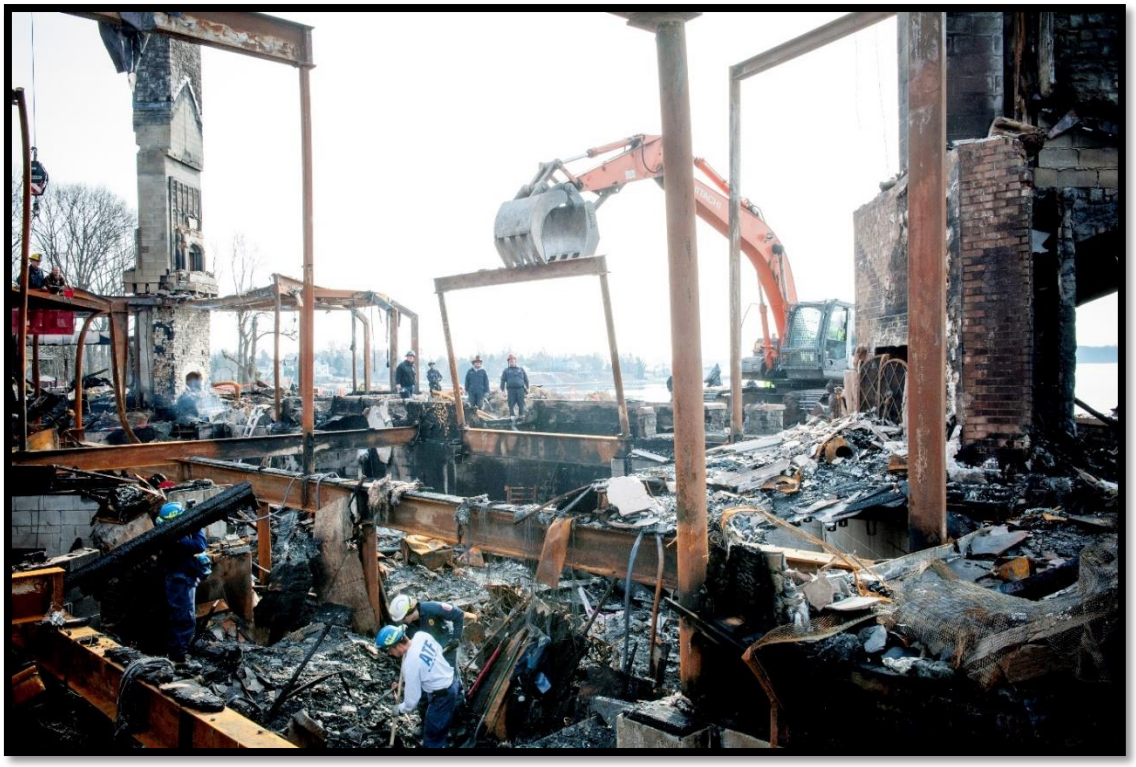
Executive Summary

Fire at 936 Childs Point Road



Bureau of Alcohol, Tobacco, Firearms and Explosives
Anne Arundel County Fire Department

Executive Summary
ATF Investigation # 761010-15-0026 / AAFD Investigation # 15-017
Fire at 936 Childs Point Road, Annapolis, MD

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INCIDENT BACKGROUND

On Monday, January 19, 2015, a fire occurred at a residential dwelling located at 936 Childs Point Road, Annapolis, Anne Arundel County, Maryland 21401. The residence was owned by Mr. Donald Pyle and Mrs. Sandra Pyle. The two-story occupied single family dwelling was approximately 16,386 square feet in size and sustained a complete loss to the structure and contents. The damage was estimated to be approximately $16 million to $18 million.

There was a monitored automatic fire alarm system which provided the initial notification to emergency 911. The first units arriving on the scene received conflicting reports about the status of the occupants of the dwelling; some reports indicating that they were home, and others suggesting they were out of town. It was later determined that the two adult home owners, Donald (age 56) and Sandra (age 63), and their four grandchildren, Charlotte Boone, Wesley Boone, Alexis Boone and Kaitlyn Boone (ranging in ages 6 to 9 years old) were unaccounted for. The investigation ultimately concluded that all six individuals died as a result of the fire.

This document serves as the Executive Summary of the multi-agency investigation led by the Bureau of Alcohol, Tobacco, Firearms & Explosives (ATF) and the Anne Arundel County Fire Department (AAFD). It summarizes over 60 separate reports consisting of approximately 500 pages of material documenting interviews, examinations, assessments and research conducted by the 295 investigators who participated in the investigation.

PARTICIPATING INVESTIGATIVE AGENCIES

1. Bureau of Alcohol, Tobacco, Firearms & Explosives (ATF)
2. Anne Arundel County Fire Department (AAFD)
3. Anne Arundel County Police Department (AAPD)
4. Anne Arundel County State's Attorney's Office
5. Anne Arundel County Office of Emergency Management
6. State Of Maryland Chief Medical Examiner's Office
7. Prince George's County Fire Department
8. Prince George's County Police Department
9. Maryland State Police, Office of the State Fire Marshal
10. Montgomery County Fire Department
11. Annapolis Fire Department
12. Bay Area Recovery Canines
13. Mason Dixon Rescue Dogs
14. Mid-Atlantic Dogs

TIMELINE

Monday, January 19, 2015

3:28:57am	Pyle's home alarm monitoring company receives Automatic Fire Alarm Notification (1st & 2nd floor smoke detector).
3:28:59am	Alarm company receives Automatic Fire Alarm Notification (basement smoke detector).
3:29:05am	Alarm company receives "Basement – Trouble" (basement smoke detector).
3:29:53am	Alarm company receives Supervisory Alarm Notification (Master Bedroom gas detector).
3:30:15am	Alarm company dispatcher calls Pyle's home phone and leaves message.
3:30:41am	Alarm company dispatcher attempts to call Pyle's second home phone line (incomplete call).
3:31:25am	Alarm company dispatcher calls Anne Arundel County 911 reporting smoke detector activations.
3:32:44am	AAFD dispatches Annapolis Fire Department Engine 351 for an automatic fire alarm activation in a dwelling.
3:33am	Pyle's neighbor observes the fire and calls 911 to report that fire is visible from the dwelling.
3:33:35am	Alarm company dispatcher calls Sandy Pyle's cell phone and leaves message.
3:34:30am	AAFD, based upon additional 911 information, dispatches additional units (full "Box Alarm" assignment) from Anne Arundel County, Annapolis, and US Naval Academy (3 engines, 2 ladder trucks, 1 heavy rescue, 1 paramedic unit, 2 water tankers, 2 battalion chiefs)
3:34:33am	Alarm company dispatcher calls Donald Pyle's cell phone and leaves message.
3:35:05am	Alarm company dispatcher calls Donald Pyle's cell phone and gets voicemail.
3:35am	Pyle's neighbor calls Sandy Pyle's cell phone and leaves message.
3:40:51am	Annapolis Fire Department Engine 351 advises that they are laying out a supply hose line from approximately 924 Childs Point Road.
3:41:08am	911 caller from across South River calls and states that "whole house is on fire."

3:42:15am Annapolis Fire Department Engine 351 requests 2nd alarm assignment after seeing "glow from gate".

3:42:20am AAFD dispatches 2nd Alarm assignment (4 engines, 2 ladder trucks, 1 heavy rescue, 1 paramedic unit, 4 water tankers, 1 battalion chief, safety officer, public information officer, staff chief, fire investigation units).

3:42:56am Annapolis Fire Department Engine 351 depresses "ON LOCATION" status message button.

3:43:19am Annapolis Fire Department Engine 351 requests 3rd alarm assignment. Annapolis Fire Engine 351 lays out supply line hoses, enters the driveway, and observes a large volume of fire. An exterior defensive attack was initiated and maintained throughout the fire suppression efforts. Firefighters made efforts to search the dwelling for occupants but were pushed back outside by high heat, a collapsing floor and failing roof structure.

3:44:36am AAFD dispatches 3rd Alarm assignment (4 engines, 1 ladder truck, 1 Deputy Chief).

3:53:11am Incident Commander orders evacuation tones sounded and all personnel to evacuate the structure.

4:13:24am AAFD's Fire and Explosives Investigation Unit personnel arrive on location.

4:31:24am Fourth alarm requested, bringing a total of 85 firefighters to the scene from Anne Arundel County, Annapolis City and the Naval Academy (Figure 1).

7:07:06am Incident Commander places fire under control.

Figure 1 – Fire suppression activity

The fire was declared under control in just over three hours.

At the request of the AAFD's Fire and Explosives Investigation Unit, Special Agents from the ATF Baltimore Field Division's Arson & Explosives Group responded to the scene to assist with determining the cause and origin of the fire and to assist in locating the six unaccounted for family members. Personnel from AAFD and ATF began to jointly investigate the incident along with the AAPD Criminal Investigation Division and other area investigators.

At approximately 4:00pm, the ATF National Response Team (NRT) was requested by the AAFD's Fire Marshal Division via the ATF Baltimore Field Division. ATF Headquarters approved the activation on this same date.

The Anne Arundel County Mobile Crisis Unit was activated to assist the friends and relatives of the Pyle family.

Units remained on the scene extinguishing hot spots throughout the day before scaling back operations for the night. Continuing active fire in the dwelling and the concern of the stability of the structure prohibited placing personnel inside the structure to begin a search for occupants.

Tuesday, January 20, 2015

An initial briefing for all investigative personnel was held. Investigators from the ATF, AAFD, AAPD and the Maryland State Fire Marshal's Office were incorporated into the team concept. Members of the ATF's National Response Team began arriving in the area to assemble their team.

The six occupants remained missing and unaccounted for. Following interviews with the family indicating that the house was their last known location, the house became the primary focus of the searching.

In order to establish a legal basis for the presence of investigators, a state Administrative Warrant was obtained allowing access for the investigation.

During the day, preparatory work was conducted at the site to allow for searchers and investigators to enter the house on Wednesday. Heavy equipment and machinery from Digging and Rigging, Inc. was brought into the scene. There were several issues to include water in the basement, unstable steel beams and unstable walls that needed to be mitigated before personnel could be placed into the basement to begin digging out the debris.

There were no significant developments on this date. AAPD officers and ATF agents remained on location overnight to maintain security of the scene.

Wednesday, January 21, 2015

Crews were able to secure the structure to make it safe for investigators to enter. A search with a Cadaver Canine resulted in positive alerts. As investigators started to process the scene, they were able to visually observe exposed portions of two victims. Once the two victims were dug out by

investigators, the Office of the Chief Medical Examiner took possession of the bodies and transported them to Baltimore for autopsy and identification.

The Office of the Chief Medical Examiner positively identified Victim # 1 as Wesley Boone (OCME Case # 15-00769). Wesley was recovered in the collapsed debris of Guest Bedroom # 3 (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

The Office of the Chief Medical Examiner positively identified Victim # 2 as Charlotte Boone (OCME Case # 15-00764). Charlotte was recovered in the collapsed debris of Guest Bedroom # 4 (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

Operations inside the dwelling were suspended when darkness set in. There were four occupants still unaccounted for. AAPD officers and ATF agents remained on location overnight to maintain security of the scene.

Thursday, January 22, 2015

Recovery operations continued at the fire site. Cadets from the AAPD Academy were brought in as additional resources to help search the scene and excavate debris. During the excavation, investigators were able to locate the bodies of two additional victims. The Office of the Chief Medical Examiner took possession of the bodies and transported them to Baltimore for autopsy and identification.

The Office of the Chief Medical Examiner positively identified Victim # 3 as Donald Pyle (OCME Case # 15-00800). Donald was recovered in the collapsed debris of the Great Room in close proximity to the area where the family's Christmas tree had stood (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

The Office of the Chief Medical Examiner positively identified Victim # 4 as Kaitlyn Boone (OCME Case # 15-00801). Kaitlyn was recovered in the collapsed debris of Guest Bedroom # 3 (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

Operations inside the dwelling were suspended when darkness set in. There were two occupants still unaccounted for. AAPD officers and ATF agents remained on location overnight to maintain security of the scene.

Friday, January 23, 2015

Recovery operations continued at the fire site. Cadets from the AAPD were again brought in as additional resources to help search the scene and excavate debris. During the excavation, investigators were able to locate an additional victim. The Office of the Chief Medical Examiner took possession of the body and transported it to Baltimore for autopsy and identification.

The Office of the Chief Medical Examiner positively identified Victim # 5 as Sandra Pyle (OCME Case # 15-00859). Sandra was recovered in the collapsed debris of Guest Bedroom # 3 (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

Operations inside the dwelling were suspended when darkness set in. There was still one occupant unaccounted for. AAPD officers and ATF agents remained on location overnight to maintain security of the scene.

Saturday, January 24, 2015

Recovery operations continued at the fire site. Investigators also began sifting operations in the location where the Great Room collapsed in an effort to recover evidence related to a 15-foot Christmas tree that stood in that area.

Operations inside the dwelling were suspended when darkness set in. There was still one occupant unaccounted for. AAPD officers remained on location overnight to maintain security of the scene.

Sunday, January 25, 2015

Recovery and sifting operations continued simultaneously at the fire site. Investigators were unsuccessful in locating the remaining missing victim; however, several items of evidentiary value were recovered in the vicinity of where the Christmas tree once stood.

Operations inside the dwelling were suspended when darkness set in. AAPD officers remained on location overnight to maintain security of the scene.

Monday, January 26, 2015

Recovery operations continued at the fire site. During the excavation of debris, investigators were able to locate the body of the final victim. The Office of the Chief Medical Examiner took possession of the body and transported it to Baltimore for autopsy and identification.

The Office of the Chief Medical Examiner positively identified Victim # 6 as Alexis Boone (OCME Case # 15-00953). Alexis was recovered in the collapsed debris of Guest Bedroom # 2 (see Attachment A). The Medical Examiner's report advised that examination of the victim revealed no obvious non-thermal abnormalities and there was no evidence of antemortem injury. The manner of death was ruled Accidental and the cause of death was ruled to be smoke inhalation and thermal injury.

At the conclusion of the day, all occupants were believed to be accounted for. Operations centering on the investigation were scheduled to continue at the site the following day. AAPD officers remained on location overnight to maintain security of the scene.

Tuesday, January 27, 2015

Investigative operations at the scene continued on this date. Operations inside the dwelling were suspended when darkness set in. AAPD officers remained on location overnight to maintain security of the scene.

Wednesday, January 28, 2015

At approximately 2:00pm, investigation at the scene was completed. Custody of the scene was turned over to the sister of Donald Pyle, who was representing the family. The family was then briefed regarding the status of the investigation and the findings to date.

At 4:00pm, a press conference was held at AAFD Headquarters to brief the media on the status of the investigation.

PERSONNEL UTILIZED

Bureau of Alcohol, Tobacco, Firearms & Explosives - 66 Personnel

The ATF National Response Team (NRT) component that deployed to Annapolis was comprised of twelve individuals from around the country. The team was composed of veteran Special Agents, including Certified Fire Investigators (CFI), Certified Explosives Specialists, Forensic Mapping Specialists, an Accelerant/Explosives Detection canine team, Explosives Enforcement Officers, Fire Protection Engineers, Electrical Engineers, Forensic Chemists, Photographers and Evidence Technicians. The NRT's resources include a fleet of fully equipped response vehicles strategically located throughout the United States that allow the NRT to be self-contained for the forensic examination of explosives and fire scenes. The primary mission of the NRT is to concentrate ATF explosives and fire investigative resources and expertise on large scale incidents, or on more complex investigations due to the size, scope, or number of victims as a result of the incident. The NRT provides an immediate and sustained nationwide response capability, typically deploying within 24 hours of notification, with state-of-the-art equipment and the most qualified ATF

personnel available. The NRT members worked in conjunction with the local investigators to reconstruct the scene, identify the origin of the fire and determine the cause.

A total of twenty-nine individuals from the ATF Baltimore Field Division supplemented the ATF NRT and participated in the investigation. This includes the ATF Baltimore Special Agent in Charge, Assistant Special Agent in Charge, Arson & Explosives Group Supervisor, Intel Group Supervisor, and Public Information Officer. The case was led by a Special Agent CFI Candidate and an ATF Task Force Officer from AAFD. An additional eight Special Agents (including one CFI), two Explosives Enforcement Officers and two Task Force Officers conducted forty-nine separate interviews to include family members, friends, and neighbors of the victims as well as employees/contractors whom either had access to the Pyle's residence or conducted business with the Pyle's. Furthermore, seven Special Agents provided security for the scene during overnight hours. An ATF Investigative Research Specialist, the ATF Baltimore Technical Surveillance Specialist and the ATF Baltimore Technical Operations Officer also provided administrative, logistical and investigative support.

Six individuals from ATF's Technical Operations Branch responded to establish and maintain ATF's Mobile Command Post. Nineteen additional individuals from ATF HQ and the surrounding field divisions also responded to assist and support the investigation to include additional Special Agent CFI's, Special Agent Profilers, Fire Protection Engineers, Public Affairs personnel, Visual Media personnel, Audio/Video Group personnel and Peer Support personnel.

The investigative team was broken down into two components: a group that processed the scene and an investigative-lead element. In the course of the overall investigation, both components coordinated daily to ensure investigative continuity.

Anne Arundel County Fire Department - 43 Personnel

Forty-three different individuals form the AAFD participated in the investigation (does not include personnel who participated in fire suppression activity and logistical support activities). Personnel included the Fire Chief, Deputy Fire Chief, Battalion Chief, three Captains, four Lieutenants, four Lieutenant/Investigators, three Firefighter/Investigators, four paramedics, and twenty-two firefighters.

Anne Arundel County Police Department - 74 Personnel

Seventy-four different individuals form the AAPD participated in the investigation (does not include personnel who participated in crowd/media control). Personnel included a Homicide Sergeant, a Homicide Detective, two Crisis Intervention Team (Peer Support) members, three Academy Sergeants, one Academy Corporal, three Academy Instructors and 63 Academy cadets.

Maryland State Police, Office of the State Fire Marshal - 8 Personnel

Eight different individuals from the Office of the State Fire Marshal participated in the investigation. Personnel included the State Fire Marshal, Deputy Chief, two Fire Protection Engineers and four Senior Deputies.

Prince George's County Fire Department - 8 Personnel

Eight different individuals from the Prince George's County Fire Department participated in the investigation and provided assistance with several pieces of specialized heavy excavation equipment. Personnel included the Assistant Fire Chief, two Captains, three Lieutenants and two Fire Investigators.

Anne Arundel County Office of Emergency Management - 6 Personnel

Six individuals from Anne Arundel County's Office of Emergency Management responded to establish and maintain a mobile command post.

Montgomery County Fire Department - 4 personnel

Four different individuals from the Montgomery County Fire Department participated in the investigation. Personnel included two Captains, a Lieutenant and a Master Firefighter.

Annapolis Fire Department - 4 Personnel

Four different individuals form the Annapolis Fire Department participated in the investigation (does not include personnel who participated in fire suppression activity). Personnel included a Lieutenant/Investigator and three Firefighter/Investigators.

Anne Arundel County State's Attorney's Office - 3 Personnel

The State's Attorney and two Assistant State's Attorneys were present during the course of the investigation to provide resources and guidance related to any possible criminal prosecution.

State Of Maryland Chief Medical Examiner's Office - 3 Personnel

A Forensic Anthropologist and two Forensic Investigators from the State of Maryland Chief Medical Examiner's Office were on scene to assist with the recovery of victims. Additional personnel from the Chief Medical Examiner's Office conducted autopsies and other forensic examinations that aided in the positive identification of all six victims.

Digging & Rigging, Inc. - 3 Personnel

Three Operators from Digging and Rigging, Inc. provided assistance with the operation of several pieces of heavy excavation equipment.

Bay Area Recovery Canines - 3 Personnel

One Cadaver Canine Handler and two Cadaver Canines from Bay Area Recovery Canines were used to help locate victims' remains.

Mason Dixon Rescue Dogs - 2 Personnel

One Cadaver Canine Handler and one Cadaver Canine from Mason Dixon Rescue Dogs were used to help locate victims' remains.

Mid-Atlantic Dogs - 2 Personnel

One Cadaver Canine Handler and one Cadaver Canine from Mid-Atlantic Dogs were used to help locate victims' remains.

Prince George's County Police Department - 2 Personnel

Two different individuals from the Prince George's County Police Department participated in the investigation. Personnel included one Sergeant and one Corporal.

Anne Arundel County Public Works - 1 Personnel

A Senior Equipment Operator from the Anne Arundel County's Department of Public Works was present on scene to operate heavy excavation equipment.

IDENTIFIED HAZARDS AND INJURIES

There were numerous identified hazards associated with this scene. The primary hazard was that, although this was a residential building, it was built like a commercial building. The superstructure for the building was comprised of steel and the building was approximately 16,000 sq. /ft., not including the basement. Sections of the exterior walls were comprised of stone and there were three large chimneys throughout the structure. Additionally, the building had been built to look like a castle so there were numerous round turrets located throughout the building. All of these factors created potential collapse issues. Initially, exclusionary zones were established to keep the investigators out of the area. One of the turrets and one of the chimneys had to be pulled down so that investigators could continue their hand excavation into those areas.

Additional concerns were an in-ground outdoor pool, an in-ground outdoor hot tub, and an in-ground indoor pool within the residence. All of these areas were marked off as exclusionary zones throughout the investigation.

As always when recovering remains, there were potential blood borne pathogen issues. This was mitigated by having the recovery team wear Tyvek clothing while conducting aspects of the recovery operations.

Weather was an issue as it snowed and was below freezing on many of the days. To overcome this, local authorities provided three insulated, warming tents. Throughout the day, the scene team would be removed from the scene and brought to the tents to warm.

There were no significant injuries sustained to any personnel during the fire suppression activity or the excavation process.

BUILDING CONSTRUCTION

Because of the severe damage caused to this structure in the fire, the information in this section was derived and summarized from examining the remaining portions of the structure, information from other fire investigators, interviews and pre-fire pictures and architectural drawings obtained from various sources. The floorplan is depicted in Attachment B and Attachment C.

This structure was located on approximately 8 acres and was situated on the dead-end of a peninsula. The location was accessed via a narrow private road to a columned and gated entrance. The driveway continued to the house and then past the house on the north side until it ended in a circle at the boat house near the water's edge. The topography of the location has the house sitting on approximately the highest point of the property. The entranceways were largely on grade or a foot or so above grade and the structure looked out over the water on the south side. The main residence can be seen in pre-fire aerial photos as depicted below in Figure 2.

Figure 2 - Aerial photos of residence

For purposes of this report, investigators divided the main residence into three wings: the north wing, the main wing, and the east wing. The north wing consisted of the following first floor areas: west garage, back hall, coat closet, Guest Bedroom # 1 with bathroom. The north wing also included the following second floor areas: Study, bathroom, Guest Bedroom # 4 with bathroom, and Guest Bedroom # 3 with bathroom. The main wing included the Great Room and Foyer area, as well as the second floor walkway connecting the east and north wings. The east wing included all first and second floor areas east of the Great Room.

The Pyle's reportedly purchased the property with an existing house on it, which they razed, and constructed the present house in 2005. The house is reported to be 16,000 square feet in size. The house was a mix of construction types but overall it was largely two stories with one section that was three stories. The Great Room was a high ceiling one-story room and a basement or crawl space ran under the majority of the house.

This structure was built in the Tudor-style and reportedly was referred to locally as "The Castle" for its construction and appearance. The majority of the front of the main house was covered on the exterior with an approximately 6" thick, greyish colored, stone façade, the roof was covered with slate, there were multiple turrets, three tall stone covered fireplace chimneys and a shorter chimney for the guest house. The exterior of the remainder of the structure was a mix of largely stone façade and stucco. The house was built in essentially a circle around an open paver stone covered parking court that had two vehicular entrances. The main entrance was via a stone columned opening with stucco covered walls between the main house on the right and the guest house on the left. The second entrance to the courtyard was via an arcade or covered breezeway that connected the guest house to the main house and was between the parking court and the previously mentioned entrance road that continued by the house proper.

For the purposes of this report, the front of the residence faced north. Upon entering the parking court, immediately to the right was a two car garage (referred to as the west garage) which had a

second story above it. The west garage was approximately on grade with the first floor and had individual wooden overhead garage doors. In the south wall of the garage was a door to the back hall of the house proper. Just inside this door, to the west was the entrance to Guest Bedroom # 1 which was behind the main entranceway's curving stone staircase. In the northwest corner of the west garage was a door to the west turret. The west turret was constructed with what appeared to be plaster covered interior walls over wooden framing and a wooden spiral staircase to the second story. At the top of the staircase was a Study with a bathroom and a second story fireplace. Through a door in the south wall was an open hallway along the interior east wall that went first by Guest Bedroom # 4 and then Guest Bedroom # 3. The door to Guest Bedroom # 3 was behind the top of the main entranceway staircase.

Continuing counter-clockwise around the parking court, was the front door to the structure framed by side windows (the opening was approximately 10 ½ feet wide) and with a large group of windows above it, as depicted below in Figure 3.

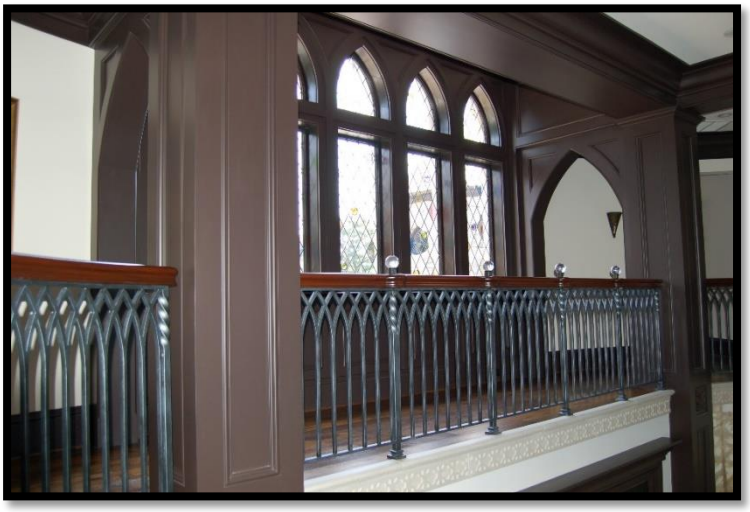
Figure 3 – Front of main residence

The window opening was approximately 12 ½ feet wide by approximately 7 ½ feet tall. The wall for the overhead window extended out over the front door by approximately four feet creating a covered stoop. Inside the front door was the Foyer with the bottom of the curving staircase on the right and a curved mural on the left, as depicted below in Figure 4.

Figure 4 – Foyer entrance

Information received during a meeting with the builders was that from the top of the staircase to the ceiling overhead was approximately nine feet. The floor of the Foyer area appeared to be stone. Directly overhead, and below the large window on the inside was an open walkway with an open railing that joined the western and eastern second stories, as depicted below in Figure 5. This walkway was covered with wooden tongue and groove flooring.

Figure 5 – Walkway between East Wing and West Wing



Through the Foyer was the Great Room, a large, open, high ceilinged room with a grand fireplace in the southwest corner, two sets of French doors in the south wall, two sets of French doors in the west wall and a large set of windows high in the walls above each set of doors. The floor of the Great Room was covered with wooden tongue and groove flooring. From interviews with the builders, the ceiling of the Great Room was approximately 19 feet high. There was also a dome in the ceiling close to the fireplace from which a large metal candelabra was suspended. A pre-fire

image of the Great Room is depicted below in Figure 6. It should be noted that this picture does not contain the furniture or decorations that were known to be present at the time of the fire.

Figure 6 – Great Room

The ceiling above the large window over the front door was approximately 23 feet high or approximately four feet higher than the Great Room ceiling. Exposed beam construction was used in this area and one beam appeared to run parallel to the walkway on the Great Room side.

On the first floor to the east of the Great Room/Foyer was an arched hallway with stone flooring to the main turret area. Between the two areas along the north exterior wall was a bathroom and two other rooms. An elevator that went from the basement to second story was also located in this area. The ceiling height in this area was approximately nine feet. Off the Great Room along the south side of this hallway was a Dining Room. This room appeared to be open walled on the hallway and Great Room sides. The ceiling was lower than the Great Room, the floor was wooden tongue and groove and exposed beams were visible. To the east of the Dining Room was the Butler's Pantry and then the Kitchen. Further to the east, north to south, was the main turret built into the north exterior wall, an unnamed area and the round Family Room in the south exterior wall. As was mentioned, the main turret went from the basement to the second story. It was constructed with a wooden frame covered on the inside with a light colored stone and on the exterior with the gray stone. The steps also appeared to be stone and it used a metal handrail.

Further to the east was the Recreation Room, the Wet Bar and then the two car east garage. The east garage was accessed via the driveway that passed by the house, also had individual wooden overhead garage doors and used garage door openers. On the north side of this area was an interior Mud Room that connected to the east end of the arcade/breezeway to the guest house. On the south side of this area was a screened in porch and then a Spa Room.

On the second floor over the east area, along the north wall was a hallway that went from the Great Room to the top of the main turret. Accessed off the hallway and along the south wall over the Dining Room was Guest Bedroom # 2. East of Guest Bedroom # 2 and south of the hallway and the main turret was an extensive Master Bedroom suite. Just inside the suite was the sitting/vestibule area and immediately on the right was a metal spiral staircase that provided access to the third story area. To the west, over approximately the kitchen area, was the master bath and dressing area and the elevator. Straight ahead was the round Master Bedroom over the Family Room; to the east was a Study over approximately the Recreation Room and then the Exercise Room over the Wet Bar area. There was a tall chimney that facilitated fireplaces on the first floor between the Family Room and the Recreation Room and between the Master Bedroom and the Study on the second floor. There were three second story balconies (off the south side of the Master Bedroom suite and outside Guest Bedrooms # 2 and # 3).

The walking space inside the arcade/breezeway was approximately 5 ½ feet wide and 33 ½ feet from the guesthouse door to the East Garage. The guesthouse had four rooms (sitting room, wet bar, bath and bedroom), was of wooden frame construction covered on the interior with gypsum board and on the exterior with a mix of stucco or stone facade. The interior floor coverings were wooden parquet tiles everywhere except for the bathroom, which had a tile floor. The roof assembly was approximately 2" x 12" roof rafters covered with a plywood roof deck and then slate. The guesthouse had three access points (one via the door through the arcade/breezeway and two side doors on the north side) and a fireplace.

The main house was built using a combination of poured in place concrete slabs, a crawlspace and a basement. Both the east and west garages and the screened porch area appeared to rest on concrete slabs. The area of the house approximately from Guest Bedroom # 1 on the west and including the Foyer, the Great Room, the Dining Room, Kitchen and other rooms located between the main front door and the main turret were built over the basement. It appeared that starting from approximately the east edge of the Kitchen an approximately 40" high crawlspace ran underneath this area except for the east garage and the screened area. The guesthouse reportedly also had a crawlspace under it.

The basement was constructed using a mix of 12" and 16" concrete block walls and was reportedly unfinished. The basement had a poured-in-place concrete floor and was approximately 9 ½ feet high to the top of the block walls in the Utility Room in the northwest corner of the basement. Part of this area had wooden furring strips attached to the concrete blocks which were covered with plywood. The east and south sides of this area at least partially appeared to have had a wooden stud wall covered on the inside with plywood. A door, that appeared to still be closed when examined, provided access to the rest of the basement. In this area, among other things, were several electrical distribution panels, a water softener system, and the geo-thermal system. Also in the basement were two curved concrete block walls topped with bricks formed around the wooden first floor supports. These walls appeared to be for supporting the weight of the marble first floor staircase. Below the mural in the Foyer was a concrete block alcove-type fixture that

the plans showed had been intended for a reflecting pool. The base of the elevator shaft in the basement was also concrete block formed.

There were three access points to the basement: 1) via a stone staircase that descended along the west exterior wall from the west side yard, 2) via the elevator and 3) via the Main Turret.

The first floor above the basement area was supported by a combination of steel beams and wooden pre-engineered trusses. Traversing across the basement, east-to-west, was what will be referred to as the main steel beam. The ends of this beam rested on the west exterior block wall of the Great Room and a block wall approximately under the east side of the Kitchen. The beam was approximately 18 5/8" tall x 11 1/8" flange x 7/8" thick and was three sections bolted together lengthwise. Between the walls, this beam was supported by five 6" square columns. To the north of the main beam was a second smaller and shorter beam that ran parallel to the main beam. This beam was approximately 12" tall x 6-1/2" flange and 1/4" thick. It rested on the west block wall under Guest Bedroom # 1 and the block wall to the east of the front door and was supported by four 6" square columns. From approximately the middle of this beam, another beam ran north and rested on the north basement block wall. This beam was approximately 12-1/4" tall x 6" flange x 1/4" thick. Perpendicular to the main beam, in approximately the middle of the basement was a steel beam that ran north to south, from the north block wall just east of the front door to the south block wall. This beam was approximately 16-3/8" tall x 7-1/8" flange x 5/8" thick and was notched over the top of the main beam. Another beam ran perpendicular from the main beam to the north block wall just west of the main turret. This beam was approximately 12-1/2" tall x 6-1/2" flange x 3/8" thick. There were two other beams that spanned outsets in the south block wall. One span was under the Dining Room and the other was under the bay window in the Kitchen. Supporting the floor in front of the fireplace in the Great Room was a series of beams forming a triangle and connecting to the main beam. One beam ran from the block wall to the left of the fireplace (as facing it from inside) to a short round column on the main beam. This beam was approximately 8-1/4" tall x 5-1/4" flange x 3/8" thick. A second similar size beam connected to this first beam and rested on the block wall to the right of the fireplace. A third similar size beam ran in front of the fireplace and connected to these two beams.

Around the perimeter, the rim joist appeared to have been constructed using approximately 2"x8" and 2"x10" boards as a sill plate, then approximately 1-1/2" x 14" Oriented Strand Boards (OSB) were set on edge. Pre-engineered floor trusses constructed with approximately 2" - 2-1/4" top and bottom chords and ½" OSB in the center sat on the sill plates and ran across the spans. The trusses ran north and south over the basement area and it appeared that where they didn't rest on a beam or block wall joist hangers were used. The trusses were covered on top with approximately 3/4" tongue and groove plywood. Wooden furring strips were placed on top of this plywood and approximately 1-1/2" of lightweight concrete or Gypcrete (according to the builder) was poured between the spaces. In portions of the house, plastic tubing for a radiant floor heating system was in the Gypcrete. The next layer was approximately 3/4" OSB or plywood and then various floor coverings including but not limited to stone, hardwood flooring, carpet, and ceramic floor tiles were observed in the remains. A covered porch extended from an outside door in Guest Bedroom

1 through an arch in the outside of the Great Room's fireplace and around the rear to a side exterior door of the Dining Room.

The remainder of the house was constructed with a mix of wood and steel supports and the area over the crawlspace, that was visible, appeared to have used a similar flooring system as the basement area. In the main house, there were approximately twenty-one exterior entrances to the basement and first floor areas. From the remains of the visible above ground interior walls, it appeared that most had been constructed with 2"x6" wooden stud wall framing covered on the exterior with plywood. According to the builder, 5/8" gypsum board or three layer plaster for the curved areas was used throughout the structure. The ceilings were all plaster and 1-1/2" of Gypcrete had been used throughout the entire first floor area. From the visible remains and the plans the second story floor system appeared consistent with the first floor system in using pre-engineered floor trusses. From the plans observed at the builder's office, it appeared that the roof system was supported by various types of trusses. At least in one location, the roof decking was 3/4" plywood covered by the slate tiles.

Off the east side of the structure was a stone covered patio area around an infinity pool and a hot tub. A detached wooden construction Tiki Hut-type pool house with a bar was located across a stone walkway from the Spa Room.

UTILITY SERVICES

Gas Service

Liquid petroleum gas service was provided to the structure by two 1,000 gallon propane tanks. These tanks were buried in the ground and located near the southeast portion of the front yard.

Gas service was delivered to the structure via multiple underground lines. Records indicate that the propane service was in working order at the time of the fire and that there were no recent increases in gas usage.

On the morning of the fire, AAFD personnel disconnected the propane service by closing the shut off valve on both propane tanks. Investigators later examined the visible components of the previously mentioned propane tanks and noted that both tanks contained propane and were not affected by the fire incident. Examination of the regulator valves, located on the east side of the pool house, south garage and guest house did not reveal any fire related damage. An additional regulator valve, which was attached to a gas grill, located next to the outdoor bar, was examined and found to be free of fire damage.

In summary, the propane gas tanks and regulators were not affected by the fire incident.

Electrical Service

The primary electrical distribution system in the area was a nominal 7200 V, single-phase, overhead system as reported by the local electric utility provider. 120/240 V single-phase, three-wire electrical service was provided to the structure from a dedicated 50 kVA pole mounted transformer located at the west side of the property. It was noted that the grounding conductor at the base of the utility pole was not connected to the grounding electrode at the time of the examination.

Witnesses indicated that the fused cutout supplying the transformer was open (hanging down) during fire suppression efforts.

The electrical service was disconnected during fire suppression efforts. The primary tap supplying the transformer was disconnected, the transformer primary fuse (fuse carrier of the fused cutout) was removed and the transformer secondary taps were disconnected, effectively de-energizing the structure.

A service-lateral extended from the utility pole to the west wall of the structure. It entered the basement, below grade, where it supplied a 1200-A main distribution panelboard. Current transformers and an electric meter were installed adjacent to the main distribution panelboard. Numerous distribution panelboards and home automation panelboards were located in the basement as well as throughout the structure.

The distribution panelboards were significantly damaged by fire. The status of the circuit breakers could not be determined. The remainder of the electrical distribution system within the structure was significantly damaged by fire and structural collapse. Electrical activity and damage to the electrical distribution system was of little significance as the system remained energized for an extended time as the fire progressed throughout the structure.

A 20 kVA LP-gas-engine-driven standby generator was located at the west side of the property, adjacent to the transformer utility pole. It was connected to the structure's electrical system via an automatic transfer switch located in the basement. The gas supply valve at the generator was closed and the generator control switch was set to 'Stop' at the time of the examination. For safety purposes during the examination, the generator's battery terminals were disconnected and the main circuit breaker was switched to the 'OFF' position.

Witnesses indicated that exterior lighting remained on during the early stages of fire suppression efforts. Exterior lighting remaining energized while a large volume of fire was present on the first floor of the structure is inconsistent with a fire originating in the basement. A fire originating in the basement would likely cause exterior branch circuits to be de-energized as a result of fire impingement on the basement electrical equipment prior to extension to the first floor.

It was concluded that neither the liquid petroleum gas service nor the electrical supply service were factors contributing to the cause of the fire.

SUMMARY OF INTERVIEWS

Alarm System

The alarm system in the Pyle's residence was monitored by a Central Station Monitoring Facility. The investigation revealed that the notification procedure established for the Pyle's residence for a smoke alarm activation was for the Central Station Monitoring Facility to call the customer's landline and then follow up with a call to the customer's cellular telephone. The alarm company was unable to reach the Pyle's by telephone on the night of the fire after the alarm activated.

The alarm system report revealed that at 3:28:57am "Zone 2 – 1st and 2nd Floor" alerted, and that "Zone 1 – Basement" alerted 2 seconds later. Based on this information, it is believed that the smoke alarms were activated in these zones. The basement smoke alarm was located at the top of the basement stairs near the 1st level of the residence. The report also shows that at 3:29:05am, "Basement – Trouble" alerted. It is believed that this signal meant that the electrical conductor for this device became compromised. It was surmised that the fire at the house grew very rapidly because the fire compromised the conductor so quickly after the smoke alarm activation.

Firefighters

Annapolis Fire Department Engine 351 was dispatched to the fire at approximately 3:32am and arrived on scene of the fire at approximately 3:42am. The initial dispatch report was for a smoke alarm. After a neighbor reported seeing the fire, the call was upgraded to a full box assignment. As the engine company was approaching the scene, they observed fire through the trees.

The driver parked the engine near the north courtyard entrance at the front of the building. Upon their arrival, the wind was out of the west. As they began to deploy hose lines to fight the fire, they observed that the two overhead doors in the west garage of the building were open and that there was a vehicle parked in each garage bay. There was no smoke or fire visible in the garage bays and there was no smoke or fire visible in the second floor windows above the garage. There was another vehicle parked in the east end of the courtyard. The front door of the residence was on fire and the top half of the door was consumed by fire. There were two first floor windows east of the front door. There was fire visible in the first window east of the front door and smoke visible in the second window east of the front door. There was a second floor window above the two previously described windows and fire was progressing from the west side of the window to the east. There was fire visible in the windows above the front door and fire venting from the peak of the roof above the Great Room.

After extending hose lines to the front of the building, firefighters walked around the north end of the building to assess the scene. There was fire observed through the first and second floor windows between the chimney in the Great Room, north to the area near the bottom of the exterior stairwell, along the west wall. After observing the fire from the northwest corner of the building, the firefighters returned to the courtyard.

From the courtyard, firefighters observed fire progressing from the Great Room to the east and thick black smoke emitting from the windows above the garage. Firefighters checked the north garage and opened the pedestrian door on the south interior wall of the garage, which provided access to the interior of the residence. Firefighters attempted to fight the fire from this door.

Firefighters advanced a hand line into the courtyard of the residence toward a first floor window located to the right of the main entry door. Firefighters stated that there was no fire extending from the window but they could see fire in the Foyer of the house. The second floor window glass had failed and fire was venting out.

Firefighters noticed the garage doors to their right were open and they advanced into the garage and found a pedestrian door to the south. They opened the door and attacked the fire. Firefighters described the fire in the Foyer as a "kiln". A ladder was deployed to the second floor windows above the garage; however, firefighters were unable to enter the building due to the fire conditions.

Approximately five minutes after arriving on scene, the front door was completely consumed by fire, the Great Room was engulfed in fire and the structural roof members were starting to collapse in the Great Room.

After the Great Room roof members began to collapse, an evacuation order was issued for all firefighters on the scene. Following the evacuation order, the commanding officer completed an assessment of the entire building. During their walk around the building, the second floor above the west garage become involved in fire. The entire west wall and roof, from the west garage to the Great Room chimney was involved in fire. The south wall and roof that extended from the Great Room chimney, east to the Master Bedroom, was also involved in fire. There was a large blue flame venting from the east end of the Great Room. The fire had not yet progressed to the east wing of the building where the indoor pool was located. The garage doors in the east garage were closed and there was no fire visible in the garage. The guest house was not involved in fire and was visually searched for victims through the windows.

Employees / Contractors

Multiple employees and contractors were interviewed in reference to possible sources of ignition in the residence.

The four gas fireplaces in the building were serviced on Friday, January 16, 2015. According to the contractors, Mrs. Pyle told them that they used the fireplace regularly and they noticed a slight buildup of soot, but nothing out of the ordinary. Contractors took out the decorative logs from each fireplace and then ignited each fireplace, noticing nothing out of the ordinary. They cleaned the units and re-installed the decorative logs. After they cleaned the fireplaces in the main residence, they cleaned the fireplaces in the guest house. They stated that Mrs. Pyle had reported

that there may have been something wrong with one of the remote control devices to one of the fireplaces, but when they tested it, it was functional.

There was a "Light-Touch" light switch in the Great Room that was on the wall to the left (east) of the fireplace. The chandelier in the Great Room was on a motor that could be lowered to replace the light bulbs. There were recessed lights in the ceiling and sconces on the walls.

The doors in the Great Room were accented with fabric that was hanging from rods. On windows to the left (east) and right (north) of the fireplace were velvet draperies. There were no blinds or other curtains anywhere else in the Great Room. There were two sofas, a rug, two glass coffee tables, a leather chair, and a large chaise in the Great Room.

The Pyle's residence had two Christmas trees, a 15-foot Fraser fir tree and a 7-foot Douglas fir tree. The larger tree was kept in the Great Room and the smaller tree was placed in the bar area. The Fraser fir tree in the Great Room is depicted below in Figure 7.

Figure 7 – Decorations in Great Room

Investigators were able to establish the following timeline relevant to the Great Room's Fraser fir tree:

- 11/14/2014 - Fraser fir tree cut down from a tree farm in West Jefferson, NC
- 11/15/2014 - Tree transported to a tree farm in Hunt Valley, MD
- 11/22/2014 - Tree bailed and transported to a lawn and garden center in Lutherville, MD
- 11/28/2014 - Pyle's purchased tree from lawn and garden center in Lutherville, MD
- 12/8/2014 – A landscaping service installed tree at the residence
- 12/9/2014 - Tree decorated by an interior decorator

After being purchased from the lawn and garden center, the trees were delivered and installed by the landscaping service. The trees were wrapped in twine and transported to the Pyle residence,

where the twine was removed. The installer used a chainsaw to cut approximately 2" off of the approximately 10" diameter trunk of the Fraser fir. The base of the tree was approximately 6 feet in diameter. The larger tree was placed on a tree stand and moved into the Great Room, approximately 6 - 8 feet to the left (east) of the fireplace and approximately 6" from the south wall. The tree was approximately 3 - 4 feet from the ceiling when standing and may have been touching the curtains. The contractors installed watering pans that were provided to them by Mrs. Pyle.

There were no timers on the Christmas lights. The lights were plugged into the receptacle next to the tree and the lights were left on 24 hours a day, 7 days a week. The lights on the Christmas tree were the same lights that were used on the outside trees (the lights on the outside of the house were not rated for outdoor use). The tree had mostly plastic decorations on it. There was a cloth/felt tree skirt around the base of the tree that covered the actual stand and water pan.

A green-colored extension cord was plugged into a floor receptacle near the tree. The extension cord contained a foot switch and had multiple receptacles along the length of the cord. The extension cord extended from the floor receptacle up to the top of the tree. There were approximately 1500 incandescent lights on the tree that were in strings of 100. No more than five strings of 100 lights were connected together and each of these groups of lights were plugged into individual receptacles on the green-colored extension cord. The green-colored extension cord was then plugged into a 5 or 6 receptacle power strip that was plugged into the 15-Amp duplex receptacle located in the floor next to the floor vent. The vent near the receptacle was covered with a rubber mat to protect the floor. Most of the power strip receptacles were being utilized with the exception of possibly one or two. Both floor receptacles had electrical cords plugged into them.

The mantel of the Great Room fireplace was decorated with garland and approximately 200-300 incandescent lights. These light strings were plugged into the wall receptacle on the right side of the fireplace.

According to interviews, the tree located in the Great Room was steadily dropping needles and the branches had started drooping. Individuals who were employed by the Pyle's advised that they knew that the two Christmas trees in the residence were dry and added that Mrs. Pyle was aware of the condition of the trees. The needles around the Great Room Christmas tree had been cleaned as recently as Friday, January 16, 2015. Don and Sandy Pyle both wanted to keep the tree in the Great Room longer because they felt like they hadn't had a chance to enjoy it; however, both trees had been scheduled to be removed for Tuesday, January 20, 2015.

Through multiple interviews, the trees were reported to have been watered; however, an exact watering schedule was unable to be determined. It was approximated that the trees were watered once per week.

SCENE PROCESSING

A systematic approach was used in the scene investigation. Specifically, investigators conducted comparison examinations of areas of less damage to areas of greater damage with emphasis on recognition, identification, and analysis of fire patterns. During the comparison analysis, investigators attempted to identify any anomalous mass loss to material that could not be attributed to fuel load, ventilation conditions, or lack of suppression. Areas of anomalous mass loss were further examined as potential areas of fire origin.

On Wednesday, January 21, 2015, the scene examination began. Prior to entering the scene, a safety briefing was conducted for all agents, investigators and contractors regarding potential safety issues such as slip and fall hazards. Additionally, a safety briefing was held at the beginning of each subsequent workday.

Prior to entering the footprint of the building (to include the guesthouse and courtyard area), investigators washed their boots with Dawn detergent and water. All scene investigators, contractors, and canines entered the structure through one of three access points which included a decontamination line. The courtyard decontamination access point was located at the west entrance to the courtyard. The basement decontamination access point was located near the west exterior basement staircase. The third decontamination access point was located near the Master Bedroom/Family Room turret. Investigators re-washed their footwear each time they entered the structure. Additionally, the decontamination tubs were refreshed with water and detergent during the midday breaks.

The hand tools and wheelbarrows used in the excavation operations were new and not previously used.

Prior to excavation, an Accelerant Detection Canine deployed into the courtyard and did not alert in that area. Additionally, four Cadaver Canines were periodically deployed into the structure in an effort to locate the remains of victims.

DAMAGE ASSESSMENT – EXTERIOR

A survey of the structure beginning on the north exterior and traveling clockwise around the building revealed that the roof system over the entire main residence had completely collapsed or was consumed by fire. Examination of the north exterior revealed that north facing exterior stone walls survived in varying degrees. The west turret and west garage walls were largely intact, along with the chimney in the north wing.

All north facing window openings were void of windows. Additionally, the window openings above the main entrance were partially collapsed and several feet of stone rubble was found on the front stoop.

Further examination revealed the north walls of the east garage were intact and the two garage doors appeared to be in the down position; however, those garage doors were mostly collapsed. Investigators also observed the roof system above the arcade (breezeway) was completely consumed from the east garage to the guesthouse. There was also a heavily fire-damaged minivan parked under the arcade.

Investigators continued the exterior damage assessment to the east exterior and observed that the east exterior stucco walls of the east garage and Spa Room were mostly intact. Further examination showed that the screened in porch had been completely consumed or collapsed. The exterior examination continued to the south exterior where investigators observed complete collapse and/or consumption of the south wall. Investigators further noted that a steel column and beam header in the area of the Dining Room near the south exterior wall was leaning into the structure to the north.

As investigators continued to the west exterior of the residence they noted that the southwest stone corner and fireplace chimney was intact. Additionally, investigators observed the west facing exterior stucco wall had collapsed and a large section of it was on top of the west garage debris field. Examination of the west exterior stairwell revealed pieces of the exterior stucco wall had also collapsed into that area. There was also a steel column and beam header in the area of Guest Bedroom #1 exposed near the west exterior wall.

Investigators were unable to assign any meaningful significance to macro fire patterns due to the extensive damage observed to all major structural members throughout the building. Therefore, investigators subsequently attempted to use micro, or local, fire damage comparisons in an effort to identify potential directional fire patterns.

An aerial view highlighted the vast devastation to the structure as depicted below in Figure 8.

Figure 8 – Aerial view of main residence

DAMAGE ASSESSMENT – INTERIOR

Most interior areas of the structure were not available for direct examination due to their complete consumption or collapse. Each interior section of the residence had several feet of debris. Therefore, the following is an assessment of general areas and footprints which may include multiple floor levels.

East Wing

Examination of the east wing garage revealed two heavily fire damaged vehicles parked inside the stalls. Further examination showed that there was more survivability of the wood wall framing for the east garage and Spa Room when compared to the rest of the structure. Investigators also noted there were more wood structural members remaining in the east garage, Spa Room, and Recreation Room when compared to the rest of the main residence.

Investigators also examined the stone turret stairwell in the east wing and found that the interior staircase had completely collapsed.

The east wing included several steel structural support columns and beams which were heavily oxidized and were deformed in varying degrees, including the support framing for the Master Bedroom turret. Investigators further observed remnants of mattress springs hanging from the support framing for the Master Bedroom turret. The two-story chimney located adjacent to the Master Bedroom was still intact.

Investigators also noted the concrete block foundation for the elevator shaft was intact, but the first and second floor wood framing was consumed. Additionally, the metal framing and tracks for the elevator were collapsed and/or deformed.

Examination of the east wing also revealed an apparent west to east directional pattern on the interior wood framed north walls of the Pantry Room and Laundry Room.

North Wing

Examination of the north wing showed minimal remnants of the wood wall framing on the second floor east wall of the north/south hallway. Additionally, investigators noted minimal wood framing on the east wall of the garage. There was at least one burned vehicle visible in the west garage debris field, and it was parked in the south stall.

Main Wing

Examination of the main wing revealed substantial collapse of the concrete block support system for the Foyer staircase which led to the second floor. Additionally, investigators noted charred

remnants of the rim joist and oxidized metal joist hangers which had supported the second floor walkway above the Foyer.

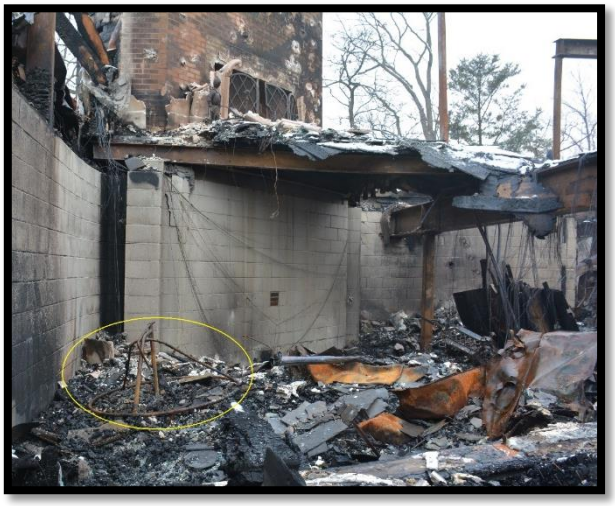
Further examination of the Great Room showed a section of flooring was still intact and in place directly in front of the fireplace. That small section of flooring was being supported by three perpendicular I-beams. Additionally, investigators observed two metal racks with surveillance equipment in the basement, immediately adjacent to the east concrete block support system under the Foyer area.

Continued assessment of the main wing revealed several sections of the Great Room flooring visible under or adjacent to the southernmost east/west support I-beam. A number of those flooring pieces were on their ends, and had remnants of both subfloor and heavily charred tongue and groove finish.

Investigators also noted a large chandelier near the top of the debris field and near the center of the Great Room. Further examination also revealed remnants of a floor lamp near the center of the Great Room debris. Examination of the Great Room fireplace also revealed remnants of two wall mounted duplex receptacles, one on each side of the fireplace.

During initial damage assessment, investigators also discovered remnants of a metal Christmas tree stand in the Great Room debris field. The stand was near the top of the debris with a burned stump still in the bottom screw of the stand. The Christmas tree stand stood approximately 2 feet high and the diameter of its base spanned approximately 4 feet. The charred tree stump remnants were approximately 6" wide and 10" high. The metal stand was located just off the south wall, east of the Great Room fireplace, as depicted below in Figure 9.

Figure 9 – Location of Christmas tree stand



Investigators noted that the Christmas tree area was a potential fire origin, so that area was taped off for later excavation.

EXCAVATION

A two-prong excavation operation commenced on Wednesday, January 21, 2015 with teams of investigators beginning to excavate select areas in search of victims, while other investigators concentrated excavation efforts toward determining fire origin and cause. The victim recovery operations were largely dictated by cadaver canine alerts. Multiple cadaver canines were deployed through the structure over the span of January 21 – January 25, 2015 in an effort to locate all six fire victims.

All six fire victims were recovered using the same personnel and protocol. The victims were photographed and their recovery locations were also forensically mapped.

Based on early witness statements and building construction design, investigators were able to eliminate fire originating in the north wing. Also based on witness statements and building construction design, investigators were further able to eliminate all areas east of the Dining Room as potential fire origins. Additional information regarding the elimination of certain areas as fire origin is detailed under the section of this report entitled Theories of Origin, First Fuels Ignited, and Ignition Sources.

Investigators utilized a crane and skidpans to remove debris from the fire scene, as well as large sections of structural members and collapsed contents. Periodically through the excavation operations, an Accelerant Detection Canine was deployed over the removed debris piles taken from most of the structure, with no positive alerts. The Accelerant Detection Canine was not deployed into the garages or garage debris piles because those areas were known to have ruptured gasoline tanks from vehicles.

Photographs were periodically taken to capture excavation progress as well as document potentially relevant items and/or patterns related to fire origin and cause.

North Wing - Footprint of Study, Guest Bedroom # 4 & West Garage

A Cadaver Canine was deployed into the north wing debris and alerted in the footprint of the west garage area. Investigators subsequently began excavating in the area of that canine alert and located Victim # 2 (Charlotte) higher in the debris field consistent with that victim being in Guest Bedroom # 4 on the second floor. Victim # 2 was found in debris immediately north of the vehicle parked in the south stall of the west garage.

During excavation of the north wing, investigators noted remnants of clothes and a metal bedframe higher in the debris field. All of the content items observed within the north wing garage footprint were heavily fire damaged. Investigators further located a cast iron bathtub in the debris on the south edge of the west garage footprint.

Investigators continued excavation of the garage footprint with the assistance of cadets from the Anne Arundel County Police Department Academy, who raked and removed debris under the supervision of certified fire investigators. More specifically, one investigator monitored the raking and removal of debris while a second investigator monitored the disposal of debris outside the structure. Debris from the north wing was removed to two areas, one area just outside the west entrance to the courtyard and a separate area west of the structure near the sloped brush line.

Investigators also located remnants of three vehicles as well as a smaller motorized vehicle on the slab in the west garage. Additionally, excavation revealed the metal frame of a motorcycle as well as other unidentifiable vehicle parts inside the west garage.

North Wing - Footprint of Guest Bedroom # 1 & Guest Bedroom # 3

On Wednesday, January 21, 2015, excavation of the basement debris field within the footprint of Guest Bedroom # 3 led to the discovery of Victim # 1 (Wesley). The elevation of the victim in the debris field was consistent with Victim # 1 being inside Guest Bedroom # 3 on the second floor at the time of the fire. Victim # 1 was found in close proximity to bathroom fixtures.

The following day, investigators continued searching for victims in the footprint of Guest Bedroom # 3 based on witness statements regarding typical sleeping arrangements. A Cadaver Canine alerted to an area within the footprint of Guest Bedrooms # 1 and # 3 while investigators were excavating that area. Subsequent excavation in the area of the canine alert revealed the remains of Victim # 4 (Kaitlyn). The location of Victim # 4 higher in the debris field was consistent with that victim being inside Guest Bedroom # 3 at the time of the fire. Investigators further observed remnants of a cast iron bathtub near Victim # 4.

Excavation of the area continued the next day with periodic Cadaver Canine deployments. A subsequent Cadaver Canine alert resulted in the discovery of Victim # 5 (Sandra) in the fire debris within the footprint of Guest Bedroom # 3. Victim # 5 was located nearby remnants of clothes on hangers.

East Wing - Footprint of Master Bedroom and Family Room

A Cadaver Canine was deployed into the scene and alerted inside the footprint of the Master Bedroom and Family Room. Investigators subsequently began excavating that footprint and removed the debris onto the lawn immediately south of the structure.

A Cadaver Canine also alerted in the area of the kitchen footprint, and investigators subsequently excavated that alert area; however, investigators did not locate any victims as result of canine alerts in the east wing.

East Wing - Footprint of Dining Room and Guest Bedroom # 2

Investigators began excavating the footprint of the Dining Room in effort to assess first floor fire damage in the Dining Room. During that excavation, investigators located mattress springs higher in the debris field, consistent with the mattress from Guest Bedroom # 2.

Investigators subsequently located the floor of the Dining Room under several feet of debris. The Dining Room subfloor was largely intact. The Dining Room floor was found at the approximate same elevation as the basement "stage" in the alcove immediately south.

Investigators noted that there was less survivability of the Dining Room tongue and groove finish flooring near the Great Room when compared to flooring further away from the Great Room.

Main Wing

Prior to origin and cause excavation in the main wing, an Accelerant Detection Canine was deployed into that area with negative results. Investigators initiated origin and cause excavation of the main wing with three separate teams working from the northernmost and easternmost edges of that area, as well as from the front door stoop.

ATF Forensic Video Specialists examined the remnants of the surveillance DVR found in the basement. The surveillance equipment was visible and relatively easily accessed. Upon examination of the surveillance equipment, it was determined that the DVR system was damaged beyond repair and that no usable data would be available from the system.

Investigators utilized the crane to lower the skid-steer onto the basement slab in the Utility Room. The skid-steer buckets were decontaminated prior to being lowered into the basement. An Accelerant Detection Canine was deployed into and near the bucket with negative results. Investigators continued to rake and hand shovel first floor layers of debris until investigators reached the basement layer of debris. Once the first floor debris had been excavated by hand tools, the skid-steer assisted in the removal of basement debris.

Footprint of Foyer

Investigators began excavating the Foyer area by hand digging the front stoop area and working southward into the structural footprint. During those excavation efforts, investigators noted large remnants of thick stone slate finish flooring in the Foyer area, which were subsequently removed.

Great Room Patio

Investigators excavated the south patio area adjacent to the Great Room and located remnants of exterior can lights and minimal debris.

Footprint of Great Room

A Cadaver Canine alerted to an area of fire debris near the center of the Great Room, under the southernmost east/west steel support I-beam. Minimal excavation in that area revealed the remains of Victim # 3 (Donald). The location of Victim # 3 high in the debris field was consistent with that victim being inside the Great Room at the time of the fire.

Investigators began excavating from the footprint area of Guest Bedrooms # 1 and # 3 southward into the Great Room footprint. During excavation efforts, investigators located several large can lights in the debris field near the northernmost east/west steel support I-beam as well as a multitude of slate shingles. Investigators did not locate any identifiable remnants of wood roof decking or roofing system structural supports in the Great Room debris field, other than metal gusset plates.

The excavation of the upper layers of debris from between the two east/west steel support I-beams resulted in the discovery of the following notable items: a floor lamp, possible wood leg from the curio cabinet with figurines nearby, and remnants of a wood file cabinet with miscellaneous documents and invoices inside. Additionally, investigators located minimal remnants of furniture springs near the southernmost I-beam.

An excavator was used to remove large beams and ductwork sections from the Great Room debris footprint.

Christmas Tree Area Excavation

For purposes of this report, the "Christmas tree area" extended from the Great Room's south patio doors approximately 15 feet northward into the room, and from the Dining Room east to the fireplace to the west. This area included the metal Christmas tree stand previously mentioned in this report.

On Saturday, January 24, 2015, investigators began excavating the Christmas tree area with hand shovels, rakes and trowels. The upper layers of debris in this area included several inches of slate shingles. After investigators removed the slate shingles, they hand-raked and sifted the Christmas tree area while methodically converging from all directions toward the area of the metal Christmas tree stand. Electrical circuitry and components located inside the Christmas tree area were set aside for later analysis by an ATF Electrical Engineer.

Excavation of the Christmas tree area immediately adjacent to the Dining Room footprint and patio door revealed remnants of the a single metal French patio door frame just west of the Dining Room. Investigators also located remnants of, what appeared to be, speaker wire within the Christmas tree area.

The Great Room floor within the Christmas tree area was completely consumed approximately 4 - 6 feet north of the metal Christmas tree stand. Investigators located remnants of furniture springs

in the area where the flooring was consumed. As investigators excavated southward toward the metal Christmas tree stand, the subflooring came back.

Investigators placed a tarp over the Christmas tree area and excavated the intact floor immediately in front of the fireplace. Utilizing a ladder, investigators raked debris from that piece of flooring and located two can lights and remnants of the electric garland that had been draped across the mantel. The fire damage to that surviving section of flooring had relatively uniform charring to the still present tongue and groove finish floor.

Investigators screen sifted all debris within approximately 5 feet of where the metal Christmas tree stand had come to rest in the debris. As investigators got closer to the area of the stand, the fire debris became more fine and smaller when compared to general debris farther away from the tree stand. Investigators continued their search for electrical components and began locating remnants of Christmas tree lights within 2 - 3 feet of the metal stand.

As investigators excavated immediately east of the fireplace and adjacent to the south basement wall, they located a ceiling can light that exhibited more oxidation and mass loss than any other can light located in the Great Room debris, as depicted below in Figure 10. Additional excavation within this general vicinity also revealed a metal door frame for the south exterior patio doors.

Figure 10 – Damaged ceiling light can

Further excavation of the Christmas tree area revealed a 16" diameter metal water pan for the Christmas tree located 1 - 2 feet to the west of the where the metal stand came to rest near the top of the debris. As investigators began unearthing the water pan, they located clumps of Christmas tree light strands near the water pan. Sifting of that immediate area resulted in the recovery of several Christmas tree lights, plug blades, as well as light strand receptacles. Those artifacts were placed in plastic bags for later analysis by an ATF Electrical Engineer. Additionally, investigators observed numerous charred Christmas ornaments within the debris field surrounding the pan.

Investigators removed the water pan with its debris contents from it resting location and observed that it was directly on the Great Room floor. The flooring under and around the water pan was largely intact. The contents of the water pan were subsequently flipped onto a sifting screen where investigators noted several inches of pines needles had accumulated inside the pan. Closer examination of the contents of the water pan revealed remnants of a power strip near the bottom of the pan, which was subsequently examined by an ATF Electrical Engineer.

Excavation along the south wall edge of the Great Room floor revealed an east/west section of that edge had largely been consumed. Additional excavation of the area showed a floor cutout for an HVAC register approximately 4" – 6" to the south of the water pan's edge.

Screen sifting of the Christmas tree area continued for a second day and the sifting operation resulted in the discovery of a duplex receptacle, several plug blades, lights, and ornaments. At the completion of the origin and cause excavation operation in the Great Room footprint, investigators placed the following items under the surviving floor in front of the fireplace: can lights, the chandelier, Christmas tree stand and stump, the water pan, and flooring material. Electrical components from within the Christmas tree area, such as plug blades and receptacles, were seized by ATF for later examination by the ATF Laboratory.

Analysis of electrical components

As noted above, investigators located a floor-mounted duplex receptacle approximately 2 feet west of the floor vent; however, the receptacle was found in loose debris and not within a floor cutout. According to interviews, investigators believed this floor receptacle had been located between the two pairs of south facing French doors immediately adjacent to the Christmas tree. The floor duplex receptacle was found with one of its covers open consistent with a device being plugged into that receptacle. An ATF Electrical Engineer examined the floor receptacle and found mass loss to certain items.

Further analysis was conducted on the floor duplex receptacle. The receptacle was mounted in a metal outlet box with a brass cover plate with hinged covers over the receptacles. The outlet box, cover plate and receptacle mounting yoke were intact with no evidence of electrical activity observed. The receptacle power rails were present within the outlet box, attached to two sets of conductors. The four receptacle screw terminals were observed to be intact. Three of the blade receptors were intact. The fourth blade receptor was observed to be melted. The remnants of an attachment plug blade was present in the receptor; it was observed to be melted. A second attachment plug blade was present within the outlet box. A rounded globule of melted material was present at the top of the plug blade, as depicted below in Figure 11.

Figure 11 – Plug blade with localized melting

The damage to the receptacle power rail and attachment plug blades was highly localized. Other brass components in the vicinity with less mass, such as the ground pin contacts, were observed to be intact. The possibility of failure of the connection between the blade receptor and attachment plug blade or failure of an internal connection within the plug assembly resulting in the production of heat due to a resistive connection cannot be precluded.

TRANSITION TO RECOVERY OPERATIONS

During the afternoon hours of Sunday, January 25, 2015, the origin and cause excavation operation concluded in the Great Room. At that time, investigators transitioned all efforts to search and recovery operations in an attempt to locate Victim # 6 (Alexis). In order to thoroughly excavate all areas in search of Victim # 6, investigators moved the surviving sections of the Great Room flooring adjacent to the Christmas tree stand to under the fireplace area. Additionally, investigators placed all ceiling can lights, the chandelier, and other electrical components located within the vicinity of the Christmas tree stand under the intact flooring in front of the fireplace for preservation purposes.

The decontamination zones were discontinued when the origin and cause excavation was completed. The search and recovery operations at this time consisted of hand raking and shoveling debris with the assistance of a skid-steer which had been lowered into the basement. Investigators utilized a grid approach in search for Victim # 6, assigning separate sections of the residence with letter designations A – G. Debris that was removed from a specific area was then placed in an area on the lawn that shared the same letter designation.

On Monday, January 26, 2015, search and recovery operations continued. That morning, Victim # 6 was located under a cast iron bathtub higher within the debris field for Guest Bedroom # 2.

THEORIES OF ORIGIN, FIRST FUELS IGNITED & IGNITION SOURCES

Room of Origin Considerations

The first arriving firefighters reported that the fire was already venting the windows above the front main entrance upon their arrival at approximately 3:42am. Additionally, the firefighters stated that the top of the front door was burned through and venting fire. The firefighters also observed fire throughout the Great Room. Furthermore, upon approach to the residence from the west, firefighters observed fire venting the building near the southwest corner of the structure, which is area of the Great Room.

Additionally, firefighters reported seeing fire venting an area of the roof above the Great Room, and subsequently watching the fire extend from the Great Room roof area to the east and west wing rooftops. Firefighters also observed fire extend from west to east in the second floor hallway window in the east wing, indicating interior fire extension from the Great Room. Also, a firefighter was able to open the door inside the west garage that led into the residence and he did not experience heat or fire coming from the area of Guest Bedroom # 1.

Furthermore, investigators reviewed video footage from across the body of water from the residence that showed a glow on the water at 3:30 am. This glow was from a large fire in the residence.

Investigators critically analyzed the building construction design and layout of the residence in attempt to challenge the theory of fire originating inside the Great Room or Dining Room. Subsequently, investigators concluded a fire originating anywhere other than the Great Room would not have manifested itself in the way described by firefighters. Specifically, a basement fire would have been visible extending into the east turret through the staircase windows. Additionally, the fire was observed extending from the Great Room area into other sections of the building that were not previously involved in fire.

Investigators were aware of the fire protection alarm system noting a “basement” zone alarm within 2 seconds of the first and second floor alarm. Further examination of that data revealed there was a smoke alarm located on the first floor in the east turret stairwell which was assigned to the “basement” zone.

Consideration of the Dining Room as an area of origin revealed that the Dining Room contained minimal combustible material, which were improbable of producing enough energy to extend fire to the combustible fuel packages inside the Great Room. Additionally, excavation of the surviving floor inside the Dining Room showed more mass loss to tongue and groove flooring near the Great Room threshold when compared to areas farther east in the Dining Room. Like the Dining Room, investigators determined the Foyer also contained minimal combustible material, which were improbable of producing enough energy to extend fire to the combustible fuel packages inside the Great Room.

Area of Origin Considerations

Within the Great Room, investigators contemplated potential fire origins in several areas inside that room. Investigators considered the curio cabinet area as a potential origin, however, based on the relative size of the cabinet to the size of the Great Room and the cabinet's distance from other fuel packages, investigators concluded the curio cabinet was not a sufficient fuel load to transfer its energy to the furniture near the center of the Great Room. Additionally, a fire originating in or near the curio cabinet would have a relative lower Heat Release Rate compared to the upholstered furniture and live Christmas tree in the same room. Specifically, investigators believe a fire in or near the curio cabinet would not have developed at a rate which would have incapacitated and trapped the victims in the manner in which the victims were discovered. Instead, a fire involving the curio cabinet would have subsequently activated the fire protection system (which was known to be functional at the time of the fire) and the victims would have had a high probability of escaping the structure.

Investigators also considered the area of the electric garland which hung over the mantel as potential fire origin. However, like other areas of consideration, the mantel area lacked sufficient combustible fuel packages necessary to extend the fire beyond the mantel.

Investigators made note of the fire protection alarm system data, specifically the activation of a smoke alarm on either the first or second floor at approximately 3:29am. The alarm data was considered noteworthy in conjunction with the surveillance video from across the creek/river to the south. The surveillance video showed a sudden illumination from 936 Childs Point Drive at approximately 3:30am. Those two data points when taken together show that this fire event developed rapidly. Another indication this fire quickly developed is the fact that six victims were unable to escape despite a functioning alarm system.

Investigators also considered an area of origin in or near the furniture located in the middle of the Great Room; however, there was only one potential heat source in that area – a floor lamp. There were no probable ignition scenarios in which investigators could envision a floor lamp igniting either the area rug or nearby furniture. Investigators determined that even if an electrical failure of the floor lamp had somehow been able to ignite adjacent items, the fire protection system would have most probably alerted the occupants in time for their safe evacuation.

Investigators further considered the possibility of an ignitable liquid accelerated fire; however, no evidence was located to support that theory. In fact, the Accelerant Detection Canine did not alert to any areas inside the structure.

The only theory of fire origin that is consistent with the known data points is in or near the Christmas tree. A fire originating in or near the Christmas tree is the only reasonable explanation as to why this fire developed at the rate it did. The moisture content of the Christmas tree at the time of the fire is suspect due to witness statements regarding the increased loss of needles in recent days prior to the fire. Investigators know from prior research that dry Christmas trees produce a tremendous Heat Release Rate in a very short period of time following their ignition near the base of the tree. The location of the HVAC floor register under the base of the tree may have also contributed to the rate at which the tree lost its moisture.

Theories of First Fuels Ignited

The suitable first fuels known to be in the area of the Christmas tree were the needles on the tree, the decorative blanket/tree skirt under the tree, the plastic sheet under the decorative blanket and on top of the hardwood floor, the plastic housing for the power strip under the tree, and the velvet drapes on the patio doors.

Theories of Ignition Sources

Weather conditions in the area prior to the fire were reviewed and weather was determined to not have been a factor in the cause of the fire.

The suitable ignition sources within the area of origin included: a high resistance connection in one of the multiple plug connections between the 15 strands of Christmas lights, a high resistance connection in one of the plugs in the power strip under the tree, and a high resistance connection in the floor receptacle located under the tree.

Theories of Ignition Scenarios

Investigators critically examined the conditions that existed within the area of origin at the time of the fire and concluded there were multiple compelling factors that supported a probable accidental scenario. Those factors include the following:

1. The Christmas tree was exhibiting signs of moisture loss at the time of the fire.
2. As many as 15 strands of Christmas tree lights were plugged into a power strip, which was plugged into a floor receptacle.
3. The Christmas tree lights had been left on for approximately 6 weeks leading up to the fire.
4. The power strip and floor receptacle were covered by the plastic sheet and blanket/tree skirt under the tree.
5. The Christmas tree, after its ignition, was very capable of delivering sufficient heat flux to the furniture pieces in the middle of the room and igniting those items.
6. Watering of the Christmas tree may have introduced moisture to areas under the tree and outside the water pan, increasing the possibility of corrosion resulting in high resistance connections.

Additionally, the mass loss of the blade and floor receptacle detailed by ATF Electrical Engineers, in conjunction with other known data points, provides compelling evidence of a probable accidental scenario.

Though investigators were unable to affirmatively exclude the possibility that this fire was the result of human introduction of open flame to available combustible material, there is no evidence to suggest such a thing happened. Given the aforementioned known data points, the theory of an intentional act is improbable.

CONTROLLED BURNS CONDUCTED BY ATF FIRE RESEARCH LAB

Background

During the course of the investigation, investigators referred to literature reviews in order to gather data about Christmas tree fires and came to realize that there has never been any research done on a tree the size of the one in the Pyle's home. Therefore, in an effort to gain a better understanding of fire dynamics in relation to a 15 foot Christmas tree, investigators began the process of exploring a scientific endeavor.

Validation is a standard of the scientific community, and while the purpose of the test was certainly, in part, to validate the hypothesis reached by the fire investigators from ATF and AAFD, more importantly, these controlled burns were conducted to gain a further understanding of the magnitude and growth of Christmas tree fires. The primary goal was to conduct the research from an academic and public safety perspective.

Investigators, working with personnel from the ATF Fire Research Lab in Beltsville, MD, were interested in several factors to include determining the Heat Release Rate off of a burning 15 foot Christmas tree, the fire growth time from tree ignition until measured peak burning rate and the effect of moisture content with respect to the rate at which a Christmas tree will burn.

Approach

As the literature is lacking on burning characteristics of a Christmas tree the size and display duration relevant to the investigation, investigators provided the ATF Fire Research Lab with three Fraser Fir trees obtained from the same farm and substantially similar in size to the one that was displayed in the Great Room of the Pyle's residence. The trees were bundled and delivered to the ATF Fire Research Lab on the day after harvesting, stored in an unconditioned building for 23 days and then placed in display stands for an additional 42 days (which is consistent with the timeline of the Pyle's tree). Approximately 2" - 4" of the base of the trunk were removed as part of the mounting procedure.

The moisture content of a Christmas tree has a significant effect on the ignition potential and subsequent burning characteristics of the tree. The moisture content of a tree when first cut is generally greater than 100%, meaning the mass of water within the tree trunk, branches and needles is greater than the dry mass of the trunk, branches and needles combined. Once harvested, the trees are typically baled and stored until delivery and final set up for display.

Moisture content lost during this time is generally regained after a small segment is removed from the base of the trunk and displayed in a water pan. However, the amount of water the cut base will uptake decreases over time. At some point the moisture content of the twigs and needles would be expected to decrease leading to an increased potential for ignition and subsequent spread of fire. The tree species, display conditions and watering regimen would be expected to have an effect on the rate at which the tree dries out.

As the frequency of watering of the tree in the Great Room could not be determined during the investigation, two different watering schedules were followed for the three trees. Tree A and Tree B were refilled on a weekly basis, while Tree C was continuously watered.

The amount of water needed to refill the pans for Tree A and Tree B noticeably decreased after the third week of display. By the end of the sixth week of display, all three trees showed signs of decline from initially looking green and fresh to dropping needles and beginning to turn brown. On the morning of the tests, four representative samples were cut from the perimeter of each tree with two samples from low and two at mid-height.

Each of the three trees was positioned under a 4 megawatt Fire Product Collector in the ATF Fire Research Lab's Medium Burn Room (Figure 12).

Figure 12 – Trees under Fire Product Collector

The trees were then exposed to an open flame from an ignition package placed under the tree (Figure 13). The ignition package had burning characteristics similar to that of a small wastebasket and a burn duration of approximately 10 minutes.

Figure 13 – Ignition package

Figure 14, Figure 15 and Figure 16 depict the fire development around the time of peak burning for each of the three trees. The Heat Release Rate from each tree was assessed over the duration of the test.

Figure 14 – Tree A near peak burning

Figure 15 – Tree B near peak burning

Figure 16 – Tree C near peak burning

Results

Several key factors were measured to include the moisture content of each tree, the time from lighting of the ignition package at the start of the test until the package was observed to ignite the tree, the fire growth time from observed tree ignition until measured peak burning rate, the duration of burning rate exceeding 1 megawatt, and the peak Heat Release Rate. The results of each factor are denoted in Figure 17.

Figure 17 – Measurements relating to key factors based on watering schedule

	Tree A (weekly)	**Tree B (weekly)**	**Tree C (continuous)**
Moisture Content at time of test	32%	15%	73%
Time until observed ignition of tree	30 seconds	5 seconds	421 seconds
Fire growth time to peak burning rate	44 seconds	35 seconds	46 seconds
Duration of significant burning	83 seconds	76 seconds	38 seconds
Peak Heat Release Rate	15 mw*	17.6 mw*	4.3 mw

* values above 5.6 megawatts should be views as approximate.

Analysis

The weekly watered trees (Tree A & Tree B) significantly decreased water uptake by the third week of display. By the end of the six-week display period, all three trees had begun to drop needles and turn brown. The decline was more noticeable in Tree A & Tree B. Post-display moisture content of the lower and midlevel twigs and needles for the two weekly watered trees was determined to be 32% (Tree A) and 15% (Tree B). The moisture content for the continuously watered tree (Tree C) was 73%.

The burning characteristics for all three trees were dependent on their moisture content. The trees with lower moisture content (Tree A & Tree B) ignited sooner and produced a higher peak Heat Release Rate. The lower moisture also resulted in a relatively longer burning duration primarily due to more of the tree being consumed by the fire.

These results are mostly consistent with prior studies which exposed branches of Fraser Fir of varying moisture content to a small flame for 5 seconds. The study showed that the samples would always spread flame for moisture content less than about 25% and sometimes spread flame for moisture content up to about 50%. It should be noted that burning in Tree C was primarily located in the crown in the upper portion of the tree while the samples were culled from the lower and mid-portion of the trees. Considering the crown appeared drier than the lower portions for each of the trees, it is probable that the ability of a cut tree to uptake water to the crown is less than for the lower portions of the tree. The result would be a lower moisture content in the crown and thus a higher burning potential. Additionally, Tree C withstood the flame from the ignition package for 7 minutes before igniting. While the study above utilized an exposure of 5 seconds, this extended duration exposure would be expected to dry out the lower branches and decrease the moisture content to the point they would ignite.

Ignition of the trees with an open flame exposure similar in size to that of a small trash can resulted in fires consistent with the moisture content of the trees. The weekly watered trees (Tree A & Tree B) ignited within 30 seconds of the exposure while the continuously watered tree (Tree C) ignited 7 minutes after the start of the exposure. However, once ignited, the peak Heat Release Rate occurred less than one minute later for all three trees. The magnitude of the peak Heat Release Rate was found to be inversely related to the moisture content. The weekly watered trees (Tree A & Tree B) peaked at a higher Heat Release Rate, approximately 15 megawatts and 17.6 megawatts, while the continuously watered tree (Tree C) peaked at a lower Heat Release Rate of 4.3 megawatts and had portions of the lower foliage remaining unburned at the end of the test.

From the tests, the shape of the fire was approximated as a cylinder, with an estimated flame height of approximately double the height of the tree. Burning embers were also observed to float down from each tree and were particularly prevalent as they began to burn out, as depicted in Figure 18.

Figure 18 – Burning embers floating down late in test

For Tree A & Tree B, the peak heat flux at a distance of 10 ft. exceeded 10 kW/m2. Ordinary combustibles such as upholstered furniture would be expected to be ignited by this exposure with consideration of the burning embers observed to float down from all three trees.

Further details and specific data relevant to these tests are documented in the ATF Fire Research Lab's official Test Record (Title: Fraser Fir Tree Fire Product Collector Tests; Test Type: NFPA 289; Lab #: 15F0006-3; Test Date: 4/2/2015).

Conclusions drawn from tests

The tests performed at the ATF Fire Research Lab were not intended to replicate the fire that began in the Great Room of the Pyle's residence. While the three trees were obtained from the same farm as the tree located in the Pyle's residence and displayed for the same duration of time, the watering regimen for the tree in the Great Room could not be fully determined. Additionally, the Pyle's tree was situated in a heated home and displayed next to windows with a southern exposure.

As such, the precise moisture content of the tree at the time of the fire is unknowable and a direct comparison is not appropriate.

The tree in the Great Room was below a 19 foot ceiling, while the trees burned in the ATF Fire Research Lab were placed under an open Fire Product Collector. The presence of a ceiling would be expected to induce flame spread across the ceiling which would have the effect of enhancing burning rate and increasing the potential for the fire to spread to additional combustibles.

Furthermore, the presence of falling embers, as observed during the testing at the ATF Fire Research Lab, have the potential to act as a pilot and ignite nearby combustibles exposed to the heat flux from the tree. Many ordinary combustibles, such as upholstered furniture, would be expected to ignite via a pilot.

As noted above, it took just 35 seconds for Tree B to produce an approximate Heat Release Rate of 17.6 megawatts. By comparison, prior research has shown that it took 215 seconds for a typical household upholstered sofa to produce an approximate Heat Release Rate of 3.1 megawatts. Keeping in mind that the Heat Release Rate of Tree B cannot definitively be comparted to the Heat Release Rate from the Pyle's tree, it can be reasonably inferred that the amount of heat generated during the fire in the Great Room of the Pyle's residence was overwhelming and that it spread at an extremely rapid rate. These factors explain why all six occupants were unable to escape and ultimately fell victim to the fire.

CONCLUSION OF INVESTIGATION

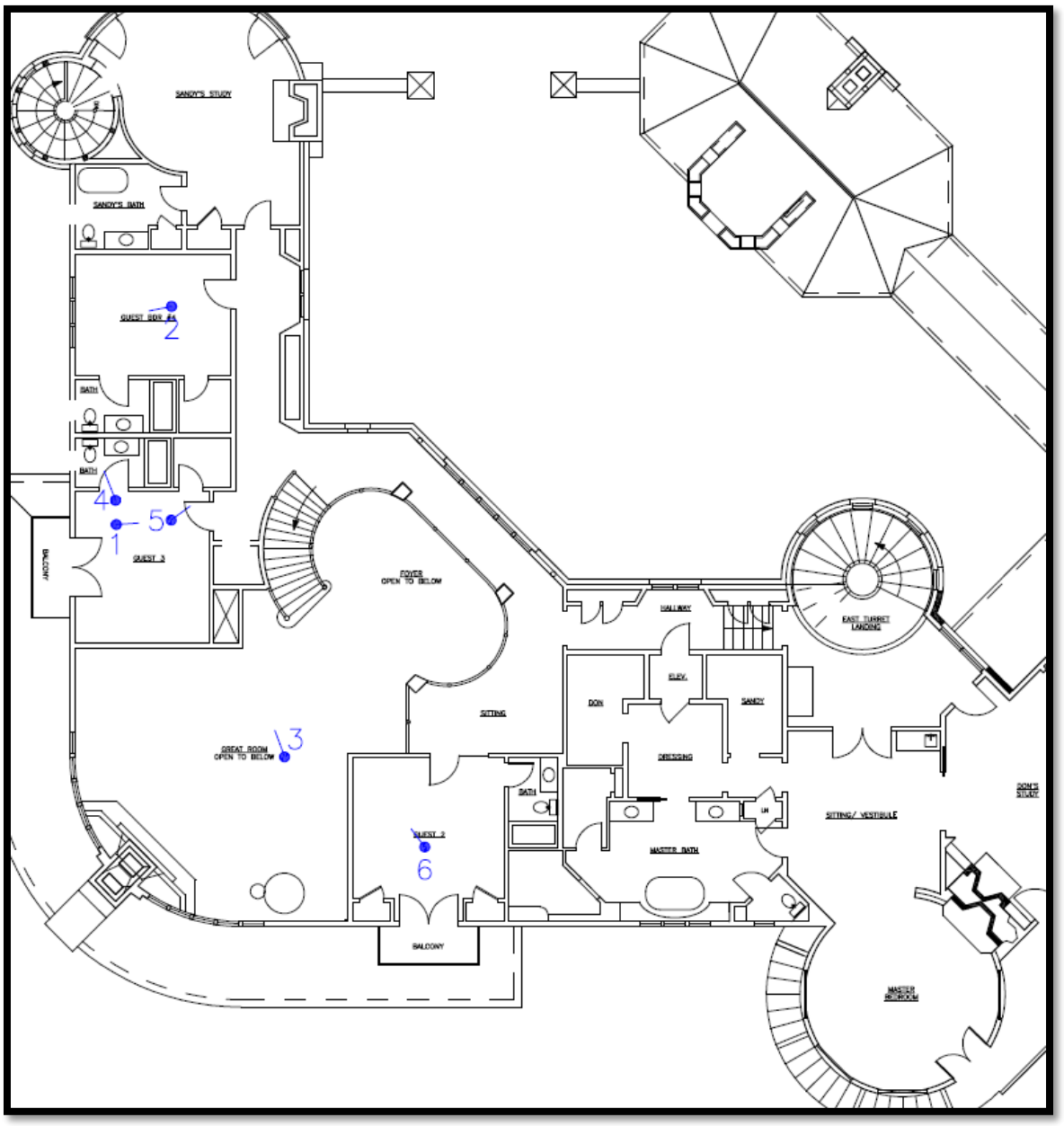
Based on the information available to the investigators at the time of this report, and after the examination of the fire scene, reviewing witness statements, examining pre-fire and fire photographs and videos, reviewing research literature, conducting calculations and test burns in controlled environments, it is the opinion of all participating investigators that the fire originated under or near the Christmas tree in the Great Room. Specifically, a probable high resistance connection inside the floor receptacle under the tree subsequently ignited the plastic sheet and/or decorative blanket/tree skirt, which in turn ignited the Christmas tree.

Numerous other hypothesis were identified and analyzed with all of them eventually being discarded. Based on the aforementioned, the fire investigators are in agreement that this fire is classified as an "Accidental" fire.

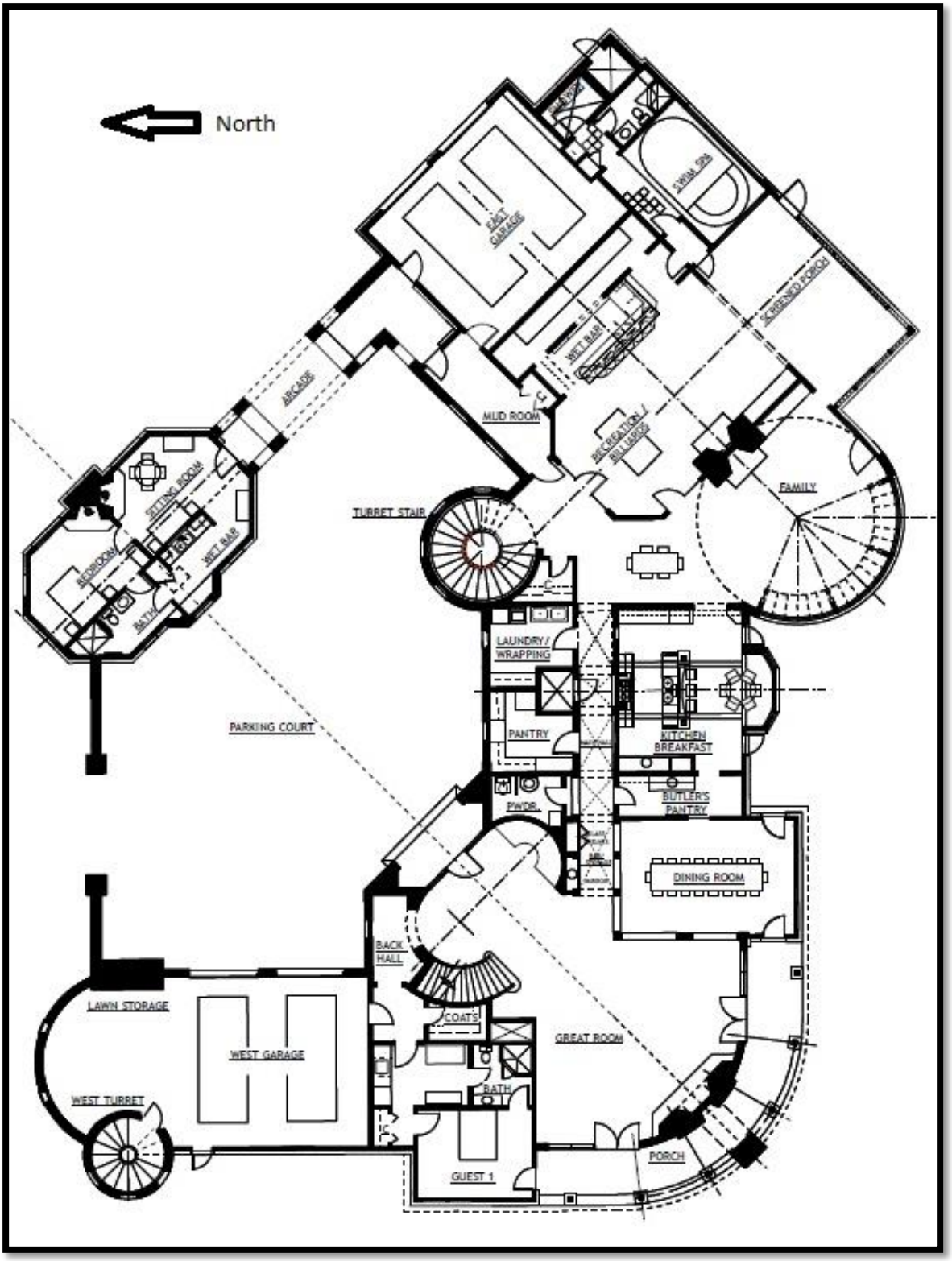
ATF Investigation # 761010-15-0026 / AAFD Investigation # 15-017 was officially closed on August 5, 2015 contemporaneous to the public distribution of this Executive Summary.

ATTACHMENTS

Attachment A – Recovery Location of Victims



Attachment B – Floor Plan, Ground Level



Attachment C – Floor Plan, Upper Level