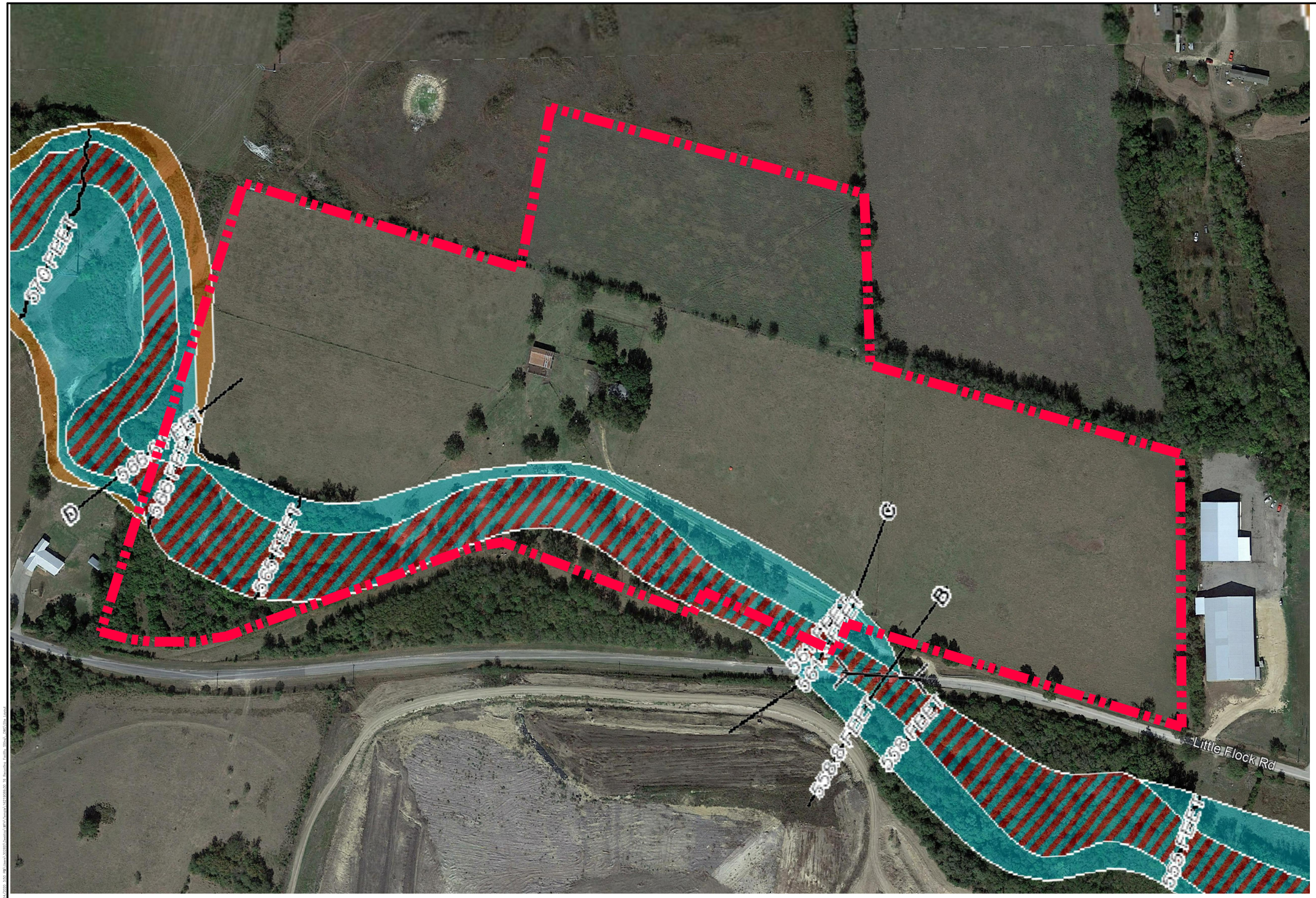
LEGEND

- POTENTIAL SITE LOCATIONS
- EXISTING POTABLE WATER
- EXISTING PRESSURIZED MAIN
- EXISTING MANHOLE
- EXISTING HYDRANT (APPROXIMATE)

CITY OF TEMPLE
RECYCLING FACILITY SITING
EXHIBIT 4.3 - POTENTIAL SITE 1



CITY OF TEMPLE
RECYCLING FACILITY SITING
EXHIBIT 4.4 - POTENTIAL SITE 2



0 100 200
SCALE IN FEET

N

LEGEND

POTENTIAL SITE LOCATIONS

REFERENCE LAYERS
- NFHL Data Available
- FIRM Panel Boundary
- LOMR Boundary

SPECIAL FLOOD HAZARD AREAS
- 1% Annual Chance Flood Hazard *Zone A, AE, A99, AO, AH, AR, V, VE*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee *Zone X*
- NO SCREEN Areas Outside the 0.2% Annual Chance Floodplain *Zone X*
- Areas of Undetermined Flood Hazard *Zone D*

CROSS SECTIONS & BFES
- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- B Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- 513 Base Flood Elevation

SUPPORTING INFORMATION
- Limit of Study
- Jurisdictional Boundary

CITY OF TEMPLE
RECYCLING FACILITY SITING
EXHIBIT 4.5 - POTENTIAL SITE 3

Exhibit 4.6 Assessment of Transfer Station Sites

Site	Acreage Total(Usable)	Shape and Usable Area	Utilities	Roadway Access	Floodplain Drawings	Other Issues
1	12(10)	Limited Size	Yes	Adequate	No	Landfill Existing Structures
2	27(18)	Good	Yes	Good	Partial	Transmission Lines
3	40(30)	Good Outside Floodplain	No	Limited	Yes	Roadway Site Distance

Usable Acreage is the approximate area of the tract that is outside of floodplain, easements and is not cut off from access due to these features.

3.0 CONCEPTUAL PLANS FOR NEW RECYCLING TRANSFER FACILITY, SOLID WASTE OFFICES AND SUPPORT FACILITIES

3.1 SUMMARY

Conceptual Design of the New Recycling Transfer Facility and solid waste facilities includes the following:

- A new building to accommodate the current recycling transfer operations and limited material processing, storage and distribution.
- New solid waste offices to replace the existing offices and facilities.
- Area truck and container maintenance building, staging and storage areas to consolidate the City's solid waste facilities at one location.

The conceptual design includes the facilities that were identified in staff interviews and meetings conducted by SCS as part of the needs assessment. The concept may be adapted to other sites provided they will accommodate the features identified in this section and shown on the Site Plan included in the Appendix.

3.1.1 Conceptual Design of Recycling Transfer Facility

The current recycling operations are located in a building that is approximately 30,000 square feet in area. The primary operation at this building consists of receipt of the City's single stream recyclables collected in the curbside residential recycling program. The collected materials are tipped at the building and loaded into trailers using a conveyor system that moves materials into rear-loading trailers for transport to the recycling processing facility located in Austin. It is our understanding that the equipment, including the balers and conveyor loading system and transfer trucks, are owned by the recycling company. As such, the transfer frequency and equipment maintenance is not controlled by the City. This frequently leads to excess bulk materials at the facility and limits space for storage of other materials. This also provides potentially undesirable conditions at the facility. The baler is also leased by the City for use in processing other materials. The building structure is also leased and is not adequate for this type of operation due to its age, condition, and severe limitations.

SCS developed a concept design for the new building based on the following considerations:

- Provide a safe and efficient system for receipt and transfer of single stream materials.
- Include areas for processing, storage and loading of other materials received by the City such as cardboard and paper.
- Provide a loading and transfer system that is more flexible and can be controlled by the City to accommodate future growth and potentially serve other communities.

The current loading system that includes a conveyor and hopper for loading into rear loading trailers will be eliminated and replaced with a direct–dump, top-loading system that will utilize open-top trailers. It is anticipated that the open-top transfer trailers would be provided by contract haulers. This system would reduce the loading time and temporary storage requirements for the tipping floor. The system also would allow the City to better control the flow of materials while avoiding downtime due to equipment repairs and maintenance. The City collected approximately 3,300 tons of recyclable materials in the residential curbside program in FY 2019. This is approximately 15% more than the tonnage collected in 2018. That averages out to approximately 64 tons of materials to be transferred

on a weekly basis, which would require 3 to 4 transfer hauls per week depending on volume fluctuations. The proposed system could easily handle much greater volumes of materials by increasing the number of transfer hauling trips. This will allow expansion of the current program or potentially serving other communities or other private entities. The proposed building configuration utilizes a single lane drive through tunnel that is partial depth. This type of tunnel configuration works best with a single truck loading bay and is typically used for low volume transfer operations. The partial depth tunnel reduces the need for retaining walls, and grading and drainage issues created with full depth tunnels. The single lane drive through tunnel requires approximately 3750 sf.

The other portion of the building is dedicated to the receipt, processing and storage of other specific recycled materials that would be baled and loaded into trucks for distribution. The total square footage of the proposed facility is approximately 22,000 sf. The size of the proposed building is smaller than the existing facility, but will provide more area for storage and processing due to the improved efficiency of the loading system for single stream materials. Square footage for storage and processing areas as well as tipping and storage are provided on the site layout drawing contained in the appendix. 6300 sf are provided for the tipping floor. This allows room for trucks to back fully into the building and unload. The tipping floor allows for at least a week of storage at current levels, which is well beyond normal transfer practices. Approximately 3300 sf are provide for storage of baled materials that will be shipped from the facility. An additional 3150 sf is provided for overflow tipping or storage as needed. Based on our review of the current and potential future tonnages of recyclables this will provide adequate space for temporary storage of materials. A 3375 sf area is designated for baling and shredding which provides adequate space for equipment and materials. The loading area for baled materials is 2400 sf which includes area for mobile loading equipment and loading docks.

The proposed building is envisioned to be a clear span metal structure with adequate clearances to accommodate City trucks fully extended. This building configuration will also permit adjustments to the functional areas within the building to accommodate future changes to the recycling system and materials that are processed at the facility.

3.1.2 Solid Waste Offices

The proposed solid waste offices were developed to accommodate the anticipated needs of the solid waste staff based on interviews with staff and responses to RFIs regarding facility needs. Exhibit 4 7 provides a summary of the analysis performed to size the proposed office area. The new office building will be collocated with the recycling facility at the selected site location.

Exhibit 4.7 New Recycling Staging and Transfer Facility Program & Area Analysis

Broad Summary

Office / Support Area Data
Total numbers of staff Present-11 Future-15
Number of work shifts= 1 shift 7am-5:30pm

Break Room / Meeting Room
Quantity of staff for safety meetings = 60+

Quantity of staff for seated lunch = 60 Vending machines = 1-soda/Gatorade, 1 snack, ice machine, kitchen area
Microwave oven quantity = 2
TV with data hookups and computer capability for showing safety videos/ possible sound system needed for large space

Locker Rooms & Toilets
Quantity of showers: Male= 2 Female= 1 Toilets – Male 4 toilet stalls 2 urinal Female 3-4 Toilets
Quantity of lockers: Male= 60 Female= 10
Locker size= 18 X 18 X 36, two tiers

Offices
Large (14 X 14) -1
Medium (12 X 12)-3
Small (10 X 10) - 5
Special adjacencies between offices= none

Conference Room
12-person conference room with tv/computer capabilities along with phone for teleconference

Reception & Waiting
Number of visitors waiting= 5
Security considerations= Payment drawer lockup for receptionist area
Number of receptionists= 1

Other Considerations within Office Area
Storage Requirements= File room/Copy room also need storage space for safety gear
Radio dispatch room = large room for customer service rep area and dispatch – 6 spaces
Other Considerations within Main Building
Paint Booth for container shop
Air Compressor room for grease and hydraulic oil system
Welding in container shop
Truck wash will be manual with catwalk to allow for ability to wash top of the trucks

Office Area Summary

Break Room / Meeting Room
65 staff X 15/sf per occupant = 975sf + 25% circulation (244sf) = 1,220sf

Locker Rooms & Toilets
Female
1 ADA toilet 25sf + 3 toilets 50sf + 1 shower 16sf + 10 lockers 30sf
+ 2 lavatories 25sf = 146sf + 100% circulation & chase = 292sf

Male

1 ADA toilet 25sf + 3 toilets 50sf + 2 urinals 36sf + 2 shower3 32sf + 30 lockers 90sf + 2 lavatories 25sf = 146sf + 100% circulation & chase =		396sf
Offices		
Large (14 X 14)	1 X 196sf =	196sf
Medium (12 X 12)	3 X 144sf =	432sf
Small (10 X 10)	5 X 100sf =	500sf
Conference Room		
12 occupants X 30 sf/occupant =		360sf
Reception & Waiting		
Reception desk w/ 1 occupant 50sf + 5 waiting 150sf =		200sf
Dispatch		
6 spaces X 100sf/space =		600sf
Customer service area 100sf =		100sf
Storage & Work Areas		
Safety Equipment Storage =		90sf
File Storage =		100sf
Copy Room =		100sf
General Storage =		70sf
Custodial Storage =		70sf
Utility & MEP		
IT Room =		60sf
Electrical Room =		80sf
Fire Riser Room =		60sf
Office Area Sub-Total =		**4,925sf**
Add 30% X 4,925sf Circulation & Partitions =		1,478sf
Office Area Grand-Total =		**6,404sf**

Maintenance Building Area Summary

Service Bays =	3,080sf
Container Paint Booth =	770sf
Air Compressor & Equipment Room =	560sf
General Storage (parts & tools) =	770sf
Truck Wash =	1,540sf
Break, Toilets & Office=	815sf
Maintenance Area Total =	**7,535sf**

Transfer Station Building Area Summary

Transfer Station Approx. Area =	**21,875sf**

Total Building Area Summary

Office Total =	**6,404sf**
Maintenance Total =	**7,535sf**
Transfer Station Total=	**21,875sf**

Building / Project Grand-Total =	**35,814sf**

3.2 CONCEPTUAL COST ESTIMATE FOR THE PROPOSED RECYCLING TRANSFER FACILITES, NEW OFFICES AND SUPPORT FACILITIES

Exhibit 4.8 provides a conceptual-level estimate of capital improvements for the proposed recycling transfer facility and new office building. The estimated costs include site work, utilities and building improvements. An equipment budget is also included in the estimate. It is assumed that the property is currently owned by the City would be acceptable to be developed for the intended use. The estimates are in current dollars and do not include inflation considerations if the project is constructed in the future.

Exhibit 4.8 Recycling Transfer Facility Capital Cost

Solid Waste Facilities Capital Costs	Comments	Year FY2020
Site Preparation		$50,000
Property	Assumes property provided at no cost to this City project.	$0
Mobilization		$200,000
Earthwork		$80,000
Utilities	Water and Sewer Services	$80,000
Pavement Concrete	Parking, access road and truck lanes	$450,000
Asphalt Concrete	Truck and Container Area	$140,000
TRec Building	basis 21,875 SF @ $100/SF	$2,187,500
Fire Protection	$13/SF for fire protection	$284,400
Offices	6400 SF Single Story Office Structure @ $165/SF	$1,056,000
Retaining Walls	Partial Depth Tunnel	$100,000
Equipment	Baler and Shredder	$150,000
Maintenance Bldg	Maintenance and Paint Booth, Office and Breakroom	$700,000
Engineering/Testing		$250,000
Contingency (15%)		$859,185
TOTAL		**$6,587,085**

1. 2020 Dollars
2. One-bay direct dump with partial depth tunnel
3. Concept Level Estimate Based on Concept Drawings June 20279

3.3 CONCEPTUAL PLANS FOR THE NEW FACILITIES

A set of conceptual plans for the new recycling transfer building and solid waste offices are included in the Appendix of this memorandum. We have included the following drawings in this phase:

A1	Site Plan
A2	Recycling Building Floor Plan
A3	Recycling Building Exterior Elevations
A4	Office Floor Plan
A5	Office Exterior Elevations
A6	Office Exterior Views
A7	Maintenance Building Plan

These conceptual plans provide the basis for final design and building plans for the new solid waste facilities. As previously discussed the selected site will accommodate future facilities including maintenance, staging and storage areas for solid waste equipment and containers.

It should also be noted that the TCEQ issues transfer station permits for the life of the facility with no expiration date or renewal requirements. It is envisioned that the solid waste depot will continue to be an ideal location for a transfer station. As such, if the City were to consider permitting a transfer station in the near future, this would minimize the impact of future developments on the permitting process.

4.0 OPERATING COST

We are assuming that the new recycling facility will be operated by the City with equipment purchased and used by City personnel. The hauling of transferred materials could be contracted out to a private hauling company by the City. This may require changes to the current recycling contract that include recycling materials to be hauled by the recycling company. Prior to implementation of the proposed improvements, SCS recommends coordination with the current recycling company to discuss the plans and negotiate any potential changes to the current contract. Exhibit 4.9 summarizes anticipated annual operating costs for the proposed recycling facility.

Exhibit 4.9 Recycling O&M

Recycling O&M[1]	Year				
	FY2021	FY2022	FY2023	FY2024	FY2025
Personnel[2]	$153,450	$156,979	$160,590	$164,283	$168,062
Equipment Maintenance[3]	$24,000	$24,552	$25,117	$25,694	$26,285
Equipment power[4]	$20,000	$20,460	$20,931	$21,412	$21,904
Utilities (Building electric, water, etc.)	$20,000	$20,460	$20,931	$21,412	$21,904
Supplies and Fuel	$10,000	$10,230	$10,465	$10,706	$10,952
Building Maintenance	$8,000	$8,184	$8,372	$8,565	$8,762
TOTAL	**$235,450**	**$240,865**	**$246,405**	**$252,073**	**$257,870**

1 - Increase from FY2020 by 2.3% Inflation
2 - Personnel @ $50K/year in FY2020
3 - 6% of Equipment Capital Costs in FY2021
4 - Electricity Usage for stationary equipment

5.0 CONCLUSIONS AND RECOMMENDATIONS

1. Based on the existing and future needs of the City's recycling program, SCS has provided a conceptual design for a new Recycling Transfer Facility that provides flexibility to accommodate future growth and changes to the recycling programs.

2. New offices are proposed to provide adequate support facilities to the current and future solid waste staff for the City. The current facilities are not adequate to serve the needs of the current or future solid waste staff. The concept layout design includes a new maintenance building along with areas for parking and equipment storage.

3. Site 2 appears to be the location that provides the City with adequate development characteristics as well as future expansion capabilities.

NEW RECYCLING STAGING AND TRANSFER FACILITY

CITY OF TEMPLE

PUBLIC WORKS DEPARTMENT, TRASH & RECYCLING, TEMPLE, TEXAS

INDEX TO DRAWINGS

SCS ENGINEERS
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DATE: 05/18/2020

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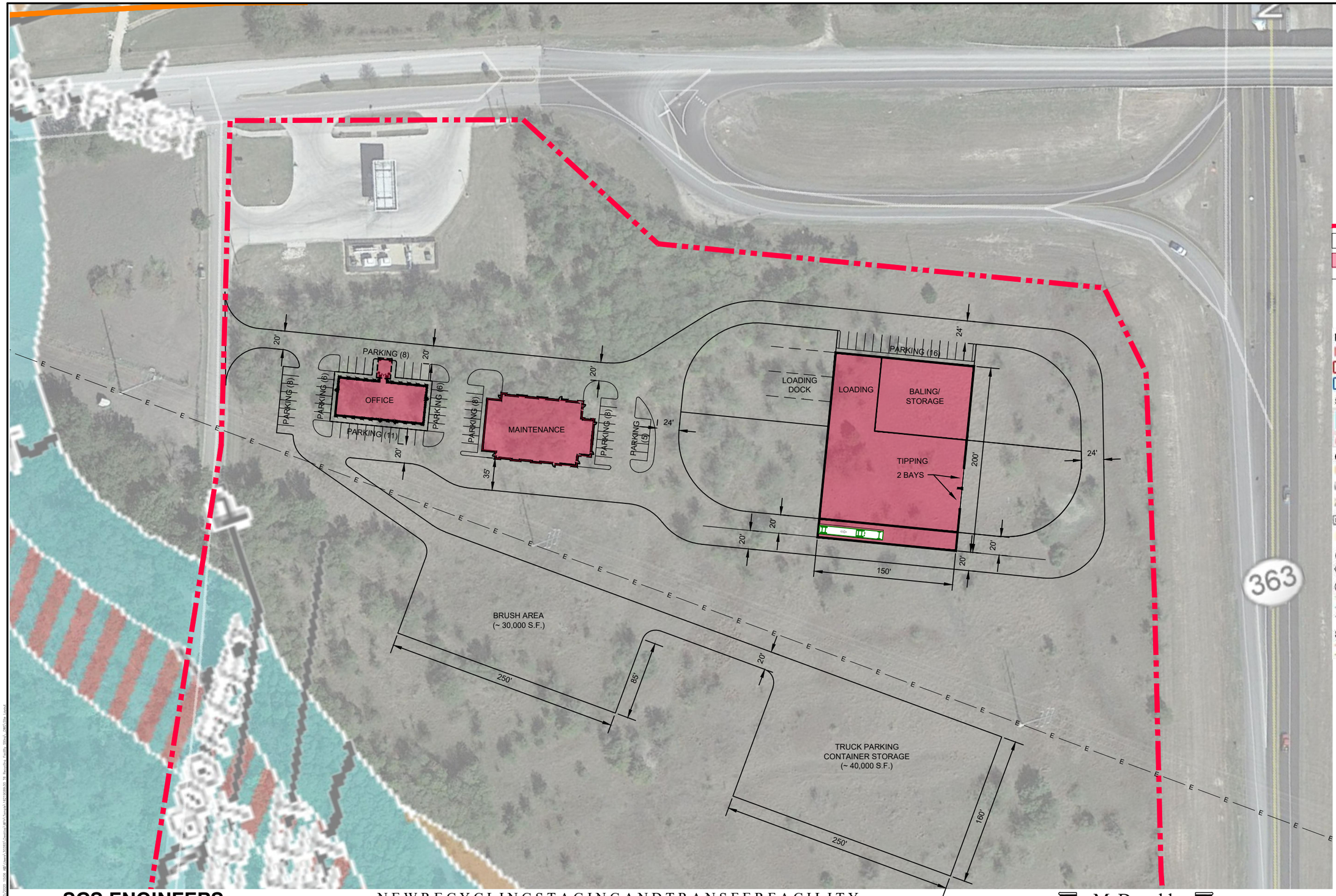

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LEGEND

- POTENTIAL SITE LOCATIONS
- PAVING
- BUILDING
- E — EXISTING TRANSMISSION LINES

REFERENCE LAYERS
- NFHL Data Available
- FIRM Panel Boundary
- LOMR Boundary

SPECIAL FLOOD HAZARD AREAS
- 1% Annual Chance Flood Hazard Zone A, AE, A99, AO, AH, AR, V, VE
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee Zone X
- NO SCREEN Areas Outside the 0.2% Annual Chance Floodplain Zone X
- Areas of Undetermined Flood Hazard Zone D

CROSS SECTIONS & BFES
- 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- 10 Base Flood Elevation

SUPPORTING INFORMATION
- Limit of Study
- Jurisdictional Boundary

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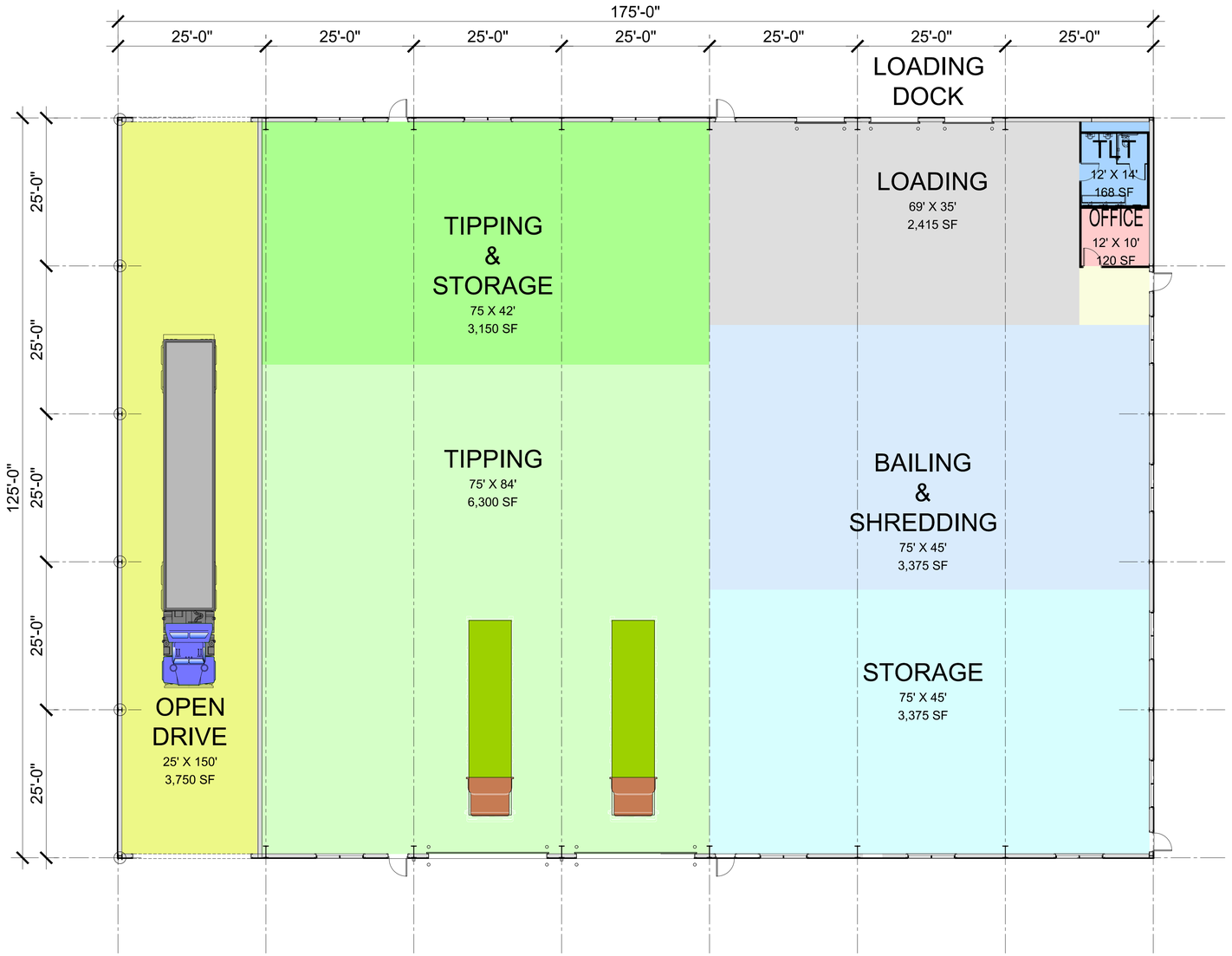

FLOOR PLAN - TRANSFER BUILDING

0 4 8 16 32

graphic scale in feet (scale: 3/32" = 1'-0")

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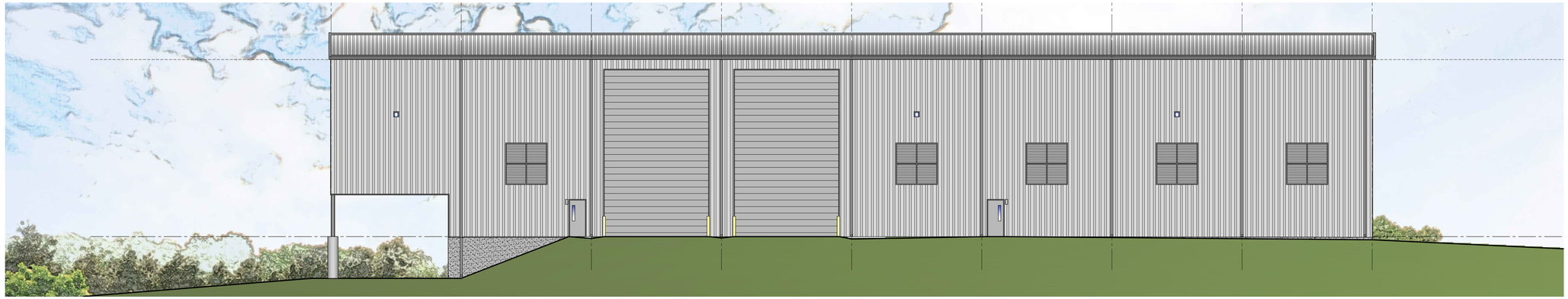

EAST VIEW - RECYCLING BUILDING

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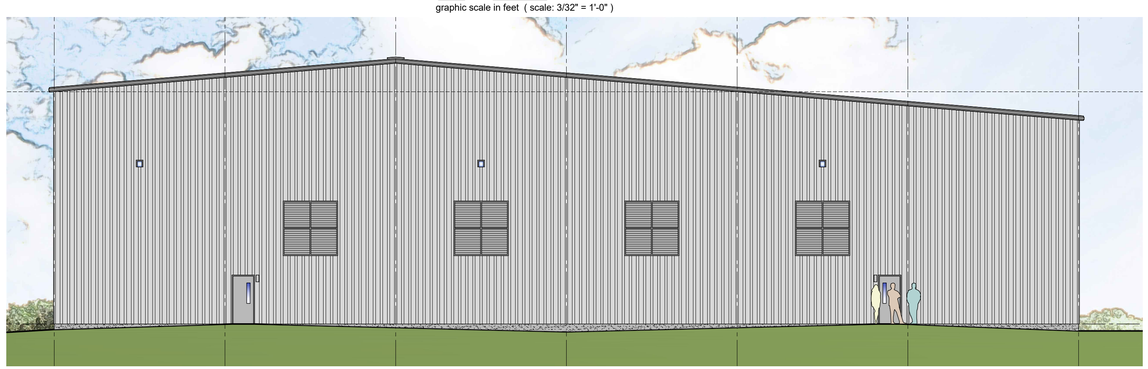

NORTH VIEW - RECYCLING BUILDING

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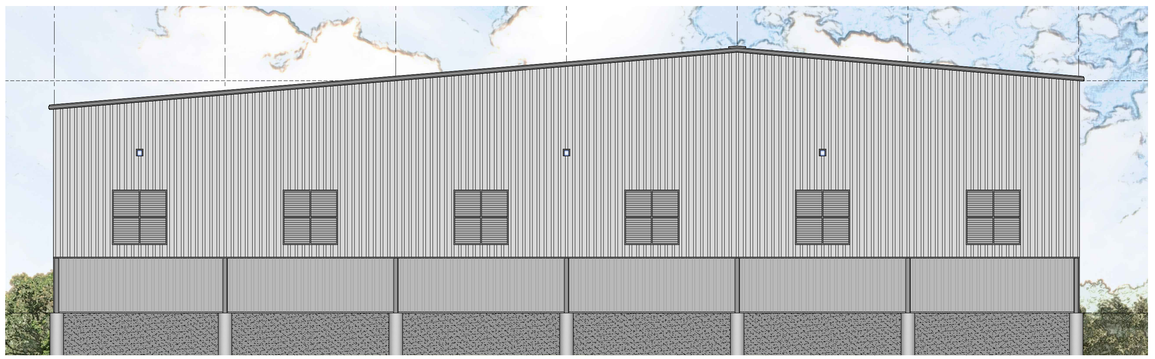

SOUTH VIEW - RECYCLING BUILDING

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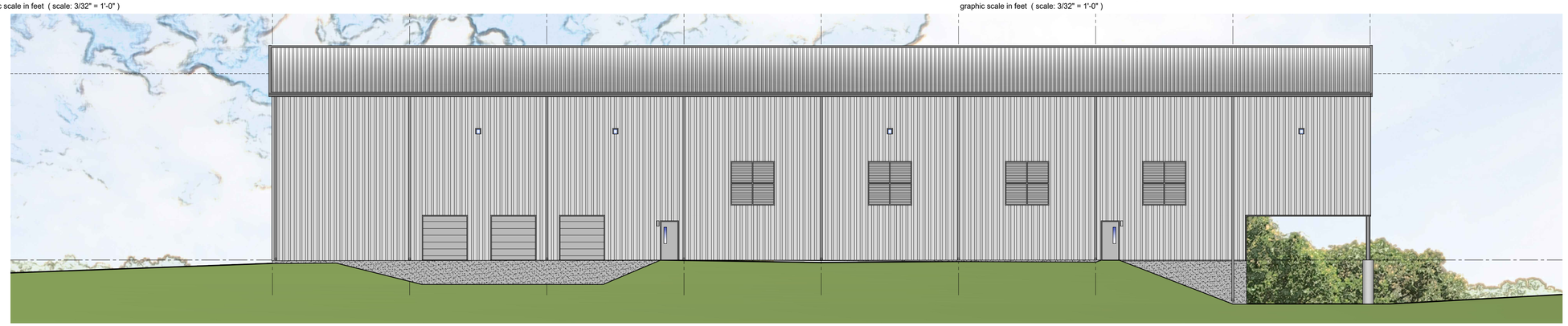

WEST VIEW - RECYCLING BUILDING

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graphic scale in feet (scale: 3/32" = 1'-0")

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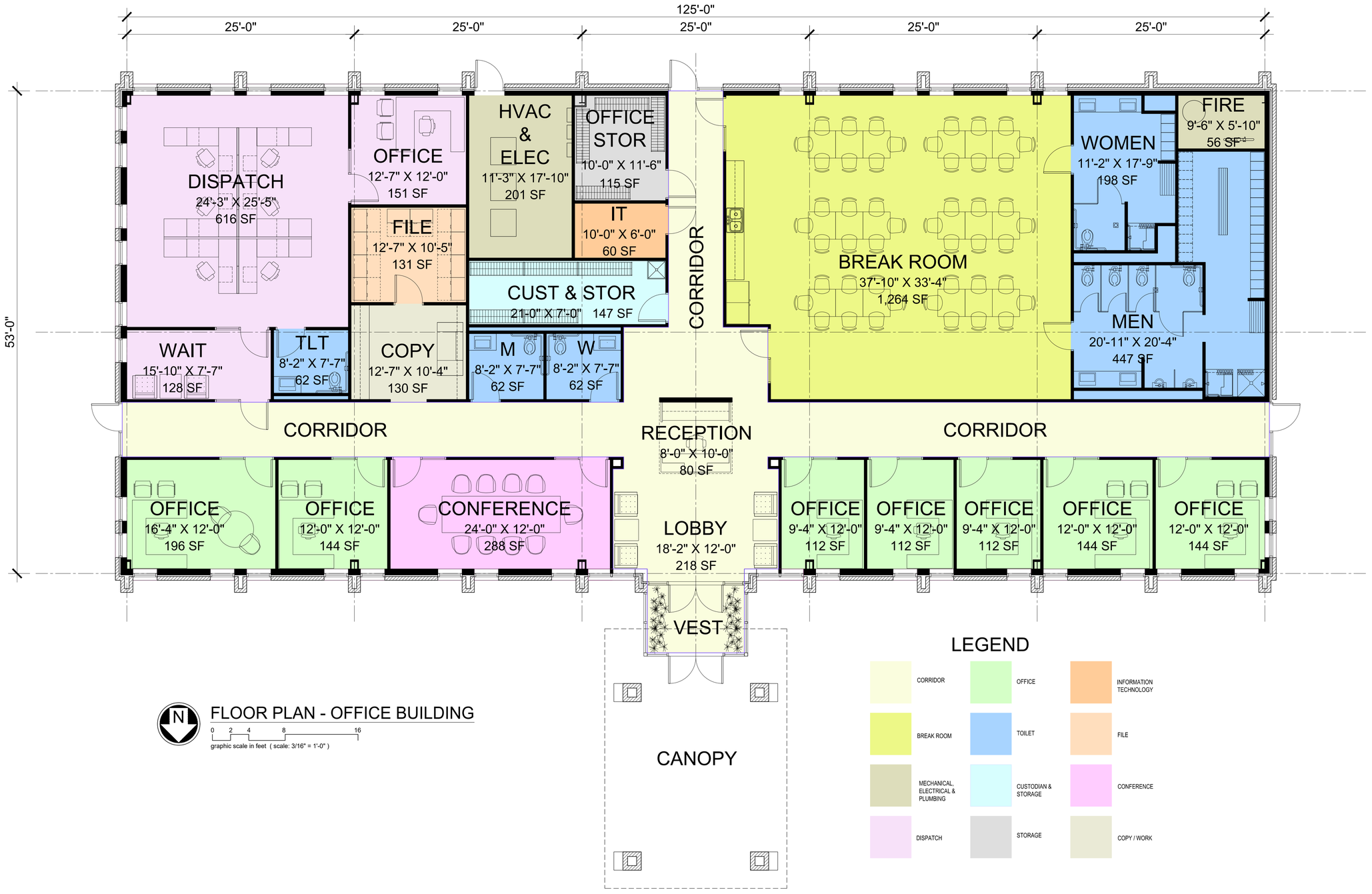

FLOOR PLAN - OFFICE BUILDING

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graphic scale in feet (scale: 3/16" = 1'-0")

LEGEND

- CORRIDOR
- OFFICE
- INFORMATION TECHNOLOGY
- BREAK ROOM
- TOILET
- FILE
- MECHANICAL, ELECTRICAL & PLUMBING
- CUSTODIAN & STORAGE
- CONFERENCE
- DISPATCH
- STORAGE
- COPY / WORK

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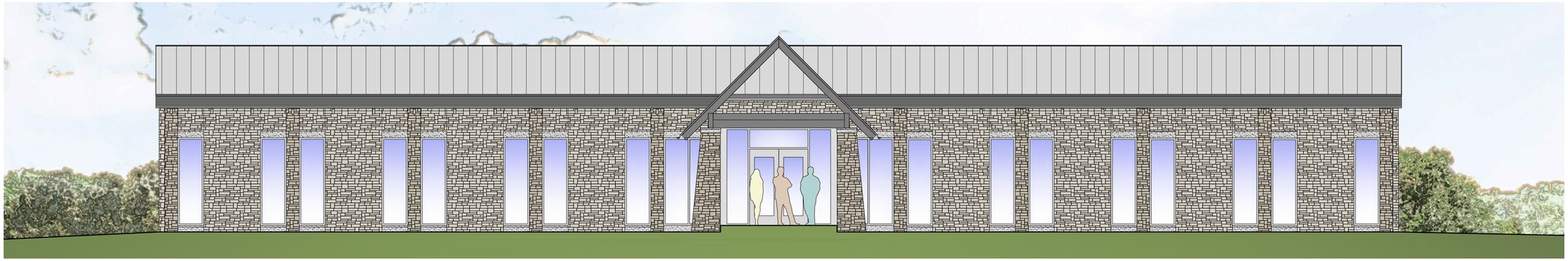

NORTH VIEW - OFFICE BUILDING

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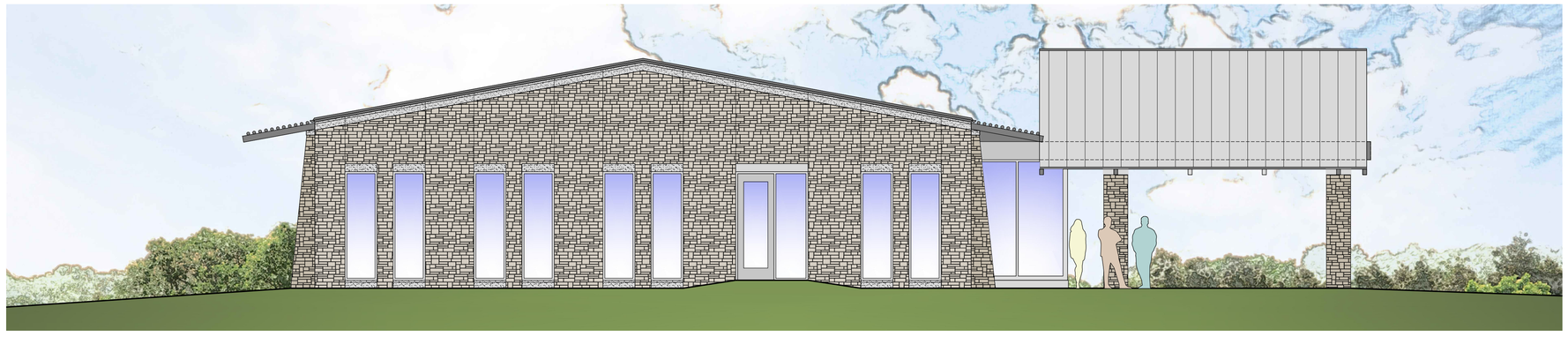

EAST VIEW - OFFICE BUILDING

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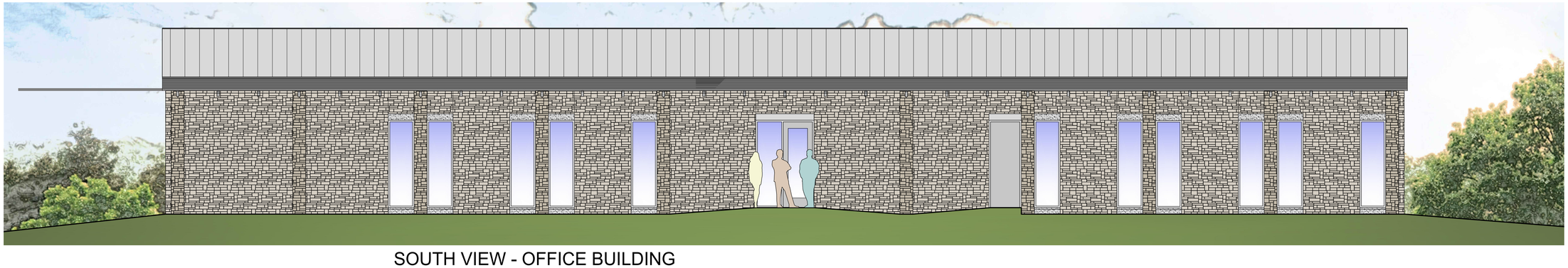

SOUTH VIEW - OFFICE BUILDING

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EXTERIOR VIEWS - OFFICE BUILDING

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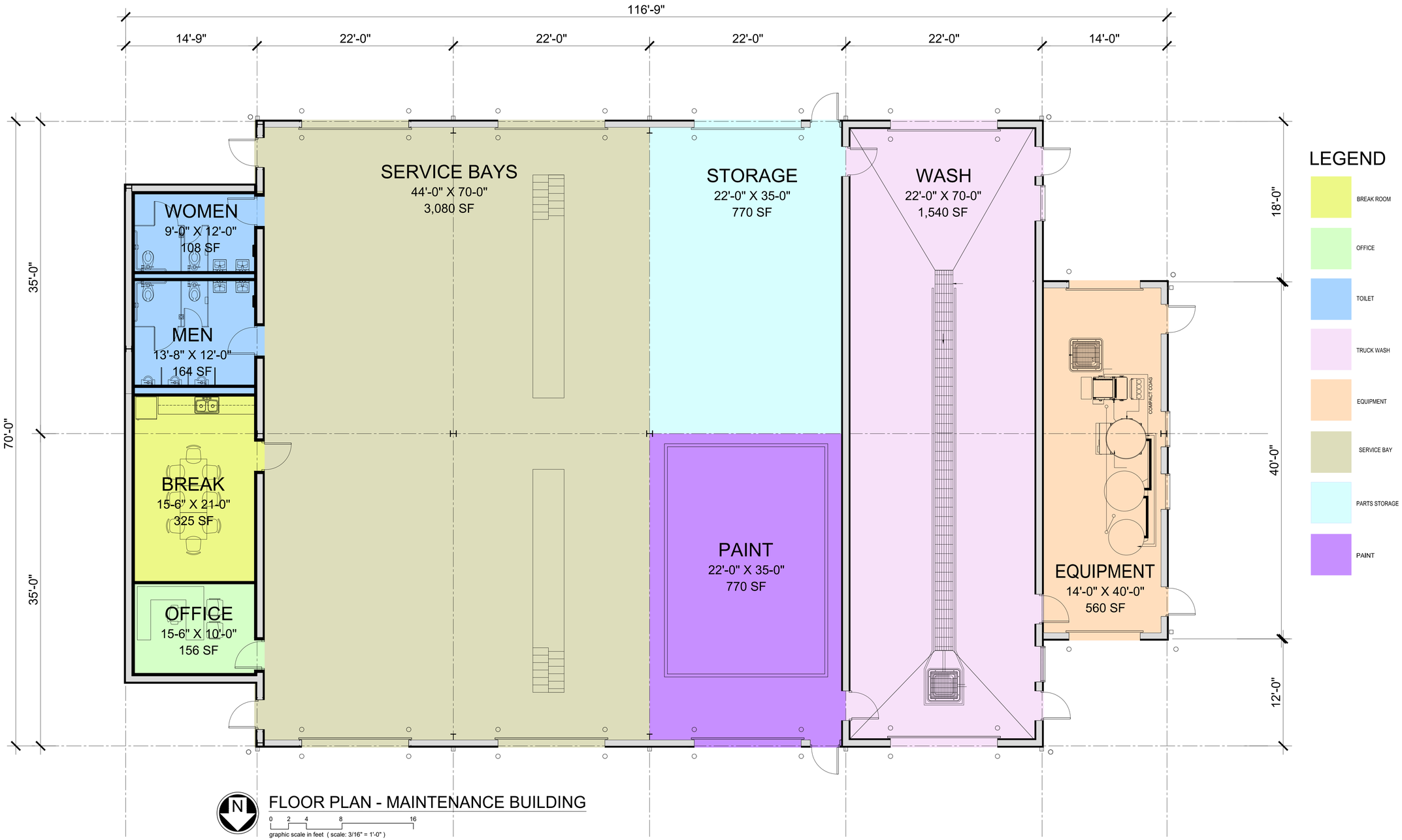

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Task 6 Technical Memorandum: Assessment of Future Solid Waste Management Alternatives and Capital Improvements

City of Temple
2 N Main Street
Temple, TX 76501

SCS ENGINEERS

File No. 16219089.00 | March 12, 2021

1901 Central Dr #550
Bedford, Texas 76021
817-571-2288

Table of Contents

Exhibits

EXECUTIVE SUMMARY

Based on a summary of work completed to date in Tasks 1 – 5, SCS has identified alternatives for the future management of solid waste in the City of Temple. This memo summarizes the proposed changes to the current solid waste system and provides analysis of the alternatives along with a schedule to complete the improvements to the system. The items addressed in this task include:

A budget of $6,530,000 is recommended for estimated capital cost to develop the following new solid waste facilities including:

- New Recycling Transfer Facility
- New Solid Waste Offices
- New Maintenance Building
- Parking for Employees and Equipment
- Brush Staging Area

A set of conceptual plans for the new solid waste facilities including recycling transfer building, solid waste offices and maintenance building, and associated access drives and parking and staging areas are included in the previous TM3.

A budget of $1,200,000 is recommended to add slow fill capabilities to the existing CNG fill station. This will improve collection efficiency and potentially delay the need to add routes in the future.

An equipment replacement plan is developed to provide a schedule for replacement of the solid waste fleet based on a 7 years replacement schedule.

Other capital items are included along with these major items and listed in the capital improvements plan for the next ten years.

1.0 INTRODUCTION

This Task 6 technical memorandum presents the following: 1) an equipment replacement plan for maintaining a truck fleet with reduced maintenance and down time by replacing the truck fleet on a 7 year schedule. 2) a summary of facilities capital improvements and schedule for development. 3) analysis of development of CNG slow fill operation along with capital costs to complete the addition to the existing facility. 4) a capital improvements plan that summarizes the recommended major capital expenditures over the next 5 to ten year period.

2.0 EQUIPMENT REPLACEMENT PLAN

The City purchases and maintains a fleet of collection vehicles that collect solid waste and recyclables from the City's residential and commercial customers. The City operates and maintains the fleet as well. Approximately 80% are CNG fueled truck with the remainder diesel trucks. Exhibit lists the current equipment inventory along with purchase dates and type of truck. The trucks are separated into the categories based on the department including residential, brush and bulk, commercial and roll-off trucks. The current inventory of vehicles includes Frontload, Side load and roll-off trucks. The fleet is divided into frontline and backup trucks.

The City currently has as a goal to replace truck and equipment within 7 years of purchase. The proposed equipment replacement plan was created with that goal in mind. The plan is presented in Exhibit 6.2, which includes equipment purchases over a ten year period beginning in FY 2020-2021. Based on the current age of the fleet, there are a large number of trucks that exceed the 7 year period that are currently in use. Many of the older trucks are phased out as the size of the fleet to be maintained is reduced. The total fleet size to be maintained is approximately 63 collection vehicles. That is a significant reduction of fleet size over the current inventory of trucks. The fleet size is based upon the number of trucks needed to perform the current and planned routes as well as 20 to 30% backup vehicles. The planned annual expenditures for trucks over the 10 year period range from $1,000,000 to $1,555,000. The number of truck purchases each year range from 6 to 15 in a single year. The plan also includes the current trucks budgeted for the upcoming FY 20-21 period.

Exhibit 6.1 Equipment Inventory

Equipment List - September 2020

Asset Number	Truck type	Vehicle Type	Acquire Date	Acquire & Capitalized Cost	Depreciated Amount	Year Renewed
NEW						
NEW	NEW	ASL Residential Truck	12/1/2020	N/A	N/A	2020
NEW	NEW	ASL Residential Truck	12/1/2020	N/A	N/A	2020
NEW	NEW	ASL Residential Truck	12/1/2020	N/A	N/A	2020
NEW	NEW	Roll-Off	12/1/2020	N/A	N/A	2020
NEW	NEW	Roll-Off	12/1/2020	N/A	N/A	2020
NEW	NEW	Roll-Off	12/1/2020	N/A	N/A	2020
NEW	NEW	Frontload	12/1/2020	N/A	N/A	2020
NEW	NEW	Frontload	12/1/2020	N/A	N/A	2020
NEW	NEW	Frontload	12/1/2020	N/A	N/A	2020
Department: Solid Waste Admin Overhead - 2310-540						
8023	-	2004 Diesel Can Diesel Can Solid Was 8023[1]	6/30/2004	$1.00	$1.00	-
Light duty						
5683	-	1985 B&B Flat Bed[1]	1/1/1986	$500.00	$500.00	-
8003	-	2004 Not Applicable Not Applicable[1]	6/30/2004	$1.00	$1.00	-
13517	-	2012 Ford F-150 Regular Cab 4x2	5/4/2012	$20,319.88	$20,319.88	2022
Department: Solid Waste Brush/Bulk - 2320-540						
14153-220	B&B Frontline	2016 HOOD 7000	11/3/2015	$82,586.00	$34,410.83	-
14614	-	2018 FREIGHTLINER M2-112	7/3/2018	$136,152.00	$20,422.80	2025
14613-219	B&B Frontline	2017 HOOD 7000	6/15/2018	$87,930.00	$17,402.81	2025
13695	-	2014 FREIGHTLINER M2-112	10/1/2013	$108,831.72	$68,019.83	-
14512	-	2018 FREIGHTLINER M2-106	8/29/2017	$83,283.00	$25,158.41	-
14265	-	2016 FREIGHTLINER M2-112	7/22/2016	$113,939.00	$48,851.35	-
13072	-	2010 FREIGHTLINER M2-106	9/22/2009	$71,055.00	$71,055.00	-
12817	-	2009 STERLING ACTERRA	7/17/2008	$112,523.34	$112,523.34	-
14153	-	2016 FREIGHTLINER M2-112	11/3/2015	$144,879.67	$60,366.53	2022
13695-227	B&B Frontline	2013 Petersen TL-3	9/27/2013	$99,103.96	$62,765.84	2022
14615-222	B&B Frontline	2017 HOOD 7000	6/15/2018	$87,930.00	$1,392.23	2025
10263	-	1998 HEIL 4000 11 YD	1/7/1998	$40,000.00	$40,000.00	-
12817-226	B&B Backup	2009 Petersen TL-3	7/18/2008	$50,000.00	$50,000.00	-
14512-212	B&B Frontline	2017 HOOD 7000	8/29/2017	$87,930.00	$26,562.19	-
14613	-	2018 FREIGHTLINER M2-112	6/15/2018	$136,152.00	$26,946.75	-
10262	-	1997 INTERNATIONAL 4700	1/7/1998	$20,033.38	$20,033.38	-
13072-224	B&B Backup	2010 HOOD 7000	9/25/2009	$50,888.00	$50,888.00	-
14615	-	2018 FREIGHTLINER M2-112	6/15/2018	$136,152.00	$21,557.00	-
14265-228	B&B Backup	2016 Petersen TL-3	7/22/2016	$108,742.00	$38,059.70	2023
14614-223	B&B Frontline	2017 Petersen TL-3	7/6/2018	$71,220.49	$10,683.07	2025
Department: Solid Waste Residential - 2320-540						
14612	-	2018 AUTOCAR ACX 64	5/16/2018	$152,571.41	$31,785.71	-
13688-246	Residential Backup	2013 HEIL 612 3532	7/23/2013	$141,431.00	$141,431.00	-
14952	-	2019 AUTOCAR ACX 64	6/4/2019	$181,481.12	$13,233.00	-
13687-247	Residential Frontline	2013 HEIL 612 3532	7/23/2013	$141,431.00	$141,431.00	2022
14276-241	Residential Frontline	2016 HEIL Durapack 7000 26YD	4/20/2016	$155,874.00	$155,874.00	2023
14146-248	Residential Frontline	2015 DaDee Scorpion 32YD	11/23/2015	$143,675.00	$74,830.73	2022
13382	-	2012 FREIGHTLINER M2-112	8/18/2011	$84,613.00	$84,613.00	-
14275-240	Residential Frontline	2016 HEIL Durapack 7000 26YD	4/15/2016	$155,874.00	$155,874.00	2023
13689	-	2014 FREIGHTLINER M2-112	10/1/2013	$126,986.00	$99,207.81	-
14504-232	Residential Frontline	2017 DaDee Scorpion 32YD	9/25/2017	$136,689.00	$39,867.63	2024
14952-235	Residential Frontline	2019 DaDee Scorpion 32YD	6/4/2019	$148,154.80	$10,802.95	2026
14277-230	Residential Frontline	2016 DaDee Scorpion 32YD	6/3/2016	$143,675.00	$64,354.43	2023
14611	-	2018 AUTOCAR ACX 64	5/2/2018	$152,325.00	$31,734.38	-
14540-234	Residential Frontline	2017 DaDee Scorpion 32YD	12/20/2017	$136,689.00	$35,596.09	2024
13384	-	2012 FREIGHTLINER M2-112	8/24/2011	$84,613.00	$84,613.00	-
14276	-	2016 AUTOCAR ACX 64	4/20/2016	$153,090.00	$71,760.94	-
13687	-	2014 FREIGHTLINER M2-112	7/23/2013	$127,282.22	$103,416.81	-
14146	-	2016 AUTOCAR ACX 64	11/23/2015	$152,165.31	$105,670.35	-
13383-243	Residential Backup	2012 HEIL 612-3533	8/18/2011	$98,790.00	$98,790.00	-
14540	-	2018 AUTOCAR ACX 64	12/20/2017	$144,000.00	$37,500.00	2024
14277	-	2016 AUTOCAR ACX 64	6/2/2016	$153,455.00	$153,455.00	-
14275	-	2016 AUTOCAR ACX 64	4/15/2016	$153,127.09	$153,127.09	-
13688	-	2014 FREIGHTLINER M2-112	10/1/2013	$126,986.00	$99,207.81	-
13382-242	Residential Backup	**2012 HEIL RAPID RAIL 55000020	8/18/2011	$98,790.00	$98,790.00	-
14611-233	Residential Frontline	2018 DaDee Scorpion 32YD	5/2/2018	$164,411.00	$34,252.29	2025
14504	-	2018 AUTOCAR ACX 64	9/25/2017	$144,000.00	$42,000.00	2024
14278	-	2016 AUTOCAR ACX 64	6/3/2016	$153,455.00	$68,735.05	2023
14612-236	Residential Frontline	2018 DaDee Scorpion 32YD	5/16/2018	$164,411.00	$34,252.29	2025
13384-244	Residential Backup	**2012 HEIL 612-3533	8/18/2011	$98,790.00	$98,790.00	-
13689-245	Residential Frontline	2013 HEIL 612 3532	7/23/2013	$141,431.00	$141,431.00	2021
13383	-	**2012 FREIGHTLINER M2-112	8/23/2011	$84,659.55	$84,659.55	-
14278-231	Residential Frontline	2016 DaDee Scorpion 32YD	6/3/2016	$143,675.00	$64,354.43	2023
Light Duty						
14513	-	2017 FORD F-250 Super Duty Regular Cab 4x2	8/24/2017	$30,169.00	$7,290.84	2024
13880	-	2014 FORD FOCUS	7/24/2014	$17,313.54	$17,313.54	2021
13131	-	2010 FORD F-150 Regular Cab 4x2	2/2/2010	$18,064.20	$17,913.67	2022
14304	-	2016 FORD F-150 Regular Cab 4x2	7/1/2016	$29,415.36	$10,295.38	2023
13295	-	2011 FORD F-150 Regular Cab 4x2	4/15/2011	$18,591.00	$18,591.00	2022

Exhibit 6.1 Equipment Inventory (cont.)

Equipment List-September 2020

Asset Number	Truck type	Vehicle Type	Acquire Date	Acquire & Capitalized Cost	Depreciated Amount	Year Renewed
Department: Solid Waste FrontLoad - 2320-540						
13682-252	-	2013 MCNEILUS ATLANTIC	6/27/2013	$124,473.00	$124,473.00	-
13685	-	2013 AUTOCAR ACX 64	7/1/2013	$142,428.00	$142,428.00	2022
13276-257	Frontload Backup	**2010 MCNEILUS ATLANTIC	12/27/2010	$100,000.00	$100,000.00	-
13276	-	**2011 PETERBILT 320	12/27/2010	$123,428.53	$123,428.53	-
13684	-	2013 AUTOCAR ACX 64	6/1/2013	$142,684.44	$117,417.41	-
13682	-	**2013 AUTOCAR ACX 64	6/27/2013	$142,428.00	$142,428.00	2020
14953-251	Frontload Frontline	2019 DaDee Mantis AFL-40 Yard	6/7/2019	$148,154.00	$10,802.95	2026
13683-253	Frontload Frontline	2013 MCNEILUS ATLANTIC	7/1/2013	$124,473.00	$124,473.00	2021
14953	-	2019 AUTOCAR ACX 64	6/7/2019	$169,398.50	$12,351.97	2026
13684-254	Frontload Frontline	2013 MCNEILUS ATLANTIC	6/1/2013	$124,473.00	$124,473.00	2021
13686-256	Frontload Frontline	2013 MCNEILUS ATLANTIC	6/1/2013	$124,473.00	$102,430.91	2021
13686	-	2013 AUTOCAR ACX 64	7/3/2013	$142,428.00	$142,428.00	-
13685-255	Frontload Frontline	2013 MCNEILUS ATLANTIC	7/1/2013	$124,473.00	$124,473.00	2021
13683	-	2013 AUTOCAR ACX 64	6/1/2013	$142,428.00	$142,428.00	-
Light Duty						
13389	-	**2011 FORD F-150 Regular Cab 4x2	6/21/2011	$22,153.00	$22,153.00	-
13541	-	2015 FORD F-550	8/7/2014	$59,327.00	$59,327.00	2021
Department: Solid Waste Sideload - 2320-540						
205	-	2009 BOBCAT 225[1]	2/18/2009	$500.00	$500.00	-
13694-261	Sideload Frontline	2013 Southwestern Equipment Company Champion	10/1/2013	$120,076.00	$120,076.00	2021
12581	-	2008 INTERNATIONAL WORK STAR	8/21/2007	$117,388.74	$117,388.74	-
12581-264	Sideload Backup	2007 Southhwestern Equipment Company Challenger CL-30-LD	8/23/2007	$110,380.00	$110,380.00	-
14954-01	-	2019 Southwestern Equipment Company Champion CL-32-LD[1]	7/18/2019	$0.00	$0.00	-
14954	Sideload Frontline	2020 AUTOCAR ACX 64[1]	7/18/2019	$0.00	$0.00	-
13694	-	2014 FREIGHTLINER M2-106	10/1/2013	$113,820.66	$88,922.39	2022
Light Duty						
12962	-	2009 FORD F350	2/18/2009	$48,507.49	$48,507.49	2022
Department: Solid Waste Rolloff - 2320-540						
13691-270	Rolloff Frontline	2013 ROLL OFFS USA DST	5/8/2013	$33,850.00	$28,208.33	2021
12386-279	Rolloff Backup	**2007 G&D MANUFACTURING 1500	6/15/2006	$36,966.00	$36,966.00	-
12385-278	Rolloff Backup	**2007 G&D MANUFACTURING 1500	6/15/2006	$36,966.00	$36,966.00	-
13768-273	Rolloff Frontline	2014 GALBREATH OUTSIDE RAIL HOIST	6/2/2014	$34,250.00	$23,903.65	2021
13692	-	2014 FREIGHTLINER M2-112	10/1/2013	$146,755.66	$114,652.86	-
14616-274	Rolloff Frontline	2018 ROLL OFFS USA DST	5/23/2018	$38,650.00	$8,052.08	2025
12385	-	2007 FREIGHTLINER M2-106	6/15/2006	$122,019.00	$122,019.00	-
13690	-	2014 FREIGHTLINER M2-112	10/1/2013	$146,755.46	$114,652.90	-
14616	-	2019 FREIGHTLINER M2-112	5/22/2018	$141,061.00	$29,387.71	2025
13768	-	2015 FREIGHTLINER M2-112	6/2/2014	$148,902.02	$103,921.20	-
13693	-	2014 FREIGHTLINER M2-112	10/1/2013	$146,755.71	$114,652.90	-
13692-271	Rolloff Frontline	2013 ROLL OFFS USA DST	5/8/2013	$33,850.00	$28,208.33	2021
15012-275	-	2019 GALFAB OR 60174	5/8/2019	$38,457.00	$2,563.80	2026
13690-272	Rolloff Frontline	2013 ROLL OFFS USA DST	5/8/2013	$33,850.00	$28,208.33	2021
13693-275	Rolloff Frontline	2013 ROLL OFFS USA DST	5/8/2013	$33,850.00	$28,208.33	2021
13691	-	2014 FREIGHTLINER M2-112	10/1/2013	$146,755.46	$114,652.70	-
14521-277	Rolloff Frontline	2018 ROLL OFFS USA DST	9/11/2017	$37,500.00	$10,937.50	2024
12836	-	**2007 FREIGHTLINER M2-106	6/7/2006	$123,084.75	$123,084.75	-
14521	-	2018 FREIGHTLINER M2-106	9/11/2017	$98,256.00	$28,658.00	-
15012	-	2019 WESTERN STAR 4700SB	5/8/2019	$121,410.65	$8,094.04	2026
Department: Solid Waste Recycling - 2320-540						
12283	-	2005 KOMATSU FG40ZT2-8	11/28/2005	$34,600.00	$34,600.00	2022
13767	-	2014 AUTOCAR ACX 64	7/14/2014	$142,818.44	$98,187.68	2021
13767-250	Frontload Frontline	2014 MCNEILUS ATLANTIC	7/14/2014	$15,715.00	$101,384.64	2021
8080	-	2019 N/A N/A[1]	1/1/2019	$0.00	$0.00	-
Light Duty						
12141	-	2005 FORD F-150 Regular Cab 4x2	4/19/2005	$15,715.00	$15,715.00	2022
Department: Solid Waste Recycling Processing - 2320-540						
14950	-	2018 CASE SR210 SKID STEER	11/30/2018	$47,256.87	$5,513.30	2025
14733	-	2018 CASE SR210 SKID STEER	7/19/2018	$47,675.67	$7,151.35	2025
14951	-	2018 DOOSAN D20S-7 FORKLIFT	11/30/2018	$32,106.09	$3,745.71	2025
14734	-	2018 DOOSAN D20S-7 FORKLIFT	7/19/2018	$32,106.09	$4,815.91	2025

[1] Trucks were not included in calculations

[2] Red Front are priority equipment.

[3] Currently there is 105 trucks categorized as heavy equipment, this does not include the 9 new trucks purchased in 2020. After phasing out the non-priority or back-up equipment the new heavy equipment total is 59 trucks.

[4] There is a total of 9 Light Duty Trucks.

**Equipment that is being replaced with 2020 purchases.

= Are backups (10 total)

= CNG

Exhibit 6.2 Equipment Replacement Plan

September 2020

UNITS NEEDED

	-	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	Year10
	2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Department: Solid Waste Admin Overhead - 2310-540											
Other	-	-	1	-	-	-	-	-	-	1	-
Department: Solid Waste Brush/Bulk - 2320-540											
B&B Frontline	-	-	1	-	-	3	-	-	-	1	-
B&B Backup	-	-	-	1	-	-	-	-	-	-	1
Other	-	-	1	-	-	1	-	-	-	1	-
Department: Solid Waste Residential - 2320-540											
Residential Backup	-	-	-	-	-	-	-	-	-	-	-
Residential Frontline	-	1	2	4	2	2	1	-	1	2	4
Other	-	1	2	2	3	-	1	-	1	2	2
Department: Solid Waste FrontLoad - 2320-540											
Residential Backup	-	-	-	-	-	-	-	-	-	-	-
Residential Frontline	-	4	-	-	-	-	1	-	4	-	-
Other	1	1	1	-	-	-	1	1	1	1	-
Department: Solid Waste Sideload - 2320-540											
Sideload Backup	-	-	-	-	-	-	-	-	-	-	-
Sideload Frontline	-	1	-	-	-	-	-	-	1	-	-
Other	-	-	2	-	-	-	-	-	-	2	-
Department: Solid Waste Rolloff - 2320-540											
Rolloff Frontline	-	5	-	-	1	1	-	-	5	-	-
Rolloff Backup	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	1	2	-	-	-	-
Department: Solid Waste Recycling - 2320-540											
Frontload Frontline	-	1	-	-	-	-	-	-	1	-	-
Other	-	1	2	-	-	-	-	-	1	2	-
Department: Solid Waste Recycling Processing - 2320-540											
Other	-	-	-	-	-	4	-	-	-	-	-
NEW											
Residential Truck	3	-	-	-	-	-	-	3	-	-	-
Roll-off Truck	3	-	-	-	-	-	-	3	-	-	-
Frontload	3	-	-	-	-	-	-	3	-	-	-
TOTAL	10	15	12	7	6	12	6	10	15	12	7

Exhibit 6.2 Equipment Replacement Plan (cont.)

September 2020

COST PER UNIT

	-	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	Year10
	2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Department: Solid Waste Admin Overhead - 2310-540											
Other	-	-	$24,770	-	-	-	-	-	-	$28,453	-
Department: Solid Waste Brush/Bulk - 2320-540											
B&B Frontline	-	-	$118,438	-	-	$283,818	-	-	-	$136,048	-
B&B Backup	-	-	-	$124,910	-	-	-	-	-	-	$143,483
Other	-	-	$166,421	-	-	$156,396	-	-	-	$191,166	-
Department: Solid Waste Residential - 2320-540											
Residential Backup	-	-	-	-	-	-	-	-	-	-	-
Residential Frontline	-	$165,709	$334,061	$688,175	$314,025	$377,713	$170,183	-	$190,348	$383,731	$790,497
Other	-	$19,888	$46,025	$210,061	$365,476	-	$208,465	-	$22,845	$52,869	$241,294
Department: Solid Waste FrontLoad - 2320-540											
Frontload Backup	-	-	-	-	-	-	-	-	-	-	-
Frontload Frontline	-	$583,360	-	-	-	-	$170,182	-	$670,097	-	-
Other	$163,605	$68,148	$170,215	-	-	-	$194,586	$187,931	$78,281	$195,523	-
Department: Solid Waste Sideload - 2320-540											
Sideload Backup	-	-	-	-	-	-	-	-	-	-	-
Sideload Frontline	-	$140,688	-	-	-	-	-	-	$161,606	-	-
Other	-	-	$198,776	-	-	-	-	-	-	$228,331	-
Department: Solid Waste Rolloff - 2320-540											
Rolloff Frontline	-	$197,985	-	-	$43,076	$44,397	-	-	$227,423	-	-
Rolloff Backup	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	$162,035	$183,638	-	-	-	-
Department: Solid Waste Recycling - 2320-540											
Frontload Frontline	-	$18,052	-	-	-	-	-	-	$20,736	-	-
Other	-	$164,053	$70,453	-	-	-	-	-	$188,446	$80,929	-
Department: Solid Waste Recycling Processing - 2320-540											
Other	-	-	-	-	-	$182,807	-	-	-	-	-
NEW											
Residential Truck	$555,332	-	-	-	-	-	-	$637,902	-	-	-
Roll-off Truck	$117,678	-	-	-	-	-	-	$135,176	-	-	-
Frontload	$518,359	-	-	-	-	-	-	$595,432	-	-	-
TOTAL	$1,354,975	$1,357,883	$1,129,159	$1,023,146	$722,577	$1,207,165	$927,054	$1,556,440	$1,559,781	$1,297,049	$1,175,273

Notes:

[1] This plan is based on 7 year replacement cycle with 2% annual inflation rate considered. Based on maintaining vehicles fleet of 49 frontline and 10 backups.

3.0 SUMMARY OF FACILITIES CAPITAL IMPROVEMENTSS

3.1 SUMMARY

The proposed new solid waste facilities were detailed in the previous TM-4. These included the following:

- A new recycling transfer facility.
- New solid waste offices to replace the existing offices and facilities.
- New truck and container maintenance building, staging and storage areas to consolidate the City's solid waste container storage, truck parking and other facilities at one location.

The detailed concept plans are presented in TM – 4 including a breakdown of capital and O & M

Exhibit 6.3 New Solid Waste Facilities Building Summary & Area Analysis

Total Building Area Summary	
Office Total=	6,404sf
Maintenance Total=	7,535sf
Transfer Station Total=	21,875sf
Building / Project Grand Total=	35,814sf

3.2 SUMMARY OF CAPITAL COST FOR THE PROPOSED RECYCLING TRANSFER FACILITIES, NEW ORFFICES AND SUPPORT FACILITIES

Exhibit 6.2 summarizes the capital costs for the new solid waste facilities that were detailed in TM 4. This breakdown provides a potential phasing of the new facilities over several years for budgeting purposes. The first facility to be built would be the new recycling facility to replace the operation that the City conducts in the older warehouse structure near the downtown area. This cost includes the development of the new building, parking and new access drives. The next facility proposed breakdown is new offices and parking. The final addition would be the new maintenance facility along with additional paving for the parking and staging areas. This development process could be phased out over several years or longer if needed. Another option would be to finance the new facilities through bonds and construct the entire complex at one time. This would allow a quicker transition into the new facilities

Exhibit 6. 4 Summary of Facilities Capital Cost

1. New Recycling Transfer Facility with Site Improvements	$4,300,000
2. New Solid Waste Offices	$1,200,000
3. Maintenance Facility	$800,000
4. Parking and Staging Areas	$200,000
5. Equipment Replacement Plan	$700,000-1,500,000
6. CNG Fill Station Upgrade	$1,200,000

1. 2020 Dollars

Note: As described in TM-4, these estimates are based on design concepts that are subject to change as these projects proceed into detailed design and more detailed, site-specific information becomes available.

4.0 CNG FILL STATION ALTERNATIVES

The City currently utilizes commercial fast fill CNG stations to fill the CNG fleet. This type of CNG filling process requires approximately 20 to 30 minutes to complete and trucks typically require two filling operations per day to complete the routes. As an alternative to this process, SCS considered the option of developing a slow fill station at the same location to eliminate the second filling process from the standard collection route. This would increase the efficiency of the collection routes and could delay the need for adding a new route in the future. The weekly time savings would translate into costs saving over time. It is not clear that the cost savings alone would justify the need for the additional capital investment required to add the slow fill capability. More detailed discussion of the effects of this option on the collection routing is discussed in TM3. SCS developed conceptual costs to develop the slow fill operation at the current location. The cost for equipment we provided by a well known CNG developer and SCS experience. The capital cost would be in the ranged of $1,200,000 to convert to slow fill operations. Since we currently have no information on the location of the gas line to serve as the fuel source, this estimate does not include the cost of a gas line extension. We are assuming that the new slow fill spaces would be added to the existing facility along with new paving and site work. Prior to proceeding, we recommend a detailed cost-benefit analysis based on a site plan that is prepared by the developer and reviewed by the City. SCS can assist in this analysis. Exhibit 6.5 summarizes anticipated conceptual capital cost for the facility.

Exhibit 6.5 CNG Slow Fill Station Capital Costs-Temple CNG

CNG Slow Fill Station Development	Comment	Year FY2020
Site Preparation		$50,000
Demo	Existing Pavement and some equipment	$10,000
Earthwork		$40,000
Utilities	Line Work	$60,000
Pavement	Additional Pavement	$90,000
CNG Slow Fill	20 fill station	$750,000
Engineering/Oversight		$30,000
Contingency (15%)		$154,500
TOTAL		$1,184,500

1. assumes inflation at 2% per year

5.0 CAPITAL IMPROVEMENTS PLAN

Exhibit 6.6 presents a capital improvements plan for the City over the next five to ten years. The plan includes the proposed recycling transfer facility, office, maintenance building and parking and staging areas. Also included in the plan are equipment purchases and other needs that will require major capital expenditures. The plan does not include routine maintenance and personal expenditures. The capital costs were summarized in the TM 4 memo. SCS recommends revisiting the plan in 3 to 5 years.

.

Exhibit 6.6 Capital Improvement Plan

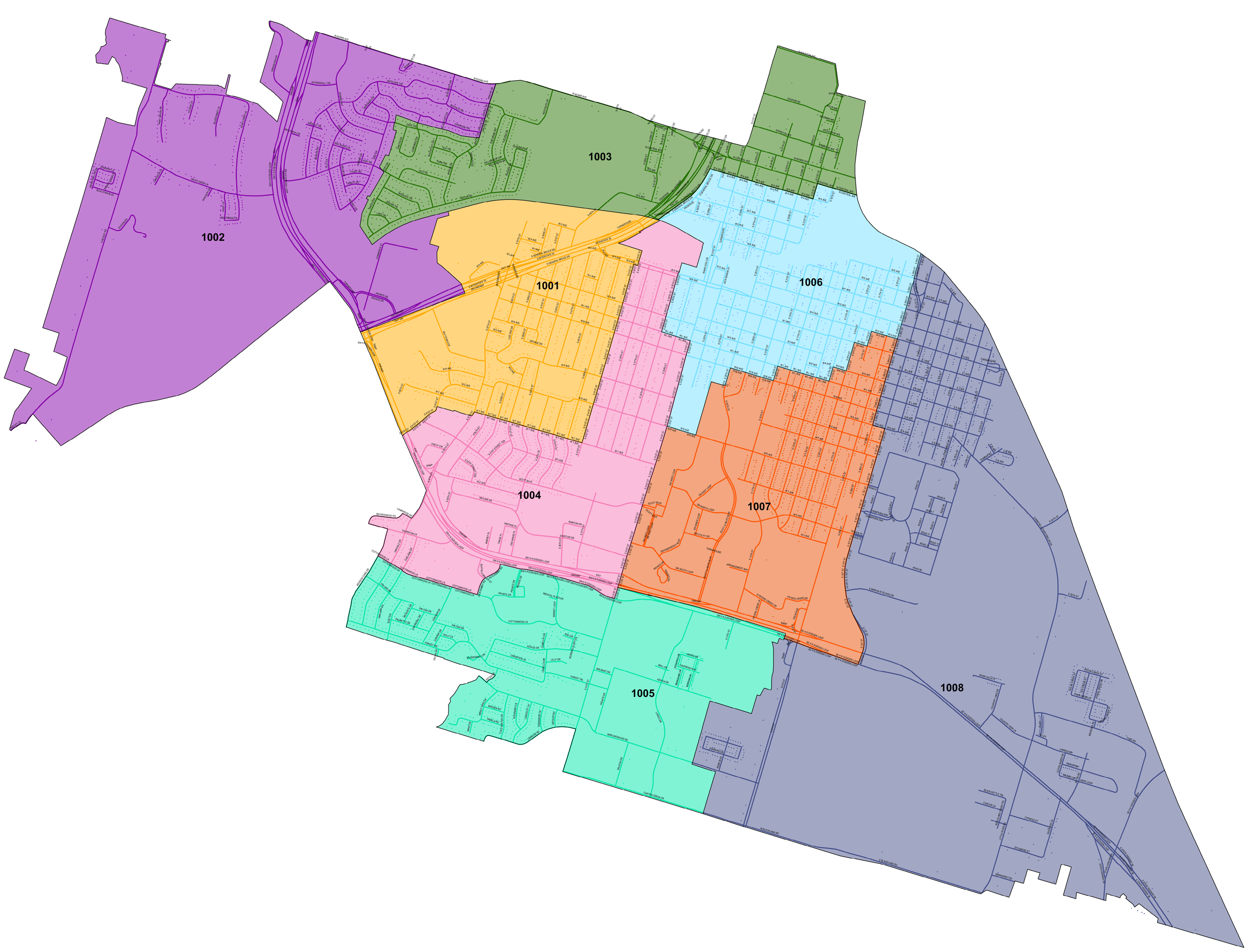
	Year									
	FY2021	**FY2022**	**FY2023**	**FY2024**	**FY2025**	**FY2026**	**FY2027**	**FY2028**	**FY2029**	**FY2030**
New Recycling Transfer Facility with Site Improvements	$4,300,000	-	-	-	-	-	-	-	-	-
New Solid Waste Offices		$1,200,000	-	-	-	-	-	-	-	-
Maintenance Facility/Parking and Staging Areas	-	-	$1,000,000	-	-	-	-	-	-	-
CNG Fill Station Upgrade	-	-	-	$1,100,000	-	-	-	-	-	-
Citizen Collection Station Upgrade	-	-	-	-	$500,000	-	-	-	-	-
Cart Replacement	-	-	-	-	-	-	-	-	-	-
Roll of Containers	-	-	-	-	-	-	-	-	-	-
TOTAL	**$4,300,000**	**$1,200,000**	**$1,000,000**	**$1,100,000**	**$500,000**	**$0**	**$0**	**$0**	**$0**	**$0**

Appendix B
Collection Route Maps

Garbage Pick-Up Days

Garbage Pick-Up Day	Garbage Stops
Monday	Monday
Tuesday	Tuesday
Thursday	Thursday
Friday	Friday

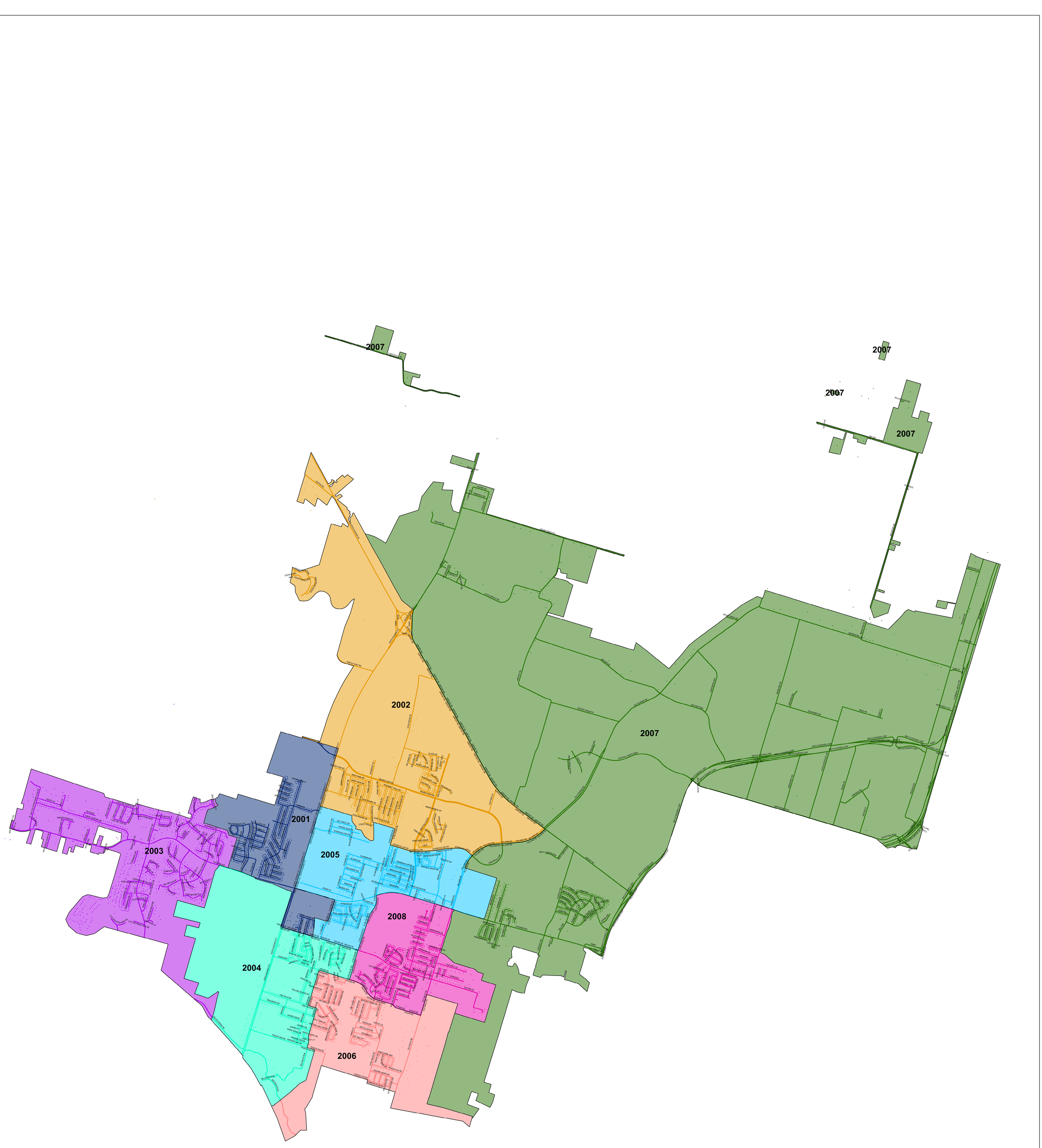
City of Temple



Monday Routes - Garbage

Route Areas	Route Streets	Route Stops
1001	1001	1001
1002	1002	1002
1003	1003	1003
1004	1004	1004
1005	1005	1005
1006	1006	1006
1007	1007	1007
1008	1008	1008

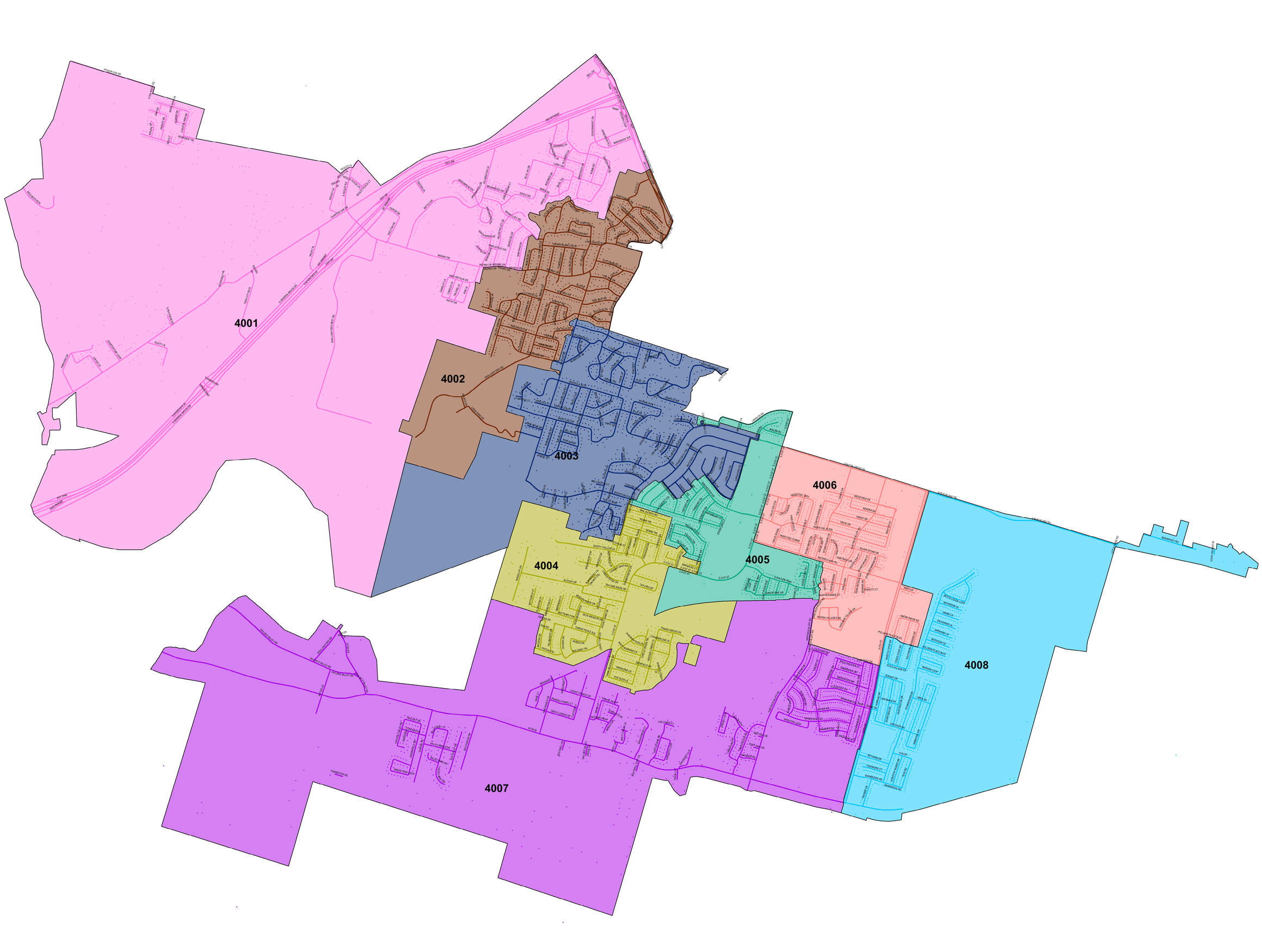
City of Temple



Tuesday Routes - Garbage

Route Areas	Route Streets	Route Stops
2001	2001	2001
2002	2002	2002
2003	2003	2003
2004	2004	2004
2005	2005	2005
2006	2006	2006
2007	2007	2007
2008	2008	2008

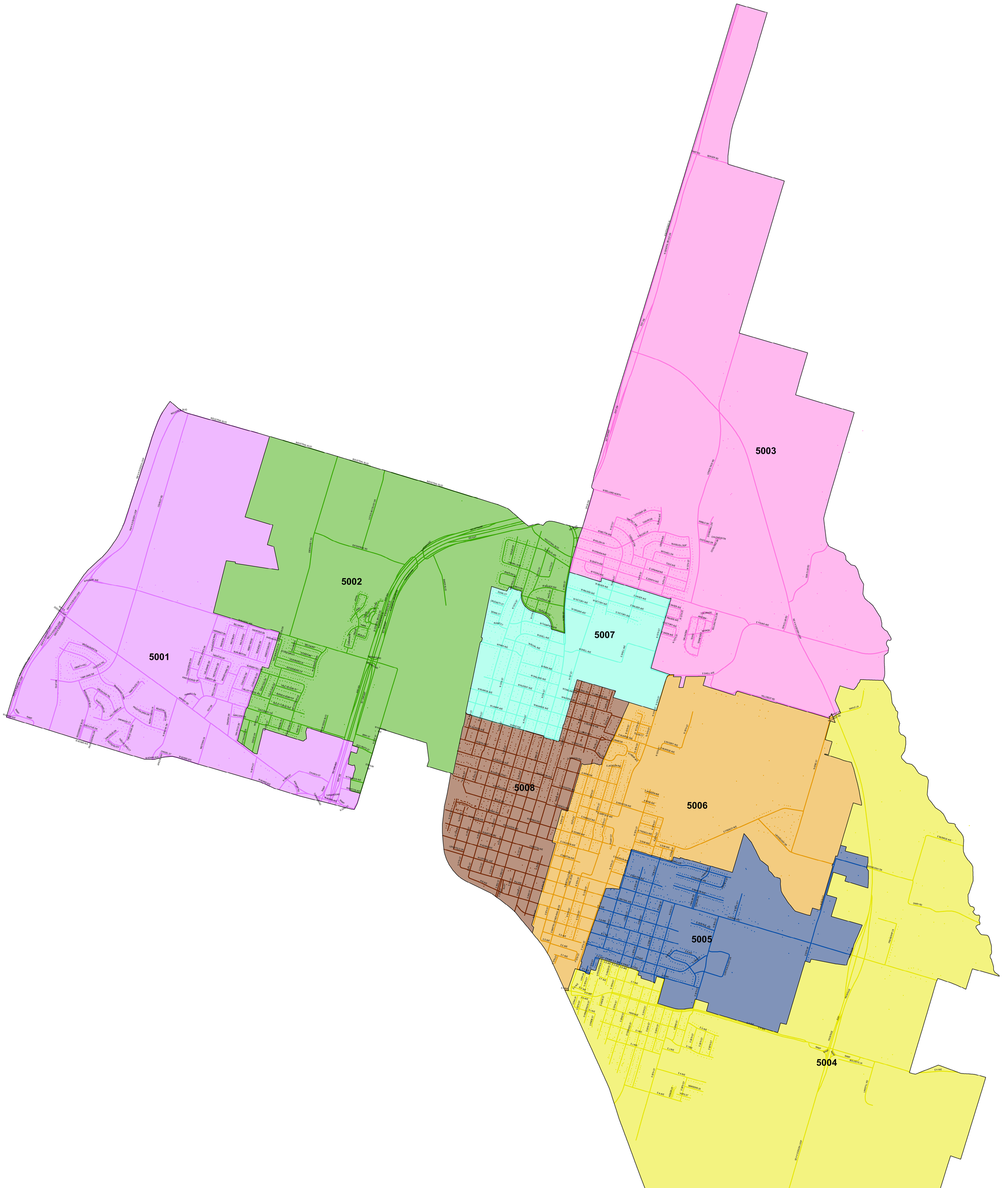
City of Temple



Thursday Routes - Garbage

Route Areas	Route Streets	Route Stops
4001	4001	4001
4002	4002	4002
4003	4003	4003
4004	4004	4004
4005	4005	4005
4006	4006	4006
4007	4007	4007
4008	4008	4008

City of Temple


5001
5002
5003
5004
5005
5006
5007
5008
INDUSTRIAL BLVD
W NUGENT AVE
W AVENUE H
OLEN RD
BERNARD RD
ENTERPRISE RD
W ADAMS AVE
W KENNEDY AVE
W FRANCIS AVE
W WALKER AVE
W VICTORY AVE
W VIRGINIA AVE
W SHELL AVE
W ROYAL AVE
W PARK AVE
W OAKLAND AVE
W NUGENT AVE
W MUNROE AVE
W LAMAR AVE
W KOHL ST
W 57TH ST
W 53RD ST
W 51ST ST
W 49TH ST
W 47TH ST
W 45TH ST
W 43RD ST
W 41ST ST
W 39TH ST
W 37TH ST
W 35TH ST
W 33RD ST
W 31ST ST
W 29TH ST
W 27TH ST
W 25TH ST
W 23RD ST
W 21ST ST
W 19TH ST
W 17TH ST
W 15TH ST
W 13TH ST
W 11TH ST
W 9TH ST
W 7TH ST
W 5TH ST
W 3RD ST
W 1ST ST
W WILLAMS NORTH
E SHELL AVE
E VICTORY AVE
E WALKER AVE
E FRANCIS AVE
E CENTRAL AVE
E ADAMS AVE
E AVE H
E AVE J
E AVE K
E AVE M
E AVE N
E AVE O
E AVE P
E AVE Q
E AVE R
E AVE S
E AVE T
E AVE U
E AVE V
E AVE W
E AVE X
E AVE Y
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E 5TH ST
E 7TH ST
E 9TH ST
E 11TH ST
E 13TH ST
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E 23RD ST
E 25TH ST
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E 29TH ST
E 31ST ST
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E 35TH ST
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E 45TH ST
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E 49TH ST
E 51ST ST
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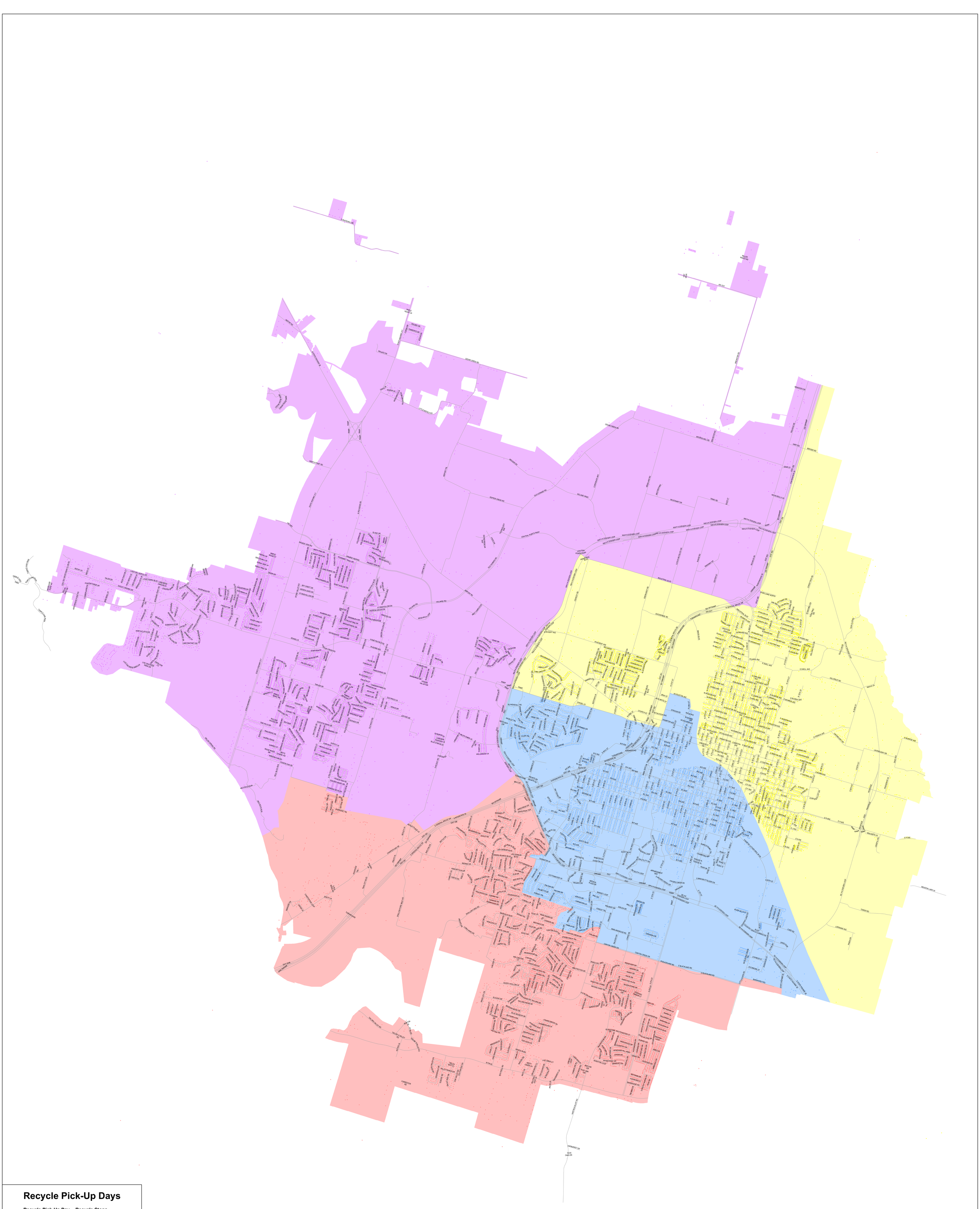
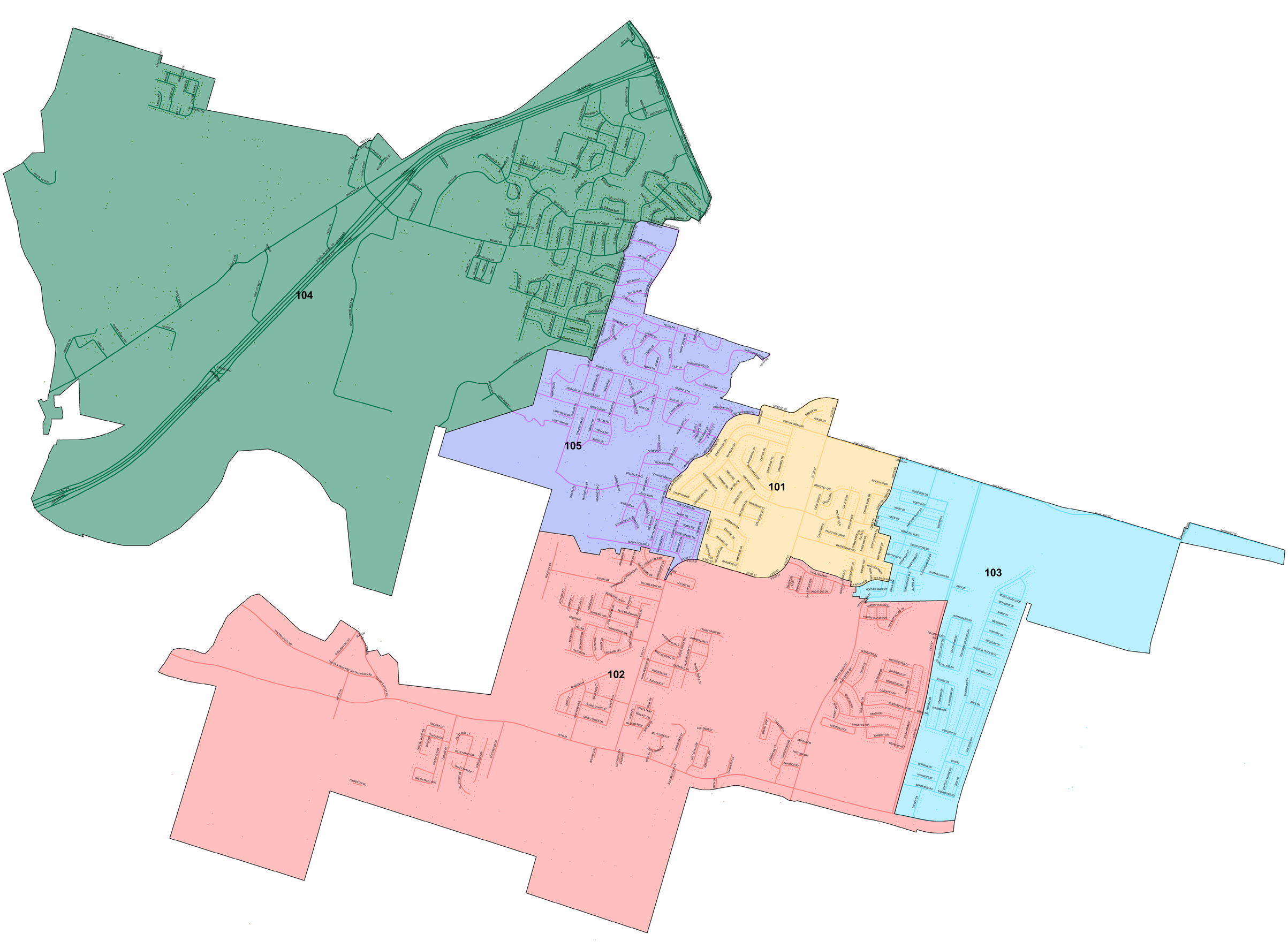
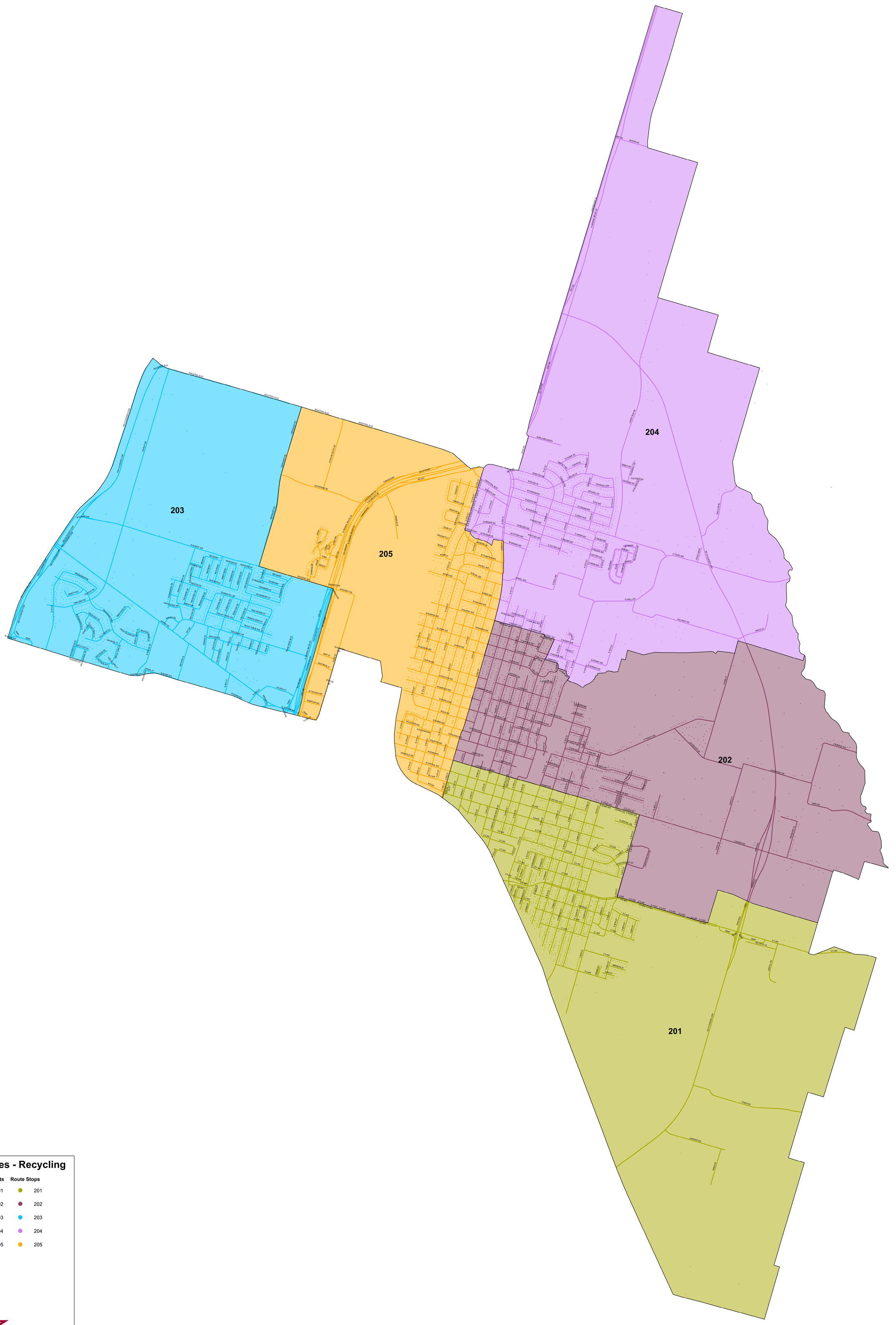

Recycle Pick-Up Days
Recycle Pick-Up Day
Monday
Tuesday
Thursday
Friday
Recycle Stops
Monday
Tuesday
Thursday
Friday
City of Temple



Monday Routes - Recycling

Route Areas	Route Streets	Route Stops
101	101	101
102	102	102
103	103	103
104	104	104
105	105	105

City of Temple



Tuesday Routes - Recycling

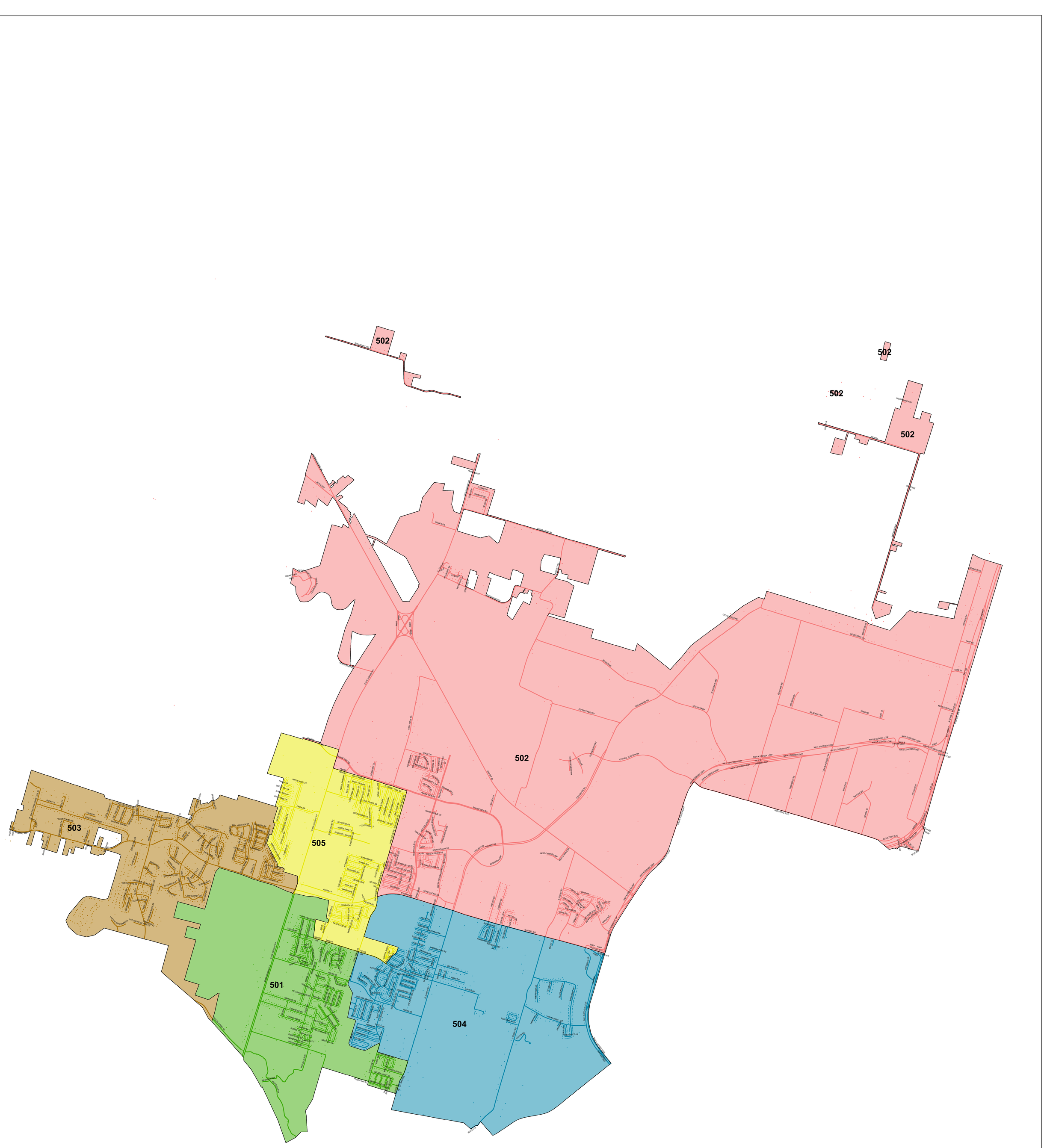
Route Areas	Route Streets	Route Stops
201	201	201
202	202	202
203	203	203
204	204	204
205	205	205

City of Temple

Thursday Routes - Recycling

Route Areas	Route Streets	Route Stops
401	401	401
402	402	402
403	403	403
404	404	404
405	405	405

City of Temple



Friday Routes - Recycling

Route Areas	Route Streets	Route Stops
401	401	401
402	402	402
403	403	403
404	404	404
405	405	405

City of Temple