SECTION 3

FIRE/RESCUE-RELATED RISK AND CUSTOMER NEEDS AND EXPECTATIONS

This section of the *Fire, Rescue, Emergency Medical Services, and Community Risk Reduction Master Plan* addresses fire/rescue-related risk (as defined by MCFRS) as well as the needs and expectations of the general public. It is appropriate to address fire/rescue-related risk and customers' needs/expectations together because they are closely related -- customer needs and expectations are based largely on perceived risks. **Actual risk and customers' needs and expectations dictate the services and programs provided by the MCFRS**.

CUSTOMER NEEDS AND EXPECTATIONS

Meeting the needs and expectations of the public is the primary focus of this Master Plan. Customer needs and expectations are discussed below.

CUSTOMER NEEDS

Throughout the development of this Master Plan, the input of citizens was encouraged and solicited. Early in the process, the MCFRS Research and Planning staff met with each of the Regional Service Center Directors representing the five Regional Service Areas -- Western Communities, Mid-County, Silver Spring, East County, and Up-County -- to discuss their views on the fire/rescue-related needs and expectations of the citizens whom they serve. Issues and topics for inclusion in the Master Plan were also solicited. Later, Research and Planning staff participated in meetings of the Citizens Advisory Boards (CABs) of the Regional Service Areas to discuss the development of the new *Fire, Rescue, Emergency Medical Services, and Community Risk Reduction Master Plan*, as well as Capital Improvements Program (CIP) projects associated with the original Master Plan.

Members of the Citizen Advisory Boards were asked to rank a list of issues specific to their Regional Service Area. The survey results of each Regional Service Area are found in Appendix B. **The combined results of all Regional Service Areas indicate that the top ten County-wide fire-rescue issues are as follows:**

Top 10 Fire-Rescue Priorities as Determined by Citizen Advisory Boards

1. Emergency medical services
2. Response time [to all incident types]
3. Residential fires
4. Preparedness for weather-related emergencies
5. Fires in businesses, institutions and community buildings
6. High-rise fires
7. Pedestrian safety
8. Providing service to populations having special needs
9. Homeland security
10. Level of staffing [on apparatus]

Regardless of where citizens live and where business owners' properties are located, all MCFRS customers want quick, effective, efficient, reliable and courteous fire-rescue services. Generally speaking, **citizens who believe they are receiving adequate fire-rescue services express their desire to maintain that level of service and to ensure that future service can adequately respond to the growth and/or change anticipated for their community**. **Citizens in fast-growing areas** (e.g., Germantown, Clarksburg, northern and western Rockville, North Potomac**) who feel that fire-rescue services could be improved due to issues such as longer response times and lack of specific resources, voice their desire for an increased level of service through facility and resource enhancements, including additional stations, staff, and/or specific types of services or vehicles** (e.g., ALS service, tankers).

Not surprising, the #1 priority of the five Citizens Advisory Boards that participated in the survey is **emergency medical services,** due to the long-term trend of increasing numbers and percentages of EMS incidents coupled with an aging County population and other special needs populations within the County placing an increasing burden upon EMS resources. Also without surprise, the #2 Priority is **response time,** since citizens realize the importance of quick response in reducing the number of deaths, number and severity of injuries, and amount of property damage.

Priorities #3, #5 and #6 pertain to structure fires; with #3 (**residential fires**) being the greatest fire-related risk in the County, and Priorities #5 (**fires in businesses, institutions and community buildings**) and #6 (**high-rise fires**) presenting substantial risks to both residents and business owners. The unusually high dollar loss due to structure fires occurring within the County during the 16-month period between January 2003 and April 2004 contributed to the citizen's perception that structure fires of various types represent some of the County's highest fire-rescue related risks.

Considering the unusual weather that occurred during 2002 and 2003 (e.g., Tropical Storm Isabel, numerous heavy snowfalls, drought followed by record rainfall, several

major windstorms, two small tornadoes, etc.), the CABs indicated that Priority #4 is **preparedness for weather-related emergencies**.

After several consecutive years of far above average numbers of pedestrians being struck throughout the County, fire-rescue Priority #7 is **pedestrian safety** as indicated by the CABs. Statistics reveal that a disproportionate number of certain minorities are involved in these incidents (see further discussion later in this Section), which will require a multi-agency approach, including MCFRS' participation, to address effectively.

In view of the changing demographic character of the County, the eighth highest priority expressed by the CABs is for MCFRS to meet the **special needs of specific populations** such as non-English speaking residents, the elderly, the handicapped, and children. These special-needs groups require emergency and non-emergency services tailored to their specific needs such as bilingual service providers, educational and fire code-related materials published in foreign languages or in Braille, and service providers who exercise great understanding, compassion, and patience with customers having special needs.

The need for **greater homeland security** is the ninth highest priority of the five CABs. Considering the terrorism threat associated with our location adjacent to the Nation's Capital as well as the threat posed by the many terrorist target hazards present within the County, citizens demand that MCFRS, as well as other County departments and agencies, take appropriate actions to ensure the public's safety from terrorism. Citizens want to know what to do to protect themselves, their families, and their property. They want to remain safe and know that the County is prepared to withstand a terrorist attack and continue providing emergency and non-emergency services. MCFRS plays a major role in preparing citizens for terrorist attacks and in having trained personnel and specialized resources in place to respond quickly, effectively, and safely.

Rounding out the top ten, the **level of staffing on fire-rescue apparatus** is the #10 fire-rescue priority issue according to the CABs as they become aware of the County's minimum staffing practices versus the latest national standards calling for higher levels of staffing on fire-rescue units. The CABs realize that MCFRS can perform its services with greater effectiveness and safety if it establishes and meets higher minimum staffing requirements.

CUSTOMER EXPECTATIONS

In terms of expectations, residents and business owners in Montgomery County must realize that MCFRS, like all other County departments and offices, has fiscal constraints that limit its ability to meet all of the public's expectations. The MCFRS, with its customer service focus, will always strive to meet the expectations and needs of its customers but must first focus its efforts and funding on the core services that serve everyone. These core services include emergency medical services, fire suppression,

rescue, fire safety and injury prevention education, public information, fire code enforcement, and fire investigation. Other core services of a specialized nature include response to hazardous materials incidents, explosive devices and suspicious packages, water rescues, confined space rescues, trench rescues, high-angle rescues, and other types of rescue incidents involving specialized equipment and expertise. These core services are described in Section 4 of this Master Plan. During difficult financial times, such as those faced by the County during FY03, FY04, and FY05, the MCFRS must expend nearly all of its funding on maintaining its core services as best as possible. Even in "good" financial times, the MCFRS may not have sufficient funding to meet all of the expectations of its customers, despite the best intentions of doing so.

As stated above, all County residents and business owners expect quick, effective, efficient, reliable, and courteous fire-rescue services. While every one of these expectations is fair, the expectation of quick service can be difficult, if not impossible, to meet if customer expectations are unrealistic. For example, if citizens always expect the arrival of an MCFRS unit within a time frame lower than the response time goals established by the Fire Chief and County Council, then their expectations will not likely be met. The cost associated with providing that faster service would be extraordinarily high. It is important that County citizens have realistic expectations that strike a balance between reasonable service and fiscal constraints.

WHAT IS RISK?

Montgomery County's fire/rescue-related risk is the combined risk that County residents, business owners, and visitors encounter from the following hazards:

- **Fire (involving structures, vehicles, trains, aircraft, vegetation, other property)**
- **Illness, disease, bodily injury, and unexpected medical conditions**
- **Transportation networks (e.g., highway, rail, air) and vehicles/trains using them**
- **Hazardous materials, including destructive/explosive devices and WMD**
- **Terrorism (with and without use of hazardous materials/WMD)**
- **Natural hazards (e.g., floods, thunderstorms, tornados, winter storms, drought)**
- **Bodies of water (rivers, streams, lakes, ponds, etc., encountered through travel, recreational activities, etc.).**
- **Nature (wild animals, stinging/biting insects, temperature extremes, etc.)**

Citizens face other types of risk, as well, such as crime, civil unrest, commodity shortages and financial crises, but those types of risk are beyond the scope of the fire/rescue-related risk (as defined above) normally addressed by MCFRS and discussed within this *Fire, Rescue, Emergency Medical Services, and Community Risk Reduction Master Plan.*

Risk is defined as the **likelihood** or frequency of a damaging or injury-inflicting occurrence (e.g., fire, heart attack, vehicle collision) **in-combination with** the consequences or **severity** of that occurrence. Stated mathematically:

RISK = PROBABILITY OF OCCURRENCE X SEVERITY

where probability and severity can be stated numerically to derive a numerical level of risk that can be compared with other risks in order to rank them. Risk can also be examined and compared subjectively in terms of categories such as low, medium, and high, or expanded variations of these same qualitative measures.

By combining both likelihood and severity, risk can be viewed as an average, of sorts, between the two component factors. In other words, just because vehicle collisions occur frequently in Montgomery County, the risk of associated injury and property damage posed to the entire population on any given day is relatively low due to the consequences of collisions (e.g., injury, vehicle damage) impacting a relatively small number of County residents compared to the overall County-wide population. As a second example, there is a low likelihood that, on any given day, a train carrying hazardous materials would derail and produce a toxic vapor cloud within a densely populated area of the County; however, the consequences of that occurrence could easily impact thousands of citizens resulting in scores of casualties and widespread evacuation of the impacted area. Once again, the overall daily risk is not great because the probability of occurrence is very low in contrast to the high level of severity. **The highest risk posed to the citizens of Montgomery County on a daily basis is the result of a hazard posing both high likelihood of occurrence and severe consequences**. An example is a line of severe thunderstorms with heavy rain, strong winds, and frequent lightning, which can occur frequently between April and September, and result in deaths/injuries and severe property damage having long-term consequences (e.g., damage to utility lines, homes, businesses, institutions, etc.) to a large portion of the County.

Historically, risks have been reduced or mitigated to an acceptable level utilizing a variety of strategies, including the deployment of specific fire-rescue units within specific time frames. **In some cases, however, an unacceptable level of risk exists which potentially threatens the health, safety, and welfare of the overall population as well as MCFRS personnel**. The line between acceptable and unacceptable level of unprotected risk is not precise. The potential for a given event to occur based upon historical frequency further blurs the line between acceptable and unacceptable risk. While the frequency of certain incidents may be low, the associated risk may be moderate to high, depending on the severity of the incident. Between 1935 and 2002, for example, Montgomery County experienced at least six incidents of this nature. In 1935, a B&O train struck a school bus in Rockville killing fourteen children and injuring thirteen[1].

[1] Source: Rockville Volunteer Fire Department, 75th Anniversary Program, 1996.

During WWII, three troop trains collided in Dickerson killing and injuring numerous passengers (number unknown), mostly U.S. servicemen[2]. In the early 1950s, two Navy fighter planes collided in mid-air and crashed in the Up-County area, killing several on board[3]. More recently, eleven people were killed in a train collision/fire in Silver Spring in 1996; a crowded passenger train derailed in Kensington in July 2002 injuring 120 passengers; and a sniper shot and killed five people in Montgomery County (and another County resident in Virginia) in October 2002. All six incidents had a low to very low likelihood of happening, yet they occurred, and the consequences of each incident impacted the entire population of Montgomery County directly or indirectly, as well as the entire metropolitan area in most cases.

These historical incidents underscore the potential for similar low frequency/high severity incidents in the future. In fact, **risk within Montgomery County will inevitably increase** due to population growth and continued development throughout the County, particularly within rural areas. **Taking into account the combined risk associated with transportation networks, flight paths, hazardous materials, underground fuel pipelines, potential acts of terrorism due to the target-rich environment, and other major risks, the likelihood of a catastrophic event occurring over the next ten years in the National Capital Region is high to very high, and moderate to high within Montgomery County.**

DETERMINING AN ACCEPTABLE LEVEL OF RISK

It is not feasible to eliminate all fire/rescue-related risk (see definition above) facing Montgomery County's residents, business owners and visitors, however, the overall level of risk can be reduced to a level that is "acceptable" to County elected officials and taxpayers. The County strategically utilizes many resources and programs in an effort to reduce its fire/rescue-related risk, including deployment of firefighter-rescuers and other personnel working to reduce fire/rescue-related risk; modern fire, rescue and EMS apparatus and equipment; automatic fire suppression systems; and a variety of risk reduction programs such as fire code enforcement, emergency management, and fire safety/injury prevention programs.

Despite these on-going efforts to reduce fire/rescue-related risk, some portion of the overall level of risk remains. This remaining risk is referred to as "unprotected risk" or "acceptable risk." Simply stated, unprotected risk is that risk which the County is willing to accept rather than expending an infinite amount of resources and programs attempting to eliminate all fire/rescue-related risk. **Minimizing or eliminating**

[2] Source: Former Chief George Hillard, Upper Montgomery County Volunteer Fire Department.

[3] Source: Rockville Volunteer Fire Department, 75th Anniversary Program, 1996.

unprotected risk requires significant expenditures by the County, its municipalities, the private sector, and individual property owners. By choosing not to fund the immense amount of resources and programs that would be required to eliminate the overall fire/rescue-related risk throughout the County, the County "accepts" a certain level of unprotected risk.

It is important that elected officials of Montgomery County take great care and attentiveness in establishing an acceptable level of fire/rescue-related risk as this important determination will impact communities for many years. **This acceptable level of risk will serve as the basis upon which the delivery of fire-rescue services will be established or maintained,** the number and distribution of stations, career staffing level and deployment, and number and distribution of apparatus and specialized equipment.

Using the funding allocated by the County Council along with funds raised by the LFRDs, the MCFRS must maximize its risk reduction efforts to close the gap between the County's protected and unprotected risks. In addition, the private sector and individual property owners, collectively, must do their part to reduce risk by installing automatic fire suppression systems (e.g., sprinkler systems), fire detection systems, alarm systems, carbon monoxide detectors, lightning protection systems; purchasing adequate amounts of insurance (i.e., property, vehicle, unemployment, life); purchasing automatic external defibrillators and training staff and/or family members in their use; taking CPR training; preventing injuries and fires; and taking steps to minimize the impacts of fire/rescue-related emergencies. **Risk reduction is a critical responsibility and vitally important task that must be undertaken by County and municipal resources, as well as the public, in order to close the gap between the County's protected and unprotected risks**.

WHAT AND WHERE ARE TARGET HAZARDS?

A "**target hazard**" is defined as any structure, occupancy or place that presents a major risk to occupants, and an undue challenge or risk to MCFRS personnel due to one or more of the following factors relating to rescue, safety, loss potential, and/or access:

- Potential for significant number of casualties
- Structure design, condition, use, and/or surrounding topography
- Potential for high dollar loss from fire, explosion, collapse or similar event
- Potential for significant loss of jobs and/or long-term business interruption following a fire, explosion, collapse or similar event

- Potential for significant disruption or loss of a key public service such as a governmental, medical, postal or utility service

- Potential for a reduced level of community pride due to loss of an important historical, social, recreational, or religious facility or landmark

Target hazards[4] in Montgomery County include the following types of occupancies, facilities, landmarks and recreational areas:

- Unsprinklered residential high-rises, garden apartments, and townhouses
- Large, unsprinklered single-family homes, particularly in non-hydranted areas
- Hospitals, nursing homes, assisted living facilities, and group homes
- Residences and care facilities for the elderly and handicapped
- Places of public assembly (e.g., fairgrounds, large parks, convention center)
- Terrorist targets – including many of the target hazards appearing in this list
- Churches, synagogues, temples, and other places of worship
- Schools and college campuses
- Shopping malls and large retail stores
- Detention/correctional facilities
- Businesses, research facilities, and other buildings storing, using, manufacturing and/or processing hazardous materials/wastes
- Interstate and U.S. highways (e.g., I-495, I-270, I-370, U.S. Route 29)
- METRO Rail
- CSX Railroad lines
- Federal, State, County and municipal government facilities
- Barns and other agricultural buildings
- Historic buildings
- Interstate fuel pipelines
- Utility networks and facilities
- Airparks
- Dams
- Potomac River, particularly between Great Falls and Little Falls

Fire-rescue incidents, usually of an EMS nature, have occurred on a frequent basis at many of these target hazards, while incidents have occurred far less frequently, or never, at many others. Regardless of their past incident frequency, every one of these target hazards poses a significant daily risk, and the MCFRS must maintain a constant state of readiness to respond to incidents involving these hazards.

[4] Specific facilities and their locations are not revealed for security reasons.

TYPES OF RISK IN MONTGOMERY COUNTY

Returning to the definition of risk appearing above, **Montgomery County's fire/rescue-related risk is the combined risk that County residents, business owners and visitors encounter from the following hazards: unexpected medical conditions, bodily injury, illness, contagious and non-contagious disease, epidemic, fire, hazardous materials, terrorism, destructive devices, transportation networks, bodies of water, natural hazards, technological hazards, and collapse hazards.** The risks associated with these hazards are condensed in this Plan into six major categories – EMS, Fire, Hazmat/Destructive Devices/Terrorism-WMD, natural hazards, technological hazards, and societal hazards -- each of which is described in detail below.

EMS RISK

Emergency medical services (EMS)-related risk is one of the most significant risks facing Montgomery County's residents, business owners and visitors on a daily basis. The consequences of EMS incidents can impact one individual (e.g., person suffering a heart attack) up to potentially hundreds or even thousands of people depending upon the scope of the incident (e.g., mass casualty incident such as a collision of passenger trains or crash of a commercial airline into a populated area).

ALS AND BLS INCIDENTS

The MCFRS categorizes EMS incidents into advanced life support (ALS) and basic life support (BLS) incidents. **ALS incidents require the services of Paramedics, often supported by Emergency Medical Technicians** (EMTs). All MCFRS personnel providing direct operational services, regardless of the type of apparatus to which they are assigned, are required to be State-certified EMTs (at the EMT-B level), so that they can provide basic life support services during any incident. BLS services include such services as patient assessment; airway management; cardiopulmonary resuscitation (CPR); rescue breathing; use of automated external defibrillators (AEDs); treatment of contusions, puncture wounds, broken bones, sprains and strains; spinal immobilization; child delivery; and similar basic-level life support.

Approximately 30% of MCFRS personnel providing direct operational services have also attained State certification as **Paramedics** ("EMT-P"). Only paramedics are authorized to provide advanced life support services, including administering of certain life saving drugs; electrical therapy including defibrillation; advanced airway management including orotracheal and nasotracheal intubation; intravenous maintenance therapy, use of pneumatic anti-shock garments, and other advanced-level life support services.

BLS incidents include non-life threatening incident types such as injured persons, sick persons, seizures, hemorrhages, patients with mental disorders, child deliveries, and

similar incidents of a basic life support nature. **ALS incidents include life-threatening incident types** such as cardiac arrest, chest pains, heart attack, unconscious person, asthma, choking, diabetic, shooting, stabbing, electrocution, pedestrian struck, allergic reactions, severe bleeding, poisoning, and anaphylactic shock.

BLS incidents usually require the response of a two-person ambulance with EMTs on-board and sometimes a first responder unit such as an engine, aerial unit, or rescue squad staffed by at least three firefighter/EMTs, if closer than the nearest available ambulance. **ALS incidents typically require a multi-unit response in order to deploy the appropriate personnel, expertise, and specialized equipment to the incident scene. For example, a two-person medic unit, with at least one paramedic on-board, and a three-person suppression unit with three firefighter/EMTs on-board may be dispatched to an ALS incident.** When a medic unit is not nearby, the dispatch assignment to an ALS incident might include a first responder unit (e.g., engine, aerial unit, or rescue squad staffed with firefighter/EMTs), the closest ambulance, and the closest medic unit. Other times, ALS first responder apparatus (e.g., engine with a paramedic on-board), if available, would be dispatched if closer than a medic unit, along with the closest ambulance and/or closest medic unit.

Patients having traumatic injuries or other serious injuries are often transported to trauma centers or specialized hospitals (e.g., Children's Hospital) by medevac helicopters operated by the Maryland State Police or U.S. Park Police. The majority of BLS and ALS patients, however, are transported to hospitals in ambulances or medic units. Weather permitting, medevac helicopters are frequently used to transport patients suffering traumatic injuries resulting from vehicle collisions or long-distance falls.

COUNTY EMS STATISTICS AND TRENDS

Calls for emergency medical services continue to be the number one demand for MCFRS services. Figure 3.1 shows the number of EMS incidents to which MCFRS responded during the period 2000-2002. ALS, BLS, and total EMS incidents are shown, along with the percentages of their distribution. Incidents are presented in terms of in-County incidents, out of County, and both combined. The chart reveals several important facts and trends:

- The number of EMS incidents to which MCFRS responds is increasing, both within and outside Montgomery County
- EMS incidents comprise about 73% of all fire-rescue incidents
- The ratio of BLS to ALS incidents (as dispatched) is about 2:1 (64% BLS/36% ALS)
- The number of out of County/mutual aid EMS incidents is increasing, especially ALS

In 2002, there were 24,773 ALS and 43,545 BLS incidents in Montgomery County. MCFRS units also responded to 3087 EMS incidents in surrounding jurisdictions under

mutual aid agreements, mostly to Prince Georges County. The most frequent EMS incident types are "sick person" (comprising 13.4% of all fire-rescue incidents in 2002), "injured person" (comprising just over 10% of all incidents in 2002), and "personal injury collisions," a.k.a. "vehicle collisions," (comprising almost 10%). Combined, these three types of EMS incidents comprised about 33% of all fire-rescue incidents during 2002. The EMS incident types having the highest frequency during 2002, and for many years previously, are presented in Figure 3.2.

The number and percentage of EMS incidents has been increasing for at least the past two decades, with minor fluctuations in certain years, and this trend is expected to continue between 2005 and 2015 due to an aging population and an ethnically diverse population -- both primary factors in increased demand for EMS.

Figure 3.1 - EMS Incidents to which MCFRS Responded, 2000-2002

EMS Incidents	CY2000	CY2001	CY2002
ALS Incidents In-County	22,497 (34.5%*)	23,541 (35%*)	24,773 (36%*)
BLS Incidents In-County	42,559 (65.5%*)	44,061 (65%*)	43,545 (64%*)
EMS Incidents In-County	65,056 (73.5%**)	67,602 (73%**)	68,318 (72%**)
ALS Incidents Out of County	1,284	1,935	2,156
BLS Incidents Out of County	704	857	931
EMS Incidents Out of County	1,988	2,792	3,087
ALS Incidents – Total	23,781 (35.5%*)	25,477 (36%*)	26,929 (38%*)
BLS Incidents – Total	43,263 (64.5%*)	44,918 (64%*)	44,476 (62%*)
EMS Incidents – Total	67,044 (73.5%**)	70,395 (73%**)	71,405 (72%**)

* Percentage of EMS incidents ** EMS percentage of all fire-rescue incidents

While EMS incidents are distributed throughout Montgomery County, these incidents are heavily concentrated in certain areas within the south and central portions of the County. The maps in Figures 3.3 and 3.4 present the density (i.e., incidents per square foot) of ALS and BLS incidents for the three-year period of 2000-2002. Incident density is expressed in subjective terminology -- low through high – on these maps, so that Plan users can easily understand and compare levels of density. EMS (ALS and BLS) incident density is highest in areas having the following characteristics:

- High population density
- Nursing homes, assisted living facilities, and group homes
- Residential communities or individual mid-rise/high-rise residences for seniors
- Large concentrations of mid- and high-rise occupancies, particularly residential
- Major highways
- Shopping malls or other large concentrations of commercial/retail occupancies

Figure 3.2 - 2002 EMS Incident Frequency

Incident Type	Number	% of All Fire, Rescue and EMS Incidents
Sick person[5]	13,249	13.4%
Injured person	10,237	10.3%
Personal injury collision (PIC)[6]	9563	9.7%
Trouble breathing	5875	5.9%
Chest pains	4186	4.2%
EMS service call[7]	2232	2.3%
Seizure	1909	1.9%
Deceased level of consciousness	1891	1.9%
Unconscious person	1871	1.9%
Person down	1766	1.8%

Source: CY2002 MCFRS Incident Statistics

The highest density of EMS incidents is found in a geographical area that extends from the District of Columbia and Prince Georges County lines northwestward to the center of Germantown. The northern boundary of this area extends from White Oak through Norbeck, Aspen Hill, eastern Rockville, Derwood, and Gaithersburg, to the Germantown Town Center. The southern boundary of this area extends from Friendship Heights through Bethesda, northern Potomac, western Rockville, Traville, North Potomac, the Kentlands community and western Gaithersburg, to the Germantown Town Center. **To assist Master Plan users with visualization, this high density call load area forms the rough outline of an "airplane wing," wide on one end (southeast side of County) and tapered to almost a point at the other (Germantown Town Center).** The one area of high EMS incident density located outside this larger area is the Burtonsville/Fairland area in the vicinity of Station 15.

ALS INCIDENTS

The map in Figure 3.4 shows the density of ALS incidents between 2000 and 2002. The map also pinpoints the location of skilled nursing care facilities ("nursing homes") to illustrate their collective impact on ALS incident volume. For the most part, the larger nursing homes are located in grids that are shaded dark green and yellow and average about one to two ALS incidents per day. The sprawling "Leisure World" community for seniors, located north of Station 25 in the Aspen Hill area, experiences a very high volume of ALS incidents (and BLS incidents; see below). Another heavy user of ALS (and BLS) services is the large Asbury Methodist complex located south of Station 8 in

[5] "Sick" refers to a patient with a known illness or ailment, or an unspecified illness or ailment
[6] Combines all PIC incident types: PIC(BLS), PIC/ALS, PIC/Pin, PIC/Fire, PIC/Cycle, PIC/Hazmat
[7] These calls include services such as assisting elderly persons who have fallen but are not injured

Gaithersburg. A third complex consisting of a large residential occupancy for seniors (Revitz House), two nursing homes (Smith-Kogod and Wasserman Buildings), and a community center, located on Montrose Road near East Jefferson Street in Rockville, also experiences an especially high volume of ALS (and BLS) incidents annually.

The "wing-shaped" area described above between the District of Columbia and Prince Georges County lines, to the center of Germantown, is the general area of highest ALS incident density. The heaviest concentrations of ALS incidents are located in Rockville, Aspen Hill, Gaithersburg, Germantown, Silver Spring, Four Corners, Wheaton, Chevy Chase, Bethesda, and Friendship Heights. This density of ALS incidents is expected to continue throughout the 2005-2015 period, and the volume of ALS incidents is expected to increase as the County's senior population and overall population increases.

Figure 3.5 is a map indicating the density of cardiac arrest incidents within Montgomery County. This type of risk presents the highest ALS challenge to the MCFRS and serves as a key factor in the deployment of ALS resources. **The areas of cardiac arrest density closely parallel those pertaining to the larger EMS and ALS categories**, primarily Aspen Hill, Wheaton, Kensington, Silver Spring, Chevy Chase, Bethesda, Friendship Heights, Rockville, and Gaithersburg. Areas of moderate density of cardiac arrests include Takoma Park, Burtonsville, Hillandale, and Germantown. **The highest density of cardiac arrests occurs primarily in areas having a high population of seniors, particularly health care facilities** (Figure 3.6 shows locations of all health care facilities in the County) **and communities/complexes for seniors**. This density of cardiac arrest incidents is expected to continue over the next ten years, and **the volume of cardiac arrest incidents is expected to increase as the County's senior population increases.**

BLS INCIDENTS

The map in Figure 3.3 shows the density of BLS incidents between 2000 and 2002. The map indicates that the areas of highest density of BLS incidents closely mirror the areas having the highest density of ALS incidents. **The area described earlier between the District of Columbia and Prince Georges County lines northwestward to the center of Germantown is the general area of highest BLS incident density**. Similar to ALS incidents, there are heavy concentrations of BLS incidents in Aspen Hill, Rockville, and Gaithersburg, as well as in Silver Spring, Wheaton, Chevy Chase, Bethesda, and Friendship Heights. Areas of moderate density of BLS incidents include Hillandale, Burtonsville, Kensington, and Germantown. Much like ALS incidents, **a high volume of BLS incidents occurs at nursing homes, assisted living facilities, group homes and senior communities/complexes**. Roadways, shopping malls, schools, and recreational facilities also generate a large frequency of BLS incidents. This density of BLS incidents

is expected to continue for at least the next ten years, and **the volume of BLS incidents is expected to increase as the senior population and overall population increases**.

PERSONAL INJURY COLLISIONS

A "personal injury collision" (PIC) is a collision involving one or more vehicles resulting in injuries to drivers and/or passengers. Some PICs involve one or more vehicles that have overturned; hit trees, utility poles or other stationary objects; or have come to rest into or on top of the other vehicle(s). When they occur, the occupants may be trapped or pinned inside the vehicle(s) and require extrication. Occasionally, the vehicle(s) involved may be burning, thus requiring suppression services. PICs do not include collisions resulting in property damage only, where the police typically respond but MCFRS services are not needed unless the vehicle(s) are burning, or fuel or hazardous materials are spilled. Not all incidents dispatched as PICs involve actual injuries but are assumed to be PICs based upon the information provided to 911 call-takers. In these cases, MCFRS Communications must dispatch fire-rescue units which, in turn, confirm whether injuries have occurred.

PICs usually require the response of several MCFRS units. Through 2003, the standard response assignment for PICs included an ambulance, rescue squad, and engine, staffed by at least eight personnel (i.e., minimum of three personnel on rescue squad, three on engine, two on ambulance). This combination of units, equipment, and personnel allow for vehicle stabilization, rescue (if required), fire suppression (if required), patient assessment and treatment, and scene safety. In August 2004, a new policy became effective whereby rescue squads are only dispatched on PICs meeting one of several criteria[8]. A medic unit is included for certain types of collisions (e.g., collision involving a motorcycle) and if 911 callers report that motorists are seriously injured, entrapped, unconscious, having chest pains, or trouble breathing. For PICs occurring on interstate highways with "Jersey" barriers separating opposite directions of travel, the correct side of the highway is often misreported by 911 callers (e.g., inner loop vs. outer loop of I-495), so MCFRS dispatches the standard PIC assignment to the side on which the collision is reported and an additional ambulance and engine to the other side, in case the collision occurred there. Occasionally, an ambulance (alone) will be dispatched if MCFRS personnel or police officers report a collision and can verify that only an ambulance is required (i.e., the services of a rescue squad and engine are not needed) to treat an injured motorist.

PICs comprised about 10% of all fire-rescue incidents during 2002 and have been close to that percentage for many years. In 2002, MCFRS responded to 9563 PICs, averaging 26 per day, or about one every hour. While PICs can occur on any roadway,

[8] Criteria include: roads with speed limit at or above 40 mph, report of entrapment, mechanism of injury, and at the discretion of the MCFRS Communications Supervisor

most occur on heavily traveled roadways. Intersections are prime locations, and excessive speed is frequently involved. **During 2002, almost 76% (about three quarters) of PICs occurred on roadways having speed limits at or above 40 mph, and 52% (about half) occurred on roadways having speed limits at or above 45 mph.** Vehicles involved in many of these 40 and higher miles-per- hour collisions were traveling above the speed limit, so the actual speed at point of impact may have been 5-20 mph (or higher) above the speed limit, thus adding to the severity of the collisions.

The map in Figure 3.7 shows the density of PICs that occurred throughout the County between 2000 and 2002. **The areas of highest density and risk are along the busiest roadways, including I-495, I-270, U.S. Route 29, and Maryland Routes 355 (Wisconsin Ave/Rockville Pike /Frederick Road), MD97 (Georgia Ave), MD185 (Connecticut Ave), MD650 (New Hampshire Ave), MD193 (University Blvd), MD410 (East-West Hwy), MD187 (Old Georgetown Road), MD586 (Viers Mill Road), and MD119 (Great Seneca Hwy). Many of the busiest County roadways have a high incidence of PICs, as well, including Shady Grove Road, Montrose /Randolph/Fairland Road, Montgomery Village Avenue, Democracy Boulevard, Bel Pre Road, and Old Columbia Pike**. The areas having the highest density of PICs include Silver Spring, Four Corners, Bethesda, Hillandale/White Oak, Burtonsville, Wheaton, Aspen Hill, Rockville and Gaithersburg. **These roadways and areas of highest risk and incidence of PICs are expected to remain the County's worst for the foreseeable future, as traffic congestion increases**. The one exception might prove to be U.S. Route 29 where overpasses will be built by the State at major intersections, which may reduce the number of collisions along the Route 29 corridor due to fewer traffic signal-controlled intersections.

PEDESTRIANS STRUCK BY VEHICLES

One of the fastest-growing incident types and largest risks in Montgomery County in recent years is that of pedestrians being struck by vehicles. Increasingly, pedestrians are being killed or injured along our roadways. In 2002, at least 382 citizens were struck and injured by vehicles along the County's road network, including 18 fatalities. During 2000, 398 pedestrians were struck and injured and, of those, 16 were killed. In 2001, 378 pedestrians were struck and injured, and, of those, 14 were killed[9]. The map in Figure 3.8 indicates the number of pedestrians struck between 2000 and 2002 in terms of geographic grids[10]. **The map reveals major problem areas in Downtown Silver Spring, Downtown Bethesda, and Downtown Rockville** – all areas having high

[9] Source: Montgomery County's "Street Smart" web site addressing pedestrian safety (May 2004)

[10] The grid system used for this analysis is the system derived and used by Washington Suburban Sanitary Commission (WSSC). The grids are uniform, each grid measuring 4000 X 6000 feet, or about 0.8 square mile (slightly more than three quarters of a square mile).

pedestrian traffic. **Other areas of significant concern include Takoma Park, Friendship Heights, Wheaton, Glenmont, Aspen Hill, south Rockville (vicinity of Station 23), and the Germantown Town Center**.

Factors contributing to pedestrians being struck include, but are not limited to, the following:

- Risk-taking by pedestrians
- Poor judgment on the part of pedestrians and/or motorists, sometimes involving alcohol and/or drugs
- Pedestrians not using crosswalks or disobeying crossing signals
- Pedestrians and motorists not paying adequate attention to one another
- Inadequate adult supervision of young pedestrians
- Pedestrians with physical impairments (e.g., poor eye sight, walking difficulties)
- Drivers with physical impairments (e.g., poor eye sight)
- Pedestrians who do not understand automated traffic/pedestrian signals and laws pertaining to pedestrian safety
- Excessive speed by motorists
- Motorists not yielding the right-of-way to pedestrians
- Vehicles without headlights illuminated during conditions of poor visibility

During 2002, one third (33.3%) of pedestrians struck by vehicles in Montgomery County were within the 35-54 age group, while one quarter (25.3%) were within the 20-34 age group, and about one fifth (20.5%) were within the 10-19 age group. African Americans were the victims of at least one quarter of the incidents where pedestrians were struck by vehicles in 2002, a percentage disproportionately high to the percentage of African Americans residing in the County. Other races were involved in this type of incident during 2002 at percentages equal to or less than their percentage of the overall County population. [The relationship of age and race to EMS incident frequency is presented in greater detail below.]

To address this problem, Montgomery County formed a blue ribbon committee to study pedestrian issues and to make recommendations for improving pedestrian safety. A program called “Street Smart” was initiated in 2002 to improve pedestrian safety.

RELATIONSHIP OF AGE & RACE TO EMS CALL LOAD

It is useful to examine the relationship of both age and race to the emergency medical services (EMS) incident call load. The purpose of this type of analysis is to identify groups that require a disproportionately high volume of EMS service in comparison to the percentage of County-wide population that they comprise. By identifying the age and racial groups that are involved in a disproportionate volume of EMS incidents, MCFRS

can better determine the type and level of service required, as well as the appropriate deployment of EMS units to effectively provide that service.

For the purpose of this analysis, EMS incidents have been categorized as advanced life support (ALS), basic life support (BLS), personal injury collisions (PICs), and pedestrians struck by vehicles. MCFRS categorizes PICs as a type of BLS incident, whereas "pedestrians struck" is categorized as a type of ALS incident.

- **AGE-RELATED CONCLUSIONS**– based upon 2002 EMS incident data

1. 5.5% of the County's population (i.e., those greater than 74 years of age) generated almost one-third (29.5%) of the total EMS call load (i.e., ALS and BLS combined), almost 35% of the ALS call load, and about 26% of the BLS call load.

2. 11.2% of the County's population (i.e., those 65 years and above) generated about 39% of the total EMS call load, nearly half (46.7%) of the ALS call load, and about one-third (34%) of the BLS call load.

3. 35.3% (slightly more than one-third) of the County's population (i.e., those 45 years and above) generated almost 60% of the total EMS call load, 69% of the ALS call load, and almost 53% of the BLS call load.

4. For 64.7% (almost two-thirds) of the County's population (i.e., those under 45 years of age), their ALS to BLS incident ratio is about 1 to 2.25, whereas the ALS to BLS ratio for persons at or above 45 years (about 35% of population) is about 1 to 1.1. Thus, the ALS to BLS incident ratio for those County residents 45 years and above is about twice that of the County population below 45 years. In addition, the County population at or above 45 years of age is more than twice as likely to require ALS service than those County residents under 45 years of age.

5. 64.7% (almost two-thirds) of the County's population (i.e., those below 45 years) generated only 40.5% of the total EMS call load, only 31% of the ALS call load, but almost half (47%) of the BLS call load.

6. 27.2% (just over one-quarter) of the County's population (i.e., those under 20 years of age) generated only one-eighth (12.5%) of the EMS call load, 10.4% of the ALS call load, and about 14% of the BLS call load.

7. 46% of the persons injured in vehicle collisions in the County fall within the 15-34 age group, which represents only 25.4% (about one-quarter) of the County's population. This data implies that nearly half of those injured in vehicle collisions are either young, less-experienced drivers, or teenaged to young adult passengers riding in vehicles involved in collisions. Lack of seatbelt usage is a major contributing factor to injuries sustained by this age group.

8. Only 3.5% of persons injured in vehicle collisions in the County during 2002 were under 10 years of age. This low percentage is most likely associated with children riding in rear seats wearing seat belts, and the increasing use of infant-toddler safety seats, and use of booster seats for children between the ages of about 5 and 9. [Use of child safety seats and booster seats is discussed later in this Plan.]

9. During 2002, one third (33.3%) of pedestrians struck by vehicles in Montgomery County were within the 35-54 age group, while one quarter (25.3%) were within the 20-34 age group, and about one fifth (20.5%) were within the 10-19 age group. Thus, almost four fifths (79.1%) of pedestrians struck by vehicles in the County were within the combined 10-54 age group. The lower half of this combined age group are typically pedestrians who may be taking risks that other age groups do not normally take (e.g., attempting to outrun oncoming traffic), whereas the upper half of this age group are more likely to be exercising poor judgment when crossing streets as opposed to purposely taking risks. This is not to say that drivers were not at fault in a significant number of these incidents, as well.

- **RACE-RELATED CONCLUSIONS** - Based on 2002 EMS incident data

In 2002, EMBRS reports offered the following categories under the race entry: "Caucasians, African-Americans, Native American, Asian, Hispanic, and Unknown." The latter category is recorded when MCFRS personnel cannot determine a patient's race due to the level of coherence of the patient and lack of individuals on the scene having information about the patient.

The purpose of this type of analysis is to identify groups that require a disproportionately high volume of EMS service in comparison to the percentage of County-wide population they comprise.

Race was only noted on EMBRS reports for EMS incidents where there was a definitive party impacted (i.e., patient). For incidents such as fires, activated alarms, downed wires, etc., it is difficult or impossible for firefighters to record information regarding the race of the person(s) directly impacted by or causing the emergency condition (e.g., property owner who may not be present), so race is only captured in EMBRS reports pertaining to EMS incidents.

In approximately 20% of the EMS incidents during 2002 in Montgomery County, the patient's race was recorded as "Unknown." This renders the racial data associated with the remaining 80% of the incidents somewhat incomplete, in that the percentages of Caucasians, African-Americans, Hispanics, Asians, and Native Americans involved in EMS incidents would each likely be higher had the patient's race been known for all EMS incidents. Considering this limitation, only limited conclusions can be drawn from this data as follows:

- **Caucasians** comprised about 60% of the County's 2002 population and were involved in at least 50% of the ALS incidents; somewhat more if the appropriate number of patients recorded as "race unknown" (see explanation above) had been accurately recorded as Caucasians. The percentage of 2002 BLS incidents involving Caucasians was at least 60% in 2002; somewhat higher had the appropriate number of patients recorded as "race unknown" been accurately recorded as Caucasians. During 2002, Caucasian drivers and passengers were involved in at least 37% of personal injury collisions (PICs), a disproportionately low percentage of County-wide PICs, although this number would have been somewhat higher, but less than 60%, had the appropriate number of patients been accurately recorded as Caucasians. Caucasians were also the victims of about 37% of the incidents where pedestrians were struck by vehicles in 2002, a disproportionately low percentage of County-wide incidents of this type, although this number would have been somewhat higher, but less than 60%, had the appropriate number of patients been accurately recorded as Caucasians.

- The percentage of BLS incidents involving **African American** patients during 2002 was disproportionately high to the percentage of African Americans residing in the County (i.e., about 11.5% at the time). African Americans were involved in at least 25% of BLS incidents; somewhat more had the appropriate number of patients recorded as "unknown" been accurately recorded as African Americans. Likewise, the percentage of ALS incidents involving African Americans was at least 20% during 2002; somewhat higher had the appropriate number of patients recorded as "race unknown" been recorded accurately as African Americans. African Americans were also involved in at least 21% of PICs during 2002, a disproportionately high percentage of County-wide PICs, and that figure would have been somewhat higher had the appropriate number of patients been recorded accurately as African Americans. In addition, African Americans were the victims of at least 24% of the incidents where pedestrians were struck by vehicles in 2002, a disproportionately high percentage of County-wide incidents of this type, and would have been somewhat higher had the appropriate number of patients been accurately recorded as African Americans.

- During 2002, **Asians** were involved in a disproportionately low percentage of EMS incidents compared to the percentage of the County-wide population that Asians comprise (i.e., about 11.5% at the time), although this number would have been somewhat higher, but likely less than 11.5%, had the appropriate number of patients recorded as "race unknown" been accurately recorded as Asians. Asians were involved in only about 3% of ALS incidents and about 4% of BLS incidents during 2002, although these numbers would have been somewhat higher, but probably less than 11.5%, had the appropriate number of patients recorded as "race unknown" been accurately recorded as Asians. Asian drivers and passengers were involved in about 6% of PICs during 2002, a disproportionately low percentage of County-wide PICs, although this number would have been somewhat higher, but likely less than 11.5%,

had the appropriate number of patients been accurately recorded as Asians. Asians were also the victims of about 4.5% of the incidents where pedestrians were struck by vehicles in 2002, a disproportionately low percentage of County-wide incidents of this type, although this number would have been somewhat higher, but less than 11.5%, had the appropriate number of patients been accurately recorded as Asians.

- The percentage of 2002 EMS incidents involving **Hispanics** was disproportionately low compared to the percentage of Hispanics comprising the County's population (i.e., about 11.5% at the time). Hispanics were involved in about 5% of ALS incidents during 2002, but this number would have been somewhat higher had the appropriate number of patients recorded as "race unknown" been accurately recorded as Hispanic. The percentage of BLS incidents involving Hispanics was about 10%, but this number would also have been somewhat higher had the appropriate number of patients recorded as "race unknown" been accurately recorded as Hispanic. Hispanics drivers and passengers were involved in about 13.5% of PICs during 2002, a slightly higher percentage of PICs than the percentage of County-wide population that Hispanics comprise, and this number would have been somewhat higher had the appropriate number of patients been accurately recorded as Hispanic. In addition, Hispanics were the victims of about 12.5% of the incidents where pedestrians were struck by vehicles in 2002, a slightly higher percentage of this type of incident than the percentage of Countywide population that Hispanics comprise. This number would have been somewhat higher had the appropriate number of patients been accurately recorded as Hispanic.

- **Native Americans**, who comprised less than 1% of the 2002 County-wide population, were involved in less than 1% of ALS and BLS incidents during 2002, although this number could have been slightly higher had the appropriate number of patients recorded as "race unknown" been accurately recorded as Native Americans. In addition, Native American drivers and passengers were involved in less than 1% of PICs during 2002 and were the victims of less than 1% of the incidents where pedestrians were struck by vehicles in 2002, although these numbers could have been slightly higher had the appropriate number of patients been accurately recorded as Native Americans.

NATIONAL INJURY STATISTICS AND TRENDS

In assessing EMS risk within Montgomery County, it is useful to look at **national injury statistics and trends** to determine their potential relevancy in this County. Considering that EMS incidents comprise almost 75% of the fire-rescue incidents in Montgomery County, it is important to examine national statistics and trends for comparison purposes. Sources of this data include the Centers for Disease Control (CDC), Federal Emergency Management Agency (FEMA), and the National Safe Kids Campaign appearing on the Firehouse.com web site.

Children 14 Years and Under in the U.S.

Unintentional injury is the leading cause of death among children ages 14 and under. Primary causes are motor vehicle collisions (involving children as occupants, pedestrians and bicyclists), drowning, fire and burns, suffocation, choking, unintentional firearm injuries, falls, and poisonings. Each year, one of every four children ages 14 and under sustains injuries serious enough to require medical attention.

Younger children, males, minorities, and children of low income households suffer injuries disproportionately. Males are at greater risk of unintentional death and injury than females, due to greater exposure to activities that result in injury (e.g., contact sports) and patterns of risk-taking and rough play.

Leading causes of unintentional injury-related death (in order of occurrence), by age group:

- Under age 1: suffocation, motor vehicle collision, choking, drowning, fire & burns.
- Ages 1-4: drowning, motor vehicle collision, fire & burns, pedestrian, airway obstr.
- Ages 5-9: motor vehicle collision, pedestrian struck, drowning, fire & burns, bicycle.
- Ages 10-14: motor vehicle collision, pedestrian struck, drowning, bicycle, fire/burns.

Children 4 years and under are at greater risk from unintentional injury-related death and disability and account for nearly half of the deaths among children ages 14 and under. Infants have an even higher rate of unintentional injury-related death and are also more likely to sustain non-fatal injuries.

The vast majority of unintentional injury-related deaths occur in the evening when children are most likely to be out of school and unsupervised.

Unintentional injuries disproportionately affect children of low income households**. Poverty is the primary predictor of injury to children**. Contributing factors include single-parent households, lack of education, young maternal age, multiple siblings, and living in more hazardous environments. Low-income families are also less likely to use safety devices and to practice safe behaviors. Children from low-income families are twice as likely to die in a motor vehicle collision, four times more likely to drown, and five times more likely to die in a fire. African Americans, Hispanic, and Native American children have disproportionate death and injury rates. Racial disparities in unintentional injury rates appear to have **more to do with living in impoverished environments (i.e., parents' lower levels of income and education) than with ethnicity**. Minorities are more likely to seek care in hospital emergency rooms, as well. Native American children have the highest unintentional injury death rate and are twice as likely to die from unintentional injury as Caucasian children. African American children have the second highest unintentional injury death rate and are 1.7 times more likely to die from unintentional injury than Caucasian children.

Children living in rural areas are at greater risk from unintentional injury-related death than those living in urban areas. Children account for 20% of all injury-related farm fatalities and also comprise a larger proportion of non-fatal injuries than children living in urban areas. Inner-city children are at greater risk from sustaining severe non-fatal injuries than suburban and rural children.

Statistics on sports/recreation-related deaths and injuries:

- Brain injury is the leading cause of sports/recreation-related deaths among children.
- Nearly half of all sports/recreation-related head injuries among children involve bicycling, skating and skateboard incidents.
- Children ages 9 and under are more likely to sustain playground and bicycle-related injuries, whereas older children are more likely to sustain bicycle- and sports-related injuries.
- While contact sports are associated with higher rates of injury, injuries from recreational activities and non-team sports tend to be more severe.
- About 20% of children participating in sports are injured each year. About 25% of these injuries are considered serious.
- Sports involved in the highest number of injuries among children ages 14 and under are (in order): baseball/softball, soccer, and gymnastics.
- The recreational activities involved in the highest number of injuries among children ages 14 and under are (in order): bicycling, playground activities, trampolines, in-line skating, roller skating, and skateboarding.
- Children ages 14 and under account for about 40% of sports-related injuries for people of all ages.

Injuries Involving All Age Groups in the U.S. in 2000

More "medically attended" injuries[11] occurred in or immediately outside the home (e.g., yard) than any other place. Recreation areas and roadways were the next most common areas of occurrence. The rate of medically attended injury and poisoning incidents occurring inside the home was highest among females, while the rate of medically attended injury and poisoning incidents occurring immediately outside the home was

[11] Some persons injured or poisoned were "medically attended to" by physicians or emergency room staff without EMS intervention, while the remainder received EMS assistance.

highest for males. Rates of medically attended injury and poisoning incidents inside the home were highest for persons aged 75 and over and children under 12 years.

Non-sports leisure activities and paid work were most often reported as the activity underway when an injury occurred, followed by sports activities. The rate of medically attended injury and poisoning incidents that occurred while working at a paid job or while engaged in sports were twice as high for males as for females. The rate of medically attended injury and poisoning incidents that occurred while working at a paid job was highest for persons aged 18-44. In terms of racial factors, the rate of medically attended injury and poisoning incidents that occurred while working at a paid job, participating in sports, or engaging in leisure activities was higher for Caucasians than African Americans. In addition, the rate of medically attended injury and poisoning incidents that occurred during sports or non-sports leisure activities among non-Hispanics was almost triple the rate for Hispanic persons.

Overall, females had a slightly higher frequency and rate of medically attended injuries and poisonings than males. Females were more than twice as likely to be injured in the home, whereas males were more likely to be injured at sports facilities, industrial /construction sites, and at schools. Injury/poisoning incident rates were highest among people in the 12-17 year age-group (146 per 1000 population) and 18-44 age-group (105 per 1000). The next highest injury/poisoning rates were among the following age groups and were within about 1 point of each other: 75 and over (84.4 per 1000), 45-64 years (83.6 per 1000), under 12 years (83.1 per 1000). The lowest rate of injury and poisoning incidents occurred to persons within the 65-74 age-group (67 per 1000).

The leading external causes of medically attended injury and poisoning incidents (in order) in the U.S. during 2000 were the following:

- Falls (most common in persons 75 years and older, especially females)
- Being struck by/against a person/object (common for ages 12-17, particularly males)
- Transportation-related injuries (most frequent among people aged 18-44)
- Overexertion (most frequent among people aged 18-44)
- Cuttings and piercing instruments (most frequent among people aged 18-44)
- Poisonings (most frequent among children under 12 years)

The leading types of injury (in order) included the following: sprains and strains, open wounds, fractures and contusions.

COMPARISON OF NATIONAL AND COUNTY EMS/INJURY STATISTICS

Upon comparing EMS/injury statistics and trends for Montgomery County with those for the entire nation, it appears that most statistics and trends are similar. When applied to Montgomery County demographics, national trends and statistics for injuries and poisonings indicate the following:

1. MCFRS will be responding to an increasing volume of EMS incidents, due to the increasing number of young and elderly residents living in Montgomery County.

2. MCFRS and its partner agencies must focus greater attention on injury prevention to reduce the number and severity of injuries experienced by County residents, business owners and visitors.

FIRE RISK

Fire risk is another type of risk that residents and other property owners face on a daily basis throughout Montgomery County. Fires can be categorized as structure fires, vehicle fires, rubbish fires, utility pole fires, and fires involving natural resources such as brush, grasslands, croplands, and forests. All fires present some degree of danger to people and animals, sometimes resulting in injuries and deaths. With the exception of rubbish fires, all fires cause property damage ranging from minor to catastrophic. While automatic suppression systems (e.g., sprinklers) control or extinguish some structure fires while they are in their early stage of development, the fire department is called upon to suppress most fires. The causes of fire include:

- Human carelessness, particularly involving smoking materials
- Faulty electrical systems, equipment, appliances and wiring
- Faulty mechanical systems and equipment
- Equipment and appliances overheating
- Arson
- Explosions
- Chemical reactions
- Spontaneous combustion
- Lightning
- Collisions involving vehicles, trains and planes where flammable liquids or combustible materials ignite
- Airborne embers from other fires
- Radiant heat or convective heat from other fires

Structure Fires

Although relatively few structure fires occur each year within Montgomery County considering the vast number of structures and individual households, **the potential for fires in structures is great**. Structures that are involved in fire include single-family homes, house trailers, townhouses, garden apartments, mid-rise apartments and offices, high-rise apartments and offices, retail and wholesale stores/malls, places of public assembly, institutional buildings, government buildings, storage buildings, and all other types of commercial, leisure and recreational structures.

In 2000, there were about 323,000 households in the County, including single-family homes, house trailers, townhouses, garden apartments, mid-rise apartment buildings and high-rise apartment buildings. By 2010, this figure is expected to grow by 47,000 to 370,000 households. By 2020, the number of households is forecasted to reach 405,000. The total number of structures in the County was 268,693 in 2003, about 7300 of which were non-residential (about 3% of total).[12]

While older structures have a higher potential for experiencing fires due to the age and condition of building systems (particularly electrical systems), newer structures have a higher potential for faster fire growth/fire spread due to light-weight building components that burn quickly and fail quickly, often collapsing. Most of the newer homes are built closer together than in the past, thus increasing the potential for fires to damage houses or other structures surrounding the house where the fire originated. Damage to nearby structures can include direct flame impingement, airborne embers landing on their roofs, and/or the effects of smoke, radiant heat (e.g., resulting in melted siding) or convective heat. It is not uncommon for a house fire in a newer community (with dwellings close together) to damage several nearby structures, even though flames were confined to the house of fire origin. When there is a delay in reporting a house fire to the Public Safety Communications Center, arriving MCFRS units often find a house mostly or fully engulfed in flames, with little or no chance of saving the house or any occupants that did not escape, and damage occurring to nearby structures and vegetation. In this scenario, standard operating procedures dictate that firefighters protect the surrounding exposures (i.e., houses, other buildings, vehicles parked outside) while attempting to control the fire in the house of origin.

While automatic suppression systems present in some high-rise buildings, commercial structures, garden apartment buildings, townhouses, places of public assembly and institutional occupancies (per County Code) control or extinguish some fires, many fires grow unchecked due to the lack of automatic suppression systems in nearly all single-family homes[13] and in certain other structures. This

[12] Sources: Montgomery County GIS Office and M-NCPPC Research and Technology Center

[13] Except those single-family homes equipped with sprinklers as the result of County and municipal sprinkler laws adopted by city councils and the County Council between 2002 and 2004.

situation will be somewhat improved over time due to the County Fire Code requirement that became effective in January 2004 that all new single-family homes be equipped with automatic sprinkler systems. A County tax incentive was also adopted in September 2000 to encourage homeowners to install sprinkler systems voluntarily, if not otherwise required to do so. Although an excellent opportunity to protect life and property, and to lower property taxes the first year of installation, few homeowners had taken advantage of the offer within the first three years and a small percentage of homeowners will likely install sprinklers voluntarily. Even with the benefit of these new laws, most single-family homes in the County still lack sprinkler protection and remain a major fire risk.

With many structures lacking automatic suppression systems, the incidence of structure fires is a significant life safety and property damage issue in Montgomery County. Figures 3.9 - 3.12 show the County's structure fire history for the period of 2000-2002, with 3154 structure fires, averaging almost three per day. The averages per year include: 6.7 civilian deaths, 51 civilian injuries, 1051 structure fires, and $20.65 million damage to structures. During the three year period, nearly three of four (74.2%) structure fires, 90% of the civilian fire deaths and injuries, and nearly seven-eighths ($53 million or 86%) of the total property damage occurred in residential fires. Over half (1697 or 53.8%) of the structure fires occurred in single-family dwellings and involved 75% of the civilian fire deaths, 71% of the fire-related civilian injuries, and almost 74% of the property damage. During the same three-year period, nearly 19% (595) of the structure fires occurred in apartments and involved 15% of the fire deaths, 18% of the fire-related injuries, and almost 15% of the property damage.

Between 2000 and 2003, fires in non-residential buildings accounted for slightly more than one of four (813 or about 26%) structure fires, only 10% of the civilian fire deaths and injuries, and slightly more than one-eighth (14.4% or $8.9 million) of the total property damage to structures of all types. Only two of twenty civilian fire deaths occurred in non-residential fires over the three year period, both in health care facilities.

By examining the individual charts for 2000, 2001 and 2002, a few trends can be seen. Most importantly, the overall number of structure fires is increasing. At the same time, residential fires have comprised a smaller percentage of overall structure fires, while non-residential fires have comprised a larger percentage. The numbers of residential and non-residential fires over the three year period, however, have both increased.

Figure 3.9 - Total Structure Fires Occurring Between 2000-2002

Type Occupancy	Number	Avg./Yr.	% Total	Civilian Deaths/Injuries	Dollar Loss ($)	Dollar Loss Avg./Yr.
1-Fam. Dwelling	1697	566	53.8%	15/108	43,523,600	14,507,867
Apartments	595	198	18.9%	3/28	9,032,734	3,010,911
Hotels/Motels	22	7	<1%	0/1	52,318	17,439
Other Residential	27	9	<1%	0/0	446,946	148,982
Residential Total	**2341**	**780**	**74.2%**	**18/137**	**53,023,505**	**17,674,502**
Public Assembly	135	45	4.3%	0/3	632,721	210,907
Schools/Colleges	87	29	2.8%	0/0	208,210	69,403
Health Care	51	17	1.6%	2/6	2,038,181	679,394
Retail & Offices	220	73	7.0%	0/2	2,132,011	710,670
Industrial	94	31	3.0%	0/3	1,666,300	555,433
Storage	71	24	2.3%	0/1	1,271,626	423,875
Other	155	52	4.9%	0/1	941,549	313,850
Non-Resd. Total	**813**	**271**	**25.8%**	**2/16**	**8,925,612**	**2,975,204**
Grand Total	**3154**	**1051**	**100%**	**20/153**	**61,949,117**	**20,649,706**
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Figure 3.10 - Structure Fires Occurring in 2002

Type Occupancy	Number	% of Total	Civilian Deaths	Civilian Injuries	Dollar Loss
1-Fam. Dwelling	605	45.1%	4	44	$9,780,438
Apartments	291	21.7%	0	18	$6, 220,901
Hotels/Motels	16	1.2%	0	1	$19,700
Other Residential	10	0.7%	0	0	$301,201
Residential Total	**922**	**68.7%**	**4**	**63**	**$16,322,240**
Public Assembly	78	5.8%	0	0	$480,885
Schools/Colleges	45	3.4%	0	0	$155,545
Health Care	30	2.2%	1	3	$2,017,775
Retail & Offices	130	9.7%	0	0	$1,936,711
Industrial	59	4.4%	0	1	$285,125
Storage	42	3.1%	0	0	$311,176
Other	36	2.7%	0	0	$37,010
Non-Resd. Total	**420**	**31.3%**	**1**	**4**	**$5,224,227**
Grand Total	**1342**	**100%**	**5**	**67**	**$21,546,467**

Figure 3.11 - Structure Fires Occurring in 2001

Type Occupancy	Number	% of Total	Civilian Deaths	Civilian Injuries	Dollar Loss
1-Fam. Dwelling	736	67.3%	8	32	$26,997,895
Apartments	110	10.1%	2	1	$32,593
Hotels/Motels	2	0.2%	0	0	$500
Other Residential	6	0.5%	0	0	$96,000
Residential Total	**854**	**78.1%**	**10**	**33**	**$27,126,988**
Public Assembly	28	2.6%	0	2	$35,050
Schools/Colleges	25	2.3%	0	0	$21,303
Health Care	10	0.9%	0	1	$2,506
Retail & Offices	39	3.6%	0	1	$42,825
Industrial	19	1.7%	0	2	$161,725
Storage	15	1.4%	0	0	$184,400
Other	103	9.4%	0	0	$46,639
Non-Resd. Total	**239**	**21.9%**	**0**	**6**	**$494,448**
Grand Total	**1093**	**100%**	**10**	**39**	**$27,621,436**

Figure 3.12 - Structure Fires Occurring in 2000

Type Occupancy	Number	% of Total	Civilian Deaths	Civilian Injuries	Dollar Loss
1-Fam. Dwelling	356	49.5%	3	32	$6,745,267
Apartments	194	27.0%	1	9	$2,779,240
Hotels/Motels	4	0.6%	0	0	$25
Other Residential	11	1.5%	0	0	$49,745
Residential Total	**565**	**78.6%**	**4**	**41**	**$9,574,277**
Public Assembly	29	4.0%	0	1	$151,800
Schools/Colleges	17	2.4%	0	0	$31,362
Health Care	11	1.5%	1	2	$17,900
Retail & Offices	51	7.1%	0	1	$152,475
Industrial	16	2.2%	0	0	$1,219,450
Storage	14	2.0%	0	1	$776,050
Other	16	2.2%	0	1	$857,900
Non-Resd. Total	**154**	**21.4%**	**1**	**6**	**$3,206,937**
Grand Total	**719**	**100%**	**5**	**47**	**$12,781,214**

Figure 3.16 - Highest Frequency of Structure Fires by Station Area in 2002

Station Area	Number as Dispatched	Percentage of Total	Number as Cleared	Percentage of Total
8	120	8.7%	48	9.2%
25	86	6.8%	43	8.3%
29	83	6.6%	39	7.5%
15	72	5.7%	19	3.7%
3	70	5.6%	36	6.9%
1	65	5.2%	31	6.0%
12	58	4.6%	22	4.2%
18	54	4.3%	19	3.7%
31	52	4.1%	22	4.2%
23	47	3.7%	23	4.4%
2	46	3.6%	17	3.3%
28	42	3.3%	22	4.2%

The map in Figure 3.13 (see appendix) indicates the density of structure fires, as dispatched[14], during the three year period from 2000 to 2002, while the map in Figure 3.14 (see appendix) shows the density of structure fires, as cleared,[15] during the same three year period. Figure 3.15 (see appendix) presents a map indicating the frequency and distribution of structure fires, as cleared, during 2002 in terms of grids. Figure 3.16 indicates the station areas having the highest frequency of structure fires in 2002.

It can be easily seen from the three maps and the chart that the following areas experience the highest incidence of structure fires, both as dispatched and as cleared:

- Silver Spring
- Takoma Park
- Rockville
- Aspen Hill
- Gaithersburg
- Germantown

[14] Structure fires "as dispatched" are fires in structures that have been reported to the PSCC and dispatched as standard box alarms (i.e., 4 engines, 2 aerial units, rescue squad, ambulance and command unit) or high-rise box alarms (i.e., 5 engines, 3 aerial units, rescue squad, ambulance and command units), as appropriate.

[15] The incident was "cleared" by the incident commander as Incident Type 11 – an actual fire that occurred in a structure. Not all fires dispatched as structure fires turn out to be actual fires involving fire damage to the structure or contents (e.g., smoke coming from an apartment is reported but MCFRS determines that it came from burned food on the stove, with no fire damage to the building or contents).

- Hillandale-White Oak
- Burtonsville
- Wheaton-Glenmont

Much like EMS incidents, the area of highest incidence of structure fires falls within the same "airplane wing-shaped" area starting along the D.C. and Prince Georges County lines and extending northwestward in a tapered manner to almost a point in Germantown. This area contains the County's highest density of both population and structures.

Fire Deaths

Death from fire is a moderate risk in Montgomery County as compared to the death rate in other "accidental" types of incidents such as vehicle collisions and pedestrians struck by vehicles. Appendix C indicates the fire death frequency and rate between 1972 and 2002. As shown in the chart, **the number of fire deaths per 100,000 residents has decreased considerably over the past 30 years**. Since the period from 1972-77, when the County's fire death rate was around 2.0 per 100,000 residents, the rate has decreased to slightly less than 1.0 during the latter 25 years of the 30-year period. Between 1998 and 2002, the fire death rate was 0.74 per 100,000 residents. For comparison purposes, the average national fire death rate[16] between 1997 and 2001 was 1.43 deaths per 100,000 people per year. The average fire death rate in the State of Maryland[17] between 1998 and 2002 was 1.5 deaths per 100,000 residents. Montgomery County's fire death rate during the same time period was about half that of both the nation and the State; 93% less than the national average and 103% less than the State average.

A major milestone in the fire death rate occurred in 1978, when the **Residential Smoke Detector Law** became effective in Montgomery County. The law requires smoke detectors to be placed in specific locations/floors in all residential dwellings including single-family homes. **Since 1978, the average annual fire death rate through 2002 has shrunk to 0.96 deaths per 100,000 residents, compared to a rate of 1.95 between 1972 and 1977 prior to the law, a drop of almost 51%.** While the smoke detector law is a major contributing factor in this dramatic reduction in fire deaths, other factors have had an impact, as well -- a primary factor being fire safety education programs offered to the public by the MCFRS. Another key factor in the reduction of fire deaths has been the expanded use of residential sprinkler systems brought about by the 1986 County law requiring sprinkler systems in newly constructed townhouses. As beneficial as they are, smoke detectors and sprinkler systems are no guarantee against fire deaths if they are not maintained. Property owners must take the initiative to ensure that these systems will

[16] Source: "The U.S. Fire Problem Overview Report: Leading cause and Other Patterns and Trends," National Fire Protection Association, June 2003, page 22. Cited figure converted to death rate per 100,000.

[17] Source: Maryland State Fire Marshall's Office; chart on web site.

operate by conducting regular tests of sprinkler systems and smoke detectors, regularly changing batteries in detectors, and refraining from disconnecting batteries in detectors and closing sprinkler valves.

Socioeconomic Factors in Structure Fires

National statistics[18] show that there is a correlation between the socioeconomic characteristics of a neighborhood and the incidence of fire. Reasons for poor neighborhoods' vulnerability to fire include the following:

- Neighborhood decline – poorly maintained buildings and internal systems
- Vacant and abandoned buildings
- Arson – leading cause of residential fires in metropolitan areas

Household factors relevant to fire rates include:

- Housing quality – related to age and condition of houses
- Housing affordability – related to household income
- Household structure – family vs. individual(s); single parent vs. two-parents

In Montgomery County, the highest frequency of "cleared" structure fires occurs predominantly in areas having low to moderate household incomes and the highest percentage of single parent/guardian households. This conclusion can be seen in Figure 3.17 (below) that indicates the M-NCPPC Planning Areas[19] experiencing the highest incidence of fire between 2000 and 2002. The County's structure fire experience, when analyzed in terms of socioeconomics of the neighborhoods where the fires occurred, closely parallels that of the nation.

The chart reveals that the highest frequency of "cleared" structure fires occurred in areas having low to moderate household incomes (<$50,000) and the highest percentage of single parent households. Two planning areas are the exceptions to this correlation -- Bethesda-Chevy Chase and North Bethesda-Garrett Park. The high incidence of actual structure fires in these two planning areas appear to be less related to socioeconomic characteristics and more related to other factors such as age of dwellings and non-residential structures (i.e., older electrical and heating systems which cause many fires) and the number of residents aged 65 years and older (i.e., these two planning areas have some of the highest numbers and percentages in the County[20]) whose age and failing health can often lead to less attention to fire safety in their residences.

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[18] Source: "Socioeconomic Factors and the Incidence of Fire," FEMA, 1997

[19] M-NCPPC Planning Areas are shown in the map in Figure 3.20. These planning areas do not correspond to the first-due areas of MCFRS fire-rescue stations. M-NCPPC publishes demographic information in terms of their designated Planning Areas.

[20] Almost 17,000 residents (19.6% of total) in the B-CC Planning Area are 65 years or older. About 6,000 residents (15.4% of total) in the N. Bethesda-Garrett Park Planning Area are 65 years or older.

Figure 3.17 - Socioeconomic Characteristics of M-NCPPC Planning Areas Having the Highest Incidence of Structure Fires Between 2000 and 2002

Planning Area	Number of Structure Fires	% Household Income <$50K	Median Income	% Single Parent Households
Takoma Park	17	52.3%	$46,260	14.1%
Silver Spring	33	50.8%	$49,630	7.8%
Aspen Hill	48	44.2%	$54,330	12.7%
Kensington-Wheaton	44	43.3%	$55,625	10.4%
Kemp Mill-4 Corners	20	40.7%	$56,020	9.0%
Gaithersburg & Vicinity	38	39.4%	$60,400	11.4%
Colesville-White Oak	26	38.3%	$60,545	13.5%
Rockville	39	37.4%	$63,350	9.3%
Germantown	42	35.9%	$60,080	9.6%
Fairland	19	36.5%	$59,225	13.9%
N.Bethesda-Garrett Park	24	32.0%	$67,610	7.0%
Bethesda-Chevy Chase	40	20.8%	$95,480	5.7%

Non-Structure Fires

Non-structure fires pose less risk than structure fires but their level of risk must not be underestimated. Fires of a non-structural nature include fires involving vehicles, trains, planes, boats, brush, leaves, mulch, grasslands, croplands, woods, forests, dumpsters, trash cans, debris, utility poles, illegal fires (e.g., piles of leaves or branches set on fire without a permit being obtained), barbeque grills and other outdoor fires. While non-structure fires result in far fewer deaths and injuries than structure fires, the risk of casualties associated with non-structure fires is always present, particularly when vehicles, trains, and planes are considered. For example, in 1996, 11 travelers were killed when two passenger trains collided in Silver Spring; 8 of the fatalities were caused by the ensuing fire, while 3 died of traumatic injuries caused by the impact. In addition, one motorist dies in a collision-related vehicle fire every 3-5 years in Montgomery County, on average. In addition to casualties, non-structure fires can cause considerable property damage, especially when vehicles, trains, or planes are involved.

There were 4983 non-structure fires in 2002 in Montgomery County, averaging about 14 per day. The map in Figure 3.18 indicates the density of non-structure fires during the three-year period from 2000 to 2002. From this map, it can be seen that the following areas experience the highest incidence of non-structure fires:

- Silver Spring
- Takoma Park

- Bethesda
- Rockville
- Burtonsville
- Gaithersburg
- Germantown
- Aspen Hill
- Wheaton-Glenmont
- Hillandale-White Oak
- Kensington

As with all other fire and EMS incident categories, the area of highest incidence falls within the same "airplane wing-shaped" area starting along the D.C. and Prince Georges County lines and extending northwestward to Germantown. This area includes the highest concentration of people, roads, vehicles and trash receptacles in the County, all of which are closely associated with the incidence of non-structure fires. Despite the smaller acreage of woods, brush, grasslands, etc. in the most urbanized portion of the County, most fires involving vegetation occur in the urbanized area. These fires are usually small in scope, however, and require far fewer suppression resources than structure fires or fires involving vegetation in rural areas. Although fewer in number, the largest-scope fires involving woods, brush, grasslands, croplands, etc. occur in the rural area of the County, where greater quantities of vegetation are found and where fires may grow unnoticed for a longer period. These larger brush/woods fires typically require the deployment of several suppression resources that must travel a considerable distance to reach the fire scene.

Incidents Involving Alarms and Detectors

MCFRS responds to thousands of activated alarms each year. These include activated smoke/fire detectors, carbon monoxide detectors, combustible gas detectors, fire/building evacuation alarms/bells, automatic home fire alarms, automatic fire alarms in non-residential buildings, and water flow alarms (indicating that a sprinkler system may have been activated). Each of these alarm-related incidents has the potential for indicating an actual fire or other emergency situation to which the MCFRS must respond to investigate and re-set. While most of these incidents are unintentional false alarms[21] that require little or no MCFRS intervention other than an initial investigation, a small percentage turn out to be actual fires or other emergencies requiring significant MCFRS intervention. Reports of activated alarms usually originate from security companies that are monitoring alarms for clients; therefore, they cannot provide on-site observations to PSCC personnel. The standard response assignment to an activated alarm, when no further information is

[21] The majority of automatic alarms are caused by malfunctions or activation due to a condition such as dry wall dust where the alarm is not sufficiently sensitive to detect that the condition is not a true emergency.

available from the 911 caller, is one engine and one aerial unit or rescue squad, or one engine in the case of a house or townhouse, that is/are sent to investigate the alarm. If an actual emergency situation is found, then the unit officer calls for additional apparatus.

In 2002, the MCFRS responded to 8705 activated alarm incidents, averaging about 24 per day. The stations dispatched to the highest frequency of alarm incidents during 2002 included 1-Silver Spring, 3-Rockville, 6-Bethesda, 8-Gaithersburg/Washington Grove, 15-Burtonsville, 23-Rockville, 25-Aspen Hill, 26-North Bethesda, 29-Germantown, 31-North Potomac, and 33-Rockville/Potomac. Most of these station areas average between one and two alarm incidents per day.

Figure 3.19 shows the density of alarm incidents throughout the County between 2000 and 2002. The areas of highest density are closely associated with the greatest number of high-rise buildings, health care facilities, senior housing complexes, shopping malls/plazas, and other commercial/retail occupancies. Alarm incidents, primarily automatic fire alarms (AFAs), occur most frequently in Bethesda and Silver Spring where most of the County's high-rise buildings are located, as well as two of the busiest shopping malls. Areas experiencing a medium number of alarm incidents include Rockville, Chevy Chase, Wheaton, and Gaithersburg, all of which have a moderate number of high-rise buildings and retail/commercial properties. Gaithersburg is the site of a large mall, and Wheaton is the site of another large mall, both complexes producing a moderate number of AFAs annually.

Automatic home fire alarms (AHFAs), activated smoke detectors, and activated carbon monoxide detectors occur most often in single-family homes and townhouses. Considering the widespread distribution of houses and townhouses throughout the County, the map in Figure 3.19 indicates a low density of alarms in the areas where most of the houses and townhouses are located. Even though the density is low, the frequency of alarm incidents in houses and townhouses throughout the County is significant. Areas having residents with the highest household incomes – Potomac, Bethesda and Chevy Chase – have the greatest frequency of AHFAs, since these residents are more likely to have had AHFAs installed and monitored by an off-site monitoring center than residents in less affluent areas of the County.

HAZARDOUS MATERIALS, DESTRUCTIVE DEVICES, AND TERRORISM RISK

Hazardous materials, destructive devices, and terrorism (especially terrorism involving the use of weapons of mass destruction) pose a serious risk to residents, business owners, and visitors to Montgomery County. While hazardous materials are present within the County on a daily basis and pose a constant risk, destructive devices and weapons of mass destruction (WMD) are considerably less prevalent yet pose a

substantial risk to nearly everyone. Whereas hazardous materials are typically released by means of damaged or malfunctioning systems, containers, and equipment, or through accidental or careless actions of workers and others going about their daily routines, destructive devices and WMD are intentionally placed, released or dispersed by persons with the intent of causing maximum number of casualties, property damage, and disruption of routine activities/services. The risks associated with hazardous materials, destructive devices, and terrorism/WMDs are each described below.

Appendix D presents a matrix of all types of hazards, including hazmat, destructive devices, and WMD hazards, and compares the likelihood of each hazardous event occurring on a daily basis and its degree of impact. Events are listed in the order of their likelihood of occurrence. Hazmat, destructive device, and WMD hazards appear in the upper third of the matrix.

HAZARDOUS MATERIALS

Hazardous materials ("hazmats") present a significant risk within the nation, State, and Montgomery County on a daily basis. The U.S. Department of Transportation defines a hazardous material as "any substance or material in any form or quantity that poses an unreasonable risk to the safety, health, and property when transported in commerce." The U.S. Environmental Protection Agency defines a hazmat as "any substance or material posing a threat to health and the environment," and the Occupational Safety & Health Administration defines a hazmat as "any chemical that would be a risk to employees if exposed in the workplace." Whatever the definition, hazmats pose serious risks to humans, animals, property and the natural environment. Hazmats are classified as flammable/combustible liquids, compressed gases, corrosives, poisons/toxic materials, oxidizers, flammable solids, etiologic agents, cryogenics and radioactive materials. Many hazmats pose multiple hazards such as flammable gases (e.g. acetylene), poisonous corrosives (e.g., drain cleaner), and cryogenic oxidizers (e.g., liquid oxygen stored and transported below its critical temperature of minus -182 degrees F.). These terms are defined in the Glossary.

Substantial quantities of hazardous materials are present in Montgomery County every day, whether in storage, in use, or transported within or through the County. Hazmats are stored and used in numerous businesses, offices, laboratories and other facilities throughout the County and hazmats are transported through the County by means of vehicles, trains, and underground pipelines, and over the County by aircraft. No portion of the County is free of risk from hazmats, although the urbanized areas are considerably more at risk than other areas. While the hazmat risk is present on a daily basis, it is also important to note that hazmats are transported, stored, and handled safely throughout the County on a regular basis without incident, as well.

Hazmats can be released from their containers into the surrounding environment in the form of leaks, spills, explosions, and/or fires. The release may occur all at once in a catastrophic container failure, or gradually through small breaches in containers. Upon entry to the environment, released hazmats can cause immediate harm to nearby people, animals, property, and the natural environment. Spills will flow downhill and can harm anyone or anything in their path. Leaks produce vapors, sometimes large vapor clouds, which will be carried downwind to impact anything or anybody with whom the vapors come in contact. Even if a hazmat has not been released from its container following a collision, fire or some other damaging event, the potential for a release often poses a substantial risk to nearby persons, animals, property, and the environment.

Hazmat risk is described below in terms of transportation, pipelines, and fixed facilities.

Transportation

Hazmats are constantly on the move across, beneath and above Montgomery County. Hazmats are transported across the County by a variety of highway vehicles and train cars on a daily basis. At the same time, aircraft are transporting hazmats above the County around the clock. Aside from any hazardous cargo, commercial aircraft carry thousands of gallons of fuel which presents a life safety and environmental risk in and of itself should the aircraft crash. Some hazmats are being delivered within the County for sale or for use while others are simply passing through, or over, en route to other destinations.

Hazmats are transported through the County in several types of highway vehicles (i.e., large tractor-trailers, smaller container trucks, tankers, stake body trucks, special tankers for cryogenic materials, pickup trucks, vans, step vans, and automobiles and train cars (i.e., tank cars, box cars, trailers on flat cars, hopper cars). Loads may range from a few pounds or gallons up to thousands of pounds or gallons. Hazmats may be containerized in boxes, crates, cylinders, bottles, cans, carboys, drums and other containers. Hazardous materials transported range from gasoline and other petroleum products, to other flammable liquids, combustible liquids, corrosives, poisons, oxidizers, cryogenics, compressed gases, flammable solids, etiologic agents, and radioactive materials. Hazmats may be released in transit due to damaged or malfunctioning containers, or they may become damaged or compromised as the result of vehicle collisions or fire.

Federal and State laws regulate the transport of hazardous materials throughout the United States. These laws stipulate that hazardous materials be shipped safely and that containers meet rigid specifications and are tested regularly to ensure their integrity. While many types of trucks and some containers are required to be equipped with safety devices (e.g., pressure relief valves) that will reduce hazards should the vehicle be involved in a collision or fire, nothing will completely eliminate the risk of a hazmat release during shipment or storage. In case they are involved in a collision, fire or other incident, containers are required to have hazmat warning labels, and vehicles transporting

hazmats are required to display hazmat placards to enable emergency services personnel, and even civilians, to quickly identify the material(s) and exercise due caution.

Although hazmats are transported over nearly every roadway in the County, including residential streets (e.g., pest control vehicles and lawn care trucks carrying pesticides and fertilizers to residences), the greatest quantity of hazmats are transported along major road networks and rail lines. Primary roadways used by vehicles transporting hazmats include Interstates 495, 270 and 370; U.S. Route 29, and Maryland Routes 355-Rockville Pike, 97-Georgia Avenue, 650-New Hampshire Avenue, 193-University Boulevard, 185-Connecticut Avenue, 108-Olney-Sandy Spring Road, 28-Darnestown Road, 190-River Road, 410-East West Highway, 124-Woodfield Road, 27-Ridge Road, 119-Great Seneca Highway, 109-Beallsville Road, and 586-Veirs Mill Road. **I-495 carries the highest number of hazmat vehicles in the County on a daily basis.** County owned and maintained roadways with heavy hazmat traffic include Shady Grove Road, Montrose-Randolph Road, and Bel Pre Road.

Commonly transported hazmats by highway in Montgomery County include gasoline, diesel fuel, heating oil, propane, hot tar, muriatic acid, pesticides, compressed gases (e.g., oxygen, acetylene), sodium hydroxide, potassium hydroxide, chlorosulphonic acid, and hydrogen peroxide. A wide variety of flammable, combustible, corrosive and compressed gas products are also transported in tractor-trailers and smaller delivery trucks/vans. Many products have multiple hazards such as acetylene (a flammable compressed gas), auto products (often flammable and poisonous) and household cleaners (often poisonous and mildly to highly corrosive).

Large quantities of hazmats are also transported by rail along the CSX Railroad tracks running between Silver Spring and Dickerson, through Kensington, Rockville, Gaithersburg, Germantown, Boyds and Barnesville. Freight trains composed of tank cars, box cars, trailers on flat cars, containers on flat cars, cryogenic cars, refrigerated box cars, gondolas, and/or hoppers transport a wide spectrum of hazmats in the form of liquids, solids, and compressed gases. Commonly transported hazmats by rail include: propane, liquid petroleum gas, chlorine, anhydrous ammonia, hydrochloric acid, sulfuric acid, caustic soda, nitric acid, phosphoric acid, acetic acid, acetone, alcohols, molten sulfur, acrylonitrile, ethylene oxide, and methyl mercaptan. Some products have multiple hazards, such as anhydrous ammonia which is corrosive, flammable, and a compressed gas. Even passenger train locomotives carry about 3,000 gallons of diesel fuel in each fuel tank that can spill during derailments, endangering passengers, crew, and emergency responders, and impacting the environment.

Pipelines

High pressure petroleum product pipelines that traverse the County are considered Montgomery County's #1 conventional hazmat risk by the Hazardous Incident Response Team (HIRT). The Colonial Pipeline transports gasoline and diesel fuel, and

the Columbia, Williams (Transcontinental) and Dominion pipelines transport natural gas. All four pipelines transport products at extremely high pressure, adding to the risk of the flammable fuels being transported.

Several incidents have occurred within the County and the region involving these pipelines. In 1990, lightning struck an above ground portion of the Columbia pipeline north of Germantown igniting escaping natural gas. The fire was located immediately next to Interstate 270, so the busy north-south highway was closed for the night while the fire and leaking gas were controlled. Fortunately, the fire occurred in an unpopulated area and the burning gas did not directly impact traffic on I-270 before the highway was shut down.

In 1993, a natural gas leak occurred in Rockville involving the Colonial pipeline when a 36-inch main ruptured releasing gas at 800 psi. The leak occurred near the intersection of Darnestown Road and Research Boulevard, forcing the evacuation of the immediate area, including townhouses, a nursing home, and an ATF office, and shutting down one of Rockville's busiest roadways. Luckily, there was no fire or injuries, and the leak was repaired quickly, but the outcome could have been catastrophic had the gas ignited.

Nearby Fairfax County has experienced two major incidents since the 1980s involving two of the interstate pipelines that transport fuels through both Fairfax and Montgomery Counties on their way from the Gulf Coast to New England. The first incident occurred in a residential neighborhood in Centerville when the Colonial pipeline ruptured, sending gasoline under high pressure about 200 feet skyward in a geyser. Luckily, the flammable vapors did not ignite and no one was injured. Environmental contamination was the major outcome of this incident, but the potential for casualties and significant property damage to residences was present throughout the incident.

The second incident several years later involved a rupture of the same pipeline near the Fairfax-Loudoun County border. Almost 500,000 gallons of diesel fuel spilled into the Sugarland Run before the leak could be repaired. Despite containment efforts by emergency personnel, a large percentage of the spilled fuel flowed into the Potomac River upstream of water intakes going to filtration plants serving Montgomery County, Fairfax County, and the District of Columbia. With heavy rainfall in the region, the fuel was quickly diluted and carried downstream by the high volume of water in the Potomac River. Once again, environmental damage was the greatest impact of this pipeline break.

In all four of these pipeline incidents, the outcome was much less severe than could have been the case. Nonetheless, these incidents illustrate the dangers presented by pipeline leaks and the risk that is always present with underground pipelines.

Fixed Facilities

Thousands of businesses, facilities, and other occupancies store, use or process hazardous materials in Montgomery County. Types and quantities of hazmats vary considerably from location to location, posing varying degrees of risk. Figure 3.21 (below) lists the types of occupancies that store, use or process hazmats on the premises.

Until 2005 when transitioned to the County's Homeland Security Department, MCFRS managed a program whereby, under federal and local laws, permits are issued to businesses, organizations, and individuals who store specific quantities of hazmats. The category of permit that is required for each facility depends upon the type and quantity of material(s) stored. "SARA-Use" permits are issued to facilities storing 10,000 pounds or greater of any hazardous substance, or the "threshold planning quantity" or greater of an "extremely hazardous substance" (EHS) listed as such in federal publications relating to SARA, Title III[22]. Facilities requiring a SARA-Use permit pose the greatest risk to the public and emergency services personnel. "High-Use" permits are issued to facilities storing greater than or equal to 2000 pounds of a single hazardous substance or aggregate weight of multiple hazardous substances (but less than 10,000 pounds), or greater than or equal to 10 pounds of an EHS. Facilities requiring a High-Use permit generally pose the next greatest hazmat risk to the public and emergency services personnel after SARA facilities. "General-Use" permits are issued to facilities storing greater than or equal to 500 pounds of a single hazardous substance or aggregate weight of multiple hazardous substances (but less than 2000 pounds), or greater than or equal to 2 pounds of an EHS (but less than 10 pounds). Facilities requiring a General-Use permit generally pose the third greatest hazmat risk to the public and emergency services personnel. "Light-Use" permits are issued to facilities storing greater than or equal to 50 pounds of a single hazardous substance or aggregate weight of multiple hazardous substances (but less than 500 pounds), or less than 2 pounds of an EHS. While facilities requiring a Light-Use permit generally pose the least risk of the facilities required to hold a permit for hazmat storage, they still pose a risk to firefighters and the community when the facility experiences a fire or spill. In 2003, the breakdown of hazmat permits by permit category included: SARA – 188, High Use – 828, General Use – 712, and Light Use – 313. In addition, 451 pools had been issued hazmat permits -- high, general, or light use permits, depending upon the quantity of chemicals stored and number of months the pool is open.

Figure 3.22 (below) indicates the number of facilities having hazmat permits, by station area, in 2003. **The central portion of the County (comprised mostly of Station Areas 3, 28, 23, 8 and 29, encompassing Rockville, Gaithersburg, and Germantown) clearly has the greatest number of facilities (i.e., 1425, or 50.3% of total) holding hazmat permits**. A large percentage of the County's bio-technology labs and light-industrial facilities are located within this area. The south and eastern areas of the

[22] "Superfund Amendments and Reauthorization Act of 1986," Title III addressing the rights of communities to be made aware of the threats posed by facilities in the community storing hazmats.

County have the next highest number (i.e., 545, or 19.2% of total) of facilities holding hazmat permits (primarily station areas 1, 2, 12, 15, 16, 18, 19 and 24) encompassing Silver Spring, Takoma Park, Wheaton, Hillandale, and Burtonsville). This is not to say that these areas are in grave danger of a catastrophic hazmat incident; rather, that the risk associated with fixed facilities storing hazmats is higher in these particular areas than elsewhere in the County.

Hazmat Team

Since 1981, the MCFRS has had a hazardous materials response capability in the form of the Hazardous Incident Response Team (HIRT). Since 1983, the primary component of the team has been based at Chevy Chase Station 7. Satellite HIRT resources were established at Station 20 in 1991 and Station 28 in 2002. [Detailed information about the HIRT is presented in Section 4 of this Plan.]

Hazmat Incident History

The charts in Appendix E and Figure 3.23 (below) indicate the breakdown of hazmat incidents to which the HIRT has responded since 1990. **HIRT has averaged 109 incidents per year,** or about 8.5 per month. The most commonly encountered hazmats have been flammable/combustible liquids, gases and solids, and toxic/poisonous materials. The map in Figure 3.24 shows the frequency of hazmat incidents between 2000 and 2002. The highest frequency of incidents has occurred in the southeastern portion of the County, including Interstate 495, and along the Interstate 270 and Route 355 corridors up to Germantown. One particular 4000 X 6000 ft. (0.8 sq. mi.) grid in Silver Spring located between Stations 1 and 19 had the highest frequency of hazmat incidents in the County between 2000 and 2002, experiencing up to 15 incidents. A nearby grid located in Takoma Park experienced up to 12 incidents. Two grids located between Rockville and Gaithersburg each had up to 12 hazmat incidents during the three year period. Nine grids spread out between Bethesda and Gaithersburg and including Wheaton each experienced up to 9 incidents during this period, as well.

When considering the 1421 hazmat incidents to which the HIRT has responded between 1990 and 2002 and the combined transportation, fixed facility, and pipeline hazmat threat in the County, it is **transportation-related incidents that have generated the greatest percentage (approximately 59%) of hazmat calls**. Almost 9% of all hazmat incidents in the County have occurred along Interstates 495, 270, and 370 and on U.S. Route 29, most occurring in the southern and eastern portions of the County. Nearly 6% of HIRT's responses since 1990 have occurred on I-495 alone. Incidents involving fixed facilities have comprised about 40% of the HIRT responses since 1990, and most have occurred in the central portion of the County. Although one of Montgomery County's leading hazmat risks, interstate pipelines have been involved in less than 1% of the HIRT responses.

FIGURE 3.21 - FIXED FACILITIES WHERE HAZARDOUS MATERIALS ARE STORED, USED OR PROCESSED

OCCUPANCIES/LOCATIONS	COMMONLY-STORED HAZMATS
Laboratories	Multiple/all categories of hazmats
Research & development firms	Multiple/all categories of hazmats
Bio-technology firms	Multiple/all categories of hazmats
Manufacturers	Multiple categories of hazmats
Hospitals	Comp. gases, cryogenics, etiologic agents
Garden centers	Pesticides, fertilizers
Nurseries	Pesticides, fertilizers, flammable fuels
Lawn care storage/filling facilities	Pesticides, fertilizers
Farms	Pesticides, fertilizers, flammable fuels
Golf courses	Pesticides, fertilizers, flammable fuels
Pest control storage facilities	Poisons
Chemical suppliers	Multiple categories of hazmats
Vehicle repair and painting shops	Flammables, corrosives, compressed gases
Automobile dealerships	Flammables, corrosives, compressed gases
Auto parts stores	Flammables, corrosives, compressed gases
Gasoline/service stations	Flammables, corrosives, compressed gases
Propane storage/filling facilities	Flammable liquids, compressed gases
Compressed gas storage/filling facilities	Compressed gases–flammable and non-flam.
Refinishing shops	Flammables, corrosives, compressed gases
Home improvement centers	Multiple categories of hazmats
Hardware stores	Multiple categories of hazmats
Grocery stores	Multiple categories of hazmats
Pharmacies	Multiple categories of hazmats
Sporting goods stores	Flammables, compressed gases
Camping goods stores	Flammables, compressed gases
Paint stores	Flammables, comp gases, poisons, corrosive
Department stores	Multiple categories of hazmats
Warehouses	Multiple categories of hazmats
Quarries and construction sites	Explosives, flammable fuels
Water filtration plants	Chlorine, other hazmats for water treatment
Power plant	Flammables, compressed gases
Natural gas pressure reduction facilities	Flammable compressed gas
Cell/microwave towers	Corrosives (batteries)
Schools/colleges (chemistry labs)	Multiple categories of hazmats
Pools	Chlorine, corrosive acids

NOTE: List is not all-inclusive

Figure 3.22 - Hazmat Permits by Station Area in 2003

Station Area	Hazmat Permits	Station Area	Hazmat Permits
1	95	17	36
2	37	18	67
3	**425**	19	108
4	38	20	36
5	92	21	27
6	106	23	**214**
7	23	24	42
8	**218**	25	90
9	22	26	63
10	30	28	**311**
11	62	29	**167**
12	67	30	29
13	49	31	106
14	48	33	36
15	81	40	59
16	48	Total	2832

Source: MCFRS Office of Emergency Management
Boldface figures highlight highest number of permits

Figure 3.23 - Summary of Hazmat Incidents, 1990-2002

Hazmat Involved in Incident	Number of Incidents	Percentage of Incidents
Flammable/combustible liquid, gas or solid	565	39.8%
Toxic/poisonous material	330	23.2%
Miscellaneous or unknown	232	16.3%
Explosives/destructive devices	142	10.0%
Compressed gases	70	4.9%
Corrosive substances	57	4.0%
Oxidizers and organic peroxides	22	1.6%
Radioactive	3	<1%
TOTALS/Average per Year	1421 (109/yr avg)	100%

Source: MCFRS Hazardous Incident Response Team

Using Randolph Road-Montrose Road as a north-south "dividing line" across the County, almost 60% of the hazmat incidents between 1990 and 2002 have occurred south of this line and about 40% north of that line.

The most common hazmat incident has involved flammable/combustible substances. **Almost 40% of the HIRT's 1421 incidents over the 13-year period involved flammable /combustible substances**. The most common hazmat incident has involved flammable or combustible liquids and gases, mostly gasoline and diesel fuel spilled on highways, other paved surfaces, or in streams or storm drains. The second most common hazmat incident has involved toxic/poisonous materials. Seventy five incidents of this type (5.3% of the 1421 hazmat incidents) occurred in 2001 alone, associated with the back- to-back terrorism incidents impacting the entire nation involving the use of airplanes as missiles and the dispersal of anthrax through the U.S. Mail. Combined, toxic /poisonous and flammable/combustible substances have been involved in nearly 63% of the HIRT's incidents during the period of 1990-2002.

The fixed facilities that have experienced the most serious hazmat incidents have been the Harry Diamond Laboratory in White Oak and the Naval Surface Warfare Center (originally located in White Oak but moved to Carderock in 1996). Facilities that have experienced the most hazmat incidents include facilities storing/dispensing various fuels, automotive repair/painting shops, hospitals, and research laboratories.

In addition to responding to "conventional" types of hazmat incidents such as those described above involving commonly used materials, the public, MCFRS, and HIRT also face the threat of more "unconventional" hazmat incidents involving weapons of mass destruction (WMD). Explosives and other WMD are addressed below.

DESTRUCTIVE DEVICES

A "**destructive device**" is an explosive, incendiary, or toxic material that has been combined with a delivery or detonating apparatus, rendering the device capable of inflicting life-threatening injury to people and damage to property; or deliberately modified, containerized, or otherwise equipped with a special delivery, activation, or detonation component that gives the material destructive characteristics of a military ordnance. While many devices involve explosives or flammable materials, some contain chemicals or other toxic/hazardous substances that lack the explosive power or heat release of other devices, but still have the potential of inflicting injury and damage when the material is released. "Suspicious packages" are also included under this definition as are "powder incidents" (see below).

The MCFRS, along with the MCP, respond to all reports of destructive devices, although the MCFRS has the lead responsibility for identifying the device and mitigating the emergency. The typical initial response to a destructive device incident

includes the MCFRS Bomb Squad, the HIRT, an engine, a medic unit and MCP units. Other MCFRS, MCP, and State and federal agency resources (e.g., FBI, State Fire Marshal, ATFE) are requested to assist, as needed.

Explosives

Explosives are defined as any substance designed to produce an explosion, or capable of producing an explosion by reacting with itself. Explosives pose the most immediate danger to persons and property within the immediate vicinity of the device due to the speed in which they may explode and inflict injury and damage, as well as their intense destructive power. Explosives that might be present in Montgomery County include military ordnance that have surfaced outside military installations, explosives used by quarries and construction or demolition companies, and devices that have been assembled and strategically placed by persons having malicious intent to inflict injury and destruction. The latter category of explosives is found infrequently within the County and usually consists of pipe bombs or improvised explosive devices, sometimes built by teenagers. Those responsible for assembling explosive devices pose a great risk to themselves and other nearby people and property while the device is being built and transported. For example, four Whitman High School students and graduates were killed while assembling a pipe bomb in the garage of a home in Bethesda in 1988. Possession of an explosive or other destructive device with malicious intent to activate it is a serious crime with penalties of up to 25 years in prison and $250,000 fines.

Military ordnance surfaces occasionally in Montgomery County, usually found within a property by someone not having prior knowledge of its whereabouts. An example is someone who discovers a wartime souvenir (e.g., hand grenade in the basement or attic) left behind by a previous owner who had served in the military. Other incidents involve wartime souvenirs from the current owner's collection, where the owner decided it was time to get rid of them for reasons of safety. Less frequently, a property owner might find ordnance buried on the property while excavating or landscaping. In these cases, the ordnance is usually a mortar, shell, or grenade, or several buried together. This ordnance may have been buried by a previous property owner or might be stray unexploded ordnance leftover from the Civil War or from a former military ordnance burial site. When the MCFRS Bomb Squad is called upon to respond to an incident where ordnance has been found by a property owner, these incidents are considered "recoveries" and the Bomb Squad handles disposal. A small percentage of these incidents involve the execution of a criminal search warrant.

Incendiary Devices

An incendiary device is any mechanical, electrical, or chemical device used intentionally to initiate combustion and cause a fire. Incendiary devices may be as simple as a "Molotov cocktail" (i.e., breakable container holding a flammable liquid and a burning cloth as an igniter) that is thrown at a target to cause a fire, to highly-sophisticated

devices built by experts containing flammable or combustible materials, timing mechanisms, and some type of engineered sequence of mechanical, electrical, and/or chemical actions/reactions that ignite the device to start a large fire. Materials needed for incendiary devices are considerably easier to find and purchase than materials for explosive devices or devices that release toxic materials. Incendiary devices are used by arsonists as well as terrorists.

Suspicious Packages

A suspicious package is one that may not actually be destructive in nature but may be perceived as posing a threat to the public due its appearance, location, and/or other unusual circumstances. The package could be a brief case, box, luggage, or any other type of parcel. Suspicious packages comprise a high percentage of the MCFRS Bomb Squad's responses, and these incidents are treated as potential destructive devices until the Bomb Squad determines otherwise. Generally, suspicious packages turn out to contain common/legitimate items that were inadvertently left behind by their owners. **About 3-5% of suspicious package incidents involve actual destructive devices or confirmed hoaxes**. With the awareness and risk of terrorism on the rise, the incidence of suspicious package incidents will likely increase over the next ten years and beyond.

Powder Incidents

A "powder incident" involves someone discovering an unidentifiable powdery substance under suspicious or threatening circumstances. Powder may show up unexpectedly in letters, parcels, or other mail or in boxes, plastic containers, or any other item capable of holding powder. Terrorists and hoaxers have been sending powders inside letters and packages for decades with the intent of having the recipient think that it is deadly Anthrax or something similar. Powder incidents are not specifically categorized as destructive devices but are being presented in this Master Plan under this heading.

Powder incidents in Montgomery County first occurred with high frequency in October 2001, following two major terrorist incidents – the September 11 attacks on the Pentagon and World Trade Towers, and the well publicized Anthrax incidents in Boca Raton, New York City, and Washington, D.C. in early October of that year. With County residents understandably anxious at the time, incidents involving suspicious powders escalated sharply during October and November 2001. **During that time, MCFRS responded to more than 600 incidents involving suspicious powders and suspicious packages**. The Bomb Squad responded to more than 250 incidents during a one week period in mid-October 2001.

MCFRS handles powder incidents as modified hazmat incidents, with focus on threat assessment and any required emergency action. Response typically includes the HIRT and Bomb Squad, and other MCFRS units as support. During periods of heavy incident

activity involving powders, an adaptive response assignment (i.e., reduced number of MCFRS units) may be necessary to cope with the call load.

Bomb Threats

The Bomb Squad also responds to bomb threats made against individuals, organizations, and specific properties, although threats remain the responsibility of MCP as the lead investigative agency. The Bomb Squad provides direct and indirect support for bomb threats. Bomb threats are a chargeable offense, with penalties of up to 10 years in prison and $15,000 fines.

Incident History Involving Destructive Devices

During FY03, the MCFRS Bomb Squad responded to over 300 destructive device incidents, including 269 suspicious packages, 22 actual devices and 14 explosive recoveries. The map in Figure 3.25 indicates the frequency of destructive device incidents between 2000 and 2002. **The areas of highest frequency include Bethesda-Chevy Chase, Silver Spring, downtown and south Rockville, Wheaton, and Germantown**. There are two side-by-side 4000 X 6000 ft grids in downtown Bethesda and Chevy Chase that experienced up to 20 and up to 15 destructive device incidents, respectively. In addition, there are two side-by-side grids in downtown Silver Spring that, likewise, experienced up to 20 and up to 15 incidents, respectively. Two grids in Rockville experienced up to 15 incidents each and one in Montgomery Village. During the three-year period, 23 grids experienced up to 10 incidents each, located mostly in Gaithersburg, Rockville, and Wheaton, but also in Bethesda, Kensington and Olney.

TERRORISM/WEAPONS OF MASS DESTRUCTION

The newest threat facing Montgomery County, as well as the nation, is terrorism -- particularly weapons of mass destruction (WMD). Terrorism is defined by the Federal Bureau of Investigation as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.” Acts of terrorism can involve the use of conventional firearms, other conventional weapons, or weapons of mass destruction (WMD) -- biological agents, war chemicals, radioactive materials, high-yield explosives, and nuclear weapons.

The risk of terrorism is posed by domestic terrorists as well as international terrorists. The incidence of terrorism is increasing steadily throughout the world. The scope of terrorism in the United States has ranged from bombings that have injured one person and/or caused extensive property damage (e.g., abortion clinic bombings), up to the September 11, 2001 terrorist attacks by the al-Qaeda terrorist network involving the use of commercial aircraft as missiles to topple prominent national landmarks (i.e., Pentagon,

World Trade Towers) and kill thousands of people in the process. Other major terrorist incidents in the U.S. include the truck-bombing of the Murrah Federal Building in Oklahoma City in 1995 which killed 168 people and destroyed several buildings, and the bombing at the 1996 Olympic Games in Atlanta that killed one and injured dozens in the Olympic Park setting. The latter two incidents were attributed to domestic terrorists.

While no major single acts of terrorism have occurred in Montgomery County (through 2003), there is a moderate-high risk of a terrorist incident occurring here between 2005 and 2015 (and beyond) considering the County's proximity to the Nation's Capital and the presence of federal facilities, foreign embassies, and ambassadors' residences in Montgomery County. The County has numerous other potential terrorist targets, as well. For security reasons, specific "targets" (i.e., buildings and locations) will not be identified in this Plan. **The risk of a terrorist attack in the County on a daily basis is very low, however, that risk increases considerably when viewed over a 10-year period**. The daily risk of terrorism within the County also increases during periods of increased national risk, as determined by the Department of Homeland Security based on their on-going national threat assessment.

The likelihood of a terrorist attack in the United States, Maryland, or Montgomery County itself involving firearms, other conventional weapons, incendiary devices, commonly found chemicals, and/or non-military explosives is much higher than an attack using military ordnance, biological agents, war chemicals, or radiological materials, due to the relative ease with which the former group of devices can be obtained by terrorists. WMD can cause mass hysteria, heavy casualties, catastrophic property damage, and environmental contamination. In fact, the mass hysteria and fear may have greater and longer lasting impact on U.S. citizens than would the number of casualties and extent of property and environmental damage.

Despite the concerted effort by the MCFRS and its partner agencies to plan and prepare for acts of terrorism and to employ countermeasures to minimize the impact of terrorist attacks in Montgomery County, a formidable risk remains. The County has in place a "Terrorism Annex" to the *Emergency Operations Plan* that outlines each County agency's responsibilities in mitigating, preparing for, responding to, and recovering from acts of terrorism. In terms of preparedness, the MCFRS has an experienced and well-equipped HIRT that is continuously building its inventory of protective gear, detection and monitoring equipment, containment and clean up equipment, antidote kits, and decontamination equipment in preparation for an attack involving WMD. In addition, the MCFRS Bomb Squad has a comprehensive inventory of protective gear and equipment for handling incidents involving destructive devices, and the Bomb Squad is also continuously working to expand its inventory in preparation for acts of terrorism. While Montgomery County may be better prepared for terrorism than most municipalities across the nation, much work remains. Total/complete preparation for a terrorism incident, however, is not possible due to the innovativeness of

the terrorists' plans, complexity of the attack, and lack of moneys to fund the vast number of resources that would need to be in place continuously.

Fortunately, federal grant moneys are available to Montgomery County and other counties and municipalities across the U.S. to address needs for equipment, protective gear, training, exercises and planning as they relate to terrorism preparedness and response. Montgomery County is one of several Washington D.C. Metropolitan Area counties that comprise the "National Capital Region" – a region designated by the U.S. Department of Homeland Security (DHS) to receive tens of millions of dollars in federal grants for terrorism preparedness. The moneys are being distributed according to each County's needs identified in a comprehensive assessment conducted in 2003 by the DHS addressing the needs of all local level departments and agencies having terrorism mitigation, preparedness, response and recovery responsibilities, including homeland security, emergency management, fire-rescue, law enforcement, health, and transportation/public works. MCFRS must aggressively pursue any other federal and State grant opportunities for terrorism mitigation, preparedness and response that arise in the future.

BUILDING/TRENCH COLLAPSE RISK

While the County does not typically experience many incidents involving building collapse, trench collapse, confined space rescue and high-angle rescue, the risk is always present. A couple examples of incidents that occurred in 2003 include the collapse of a parking garage under construction in Rockville and an incident involving two workers trapped in a trench collapse in Rockville. When one of these incidents occurs, it poses a unique challenge to MCFRS personnel that require special skills and equipment and a very labor-intensive response. For these reasons, the MCFRS has a Collapse Rescue Team that is dispatched along with other MCFRS resources to incidents involving building collapse, trench collapse, confined space rescue, and high-angle rescue. The team will respond statewide when requested and is also one of 28 teams comprising FEMA's National Urban Search and Rescue Response System. [Section 4 of this Master Plan describes this specialty team.]

WATER-RELATED RISK

The many rivers, streams, creeks, lakes, ponds, reservoirs and other bodies of water present in Montgomery County create a combined risk to citizens who use them for recreational purposes, as well as those who venture too close while in vehicles or on foot. Even under low water conditions, many of these bodies of water present significant drowning potential. High water conditions greatly increase these risks.

The #1 water-related risk in the County is the Potomac River, which features Great Falls and many stretches of whitewater rapids, in addition to numerous calm stretches of flowing water. Even when water levels are low, the Potomac poses great risk to those who do not respect its power and unpredictable currents. In fact, many drownings have occurred in seemingly calm portions of the river when the foolhardy[23] attempt to swim across, only to discover that the unseen current below the surface outmatches their swimming abilities. A second major cause of drowning occurs when fishermen and hikers, many of whom cannot swim, fall in. Kayakers and canoeists, who regularly venture out into the rapids and swift current, have the lowest incidence of drowning on the Potomac, probably because they typically wear personal floatation devices, have the ability to swim and to "roll" their closed-deck boats upright after capsizing, and have knowledge of the river's dangers. Novice boaters who enter the river without exercising these safeguards tend to get themselves into trouble and require rescuing by MCFRS, U.S. Park Police, and fire-rescue departments of adjacent counties.

Despite considerable public education efforts by the U.S. Park Service, State Natural Resources Administration, MCFRS, fire-rescue departments of bordering counties, and the media, the Potomac claims an average of about 3-4 drowning victims annually between White's Ferry and the Brookmont Dam, most occurring downstream of Great Falls. Educational efforts have helped, however, to reduce the annual drowning rate by about half, compared to the rates experienced in the 1970s and 80s.

Other bodies of water that pose lesser risk than does the Potomac River include the C&O Canal (which parallels the Potomac River), Little Seneca Lake at Black Hills Regional Park, Lake Needwood, Lake Whetstone, Clopper Lake, Triadelphia Reservoir, Patuxent River, and Seneca Creek. **During high water levels following heavy rains or melting snow, even normally shallow streams become dangerous to vehicles crossing flooded bridges and people venturing too close to swift currents**.

MCFRS operates a water rescue team ("RRATS" – see Section 4) to help address the risk brought about by the County's many water-related hazards. The team and its functions are described in Section 4 of this Master Plan.

NATURAL HAZARDS RISK

Natural hazards are those hazards related to acts of nature. Natural hazards that present risks to Montgomery County include severe thunderstorms, tornadoes, hurricanes, winter storms, floods, extreme heat, extreme cold, drought, earthquake, and sink holes. These hazards range from thunderstorms, which can occur in any month but most frequently between April and September, to earthquakes which occur infrequently and usually go unnoticed due to their low level of energy released. **Natural hazards typically pose**

[23] Many of these victims are intoxicated, as reported by witnesses and in police reports

low-moderate risk (e.g., floods, tornados, earthquakes, sink holes) because they tend to be of very low probability regardless of the associated severity, or of high probability but with low-moderate severity (e.g., thunderstorms, winter storms). Varied events of nature during Calendar Year 2003 proved that Montgomery County is susceptible to many types of natural hazards even though some occur infrequently. During 2003, the County experienced a tropical storm, two "F0 or F1" tornadoes, flooding (mostly impacting roadways), multiple severe thunderstorms, multiple winter storms, and even felt mild earth tremors from a low/moderate-intensity earthquake centered in southern Virginia. Record-setting rainfall of almost 65 inches (measured at nearby Reagan National Airport) also occurred in 2003 resulting in periodic flooding of low-lying areas along the Potomac River (e.g., White's Ferry) and several roadways that cross creeks and streams (e.g., numerous rescues of stranded motorists on West Old Baltimore Road at Ten Mile Creek).

While MCFRS does not have incident types directly matching natural hazards (e.g., there is no "tornado" incident type in the CAD System), MCFRS responds to incidents directly or indirectly related to these events of nature. Tropical Storm Isabel in September 2003, for example, produced hundreds of incidences of downed power lines, trees that had fallen on buildings and vehicles, trapped motorists in high water on roadways, etc. These events can place a huge demand on MCFRS resources responding to emergencies related to the event. An example is a heavy snowstorm that requires a plow-equipped brush truck or utility unit to accompany an ambulance to a routine type of medical emergency, such as sickness, injury, or seizure, to ensure both a timely response and that the ambulance does not get stuck in the snow.

Certain acts of nature require relatively few calls for service, such as a drought event. The most likely demand for service relating directly to a drought would be fires involving brush, grasslands, croplands, and woods. An indirect impact of a drought would be decreased availability of water at drafting sites for use in fire fighting. Droughts are often accompanied by extreme heat, another natural hazard, which produces a higher than normal frequency of heat exhaustion and heat stroke incidents, as well as respiratory distress and cardiac incidents. High heat also poses an added risk to firefighters during long-duration fire-rescue operations.

Appendix D presents a matrix of natural hazards, as well as other hazards, and compares the likelihood of each hazardous event occurring on a daily basis and its degree of impact. Events are listed in the order of their likelihood of occurrence. Natural hazards appear in the latter half of the matrix.

TECHNOLOGICAL HAZARDS RISK

Technological hazards are hazards created by, or related to, technological infrastructure, business/manufacturing processes, and by-products of a technological civilization. Technological hazards include: utility disruptions (power, water, natural gas, and phone systems), dam failures, pollution emergencies and conflagrations. **Two of the categories -- conflagration and dam failure -- could involve moderate to catastrophic destruction of property and could pose a serious risk to life; however, both have a very low probability of occurring in Montgomery County due to strict building, land-use and fire codes, and the small number and size of dams.** Conflagrations are possible in newer communities where structures are spaced close together, where a roof or attic fire[24] can spread quickly from structure to structure or radiant heat can ignite nearby structures. Pollution emergencies in the County would largely consist of episodes of poor air quality (e.g., "Code Red" air quality due largely to vehicle emissions as opposed to a sudden build-up or release of pollutants from large industrial facilities (which this County lacks). A major spill of fuel from a pipeline, tanker, or tank car could occur at any given time, but this would be considered a hazmat incident rather than a pollution emergency.

Widespread utility disruptions can impact many residents and businesses, but do not occur with great frequency in Montgomery County and are typically associated with winter storms, thunderstorms, or infrequently-occurring tornadoes. Damaged power lines and gas lines pose serious risks to nearby people and property due to the danger of fire and electrocution. These incidents occur fairly frequently, particularly during storms. Gas lines and gas services develop leaks on a fairly frequent basis in the County, and gas lines are occasionally struck by contractors while digging. Widespread water disruptions, although infrequent, can occur for several reasons (e.g., burst pipes, shut down of water pumps, sabotage, terrorism) and typically have a serious impact on sanitation, health care, commerce, and even travel (i.e., burst pipe flooding a roadway). **For MCFRS, water disruptions can result in low water pressure for firefighting, resulting in the need for water tankers and additional engines to be dispatched on structure fires in urban and suburban areas.** A disruption in one area can impact the entire water distribution system, as well. Widespread phone service disruptions do not occur often (mostly during winter storms or thunderstorms) but can seriously impact the ability of citizens to report emergencies to the Public Safety Communications Center. The wide use of cell phones, however, reduces the scope and severity of this problem. Those without cell phones are at greatest risk.

The matrix in Appendix D presents technological hazards, as well as other hazards, and compares the likelihood of each hazardous event occurring on a daily basis and its degree

[24] Although structures may be equipped with fire sprinkler systems, those systems do not extend above ceilings to protect attics and roofs. Fires can originate in attics and roofs from ignition sources such as lightning, malfunctioning HVAC units, and the improper application of hot tar by roofing contractors.

of impact. Events are listed in the order of their likelihood of occurrence. Technological hazards appear in the latter third of the matrix.

SOCIETAL HAZARDS RISK

Societal hazards are those hazards related to the close interaction of people in daily activities and adverse occurrences that arise due to various political, physiological and psychological factors, influences and events. **Societal hazards include health/disease epidemics, civil disorder, commodity shortages, and war. All of these hazards have a low likelihood of occurring in Montgomery County on a daily basis but could have very serious and widespread consequences if they occur**. Outbreak of war is very improbable in the United States but could have devastating consequences on the County, region, State, and nation with direct impact on the demand for fire-rescue services as well as the delivery of those services.

Epidemics, civil disorder, commodity shortages, and war do not typically occur suddenly and without warning signs. Most develop gradually[25]; thus providing lead time for mitigation and preparedness actions on the part of the government and the public. With epidemics, the degree to which the population is affected can be positively impacted by surveillance and mitigation measures, including immunization, exercising due caution in daily activities, change in daily routines, sheltering in place, and others. Civil disorder is usually preceded by mounting tensions by some segment of the population, although events can escalate quickly. Civil disorder is largely a law enforcement responsibility to address; however, MCFRS would be involved in the response to incidences of fire, medical emergencies, and any other hazardous conditions related to the unrest. The last civil disorder that involved the response of MCFRS resources was the riot that occurred in Washington D.C. in April 1968, following the assassination of Martin Luther King, when MCFRS units responded mutual aid to the District of Columbia for numerous simultaneous structure fires. The riot did not cross the District line into Montgomery County, but easily could have if not for the actions of the MCP, MSP, and the Maryland National Guard. A large-scale riot in any jurisdiction within the Washington Metropolitan Area is a regional issue and involves a regional response to bring it under control, including fire-rescue resources.

Montgomery County has experienced several commodity shortages in recent decades. The most notable was the fuel shortage in 1973 during the Arab oil embargo against the United States that significantly impacted County residents and business owners. Another fuel shortage occurred in 1979 that led to long lines at gasoline stations throughout the County. These events did not have an appreciable or direct impact on the volume of fire-rescue incidents, but did lead to the creation and adoption of fuel usage reduction policies

[25] One significant exception would be an outbreak of certain diseases such as smallpox that can occur suddenly and represent a worldwide health emergency.

by the MCFRS. Most notably, these fuel shortages led to the adoption of adaptive response (i.e., two engines and a ladder truck) to certain fire-related incidents, rather than sending a full structure fire assignment. For example, instead of dispatching eight or more units for the report of a fire alarm, the response assignment was reduced to two or three suppression units, since this type of incident rarely resulted in an actual structure fire. The rationale was that additional units could be requested by the first-arriving unit(s), if needed. This policy, although amended several times by the FRC over the 1980s and 1990s, still exists today as a fuel saving measure and as a resource deployment strategy in response to reduced availability of personnel and apparatus due to increasing incident volume and reductions in personnel availability.

Shortages involving key commodities such as fuel, electricity, natural gas, water, food, and medications may occur again within the County, State, and nation between 2005 and 2015 and have the potential of significantly impacting the entire population. The consequences, however, would not be expected to have a major impact on fire-rescue call volume, but could lead to new policies addressing how the MCFRS copes with the direct impact of a reduction in commodities that it relies upon to deliver effective services to the County's population.

The matrix in Appendix D presents societal hazards, as well as other hazards, and compares the likelihood of each hazardous event occurring on a daily basis and its degree of impact. Events are listed in the order of their likelihood of occurrence. Societal hazards appear in the latter third of the matrix.