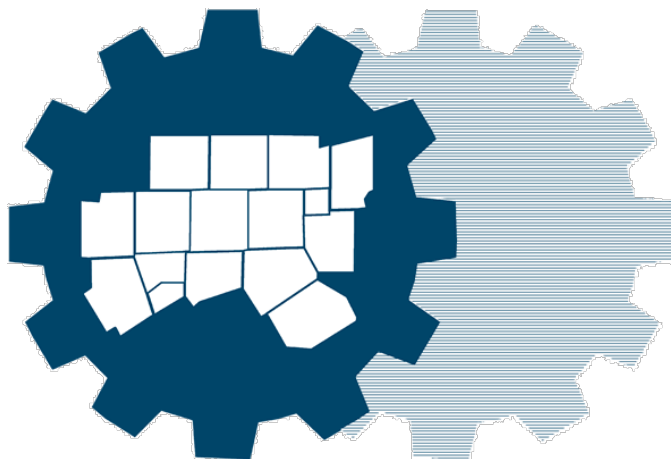


Regional Solid Waste Management Plan



**North Central Texas Council of
Governments**

**Final Draft
11/18/2022**

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LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Name/Phrase/Term</u>
BEV	Battery electric vehicles
BOPA	Batteries, oil, paint, and antifreeze
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
C&D	Construction and demolition
Cal Recycle	The California Department of Resources Recycling and Recovery
CEDS	Comprehensive Economic Development Strategy
COG	Council of governments
CRWD	Construction Recycling & Waste Corporation
CWD	Community Waste Disposal
EDA	Economic Development Administration
GHG	Greenhouse gas
HDPE	High density polyethylene
HHW	Household hazardous waste
LDPE	Low density polyethylene
LFGTE	Landfill gas to energy
LLDPE	Linear low-density polyethylene
MRF	Materials recovery facility
MSW	Municipal solid waste
NCTCOG	North Central Texas Council of Governments
NTMWD	North Texas Municipal Water District
OBD	On-board diagnostics
OCC	Old corrugated cardboard
PAG	Policy Advisory Group
PAYT	Pay-as-you-throw
PET	Polyethylene terephthalate
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
RCC	Resource Conservation Council
RFID	Radio-frequency identification
RMDP	TCEQ Recycling Market Development Plan
RNG	Renewable natural gas
RSWMP	Regional Solid Waste Management Implementation Plan
RSWMP Subcommittee	Regional Management Plan Subcommittee
SEIR	TCEQ Study on the Economic Impacts of Recycling
Survey	Main Volume II Survey
TCEQ	Texas Commission on Environmental Quality
TxDOT	Texas Department of Transportation
USEPA	United States Environmental Protection Agency
UTA	University of Texas at Arlington
Western Region Study	Western Regional Landfill Capacity Study
WRSWMA	Western Region Solid Waste Management Authority

OVERVIEW AND INTRODUCTION

As required by the Texas Commission on Environmental Quality (TCEQ), the North Central Texas Council of Governments (NCTCOG) completed Volume I and Volume II of the Regional Solid Waste Management Plan (RSWMP). Volume I and Volume II, which are required by TCEQ for Councils of Governments (COGs), provide a consistent format for all of the councils of governments in Texas to submit key solid waste and recycling planning details. Additionally, TCEQ provides the opportunity for additional information to be provided via the Volume II Attachments.

This section provides overview of the project approach NCTCOG implemented to develop the RSWMP, describes the Volume II Survey, describes data sources used to develop the RSWMP, communicates the organizational structure of the RSWMP, and provides definitions of key terms used throughout the RSWMP and Volume II Attachments.

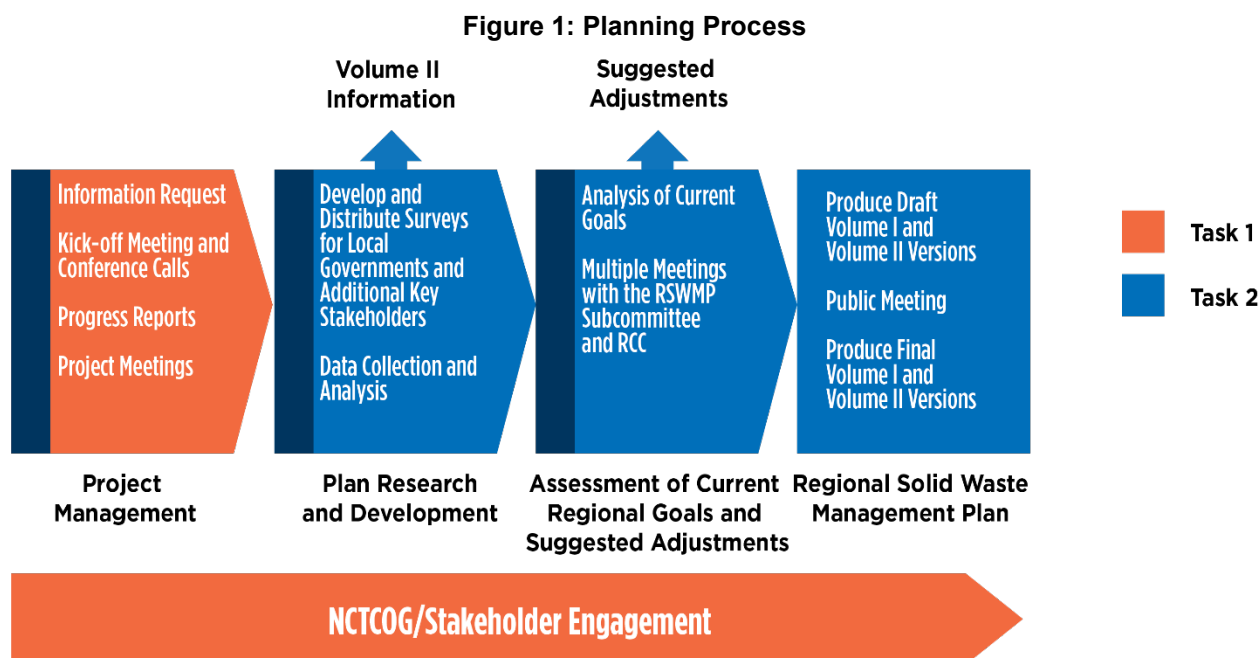
Project Approach

This RSWMP represents a critical step for NCTCOG to consider the technological, institution, legal, social, economic, and environmental factors to support effective material management among its constituent municipalities as regional growth continues and market factors evolve.

Planning for and implementing an integrated solid waste system is a complex and challenging endeavor requiring a collaborative effort. NCTCOG collaborated extensively with the Resource Conservation Council (RCC), whose primary responsibility is to provide support and advice to NCTCOG's Executive Board on material management approaches to conserve, recover, and recycle valuable resources. The RCC is made up of 36 committee members, including individuals from local government, the private sector, and environmental and public interest groups. The RCC established a Regional Management Plan Subcommittee (RSWMP Subcommittee), whose primary purpose is to annually update the RSWMP and provide key insights on ongoing regional planning issues. To support the data analysis, current system assessment, and report preparation, NCTCOG retained Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). Burns & McDonnell has completed several recent solid waste and recycling related projects in the North Central Texas region, including strategic planning efforts for communities and across the state of Texas. Further description of recent and ongoing studies is presented in Data Sources.

Figure 1 summarizes the planning process utilized by NCTCOG and Burns & McDonnell to complete the RSWMP. Task 1 included project management, information request and the kick-off meeting, as well as multiple meetings with the RSWMP Subcommittee, RCC and the NCTCOG Executive Board. Task 2

focused on development of the RSWMP. Through surveys for municipalities in the North Central Texas region and further data collection and analysis, NCTCOG and Burns & McDonnell developed the Volume II information. Then, multiple meetings occurred with the RSWMP Subcommittee and RCC in an effort to analyze current goals and to provide suggested adjustments. After producing Volumes I and II, NCTCOG conducted a public meeting and subsequently produced the final versions of Volumes I and II, incorporating applicable comments from the public and the members of the RCC.



Volume II Survey

The Project Team surveyed municipalities in the region to gather the necessary data to complete Volume II. Using NCTCOG’s contact lists, publicly available municipal information, and Project Team contacts, the Project Team distributed two surveys to municipalities to complete between December 27, 2021 and February 18, 2022. The Project Team distributed a Main Volume II Survey (Survey), requesting data required to complete Volume II, in addition to a Supplemental Volume II Survey requesting data that would be helpful for NCTCOG’s planning efforts, but not necessary to complete Volume II.

In collaboration with NCTCOG, the Project Team completed the following efforts to promote a broad base of communities participation in the Survey:

- Weekly email blasts reminders to NCTCOG’s email lists
- Weekly phone call reminders to NCTCOG contacts
- Targeted emails to Project Team municipal contacts

Survey responses represent approximately 70 percent of the region's population.¹ Cities that responded ranged in population from approximately 450 to more than 1.3 million residents. Additionally, Ellis and Wise Counties completed the survey. The geographic area within the region covered by survey participants is provided in Appendix A – Regional Maps.

Structure of the RSWMP

The structure of the RSWMP follows the format that all Councils of Governments (COGs) in Texas are required to follow per TCEQ instructions. Due to this format, the RSWMP includes the Volume I Form, Volume II Form Tables, Volume II Attachments, followed by three appendices. Descriptions of each of these sections is provided below.

- **Volume I Form.** Volume I Form provides detail related to the updated Goals and Objectives for the North Central Texas region, efforts to minimize waste, reuse, and recycle, and commitments related to the management of solid waste facilities.
- **Volume II Form Tables.** Volume II Form Tables provide an overview on various key solid waste topics in the region, including demographic projections, current and planned practices, facility adequacy, opportunities, recommendations, and other planning details. When applicable, Volume II Form Tables include references to Volume II Attachments, which provide additional detail.
- **Volume II Attachments.** Volume II Attachments correspond with Volume II Form Tables, providing additional detail such as the methodology, key assumptions, and other relevant supporting information, as they apply.
- **Required Approvals.** As a requirement for Attachment IV.B of Volume II, this section provides documentation of the public meeting required for final approval of the RSWMP.
- **Appendix A – Regional Maps.** Appendix A provides a series of maps that represent Survey responses and key information on facilities within the North Central Texas region that are referenced throughout in the Volume II Form Tables and Attachments. These maps include:
 - Map A–1: Survey Responses by Geographic Area
 - Map A–2: Landfills, Transfer Stations, and Citizen Collection Stations in the North Central Texas Region

¹ Surveys completed by counties provided data that was necessary for completing Volume II; however, sections related to collection systems and facility use were predominantly based on Survey responses from cities. The population estimate and map data is based on cities that responded, in order to represent the population and area covered with the greatest amount of detail.

- Map A–3: MRFs, C&D Recycling Facilities, and Mulching and Composting Facilities in the North Central Texas Region
- Map A–4: HHW Collection Facilities, Liquid Waste Treatment Facilities, Medical Waste Treatment Facilities, and Tire Facilities in the North Central Texas Region
- **Appendix B – Implementation Activities by Goal and Objective.** Appendix B provides the 68 implementation activities, organized by NCTCOG’s Goals and Objectives. The Goals and Objectives are introduced in Volume I of the RSWMP and are discussed in Form Table III.L.
- **Appendix C – Material Composition Profiles and Capture Rate.** Appendix C provides detailed information about the composition profile of trash and recycling from single-family generators and the composition of trash from commercial generators. This information is used in the evaluation of current and planned activities provided in Attachment III.C.

References throughout the RSWMP provide guidance on where additional information on a particular topic is provided, as the structure requires summary level discussion (e.g., Volume II Form Tables) to be separated from more detailed discussion (e.g., Volume II Attachments).

Data Sources

The following data sources were utilized to develop the information presented in the RSWMP.

- **RSWMP Volume I Survey.** NCTCOG surveyed municipalities in the region regarding the North Central Texas region’s Goals and Objectives. Feedback received was used to update the Goals and Objectives from NCTCOG’s 2015 RSWMP.
- **RSWMP Volume II Survey.** NCTCOG collaborated with the Project Team to develop and distribute the Survey previously described in the Volume II Survey section.
- **2021 – 2026 Comprehensive Economic Development Strategy (CEDS).**² To fulfill a requirement to designate the North Central Texas region as an Economic Development District, NCTCOG developed the CEDS to establish an economic development strategy to assure that the region is in a position to apply to the federal Economic Development Administration (EDA) Public Works or Economic Adjustment Assistance Programs.
- **Regional Recycling Survey and Campaign.** NCTCOG, with assistance from members of the Project Team, developed a recycling survey in 2018 to collect data regarding the material management practices and composition of residential solid waste in the North Central Texas

² North Central Texas Council of Governments. 2022. “2021-2026 Comprehensive Economic Development Strategy.” Available online: https://www.NCTCOG.org/getmedia/b54a237c-b623-4bec-86c7-4ea6009595be/Draft-2021-2027-CEDS_2.pdf.aspx

region. This data was used to develop an education and outreach campaign to minimize contamination and increase recycling.

- **Western Regional Landfill Capacity Study (Western Region Study).** NCTCOG completed a study in 2021 to better understand the long-term solid waste management needs in the eight western-most counties (Erath, Hood, Johnson, Palo Pinto, Parker, Somervell, Tarrant, and Wise Counties) referred to as the Western Region. The study identified needed actions to develop recycling, transfer station, and landfill infrastructure to ensure disposal capacity is adequate in the Western Region.
- **North Central Texas Organic Waste to Fuel Feasibility Study.** This ongoing study supported by a grant from the U.S. Environmental Protection Agency (USEPA) is a coordinated effort among NCTCOG, University of Texas at Arlington (UTA), and members of the Project Team to explore the potential for organic waste diversion through anaerobic digestion, and renewable natural gas (RNG) technologies in the North Central Texas region.
- **Metroplex Area Sub-Regional Solid Waste Study.** NCTCOG, with assistance from members of the Project Team, completed this study in 2003 to evaluate the long-term availability of disposal capacity in a sub-region of the North Central Texas region consisting of Dallas, Ellis, Johnson, Kaufman, and Tarrant counties (DFW Metroplex) with high projected population growth.
- **Recycling Ordinances and Building Design Guidelines.**³ NCTCOG, with assistance from members of the Project Team, developed guidelines in 2009 for municipalities in the North Central Texas region related to developing ordinances that can be implemented to enhance recycling efforts.
- **TCEQ Solid Waste Annual Reports and Permitting Data.** Owners and operators of municipal solid waste landfills and other waste management facilities submit an annual report to TCEQ each fiscal year (beginning September 1 and ending August 31), detailing the amount and types of solid waste handled at each facility. The data for some facility types are compiled and published in an annual summary report titled Municipal Solid Waste in Texas: A Year in Review⁴, while others are available through TCEQ reporting and permitting databases.

³ North Central Texas Council of Governments. August 2009. "Recycling Ordinances and Building Design Guidelines." Available online: https://www.NCTCOG.org/nctcg/media/Environment-and-Development/Documents/Materials%20Management/Final_Report-Ordinances_Guidelines_August_2009.pdf

⁴Annual Summary of Municipal Solid Waste Management in Texas. Available online: https://www.TCEQ.texas.gov/permitting/waste_permits/waste_planning/wp_swasteplan.html

- **Texas Recycling Market Development Plan (RMDP).**⁵ In 2021, TCEQ published the RMDP to promote the use of recyclable materials as feedstock in processing and manufacturing. The RMDP provides state-level estimates of recycling and landfill disposal quantities statewide and estimates the resulting economic benefits of recycling. The RMDP also provides a plan of recommendations to increase recycling, developed based on the key barriers and opportunities identified across the State. This study built from the TCEQ's prior Study on the Economic Impacts of Recycling.
- **Study on the Economic Impacts of Recycling (SEIR)**⁶. This 2017 study, completed by the TCEQ as outlined in House Bill 2763 of the regular session of the 84th Texas Legislature, documented the quantities of municipal solid waste (MSW) recycled and landfilled in Texas. The report provides a state-level understanding of 2015 recycling and landfill disposal quantities and composition and provides key economic and market trend data. The study also includes comprehensive information and recommendations on funding methods to increase recycling and identified infrastructure needs and opportunities for rural and underserved areas.
- **Local Solid Waste Management Planning Studies and Analysis.** The Project Team has completed or is in the process of completing solid waste planning efforts for municipalities in the North Central Texas region including in Collin, Denton, Dallas, and Tarrant Counties.

Key Terms

This section presents key terms and concepts used throughout the Form Tables, Part II Attachments to provide context for the information and analysis presented in the RSWMP.

Generation, Recycling and Disposal

- **Generation.** Solid waste generation is the total quantity of material collected and disposed among all generator sectors. Total generation is the quantity of material that must be managed through various programs and services.
- **Recycling.** For the purposes of the RSWMP, recycling is defined consistently with Texas Health and Safety Code §361.421(8) to include typical single-stream recyclables, composting, land application of biosolids/sludge, and pyrolysis of post-use polymers; and to exclude source reduction, energy recovery and reuse.

⁵ Texas Commission on Environmental Quality (TCEQ). August 2021. "Recycling Market Development Plan." Available online: <https://www.TCEQ.texas.gov/assets/public/assistance/P2Recycle/Recyclable-Materials/2021%20Recycling%20Market%20Development%20Plan.pdf>

⁶ Texas Commission on Environmental Quality (TCEQ). July 2017. "Study on the Economic Impacts of Recycling." Available online: <https://www.TCEQ.texas.gov/p2/recycle/study-on-the-economic-impacts-of-recycling>.

- **Disposal.** Disposal refers to all remaining solid waste placed in landfills that has not been processed for sale on the secondary material commodity market, composted, or otherwise diverted. Disposed materials include some quantities of solid waste that were not recovered prior to disposal but could potentially be recovered through improvement of recycling programs, policy, infrastructure, or education, outreach, and compliance efforts.

Material Types

- **Municipal Solid Waste (MSW).** MSW refers to the solid waste stream that is generated by everyday activities in homes, institutions such as schools and hospitals, and commercial sources such as restaurants, offices, and small businesses. MSW can be further categorized by material types. Different categories of MSW require different methods of handling for best management practices. MSW does not include hazardous, industrial, agricultural, or mining wastes.
- **Trash.** The portion of MSW that is disposed rather than recycled, reused, or otherwise diverted is referred to as trash.
- **Single-Stream Recycling.** Single-stream recycling refers to materials that are typically accepted through municipal curbside recycling programs, processed through materials recovery facilities (MRFs), and sold as commodities to markets where the material is then repurposed. Recyclables include items such as plastic and glass containers, aluminum and steel cans, cardboard, and other various paper products.
- **Bulky Items.** Bulky items consist of items generated from residential or commercial entities that are too large to be placed inside a customer's regular roll-cart and are collected through brush and bulky item collection programs.
- **Organics.** Organics refers to materials such as brush and yard trimmings and food waste. Depending on processing technology, these materials may be processed together or separately. Organics have the potential to be recycled through composting, mulching, or anaerobic digestion processes.
 - **Brush and Yard Trimmings.** Leaves, grass clippings, yard and garden debris, brush, tree branches, and stumps generated by landscaping maintenance and land-clearing operations.
 - **Food Waste.** Putrescible fruits, vegetables, meats, dairy, coffee grounds, and food-soiled paper products generated by residential, multi-family and commercial sector generators. Pre-consumer food waste is considered kitchen waste from food preparation and post-consumer food waste is plate waste discarded after food has been served. Some food waste is collected by private sectors haulers that provide this service and composted at private sector processing facilities, but most food waste is discarded with refuse.

- **Household Hazardous Waste (HHW).** HHW refers to common household chemicals or other materials such as electronics that should not be disposed of in MSW landfills due to their potential for environmental contamination, health, and safety impacts.
- **Construction & Demolition (C&D) Debris.** C&D debris refers to materials generated from construction and demolition activities and includes building materials (e.g., treated and untreated lumber, wallboard, carpet) and brush and other organics generated during land clearing activities. A portion of C&D debris is recyclable.

Generator Sectors

- **Residential.** The residential sector includes solid waste generated by single-family homes and multi-family complexes.
- **Commercial.** The commercial sector includes solid waste generated by a wide variety of properties, facilities and business operations including offices, retail, restaurants, and institutional entities such as schools, libraries, and hospitals.
- **Industrial.** The industrial sector includes all solid waste generated by manufacturing, wholesale trade, transportation, warehousing, postal services, mining, agriculture, forestry, finishing and hunting.

Solid Waste Management Activities

- **Source Separation.** Source separation refers to separation practices required to manage material streams by material type for disposal, single-stream recycling processing, or other means of recycling (e.g., composting).
- **Collection.** Collection refers to the logistics of removing solid waste (or materials that have been separated for the purpose of recycling) for transport.
- **Handling.** Handling refers to all activities and facilities managing solid waste, including collection, storage, transportation, processing, treatment, resource recovery, and disposal.
- **Storage.** Storage refers to all activities that store solid waste in preparation for further handling, such as material stored at citizen collection stations prior to transportation or bales of processed recyclables warehoused at MRFs prior to being transported to end users.
- **Transportation.** Transportation includes all activities to consolidate and transfer solid waste distances longer than capable by direct hauling from the point of collection.
- **Treatment.** Treatment refers to processing activities such as reducing the hazards associated with a specific waste material, for example medical waste.

- **Resource Recovery.** Resource recovery refers to activities that recover valuable materials from the waste stream.

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REGIONAL SOLID WASTE MANAGEMENT PLAN VOLUME I

Regional Organization Information

Table 1. Organization Information

Name of Council of Government	North Central Texas Council of Governments
Mailing Address	616 Six Flags Dr, Arlington, TX 76011
Website	https://www.NCTCOG.org
Phone Number	(817) 640-3300
Email Address	EandD@NCTCOG.org

Section I. Geographic Scope

Table I.I. Geographic Scope

Names of Member Counties in the Entire Planning Region	Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, Wise
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Section II. Plan Content

II.A. Regional Goals and Objectives

Table II.A. Regional Goals and Objectives

Goal #1 Support Materials Management Education and Training	Objective 1.A. Support outreach and education programs to facilitate long-term increases in source reduction, reuse and recycling. Objective 1.B. Educate the public about proper waste management opportunities and alternatives to reduce illegal dumping. Objective 1.C. Educate the public about proper management and alternative options for Household Hazardous Waste (HHW).
Goal #2 Promote Creation and Expansion of Waste Management Programs	Objective 2.A. Encourage establishment, maintenance and expansion of government, single and multi-family residential, and commercial waste source reduction, reuse, and recycling programs. Objective 2.B. Expand reuse and recycling on construction and demolition materials. Objective 2.C. Expand reuse and recycling of organic material.

	Objective 2.D. Expand existing collection and management alternatives for other wastes and establish and expand new product markets. Objective 2.E. Facilitate the development and implementation of integrated solid waste management plans. Objective 2.F. Promote integrated waste management practices and provide ample, convenient collection, and disposal options in rural and underserved areas.
Goal #3 Measure Regional Waste Reduction Efforts	Objective 3.A. Encourage survey and evaluation techniques to establish baselines and effectively track waste reduction. Objective 3.B. Encourage the maintenance of disposal and processing capacity to meet the needs of the region.
Goal #4 Support and Encourage Innovative Technologies for Other Waste	Objective 4.A. Encourage innovative technologies to reduce, manage, and process emerging waste streams.
Goal #5 Promote Public and Private Sector Partnerships	Objective 5.A. Increase coordination between cities and counties organizational entities to address solid waste needs. Objective 5.B. Increase coordination between cities and counties organizational entities to reduce illegal dumping. Objective 5.C. Evaluate that applicants for state permits demonstrate compliance with the adopted regional solid waste plan. Objective 5.D. Maintain and update the closed and abandoned landfill inventory.

II.B. Efforts to Minimize, Reuse, and Recycle Waste**Table II.B. Waste Minimization, Reuse, and Recycling**

Subject	Description
Current Efforts to Minimize Municipal Solid Waste and to Reuse or Recycle Waste	Based on municipal responses from the Volume II Survey (Survey) completed for the Regional Solid Waste Management Plan (RSWMP), at least 5.3 million residents in the North Central Texas region receive curbside recycling collection and 2.4 million receive yard trimmings collection (separate from trash), representing 67 and 30 percent of the total region's population, respectively. In less populated areas of the region, curbside collection becomes more of a challenge due to factors such as increased collection route distances. In these areas, residents are largely served by citizen collection stations. There are at least 17 total citizen collection stations in the North Central Texas region. Based on Survey responses, there are additional efforts in the region to recycle electronics, household hazardous waste (HHW), tires, and sludge. Municipalities in the region have also focused efforts to increase reuse and waste reduction primarily through education (e.g., discouraging use of single-use items) rather than policy.
Recycling Rate Goal for the Region	Based on a 2020 waste characterization study completed by NCTCOG, 28.7 percent of single-stream recycling generated in the North Central Texas region by single-family residents is captured and processed for recycling, representing the capture rate. Increasing the average residential capture rate of single-stream recycling (including material generated by both single- and multi-family residents) to 60 percent over the next 15 years would increase the residential recycling rate in the region from 14.4 percent to 24.6 percent. Further development of organics recycling programs in the region during this timeframe would further increase the recycling rate. The North Central Texas region currently has a 27.0 percent recycling rate across generator types (residential, commercial, and industrial) based on tonnage tracked and reported by TCEQ. NCTCOG has a goal of recovering an additional 10 percent of what is currently being disposed of over the next 15 years. This results in an overall recycling rate goal of 34.3 percent. The region has programs aimed at increasing recycling and will continue to improve these programs and make progress in the future.

Subject	Description
Recommendations for Encouraging and Achieving a Greater Degree of Waste Minimization and Waste Reuse or Recycling	In the short-term planning period (2022 – 2027), NCTCOG will adopt the following recommendations to achieve a greater degree of waste minimization, waste reuse, and recycling: 1. Continue educating residents and facilitating regional collaboration 2. Promote best management practices, including C&D and HHW management 3. Support commercial recycling 4. Promote recycling market development and innovation in source reduction and reuse 5. Support organics recycling, including food waste 6. Address limited access to disposal capacity In the intermediate and long-range planning period (2028 – 2042), NCTCOG will aim to further assist municipalities in developing policies related to commercial recycling, organics recycling, C&D recycling, illegal dumping and proper HHW management, as needed.
Existing or Proposed Community Programs for the Collection of Household Hazardous Waste	Generally, the region has one of the most extensive networks of HHW facilities in Texas (e.g., Cities of Denton, Fort Worth, Frisco, and Dallas County), many of which are operated as regional programs through interlocal agreements and cooperation. There are presently eight HHW facilities in the North Central Texas region. Several cities in the North Central Texas region are exploring options to expand HHW programs, including the acceptance of additional hard-to-recycle materials as well as options to expand access to existing programs through interlocal agreements.
Composting Programs for Yard Waste	The recommended composting programs for yard waste and related organic wastes may include: ☒ (I) creation and use of community composting centers; ☒ (II) adoption of the "Don't Bag It" program for lawn clippings developed by the Texas Agricultural Extension Service; and ☒ (III) development and promotion of education programs on home composting, community composting, and the separation of yard waste for use as mulch.
Public Education/Outreach	The NCTCOG's Know What To Throw education and outreach campaign was developed and implemented to help municipalities improve capture rates and reduce contamination by streamlining recycling messaging. NCTCOG will adapt the Know What To Throw campaign's

Subject	Description
	messaging to include yard waste and organics as more municipalities in the region develop collection programs for these materials.

II.C. Commitment Regarding the Management of MSW Facilities

By checking the boxes below, the Council of Government makes a commitment to the following, regarding the management of MSW facilities:

- ☒ (i) encouraging cooperative efforts between local governments in the siting of landfills for the disposal of solid waste;
- ☒ (ii) assessing the need for new waste disposal capacity;
- ☒ (iii) considering the need to transport waste between municipalities, from a municipality to an area in the jurisdiction of a county, or between counties, particularly if a technically suitable site for a landfill does not exist in a particular area;
- ☒ (iv) allowing a local government to justify the need for a landfill in its jurisdiction to dispose of the solid waste generated in the jurisdiction of another local government that does not have a technically suitable site for a landfill in its jurisdiction;
- ☒ (v) completing and maintaining an inventory of MSW landfill units in accordance with Texas Health and Safety Code, §363.0635. One copy of the inventory shall be provided to the commission and to the chief planning official of each municipality and county in which a unit is located; and
- ☒ (vi) developing a guidance document to review MSW registration and permit applications to determine conformance with the goals and objectives outlined in *Volume II: Regional Solid Waste Management Plan Implementation Guidelines* as referenced in 30 TAC §330.643.

Section III. Required Approvals

Table III.I. Required Approvals

Solid Waste Advisory Committee	July 29, 2022
Public Meeting Dates	June 30, 2022
Executive Committee	August 25, 2022

REGIONAL SOLID WASTE MANAGEMENT PLAN VOLUME II

Regional Organization Information

Table 1. Organization Information

Name of Council of Government	North Central Texas Council of Governments
Mailing Address	616 Six Flags Dr, Arlington, TX 76011
Website	https://www.NCTCOG.org
Phone Number	(817) 640-3300
Email Address	EandD@NCTCOG.org

Section I. Geographic Scope

Table I.I. Geographic Scope

I.A. Names of Member Counties in the Entire Planning Region	Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, Wise
I.B. Geographic Planning Units Used in the Regional Implementation Plan	☐ Small geographic areas such as census tracts or city boundaries for the most detailed data collection and manipulation; ☐ Planning areas to be used for the assessment of concerns and the evaluation of alternatives. These planning areas shall be aggregations of small geographic areas; ☐ County boundaries for the summarization and presentation of key information; or ☒ The entire planning region

Section II. Planning Periods

Table II.I. Planning Periods

II.A.1. Current and Historical Information	The current planning year corresponding with the North Central Texas Council of Governments (NCTCOG) Regional Solid Waste Management Plan (RSWMP) is 2022. Goals and Objectives developed as part of the RSWMP correspond with the current planning year (2022) and are updated in collaboration with municipalities in the North Central Texas region each time the RSWMP is updated. NCTCOG has 68 implementation activities for the current planning period, organized by Goal and Objective. The following set of bullets is a sample of five implementation activities. The full list of implementation activities is provided in Appendix B. • Promote the exchange of information and education between local governments, private sector, public, and other stakeholders about regional source reduction, reuse, recycling, product stewardship, and other appropriate and emerging materials management topics • Provide regional training opportunities to share knowledge and best management practices, collect case studies, and provide a regional information clearinghouse to reduce litter and illegal dumping • Promote public and private sector use of environmentally friendly goods and services • Encourage city and county programs that promote and provide opportunities for residents to participate in source reduction, recycling, composting, and waste diversion programs (e.g., composting facilities, electronics and pharmaceutical take-back programs, food waste programs, etc.) • Support development and implementation of ordinances, building codes, and other regulatory and non-regulatory measures to encourage greater construction and demolition materials reuse and recycling opportunities
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II.A.2. Short-range Planning Period	The short-range planning period is 2022 – 2027. Within the short-range planning period, the current planning period’s Goals & Objectives may either remain in place or be further refined with input from municipalities in the North Central Texas region, depending on whether the next RSWMP is completed before 2028. The following bullets represent high-level implementation activities corresponding with the short-range planning period and are consistent with the Recommendations described in Form Table III.G. • Continue educating residents and facilitating regional collaboration • Promote best management practices, including C&D and HHW management • Support commercial recycling • Promote recycling market development and innovation in source reduction and reuse • Support organics recycling, including food waste • Address limited access to disposal capacity
II.A.3. Intermediate Planning Period	The intermediate planning period is 2028 – 2032. Within the intermediate planning period, the current Goals & Objectives will be further refined with input from municipalities in the North Central Texas region. Within the intermediate planning period, NCTCOG will aim to further assist municipalities in developing policies related to commercial recycling, organics recycling, C&D recycling, illegal dumping and proper HHW management, as needed.
II.A.4. Long-range Planning Period	The long-range planning period is 2033 – 2042. Materials used in the long-range planning period are subject to significant change and planning for this period must be adaptable. NCTCOG will plan to maintain the approach to implementation activities described in the intermediate planning period within the long-range planning period and adapt these actions in response to changes in material management needs.
☒ Check box if additional details provided in <i>Attachment II.A.</i>	

Section III. Plan Content

III.A Demographic Information

Table III.A.I. Residential Waste Generation

Year	Growth Rate per Year	Current Population/ Population Projection	Landfill Disposal (Tons)	Disposal Rate (lbs./Person/Day)	Recycling (Tons)	Recycling Rate (lbs./Person/Day)	Residential Waste Generation (Tons)
Current (2022)	1.67%	8,006,301	4,280,099	2.93	721,045	0.49	5,001,143
2027	1.67%	8,696,657	4,649,157	2.93	783,218	0.49	5,432,375
2032	1.67%	9,446,540	5,050,038	2.93	850,752	0.49	5,900,790
2037	1.67%	10,261,083	5,485,486	2.93	924,110	0.49	6,409,595
2042	1.67%	11,145,861	5,958,480	2.93	1,003,792	0.49	6,962,273

Table III.A.II. Commercial Waste Generation

Year	Description of significant commercial activities affecting waste generation and disposal in the area.				Expected increase or decrease to Commercial Waste Generation																																					
2022	There are an estimated 3.5 million employees in commercial (i.e., non-industrial) industries in the North Central Texas region. The ranking of commercial industries, by number of employees, is summarized in the table below: <table><tr><th>Rank</th><th>Industry</th><th>Employees</th><th>%</th></tr><tr><td>1</td><td>Trade, Transportation, and Utilities</td><td>876,600</td><td>25%</td></tr><tr><td>2</td><td>Professional and Business Services</td><td>722,100</td><td>21%</td></tr><tr><td>3</td><td>Education and Health Services</td><td>483,500</td><td>14%</td></tr><tr><td>4</td><td>Government</td><td>453,200</td><td>13%</td></tr><tr><td>5</td><td>Leisure and Hospitality</td><td>392,400</td><td>11%</td></tr><tr><td>6</td><td>Financial Activities</td><td>360,700</td><td>10%</td></tr><tr><td>7</td><td>Other Services</td><td>126,800</td><td>4%</td></tr><tr><td>8</td><td>Information</td><td>85,600</td><td>2%</td></tr></table> The North Central Texas region is currently home to 24 Fortune 500 Headquarters, 44 Fortune 1000 Headquarters, three Fortune 10 Companies, and three Global 25 Companies. According to the Dallas Regional Chamber, over the last five years, the region has created 300,000 new jobs. Additionally, as part of a Strength, Weakness, Opportunity, and Threat (SWOT) analysis completed by NCTCOG for its <u>Comprehensive Economic Development Strategy (CEDS)</u>, the region benefits from:				Rank	Industry	Employees	%	1	Trade, Transportation, and Utilities	876,600	25%	2	Professional and Business Services	722,100	21%	3	Education and Health Services	483,500	14%	4	Government	453,200	13%	5	Leisure and Hospitality	392,400	11%	6	Financial Activities	360,700	10%	7	Other Services	126,800	4%	8	Information	85,600	2%	Commercial Tons (2022)	
					Rank	Industry	Employees	%																																		
					1	Trade, Transportation, and Utilities	876,600	25%																																		
					2	Professional and Business Services	722,100	21%																																		
					3	Education and Health Services	483,500	14%																																		
					4	Government	453,200	13%																																		
					5	Leisure and Hospitality	392,400	11%																																		
					6	Financial Activities	360,700	10%																																		
					7	Other Services	126,800	4%																																		
					8	Information	85,600	2%																																		
Disposed	6,271,540																																									
Recycled	3,326,401																																									
Generated	9,597,941																																									
Employee Count (2022)	3,500,900																																									
Projected Annual Growth Rate (2022 – 2042)	1.67%																																									

	• High quality of life • Capacity for growth (land) • Multiple airports • A unique and strong mix of tourist attractions		
2027	New technologies, tools, ways of working, and opportunities for innovation related to commercial activities are expected to continue in the short-range planning period. The CEDS Committee, consisting of municipal, business, and educational representatives with the North Central Texas region, reached a strong consensus about the need for the region to develop innovation-based sub-regional clusters of industries, as well as support efforts to attract new and expanding businesses while retaining existing businesses. The sub-regional clusters will influence the types of businesses that will be encouraged to grow within the clusters, and correspondingly, will influence the types and amounts of material generated throughout the North Central Texas region. Further detail about the sub-regional clusters is described in Appendix C of the CEDS.	Commercial Tons (2027)	
		Disposed	6,812,314
		Recycled	3,613,225
		Generated	10,425,539
		Employee Estimate (2027)	3,802,771
2032	New technologies, tools, ways of working, and opportunities for innovation related to commercial activities are expected to continue in the intermediate planning period. As identified in the CEDS, NCTCOG is planning to address the current lack of a comprehensive, long-term approach to transportation (e.g., updating highways) in the North Central Texas region. Generation of material in the intermediate planning period will be influenced by the approach taken to address transportation needs.	Commercial Tons (2032)	
		Disposed	7,399,717
		Recycled	3,924,782
		Generated	11,324,498
		Employee Estimate (2032)	4,130,671
2037	New technologies, tools, ways of working, and opportunities for innovation related to commercial activity are expected to continue in the long-range planning period. The North Central Texas region can be expected to address various long-term opportunities identified in the CEDS to continue developing a strong economy for commercial activity, including efforts to: • Enhance communication and partnerships with the hospitality and tourism sectors • Embrace emerging technologies • Continue to develop and emphasize programs at local schools to make them more job-ready for employment These factors will influence commercial material generation in the long-term.	Commercial Tons (2037)	
		Disposed	8,037,769
		Recycled	4,263,202
		Generated	12,300,971
		Employee Estimate (2037)	4,486,844
2042	New technologies, tools, ways of working, and opportunities for innovation related to commercial activity are expected to continue in the long-range planning period, through 2042 and beyond. Efforts to continue developing a strong economy are expected to	Commercial Tons (2042)	
		Disposed	8,730,838
		Recycled	4,630,804
		Generated	13,361,642

	continue. Material types used in commercial activities in the long-range planning period may differ significantly from current material types.	Employee Estimate (2042)	4,873,730

Table III.A.III. Industrial Waste Generation

Year	Description of significant industrial waste activities affecting waste generation and disposal in the area.	Expected increase or decrease to Industrial Waste Generation	
2022	There are an estimated 583,500 employees in industrial industries in the North Central Texas region, including manufacturing, mining, logging, agriculture, and other industries related to the production of goods or raw materials. The DFW Metroplex (including Dallas, Ellis, Johnson, Kaufman, and Tarrant counties) has more manufacturing activity than any other metro area in Texas. The North Central Texas region has been able to recently attract world-class businesses (e.g., Toyota Motor Manufacturing) due to its high quality of life. The types of manufacturing within the North Central Texas region are varied; goods built in the region range from boots to aerospace components, corresponding with a varied material stream.	Industrial Tons (2022)	
		Disposed (Includes Tons Disposed in MSW Landfills and other facilities)	792,426
		Recycled	158,519
		Generated	950,945
		Employee Count (2022)	583,500
		Projected Annual Growth Rate (2022 - 2042)	1.67%
2027	The emergence of new technologies, tools, ways of working, and opportunities for innovation related to industrial activities is expected to continue in the short-range planning period. High tech infrastructure, logistics, and manufacturing are targeted industry clusters for the urban Metroplex region according to the Dallas Regional Chamber. Growth of these industries within the Metroplex will influence material generation, based on the exact business types recruited to the region.	Industrial Tons (2027)	
		Disposed (Excludes Tons Disposed in MSW Landfills)	860,754
		Recycled	172,187
		Generated	1,032,941
		Employee Estimate (2027)	633,813

Year	Description of significant industrial waste activities affecting waste generation and disposal in the area.	Expected increase or decrease to Industrial Waste Generation	
2032	New technologies, tools, ways of working, and opportunities for innovation related to commercial activities are expected to continue in the intermediate planning period. As identified in Form Table III.A.II., NCTCOG is planning to address the current lack of a comprehensive, long-term approach to transportation, and as noted in the CEDS, there is a need for upgraded roads and highways within North Central Texas region. The approach taken to upgrade this infrastructure may have a significant impact on material generation.	Industrial Tons (2032)	
		Disposed (Excludes Tons Disposed in MSW Landfills)	934,974
		Recycled	187,034
		Generated	1,122,008
		Employee Estimate (2032)	688,465
2037	New technologies, tools, ways of working, and opportunities for innovation related to industrial activity are expected to continue in the long-range planning period. The North Central Texas region can be expected to address various opportunities identified in the CEDS to continue developing a strong economy for industrial activity, including efforts to: • Build infrastructure for the future • Increase industrial investment in job creation These factors will influence industrial material generation in the long-term.	Industrial Tons (2037)	
		Disposed (Excludes Tons Disposed in MSW Landfills)	1,015,593
		Recycled	203,162
		Generated	1,218,755
		Employee Estimate (2037)	747,829
2042	New technologies, tools, ways of working, and opportunities for innovation related to industrial activity are expected to continue in the long-range period, through 2042 and beyond. Efforts to develop a strong economy are expected to continue. Material types used in industrial activities in the long-range planning period may differ significantly from current material types.	Industrial Tons (2042)	
		Disposed (Excludes Tons Disposed in MSW Landfills)	1,103,165
		Recycled	220,680
		Generated	1,323,844
		Employee Estimate (2042)	812,311

III.B. Estimates of Current and Future Solid Waste Amounts by Type

Waste Type	Number of Landfills Accepting Waste Type	Percent of Total Tons Disposed	Current Year	5-year Projection (tons)	10-year Projection (tons)	15-year Projection (tons)	20-year Projection (tons)
Municipal	16	68%	7,648,806	8,309,172	9,026,552	9,805,867	10,652,465
Brush	5	1%	58,096	63,112	68,561	74,480	80,910
Construction or Demolition	19	18%	1,995,751	2,168,056	2,355,237	2,558,579	2,779,476
Litter	3	0%	433	470	511	555	603
Class 1 Non-hazardous	2	0%	34,935	37,951	41,228	44,787	48,654
Classes 2 and 3 Non-hazardous	13	6%	645,469	701,196	761,735	827,500	898,943
Incinerator Ash	0	0%	-	-	-	-	-
Treated Medical Waste	3	0%	14,450	15,697	17,053	18,525	20,124
Municipal Hazardous Waste from CESQGs	1	0%	3,702	4,021	4,368	4,746	5,155
Regulated Asbestos-containing Material (RACM)	3	0%	36,964	40,156	43,623	47,389	51,480
Non-RACM	4	0%	2,741	2,978	3,235	3,514	3,818
Dead Animals	11	0%	5,795	6,296	6,839	7,430	8,071
Sludge	14	3%	364,515	395,985	430,173	467,312	507,658
Grease Trap Waste	0	0%	-	-	-	-	-
Grit Trap Waste	3	0%	-	-	-	-	-
Septage	1	0%	2,398	2,605	2,830	3,074	3,339
Contaminated soil	8	3%	358,344	389,282	422,891	459,402	499,065
Tires (split, quartered, shredded)	3	0%	12,028	13,066	14,194	15,420	16,751
Pesticides	0	0%	-	-	-	-	-
Used Oil Filter	0	0%	-	-	-	-	-
Other	7	0%	47,615	51,726	56,192	61,043	66,314
Total	N/A	100%	11,232,043	12,201,771	13,255,221	14,399,622	15,642,826
☒ Check box if additional details provided in <i>Attachment III.B.</i>							

III.C. Estimates of Current and Future Solid Waste Management Activities

Table III.C.I. Current Solid Waste Management Activities in the Region

Activity	Description
Generation	Waste in the North Central Texas region is generated by residents, commercial entities, and industrial entities. The residential sector (including both single- and multi-family homes) generates municipal solid waste (MSW). The commercial sector also generates a portion of total MSW and all other material types identified in Form Table III.B., excluding Class 2 and 3 non-hazardous waste. The industrial sector generates Class 1, 2, and 3 non-hazardous waste, as well as other materials. Further detail related to material generation is provided, by sector, in Form Table III.B. Attachment III.C. provides additional detail related to generation practices in the North Central Texas region, as well as practices related to all other activities (i.e., source separation, collection, etc.) described in Form Tables III.C.I and III.C.II.
Source Separation	Source separation refers to separation practices required to manage material streams for disposal, single-stream recycling processing, or other means of recycling (e.g., composting, material sent directly to a processor for re-manufacturing). The residential sector separates materials via curbside collection (e.g., bags, carts, brush/bulky item set outs), dumpsters (multi-family homes only), and citizen collection stations. There are at least 17 citizen collection stations in the North Central Texas region. The commercial sector source separates using carts, dumpsters, roll-offs and other methods, including back-hauling (e.g., retailers self-hauling bales of cardboard in from retail locations back to distribution centers where they are aggregated for processing). Industrial sector source separates using dumpsters, roll-offs, back-hauling, and other methods.
Collection	Collection is provided by municipalities and private haulers that collect material from generators. Curbside collection from residents is provided using automated or semi-automated side-load collection vehicles, semi-automated or manual rear-load collection vehicles, or collection vehicles with knuckleboom crane equipment that can pick up bulk items. Multi-family homes may receive collection from front-load collection vehicles. The frequency of residential collection for trash, single-stream recycling, yard waste, and bulk item collection is provided in Attachment III.C. Collection from commercial and industrial entities is provided using front-loading vehicles and roll-off collection vehicles.

Activity	Description
	Citizen collection centers are serviced with the same types of vehicles and equipment used to provide service to commercial and industrial entities. Based on the Volume II Survey results (further discussed in the Overview and Introduction), there are currently 10 municipally-operated collection systems in the North Central Texas region that serve residential customers. Four of these municipal collection programs serve commercial customers as well. There are also several large private haulers providing residential and commercial collection service in the North Central Texas region and many other smaller private-sector haulers. There are at least 17 total citizen collection stations in the North Central Texas region.
Handling	Handling refers to all activities and facilities managing solid waste, including collection, storage, transportation, processing, treatment, resource recovery, and disposal. All identified MSW facilities and transporters perform handling activities, which total at least 209 entities. Specific handling activities (i.e., storage, transportation, processing, treatment, resource recovery and disposal) are described in more detail in the respective sections of this Form Table.
Storage	Storage refers to all activities to store material and prepare it for transportation, including management of separate material types (e.g., trash, single-stream recycling, etc.). Regulations and permit conditions specify the amount of time and methods by which materials can be safely stored at facilities. There are presently at least 122 facilities identified in the North Central Texas region that may perform storage activities. There is not currently data available concerning the amount of material or how long material is stored at these facilities.
Transportation	Transportation includes all activities to consolidate and transfer materials to a facility, rather than hauling from the point of collection. Collection vehicles may either haul material directly to a resource recovery or disposal facility (referred to as “direct haul”) or utilize a transfer station, which aggregates material into larger transfer trailers for more efficient transportation (referred to as “long haul”). There are presently 17 active transfer stations in the North Central Texas region. In 2020, these transfer stations facilitated the transport of approximately 1.8 million tons of material. There are also 93 entities registered with TCEQ for the storage and transport of tires in the region.
Processing	Processing includes all facilities that transfer, shred, grind, bale, salvage, separate, dewater, reclaim, and/or otherwise prepare solid waste materials for treatment or resource recovery activities. There are presently at least 88 identified processing facilities in

Activity	Description
	the North Central Texas region, described in the treatment and resource recovery sections of this Form Table.
Treatment	Treatment includes any processing activities that reduce the hazards associated with a specific waste material, such as household hazardous waste (HHW), liquid waste, and medical wastes. There are presently 8 liquid waste facilities, 2 medical waste facilities, and 9 HHW facilities in the North Central Texas region.
Resource Recovery	Resource recovery includes all activities that recover valuable materials from the waste stream. There are presently 11 MRFs, at least 27 composting facilities, 1 C&D recycling facility, 9 HHW permanent facilities (and 6 other collection programs), and 20 tire processing/recycling facilities in the North Central Texas region performing resource recovery activities by diverting materials that can be processed and used as feedstock for the creation of saleable product. Resource recovery activities also include the production and recovery of energy from waste material. There are gas-to-energy projects at 10 landfills in the North Central Texas region, half of these projects produce high-BTU RNG for distribution off-site and half produce electricity. There are also 3 facilities recovering energy from waste tires. In 2021, resource recovery activities resulted in an estimated total of 5.8 million tons of recycling (including single-stream, organics, C&D, tires, HHW, industrial, and other materials). Resource recovery activities also produced 255 gigawatt-hours of electricity for sale to the grid and 10 billion cubic feet of renewable natural gas (RNG) from LFGTE projects.
Disposal of Solid Waste	Disposal refers to the landfill disposal of materials that cannot be recycled or otherwise diverted. There are presently 18 active Type I landfills and 4 Type IV landfills in the North Central Texas region. In 2021, an estimated 11 million tons of materials were disposed in landfills in the region.

Table III.C.II. Planned Solid Waste Management Activities in the Region

Activity	Description
Generation	A 1.67 percent annual population growth rate is estimated in the North Central Texas region from 2022 - 2042, corresponding with a 1.67 percent annual increase in residential material generation. Projections for commercial, and industrial employee growth rates are also estimated to be 1.67 percent annually from 2022 - 2042, corresponding with a 1.67 percent annual increase in commercial and industrial material generation.
Source Separation	There are planned activities to increase source separation among residential, commercial, and industrial sectors in the North Central Texas region, including

Activity	Description
	separation of single-stream recycling, bulky items, organics, HHW and electronics. To increase source separation from residential generators, NCTCOG is planning to leverage its ongoing Know What To Throw education and outreach campaign to increase the capture rate of single-stream recycling from residential curbside collection programs (i.e., increase the rate of recyclable materials being captured for recycling processing). Additionally, NCTCOG will support the development or expansion of citizen collection stations to separately manage single-stream recycling or other materials (e.g., organics). Source separation of materials is more challenging to provide in the commercial/industrial sectors but could be increased by supporting municipalities to explore exclusive/non-exclusive franchising or hauler licensing programs that require commercial haulers to provide source separated collection of single-stream or organics materials. Based on regional Solid Waste Grant funding allocated by TCEQ, the City of Arlington is implementing a contamination reduction campaign focused on creating equitable access to recycling and the City of Southlake is developing a cardboard drop-off station.
Collection	There are planned activities to increase the number of collection vehicles fueled by alternative fuels such as Renewable Natural Gas (RNG) or Battery Electric Vehicles (BEVs). NCTCOG plans to support the diversion of residential and commercial food waste and wastewater biosolids and to generate RNG as a source of vehicle fuel, subject to the forthcoming findings of its Organic Waste to Fuel Feasibility Study. As municipalities in the North Central Texas region seek to increase recycling from the commercial sector, there are planned activities to increase the requirements for service provision and data reporting for private-sector collection operators servicing commercial/industrial sector generators. There are planned activities to increase the integration of on-board vehicle technology for service validation, safety and data collection and reporting (e.g., participation rates, etc.). Some municipalities in the North Central Texas region are revising development code and/or the process by which permits are reviewed to avoid the creation of challenging collection environments (e.g., inaccessible alleys, dead ends).
Handling	Planned handling activities (i.e., storage, transportation, processing, treatment, resource recovery and disposal) are described in more detail in the respective sections of this Form Table.
Storage	There are no planned activities for storage facilities in the North Central Texas region.
Transportation	There is currently one pending TCEQ permit application for the development of a new transfer station, the Highway 24 Transfer Station (Permit MSW-2411) in Hunt County. The facility would be authorized to accept MSW, C&D, Class 2 and 3 non-hazardous industrial waste, and some special wastes for transport to landfill for disposal. There are also ongoing planning discussions to site a fourth North Texas Municipal Water District (NTMWD) transfer station to address capacity issues. These facilities are planned to take residential and commercial sector materials. Additionally, as the existing transfer capacity continues to age

Activity	Description
	larger municipalities (e.g., City of Dallas) are planning to upgrade facilities to manage multiple material streams more effectively (e.g., trash, single-stream recycling, organics).
Processing	There are a total of five planned processing facilities with pending permits, and additional known planned processing activities. Further description of planned processing facilities is provided in the treatment and resource recovery sections of this Form Table.
Treatment	There is currently one pending TCEQ permit application for the development of a new medical waste processing facility, a Safety-Kleen Systems (Clean Harbors Environmental Services) facility in Denton County. Several cities in the North Central Texas region are exploring options to expand HHW programs, including the acceptance of additional hard-to-recycle materials as well as options to expand access to existing programs through interlocal agreements. Based on regional solid waste grant funding allocated by TCEQ, the City of Frisco is exploring greater efficiencies in transportation of re-manufacturing paint, Kaufman County is hosting HHW collection events for residents, Collin County is installing cameras to reduce illegal dumping, and City of Rowlett is increasing compliance efforts to reduce illegal dumping.
Resource Recovery	There are no pending permits for resource recovery facilities in the North Central Texas region. There is at least one recycling processor looking to build new technologically-advanced MRF in the North Central Texas region. Based on regional solid waste grant funding allocated by TCEQ, the City of Cedar Hill is installing an asphalt recycling system, the City of Denton is implementing a commercial food waste diversion pilot, the City of Weatherford is developing a composting feasibility and implementation plan, and the City of Plano is implementing a residential food scrap composting pilot program.
Disposal of Solid Waste	There are pending TCEQ permit modifications at three solid waste disposal sites in the North Central Texas region: • Waste Connections Type I Turkey Creek Landfill (Permit MSW-1417D) for a vertical expansion • The Waste Management Type I Skyline Landfill (Permit MSW-42D) for an increase in daily and annual waste acceptance rate • CRWD Type IV Ostend/380 McKinney C&D Landfill (MSW-2278A) for revised excavation grades which would increase capacity
☒ Check box if additional information of solid waste management activities is provided as <i>Attachment III.C.</i>	

III.D. Description and Assessment of the Adequacy of Existing Solid Waste Management Facilities & Practices, and Household Hazardous Waste Programs

Table III.D.I. Adequacy of Existing Facilities and Practices

Program	Facility Adequacy	Practices Adequacy
Resource Recovery	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Storage	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Transportation	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Treatment	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Disposal	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Household Hazardous Waste Collection	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>
Household Hazardous Waste Disposal	☐ Yes ☒ No, description of facility inadequacy provided in <i>Attachment III. D.</i>	☐ Yes ☒ No, description of practice inadequacy provided in <i>Attachment III. D.</i>

III.E. Assessment of Current Source Reduction and Waste Minimization Efforts, Including Sludge and Efforts to Reuse or Recycle Waste

- ☒ Assessment of current source reduction and minimization efforts, including activities to reduce sludge, and efforts to reuse or recycle waste is provided as ***Attachment III.E.***

III.F. Identification of Additional Opportunities for Source Reduction and Waste Minimization, and Reuse or Recycling of Waste

Table III.F.I Additional Opportunities for Source Reduction and Waste Minimization, Reuse and Recycling of Waste

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
Recycling	Increase access to recycling	Access to recycling is currently limited in parts of the North Central Texas region. Creating more opportunities through recycling centers and residential collection programs can increase community participation in waste reduction—an integral aspect of efforts to improve the quality of material being recovered for recycling.
Recycling	Increase capture rate of recycling	Continue Know What To Throw campaign messaging to improve capture of recycling materials. Messaging will be adapted to include yard waste and organics as more municipalities in the region develop collection programs for these materials.
Recycling	Reduce contamination in recycling	Encourage cities and counties to use the existing NCTCOG resources in the Know What To Throw campaign to address contamination challenges
Recycling	Expand market development	NCTCOG can inform the public and commercial sectors of existing markets for materials. To further develop local or regional markets/uses, NCTCOG could allocate a certain amount of Solid Waste Grant Program funding aimed at addressing specific recycling market development opportunities regionally such as to create hub-and-spoke systems, establish recycling market development zone programs, purchase needed equipment, fund recycling market development studies, and/or implement buy recycled promotion campaigns.
Recycling	Cardboard recycling	Encourage cities and counties to offer cardboard recycling at offices and residential bulky box recycling
Recycling	Shredded paper recycling	Encourage cities and counties to offer free shredding events to encourage

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
		safe document destruction and recycling
Recycling	Clothing/textiles recycling	Educate residents about where to take their textiles to be reused or recycled or consider creating reuse and recycling opportunities for textiles
Recycling	Cooperative tire collection & recycling	Facilitate cooperative efforts for local governments to work together to collect and recycle tires -including the use of tires for land use reclamation projects
Recycling	Glass recycling	Consider implementing dumpsters specifically for glass recycling to decrease contamination in curbside glass collection and to allow communities without glass collection to recycle through drop-off opportunities. These drop-offs could include glass crushing equipment for size reduction, to make transportation more cost-effective for recovered glass.
Recycling	Encourages greater waste exchanges within the private sector	Businesses and institutions generate waste materials that can often be resources to other businesses. In an effort to connect generators with markets, the TCEQ maintains a waste exchange program called RENEW. NCTCOG can encourage the use of the TCEQ's RENEW program by local businesses and institutions.
Recycling	Collect and recycle HHW	Seek additional funding from other sources (environmental organizations and the private sector) for additional collection events. The North Central Texas region is home to some of the largest regional HHW programs in the state; however, NCTCOG could help coordinate additional efforts between counties and cities so that HHW collection opportunities are available on a regional basis.
Recycling	Citywide recycling ordinances	Implement city-wide recycling ordinance for businesses and/or multifamily to offer recycling
Recycling	Compost agricultural waste	Encourage agricultural waste generators to compost or anaerobically digest organics, which could reduce the demand for

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
		chemical fertilizers, improve soil health and generate renewable energy
Recycling	Compost education	Develop programs or promote existing technical assistance programs that educate residents and businesses about composting
Recycling	Composting facility capacity expansion	Optimize regional composting capacity increase through study of regional needs, existing facility expansion opportunities, and brownfield or greenfield development locations
Recycling	Organic waste conversion to transportation fuels	Coordinate and support regional efforts to divert organic waste materials for the production of renewable natural gas (RNG) for transportation fuel through existing anaerobic digestion facilities, landfill gas-to-energy facilities, or new greenfield or brownfield development projects
Recycling	Sludge composting	Encourage wastewater treatment plants (WWTPs) to compost sludge instead of sending it the landfill
Recycling	Styrofoam densification	Promote use of Styrofoam densifiers to reduce the volume of discarded Styrofoam and facilitate cost-effective recycling of this material
Reuse	Donate materials	Encourage businesses and offices to donate products or usable materials to local charities or non-profits, including regional outreach through NCTCOG's Known What To Throw campaign
Reuse	Landfill reuse centers	Establish centers for drop-off and reuse of materials such as bulky (e.g., furniture), home chemicals, etc.
Reuse	C&D reuse center	Establish C&D reuse centers for drop-off and pick-up of reusable construction materials
Reuse	Reuse in hospitals	Encourage hospitals to replace disposable items with reusable items where possible, such as waterproof mattresses, cloth diapers, or reusable containers for sharps
Reuse	Reuse office materials	Encourage businesses and offices to reuse materials such as boxes, shipment packaging, and office furniture

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
Reuse; Recycling	Paint reuse and recycling	Create paint reuse programs, either direct reuse such as at landfill reuse centers or reblend programs where supply and demand could support such efforts
Reuse; Recycling	C&D recycling incentives	Create or update policies to incentivize recycling of C&D materials and on-site reuse/recycling
Reuse; Recycling	Encourage C&D recycling through refundable deposits	Consider charging a deposit on permitted C&D projects, refunded if the permittee demonstrates a preset level of materials were recovered
Source Reduction and Waste Minimization	Business, government, school paper reduction	Encourage businesses, governments, and schools to adopt paper-reduction policies, such as printing double-sided and printing only when absolutely necessary
Source Reduction and Waste Minimization	Community composting	Encourage establishment or expansion of backyard or community compost centers
Source Reduction and Waste Minimization	Reduce food waste in schools	Encourage schools to create share tables during lunch times so that unopened/untouched foods can be donated or provide an extra serving to other students
Source Reduction and Waste Minimization	Reduce toxicity	Encourage business and industry to reduce the amount and toxicity of their waste by joining the U.S. EPA's Toxic Release Inventory Program
Source Reduction and Waste Minimization	Restaurant waste minimization	Encourage restaurants to adopt waste minimization policies, such as only provide condiments and plasticware when requested
Source Reduction and Waste Minimization	Vermicomposting food scraps	Promote vermicomposting, specifically in multifamily complexes
Source Reduction and Waste Minimization	Waste tracking	Encourage businesses to track their waste generation for easier management
Source Reduction and Waste Minimization	Enhanced public information programs	NCTCOG has funded various public information programs in the past, including the successful Know What To Throw recycling outreach campaign. There is opportunity to include additional source reduction information into this program.
Source Reduction and Waste Minimization; Recycling	Food waste in hospitals	Encourage hospitals to reduce their food waste by donating unused food, composting, or reevaluating their

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
		services and menus so that less food is uneaten
Source Reduction and Waste Minimization; Recycling	Food waste in prison system	Encourage prison systems and other correctional facilities to compost their food waste with in-vessel systems
Source Reduction and Waste Minimization; Recycling	Feed hungry people	Encourage partnerships between food generating businesses and industries and the agricultural industry so that excess food can be donated to help feed hungry people, rather than being disposed
Source Reduction and Waste Minimization; Recycling	Give food waste to farmers	Encourage partnerships between food generating businesses and industries and the agricultural industry so that food scraps, if not suitable for feeding hungry people, can feed livestock. This reduces waste disposal costs for the business and reduces animal feed costs for the farmer.
Source Reduction and Waste Minimization; Recycling	Municipal program tracking and benchmarking	Encourage municipalities to track waste generation and recycling quantities, which could be facilitated through the NCTCOG or an external program such as the Municipal Measurement Program (MMP)
Source Reduction and Waste Minimization; Recycling	Environmentally preferred purchasing	As part of the recent Governmental Entity Recycling Program (30 TAC §328 Subchapter K), many counties, municipalities, school districts, and certain other public entities not previously subject to the state's procurement policies (described in more detail below) must now have environmentally preferred purchasing policies. The NCTCOG can support entities in the North Central Texas region in setting and maintaining these policies through technical assistance and information sharing.
Source Reduction and Waste Minimization; Recycling	Commercial & Institutional program	Facilitate increased commercial and institutional waste reduction and recycling through collaborative efforts with businesses, local institutions, material markets and local governments.
Source Reduction and Waste Minimization; Recycling	Local government program	Local governments in Texas are required to implement in-house recycling programs. NCTCOG can assist with these programs through:

Category of Activity (Source Reduction and Waste Minimization, Reuse or Recycling of Waste)	Opportunity Name	Brief Description
		(i) training local government elected officials and staff on program requirements and market options and (ii) assisting in the development of cooperative efforts between local governments and local material markets.
Source Reduction and Waste Minimization; Recycling	Increase funding for programs that target source reduction and recycling	NCTCOG, cities, and counties can work together to identify additional funding sources for regional source reduction and recycling programs. Sources may include additional grants from foundations, private industry, or state and federal agencies.
Source Reduction and Waste Minimization; Reuse; Recycling	Pay-as-you-throw (PAYT) user fee systems	Facilitate information sharing between cities that have successfully implemented PAYT user fee systems in the North Central Texas region with those that may be considering such policies. PAYT programs can result in higher recycling rates (especially in communities with bag-based programs) due to the financial incentive of minimizing waste disposed. PAYT user fee systems have been recommended by the U.S. EPA for decades and are well-demonstrated in their effectiveness.
Source Reduction and Waste Minimization; Reuse; Recycling	Awards and recognition programs	Establish regional awards/recognition and technical assistant programs to replace those recently retired by U.S. EPA (WasteWise, Food Recovery Challenge, SMM Electronics Challenge, Federal Green Challenge) to encourage and support efforts by cities and counties to reduce, reuse, or recycle these materials.
☒ Check box if additional information of opportunities and source reduction and waste minimization, reuse and recycling of waste is provided in <i>Attachment III. F.</i>		

III.G. Recommendations for Encouraging and Achieving a Greater Degree of Source Reduction and Waste Minimization, and Reuse or Recycling of Waste

Table III.G.I. Recommendations for Greater Source Reduction and Waste Minimization, and Reuse or Recycling of Waste

#1 Continue educating residents and facilitating regional collaboration Thirty current implementation activities identified by NCTCOG relate to continuing educating residents on recycling practices and being a resource to municipalities in the North Central Texas region for distributing messaging. A list of five of the 30 implementation activities is provided below, with the complete list provided in Appendix B. Further detail related to the development of recommendations, including how implementation activities were considered, is also provided in Attachment III.G. • Promote the exchange of information and education between local governments, private sector, public, and other stakeholders about regional source reduction, reuse, recycling, product stewardship, and other appropriate and emerging materials management topics • Support and promote public education and outreach activities related to composting, commercial and demolition debris, wish-cycling and other appropriate materials management topics • Support the use of popular technologies and media to market and educate the public and commercial sector for special waste collection events, recycling programs, and proper disposal methods for toxic materials • Support and promote public education and outreach activities related to proper waste collection and alternative disposal methods, such as the regional reduce, reuse, and recycling and illegal dumping resource clearinghouses • Encourage cities and counties to collaborate with private, non-profit, and other local government partners to establish and maintain HHW collection/reuse centers or regularly occurring collection events These implementation activities validate and further the progress that NCTCOG has made on improving recycling behaviors through the Know What To Throw campaign. As more municipalities in the North Central Texas region develop yard waste, brush, and food waste collection programs, messaging developed by NCTCOG will be updated to include more information on recycling these material types.
#2 Promote best management practices, including C&D and HHW management Twenty-three implementation activities identified by NCTCOG relate to promoting solid waste and recycling industry best management practices as they relate topics including single-stream recycling, managing illegal dumping, recycling C&D, managing HHW, and contracting for collection services. A list of five of the 23 implementation activities is provided below, with the complete list provided in Appendix B. • Promote the exchange of information and education between local governments, private sector, public, and other stakeholders about regional source reduction, reuse, recycling, product stewardship, and other appropriate and emerging materials management topics • Provide regional training opportunities to share knowledge and best management practices, collect case studies, and provide a regional information clearinghouse to reduce litter and illegal dumping • Encourage and support implementation of best management practices in contracting for solid waste and recycling collection and transportation services

- Encourage implementation of best management practices for recycling and reuse of construction and demolition materials produced by local government public works projects, including cities, counties, school districts, and special districts
- Encourage and support updates and regular review of existing waste management plans, ordinances, and development/zoning codes to incorporate best management practices and current state of practice in source reduction and reuse; recycling and composting; energy recovery; treatment and disposal

#3 Support commercial recycling

Thirteen implementation activities identified by NCTCOG relate to supporting commercial recycling practices. Based on Survey results, businesses in at least 24 municipalities in the North Central Texas region receive curbside single-stream recycling collection either through municipal crews, private haulers contracting with the municipality, or through private contracts directly with haulers. These results may indicate that additional commercial recycling efforts occur in the North Central Texas region (e.g., businesses separating single material types for processing); however, additional commercial recycling can significantly increase the amount of resource recovery within the North Central Texas region.

A list of five of the 13 implementation activities is provided below, with the complete list provided in Appendix B.

- Support the use of popular technologies and media to market and educate the public and commercial sector for special waste collection events, recycling programs, and proper disposal methods for toxic materials
- Support targeted outreach and education programs to major employers and employment centers
- Provide training and resources and encourage cities to establish or expand multi-family and commercial recycling programs and support development of additional recycling facilities for residents
- Enhance and coordinate public education and outreach to increase demand for and participation in multi-family and commercial recycling programs.
- Create collaborations with public and private sectors to increase recycling and material recovery

#4 Promote recycling market development and innovation in source reduction and reuse

Thirteen implementation activities identified by NCTCOG relate to promoting regional recycling markets and supporting R&D related to source reduction and reuse. These implementation activities help reinforce recycling systems for a wide range of materials and promote the North Central Texas region's overall economy.

The 2021 TCEQ Recycling Market Development Plan (RMDP) can serve as a guide for pursuing these 13 implementation activities, five of which are provided in the list below. The complete list is provided in Appendix B.

- Support development of new product markets and expansion of existing product markets for construction and demolition materials
- Encourage implementation of and expansion of electronics recycling programs and projects
- Support innovative and creative approaches for transforming trash components into new products for new purposes and creation of new product markets
- Promote innovative approaches to establish new product markets through development of technologies and processes that maximize waste value and create economic opportunity
- Encourage innovative reuse of landfill and waste disposal sites including energy recovery, renewable energy, and redevelopment opportunities

#5 Support organics recycling, including food waste

Three implementation activities identified by NCTCOG relate specifically to organics recycling.

- Encourage local government and public/private partnerships to decrease food waste disposed of in landfills such as educating the public and private sector about food waste source reduction, developing food waste disposal and processing infrastructure (e.g., community gardens or composting centers), and increasing the convenience of food waste recycling
- Support development and implementation of ordinances and other regulatory and non-regulatory measures to encourage greater organic materials reuse and recycling opportunities
- Encourage partnerships between local governments and large venues and event centers to establish recycling and food waste minimization programs

In support of the implementation activities, NCTCOG is additionally exploring converting methane created from food waste into fuel and addressing the gap between existing organic materials processing capacity in the North Central Texas region and the expected capacity to meet short-term organics recycling demands. Waste composition data from 2020 indicates that 46 percent of disposed residential material is organics waste, which NCTCOG is proactively seeking to address.

#6 Address limited access to disposal capacity

Three implementation activities identified by NCTCOG relate to improving access to disposal, particularly to rural or underserved parts of the North Central Texas Region.

- Encourage the establishment and expansion of transfer stations and citizen collection stations in rural or underserved areas
- Support the planning, design, and/or construction of citizen collection stations
- Encourage government to government (e.g., multi-county) and public/private partnerships to establish cost-effective collection and disposal options

In support of the implementation activities, NCTCOG has completed the Western Region Solid Waste Capacity Study, in which disposal capacity of the eight most western counties is assessed and alternatives and recommendations are identified. These alternatives are listed in Attachment III.G.

☒ Check box if additional details are provided in *Attachment III.G.*

III.H. Identification of Public and Private Management Agencies and Responsibilities

- ☒ A list of public and private solid waste management agencies and their responsibilities that affect and impact solid waste management in the planning region is provided as ***Attachment III.H.***

III.I. Identification of Solid Waste Management Concerns and Establishment of Priorities for Addressing Those Concerns

Table III.I Solid Waste Management Concerns and Priorities

Solid Waste Management Concern	Priorities to Address the Concern
Varying set out types (e.g., customers within a close proximity setting out material in a combination of bags)	Priorities to address this concern include working closely with the development community to ensure future developments are compatible with existing collection protocol

Solid Waste Management Concern	Priorities to Address the Concern
and carts) and challenging collection environments	
Landfill capacity decreasing at accelerated rate	Priorities to address the concern include supporting regional recycling activities and collaborative approaches to developing future disposal facilities through public-private partnerships
Low capture rate of residential single-stream and organics	Priorities to address the concern include leveraging the know what to throw campaign to continue to streamline education/outreach efforts, increase the capture rate of single-stream recycling, and direct focus on organics recycling behaviors. NCTCOG is also in the process of developing a study on the feasibility of increasing organics processing in the North Central Texas region to further assess next steps related to organics recycling. Based on the demand for natural gas-powered vehicles in the region, NCTCOG is also currently studying the feasibility of converting methane created from food waste into fuel.
Open commercial collection markets do not incentivize recycling from commercial and industrial-sector generators	Priorities to address the concern include supporting municipalities in implementing ordinances or creating licensing requirements that increase commercial generators' access to recycling
Limited regional C&D recycling in the North Central Texas region	Priorities to address the concern include supporting the development of C&D processing and re-manufacturing facilities (e.g., batch plants)
Improper management of HHW/Illegal dumping	Priorities to address the concern include supporting municipalities in ensuring adequate accessibility to HHW collection facilities. Some areas of the North Central Texas region currently have limited access to HHW and electronics collection facilities, making it challenging to curb illegal dumping activity.
Commingled collection of brush and bulky items limits ability to recycle organics	Priorities to address the concern include supporting municipalities in implementing separate set out and collection of yard waste/brush for transportation to and processing at composting facilities in the North Central Texas region. Commingling materials for collection improves collection efficiency but minimizes the ability to recycle the yard trimmings/brush material.
Limited accessibility to recycling for residential multi-family units	Priorities to address the concern include supporting municipalities to implement policy approaches to multi-family recycling requirements. This is particularly important, as multi-family units provide housing for a growing proportion of the North Central Texas region.
☐ Check box if additional details are provided in <i>Attachment III.I</i>	

III.J. Planning Areas and Agencies with Common Solid Waste Management Concerns that Could be Addressed Through Joint Action

Table III.J.I Planning Areas and Agencies with Common Solid Waste Management Concerns

Solid Waste Management Concern	Names of Planning Areas and Agencies that Could Address the Concern via Joint Action(s)
Varying set out types (e.g., customers within a close proximity setting out material in a combination of bags and carts) and challenging collection environments	NCTCOG, municipalities and counties, private haulers, regional and local development services departments
Landfill capacity decreasing at accelerated rate in Western region	NCTCOG, municipalities And counties, private haulers, public and private disposal facility owners
Low capture rate of residential single-stream recycling and organics	NCTCOG, municipalities and counties, private haulers
Open commercial collection markets do not incentivize recycling from commercial and industrial generators	NCTCOG, municipalities and counties, private haulers
Limited regional C&D recycling in the North Central Texas region	NCTCOG, municipalities and counties, private haulers, public and private organics processing facility owners
Improper management of HHW and illegal dumping	NCTCOG, municipalities and counties, Keep Texas Beautiful, NTMWD
Commingled collection of brush and bulky items limits ability to recycle organics	NCTCOG, municipalities and counties, private haulers, public and private organics processing facility owners
Limited accessibility to recycling for residential multi-family units	NCTCOG, municipalities and counties, private haulers, apartment owners and associations

III.K. Identification of Incentives and Barriers for Source Reduction and Waste Minimization, and Resource Recovery, Including Identification of Potential Markets

Table III.K.I Incentives and Barriers for Source Reduction and Waste Minimization, and Resource Recovery

Source Reduction and Waste Minimization	
Category	Barrier/Incentive (Number of Times Cited by Municipalities)
Incentives	Increased investment in package redesign (17)
	Increased market development for reusable materials/products (16)
	Reduced consumption-based behavior (12)
	Increased demand for reusable materials/products (10)
	Reduced product lifecycle carbon footprint (9)
	Reduced littering of single-use products (9)
	Reduced manufacturing cost of excess packaging (8)
	Reduced transportation cost of reducing packaging volume (8)
	Increased demand for reusable materials/products (7)
	Increased demand for new waste minimization research and technologies (5)

Barriers	Difficulty overcoming convenience of single-use items (15)
	Lack of staff (15)
	Lack of funding for programs (14)
	High transportation cost and/or shipping distance to transport reusable products (12)
	Lack of political will for government regulations (11)
	Barriers to enacting local policy or mandates (8)
	Technological issues (e.g., challenges further reducing packaging) (8)
	Lack of staff expertise (8)
	Lack of community support for reuse and/or waste reduction (7)
	Low demand for reusables (7)
	High prices of reusables (6)
	Difficulty in training staff (3)
Resource Recovery	
Category	Barrier/Incentive (Number of Times Cited by Municipalities)
Incentives	Increased market development for recyclable/compostable products (15)
	Extended landfill life (15)
	Minimized illegal dumping (14)
	Improved community sustainability (13)
	Reduced product lifecycle carbon footprint of diverting material (12)
	Improved aesthetic of communities (12)
	Increased demand for recyclable/compostable products (12)
	Increased investment in quality of life (10)
	Reinforced sustainable material management systems (9)
	Increased investment in recycling- and organics-processing jobs (9)
	Meeting policy-driven diversion targets (8)
Barriers	High cost of recycling processing (15)
	High contamination/low quality of materials (13)
	Lack of funding for programs (12)
	Difficulty in changing behavior regarding recycling and composting (12)
	Lack of staff (12)
	Unpredictable recycling markets causing uncertain revenue source from recycling (12)
	Misconceptions regarding proper recycling and composting (11)
	Lack of political will for government regulations (10)
	Low participation in recycling and composting collection programs (9)
	Lack of community support for recycling and/or composting (8)
	Lack staff expertise (8)
	Lack of capital for collection equipment or facility upgrades (7)
	Barriers to enacting local policy or mandates (6)
	Challenging collection environments (e.g., private drives, dead-ends) (5)
	Insufficient processing capacity for materials (5)
	Difficulty in training employees (3)
	Insufficient material feedstock for processors (3)
	Technological issues in material processing facilities (e.g., outdated equipment) (2)
Potential Markets	
Mixed Paper, SOP, OCC, newsprint	There are multiple end users including recovered paper mills, a cellulose insulation plant, and a molded pulp plant in the North Central Texas region and surrounding areas that create demand for many grades of paper and paperboard, including OCC, SOP, and newsprint

Plastics PET (#1) and HDPE (#2)	PET reclamation capacity exceeds available supply, and PET is currently imported from other states. Increased PET recovery in the North Central Texas region could be managed by in-state reclaimers. In-state reclaimers also need more supply of natural HDPE and clean post-commercial film to meet demand.
Printer Cartridges (plastics)	There is one recycler in the state for laser toner cartridges, which receives material from across the U.S. and additional recovery in the North Central Texas region could be managed through this facility
Glass (bottles and non-bottles)	The North Central Texas region and nearby counties are home to key infrastructure and recycled glass end users to support healthy recycled glass markets, specifically secondary glass processing/beneficiation facilities to further clean and sort glass and produce clean cullet and end users such as bottle and fiberglass manufacturers
Yard Trimmings, Food Waste, and Other Compostable Materials	Demand for clean, high-quality compost product is high, and some cities in the North Central Texas region report that demand has increased significantly in the last few years including from high volume end-users such as the Texas Department of Transportation (TxDOT)
Construction & Demolition (C&D) Debris	Markets are available for key C&D materials including concrete/aggregate, metals, cardboard, plastic, lumber, and gypsum. Concrete/aggregate, metals, cardboard, and plastic have established end-markets that are strong and consistent.

III.L. Regional Goals and Objectives, Including Waste Reduction Goals

Table III.L.I Regional Goals and Objectives

Goal #1 Support Materials Management Education and Training	Objective 1.A. Support outreach and education programs to facilitate long-term increases in source reduction, reuse and recycling. Objective 1.B. Educate the public about proper waste management opportunities and alternatives to reduce illegal dumping. Objective 1.C. Educate the public about proper management and alternative options for Household Hazardous Waste (HHW).
Goal #2 Promote Creation and Expansion of Waste Management Programs	Objective 2.A. Encourage establishment, maintenance and expansion of government, single and multi-family residential, and commercial waste source reduction, reuse, and recycling programs. Objective 2.B. Expand reuse and recycling on construction and demolition materials. Objective 2.C. Expand reuse and recycling of organic material. Objective 2.D. Expand existing collection and management alternatives for other wastes and establish and expand new product markets. Objective 2.E. Facilitate the development and implementation of integrated solid waste management plans. Objective 2.F. Promote integrated waste management practices and provide ample, convenient collection, and disposal options in rural and underserved areas.
Goal #3 Measure Regional Waste Reduction Efforts	Objective 3.A. Encourage survey and evaluation techniques to establish baselines and effectively track waste reduction. Objective 3.B. Encourage the maintenance of disposal and processing capacity to meet the needs of the region.
Goal #4 Support and Encourage Innovative Technologies for Other Waste	Objective 4.A. Encourage innovative technologies to reduce, manage, and process emerging waste streams.
Goal #5 Promote Public and Private Sector Partnerships	Objective 5.A. Increase coordination between cities and counties organizational entities to address solid waste needs. Objective 5.B. Increase coordination between cities and counties organizational entities to reduce illegal dumping. Objective 5.C. Evaluate that applicants for state permits demonstrate compliance with the adopted regional solid waste plan. Objective 5.D. Maintain and update the closed and abandoned landfill inventory.

III.M. Advantages and Disadvantages of Alternative Actions

Are alternative actions being considered in this plan for the regional area?	☐ Yes. Provide details in <i>Attachment III.M.</i> ☒ No. No further action required.
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III.N. Recommended Plan of Action and Associated Timetable for Achieving Specific Goals and Objectives

Table III.N.I Plan of Action and Timetable for Achieving Specific Goals and Objectives

Goal/Objective	Plan of Action	Milestone Dates
Waste Reduction	Support innovation and education related to waste reduction and implement opportunities identified in Form Table III.F. to further encourage residential and commercial waste reduction. In the short-term, NCTCOG will prioritize supporting development of recycling (single-stream and organics) systems in the North Central Texas region prior to developing policies related to waste reduction. In the intermediate and long-term, NCTCOG will further prioritize waste reduction within the North Central Texas region, as waste reduction is the most preferred means of material management per the U.S. EPA waste hierarchy (provided in Attachment III.N.)	Completion of implementation activities related to waste reduction innovation in the short-term (2022 - 2027). Waste reduction will be further prioritized in the intermediate and long-term (2027 - 2042).
Composting Programs for Yard Wastes and Related Organic Wastes	Supporting the development of programs for collection and composting of yard waste and organic waste, including food waste, is a high priority for NCTCOG in the short-term. As communities may need assistance financially or technically with implementation of organics composting program, NCTCOG will continue to support these efforts in the intermediate and long-term. It should be emphasized that different municipalities in the North Central Texas region have specific needs in development of these programs and timeframes for implementation will not be uniform.	Complete the organics processing gap study and support municipalities in developing yard waste and organics collection and composting programs in the short-term (2022 - 2027). Continue support for organics collection and composting programs in the intermediate and long-term planning periods based on regional processing capacity (2027 - 2042).
Household Hazardous Waste Collection and Disposal Programs	NCTCOG identifies educating the public about proper management and alternative options for HHW as Objective 1.C. of its current Goals and Objectives, as provided in	Continuous support for proper management of HHW collection and disposal programs in short-term,

Goal/Objective	Plan of Action	Milestone Dates
	Form Table III.C. As described in Attachment III.D., access to proper of HHW is not uniform within the North Central Texas region, and NCTCOG will support programs to improve access to HHW management in the short-term, intermediate, and long-term planning periods.	intermediate, and long-term planning periods (2022 - 2042)
Public Education Programs	In the short-term, NCTCOG will continue supporting municipalities through the Know What To Throw campaign and include messaging related to organics recycling as more municipalities develop their yard waste and organics collection programs. Public education will continue to be a high priority for NCTCOG throughout the intermediate and long-term planning periods.	Continuous implementation of public education programs in short-term, intermediate, and long-term planning periods (2022 - 2042)
The Need for New or Expanded Facilities and Practices	Assessment of needs related to facilities is ongoing within the North Central Texas region. NCTCOG has recently completed the Western Region Solid Waste Capacity Study to assess access to disposal and is currently assessing opportunities for generating fuel from organic waste and identifying gaps in organics processing. NCTCOG will complete further studies related to facility needs on an as-needed basis in the intermediate and long-term.	Continuous assessment of facility needs in short-term, intermediate, and long-term planning periods (2022 - 2042)
☒ Check box if additional details are provided in <i>Attachment III.N.</i>		

III.O. Identification of the Process that Will be Used to Evaluate Whether a Proposed Municipal Solid Waste Facility Application Will be in Conformance with the RSWMP

- ☒ The process that will be used to evaluate whether a proposed municipal solid waste facility application will be in conformance with the regional plan is identified in *Attachment III.O.*

SECTION IV. REQUIRED APPROVALS

Table IV.I Required Approvals

Solid Waste Advisory Committee	July 1, 2022
Public Meeting Dates	June 30, 2022
Executive Committee	August 25, 2022

- ☐ Check box if local government and jurisdiction resolutions, and letters of support are included in **Attachment IV.A.**
- ☒ Public notice, agenda, public comments, and the transcript of the required public meeting are included as **Attachment IV.B.**

VOLUME II ATTACHMENTS

The following attachments correspond to each Volume II Form Table to provide additional detail such as the methodology, key assumptions, and other relevant supporting information.

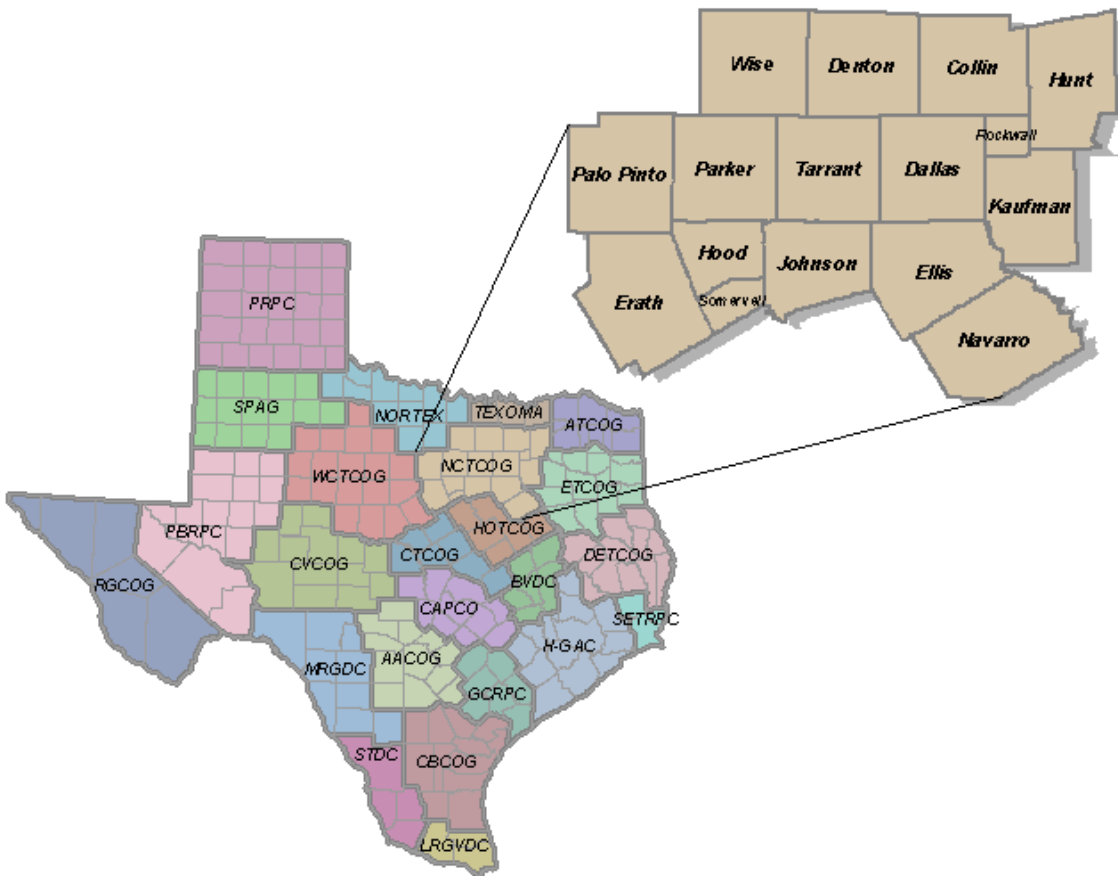
For Form Tables where no additional information is required, the box in the Form Table indicating that additional information is provided in an attachment is not checked and the corresponding attachment is intentionally left blank. Tables within the Volume II Attachments begin on Table 1 and are listed along with figures in the Table of Contents.

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Attachment I.I: Geographic Scope

As described in Form Table I.I, the geographic scope of the RSWMP is the 16 member counties in the North Central Texas region. A visual representation of the North Central Texas region is provided in Figure 2, showing the planning region relative to other COGs in Texas. Detailed maps of the facilities located in the North Central Texas region are provided in Appendix A – Regional Maps.

Figure 2: North Central Texas Region and Member Counties



Attachment II.I: Planning Periods

Form Table II.I provides the four planning periods that are covered within the RSWMP. Per TCEQ instructions, this Form Table includes detail related to implementation activities for each of the planning periods. The following bulleted list describes the approach the Project Team took to complete the Form Table, by planning period.

- **Current Year (2022).** The Project Team considers the 68 implementation activities to apply to the current year planning period. The implementation activities, provided as a complete list in Appendix B, were developed by NCTCOG in 2021 as specific actions to achieve the Goals and Objectives, provided in Form Table III.L. The full list of implementation activities, organized by Goal and Objective, is provided in Appendix C – Material Composition Profiles and Capture Rate.
- **Short-Range (2022 – 2027).** The Project Team considered the recommendations developed for Form Table III.G. to be the activities corresponding with the short-range planning period. The basis for how the Project Team developed the recommendations is provided in Attachment III.G.
- **Intermediate (2028 – 2032).** Within this planning period, the implementation activities were adaptable and higher-level than in the two previous planning periods, as the solid waste system in the North Central Texas region will likely evolve to include new collection methods, policies, material types, and other factors that are currently unpredictable.
- **Long-Range (2033 – 2042).** As factors influencing the region’s solid waste system will likely change in this planning period as well, the Project Team used the same approach for the long-range as the intermediate planning period.

Attachment III.A: Demographic Information

This attachment provides a summary of the demographic trends that will influence solid waste and recycling generation in the North Central Texas region during each planning period.

The population and economic growth that the North Central Texas region experiences in the coming years will be the primary factor impacting the quantities and quality of material generated. As described in Form Table III.A., over 8.0 million people currently live in the North Central Texas region, and nearly 4.1 million people work in the region in the commercial and industrial sectors. Table 1 provides detail on the residential, commercial, and industrial generators in the North Central Texas region for the current planning year (2022). Population data was obtained through NCTCOG's Regional Data Center and employment data was obtained through the Bureau of Labor Statistics' data for the 16 counties in the region.

Table 1: Generator Types and Population/Employees (2022)

Residential¹	
Detail	Population²
Population	8,006,301
Commercial	
Detail	Employees³
Trade, Transportation, and Utilities	876,600
Professional and Business Services	722,100
Education and Health Services	483,500
Government	453,200
Leisure and Hospitality	392,400
Financial Activities	360,700
Other Services	126,800
Information	85,600
Total Commercial Employees	3,500,900
Industrial	
Detail	Employees³
Manufacturing	293,200
Mining, Logging, and Construction	225,700
Agriculture	64,600
Total Industrial Employees	583,500

1. Includes population living in both single- and multi-family homes.
2. Based on population data provided by NCTCOG for the region in 2021, with a 1.67 percent growth rate applied to project 2022 population.
3. Commercial and industrial employment data based on the most recent Bureau of Labor Statistics data provided for the 16 counties in the North Central Texas region.

The North Central Texas region is home to some of the fastest growing cities in the U.S. and the region as a whole is currently experiencing population growth at rates above both the statewide and national averages. Based on population data from the NCTCOG Regional Data Center, the total population grew at a compound annual growth rate of 1.67 percent per year from 2010-2020. Population growth was used to project solid waste generation rates from the residential sector as this directly correlates with population.

There is significant economic activity in the North Central Texas region. Economic characteristics and trends in the North Central Texas region that may impact solid waste and recycling generation include the following factors, based on NCTCOG's CEDS:⁷

- The North Central Texas region is currently home to 24 Fortune 500 Headquarters, 44 Fortune 1000 Headquarters, three Fortune 10 Companies, and three Global 25 Companies.
- According to the Dallas Regional Chamber, over the last five years, the region has created 300,000 new jobs, demonstrating a highly active economy.
- The DFW Metroplex has more manufacturing activity than any other metro area in Texas. The North Central Texas region has been able to recently attract world-class businesses (e.g., Toyota Motor Manufacturing) due to its high quality of life.
- The CEDS Committee, consisting of municipal, business, and educational representatives with the North Central Texas region, reached a strong consensus about the need for the region to develop innovation-based sub-regional clusters of industries, as well as support efforts to attract new and expanding businesses while retaining existing businesses.
 - The sub-regional clusters will influence the types of businesses that will be encouraged to grow within the clusters, and correspondingly, will influence the types and amounts of solid waste generated throughout the North Central Texas region. Further detail about the sub-regional clusters is described in Appendix C of the CEDS.
- NCTCOG is planning to address the current lack of a comprehensive, long-term approach to transportation, and as noted in the CEDS, there is a need for upgraded roads and highways within North Central Texas region. The approach taken to upgrade this infrastructure may have a significant impact on solid waste generation.
- High tech infrastructure, logistics, and manufacturing are targeted industry clusters for the urban DFW Metroplex region according to the Dallas Regional Chamber. Growth of these industries within the DFW Metroplex will influence solid waste generation, based on the exact business types recruited to the region.
- New technologies, tools, ways of working, and opportunities for innovation related to commercial activities are expected to continue in the short-range, intermediate, and long-range planning periods

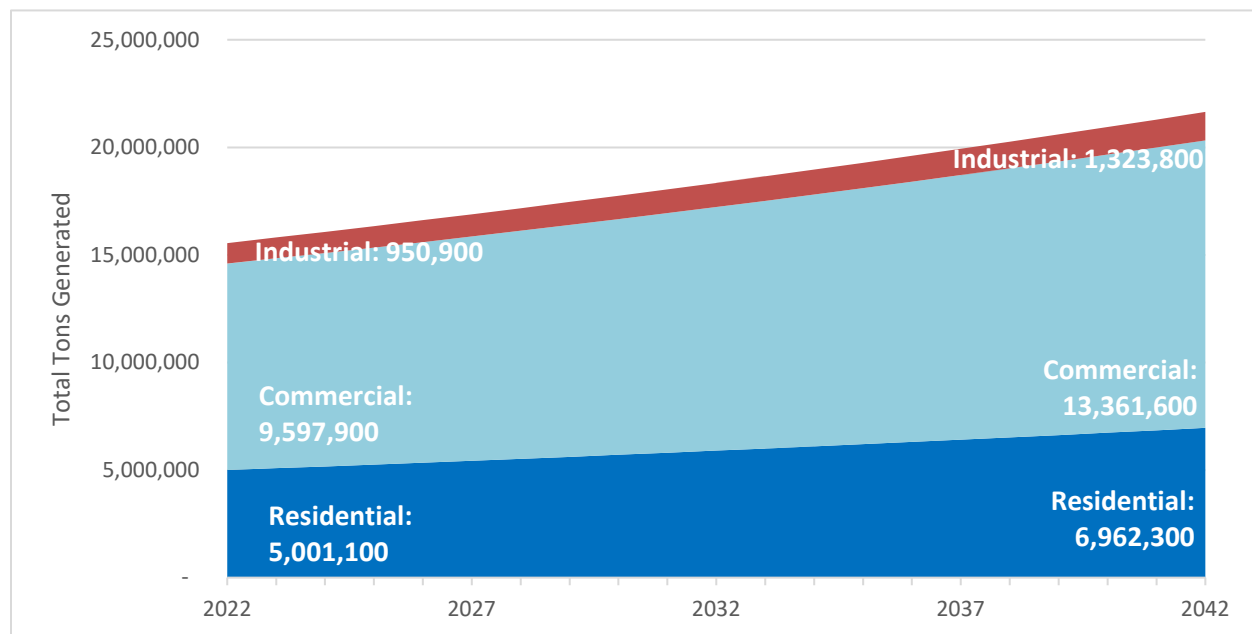
Based on NCTCOG's 2030 and 2045 employment projections, employment is projected to grow at 1.67 percent per year on average through the four planning periods. Economic activity (represented by

⁷ North Central Texas Council of Governments - Regional CEDS (2022). Available online at: <https://www.NCTCOG.org/nctedd/regional-ceds>

employment growth) was used to project solid waste generation in the commercial and industrial sectors as these are influenced strongly by economic activity.

The population growth rate (1.67 percent per year) and projected employment growth rate (1.67 percent per year) were used to develop the residential, commercial, and industrial projections presented in this attachment and Form Tables III.A.I, III.A.II and III.A.III. The resulting projections suggest that a total of 21,439,654 tons of solid waste will be generated in the region in 2042 comprised of 6,768,100 tons from the residential sector (22 percent of total), 13,337,000 tons from the commercial sector (44 percent), and 1,334,528 tons from the industrial sector (34 percent), as shown in Figure 3.

Figure 3: 2022 – 2042 Solid Waste Generation Projection by Sector



Residential Generation and Projections

Based on 2020 data from the TCEQ MSW Annual Reports, disposal from the residential sector is approximately 2.93 pounds per person per day in the North Central Texas region. An additional 0.49 pounds per person per day is recycled from the residential sector, including single-stream recycling, organics (e.g., yard trimmings), HHW, and textiles.⁸ Data related to residential generation and

⁸ Based on data from multiple sources, including facility data from the TCEQ MSW Annual Reports and interviews with regional facility operators and municipalities and supplemented by statewide studies when regional data were not available.

projections is provided in Table 2. A detailed discussion of current disposal and recycling facilities and quantities used as the basis for these projections is provided in Attachment III.C.

Projections for solid waste generation from the residential sector were developed by applying these rates to the projected population growth (1.67 percent per year) through the four planning periods summarized in Form Table III.A.I.

Table 2: Residential Generation and Projections¹

Planning Period	Annual Growth Rate	Current Population/ Population Projection	Landfill Disposal (Tons)²	Disposal Rate (lbs./Person/Day)	Recycling (Tons)³	Recycling Rate (lbs./Person/Day)	Residential Waste Generation (Tons)
Current (2022)	1.67%	8,006,301	4,280,099	2.93	721,045	0.49	5,001,143
2027	1.67%	8,696,657	4,649,157	2.93	783,218	0.49	5,432,375
2032	1.67%	9,446,540	5,050,038	2.93	850,752	0.49	5,900,790
2037	1.67%	10,261,083	5,485,486	2.93	924,110	0.49	6,409,595
2042	1.67%	11,145,861	5,958,480	2.93	1,003,792	0.49	6,962,273

1. Values do not calculate exactly due to rounding of disposal and recycling rates.
2. All residential tonnage is MSW.
3. Residential recycling includes single-stream, organics, HHW, and textile recycling.

Commercial Generation and Projections

Based on 2020 data from the TCEQ MSW Annual Reports, disposal from the commercial sector is approximately 9.82 pounds per employee per day. An additional 2.91 pounds per person per day are recycled from the commercial sector, including single-stream recycling, organics (e.g., yard trimmings), C&D debris, and other non-industrial recycling (e.g., tires).⁸ Data related to commercial generation and projections is provided in Table 3.

A detailed discussion of current disposal and recycling facilities and quantities used as the basis for these projections is provided in Attachment III.C. Projections for solid waste generation from the commercial sector were developed by applying these rates to the projected 1.67 percent per year employment growth through the four planning periods summarized in Table 3.

Table 3: Commercial Generation and Projections¹

Planning Period	Annual Growth Rate	Current Employees/Employee Projection	Landfill Disposal (Tons) ²	Disposal Rate (lbs./Employee/Day)	Recycling (Tons) ³	Recycling Rate (lbs./Employee/Day)	Commercial Waste Generation (Tons)
Current (2022)	1.67%	3,500,900	6,271,540	9.82	3,326,401	2.91	9,597,941
2027	1.67%	3,802,771	6,812,314	9.82	3,613,225	2.91	10,425,539
2032	1.67%	4,130,671	7,399,717	9.82	3,924,782	2.91	11,324,498
2037	1.67%	4,486,844	8,037,769	9.82	4,263,202	2.91	12,300,971
2042	1.67%	4,873,730	8,730,838	9.82	4,630,804	2.91	13,361,642

1. Values do not calculate exactly due to rounding of disposal and recycling rates.
2. Commercial disposal tonnage includes MSW, brush, C&D debris, litter, and other waste types identified in Form Table III.B.
3. Commercial recycling tonnage includes single-stream materials (i.e., paper, plastic, metal and glass), organics, C&D debris, and tire recycling.

Industrial Generation and Projections

Total solid waste generation in the industrial sector was estimated to be 8.93 pounds per industrial employee per day based on industry accepted waste generation factors developed for the City of Los Angeles and used by the State of California (CalRecycle)⁹ and other entities including other Texas COGs when estimating industrial sector generation (since Texas specific data for this sector is not available). Data related to commercial generation and projections is provided in Table 4. An estimated 1.49 pounds per industrial employee per day is recycled in the industrial sector primarily single-stream recyclable materials (i.e., paper, plastic, metal, glass). Projections for solid waste generation from the industrial sector were developed by applying these rates to the projected 1.67 percent employment growth through the four planning periods summarized in Form Table III.A.III. In subsequent attachments, industrial disposal includes only Class 1, 2, and 3 non-hazardous waste disposed in MSW landfills (680,404 (2022)),¹⁰ and does not include an additional 112,022 (2022) tons that are estimated using the CalRecycle growth factor, as this tonnage is not tracked or reported.

⁹ CalRecycle (2019) Estimated Solid Waste Generation Rates: Industrial Sector Generation Rates. Available at: <https://www2.calrecycle.ca.gov/wastecharacterization/general/rates>

¹⁰ Based on data from the TCEQ used to update the Municipal Solid Waste in Texas: A Year in Review.

Table 4: Industrial Generation and Projections¹

Planning Period	Annual Growth Rate	Current Employees/ Employee Projection	Landfill Disposal (Tons)²	Disposal Rate (lbs./Employee/Day)	Recycling (Tons)³	Recycling Rate (lbs./Employee/Day)	Industrial Waste Generation (Tons)
Current (2022)	1.67%	583,500	792,426	7.44	158,519	1.49	950,945
2027	1.67%	633,813	860,754	7.44	172,187	1.49	1,032,941
2032	1.67%	688,465	934,974	7.44	187,034	1.49	1,122,008
2037	1.67%	747,829	1,015,593	7.44	203,162	1.49	1,218,755
2042	1.67%	812,311	1,103,165	7.44	220,680	1.49	1,323,844

1. Values do not calculate exactly due to rounding of disposal and recycling rates.
2. Industrial disposal tonnage includes Class 1, 2, and 3 non-hazardous waste and an estimated amount of additional tonnage based on an industry accepted generation rate (including disposal and recycling generation) from CalRecycle of 8.93 lb/industrial employee/day.
3. Industrial recycling tonnage extrapolated based on statewide data collected as part of the RMDP.

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Attachment III.B: Current and Future Solid Waste Amounts by Type

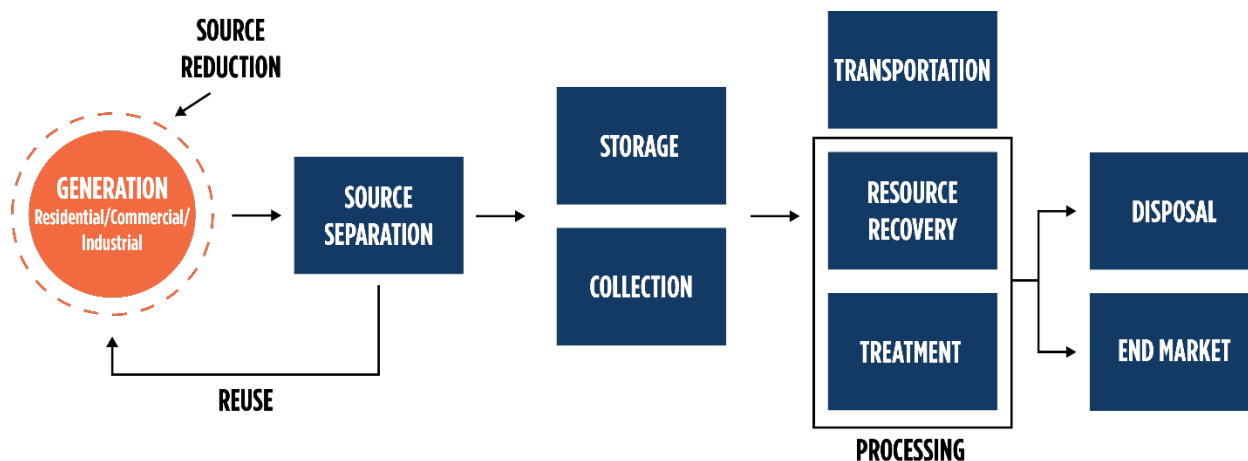
Tonnages by material type presented in Form Table III.B are based on 2021 annual solid waste reporting data available through the TCEQ for all landfills receiving MSW in the North Central Texas region. Data presented in Form Table III.B do not include materials imported from outside of the state. These values were used to as the baseline for residential and commercial disposal when developing the year-over-year disposal projections presented in Form Table III.A and Attachment III.C. The “Other” category shown in Form Table III.B corresponds to polychlorinated biphenyls (PCB) waste, miscellaneous food waste, and paint waste.

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Attachment III.C: Current and Planned Solid Waste Management Activities

This section provides additional detail regarding the current and planned solid waste and recycling practices, organized by the activity types described in Form Tables III.C.I. and III.C.II. These activity types are: generation, source separation, collection, handling, storage, transportation, treatment, processing, resource recovery, and disposal. Figure 4 presents a visualization of the solid waste and recycling activity types.

Figure 4: Solid Waste and Recycling Activity Types^{1,2}



1. Handling not included, as handling activities are provided by entities throughout the solid waste and recycling lifecycle.
2. Storage may also occur at facilities associated with activities shown further (to the right) in the solid waste and recycling lifecycle.

The entities (e.g., facilities, service providers) within the North Central Texas region's solid waste and recycling system associated with each of the solid waste and recycling activity types is provided in Table 5.

Table 5: Solid Waste Management Entities and Activities by Type

Entity	Number of Facilities ¹	Solid Waste Management Activity Types								
		Source Separation	Collection	Handling	Storage	Transportation	Processing	Treatment	Resource Recovery	Disposal
Haulers	n/a		✓	✓						
Citizen Collection Stations	At least 17	✓		✓	✓				✓	
Transfer Stations	17			✓	✓	✓				
MRFs	11			✓	✓		✓		✓	
Compost/mulch Facilities	At least 27			✓	✓		✓		✓	
C&D Recycling	1			✓	✓		✓		✓	
Tire Storage	2			✓	✓					
Tire Transporters	93			✓		✓				
Tire Processing, Recycling and Energy Recovery	20			✓	✓		✓		✓	
HHW Collection and Processing	9	✓		✓	✓		✓	✓	✓	
Medical Waste Treatment	2			✓	✓		✓	✓		
Liquid Waste Treatment	8			✓	✓		✓	✓		
Landfills (Type I)	18			✓	✓				✓ ²	✓
Landfills (Type IV)	4			✓	✓					✓

1. Facilities are shown in a series of maps in Appendix A. Facilities may be included in more than one category, for example compost facilities co-located and operated at a landfill. Therefore, the sum of the number of facilities listed does not equal the total number of solid waste management facilities in the region.
2. Applies only to landfills with active gas-to-energy projects.

Each of the following sections supports information presented in Form Tables III.C.I and III.C.II by presenting a brief overview and a description of the current and future activity in the North Central Texas region for each activity type. Maps of facilities that are discussed throughout this attachment are provided in Appendix A, as shown below:

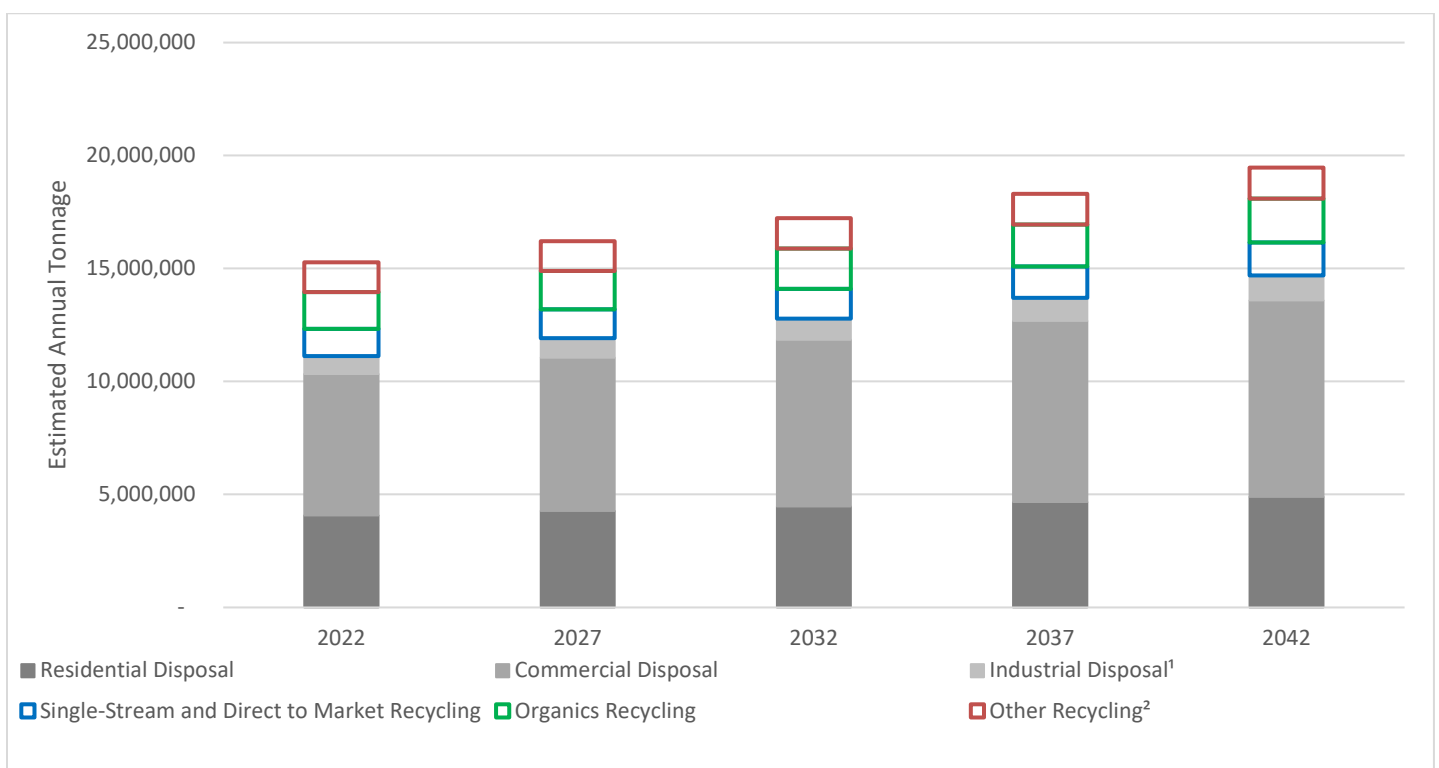
- **Map A–2.** Type I and IV MSW landfills (including whether the landfill has landfill gas-to-energy and/or generates RNG), transfer stations, and Citizen Collection Stations.

- **Map A–3.** MRFs, C&D recycling facilities, and mulching and composting facilities
- **Map A–4.** HHW collection facilities, tire processing, recycling, and energy recovery facilities, liquid waste treatment facilities and medical waste treatment facilities.

Generation

Solid waste generated in the region among all the generator sectors is reused, collected, processed, recycled, or disposed. Figure 5 presents the current and projected future solid waste generation in the Central Texas region based on projections is presented in Attachment III.A.

Figure 5: Projected Solid Waste Generation and Management in the Solid Waste System¹



1. Industrial waste includes Class 1, 2, and 3 non-hazardous waste (NHIW) disposed at municipal landfills, as shown in Form Table III.B. It does not include industrial wastes managed in industrial facilities, as those quantities for Class 2 and 3 NHIW are not tracked.
2. Other recycling includes C&D, tire, textile, and HHW industrial recycling. Tonnage data for these materials were based on 2019 data from RMDP and additional data from 2021 and projected as appropriate.

Decreasing the amount of solid waste generated through source reduction and increasing the amount of solid waste diverted from disposal through recycling is a high priority for regional education and outreach efforts. In addition to understanding the quantity of material generated, understanding the composition profile of solid waste that is recycled and disposed is critical for improving the current recycling rate,

increasing the capture rate, and decreasing the volume of material sent for disposal recycling in the North Central Texas region.

As part of the Regional Recycling Survey and Campaign, Burns & McDonnell assisted NCTCOG with conducting waste characterization studies that included sorting single-family trash and recycling samples to understand their respective composition profiles. Three consecutive annual sorting events were held in 2018, 2019 and 2020 where up to 10 municipalities in the North Central Texas region each provided samples of trash and recycling samples. The 2019 and 2020 evaluations included sorting trash and recycling samples to generate the composition profile of both disposed and recycled material streams.

The regional waste composition provides an understanding of the composition of refuse disposed among all the cities in the North Central Texas region and is used to generate regional composition profiles and capture rate figures. Figure 6 and Figure 7 present the regional composition profiles of trash and recycling.

Figure 6: 2020 Regional Composition of Single-Family Residential Trash

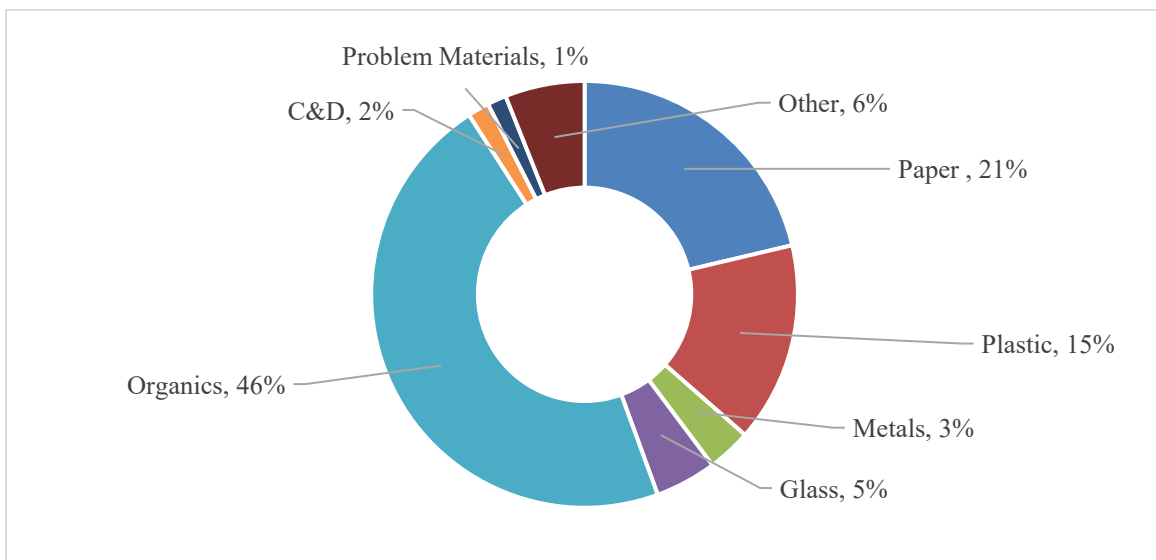
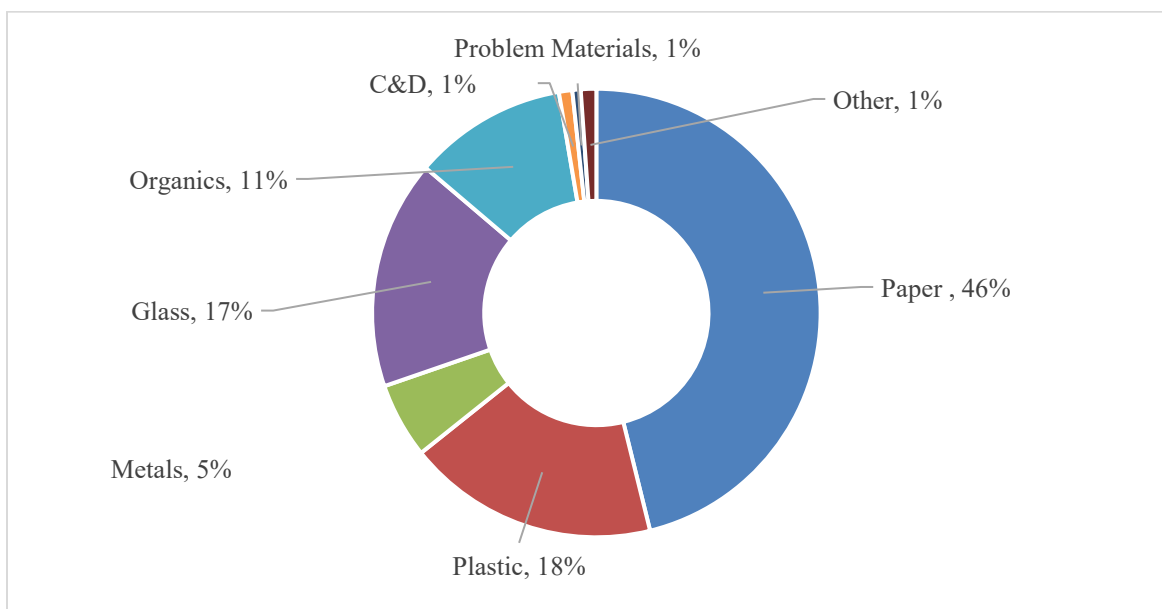


Figure 7: 2020 Regional Composition of Single-Family Residential Recycling

Further detailed material composition profiles for single-family trash and recycling are provided in Appendix C – Material Composition Profiles and Capture Rate.

Capture rate is a key metric that provides insight on how much individual material types are being recycled, which assists with NCTCOG's education and outreach campaign materials. Low capture rates indicate where opportunities exist to increase material recovery through single-stream recycling and provide an understanding of how effectively a curbside recycling program operates. Table 6 compares the capture rate for the region based on the 2019 and 2020 sorting events. The regional capture rate shown (29.8 percent) reflects an estimate based on total tonnage disposed in the North Central Texas region. The capture rate of the materials received during the sorting events reflected a higher capture rate due to small sample size.

Table 6: Regional Capture Rate by Individual Recyclable Materials

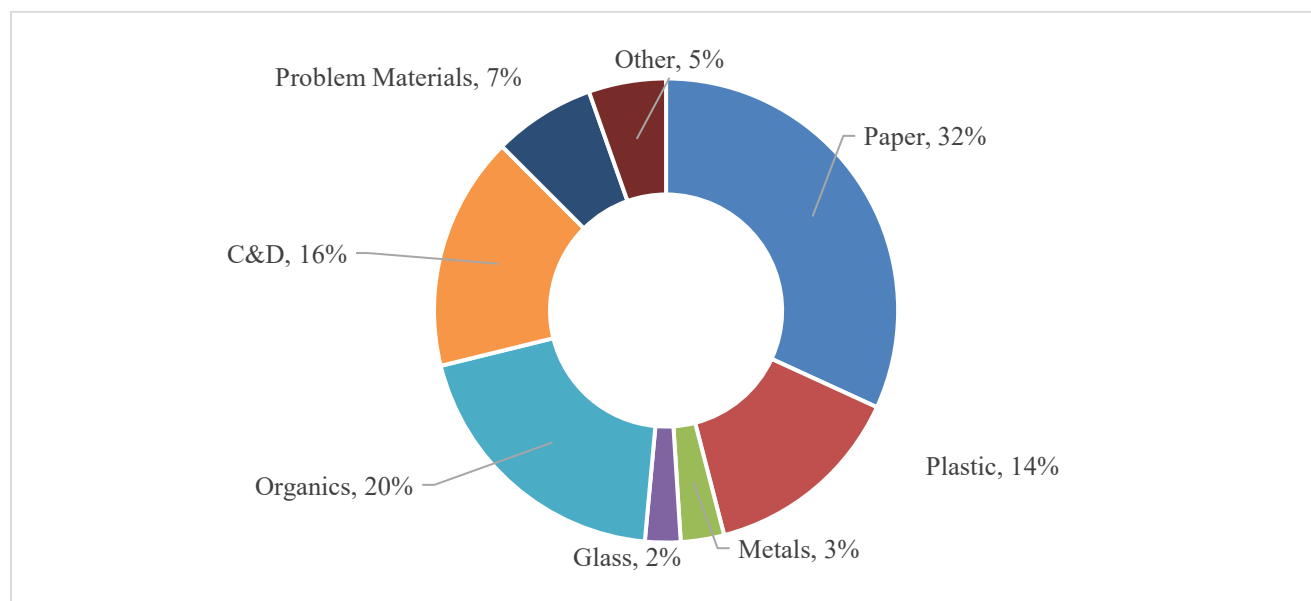
	Material Category	2019 Regional Capture Rate	2020 Regional Capture Rate	Year-over-Year Change
Paper	Recyclable OCC	58.8%	62.4%	3.6%
	Mixed Paper	34.1%	27.7%	(6.4%)
	Subtotal	41.1%	38.0%	(3.1%)
Plastics	PET Containers	24.9%	26.5%	1.6%
	HDPE Containers - Natural	28.0%	34.2%	6.2%
	HDPE Containers - Colored	25.8%	26.1%	0.3%

	Material Category	2019 Regional Capture Rate	2020 Regional Capture Rate	Year-over-Year Change
	#3-#7 Containers	11.3%	12.7%	1.4%
	Subtotal	22.2%	23.7%	1.5%
Metals	Aluminum Used Beverage Containers	26.1%	31.0%	4.9%
	Ferrous Metal Food Containers	14.2%	18.4%	4.2%
	Subtotal	19.5%	24.4%	4.9%
Glass	Recyclable Glass	34.4%	33.9%	(0.5%)
	Subtotal	34.4%	33.9%	(0.5%)
Regional Capture Rate		29.8%	28.7%	(1.3%)

Materials generated by the commercial sector differ from single-family residential materials in the types and relative quantities of waste. For example, depending on the commercial sector, individual entities may generate large quantities of potentially recyclable materials (e.g., glass bottles at bars and restaurants, food waste at restaurants or grocery stores). While there are no recent studies of commercial waste characterization for the region, the RMDP developed an estimated statewide composition for commercial trash based on commercial waste characterizations conducted by the Cities of El Paso and Dallas.

Figure 8 presents the estimated statewide composition of commercial trash in Texas by material category. A detailed material composition profile for commercial refuse is provided in Appendix C – Material Composition Profiles and Capture Rate.

Figure 8: 2019 Estimated Statewide Composition of Commercial Trash



Source Separation

Source separation refers to separation practices required to manage solid waste streams by material type for disposal, single-stream recycling processing, or other means of recycling (e.g., composting). To effectively source separate material, education, outreach, and compliance efforts are required to ensure that generators understand the technical requirements and instructions enabling haulers to efficiently collect solid waste.

Current Activities

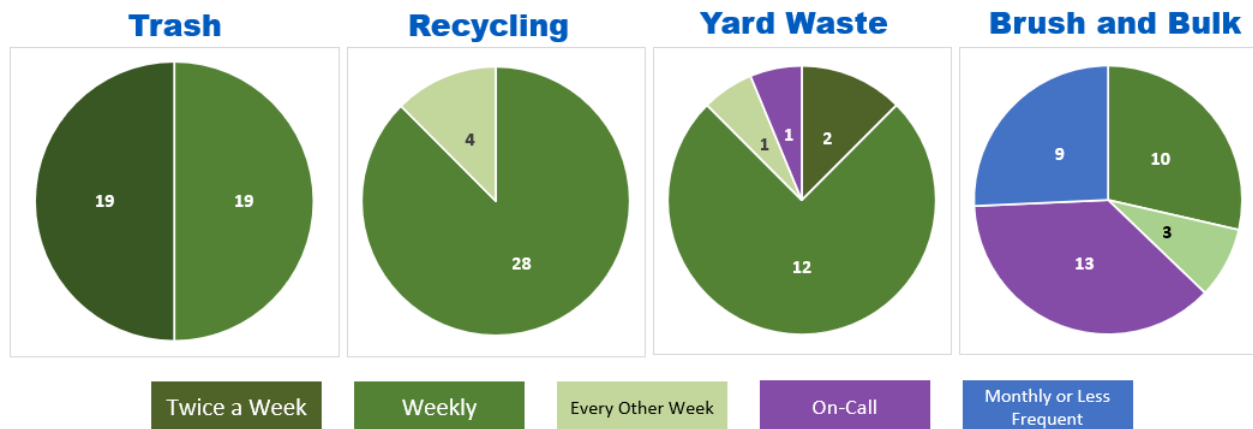
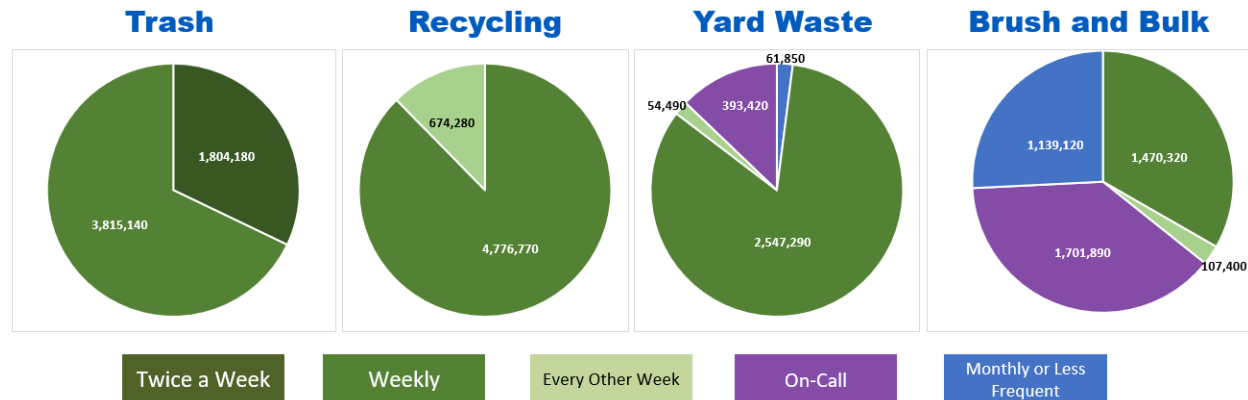
There are presently several approaches to source separation in the region that vary by generator sector. For example, residential single-family homes may set out solid waste in roll-carts and industrial generators may back-haul materials that are baled on site. Table 7 presents the source separation methods by generator sector followed by brief descriptions of each method.

Table 7: Source Separation Methods by Generator Sector

Generator Sector	Trash					Recycling					Organics	
	Bags	Carts/Bins	Dumpsters	Citizen Collection Stations	Roll-Offs	Carts/Bins	Citizen Collection Stations	Dumpsters	Roll-Offs	Other	Bags/Bundles	Carts/Bins
Residential	✓	✓	✓ ¹	✓		✓	✓	✓ ¹			✓	
Commercial		✓	✓		✓	✓		✓	✓	✓ ²		✓
Industrial			✓		✓			✓	✓	✓ ²		✓

1. Residents living in multi-family apartment complexes typically manage trash through shared dumpsters.
2. Commercial and industrial entities may process materials on site (e.g., a grocery store separating and baling old corrugated cardboard (OCC)) for collection or for back-hauling to a regional distribution center to aggregate material from multiple stores prior to transporting to end markets.

Residential. Figure 9 and Figure 10 shows the breakdown of curbside collection services provided to single-family residents in the North Central Texas region based on Survey responses. Results are shown based on number of responses (Figure 9) and the corresponding population represented by these responses (Figure 10).

Figure 9: Frequencies of Residential Collection Services Based on Number of Survey Responses**Figure 10: Frequencies of Residential Collection Services Based on Representative Population**

While many cities in the North Central Texas region collect brush and bulky items curbside, they are often commingled, preventing the separate collection and processing of organics. Several municipalities have expressed interest in providing separate collection, but indicated challenges justifying the additional staffing or equipment and additional effort for education, outreach and compliance related to the potential program.

In areas of the North Central Texas region where curbside collection is less available, citizen collection stations provide the most effective way to source separate materials. There are presently at least 17 citizen collection stations in the North Central Texas region, located among Collin, Dallas, Denton, Hood, Johnson, Kaufman, and Tarrant Counties (as shown in Table 8).

Table 8: Identified Citizen Collection Stations in the North Central Texas Region

Facility Name	Owner/Operator	County
City of Frisco Environmental Collection Center	City of Frisco	Collin
Waste Connections MRF – McKinney	Waste Connections	Collin
Garland Transfer Station Citizen Drop off Center	City of Garland	Dallas
Charles Hinton Jr Landfill	City of Garland	Dallas
Hunter Ferrell Landfill Drop-Off Location	City of Irving	Dallas
McCommas Bluff Citizen Convenience Center	City of Dallas	Dallas
City of Mesquite Convenience Center	City of Mesquite	Dallas
North Lakes Park Drop-Off Center ¹	City of Denton	Denton
Hood County Citizens Collection Station	Hood County	Hood
City of Cleburne Transfer Station	City of Cleburne	Johnson
Kaufman County Kemp Eco Station	BlackJack Disposal	Kaufman
Terrell Station	BlackJack Disposal	Kaufman
City of Arlington	City of Arlington	Tarrant
Brennan Drop-Off Station	City of Fort Worth	Tarrant
Southeast Drop-Off Station	City of Fort Worth	Tarrant
Old Hemphill Drop-Off Station	City of Fort Worth	Tarrant
Hillshire Drop-Off Station	City of Fort Worth	Tarrant

1. North Lakes Park Drop-off Center only accepts recycling.

The NCTCOG’s regional Know What To Throw education and outreach campaign was developed and implemented in 2019 to provide information and context about how municipalities in the region can continue to actively participate in the regional campaign and incorporate its overall approach to campaign development to individual programs. The campaign’s target audience includes residents that live, work, and play in the North Central Texas region. A primary goal of Know What To Throw is to streamline messaging and minimize confusion for residents that may live in a different municipality than they work. Confusion among residents results from varying accepted material types among recycling programs based on the capability of the MRF where material is processed (e.g., glass, rigid plastics).

A key consideration in the development of the Know What to Throw campaign is the focus on increasing the capture rate of targeted recyclables from single-family residential generators. Figure 11 provides an example calculation of capture rate provided by The Recycling Partnership.

Figure 11: Example Capture Rate Calculation

For other recyclable materials (e.g., film plastics, batteries, textiles, paint, tires), typical collection options include drop-off collection at locations such as a retailer, nonprofit or private recycling business, municipal transfer station, or HHW collection facility or event depending on the material type. For example, film plastics are often accepted at return-to-retail locations such as dry cleaners and grocery stores, as they are problematic materials for MRFs processing single-stream materials. Batteries, oil, paint, and antifreeze (BOPA), tires, and other HHW materials are collected through HHW programs (via permanent HHW facility, collection events, or on-demand at-your-door service). Electronics may, in some cases, be returned through a mail-in program and sometimes through takeback programs.

Commercial and Industrial. The North Central Texas region's commercial sector consists of a wide variety of properties, facilities, and business operations. Solid waste from the commercial sector is not managed the same way as the single-family residential sector and although a significant amount of solid waste has diversion potential, effectively segregating and diverting this material presents significant challenges due to the broad set of entities and material types in the commercial and industrial sector. There are a variety of program and policy approaches currently used by municipalities in the North Central Texas region to incentivize source separation of recyclables in the commercial sector. These approaches include voluntary incentives (e.g., green business awards or programs), design requirements (e.g., requiring that recycling enclosures be considered and designated for new and renovated commercial properties), and mandatory programs (e.g., mandatory recycling ordinances).

Planned Activities

NCTCOG has developed Goals and Objectives specific to increasing the ability for each of the generator sectors to further source separate material for recycling, including single-stream recycling, bulk items, organics, HHW, electronics and other material types (e.g., C&D debris, textiles, etc.).

Residential. There are planned activities to leverage the Know What To Throw campaign to increase the capture rate of single-stream recycling from curbside collection programs. Since the campaign was

launched in 2019, NCTCOG staff have actively collected engagement data, incorporated feedback from municipalities and residents, hosted recycling roundtable events to support further coordination and collaboration, amplified the collective messaging being distributed, and discussed next steps to continue working to achieve the goals of the campaign.

While cart-based programs are not necessary to source separate single-stream recycling, they are more efficient collection systems in high density areas with high levels of participation. Additionally, cart-based collection allows municipalities to deploy compliance efforts to target education and outreach (e.g., cart auditing programs). Another key focus in the residential sector is to increase the number of municipalities that have programs to source separate food waste, yard trimmings/brush, and recyclable bulky items.

In the rural areas where curbside collection is less cost effective due to less participation density, there are planned activities to support the development and/or expansion of citizen collection stations to separately manage solid waste.

Based on Regional Solid Waste Grant funding allocated by TCEQ, the following are planned initiatives to support increased source separation in the region:

- The City of Arlington received \$93,500 for a Creating Equitable Access to Recycling and Contamination Reduction Campaign to create equitable access to recycling and solid waste information through outreach and education. The funds will be used for the implementation of a digital communication tool, promotional materials related to recycling and waste diversion, and updated community recycling labels and signage.
- The City of Southlake received \$16,500 to provide a cardboard drop-off station at a central location of the City of Southlake. This program is driven by resident requests for a drop-off location to provide an option when residents have more boxes than will fit in a cart, such as around the holidays or upon move-in, or when they have boxes from expensive and/or large purchases such as televisions or new computers. The drop-off station will also accept paper for recycling.

Commercial and Industrial. As municipalities in the North Central Texas region seek to increase recycling from the commercial sector, there are planned activities to increase the requirements for service provision and data reporting for private haulers servicing commercial and industrial generators. Some cities in the region are considering revised or additional policies or ordinances to target increased commercial and industrial recycling.

Collection

Collection refers to the logistics of removing solid waste (or materials that have been separated for the purpose of recycling) for transport. Collection of solid waste can be provided through curbside collection and citizen collection stations. Residential refuse collection is generally provided curbside, either bagged or in carts. Residential recycling in more densely-populated areas is generally provided as curbside single-stream recycling. Some cities have curbside programs in place with limited materials accepted (e.g., glass is collected separately at drop-off locations). Organics collection is provided via curbside collection in larger cities, primarily for yard trimmings and brush. Curbside collection is provided through the following vehicle types:

In less populated areas, curbside collection becomes more of a challenge due to factors such as increased collection route distances. In these areas, residents are largely served by citizen collection stations. For areas served exclusively or primarily by citizen collection stations, convenience and cost are important considerations. If options are perceived to be too expensive or inconvenient, areas may experience an increase in illegal dumping of materials along roadsides, in vacant lots, or in commercial dumpsters. Organics collection may be provided via citizen collection stations (typically for yard trimmings and brush only). Citizen collection station programs have lower participation rates and yield significantly less material per participant, but the materials may contain less contamination than curbside recycling programs.

Current Activities

Source-separated material is collected curbside by municipal crews in 16 cities within the North Central Texas region based on responses to the Survey. Table 9 presents each of the municipalities that operate collection systems, including which generators are served. All other collection operations are private sector entities that contract directly with municipalities or with individual residential, commercial, and/or industrial customers.

Table 9: Municipally-Operated Collection Systems Based on Survey Results

City	Municipally-Operated Collection		
	Residential (Single-Family)	Residential (Multi-Family)	Commercial
Cleburne	✓	✓ ¹	
Corinth	✓	✓	✓
Dallas	✓		
Denton	✓	✓	✓
Forest Hill	✓	✓	

City	Municipally-Operated Collection		
	Residential (Single-Family)	Residential (Multi-Family)	Commercial
Garland	✓	✓	✓
Grand Prairie	✓ ²		
Granbury	✓	✓	
Irving	✓		
McKinney	✓ ³		
Mesquite	✓		
Plano	✓		
Richardson	✓	✓	✓
Sanger	✓ ⁴		
Weatherford	✓	✓	✓
University Park	✓	✓	✓

1. The City of Cleburne provides only brush and bulk item collection to multi-family residents via municipal operations.
2. The City of Grand Prairie provides only separate yard trimmings collection to single-family residents via municipal operations.
3. The City of McKinney provides only HHW collection to single-family residents via municipal operations.
4. The City of Sanger provides only brush and bulk item collection to single-family residents via municipal operations.

To provide context regarding how much of the North Central Texas region's population is served by municipal crews versus private haulers, the following figures provide a comparison of the number of municipalities receiving trash (Figure 12), recycling (Figure 13), yard trimmings (Figure 14), and brush and bulky item collection (Figure 15) by service provider, compared with the corresponding number of residents in the region served. For yard trimmings, brush and bulky item collection, data is provided only for residential (single-family) service, as these services are not typically provided for multi-family or commercial customers. The legend used in Figure 12 applies to each of the subsequent three Figures. For some collection services (e.g., trash, recycling) the proportion of the region's population served by municipal operations is higher than the relative number of communities that receive municipal service, based on Survey data.

Figure 12: Trash Collection by Service Provider

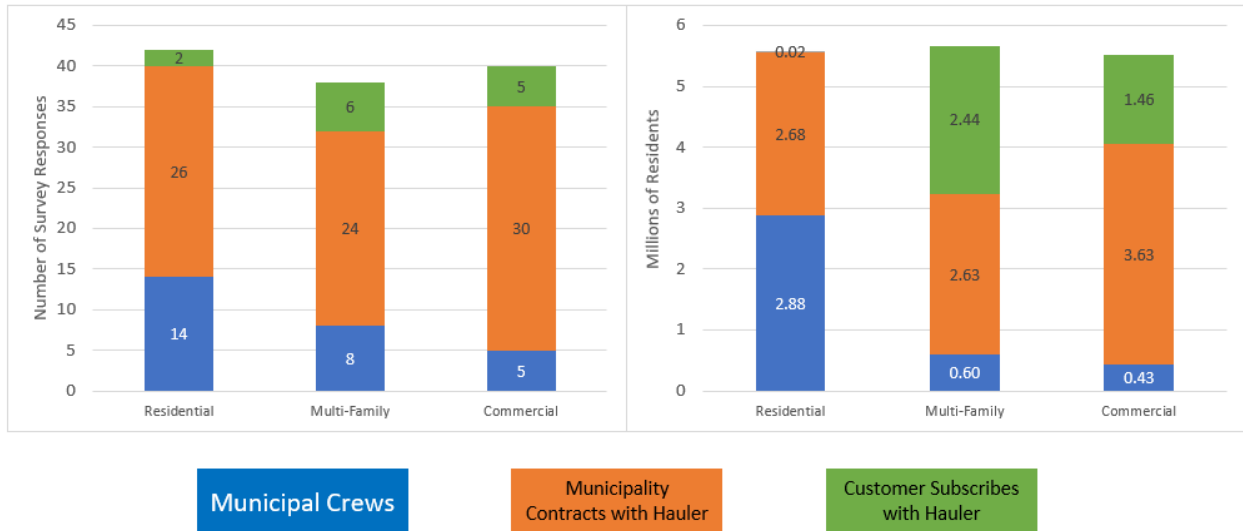


Figure 13: Recycling Collection by Service Provider

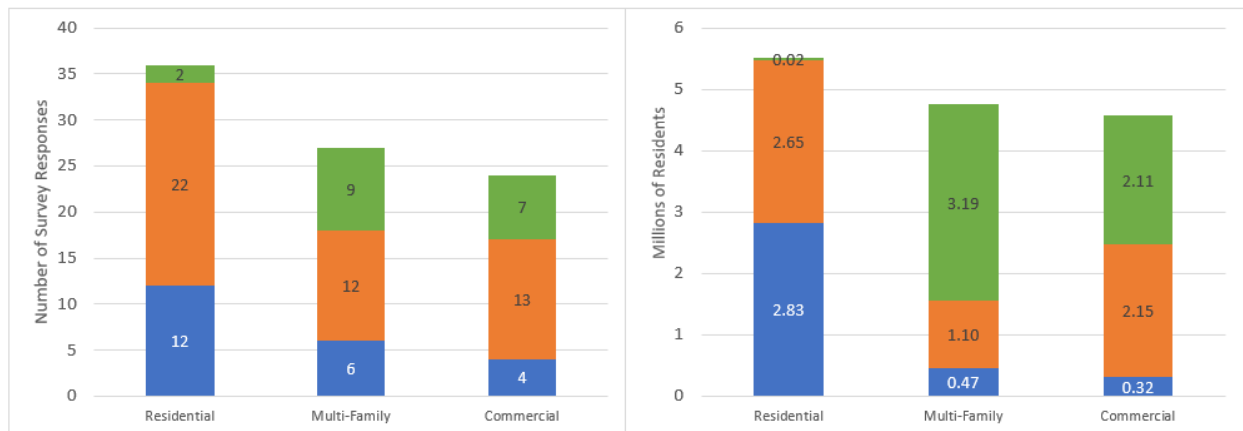


Figure 14: Yard Trimmings Collection by Service Provider

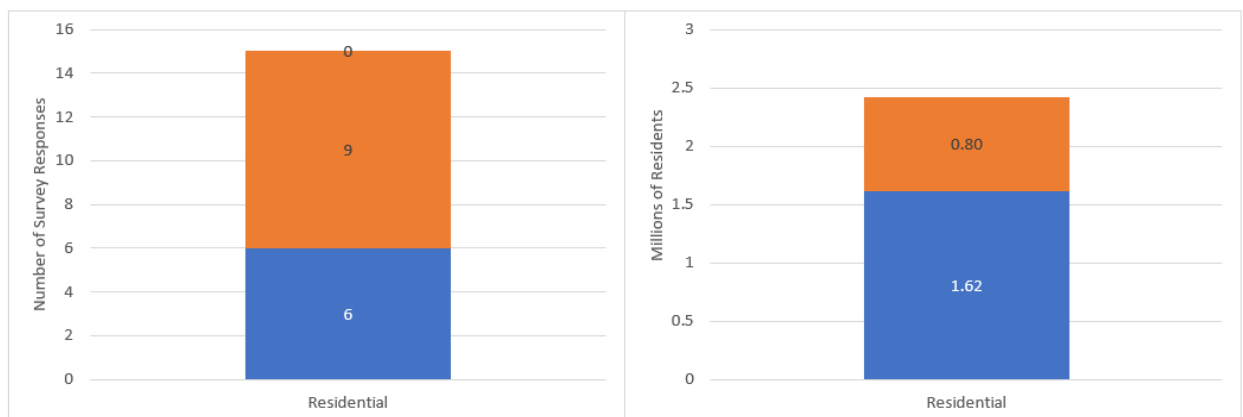
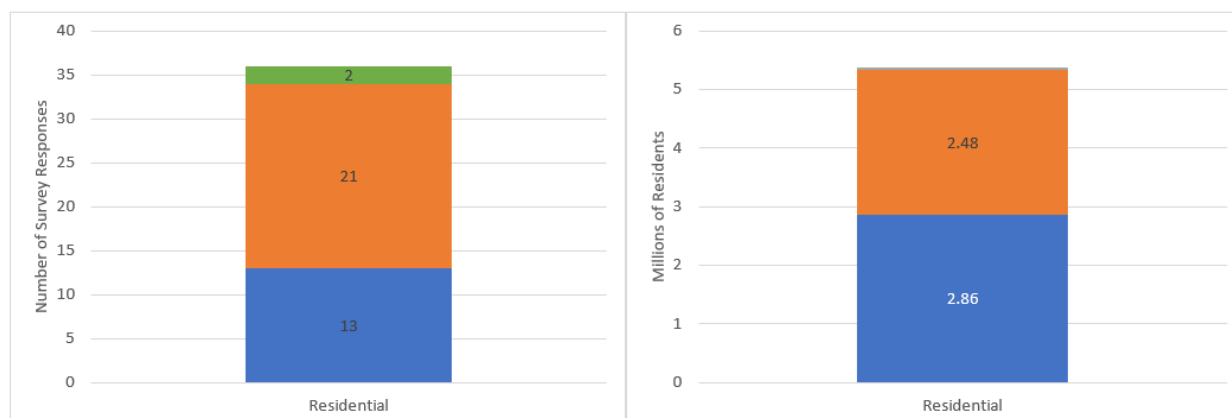


Figure 15: Brush and Bulky Item Collection by Service Provider

Planned Activities

There are planned activities in the North Central Texas region related to multiple facets of collection, specifically:

- Using Alternative Fuel Powered Collection Vehicles.** There are planned activities to increase the number of collection vehicles fueled by alternative fuels such as renewable natural gas (RNG) or Battery Electric Vehicles (BEVs). Both public and private collection operators have indicated that there is an interest to increase the percentage of fleets that are fueled by natural gas, given its environmental benefits. For example, the City of Dallas has indicated an interest to increase the percentage of vehicles in its collection fleet that are natural gas powered and a portion of the Waste Management Inc. collection fleet is fueled by natural gas generated at the Skyline Landfill in Ellis County. Additionally, NCTCOG plans to support the diversion of residential and commercial food waste and wastewater biosolids and to generate RNG as a source of vehicle fuel, subject to the forthcoming findings of the North Central Texas Organic Waste to Fuel Feasibility Study.
- Integrating On-Board Technology.** There are planned activities to increase the integration of on-board technology in waste collection vehicles. Such technology can be used for a variety of functions including service validation (e.g., taking photos to confirm if a bin was at the curb at the time of service for missed collection complaints), safety (e.g., using cameras, sensors, and on-board diagnostics to assist drivers and cities in identifying and avoiding unsafe conditions or driving practices), and data collection and reporting (e.g., using sensors such as radio-frequency identification (RFID) or cameras to track participation and set-out rates, or identify areas with high levels of recycling contamination). Multiple cities and private haulers in the region are planning to increase on-board technology use in the coming years.

- **Addressing Challenging Collection Environments.** A shift toward more condensed development is an ongoing trend among many cities in the region. In many areas, new communities are developed based on Form-Based Code (e.g., SmartCode¹¹) to accommodate environmental techniques such as reduced usage of impervious cover (e.g., pavement, asphalt, cement), increased usage of green spaces (e.g., parks, fields, gardens), and more walkable or multi-modal transit (e.g., bicycle lanes, trolley tracks). The proliferation of higher-density developments can create challenges for solid waste collection to be performed safely and efficiently. If zoning requirements and design codes do not provide accessibility for solid waste collection vehicles or equipment, challenging collection environments are built such as:
 - **Inaccessible Alleys.** Service location in narrow or obstructed alleys.
 - **Private Drives With Limited Maneuverability.** Service locations only accessible by private drives.
 - **Cul-De-Sacs With Inaccessible Set Outs.** Service locations on Cul-de-sacs that are too small or contain obstructions.
 - **Hammerhead or Dead Ends.** Service locations on hammerhead (i.e., dead-end streets that end in a “Y” shape) or dead-end streets with undersized turn radii.
 - **Boulevards.** Service locations on arterial roads that contain obstacles for collection due to multi-modal transportation lanes.

Multiple cities across Texas are experiencing collection challenges associated with the implementation of SmartCode and similar high-density development despite. Many cities in the region are evaluating the review process for new developments; while review process may consider the needs of fire truck equipment, the needs of solid waste and recycling collection vehicles require additional consideration to avoid creation of challenging collection environments.

Handling

Handling refers to all activities and facilities managing solid waste, including collection, storage, transportation, processing, treatment, resource recovery, and disposal. The entities (e.g., facilities, service providers) within the North Central Texas region’s solid waste and recycling system associated with each of the solid waste and recycling activity types is provided in Table 5.

¹¹ SmartCode is a model transect-based planning and zoning document based on the tenants of Form-Based Code intended to keep settlements compact and rural lands open by reforming the patterns of separated-use zoning. More information on SmartCode is available at the following link: <https://smartcodecentral.com/>

communicates the number and types of entities handling solid waste in the region, and the activities performed by each. These activities and facilities are described in more detail in the respective sections of this attachment.

Storage

Storage refers to all activities that store material in preparation for further handling, such as solid waste stored at citizen collection stations prior to transportation or bales of processed recyclables warehoused at MRFs prior to being transported to end users. Table 5 communicates the number and types of entities that may be storing solid waste in the region, and the activities performed by each. These activities and facilities are described in more detail in the respective sections of this attachment.

Transportation

Transportation includes all activities to consolidate and transfer solid waste distances longer than capable by direct hauling from the point of collection.

Collection vehicles may either haul solid waste directly to a resource recovery or disposal facility (referred to as “direct haul”) or utilize a transfer station, which aggregates solid waste into larger transfer trailers for more efficient transportation (referred to as “long haul”). When transport distances are longer, transfer stations allow collection vehicles to be more efficient by maximizing the amount of time spent collecting solid waste rather than driving to a distant disposal or processing facility. Benefits associated with transfer station use can include:

- **Quicker Turn-Around Times for Collection Route Service.** Collection vehicles can often save time and return to service sooner by tipping at a transfer station rather than a landfill that is further away or has significantly more scalehouse and working face traffic.
- **Reduced fuel use and air emissions.** Consolidation of solid waste for transportation to the landfill increases efficiency, and thereby reduces the overall fuel use and air emissions of collection activities. As alternative fuel vehicles gain popularity, they can be tailored to the specific use or service duty for best performance (i.e., low-speed frequent stops of collection routes vs. long-haul transport from transfer station to landfill).
- **Increased lifespan of collection fleet.** Due to reduced travel time and consolidated transportation, the lifespan of the collection fleet could be extended through use of a transfer station.

- **Co-located services such as community drop-off.** A transfer station can improve convenience for residents, further reduce small vehicle traffic at the landfill, and improve safety by directing self-haul residents to transfer station drop-off rather than the landfill working face.

Current Activities

There are presently 17 active transfer stations in the North Central Texas region, located among Collin, Dallas, Denton, Ellis, Johnson, Somervell, and Tarrant Counties (as shown in Table 10).¹² In 2020, these transfer stations facilitated the transport of approximately 1.8 million tons of solid waste.

Table 10: Identified Transfer Stations in the North Central Texas region

Facility Name	Owner/Operator	County
Custer Solid Waste Transfer Station	North Texas Municipal Water District	Collin
Lookout Drive Transfer Station	North Texas Municipal Water District	Collin
Parkway Transfer Station	North Texas Municipal Water District	Collin
Town and Country Recycling Facility	Champion Waste & Recycling Services	Collin
Bachman Transfer Station	City of Dallas	Dallas
Fair Oaks Transfer Station	City of Dallas	Dallas
Westmoreland Transfer Station	City of Dallas	Dallas
Garland Transfer Station Facility	City of Garland	Dallas
Mesquite Transfer Station Facility	City of Mesquite	Dallas
University Park Transfer Station	City of University Park	Dallas
Community Waste Disposal Transfer Station	Community Waste Disposal	Dallas
City of Cleburne Transfer Station Facility	City of Cleburne	Johnson
Somervell County Transfer Station	Somervell County	Somervell
North Texas Recycling Complex Transfer Station	Republic Services	Tarrant
WC Minnis Drive Transfer Station	Waste Connections	Tarrant
Southwest Paper Stock Transfer Station	Southwest Paper Stock	Tarrant
Westside Transfer Station	Waste Management of Texas	Tarrant

Some materials, such as tires, are aggregated, stored, and transported through separate material-specific infrastructure. There are presently 93 entities registered with TCEQ for the storage and transport of tires in the region, located among Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Navarro, Palo Pinto, Parker, Rockwall, Tarrant, and Wise Counties.

Planned Activities

¹² Texas Commission on Environmental Quality (TCEQ). September 2021. "Municipal Solid Waste in Texas: A Year in Review; FY 2019 Data Summary and Analysis." <https://www.TCEQ.texas.gov/downloads/permitting/waste-permits/waste-planning/docs/187-21.pdf>

There is currently one pending permit application listed by the TCEQ for the development of a new transfer station to be located in an unincorporated area of Hunt County. The proposed Highway 24 Transfer Station (Permit MSW-2411) would be authorized to accept MSW, C&D debris, non-hazardous industrial waste, and some special wastes for transport to landfill for disposal.

There are also ongoing planning discussions to site a fourth North Texas Municipal Water District (NTMWD) transfer station to address capacity issues. There are three transfer stations currently active and operated by NTMWD (Custer, Lookout, and Parkway Transfer Stations) that receive and transfer residential and commercial waste and recycling. The Custer Transfer Station receives significantly more tonnage than the other facilities in the system and the facility often reaches its permitted daily capacity and must then decline inbound tonnage. The City of Denton is also considering the development of a future transfer station as it continues to grow.

Additionally, as the existing transfer capacity continues to age, larger municipalities (e.g., City of Dallas) are planning to upgrade facilities to more effectively manage multiple material streams (e.g., trash, single-stream recycling, organics).

Treatment

Treatment refers to processing activities such as reducing the hazards associated with a specific solid waste material, for example medical waste or HHW. Treatment facilities include the following types of activities:

- Medical waste treatment facilities, which process medical waste through autoclaving, incineration, or other technologies to safely manage medical waste materials.
- Liquid waste treatment facilities, which process materials from commercial grease traps, grit traps, septage, or a combination of these wastes. Landfills may also perform liquid waste treatment activities.
- HHW collection, which can be performed at permanent HHW facilities or through other mobile or curbside collection programs.

Current Activities

There are presently eight liquid waste treatment facilities and two medical waste treatment facilities in the North Central Texas region, located among Dallas, Johnson, and Tarrant Counties (as shown in Table 11). In 2021, these facilities treated a total of approximately 1.3 million tons of solid and liquid waste from in-state sources in the North Central Texas region and surrounding areas, comprised primarily of over 1.2 million tons of grease trap waste. Landfills may also perform liquid waste treatment activities. As of

2020, no landfills in the region are authorized for grease/grit trap or medical waste treatment activities and one landfill performed bulk liquid stabilization for disposal.

Table 11: Identified Liquid and Medical Waste Treatment Facilities in the North Central Texas Region

Facility Name	Owner/Operator	County
Liquid Waste Treatment Facilities		
Clean Earth Environmental Solutions	Clean Earth Environmental Solutions	Dallas
Dallas Grease Trap Grit Trap Treatment Facility	Liquid Environmental Solutions of Texas, LLC	Dallas
Wilmer Processing Facility	Cactus Reclamation Services LLC	Dallas
Harrington Environmental Liquid Transfer Station	Harrington Environmental Services LLC	Johnson
Reitz Environmental Services	Reitz Environmental LLC	Johnson
Cold Springs Processing & Disposal	Cowtown Processing & Disposal Inc	Tarrant
Southwest Disposal Facility	Dallas Disposal Interest LP	Tarrant
Liquitek Arlington Liquid Waste Processing Facility	Liquitek, LLC	Tarrant
Medical Waste Treatment Facilities		
Stericycle Garland	Stericycle	Dallas
Oncore Technology	Oncore Healthcare Solutions, LLC	Tarrant

There are presently nine HHW facilities operating in the region for collection and/or reuse across Collin, Dallas, Denton, Hunt, Kaufman, and Tarrant Counties (as shown in Table 12). In addition to the identified HHW facilities, there are at least six additional HHW programs operating including two curbside at-your-door programs (City of McKinney and City of Rockwall) and additional collection events provided by municipalities or haulers in the region.

Table 12: Identified HHW Facilities in the North Central Texas Region¹

Facility Name	Owner/Operator	County
City of Plano HCC Reuse Center	City of Plano	Collin
City of Frisco ECC	City of Frisco	Collin
Dallas County HCC Center	Dallas County	Dallas
City of Denton HCC	City of Denton	Denton
City of Lewisville RCC	City of Lewisville	Denton
Greenville Hunt County Regional HHW Facility	City of Greenville	Hunt
Kaufman County Kemp Eco Station	BlackJack Disposal	Kaufman
City of Fort Worth ECC	City of Fort Worth	Tarrant
City of Mansfield ECC	City of Mansfield	Tarrant

-
1. Does not include two known curbside at-your-door HHW collection programs (City of McKinney and City of Rockwall), as well as other cities and haulers providing mobile/collection event opportunities within the region

Planned Activities

There is currently one pending permit application by Safety-Kleen Systems / Clean Harbors Environmental Services (Pending Permit MSW-40327) for a medical waste processing facility to be constructed in Denton County.

Several cities in the region are exploring options to expand existing HHW programs, including the acceptance of additional hard-to-recycle materials as well as options to expand access to existing programs through interlocal agreements.

Based on Regional Solid Waste Grant funding allocated by TCEQ, the following are additional planned initiatives to address HHW program needs and/or deter illegal dumping in the region:

- The City of Frisco received approximately \$16,300 for improving transportation efficiency for remanufacturing paint from residential household chemical drop-off. Remanufacturing is a method of reuse/recycling that does not require incineration and the creates a consumer product (paint).
- Kaufman County received approximately \$29,000 to conduct HHW events for residents of Kaufman County. During these events, household chemicals, electronic waste, batteries, and lightbulbs will be collected for free. Events are planned for a central location in the County on two different dates within the year (fall and spring). Along with the collection events, the funding will support an educational campaign on the importance of properly managing HHW.
- Collin County received approximately \$27,700 to reduce illegal dumping through the installation of camera to monitor illegal dumping sites throughout various places in Collin County and for use to detect what is found to be hazard and/or toxic substances.
- The City of Rowlett received approximately \$27,200 for a program to eliminate illegal dumping and litter from areas that are diminishing public health and environmental quality. The proposed project will fund the purchase of an all-terrain vehicle and trailer that will be used to carry out the program. The program is a public and private sector partnership.

Resource Recovery

Resource recovery refers to activities that recover valuable materials from the waste stream. Resource recovery involves the following facilities and activities:

- **MRFs.** MRFs are designed to receive, process, segregate, and bale various typical recyclable materials (i.e., plastic, paper, metal, glass) and prepare them for sale on the secondary material commodity market.
- **Composting/Mulching.** Composting/mulching facilities process the organic fraction of the solid waste stream (e.g., branches, leaves, grass, food waste) to produce compost and mulch for use as soil amendments.
- **C&D Recycling Facilities.** C&D recycling facilities includes mixed material processing facilities (referred to as C&D MRFs, and which have conveyors and automated sorting). There are also recycling facilities that manage source-separated C&D debris such as concrete and aggregate, shingles, wood and metals. Some aggregate/concrete/asphalt recyclers have portable equipment to process material on site, reducing transportation resource needs.
- **Tire Processing, Recycling, and Energy Recovery.** Tire processing includes activities such as cutting, grinding, shredding, baling, crushing, splitting, and recapping or retreading recovered tires. Some processors send cut or shredded tires to the landfill, while others send for use as tire-derived fuel, recycling, or to a land reclamation project using tires.
- **Citizen Collection Stations.** While primary function of citizen collection stations is typically source separation/collection of solid waste, many locations also process material such as crushing glass and baling recyclables. Citizen collection stations that process recyclables can help improve the feasibility of recycling in rural areas by supporting a “hub-and-spoke” system for processing and aggregating recyclable commodities into sufficient quantities to deliver directly to an end user (bypassing MRFs).
- **HHW Collection and Processing.** HHW collection can be performed at permanent HHW facilities or through other mobile or curbside collection programs.
- **Landfill Gas-to-Energy (LFGTE).** When organic waste decomposes in a landfill, it is converted to landfill gas (primarily composed of methane and carbon dioxide) which is collected and managed. LFGTE projects make beneficial use of landfill gas, and end uses include electricity/combined heat and power generation and the production of RNG for vehicle fuel or pipeline injection.

Current Activities

In 2021, resource recovery activities resulted in an estimated total of 4.1 million tons of recycling (including single-stream, organics, C&D, tires, HHW, industrial and other materials), equivalent to approximately a 27 percent recycling rate for the North Central Texas region. Resource recovery activities also produced 255 gigawatt-hours of electricity for sale to the grid and 10 billion cubic feet of

RNG from LFGTE projects. Current facilities and activities for each type of resource recovery are described in more detail below.

MRFs. There are presently 11 active MRFs in the North Central Texas region, located among Collin, Dallas, Denton, and Tarrant Counties (as shown in Table 13). Across the North Central Texas region, there is a reported total of nearly 600,000 tons per year of MRF processing capacity currently installed. In 2021, MRFs in the region recovered an estimated 493,000 tons of single-stream recycling.

Table 13: Identified Materials Recovery Facilities (MRFs) in the North Central Texas Region

Facility Name	Owner/Operator	County
Waste Connections MRF – McKinney	Waste Connections	Collin
Plano Recycle Center	Republic Services	Collin
CWD Recycling Facility	Community Waste Disposal (CWD)	Dallas
FCC – Dallas	FCC Environmental Services	Dallas
Champion MRF	Champion Waste Services	Dallas
Dallas Recycling Facility	Dallas Waste & Recycling Inc	Dallas
Balcones – Dallas	Balcones	Dallas
Waste Management Dallas Metroplex	Waste Management	Dallas
Pratt – Denton	Pratt Industries	Denton
North Texas Recycling Complex	Republic Services	Tarrant
Waste Management – Arlington	Waste Management	Tarrant

Composting/Mulching. At least 27 composting/mulching facilities were identified in the region, across Collin, Dallas, Denton, Erath, and Tarrant Counties (as shown in Table 14). Identified facilities include large-scale commercial composters, municipal composting and mulching programs, and composting operations that are co-located at landfills. TCEQ regulation and oversight of organics processing regulations vary depending on the types of materials a facility accepts and therefore TCEQ does not actively regulate all organics processing facilities or have a comprehensive dataset of composting activity in the region. In 2021, composting/mulching facilities in the region recovered an estimated 1.5 million tons of organics from residential and commercial sources.

Table 14: Identified Compost and Mulch Facilities in the North Central Texas Region

Facility Name	Owner/Operator	County
Plano Pure Products	Texas Pure Products	Collin
Living Earth - Plano	Living Earth	Collin
Sustainable Soil Solutions	Sustainable Soil Solutions	Collin
The Organic Recycler of Texas - Melissa	The Organic Recycler of Texas	Collin

Facility Name	Owner/Operator	County
Osttend/380 McKinney C&D Landfill	Construction Recycling & Waste Corporation	Collin
Living Earth - Dallas	Living Earth	Dallas
Soil Building Systems	Soil Building Systems	Dallas
The Organic Recycler of Texas - Dallas	The Organic Recycler of Texas	Dallas
The Organic Recycler of Texas - Hutchins	The Organic Recycler of Texas	Dallas
City of Grand Prairie Landfill	City of Grand Prairie	Dallas
Hunter Ferrell Landfill	City of Irving	Dallas
Charles M Hinton Jr Regional Landfill	City of Garland	Dallas
City of Mesquite Municipal Composting Facility	City of Mesquite	Dallas
DynoDirt	City of Denton	Denton
Living Earth - Flower Mound	Living Earth	Denton
City of Stephenville (Type IV)	City of Stephenville	Erath
City of Cleburne Transfer Station	City of Cleburne	Johnson
DC Organics Inc.	DC Organics Inc.	Johnson
Scotts Co.	ScottsMiracle-Gro	Johnson
The Organic Recycler of Texas - Forney	The Organic Recycler of Texas	Kaufman
Alpine Materials LLC	Alpine Materials LLC	Tarrant
Living Earth - Lakeside (N. Fort Worth)	Living Earth	Tarrant
Living Earth - Fort Worth SELF	City of Fort Worth/Living Earth	Tarrant
Living Earth - City of Arlington Landfill	City of Arlington/Living Earth	Tarrant
Silver Creek Materials Recovery Facility	Silver Creek	Tarrant
The Organic Recycler of Texas - Forest Hills	The Organic Recycler of Texas	Tarrant
Thelin Recycling	Thelin Recycling	Tarrant

C&D Recycling Processing. There is one mixed C&D recycling facility in the region (Champion Waste & Recycling's Town & Country Recycling Facility in Celina) which opened in 2015 as a single-stream construction MRF in North Texas. The facility separates construction material using a combination of processing equipment and sorting labor. Materials recycled throughout the process include cardboard, wood, concrete, metal, plastics, wall board, paper, and aluminum. In addition to the C&D MRF, there are a number of material-specific processors throughout the region processing materials such as concrete/aggregate and scrap metal and disposal facilities in the region may manually sort mixed C&D loads to divert high-value materials such as scrap metal. The exact number of material-specific C&D recycling facilities in the region is unknown. In 2021, C&D recycling facilities recovered at least 1,110,000 tons of recyclables based on available data.

Tire Processing, Recycling, and Energy Recovery. There are presently 20 registered scrap tire facilities involved in tire resource recovery in the North Central Texas region, located across Collin, Dallas, Ellis, Hunt, Kaufman, Palo Pinto, Tarrant, and Wise Counties (as shown in Table 15). Registered scrap tire resource recovery activities include processing (i.e., cutting, grinding, shredding, baling, crushing, splitting, and recapping or retreading), recycling (i.e., preparation of used or scrap tires for re-use) and energy recovery (such as tire derived fuel). In 2021, tire processing and recycling facilities recovered an estimated 30,000 tons of tires for recycling.

Table 15: Identified Tire Processing, Recycling and Energy Recovery Facilities in the North Central Texas Region

Facility Name	Owner/Operator	County
Tire Processing¹		
Warrior Tire	Colmark Holdings, Inc.	Collin
G5 Industrial	Texas Tire Recyclers, LLC	Dallas
IDSA dba TDSA	IDSA dba TDSA	Dallas
City of Dallas McCommas Bluff	City of Dallas	Dallas
Hughes Auto Sales	Hughes Auto Sales Inc	Dallas
3 Star Recycling	3 Star Recycling	Ellis
J & L Tire Services	J & L Tire Services	Hunt
360 Tire Group	360 Tire Group, LLC	Hunt
Discount Tire & Service	Discount Tire & Service	Kaufman
Real Deal Recycling	Real Deal Recycling	Palo Pinto
QB Tires Recycling	QB Tires Recycling	Tarrant
Nortex Tire Recyclers	Nortex Tire Recyclers LLC	Wise
Tire Recycling²		
USAR ³	USAR LLC	Dallas
Liberty Tire Recycling ³	Liberty Tire Recycling	Dallas
All American Tire Recyclers ³	TJP Enterprises, LLC	Tarrant
TDSA	TDSA	Dallas
Vista International Technologies	Vista International Technologies	Dallas
Energy Recovery⁴		
Holcim Texas	Holcim (Texas) LP	Ellis
Ash Grove Cement	North Texas Cement Company LLP	Ellis
TXI Operations	TXI Operations, LP	Ellis

1. Activities include cutting, grinding, shredding, baling, crushing, splitting, and recapping or retreading.

2. Activities include separation and preparation of used or scrap tires for reuse.

3. Facility holds both processing and recycling registrations.

4. Activities include use as tire-derived fuel.

HHW Collection and Processing. There are presently eight HHW facilities operating in the region as well as additional collection programs and events (as discussed under Treatment in this Appendix and shown in Table 12). In 2021, HHW facilities and programs were responsible for recovering as estimated 3,255 tons of HHW materials (e.g., household chemicals, electronics, paint, oil filters) for recycling or energy generation and an additional 226 tons of materials for reuse.

Landfill gas-to-energy (LFGTE). There are presently gas-to-energy projects at 10 landfills in the region, located among Collis, Dallas, Denton, Ellis, Johnson, and Tarrant Counties (as shown in Table 16). Half of these projects produce high-British thermal unit (BTU) RNG for distribution off-site and half are power generation electricity. Based on data from the TCEQ MSW Annual Reports and the USEPA Greenhouse Gas (GHG) Reporting Program, these projects result in more than half of the landfill gas collected in the region going to beneficial use through resource recovery.

Table 16: Identified LFGTE Projects in the North Central Texas Region

Facility Name	Project Owner/Operator¹	County
Renewable Natural Gas (RNG)		
121 RDF LFG Treatment Facility	North Texas Municipal Water District	Collin
McCommas Bluff LFG Processing Facility	Dallas Clean Energy McCommas Bluff	Dallas
Waste Management Skyline Landfill	WM Renewable Energy, LLC	Ellis
Turkey Creek Landfill	Turkey Creek Renewables, LLC	Johnson
City of Arlington Landfill Gas Processing Plant	MAS Arlington RNG, LTD	Tarrant
Power Generation		
City of Grand Prairie Landfill	Grand Prairie Landfill Gas Production, LLC	Dallas
City of Denton Landfill Gas to Energy Facility	City of Denton	Denton
Camelot Landfill Gas to Energy Facility	WM Renewable Energy, LLC	Denton
DFW Recycling and Disposal Facility	WM Renewable Energy, LLC	Denton
Westside Recycling and Disposal Facility	WM Renewable Energy, LLC	Tarrant

1. Owner/operator information refers to the LFGTE project. Landfill owner/operator information is provided in Table 17.

Planned Activities

Although there are no known pending permit applications for resource recovery facilities in the region, there is at least one known recycling processor looking to build new a technologically-advanced MRF in North Central Texas, which would provide needed processing capacity in the region. NCTCOG is also planning to initiate a Regional Organic Waste Gap Analysis Study that will identify and evaluate the need for enhanced and/or additional organics processing infrastructure. The City of Fort Worth is presently evaluating options for a LFGTE project for the production of RNG at the City's Southeast Landfill. Once completed, only significantly smaller sites (i.e., less than 800 standard cubic feet per minute of landfill gas collected) will remain without active LFGTE projects and there are notable feasibility challenges for LFGTE projects at these low flowrates.

Based on Regional Solid Waste Grant funding allocated by TCEQ, the following are planned resource recovery initiatives in the region:

- The City of Cedar Hill received approximately \$55,400 for an asphalt recycler and hotbox to divert approximately 2,844 tons per year of asphalt waste from local landfills.
- The City of Denton received approximately \$60,700 for a commercial food waste diversion pilot to enhance the valet collection program, promote organics reuse, and increase the landfill diversion rate. Approximately 35 percent of the targeted commercial waste is food waste (pre- and post-consumer).
- The City of Weatherford received approximately \$125,000 to develop a Western Region Composting Feasibility and Implementation Plan. The City of Weatherford, as well as many other governmental entities, use the IESI Weatherford Landfill to dispose of both wastewater biosolids (sludge) and brush. Because this landfill has an anticipated closure of less than a year, these entities will be forced to take their biosolids considerable distances to find the closest landfill that will accept them. This effort will build on existing identified recommendations of the Western Area Regional Study and will result in a plan to implement a compost facility for the City of Weatherford, as well as other potential partners.
- The City of Plano received approximately \$60,200 to institute a subscription-based residential food scrap composting pilot program for residents of the City. The proposed program will consist of food waste collection sites located throughout the City, where program participants will be able to drop-off food waste for collection and composting by a selected service provider.

Disposal of Solid Waste

MSW landfills in Texas are classified as either Type I or Type IV facilities. A Type I landfill can accept a range of putrescible (organic waste that decomposes) and non-putrescible wastes, including typical household and commercial wastes, brush, C&D, nonhazardous industrial solid waste, and other wastes (e.g., wastewater treatment plant sludge, special waste). A Type IV landfill only accepts brush, C&D debris, and other similar non-household or non-putrescible waste.

Current Activities

There are presently 18 active Type I landfills (landfills that accept all types of MSW, including C&D materials and special waste) in the North Central Texas region, located among Collin, Dallas, Denton, Ellis, Johnson, Navarro, Parker, and Tarrant Counties (as shown in Table 17). An estimated 11 million tons of solid waste was disposed in Type I landfills in the region in 2020, and there is an estimated 377 million cubic yards of capacity remaining at these sites.¹³ This equates to total remaining landfill life of

¹³ This estimate differs from those presented in the TCEQ's FY2020 Annual Summary of Municipal Solid Waste Management in Texas as it includes recently approved landfill expansions approved by the TCEQ in 2021.

27 years for the region, from the year 2020.¹⁴ Landfill life and adequacy of disposal capacity for future needs is discussed in more detail in Attachment III.D.

Table 17: Identified Type I Landfill Facilities in the North Central Texas Region

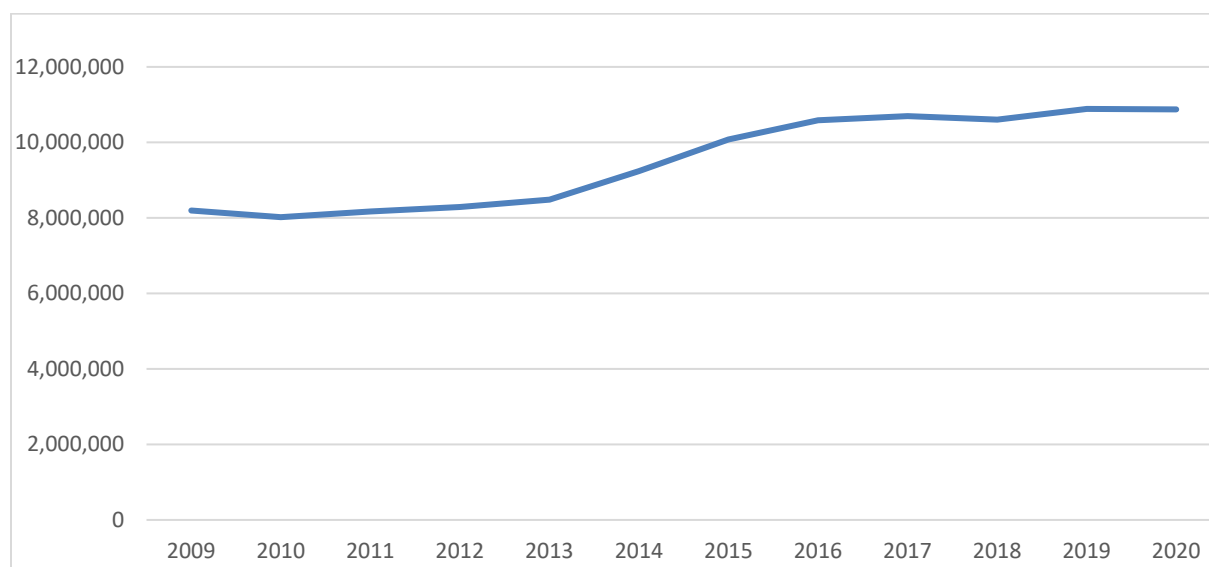
Facility Name	Owner/Operator	County
121 Regional Disposal Landfill	North Texas Municipal Water District	Collin
McCommas Bluff Landfill	City of Dallas	Dallas
City of Grand Prairie Landfill	City of Grand Prairie	Dallas
Hunter Ferrell Landfill	City of Irving	Dallas
Charles M Hinton Jr Regional Landfill	City of Garland	Dallas
Camelot Landfill	City of Farmer's Branch (owner) Republic Services (operator)	Denton
City of Denton Landfill	City of Denton	Denton
DFW Recycling and Disposal Facility	Waste Management	Denton
Skyline Landfill & Recycling Facility	Waste Management	Ellis
CSC Disposal and Landfill	Republic Services	Ellis
ECD Landfill	Republic Services	Ellis
Republic Maloy Landfill	Republic Services	Hunt
City of Cleburne Landfill ¹	City of Cleburne	Johnson
Turkey Creek Landfill	Waste Connections	Johnson
City of Corsicana Landfill	City of Corsicana	Navarro
Weatherford Landfill	City of Weatherford (owner) Waste Connections (operator)	Parker
Southeast Landfill	City of Fort Worth (owner) Republic Services (operator)	Tarrant
City of Arlington Landfill	City of Arlington (owner) Republic Services (operator)	Tarrant

1. The City of Cleburne Landfill only accepts sludge and other waste on an emergency basis. It is not accepting waste from public sources.

Figure 16 illustrates how remaining regional landfill capacity disposal has changed from 2009–2020.

During this time, total annual regional disposal has trended upward, from 8.1 million tons in 2009 to 10.8 million tons in 2020. Data is based on past annual TCEQ MSW Annual Reports.

¹⁴ This estimate differs from those presented in the TCEQ's FY2020 Annual Summary of Municipal Solid Waste Management in Texas as it accounts for population growth and increased waste generation, rather than a straight-line disposal projection using current year annual tonnage. This methodology is described in more detail in Attachment III.D.

Figure 16: Trends in Annual Regional Disposal, Type I and IV Landfills (Tons)

There are four Type IV landfills in the North Central Texas region, located among Collin, Denton, Erath, and Tarrant Counties (as shown in Table 18). These sites disposed of an estimated 642,118 tons of solid waste in FY 2020.

Table 18: Identified Type IV Landfills in the North Central Texas Region

Facility Name	Owner/Operator	County
Osttend/380 McKinney C&D Landfill	Construction Recycling & Waste Corporation (CRWD)	Collin
Lewisville Landfill	Republic Services	Denton
City of Stephenville Landfill	City of Stephenville	Erath
Fort Worth C&D Landfill	Waste Connections	Tarrant

Planned Activities

There are multiple recent and pending permit amendment applications to address anticipated disposal capacity challenges in the North Central Texas region, as follows:

- The Waste Connections Type I Turkey Creek Landfill (Permit MSW-1417D) has a pending permit amendment for a vertical expansion to add 4.85 million cubic yards of capacity to meet the needs of Johnson County and surrounding areas. The site currently has less than five years of capacity remaining. The permit amendment also includes increases to the daily and annual waste acceptance rates to account for an increase in disposal due to the closure of other landfills in the region.

- The Waste Management Type I Skyline Landfill (Permit MSW-42D) submitted a notice modification to TCEQ to increase the site's waste acceptance rate to account for an increase in disposal due to the closure of other landfills in the region.
- The CRWD Type IV Ostend/380 McKinney C&D Landfill (MSW-2278A) has pending permit modification application revising grades and would add an additional approximately 1.6 million cubic yards of capacity for C&D and other non-putrescible wastes.

While the North Central Texas region as a whole is experiencing disposal challenges as landfills in the region reach capacity and close, this challenge is more pronounced in the Western Region. The Western Region has an estimated 15 years of remaining capacity. In 2021, NCTCOG completed a study to better understand the long-term solid waste management needs in the Western Region. Based on the results of the study, NCTCOG has undertaken steps to establish a Western Region Solid Waste Management Authority (WRSWMA) and coordinate efforts to establish needed disposal capacity in the region. A Policy Advisory Group (PAG), which include representatives of communities in the six western-most counties in the region, meets to determine how to move forward with recommendations from the Western Region Study.

Attachment III.D: Facility Adequacy

Evaluating the adequacy of existing facilities, practices and programs is a key part of the planning process. Form Table III.D communicates that all of the facility categories in the North Central Texas region are inadequate. While the North Central Texas region includes an extensive network of many sophisticated facilities, the Project Team concluded that the facilities are inadequate based on the changing landscape of solid waste management and resource recovery in the region. Moreover, as the population and economic activity continue to grow, coupled with increasing demand for diversion programs, there will be an increased need going forward for all of the facility types evaluated in the following sections.

Resource Recovery

Based on the identified relevant facilities in Attachment III.C, resource recovery infrastructure is inadequate in the region. The continued population growth of the region will further strain the materials management infrastructure and facilities in the region including MRFs and organics processing facilities (e.g., composting/mulching facilities). The adequacy of specific types of resource recovery facilities is described below.

MRFs. The majority of MRFs currently operating in the region are at or near capacity, meaning there is significantly more material potentially available for processing from both residential and commercial sources than there is processing capacity. Increases in recycling participation (through expanded access in rural areas of the region and/or increased capture of material from established or new programs) could quickly exceed existing capacity. Further, the level of technology installed at MRFs in the region varies. While several of the MRFs have “state of the art” processing equipment, there are a few facilities that have older, less technologically-advanced processing systems. Several of the MRFs with older systems are currently in the process of upgrading their processing equipment.

Composting/Mulching. While notable quantities of organics are recovered in the region for composting/mulching activities, organics comprise a significant portion of the landfilled trash in the North Central Texas region (e.g., about 50 percent of the residential waste stream). Diverting more organics in the future is anticipated to exhaust existing composting/mulching facility infrastructure and require the expansion of existing facilities and/or citing of new facilities. NCTCOG is in the process of initiating a Regional Organic Waste Gap Analysis study, which will help to identify existing capacity and potential future locations for expanded organics recycling infrastructure.

C&D Recycling Processing. The North Central Texas region includes some of the fastest growing communities in the country. As growth continues and accelerates throughout the region, development activities including new construction and renovation will also increase and results in large amounts of C&D debris being generated. Generally, C&D is collected in a co-mingled form, which requires MRF capacity. The only C&D MRF in the region is located in north Collin County, which provides mixed C&D recycling capacity to northern parts of the region; however, other areas in North Central Texas lack mixed C&D processing capacity. There are material-specific C&D recycling facilities/end-users in the region (e.g., concrete recyclers), which support strong markets for individual materials such as concrete and asphalt. These material-specific facilities generally have sufficient capacity to recovery additional material.

HHW. Based on the evaluation in Attachment III.C, HHW collection and processing infrastructure in the region is inadequate. This is discussed in more detail in the Household Hazardous Waste section of this attachment.

LFGTE. Based on the evaluation in in Attachment III.C and landfill gas collection data from the USEPA GHG Reporting Program, current LFGTE facilities are adequate. LFGTE projects have been cited or are planned at all landfills with sufficient landfill gas flowrates; however, the ongoing Regional Organics to Fuel Feasibility Study serves as an assessment of the opportunities for generating additional biomethane in the region for vehicle fuel, which may identify opportunities to upgrade existing power generation projects to RNG projects.

Storage

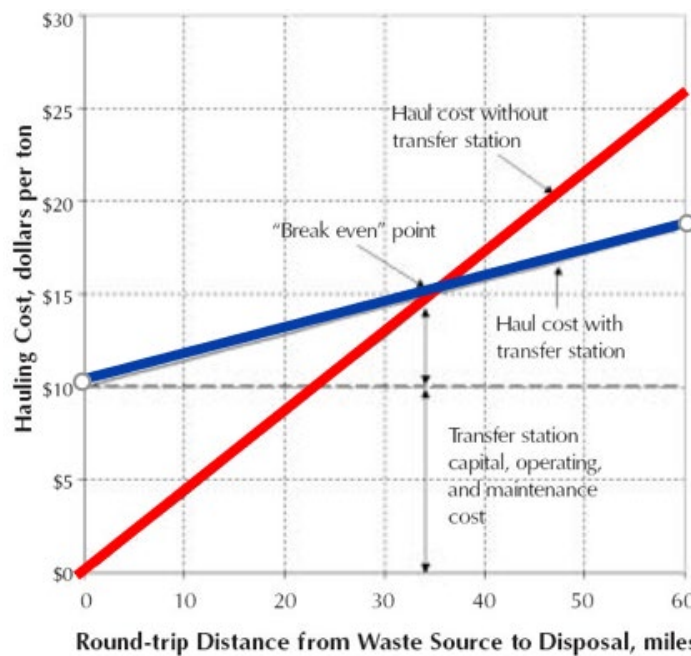
As discussed in Attachment III.C. and Form Table III.C.I, storage refers to all activities that store solid waste in preparation for further handling. Many facility types perform storage activities incidentally to a primary purpose (e.g., a MRF's primary purpose is to process single-stream recycling but will store bales of processed materials prior to being transported to end users). Correspondingly, the discussion of facility adequacy for many facilities that perform storage is presented in other sections within this attachment. Citizen collection stations, however, represent important collection and storage infrastructure and are discussed herein. Based on the evaluation in Attachment III.C, as the North Central Texas region continues to grow there will be critical need for access to material drop-off via citizen collection stations, particularly for more rural areas of the region. These facilities can play a vital role for both disposal and recycling, as certain residents (e.g., those in multifamily complexes) may not be served via curbside collection programs.

A specific example of current storage constraints is at the City of Cleburne Transfer Station, which does not have the required space nor operating capacity to operate a co-located citizen collection station or process recycling. These are improvements that the City had explored by applying for \$160,500 in funding through the Regional Solid Waste Grant program but was not selected. A need for recycling drop-off capacity is a continued priority for the Western Region but requires infrastructure and staffing, as discussed in the Resource Recovery and Transportation sections of this attachment.

Transportation

As the region continues to grow and solid waste generation increases landfill airspace will diminish. Additional landfill capacity may be sited further away from where solid waste is generated, increasing the importance of transfer stations to manage solid waste in the most cost effective and environmentally conscious way possible. For example, the City of Fort Worth's Southeast Landfill currently has approximately 15 years of capacity remaining and accepts approximately 1 million tons annually for disposal. When this facility reaches capacity, these tons will be redistributed to other disposal facilities throughout the North Central Texas region. This solid waste may need to be hauled to facilities further from the point of generation, increasing the need for use of a transfer station.

Figure 17, developed by the USEPA, shows a comparison of the cost per hauling with and without use of a transfer station. A municipality or private hauler with round-trip hauling distances exceeding 34 miles will incur higher operational costs per tons by direct hauling solid waste compared to their costs of utilizing a transfer station.

Figure 17: Comparison of Hauling Costs With and Without a Transfer Station

Accessibility to transfer stations is particularly important in the western and more rural areas of the North Central Texas region that have less available landfill airspace capacity. The inadequacy of transfer station infrastructure serving the Western Region was identified in the NCTCOG's Western Region Landfill Capacity Study, which noted that increased transfer station capacity in certain areas will reduce haul costs and make collection systems more efficient.

The majority of transfer stations in the North Central Texas region were originally designed to manage only trash but are now required to manage multiple solid waste streams separately. While many of these transfer stations can provide this service, it strains the capacity of the facilities, operating staff, and hauling fleet, resulting in the transfer stations reaching operational capacity well before reaching their permitted capacity of inbound tonnage. As the region increases its efforts to capture recycling, including organics, transfer stations will require additional capabilities for handling recycling.

Treatment

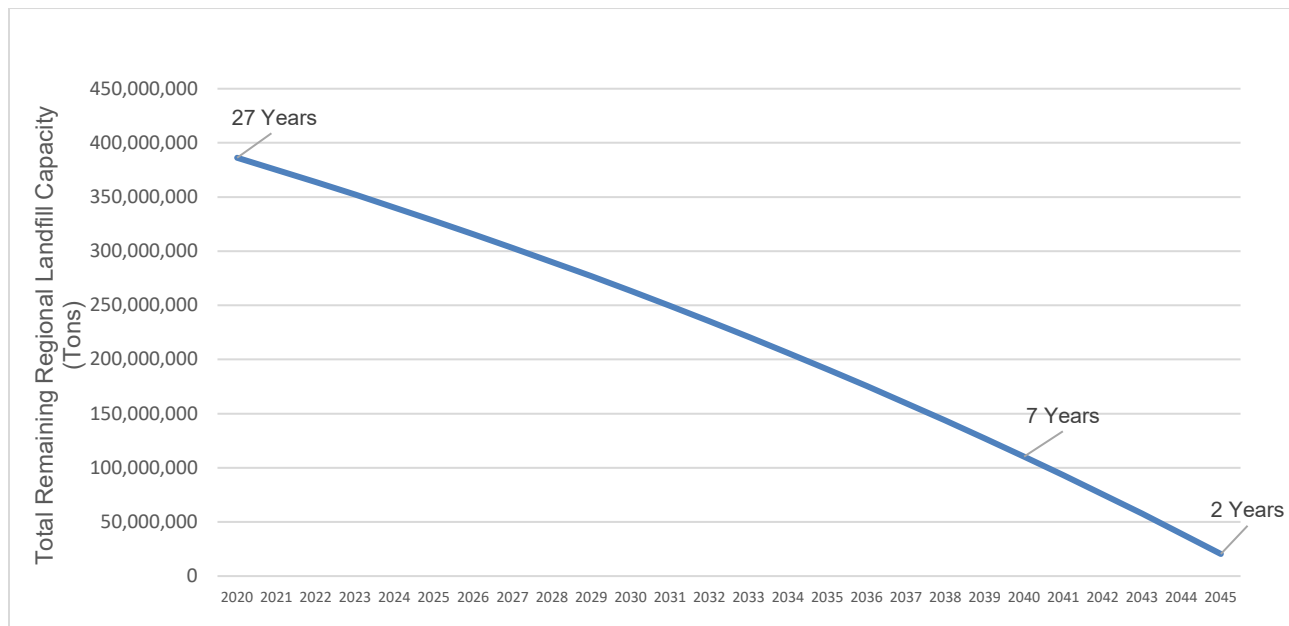
Based on the evaluation in Attachment III.C, regional infrastructure for liquid and medical waste treatment is expected to increase to meet growing needs. The adequacy of HHW collection and treatment infrastructure, which is inadequate in some areas of the region, is discussed separately in this attachment. While expanding facility and/or programs for waste treatment may be able to meet future volumes, some waste handling and treatment systems may remain inadequate due to challenges such as the current labor shortage. Recently, there have been serious backlogs for medical waste and HHW recycling processing in

Dallas and surrounding areas in the region due to labor shortages. These labor shortages have also impacted collection and transportation activities.

Disposal

Based on the identified disposal facilities (listed in Table 17 and Table 18) and TCEQ MSW Annual Reporting Data, disposal infrastructure is expected to be inadequate for anticipated future volumes.¹⁵ Figure 18 shows the projected remaining North Central Texas region landfill capacity through 2045, taking into account future population and economic growth and assuming no landfill capacity is added through existing landfill expansion or new permitted landfills. As of 2020 the estimated the remaining landfill capacity of the region is approximately 386.3 million tons. If annual disposal quantities, totaling approximately 10.8 million tons in 2020, were to increase at the same rate as regional population projections,¹⁶ the remaining North Central Texas regional landfill capacity would be fully depleted in the year 2047. This equates to total remaining landfill life of 27 years for the region, from the year 2020.

Figure 18: Projected NCTCOG Remaining Regional Types I and IV Landfill Capacity, 2021-2045



¹⁵ When calculated the way data has traditionally been presented by TCEQ in its MSW annual reports, the region has approximately 37 years of total Type I Landfill capacity remaining at current reported annual disposal rates. This TCEQ method does not account for future population and economic growth. Actual total remaining landfill life, given current remaining capacities, is expected to be lower.

¹⁶ 2040 NCTCOG Demographic Forecast. North Central Texas regional Data Center. Accessed February 2021. https://data-NCTCOGgis.opendata.arcgis.com/datasets/6e99f37880d845758788c18f5a2c36f2_10

Contributing to the inadequacy of disposal infrastructure is the fact that remaining disposal capacity is concentrated in the DFW Metroplex area of the region and as a result, the Western Region has only 15 years of currently permitted landfill life. In 2021, NCTCOG completed the Western Region Study to better understand the long-term solid waste management needs in the Western Region and identify needed actions to develop recycling, transfer station, and landfill infrastructure to ensure disposal capacity is adequate.

Household Hazardous Waste Collection

Generally, the region has one of the most extensive networks of HHW facilities in Texas (e.g., Cities of Denton, Fort Worth, Frisco, and Dallas County), many of which are operated as regional programs through interlocal agreements and cooperation. However, there remain areas of the region (e.g., South portion of the DFW Metroplex, rural areas such as the Western Region) that are still in need of additional HHW infrastructure. For example, there are areas with the ability to participate in existing programs but the available drop-off facility is prohibitively far or inconvenient. Residents in other (especially rural) areas may be willing to transport solid waste to a nearby facility/program but since they are not residents they cannot use the program and must be turned away.

Household Hazardous Waste Disposal

Household hazardous waste disposal is inadequate in the North Central Texas region due to the same challenges as household hazardous waste collection—certain areas in the region (e.g., South portion of the DFW Metroplex, rural areas such as the Western Region) lack of access to HHW facilities.

Attachment III.E: Current Source Reduction and Resource Recovery Efforts

This attachment describes the efforts throughout the North Central Texas region related to education, source reduction, reuse, and other means of reducing disposal and promoting recycling based on information provided through the Survey.

Figure 19 summarizes the Survey data related to municipal source reduction and waste minimization efforts. Municipalities have focused efforts to increase reuse and waste reduction primarily on education (e.g., discouraging use of single-use items) rather than policy. This is consistent with NCTCOG's Goals and Objectives, as efforts are primarily focused on recycling material in the short-range planning period. As discussed in Attachment III.N., region-wide action related to source reduction and waste minimization is a focus of NCTCOG in subsequent planning periods.

Figure 19: Current Source Reduction and Waste Minimization Efforts

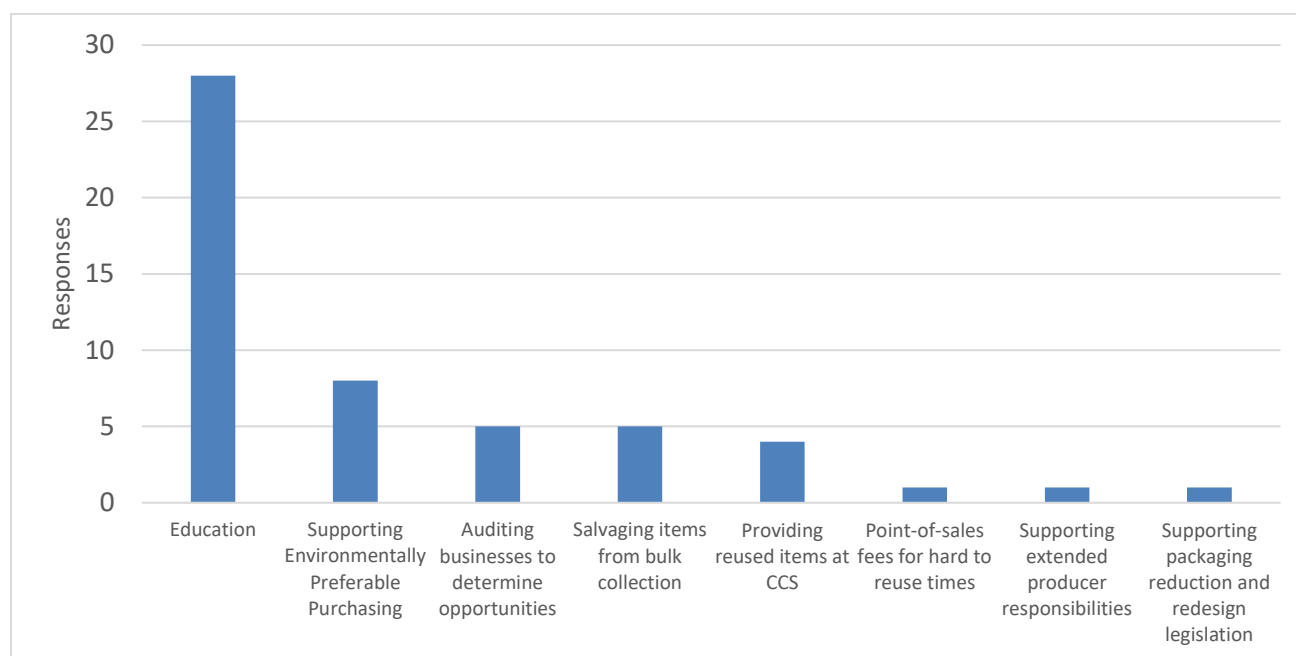
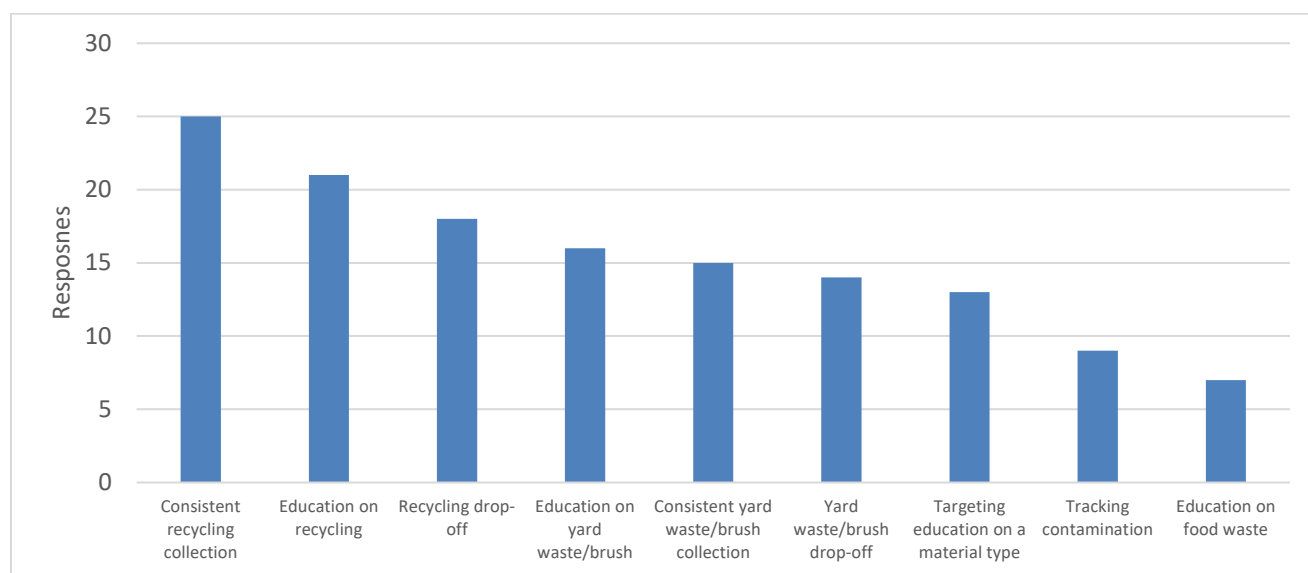


Figure 20 summarizes the Survey data related to municipal recycling efforts. Recycling efforts varied in both activities—including collection programs, education, and data collection—and material types. As is consistent with the NCTCOG's Goals and Objectives, municipalities cited efforts to recycle organics in addition to single-stream materials.

Figure 20: Current Recycling Efforts

The Survey also asked municipalities in the North Central Texas region to provide information regarding efforts related to the management of electronics, tires, and sludge, with key takeaways summarized below:

- **Electronics.** A majority of municipalities that responded indicated that electronics recycling was provided either through annual or biannual (twice a year) events or facilities.
- **Sludge.** Communities indicated that sludge is managed by composting and/or land application. Some communities that currently landfill or incinerate sludge noted that they are assessing composting options. Responses indicated that sludge was not widely recycled in the region.
- **Tires.** Communities listed grinding tires for fuel, asphalt, and use in civil/construction projects. Responses indicated that tires were not widely recycled in the region.

Attachment III.F: Additional Opportunities

This attachment provides further detail related to the additional opportunities for source reduction, waste minimization, and recycling in the North Central Texas region described in Form Table III.F.

Opportunities were identified based on a variety of sources including regional, statewide, and national solid waste management trends; current and planned activities in the North Central Texas region and throughout the U.S.; best practices and recommendations from national organizations such as the USEPA and the National Product Stewardship Council; and scholarly and industry articles.

The opportunities listed in Form Table III.F are suggestions that would support source reduction and waste minimization, reuse and recycling and are not intended to be a comprehensive listing of recommendations for implementation.

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Attachment III.G: Recommendations

This attachment provides further detail related to the recommendations for encouraging and achieving a greater degree of source reduction and waste minimization, reuse, and recycling in the North Central Texas region that are presented in Form Table III.G.

Recommendations for NCTCOG in the short-term planning period were determined by the Project Team based on:

1. The frequency in which key topics were included within the 68 implementation activities developed by NCTCOG and provided in Appendix B – Implementation Activities By Goal and Objective. Implementation activities cited in Form Table III.G. are attributed to multiple recommendations if applicable. For example, the implementation activity “support source reduction and reuse; recycling and composting; and energy recovery initiatives to reduce additional landfill capacity needs” may be applicable to all of the recommendations.
2. Priorities demonstrated by NCTCOG based on current and recently completed studies (e.g., Regional Organics to Fuel Feasibility Study).
3. Statewide and national solid waste and recycling industry trends.

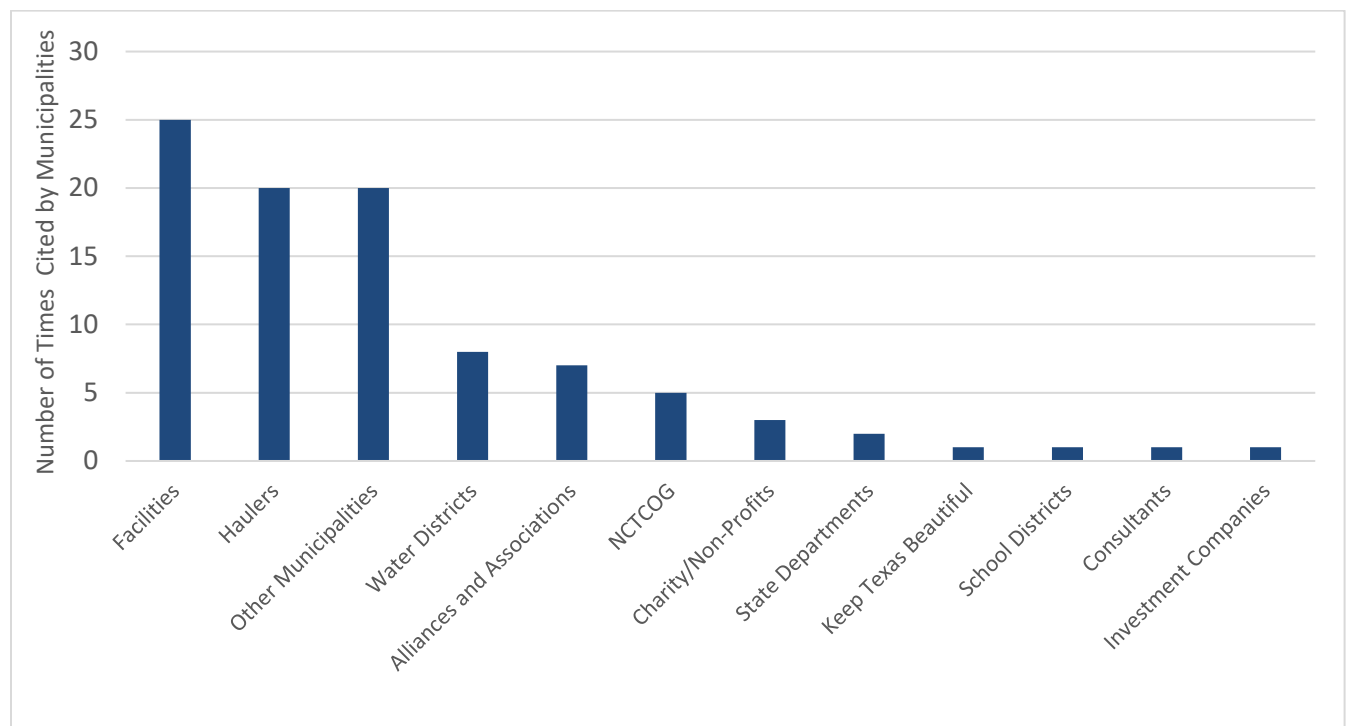
These recommendations represent higher-level priorities for NCTCOG, each of which has been appreciably started in the North Central Texas region through regional, municipal, and/or statewide efforts.

Attachment III.H: Agencies Supporting Solid Waste Management

This attachment provides details on the types of public and private solid waste management agencies and their responsibilities.

As part of the Survey, respondents were asked to identify the public and private agencies currently supporting municipalities for a range of solid waste and recycling activities, including operations, education, and program funding. Figure 21 summarizes the types of public and private agencies identified in the Survey. Following the figure, a brief description of the roles and responsibilities for each type of the agency is provided.

Figure 21: Types of Public and Private Agencies Supporting Municipalities



- Facilities.** Facilities provide various services essential to the region's solid waste and recycling system, including material collection, storage, processing, resource recovery, and disposal. As shown throughout Attachment III.C, facilities throughout the region are owned and operated by public or private entities or developed and operated through public-private partnership.
- Haulers.** Haulers enable material to move through the solid waste and recycling system, collecting material from generators and transporting it to facilities for subsequent processing, resource recovery and/or disposal. As described Attachment III.C, some municipalities in the

North Central Texas region provide collection service, though many others partner with private haulers to provide this service.

- **Other Municipalities.** Municipalities assist each other with various solid waste services that may not be feasible for each municipality to independently operate. For example, the City of Fort Worth operates the Environmental Collection Center HHW facility which is available to residents of 51 other municipalities through interlocal agreements.
- **Water Districts.** Tarrant Regional Water District collaborates with municipalities on litter and recycling education and NTMWD operates three transfer stations and one active landfill.
- **Alliances and Associations.** Associations such as the State of Texas Recycling Alliance and the North Texas Corporate Recycling Association exist to promote recycling and the use of recycled goods to area businesses through leadership, advocacy, and education.
- **NCTCOG.** NCTCOG's primary purposes are to perform long-range, comprehensive plans for matters that transcend jurisdictional boundaries, promote the sound development of the 16-county region, and facilitate cooperation and coordination among its member governments.
- **Charities/Non-Profits.** Organizations such as Habitat for Humanity provide municipalities with established exchange centers for pre-owned products to be purchased or dropped off.
- **State Agencies.** State agencies, such as the Texas Department of Transportation, can help municipalities coordinate on litter and recycling education and clean up. The TCEQ administers the State's Regional Solid Waste Grants Program and provides educational efforts via the Take Care of Texas campaign.
- **Keep Texas Beautiful.** Keep Texas Beautiful is a non-profit organization with community-affiliated organizations which provide recycling, litter prevention and illegal dumping education. Keep Texas Beautiful and its affiliates provide litter reduction and recycling education programs within Texas. Keep Texas Beautiful serves as the state leader for Keep America Beautiful, a national non-profit organization.
- **School Districts.** School districts help teach the region's next generation on recycling behaviors.
- **Consultants.** Consultants provide municipalities with guidance on program implementation, financial planning, procurement, engineering and other key activities within a solid waste and recycling system.
- **Investment Companies.** Investment companies may assist municipalities with reinforcing recycling systems through financial support for education or program infrastructure.

Attachment III.J: Agencies That Could Address Concerns

This attachment provides further detail related to solid waste management concerns in the North Central Texas region and priorities to address these concerns, as described in Form Table III.J.I. Table 19 presents a modified version of Form Table III.J.I, providing detail on the planning areas and agencies that share the solid waste management concerns identified in Form Table III.I.I and that can assist in addressing these concerns through joint action.

Table 19: Solid Waste Management Concerns and Planning Areas and Agencies that Could Address Concerns

Solid Waste Management Concern	Planning Areas and Agencies that Could Address Concerns			
	NCTCOG	Municipalities and Counties	Private Haulers	Other Entities
Landfill capacity decreasing at accelerated rate in Western Region	✓	✓	✓	Public and private disposal facility owners
Low capture rate of residential single-stream recycling and organics	✓	✓	✓	
Open commercial collection markets do not incentivize recycling from commercial and industrial generators	✓	✓	✓	
Limited regional C&D recycling in the North Central Texas region	✓	✓	✓	Private-sector processing facility owners
Improper management of HHW and illegal dumping	✓	✓		Keep Texas Beautiful, NTMWD
Commingled collection of brush and bulky items limits ability to recycle organics	✓	✓	✓	Public and private sector organics processing facility owners
Limited accessibility to recycling for residential multi-family units	✓	✓	✓	Apartment owners and associations
Varying set out types and challenging collection environments	✓	✓	✓	Regional and local development services departments

Attachment III.K: Barriers, Incentives, and Potential Markets

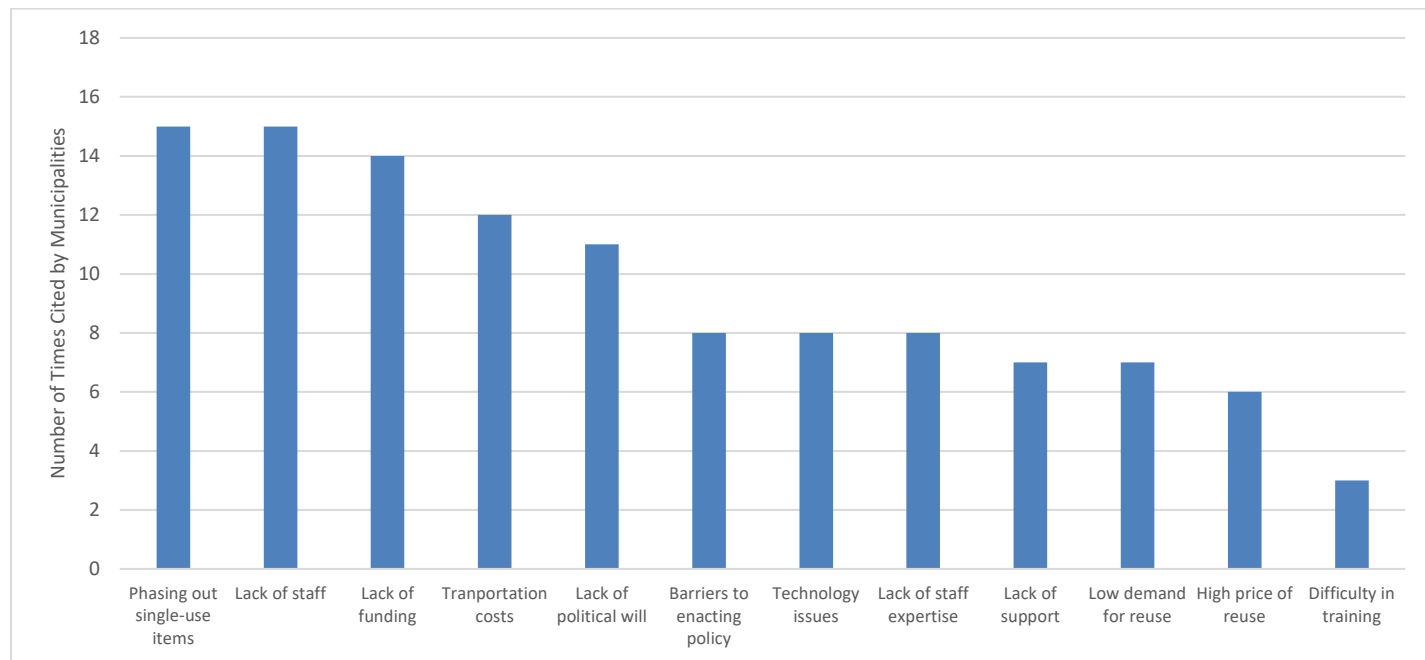
This attachment provides a discussion of the barriers and incentives to source reduction and waste minimization, and resource recovery in the North Central Texas region. As a part of the Survey, municipalities were asked to identify the key barriers and incentives that should be considered in local and regional planning in the North Central Texas region. Barriers and incentives were identified for source reduction and waste minimization practices as well as for resource recovery practices. This attachment summarizes the key findings of these responses and provide a visual representation of the data provided in Form Table III.K. Consistent with Form Table III.K, this appendix also identifies and discusses current and potential markets for recyclable solid waste material types.

Survey Results Related to Barriers and Incentives

Source Reduction and Waste Minimization

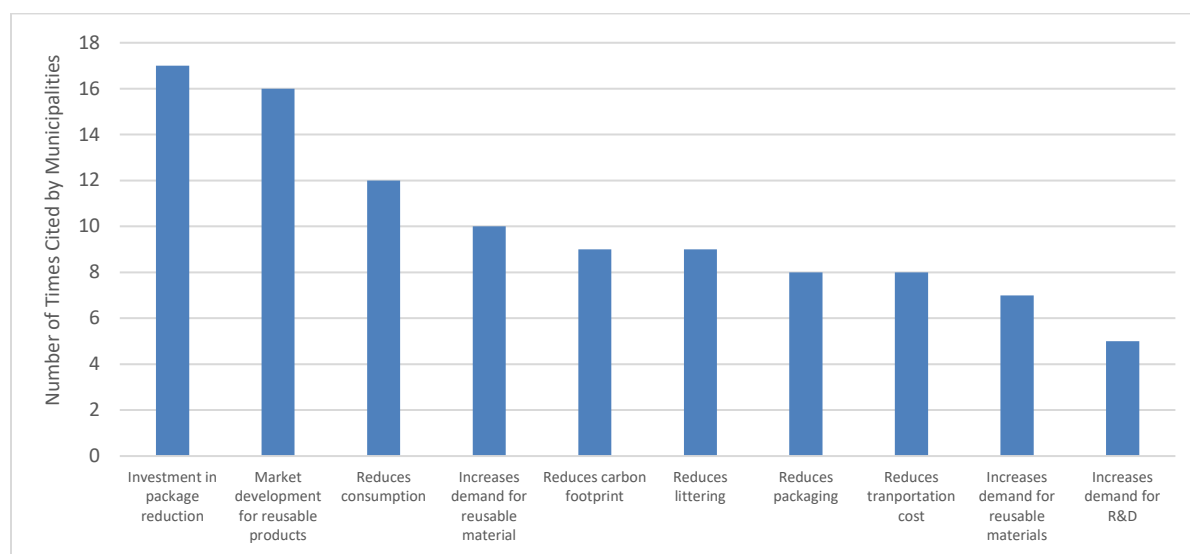
Survey respondents were asked to select key source reduction and waste minimization barriers to be addressed. The number of times each barrier was cited by municipalities is provided in Figure 22. The most-cited barriers were related to addressing the convenience of single-use items and the difficulties in staffing municipal programs that encourage reuse. The next three of the top five most-cited responses were related to access to resources, including funding, staffing, or political will.

Figure 22: Source Reduction and Waste Minimization Barriers



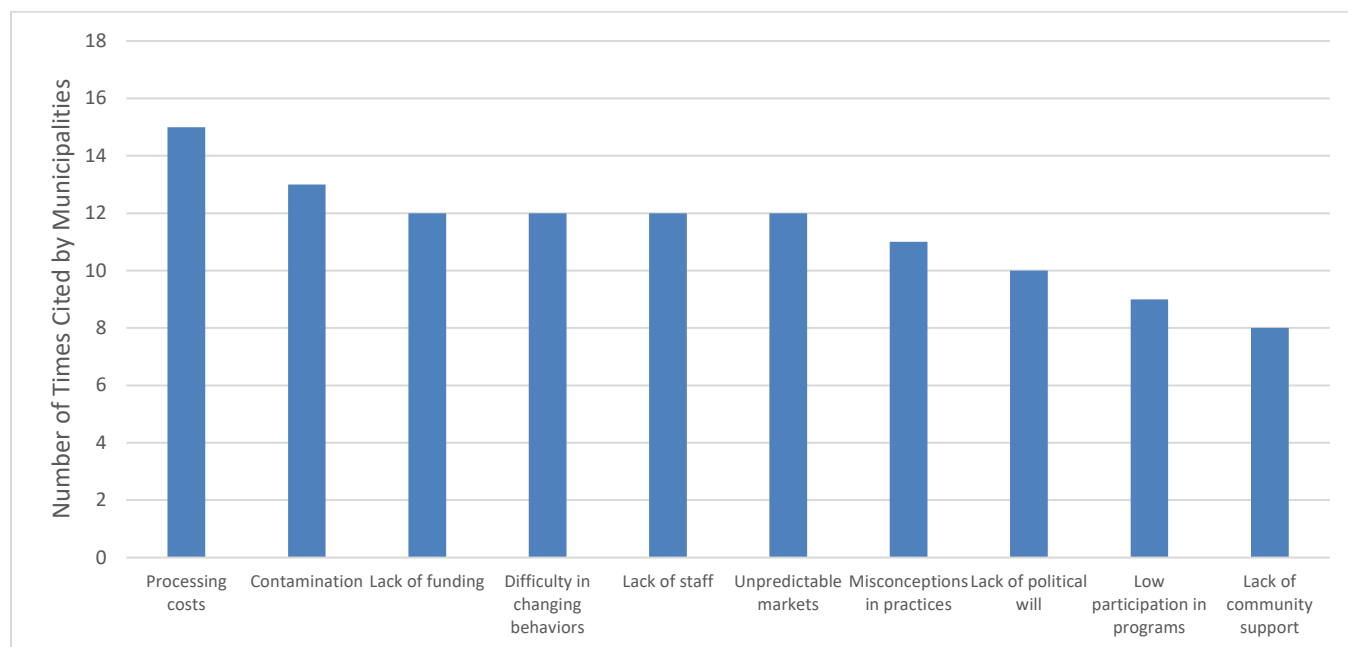
Survey respondents were also asked to select key source reduction and waste minimization incentives or benefits to be considered. The number of times each incentive was cited by municipalities is provided in Figure 23. The top incentives cited for source reduction and waste minimization show strong correlation to the top barrier of single-use items (Figure 23). The two most-cited incentives, investment in package reduction and market development for reusable products, illustrate a clear interest by municipalities in the North Central Texas region to approach source reduction and waste minimization from a systems perspective addressing the production, consumption patterns, and end markets for packaging and reusable products.

Figure 23: Source Reduction and Waste Minimization Incentives



Resource Recovery

Survey respondents were asked to select key resource recovery barriers to be addressed. The number of times each barrier was cited by municipalities in the Survey is provided in Figure 24. The top two most-cited barriers, recycling processing costs and contamination, validates the focus that NCTCOG has on improving recycling behaviors through the Know What To Throw campaign. These barriers are closely related, as contamination impacts the cost of processing recycling. Other barriers, including difficulty in changing behaviors and misconceptions in practices are similarly actively addressed through regional education and outreach. There was a strong response for all of the top 10 barriers, demonstrating that multiple types of barriers (e.g., costs, staffing, markets) routinely affect municipalities' recycling efforts.

Figure 24: Resource Recovery Barriers

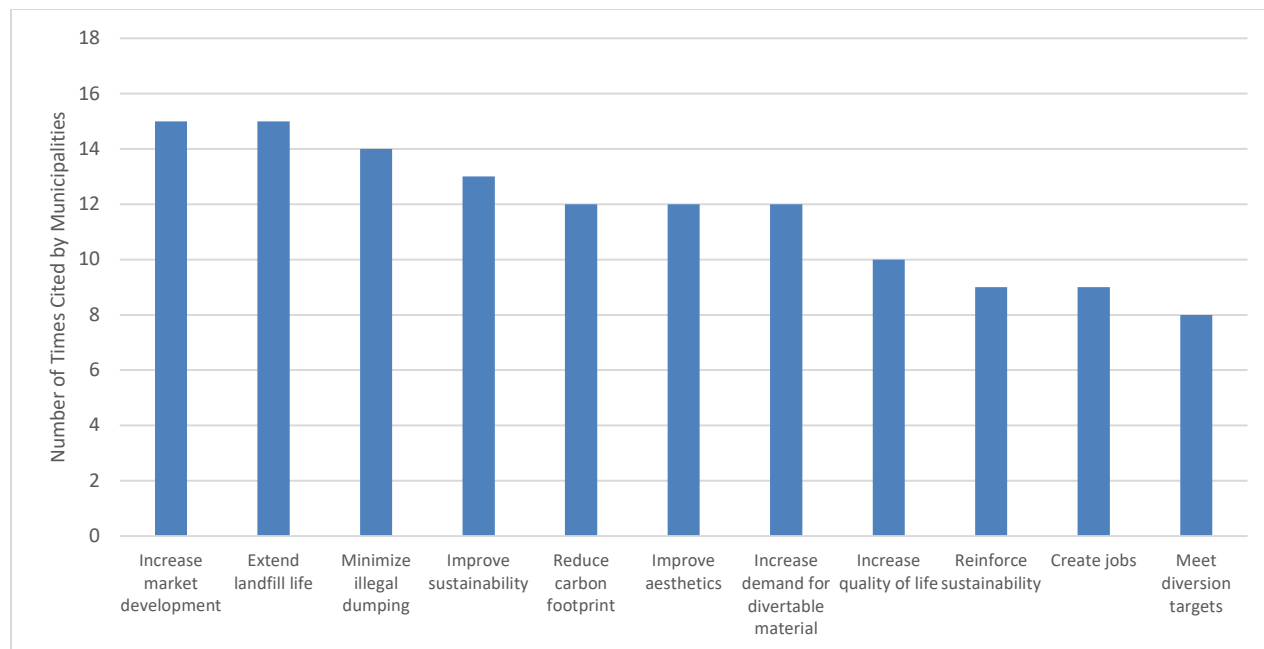
Survey respondents were also asked to select key resource recovery incentives and benefits to be considered. The number of times each incentive was cited by municipalities in the Survey is provided in Figure 25. High levels of response for all the incentives shown in Figure 25 demonstrates that resource recovery incentives are varied, and municipalities identified multiple key incentives. The incentive to increase market development being among the most-cited resource recovery incentives provides validation to the TCEQ's RMDP, which offers guidance for state, regional, and local entities to strengthen recycling markets. Extending landfill life, also among the most-cited incentives, ties closely to ongoing efforts by NCTCOG to increase recycling capture rates through the Know What To Throw campaign, thereby helping reduce tonnage going to landfills. Municipalities also recognized the ability for resource recovery activity to create jobs. Based on modeling performed as part of the RMDP, recycling activity provides the following economic benefits (including local benefits of material collection and processing):

- Employment per 10,000 tons diverted:
 - Single-stream recycling: 38 full-time person-years
 - Organics composting: 17 full-time person-years
 - C&D recycling: 5 full-time person-years
- Economic benefit¹⁷ per ton diverted:
 - Single-stream recycling: \$790 per ton¹⁸

¹⁷ Economic benefit is defined as the sum of labor income, value added, and tax revenue.

¹⁸ Excludes additional economic benefits of manufacturing using recycling material feedstock.

- Organics composting: \$350 per ton
- C&D recycling: \$110 per ton

Figure 25: Resource Recovery Incentives

Potential Markets for Single-Stream Recyclables

As described in Attachment III.C: Current and Planned Solid Waste Management Activities, there is significant infrastructure in the North Central Texas region for the source separation, collection, and processing of single-stream recyclables into specific material types and grades of materials (e.g., sorted office paper, plastic resin types, glass bottles, aluminum cans). Once processed, sorted and baled materials are transported to users that use these recycled material feedstocks in the production of goods (e.g., production of plastic bottles from recycled plastic resin). The following sections describe the existing end markets for single-stream recyclable materials, for paper, metals, plastics, and glass.

Paper Markets

Recovered paper can be recycled into a variety of products and packing, including recycled printing and office papers, toilet paper, towels, napkins, newsprint, paperboard, cellulose insulation, roofing felt, cushioning material for packaging and molded pulp products (e.g., egg cartons, nursery pots). Recovered paper may be processed and separated into grade by a paper stock dealer (which typically handle mostly or exclusively commercial sources) or a MRF (which typically handles mainly residential as well as selected commercial and institutional sources). Some paper manufacturing companies are vertically integrated into recycling processing as a means to secure feedstock of recovered paper feedstocks. In

addition to processing commingled recyclables, such MRFs may receive source separated paper (e.g., cardboard, commercial sorted office paper) to be baled and shipped to mills.

There are multiple end users of recycled paper in Texas including recovered paper mills, a cellulose insulation plant, and a molded pulp plant in the region and surrounding areas, listed below.

- **Recovered Paper Mills.** Smurfit Kappa (Forney), WestRock (Dallas), International Paper (Queen City).
- **Cellulose Insulation Plants.** U.S. Green Fiber LLC (Waco)
- **Molded Pulp Plants.** Western Pulp Products Company (Jacksonville)

In response to changes in the global recovered fiber marketplace, multiple mill expansions and new mills have been announced in the U.S. and Mexico that will markedly expand domestic fiber demand over the next two years. However, contamination affecting material quality is a significant concern, particularly with respect to residential fiber. Consequently, MRFs are working to improve their ability to generate cleaner fiber supply to meet domestic mill and fiber product manufacturer feedstock requirements. Many MRFs are installing equipment such as optical sorters and robots to enable further sorting and cleaning; however, doing so means the cost of processed recovered fiber is increasing.

Metals Markets

Most ferrous and non-ferrous metals are recycled into durable products, with a portion of steel and aluminum also recycled into product packaging (i.e., steel cans, aluminum beverage containers, foil wraps). A significant portion of metals recycling occurs within the scrap industry, comprised of scrap yards, auto shredders, mills, and foundries. There are over 600 scrap mills in the state, and the region has sufficient capacity to recycle additional ferrous and non-ferrous scrap.

Due to the value of recycled metals, as well as the environmental benefits of recycling these materials, metals markets can be larger geographically with longer transport distances while still maintaining financial and environmental benefits compared to landfilling. A significant amount of steel is shipped to consumers in other states or countries. For example, there are four steel mills in Mexico near the Texas border that likely source from Texas, as well as Gulf Coast ports for shipping processed steel to recyclers in other countries. Texas-generated non-ferrous recyclable scrap metal end markets vary by material. Baled aluminum cans are sent to Alabama, Georgia, or Tennessee. The national recycling infrastructure can recycle more cans from Texas than are currently collected.

Plastics Markets

Plastic containers and packaging can be made from various resins, including polyethylene terephthalate (PET), high density polyethylene (HDPE), polyvinyl chloride (PVC), low density polyethylene (LDPE), linear low-density polyethylene (LLDPE), polypropylene (PP), and polystyrene (PS). Plastics can be recycled into a variety of products and packaging, depending on the resin type.

There are multiple plastics reclaimers and end users in Texas, including:¹⁹

- Two PET reclaimers, one supplying PET to bottle manufacturers and one focused on chemical recycling of hard-to-recycle items
- Two HDPE bottle reclaimers
- Two end users for recycling HDPE crates, bins, and pallets
- Six companies recycling clean post-consumer commercial film plastic to produce garbage bags, single-use retail plastic bags, and other commercial-use bags
- One recycler for laser toner cartridges, which receives material from across the U.S.

PET reclamation capacity exceeds available supply, and PET is currently imported from other states. Increased PET recovery in Texas could be managed by in-state reclaimers. In-state reclaimers also need more supply of natural HDPE and clean post-commercial film to meet demand. Other plastic types (i.e., PET thermoforms, pigmented HDPE, contaminated film, and mixed plastics) face challenging recycling markets in Texas due to a number of factors including lack of demand for specific resins, contamination, and lack of sorting for plastics #3-7.

Glass Markets

Clean recovered glass can be recycled into a variety of end products including into new glass containers, plate glass, glass beads; or beneficially reused in applications such as alternative landfill cover, aggregate, filter material, and road base. The strength of glass recycling markets is often dependent on the infrastructure at the local level, as glass is heavy and can be costly to transport.

The North Central Texas region and nearby counties are home to key infrastructure and recycled glass end users to support healthy recycled glass markets, specifically secondary glass processing/beneficiation facilities to further clean and sort glass and produce clean cullet and end users such as bottle and fiberglass manufacturers.

Secondary Processors:

- Strategic Materials (Midlothian)

¹⁹ Specific company names and locations are not shared for plastics recycling facilities due to confidentiality associated with the *Recycling Market Development Plan*.

- Dlubak Glass (Waxahachie)

End Users:

- Owens Corning (Waxahachie), manufacturer of fiberglass;
- Johns Manville (Cleburne), manufacturer of fiberglass;
- Potters Industries (Brownwood), Manufacturer of industrial glass beads; and
- SWARCO Reflex (Mexia), manufacturer of industrial glass beads.

While most of this infrastructure is located in or south of the North Central Texas region, areas throughout the region still have competitive access to infrastructure to support glass recycling markets. Clean material is key to maximizing the economic viability and environmental benefits of processing and recycling glass, as environmental benefit is high for end uses such as bottle-to-bottle glass recycling and low or negative for other beneficial uses such as sandblasting or landfill cover.

Potential Markets for Organics

As described in Attachment III.C., there are both municipal and private organics processing facilities in the region producing finished compost and mulch products for market. Most private compost facilities indicate they could use more feedstock.

Current end markets for compost and mulch products include residents, professional landscapers, as well as purchase agreements with between facilities and entities such as the Texas Department of Transportation (TxDOT). Demand for clean, high-quality product is high, and some cities in the region report that demand has increased significantly in the last few years.

Compost markets in the region can face challenges from contamination (primarily in the food waste stream) as well as limited demand for some compost products. As cities in the region begin to implement residential or commercial food waste diversion pilot programs, it will be important to address contamination and work with participants to identify tools and strategies (e.g., signage) to prevent contamination in the future. A lack of end product demand can result from a lack of awareness of the benefits of using compost as well as concerns over the quality and safety of compost products (typically for non-certified compost products). Best practices to maintain product demand include certification (e.g., use of the U.S. Composting Council's Seal of Testing Assurance Certification) and education and outreach on the benefits of using compost (e.g., water conservation, soil health).

Potential Markets for C&D Debris

As growth continues and accelerates throughout the region, development (and therefore C&D debris generation) will also increase. C&D debris includes materials from new construction, renovation, and demolition projects such as:

- Concrete/masonry
- Ferrous and non-ferrous metals
- Wood
- Cardboard
- Other materials, including soil, asphalt, drywall, roofing, carpet, ceiling tiles, and insulation.

The best practice for handling C&D debris generated on the construction and/or demolition project sites is to separate C&D debris into separate roll-off containers for individual recyclable materials. Most job sites that separate and recycle material have two types of containers, one for commingled recyclable C&D material and one for disposal. Commingled recyclable C&D must then be processed at a mixed C&D processing facility (or C&D MRF). One large and well-equipped mixed C&D processing facility is located in North Texas (Champion Waste & Recycling Services), providing valuable C&D processing capabilities in the region to support end-market demand for uncontaminated concrete/aggregate, cardboard, plastic, and metals. Additional material-specific C&D recycling facilities/end users also exist throughout the region, supporting strong markets for materials such as concrete and asphalt. There is also an asphalt shingle recycling company with locations in the North Central Texas region (Sustainable Pavement Technologies, LLC (Dallas, Fort Worth)).

Markets are available for key C&D materials including concrete/aggregate, metals, cardboard, plastic, lumber, and gypsum. Concrete/aggregate, metals, cardboard, and plastic have established end-markets that are strong and consistent. Demand of recycled asphalt shingles has waned in recent years, with TxDOT and private contractors reducing its use in new pavement application; and some C&D recycling facilities have stopped accepting this material. Facilities with stockpiles of shingles are working to sell them as they are able. Other materials may have more limited or intermittent local markets. There are limited end-markets for gypsum other than processing the material on-site as part of composting operations and wood is often ground on processors' sites and used as part of disposal operations, composted, or otherwise re-purposed.

There is significant opportunity to increase C&D recycling in the region. One key challenge to C&D recycling is that when project sites are not required to recycle by local ordinance or company policy, they

likely will only separate high-value materials like scrap metal. A limited number of cities in Texas have enacted policies to require or incentivize C&D recycling.

Attachment III.L: Goals and Objectives

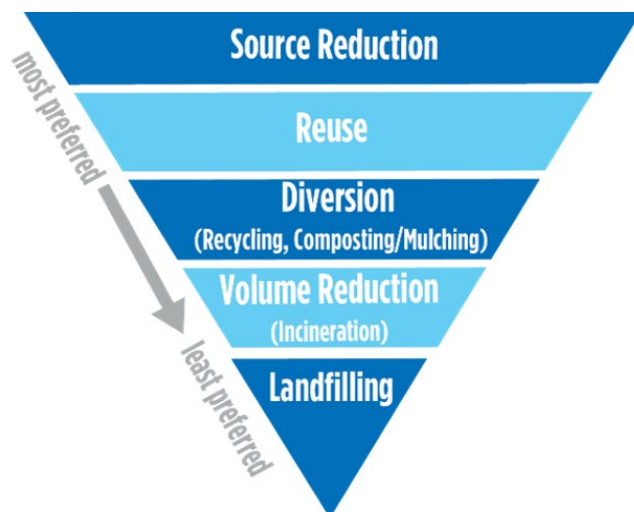
In 2020, NCTCOG surveyed municipalities in North Central Texas region to receive feedback on updating the Goals and Objectives that were included in the 2015 RSWMP. Following the survey, NCTCOG updated the Goals and Objectives for the region. These Goals and Objectives are provided in Form Table III.L. The implementation activities that correspond with each Goal and Objectives are provided in Appendix B – Implementation Activities By Goal and Objective.

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Attachment III.N: Plan of Action

As described in Form Table III.N., NCTCOG has developed 68 implementation activities, corresponding with the Goals and Objectives presented in Appendix B – Implementation Activities By Goal and Objective. Based on Volume II requirements, NCTCOG developed a plan of action and corresponding milestone dates for five key solid waste and recycling initiatives that were determined by TCEQ. Due to the long-term planning nature of the RSWMP, the milestone dates determined by NCTCOG are based on the short-term, intermediate, and long-term planning periods. The key initiatives and corresponding plan of action and milestone dates are provided in Form Table III.N. Actions for each of the five key solid waste and recycling initiatives were prioritized based on the level of preference in the waste management hierarchy (Figure 26).

Figure 26: USEPA Waste Management Hierarchy



The waste management hierarchy, developed by the USEPA, has been adopted by many communities in the North Central Texas region as a guide to managing solid waste. This hierarchy is used as a tool in implementing a sustainable material management (SMM) approach to waste management. It was developed in recognition that no single waste management approach is suitable for managing all materials and all waste streams in all circumstances. The hierarchy ranks various management strategies from most to least environmentally preferred. It places emphasis on reducing, reusing, and recycling as key to SMM.²⁰

²⁰ U.S. Environmental Protection Agency. 2017. “Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy.” Available online: <https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy>

Attachment III.O: Process to Evaluate Conformance Review

Background

In accordance with the [Permit and Registration Application Procedures of 30 Texas Administrative Code §330.61\(p\) \(2006\)](#), the owners or operators of municipal solid waste (MSW) facilities must submit to the Texas Commission on Environmental Quality (TCEQ) documentation showing that Parts I and II of their applications were submitted for review to the applicable council of government for compliance, or conformance, to the regional solid waste plan. As the regional solid waste planning agency for the North Central Texas region, the North Central Texas Council of Governments (NCTCOG) maintains the [North Central Texas Regional Solid Waste Management Plan](#), which was recently updated and will be submitted to TCEQ for approval in August 2022. Therefore, NCTCOG is responsible for conformance reviews for municipal solid waste facilities in the 16-county North Central Texas region. The conformance review is not a regulatory technical review of the application and that the regional organization does not approve or deny permit applications. Approval of municipal solid waste management permit applications are the responsibility of the TCEQ.

The facility conformance review process *only* evaluates whether permit or registration applications for existing or new facilities conform to the *goals and objectives* of a region's solid waste management plan and is performed as a required COG role in the TCEQ's overall review of permit and registration applications. TCEQ is the agency responsible for reviewing and then approving or denying permit or registration applications in Texas. Therefore, it is also TCEQ's role to receive public comment on permit or registration applications.

Summary of Overall Process

The conformance process at NCTCOG is initiated when NCTCOG receives a mailed letter from the solid waste permit or registration applicant requesting a review along with a copy of Parts I and II of the application. NCTCOG will then reach out to the applicant to confirm receipt, request the completion of the Municipal Solid Waste (MSW) Facility Evaluation Form for Conformance Review (attached), and schedule a meeting between NCTCOG, the applicant, and the [Facility Conformance Subcommittee](#), the group that evaluates the documentation submitted by the applicant. The Facility Conformance Subcommittee is a subcommittee of the [Resource Conservation Council \(RCC\)](#), which is the solid waste advisory committee for the North Central Texas region. The RCC votes on the final approval of the conformance determination after receiving the subcommittee's recommendation.

At NCTCOG, conformance reviews are completed as applications are received. The applicant is asked to attend a meeting of the Facility Conformance Subcommittee, provide a brief presentation on how the facility permit or registration application conforms to the goals and objectives of NCTCOG's *Regional Solid Waste Management Plan* and be available for questions. Prior to the meeting, the subcommittee reviews Parts I and II of the application along with the applicant's completed MSW Facility Evaluation Form for Conformance Review. The subcommittee will make a recommendation as to whether the permit or registration application conforms or does not conform to the goals and objectives of the *North Central Texas Regional Solid Waste Management Plan*. This recommendation is transmitted to the RCC for a vote at its next meeting. After the RCC has voted on the conformance recommendation from the Facility Conformance Subcommittee, NCTCOG, on behalf of the Chair of the RCC, will mail a formal letter stating the final outcome and email a scanned copy of the letter to TCEQ and the applicant.

Given the substantive documents to review and coordination required among the applicant, the subcommittee members, and the RCC, the entire NCTCOG conformance review process takes about two to three months. This review occurs concurrently with TCEQ's review of the application.

Please complete this form as fully and as accurately as possible.

Section 1: General Applicant Information

1.1 Applicant's Name: _____
Mailing Address: _____
City, State, Zip Code: _____
Contact Person: _____

1.2 Site Location
Address: _____
Nearest City: _____
Zip Code: _____
County: _____

1.3 Is this a new facility?

☐ Yes ☐ No

1.4 If this is an amendment, please provide the following:

☐ Permit No. _____ ☐ Registration No. _____

1.5 What type of MSW facility is being registered or permitted?

☐ Type I Landfill	☐ Type IV AE Landfill
☐ Type I AE Landfill	☐ Type V Facility
☐ Type IV Landfill	☐ Other (please describe)

Describe "Other" below:

1.6 What type(s) of waste(s) is/are currently accepted at your facility?

- | | |
|--|--|
| ☐ Municipal Waste | ☐ Industrial Class III |
| ☐ Industrial Class I | ☐ Special Waste (please describe) |
| ☐ Industrial Class II | ☐ Other (please describe) |

Describe "Special Waste" and/or "Other" below:

Source: TAC 30, §330.61 (b)(1)

1.7 What types of waste(s) will be accepted at your facility in the future?

- | | |
|--|--|
| ☐ Municipal Waste | ☐ Industrial Class III |
| ☐ Industrial Class I | ☐ Special Waste (please describe) |
| ☐ Industrial Class II | ☐ Other (please describe) |

Describe "Special Waste" and/or "Other" below:

Source: TAC 30, §330.61(b)(1)

Section 2: Regional Conformance

Another component of evaluating conformance includes how the facility will affect the regional solid waste management goals of the North Central Texas Council of Governments that are included in the recently updated regional solid waste management plan, Regional Solid Waste Management Implementation Plan Volume II, which will be submitted to TCEQ for approval in August 2022. In order to complete this evaluation, please provide a description of how your facility will contribute to the attainment of these goals.

In requesting this information, NCTCOG recognizes that individual facilities alone will not be held responsible to achieve these regional goals. However, solid waste facilities represent an important component of a regional integrated solid waste management system and can contribute to the attainment of regional goals.

To assist in the completion of this section, examples of activities/programs that could be implemented to assist in the attainment of these regional goals are listed for each of the five goals. These examples are based directly on objectives included in the Regional Plan. However, they are intended to only serve as examples, as individual facilities need to determine how they will contribute to regional goals.

Goal No. 1: Support Materials Management Education and Training

Examples for Facilities to Consider

- Support outreach and education programs to facilitate long-term increases in source reduction, reuse, and recycling.
- Educate the public about proper waste management opportunities and alternatives to illegal dumping.
- Encourage cost-effective illegal dumping cleanup programs, such as cleanup events, purchasing of cleanup trailers, or other collaborations with the public/private sector.
- Educate the public about proper management and alternative options for household hazardous waste.

2.1 Please describe any services or activities that you can provide, or are currently providing, to the region to assist with meeting this regional goal.

Goal No. 2: Promote Creation and Expansion of Waste Management Programs**Examples for Facilities to Consider**

- Encourage the reuse and recycling of construction and demolition materials.
- Encourage the reuse and recycling of organic material, such as yard waste and food waste.
- Assist in the expansion of existing collection and management alternatives for other wastes, such as scrap tires, electronics, household hazardous waste, or those outside of the curbside materials typically collected.
- Promote integrated waste management practices.
- Support the planning, design, and/or construction of citizens' collection stations.
- Provide ample and convenient collection and disposal options in rural and underserved areas, including the establishment and expansion of transfer stations and citizen collection stations.
- Transfer stations can contribute to this goal by providing more efficient transportation to more distant landfills.

- 2.2 Please describe any services or activities that you can provide, or are currently providing, to the region to assist with meeting this regional goal.

Goal No 3. Measure Regional Waste Reduction Efforts**Examples for Facilities to Consider**

- Encourage the maintenance of disposal and processing capacity to meet the needs of the region.

- Encourage efforts to reduce additional landfill capacity needs, including initiatives for source reduction and reuse, recycling and composting, and energy recovery.

2.3 Please describe any services or activities that you can provide, or are currently providing, to the region to assist with meeting this regional goal.

Goal No. 4. Support and Encourage Innovative Technologies for Other Waste

Examples for Facilities to Consider

- Encourage innovative technologies to reduce, manage, and process emerging waste streams.

2.4 Please describe any services or activities that you can provide, or are currently providing, to the region to assist with meeting this regional goal.

Goal No. 5. Promote Public and Private Sector Partnerships

Examples for Facilities to Consider

- Expand waste collection opportunities.
- Provide enhanced resident and private sector education in rural and underserved areas.
- Participate in collaborations with the public sector to increase recycling and material recovery.

- 2.5 Please describe any services or activities that you can provide, or are currently providing, to the region to assist with meeting this regional goal.

Section 3: Certification

I certify that the information contained in this form is complete and accurate and that the information in fact represents the MSW facility for which this entity is requesting a TCEQ permit or registration.

Type or Printed Name of TCEQ Permit/Registration Application Signatory

Title of TCEQ Permit/Registration Application Signatory

Signature of TCEQ Permit/Registration Application Signatory

Date

REQUIRED APPROVALS

Attachment IV.B. Required Approvals

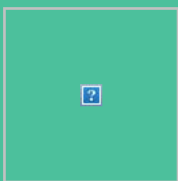
This section provides the following documentation as a part of the Section IV in Volume II:

- Public notice for the public meeting
- Public meeting agenda
- Public meeting transcript
- Public comments

Public Notice

The public notice is provided in Figure 27 and Figure 28.

Figure 27: Public Notice (Page 1)



Reminder! Now Accepting Feedback & Upcoming Virtual Public Meeting for Draft Regional Solid Waste Management Plan

To: Resource Conservation Council Members, Materials Management Interested Parties, and Others:

The North Central Texas Council of Governments (NCTCOG), with assistance from Burns & McDonnell and the Resource Conservation Council (RCC), is working to update both Volume I and Volume II of the Regional Solid Waste Management Plan (Regional Plan), as required by the Texas Commission on Environmental Quality (TCEQ).

The draft Regional Plan is available for comments through July 1, 2022. Comments, feedback, and questions can be directed to Hannah Allen at hallen@nctcog.org or (817) 695-9215.

Draft Regional Solid Waste Management Plan

In addition to the comment period, a Public Meeting will be held virtually on June 30, 2022 at 1:00 PM. During this meeting, NCTCOG and Burns & McDonnell will present the draft Regional Plan, open the meeting for discussion and questions, and present the next steps for approval of the Regional Plan. Information on how to join the meeting, including a link to add this meeting to your calendar, is included below.

Regional Solid Waste Management Plan Public Meeting
Thursday, June 30, 2022
1:00 PM - 3:00 PM
via Microsoft Teams
[Link to Join Meeting](#)
Or call in (audio only)

Figure 28: Public Notice (Page 2)

[+1 903-508-4574](tel:+19035084574)

Phone Conference ID: 997 117 572#

Add Public Meeting to Calendar

If you have any questions, comments, or concerns, please do not hesitate to reach out.
Please forward this email as appropriate.

Thank you!

NCTCOG Staff Contact:

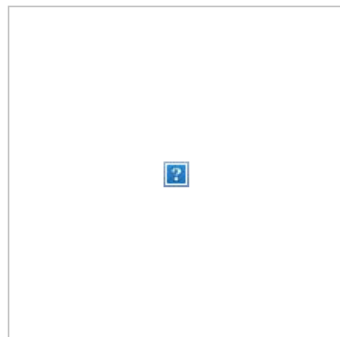
Hannah Allen

Environment and Development Planner III

North Central Texas Council of Governments

hallen@nctcog.org

(817) 695-9215



www.nctcog.org/envir

[Forward this email to a friend](#)

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Public Meeting Agenda

The agenda for the Public Meeting is presented in Figure 29.

Figure 29: Public Meeting Agenda



Public Meeting Transcript

The Public Meeting was held at 1:00PM CT on June 30, 2022, as a virtual meeting in which members of the project team provided a presentation. A video of the Public Meeting can be accessed at the following link: [Regional Solid Waste Management Plan Public Meeting - YouTube](#). During the public meeting, the project team presented key RSWMP topics, including:

- Goals and Objectives
- Demographics
- Generation
- Partnerships
- Current and Planned Practices
- Facility Adequacy
- Incentives and Barriers

Following the presentation, attendees were able to answer questions related to the RSWMP and were reminded of the Public Meeting Review Period dates (June 21 – July 1, 2022).

Public Comments

A compiled list of public comments on the Draft RSWMP and the Project Team’s approach to including these comments within the Final RSWMP is provided in Table 20. Please note that page and table reference refer to a previous version of the RSWMP.

Table 20: Public Comments

Comment	Approach
Pg. 69, Table 8 – the City of Denton’s facility should be recycling only.	Addressed via footnote in Table 8.
Pg. 72, Table 9 – the City of Denton also collects commercial waste.	Updated Table 9.
Pg. 80, Table 11 – Harrington Environmental is listed as a liquid waste facility in Johnson County. I believe this facility had their permits cancelled by TCEQ, but not sure if it included all of their activities. Reitz Environmental may have a liquid waste facility in Johnson County.	Added Reitz Environmental to Table 11. Maintained Harrington Environmental, as they were included within TCEQ liquid waste facility list and appear to be currently performing liquid waste treatment activities
Pg. 83/84, Table 14 – City of Cleburne mulching operation in Johnson County is not listed.	Added City of Cleburne Transfer Station in Table 14.
Pg. 86, Table 15 – I don’t think there is adequate explanation as to what these facilities do with tires. For example, what is the difference between processing versus recycling? Do these energy recovery facilities incinerate tires for energy, or what do they do?	Provided examples of differences among tire processing, tire recycling, and energy recovery in Table 15 footnotes.
Pg. 91, third sentence in last paragraph has typo (delete “of”).	Corrected typo.
Pg 93, C&D Recycling Processing paragraph. Unclear on only one facility in the region/those areas in North Central Texas lack processing capacity, but next few sentences start with “Additionally,...”	Clarified role of C&D MRF in region compared to that of single-material C&D processors.

Comment	Approach
Pg. 94, Storage – The City of Cleburne Transfer Stations Citizen Collection Station (that was not selected for solid waste grant funding) was constructed by the City of Cleburne. Because of space constraints due to the volume of customers continuing to use the transfer station during construction, the drop-off bay construction project could not include any improvements in drop off or processing of recyclable materials. Improvement to recycling capacity at this facility would be useful for the Western Region (section on Resource Recovery / Attachment III C.), but would also require additional staffing (as noted in Transportation section).	Incorporated City of Cleburne’s clarification in section.
Pg. 94, Transportation paragraph should be titled Transfer Stations and Hauling Costs.	In order to maintain consistency with the TCEQ’s format and structure, we propose to keep the title of this paragraph/subsection as Transportation.
Pg. 97, Household Hazardous Waste paragraph – Could it be possible to mention that one-day HHW Collection Events are one of the most requested items in the pass-through grant program?	Comment acknowledged. No changes made per NCTCOG’s comment that events are not among the most requested items in the grant program.
Pg. 112, Glass Markets, Secondary Processors – I noticed that Dlubak was listed as a secondary glass processing/beneficiation facility. Dlubak is under an enforcement order (TCEQ Docket No. 2016-1479-IHW-E) for the unauthorized storage, processing, or disposal of cathode ray tubes (CRT) hazardous industrial solid waste or municipal hazardous waste at their Waxahachie facility that was identified in the Regional Solid Waste Management Plan. The order requires them to remove all hazardous CRT glass and dispose of it at an authorized facility and to perform closure of the storage areas. They have yet to comply with the order, but have requested extensions which have been granted by the agency.	Comment acknowledged. No changes made, as this level of detail is outside of the context of the discussion, and compliance with the order is not final, per the comment.
Pg. 129, Appendix A-2 – The City of Cleburne Landfill is not open to accept waste from public sources (only accepting WTP sludge and emergency use).	Added footnote in Table 17 to include this detail.
Pg. 130, Appendix A-3 – DC Organics, located in Godley, and Scotts, located in Cresson, both have composting facilities in Johnson County.	Added facilities to Table 14 and Appendix A-3.

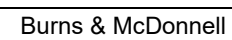
Comment	Approach
Pg. 132 – map is illegible.	Reprinted maps based on changes and reformatted.
Pg. 134, Appendix B. Goal #2 – For the objective ‘Expand reuse and recycling on organic materials’ the implementation item b. needs to be re-written. At the beginning of the sentence, you might use ‘by:’ instead of ‘such as’. The last part of the sentence does not quite make sense. It should be ‘... increasing the convenience of food waste recycling.’	Updated Implementation Action based on comment.

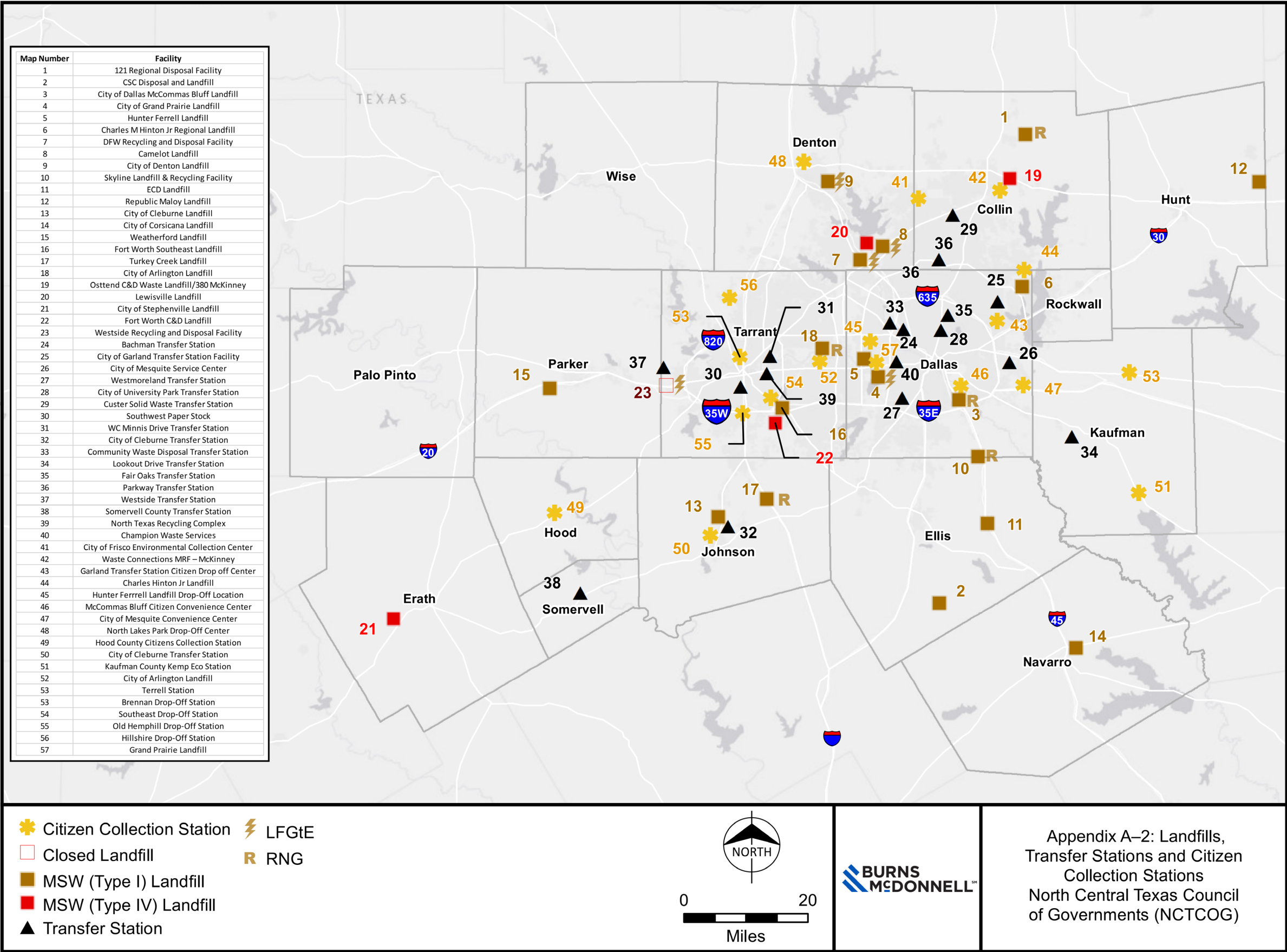
APPENDICES

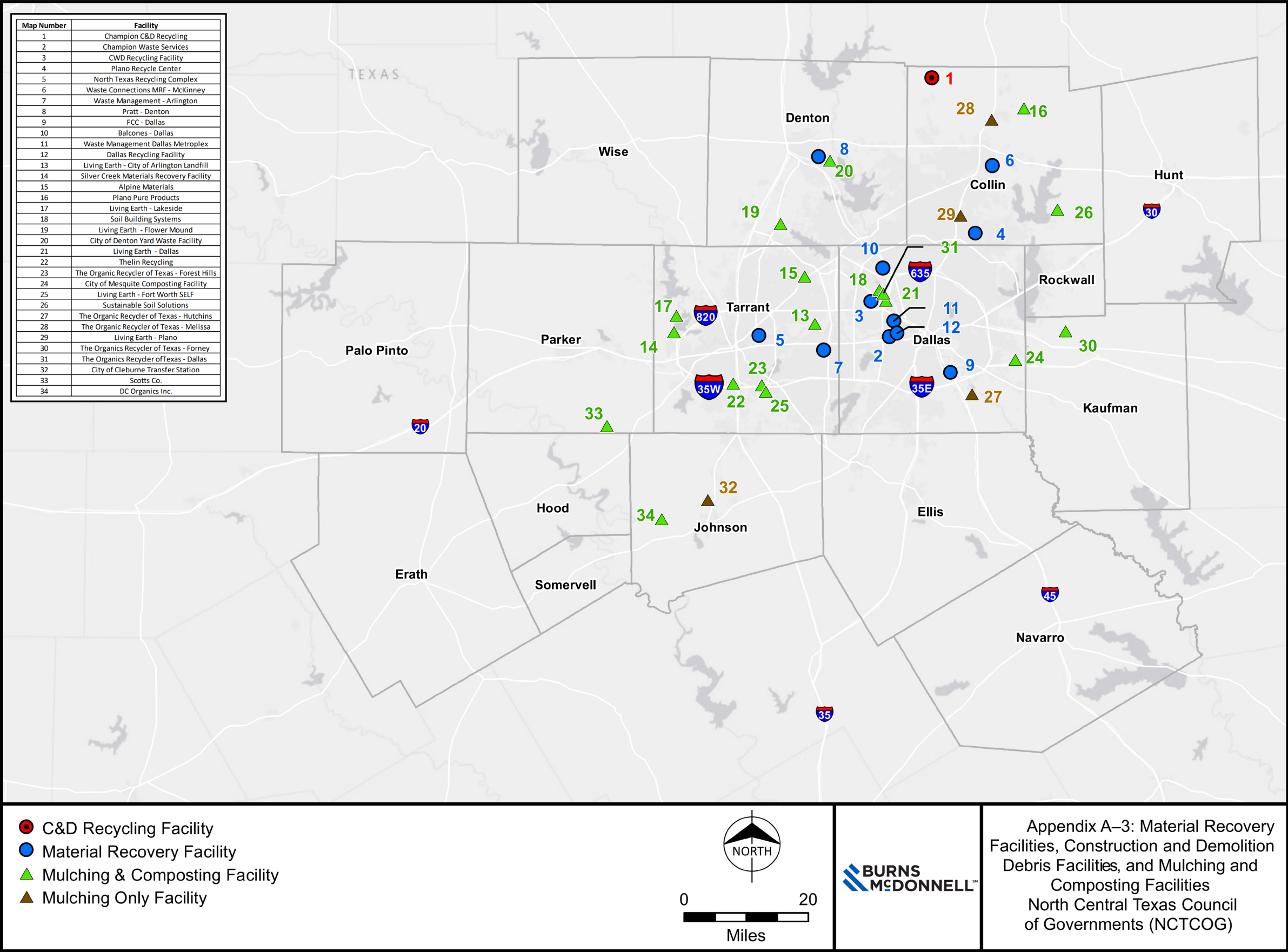
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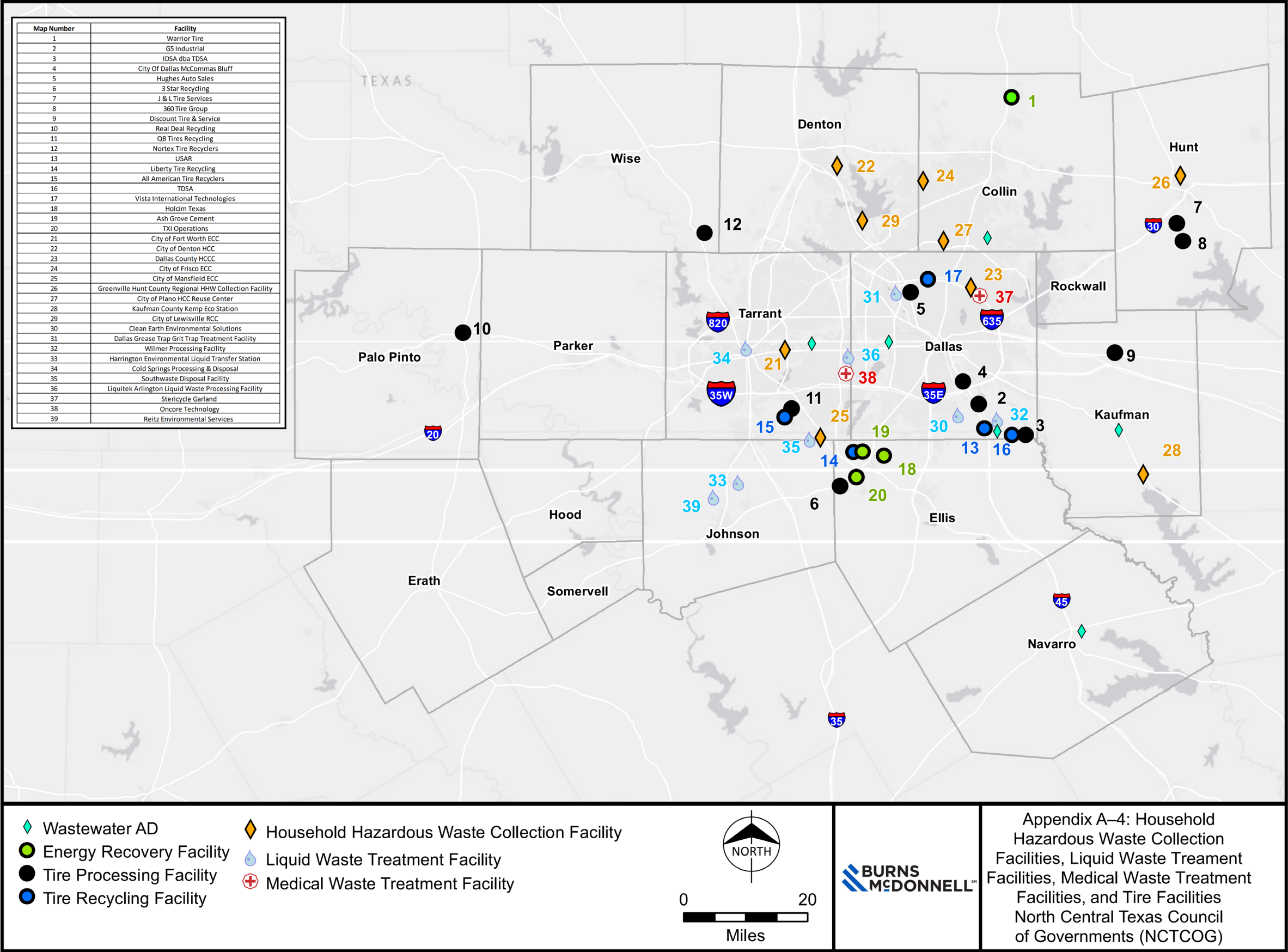
Appendix A – Regional Maps

<u>Map</u>	<u>Name/Phrase/Term</u>	<u>Page</u>
A-1	Survey Responses by Geographic Area	128
A-2	Landfills, Transfer Stations, and Citizen Collection Stations in the North Central Texas Region	129
A-3	MRFs, C&D Recycling Facilities, and Mulching and Composting Facilities in the North Central Texas Region	130
A-4	HHW Collection Facilities, Liquid Waste Treatment Facilities, Medical Waste Treatment Facilities, and Tire Facilities in the North Central Texas Region	131









Appendix B – Implementation Activities By Goal and Objective

The following table lists NCTCOG's implementation activities organized by Goal and Objective.

Objective	Implementation Activities
Goal #1: Support Materials Management Education and Training	
Support outreach and education programs to facilitate long-term increases in source reduction, reuse, and recycling	a. Promote the exchange of information and education between local governments, private sector, public, and other stakeholders about regional source reduction, reuse, recycling, product stewardship, and other appropriate and emerging materials management topics
	b. Support and promote public education and outreach activities related to composting, commercial and demolition debris, wish-cycling and other appropriate materials management topics
	c. Support the use of popular technologies and media to market and educate the public and commercial sector for special waste collection events, recycling programs, and proper disposal methods for toxic materials
	d. Support targeted outreach and education programs to major employers and employment centers
Educate the public about proper waste management opportunities and alternatives to reduce litter and illegal dumping	a. Educate the public about proper waste management opportunities and alternatives to reduce litter and illegal dumping
	b. Support and promote public education and outreach activities related to proper waste collection and alternative disposal methods, such as the regional reduce, reuse, and recycling and illegal dumping resource clearinghouses
	c. Encourage implementation of cost-effective litter and illegal dumping programs such as demonstrations projects, clean-up events, purchasing of clean-up trailers, and other innovative projects through enhanced government to government and public/private sector collaboration
Educate the public about proper management and alternative options for HHW	a. Promote public and private sector use of environmentally friendly goods and services
	b. Encourage cities and counties to collaborate with private, non-profit, and other local government partners to establish and maintain HHW collection/reuse centers or regularly occurring collection events

Objective	Implementation Activities
	c. Promote public awareness about options to donate certain types of HHW (e.g., paint and electronics) to donation or reuse centers, including maintenance of the regional reduce, reuse, and recycling resource clearinghouse
Goal #2 Promote Creation and Expansion of Waste Management Programs	
Encourage establishment, maintenance, and expansion of government, single and multi-family residential, and commercial waste source reduction, reuse, and recycling programs	a. Encourage city and county programs that promote and provide opportunities for residents to participate in source reduction, recycling, composting, and waste diversion programs (e.g., composting facilities, electronics and pharmaceutical take-back programs, food waste programs, etc.)
	b. Encourage the implementation of source reduction, waste reduction, and recycling programs for all local governments, including school districts, special districts, and other governmental organizations
	c. Provide training and resources and encourage cities to establish or expand multi-family and commercial recycling programs and support development of additional recycling facilities for residents
	d. Enhance and coordinate public education and outreach to increase demand for and participation in multi-family and commercial recycling programs
	e. Encourage government to government and public/private sector collaboration to establish cost-effective government, single and multi-family residential, and commercial recycling programs
	f. Encourage and support implementation of best management practices in contracting for solid waste and recycling collection and transportation services
	g. Provide resources to encourage cities to review and update local regulations and safety codes to allow for greater source reduction, reuse, and recycling opportunities, such as allowing food donation or enhanced recycling collection
	h. Provide training and peer exchange opportunities to meet single and multi-family residential, commercial, and government recycling regulatory (e.g., ordinance development and waste services contracting) and program development needs
	i. Encourage partnerships between local governments and large venues and event centers to establish recycling and food waste minimization programs

Objective	Implementation Activities
Expand reuse and recycling on construction and demolition materials	a. Support development and implementation of ordinances, building codes, and other regulatory and non-regulatory measures to encourage greater construction and demolition materials reuse and recycling opportunities
	b. Support development of new product markets and expansion of existing product markets for construction and demolition materials
	c. Encourage construction and demolition best management practices during new construction, building retrofits and rehabilitation, and infrastructure development and replacement
	d. Encourage builders and infrastructure developers to utilize lifecycle cost analyses and consider green construction and building practices
	e. Encourage implementation of best management practices for recycling and reuse of construction and demolition materials produced by local government public works projects, including cities, counties, school districts, and special districts
	f. Support alternative practices to demolition and development and expansion of reuse and recycling facilities for construction and demolition materials
Expand reuse and recycling on organic materials	a. Support development and implementation of ordinances and other regulatory and non-regulatory measures to encourage greater organic materials reuse and recycling opportunities
	b. Encourage local government and public/private partnerships to decrease food waste disposed of in landfills by educating the public and private sector about food waste source reduction, developing food waste disposal and processing infrastructure (e.g., community gardens or composting centers), and increasing the convenience of food waste recycling.
Expand existing collection and management alternatives for other wastes and establish and expand new product markets	a. Support establishment and expansion of used and scrap tire management programs through local governments and public/private partnership programs
	b. Encourage expansion of reuse and recycling services outside of the curbside materials typically collected
	c. Encourage and support development and maintenance of programs for collection and disposal of household hazardous waste beyond one day events
	d. Encourage implementation of and expansion of electronics recycling programs and projects

Objective	Implementation Activities
	e. Support enhanced education on proper disposal of residential waste and development of residential medical waste disposal programs and processing facilities
	f. Encourage implementation of pharmaceutical take-back programs by local governments and public/private partnerships and support enhanced education on proper pharmaceutical disposal
	g. Support innovative and creative approaches for transforming trash components into new products for new purposes and creation of new product markets
	h. Support new or the expansion of existing energy recovery programs to decrease landfill discards
Facilitate the development and implementation of integrated solid waste management plans	a. Encourage incorporation of materials management policies, goals, and actions into local government planning documents such as the comprehensive plan or sustainability plans
	b. Encourage and support updates and regular review of existing waste management plans, ordinances, and development/zoning codes to incorporate best management practices and current state of practice in source reduction and reuse; recycling and composting; energy recovery; treatment and disposal
	a. Support continued evaluation of organization's goals and programs to be responsive to and meet the needs of the residents and business sector
	b. Encourage government to government and public/private partnerships in waste management implementation plans
	c. Encourage plans, goals, and implementation programs that support the waste management hierarchy and provide waste management planning resources for local governments, school districts, and special districts
	d. Encourage and support development of disaster debris management plans by local governments
	e. Encourage innovative reuse of landfill and waste disposal sites including energy recovery, renewable energy, and redevelopment opportunities
Promote integrated waste management practices and provide ample, convenient	a. Encourage the establishment and expansion of transfer stations and citizen collection stations in rural or underserved areas
	b. Support the planning, design, and/or construction of citizen collection stations

Objective	Implementation Activities
collection, and disposal options in rural and underserved areas	c. Encourage government to government (e.g., multi-county) and public/private partnerships to establish cost-effective collection and disposal options
Goal 3: Measure Regional Materials Management and Waste Reduction Efforts	
Encourage survey and evaluation techniques to establish baselines and effectively track waste reduction	a. Measure and track progress and impacts of source reduction and reuse; recycling and composting; energy recovery; and treatment and disposal programs
	b. Develop regional reporting system to mirror TCEQ and USEPA models to enhance data collection and reporting at the regional level
	c. Support statewide and regional efforts to establish and update waste generation, reduction, reuse, recycling, and discard rates
Encourage the maintenance and expansion of disposal and processing capacity to meet the needs of the region	a. Support source reduction and reuse; recycling and composting; and energy recovery initiatives to reduce additional landfill capacity needs
Goal 4: Support and Encourage Innovative Technologies for Other Waste	
Encourage innovative technologies to reduce, manage, and process emerging waste streams	a. Identify and provide opportunities to incentivize private sector to transition to innovative technologies that reduce or process emerging waste streams (e.g., tires, electronic waste, batteries, lightbulbs, etc.)
	b. Encourage pilot programs and partnerships with local governments and private sector to demonstrate viability, feasibility, and cost effectiveness of technologies
	c. Promote innovative approaches to establish new product markets through development of technologies and processes that maximize waste value and create economic opportunity
Goal 5: Promote Public and Private Sector Partnerships	
Increase coordination between cities and counties organizational entities to address solid waste needs	a. Provide support and development of regional resources and information exchange for local governments focused on the waste management hierarchy
	b. Encourage and support government to government and public/private partnerships to address solid waste needs
	c. Provide and maintain regional reduce, reuse, and recycling resource clearinghouse
Increase coordination between cities and counties organizational entities to reduce illegal dumping	a. Provide support and development of regional illegal dumping resources and information exchange for local governments focused on illegal dumping prevention and enforcement

Objective	Implementation Activities
	b. Expand waste collection opportunities and provide enhanced resident and private sector education in rural and underserved areas
	c. Encourage collaboration among rural communities to create efficient and cost-effective recycling collection and material recovery processing
	d. Encourage funding of initiatives such as the Closed Loop Fund to increase source reduction and reuse, and recycling and composting
	e. Encourage regional, multi-governmental, and local/neighborhood clean-up events in rural and underserved areas through diverse partnerships
	f. Create collaborations with public and private sectors to increase recycling and material recovery
	g. Provide and maintain regional illegal dumping resource clearinghouse and information resources
Evaluate that applicants for state permits demonstrate compliance with the adopted regional solid waste plan	a. Follow recommended Permit Application Review process as outline in Regional and Local Review of MSW Facility Applications
	b. Encourage and support adoption and update of county siting ordinances
	c. Provide recommendations for conformance with the RSWMP
Maintain and update the Closed and Abandoned Landfill Inventory	a. Maintain and update the closed and abandoned landfill inventory as new information is received from local governments or owners/operates and/or as landfills are closed
	b. Respond to information requests for closed and abandoned landfill inventory, maintain closed and abandoned landfill records, and update and maintain online and print resources
	c. Maintain and update notification process on new site closure and development over former landfills

Appendix C – Material Composition Profiles and Capture Rate

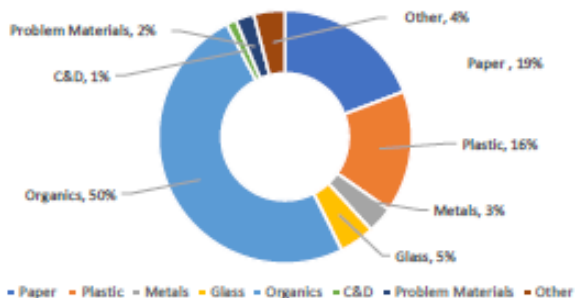
The following presents a summary of the composition profile analysis for single-family residents.

2019 Composition Summary							2020 Composition Summary								
	Garbage Summary				Recycling Summary				Garbage Summary				Recycling Summary		
	Mean	Upper Bound	Lower Bound		Mean	Upper Bound	Lower Bound		Mean	Upper Bound	Lower Bound		Mean	Upper Bound	Lower Bound
Newsprint	0.4%	0.6%	0.3%		6.0%	8.6%	3.3%		0.4%	0.5%	0.3%		3.3%	4.8%	1.8%
Recyclable OCC	0.8%	1.0%	0.6%		12.8%	15.0%	10.7%		1.3%	1.5%	1.0%		11.5%	13.8%	9.2%
Recyclable E-Commerce OCC	0.3%	0.5%	0.1%		3.7%	4.8%	2.5%		0.2%	0.3%	0.2%		6.9%	8.7%	5.0%
Pizza Boxes	0.6%	0.8%	0.4%		1.1%	1.4%	0.8%		0.1%	0.1%	0.0%		0.8%	1.4%	0.3%
Non-Recyclable OCC	0.3%	0.4%	0.1%		1.4%	2.6%	0.2%		0.4%	0.5%	0.3%		1.2%	1.6%	0.8%
Kraft Paper/paperboard	1.9%	2.2%	1.6%		6.5%	7.4%	5.7%		2.4%	2.7%	2.0%		7.9%	8.8%	6.9%
High Grade Office Paper	1.5%	2.3%	0.7%		2.1%	2.8%	1.3%		0.9%	1.3%	0.5%		1.7%	2.5%	1.0%
Magazines/ Glossy	0.6%	0.8%	0.5%		5.8%	7.6%	3.9%		0.6%	0.8%	0.3%		2.8%	3.8%	1.7%
Polycoated/ Aseptic Containers	0.3%	0.4%	0.2%		0.6%	0.7%	0.4%		0.3%	0.4%	0.2%		0.7%	0.9%	0.4%
Mixed (Other Recyclable)	1.8%	2.5%	1.2%		4.5%	5.5%	3.6%		2.7%	4.2%	1.2%		4.2%	5.4%	2.9%
Other (Non-Recyclable)	10.8%	11.9%	9.6%		5.5%	6.5%	4.5%		12.1%	13.1%	11.0%		5.3%	6.5%	4.2%
Paper Subtotal	19.2%	20.6%	17.8%		49.9%	53.6%	46.3%		21.3%	23.2%	19.4%		46.1%	49.3%	43.0%
PET Containers	2.4%	2.7%	2.0%		5.9%	6.7%	5.0%		2.1%	2.3%	1.9%		5.6%	6.2%	4.9%
HDPE Containers - Natural	0.5%	0.7%	0.2%		1.4%	1.6%	1.1%		0.3%	0.4%	0.3%		1.2%	1.6%	0.8%
HDPE Containers - Colored	0.6%	0.8%	0.5%		1.7%	2.0%	1.3%		0.5%	0.6%	0.4%		1.3%	1.6%	1.1%
#3 - #7 Containers	0.4%	0.5%	0.4%		0.4%	0.5%	0.3%		0.4%	0.6%	0.3%		0.3%	0.4%	0.2%
Polypropylene	0.8%	1.0%	0.6%		0.8%	1.0%	0.6%		0.7%	0.8%	0.6%		0.9%	1.2%	0.7%
Non Recyclable Plastic	10.9%	11.8%	9.9%		6.8%	7.6%	5.9%		11.1%	12.0%	10.1%		8.8%	10.1%	7.6%
Plastic Subtotal	15.6%	16.8%	14.4%		16.8%	18.1%	15.5%		15.1%	16.2%	14.1%		18.1%	19.9%	16.4%
Aluminum Used Beverage Containers	0.6%	0.8%	0.5%		1.7%	2.0%	1.4%		0.6%	0.8%	0.5%		2.1%	2.5%	1.8%
Ferrous Metal Food Containers	0.9%	1.1%	0.7%		1.1%	1.4%	0.9%		0.9%	1.0%	0.7%		1.4%	1.8%	1.1%
Other Ferrous Metal	0.9%	1.1%	0.6%		1.2%	1.8%	0.6%		1.0%	1.3%	0.7%		1.2%	1.8%	0.6%
Other Non-Ferrous Metal	0.9%	1.2%	0.7%		0.4%	0.5%	0.3%		0.8%	1.0%	0.6%		0.6%	0.9%	0.4%
Metals Subtotal	3.3%	3.8%	2.8%		4.4%	5.2%	3.6%		3.3%	3.8%	2.8%		5.4%	6.3%	4.6%
Recyclable Glass	3.7%	4.7%	2.6%		14.5%	17.2%	11.7%		3.9%	4.8%	3.1%		14.8%	17.2%	12.5%
Non-Recyclable Glass	0.9%	1.1%	0.6%		1.4%	2.1%	0.6%		0.7%	0.9%	0.5%		1.7%	2.7%	0.7%
Glass Subtotal	4.5%	5.5%	3.5%		15.8%	18.8%	12.8%		4.7%	5.5%	3.8%		16.5%	18.8%	14.2%
Yard Waste	3.8%	6.4%	1.1%		0.5%	1.0%	0.0%		5.1%	7.3%	3.0%		0.3%	0.4%	0.1%
Wood (non-C&D)	0.4%	0.6%	0.1%		0.4%	0.9%	0.0%		0.4%	0.6%	0.2%		0.4%	0.7%	0.1%
Food Waste	31.3%	34.0%	28.5%		3.5%	4.9%	2.0%		27.8%	30.3%	25.2%		6.3%	8.4%	4.2%
Other Organics	14.4%	16.5%	12.2%		6.1%	8.1%	4.2%		13.2%	15.8%	10.5%		4.2%	5.3%	3.0%
Organics Subtotal	49.8%	52.9%	46.7%		10.5%	13.3%	7.7%		46.5%	49.0%	43.9%		11.1%	14.0%	8.2%
Recyclable C&D	0.3%	0.4%	0.1%		0.0%	0.0%	0.0%		0.1%	0.2%	0.0%		0.0%	0.1%	0.0%
Other C&D	1.0%	1.8%	0.2%		0.5%	1.3%	0.0%		1.6%	2.8%	0.4%		0.9%	1.8%	0.0%
C&D Subtotal	1.2%	2.1%	0.4%		0.5%	1.3%	0.0%		1.6%	2.8%	0.4%		1.0%	1.9%	0.1%
Electronics	0.8%	1.2%	0.3%		0.7%	1.0%	0.3%		0.8%	1.2%	0.3%		0.4%	0.8%	0.0%
HHW	0.8%	1.3%	0.3%		0.1%	0.1%	0.0%		0.4%	0.7%	0.1%		0.1%	0.2%	0.0%
Bulky Waste	0.8%	1.5%	0.1%		0.4%	1.1%	0.0%		0.3%	0.7%	0.0%		0.1%	0.3%	0.0%
Problem Materials Subtotal	2.4%	3.3%	1.4%		1.1%	1.9%	0.4%		1.4%	2.1%	0.7%		0.6%	1.0%	0.2%
Other Inorganics	0.7%	1.0%	0.4%		0.7%	1.7%	0.0%		2.7%	3.7%	1.8%		0.9%	2.0%	0.0%
Fines	3.3%	3.7%	2.8%		0.1%	0.3%	0.0%		3.3%	3.7%	2.9%		0.2%	0.4%	0.0%
Other Subtotal	4.0%	4.5%	3.4%		0.8%	1.8%	0.0%		6.0%	7.1%	5.0%		1.1%	2.2%	0.1%

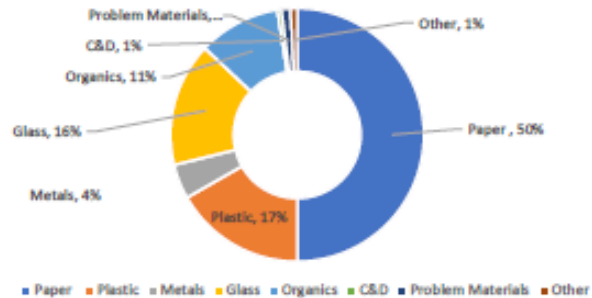
Material Category Summary

	2019		2020		Percent Change between 2019 and 2020	
	Garbage	Recycling	Garbage	Recycling	Garbage	Recycling
Paper	19.2%	49.9%	21.3%	46.1%	2.1%	-3.8%
Plastic	15.6%	16.8%	15.1%	18.1%	-0.4%	1.3%
Metals	3.3%	4.4%	3.3%	5.4%	0.0%	1.0%
Glass	4.5%	15.8%	4.7%	16.5%	0.1%	0.7%
Organics	49.8%	10.5%	46.5%	11.1%	-3.3%	0.6%
C&D	1.2%	0.5%	1.6%	1.0%	0.4%	0.4%
Problem Materials	2.4%	1.1%	1.4%	0.6%	-0.9%	-0.5%
Other	4.0%	0.8%	6.0%	1.1%	2.1%	0.3%
Total	100%	100%	100%	100%		

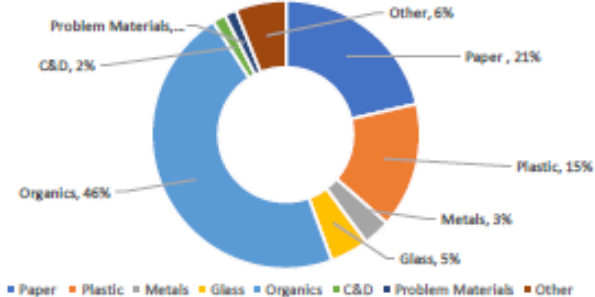
2019 Garbage Material Category Summary



2019 Recycling Material Category Summary



2020 Garbage Material Category Summary



2020 Recycling Material Category Summary

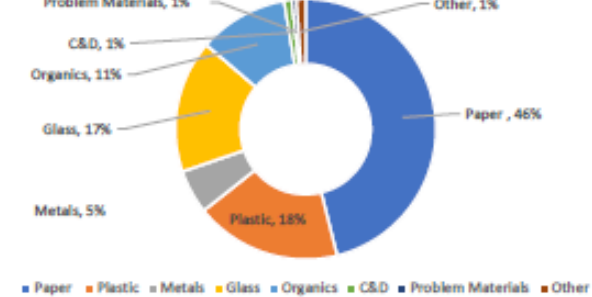


Table 21 presents the composition of commercial solid waste disposed by material category.

Table 20: Composition of Commercial Solid Waste Disposed by Material Category

Material Group	Material Category	Percentage¹
Paper	Cardboard	13.60%
	Office Paper	1.80%
	Mixed (Other recyclable)	7.00%
	Other (Non-recyclable)	9.40%
	Subtotal	31.80%
Plastics	PET#1	1.30%
	HDPE #2	1.50%
	Plastics #3-7	0.80%
	Plastic Bags & Film Wrap	4.80%
	Other Plastic	5.60%
	Subtotal	14.00%
Metals	Ferrous	1.00%
	Non-Ferrous	2.00%
	Subtotal	3.00%
Glass	Glass	2.30%
	Subtotal	2.30%
Organics	Yard Trimmings, Brush, and Green Waste	2.80%
	Food and Beverage Materials	13.60%
	Textiles	3.90%
	Diapers	0.70%
	Other Organics	2.60%
	Subtotal	23.60%
C&D Debris	Clean/Unpainted C&D Aggregates	0.00%
	Clean/Unpainted C&D Wood	7.60%
	Other C&D Materials	8.70%
	Subtotal	16.30%
Other	Batteries	<0.1%
	Electronics	1.40%
	Paint	0.00%
	Tires	1.80%
	Other	5.40%
	Subtotal	8.60%
Subtotal Recyclable^{2, 3}		60.3%
Subtotal Non-recyclable²		39.7%

Material Group	Material Category	Percentage¹
Total²		100.0%

1. Percentages based on material category tonnage divided by total tonnage.
2. Due to rounding, percentages may not add exactly
3. Recyclable materials include recyclable paper, plastic containers #1-7 and film plastics, ferrous and non-ferrous metal, glass, food waste and yard trimmings, and clean/unpainted wood.