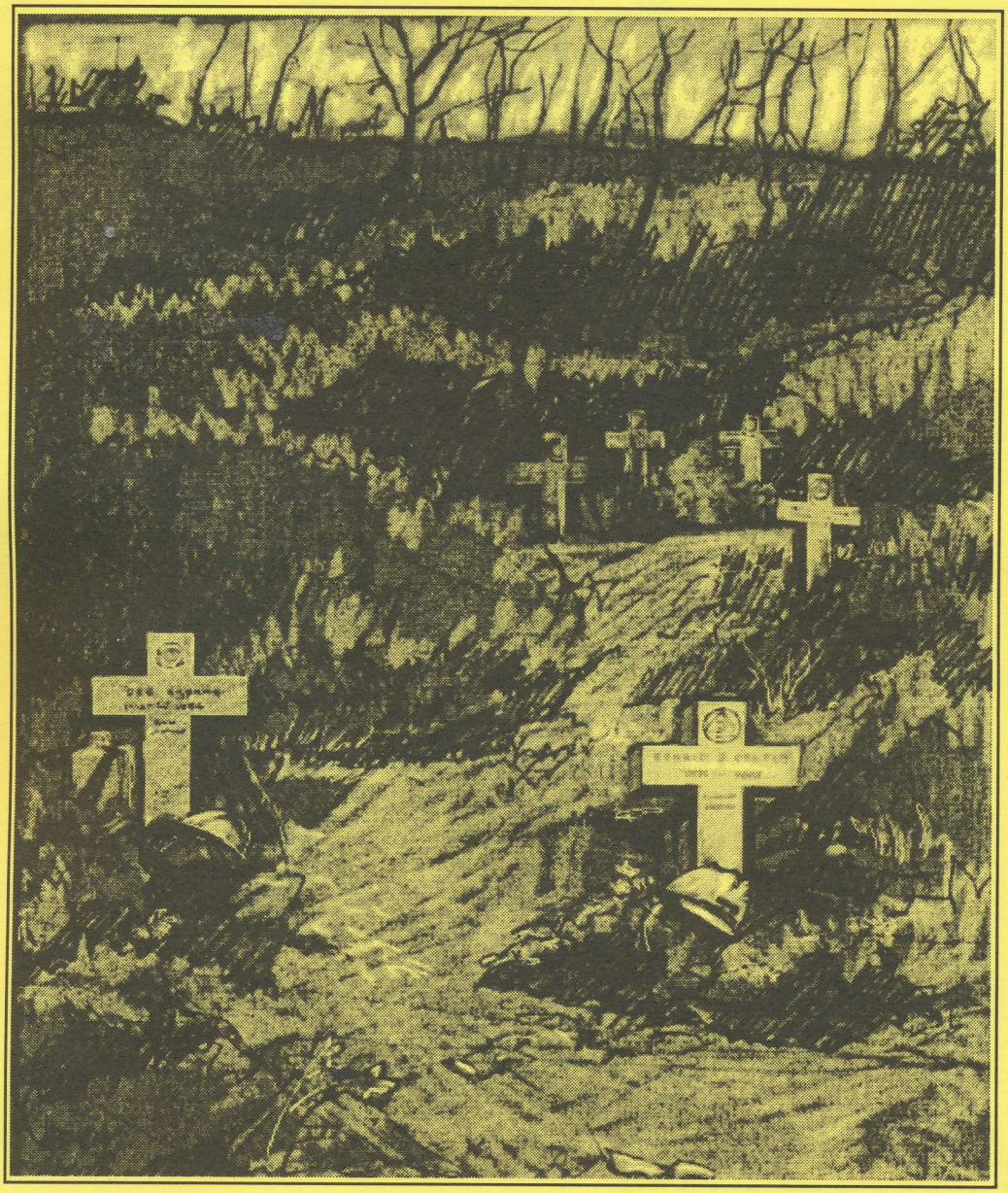
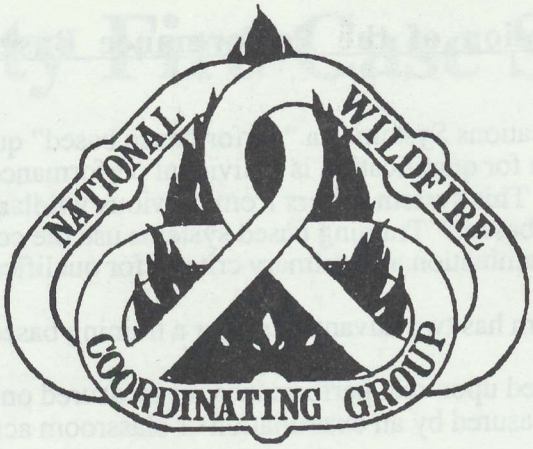
LESSONS LEARNED:
Fatality Fire Case Studies
PMS 490



Trainee Workbook

DECEMBER, 1998

NFES 2564



CERTIFICATION STATEMENT

on behalf of the

NATIONAL WILDFIRE COORDINATING GROUP

The following training material attains the standards prescribed for courses developed under the interagency curriculum established and coordinated by the National Wildfire Coordinating Group. The instruction is certified for interagency use and is known as:

Lessons Learned: Fatality Fire Case Studies
Certified at Level II

Chair, Training Working Team

Date 11/30/98

Member, NWCG and Training Working Team Liaison

Date 12/14/98

Member, NWCG and Safety and Health Working Team Chair

Date 11/2/98

Description of the Performance Based System

The Wildland Fire Qualifications System is a "performance based" qualifications system. In this system, the primary criteria for qualification is individual performance as observed by an evaluator using approved standards. This system differs from previous wildland fire qualifications systems which have been "training based." Training based systems use the completion of training courses or a passing score on an examination as a primary criteria for qualification.

A performance based system has two advantages over a training based system:

- Qualification is based upon real performance, as measured on the job, versus perceived performance, as measured by an examination or classroom activities.
- Personnel who have learned skills from sources outside wildfire suppression, such as agency specific training programs or training and work in prescribed fire, structural fire, law enforcement, search and rescue, etc., may not be required to complete specific courses in order to qualify in a wildfire position.

1. The components of the wildland fire qualifications system are as follows:

   a. Position Task Books (PTB) contain all critical tasks which are required to perform the job. PTB's have been designed in a format which will allow documentation of a trainee's ability to perform each task. Successful completion of all tasks required of the position, as determined by an evaluator, will be the basis for recommending certification.

      IMPORTANT NOTE: Training requirements include completion of all required training courses prior to obtaining a PTB. Use of the suggested training courses or job aids is recommended to prepare the employee to perform in the position.

   b. Training courses and job aids provide the specific skills and knowledge required to perform tasks as prescribed in the PTB.

   c. Agency Certification is issued in the form of an incident qualification card certifying that the individual is qualified to perform in a specified position.

2. Responsibilities

   The local office is responsible for selecting trainees, proper use of task books, and certification of trainees, see the Task Book Administrators Guide 330-1 for further information.

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Fatality Fire Case Studies
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Additional copies of this publication may be ordered from: National Interagency Fire Center, ATTN: Great Basin Cache Supply Office, 3833 S. Development Avenue, Boise, Idaho 83705. Order NFES # 2564.

Trainee Workbook

DECEMBER, 1998

NFES 2564

PREFACE

An interagency development group has developed this course material with guidance from the Safety and Health Working Team (SHWT) under the authority of the National Wildfire Coordinating Group (NWCG).

The Lesson Learned training package was added to the Publication Management System based on the South Canyon Interagency Management Review Team (IMRT) recommendation to incorporate lessons learned into course curriculums as appropriate.

The development group was made up of the following individuals:

Doug Blangsted, California Department of Forestry
Dan Buckley, USDI, Point Reyes National Seashore
Malcolm Cockerham, USDA, Ouchita National Forest
Jim Cook, Project Leader, USDA, Boise National Forest
John Craney, California Department of Forestry
Paul Gleason, USDA, Arapaho-Roosevelt National Forest
John Harris, Los Angeles County Fire Department
Antonia Hedrick, USDI, NIFC Instructional Media
Bob Kambitsch, USDI, NIFC Instructional Media
John Koehler, Florida Division of Forestry
Mark Linane, USDA, Los Padres National Forest
Dick Mangan, USDA, Missoula Technology Development Center
Doug Riley, USDI, Delaware Water Gap National Recreation Area
Paul Schmidtke, USDA, Huron-Manistee National Forest
Nina Walker, USDI, NIFC Instructional Media

Comments regarding this package or additional information should be addressed to:

National Interagency Fire Center
National Fire and Aviation Training Support Group
Training Standards Team
3833 South Development Avenue
Boise, Idaho 83705

CONTENTS

INTRODUCTION

The purpose of the Lessons Learned training course is to use historical fatality fires as a learning tool to help fireline decision makers avoid making similar mistakes in the future.

The Lessons Learned training course is designed as series of nine case studies. This trainee workbook includes:

a) An outline of the information provided during the instructor presentations.

b) Analysis worksheets for each of the nine case study fires to complete during the case study analysis exercise.

c) A sequence of events document for each of the nine case study fires to use as a reference during the case study analysis exercise.

UNIT 0 HISTORICAL OVERVIEW

I. INTRODUCTION

By its nature firefighting is a dangerous undertaking. Wildland fires are dangerous because they are dynamic and constantly changing as the result of many complex factors. Unfortunately, sometimes wildland fires bring death and injury to firefighters. Each firefighter fatality should motivate us to study the incident, learn from it, and share the lessons of this blunt but effective teaching tool so that others may engage wildland fires without paying such a price.

II. COURSE OBJECTIVES

Unit 0 - Demonstrate an awareness of the value in the study of historical fatality fires.

Unit 1 - Given a fatality fire case study:

a) Identify causal factors using a risk management process.

b) Determine lessons to be learned from these causal factors.

III. STAFF RIDE

A Staff Ride is a military training technique that entails an on-site study of a historical battle. The process involves critical analysis of the event to convey past lessons for current application. This Lessons Learned training program is a simplified version of the Staff Ride.

IV. LESSONS LEARNED

Why should we study lessons from fires of the past?

-
-
-

CHRONOLOGY OF MAJOR FATALITY FIRES

Wildland firefighter safety is a problem that has been with fire agencies for as long as they have been suppressing fires; the only difference is the changing faces and some new technical and social complexities. The following is a chronology of wildfires where multiple firefighter fatalities occurred that resulted in major changes in fire service practices and policies.

1910 FIRES / IDAHO / 78 fatalities

The first fire suppression and prevention policy was legislated by congress.

1933 GRIFFITH PARK / CALIFORNIA / 28 fatalities & 125 injuries
1937 BLACKWATER / WYOMING / 15 fatalities

A firefighting training curriculum was established for the Civilian Conservation Corp.

1943 HAUSER CREEK / CALIFORNIA / 11 fatalities & 72 injuries
1949 MANN GULCH / MONTANA / 13 fatalities

Fire behavior research began with a focus on application to fireline safety.

1953 RATTLESNAKE / CALIFORNIA / 15 fatalities
1956 INAJA / CALIFORNIA / 11 fatalities

The 10 Standard Firefighting Orders and 13 Watch Out Situations were developed and instituted in all firefighter training.

1966 LOOP / CALIFORNIA / 12 fatalities
1968 CANYON / CALIFORNIA / 8 fatalities

The Downhill Line Construction Rules were developed and the use of handheld radios for intra-crew communication became standard.

1971 ROMERO / CALIFORNIA / 4 fatalities

A national fire qualification system with minimum standards was implemented; funding was made available to organize the national radio cache; the first safety officer positions were established; and fire shelters became mandatory in California.

1976 BATTLEMENT CREEK / COLORADO / 3 fatalities
1977 CART CREEK / UTAH / 3 fatalities
1977 HONDA CANYON / CALIFORNIA / 3 fatalities
1977 BASS RIVER / NEW JERSEY / 4 fatalities

Fire shelters became mandatory on a national basis and a study to determine the common denominators of fatality fires was completed. The findings of the study were as follows:

33% involved fire running upslope.
24% involved fire responding to sudden wind shifts.
15% involved fire accelerating into lighter fuels.
11% involved heavy spot fire activity.
17% involved unusual occurrences such as thunderstorm downdrafts, downslope winds, or aircraft turbulence.

1990 DUDE / ARIZONA / 6 fatalities

Reviews of the fire safety guidelines and fire behavior training resulted in the development of the LCES fireline safety system (Lookouts, Communications, Escape Routes, Safety Zones) and the Look Up/Look Down/Look Around approach to fire behavior size-up.

1994 SOUTH CANYON / COLORADO / 14 fatalities

A national interagency review of all wildland fire operations was undertaken. Significant emphasis was placed on mandatory annual training standards; an external review of the firefighting culture; and developing an awareness of the dynamics of decision making in high risk environments.

UNIT 1 ANALYSIS PROCESS

I. RISK MANAGEMENT PROCESS

Risk management is a five step decision making tool adapted from the U.S. Army. In this course, it will be used as the method to analyze each of the case studies (except Case Study #9) to determine causal factors.

Step 1 Situation Awareness: A combination of long held attitudes, previously learned knowledge, and new information gathered from the current work environment.

Step 2 Hazard Assessment: Identification and evaluation of dangerous situations caused by fire behavior, tactical position, and environmental conditions.

Step 3 Hazard Controls: Specific measures established to reduce to an acceptable level or eliminate identified hazards.

Step 4 Decision Point: A Go/No Go decision based on adequate hazard controls, appropriate tactics, and ability to establish two-way communication.

Step 5 Evaluate: Monitoring what is changing in the current work environment and yourself in order to make adjustments and respond to the observed changes.

II. CASE STUDY ANALYSIS EXERCISE

Read the selected Case Study Sequence of Events document.

View the selected Case Study video.

Complete the selected Case Study Analysis Worksheet (Part 1 and Part 2) with your work group (or individually if directed by the instructor). Use the Case Study Sequence of Events document and the Incident Response Pocket Guide as references.

Prepare to present your work group responses for Part 1 and for Part 2 when the class is reconvened.

NOTES

NOTES

Bass River Fire
Case Study #1

Analysis Worksheet and Sequence of Events

BASS RIVER FIRE CASE STUDY #1 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

MAJOR FIRE REPORT

Fire # B-07-22-02 - Section 4, District 6, Bass River Township - 2,300 Acres

In accordance with Circular #18 - 500-C - April 1972, and as a result of a forest fire burning 2,300 acres, the following is a report in compliance thereto.

The report is in reference to Fire No. B-07-22-02 which started on July 22, 1977 in Bass River Township, Burlington County, and being approximately 359° 3.5 miles from Bass River Fire Tower.

Having just completed picking up equipment from Marshall's Hardware in Tuckerton Boro, approximately 7 road miles from the fire origin, Truck Tanker "B-4" was moving South on Route 9 in West Tuckerton when the radio report of smoke was given by Batsto Tower. Knowing the area to be distant from water with little or no natural breaks and heavy with fuel was cause for great concern for early attack and possible containment.

Units B-2, B-4 and B-19 responded immediately with the greatest of speed, without exceeding safety, and arrived at the fire site on Allen Road at approximately 1505 hours. B-4 was among the first arrivals and crossed the burn to the East flank, the hottest side, and began direct attack. B-2 and B-19 worked the West flank in a team effort to pinch off the head.

It is believed the fire was in excess of 5 acres when first contact was made.

All fire behavior factors were quickly evaluated and request for all available units in the area be dispatched. West Tuckerton brush truck and tanker was requested to respond, as well as New Gretna Fire Co. for water. I was informed B-5 was enroute.

At 1516 hours I was informed that B-11 and B-14 were enroute. At 1610 hours Car 53 reported on the scene. All units arriving were placed into direct attack on the flanks as they arrived, depending upon fire suppression demands. The Mobile Unit, "B-4", was used as Headquarters until the initial attack would suppress the fire enough to permit a transfer from the truck to the Main Office at Bass River State Park.

Fire Headquarters was maintained at this location and all further actions were directed from this location, or Copter 1, until such time as the fire was safe enough to return to regular Section control and all other crews were relieved.

The Control Plan was carefully followed for this particular area, under the existing conditions, and appeared to work reasonably well. The initial attack was direct due to the area, location, fuel, and winds involved.

Containment being difficult, due to shifting winds, at 1546 hours forces were ordered off the line and to go East to Cole Road to commence backfiring. B-4, B-14, and B-19 commenced firing, at 1612, forces were ordered further East to Dan's Bridge Road to backfire. B-5, B-2 began backfiring immediately and were soon joined by B-4 and B-19.

.t 1522 the Eagleswood Fire Chief called Section Warden Smith by County Radio and advised him that they had a crew standing by with their Brush Truck if they were needed. Smith advised Chief Cranmer to move toward the fire area and then if needed he would be in the area.

At 1525 the Eagleswood Brush Truck #731 signed on the air with KQP 474 (Little Egg Harbor dispatcher). - he was asked to repeat because his transmission was broken up.

At 1525 Assistant Division Warden Sloan, in Division Headquarters at Lanoka Harbor, started a southward movement of equipment to cover the void left by equipment working on this fire - B-20 was dispatched to the fire.

At 1526 Division Warden Harrison and Sid Walker, who were flying the Division "C" fire along the south side of the Batsto Fire Line, diverted their helicopter to this fire.

At 1527 the West Tuckerton Brush Truck arrived and District Warden Mathis as operator - they were assigned to work with the Plow 204 and allow B-19 to move faster with direct attack. A State Forest Fire portable radio was installed in the brush truck.

At 1537 Harrison in the helicopter advised Smith that the fire was about 100 acres and rekindling behind the direct attack vehicles and he should start thinking about moving ahead to backfire.

At 1537 the Eagleswood Fire Company plectron alert was sounded by KQP 474. Chief Cranmer called 474 and advised them that he was in truck 731 and to advise Eagleswood to send out the tanker with two men. He also stated "I'm coming up on Oswego Road now". Neither of these transmissions were acknowledged by KQP 474.

At 1544 Smith was advised by Harrison that the fire was spotting in front of the Head Fire and he would have to backfire Coal Road.

At 1546 Chief Cranmer called Smith on the County Radio using his call letters as 740 and advised him that "we're right out here where do you want us at?" He (Cranmer) was advised by Smith "Hit the line and turn to your right, that would be to the south and try to catch her. We might have to move out to the other side. There is a tractor and plow there on the line, meet him and follow him down. When you get to him let us know". (Transmissions recorded from the tape at Long Beach Township Police Department). There was no acknowledgement by 740 at this message on the tape.

At 1546 all equipment and personnel were ordered out of the woods and to Coal Road to backfire on the State radio frequency.

At 1547 Section Warden Smith County Radio #784 transmitted on the County Radio Band for all Fire Company Units to pull out and move to Coal Road.

At 1547 Bass River Office was notified to evacuate the camp grounds.

At 1549 Ocean County Mobile Headquarters was ordered set up at Bass River Headquarters.

At 1550 B-19, B-4 and Warren Grove Brush Truck started backfiring Coal Road (at Pt. 3) to burn out the area on the west side of Coal Road between the road and the west branch of the Bass River. It was felt that the swamp along the West Branch of the River would slow the fire down. Units B-2, B-5 and B-14 were sent to Dan's Bridge Road to stand by in the event the fire jumped Coal Road.

At 1612 the fire jumped the swamp and Coal Road and the units on Dan's Bridge Road started backfiring at Pt. 4. Some of the area between Coal Road and Dan's Bridge Road had been treated with Rxb previously, however it crowned all the way to Dan's Bridge Road.

At 1631 the fire spotted across Dan's Bridge Road. B-5 reported spots all over and too hot to handle. The fire was reported at 500 acres at this time.

At 1640 Harrison in the helicopter reported the head fire was burning into the East Branch of the Bass River and should hit Lake Absegami.

At 1645 John Perry and Section Warden Smith set up Fire Headquarters at the Bass River Park Office.

At 1646 Units B-4, B-2 and B-19 were assigned along the south and east banks of Lake Absegami to take care of spot fires.

At 1654 the TD-20 was assigned to work the south west flank from Allen Road to Coal Road to keep the fire off from Pilgrim Lake Camp ground.

At 1711 the Head Fire was held at Lake Absegami. (Pt. 5)

At 1712 Units B-5, B-14 and B-20 made an attempt to pump out the southwest flank from Coal Road to Dan's Bridge Road across the area that had been Rxb burned. However the fire was too hot and they had to pull out. The fire was reported at 700 acres at this time.

At 1715 a burning-in operation was started from the Bass River Office along the Lake Absegami perimiter road westward to the Stage Road, then along the Stage Road to the Coal Road.

At 1816 Harrison, in the Helicopter, while in route to give directions to the TD-20 crew on the Allen Road, observed a burning vehicle at Pt. 6. Two bodies were also observed in the vicinity of the vehicle. The helicopter landed on the Beach at Lake Absegami and this information was given to Smith and New Jersey State Police Trooper Cranmer. Smith was relieved as Fire Boss to investigate the area with Unit B-4. Section Warden Tansley was assigned as Fire Boss.

At 1840 B-2 reported the firing-in along the Stage Road complete.

At 1855 Smith and Trooper Cranmer had recovered the two bodies at the vehicle and were directed to the two other bodies by Harrison in the Helicopter.

At 1911 the TD-20 was pulled off the line in the area of Pt. 1 because of slow progress and sent south along the Allen Road to Pt. 7 to push a line directly in to the Flank Fire then work the flank southward to keep the fire out of the camp ground.

At 1912 a D-8 Dozer from Hanselman Construction Company was assigned to push a line from the Bass River Camp Sites at Pt. 8 northward to Dan's Bridge Road.

At 1935 Unit B-19 was assigned to assist B-4 in transporting the bodies to Southern Ocean County Hospital.

At 2000 a back firing operation was started from Dan's Bridge Road northward along an old sand road at Pt. 9 by B-5, B-20, Warren Grove Brush Truck and West Tuckerton Brush Truck.

At 2350 the bodies of the deceased were identified as: Chief Harold E. Cranmer, Jr.
Herbert E. Blackwell
John F. Baker
Marcus P. Cullen, Jr.

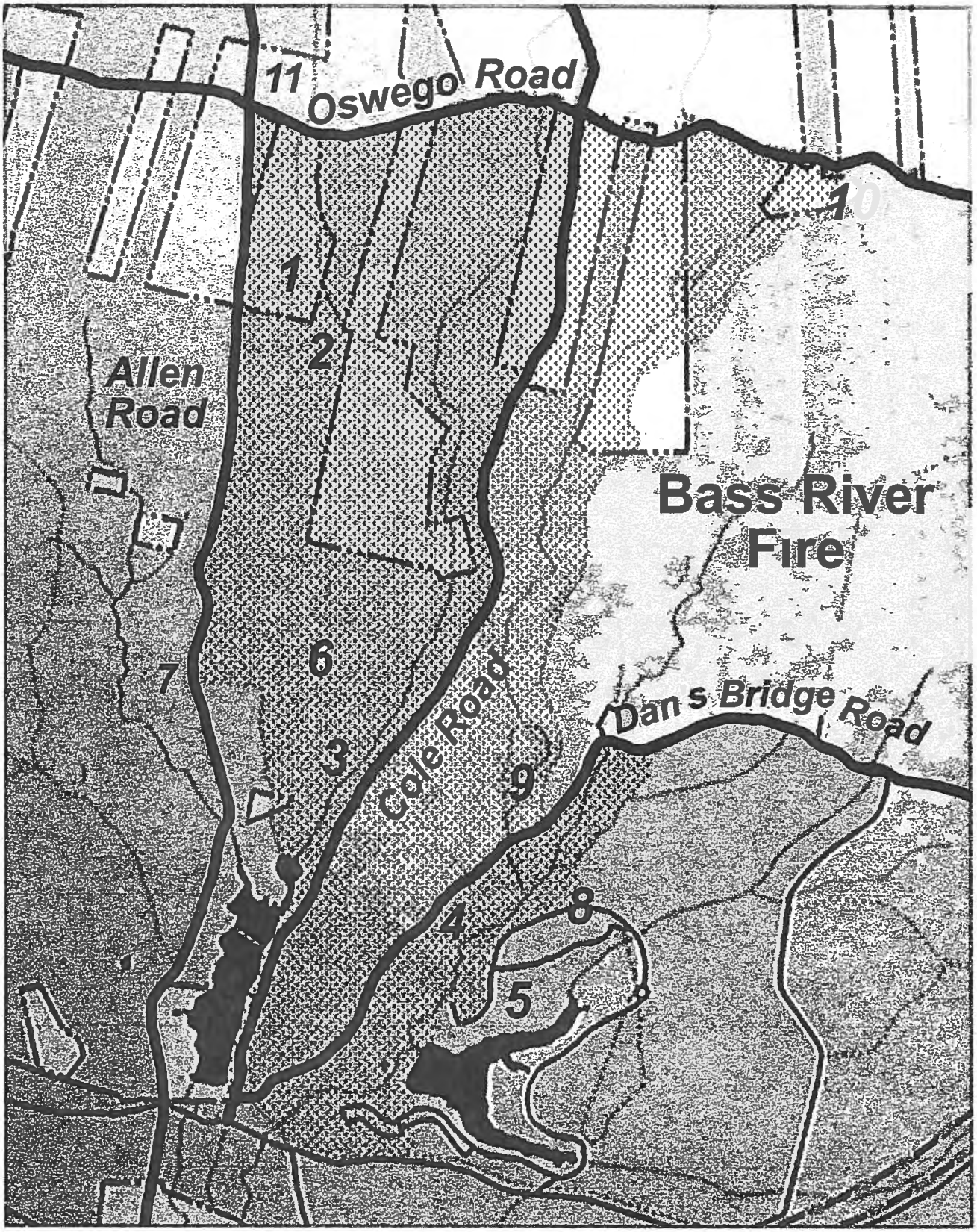
July 23, 1977
At 0008 the TD-20 had completed the line along the south west flank to protect Pilgrim Lake Camp Ground and was assigned to push out the old Sand Road that B-5 was backfiring.

At 0010 the D-8 Dozer completed the line to Dan's Bridge Road and was assigned to work with the TD-20.

At 0600 the dozed line and backfiring operation was completed to Oswego Road at Pt. 10.

At 0830 the firing-in operation from Pt. 10 along the Oswego Road to Pt. 11 was completed and the fire was contained.

There were several spot fires along the line between Pt. 9 and Pt. 10 on both July 23 and July 24 - all were contained and the fire was patrolled and pumped on until 0900 hours on August 15, 1977 when it was declared "Out".


11
Oswego Road
10
1
2
Allen
Road
Bass River
Fire
6
7
3
Cole Road
9
Dan s Bridge Road
4
8
5

Dude Fire
Case Study #2

Analysis Worksheet and Sequence of Events

DUDE FIRE CASE STUDY #2 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

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5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

Accident Investigation Report

Dude Fire Incident
Multiple Firefighter Fatality

June 26, 1990
Southwestern Region
Tonto National Forest

Accident Investigation Report

Dude Fire Incident

Multiple Firefighter Fatality

June 26, 1990
Southwestern Region
Tonto National Forest

ELDON W. ROSS
Chief Investigator
JUL 2 0 1990

Team Members:

Jerry Monesmith, Fire Operations, Safety and Training
Washington Office

Hank Walters, Regional Safety and Health Manager
Intermountain Region

Frank Quintana, Regional Safety and Health Manager
Southwestern Region

Arvin White, Director, Fiscal and Public Safety
Southwestern Region

Dick Mangan, Program Leader, Fire, Aviation and Safety
Missoula Technology Development Center

Ted Putnam, Equipment Specialist
Missoula Technology Development Center

Patrica Andrews, Fire Behavior Specialist
Intermountain Forest and Range Experiment Station

Lee Redding, Staff Officer, Recreation and Wilderness
Southwestern Region, Tonto National Forest

David Goens, Fire Weather Program Manager
National Weather Service

A. Sequence of Events

At approximately 1230 hours, June 25, 1990, a dry lightning storm started a fire under the Mogollon Rim on the Payson Ranger District, Tonto National Forest, Southwestern Region. It was sighted 1315 hours and when observed from the air at 1330 hours, the Dude Fire was estimated at 5 acres and located just below the Mogollon Rim.

An hour later, the size had grown to 50 acres and at 1615 hours, it was reported at over 100 acres with a spot fire about one mile east of the main fire.

By 1800 hours, 18 crews (360 firefighters) had been ordered in addition to the initial attack resources. A Type II Incident Management Team had been ordered earlier and was on the fire.

A Type I Incident Management Team was ordered at 2105 hours, on the 25th. The Team received a Line Officers briefing at 0430 hours, June 26.

Brisk down canyon winds pushed the fire to approximately 1900 acres by 0500 hours, on June 26, when winds subsided and the fire laid down.

The Perryville Crew arrived at the Payson Ranger District at approximately 1930 hours., Monday, June 25th. They were given instructions to eat and go to the Base Camp. While enroute to the Camp, following dinner, they were redirected to the Bonita Creek Subdivision on the fireline, arriving there about 0100 hours. Shortly after, they were moved again to the junction of Walk Moore Canyon and Control Road, arriving there at about 0230 hours.

The Crew began clearing a fireline up the jeep trail in Walk Moore Canyon. Part way up the Canyon, they were directed to continue the line along a power line right-of-way up to the Bonita Creek Subdivision. They arrived at the Subdivision at about 0500 hours, and worked there until 0900-1000 hours,

Following lunch they were directed to improve the dozer line, working down Walk Moore Canyon toward the Control Road where they had begun. By this time the jeep trail had been bladed by a dozer as a part of the fire control effort.

Type I Incident Management Team Operations Section Chief Derrick Cooke met with Type II Operations Section Chief Butch VanTilborg at about 1200 hours in the Bonita Creek Subdivision to discuss Overhead transition. Cooke made assignments to Type I Team Division Supervisors Bead, Bernal Gatewood and Jeffrey Whitney who also were in the area. Cooke then walked the fireline down Walk Moore Canyon from Bonita Creek, arriving at the Control Road at about 1415 hours.

A spot was reported below the Control Road on the west side at 1345 hours. Also, at approximately 1330 hours members of the Type II and Type I teams, when attempting to leave the Bonita Creek area found that it was surrounded by fire. Two dozers were directed to build a safety zone within the burned area.

The Perryville Crew was located approximately one-third of the way down the Canyon, at about 1300 hours, when they ran out of water. Crew Boss Larry Terra took Crew Member Fred Hill and left to get water at the Control Road leaving Assistant Crew Boss Sandra Bachman in charge with Crew Representative Dave LaTour. Terra sent the water up the line on an all-terrain-vehicle and began walking back with Hill.

The Crew gathered around the water supply, 3,300 feet from the Control Road, to fill their canteens. Just minutes after returning to work at about 1415-1420 hours, a Navajo crew member yelled "Get Out". All of the Navajo and Perryville Crew members, realizing the fire was blowing up, immediately began running down Walk Moore Canyon toward the Control Road. Part way down, 11 members of the Perryville Crew

were cut off when the fire crossed the dozer line. They turned around and began running back up the Canyon with orders to deploy their shelters.

Crew Representative LaTour radioed that the Perryville Crew was deploying their shelters. Strike Team Leader Scopa forwarded the message to Operations Section Chief Cooke at 1423 hours.

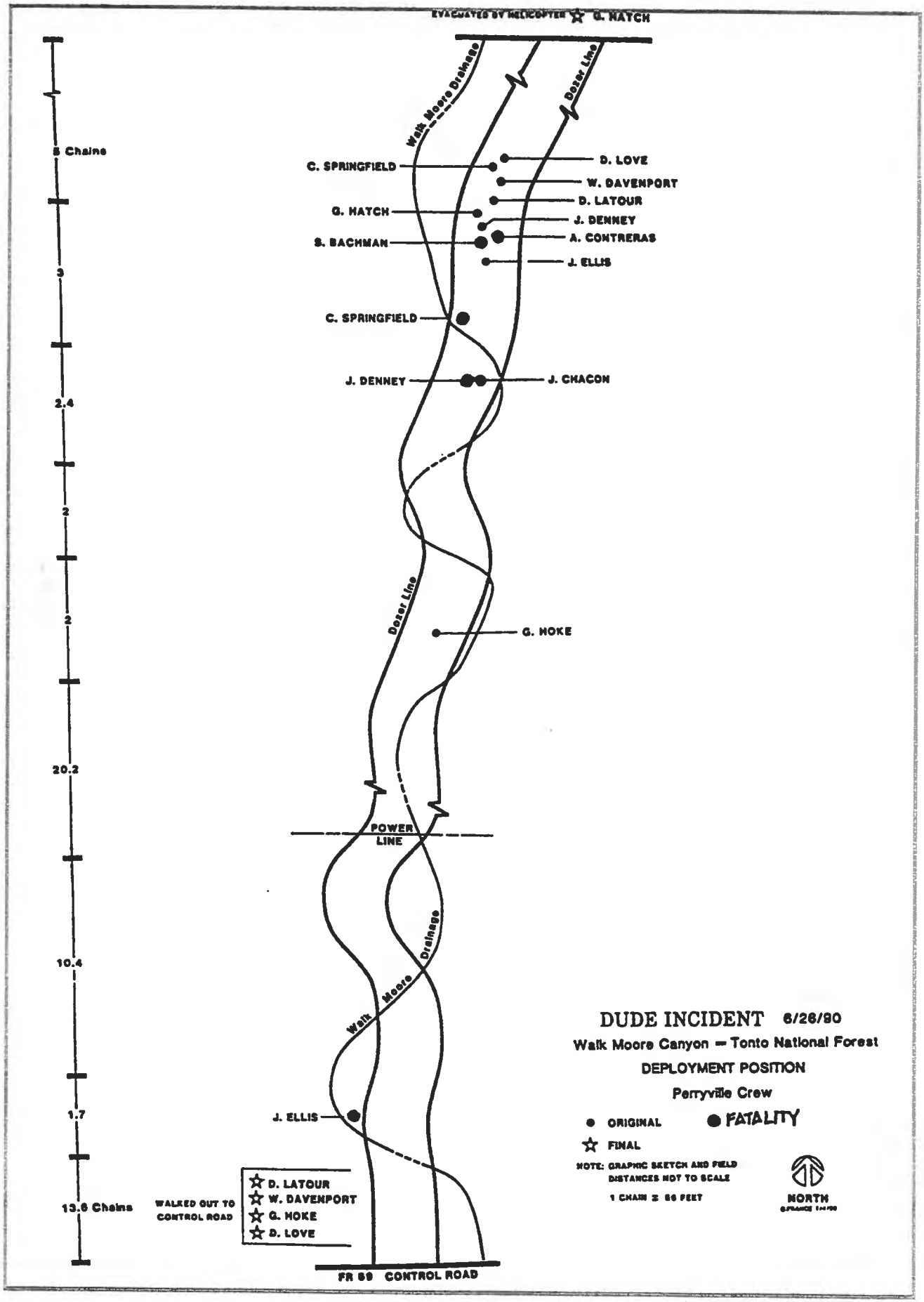
Crew member Donald Love deployed the furthest up the dozer line. Curtis Springfield was to his left, William Davenport to his right and just below. LaTour was just below Davenport. Geoffrey Hatch was below this group, then Alex Conteras, James Denney and Bachman. James Ellis probably deployed somewhere nearby. Joseph Chacon deployed 60 feet below Bachman and Gregory Hoke approximately 400 feet below Chacon.

At the time of the deployment, Denney was assisting Bachman with getting her shelter out. He then went down the dozer line. He was later found lying under Chacon. Springfield yelled "I can't take it anymore", got up, stumbled into Love's shelter, then went down the dozer line to where he expired about 150 feet below Love.

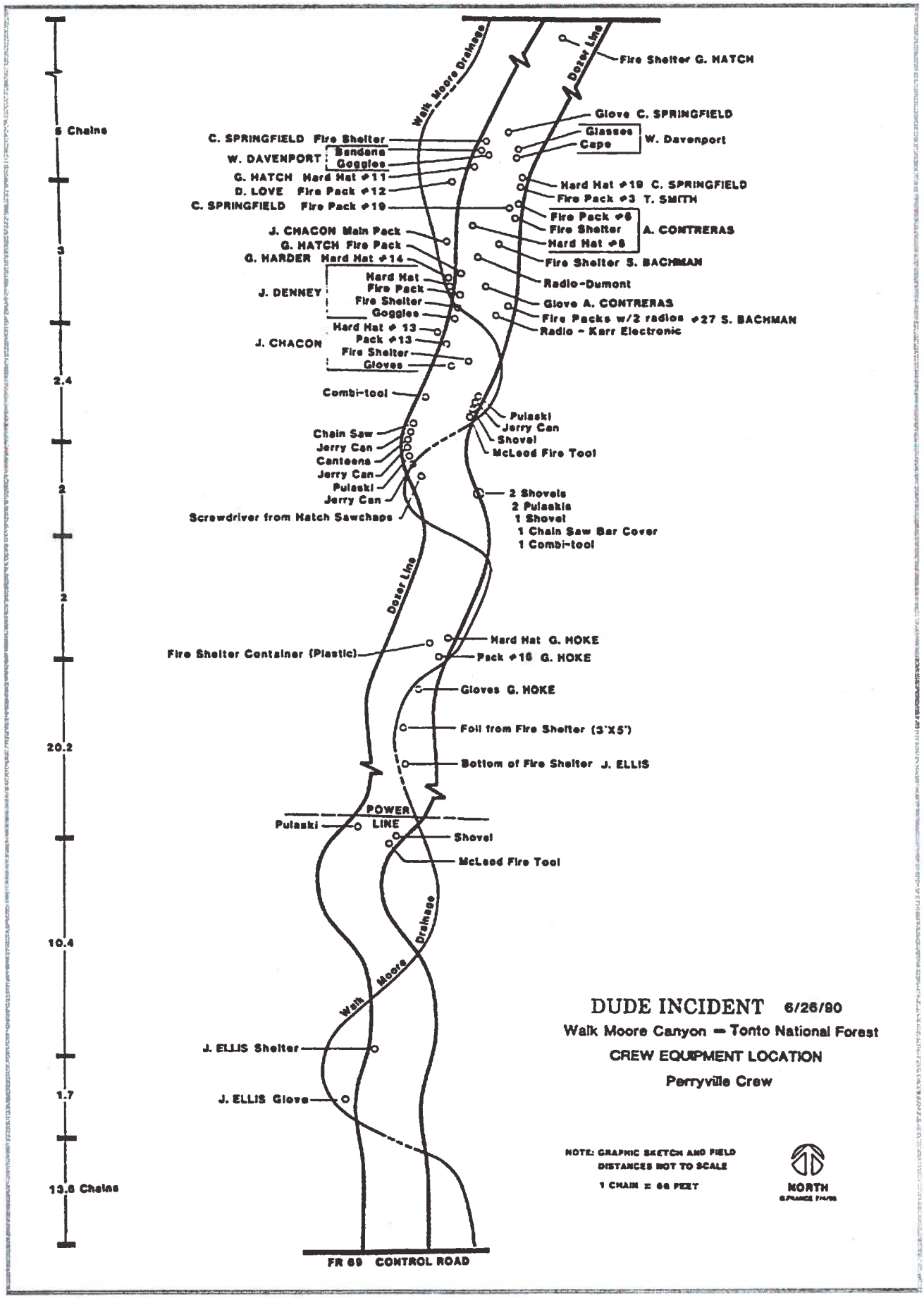
The front of Hatch's shelter was either blown or kicked off. Since he had lost part of his protection, he got up and ran up the dozer line. He continued up the dozer line about 200 yards where he was seen by Zigzag Hotshot Crew Superintendent Paul Gleason. Gleason call for Emergency Medical Technician (EMT) assistance and reported to Cooke, at 1434 hours, that he had found an injured firefighter.

Sometime during the entrapment, Ellis got up and walked down the creek bed and dozer line and spoke to Hoke who was still under his shelter.

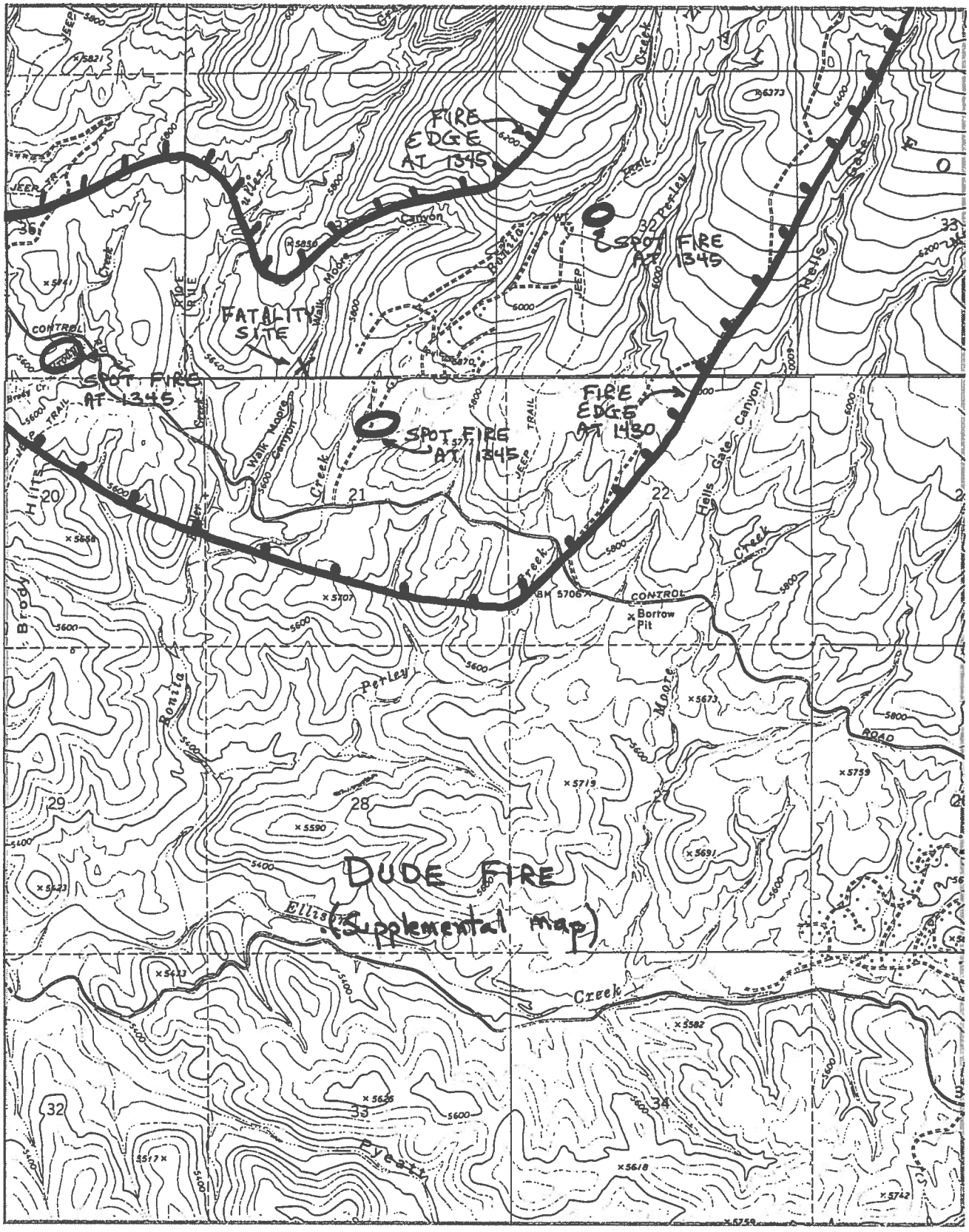
After the deployment site had cooled down, Davenport, Love, and La Tour got out of their shelters and proceeded down the dozer line toward the Control Road. They came to Hoke still in his shelter. The four continued down the Canyon and met Ellis coming up. The five then proceeded down Walk Moore Canyon where Ellis expired 900 feet from the Control Road. The remainder then continued on and met an Engine Crew on the Control Road at about 1505 hours.



Case Study 2-9



Case Study 2-10



Case Study 2-11

Golden Gate Estates Fire
Case Study #3

Analysis Worksheet and Sequence of Events

GOLDEN GATE ESTATES FIRE CASE STUDY #3 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

FIRE FATALITY ACCIDENT REPORT

Golden Gate Estates Fire
January 30, 1985

Florida Department of Agriculture
& Consumer Services
Division of Forestry
3125 Conner Boulevard
Tallahassee, Florida 32301
904/487-0936

March 14, 1985

Investigation Team

Team Leader

Bobby D. James
Aviation and Fire
U.S.D.A. Forest Service
Southern Region, Atlanta, Georgia

Safety

Gene Morse
Division Training and Safety Officer
Florida Division of Forestry
Tallahassee, Florida

Investigation

Earl Robertson
Investigator
Gainesville District
Florida Division of Forestry

Fire Behavior

Steve McCorquodale
Fire Behavior Officer
U.S.D.A. Forest Service
Montgomery, Alabama

Report Presented by:

Bobby D. James, Team Leader

Reviewed by:

Michael Long, Chief, Fire Control

Accepted by:

John Bethea, Director, Division of Forestry

FIRE FATALITY
SEQUENCE OF EVENTS

January 30, 1985

8:00 a.m. - Miranda spends the morning at the Naples Work Center attending to some repairs to his tractor plow. He had worked on a fire until 10:00 the previous evening.

11:00 a.m. - Fire Started

11:18 a.m. - Fire Discovered

11:30 a.m. - Fire Reported

11:38 a.m. - First crews dispatched to fire.

12:40 p.m. - First crews arrived on fire.

2:30 p.m. - Miranda notifies Forest Ranger Supervisor Young that his plow is repaired, and he is ready to go to the fire. He is immediately dispatched to the fire in the Golden Gate Estates area.

2:55 p.m. - Miranda arrives on Golden Gate Boulevard. He has some difficulty in determining exactly where he should go, and moves to a point on Golden Gate Boulevard east of the fire. He radios Young. Young, on 15th Street at the time with District Forester Graham, tells him that he will come out to Golden Gate Boulevard and lead him in to the fire. The radio traffic is heard by Pilot Ryan , who advises Young that he will direct Miranda to the fire. Young agrees, and instructs Ryan to position Miranda on the west flank, or where he is most needed.

3:00 p.m. - Mechanic Smith is a short distance away and moves to Golden Gate Boulevard to assist in leading Miranda to a point south of two structures on 13th Street, according to Ryan's directions. Ryan's final instructions to Miranda are to "grab the first piece of fire you come to and do the best you can."

3:05 p.m. - Miranda off-loads his tractor on 13th Street approximately 1,000 feet south of the two structures he is to protect. Smith notes that the fire is now coming around a home approximately 2,000 feet south of Miranda's position. He directs Miranda to put in one or more lines, and cautions him to plow in nothing less than third or fourth gear. He repeats his instructions: "Marco, nothing less than third or fourth gear." Miranda says, "O.K."

3:08 p.m. - On the roadside, a rag in Smith's hand is snatched away by a sudden wind. He notices that the fire intensity has picked up sharply. He jumps in his truck and radios Miranda to "Get out . . . come out of there." Smith puts the truck in reverse gear and backs as fast as possible. As he starts backing, he sees Marco's tractor headlights turn toward the road. Within seconds, heavy smoke covers the scene. The hair on his arm is singed by a flash of heat as the surrounding area bursts into flames. The fire overtakes him and rolls over the truck. He shifts to forward gear and drives back through fire and smoke.

3:10 p.m. - Smith proceeds northward, looking for some sign of Miranda, continuing until he reaches the house under construction. Graham and Young are there. He tells them that Miranda is in the fire somewhere, and that he might have come out on the other side of the block. They leave to search for Miranda on the other side of the block.

3:11 p.m. - Smith returns to where Miranda had started his line. Two fire trucks come by; neither has a Scott Air Pack. He places a wet cloth over his face and moves down the plow line in search of Miranda. The heavy smoke and intense heat force him to come back out. He drives to Golden Gate Boulevard and locates two firemen with Scott

Air Packs. They return with him to the scene. The firemen go in looking for Miranda. They return and tell him they have located Miranda's body.

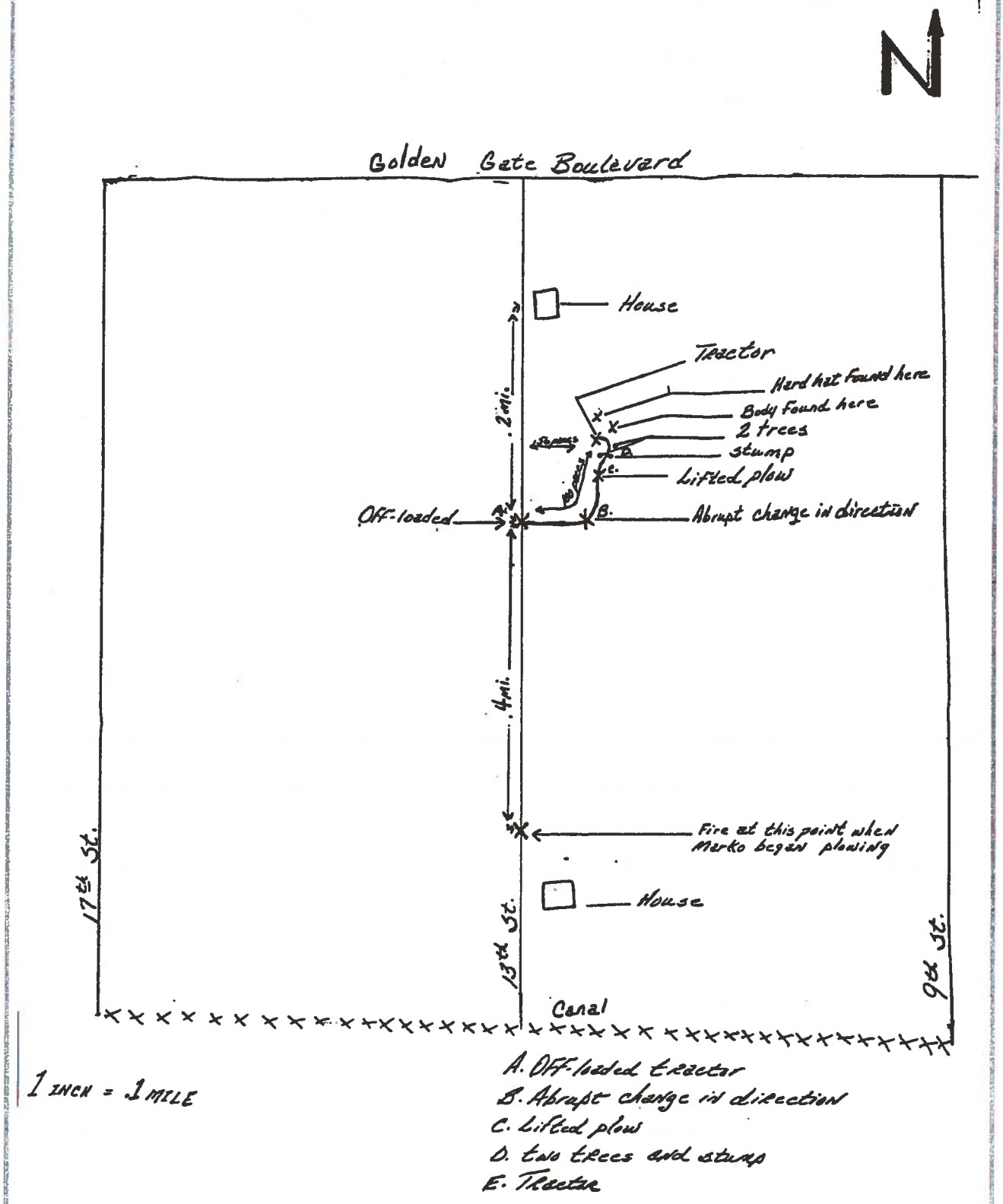
3:29 p.m. - He radios Young to come immediately: there is an emergency.

3:30 p.m. - Investigator Jones is nearby. He hears the message to Young, notes the time, and drives to the scene.

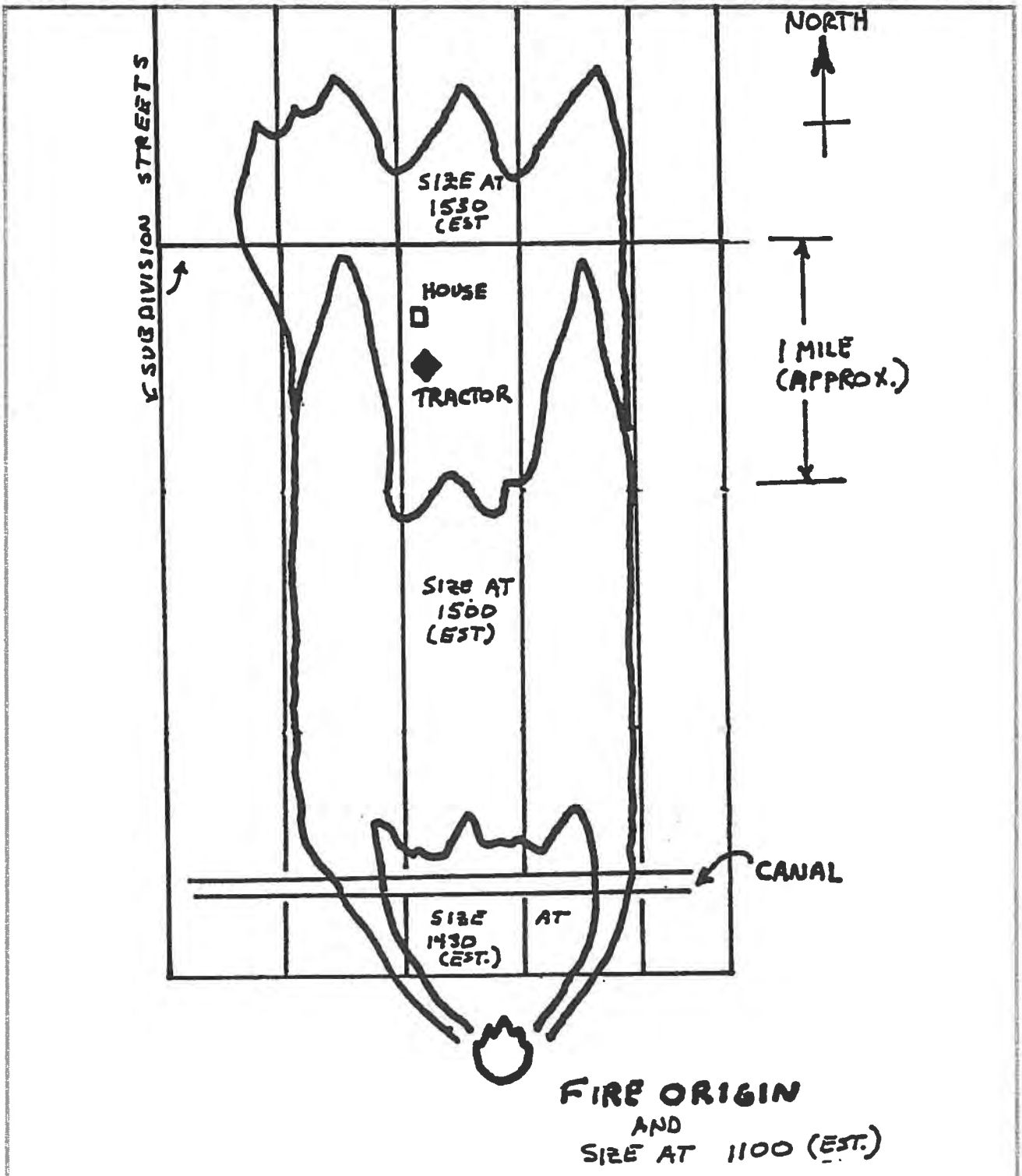
3:32 p.m. - Graham, Young, and Jones arrive at the same time. With Smith, they go in and locate Miranda's body.

5:01 p.m. - The body is removed from the scene by the Coroner's Office.

##########



Case Study 3-10



JANUARY 30, 1985
GOLDEN GATE FIRE GROWTH (ESTIMATED)

Lauder Fire
Case Study #4

Analysis Worksheet and Sequence of Events

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

LAUDER FIRE

ACCIDENT INVESTIGATION REPORT

SEPTEMBER 29, 1987

Dennis Lee Cullins Death

Four Employees Seriously Burned

Investigation Team:

William Harrington, Region I
Jack McCurnin, Region I
Dave Ebert, Fire Academy
Robert Hackbart, Sacramento Hqs.
Charles Chrysler, CDFEA

February 20, 1987

I. ACCIDENT SUMMARY

On September 29, 1987, at approximately 1005 AM, helitack crew 102, stationed at Kneeland in Humboldt Co., was working on the right flank (north side) of the Lauder Incident in Lake Co., when fire conditions caused the five-person crew to enter the burn to escape a portion of the main fire which was extremely hot, serious burn injuries were received by all the crew members; one crewman died at the scene. Shelters were deployed by all of the crew members shortly after entering the fire which probably saved the lives of the four members. While the crew member that died (Cullins) partially deployed his shelter, MacDonell stated Cullins had some difficulty deploying the shelter properly because of burns already received and panic. He was found partially outside of the shelter by rescue personnel.

The Kneeland Copter Crew was composed of Fire Captain Douglas MacDonnell, Firefighters Jeff Smith, Robert Munias, Dennis Lee Cullins and Tommie Brown loaned from the Howard Forest Copter Crew.

After landing at the incident, the crew (102) went up the right flank of the fire and met with several engine crews. They worked with the engine crews in line construction up the right flank. After working approximately two hours, they received a radio message asking them to go to the ridgetop to assist Copter Crew 101 with spot fires. This occurred about one-third of the way up the slope.

Copter Crew 102 proceeded up the slope approximately 500 feet and were in extremely heavy brush, with an overstory of oak and madron and

numerous 60 year old fir snags. The slope had increased to over 70 percent in spots.

A short time after starting to the top of the hill, their chainsaw, which was borrowed from Engine 1166, was heard running further up the slope and near the main fire's edge. The crew was cutting a way through the extremely dense brush to gain access and provide an escape rout should one be needed.

At the point where Copter Crew 102 ultimately entered the burn, they became aware of a minor flare-up below them. N. Moulett, Copter Pilot on 0102, had just previously warned of increased fire activity below them, which they acknowledged. With the flare-up, the crew became extremely concerned for their safety and the activity was approaching panic. Their escape route had been overrun by the fire. It was much too hazardous and difficult to try to cross the brush field to get further into the green, and Capt. MacDonnell told them their escape would be into the burn. Prior to the flare-up, the fire was described as light to moderate by some of the crew members, and they did not feel endangered in any way. The first flare-up was followed shortly by a significant increased activity described as 20 ft. flame lengths and a "wall of fire" just below their position.

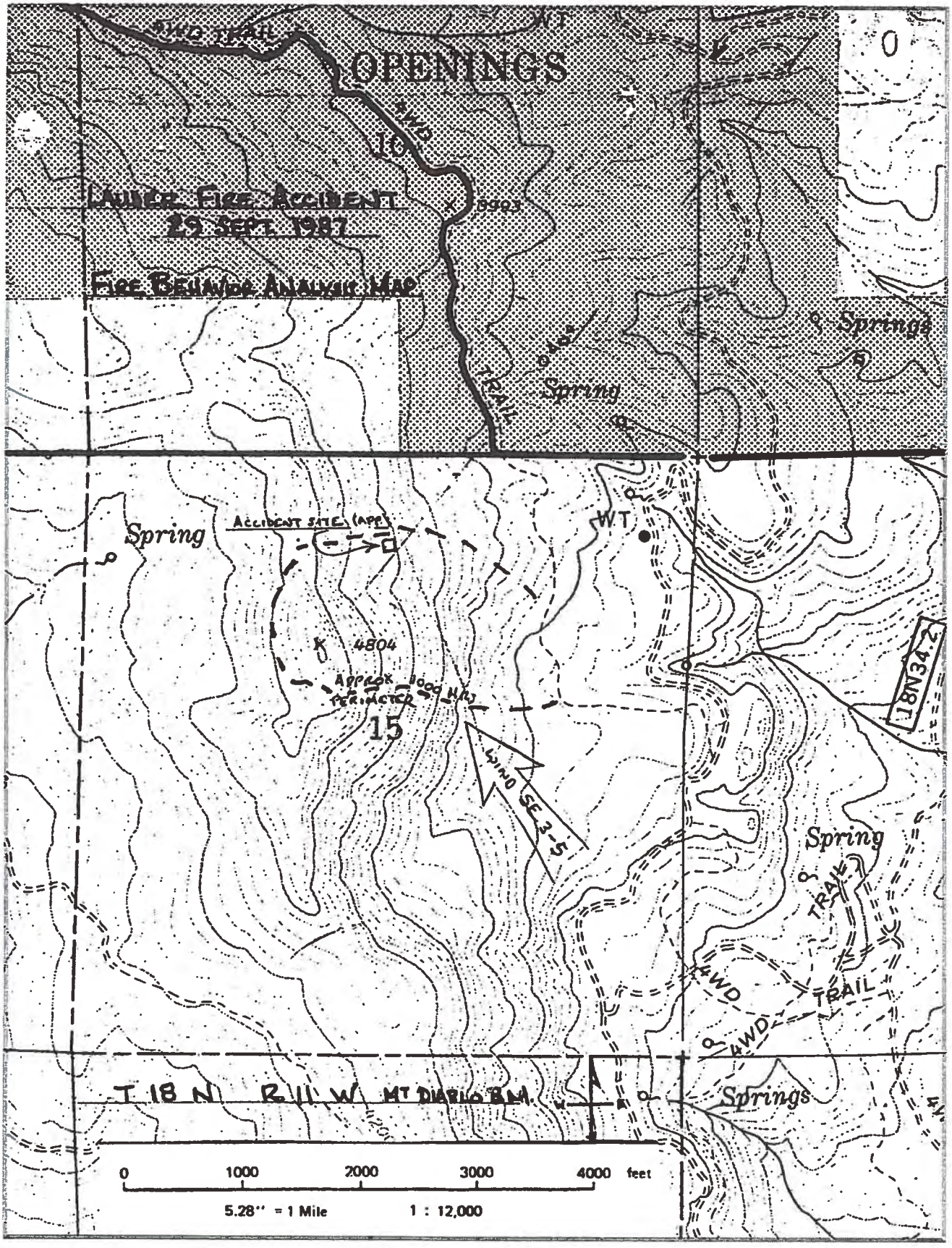
The crew entered the burn approximately 70 to 80 feet in a southeasterly direction. Because of large, burning old down logs and the intense heat, they turned back momentarily and deployed their shelters in a small opening. The heat was much too intense and all received burns before shelters were deployed. All had difficulty in

deploying shelters because of burns on their hands and panic. Firefighter Cullins tried to deploy next to a burning log and had to be moved several times because he kept getting up and seemed out of control to Capt. MacDonnell. The fuel bed where the shelters were deployed indicates brush stumps protruded from thick duff mantle. The ground fuel bed is a smoldering fire having burned approximately 15 mins. prior to their entry. The ground temperature was so intense, they had to keep changing positions in the shelters every 20 seconds or so. They may have sustained additional burns from holding the shelters against the hot ground.

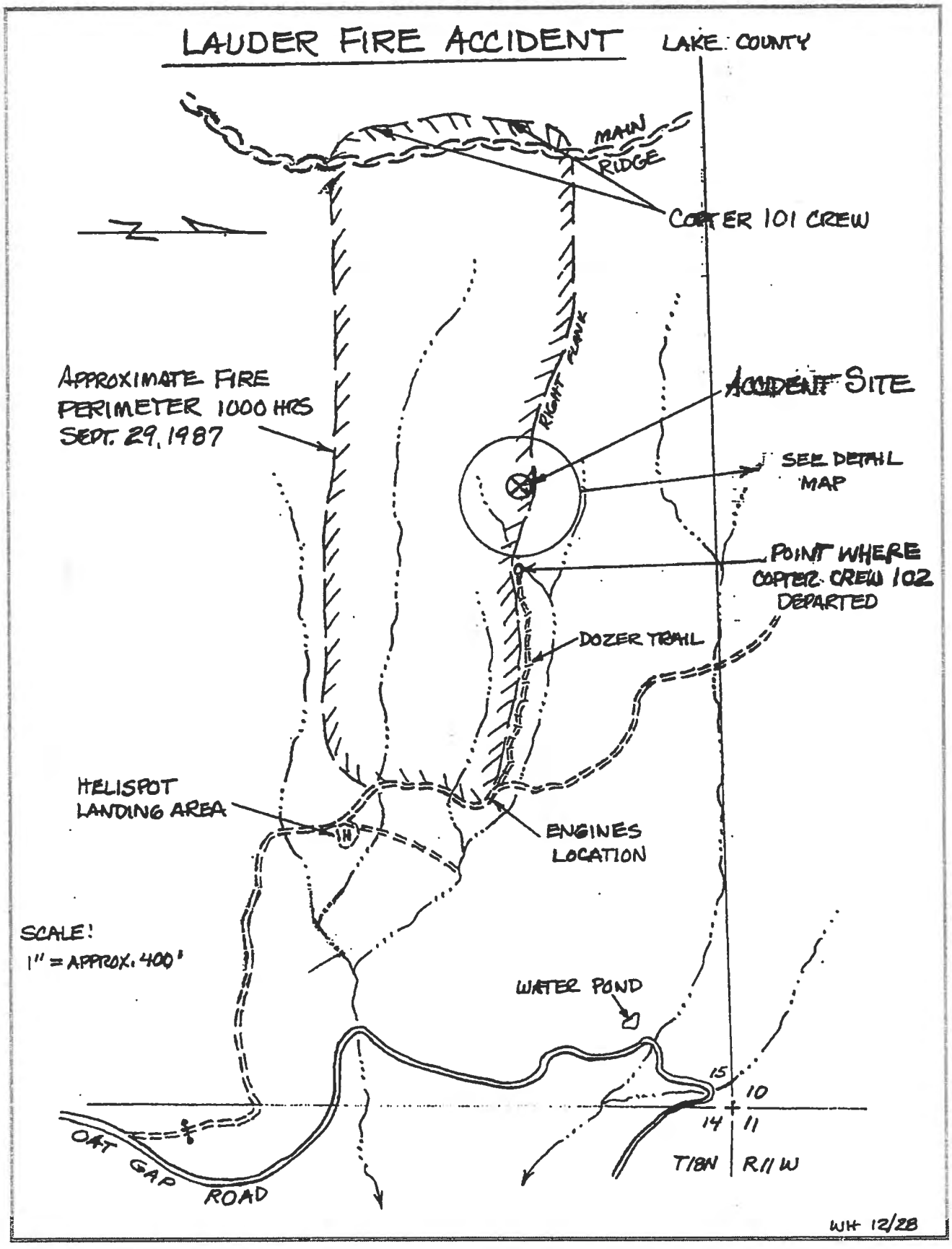
A message was broadcast from the crew on Yellow Air that they were in trouble and needed water. The pilot on Copter 102, overheard the message and began dropping water on the crew. After several water drops from Copter 102, airtankers began dropping retardant on and below them.

Radio messages from the trapped firefighters were heard by several units, and additional rescue operations were begun. Rescue included Copter 101 Crew, with Capt. Wattenburger and four firefighters, coming down from the top of the ridge; Engine Captain Robertson coming up from the lower right flank, and later they were joined by engine crew personnel and two Eel River crews. Additionally, two Coast Guard helicopters and an advanced life support helicopter from Santa Rosa were ordered. Initial rescue plans considered moving the victims down the hill in litters but that plan was abandoned by Fire Captains Robertson and Wattenburger because of

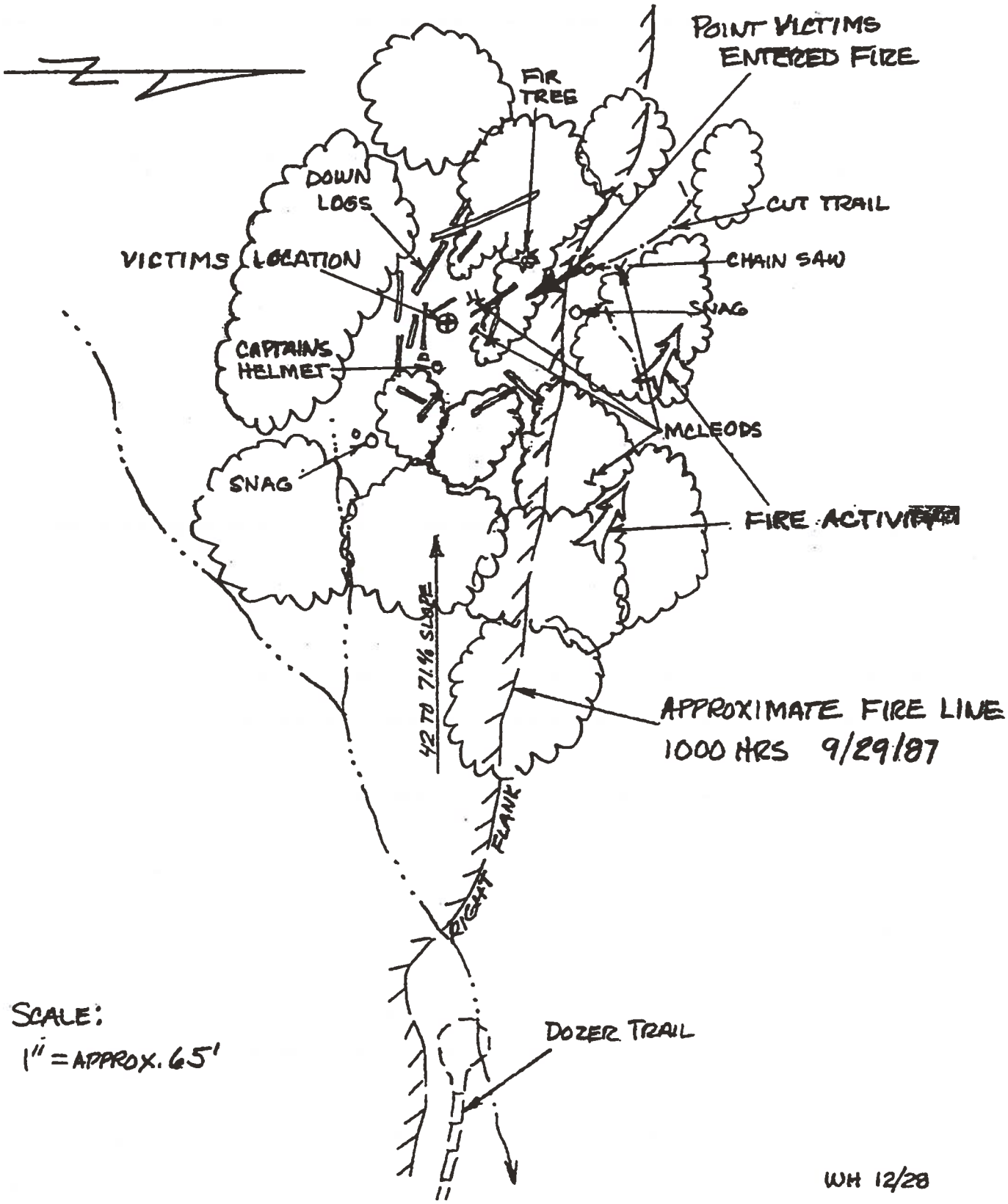
steepness of the hill, distance to an evacuation landing point and the additional trauma that it would cause victims. All injured were removed in litters by long cables from two hovering Coast Guard helicopters and transported to a nearby mill site for medical stabilization prior to transporting to the Chico Burn Center. The deceased was carried downhill to the road and turned over to the Lake Co. Coroner.



Case Study 4-10


LAUDER FIRE ACCIDENT
LAKE COUNTY
MAIN RIDGE
COPTER 101 CREW
APPROXIMATE FIRE PERIMETER 1000 HRS SEPT. 29, 1987
RIGHT FLANK
ACCIDENT SITE
SEE DETAIL MAP
POINT WHERE COPTER CREW 102 DEPARTED
DOZER TRAIL
HELISPOT LANDING AREA
H
ENGINES LOCATION
SCALE:
1" = APPROX. 400'
WATER POND
15
10
14
11
T18N
R11W
OAT GAP ROAD
WH 12/28

LAUDER FIRE ACCIDENT SITE DETAIL



Mack Lake Fire
Case Study #5

Analysis Worksheet and Sequence of Events

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

FIRE ANALYSIS REPORT

Mack Lake Fire
May 5-8, 1980

Mio Ranger District
Huron-Manistee National Forests

SUMMARY REPORT

Mack Lake Fire, May 5-8, 1980

SIZE: 24,790 acres (1,498 private; 23,292 NFS)

LOCATION: Mio Ranger District, Huron-Manistee National Forests

SPECIFIC CAUSE: Escape of Forest Service prescribed fire.

RESOURCE OBJECTIVES FOR PRESCRIBED FIRE: Critical habitat management for Kirtland's Warbler (endangered species), fuel reduction, site preparation.

ANALYSIS TEAM:

Richard Blank, Forestry Technician, North Central Forest Research Station, East Lansing, Michigan

John Frost, Meteorologist Technician, North Central Forest Research Station, East Lansing, Michigan

Dale Gorman (Team Leader), Deputy Forest Supervisor, White Mountain National Forest, Laconia, New Hampshire

Donald Grant, Forest Resource Protection Section Leader, Michigan Department of Natural Resources, Lansing, Michigan

Donald Haines, Research Meteorologist, North Central Forest Research Station, East Lansing, Michigan

William Herbolsheimer, Staff Director, Cooperative Forest Fire Management, Northeast Area State and Private Forestry, Broomall, Pennsylvania

William Martin, Forester, Fire Control, Mark Twain National Forest, Missouri

Robert Radtke, Wildlife Biologist, Regional Office, Milwaukee, Wisconsin

Al Simard, Fire Management and Planning Project Leader, North Central Forest Research Station, East Lansing, Michigan

The Analysis Team thanks the many Forest Service employees, State of Michigan employees, and private individuals that provided information to the Analysis Team.

CONDUCT OF ANALYSIS:

This report is based on information collected and measurements made between 1500 on Tuesday, May 6, and 1200 on Saturday, May 10, 1980. The analysis team has generally observed the entire fire by auto and aircraft. They have walked and observed conditions in detail in the prescribed fire area, escape area, the area at the scene of the fatality, and the Mack Lake subdivision. They have interviewed the fire boss and some of the members of the burning and initial attack crew, members of some VFD and MDNR, property owners at Mack Lake, and listened to concerns of area residents. They have interviewed weather personnel and gathered immediately available weather records. They have examined documents pertaining to the prescribed burn and made during the wildfire. Field measurements have been taken and samples collected and analyzed. Television video tapes and Polaroid pictures of the fire have been viewed. While we have tried to verify all the report's contents, it must be emphasized that parts of the report are based on hearsay and observations after the fact. This report follows guidelines found in Forest Service Manual 5190.

BACKGROUND:

The Kirtland Warbler's available habitat is critical to survival of species (211 known breeding pairs). Recovery plan developed jointly by Forest Service and Michigan DNR, approved by Director of Fish and Wildlife Service in 1976 identified maintenance and development of 130,000 acres in lower Michigan. To reach established goals through 1984, 3,500 acres of suitable jack pine need to be regenerated annually. Prescribed fire is used as a management tool. With few exceptions, the Warbler has been found to nest only on areas that have been burned. For the period 1964 to 1979 the Forest Service has successfully burned 26 areas totaling 3,960 acres, Michigan DNR 29 areas on 1,664 acres during the period 1977 to 1979. Fire excapes from spotting have occurred on past burns but in each case few acres were burned with minimum loss.

There are other resource benefits derived from management for the species. The jack pine stands are harvested for their timber resource

FIRE SITUATION:

Winter of 1979 to 1980 was marked by 35% below normal snow fall, April precipitation was 50% above normal. There are no indications of any drought situation existing at time of fire. Fine fuels were extremely dry for three days preceding the fire. District had controlled fires on April 22 (18 acres) April 22 (152 acres), May 3 (1/4 acre), May 4 (1 acre). The fire weather forecast the day of the prescribed fire indicated a low relative humidity and moderately gusty winds. A weak cold front was forecast to pass through area between 3 to 5 p.m. with wind shift but little change in wind speed, and possible showers. This forecast predicted very high fire danger.

Observations were taken by the burning crew on the fire at 9:45 a.m. A key component of the fire danger at that time was not calculated. The start decision was made by the District Ranger on recommendation of his technical staff, with plans that only a portion of the area would be

ignited and controlled if intensity became too great. The firing crews started a backing fire into the wind at 10:26 a.m. An 11 person crew with one 1,000-gallon tanker and one 125-gallon tanker and a tractor plow were assigned to execute burn. Several spot fires crossed the control line in a logged area but were easily controlled. Between 12:00 and 12:15 another spot fire jumped established control line into standing timber left for aesthetic purposes and burned two acres before it was contained. Another spot fire developed across Highway 33, was controlled, and another torched and crowned, spread 600 feet in six minutes and was declared an escaped wildfire.

WILD FIRE

Aggressive action was taken by the limited resources from the prescribed burn. The tractor plow and 1,000-gallon tanker began a flanking action on north edge of fire through dense stand of jack pine. The two units became separated, the tanker going ahead of the tractor plow. The fire turned north and crowned in front of the tractor, but behind the tanker. Tractor operator James L. Swiderski, age 29, Forest Service Biological Technician, attempted to turn north and then ran from the tractor but was likely caught by a second moving crown fire; death was immediate.

One motorcyclist in the area was hospitalized with first and second degree burns and released after three days.

Real and personal property loss is expected to reach $2,000,000. Suppression and related costs total about $500,000.

By 1:15 the fire had reached Mack Lake, two miles distant. It covered six miles by 3:30 p.m. Immediate assistance was provided by area volunteer fire departments and Michigan DNR. Sheriff's Department and State Police assisted in emergency services, evacuating the Mack Lake community. A frontal passage altered direction of fire at about 4:30 p.m. and forced evacuation of residents of South Branch, 12 miles distant.

Additional resources, manpower, equipment and overhead were ordered and delivered to Wurtsmith Air Force Base and Saginaw, Michigan. On May 6 resources on the fire included:

	Forest Service	Michigan DNR	Other
Manpower	123	20	44
Tractor	5	5	6
Pumpers	8	6	8
Salvation Army			6
Air Force			4
Local Cooperators			8

CONTROL

On the evening of May 5 and early hours of May 6, the fire moved south and east and spread was slowed by hardwood timber types and higher relative humidity. This allowed effective line construction and containment of fire. The final containment with completed line around the fire was at 1800 hours on May 6. The fire was halted about six miles from South Branch and two and one half miles from Curtisville. Final size was 24,790 acres. Fire was declared controlled at 1200 on May 7.

4. Execution of the Prescribed Burning Plan

The start decision was made by the District Ranger on recommendation of his technical staff. Weather forecasts received Sunday and early Monday were used in making the start decision. These forecasts came from a National Oceanographic and Atmospheric Administration (NOAA) State Forecast Center, Ann Arbor, Michigan. Forecast temperature (82°) and wind direction SW-W-NW were within the prescribed parameters. Days since rain (4) was also acceptable. Forecast minimum relative humidity (18-23%) was less than in the prescription. Forecast 10-hour timelag fuel moisture (12) was within acceptable limits. Forecast burning index (69) was more than double the prescribed upper limit. A wind shift to the NW occurring sometime between 3-5 pm was also predicted.

On-site observed weather measurements at 0945 were within the prescribed limits but daily maximums/minimums for wind, humidity, and fuel moisture were 4-6 hours away. The prescribed burning team took the field measurements but did not calculate the Burning Index prior to ignition at 1026 hours. Later calculation by the Mio Ranger Station indicated the Burning Index at time of field observation at 28 for the C Fuel Model and 58 for the Q Fuel Model. The critical fuel and weather factors predicted for the afternoon placed prescribed burn conditions out of accepted prescriptions that had been used successfully in the past.

The prescribed burning team's plan was to complete the burn before the wind shift. The firing technique used was a backing-fire starting at the SE corner of sub-unit 1A as prescribed (Figure 1). The backing-fire technique consists primarily of backing fire into the wind. Fire is started along arprepared base line, such as a road or other form of barrier, and allowed to back into the wind.

Normally, such fire proceeds at a speed of 1 to 3 chains per hour. This technique is perhaps the easiest and safest type of prescribed fire to control. It produces minimum scorch height for underburning and maintsins higher temperatures on the soil; works best in heavy fuels. One disadvantage is slow progress of the fire.

A test fire was not used.

As ignition began (Figure 1) and for the first 45 minutes, no particular problems were noted. The fire was contained within the line and was described as "not particularly active." It appears that a 50-foot wide back-burned strip with spotty combustion was completed prior to starting the second firing. After some distance had been covered, several spots (spots 1, 2, and 3 on Figure 1) crossed the line but were easily controlled as they were still in the cutover area.

Firing was stopped while suppression was going on. To be able to burn an area, you must burn on a day when burning conditions are conducive to burning. Thus, spot fires are anticipated and planned for.

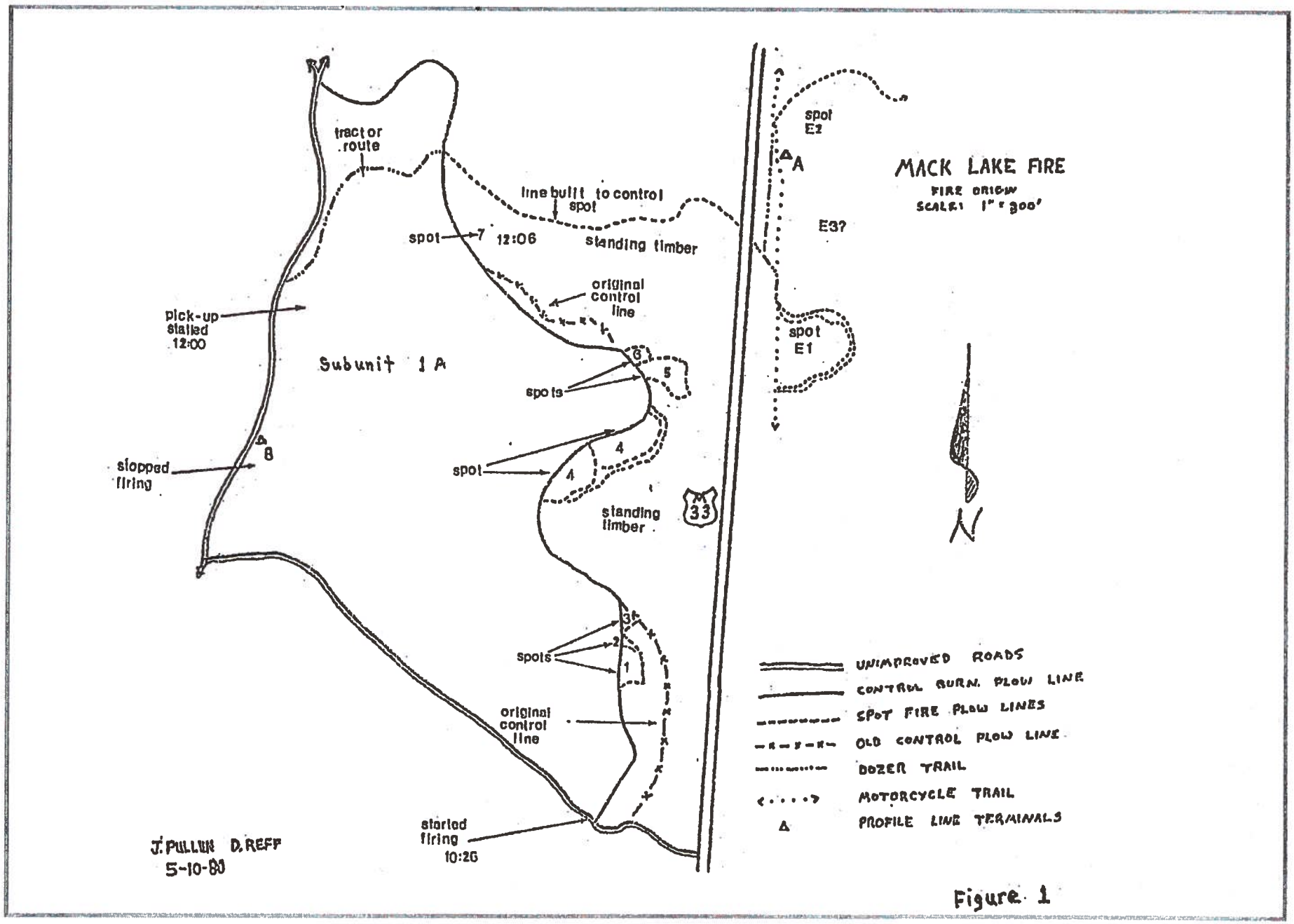

tractor route
line built to control spot
spot 7 12:06
standing timber
original control line
pick-up stalled 12:00
Subunit 1A
spots
6
5
4
4
spot
stopped firing
8
standing timber
33
spots
3
2
1
original control line
started firing 10:26
J. PULLEN D. REFF
5-10-80
spot E2
A
E3?
spot E1
MACK LAKE FIRE
FIRE ORIGIN
SCALE: 1" = 300'
N
UNIMPROVED ROADS
CONTROL BURN. PLOW LINE
SPOT FIRE PLOW LINES
OLD CONTROL PLOW LINE
DOZER TRAIL
MOTORCYCLE TRAIL
PROFILE LINE TERMINALS

Figure 1

The ignition of the backing-fire was proceeding at about 1,300 feet per hour (2,000 feet in 1½ hours). A perimeter fire with the wind was being coordinated with the backing-fire. It was the opinion of the Fire Boss and fire crew that either sub-unit 1A or 1B could be burned depending on the prevailing wind. The strategic plan was to ignite small blocks on the east side of the Crane Lake unit to widen the control line. By tackling small u nits of the whole it was felt the burning could be stopped and secured with short notice and if the weather stayed favorable for burning, a secure control line would be established for firing the remaining acreage of Unit 1 and all of Unit 2. The vegetation was in a transition stage and the District staff anticipated difficulty in getting the area to ignite due to the amount of new green ground vegetation so they wanted to start early in the day. Seven to ten days before May 5, a crew working on improving the fire line found ice still existing in the shade of slash piles.

After the spots were controlled, ignition resumed. A fourth spot occurred in a patch of standing timber left for aesthetic purposes. Spots 5 and 6 occurred in a second finger of the cut-over area which was to be left unburned. These were controlled. A seventh spot jumped into the northern most aesthetic strip of standing timber between the line and Highway 33. The location of the line adjacent to standing timber below the crest of the ridge could have been a major contributor to the escape. A 2-acre fire that burned into the standing timber between the planned area and Highway 33 eventually spotted across the highway. The tanker crew estimated winds at the ridge top to be 20 mph during the time of escape. No dust or fire whirls were observed. The crew expressed considerable surprise at how fast the fire was moving at this time.

Spot fire 7 happened about 1½ hours after the prescribed burn had been started. During this time of the prescribed burn very little material greater than ¼ inch in diameter was consumed. Al most no duff was consumed and char depth was ¼ to ½ inch.

The District Ranger feels the proximity of jack pine slash piles to the east prescribed burn line may have contributed to the fire's escape. The slash piles did contribute to some of the early spot fires. Because it was known at the time of the timber sale that this area was to be burned, the slash should not have been deposited near the planned control lines or if the control line location changed, the slash piles moved.

5. Fire Behavior

a. The Escape Area

At 1206 (in log), the prescribed fire spotted into standing timber adjacent to and up-slope of the prescribed area (Figure 1, Spot 7, Figure 6). At this time, the prescription was abandoned and wildfire suppression began. Scorch heights in this area were 2 - 6 feet and the fire was moving generally eastward. A plow line attempted to contain the fire between the prescribed burn and Highway 33. About 1215, the fire torched on the western edge of Highway 33 and spotted across. The first spot (100 feet away) burned about 3/4 of an acre with 2 - 4 feet scorch heights, but it was contained. The second spot (E-2,-Figure 4, 225 feet away) was noted at 10-15 feet in diameter. The fire was described as "very aggressive" by the fire boss. At this time, a great deal of smoke was reported across Highway 33. The tanker experienced considerable visibility problems. The second spot torched within 25 feet of the ignition point, and crowned within 100 feet. At this point, the fire was essentially lost. What may have been a secondary fire front burned 600 feet in approximately 6 minutes. A possible third spot was reported by the Fire Boss between the two main ones, but further back from Highway 33.

b. The Fatality Area

The tractor/plow unit was reported to have reached the second spot within 3 minutes of being called. It began plowing line and apparently attempted to circle the fire to the south (Figure 7). The fire likely jumped the plowed line and the tractor turned back north and tied in to the power line. The tanker which followed attempted to tie off the spot. The tractor resumed plowing just north of the power line, suggesting that the fire had just crossed the line. An estimated 6 minutes had elapsed between the start of the plow line and this point. The lineal distance from the highway was 600 feet, suggesting a spread rate of 100 feet/minute. It is hypothesized, however, that the main fire had already moved east some distance and that this particular involvement was with a secondary front/flank.

The tanker followed the tractor, working on the active northern flank. The fire was reported to be on the ground in the vicinity of the plowed line, but torching and crowning could be seen 100 to 200 feet inside the line. "Heavy, roiling black smoke" was described. The fire was then described as a turbulent ground fire with 6-inch to 2-foot flame heights. It shifted direction a number of times and there was fingering in a northern direction. The fire was reported

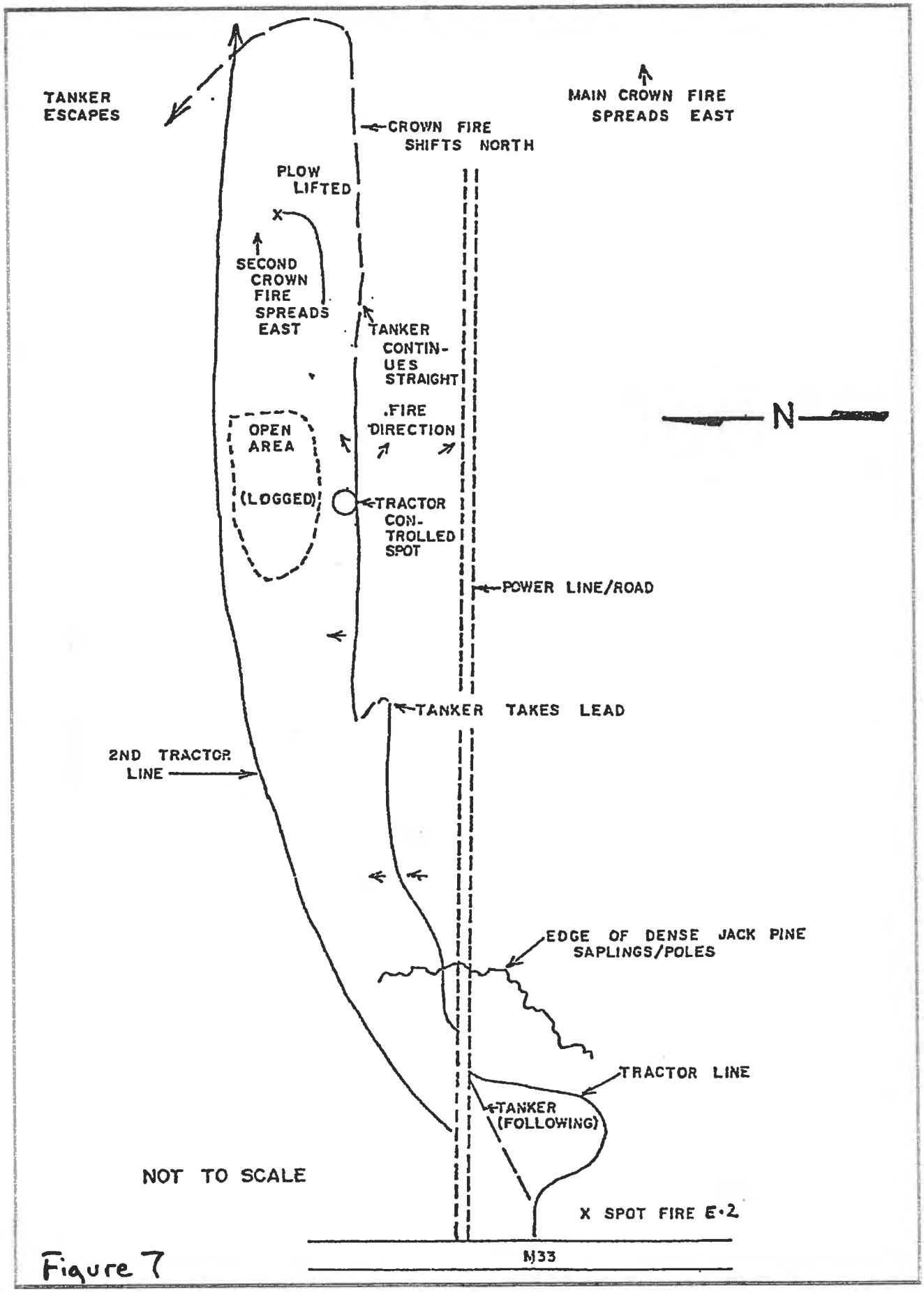

TANKER ESCAPES
MAIN CROWN FIRE SPREADS EAST
CROWN FIRE SHIFTS NORTH
PLOW LIFTED
X
SECOND CROWN FIRE SPREADS EAST
TANKER CONTIN-UES STRAIGHT
N
FIRE DIRECTION
OPEN AREA
(LOGGED)
TRACTOR CON-TROLLED SPOT
POWER LINE/ROAD
TANKER TAKES LEAD
2ND TRACTOR LINE
EDGE OF DENSE JACK PINE SAPLINGS/POLES
TRACTOR LINE
TANKER (FOLLOWING)
NOT TO SCALE
X SPOT FIRE E·2
M33

Figure 7

to be 'very sensitive to wind.' A slight change in the wind direction and a hot flank immediately turned into a crowning head." The changes were described as "instant." Fuels were variable-heavy to light. The tanker crew reported that despite traveling at 4-6 mph as they sprayed water, they could not catch the fire.

The tractor entered a dense stand of jack pine and small poles, 15 - 25 feet tall, 2"-6" dbh, and 500-2,000 stems per acre. It remained in this type throughout its efforts. The impact of the following tanker can be seen in an unburned strip of ground fuels 1-4 feet wide where the core of the spray landed. Also, there is a strip of uncrowned jack pine 25-50 feet wide on both sides of the plow/spray line. The tanker clearly wet the fuels sufficiently to knock down the crown fire. At no point, however, did the line hold. It can be noted that the fires spread 50-75 feet on the ground, north of the line, before it crowned again. Some torching on the north edge of the line was also noted.

Shortly after tractor and tanker left the power line, the tanker took the lead and the line was shifted 50 feet to the north. The plow overlapped the previous line, but did not tie the two together. Somewhat further along, the plow circled around a spot, indicating control difficulty immediately behind the tractor. It is reasonable to assume that by this time the fire had crossed the line behind both units (likely fairly extensively). A second plow line started from the power line about 200 feet west of the tractor #1. Clearly, by the time the second plow unit had arrived, the first line had been lost. At the point of the circle, Figure 7, (Tractor Controlled Spot), the fire is burning southeast to south on the south side of the line, indicating possible drawing in by the main fire. Just north of the line, the fire is spreading northeast to north, indicating that it was no longer under the influence of the main fire.

Somewhat further along, the tanker continued straight while the plow again shifted 75 feet north leaving a segment of unconstructed line behind him. Presumably, at this time the fire was north of the tanker line. We can hypothesize a separation between the units on the order of 5 minutes at this time. The tractor continued plowing eastward for a short distance (100 to 200 feet). It appears that the fire crowned to the north, across the path of the tractor. He turned north and lifted his plow. After about 100 feet he abandoned the tractor and ran eastward. By this time, however, the fire which had crossed the line behind the tractor had reached a large logged over open area with a good wind fetch. It crowned, spreading eastward, trapping the operator. The tractor's elapsed time from M-33 to this point was 20 to 25 minutes.

Meanwhile, the tanker, which had also abandoned its control effort turned north and then west, escaping ahead of the second crown fire. The two units were separated by approximately 100-200 yards. Finally, sometime afterwards the second plow line crossed the tanker's path and continued eastward. In the final analysis, not one of the control lines constructed during this period held the fire. The tanker operators reported that even traveling at 4-6 mph they never saw the head of the fire.

f. Status and Location of District Initial Attack Forces

On May 5, 1980, the Mio Ranger District had a predicted (AFFIRMS) FLI of 34-C model, 54-Q model. This put them in Manning Class Level 7 according to the District Mobilization Plan, Manning and Specific Action Guide (Appendix G). A comparison of the M-SAG and actual action follows:

Manning and Specific Action Guide Calls For:	Actual Location
5-2 6x6 tanker at Mio w/2	On prescribed burn
5-4 tilt bed at Mio w/1	On prescribed burn
5-5-4 tractor plow w/1 at Mio	On prescribed burn
5-3 pickup w/3 in Luzerne area	On prescribed burn
5-5 120-gallon tanker w/3 in Mack Lake area	On prescribed burn
Cooperator w/tractor plow unit with F.S. Foreman	Not on standby
Radio and tractor foreman in Mio	Not on duty
Mack Lake VFD and 190-gallon slip-on with 2 tankers on standby at Mack Lake	Not on standby
3 men w/50-gallon slip-on tanker at Mio	Not on duty
Cooperator w/tractor and plow with F.S. radio and tractor foreman at McKinley	Not on duty
McKinley, Luzerne, Mio, Lupton VFD on standby	Not on standby
3 men w/handtools at Mio	Not on duty

Total manpower = 42

Actual manpower in place as specified in M&SA Guide - 0

The manning specified in the Manning and Specific Action Guide was not met; the items at the prescribed burn should not be considered since they were not free to leave the area and respond to an unexpected wildfire.

SECTION II - FIRST PHASE - INITIAL ATTACK

A. INTRODUCTION

On May 5 the District Clerk (primary dispatcher) was off duty on a flexi-tour. The Clerk Typist (back-up dispatcher) and a Senior Community Service Employment Program (SCSEP) employee were working in the Mio office. The Clerk Typist has worked for the Mio District and Forest Service for about 2 years and is acquainted with the operation of the District radio. Her experience has been gained as back up dispatcher and has dispatched on several small fires. She has been instructed in making entries in the fire log book. The afternoon of May 5, she was assisted by the SCSEP employee who helped out by answering the telephone. The District Clerk was called to duty at 1245 (radio log) and reported about 1300.

The location and behavior of the fire was observed by the initial attack Fire Boss from detection through initial attack. As explained previously, report and travel time are immaterial since the initial attack forces were at the scene. Initial attack on spots east of M-33 were fast and aggressive.

B. INITIAL ATTACK FORCES

1 - Fire Boss
1 - Tractor-plow unit and operator
1 - 1000-gallon pumper with driver and nozzleman
1 - 125-gallon tanker with driver and crewman
(on way to Mio to have 4x4 electrical system repaired when fire jumped M-33)
2 - Misc. overhead
3 - Crewman with hand tools and pack pumps

Total of 11 people, all from the prescribed burn.

C. REINFORCEMENTS*

1 - Tri-Town VFD 4x4 - Arrived at 1225
1 - Tractor plow unit - Arrived at 1230
1 - MDNR Wildlife D-7 Tractor - Dispatched at 1252
1 - MDNR Tractor/plow with Forest Service radio - Dispatched 1255
1 - Tractor - Arrived at (Unknown)
1 - 1000-gallon tanker, Rose City - Arrived at (Unknown)
1 - Rose City VFD 4x4 - Arrived at 1330
1 - MDNR Skidder (Roscommon) - Dispatched at 1345
1 - MDNR 6x6 (Mio) - Dispatched at 1358
1 - Mio - Arrived at (Unknown)
1 - Luzerne VFD - Arrived at (Unknown)
3 - Fairview VFD - Arrived at (Unknown)
1 - Tawas Crew - 7 men - Arrived at 1520
2 - Brush Trucks - Camp Grayling - Arrived at 1730
1 - Dozer - Camp Grayling - Arrived at 1730
2 - McKinley VFD - Arrived at 1753
2 - St. Ignace tankers - Arrived at 2030
1 - Lupton VFD - Arrived at (Unknown)

*These reinforcements were entered in the Forest Service or MDNR radio logs. Other equipment was observed by various people as being on the fire; there is no record of what kind or owner.

The Fire Boss recognized the need for reinforcements for both the prescribed burn and initial attack. The radio log records his request for traffic control help from the Sheriff at 1142. At 1220 the Fire Boss told the dispatcher in Mio he needed the 4x4 from Tri-Town and another tractor/plow unit. At 1230 he asked for another tanker and tractor. By 1245 the Fire Boss asked for the Luzerne VFD, and more trucks. A general request for reinforcement was started by the Mio dispatcher at this time.

The initial attack forces used for much of the initial period were those assigned to the prescribed fire, MDNR equipment was readily available and they (MDNR) made two contacts (1228 and 1236 from MDNR radio log) with the Mio office to ask if they were needed. They were told to standby and that someone would get back to them; then in the press of business (or lack of a direct telephone line), the

Forest Service called back at approximately 1430 asking for equipment in the D-6 and D-7 class. However, several pieces of MDNR equipment were dispatched by someone to the fire: a Wildlife Division D-7 from Grayling at 1252, a Mio tractor at 1255 (request by Forest Service), Roscommon Skidder 1345 (request by Forest Service), and Mio 6x6 tanker at 1358.

The Assistant District Forest Manager, MDNR, Mio, upon hearing about the condition of the escaped fire from his dispatcher and aerial observation plane pilot called other MDNR units and advised them that they could expect calls for assistance. About midnight, a call was made to the Fire Boss who was at the Mio office. Equipment was offered for the following day shift and accepted. Thirteen pieces of MDNR equipment were dispatched to the Mack Lake fire on the morning of May 6.

The afternoon of May 5 the MDNR authorized its District headquarters to give all assistance possible to the Mack Lake fire. Equipment was shifted from MDNR Regions I and III to the Roscommon Region in order to provide for additional equipment, if needed, and to strengthen support fire control capability for any other occurring fires.

All personnel on the prescribed fire had the minimum fire suppression training that is required. The training records were not complete but it is doubtful that anyone except the Fire Boss and District Ranger had much additional formal fire training. The Forest has not held any formal training session on prescribed burning. This was the second time that the Forest Service Mio District tractor operator had performed on a wild fire as a tractor plow operator. He had received formal tractor driving training, but was scheduled for a license exam during the week of May 5.

The initial attack equipment assigned was the kind needed. The new armored 6x6 and the tractor with recently attached Michigan fire plow performed very satisfactorily. There was not enough of it. The 4x4 slip-on tanker unit may not have been in good condition as its crew had a problem keeping it running and starting it during the prescribed burn.

Early in the initial attack radios were available in adequate numbers for Forest Service people and when communication problems did exist, they were handled by radio replacements. Later, however, equipment operators and individuals were involved with initial attack for several hours without radio contact or direction. This was especially true for MDNR and VFD units. Control line was built by people without the ability to inform anyone of problems that might be developing. Difficulty existed in assignments and in trying to maintain contact.

There does exist in Michigan a fire control frequency assigned by the State only for on-site fire control use, 154.295, and many VFD

and all MDNR area fire supervisors have mobile radios with this capability. In addition, at Roscommon, the MDNR has a fully equipped communications command post, (mobile) self-contained, and is available for use on any emergency.

The initial attack was unsuccessful in that sufficient equipment was not available to pick up spots before the jack pine began to torch out and make a running crown fire. The availability at the fire of a second tractor plow unit, as called for in the burning plan, would probably have made picking up the first three spots east of M-33 possible. Whether this would have been enough to control any additional problems is open to question, particularly as the peak of the day's burning conditions was still to come.

A key part of the dispatching duties is to anticipate needs and do preliminary arrangements for overhead, firefighters, and equipment. The Forest does not have an automatic mobility or backup plan for wildfires. Backup to Forest Service initial attack normally comes from VFD units and the Michigan DNR. The 1968 MDNR - Forest Service Memorandum of Understanding states that either agency, upon request, will assist in mobilizing and recruiting manpower and equipment and loan to the other agency for fire suppression supervisory personnel and equipment within its ability. Cooperative agreements with local VFD spell out the responsibilities of each agency and like the Forest Service and the MDNR, the VFD have worked closely on many wild fires in the past. In fact, on May 5, at 1105, the Luzerne VFD reported a fire on County Road 490 just past Big Creek and proceeded to control it before a Forest Service dispatched dozer was needed.

D. MACK LAKE COMMUNITY

It was during the initial attack phase of the Mack Lake fire that approximately 44 private structures were damaged or destroyed. The wildfire moved from source of ignition to the Mack Lake residential area in about 45-60 minutes, a distance of 2 miles. The main fire arrived as a running head fire. It is not clear who dispatched what equipment to protect the buildings in this area. Indications are dispatching was by more than one source. The Mio-Tri-Town VFD was called at 1224 and asked to send everything. The Fairview and Rose City VFD's were called at 1315 and asked to send all equipment--Fairview to Mack Lake and Rose City to Wagner Lake. The McKinley VFD said the Sheriff's Department notified all VFD's at 1300. The Mio radio log shows Luzerne and the MDNR were on their way to the fire at 1253.

Some of the VFD, MDNR, and Forest Service units went directly to Mack Lake, others to staging areas. The Fire Boss was concerned with getting the residents to safety and was informed by the Mio Office that the Sheriff's Department had evacuated everybody from Mack Lake (time not recorded), but there were still people in the area coming and going. The Sheriff's Department patrolmen and Forest Service employees were trying at various locations to keep traffic from going into the head of the fire. At other locations, people were deciding to go into the fire to protect the cabins.

Romero Fire
Case Study #6

Analysis Worksheet and Sequence of Events

ROMERO FIRE CASE STUDY #6 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lack ing?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

ROMERO FIRE INVESTIGATION REPORT

LOS PADRES NATIONAL FOREST

REGION FIVE

OCTOBER 7, 1971

APPROVED BY: M. R. Howlett

M. R. Howlett, Chairman

R. K. Greene

R. K. Greene, Office of Inspector General

M. R. James

M. R. James, Forest Supervisor

W. R. Moore, Assistant Regional Forester

Dean Qualls

Dean Qualls, Safety Officer

FOR OFFICIAL USE ONLY

ROMERO FIRE INVESTIGATION REPORT

LOS PADRES NATIONAL FOREST

REGION FIVE

The Investigation Team

M. R. Howlett,	Director, Division of Engineering Washington Office, USDA, Forest Service
R. K. Greene,	Office of Inspector General, USDA San Francisco, California
M. R. James,	Forest Supervisor Sequoia National Forest
W. R. Moore,	Assistant Regional Forester, Region One Missoula, Montana, USDA, Forest Service
Dean Qualls,	Safety Officer Washington Office, USDA, Forest Service

Assisted By

Byron Carniglia, California Division of Forestry

Clemence R. Crouch, Deputy Forest Supervisor
Los Padres National Forest

Clive M. Countryman, Fire Behavior Specialist

Numerous Witnesses as interviewed

FOREWORD

This report is the result of an intensive on-the-ground study of the circumstances leading to this tragedy. Specific recommendations are made to reduce the chances of such future losses.

KILLED IN ACTION IN LINE OF DUTY

1.	Cumor, Richard Lee, 26	USFS Employee working as a swamper.
2.	DeLoach, Delbert Dale, 26	USFS Employee working as a swamper.
3.	Klepperich, Thomas H., 34	USFS Employee working as a tractor boss.
4.	Minneau, James	Contract bulldozer operator.

CRITICALLY or SERIOUSLY INJURED IN LINE OF DUTY

1.	Hotchkiss, Gerald	Contract bulldozer operator.
2.	Kaiser, Leonard	Contract bulldozer operator.

DETAILS SURROUNDING THE ACCIDENT

The Romero fire started at 3:45 p.m. on October 6, 1971, in an area mutually protected by the Forest Service and Santa Barbara County, a "contract county" for the California Division of Forestry. The area of the fire origin is also in a fire district. Because of Initial Attack Agreements, several fire districts were involved in the initial attack. (See Attachment 15.)

The area of the fire where the fatalities occurred was the southern fire edge above the Santa Barbara, Montecito, Summerland, Carpinteria area. The first night's action consisted of picking up the fire edge and a holding action to keep the fire out of the developed ranching and residential areas. This procedure was continued into the daylight hours of October 7 (the day of the tragedy).

During the night and early morning hours of October 7, the California Division of Forestry assumed responsibility for the portion of line where the tragedy occurred. At about 10:00 a.m. on October 7, the Forest Service committed four contract bulldozers to this section of line to work under the CDF through a liaison officer. A team of four Forest Service tractor bosses was assigned to work with the cats under Tom Klepperich. Klepperich reported to Doug Hayden, the Forest Service liaison officer who was coordinating the overall line construction with the CDF. Hayden had a line scout, Robert Nelson, who was working with Klepperich (see Attachment #5 of the Organization).

Klepperich, with the cats and CDF crews and tankers, spent the morning of October 7 building line and firing out. At this time the fire was moving slowly and was being held on the north side of the Camino Cielo firebreak and on the southeasterly edge of the ridge about Point A on Attachment #2. At the NE corner the fire had dropped over into the headwaters of Santa Monica Canyon. This easterly and northeasterly section of line was open but being held more or less static by frequent retardant drops by aircraft.

At about 1500 hours, Doug Campbell, the Day Line Boss, decided to construct an indirect line from Point B on Attachment #2, easterly to the bottom of Santa Monica Canyon (Point D). He believed that retardant drops could keep the fire backing down slowly into the bottom of Santa Monica Canyon, and could be picked up by constructing hand line and burning out from the Canyon bottom. Campbell realized this line had marginal chance for success, but it was the last hope for about 4 miles (see Attachment #10, Pre-attack Plans). This plan was discussed with the Fire Boss, Ben Lyons. Consequently, the 4 tractors, with Klepperich, Cumor, DeLoach, and McMullen, were committed to the construction of this line.

1. The night overhead and crews (CDF pumpers, hand crews, and FS and CDF overhead) were up on ridge on Point A, Attachment #2, and had not been committed.

2. The tractors under the Inyo Team were manned by a day crew which had not yet been relieved, although a relief crew was standing by. They had been told to come out but had not yet started out. They were extended on an indirect line with gaps and less than adequate safety zones constructed along the way.

3. The Forest Service CDF Liaison Officer and all other personnel with whom the tractor crews had been in contact during the day had been relieved and had started back to camp.

4. The night shift people had arrived either at dusk or after dark and were in the process of trying to assess the situation and determine what action to take.

5. At about this time, communications with Klepperich broke down due to inadequate radio equipment. (From about this time until after the tragedy, several people tried unsuccessfully to reach Klepperich on the radio. This was not a radio failure--it was due to antiquated, inadequate equipment which could not be heard by Klepperich or the tractor crews.)

We must assume that if more effective and positive management action to develop the night strategy had been taken, all men and equipment including the tractor crews would have been assigned to productive, safe tasks much before this accident occurred. A time lag of more than one and one half hours passed, in which no action was taken, after the joint decision was made not to burn out the line.

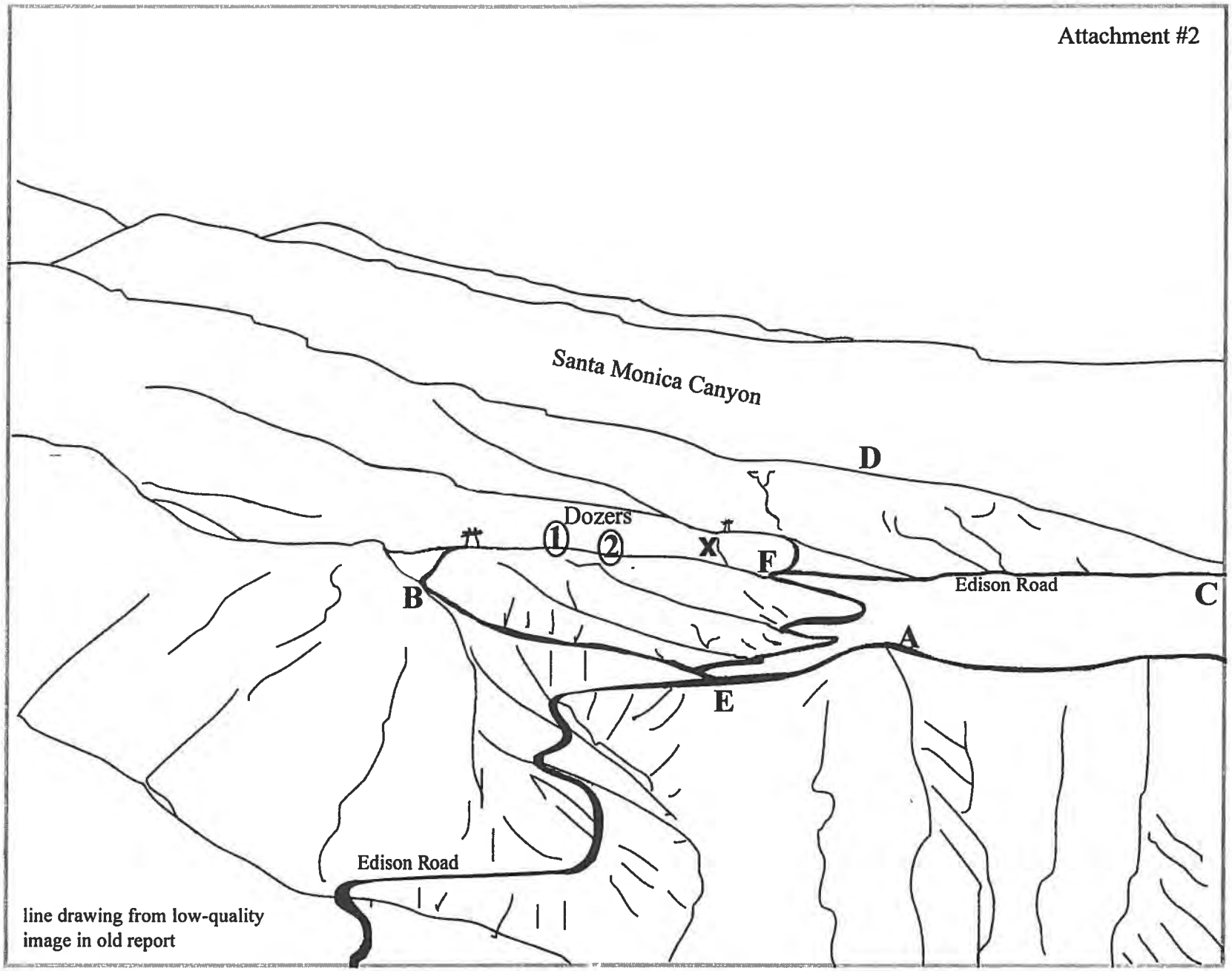
At about 2000 hours there was discussion by menbers of the tractor crew that the fire was picking up and it would be well to move out of the canyon bottom. Klepperich at this time reiterated that they would work until 2100 hours, and then go out to be refueled. This had been his decision at the time he talked to Hayden and nobody questioned it.

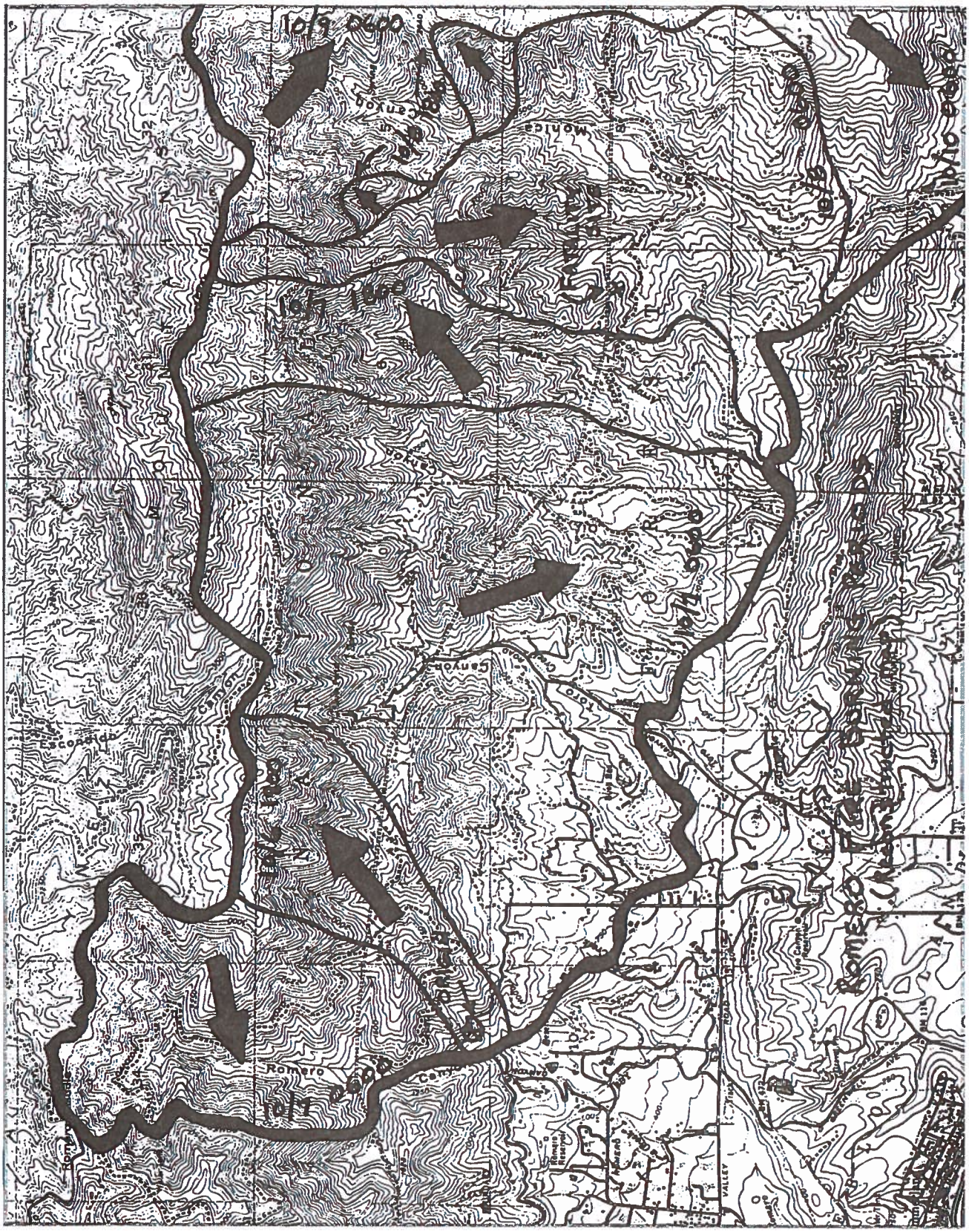
At about 2000 hours, Klepperich gave the order to start moving back toward Point B but to widen the line as they went. He assigned one cat under Cat Boss Tim McMullen to clean up the Edison Road (C to F, on Attachment #2). This cat moved out faster than the other three and got ahead. At approximately 2100 this cat, supervised by McMullen, stopped work and moved up the Edison Road and out toward Point A, arriving at the saddle (E) ahead of the fire storm. This cat was one of four, and the only one to escape unscathed.

At about 2100 hours the other three cats gathered at Point F. Klepperich and the others discussed the best way out. Klepperich decided on the fuel break (F to B) because they were familiar with it and he believed there was a protective hose-lay at the top. (From interview with hospitalized survivors.) They agreed the firebreak was the best way out and all started up the firebreak. By the time they got about half way up the slope (from Point F to B) the fire had intensified and there was spotting on each side of the firebreak.

Klepperich, about this time, realized he was in trouble and apparently decided to gather together and try to withstand the fire coming up each side of the ridge toward his cats and crew. One of the cats was caught when the flames laid over and burned the hands of the operator (Point X). He was injured and unable to control the cat, so he jumped off. The cat rolled back down the ridge and out of the action. The operator of the lost cat ran up and got on the lead cat. They abandoned the idea of digging in at this point and moved up the ridge to the approximate point where the fire caught them and stopped all forward progress (see Attachment #3). Here, the lead cat (1) stopped and weathered the fire storm. The second cat (2) tried to dig in and was not successful. The ground was too hard and the firebreak too narrow. All on the second cat died. All on the lead cat survived, but were badly burned.

Attachment #2





Case Study 6-12

Spanish Ranch Fire
Case Study #7

Analysis Worksheet and Sequence of Events

SPANISH RANCH FIRE CASE STUDY #7 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

FATALITIES AND SERIOUS

INJURY INVESTIGATION REPORT

SPANISH RANCH FIRE #395

15-August, 1979

SAN LUIS OBISPO RANGER UNIT

CALIFORNIA DEPARTMENT OF FORESTRY

CENTRAL COAST REGION

OCT. 9, 1979

II. SEQUENCE OF EVENTS

Initial Dispatch:

At 1402 hours on Wednesday, 15-August, 1979, Tim Lynn, an operator at the San Luis Obispo Ranger Unit Emergency Command Center in San Luis Obispo, received a call from the Dispatcher of the Santa Barbara County Fire Department notifying Lynn of a reported wildfire burning along State Hwy 166, west of the townsite of New Cuyama. David Driscoll, E.C.C. Chief, immediately dispatched an appropriate level of initial attack forces to what was to become the Spanish Ranch Fire.

Both the Los Padres National Forest and the Santa Barbara County Fire Department also dispatched appropriate levels of forces at approximately 1402 hours from their stations nearest the fire in accordance with existing mutual aid arrangements.

Initial attack forces responding from the three agencies consisted of one light aircraft with an Air-Coordinator, two medium air tankers, eight fire engine companies, two bulldozer units, and CDF District Ranger Lewis Killion, who would assume command as Fire Boss.

CDF's Nipomo Engine Company, consisting of Captain Edwin M. Marty, in command, and Fire Fighters Scott Cox, Ronald T. Lorant, and Steve R. Manley were delayed in their response because of mechanical difficulties with their engine (#5373). However; at 1510 hours, after they had effected repairs to their engine, Captain Marty and his Nipomo Company began their response to the Spanish Ranch Fire.

Initial Attack

A Santa Barbara County Fire Department engine company from New Cuyama and a Los Padres National Forest engine company from Pine Canyon Guard Station arrived at the fire at approximately 1423 hours, followed within two minutes by Airco 53. These forces reported the fire to be burning with a slow to moderate rate of spread and, depending upon their perspective, a fire size ranging from ten to fifteen acres to seventy-five to one-hundred acres, the latter being the estimate from Airco 53. A three to five mile per hour northeast wind, reported by the Pine Canyon Company, was influencing fire behavior and direction of spread. However, Airco 53 reported northwesterly winds.

Some of the responding forces, approaching from the west on Hwy 166, reported cumulus directly over the fire -- most did not, however; reporting normal summer cumulus to the north and east of the fire. Neither the Air-Coordinator nor his pilot observed cumulus directly over the fire during the early stages of the fire, nor at anytime during the fire.

After "sizing up" the fire, Airco 53 suggested to the San Luis Obispo E.C.C., that additional forces be dispatched to supplement the initial response effort. The San Luis Obispo E.C.C., through its normal communication channels, requested additional resources, which included engine companies, bulldozers, hand-crews, and two air tankers.

Initial Attack continued:

At 1440 hours, Fire Apparatus Engineer John Schroeder of the CDF Nipomo Station arrived with his engine company of two fire fighters on engine company 5379. Schroeder and others now reported a westerly wind of approximately five to eight miles per hour, representing a reversal of wind direction to what the "first-in" forces reported.

Schroeder assumed command of the fire and continued the strategy and tactics of the "first-in" forces -- namely relying upon State Hwy 166 for an anchor on the south and working both flanks with a direct attack, from which he would attempt a pincers action upon the head of the fire. Schroeder assigned incoming initial attack forces, upon their arrival at the fire, to this objective. He was supported to this end by air tanker activity.

Extended Attack:

While enroute to the fire, Killion observed a cumulus cloud, appearing to him to be located directly over the fire, with the smoke column of the fire "stuck in the bottom of the cloud". At the time of the observation, Killion eastbound of State Hwy 166, estimated that he was four miles west of the fire.

At 1503 hours, when Killion arrived at the fire, he found the fire to have burned approximately three hundred acres. The fuels were woodland-grass on the lower slopes, and buckwheat-sage brush, with scattered yucca upon the upper, steeper slopes.

Extended Attack continued:

Initial attack forces had previously reported five to ten mile per hour winds, varying erratically from northeast to southwest, causing a general north to northeast direction of spread. Killion observed, upon his arrival, "calm to zero" winds. Within fifteen to thirty minutes after his arrival, Killion established his command post along Carrizo Canyon Road at the base of a ridge leading to hill 2465 on Sycamore Ridge.

It was readily apparent to Killion that, despite sound strategy and tactics of the first-in forces, the initial attack had failed. Killion relieved Schroeder of command of the fire and personally assumed Fire Boss responsibilities. Killion querried the San Luis Obispo E.C.C. as to the nature and number of forces committed to the fire. After a few minutes reflection, his situation appraisal lead him to extend the attack by the commitment of additional forces:

A. The Plan:

1. Change of Tactics:

The benign appearance of the fire, along with no appreciable wind observed during the decision making process, caused Killion to change from a direct to indirect attack upon the fire by constructing a bulldozer line one-quarter to one-half mile in advance of the fire, across the fire's head or north flank.

2. Line Location:

Killion consulted with Tim Turner, Airco 53, as to possible

locations for a bulldozer line across the northern flank or head of the fire. It was suggested by Turner and determined by Killion that the north flank bulldozer line would be located upon the ridge, starting at the Carrizo Canyon Road in Section 25, Township 12N, Range 30W, SBB&M and terminating on hill 2465 in Section 36, Township 32S, Range 18E, MDB&M on Sycamore Ridge. (The grade up the ridge measured an average 35%, and was approximately three-quarters of a mile in length.) It was determined by Killion that the line to be constructed to the top of hill 2465 would be fired from the top down to the command post where indirect line construction had been initiated. The option for maintaining the indirect line as merely a safety or secondary line was also kept open by Killion. If such were the case, he would resume a direct attack upon the head of the fire with arriving incoming forces.

Air tanker effort was devoted to the north and west flanks of the fire to assist the direct or parallel attack upon the west flank and to "keep the fire knocked down" across the north flank. This would enable them to "get a dozer line on the ridge from east to west without too much problem".

3. Communication Loop:

The elements of the plan and its objectives were explained to Ted Mathiesen, Pine Canyon, Los Padres National Forest, Fire Prevention Technician, who was among the first-in

forces, Keith E. Simmons, Santa Barbara County Fire Department Battalion Chief, who had arrived at the fire scene at approximately the same time as Killion, and with Robert A. Righetti, District Fire Management Officer, Los Padres National Forest, who had arrived at the command post after Killion had committed forces to the indirect attack. None offered dissenting opinions to Killion. Mathiesen had second thoughts; however, mentioning to Righetti, his superior, that he thought people were sent too far out in advance of the fire with no backup protection. The flashy fuel, consisting of grass and sage, and the steepness of the slope leading to Sycamore Ridge bothered Mathiesen. Righetti did not agree; because of the lack of wind and the mild behavior of the fire. Neither Mathiesen nor Righetti mentioned Mathiesen's second thoughts to Killion.

B. Forces Committed to North Flank:

Richard R. Corning, CDF Heavy Fire Equipment Operator, arrived at the fire with his transport and bulldozer at 1453 hours. He unloaded his bulldozer from his transport at a location about five hundred yards south of Killion's command post on Carrizo Canyon Road, and immediately cleared an area of flammable vegetation so as to provide a fireproof parking place for his transport and then parked the transport within the cleared area. He then proceeded to construct fire line from the transport parking area westerly across

the bed of Carrizo Creek for a distance of approximately one hundred yards, turned northerly and constructed a fire line directly along the fire for about four hundred yards. From this point he started indirect line construction for about one hundred yards, where he met Fire Boss Killion at the command post.

Killion and Corning discussed the possibility of constructing an indirect fire line up the ridge to hill 2465. The wind was "quiet" and the fire appeared calm to Corning and Killion. Both men concluded that the assignment was safe, allowing Corning to begin fire line construction with his bulldozer at about 1530 hours.

At 1550 hours, Captain Marty and his Nipomo-based engine company arrived at the fire command post and reported to Killion for an assignment. Marty's assignment was to lead his three men, equipped with hand tools, two back pumps and fuzzees, to the top of hill 2465 via Corning's bulldozer line. Marty's crew was to provide protection for Corning and to backfire only in the event that it became necessary for everyone's safety. Marty and his Fire Fighters were able to begin their assignment within five minutes of their arrival at the command post.

Arriving at the command post at the same time as Captain Marty, James H. McPharlin, CDF State Forest Ranger I, reported to Killion for a fire line assignment. Killion instructed McPharlin to proceed up Corning's dozer line to one of the

high points on the ridge in order to obtain a better view of the fire and to keep the Fire Boss informed of fire conditions.

Before proceeding with his assignment, McPharlin changed into his Nomex clothing. He considered taking his "fire tent" with him, but after appraising the fire situation in relation to the dozer line being constructed, determined that he would not need the shelter. McPharlin, a credentialed instructor in intermediate fire behavior, felt "perfectly comfortable" with his normal safety gear. He observed that the fuel "wasn't heavy, there was no immediate fire threat, and the wind did not feel unusual", so much so, that he paid "very little attention to the wind". He offered no dissent to Killion with respect to the assignment. Captain Marty and his crew were seven hundred yards up the dozer line ahead of McPharlin.

At approximately 1610 hours, John K. Faezelle, Lead Bulldozer Operator, Santa Barbara County Fire Department, arrived at the fire command post and received orders from Killion through Keith Simmons, Santa Barbara County Fire Department Battalion Chief. Faezelle's instructions were to widen, by one blade width, the dozer line being constructed by Corning. These instructions were amended within minutes because of an increase in fire intensity to proceed at once to Corning's location and to assist him.

The Accident:

In the bottoms of the steep ravines to the south and to the foot of hill 2465, the fire burned through the unattended fire retardant lines which had been established by the air tankers. Within seconds, after burning through the retardant lines, a finger of fire raced up the chimney of a ravine and penetrated the uppermost south face of the peak, extending to the crest. Unpredictable, surfacing westerly twenty-five to thirty mile per hour winds aloft over the fire, acted upon the finger of fire and, together with the complex topography, impacted upon the finger; creating a new firehead, driven northerly and easterly by the winds.

As the finger of the fire crested hill 2465, Turner called Corning and informed him that he should probably start back down the hill. During that conversation, Killion inquired as to whether or not that part of the dozer line that had already been constructed could be salvaged. Turner replied that he didn't think so, unless it could be fired out immediately. Immediately after this exchange, Turner advised Corning that he definitely could not beat the fire to the top of the hill and to head back down the line. Corning requested air support from Turner. Turner responded that he had no air tankers over the fire.

Within two or three minutes of the above events at approximately 1615 hours, the entire northern flank erupted into a high intensity fire, driving through the light-flashy fuels toward the ridge where Corning and Captain Marty and his crew were located.

The Accident continued:

Corning had time to construct a safety island four blades wide, park his bulldozer, lower the two fire resistant side curtains on the bulldozer, and wrap himself within a fire resistant blanket, before the flames enveloped him and his machine. Within a minute or two, Captain Marty and his crew, located approximately five hundred yards down the ridge to the east, were subjected to extreme heat as the fire raced toward them. Marty called Killion to inform him that he would not be able to reach Corning before he would have to start firing his line. Killion told him to go ahead if it was necessary. A few moments later, Marty called McPharlin to tell him that the fire had crossed the dozer line. Marty attempted backfiring operations in order to provide a safety island for himself and crew. Spot fires erupted to the north of the dozer line, which together with the onrushing flames from the south, overwhelmed them within a firestorm of smoke and flame.

Captain Marty and Fire Fighters Lorant and Manley elected to maintain their position upon the ridge, and all three died instantly as smoke and flames overwhelmed them. Death to all three is attributed hemorrhagic pulmonary edema and third degree total body surface burns, due to inhalation of hot gases and burns received.

Surviving Fire Fighter Cox ran easterly down the ridge and escaped with grave injuries (second and third degree burns over sixty percent of his body).

Rescue and Transport of Fire Fighter Cox:

At approximately 1620 hours, Feazelle saw a badly burned man emerge from the smoke to the west and up the dozer line approximately twenty-five yards distant from his position. Feazelle notified the command post of his observation and proceeded immediately to render aid to the burned man. He loaded Cox onto his bulldozer and proceeded toward the command post, but immediately experienced difficulty in simultaneously operating the bulldozer and keeping Cox upon the machine. However, he was able to transport Cox to a location upon the ridge, which was a suitable helicopter landing spot. Feazelle stopped his machine and waited for assistance which, he was told, was to arrive shortly.

Joseph Poole, California Department of Forestry Cuesta Conservation Camp Crew Supervisor and his Crew #4 of Inmate Fire Fighters arrived within minutes and treated Cox by liberally dousing him with water and placing him in a "Santa Clara Burn Bag".

At approximately 1630 hours, a Santa Barbara County Rescue Unit, with Kenneth Frank, M.D. in attendance, was dispatched to the fire scene to render aid to survivors. (Frank is a U.S. Public Health Physician who had been working in a clinic located in the New Cuyama townsite. He has subsequently left the area. The investigation team was unsuccessful in determining his whereabouts.) At approximately 1700 hours, Frank and the rescue unit arrived at the fire scene and began stabilizing Cox.

Rescue and Transport of Fire Fighter Cox continued:

At approximately 1756 hours, U.S.F.S. helicopter #30 arrived. After Frank had stabilized Cox, he was loaded onto the helicopter, which transported both Cox and attending physician Frank to the Goleta Air Attack Base near Santa Barbara. They arrived at approximately 1748 hours and were met by Ventura County Sheriff's Office helicopter C#5 with Joane G. Baumer, M.D., on board. Baumer, with Frank, immediately revived Cox, who was lapsing into unconsciousness. Cox was then transported by helicopter C#5 to the emergency room of the Goleta Valley Hospital for an intravenous procedure of some twenty to thirty minute duration. Thereafter; with Baumer in attendance, Cox was transported in helicopter C#5 to the Sherman Oaks Burn Center, arriving at approximately 2030 hours.

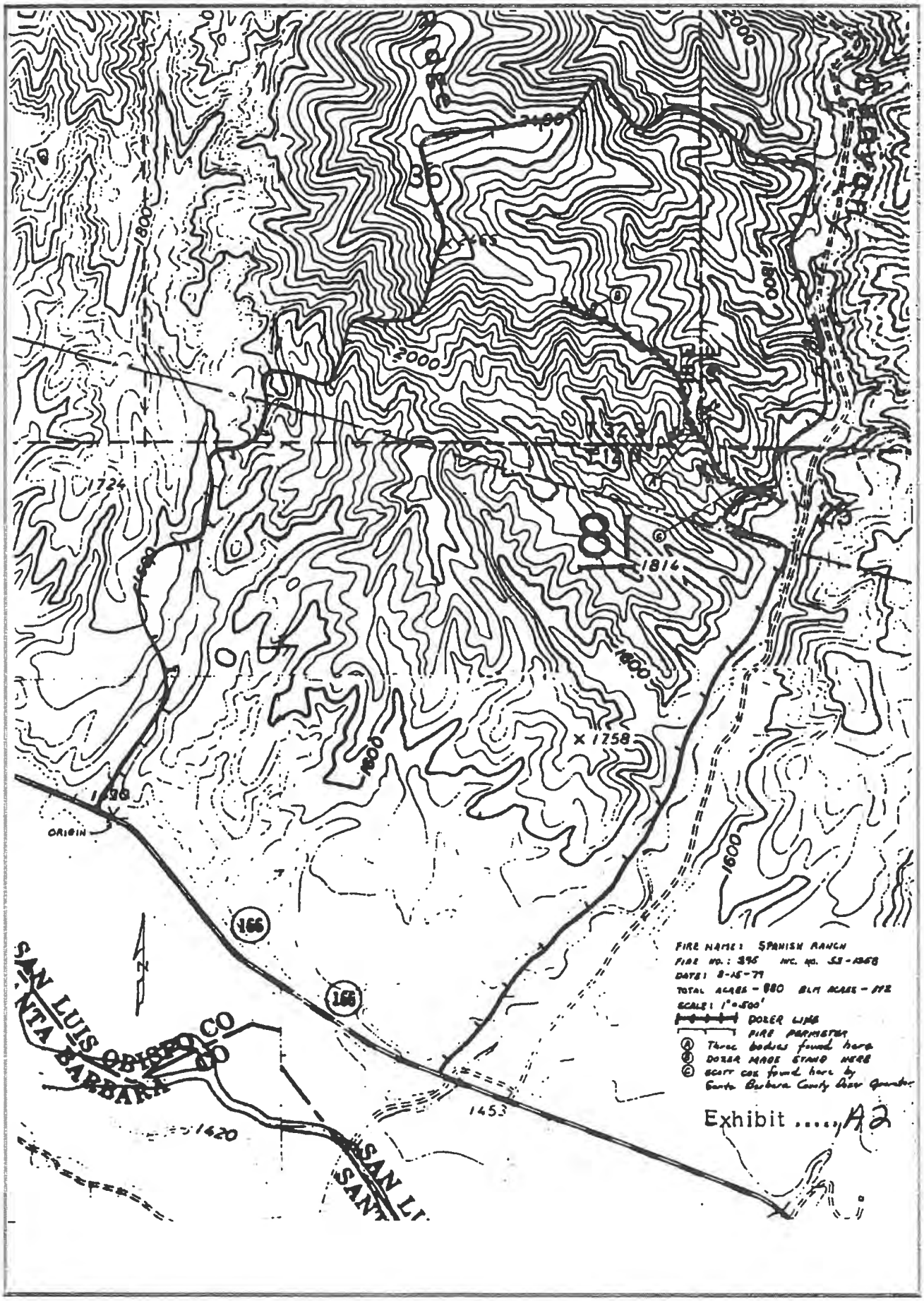
During the entire stabilization and transportation procedure, A. Jack Grossman, M.D. of the Sherman Oaks Burn Center was in continual contact with the Dispatch Center of the Los Padres National Forest at Goleta, who in turn relayed Grossman's instructions and advice to the rescue crew and attending physicians.

Discovery and Transport of Deceased:

At approximately 1620 hours, two to five minutes after the flames had passed over him, Corning emerged from under his protective blanket and engaged his machine in forward drive position and proceeded down the ridge in an easterly direction to the command post. During this time he heard a "distress

call" on the radio ordering air traffic cleared and that there were burn victims. Corning had traveled approximately 500 yards from his safety island when he noticed three bodies lying upon the bulldozer line in front of him. He immediately notified Killion of the tragedy.

At approximately 1654 hours, Sgt. Edward A. Carrol, Watch Commander of the San Luis Obispo County Sheriff's Office, upon hearing of the three fatalities, determined to dispatch Mike Sheridan, Investigator and Deputy Coroner, to the scene. Sheridan arrived at the fire scene at approximately 1837 hours and was directed to the accident location by Killion. Sheridan photographed the deceased, made arrangements for the helecopter transport of the bodies to an area near State Hwy 166, and had them transported to the Sunset Funeral Chapel in Grover City, where the bodies arrived at approximately 2120 hours.



Case Study 7-19

Rainbow Springs Fire
Case Study #8

Analysis Worksheet and Sequence of Events

RAINBOW SPRINGS FIRE CASE STUDY #8 ANALYSIS WORKSHEET

PART 1

1. SITUATION AWARENESS

   a. When did the involved personnel obtain the basic critical information?

   b. Who scouted the assignment?

2. HAZARD ASSESSMENT

   a. Which indicators of problem fire behavior were present?

   b. Which Watch Out situations were present?

   c. What other warnings or indicators were present prior to the entrapment?

3. HAZARD CONTROLS

   a. Where was the fireline anchor point?

   b. Who was the established lookout?

   c. What communication links were in place between the involved personnel and their fireline supervisor or adjoining forces?

   d. What was the identified escape route(s)?

   e. Where was the identified safety zone(s)?

4. DECISION POINT

a. Were the necessary hazard controls in place for the situation? If not, what was lacking?

b. Were the strategy and tactics based on expected fire behavior? If not, why?

c. Did all involved resources have an opportunity for feedback during the decision making process? If not, why?

5. EVALUATE

a. What individual factors existed that increased the potential for decision errors to occur?

b. What organizational factors existed that increased the potential for decision errors to occur?

PART 2

CONSIDER THE CAUSAL FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

RAINBOW SPRINGS FIRE

INCIDENT COMMANDER NARRATION

Given February 1997 for use in the Fatality Fire Case Study Training Course

During the past year I received word that I may be asked to participate in a fire safety training program that deals with past wildfires involving fatalities or serious injuries to firefighters. As Incident Commander on the Rainbow Springs Fire that started around noon on April 25, 1984 and claimed the lives of two Forest Service employees, I assumed my role would be to stand in front of a video camera and talk about the many things that went wrong from initial attack until the tragic accident over 2 hours later. My initial response was that I would help reconstruct the events that ultimately caused the two fatalities. However, with the objective of using the Rainbow Springs experience to help prevent a similar disaster, I felt very strongly that what happened on that tragic day is not nearly as important as what happened in the months and even years leading up to that day.

I am not even sure what can be learned by discussing our action from the time the fire was reported at 1330 hours to the time of the accident around 1630 hours on April 25, 1984. If I am able to provide a clear picture of our actions you will notice that to some degree we violated all of the 10 Standard Fire Fighting Orders. If there had been a Standard Order Number 11, there is every reason to believe it would have been violated too. Experts were dumbfounded because the 10 Standard Fire Fighting Orders are taught in basic firefighting courses and some of us at the Rainbow Springs Incident even had them glued to our hardhats. So what was the problem? There may not be a simple answer but a honest and candid discussion of the low priority the Mena Ranger District gave to fire management that resulted in a total lack of fire readiness should provide clues to why we performed so poorly throughout the course of the afternoon on that tragic day.

In August of 1979, I began my assignment as Timber Management Assistant (TMA) on the Mena Ranger District, Ouachita National Forest at Mena, Arkansas. My red card classification was Fire Boss III mainly due to my heavy involvement in fire suppression during the past 5 years which I had spent as Timber Management Assistant on the Andrew Pickens District in Walhalla, South Carolina. The timber program on the Mena District was much larger and more challenging than what I had dealt with on the Andrew Pickens District. I was having to spend about all of my time on the timber program and had very little involvement with fire suppression. The main reason for my lack of involvement in fire however was the Mena District organization had placed fire management under the Other Resource Assistant.

Although the Mena District experienced a few small fires during the fall and winter of 1979, I was not asked to participate in any of them. I was not asked to participate in fire suppression until April 4, 1980. On that day of extreme fire danger caused by high wind and low relative humidity, the Tower Mountain Fire was reported on the Mena district. I was dispatched to the fire not knowing what my job would be and was somewhat surprised when the ORA requested that I take charge of the fire.

Since I had not worked a wildfire with the district crew, I had no idea how they would perform. Although the fire danger was approaching extreme, I really could not anticipate a problem. The fire was less than 1 acre in size and our tractor and about 12 firefighters were already on the scene. My optimism soon faded however when I noticed the tractor operator was extremely nervous and showed signs of inexperience. The hand crews were having trouble locating

their personal protective equipment and showed absolutely no sense of urgency. The unnecessary delay resulted in the fire moving from its origin in a relatively flat flood plain to the base of a south facing slope. A few minutes later a strong gust of wind sent the fire running up slope and only with the aid of an improved pasture in front and on the right flank of the fire were we able to contain it at about 100 acres. A Forest Service engine crew and a local fire department had to work at a frantic pace to save a very expensive dwelling from going up in smoke. It was a totally different show than what I had become accustomed to seeing during my time on the previous district. A fire of that size and intensity at initial attack would have been quickly suppressed and forgotten.

The only comfort I could find with that unpleasant experience was my recollection of how a young and inexperienced group of technicians on my previous district had been molded into a very effective firefighting organization in a relatively short period of time. I felt that with the quality of people we had on the Mena District, we too, could make substantial improvements if we were willing to give a higher priority to fire management.

The following day I requested a meeting with the District Ranger and ORA in hopes we could get started on fire training for our people and develop a district fire organization for future fires such as the one we had just experienced. I expressed to them my concern for what I felt was a very dismal performance on the Tower Mountain Fire and emphasized that it was a matter of luck that no one was seriously injured or killed.

It was obvious during our short meeting that we were on a different wavelength and did not share the same concerns. For example, when I requested that the tractor operator be replaced, I recall one of them saying that he realized the operator was nervous and very slow but he takes very good care of the equipment. I did not feel then, nor do I feel now, that they had any less concern for employee safety than I did. Apparently, they had very limited firefighting experience and could not comprehend the safety risk associate with using people without proper training and experience in initial attack operations. Although the Mena District was the site of the largest fire (Eagleton Fire - 15,000 acres) that had occurred on National Forest Land in Region 8, there had not been a fire related fatality in the 76 year history of the Ouachita National Forest. Perhaps that historical fact led some to believe that killer fires were not possible in that part of the country.

The summer following the Tower Mountain Fire (1980) produced the longest period of extreme fire danger that is on record for the Ouachita National Forest. Fortunately, we were able to get a lot of help in both firefighters and air tankers from the western regions because they experienced unusually low fire activity during that same period. While Class E days were the norm from early July until mid September, the Mena District district had only two small fires until a very windy day in early September. On that day the Acorn Fire escaped from a railroad right-of-way and threatened numerous homes and a local school. We were very fortunate to have a helicopter/bucket and 8 air tankers with very short turn around times. As IC, I could see no improvement in our fire organization from the Tower Mountain Fire a few months earlier. Several of our people were already on the fire when I arrived but for most of the afternoon and certainly during the most critical period, I only had radio contact with the District Ranger and Timber Sales Administrator. I found out later that a

key member of the district staff had taken most of our people to rake a line around a dwelling near the origin of the fire and in the process turned his radio off. The fire was contained without a personal injury. A couple of poultry houses were destroyed but that happened before the Forest Service took charge of the fire. I expressed concern to the District Ranger but a letter of commendation from the local director of civil defense giving us much praise that no dwellings were destroyed seemed to carry more weight. In reality, this operation was an air show and the commendation letter would have been more appropriate for the helicopter and air tanker pilots.

In late September of 1980 we received a general rainfall that ended the famous Summer of 80 Drought. We had endured a long, dry and very hot summer. Most of us had not had a day off in months. Once the drought was broken, the last thing we wanted to think about was fire. For the next 3 1/2 years we pretty much got our wish - thanks to the unusually low fire danger during that period.

We did have a modest prescribed burning program during that 3 1/2 year period. Perhaps that program could have been used to some extent to train our young and inexperienced technicians. As I recall, the ORA and Wildlife Biologist prepared the burning plans and gave them to the Timber Sales Administrator for implementation. The Timber Sales Administrator had a lot of pride in his burning skills but did not share those skills with the younger employees. They were relegated to carrying a torch under his very close supervision or patrolling the control line for spot-overs. Management seemed content to let that happen. To make matters worse, we lost 3 of our most experienced technicians to retirement during that period and replaced them with young people that had very little fire training and fireline experience. The Timber Sales Administrator retired in January of 1984, about two months before the day of the Rainbow Springs Fire.

As usual, we came to work on the Morning of April 25, 1984 with fire being the last thing on our minds. It had been decided about a week earlier that our spring fire season was over and the fire staff officer had released the air tanker that was under contract for the forest. About 4 days earlier we had received over an inch of rainfall that helped disguise the extreme fire weather that would be experienced later that day..

While we were not thinking fire, none of us expected April 25th to be just another day. We had very serious personnel problems. One of our primary technicians was under investigation for serious ethic and conduct violations. The overall morale was extremely low. We had planned a district meeting during that afternoon to discuss our problems and identify ways to come together as a district.

Sometime during that morning the District Ranger and I traveled to the field to look at some timber marking in progress. At about 1100 hours I noticed the wind was very strong from the southeast. I remember thinking for a moment that the fire danger must still be very high because in addition to the wind, there was not as much green vegetation as one would expect that late in the spring season. We returned to the district office just before noon to make final preparations for our district meeting that was scheduled for the afternoon. At about 1330 hours the aerial observer reported a fire in the Rainbow Springs area and described the fire as spreading very rapidly. Once he gave the legal description, I realized the fire must be burning in an active timber sale with

heavy pine slash and probably on the steep south facing slope of Dallas Mountain.

As unprepared as we were, we wasted little time departing to the fire. The ORA, who had been on the district less than one year asked me to accompany him to the fire. As soon as we cleared the office parking lot we could see a very large column of black smoke that appeared to be in the vicinity of Rainbow Springs.

Travel time from the office to the fire was about 15 minutes. What I remember most about that trip was the ORA's suggestion that no matter what happens, things cannot get any worse. My reply was "Oh hell yes they can too". I was thinking about our young inexperienced people and was concerned about their mental state due to the aforesaid problems. I was also thinking about our new tractor operator that to my knowledge would be operating his first fire. I did not know for sure who would be IC but felt I would be asked to assume that responsibility once we reached the fire. Therefore, being familiar with the terrain and fuel conditions, I was already thinking about a plan of action.

Upon our arrival at the fire around 1345 hours, the District Ranger told me to take charge of the fire. Sizing up the fire was relatively simple. From point A (see attached map), I had an excellent view of the fire. The head fire had just reached the mountain top and the overall intensity was diminishing rapidly. Flames on the left flank were being pushed by a strong southeasterly wind but flame heights were generally less than 2 feet. The rate of spread was approximately 8 chains per hour on the left flank, but as you will see later, the rate of spread was greater along the lower portion of the south facing slope due to less surface rocks and a much larger accumulation of surface fuels (pine needles and hardwood leaves).

I considered a number of options but never considered a direct attack on the left flank because of the steep terrain and wind gust up to 30 MPH from the southeast. It was also my feeling that the terrain was too steep for the tractor not to mention the inexperienced operator. I was not really concerned about the head fire that had already reached the top of Dallas Mountain and perhaps started down the north slope. The overstory vegetation on the north slope was hardwood with only surface fuels consisting of cured hardwood leaves. The fire would also be backing down the very steep slope that was largely shielded from the strong southeasterly wind. My main concern at that moment was the left flank since the wind was pushing the fire in a westerly direction down the south facing slope of Dallas Mountain.

As I recall, the District Ranger, ORA, Timber Sales Administrator, Tractor Operator and I were the only arrivals. The District Silviculturist was in route. Soon after our arrival a member of the volunteer fire department for the community immediately north of Dallas Mountain arrived on the scene. He informed me that the fire was already burning down the north slope of Dallas Mountain and also informed me that the people with homes along Road 42 were already in a state of panic. I radioed the District Silviculturist who was in route and requested that he drive west on Road 42 and see if he could locate a route into the fire from the north and also give me a report on how far the fire had progressed down the north slope of Dallas Mountain. He reported back a few minutes later that crews coming in from the north would have to travel by foot from Road 42. At the same time, he reported the fire had made little, if

any, progress from the top of Dallas Mountain down the north slope. Although that news was reassuring, my brief conversation with the local fire department volunteer had brought back some horrors of the Acorn Fire in which I had to deal with home owners in panic at the same time I was attempting to direct operations on the fire. I certainly did not want the fire to reach the residential area along Road 42 and that sense of urgency most likely influenced some of my decisions.

At about 1400 the Poteau Ranger District Tractor Crew was dispatched to the fire. I was expecting a lot of handline construction on the north side of Dallas Mountain and had requested an additional 50 firefighters for handline construction and burnout.

My plan of attack was to use our tractor to clean out a primitive road from Point B to Point F and then construct a tractor line around the west end of Dallas Mountain from Point F to the ridge top. In the meantime, I would let the hand crews walk around the right flank of fire to somewhere around Point G. They would anchor to the fire at that point with most of them working west with a handline and doing burnout at the same time. A smaller number of them could work back along the right flank. However, the fire on the right flank was moving very slowly into the wind and I did not consider that a priority. Again, my main concern was the fire moving west along the south slope of Dallas Mountain which I refer to as the left flank. However, due to wind direction and terrain, that could have logically been called the head of fire.

At about 1415 our tractor crew had started cleaning out the primitive road moving west from Point B. Our new Timber Sales Administrator was leading the tractor but had not been red carded or even received any training for tractor boss. The District Ranger and ORA were serving as line scouts. AT 1510 the Poteau Tractor crew arrived with Paul Keener as tractor boss and James Frizzell as tractor operator. At the time they arrived, I did not know where to send them. I had a scout checking the right flank of the fire to see if they could operate in that area. A few minutes later that scout informed me that he did not feel the tractor could work the right flank due to rocks and steep terrain. In the meantime, the Mena Tractor Boss informed me that the Poteau tractor could work in his area. I directed Keener to take his tractor down the freshly bladed road (left flank) until he made contact with the Mena Tractor Crew. It was only a few minutes later however at about 1521 when the Timber Sales Administrator informed me that they had reached the mountain top with the tractor line. I recall being very surprised that they had made that much progress in the relatively short time period he had been working on the line. Although we did not have a topo map at the fire, I had estimated the distance to the west end of Dallas Mountain to be about 1/3 mile from where they started at the origin of the fire. I thought the mountain dropped off at about the letter D (in Dallas) on the attached map. I made that assumption because from my location at Point A the ridge top appeared to be dropping off. I was also using my memory of where the mountain ended from my travel of the primitive road at a much earlier date. Unfortunately, the drop off was into a saddle and the actual distance to the west end of Dallas Mountain (Point F) was closer to 1 mile. Had I been aware of the longer distance, I may have called for the tractor line to be located in the same general area that it was located. However, I would have been very concerned about having people on the steep south slope working that close to the main fire, hopefully my actions would have reflected that concern. With that approach it would have been extremely

important that the tractor line be anchored to the fire at the top of mountain and the line be constructed downhill with a very timely burn-out of that line. I would have also made certain the line scouts were closely monitoring the main fire. Whatever the strategy, I had very serious concerns about any of our people working the steep south slope in unburned fuels on the left flank of the fire. I spent the entire afternoon from initial attack until the accident thinking that none of our people were working in those conditions.

When I received word from the Timber Sales Administrator that they had reached the mountain top with the tractor line, I did not question their progress or the actual location of the tractor line. Instead, I told him to start the burn-out moving slowly back down the tractor line. Moments later he called to inform me that the backfiring torch was not on the tractor and no one had thought to bring a torch or any other firing device.

The employee under investigation that I mentioned earlier had joined me at Point A. Although he showed signs of mental stress and did not appear to be in good physical condition, he had passed the step test and was technically a qualified firefighter. Since no one else was available, I gave him a drip torch and told him to take it to the Timber Sales Administrator. From what I was told later, he stopped to rest several times along the way and did not reach his destination in a timely manner, but as it turned out, that may have been a blessing. Had he delivered that torch only a few minutes earlier it could have brought additional people into the blow-up site adding to the number of fatalities or serious injuries.

Most of the hand crews had arrived at Point A around 1530. Instead of sending them around the right flank as previously planned, they were told to use the tractor line and join up with the District Ranger and Timber Sales Administrator. The plan was to use some of them to burn out and hold the tractor line on the left flank but the majority would be used to construct and burn out a hand line working east from the tractor line that ended at the ridgetop. That line would completed a line around the fire and hopefully provided containment.

At about 1605 our fire detection aircraft flew over the fire and the aerial observer told me the fire had cooled down considerable from the time he had observed it earlier in the afternoon. That received some discussion during the subsequent investigation and review but the information from the aerial observer had nothing to do with my decisions. I knew the weather conditions had not changed and could see no reason to be complacent. The aerial observer was not a fire behavior officer and I did not feel he had the knowledge and experience to accurately evaluate the fire.

At 1610 the District Ranger informed me that he had scouted the right flank of the fire and felt the tractors could be used to construct part of that line. I called the Poteau Tractor Boss and requested that he bring his tractor back down the tractor line to my location at Point A. From there he would receive further instructions.

What I was not aware of was an incomplete section of tractor line at the fatality site (see attached map). One of our employees told the Poteau Tractor Boss to connect that section of line on his way down the mountain. That action held them up at the fatality site.

At about 1620, a member of the local volunteer fire department was located at Point E and observed a spot fire at Point D that he later described to be about 1/2 acre in size but spreading rapidly up slope toward the fatality site. He had no radio communication with Forest Service personnel but would not have known what was about to happen anyway. The spot fire moved rapidly up slope until reaching the area of preheated fuels. The influence of the mountain saddle resulted in a much higher wind velocity in that same area. The blow-up immediately south of the saddle as shown on attached map was so intense that it is difficult to describe. I was alerted by the very loud noise even as far away as Point A. It was very frightening to me although I had no idea the Poteau Tractor Crew members, Paul Keener and James Frizzell, were directly in its path. There is no way to describe the feeling that came over all of us when their bodies were discovered a few minutes later.

As indicated earlier, the rate of spread was much greater along the lower part of the south slope. The fire had moved to Point C probably around 1615 and it is likely that a very strong gust of wind carried a burning ember all the way to Point D. We had an Ignition Component of 78 but did not know that until after the fact. However, had there not been a spot fire, the main fire had already reached the base of the canyon located immediately east of the fatality site. It would have been only a matter of minutes until that fire made a run up the canyon with the same consequences, or worse. It could have been worse because the burn-out operation was getting ready to start. That would certainly have brought more people into the area. We should also remember that the hand crews used that same tractor line to reach the north side of the mountain only a few minutes earlier. As terrible as it was, it could have easily been much worse.

In the months that followed, I spent many hours reliving the fire mostly from midnight to 6:00 A.M. in the morning. There was never any difficulty coming up with ways that disaster could have been prevented.

Interviews conducted during the investigation revealed that most of the firefighters, including overhead people, were very much unaware of the actual danger prior to the tragic accident. I would seriously question anyone who would say the blow-up, especially the intensity of that blow-up should have been predicted. The majority of vegetation at the blow-up site was green black-jack oak which is not considered an explosive fuel. However, with my fire experience in similar terrain with similar weather conditions, I knew most anything was possible but I failed to convey that understanding to the people on the line. I consider that to be by far the most serious mistake I made during the course of the afternoon. I was foolish enough to think my plan would keep them out of harms way. The problem was, I seemed to be the only one that understood the plan. The lesson to any IC in a similar situation is that nothing can be substituted for a very detailed briefing prior to commencing action. It is especially important to provide a chain of communications that provides some assurance the plan is understood by all.

While a good initial attack plan that is well understood is an important first step, it will not ensure safety. Conditions can change very rapidly when dealing with extreme fire weather. That is why fireline safety so often comes down to people on the ground. Individual performance is always critical and I do not believe that was understood by many of the people that participated in

the Rainbow Springs Incident. The attitude demonstrated by some of our people during initial attack seemed to reflect the same attitude that had been given to fire readiness over the past several years.

I will provide some examples of performance that kept this fire from being remembered as just another fire and probably forgotten by now. Perhaps someone can learn from these examples and see that they are not repeated at another time and place.

The tractor line that was constructed up the mountain to the blow-up site was mostly located on the east side of the north-south ridge. That meant burn-out would involve firing downhill from the line into a very strong wind. The mountain was too steep for the tractor to construct a line moving forward up slope. Instead, the tractor operator would back up the mountain a short distance and build the line back down. Perhaps that contributed to the line being extremely crooked with some very sharp turns. In my opinion, there is no chance the line would have held had the burn-out been attempted.

The proper location for the tractor line would have been a straight line on the west side of that same ridge near Point D. That would have provided mostly uphill firing in which the fire would have moved rapidly away from the line. There would have been a reasonable chance of holding a line at that location during burn-out, but more importantly, the condition of vegetation following the blow-up revealed the likelihood that the tractor crew would have survived had they been on that side of the ridge.

Another missed opportunity for safety was not having a drip torch or any other firing device at the critical time it was needed. Had the burn out been started as soon as I directed it be done, that operation would have started at the blow-up site. The fuels in that area would have had over an hour to burn out. A reburn was very unlikely since the fire traveled entirely on the surface until reaching the blow-up site.

Yet another example of a missed opportunity for safety was the failure of a large number of people (some very experienced) to notice the imminent danger when travelling the tractor line by foot just minutes before the blow-up. The fire at Point C had almost reached the tractor line when they used it for foot travel to reach the top of Dallas Mountain. As discussed earlier, a very large portion of that line running up the mountain through the blow-up site was dangerously located either inside or immediately outside of the canyon that was a classical chimney. Since most of those people travelling the line were dispatched from other districts, they probably trusted that we would provide for their safety and were not looking for safety hazards. This is an excellent example of the need for each individual to be concerned for his/her safety at all times while on the fireline. As mentioned earlier, many of those people escaped death by only a matter of 15 to 20 minutes.

Perhaps there are dozens of other examples of what we should have done differently, but I have probably dwelled on that to much already. What I really wanted to emphasize is our lack of preparation and how that relates to the above examples.

As far as the tractor line being located in the wrong place, that was simply the lack of knowledge and experience although one person involved in locating

it had nearly 30 years experience with the Forest Service. Firefighting knowledge and firefighting experience can sometimes have a weak relationship if the person involved is not interested in fire. Some of us may find fire duty unpleasant but we could pay a terrible price if we do not endeavor to learn as much as we can about fireline safety.

We did not have enough wildfires on the Mena District to gain needed experience and failed to look for other opportunities. What if more of our people had been given major responsibilities in planning and implementing prescribed burns? That would have been a good opportunity to learn how to properly locate control lines and develop other valuable firefighting techniques. We had a prescribed burning program but did not take advantage of the training opportunities it could have provided. I might also mention that we did not encourage participation in off forest fire details. Since we had very few fires at our home unit, those details could have provided valuable firefighting experience. However, one must approach those off forest details with the intention of learning as much as possible. It should not be just a case of adventure and a fat paycheck. We usually learn a lot more if we take on responsibilities that exceed our comfort level.

The case of the drip torch not being on the tractor is perhaps the most revealing example of our lack of preparation and the very low priority given to fire management.

Several weeks before the spring fire season of 1984 officially ended, a decision was made to mount a boom-jet sprayer on our tractor to perform silvicultural work. That rendered the tractor almost useless for initial attack. Perhaps it was a stroke of luck that the silvicultural work was completed around mid April without any problems. On April 24, 1984, one day prior to the tragic fire, a group of temporary employees under the supervision of the TSI and Reforestation Forester removed the sprayer from the tractor. I was later informed that the drip torch was removed from the tractor during that operation and no one bother to put it back. As discussed earlier, just simply having the drip torch on the tractor at that most critical time when it was needed would have likely saved two lives. Had we been conducting annual fire training on the district and talking fire on a fairly regular basis, perhaps one of those employees would have have known the importance of the drip torch being on the tractor.

I talked earlier about low morale and the overall mental condition of our people. We will never know how much that affected our performance on April 25, 1984 but there is a great likelihood that it did have some negative effects. That should be another heads up when having to place people into initial attack situations during extreme fire weather.

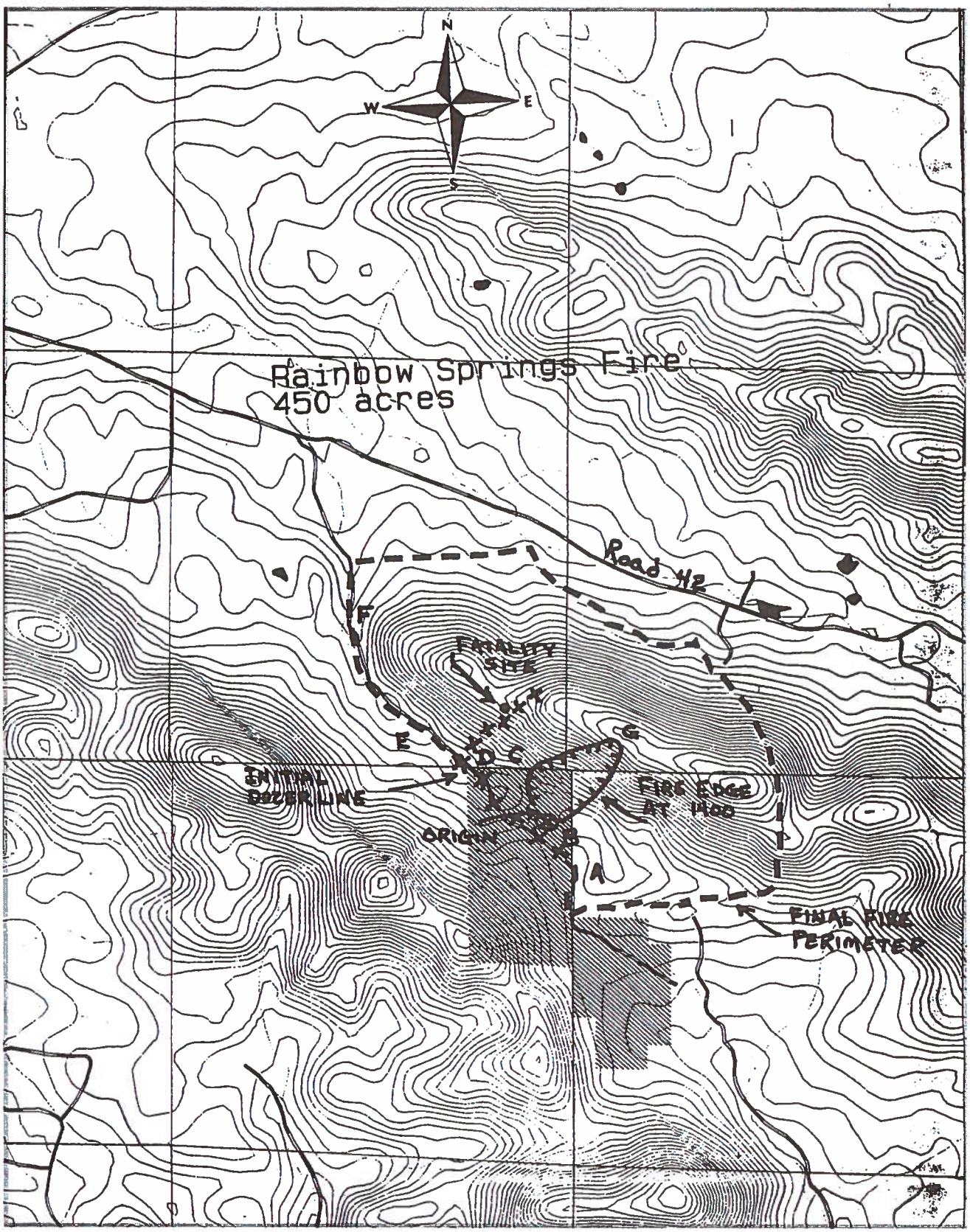
It has been 12 years since the Rainbow Springs Fire but thoughts of that day are still very painful. Although few names are mentioned, it is likely some former employees of the Mena District would be offended by my references to certain actions that, at best, would indicate negligence in some of our very important duties. Some will undoubtedly feel this is an attempt to rid myself of blame for many of the mistakes or misjudgement that occurred on the Rainbow Springs Incident. If that is my purpose, why would I have waited almost 13 years to give this statement? The fact is, I had no thought of giving my account of the Rainbow Springs Incident until receiving word of the training

exercise that would include this fire. I was also influenced by an article written about the same time by an FMO in Region 5 who recommended greater accountability for overhead people when there is a fatality or serious injury to a firefighter.

I would do anything possible to prevent another tragedy such as Rainbow Springs. Therefore, it does not bother me at all to see a training exercise developed that allows students to review our actions at Rainbow Springs and devise hypothetical solutions that would have produced a much more favorable outcome. However, I feel much would be lost if the focus is on what happen at Rainbow Springs without any regard for why it happened. In these days of heavy workloads and fewer people, I believe it would be possible for most any district with a light fireload to let a situation develop similar to what we had on the Mena District prior the Rainbow Springs Incident.

As for greater emphasis on accountability, I have very mixed feelings as to how effective that would be. I accepted the role of IC on the Rainbow Springs Incident without a strong feeling of confidence that I was qualified for such task. Afterall, I had not been involved in fire suppression in almost 4 years and did not have a particularly strong resume for the position of IC. I did feel that I was the most qualified person that happened to be available at the time. Perhaps it is ironic that I accepted that position out of concern for the safety of our employees.

Before I say anything about pain and sacrifice, let me make it clear that the real pain and sacrifices were made by the victims and members of their immediate families. As for myself, I feel very fortunate that the group of competent and highly professional people who conducted the investigation did not recommend I go stand in the long line at the local employment office. But in all honesty, that was the least of my worry. If we have people in fire overhead positions that are more concerned about that trip to the employment office than the lives of their fellow employees, I believe we have some serious problems.



Case Study 8-16

Loop Fire and Glen Allen Fire
Case Study #9

Analysis Worksheet and Sequence of Events

LOOP FIRE AND GLEN ALLEN FIRE CASE STUDY #9 ANALYSIS WORKSHEET

PART 1

1. Which of the three hazardous conditions for downhill line construction were present? (steep terrain, fast burning fuels, rapidly changing weather)
   Loop Fire:

   Glen Allen Fire:

2. Who were the supervisory/overhead personnel that discussed the situation prior to committing crews to the assignment?
   Loop Fire:

   Glen Allen Fire:

3. Who were the supervisory/overhead personnel that stayed with the job?
   Loop Fire:

   Glen Allen Fire:

4. Who scouted the proposed fireline location?
   Loop Fire:

   Glen Allen Fire:

5. Was there direct contact between the crew and a lookout that could see the fire?
   Loop Fire:

   Glen Allen Fire:

6. Was there communication between all personnel top to bottom?
   Loop Fire:

   Glen Allen Fire:

7. Was there rapid access to a pre-identified safety zone?
   Loop Fire:

   Glen Allen Fire:

8. Was direct attack being used?
   Loop Fire:

   Glen Allen Fire:

9. Was the fireline in or adjacent to a chute or chimney?
   Loop Fire:

   Glen Allen Fire:

10. Was the fireline anchored at the starting point on top?
    Loop Fire:

    Glen Allen Fire:

11. Who was monitoring the bottom of the fire?
    Loop Fire:

    Glen Allen Fire:

12. What other tactical alternatives could have been used on these two fires?

PART 2

CONSIDER THE DOWNHILL LINE CONSTRUCTION CHECKLIST FACTORS IDENTIFIED IN PART 1; THEN SUMMARIZE THE SIGNIFICANT LESSONS YOU THINK THERE ARE TO BE LEARNED FROM THIS FATALITY FIRE.

THE LOOP FIRE DISASTER

ANGELES NATIONAL FOREST
CALIFORNIA REGION

NOVEMBER 1, 1966

A BRIEF OF THE REPORT OF THE GROUP ASSIGNED TO ANALYZE THE LOOP FIRE ACCIDENT.

U. S. DEPARTMENT OF AGRICULTURE . FOREST SERVICE . WASHINGTON, D. C.

THE LOOP FIRE DISASTER

ANGELES NATIONAL FOREST
CALIFORNIA REGION

November 1, 1966

(A BRIEF)

By

The Loop Fire Analysis Group:

Hamilton K. Pyles
Alfred E. Spaulding
Carl C. Wilson
William R. Moore
George Brunton

Assisted by:

Ronald G. Metcalf, Observer
Joseph C. Springer, Observer
Clemence R. Crouch, Liaison
Clive M. Countryman, Fire Behavior Team
Mark J. Schroeder, " " "
Richard C. Rothermel, " " "
Michael A. Fosberg, " " "

This report presents the study made of the Loop Fire Disaster by the Analysis Group. It describes causes and circumstances relating to the tragedy and recommends ways to prevent similar accidents in the future. It may be supplemented later if hospitalized survivors are able to provide additional significant information.

US Department of Agriculture - Forest Service - Washington, D.C.

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INTRODUCTION

On November 1, 1966, in a canyon near the boundary of the Angeles National Forest, California, a flareup on the Loop Fire overran the Forest Service's El Cariso Interregional Fire Crew, burned to death 10 firefighters and inflicted critical to minor injuries on 12 others. One of these critically injured men died at the Los Angeles County General Hospital on November 6.

Forest Service Chief Ed Cliff immediately assigned a group of Fire Control experts to study the circumstances surrounding the tragic accident. This group, headed by Deputy Chief Hamilton K. Pyles, completed their study November 11 and prepared a report which describes the causes and circumstances relating to the tragedy and recommends ways to prevent similar accidents in the future. This brief summarizes that report.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Overall action from discovery to final control of the Loop Fire was generally good. Included in this action were some outstanding events in the evacuation of hospital patients, the rescue of the survivors of the Chimney Canyon accident and

the coordination of a number of agencies involved in control of the fire and rescue operations.

2. From all that can be determined at this time, there was no evidence of negligence, disobedience or carelessness in the Loop Fire control operation based on present standards and practices.

Recommendations

1. The highly localized decisions and actions which resulted in the tragedy points to the need of: (1) more specific direction on safe practices in similar topography; (2) specific control of helicopter attack; (3) scheduling of more complete inter- and intra-crew communication; and (4) adequate scouting to keep sector bosses currently informed when working in critical or possibly critical situations.

   a. Provide a physical checklist for downhill line operations whereby such an operation would be done only when all critical factors are aligned favorably and checked off on the list. This should be more than the standard firefighting orders or 10 rules now in use. Included in this checklist must be the complete factual knowledge that the toe of the fire edge will be held in a safe condition.

b. Improve intelligence by helicopter or on-the-ground scouting or both at all critical points in the fire area and particularly where 2 crews are working toward each other.

c. Increase the use of short-range lightweight radio units for intradivision operations on inter-crew operations as a secondary net.

2. When 2 crews are working toward one another, communication must always be provided between them. This requires special arrangements between crews whose radios are on different frequencies.

3. Increase efforts on the development of lightweight flame resistant suits, including face masks and gloves. When satisfactory items have been developed, make their use mandatory by trained men and fire suppression crews ordinarily assigned to work in fast burning fuels.

4. Continue development of improved fire protective shelters and make them standard equipment for all fire suppression men and crews who are ordinarily assigned to fight fires in fast burning fuels.

5. Reexamine the full array of presuppression activities in flash fuel areas and establish the benefits plus or minus of accelerating the fuel-break system in relation to safety and its place in the balance of all presuppression activities.

6. Make crystal clear in firefighting training that a "chimney," "narrow box canyon" or similar topographic feature is a hazard area even if devoid of fuel.

7. Establish a Task Force to study this incident in relation to the findings of the Fire Task Force of 1957. Develop an action program.

DEVELOPMENT AND CONTROL OF THE LOOP FIRE

The Loop Fire started at 5:19 a.m., November 1, 1966. It was caused by a faulty electric distribution line within the Department of the Army's Los Pinetos Nike Site on the Tujunga Ranger District, Angeles National Forest. Pushed by Santa Ana winds of up to 60 miles per hour, the fire rapidly spread from the mountain top to the urban area between Pacoima Dam and the Olive View Sanitarium, Los Angeles County. Before being brought under control, it burned 2,028 acres, 1,436 acres of National Forest Land and 592 acres of privately owned land.

Peggy Hotchkiss, lookout on Mendenhall Peak, discovered the fire immediately. The first firemen attacked the fire 17 minutes later and within 30 minutes the Forest Service, Los Angeles County and Los Angeles City Fire Departments had joined forces to control the fire.

Tujunga District Ranger Jesse J. Barton was in charge of the fire until 8:00 a.m. when William R. C. Beaty, Staff Fire Control Officer for the Angeles National Forest, took charge. Hugh Masterson was Line Boss and William C. Westmoreland was boss of Division A on the East side of the fire where the accident occurred. All are seasoned experienced Fire Control men.

Forest Service effort was directed primarily to the North and East edge of the fire. The South side, along the foothills, was the responsibility of Los Angeles County and City Fire Departments. (Figure 1)

When the fatal accident occurred on the southeast corner of the fire, the El Cariso Crew was attempting to connect a fireline some 200 feet long between Division A and Los Angeles County firefighters on Division C. This was the final action necessary to control the fire.

Case Study 9-14

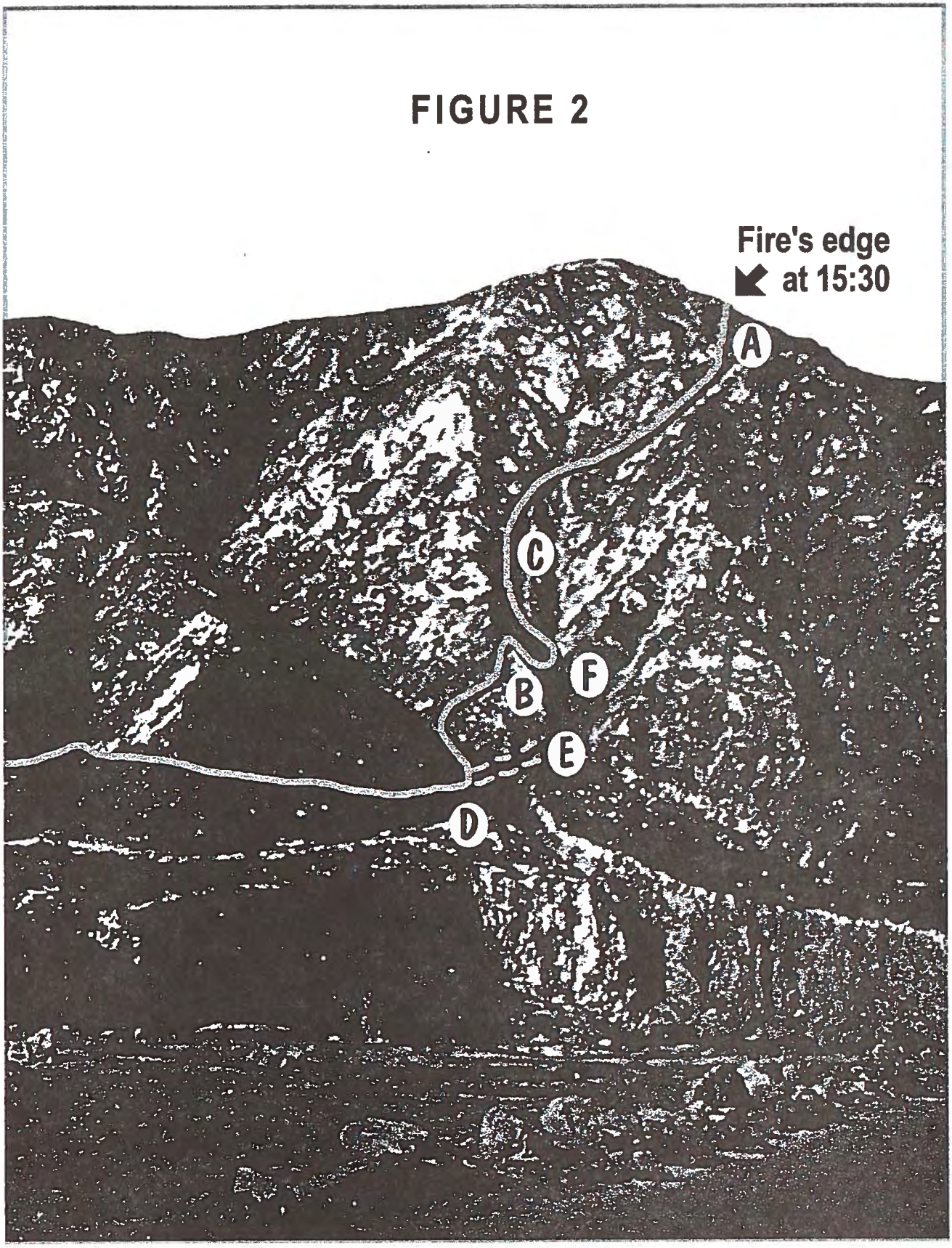
THE FATAL FLAREUP

Following instructions from Line Boss Hugh Masterson, at 3 p.m. El Cariso Crew Superintendent Gordon King led his men in a line building operation along the fire's edge into the head of a steep, rocky chimney-like canyon. In forest firefighting language, this is called "cold trailing," and is considered the safest method in California brush fields.

From the head of the canyon (Point A, Figure 2), it appeared that this crew would have no trouble extending the control line to meet the Los Angeles County Crew plainly visible below. They didn't know that near the base of the chimney canyon, a 30 foot deep gully with near vertical sides would delay the forward progress of the county crew.

At 3:30 p.m. the county crew was stopped by the steep sided gully. (Point D, Figure 2) To cross with bulldozers would have taken several hours. Fire in the gully and nearly vertical walls prevented hand crews from crossing. Los Angeles County Fire Department Captain Jerry Hayes dispatched a hand crew to circumvent the gully and begin building line on the opposite side below King and his crew. By this time, Superintendent King and his crew had cold trailed deep into the chimney canyon to the lower end of a bench-like natural fire line. (Point C, Figure 2 is in the center of the bench.)

FIGURE 2



Superintendent King observed the situation from a point 500 feet from where the Los Angeles County line building was stopped at the west side of the gully. (Point B, Figure 2) The terrain was too steep to continue his cold trailing operation from the chimney canyon into the deep gully to the west and the bottom of this gully was obviously a difficult and dangerous place to hold the fire. The wind was from the southeast, favorable to holding the fire. There was no fire on the east side of the deep gully. He apparently decided that the quickest and safest way to control the fire was to tie in with 300 feet of natural firebreaks and build about 200 feet of control line through unburned fuel along the east edge of the gully to a point directly across from the County's control line. (See dotted line, Figure 2) To do this would have taken King's crew an estimated 15 minutes.

But at 5:35 p.m. the fire direction changed due to topographic influence and surprised King and his crew. While he was positioning his men to build line, the fire crossed the gully, (Point E, Figure 2) ran up a 50 foot long slope and established itself in the chimney canyon below the El Cariso Crew and within 60 feet of Superintendent King. Before lead members of the crew could subdue this hot spot or take cover, fire swept from it up

the chimney canyon and enveloped the men. It is estimated that the fire flashed through the 2,200' long chimney canyon in less than one minute.

Point F, Figure 2, in an area 200 feet long and 30 feet wide, is where 10 members of the crew burned to death. Superintendent King ran through the fire and stumbled, badly burned into a safe area below. Four members of the El Cariso Crew and Division Boss Westmoreland survived the fire in the upper end of the chimney. These men were uninjured except for Assistant Superintendent Warren P. Burchett, who was burned and hospitalized several days. The remaining 11 men survived in or near the diamond shaped area clearly visible on Figure 2. All of these latter survivors were seriously burned.

RESCUE OPERATIONS

Helicopter Pilot Troy Cook began rescue operations within 10 minutes after the men were burned. The diamond shaped area was still surrounded by fire when Pilot Cook hovered and picked up the first survivor. Pilot Roland Barton and his helicopter soon joined him and rescue operations continued with great courage and skill until all of the injured men were evacuated to the Los Angeles County Command Post on the Pacoima. From there the injured men were taken by auto to the hospital.

FIRE BEHAVIOR

When the accident occurred, temperatures at lower elevations were in the 90's and at higher elevations in the high 70's or low 80's. Relative Humidity was 10 - 15 percent. Fuel moisture percents were 30 to 40 and ignition indexes varied from 76 to 93, which meant that almost every fire brand could start a fire in light fuels. The moisture content of live chamise in Pacoima Canyon on November 1 was 60 percent which is near the minimum possible for this species. A diminishing Santa Ana wind and the effects of steep rough topography were creating wind channeling and eddies. Fuels in the area were generally sparse, about 11 tons per acre. But at the very base of the Chimney Canyon where the fatalities occurred, sumac and heavy litter fuels were 35 tons per acre.

Burning indexes were extreme. So when the fire crossed the deep gully and ignited the heavier fuels at the base of the Canyon, its heat was all directed up the natural chimney, creating a situation of very intense heat.

GLEN ALLEN INCIDENT

ENTRAPMENT INVESTIGATION

DATE: August 20, 1993
LOCATION: Los Angeles County
Angeles National Forest

GLEN ALLEN INCIDENT

ENTRAPMENT INVESTIGATION

Report Accepted:

P. MICHAEL FREEMAN
Chief, Los Angeles County Fire Department

10/22/93
Date

FOR RONALD STEWART
Regional Forester, Pacific Southwest Region
USDA - Forest Service

10/20/93
Date

INVESTIGATION REPORT

GLEN ALLEN FIRE ENTRAPMENT

Location: Los Angeles County
Angeles National Forest

Date: August 20, 1993

GARY NELSON Assit. Fire Chief, Div. #3, L.A. County	Co-Chief Investigator
BOB TYRREL Supervisor, Shasta-Trinity NF (Ret.)	Co-Chief Investigator
JERRY MEEHAN Battalion Chief #5, L.A. County	Deputy Investigator
KEITH CRUMMER Director, Ecosystem Mgt., Lassen NF	Deputy Investigator
JERRY ELLIS District Ranger, Arroyo Seco RD, ANF	ANF Forest Supervisor Rep.
DON KANDARIAN Aviation Officer, Sierra NF	Team Member
JACK EATON Fire Behavior Analyst, Sequoia NF	Team Member
DAVE STONE Captain, Executive Services, L.A. County	Team Member
TED PUTNAM Fire Equipment Specialist, MTDC - USFS	Team Member
DICK MANGAN Program Leader, Fire & Aviation Mgt, MTDC - USFS	Team Member
BILL GLENDINNING Captain, Dept. Safety Officer, L.A. County	Team Member
JOHN HARRIS Captain, Superintendent Camp 15, L.A. County	Team Member

FORWARD

By its very nature fire fighting is a dangerous undertaking. Wildland fires are especially so because they are dynamic and constantly changing as a result of even slight variations in wind, fuel, topography, humidity and so forth. Unfortunately, sometimes wildland fires bring death and injury to fire fighters who rely on their resourcefulness, knowledge, experience and raw courage during the battle.

The Los Angeles County Fire Department has successfully fought more than 30,000 wildland fires since the last time a fire fighter lost his life in a brush fire. A quarter of a century separates that tragedy and the Glen Allen Fire; the names are different, but the sense of loss and sadness are the same; the date and location are different, but the lessons to be learned are very similar.

No amount of second-guessing or armchair quarterbacking will bring back our deceased brothers or heal all the physical and emotional scars. Still, the gallantry and spirit of Art Ruezga, Christopher Herman and their fellow crew members energize us to study this incident, to learn from it, to share its lessons so that in their name other fire fighters may engage and conquer wildland fires without paying such a dear price.

A difficult and complex fire fighting engagement has been professionally investigated, documented, evaluated and reported by the investigation team, and we are grateful for their efforts. The investigation which follows is comprehensive and factual. The report follows a format used by the National Wildfire Coordinating Group designed to identify and present the facts. Consistent with my objective of being completely candid about the Glen Allen Fire and its lessons, I have accepted this blunt yet effective teaching tool with full knowledge that it can be interpreted as being critical of many things. Yet, this tragic incident and this report must form the "anchor point" from which we shall progress, redoubling our efforts to prevent others from losing their lives in wildland fire fighting.

It is my hope that no one in the fire service ever goes so far as to think that he or she is invincible or that something like this could not happen to them. This was an experienced crew, and they were good at their jobs. Having made a safe landing, well away from the fire, they had contained the head of the fire and had cut several hundred feet of fire line.

Some 35 minutes into their work, during a short break, the fire was evaluated, options and safety considerations were weighed, and the decision was made to continue a downhill cut along an underslung line. The record will show that within the next five minutes, two men would lose their lives, two would be seriously burned and five others would narrowly escape unharmed.

In the "context" of what Crew 2-2 was doing there were numerous mitigating factors that gave them a false sense of safety. It was only seconds before the entrapment that they realized that they were in danger. In retrospect it would become clear that:

- the terrain was extremely steep and the soil so loose as to make escape to safety difficult to impossible
- a ridge prevented a full view of the fire below which was still active although laying down
- the black or burned "safe zone" was not really safe because there were unburned fuels below the intended safe zone
- the crew was cutting a direct line in a small draw (chimney)

On that fateful afternoon, no one on Crew 2-2 intended to take extraordinary risks or to place themselves in jeopardy; none of them displayed reckless disregard for their safety. Yet the sad outcome is now history. So that history does not repeat itself, this report must be accepted, not as a personal criticism of any individual or group, but as a recognition and sad reminder that the dynamics of a wildland fire have the capacity to mislead, deceive, maim and kill experienced, aggressive fire fighters.

P. MICHAEL FREEMAN, FIRE CHIEF
LOS ANGELES COUNTY FIRE DEPARTMENT

NARRATIVE

1. ***Incident Overview***:

At 1511 hours on Friday, August 20, 1993, Ms. Catherine Ryker (Reichert) reported a car and brush fire across the street from 1886 Glenn Allen Lane in Altadena, California. Los Angeles County Fire Department dispatched Engines 11 and 66 to the scene and notified Battalion Chief 4. At 1516 hours, LAC Engine 11 requested a first alarm brush response and to have JPL set up helispot 82A. LAC Engine 11 was the first on the scene and reported approximately 2 acres of brush and a car on fire. At approximately the same time, the Angeles National Forest dispatched a full brush assignment consisting of 5 engines, a dozer, and a hotshot crew to the scene. Los Angeles County also responded a full brush assignment which consisted of 5 engines (including the two already sent), 4 hand crews, Helicopter 15 with Crew 2-2, and supporting overhead.

Upon arrival at the scene, Copter 15 circled the fire three times while Pilot Dunbar, Crew Supervisor Neville and Crew Leader Ruezga discussed the fire activity and a safe off-loading area for the crew. After agreement, Pilot Dunbar landed the copter in a safe area approximately 300 feet from the fire. Copter 15 contacted the LAC dispatch (TRO) and informed them that he was landing the crew and they acknowledged receipt of the message. After leaving the helicopter, Crew Supervisor Neville, Copter 15, and TRO 10 communicated on radio channel Blue 6. The plan was for Copter 15 to return with a load of water by the time Crew 2-2 reached the fire edge. By the time Crew 2-2 reached the fire, Copter 15 had in fact returned with a load of water.

In the time between the start of the incident and approximately 1600 hours, these forces fought the fire and nearly had it contained within a ten acre area. However, approximately 35 to 40 minutes after Crew 2-2 off-loaded the fire became active along its west flank. During the next five to ten minutes the fire expanded to its eventual full size. At the commencement of this new activity both the Angeles National Forest and LAC ordered second alarms for this incident. During this period, Crew 2-2 operated essentially without radio contact with the rest of the forces on the fire scene except for Copter 15. The crew had advanced down the western side of the ridge that they were on and arrived at the Altadena Crest Trail. After a short break, some planning and assessment of alternatives, they decided to continue on down the hill cutting fire line along the advancing edge of the fire. Their strategy was direct attack (one foot in the black). This put them in the drainage that burned subsequent to the initial fire run. They left the trail and started to work downhill after posting a lookout at the point where they left the trail. This action occurred shortly after a 1607 hours request by the crew for water drops in the area below their position. The next contact with the crew occurred between 1614 and 1616 hours when the Crew Supervisor reported an entrapment and burnover incident.

Helicopter 15 immediately came to the support of the crew and tried to ascertain their position and the extent of injuries. He also commenced water drops to protect and cool the crew. Other crews immediately started moving in that direction to assist in rescue and medical evacuation. At 1654 hours after necessary dust abatement work was accomplished, paramedics were dropped into the rescue location and also commenced rescue and evacuation operations. The first victim was evacuated to Sherman Oaks Burn Center by Air Squad 9 at 1724 hours. At 1747 hours Los Angeles City Fire Department Copter 2 departed the incident enroute to Sherman Oaks with the second victim. At 1811 hours the third was transported to Verdugo Hills Hospital. The fourth and last victim was lowered to the bottom of the canyon and carried out to 1781 Skyview Drive at 2045 hours.

The Glen Allen Fire was declared under control at 2144 hours on August 20, 1993.

CHRONOLOGICAL SEQUENCE OF EVENTS

15:11 On Friday, August 20, 1993, Ms. Catherine Ryker (Reichert) reported a vehicle and brush fire across the street from 1886 Glen Allen Lane, Altadena. Los Angeles County Fire Department dispatched two Engines, 11 and 66, to the scene. Battalion 4 Chief notified.

15:13 Engines 11 and 66 dispatched to a grass and vehicle fire at the above location.

15:16 Engine 11 requested a first alarm brush assignment that should have included: included five engines (including Engine 66), four hand crews, one dozer, two helicopters with crews, two crew superintendents and one battalion chief.

15:17 Engine 11 requested Forest Service start a first alarm brush assignment which included five engines, one dozer and one hotshot crew.

15:18 Engine 11, on scene, reported approximately 2 acres in light to medium brush running uphill with a southwest wind at approximately 10 mph.

15:28 Copter 15 with Crew 2-2 arrived on scene.

15:30 Helicopter Air Squad 9 diverted to Mills Incident to fill out a second alarm brush request.

15:33 Crew 2-2 disembarked from Copter 15 at Helispot #1.

15:47 Glen Allen LAC IC notified of diversion of Helicopter Air Squad 9.

16:06 Copter 15 attempted to notify Glen Allen LAC IC that L. A. City Copter was on scene. LACC notified Copter 15 that they are unreadable.

16:07 Copter 15 asked LACC to relay information.

Copter 15 stated: "That's the Forest Service helicopter above the fire and he's in contact with me. He's gonna put his crew up where I put mine and they're gonna work their way down the east side. My crew's working their way down the west side."

LACC acknowledged message but it was not relayed to Glen Allen LAC IC.

16:07 Crew 2-2 radioed Copter 15 to make a drop in the canyon bottom below them.

16:14 Flareup and entrapment occurred sometime between 16:07 and 16:14.

16:14 Crew 2-2 sent garbled message.

16:16 Crew 2-2 requested "emergency traffic - men trapped in the fire."

16:19 Copter 15 asked if TRÖ1O dispatched an air squad. TRO1O: "Affirmative, we have an ambulance and air squad enroute. Crew 2-2, be advised. Copter 15 is enroute, and we are trying to get a hold of L. A. City Fire 4 above you to drop their water on you."

16:22 Mills IC released Air Squad 9 for medical run to Glen Allen Incident.

16:26 Air Squad 9 responded with two paramedics.

16:54 Paramedics are dropped into the incident and commenced rescue and evacuation operations.

17:24 First victim was transported to Sherman Oaks Burn Center via Air Squad 9. ETA was 10 minutes.

17:47 L.A. City Fire Copter 2 enroute to Sherman Oaks Burn Center with second fire victim.

18:11 Air Squad 9 enroute to Verdugo Hills Hospital with third fire victim.

20:45 Fourth victim lowered to the bottom of canyon and carried out to 1781 Skyview Drive.

21:44 The Glen Allen Fire was declared under control.

TO: ASISTANT FIRE CHIEF GARY NELSON
FROM: FIRE SUPPRESSION AID STEVEN KUCH

We returned to Camp 2 from Station 28 and immediately received a fire horn. We made a line up for positions for the fly crew. The line was as follows: Chris Herman -first saw, Chris Barth - first bucker, Roy Rodriquez - second saw, myself, Steven Kuch - second bucker, the rest of the crew members - Eric Goodrich, Hector Larios, Richard Palomarez, crew leader - Art Ruezga and as the foreman - Mr. Neville.

We left Camp 2 and flew to the fire in the hills above Altadena. Upon arrival we circled the fire several times looking for a safe place to land. The landing area was decided on by the foreman and the crew leader. The landing sight was located on the top of a ridge above the fire. After unloading and tooling up, we hiked down to the fire. The fire was slowly burning with about a 18" flame length on both sides of the ridge. The decision was made to split the crew and knock down the flames on both flanks at the same time. After the flames were knocked down on both flanks for about 20' the crew then re-grouped and proceeded down the hill on the west flank. There was a flare up with about a 10' flame length about 200' down from our starting point. We waited for a water drop to assist in knocking down the flames before continuing to cut a line along the west flank. The line was cut down to a dirt trail. The fire was flaring up to the north and below the trail so we waited for another water drop. While waiting for the water drop we were watching the fire's direction of travel, resting and had some water. As we watched the fire, the crew decided that we could cut down off the trail, around, and underneath the fire thus stopping the spread of the fire on that flank. The copter did a water drop knocking the flames down enough so that we could start to construct a line down off the trail.

We started cutting line downhill from the trail. The terrain was very steep and soft. When I was down approximately 30' from the dirt trail, I heard Palomarez screaming at the crew to get out. Palomarez was at the back of the line watching the fire. When I heard him yell, I looked down into the canyon and saw the fire had started burning up on the other side of the canyon. Ruezga was directly below me screaming at the other crew members below him to come out. I then turned and started to try and make my way up the hill.

The footing was very loose and I was unable to get any traction. Beside me was Goodrich who was having trouble as well. He became upset so I told him to use his tool to help get traction but he no longer had his tool with him. So I started to help him by pushing him up the hill. I also helped the foreman, Mr. Neville, by holding his foot with my hand so it wouldn't slip back. I then heard screaming below me, I turned around and saw Ruezga sliding down the hill, disappearing into the smoke. I heard several other screams below me and could hear the fire approaching. Knowing I couldn't help the others, I took an alternate route up the hill through the brush. I reached the dirt trail and saw Goodrich almost to the trail, but still struggling, I reached down and pulled him up.

I had Goodrich pull out my Sigg bottle from my pack and I then proceeded to deploy my fire shelter. Goodrich, Palomarez, Rodriquez, and Mr. Neville were also deploying their fire shelters. Palomarez and I used our fire shelters

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to shield us from the heat and flames as we ran down the dirt trail into the area that had already burned. We were able to reach a location where there was white smoke and stopped. I don't recall what direction the foreman, Goodrich and Rodriquez went; I thought they were behind Palomarez. Once I realized they were not with us, I ran back down the trail looking for them. The flames had laid down and I was able to see them not far from us on the trail. I then proceeded down the trail looking for the other missing crew members.

As I reached the area we vacated I saw Larios not far from the trail trying to walk up the hill. I ran towards him. I saw he had been burned. Then I saw Ruezga further down the hill laying on his chest trying to move. Rodriquez was right behind me so I decided to go down and help Ruezga, letting Rodriquez help Larios. When I got to Ruezga, I saw that he was in bad shape with 3rd degree burns over his entire head and his hands. He was conscious and trying to get up but was unable to. I tried to carry him, as I wasn't sure we were out of danger, but I couldn't move him as I was too exhausted. I held him on his side and poured my canteen of water over his head. I talked to him to comfort him but he was not able to reply. I looked up the hill and Rodriquez and Goodrich got Larios to the dirt trail. Then I looked down and saw Barth approximately 50' further down from my location with Ruezga. He was trying to move. I told him to stay down. Rodriquez came down the hill, passed myself and Ruezga, and went to Barth staying with him trying to take care of him. I kept yelling up to the foreman to get help. He replied, "I'm trying." It seemed that I was holding Ruezga for an hour and still no help. A crew from Camp 19 was below and down canyon from us. They saw us and asked if we needed help. I replied, "Yes, we have 3 men seriously burned." They then began to make their way over to our location. It took a long time for the crew to reach our location. At the same time the crew reached our location, Copter 12 dropped off 2 paramedics at the top of the hill. They took Larios out by the copter. One of the two paramedics staying with Larios in the copter and the other paramedic came down to our location, when seeing the seriousness of Ruezga's injuries, he realized we needed to get him out right away. He called over to the Camp 19 crewmen to help us carry him out. By placing him on the back of one of the crew members, we tried to carry him out but were unable to due to the slope and soil conditions. We needed a stretcher but none were available. We tried to make one out of Nomex jackets and McLeod tools. It was at this point that Ruezga passed away.

Being upset I crawled up the hill and walked around for a couple of minutes. A Stokes was then delivered and Barth was placed on it. Webbing was then tied together and used as a rope to pull him up the hill. When we got him to the top we carried him to the copter. After the copter left I walked back to the area asking if anyone had found Herman. They said they had found him and he had passed away.

Rodriquez, Palomarez, Goodrich and I were escorted down the hill by F.S.A. Tom Merrill to Superintendent DeYoung. We were then placed into two chiefs' vehicles and driven back to Camp 2. During the ride back to Camp 2 we were allowed to use the mobile phone to call our families.

9-15-93

MEMORANDUM OF INTERVIEW
GLEN ALLEN INCIDENT
BARTH, CHRISTOPHER
09/21/93

Officers Conducting Interview:
Glendinning and Harris

My name is Christopher Barth, I am 25 years old. I have been with the Camp 2 Crew for one year and three months (approximately). I was assigned as the first bucker, the second person in line, on Crew 2-2 during the Glen Allen Fire. The fire line order as I remember it was: Chris Herman (first saw), myself (first bucker). Art Ruezga, Gab (Hector Larios), then I am not sure how we were lined up after Gab.

When we returned to camp from a work project, they had us switch over to a fly crew from a ground crew, as fly crew 2-1 had flown to a fire on Catalina Island. While we were in the process of switching over our tools and equipment, a Pasadena City copter flew over camp using its P.A.. stating we had a fire in the Eaton Canyon area. We received a fire call within a few seconds to the Glen Allen fire. Glen Allen Lane was just a few miles to the northeast of Camp 2 and was a short flight. We flew around the fire a couple of times looking for a safe spot to land. The fire did not look like anything other than a quick one. I had not been on a fire with flames showing for a while and was a little excited.

We landed above the fire on a ridge and walked down through the unburned to the head of the fire. There we worked out both sides on the top. It looked like we had the head stopped. We then started making a scratch line down along the west flank. The flames were just creeping along with about 18 inch flame length. Not really all that big a deal. Just a normal piddly little fire you go on. They take most of the afternoon and then you go home.

We worked down on the edge until we got to a drop off above a horse trail, we then had to work over to a place where we could get a footing down to the trail. There we stopped and took a long water break. We saw a lot of fuel in the unburned area and for a while we stayed there watching the fire. We tried to figure out just what it was doing and where it was going to go. It wasn't doing much, as the water drops from the copter were doing their job.

The foreman, Mr. Neville and Dickie Palomarez were together talking about the fire. Then the crewleader, Art Ruezga and Dickie were together talking about the fire, both of them have a lot of experience. It really did not look like much to anyone. The flames were maybe about a foot tall. It was just creeping along. We decided if we could get the copter to hit it with a couple more water drops we could stop it by cutting a line from the trail down to the bottom and then continue to work the flank downhill. The fire really looked like it was not doing much. The fire was not burning very hot and I really had not taken any serious heat while working. We were pretty confident that we could lay in a line without any problems. We stayed on the trail and talked about a couple of different attack variations but we declined them as they were too dangerous. One that was considered was to follow the trail around and try and lay a black line around the horse trail. Dickie did not like this idea as he did not want to work around into the draw or get anyone else in the draw. In the same token he did not want to post a lookout over on the other side as he felt it would be too dangerous. The foreman was also in the conversation as he was the "go" or "no go" agent. As we were talking it over, we decided as a crew we could lay a downhill line off the horse trail. Soon we proceeded down. The hill side was very steep and even though the ground was covered with a pickle weed type of plant the footing was very loose. As the crew descended, we put in almost a two foot wide line just by slipping. We took the action we did as we were pretty sure if the fire took a run it would be up the draw. The fire line was angled off the horse trail to the left with black down below us. The black area below us was not burning and we figured we could make it down and tie into it. We cut right on the fire line. We could not see any fire or smoke that would have caused us to hesitate. I remember looking down and thinking it was not much. The copter had laid in at least two drops. before we jumped off the horse trail.

We had the saw started and were handing it back and forth between Herman and myself as we would finish it. We were a good team. We had the saw running for a few minutes when Gab (Hector Larios) passed the word down for us to bump out. While I was still bent over cutting, I looked down into the canyon; the whole right canyon was burning. I immediately turned around and started going up. I heard Chris (Herman) struggling so I turned around and took the saw from him. I dropped the saw on the ground and kept going. It was very steep and the soil was very loose, preventing us from making much uphill progress. I remembered my training, over and over again, "for a safe area get into the black." Art was over to my right in the burn motioning for us to come his way. He had cut a path through a bush for us to go through, so I headed that way. I was thinking the black would not re-burn and we would be safe. When Chris and I were a few yards into the black; I remember seeing Art moving up the hill also in the black. I don't remember seeing Gab. I'd say about 20 to 30 seconds after starting to bump out we were hit (smoke, heat and flames). It was just unbelievable how fast it was. I was with Chris Herman. We were about an arms length apart in the black. We were side by side moving pretty fast. We had turned to go up the slope when we bumped into each other. I am not sure what happened to him after that. I did not see him again.

It was very smokey and hot. Very hot. I thought I was going to get over run. I just had tunnel vision looking up the hill. I was not getting much air. I did not have enough time. It was all happening so quick. As I was moving uphill I heard a crackling sound, I realized that I was going to get hit as the black was burning again. When I started to feel pain, it really hurt. I just acted and did it. I dropped to the ground. As I was dropping I remember seeing flames wrap all around me. I covered my face with my gloves. My hands were not badly burned as I had on structural gloves. I was trying to protect my nose underneath my shroud. I got my nose under the shroud every once in a while and that's why I still have a nose. My feet were downhill with my head uphill. I had on my pack, a long sleeve t-shirt and all my safety gear. I am not burned on my lower face or neck and I have my ears. I think having my shroud on and closed saved my life. During the last couple of fires this year, I made up my mind to close up my shroud and wear it the right way, I'd trust it again. After the flame had gone over me, about 20 to 30 seconds later the heat subsided. This is when I knew I had been burned. I did not know to what extent or if I was still on fire. I did a stop, drop and roll. My eyes were sensitive to the light but I had to see at this time. I had my eyes closed when I was on the ground. I did not have my goggles on. My goggles melted on my helmet. My helmet also melted but saved my head. I only had some small burns on the back of my head. My back is not bad, just some small burns.

So then, after the flame front passed I figured I was still burning and due to the latent heat my burns were getting worse. Someone yelled down that Art was behind me. I looked to my left and found Art laying on the ground about five feet below me. Art's clothing was on fire so I crab walked over to him and started to pat him out.

I knew I was in bad shape and needed attention, so my next thought was to get up the 40 to 50 feet to the trail above me. I tried to go straight up, did not have enough strength, so I moved sideways. I was on my hands and knees, and a lot of times on my elbows. I did have chaps on which helped save some of my knees. Soon I got to a point where I was too weak to move. I didn't know how far I had gone or where I was. I had a hard time opening my eyes as the pain was too much. The sun seemed very, very bright. I knew I was slipping down the hill into the canyon. I saw a twig or branch sticking out from a hump above me. I thought that if I could grab the branch I could pull myself up onto the hump and hang on. I heard someone yelling but I was not sure what it was about. I made a desperation grab for the branch but missed sliding further down the hill. I stopped sliding just but just missed sliding further down the hill. I stopped sliding just a few feet from what I would later discover was a 125 foot drop off. I was yelling for help. I was really scared and hurt. I thought I was going to die.

Roy Rodriguez came down the hill from the trail and held onto my belt and made sure I didn't slide any further. He reassured me and kept me going. I was running out of willpower, strength and everything else. Roy came down and stayed with me the whole time. He poured water on me and kept me talking. I told him that I was hurting really bad and I was going to die. He would not let me, he kept me conscious. When I got panicky

he would remind me to slow down my breathing, it was a big help. I was with him a long time. A very long time. Me and Roy.

Dickie came down with a rope and tied it to my belt. He then pulled the rope tight to keep me from going over the side. Soon after, Errol Davidson came with a Camp 19 crew. That's when things really started moving. Mr. Davidson had radios. He was talking to the copters and Captain Marshall. They had water banjos and he made sure lots of water was being poured on me. He started cutting some of my Nomex off making me more comfortable. The water took away the pain for a little bit. It was nice and cool. They got me on a Stokes stretcher and carried me out. I was loaded on a Los Angeles City copter and brought to Sherman Oaks Burn Center. The paramedics on the copter started I.V.'s and removed all of my clothing. They did a good job.

MEMORANDUM OF INTERVIEW
GLEN ALLEN INCIDENT
LARIOS, HECTOR GABRIEL
09/25/93

Officers Conducting Interview:
Glendinning and Harris

My name is Hector Gabriel Larios, I am 19 years old. I have been in the Camp Program a little over one year.

On August 20, 1993, I was originally assigned to the fly crew 2-1, but I was bumped off the crew as the Battalion Chief needed a spot on the copter so he could go to the Catalina Island fire with Crew 2-1. I remained in camp until Crew 2-2 returned from their out of camp work project and received a fire response. I volunteered to go to the fire on Crew 2-2.

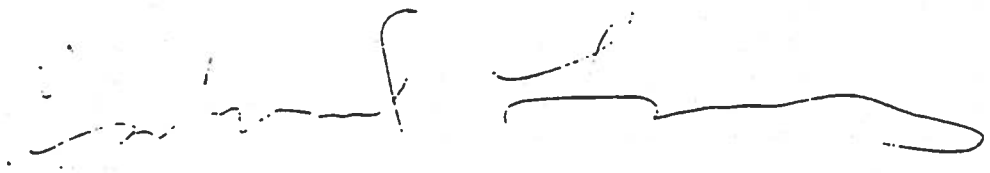
It was a long time ago and I don't remember much. I do remember being dropped off on the ridge and starting from there, we got some good hot line fire fighting in as we worked down. We were working to put in a scratch line, a direct attack with one foot in the black, just trying to put the fire out. It was burning pretty good and hot, we did what we could on the top and worked our way out towards the bottom. There was like a little cliff, a drop off along our line between us and this road or trail (Altadena Crest Trail), and there wasn't really any easy way to get down. I remember that because when I did drop off I landed on my ankle and kind of "tweeked" it. I remember walking over to Dickie and telling him I hurt my ankle and his telling crewleader Art. I told him it felt all right and I could go on.

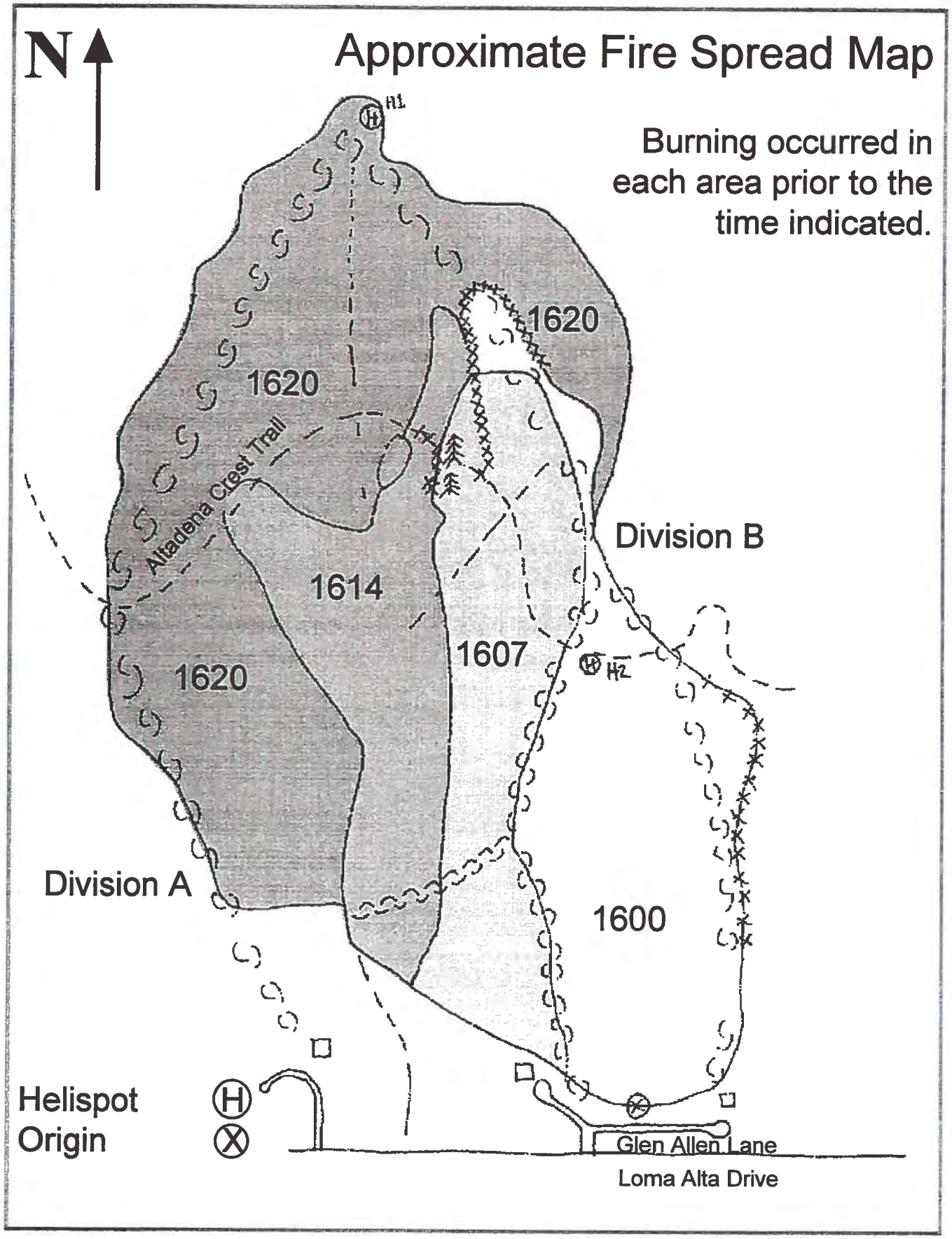
We dropped down to the trail, so now our line was tied into this trail. We stopped and discussed what we were going to do from here. The bowl where this incident happened, I would later find out had a drop off but we could not see any drop off because of the brush. There was a fire burning quite a ways down and it was coming up the bowl a little. The fire wasn't moving that fast but we could see smoke and you could tell where the fire was coming from. All the members of the crew discussed what we were going to do; that the safe area was in the black. The foreman discussed it over with the crew leader, Art, then they told us our plan of attack. We were going to drop over the side and try and put in a scratch line. The crew passed along the word that our escape route would be going into the black. A couple of people mentioned the escape route but we were never sat down and told. When you're just standing around on a fire you kind of tell everybody and pass it along, but you basically look around too, and figure where you're going if something happens.

I remember the sawmen, Chris Herman and Barth, being right in front of the line. I had a McLeod, so I was in the front. It was a very easy tool to work especially in that kind of terrain. I think I was the third person off the road. I am not exactly sure of the fire line order. I could have been in front too. I am not exactly sure, you know what happens, guys jump in they come out, letting another guy get a little. I don't remember too clearly. I do remember we had a burn already. We were not hot lining off the trail, we had it knocked down as the copter had made several water drops. So we dropped down and started putting down a line. Herman and the saw team were running pretty good. The soil was sandy and pretty steep where you can't get a good footing, you take a step and lose two. Chris Herman was pretty far ahead with the saw. I don't recall where Barth was in this situation. It all happened so fast. I just remember they started yelling from the top, "you guys better get out of there, the fire is coming up." I don't know how long we were working, not that long though. The next thing I remember is people yelling,"we've got to get out of here. It's coming up." The brush was thick and high, I looked over and saw some good smoke coming out with some good flame. I could see over the thick brush that it was coming up. I kind of got a little fear in me, like this thing is coming. I remember looking down and yelling to Herman, "come on guys." I waited there. Herman was having problems with the saw. I told Herman to drop the saw, don't worry about it, leave the saw. Let's get out. After he turned around and was getting out, I started up. The soil was really soft, it was hard getting out. I don't know where Chris was. I remember thinking I have to get out of here. I tried to get up the hill a little bit. The flame came up pretty

quick. After we were told to get out, it seemed like a minute to a minute and a half before the flame got up. I remember the flame coming up and feeling myself burning. I remained calm as I burned. I thought first about my fiancee and baby real quick as things were running through my mind. After I got that out of my mind, I was thinking, I am an EMT, I must get my airway open and clear. I never stopped trying to get out, always trying to get up the hill. I never stopped to try to protect my face or anything. I went up the hill to my right into the black area. My whole thought was to get into the black. I was burning and trying not to breathe, not to take in any smoke. I had my shroud down, but did not have my face covered. I don't remember if I had my goggles on. I do remember looking where I was going. I could not see myself burning though. I was on all fours trying to claw my way up. I was not worried about dying, just worried about getting out of the situation. I knew I was burning, but I don't remember feeling any pain. Flames were everywhere. I was in a bowl of flames. After the flames passed, I kept trying to get out. I started to breathe again. I felt myself burned pretty badly. I had all my safety gear on, double layering and structural gloves. If I didn't have on my structural gloves I would not even have my hands. As it was, the skin was dripping on the bottom of my hands and I have some clawing to my fingers but I have good mobility and will be all right. I was on a steep ridge and looking up I could see the trail. It was really hard to climb up, I used bushes, trees, anything to pull myself up. I pulled myself a good distance when I heard voices saying to stay where I was, but in my mind I had to get to the trail. I climbed my way up to where my friends could grab my hand, they had made a human chain. Once up on the trail, I started giving the damage report to my foreman. Possible respiratory damage and second and third degree burns to my body. I didn't feel too much pain, I was just glad to be on the trail. After a while, I felt I was going into shock. They were pouring water on me and it felt good while they poured it on me but when they stopped I felt I was burning, especially my hands. I could have had on my goggles as my eyelids and sight are good but I don't remember for sure. My helmet protected my head, I have just some small burns. My ears and face got it good, badly burned.

At the top, I just remember I have to get help, I have to get out of here. The foreman was calling to get the guys out of here. When I was on the hill, this is the only part that gets to me, is that I was on the hill for a long time without any help. I knew that there was a lot going on with other fires but I was there for so long. It hurt me, I expected as a fire fighter that they would have dropped down a basket and I would be at the hospital by now but it wasn't happening. They could not get a hold of an air squad. I heard so much mix up, the foreman talking on the radio, stating, "I got burn victims down here, we still got people missing, we need help down here." The radio talk back was so much noise that you just could not understand it. The foreman was saying back into the radio "no you don't understand," while I was yelling at him, "you got to get me out of here." I was feeling real pain. Soon after that a paramedic from the copter was working on me with an I.V. and a burn blanket but no drugs. I later found out that they had to make a six foot hover jump to get down to me. They carried me to where the copter was going to pick me up to get me out of here. They could not give me anything for the pain. After I was in the hospital, they did give me something but it just took off the edge.

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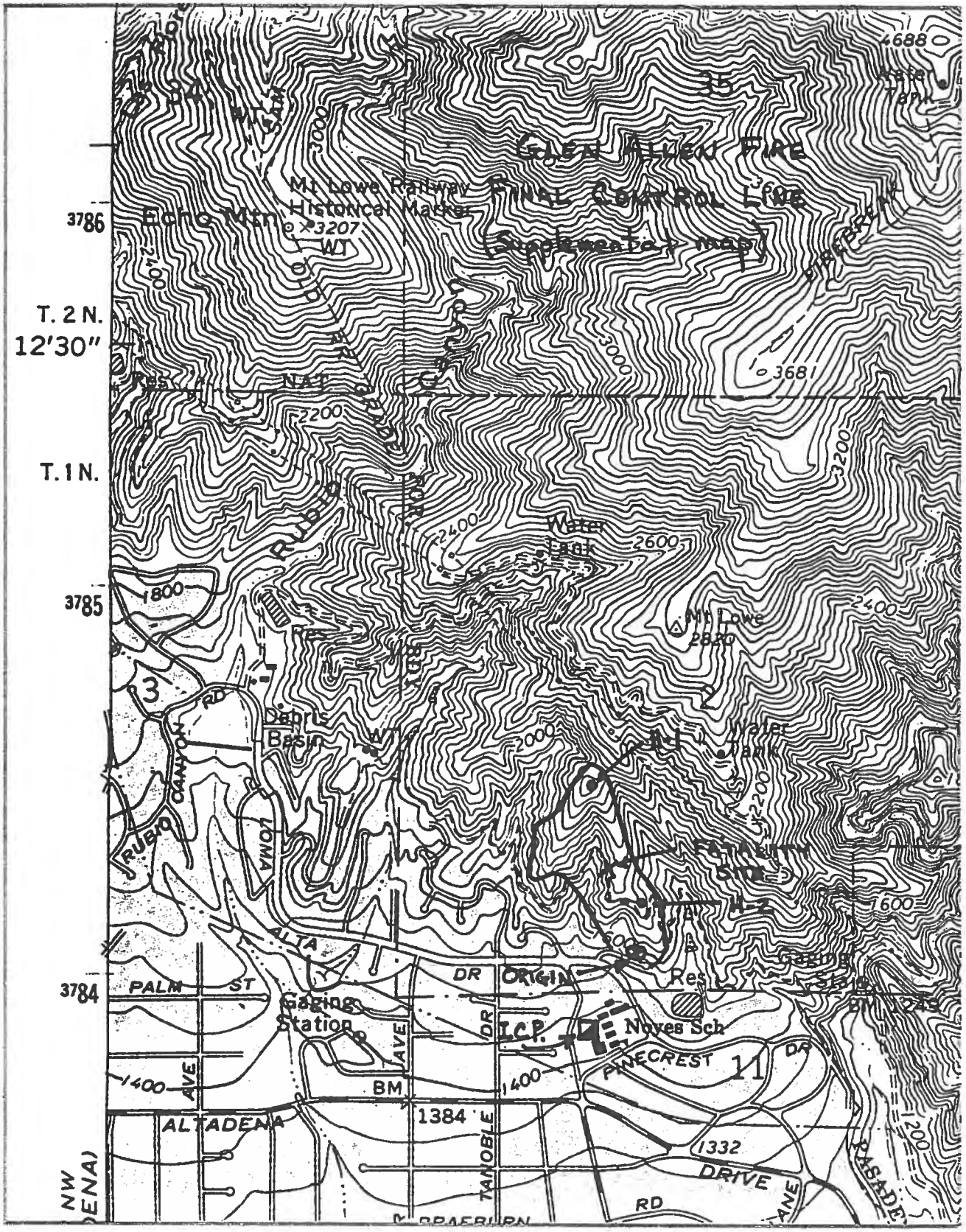
Approximate Fire Spread Map
Burning occurred in each area prior to the time indicated.
H1
1620
1620
Altadena Crest Trail
Division B
1614
1607
H2
1620
Division A
1600
Helispot
Origin
H
Glen Allen Lane
Loma Alta Drive



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