

City of Norman, Oklahoma Disaster Debris Management Plan

Table of Contents

Table of Contents

List of Tables

List of Figures

ACRONYMS AND DEFINITIONS AD-1

Section 1 INTRODUCTION 1-1

Authority.....	1-1
Regulatory and Technical Assistance.....	1-1
State Agencies.....	1-1
Federal Agencies.....	1-2
Background.....	1-2
Purposes of the Plan	1-3
General Approach and Assumptions	1-3
Situation.....	1-4
Incident Description.....	1-4
Debris Volume Estimate.....	1-5
Debris Estimate - Scenario 1.....	1-6
Debris Estimate – Scenario 2.....	1-8

Section 2 ROLES AND RESPONSIBILITIES 2-1

Administration and Logistics	2-1
Lead Departments/Divisions	2-1
Lead Agencies	2-3
City Manager	2-3
Public Works Department.....	2-3
Interdepartmental Coordination.....	2-4
Mayor and City Council.....	2-4
City Attorney	2-4
City Clerk.....	2-4
Code Compliance.....	2-5
Emergency Management	2-5
Finance.....	2-5
Fire 2-5	
Geographic Information Systems	2-5
Human Resources	2-6
Parks and Recreation.....	2-6
Police 2-6	

Table of Contents

Other Agencies	2-8
State Agencies	2-8
Federal Agencies	2-9
Section 3 ACTION PLAN	3-1
Normal Operations	3-1
Normal Operations Checklist	3-1
Pre-Event Preparation	3-3
Pre-Event Checklist	3-3
Post-Event Response (70-Hour Push)	3-5
Emergency Road Clearance Priorities	3-6
Post-Event Response Checklist	3-7
Post-Event Recovery	3-15
Post-Event Recovery Checklist: 2 Days – 2 Weeks	3-16
Post-Event Recovery Checklist: 2 Weeks – 1 Month.....	3-20
Post-Event Recovery Checklist: 1 Month – 3 Months	3-22
Recovery Checklist: 3 Months – Project Completion	3-23
Section 4 OVERVIEW OF RULES AND REGULATIONS	4-1
Federal Emergency Management Agency Guidelines	4-1
FEMA Publication 322 – Public Assistance Guide	4-1
FEMA Publication 323 – Applicant Handbook.....	4-1
FEMA Publication 325 – Debris Management Guide.....	4-2
Disaster Specific Guidance.....	4-2
Other Relevant Documents.....	4-2

Appendix A MONITORING FIRM AND DEBRIS REMOVAL CONTRACTORS.....	A-1
Appendix B DEBRIS MANAGEMENT SITE REPORT	B-1
Appendix C FIELD DOCUMENTS.....	C-1
Appendix D HAZARDOUS STUMP EXTRACTION AND REMOVAL ELIGIBILITY	D-1
Appendix E SAMPLE PRESS RELEASES	E-1
Appendix F SAMPLE RIGHT-OF-ENTRY AGREEMENT	F-1
Appendix G SAMPLE MEMORANDUM OF AGREEMENT	G-1
Appendix H ZONE MAPS	H-1
Appendix I CITY SAFETY MANUAL.....	I-1
Appendix J HEALTH AND SAFETY STRATEGY	J-1
Appendix K FEMA FACT SHEET RP9580.201.....	K-1
Appendix L CITY PROCUREMENT PROCEDURES	L-1
Appendix M MUNICIPAL ROAD MAINTENANCE AGREEMENTS.....	M-1
Appendix N CITY RESOURCES.....	N-1
Appendix O DEBRIS REMOVAL CONTRACTOR SOLICITATION	O-1
Appendix P CONTRACTS	P-1
Appendix Q DEBRIS MANAGEMENT CHECKLISTS.....	Q-1

Table of Contents

List of Tables

Table 1-1 Enhanced Fujita (EF) Scale	1-5
Table 1-2 Potential Disaster Events.....	1-6
Table 1-3 Scenario 1 – Historical Debris Data Analysis	1-7
Table 1-4 Scenario 1 - Debris Forecast Analysis.....	1-8
Table 1-5 Scenario 2 - Debris Forecast Analysis.....	1-9
Table 2-1 City Departments’ Roles and Responsibilities	2-6
Table 2-2 Other Agencies’ Roles and Responsibilities Table	2-10
Table 3-1 Key Personnel and Contact Information	3-4
Table 3-2 Emergency Road Clearance Priorities.....	3-6
Table 3-3 Recyclable Materials and End Users	3-11
Table 3-4 Potential Final Disposal Landfills	3-23
Table A-1 Primary Monitoring Firm	A-1
Table A-2 Pre-positioned Debris Removal Contractors	A-1
Table B-1 Debris Management Site Matrix.....	B-20

List of Figures

Figure 2-1 City Organizational Chart	2-2
Figure 3-1 Disaster Recovery Timeline	3-15
Figure B-1 Site 1 – Hall Park – Primary	B-4
Figure B-2 Site 1 – Hall Park – Photos	B-5
Figure B-2 Site 1 – Hall Park – Photos (Cont.).....	B-6
Figure B-3 Site 1 – Hall Park – Photos (Cont.).....	B-7
Figure B-4 Site 2 – OU Airport – Primary.....	B-8
Figure B-5 Site 2 – OU Airport – Photos.....	B-9
Figure B-6 Site 2 – OU Airport – Photos (Cont.)	B-10
Figure B-7 Site 2 – OU Airport – Photos (Cont.)	B-11
Figure B-8 Site 3 – Franklin Rd. & 12 th Ave. – Secondary	B-12
Figure B-9 Site 3 – Franklin Rd. & 12 th Ave. – Photos	B-13
Figure B-10 Site 3 – Franklin Rd. & 12 th Ave. – Photos (Cont.).....	B-14
Figure B-11 Site 3 – Franklin Rd. & 12 th Ave. – Photos (Cont.).....	B-15
Figure B-12 Site 4 – 36 th Ave. NW & Franklin Rd. – Secondary	B-16
Figure B-13 Site 4 – 36 th Ave. NW & Franklin Rd. – Photos	B-17
Figure B-14 Site 4 – 36 th Ave. NW & Franklin Rd. – Photos (Cont.).....	B-18
Figure B-15 Site 4 – 36 th Ave. NW & Franklin Rd. – Photos (Cont.).....	B-19

This report has been prepared for the use of the client for the specific purposes identified in the report. The conclusions, observations, and recommendations contained herein attributed Beck Disaster Recovery, Inc. (BDR) constitute the opinions of BDR. To the extent that statements, information, and opinions provided by the client or others have been used in the preparation of this report, BDR has relied upon the same to be accurate, and for which no assurances are intended and no representations or warranties are made. BDR makes no certification and gives no assurances except as explicitly set forth in this report.

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ACRONYMS AND DEFINITIONS

44 CFR	Title 44 of the Code of Federal Regulations
BDR	Beck Disaster Recovery, Inc.
C&D Debris	Construction and Demolition Debris
City	City of Norman
CY	Cubic Yards
DDMP	Disaster Debris Management Plan
DMS	Debris Management Site
DSG	Disaster Specific Guidance
EF Scale	Enhanced Fujita Scale
EPA	Environmental Protection Agency
EOC	Emergency Operations Center
ER Program	Emergency Relief Program
EWP Program	Emergency Watershed Protection Program
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
FEMA 325	Debris Management Guide – FEMA Publication 325
FHWA	Federal Highway Administration
GIS	Geographic Information Systems
GPS	Global Positioning System
Handbook	Applicant Handbook
HHA	Hold Harmless Agreement
HHW	Household Hazardous Waste
MOA	Memorandum of Agreement
NRCS	National Resource Conservation Service
NOAA	National Oceanic and Atmospheric Administration
ODA	Oklahoma Department of Agriculture, Food, and Forestry
ODEQ	Oklahoma Department of Environmental Quality
ODOT	Oklahoma Department of Transportation
OEM	Oklahoma Department of Emergency Management
OSDH	Oklahoma State Department of Health
OSHA	Occupational Safety and Health Administration

Acronyms and Definitions

PA	Public Assistance
PAO	Public Assistance Officer
PPE	Personal Protective Equipment
PIO	Public Information Officer
PO	Purchase Orders
PW	Project Worksheets
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFB	Request for Bids
RFP	Request for Proposals
ROE	Right-of-Entry
ROW	Right-of-Way
SHPO	State Historic Preservation Office
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
State	The State of Oklahoma
USACE	United States Army Corps of Engineers

Applicant – State agency, local government or eligible private nonprofit organization that intends on applying for Federal Emergency Management Agency (FEMA) Public Assistance (PA) grants.

Code of Federal Regulations: Title 44 – Emergency Management and Assistance – The Code of Federal Regulations – Title 44 Emergency Management and Assistance (44 CFR) provide procedural requirements for the PA Program operations. These regulations are designed to implement a statute based upon FEMA’s interpretation of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). They govern the PA Program and outline program procedures, eligibility, and funding

Construction and Demolition Debris – FEMA Publication 325 defines construction and demolition (C&D) debris as damaged components of buildings and structures such as lumber and wood, gypsum wallboard, glass, metal, roofing material, tile, carpeting and floor coverings, window coverings, plastic pipe, concrete, fully cured asphalt, heating, ventilation and air conditioning systems and their components, light fixtures, small consumer appliances, equipment, furnishings and fixtures. Current eligibility criteria include:

- Debris must be located within a designated disaster area and be removed from an eligible applicant’s improved property or right-of-way;
- Debris removal must be the legal responsibility of the applicant; and
- Debris must be a result of the major disaster event.

Debris Removal Contractor – The debris removal contractor is contracted by the City of Norman (City) to remove and dispose of debris that is a result of a severe debris-generating event.

Disaster Specific Guidance – Disaster Specific Guidance (DSG) is a policy statement issued in response to a specific post-event situation or need in a state or region. Each DSG is issued a number and is generally referred to along with their numerical identification.

FEMA Publication 322 – Public Assistance Guide – Provides a general overview of the FEMA PA Program protocol immediately following a disaster. The PA Program provides the basis for the federal/local cost sharing program. This document specifically describes the entities eligible for reimbursement under the PA Program, the documentation necessary to ensure reimbursement and any special considerations that local governments should be aware of to maximize eligible activities.

FEMA Publication 323 – Applicant Handbook – The Applicant Handbook (Handbook) is the official “how to” for local governments who are considering applying for reimbursement following a disaster through the PA Program. The Handbook provides the rules, procedures and sample documents that local governments need as the applicant to FEMA. The publication is formatted so that the applicant has a step-by-step guide for each phase of the reimbursement process including what information is critical to ensure reimbursement.

FEMA Publication 325 – Debris Management Guide – This publication is specifically dedicated to the rules, regulations and policies associated with the debris cleanup process. Familiarity with this publication and any revisions, can aid a local government to limit the amount of non-reimbursable expenses. The Debris Management Guide provides the framework for the debris removal process authorized by the Stafford Act including:

- Eliminating immediate threats to lives, public health and safety;
- Eliminating immediate threats of significant damage to improved public or private property; or
- Ensuring the economic recovery of the affected community to the benefit of the community-at-large.

Hanger – A hanger is a hazardous limb that poses significant threat to the public. The current eligibility requirements for leaning trees according to FEMA Publication 325 are:

- The limb is greater than two inches in diameter;
- The limb is still hanging in a tree and threatening a public-use area; and
- The limb is located on improved public property.

Hazardous Stump – A stump is defined as hazardous and eligible for reimbursement if all of the following criteria are met:

- The stump has 50 percent or more of the root-ball exposed;

Acronyms and Definitions

- The stump is greater than 24 inches in diameter when measured 24 inches from the ground;
- The stump is located on a public right-of-way; and
- The stump poses an immediate threat to public health and safety.

Household Hazardous Waste – The Resource Conservation and Recovery Act defines hazardous wastes as materials that are ignitable, reactive, toxic or corrosive. Examples of household hazardous waste (HHW) include items such as paints, cleaners, pesticides, etc. Due to the nature of hazardous waste certified technicians must be used to handle, capture, recycle, reuse and dispose of hazardous waste. The eligibility criteria for HHW are as follows:

- HHW must be located within a designated disaster area and be removed from an eligible applicant's improved property or right-of-way;
- HHW removal must be the legal responsibility of the applicant; and
- HHW must be a result of the major disaster event.

Leaner – A tree is considered hazardous and defined as a “leaner” when the tree's present state is caused by a disaster, the tree poses a significant threat to the public and the tree is six inches in diameter or greater, measured two feet from the ground or at chest height. The current eligibility requirements for leaning trees according to FEMA Publication 325 are:

- The tree has more than 50 percent of the crown damaged or destroyed (requires written documentation from an arborist);
- The tree has a split trunk or broken branches that expose the heartwood;
- The tree has fallen or been uprooted within a public use area; or
- The tree is leaning at an angle greater than 30 degrees.

Monitoring Firm – The monitoring firm is an organization under contract with the City to monitor debris removal operations. The monitoring firm ensures the debris removal contractor is working within the scope-of-work contracted by the City and documents debris removal operations.

Robert T. Stafford Disaster Relief and Emergency Assistance Act – Provides the authorization of the PA Program. The fundamental provisions of this act are as follows:

- Assigns FEMA the authority to administer federal disaster assistance;
- Defines the extent of coverage and eligibility criteria of the major disaster assistance programs;
- Authorizes grants to the states; and
- Defines the minimum federal cost-sharing levels.

Vegetative Debris – As outlined in FEMA Publication 325, vegetative debris consists of whole trees, tree stumps, tree branches, tree trunks and other leafy material.

Vegetative debris will largely consist of mounds of tree limbs and branches piled along the public right-of-way by residents and volunteers. Current eligibility criteria include:

- Debris must be located within a designated disaster area and be removed from an eligible applicant's improved property or right-of-way;
- Debris removal must be the legal responsibility of the applicant; and
- Debris must be a result of the major disaster event.

White Goods – As outlined in FEMA Publication 325, white goods are defined as discarded household appliances such as refrigerators, freezers, air conditioners, heat pumps, ovens, ranges, washing machines, clothes dryers and water heaters. White goods can contain ozone-depleting refrigerants, mercury or compressor oils that the federal Clean Air Act prohibits from being released into the atmosphere. The Clean Air Act specifies that only certified technicians can extract refrigerants from white goods before they can be recycled. The eligibility criteria for white goods are as follows:

- White goods must be located within a designated disaster area and be removed from an eligible applicant's improved property or right-of-way;
- White goods removal must be the legal responsibility of the applicant; and
- White goods must be a result of the major disaster event.

Section 1

INTRODUCTION

Authority

This City of Norman Disaster Debris Management Plan (DDMP) is developed, promulgated, and maintained under the following City, state and federal statutes and regulations:

- City of Norman Emergency Operations Plan
- The City of Norman is a signatory of the statewide mutual aid agreement.
- Code of Federal Regulations Title 44, Part 200 et seq.

Regulatory and Technical Assistance

State Agencies

Oklahoma Department of Agriculture, Food, and Forestry (ODA)

- Assistance regarding the disposition of dead animals.

Oklahoma Department of Emergency Management (OEM)

- Coordinates disaster response activities statewide
- Interfaces with FEMA in efforts to obtain federal disaster declarations and to ensure compliance with the Public Assistance (PA) program.

Oklahoma Department of Environmental Quality (ODEQ)

- Issues emergency permits for debris incineration and advice and assistance for debris disposal; and
- Assistance on potential environmental impacts of debris removal and disposal operations.

Oklahoma Department of Transportation (ODOT)

- Responsible for the design, construction and maintenance of the State highway system; and
- Acts as the lead agency for emergency roadway debris clearance, removal, and disposal efforts along State and Federal highways.

Section 1

Oklahoma State Department of Health (OSDH)

- Health and safety issues pertaining to debris removal and disposal operations.

State Historic Preservation Office (SHPO)

- Responsible for review of any historical issues pursuant to Title 36 of the Code of Federal Regulations (36 CFR) Part 800.12.
- Review of post-disaster Debris Management Site (DMS) plan applications.

Federal Agencies

Federal Emergency Management Agency (FEMA)

- Provides guidance relative to debris eligibility and the reimbursement process.
- Assists the City in Project Worksheet (PW) development

Federal Highway Administration (FHWA)

- Responsible for funding debris clearance on federal highways through the Emergency Relief (ER) program.

National Resource Conservation Service (NRCS)

- Administers the Emergency Watershed Protection (EWP) program, which provides for debris cleanup related to runoff retardation and soil erosion prevention.

Background

The City of Norman, seat of Cleveland County, encompasses approximately 200 square miles in central Oklahoma. Norman is located just south of the state's capitol, Oklahoma City, and is home to the main campus of the University of Oklahoma. As of the 2000 Census, the City has a population of nearly 96,000 and an estimated number of households around 39,000.

The geographic location of the city makes it extremely vulnerable to winter storms, tornadoes, and flooding. The winter of 2007 proved to be the most severe season the City had encountered in several years. On December 8, a massive storm moved through the state, bringing with it freezing rain and snow, and covering the City in over one half inch of ice. Across the state, more than 600,000 homes and businesses were left without power and 29 lives were lost. In the City of Norman alone, 536,000 cubic yards of debris was removed from the public right of way. The City also safely removed 23,250 hazardous limbs and leaning trees, or leaners and hangers, effectively protecting the lives and property of the residents of Norman. A storm of this magnitude is not without financial consequence, as the cost of debris removal and

monitoring services for the City totaled approximately 6 million dollars, which was easily the largest expense associated with this storm.

Additionally, the City lies in an area of the country that is consistently susceptible to violent thunderstorms and tornadoes, commonly referred to as “Tornado Alley.” In January 1999 a severe tornado outbreak swept across four states, with 66 of those tornadoes occurring over a 24-hour period in Oklahoma alone. The most significant tornado of the outbreak quickly escalated to catastrophic F5 strength before decimating Norman’s neighboring City of Moore.

These examples serve as reminders of how vulnerable the City of Norman is to devastating incidents that have the potential of causing massive destruction and a large amount of debris. Because of these vulnerabilities, it is of extreme importance to establish a working plan to quickly and effectively respond to future debris-generating events.

Purposes of the Plan

The City approved the preparation of this DDMP to better respond to subsequent emergency debris removal situations. The purpose of this Plan is to outline the components critical to the success of a debris removal operation in the City. This Plan provides key information that will help the City coordinate and effectively manage a turn-key debris removal effort if the City were affected by a major, debris-generating event. Central to the success of debris removal operations is the City’s understanding of the following elements prior to a debris-generating event:

- The parties involved and their roles and responsibilities with regards to the debris removal operation;
- The rules, regulations and guidelines enacted by FEMA and other agencies governing debris removal;
- The process of collecting debris; and
- The disposal of debris including where the debris will be staged for reduction and/or hauled to final disposal.

General Approach and Assumptions

This Plan provides a coordinated response blueprint for the City; the City’s monitoring firm and the City’s debris removal contractor. To assist the City in expeditiously recovering from a debris-generating event, the approach of this Plan will be to outline pre-event preparations during times of normalcy, operations immediately prior to a known disaster threat, operations following the disaster event and demobilization and close-out following completion of debris removal efforts.

With regards to debris removal efforts, this Plan assumes the following:

- The City’s greatest threat of a debris-generating event is in the form of a severe weather system, such as a tornado, ice storm or thunderstorm;

Section 1

- The response and recovery outlined in this Plan is designed to address two types of debris-generating scenarios:
 - **Scenario 1:** High Probability – Medium Consequence events
 - **Scenario 2:** High Probability – Low Consequence events
- In the occurrence of a debris-generating event, the City may activate one or more of its debris removal contractors;
- In the occurrence of a debris-generating event, the City may activate its monitoring firm;
- If warranted, the City through the state will request federal assistance from FEMA; and
- The City will be operating under the current PA guidelines for reimbursement as described in the Stafford Act. Changes to the PA Program or published program-specific guidance may result in a revision to the debris management plan or its implementation.

Situation

Incident Description

This multi-hazard DDMP is designed to address numerous debris-generating event scenarios. For the purposes of the DDMP, two scenarios have been developed based on maximum impact, ability to respond, and frequency of event.

Scenario 1: High Probability – Medium Consequence

This scenario focuses on catastrophic debris-generating events that may significantly impact the entire Oklahoma City Metropolitan Statistical Area. In this case resources are severely strained throughout the entire region; and a Presidential Disaster Declaration for Category A is immediate or imminent due to:

- Long-term impacts to roads, bridges and rail lines;
- Composition of debris is primarily vegetative with limited amounts of C&D and HHW; and
- Post-event debris estimates have the potential to exceed 100,000 cubic yards (CY).

This event is best described as a severe ice storm. The period for debris removal and demobilization may last from three-months to one year and beyond.

Scenario 2: High Probability – Low Consequence

This scenario focuses on those higher frequency debris-generating events that may impact portions of or the entire City. These events may be characterized as those that do not immediately receive a Presidential Disaster Declaration for Category A:

- Short-term impacts to roads, bridges and rail lines;
- Composition of debris is primarily C&D with limited amounts of vegetative, HHW and white goods; and
- Post-event debris estimates do not exceed 100,000 CY.

This event is best described as a moderate tornado or wind storm (65 - 110 mph). The period for cleanup may last from one to two months. Depending on the severity of the event, DMS locations may or may not be operational. In this case, the City may choose to rely on local contractors or force account labor.

The National Oceanic and Atmospheric Administration (NOAA) National Weather Service utilizes the recently updated Enhanced Fujita (EF) Scale to rate the severity of tornadoes. The table below describes the EF Scale and associated wind speed categories.

**Table 1-1
Enhanced Fujita (EF) Scale¹**

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼ Mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Debris Volume Estimate

The debris volume generated by an event will depend on the type of event. Table 1-2 describes the disaster events that may affect the City. The table also illustrates the probability of the disaster event occurring, the nature of the debris generated, the debris generation potential and the widespread impact throughout the City.

¹ The Enhanced Fujita Scale still is a set of wind estimates (not measurements) based on damage. Its uses three-second gusts estimated at the point of damage based on a judgment of levels of damage to various indicators. These estimates vary with height and exposure. The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured "one minute mile" speed.

Section 1

Table 1-2
Potential Disaster Events

Type of Event	Probability ²	Nature of Debris	Debris Generation Potential ³	Widespread Impact
Ice Storm	High	Vegetative Limited C&D Limited HHW	Medium	High
Tornado	High	C&D Limited Vegetative Limited HHW Limited White Goods	Low	Low
High Winds	High	Vegetative	Low	High
Flood	Medium	Vegetative C&D HHW	Low to Medium	Medium
Wildfire	Medium	C&D White Goods HHW Limited Vegetative	Low to Medium	Medium
Man-Made	Low	C&D HHW	Low to Medium	Low

For planning purposes, this Plan will be based on debris volumes generated by the most probable event to produce conditions common to Scenario 1, a severe ice storm. However, the guidance that follows in this Plan will apply to all debris-generating events that may affect the City.

Debris Estimate - Scenario 1

Estimating the quantities of debris that may be generated by various natural or man-made disasters is a complex analysis. There are endless variables (type of event, severity of event, etc.) that can dramatically impact the quantities of debris that may be generated by a disaster event, and virtually no debris generation models can guarantee a completely accurate estimate.

For purposes of generating debris estimates under Scenario 1, the high volume debris incident is assumed to be a major ice storm impacting the region. While storms of this magnitude are relatively rare, they have the greatest opportunity to generate debris and affect the City, and therefore will act as the basis for the high volume debris estimate.

² Likelihood of a particular event to occur over a period of time. A low probability is described as an event that may occur ever 100-500 years, medium event would be every 50 years and a high probability event may occur ever 10 to 20 years.

³ The ability of a particular event to produce debris based upon historical data on each event. High debris generation potential would be an event that generates more than 1,000,000 cubic yards of debris. Medium could generate more than 100,000 – 1,000,000 cubic yards and low could generate approximately 50,000 – 100,000 cubic yards of debris.

Debris Forecast Formula

Events of this magnitude, like severe ice storms, are highly unpredictable, which adversely affects the ability to accurately predict the amount of debris that an event of this nature would generate. There are several factors to take into consideration, such as the duration and severity of the storm, and the amount of precipitation associated with the storm. For example, a storm that covers the City in one inch of ice will generate much more debris than a storm with only one half inch of ice. Additionally, the amount of debris will depend largely on the City's vegetation characteristics and whether or not the right of way and easements have been appropriately maintained.

Based on the aforementioned factors, the forecasted amount of residential debris in the City is based on a combination of relevant historical ice storm data and debris forecast calculations. The table below provides a comparison of historical data from the ice storm that impacted the City of Norman in 2007, and storms of a similar nature that have previously impacted areas with alike characteristics. The total amount of debris collected was divided by the estimated number of households to provide an average for each event. The average number of cubic yards per household for each event was then averaged together. The total average per household is then multiplied by the estimated number of households to serve as the basis for the debris forecast for Scenario 1.

Table 1-3
Scenario 1 – Historical Debris Data Analysis

Location	Estimated Number of Households	Total Amount of Collected Debris (CY)	Average CY per Household
Norman, OK	38,834	536,000	13.8
Greene County, MO (unincorporated)	33,168	553,486	16.7
Springfield, MO	64,691	1,408,133	21.8
Historical Total Average CY per Household			17.4

Scenario 1 – Debris Forecast

A combination of relevant historical data and debris forecast calculations were used to develop the debris forecast in the high volume debris incident.

- The goal of the debris forecast analysis for a severe ice storm scenario is to provide the City with a realistic amount of debris that could be generated by an incident;
- A severe ice storm affecting the entire Oklahoma City Metropolitan Statistical Area is a plausible scenario for a high frequency, medium consequence event;
- For the purposes of this analysis only vegetative debris factors were utilized for the incident;

Section 1

- The historical total average number of cubic yards per household illustrated above is multiplied by the total number of households in Norman to provide a general debris estimate.

Table 1-4
Scenario 1 - Debris Forecast Analysis

Total Number of Households	Historical Total Average CY per Household	Debris Estimate (CY)
38,834	17.4	675,711

The estimated cubic yards for a severe ice storm to impact the City is approximately 675,711 cubic yards of debris.

Debris Estimate – Scenario 2

A high probability, low consequence incident that could impact the City may occur as a high-wind incident or moderate tornado. Based on historical data of recent debris-generating incidents of that nature, the consequences will be relatively minimal and will therefore serve as the low volume debris estimate.

Debris Forecast Formula

The forecasted amount of residential debris in the City is based on the following formula for a totally destroyed household as described in Section 6 of FEMA 325⁴:

$$L' \times W' \times S \times 20\% \times VCM = \text{___ cubic yards of debris}$$

- L = length of building in feet
- W = width of the building in feet
- S = height of building expressed in stories
- 20% = Reduction factor due to airspace in a single-family home; and
- VCM = Vegetative Cover Multiplier⁵

An estimate of a one-story, single family home that is approximately 1,500 square feet (30 feet by 50 feet) is used for this calculation. The following formula is used to derive the estimated amount of debris for a totally destroyed household.

$$30' \times 50' \times 1 \times 0.20 \times 1.3 = 390 \text{ cubic yards of debris}$$

Scenario 2 - Debris Forecast

A combination of relevant historical data and debris forecast calculations were used to develop the debris forecast in the low volume debris incident.

⁴ July 2007 version

⁵ Medium vegetative cover multiplier is assumed

- The goal of the debris forecast analysis for a tornado or high wind scenario is to provide the City with a realistic amount of debris that could be generated by an incident.
- A Category EF0 or EF1 tornado could potentially cause significant or partial damage to numerous single-family homes in the City.
- The historical data from the Moore, Oklahoma tornado of 1999 and the Lake County, Florida tornadoes of 2007 act as the basis for the number of homes destroyed or partially damaged by the tornado.
- It is assumed that the number of single family homes destroyed or damaged by the tornado represents approximately five percent of the single family homes in the City.
- It is assumed that of the five percent of single family homes affected, 80 percent of that number will experience partial damage, and 20 percent of that number will experience significant damage.
- A factor of 25 percent is applied to the debris estimate for structures sustaining significant damage.
- A factor of 10 percent is applied to the debris estimate for structures sustaining partial damage.

Table 1-5 illustrates the estimated cubic yards that could be generated from a moderate tornado or wind storm incident.

Table 1-5
Scenario 2 - Debris Forecast Analysis

	Number of Single Family Homes	CY/Home	Debris Quantities (CY)
Significant Damage	388	97	37,636
Partial Damage	1,554	39	60,606
Total			98,242

Based on the assumptions described above, the estimated debris forecast for a moderate tornado, or similar high volume debris incident, is approximately 98,242 cubic yards.