

**Serious Accident Investigation
Factual Report**

**CR 337 Fatality
Bureau of Land Management
Texas Forest Service
Mineral Wells, Texas
July 7, 2011**



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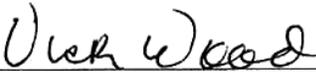
Cover Photo: The photo on the front cover was taken at a location adjacent to the accident site and is representative of the local area.

SERIOUS ACCIDENT INVESTIGATION FACTUAL REPORT

Accident: CR 337 Fatality
Location: Mineral Wells, Texas
Date: July 7, 2011

Serious Accident Investigation Team

Team Leader:
Vicki Wood
Deputy District Manager Support Services
BLM-California, California Desert District



Signature

9/6/2011

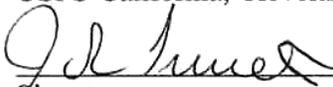
Date

Chief Investigator:
Robert Knutson
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Technical Subject Matter Expert:
John Truett
Deputy Forest Fire Chief
USFS-California, Cleveland National Forest



Signature

Safety Advisor:
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Safety and Health Manager
BLM-New Mexico
New Mexico State Office



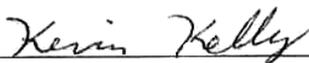
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Interagency Representative:
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Department Head Mitigation and Prevention
Texas Forest Service
College Station, Texas



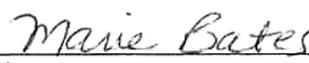
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Technical Subject Matter Expert:
Kevin Kelly
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Signature

Documentation Specialist/Scribe:
Marie Bates
Fire Training Administrative Assistant
BLM-National Interagency Fire Center



Signature

EXECUTIVE SUMMARY

On July 7, 2011, Caleb Hamm, crewmember of the Bonneville Interagency Hotshot Crew (Bonneville IHC) was working in Division A of the CR 337 (County Road 337) fire, near Mineral Wells, Texas, when he collapsed and subsequently died from hyperthermia (uncontrolled heating of the body's core temperature).

Mr. Hamm, a 23-year-old male, appeared to be in good physical condition. He was beginning his sixth season as a wildland firefighter and his first season with the Bureau of Land Management (BLM), Bonneville IHC, based in Salt Lake City, Utah, West Desert District. He was qualified as a Firefighter Type 2 (FFT2) and Faller Class A (FALA).

On July 7, 2011, the Bonneville IHC began work at 0900 hours in Division A on the CR 337 fire. It was a very hot day with temperatures reaching 105 degrees Fahrenheit. The crew's operational assignment for that shift was to continue to construct fireline, cold trail, and mop up from Drop Point (DP) 20 to DP 5. At about 1300 hours, the Bonneville IHC completed fireline construction by tying into fireline constructed by Big Bear Interagency Hotshot Crew (Big Bear IHC) coming from DP 5.

The Bonneville IHC broke for lunch and resupplied water canteens with extra water. The crew's work assignment for the afternoon was to break into squads and mop up and secure fireline back to DP 20.

At about 1550 hours, Hamm lost consciousness, and emergency medical response was activated. His condition rapidly deteriorated, and he stopped breathing. Bonneville IHC Emergency Medical Technicians (Crew EMT#1 and Crew EMT#2) arrived on scene, and performed a patient assessment. Subsequently, Hamm went into respiratory arrest, at which point they initiated Cardiopulmonary Resuscitation (CPR). Continued efforts to restore spontaneous breathing were unsuccessful. Hamm was transported by ambulance to the hospital and pronounced dead by the emergency room doctor at 1703 hours.

An autopsy and toxicology screening was performed. Results indicate Hamm died of hyperthermia. The Serious Accident Investigation Team (SAIT) received the autopsy report on August 9, 2011.

A SAIT was mobilized on July 7, 2011, arriving in Mineral Wells, Texas, on July 8, 2011.

NARRATIVE

Texas Fire Season Background

Since November 15, 2010, Texas Forest Service (TFS) and fire departments across the state have responded to 16,291 fires that burned a record-setting 3,373,059 acres. The largest fire burned 314,444 acres in Jeff Davis County and Presidio County in West Texas in April. Six of the state's largest wildfires occurred in a 19-day period during that month.¹

A record statewide drought resulted in profoundly dry fuels, producing extreme fire behavior with corresponding high flame lengths and rapid fire growth in grasses, shrubs, and timber. Texas initial attack crews and equipment were pre-positioned throughout the state to assist local fire departments with wildfire suppression actions when requested. The state Incident Command Post is located in Merkel, 15 miles west of Abilene.

As of August 15, 2011, 246 of 254 Texas counties had burn bans in place. Almost 1,900 structures, including 591 homes, were destroyed by fire. Hot and dry conditions were forecast to persist across the state into early fall.

CR 337 Fire Information

The CR 337 fire started on July 4, 2011, five miles northwest of Mineral Wells, in Palo Pinto County, Texas. The fire, reportedly started by lightning, burned 1,204 acres and destroyed four structures. Starting July 5, 2011, the fire was managed by a coalition of agencies, including county officials, the Texas Forest Service, a National Incident Management Organization (NIMO) team, and a Type 2 Incident Management Team (IMT 2) from Maine. The NIMO team provided oversight to the Maine IMT 2 in preparation for taking over the CR 337 fire. The NIMO team was expected to demobilize from the fire on July 8, 2011, and the Maine IMT 2 would continue command of the fire.

Bonneville IHC

The Bonneville IHC was on Day 13 (excluding travel) of an assignment that included six days on the Honey Prairie fire in Georgia. The crew was then reassigned to West Texas for initial attack and arrived in Abilene, Texas, on July 1. The crew was given TFS orientation on operational and environmental hazards and mitigations. Of the next five days, three were on standby; one was a cancelled assignment, and one was an evening shift on the Burnett fire on July 4, 2011. The crew was assigned to the CR 337 fire on July 6. The crew rested in hotels each night while on assignment in Texas.

¹ Source: Texas Forest Service as of August 15, 2011.

Timeline and Work-Day Narrative

Work Day on Wednesday, July 6, 2011

On July 6, 2011, the Bonneville IHC began the operational period at 0600 hours at Abilene, Texas, and was assigned and enroute to the CR 337 Fire. The crew arrived at Mineral Wells High School in time for overhead to attend the divisional breakout portion of the briefing, which occurred after the main briefing.

After morning briefing at Mineral Wells, the Bonneville IHC drove to DP 20 on CR 337 to begin work on Division A. The crew did an internal briefing led by the Bonneville Assistant Superintendent. The briefing emphasized heat and hydration, and forecasted weather, including winds, temperature, and relative humidity. All crewmembers were required to record briefing information including weather. Each crewmember was required to carry a minimum of six quarts of water during the work shift. In addition, fifteen extra one-gallon canteens (banjos) of drinking water were distributed among the crew.

The crew's operational assignment was to build handline and cold trail along the black edge within the indirect dozer line. Pieces of dozer line that did not connect along the fire edge required handline construction. Dozer line was often indirect due to rocky terrain. The crew started at DP 20 and put in four to five chains of handline. When the fuels changed, tactics switched to hot spotting and cold trailing. The crew tied into a rock bluff at the end of the day and returned to DP 20. Dinner was delivered to the crew at DP 20, and after dinner, the crew returned to the hotel in Mineral Wells. The high temperature for that day was 103 degrees Fahrenheit.

Work Day on Thursday, July 7, 2011

Times are approximate and shown in military time

0730-0830 On July 7, 2011, the Bonneville IHC began its shift at 0730 hours. The crew overhead attended the 0800 briefing at Mineral Wells High School. After the main briefing, overhead attended the Division A breakout briefing. Safety and expected fire behavior were emphasized. Safety items covered were Haines Index 6, high temperature of 105 degree Fahrenheit, relative humidity 18-26% and possible dry lightning. Crewmembers were reminded to be available for initial attack and to pace themselves.

The Bonneville IHC assignment was to continue constructing handline and cold trailing to the top of the ridge and tie in with Big Bear IHC's handline. The Big Bear IHC assignment was to construct handline east from the division break on the south end of the fire to the top of the ridge and tie in with Bonneville IHC's handline.

- 0900 The crew arrived at DP 20, unloaded, and received internal briefing on work assignment, hazards, and fire behavior, and emphasized hydration, and pacing themselves for a possible initial attack reassignment. Each crewmember (except for sawyers) carried an extra one-gallon canteen (banjo) of drinking water, as well as two bottles of Gatorade. The crew began its work assignment for the day.
- 1000 The Bonneville Superintendent walked up the line ahead of the crew to assess the work assignment for the shift. The crew walked up the line to where it ended the day before and started to cut direct fireline and cold trail where needed. Two lookouts were posted on the division. The Bonneville Superintendent was on top of the ridgeline, and the other lookout was stationed at an oil platform at DP 20, which provided a good view of Division A.
- The Line Safety Officer (hereafter referred to as Safety A) walked through Division A and observed and talked with numerous crewmembers of both Bonneville IHC and Big Bear IHC. Based on the observations of Safety A, all firefighters he encountered seemed in good shape and good spirits.
- Hamm was assigned to swamper duties on a saw team, which he performed until about an hour before lunch. He asked to take a break from swamper duties and was swapped out with another crewmember. At that point, he was assigned to help cold trail with a hand tool. Saw team duties were rotated periodically during this incident as needed.
- 1230 The Division A Group Supervisor was notified that the Bonneville IHC and the Big Bear IHC had completed hand lining and cold trailing, and were tied in with each other. The crews were continuing to mop up on the line.
- 1330 Lunches were delivered at DP 20, and a Bonneville crewmember brought lunches to the crew. Lunch break was 30 to 40 minutes. The crewmembers were together in the general area at lunch. Neither Hamm nor other crewmembers gave any indications of heat-related problems at lunch break.
- During the lunch break, Hamm was observed eating lunch and interacting in conversation with other crewmembers.
- 1405-1410 After lunch, the Bonneville IHC topped off canteens from the banjos. The squad leaders advised the Bonneville Assistant Superintendent that only 1½ banjos out of 15 still had water.
- The crew then broke into three squads, Bravo (B), Charlie (C), and Delta (D). Each squad continued the assignment of securing line and mopping up back toward DP 20, at a methodical pace. Hamm was assigned to Squad C.
- 1410-1530 Crewmembers of Squad C continued their assignment of securing line and mopping up. Hamm was interacting with other squad members.

The Division A Group Supervisor left the division to travel to Mineral Wells to attend a planning meeting. He notified Bonneville IHC that he was leaving and that Operations Chief A was staying on the fire to cover his division while he was gone.

1530-1550 About 20 minutes before the accident, the Bonneville Assistant Superintendent stopped and talked to Hamm for a couple of minutes and said he was completely lucid and did not appear to be fatigued.

Squad C crewmembers split into pairs to cold trail and follow the fire's edge around an unburned finger to tie in with Squad B, which was working on the opposite side.

1550 The Squad C lead crewmember, who was working with Hamm, asked if he was okay after he stumbled on a rocky slope while hiking down the drainage. Hamm said he was hot, with a little headache. Squad C lead crewmember advised Hamm to sit down in the shade and take a break if needed. Squad C lead crewmember told Hamm he was going to tie in with crewmembers from Squad B who were working on the other side of the unburned finger and he would be right back. Squad C lead crewmember was gone about two to three minutes before returning to Hamm's location. When Squad C lead crewmember returned, he found Hamm collapsed on the rocks and unconscious.

1553 The Squad C lead crewmember called the Bonneville Assistant Superintendent on the radio to report Hamm was down. The Assistant Superintendent immediately came down the hill, about one minute to accident site. Crew EMT#1 heard the radio traffic that Hamm was down and started moving that way. Assistant Superintendent called Crew EMT#1 on the radio and told him to come down to accident site. Crew EMT#1 arrived and found Hamm wedged in the rocks with legs dangling. When he got closer to Hamm, he heard labored breathing but noticed Hamm's respiratory rate was within normal parameters. Crew EMT#1 initiated patient assessment. Although EMT#1 suspected heat injury, he was unsure of the exact cause of Hamm's unconsciousness. Hamm was unresponsive to voice prompts, but Crew EMT#1 did a sternum rub and Hamm was semi-responsive to pain. Crew EMT#1 ordered a crewmember to get the backboard, oxygen, and trauma kit from crew truck and requested Crew EMT#2 to come to the accident scene.

The Crew Superintendent heard radio traffic of the conversation between Squad C lead crewmember and the Assistant Superintendent, and relayed to Air Attack that there was a medical emergency and requested Advanced Life Support to DP 20.

The Air Attack notified Operations Chief A by radio that Bonneville IHC had a crewmember down with what appeared to be heat-related problems. Operations Chief A was notified of the emergency by Air Attack because Operations Chief A

could not hear the full conversation from Bonneville IHC. This was due to limited and broken radio communications in Operation Chief A's location.

Operations Chief B contacted the NIMO Safety Officer (hereafter referred to as Safety B) and Maine IMT Safety Officer (hereafter referred to as Safety C) to make them aware of the medical emergency.

Air Attack asked Bonneville Superintendent if light mist from high level water bucket drops from the light Helicopter 3HX (assigned to the fire) would help cool down the crew, Hamm, and the area. Bonneville Superintendent said yes. Operations Chief A heard the message and approved the request.

Air Attack informed Operations Chief A that the Helicopter 3HX could be available for patient transport.

1554 Operations Chief A made an outgoing cell phone call to Palo Pinto County Sheriff's Office reporting that a wildland firefighter was unconscious. Operations Chief A requested permission to land Helicopter 3HX at the Palo Pinto County hospital helipad in Mineral Wells.

Pilot of Helicopter 3HX informed Air Attack that his helicopter was not configured to transport a medical litter but could haul an ambulatory patient. The pilot added that all he needed to do was to unhook the water bucket prior to passenger transport.

1556 Division A Group Supervisor notified Deputy Incident Commander that a crewmember was suffering from a heat-related injury and that a medical response was requested.

1556-1620 Crew EMT#2 arrived on scene. EMTs initiated cervical spine stabilization (C-Spine) due to the unknown cause of accident. Both Crew EMTs moved Hamm to a flat rock nearby. More sternum rubs were done. Hamm was still responsive to pain stimulus. Pulse was taken at brachial and carotid arteries.

The TFS Regional Fire Coordinator and Safety C heard radio traffic that the patient had a pulse of 120, respiration rate of 12, and pupils dilated but not fixed. The patient was responding to pain, and had blue lips.

Hamm was very hot to the touch. Crew EMTs attempted external cooling by removing Hamm's pack, shirt and boots and pouring water on him. Oxygen, backboard, and trauma kit arrived, and Hamm was placed on the backboard. Hamm's condition deteriorated. Crew EMT#1 established airway by repositioning Hamm's head. Hamm stopped breathing. Crew EMT#1 inserted an airway (oral pharyngeal airway). Crew EMTs gave Hamm several breaths using a CPR pocket mask. Crewmembers were holding a tarp over Hamm for shade. Squad C lead crewmember was serving as a scribe recording Hamm's vital signs.

The Bonneville IHC cut a direct path to the dozer line to be used to extract Hamm, which is labeled on maps in this report as “initial extraction line.” A better route was established to the dirt road with the assistance of the Big Bear IHC, and that route is labeled on maps in this report as the “actual extraction line.”

1559 Operations Chief A received incoming call from the hospital by cell phone. He requested permission to land Helicopter 3HX at the hospital based on conversation with Air Attack.

1559 Helicopter 3HX initiated high-level water-bucket drops to mist the crew. The pilot did multiple bucket drops.

1601 Air Attack contacted Granbury Dispatch and advised that a firefighter was unconscious on south end of fire and would be using Helicopter 3HX as medivac.

1603 Operations Chief A called 9-1-1 for the coordinates of the hospital helipad and relayed the information to Air Attack.

1614 Operations Chief A notified Mineral Wells Fire Department from his cell phone. Mineral Wells Fire Department ambulance was dispatched and was enroute at 1616 hours.

1616 Air Attack contacted Operations Chief A and recommended Air Evac from Mineral Wells. This request was based on Hamm’s deteriorating condition. Operations Chief A immediately called by cell phone the Air Evac number in the Medical Plan and asked them to respond. To save time, Operations Chief A asked Air Evac to launch without landing zone (DP 20) coordinates but to stay on the phone while he obtained the coordinates from personnel at DP 20.

1621 Hamm went into cardiac arrest and CPR was initiated.

After several minutes of CPR at the accident site, Hamm was moved up the actual extraction line toward the TFS Regional Fire Coordinator’s truck by conveyor belt method up to the road. CPR could not be performed during the extraction while Hamm was being moved to the truck, which took two to three minutes.

1630 Firefighters loaded and secured Hamm onto the TFS Regional Fire Coordinator’s truck with Bonneville Crew EMT#1 and Crew EMT#2, who immediately resumed CPR.

1630 Helicopter 3HX guided Air Evac helicopter to DP 20 landing spot and dropped the last bucket of water for dust abatement (four total buckets were dropped on DP 20). Helicopter 3HX cleared the air space.

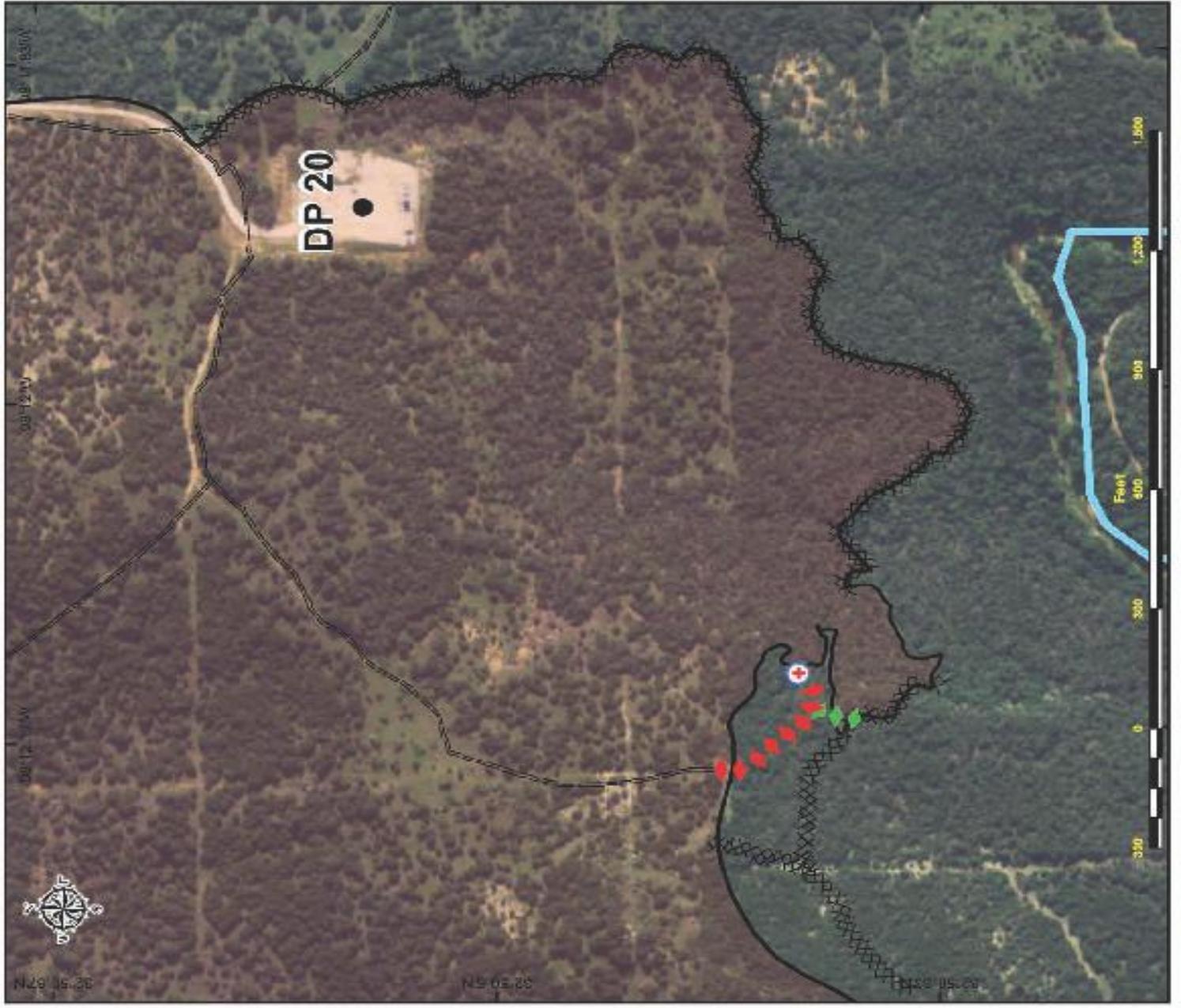
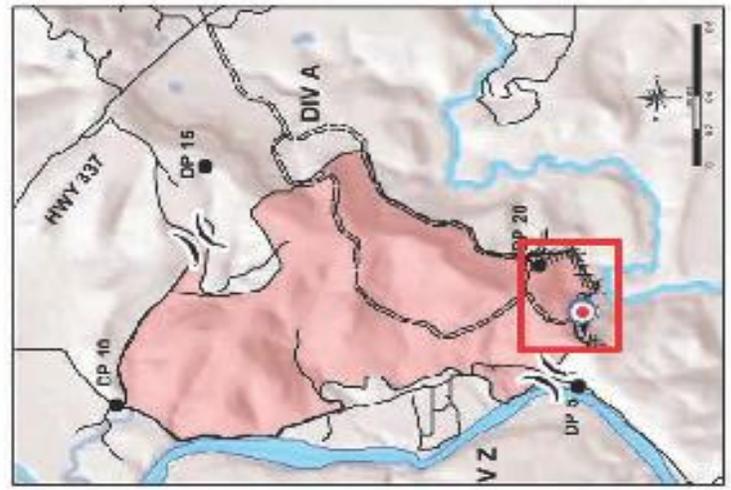
- 1631 Air Evac helicopter arrived at DP 20 with a medical flight crew (a paramedic and a Registered Nurse).
- 1633 Safety C transported medical flight crew in his truck, and drove uphill to meet the TFS Regional Fire Coordinator's truck carrying Hamm.
- 1635 Safety C with medical flight crew met the TFS Regional Fire Coordinator's truck on the dirt road. Medical flight crew joined Crew EMT#1, Crew EMT#2, and Hamm and began advanced patient care, as the TFS Regional Fire Coordinator continued down the dirt road toward DP 20.
- Operations Chief B led Mineral Wells Fire Department ambulance from County Road 337 to DP 20. Ambulance headed up dirt road and met the TFS Regional Fire Coordinator's truck coming downhill. One of the ambulance's medical crew personnel got in the TFS Regional Fire Coordinator's truck. The TFS Regional Fire Coordinator's truck took the lead downhill toward DP 20 with the ambulance following.
- All vehicles met at DP 20. The distance from the extraction point to DP 20 was about 2,100 feet.
- 1637 The patient was in full cardiac arrest and the policy of the professional medical providers on scene is to transport via ambulance as they can provide better patient care than what is possible in the helicopter. Hamm was transferred into the ambulance, where medical personnel continued advanced patient care. Crew EMT#1 and Crew EMT#2 continued CPR.
- 1645 The ambulance departed DP 20 enroute to hospital. Palo Pinto General Hospital was seven miles from DP 20 (13 minute drive).
- The Bonnevill Superintendent followed the ambulance to the hospital with one Bonnevill crewmember.
- 1658 The ambulance arrived at Palo Pinto General Hospital in Mineral Wells, Texas.
- 1703 The hospital attending physician pronounced Caleb Hamm deceased.



Photo 1: CR 337 Accident Site

Fire CR 337
1010 Acres
July 7, 2011

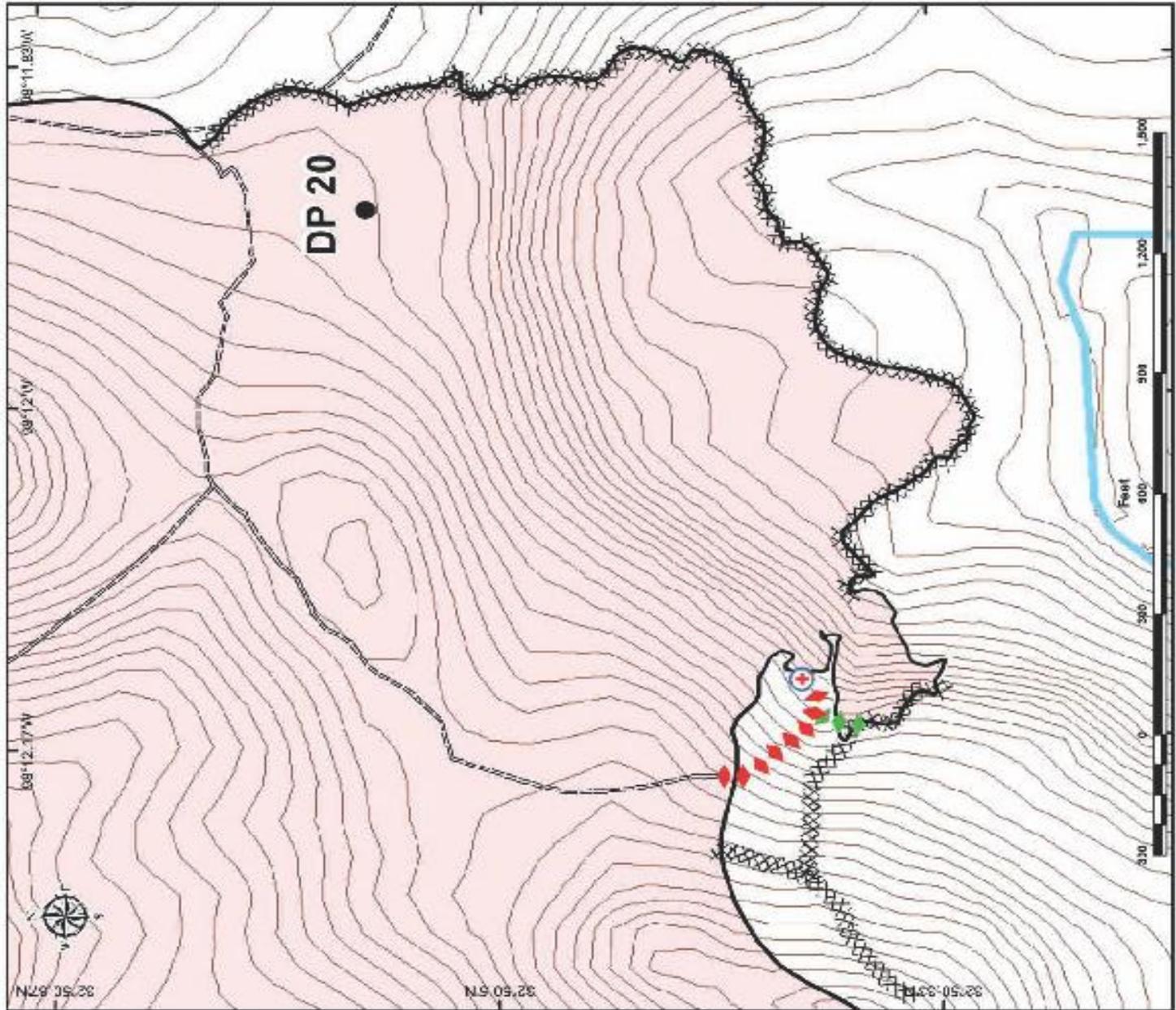
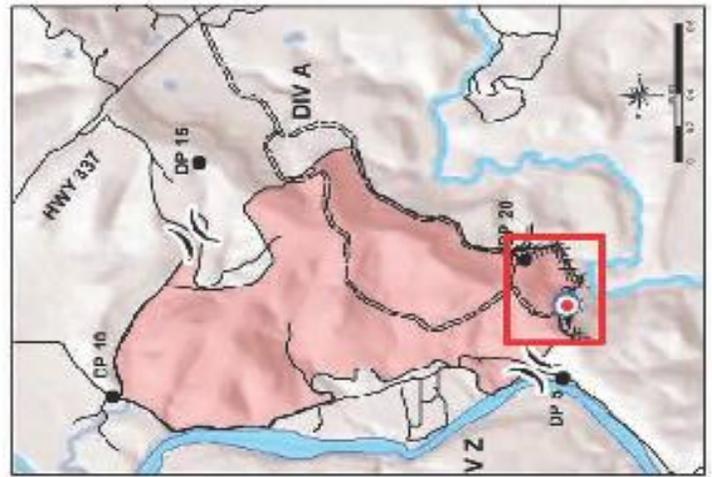
-) (Division Breaks
- Drop Points
- ⊕ Accident Site
- XXXXX Dozer
- Handline
- ◆ Initial Extraction Line
- ◆ Actual Extraction Line 271 feet
- ==== Dirt Road
- Fire Perimeter
- Major Waterways



Map 1: CR 337 Imagery Map

**Fire CR 337
1010 Acres
July 7, 2011**

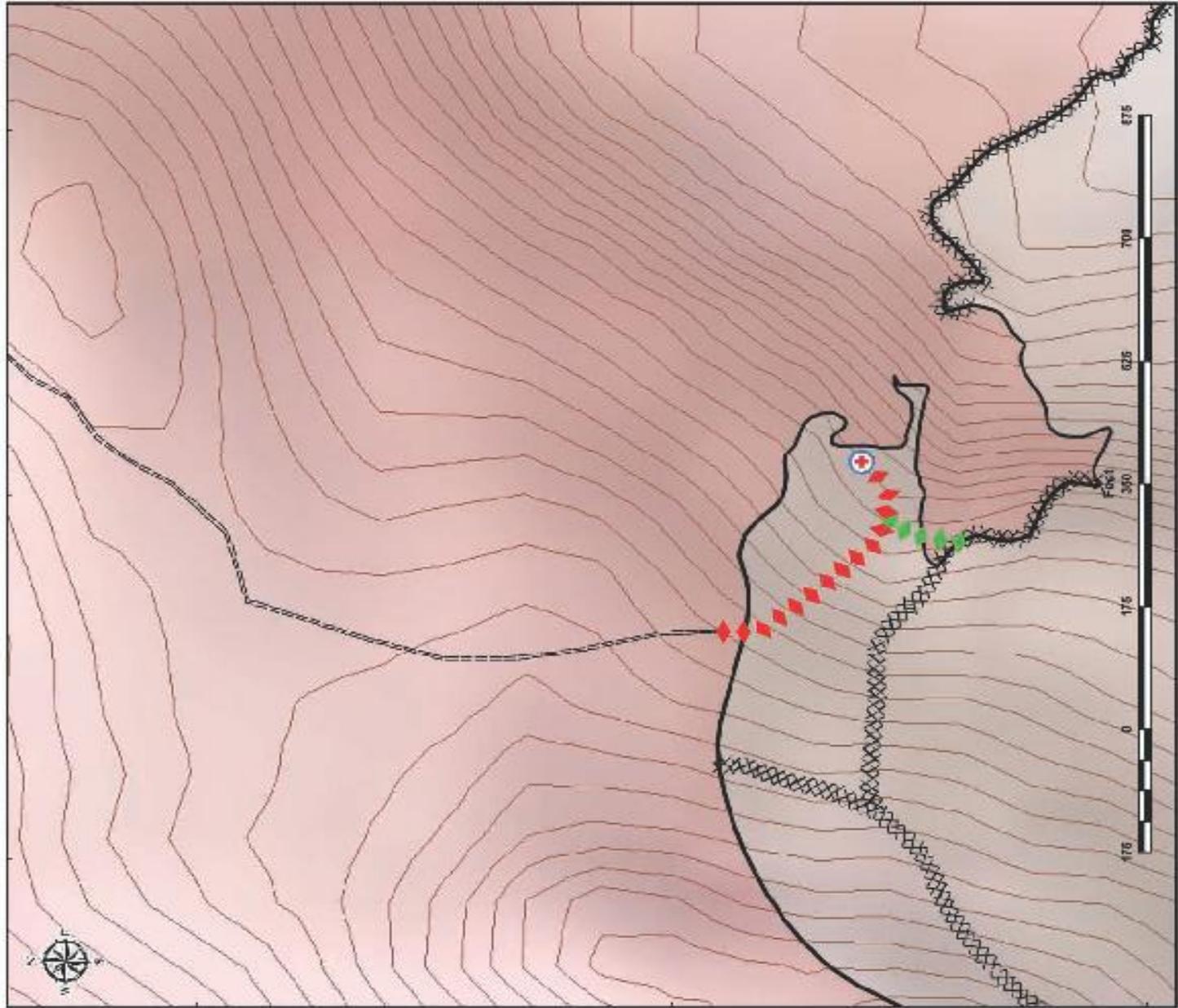
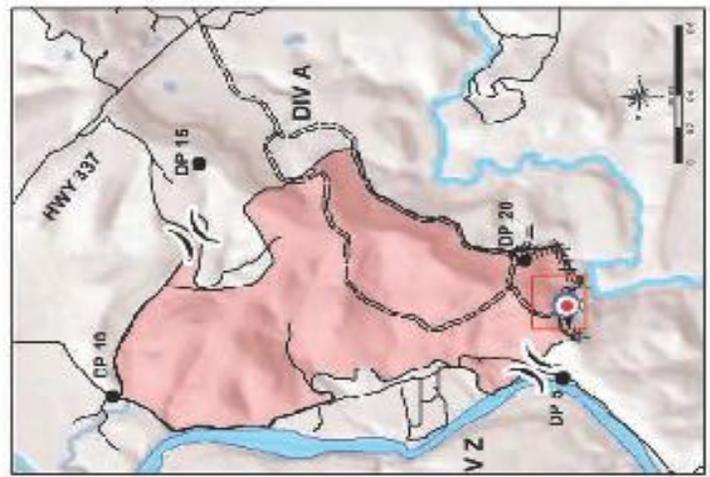
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- ◆◆◆ Actual Extraction Line
- 271 feet
- - - - - Dirt Road
- 🔴 Fire Perimeter
- 🔵 Major Waterways



Map 2: CR 337 Contour Map

**Fire CR 337
1010 Acres
July 7, 2011**

- () Division Breaks
- Drop Points
- ⊕ Accident Site
- XXXXX Dozer
- Handline
- ◆ Initial Extraction Line
- ◆ Actual Extraction Line 271 feet
- - - - - Dirt Road
- Fire Perimeter
- Major Waterways



Map 3: CR 337 Accident Area Map

INVESTIGATION PROCESS

Department of the Interior Manual 485 Chapter 7, BLM Manual 1112-1, Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1960, and the *Interagency Standards for Fire and Fire Aviation Operations* policy require that each accident that results in a fatality or hospitalization of three or more employees will be investigated to determine the causal factors involved. The BLM requires serious accidents to be investigated by a Serious Accident Investigation Team (SAIT) or Trained Investigator appointed by the BLM Safety Manager and by the BLM Designated Agency Safety and Health Official.

This fatality was reported to the BLM National Office of Fire and Aviation on July 7, 2011, and an Interagency SAIT was mobilized. The Joint Delegation of Authority was signed by Timothy M. Murphy, BLM Assistant Director, Fire and Aviation, and Mark Stanford, Fire Operations Chief, TFS, on July 7, 2011. This document delegated authority to Vicki Wood, SAIT Team Lead, to investigate a fatality outside Mineral Wells, Texas, involving a BLM firefighter.

The team consisted of the following positions:

- BLM Team Leader
- BLM Chief Investigator
- BLM Safety Advisor
- BLM Technical Subject Matter Expert (hotshot crews)
- US Forest Service Technical Subject Matter Expert
- Texas Forest Service Representative
- BLM Documentation Specialist/Scribe

The SAIT arrived in Mineral Wells, Texas, the evening of July 8, 2011. Earlier on July 8, 2011, the Bonneville IHC was released from the CR 337 assignment and returned to its duty station in Salt Lake City on a National Interagency Fire Center (NIFC) contracted jet.

The SAIT first met as a complete team at 0800 hours on July 9, 2011. After introductions, the SAIT discussed the approach and process to be used, along with steps to be taken and estimated timeframes. At 1000 hours, the SAIT in-briefed with BLM West Desert District Manager; BLM Utah State Fire Management Officer; Fire Operations Chief, Texas Forest Service; and other BLM personnel.

On the afternoon of July 9, 2011, the SAIT began gathering and organizing all human, environmental, and material evidence. The SAIT requested all communication logs, began establishing a chronology of the accident, and inventoried and photographed Hamm's line gear and personal protective equipment. The SAIT started interviews of key individuals located in Mineral Wells, Texas, who were involved with the CR 337 fire.

The OSHA Compliance Officer based in Fort Worth, Texas, contacted the SAIT Chief Investigator by telephone on the night of July 8, 2011. The OSHA Officer met with the SAIT Chief Investigator in Mineral Wells, Texas, at 1100 hours on Saturday, July 9, 2011. These two officials discussed the roles of both agencies and the extent to which the information would be shared in the investigations. They also established that the two investigations would be

independent of each other. The OSHA Officer independently interviewed five individuals. The OSHA Officer conducted an informal out-briefing with SAIT team members before returning to Fort Worth, Texas.

The Texas State Fire Marshal's Office assigned an investigator to the CR 337 Fatality, who established contact with the SAIT Team Leader on Saturday July 9, 2011, in Mineral Wells. The Texas State Fire Marshal's Office is authorized by Texas Government Code to conduct Line of Duty Deaths firefighter investigations. According to Section 1, Subsection (b), Section 417.0075, Government Code: *"If a firefighter dies in the line of duty or if the firefighter's death occurs in connection with an on-duty incident in this state, the state fire marshal shall investigate the circumstances surrounding the death of the firefighter, including any factors that may have contributed to the death of the firefighter."* These investigations are conducted in cooperation with fire-service organizations such as the State Firemen's and Fire Marshals' Association, Texas Fire Chiefs Association, Texas Association of Firefighters, Texas Fire Marshals Association, Texas Commission on Fire Protection, Texas Forest Service and Emergency Services Training Institute. The Texas State Fire Marshal's Office report will be released after the SAIT has completed its investigation and report.

On July 10, 2011, three members of the SAIT traveled to the CR 337 fire location to document and photograph the area and accident site. Four NIMO team members accompanied the SAIT to the fire site to provide an overview and orientation to the area, as well as directing them to the actual accident site.

On July 11, 2011, two SAIT members flew to Salt Lake City, where they interviewed four individuals from the Bonneville IHC on July 12, 2011. The two SAIT members then returned to Mineral Wells, Texas, to rejoin the rest of the SAIT on July 13, 2011.

The SAIT continued the investigation in Mineral Wells, Texas, collecting documentation and conducting additional interviews. On July 16, 2011, the entire SAIT flew to Salt Lake City, Utah. On July 17, 2011, the SAIT divided into pairs and individually interviewed 18 members of the Bonneville IHC. The SAIT then remained in Salt Lake City to gather final documents and began working on required reports.

During the investigation, the SAIT conducted more than 40 interviews in person and by telephone, and made three visits to the accident site. On July 15, 2011, the SAIT contacted a subject matter expert from US Forest Service's Missoula Technology Development Center with questions concerning heat-related illness.

The SAIT completed its evidence gathering and interviews and began drafting the factual and management reports on July 22, 2011.

An out-briefing was held on July 23, 2011, at 0900 hours in Salt Lake City with BLM West Desert District Manager; BLM West Desert District Fire Management Officer; TFS, Department Head Mitigation and Prevention; BLM Utah State Fire Management Officer; and BLM Utah Assistant State Fire Management Officer.

On August 10, 2011, the SAIT talked with National Institute for Occupational Safety and Health (NIOSH), concerning the autopsy and firefighter heat illness issues. NIOSH intends on conducting an independent investigation of Caleb Hamm's death, given that it was a line-of-duty, medically related fatality. In 1998, Congress allocated funds to the NIOSH to address the continuing national problems of occupational firefighter fatalities and injuries.

The SAIT reconvened on August 17, 2011, in Boise, Idaho to complete the final reports.

Factors Evaluated

The SAIT evaluated a broad set of human, environmental and material factors to determine their association to the accident.

Type	Discussion	Finding/No Finding
Human Factors		
Fatigue	Reviewed Bonneville IHC time and attendance records and recent assignments, and found no evidence of crew fatigue. Hours worked, days off, and length of assignment met agency standards. Adequate rest outside of the heat was provided during entire mobilization to the SE geographic area (motels provided).	No Finding
Training	Checked training records of Hamm, and all were current.	No Finding
Incident Qualifications and Certification System (IQCS)	IQCS records indicated Hamm was qualified and current to the level required for wildland fire operations.	No Finding
Communications	Cell phones were required for some tactical communications. Using cell phones does not allow others to hear what communication is taking place.	Finding
Hydration	Verified Bonneville IHC Standard Operating Procedures, internal briefings, and eyewitness statements that stressed hydration. Extra water was consumed and monitored by supervisors. Consulted with NIOSH physician concerning autopsy results.	Finding
Medical Record/Work Capacity Test (WCT)	Verified annual medical standards record (annual exam). Hamm was cleared for duty with no restrictions by physician. No pre-existing medical conditions were noted. Verified WCT clearance.	No Finding
Emergency Assistance Request Procedure	Verified by incident Medical Plan, 911 log, and EMS records.	Finding
Physical Fitness	Witness and interview statements indicated aerobic fitness level was high and well fit for IHC job tasks.	No Finding
Environmental Factors		
Communications	Radio communications on CR 337 fire incident were in place, but terrain and distance hampered communications.	Finding
Weather/Heat	Crew briefed on daily weather and spot weather forecasts. Crew took internal hourly weather observations. Actual weather matched predictions.	Finding
Slope/Terrain	Rocky, rough terrain.	No Finding

Type	Discussion	Finding/No Finding
Material Factors		
First Aid Equipment	Trauma kit, backboard, and oxygen always carried with Bonneville IHC. Two qualified EMTs on crew.	Finding
Line Gear and PPE	Hamm's line gear, gloves, helmet, and boots were examined and inventoried.	No Finding

FINDINGS

Findings are the conclusion of the investigation team based on the facts, weight of evidence, professional knowledge, and judgment. Findings are grouped by category: human, material, and environmental.

Finding 01: Environmental Factor

While working on the fire incident, Hamm lost consciousness and subsequently died. Signs and symptoms indicative of severe heat illness were not observed by co-workers or verbally communicated by Hamm. Autopsy report states the cause of death as hyperthermia.

Findings below did not directly impact the cause or outcome of this accident; however, they are significant enough to potentially result in improvements in the specified program areas.

Finding 02: Human Factor

Hamm was not severely dehydrated and his electrolytes were within the normal range.

Finding 03: Human Factor

The designated Division A “point of contact” (POC) did not have direct communication with accident scene personnel.

Finding 04: Human Factor

Cell phones were used to coordinate medical response per Incident Action Plan, resulting in others not being able to monitor critical communications.

Finding 05: Human Factor

The Global Positioning System (GPS) coordinates for key locations were not identified in the Incident Medical Plan (ICS-206) on the Incident Action Plan (IAP) for the CR 337 fire.

Finding 06: Human Factor

The IAPs for the CR 337 fire for July 6 through July 8, 2011, and IAP Safety Analysis (ICS-215A) did not contain specific reference to extreme temperatures or hydration nor was it included in the IAP Safety Message.

Finding 07: Material Factor

Bonneville IHC was well prepared for a medical emergency with EMTs, backboard, trauma kit, and oxygen.

APPENDIX A: GLOSSARY

Banjo: A round metal or plastic canteen used for storing and transporting water and other liquids (generally 1 gallon capacity).

BLM - Bureau of Land Management

CPR - Cardiopulmonary Resuscitation: An emergency procedure which is performed in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person in cardiac arrest. CPR involves chest compressions and the rescuer may provide breaths.

Chain: A chain is a unit of length; it measures 66 feet or 22 yards or 100 links (20.1168 m). There are 10 chains in a furlong, and 80 chains in one statute mile.

Cold Trailing: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

CR - County Road

DP – Drop Point: A pre-identified location where personnel, equipment, and supplies are to be delivered or picked-up.

Delegation of Authority: A statement provided to the incident commander by the agency executive delegating authority and assigning responsibility. The delegation of authority can include objectives, priorities, expectations, constraints, and other considerations or guidelines as needed. Many agencies require written delegation of authority to be given to incident commanders prior to their assuming command on larger incidents.

EMS - Emergency Medical Services: A type of emergency service dedicated to providing out-of-hospital acute medical care and/or transport to definitive care, to patients with illnesses and injuries which the patient, or the medical practitioner, believes constitutes a medical emergency.

EMT - Emergency Medical Technician: Emergency Medical Technician and Ambulance Technician are terms used to denote a healthcare provider of emergency medical services.

Paramedic: A professional-level provider of emergency medical care trained above the level of EMT-Intermediate to administer drugs, intubate, and perform other advanced life support procedures in a field environment, maintaining state certification in this classification.

FALA - Faller A: An individual being trained or evaluated in introductory level, noncomplex chain saw operations. Work of a Class A Faller must be under the supervision of a qualified Faller B or Faller C.

FFT2 - Firefighter Type 2: Entry level wildland firefighter.

USFS – United States Forest Service

GPS - Global Positioning System: A system of navigational satellites operated by the U.S. Department of Defense and available for civilian use. The system can track objects anywhere in the world with an accuracy of approximately 40 feet.

Haines Index: An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

Handline: Fireline constructed with hand tools.

Hot Spotting: Checking the spread of fire at points of more rapid spread or special threat. Is usually the initial step in prompt control, with emphasis on first priorities.

Hyperthermia: Is an elevated body temperature due to failed thermoregulation. Hyperthermia occurs when the body produces or absorbs more heat than it can dissipate. When the elevated body temperature is sufficiently high, hyperthermia is a medical emergency and requires immediate treatment to prevent disability or death.

IAP - Incident Action Plan: Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map. Formerly called shift plan.

ICS - Incident Command System: A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

IMT - Incident Management Team: The incident commander and appropriate general and command staff personnel assigned to an incident.

IQCS - Incident Qualifications and Certification System: The Incident Qualifications and Certification System is an information system that tracks training and certifications for Wild land Firefighters.

IA - Initial Attack: A planned response to a wildfire given the wildfire's potential fire behavior. The objective of initial attack is to stop the fire and put it out in a manner consistent with firefighter and public safety and values to be protected.

IHC - Interagency Hotshot Crew: In the United States, an Interagency Hotshot Crew (IHC), or simply Hotshot crew, is a Type 1 hand crew of 20 firefighters specially trained in wildfire

suppression tactics. Hotshot crews are considered an elite group among wildland firefighters, due to their extensive training, high physical fitness standards, and ability to undertake difficult, dangerous, and stressful assignments. They often respond to large, high-priority fires and are trained and equipped to work in remote areas for extended periods of time with little logistical support.

Interagency Standards for Fire and Fire Aviation Operations: The book contains Federal fire program policy, guidance, and standards for the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and the USDA Forest Service.

National Interagency Hotshot Crew Steering Committee: Provides the IHC community, fire managers and agency administrators a means for proactive problem and issue resolution at the national level.

NIOSH – National Institute for Occupational Safety and Health: As part of the Center for Disease Control, NIOSH is responsible for conducting research and making recommendations for the prevention of work-related illnesses and injuries.

NIMO - National Incident Management Organization: The National Incident Management Organization is composed of seven member incident management teams with complex fire management as the primary focus of their positions. NIMO uses a wide range of methods to accomplish this goal. Essential components required for success include: a strong core of full-time Command and General Staff available year round for incident response with consistent performance expectations and standards for these positions.

NIFC - National Interagency Fire Center: A facility located at Boise, Idaho, jointly operated by several Federal agencies, dedicated to coordination, logistical support, and improved weather services in support of fire management operations throughout the United States.

NWCG - National Wildfire Coordinating Group: Sets standards for training, certification, and equipment used in wildland and prescribed fire operations for member agencies.

OSHA - Occupational Safety and Health Administration: An agency of the United States Department of Labor. Its mission is to prevent work-related injuries, illnesses, and occupational fatality by issuing and enforcing standards for workplace safety and health.

PPE - Personal Protective Equipment: That equipment and clothing required to mitigate the risk of injury from or exposure to hazardous conditions encountered during the performance of duty. PPE includes but is not limited to: fire resistant clothing, hard hat, flight helmets, shroud, goggles, gloves, respirators, hearing protection, chainsaw chaps, and shelter.

POC – Point of Contact

Regional Fire Coordinator: TFS employee assigned in a specific region within a branch. Coordinates with local government and fire departments. During West Texas I.A. 2011, Regional

Fire Coordinators report directly with Branch Coordinators, who in turn report to Lone Star IMT Operations Section Chief.

Resources: Personnel, equipment, services, and supplies available, or potentially available, for assignment to incidents. Personnel and equipment are described by kind and type, e.g., ground, water, air, etc., and may be used in tactical, support, or overhead capacities at an incident.

Response: Movement of an individual firefighting resource from its assigned standby location to another location or to an incident in reaction to dispatch orders or to a reported alarm. Activities that address the short-term, direct effect of an incident, including immediate actions to save lives, protect property, and meet basic human needs. Also includes the execution of emergency operations plans as well as mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes.

Saw Team: Consists of a sawyer and a swamper.

Sawyer: A person who is qualified to cut down trees or snags, perhaps while the tree or snag is burning.

Swamper: A worker who assists sawyers by clearing away brush, limbs, and small trees. Carries fuel, oil, and tools and watches for dangerous situations.

SAIT - Serious Accident Investigation Team: A formal investigation team that is organized with the purpose of conducting an accident investigation for an occurred serious accident. The team is given full authorization to conduct the investigation from involved agencies through letter of delegation.

TFS - Texas Forest Service

West Texas Initial Attack (IA) 2011: West Texas I.A. is the description of frequent wildfires occurring within geographical branches of the state. Current West Texas I.A. 2011 fire season started November 15, 2010.

WCT - Work Capacity Test: A family of tests to determine firefighter physical capabilities. Work capacity tests are used to ensure that persons assigned to fire activities are physically capable of performing the duties of wildland firefighting and to meet National Wildfire Coordinating Group (NWCG) standards for wildland firefighters (Wildland Fire Qualification Subsystem Guide 310-1, NWCG, 1993). The WCT is a family of tests to determine firefighter physical capabilities at three levels: Arduous, Moderate and Light. Interagency hotshot crewmembers are required to pass the arduous test which consists of a 3-mile hike with a 45-pound pack over level terrain in less than 45 minutes.