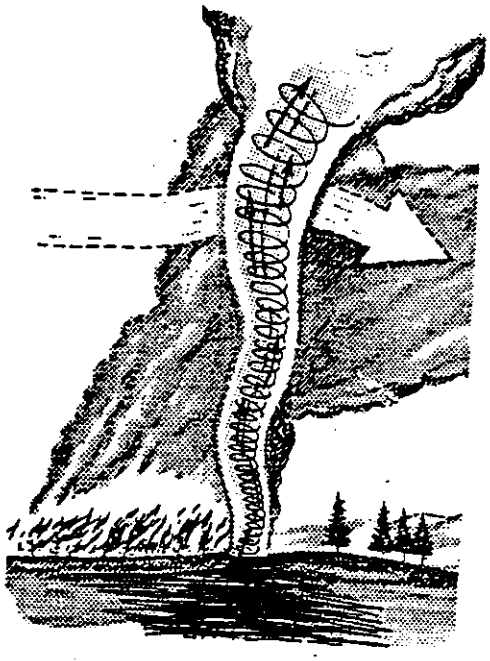
EAGLE FIRE



INVESTIGATION REPORT

VOLUME I

Eagle Fire Accident Investigation

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I. ACCIDENT SUMMARY

On July 7, 1989 at approximately 1427 hours, a vegetation fire was reported 5 miles south of Janesville in the Lassen/Modoc Ranger Unit. This fire, named the Eagle Fire, was located on the west side of Highway 395. During the first few hours, the fire burned actively along and adjacent to Highway 395 in both north and south directions; extreme fire behavior was experienced primarily due to erratic wind conditions. (Exhibit A)

On the morning of July 8, the fire behavior conditions were moderate, as the day progressed, however, fire activity increased and the behavior again became extreme.

Three incidents occurred on July 8 where fire shelters were deployed. At approximately 1110 hours, a CDF Battalion Chief, (BC) engine and dozer, along with a Lassen County Dozer were trapped when erratic fire activity over-ran their position. A safety zone was constructed and the dozer operators took shelter in the crew compartment of the CDF engine. No injuries occurred in this incident.

The summary report ("Green Sheet") is included in the Appendix of this report. (Exhibit B-1)

At approximately 1300 hours, a CDF Helitack crew was attempting a backfiring operation when erratic fire activity over-ran their position. The crew was forced to deploy their fire shelters in the two-blade wide dozer line from which they were firing from.

No injuries occurred in this incident. The summary report ("Green Sheet") of this incident is also included in the Appendix of this report for this incident. (Exhibit B-2)

At approximately 1440 hours, four CDF engines working a spot fire across Highway 395 were caught by a fire whirl advancing from the main fire. The fire whirl crossed onto Highway 395 and centered there momentarily then moved southwesterly across the highway.

The spot fire which the firefighters had just contained, was re-ignited. Numerous other spots ignited when the estimated 100 MPH winds hit the east side of Highway 395 causing an immediate blow-up condition.

Four of the firefighters, trying to return to Highway 395 (which was only 100 feet from where they stood) were lifted off the ground and rolled by the velocity of the whirl wind. Each of these firefighters received varying degrees of burns.

Injuries

Firefighter DUANE WRIGHT	45% 2nd and 3rd degree burns
Firefighter PAT NELSON	10% 2nd degree -0.5% 3rd degree burns
Firefighter JIM SCALES	5% 2nd degree burns
Firefighter JOELLE DERBONNE	3.5% 2nd degree burns

(Exhibit I 1-4)

The fifth FF MIKE KERBY, seeing the velocity of the wind wind and subsequent effect it had on the fire activity between himself and the highway, felt it was safer to move farther away from the highway and fire whirl. He climbed the right-of-way fence and moved to the abandoned highway where he deployed his shelter for radiant heat deflection and proceeded to the south of the now hotly burning fire between himself and Highway 395.

After moving far enough to the south he left the old highway pavement, returned to Highway 395, and advised his company officer that he was safe.

As soon as the four burned firefighters reached the highway they were placed on fire engines and moved approximately 300 yards to the south. Triage took place immediately and first aid treatment was begun by CDF personnel with EMT-1 certification. Two Advanced Life Support (ALS) ambulances and two CDF Helicopters were immediately dispatched to the scene.

The fire, burning extremely hot on both sides of Highway 395, began advancing toward the scene where first aid was being administered. Everyone was again loaded into vehicles and moved 1/2 mile farther south to a safer location near the El Gringo Restaurant.

At this location on Highway 395 the two ALS Ambulances arrived where paramedics stabilized the burned firefighters in preparation for air transport to the Chico Burn Center.

Approximately one hour from the time the four firefighters were burned, they had been stabilized, prepared for transportation, and loaded on board two CDF Helicopters for flights to the Chico Burn Center. Accompanying the burned firefighters was a paramedic on board CDF Helicopter 902.

At approximately 1634 hours the two helicopters arrived at the Chico Airport where the four victims were transported to the Chico Burn Center by ambulance.

Later that evening, at approximately 2030 hours, FF DUANE WRIGHT was transferred by air transport to the UC Davis Medical Center in Sacramento.

II. INVESTIGATION SEQUENCE

Upon learning of a serious accident involving firefighters from Engine 2387 and Engine 4474, an accident investigation team was requested through the Region II Emergency Command Center according to policy established by the California Department of Forestry and Fire Protection. The purpose of the team was to determine the circumstances and causative factors related to this accident. A team consisting of the following members was formed on July 8, 1989:

J. R. McCOLLISTER, Division Chief - Region Office
STEVE PETERSON, Division Chief - Lassen-Modoc Ranger Unit
DAVID B. EBERT, Battalion Chief - Fire Academy
ERIC CARR, Forester II - Nevada-Yuba-Placer Ranger Unit
WOODY ALLSHOUSE, Fire Captain - Lassen-Modoc Ranger Unit

SEQUENCE OF INVESTIGATION:

EBERT arrived at approximately 2000 hours on July 8, 1989 and met with Ranger Unit Chief Lloyd Keefer at the accident site along Highway 395 west of Honey Lake; both were soon joined by PETERSON. By 2300 hours McCOLLISTER, CARR and ALLSHOUSE were on scene and had been briefed.

The entire team assembled at 0800 on July 9, 1989 at the Lassen-Modoc Ranger Unit Headquarters in Susanville, where further briefing was conducted. It was determined at this time that in addition to the accident involving the burn injuries, two other

incidents had occurred on the Eagle Fire; a burnover and shelter deployment involving the Vina Helitack Crew and another burnover and deployment involving Engine 2181, a strike team leader and a CDF dozer. It was further determined that these two incidents did not result in any injury or damage to equipment. Priorities were established, and individual assignments were given to team members.

At 1030 hours on 7-9-89, ALLHOUSE and CARR traveled to the Chico Burn Center by CWN aircraft to interview the burn victims. The interviews were conducted with FF's DERBONNE, SCALES and NELSON.

FF WRIGHT had been transferred to the University of California Davis Burn Center. Upon conclusion of the interviews at Chico, CARR and ALLSHOUSE flew to Sacramento to interview WRIGHT; due to his medical status (critical-unstable) an interview was not possible at that time. Cursory discussions were also conducted of medical personnel at both of the hospitals. CARR and ALLSHOUSE then returned to Susanville by aircraft.

During this same period of time, McCOLLISTER, EBERT, and PETERSON conducted interviews with Fire Apparatus Engineer (FAE) VINCE WALL and Fire Captain (FC) MAHAFFEY. At 1230 hours EBERT, PETERSON, and McCOLLISTER proceeded to the accident site to measure, sketch and photograph the area.

At 1700 hours on 7-9-89, PETERSON traveled to Reno for the purpose of obtaining news video tapes of the accident from television Channel 8.

On July 10, 1989 the entire team convened at the Lassen-Modoc Ranger Unit Headquarters for a re-briefing and to view the video evidence. The remainder of the day was spent interviewing witnesses and participants to the accident and the subsequent rescue efforts. These interviews continued until mid-morning on July 11, 1989 at which time the entire team returned to the accident site in order to establish further visual evidence and to corroborate statements made by victims and witnesses.

Division Chief (DC) RON SMITH of the Lassen-Modoc Ranger Unit had been assigned as a coordinator for the Critical Incident Debriefing Team and to assist the Investigation Team with logistical support. SMITH flew in a CWN aircraft to Chico and met with Hospital Liaison Officer, Battalion Chief (BC) BOB MONSON of the Tuolumne-Claveras Ranger Unit, to retrieve the burn victim's clothing and to obtain additional video tape evidence. He then flew to Jackson, California where additional video evidence was delivered to him from Channel 13 news relative to the Vina Crew burnover.

On July 12, 1989, McCOLLISTER and EBERT concluded the witness interviews for the day then returned to the accident site while PETERSON, CARR and ALLSHOUSE reviewed the ECC tapes at the Susanville Interagency Fire Center. At 1800 hours, EBERT drove

to the Chester Air Attack Base and conducted an interview with United States Forest Service Air Attack Officer JOHN LITTLE who had been the Eagle Air Attack Supervisor on the date of the accident.

On July 13 and 14, 1989, all team members convened at the Susanville Headquarters for the purpose of organization and review of evidence and interview tapes. All clothing and safety equipment that had been worn by the injured firefighters was photographed and some was packaged to be sent to the U.S. Forest Service Textile Specialist TED PUTNAM at Missoula, Montana for analysis.

On July 15, 1989, all team members started a documentation process and departed Susanville enroute to their home units at 1730 hours.

On July 18, 1989 McCOLLISTER and ALLSHOUSE re-interviewed PAT NELSON and JIM SCALES at the Chico Burn Center; also interviewed were Captain BILL ORTHELL and Burn Center Nurse CAROL FARMER as well as Dr. KOROCK. Both team members traveled to Red Bluff where Mr. BALLANTINE of the Burn Foundation was interviewed and to Los Molinos to talk with FAE ALAN CARLSON. On this same day, EBERT and CARR re-interviewed FF DERBONNE at her residence and then traveled to Tuolumne County to interview BC MONSON. On August 10, 1989, EBERT and CARR were allowed into the Burn

Center at UC Davis where the initial interview of FF DUANE WRIGHT was conducted.

During the next several weeks, individual members of the team were conducting interviews of various other supporting witnesses as they were located and information became available.

The investigation team was re-assembled on numerous other occasions for the purpose of organizing and detailing the final report.

It should be noted that team members made numerous attempts to interview DR. DAVIS and DR. MASAVICH without success.

Written statements and transcripts of interview tapes can be found in volume II of this report.

III. FIRE LINE CONDITIONS

Fuel

Fuel in the area of the spot fire and where injuries were sustained consisted of scattered Big Sage 2 to 4 feet tall intermixed with discontinuous 12 to 18 inches tall annual and perennial grasses and forbs consisting of Great Basin Wild Rye, Cheat Grass, Tumble Mustard and Fiddle Neck. (Fuel Model 2, Exhibit C-1). Fuel on the west side of Highway 395 where the main fire resided consisted of similar fuel as described above within the highway right-of-way for a distance of approximately 33 1/2 feet and continued west of the right-of-way fence for an additional 49 1/2 feet.

Fuel then transitioned to mature Bitter Brush 6 to 8 feet high (fuel model 4 or 6) for approximately 315 feet. At this point a tree line existed consisting of Jeffrey Pine and Black Oak. Fuel for the next 130 feet consisted of intermixed Black Oak, Jeffery Pine, Bitterbrush, sage and grasses. (Exhibit C-2)

Fuel then becomes a mostly Jeffrey Pine stand with frequent areas of dense reproduction associated with areas of dense reproduction of light slash loading (Fuel model 9&10). Fuels were abnormally dry, both in terms of live and dead fuel moisture in response to prolonged drought.

Fuel Moisture:	1 hr.	2%
	10 hr.	5%
	100 hr.	4%
	1000 hr.	8%

Topography:

The fire burned between Highway 395 (Elev. 4100 feet) and the top of the Diamond Range escarpment (Elev. 6400 feet). This 2300 foot elevation change occurs within a distance of approximately 1 1/2 miles. Just east of the fire lies Honey Lake which covers more than 40,000 acres. (Exhibit C-3)

The accident site was located several hundred feet from the base of the slopes of the Diamond Range escarpment on relatively flat ground. From the toe of the highway fill slope to Honey Lake the slope is 0-3%. The general aspect can be classified as open from the accident site east to Honey Lake and west to the base of the slopes and northeast on slopes adjacent to the escarpment.

Weather:

A critical fire weather pattern existed whereby strong westerly winds were occurring over the ridges. As the large desert area of Nevada and Utah heated up a heat low formed drawing in low level air. As air flowed into the low it allowed the westerly winds aloft to surface in a Foehn wind type similar to the Santa Ana winds of Southern California or the north winds in the Northern Sacramento Valley. (Exhibit D)

As the local winds flowing from Honey Lake, across green meadow areas, reached the warmer slopes they began lifting and where they met the surfacing westerlies a situation conducive to erratic and accelerated wind conditions and horizontal vortexes (fire whirls) was created. Adding fire generated winds and heat

to this natural phenomenon served to intensify these conditions. Numerous witnesses reported that they had observed dust devils and fire whirls throughout the late morning and afternoon. The same observations were made during the previous day. In fact, a similar incident occurred the afternoon prior wherein the fire blew across Highway 395 and developed into a major fire whirl on the east side of the highway. In this instance, crews pulled out as the fire crossed the road, then returned after the fire had subsided and put a line around the slop over. No injuries were sustained. This occurred less than 1/4 mile from the accident site. Observed weather:

Temperature	-	94-97 degrees
Relative humidity	-	11-13%
Local winds	-	upslope 4-8 mph
Gradient winds	-	westerly 8-17 mph

(Exhibit D)

Fire Behavior:

By mid-morning, on the day of the accident, several crews had been forced to abandon mop up activities and retreat to safety zones as the fire became active and overran control and containment lines. Wind shear and eddy development were common which occasionally generated into fire whirls. This scenario continued and advanced downslope in response to a local or thermal winds followed by a downslope run with a rapid rate of spread crowning and spotting in response to the surfacing gradient westerly wind.

As the fire approached Highway 395, an intense downhill run occurred with flame lengths approximated at 20-35 feet in 6 to 8 feet high Bitterbrush. (Exhibit C-4) From this fire front a fire whirl developed just west of Highway 395. The whirl moved easterly, centered itself on Highway 395 then moved southwesterly adjacent to the highway then across the highway in a southeasterly direction intercepting the escape route of the firefighters. This event took approximately 17 seconds from the time the whirl formed to when it reached the area of the firefighters retreat. The fire whirl left a scorch mark on the pavement measured at 95 feet across. (Exhibit C-7) Visual estimates placed the height at approximately 200 feet with an estimated velocity, of around 100 mph. These estimations were made by Meteorologist CHRIS FONTANA, Redding Fire Weather office. (Exhibit C-5, C-6 and C-7)

As the whirl resided on and near Highway 395, it was launching a multitude of fire brands onto the east side of the highway. As it crossed the highway, it hurled a wall of fire into the area. During the time it centered on the highway, moved southerly; then across the highway it had run out of fuel. As it reached the east side of the highway it existed only in the form of a massive swirling windstorm. This situation was short lived as the whirl began to react with the numerous spot fires which had become established. The loss of fuel and subsequent diminished fire in the whirl for that very short period of time seemingly

accounted for the firefighters not being even more seriously injured. (Exhibits C-8 - 12)

This was a classic example paralleling published descriptions and illustrations of fire whirls. (Exhibit E)

It should be noted that the Fire Behavior forecast for the 7-8-89 day shift states: "Expect radical fire behavior due to the influence of the predicted wind with the mixture of the escarpment." (Exhibit F - refer to Fire Behavior forecast within Incident Action Plan)

IV. SEQUENCE OF EVENTS

A. Leading to Accident

On July 8, 1989 at approximately 1430 hours, the Eagle Fire was burning actively approximately 5 miles south of the town of Janesville in a timbered area approximately 500 feet west of Highway 395 at the base of the Diamond Range escarpment.

CDF engine strike team 9441-C led by BC JAY GASKILL had recently arrived at the incident and had been assigned to Division A along Highway 395 at the southeast portion of the fire for the purposes of structure protection. Unable to locate or contact his division supervisor at this time, GASKILL deployed the engines under his direction and proceeded to drive north on Highway 395 toward Janesville to check-in. During his return to the location of his strike team, he observed a spot fire across Highway 395 on the eastside. He proceeded in a southerly direction and notified two engines in his strike team to respond and extinguish the spot. During the time that GASKILL was lining out engines to attack the spot, engine 2387 was driving southbound on the highway and observed the spot fire.

Engine 2387 had been originally attached to a CDF Strike Team 9221-C led by BC BILL HOLMES from the Butte Ranger Unit, assigned to Division B on the northeast side of the fire. At approximately 0745 hours HOLMES was reassigned as a Division Supervisor. Captain PAT MAHAFFEY was made the acting strike

team leader; the strike team of engines was reassigned to Division E at the west side of the fire.

MAHAFFEY worked on Division E with the strike team until being run out by fire activity between 1130 and 1200 hours. At this time engines 2387 and 2379 retreated to Highway 395. Upon arrival at the highway the engine crews rolled their hose and reorganized their complement. MAHAFFEY was contacted by Division E supervisor and ordered to respond with his engine and engine 2379 to Division A at the southeast corner of the fire to assist with structure protection.

While enroute southbound on Highway 395, to their new assignment, MAHAFFEY observed the same spot fire on the east side of Highway 395, which GASKILL has observed, MAHAFFEY stopped his engine and directed FF DUANE WRIGHT and PAT NELSON to start a progressive 1 1/2" hose lay down the fill bank, a distance of 40' at a 58% slope (Exhibit H Map 1). At this time MAHAFFEY observed that the main fire was burning in the timber at a distance of approximately 500' to the west of Highway 395. A BLM water tender was getting ready to attack the spot. This apparatus left the scene after the arrival of CDF equipment. FAE KEITH BASQUE and FF MIKE KERBY were on engine 2379 which was traveling south on the highway behind engine 2387. Upon arrival at the spot fire BASQUE directed KERBY to proceed down the embankment and assist the other crew with the hose lay operation (Exhibit H Map 2).

As the three firefighters were advancing around the south side of the spot fire, which had grown to a size of approximately 50' X 100' engine 4474 arrived from the south to assist (Exhibit H Map 3). The engine, along with engine 4479 had been sent to this assignment by BC GASKILL. Engine 2379 was being moved at this time by BASQUE to a position in front of Engine 2387.

When engine 4474 arrived on scene, FAE VINCE WALL directed FF's JIM SCALES and JOELLE DERBONNE to take hose packs and proceed to assist with the efforts to extinguish the spot.

As the above evolution was taking place, GASKILL repositioned other engines on his strike team which were located on the west side of Highway 395 and approximately 1/2 mile to the south of the spot fire. This was done due to Gaskill's observations that the main fire's activity west of the highway was increasing substantially and he was concerned for their safety.

As the crews were working on the spot fire, they estimated the fire was burning in 12" to 18" tall grass, producing flame length of 2'. Suppression efforts were being met with success and the spread of fire on the spot was stopped. The crew on the hoselay had just connected with a second 100' foot section of 1 1/2 inch hose when the burning conditions on the main fire west of the highway substantially increased. This increase in fire activity and winds produced flying fire brands that caused an

additional spot fire to the south of the one the crews were working on.

Engine 4479 with FAE TIM MOYLES, FF's MELANIE TAYLOR and KEN WARNOCK had also been dispatched to the scene of the spot by GASKILL. Arriving from the south, a "U" turn was made and MOYLES backed the engine into the area where the other engines were working (Exhibit H Map 3). MOYLES directed his firefighters to deploy a reel line and attempt to extinguish the second spot.

As the reel line was being pulled, the fire activity increased substantially as winds intensified and more spots occurred. MOYLES ordered his firefighters to return to the engine before they had become committed to suppression action and upon doing so, departed, traveling south.

The main fire was being fanned by rapidly increasing wind activity coming from the west and the fire, which had been making predominately uphill runs, changed direction and swept toward Highway 395 through a heavy stand of Bitterbrush and Sage.

A large fire whirl developed west of Highway 395, almost directly opposite the location where the engines were parked. The whirl moved onto the highway and moved back and forth prior to crossing to the east side. (Exhibit H Map 4)

Engine 4474 started to back south with WALL announcing over the PA for the firefighters on the hoselay to "Run to the south, follow my voice."

MAHAFFEY was standing next to his engine when the fire whirl hit the road. He was unable to get into the cab of his engine due to the extreme winds and blowing flames, and was forced to grip the 1 1/2" discharge on the side of the engine in order to keep from being blown off of his feet. He used his engine as a shield in a standing position. When the blow-up occurred, the firefighters working the hoselay were cut off from their engines when the flames and heat blew across the highway. (Exhibit H Map 5)

FF's DERBONNE and SCALES started to retreat in or near the burned portion of the spot they had been working. Both were picked up, thrown, and rolled by the force of the winds. DERBONNE and SCALES became separated; SCALES continued in a westerly direction and climbed the embankment to the road while DERBONNE went more southwesterly before going to the road. DERBONNE lost her helmet when the force of the wind broke the chin strap and it was pulled from her head. (Exhibit H Map 6 and Exhibit C-13)

FF's WRIGHT and NELSON retreated south after abandoning a live hoselay. They were immediately picked up, thrown and rolled by the high winds; WRIGHT attempted to deploy his shelter, however it was blown from his hands. (Exhibit C-14) FF NELSON tried to deploy his shelter but the melting shelter pouch stuck to his gloves, and the packaged shelter fell to the ground unopened. (Exhibits C-15, 16) They worked their way toward the highway and helped each other up the embankment. (Exhibit H Map 6) FF KERBY,

after observing the movement of the fire whirl, jumped the fence and ran east to Old Highway 395 where he deployed his fire shelter as a shield. He was not injured. Kerby continued south and walked around the burn to Highway 395. (Exhibit H Map 6)

B. Post Accident Field Treatment

After the fire whirl crossed Highway 395 and the fire intensity on the highway decreased, a strike team of volunteer engines with BATTALION CHIEF BOB BECKER as strike team leader proceeded south into the area of the accident. Members of the Strike Team observed the burned firefighters on the highway, but because of intense heat were forced to continue through the hot spot.

He drove far enough to allow the whole strike team to clear the hot spot. When the firefighters in the Strike Team ran back to the burned firefighters they were already being attended to.

Engines 4474 and 4479 drove to the south on Highway 395 approximately 100 to 200 feet when the fire whirl crossed the highway near their original position. As 4474 was leaving, FAE WALL used the PA to tell the trapped firefighters to run to the south and to follow his voice. Once the flames decreased in intensity they drove back close to where the fire whirl had originally crossed the highway to search for the missing firefighters.

The first burned firefighter to appear was JOELLE DERBONNE. She came walking down the middle of the highway towards the engines. WALL (4474) met her first and after determining that her condition was not serious sent her to the south to get on Engine 4479. FAE MOYLES (4479) met her on the highway and placed her in the crew compartment of his engine. MOYLES directed his FF MELANIE TAYLOR to monitor DERBONNE'S condition. After securing DERBONNE in the crew compartment he notified Strike Team Leader JAY GASKILL by radio that they had burned firefighters. After WALL sent DERBONNE to Engine 4479 he met NELSON, also walking down the center of the road. NELSON was more severly burned than DERBONNE. WALL put NELSON into the cab of his Engine (4474) and told him that they would get out right away. WALL left the engine to search for other victims, but NELSON'S screams from the cab brought him back. WALL then backed his engine to about the same location they had retreated to earlier. Meanwhile MOYLES (4479) had located SCALES walking down the road. MOYLES and FF KEN WARNOCK walked SCALES back to Engine 4479. MOYLES loaded SCALES into the crew compartment next to DERBONNE. WRIGHT was met on the road by TAYLOR. She led WRIGHT back to Engine 4479 where he entered the crew compartment.

MOYLES announced on his radio that he had three victims on his engine and was coming out. Engines 4479 and 4474 then moved to the south. After travelling just a couple hundred feet, MOYLES heard something in the crew compartment that made him stop. He checked the crew compartment and found WRIGHT'S clothing was

still slightly burning (cotton undershirt). WRIGHT was unloaded and his Nomex and his undershirt were cut off with a pair of shears; the rest of the burned firefighters were also unloaded. At this time FF TROY PIETRE, Emergency Medical Technician (EMT) 1A (Engine 4466) began a triage of SCALES and WRIGHT and began treatment. Treatment consisted of removing smoldering clothing, applying water and saline to burns, taking blood pressures, putting on burn packs. WRIGHT was laid on a paper sleeping bag and covered with a burn sheet wet down with water and saline.

NELSON was brought by two firefighters to the location of the other three burned firefighters and laid in a prone position. FF CLINTON SCOTT, EMT 1A (4466) began treatment of NELSON. His treatment consisted of removing the smoldering clothes, soaking him down with the water and bandaging his burns with sterlized gauze wrap. He was wrapped in a Santa Clara Burn Pack and placed on a backboard.

DERBONNE, who had the least amount of burns, was sat down on the pavement while the other more seriously burned firefighters were attended to. She was checked on by firefighters on the scene occasionally, but she received no treatment at this time. (Exhibit C-18)

BATTALION CHIEF TOM REES, (Incident Operation Section Chief) arrived at the scene and ordered the patients moved further south on Highway 395 where helicopters could be landed and not be in

danger of being overrun by the fire. WRIGHT loaded himself into BC BECKER'S pickup cab for the move down the road. During this trip WRIGHT cooled himself by pouring a canteen of water over himself.

SCALES and DERBONNE were transported in the crew compartment of Engine 4479 to the safety location down the road.

NELSON, who was on a backboard, was loaded onto the bed of BC GASKILL'S pickup truck and transported to the safety location.

Once all patients arrived at the new location, near El Gringo Restaurant, FAE WALL was directed by BC GASKILL to perform a triage of all the burn victims. He ranked WRIGHT as number one, NELSON as number two, SCALES as number three and DERBONNE as number four relative to severity of injuries.

WRIGHT was assisted out of BECKER'S pickup and placed in a sleeping bag on a backboard on the ground. (Exhibit C-19)

ARTHUR STEINBECK, Fire Prevention Assistant, was attending to WRIGHT until the ambulances arrived within minutes of the burned firefighters' arrival at the safety location.

DERBONNE and SCALES were treated by EMT I A, PIETRE. NELSON was treated by EMT IA SCOTT along with several other helpers until the ground ambulances arrived. Patients had their burns cooled with water, blood pressures taken, and sterile dressings applied.

The fifth firefighter on the hoselay KERBY was not burned as he took a few extra moments to analyze his position and movement of the fire whirl. KERBY has 14 years of fire experience. He made his escape to a safety position on old Highway 395 which was 146 feet to the east. He crossed one fence and walked and ran through unburned sage and knee-high grass to his safety location. KERBY avoided the fire by moving north and south on old Highway 395 as different areas burned. He deployed his shelter and used it as a shield to deflect radiant heat, returning to his engine (2379) as soon as it was safe.

C. Ambulance Dispatch To Chico Burn Center

The Lassen Ambulances were staged at the Janesville Staging Area and were dispatched at 1454 hours to the accident site. They proceeded south on Highway 395 toward the accident site. The ambulances crews consisted of BRAD REGER RN; DEAN BROWN, EMT-Paramedic and LES WENJER EMT-II. They were held at the roadblock just north of the site by the Lassen County Sheriffs Department. A few minutes passed then a member of the Janesville Fire Protection District emerged from the smoke and advised the ambulances they could proceed with caution to the El Gringo treatment area. On his arrival REGER contacted CDF personnel to assess the condition of the victims. REGER assigned BROWN to begin advance life support treatment of WRIGHT. WENJER was assigned to begin treatment of PAT NELSON. The CDF EMT's continued to give aid to both JIM SCALES and JOELLE DERBONNE on CDF engine 4479.

BROWN started an IV of lactated ringers and administered 5 mg. of morphine sulfate IVP at the scene to WRIGHT. WENJER started an IV of lactated ringers on NELSON then proceeded to assist BROWN with the treatment of WRIGHT.

Helicopters 202 and 902 arrived at the El Gringo treatment area shortly thereafter.

NELSON and SCALES were loaded into Helicopter 202, assisted by FC CASE BUTTERMAN, CDF FFI EMT-II MIKE WEAVER, and WENJER.

Helicopter 202 departed for Chico Airport at 1537 hours. While enroute to Chico Airport WENJER started an IV D5W on SCALES and administered 4 mg of morphine sulfate IVP. SCALES dressings were changed from dry to wet to help alleviate the pain. NELSON received three dosages of morphine sulfate of 5,5, and 2 for a total of 12 mgs. NELSON also received 10L of oxygen via mask. NELSON'S IV was changed to D5W after the lactated ringers were exhausted.

Both NELSON and SCALES appeared to be stable during the flight to Chico Airport. Helicopter 202 arrived at Chico Airport at 1634 hours.

WRIGHT and DERBONNE were loaded into Helicopter 902 assisted by FC ED STELLE and DEAN BROWN. Helicopter 902 was enroute to Chico Airport at 1549 hrs. While enroute WRIGHT'S wounds were re-dressed and he continued to received 10L of oxygen via mask. WRIGHT was also given a total of 30 mg. morphine sulfate in 5 mg. increments to treat the pain.

Helicopter 902 arrived at Chico Airport at approximately 1634 hrs.

At 1515 hours Oroville ECC hads assigned FC BILL ORTHELL as the Liaison Officer at Chico Burn Center. ORTHELL responded to Chico Airport to await the arrival of Helicopters 202 and 902. At 1634 hours both helicopters arrived at the Chico Airport.

ORTHELL, fire personnel from Chico Fire Department #3, and Paramedics from waiting ambulances unloaded the four patients from the helicopters and loaded them into ambulances for ground transport to the Chico Burn Center.

DR. STAN KOROCK of the Burn Center had been notified of the pending arrival and was waiting at the Emergency Room when the four patients arrived. DR. TIE the Emergency Room physician and DR. KOROCK began to triage the two patients that arrived in the first ambulance. WRIGHT was placed in the major trauma room and NELSON was placed in the secondary trauma room.

Shortly thereafter the second ambulance arrived with DERBONNE and SCALES. It was determined that WRIGHT was the most severely burned patient and required a central IV line. Both DR. KOROCK and DR. TIE proceeded to stabilize WRIGHT. DR. KOROCK was able to triage the remaining patients and assess their conditions. NELSON was the first patient to be moved to the burn unit for wound cleansing and dressing. IV's were re-established on the remaining patients along with x-rays and lab workups. SCALES was next to be admitted to the burn unit for cleansing and dressing. WRIGHT was then admitted to the burn unit and was placed into the Hover tank for debreeding and wound cleansing. DERBONNE was the last patient to be admitted to the burn unit.

WRIGHT'S burns were evaluated to be 45% 2nd degree and 3rd degree. He had received 3rd degree burns to his face, left

anterior arm, right forearm, posterior left and right arms, and posterior trunk. 2nd degree burns covering his right anterior upper arm, anterior legs, and posterior legs. (Exhibit I-1)

Nelson received 1/2% 3rd degree to his lower left posterior trunk and 10% 2nd degree burns to his posterior arms, trunk, buttocks, and left thigh. (Exhibit I-2)

JIM SCALES received 2nd degree to his anterior lower right arm, posterior lower right arm and 1% 1st degree burns to his face. (Exhibit I-3) Facial burns were later determined to be 2nd degree. DERBONNE received 3.5% 2nd degree burns to her face and posterior left and right elbows (Exhibit I-4)

Shortly after the patients were admitted to the burn unit DR. KOROCK received a telephone call from DR. DAVIS, CDF Medical Officer, seeking a status report. DR. KOROCK gave a report on each of the patients and advised DR. DAVIS that he would keep him informed of their conditions. DR. KOROCK received and responded to several more telephone calls from DR. DAVIS and DR. MASAVICH of the UC Davis Medical Center over the next two hours inquiring into WRIGHT'S medical stability for transportation to UC Davis Medical Center Burn Unit. DR. KOROCK felt that at this point in the treatment, telephone calls from DRS. DAVIS and MASAVICH were becoming disruptive to the treatment.

Approximately 30 minutes after DR. KOROCK advised DR. DAVIS and DR. MASAVICH that WRIGHT could be transported that evening, DR.

KOROCK received a telephone call from the airport saying that they would be there in about 20-minutes and asked if the patient was ready. DR. KOROCK asked if they wanted him to arrange for ground transport, and was told that it would not be necessary. A short time later the ambulance and paramedics arrived at the Chico Burn Center to transport WRIGHT.

FC ORTHELL and FAE SHERRY SHELLER (stress debriefing team member) had arrived at the Chico Burn Center shortly after the patients. ORTHELL received a briefing from DR. KOROCK at 1745 hours and made several contacts. SHELLER spent time with the patients as allowed. ORTHELL began receiving telephone calls from DR. DAVIS at about 1802 hours. DR. DAVIS told him that he wanted to get WRIGHT transferred and seemed concerned about the care they would receive at Chico. ORTHELL received word at 1915 hours that WRIGHT would be transferred that evening.

ORTHELL observed that WRIGHT had been uncomfortable when he was unloaded from the helicopter and now was resting quite well and had even fallen asleep. As they began to prepare WRIGHT for transport FC ORTHELL and Burn Center Nurse CAROL FARMER felt that his condition was changing. FARMER stated that WRIGHT was acting a little confused and was not his usual self and thought that he may be becoming hypoxic. ORTHELL observed that WRIGHT was becoming worried and a little shaky. FARMER asked DR. KOROCK and DR. TIE to evaluate WRIGHT before he was moved. After re-evaluating, they felt he was stable enough for the Paramedics to

transport to UC Davis Medical Center. WRIGHT was transported at 2030 hours.

V. FINDINGS

Obviously, armed with information of what resulted when the main fire crossed Highway 395 and a documented visual account of the fire whirl, it becomes easier for the investigation team to question decisions and actions by principals who were functioning in the heat of the battle without benefit of that information.

1. Factors were present to suggest the potential for severe fire behavior; the well advertised drought, winds, events earlier in the day, and events of the previous day.

2. A massive fire whirl did occur and was a significant contributor to the injuries sustained by the firefighters.

3. A Fire Weather Meteorologist was originally ordered but was canceled.

4. The spot fire on which the injured firefighters were working was located in light fuels in front of a main fire with rapid spread potential in heavy, volatile fuels. The fuels on the eastside of the highway where the spot occurred transitioned into a green pasture and then a large lake.

5. There was no immediate threat to structures.

6. All persons involved were supplied with full wildland safety equipment and clothing in accordance with CDF specifications. Including helmets with face and neck

protection goggles, Nomex shirts and pants, fire shelter, gloves and lug-soled boots at least 8" in height.

7. All firefighters with the exception of one were wearing protective clothing in accordance with CDF standards. Evidence indicates that FF WRIGHT wore all protective clothing except his goggles which were affixed to his helmet and not over his eyes.

8. FF DERBONNE lost her helmet when a portion of her chin strap failed in the high winds.

9. The safety clothing worn by the firefighters functioned as expected and appears to have mitigated the possibility of more serious injuries. Damage to the Nomex shirts and pants of the injured firefighters varied from none to extensive charring and discoloration of the material; with exposure to radiant heat exceeding 700 degrees F and direct flame impingement. (Exhibit C-20 - C-22,C-33,C-35,C-37-39,C-41)

10. In general, areas double protected by cotton T shirts suffered less severe burn injuries. In addition, areas covered by two layers of Nomex (i.e. pockets) suffered less severe burns.

11. The shelter pouch carried by FF NELSON was melting and stuck to his glove when he attempted to extract his shelter contributing to his inability to effect deployment. This melting shelter pouch also contributed to burns; 3rd degree

burns were experienced by NELSON in the immediate adjacent area.

12. The 1 1/2 inch hose lay was charged and usable when the retreat was made.

13. Statements were made by firefighters that they did not deploy fire shelters due to a lack of time to clear the flammable vegetation.

14. There was confusion on the part of the Medical Triage Officer (RN BRAD REAGER) as to the capabilities of the helicopter crew both in terms of personnel qualifications and available medical equipment on board.

15. EMT level trained CDF personnel at scene performed expediently and professionally in the treatment of the burned firefighters.

16. Ten Standard Orders and Thirteen Situations.

10 STANDARD ORDERS

1. KEEP INFORMED ON FIRE WEATHER CONDITIONS AND FORECASTS. FIELD OBSERVATIONS WERE MADE BY ALL PERSONS INVOLVED. THE STRIKE TEAM LED BY BC GASKILL HAD RECENTLY ARRIVED ON THE SCENE AND DID NOT HAVE THE BENEFITS OF THE WEATHER HISTORY AFFECTING THE FIRE.

2. KNOW WHAT THE FIRE IS DOING AT ALL TIMES - OBSERVE

PERSONALLY, USE SCOUTS.

APPARENTLY THE EXTREME FIRE BEHAVIOR INDICATORS WERE NOT RECOGNIZED BY THE CREW LEADERS, CONSEQUENTLY THE SUDDENNESS OF THE FIRE WHIRL DEVELOPMENT CAUGHT ALL PERSONS INVOLVED BY SURPRISE.

3. BASE ALL ACTIONS ON CURRENT AND EXPECTED BEHAVIOR OF FIRE.

SOME OF THE PRINCIPALS INVOLVED WERE UNAWARE OF THE PREVIOUS DAY'S BURNING CONDITIONS WHICH WERE SIMILAR. FC MAHAFFEY AND FAE BASQUE HAD RECENTLY BEEN RUN OUT OF ANOTHER PORTION OF THE FIRE BY EXTREME FIRE BEHAVIOR. FAE WALL HAD BEEN OBSERVING THE MAIN FIRE AND TIMING MAJOR RUNS.

4. HAVE ESCAPE ROUTES FOR EVERYONE AND MAKE THEM KNOWN.

ESCAPE ROUTE HAD BEEN IDENTIFIED AS BACK TO THE ENGINES, HOWEVER, THE FIRE WHIRL WAS ACTING AS A BLOW TORCH, THREATENING THAT ESCAPE ROUTE. THIS RESULTED IN A CONDITION OF "EVERY PERSON FOR THEMSELVES".

5. POST A LOOKOUT WHEN THERE IS POSSIBLE DANGER.

CREW LEADERS WERE IN A POSITION TO SERVE AS LOOKOUTS, HOWEVER, DUE TO THE RAPID BUILD-UP OF THE FIRE THEY WERE NOT ABLE TO SERVE EFFECTIVELY.

6. BE ALERT, KEEP CALM, THINK CLEARLY AND ACT DECISIVELY.

ONLY FF KERBY FOLLOWED THIS RULE. WHILE TWO OTHER FIREFIGHTERS TRIED TO RETURN TO THEIR ENGINES BY THE PRE-DETERMINED ESCAPE ROUTE, THE RAPIDITY OF THE FIRE'S BUILD-UP CAUSED THEM TO RETREAT TO LESS SAFE AREAS. TWO OTHER FIREFIGHTERS TRIED TO OUT FLANK THE FIRE TO THE SOUTH, ALSO PROVING TO BE UNSAFE.

7. MAINTAIN PROMPT COMMUNICATION WITH YOUR CREW, YOUR BOSS AND ADJOINING FORCES.

UNCLEAR DIVISION ASSIGNMENTS DUE TO A RAPIDLY MOVING FIRE MADE COMMUNICATIONS BETWEEN SUPERVISORS AND ADJOINING FORCES POOR. WHILE THE PARTIES DIRECTLY INVOLVED IN THE ACCIDENT HAD FACE TO FACE COMMUNICATIONS, NOISE CREATED BY THE FIRE AND WIND CONDITIONS MADE HEARING DIFFICULT TO IMPOSSIBLE, AND VISUAL CONTACT WAS SEVERELY IMPAIRED JUST PRIOR TO AND DURING THE COURSE OF THE BLOW-UP DUE TO SMOKE AND FLAME.

8. GIVE CLEAR INSTRUCTIONS AND BE SURE THEY ARE UNDERSTOOD.

MAHAFFEY HAD BEEN REASSIGNED WITHOUT THE BENEFIT OF CLEAR INSTRUCTIONS AS TO WHO TO REPORT TO AND HIS SPECIFIC ASSIGNMENT; GASKILL HAD JUST ARRIVED ON SCENE AT THE INCIDENT AND WAS UNABLE TO CONTACT HIS DIVISION

SUPERVISOR.

9. MAINTAIN CONTROL OF YOU CREW AT ALL TIMES.

GOOD CONTROL BY THE CREW LEADERS WAS MAINTAINED UNTIL THE BLOW-UP OCCURRED AT WHICH TIME LACK OF VISIBILITY AND CONFUSION RESULTED IN A LOSS OF CONTROL. AFTER THE IMMEDIATE EMERGENCY HAD PASSED, EFFECTIVE CONTROL WAS REGAINED BY THE CREW LEADERS AS WELL AS OVERHEAD PERSONNEL RESULTING IN A SMOOTHLY ORGANIZED RESCUE EFFORT AND MEDICAL TREATMENT TO THE INJURED.

10. FIGHT FIRE AGGRESSIVELY AND PROVIDE FOR SAFETY FIRST.

NO DOUBT, THE CREWS WERE FIGHTING FIRE AGGRESSIVELY. THE QUESTION ARISES, HOWEVER, "WAS THE HIGHWAY AN ADEQUATE SAFETY ZONE AS COMPARED TO THE VOLUME AND INTENSITY OF FIRE ACTIVITY?"

13 SITUATIONS
THAT SHOUT WATCH-OUT

1. YOU ARE BUILDING A LINE DOWNHILL TOWARD A FIRE.

   N/A

2. YOU ARE ON A HILLSIDE WHERE ROLLING MATERIAL CAN IGNITE FUEL BELOW YOU.

   N/A

3. YOU NOTICE A WIND CHANGE.

   DOCUMENTATION AND INTERVIEWS INDICATE CHANGES BOTH IN WIND SPEED AND DIRECTION HAD BEEN EXPERIENCED ON ALL SEGMENTS OF THE FIRE THROUGHOUT THE OPERATIONAL PERIOD.

4. YOU FEEL THE WEATHER GETTING HOTTER AND DRIER.

   DOCUMENTATION AND INTERVIEWS INDICATE STEADY INCREASES IN TEMPERATURE AND DECREASES IN HUMIDITY WERE PRESENT ON ALL SEGMENTS OF THE FIRE THROUGHOUT THE OPERATIONAL PERIOD.

5. YOU ARE IN HEAVY COVER WITH UNBURNED FUEL BETWEEN YOU AND THE FIRE .

   CREWS WERE IN LIGHT FUEL, HOWEVER, HEAVY VOLATILE FUEL EXISTED ON THE WEST SIDE OF HIGHWAY 395 BETWEEN THE ENGINES AND THE MAIN FIRE.

6. YOU ARE IN AN AREA WHERE TERRAIN AND/OR COVER MAKE TRAVEL SLOW AND DIFFICULT.

THE CREWS WERE WORKING ON A SPOT AT THE TOE OF A FILL BANK WITH A 58 PER CENT SLOPE FOR A 40 FOOT DISTANCE. THIS IS IDENTIFIED AS THE ONLY DETERRENT TO NORMAL TRAVEL.

7. YOU ARE IN COUNTRY YOU HAVE NOT SEEN IN DAYLIGHT.

N/A

8. YOU ARE IN AN AREA WHERE YOU ARE UNFAMILIAR WITH LOCAL FACTORS INFLUENCING FIRE BEHAVIOR.

CREWS INVOLVED IN THE ACCIDENT WERE FROM OUT OF THE AREA AND WERE NOT FAMILIAR WITH LOCAL CONDITIONS.

9. YOU ARE ATTEMPTING A FRONTAL ASSAULT ON A FIRE WITH ENGINES.

THE CREWS WERE WORKING AHEAD OF THE FORWARD SPREAD OF THE FIRE; SPOTS WERE OCCURRING OVER THE PLANNED CONTROL LINE (HIGHWAY 395) THEREBY PLACING THE ENGINES IN A FRONTAL ASSAULT MODE.

10. YOU ARE GETTING FREQUENT SPOT FIRES OVER YOUR LINE.

YES

11. YOU CANNOT SEE THE MAIN FIRE AND YOU ARE NOT IN COMMUNICATION WITH ANYONE WHO CAN.

THE CREW LEADERS COULD SEE THE MAIN FIRE'S ACTIVITY. FIREFIGHTERS INVOLVED IN THE ACCIDENT WERE BELOW THE ROAD, UNABLE TO OBSERVE THE MAIN FIRE. THE RAPIDLY CHANGING

CONDITIONS AND SPEED AT WHICH THE FIRE WHIRL CROSSED THE ROAD PROHIBITED ADEQUATE WARNING COMMUNICATIONS.

12. YOU HAVE BEEN GIVEN AN ASSIGNMENT AND/OR INSTRUCTION NOT CLEAR TO YOU.

CONFUSION RESULTED FROM THE RECENT REASSIGNMENT OF TWO ENGINE COMPANIES AND THE RECENT ARRIVAL OF THE STRIKE TEAM JUST PRIOR TO THE ACCIDENT OCCURRENCE; PROPER BRIEFING OF THE PLAN WAS NOT ACCOMPLISHED.

13. YOU FEEL LIKE TAKING A LITTLE NAP NEAR THE FIRE LINE.

N/A

17. Training:

An examination of the training records located at the unit of the people either directly or peripherally related to the accident revealed the following:

1. FF DUANE WRIGHT; WRIGHT had received the mandatory basic fire fighting training at the Ranger Unit and was a second year Fire Fighter.

2. FF PAT NELSON; NELSON had received the mandatory basic Fire Fighter training at the Ranger Unit and had two years of experience.

3. FF JIM SCALES; SCALES had received the mandatory basic Fire Fighter training at the Ranger Unit and was a seven-year Fire Fighter.

4. FF JOELLE DERBONNE; DERBONNE had not completed the required minimum basic Fire Fighter training at the Ranger Unit. DERBONNE had completed a large portion of the training, including the Safety Section. She was a second year Fire Fighter.

5. FAE VINCENT WALL; No local training records were available for WALL due to a promotion and transfer shortly after the accident occurred. The records had been transferred and were unable to be located. An inspection of Fire Academy records indicated that WALL graduated with high grades and comments. WALL has eight years of fire service experience.

6. FC PAT MAHAFFEY; MAHAFFEY has completed all required training for his position and has 12 years of experience.

7. FAE KEITH BASQUE; BASQUE has completed all required training for his position and has eight years of experience.

8. FF MIKE KERBY; KERBY has completed the required basic Fire Fighter training at the Ranger Unit and has 14 years of experience.

9. BC JAY GASKILL; GASKILL has completed all required training for his position and has 22 years of experience.

10. BC TOM REES; REES has completed all required training for his position and has 18 years of experience.

While other persons' training and experience records were examined, the investigation team agrees that the aforementioned individuals were the ones noteworthy to this incident.

Training records are included in the Appendix of this report (Appendix J).

VI. RECOMMENDATIONS

1. Develop a training program on extreme fire behavior and make that training available to all fire going personnel down to the FAE level. A starting point for development could be extracting and expanding the section on severe fire behavior from the California Advanced Fire Behavior course.

2. Have a Fire Weather Meteorologist and Fire Behavior Analyst on all fires projected to be uncontained by the beginning of second burning period.

3. Place major emphasis on annually evaluating employee qualifications for positions listed in Emergency Resource Directories. This will require an assurance that fire line evaluations are completed on all personnel on all major incidents.

4. Emphasize at training sessions for line overhead the importance of communicating to all personnel expected fire behavior and tactical strategies and updating those communications when situations change.

5. Require helicopter crews to meet annually with the medical services community within their Zone of Influence.

6. Clarify the Department's position on burn treatment, burn treatment facilities and transfer of patients from one facility to another.

7. Encourage (or require) all CDF approved burn facilities to have a helipad at the facility.

8. Develop early warning system on an incident for all personnel when hazardous conditions have been experienced or observed.

9. Consider double layered Nomex or cotton lined Nomex, or long sleeved cotton tee shirt under Nomex as part of wildland safety uniform.

10. Require non-melting pouch for fire shelter.

VII. CONCLUSIONS

Principals involved with the decision to take action on the spot fires east of Highway 395 either did not recognize the indicators warning of extreme fire behavior or did not understand the potential severity and had a false sense of security with the highway and light fuels across the highway.

Defensive strategies were not communicated to principals involved by line overhead. No person of authority to provide instructions was available on that portion of the perimeter along Highway 395 at the time of the accident.

Firefighters probably would have suffered less severe injuries if they had planned their escape through the black of the spot they were working, particularly if they had used the 1 1/2" fog as a shield. This conclusion is supported by a comparison of burn patterns and fuel consumption within the spot to the area where injuries were sustained. Their failure to choose this route is not surprising in light of the location of the fire whirl when the retreat was initiated.

Field treatment of victims was professional and expedient and praised by medical staff at the burn facility.

All persons involved in the immediate area of the accident were trained to Department Standards with the exception of FF DERBONNE.

All of the injured firefighters were provided with wildland fire control safety uniforms and equipment according to CDF standards.

FF WRIGHT was not wearing his goggles according to CDF policy; all other involved parties were properly attired.

EXHIBIT A

Maps

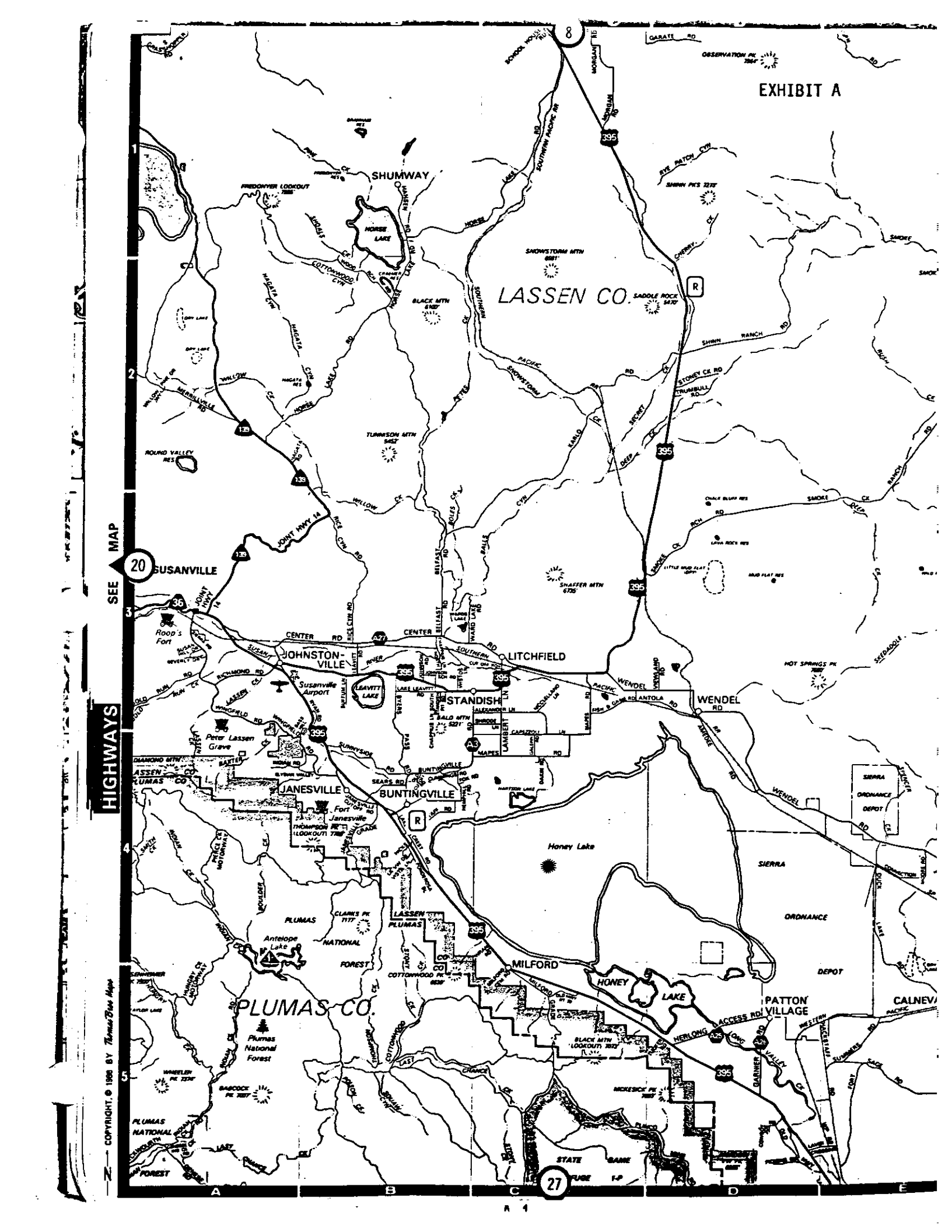
EXHIBIT A
SHUMWAY
LASSEN CO.
SUSANVILLE
JOHNSTON-VILLE
LITCHFIELD
STANDISH
WENDEL
JANESVILLE
BUNTINGVILLE
MILFORD
PATTON VILLAGE
PLUMAS CO.
Honey Lake
HONEY LAKE
Roop's Fort
Susanville Airport
Peter Lassen Grave
Fort Janesville
Antelope Lake
Plumas National Forest
SEE MAP 20
HIGHWAYS
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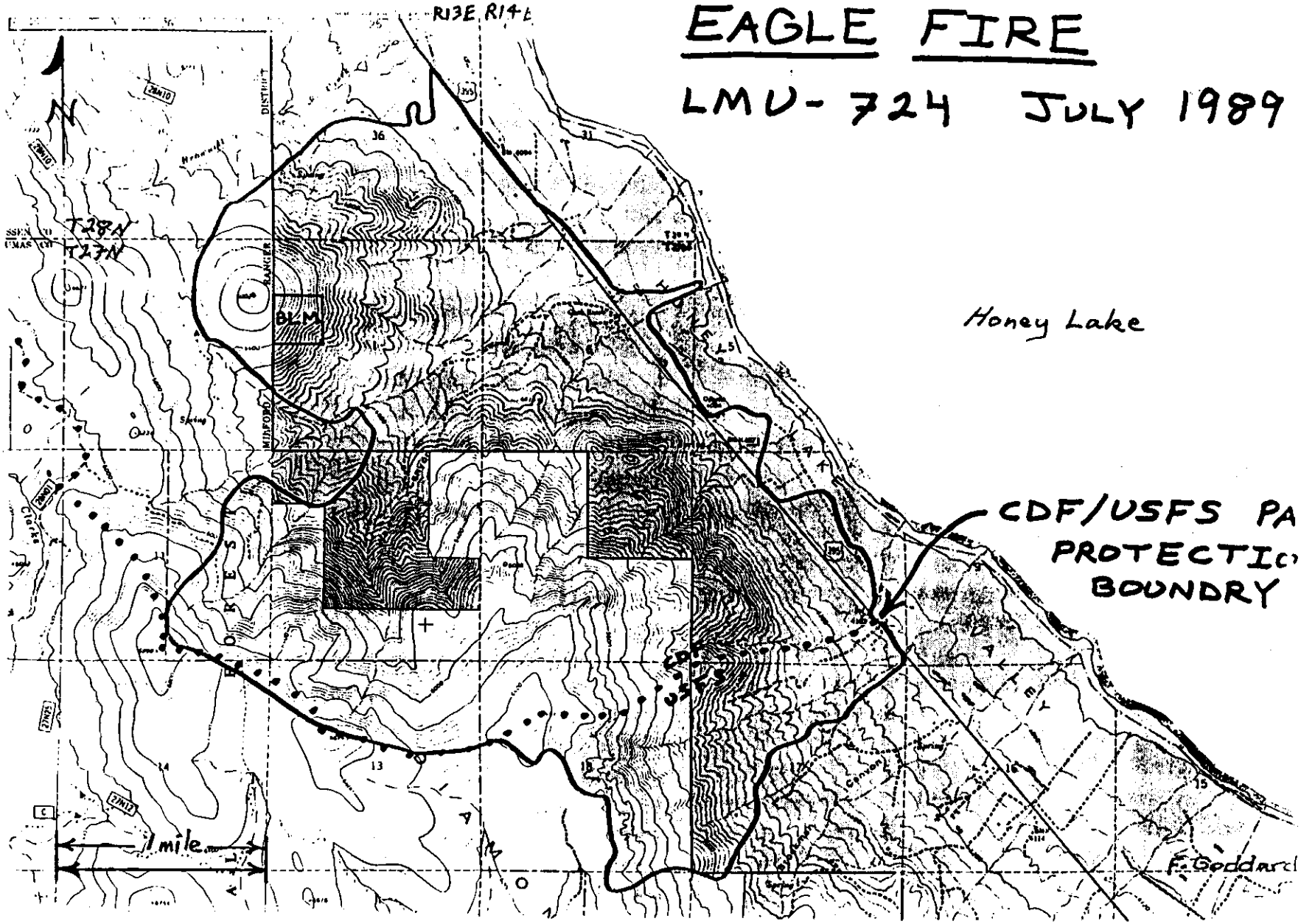
EAGLE FIRE

LMU-724 JULY 1989



Burned Acreages:	Private:	2,730
	USFS:	1,880
	BLM:	40
	Total:	4,650

Private in USFS Protection:	350
USFS in USFS Protection:	300
Total in USFS Protection:	650

Private in CDF Protection:	2,390
USFS in CDF Protection:	1,570

BLM in CDF Protection:	40
Total in CDF Protection:	4,000

EXHIBIT B

Green Sheets

SUMMARY REPORT

OF

FIRE SHELTER DEPLOYMENT

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
ENGINE 2181

ON THE
EAGLE FIRE
LASSEN/MODOC RANGER UNIT
CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
REGION II
July 8, 1989

FIRE ACADEMY

JULY 1989

SUMMARY

On July 7, 1989 at approximately 1427 hours, a vegetation fire was reported 5 miles south of Janesville in the Lassen/Modoc Ranger Unit. This fire was located on the west side of Highway 395. During the first few hours, the fire burned actively along and adjacent to Highway 395 in both north and south directions; extreme fire behavior was experienced primarily due to erratic wind conditions.

On the morning of July 8, the fire behavior conditions were moderate, as the day progressed, fire activity increased and the behavior again became extreme.

At approximately 0900 hours, Engine 2181 became stuck while attempting to extinguish fire in a downed tree along the fire's edge. A CDF bulldozer, a County bulldozer, and a strike team leader were attempting to remove the engine when fire progressed and overtook their position. A hastily constructed safety zone became a refuge for all of the personnel involved. As a precautionary measure, the engine crew deployed shelters inside the cab to protect themselves from the radiant heat. Due to the fire's activity, all persons directly involved were confined to the general area for approximately 3 hours. No injuries were sustained nor did any damage occur to fire apparatus.

Fire Line Conditions

Fuel:

Understory: Heavy pine needle duff layer with scattered but dense patches of pine reproduction.

Overstory: Second growth Jeffrey pine with a canopy closure of 55% (Fuel models were 9 and 10).

Fuel Moisture:

100 hour fuels at 4%; 1000 hour fuels at 8%.

Topography:

Slope of 20% at the deployment site. Elevation is 4700 feet. The fire burned between Highway 395 (Elev. 4100 feet) and the top of the Diamond Range escarpment (Elev. 6400 feet). This 2300 foot elevation change occurs within a distance of approximately 1 1/2 miles. Just east of the fire lies Honey Lake which covers more than 40,000 acres.

Weather:

Temperature - 87
Relative Humidity - 15%

At site: In the vicinity, winds were strong and erratic with expected gusts up to 22 to 25 mph.

General: A critical fire weather pattern existed whereby strong westerly winds were occurring over the ridges. As the large desert area of Nevada and Utah heat up, a heat low forms drawing in low level air. As air flows into the low it allows the westerly winds aloft to surface in a Foehn wind type similar to the Santa Ana winds of Southern California or the north winds in the Northern Sacramento Valley.

As the local winds flow from Honey Lake, across green meadow areas, reach the warmer slopes, they begin lifting and where they meet the surfacing westerlies a situation encouraging erratic and accelerated wind conditions and horizontal vortexes (fire whirls) is created. Adding fire generated winds and heat to this natural phenomenon serves to intensify these conditions.

Aspect:

East

Sequence of Events

On July 8, 1989 at 0900 hours Battalion Chief, Bill Holmes, directed FAE Jeff Hawkins, in E-2181, to proceed to a log landing at the end of Road N-1.4 to extinguish a log that was threatening to spot across the control line.

Engine 2181 proceeded down the dozer line to the log and proceeded to extinguish the log. At approximately 0930 FAE Hawkins reported that his #9 engine was stuck in the decomposed granite soil and that his crew was requested to assist USFS Crew 251 and E-2185 in controlling a spot fire below them.

At 1000 hours, the intensity of the spot fire increased to the point that the suppression crews withdrew from the area. At 1015 hours, Battalion Chief Holmes took FAE Hawkins and FFI Troy Adamson back to E-2181's location along with Dozer 2242 and a Lassen County dozer to assist in removing the engine to a landing that was being used as a safety zone.

At 1030 hours, Antelope Crew #2 reported to Battalion Chief Holmes that they were unable to control a spot fire that they had

been working above E-2181's location. At 1045 hours, Battalion Chief Holmes and the dozer began to remove E-2181 from its location toward's the safety zone. At 1045 hours the Antelope Hand Crews were ordered to return to their vehicles by traversing the burn. At 1055 hours, the hand crews passed E-2181's location enroute to their crew vehicles. At 1105 hours the fire intensity increased in both spot fires and at 1110 hours it became apparent that they would be unable to reach the safety zone prior to the spot fire reaching their location. Battalion Chief Holmes ordered air drops in an effort to reduce the fire's intensity as it approached their location. Several drops were made and some effect was noticed.

In a small opening in the timber stand the dozers unhooked from E-2181 and began to clear a safety zone. The dozers parked in the middle of the safety zone, E-2181 was located in the lower portion. Behind E-2181 was Battalion Chief Holmes in his 4 wheel drive Blazer. As the upper spot fire approached, the dozer operators took refuge in E-2181's crew compartment and deployed their fire curtains. The engine crew deployed their shelters inside the crew compartment to protect them against the radiant heat.

As the heat from this fire decreased, the dozer operators began to expand the safety zone while the engine crew cooled the immediate area with water. The dozers were able to construct a 90 feet by 130 feet safety zone before the 2nd (lower) fire reached their location. The engine crew again took refuge in their vehicle as the fire intensity increased. At about this time, Field observer Scott McDonald arrived at this location and took refuge in the vehicle of Battalion Chief Holmes. The dozer operators continued to widen the safety zone during this time period. Throughout this time, Battalion Chief Holmes would move his vehicle up and down the dozer trail below E-2181 to avoid individual fire runs.

After the fire intensity decreased, the dozers proceeded to pull E-2181 to the log landing which was approximately 230 feet above their location. Due to the extreme fire behavior, the crews were confined to the safety zone for an additional 3 hours until it was safe to exit the area.

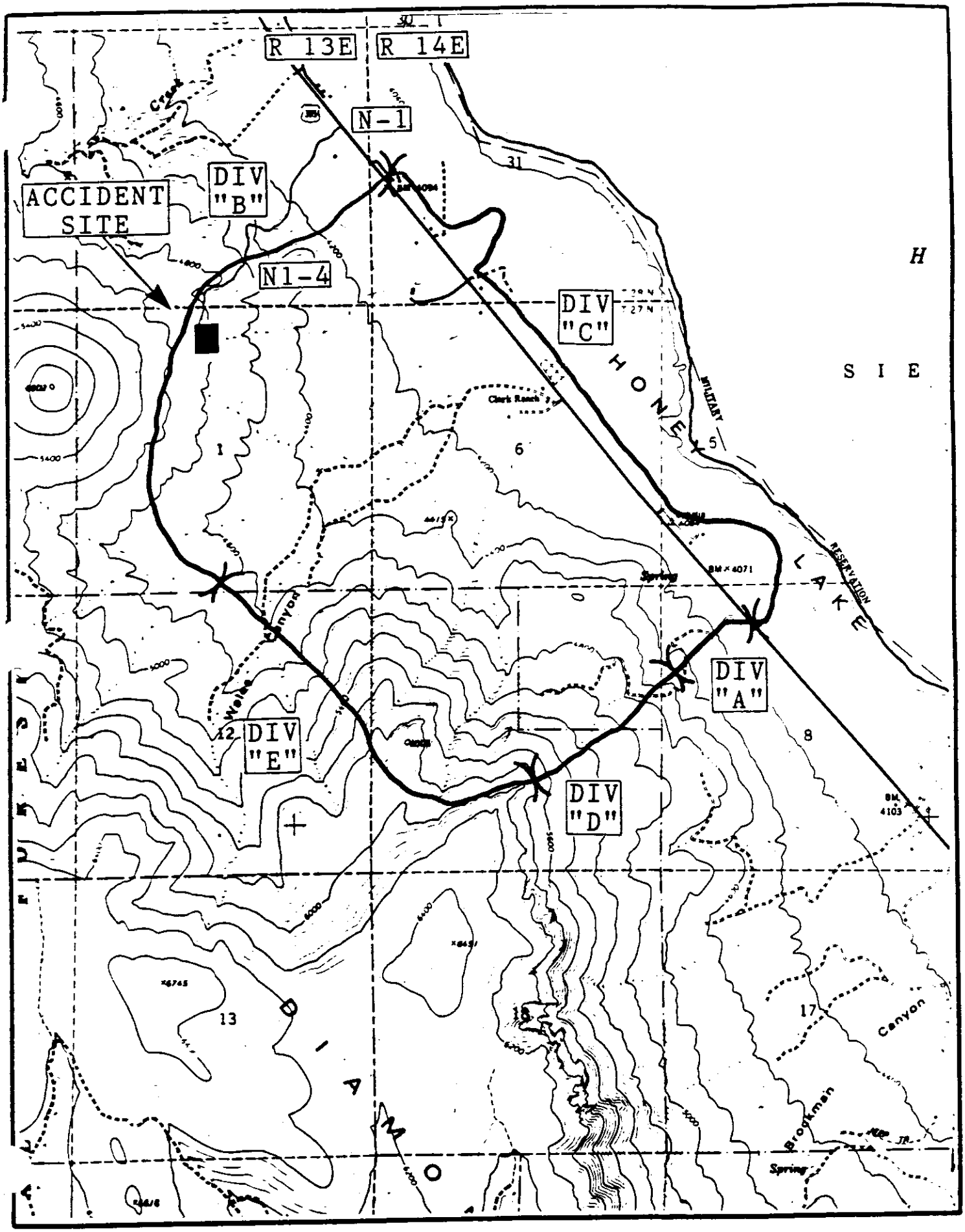
Injuries

All CDF personnel were wearing wildland firefighting safety clothing according to CDF policy. The Lassen County dozer

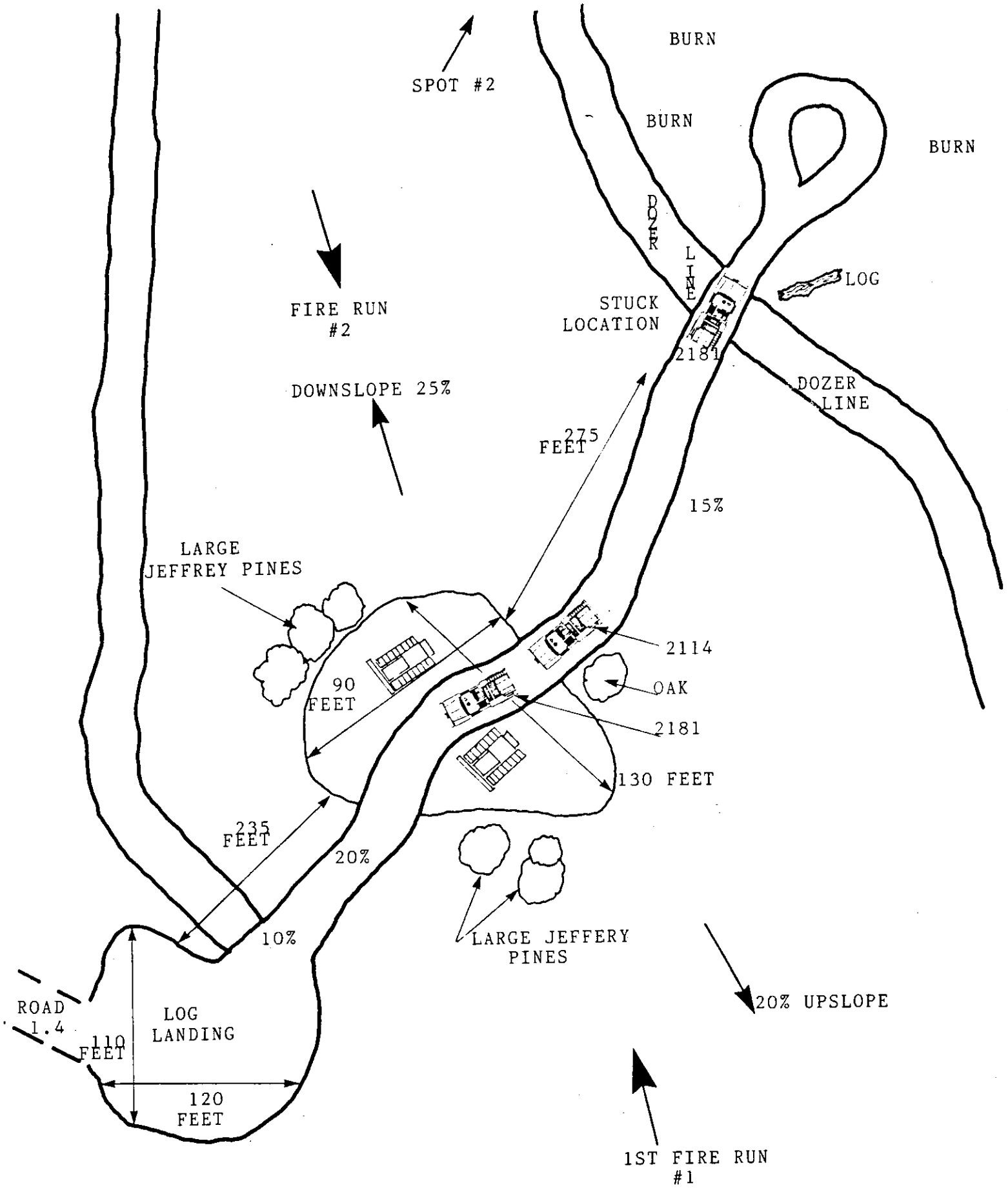
operator had been issued the required safety clothing. No injuries to personnel or damage to equipment occurred.

Cause of Incident

Critical fire weather with frequent wind changes forced crews to abandon mop up activities and retreat to safety zones as the fire became active and overran control and containment lines.



EAGLE FIRE
AT TIME OF ACCIDENT


SPOT #2
BURN
BURN
BURN
DOZER LINE
LOG
FIRE RUN #2
STUCK LOCATION
2181
DOWNSLOPE 25%
DOZER LINE
275 FEET
15%
LARGE JEFFREY PINES
2114
90 FEET
OAK
2181
130 FEET
235 FEET
20%
10%
LARGE JEFFERY PINES
20% UPSLOPE
ROAD 1.4
LOG LANDING
110 FEET
120 FEET
1ST FIRE RUN #1
SPOT #1

SUMMARY REPORT

OF

FIRE SHELTER DEPLOYMENT

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
VINA HELITACK CREW

ON THE
EAGLE FIRE
LASSEN/MODOC RANGER UNIT
CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
REGION II
July 8, 1989

FIRE ACADEMY

JULY 1989

SUMMARY

On July 7, 1989 at approximately 1427 hours, a vegetation fire was reported 5 miles south of Janesville in the Lassen/Modoc Ranger Unit. This fire was located on the west side of Highway 395. During the first few hours, the fire burned actively along and adjacent to Highway 395 in both north and south directions; extreme fire behavior was experienced primarily due to erratic wind conditions.

On the morning of July 8, the fire behavior conditions were moderate, as the day progressed, fire activity increased and the behavior again became extreme.

The Vina Helitack Crew was staged at Eagle Helibase, located on the east side of Highway 395 near Honey Lake. The crew observed the fire to be progressing toward structures along the highway. The crew proceeded on foot to this area and joined forces with a dozer who had built indirect line in the area. The crew commenced a burning operation along the line, at which time shifting winds caused the main fire to make a strong run toward their position. The crew deployed shelters in the center of the dozer line. No injuries were sustained and no damage to fire apparatus occurred.

Fire Line Conditions

Fuel:

75% canopy cover of big sagebrush with heights of 2-4 feet; 20% cover of bitterbrush, 6-8 feet tall; 5% annual grass cover.

Fuel Moisture:

100 hour fuels at 4%; 1000 hour fuels at 8%.

Topography:

600 feet west of Highway 395 and 1/2 mile west of Honey Lake. Elevation-4130 feet. The incident site is at the base of the Diamond Range escarpment, on Highway 395. Ground slope is 2% downslope to Highway 395.

Weather:

A critical fire weather pattern existed whereby strong westerly winds were occurring over the ridges. As the large desert area of Nevada and Utah heat up, a heat low forms, drawing in low level air. As air flows into the low, it allows the westerly winds aloft to surface in a Foehn wind type similar to the Santa Ana winds of Southern California

or the north winds in the Northern Sacramento Valley.

As the local winds flow from Honey Lake across green meadow areas reach the warmer slopes they begin lifting and where they meet the surfacing westerlies a situation encouraging erratic and accelerated wind conditions and horizontal vortexes (fire whirls) is created. Adding fire generated winds and heat to this natural phenomenon serves to intensify these conditions.

Aspect:

Northeast

Sequence of Events

At approximately ~~1500~~ 1300 est hours, 6 members of the Vina Helitack crew left the helibase to determine if any structures near the helibase and in the path of the advancing fire were defensible. They were instructed by Battalion Chief Don Lane (2311) to fireout a recently constructed dozer line in advance of the fire. The wind was blowing at approximately 7 mph at a 45 degree angle to the dozer line out of the northeast. The crew proceeded to fire the dozer line with all of them working together except 1 crewperson whose assignment was to drop back with a back pump and watch for spot fires. The firing operation was being pulled into the main fire as predicted.

After proceeding for approximately 270 feet from the initial point the wind direction changed 180 degrees and the wind speed increased as the main fire made a run at the line.

Fire Captain Stelli called to the crewperson that was assigned to watch for spots to join the rest of the crew. Before the crewperson could join the crew, the fire situation deteriorated rapidly. Fire Captain Stelli ordered the crew to deploy shelters on the two-blade wide dozer line. Immediately after the shelter deployment, the fire hit the dozer line hard. However, there was no direct flame impingement to the shelters. Once the fire intensity decreased sufficiently, he stood up using his shelter as a heat shield and looked for the separated crewperson who was found in the unburned brush. The crewperson was instructed to return to the location of the crew at the dozer line. The separated crewperson joined the crew immediately and never did fully deploy the shelter until it was used as a radiant heat shield as the firefighters returned to the main road by way of the dozer line. The fire did not spot across the dozer line.

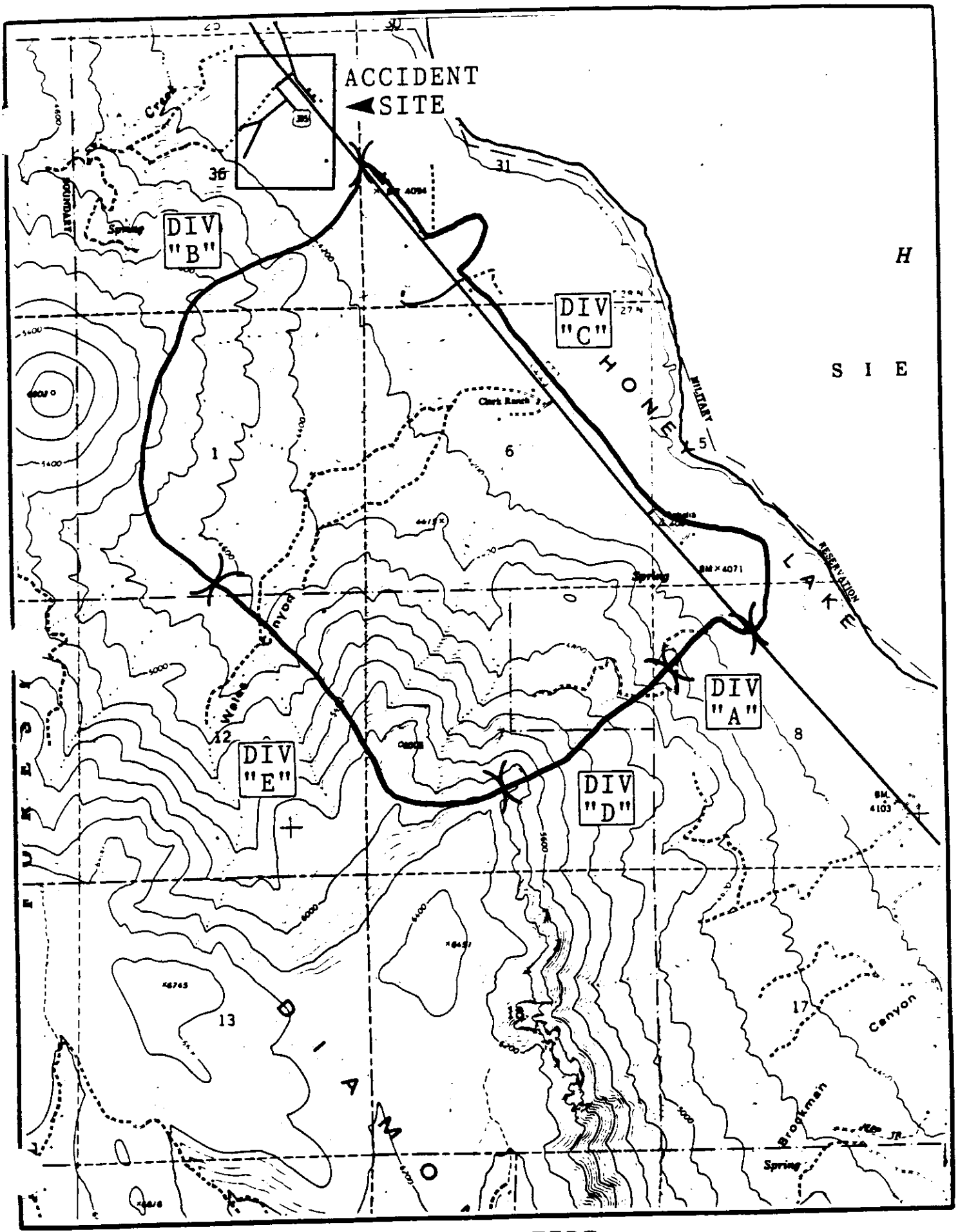
Injuries

No injuries or damage to equipment occurred during this fire shelter deployment.

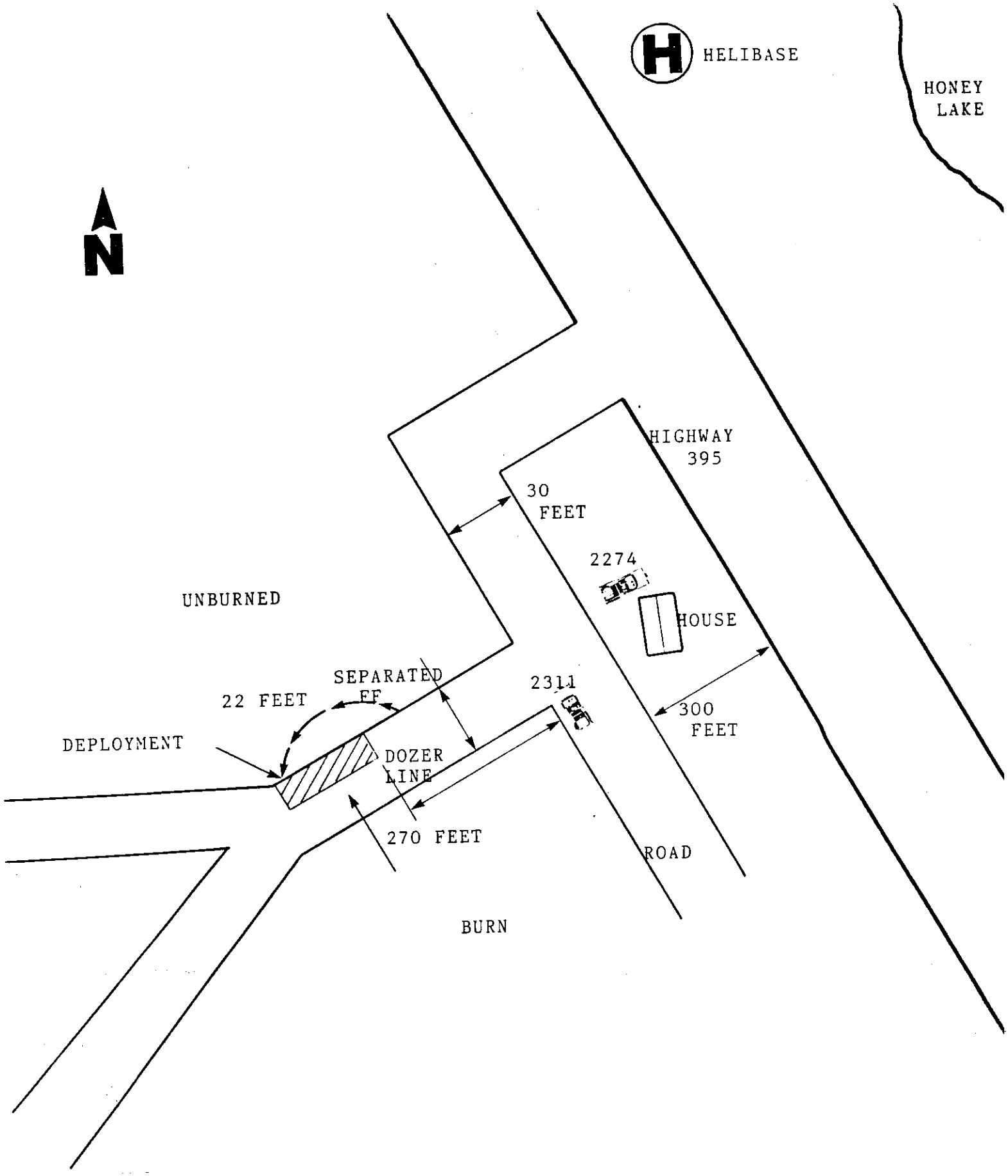
All personnel were wearing wildland firefighting safety clothing according to California Department of Forestry and Fire Protection specifications, including helmets, goggles, gloves, nomex, and fire shelters.

Cause of Incident

These fire fighters were forced to deploy fire shelters when unseasonably dry fuels and erratic winds caused the fire to make a fast run on their position.



EAGLE FIRE
AT TIME OF ACCIDENT


H
HELIBASE
HONEY
LAKE
N
HIGHWAY
395
30
FEET
2274
HOUSE
UNBURNED
SEPARATED
EF
22 FEET
2311
300
FEET
DEPLOYMENT
DOZER
LINE
270 FEET
ROAD
BURN

SUMMARY REPORT

OF

BURN INJURIES

TO

FIRE FIGHTER I DUANE WRIGHT
FIRE FIGHTER I PAT NELSON
FIRE FIGHTER I JIM SCALES
FIRE FIGHTER I JOELLE DERBONNE

AND

SHELTER DEPLOYMENT

FIRE FIGHTER I MIKE KERBY

ON THE

EAGLE FIRE
LASSEN/MODOC RANGER UNIT
CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
REGION II
JULY 8, 1989

SUMMARY

On July 7, 1989 at approximately 1427 hours, a vegetation fire was reported 5 miles south of Janesville in the Lassen/Modoc Ranger Unit. This fire was located on the west side of Highway 395. During the first few hours, the fire burned actively along and adjacent to Highway 395 in both north and south directions; extreme fire behavior was experienced primarily due to erratic wind conditions.

On the morning of July 8, the fire behavior conditions were moderate, as the day progressed, fire activity increased and the behavior again became extreme.

At approximately 1430 hours, Engine 2387 was traveling southbound on Highway 395 toward the southeast portion of the fire when they observed a spot fire on the east side of the highway; they initiated a 1 1/2" hoselay down the bank. This crew was joined shortly by Engines 4474 and 2379. A total of 5 Fire Fighters were working on the spot and had achieved knockdown at which time a large fire whirl developed on the west side of the Highway. Rapidly increasing in size and intensity, the whirl crossed the road and in the ensuing blow-up four of the Fire Fighters sustained serious burn injuries.

Fire Line Conditions

Fuel:

Fuel in the area of the spot fire and where injuries were sustained consisted of scattered big sage 2 to 4 feet tall intermixed with discontinuous 12 to 18 inches tall herbaceous annual and perennial grasses and forbs consisting of great basin wild rye, cheat grass, tumble mustard and fiddle neck (Fuel Model 2).

Fuel on the west side of Highway 395 transitions to 6 to 8 feet high bitterbrush on lower slopes (Fuel Model 6) then to a mostly Jeffrey Pine conifer stand with frequent areas of dense reproduction associated with occasional concentrations of light slash loading (Fuel Models 9 and 10).

Fuel Moisture:	1 hr.	2%
	10 hr.	5%
	100 hr.	4%
	1000 hr.	8%

Topography:

The fire burned between Highway 395 (Elev. 4100 feet) and the top of the Diamond Range escarpment (Elev. 6400 feet). This 2300 foot elevation change occurs within a distance of approximately 1 1/2 miles. Just east of the fire lies Honey Lake which covers more than 40,000 acres.

The accident site was at the base of the Diamond Range escarpment on Highway 395. From the toe of the highway fill slope to Honey Lake, the ground slopes 0-3%.

The general aspect is classified as open along Highway 395 east to Honey Lake and north east on the slopes towards the Diamond Range escarpment.

Weather:

A critical fire weather pattern existed whereby strong westerly winds were occurring over the ridges. As the large desert area of Nevada and Utah heat up a heat low forms drawing in low level air. As air flows into the low it allows the westerly winds aloft to surface in a Foehn wind type similar to the Santa Ana winds of Southern California or the north winds in the Northern Sacramento Valley.

As the local winds flow from Honey Lake, across green meadow areas, reach the warmer slopes, they begin lifting and where they meet the surfacing westerlies a situation encouraging erratic and accelerated wind conditions and horizontal vortexes (fire whirls) is created. Adding fire generated winds and heat to this natural phenomenon serves to intensify these conditions.

Observed weather:

Temperature	- 94-97 degrees
Relative humidity	- 11-13%
Local winds	- upslope 4-8 mph
Gradient winds	- westerly 8-17 mph

Fire Behavior:

By mid morning, crews were forced to abandon mop up activities and retreat to safety zones as the fire became active and overran control and containment lines. Wind shear and eddie development were common which occasionally generated into fire whirls. This scenario continued and advanced downslope in response to differential surface

heating. By midday to early afternoon fire behavior was characterized by upslope runs in response to local or thermal winds followed by a downslope run with a rapid rate of spread, crowning and spotting in response to the surfacing gradient westerly.

As the fire approached Highway 395, an intense downhill run occurred with flame lengths approximated at 20-35 feet in 6 to 8 feet bitterbrush. From this fire front a fire whirl developed just west of Highway 395. The whirl moved easterly, centered itself on Highway 395 then moved southwesterly adjacent to highway then across the highway in a south easterly direction intercepting the escape route of the injured Fire Fighters. This event takes approximately 17 seconds from the time the whirl forms to when it reaches the area of the Fire Fighters retreat. The whirl left a scorch mark on the pavement measured at 95 feet. Visual estimates placed the height of approximately 200 feet with an estimated velocity, by meteorologist Chris Fontana, of around 100 mph.

As the whirl resided on and near Highway 395, it was launching a multitude of fire brands onto the east side of the highway. As it crossed the highway, it hurled a wall of fire into the area. During the time it centered on the highway, moved southerly then across the highway it had run out of fuel. Consequently, when it reached the fuel on the east side of the highway it existed only in the form of a massive swirling windstorm. This situation was short lived, however as the whirl began to react with the numerous spot fires which had become established. The loss of fuel and subsequently diminished fire in the whirl for that very short period of time seemingly accounted for the Fire Fighters not being even more seriously injured.

Sequence of Events

At approximately 1430 hours, Engine 2387 had been directed to meet other engines along Highway 395 at the southeast corner of the fire to assist with structure protection. Enroute to this assignment, FC Pat Mahaffey noted that the main fire was burning to the west of Highway 395 and detected a spot in the grass to the east side of the highway. Mahaffey decided to take action on the spot and directed Fire Fighters Duane Wright and Pat Nelson to start a 1 1/2" hoselay on direct attack. At about this time, SFR I Jay Gaskill, strike team leader 9441-C observed the spot and directed two engines in his strike team to take action on the spot (Mahaffey is not at the scene of the spot when it is observed by Gaskill). Engine 2379 with FAE Keith Basque and Fire Fighter Mike Kerby arrived. Kerby went to assist with the hoselay. Engine 4474, led by FAE Vince Wall, arrived on scene

after the hoselay had been initiated by the 2387 crew. FAE Wall directed Fire Fighters Jim Scales and Joelle Derbonne to go down the hoselay to assist the others. Flame length was estimated by the attack crew to be approximately 24" in the discontinuous fuel described above. Basque pulled between Engine 2387 and Engine 4479 operated by FAE Tim Moyles who had come from the south, made a "U" turn and backed into the area. Moyles instructed his crew to pull a reel line to attack another spot south of the one already being controlled.

The efforts to pick up the spot were being met with success. As the second 100 foot length of hose was connected and charged, burning conditions increased substantially on the west side of the highway and Moyles directed his crew to return to the engine before they had become committed to the effort, Moyles then moved his engine to the south.

The main fire swept toward the road and a large fire whirl developed west of the highway across from the engines.

Engine 4474 started to back south with FAE Wall announcing over the PA for the Fire Fighters on the hoselay to "Run to the south, follow my voice."

Captain Mahaffey was standing next to his engine when the whirl hit the road; he was unable to get into the cab of his engine due to the extreme winds and blowing flames, and was forced to grip the 1 1/2" discharge on the side of the engine in order to keep from being blown off of his feet.

When the blow-up occurred, the Fire Fighters working the hoselay were cut off from their engines when the flames and heat blew across the highway. Fire Fighter Kerby jumped the fence and ran east to Old Highway 395 where he deployed his fire shelter, he was not injured. Fire Fighters Wright and Nelson retreated south, after abandoning a live hoselay, they were immediately thrown and rolled by the high winds; Wright attempted to deploy his shelter, however it was blown from his hands. Fire Fighter Nelson tried to deploy his shelter but the melting shelter pouch stuck to his gloves. Fire Fighters Derbonne and Scales also retreated through the green in a more southwesterly direction, both of them were also thrown and rolled by the wind, Derbonne lost her helmet when the force of the wind broke the chin strap.

Fire Fighters Wright and Nelson worked their way to the roadway and assisted each other up the embankment; Fire Fighters Scales and Derbonne were separated from each other and arrived at the road independently. The Fire Fighters were placed on engines, removed from immediate threat and First Aid treatment was started. Kerby walked through the burn to the road after the fire had passed.

After treatment at the scene by CDF and paramedic ambulance personnel, all four of the burn victims were flown by two CDF helicopters to the Chico Burn Center, with paramedics in attendance enroute.

Injuries

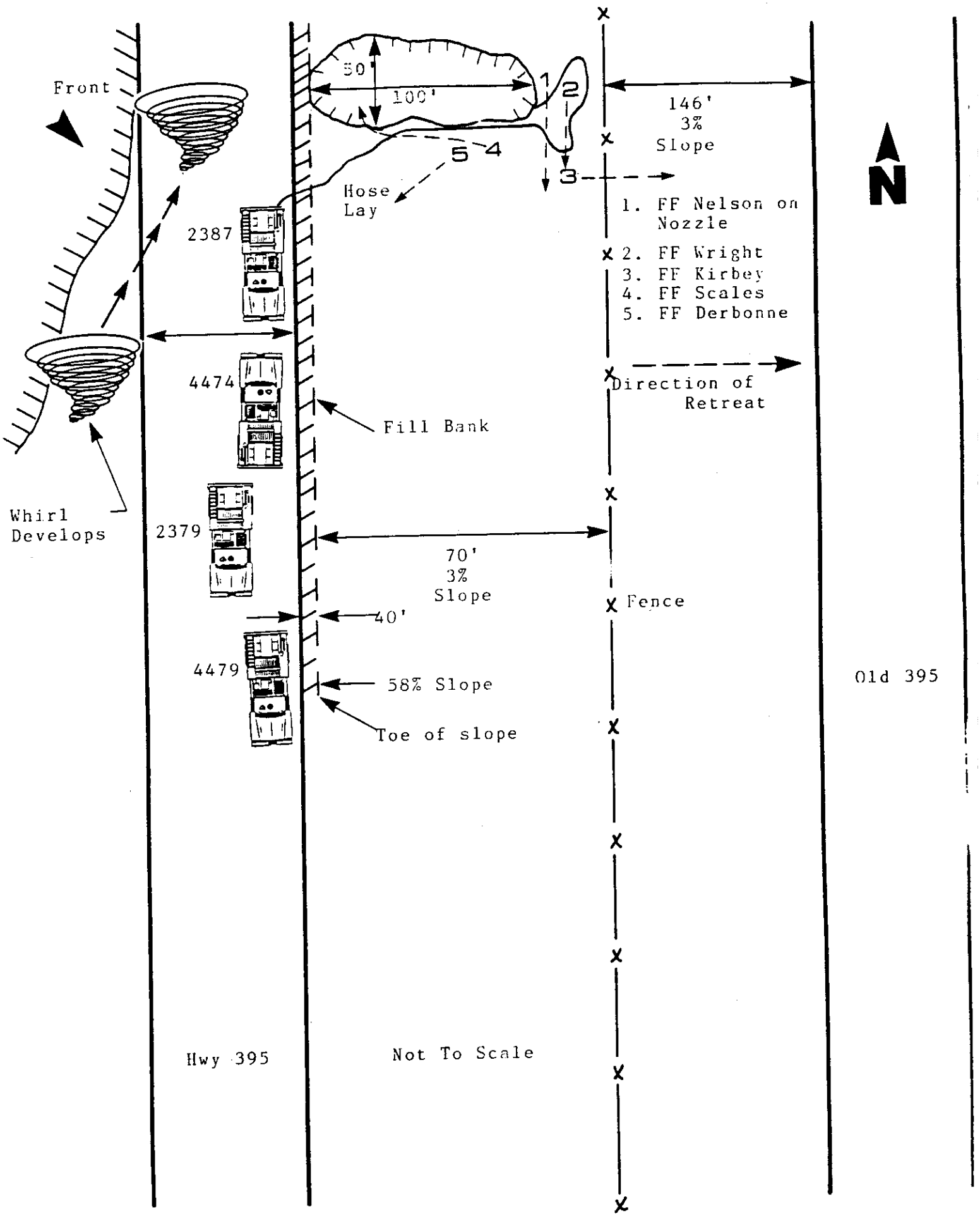
FF Duane Wright	45% 2nd and 3rd degree burns
FF Pat Nelson	10% 2nd degree - .5% 3rd degree burns
FF Jim Scales	5% 2nd degree burns
FF Joelle Derbonne	3.5% 2nd degree burns

Damage to fire apparatus was limited to minor distortion of plastic reflectors on the side of Engine 2387.

Cause of Accident

The Fire Fighters were burned after being overrun by fire when unstable weather conditions accompanied by unseasonable dry fuels and low humidities created major downhill runs and developed a fire whirl.

The fire whirl that crossed the road adjacent to the location of the Fire Fighters on the hoselay left a scorch on the pavement that measured 95 feet across and the height was estimated at approximately 200 feet; wind velocity is estimated in the 100 mph range.


Front
50'
100'
1
2
3
4
5
146'
3%
Slope
N
Hose
Lay
1. FF Nelson on Nozzle
2. FF Wright
3. FF Kirbey
4. FF Scales
5. FF Derbonne
2387
4474
Direction of Retreat
Fill Bank
Whirl Develops
2379
70'
3%
Slope
Fence
40'
4479
58% Slope
Toe of slope
Old 395
Hwy 395
Not To Scale

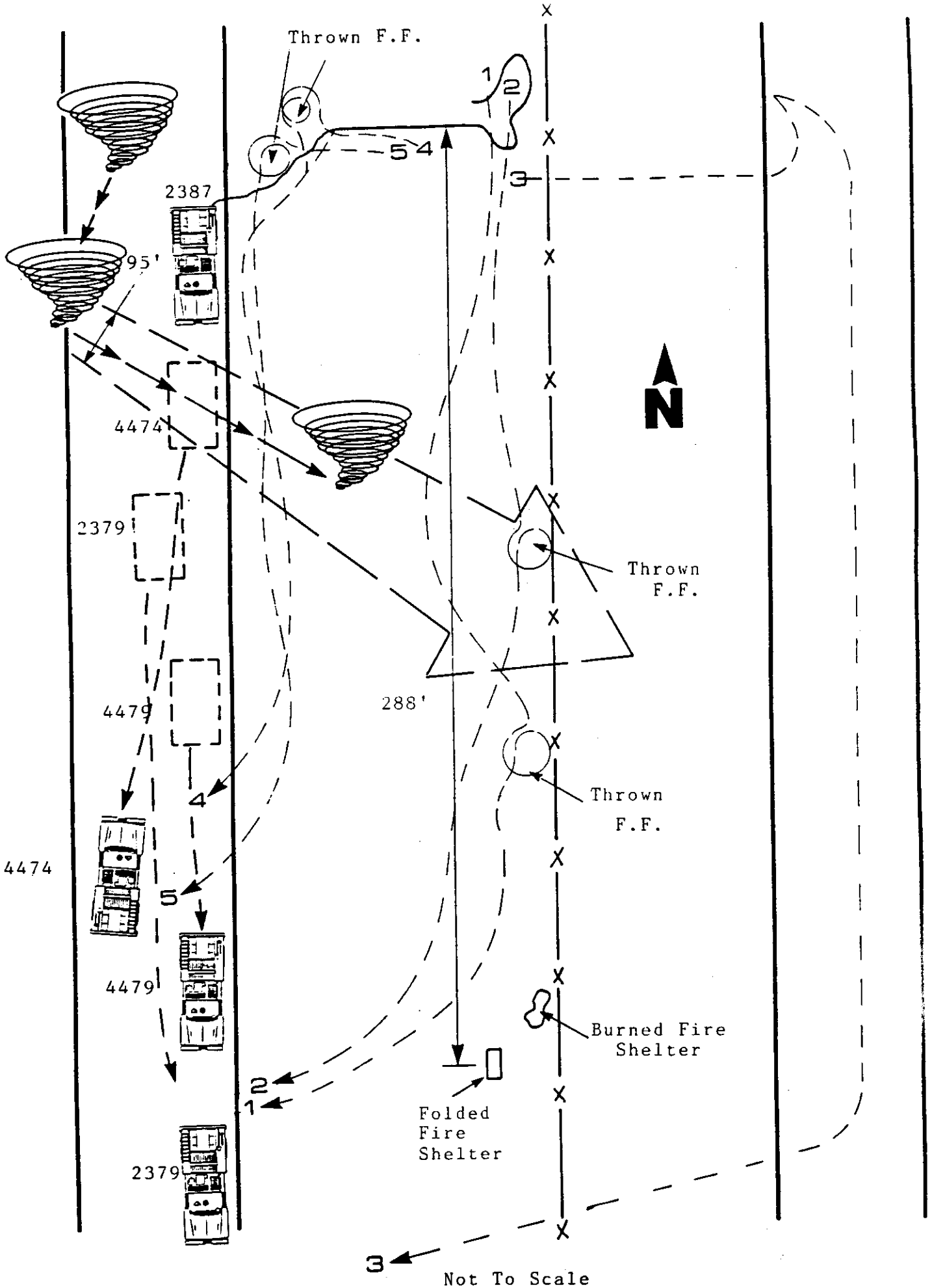
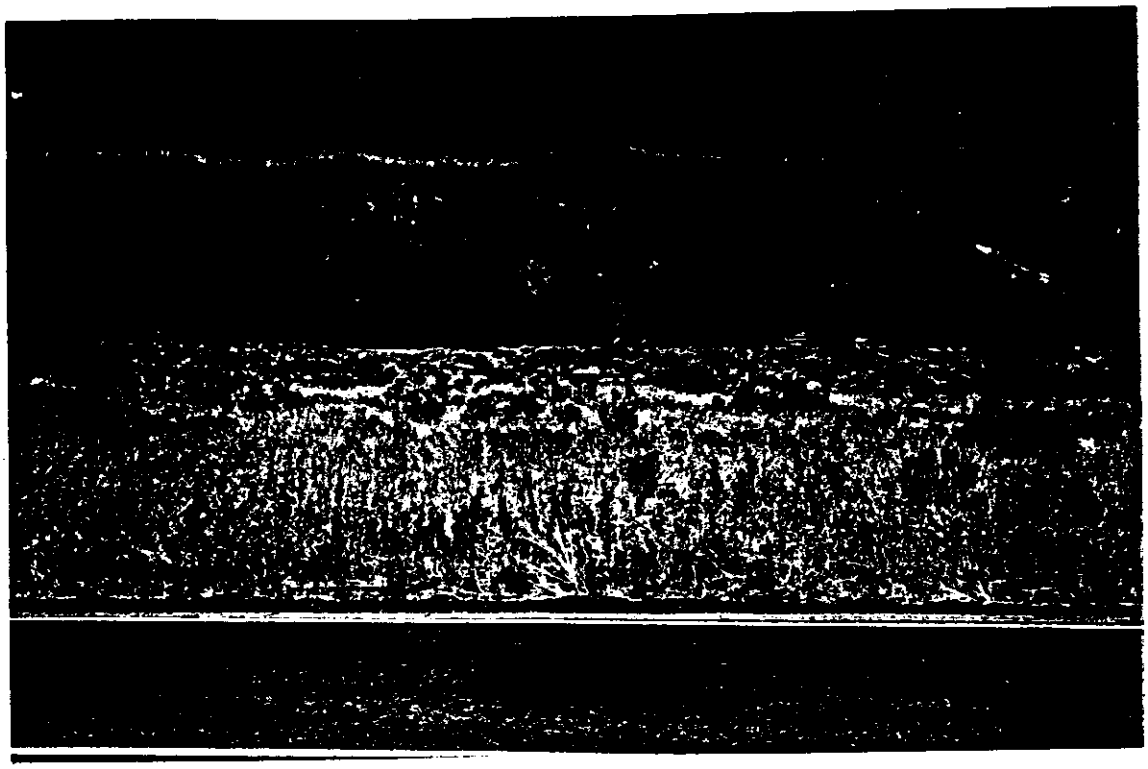
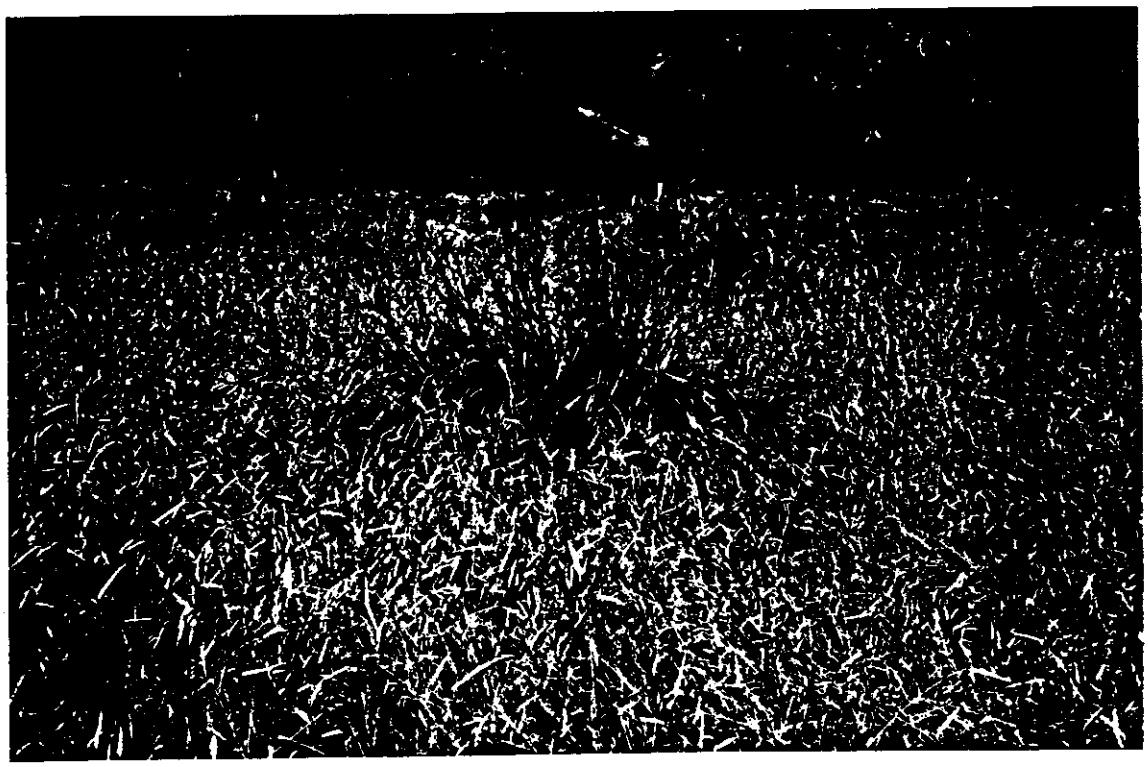

Thrown F.F.
1
2
3
4
5
2387
95'
4474
2379
4479
288'
Thrown
F.F.
Thrown
F.F.
Burned Fire
Shelter
Folded
Fire
Shelter
N
Not To Scale

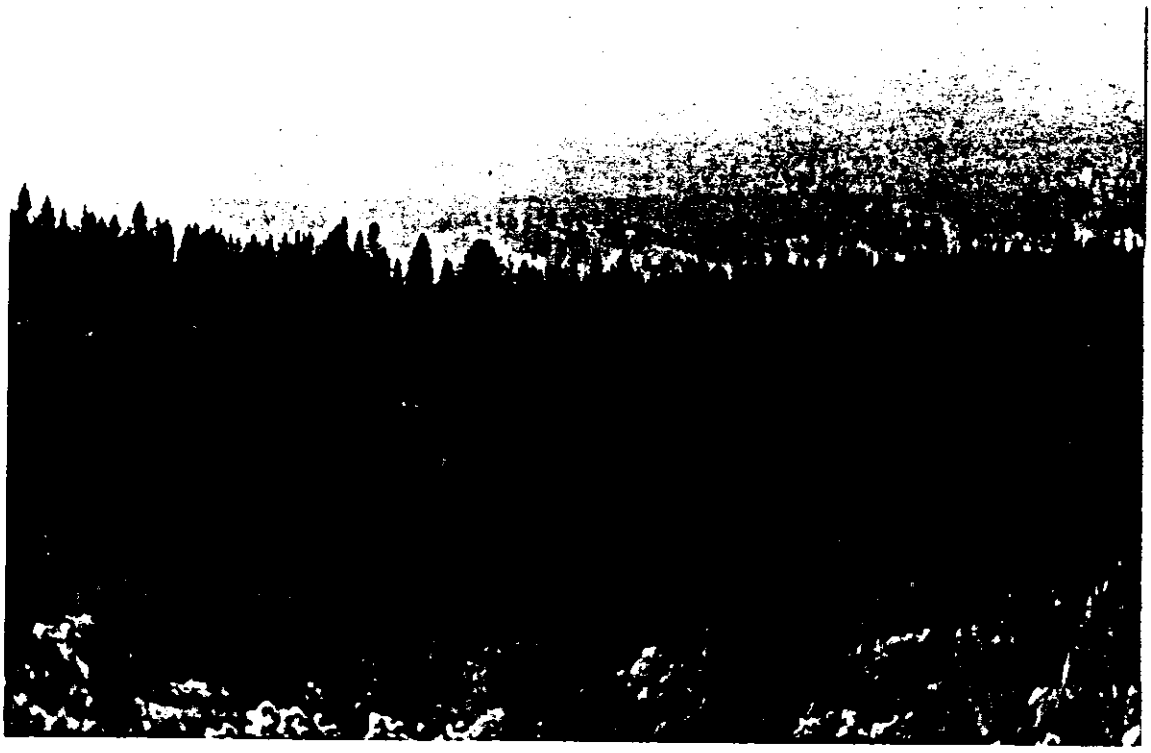
EXHIBIT C

Photographs



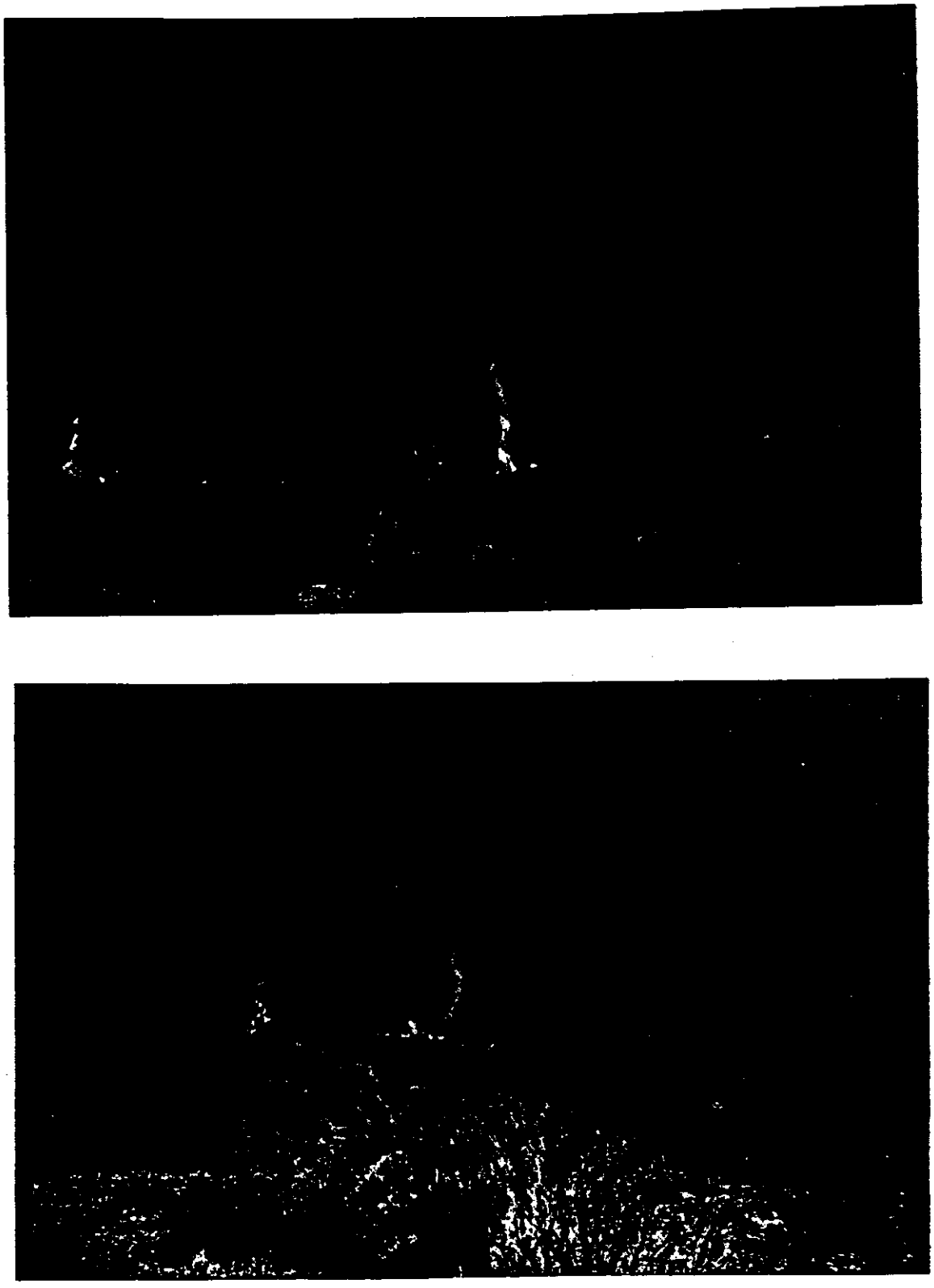


3-1 REPRESENTATIVE FUELS OF ACCIDENT AREA

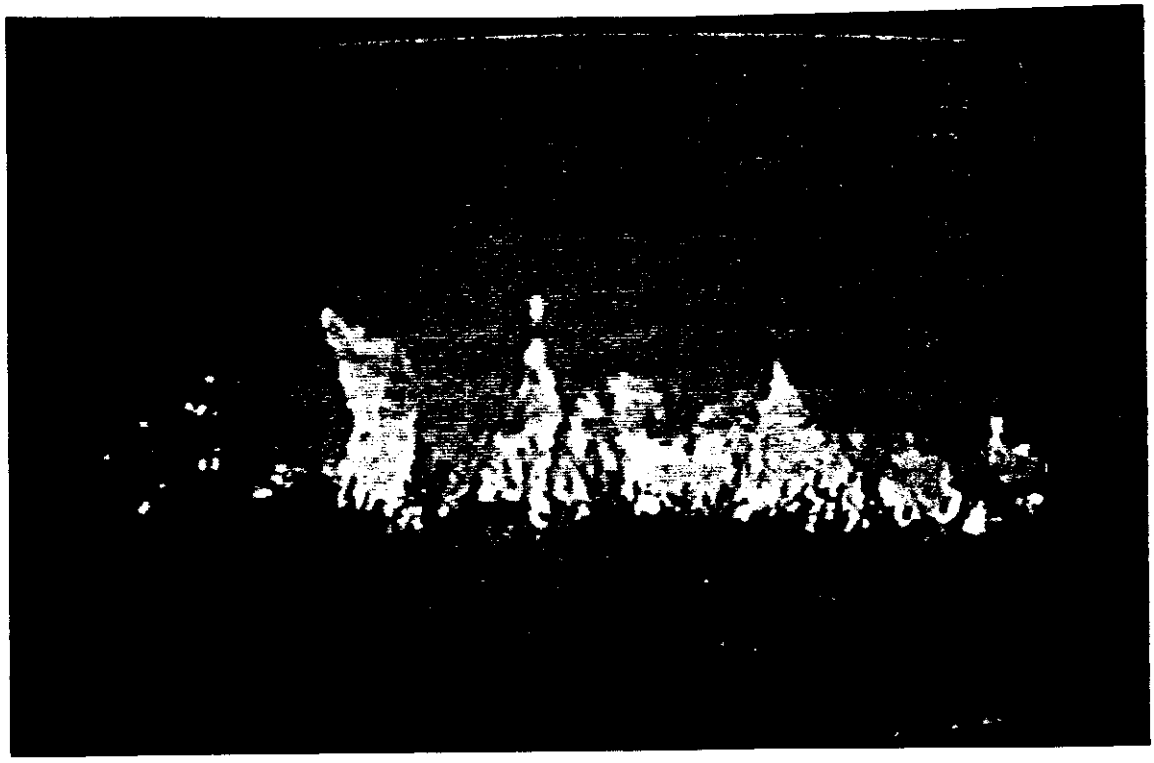


C-2. REPRESENTATIVE FUELS WEST OF HWY. 395 IN VICINITY OF ACCIDENT.

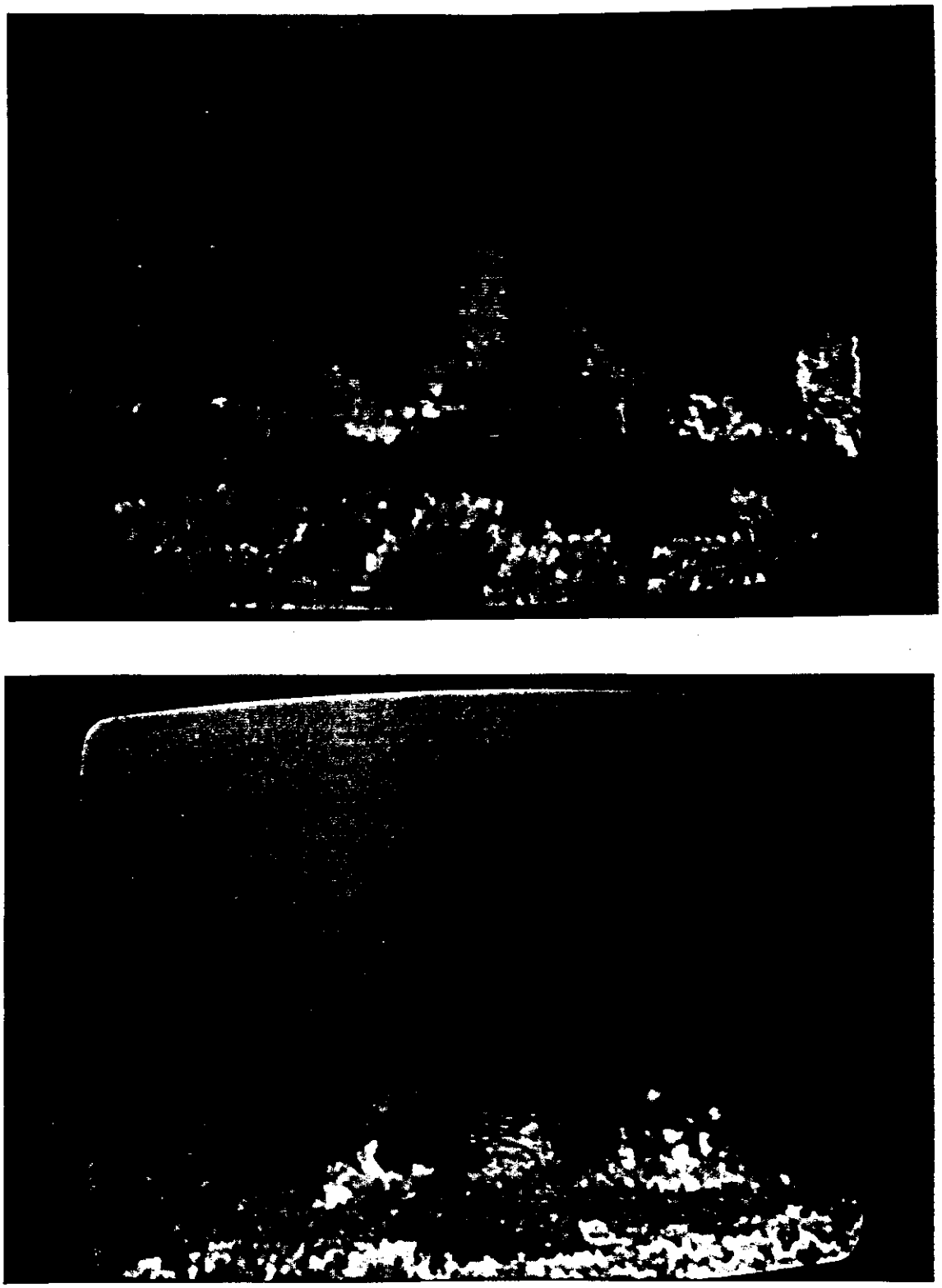
C-3. TOPOGRAPHIC OVERVIEW



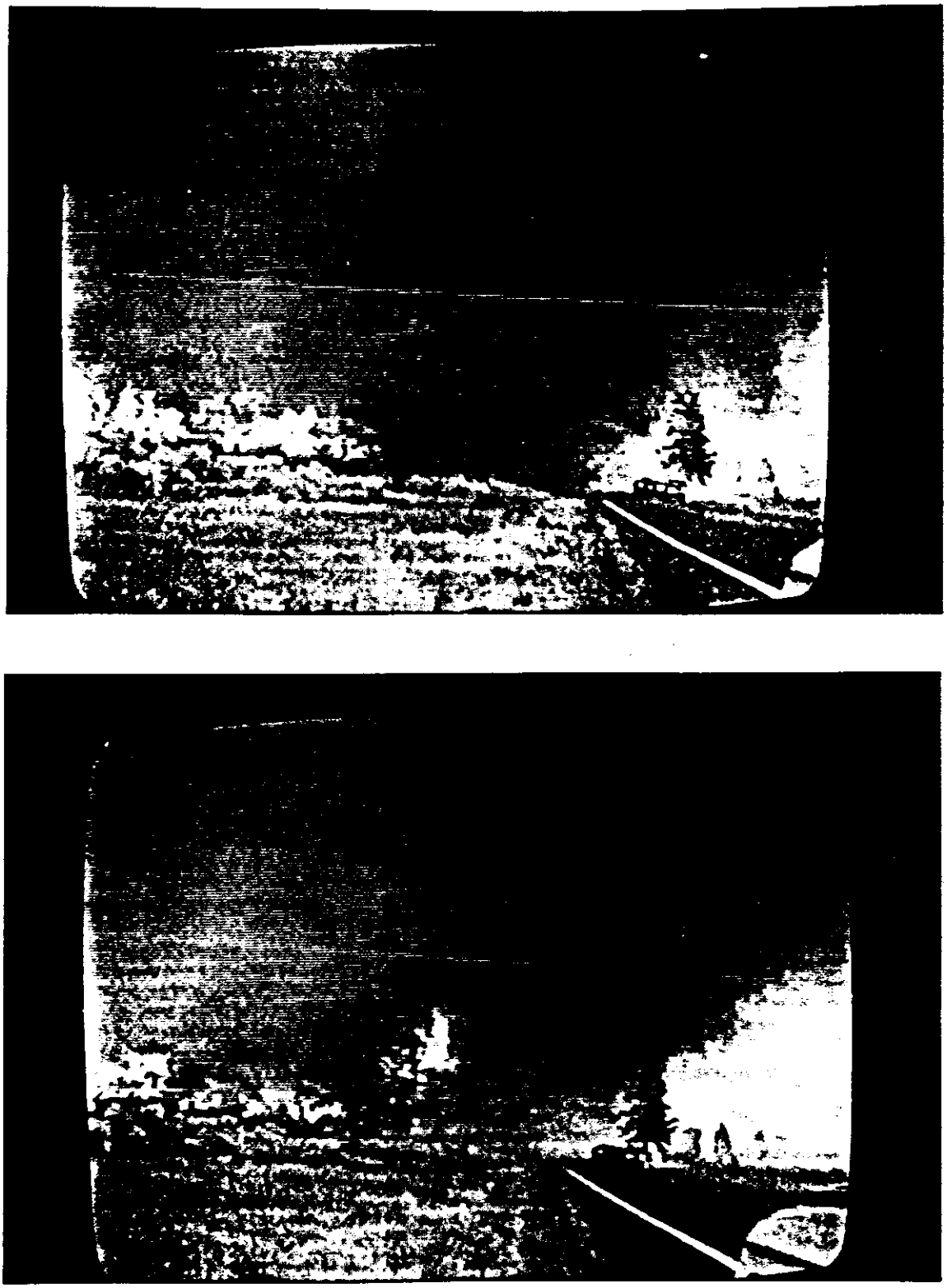
C-4. FIRE TRANSITIONING INTO BITTERBRUSH AND SAGE (EAGLE FIRE VIDEO)



C-4. FIRE TRANSITIONING INTO BITTERBRUSH AND SAGE. (EAGLE FIRE VIDEO)



C-4. FIRE TRANSITIONING INTO BITTERBRUSH AND SAGE. (EAGLE FIRE VIDEO)



C-5. SEQUENCE OF MAJOR FIRE WHIRL DEVELOPMENT AND ENGINE RETREAT (EAGLE FIRE VIDEO)

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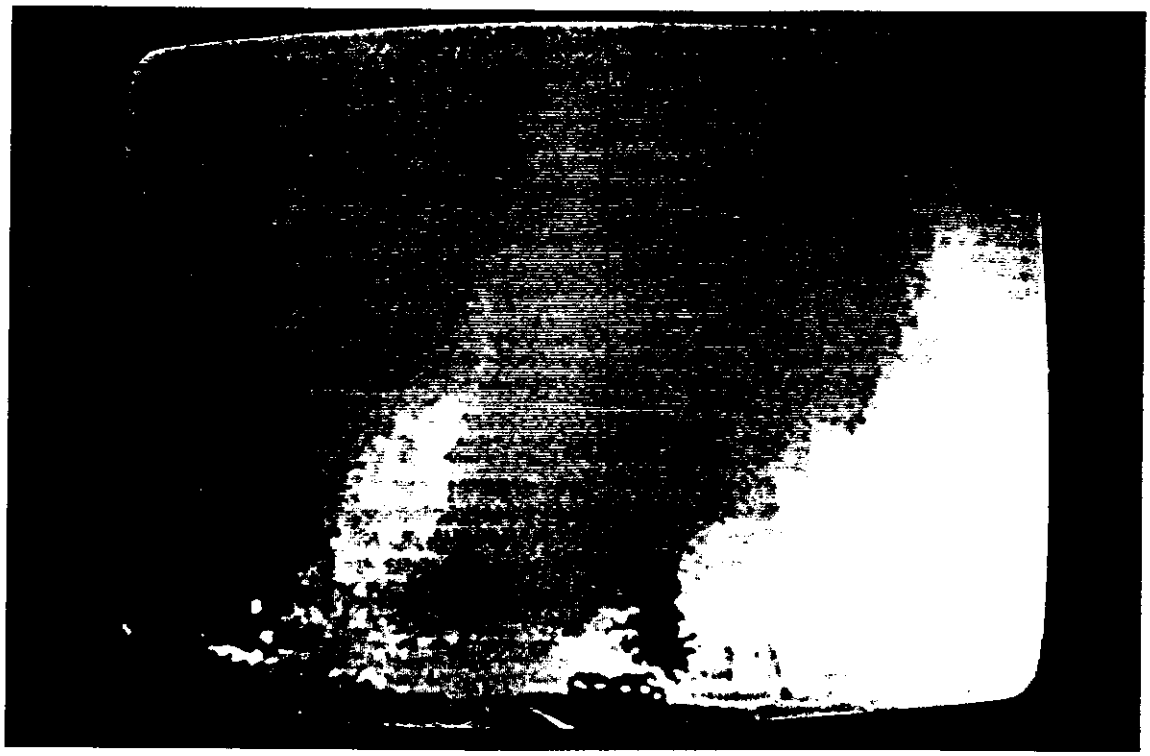

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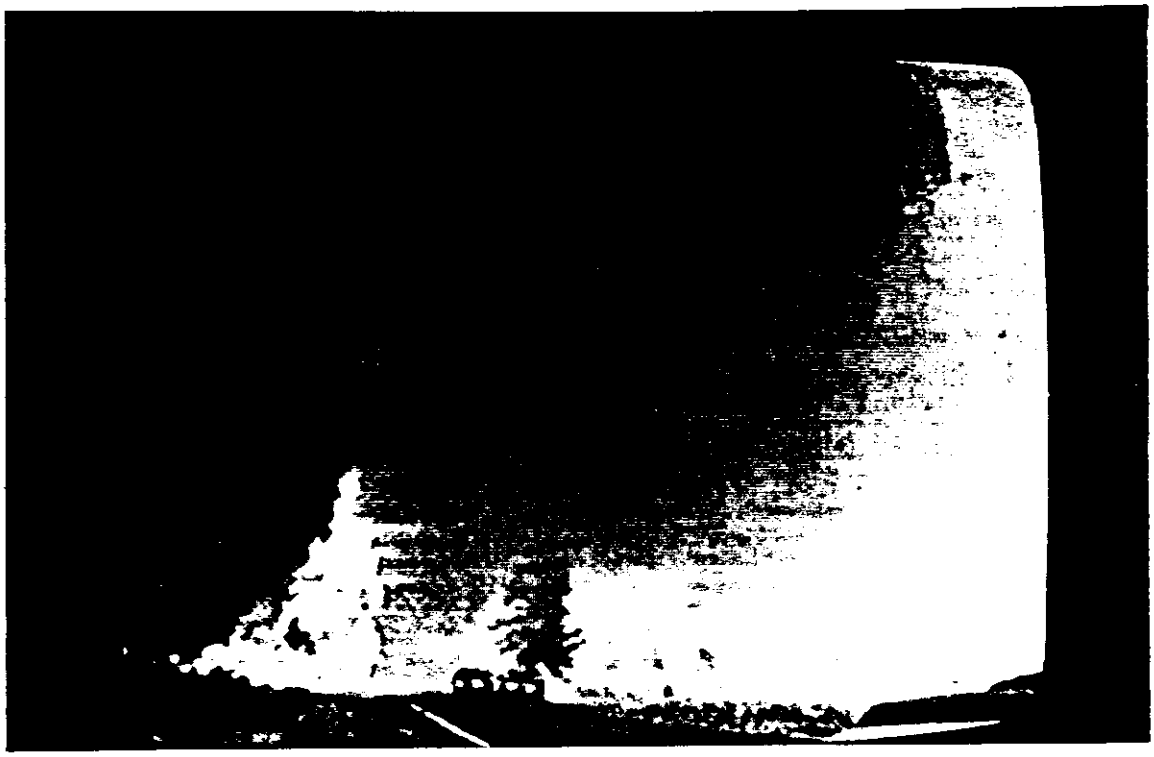

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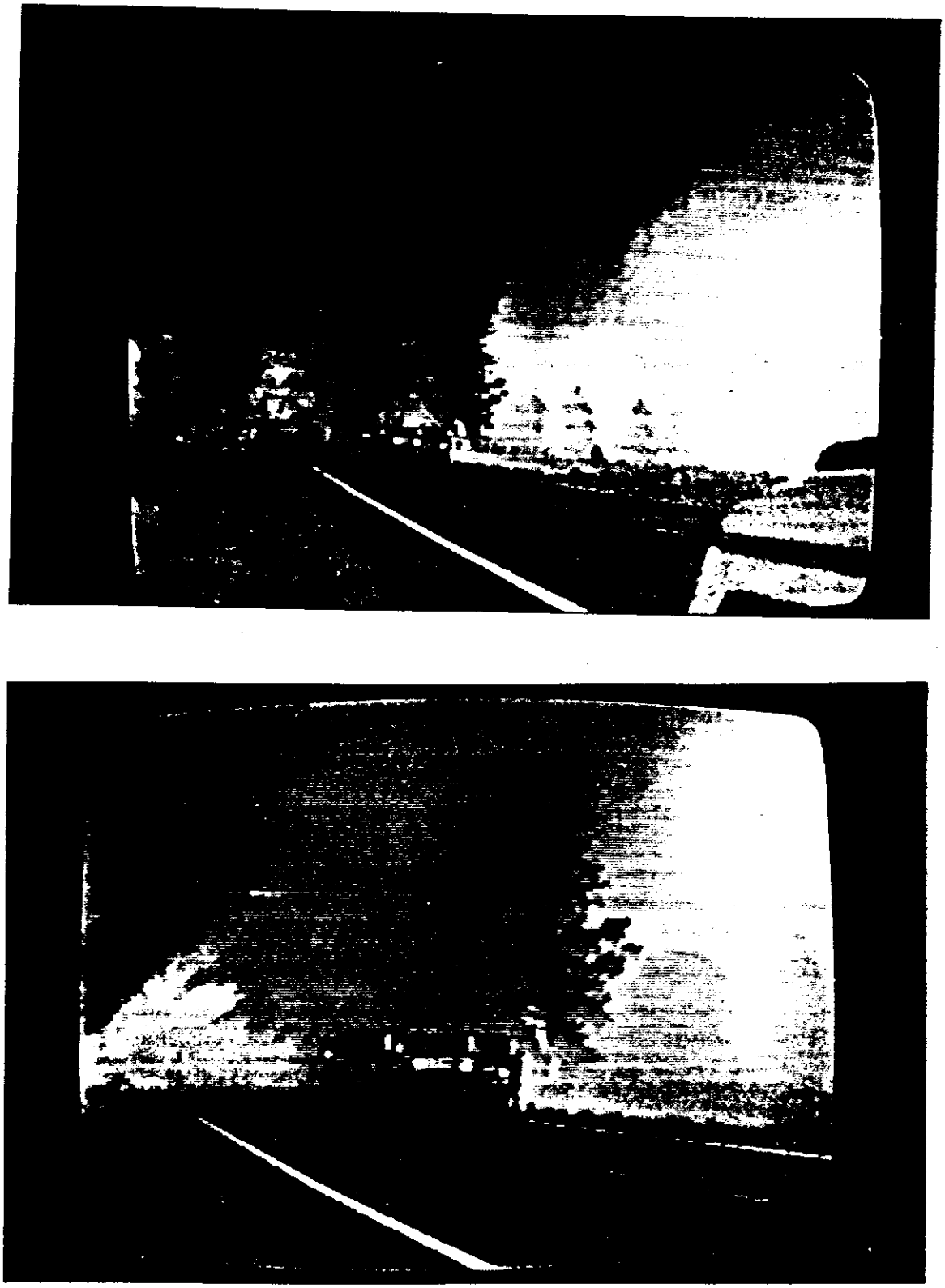

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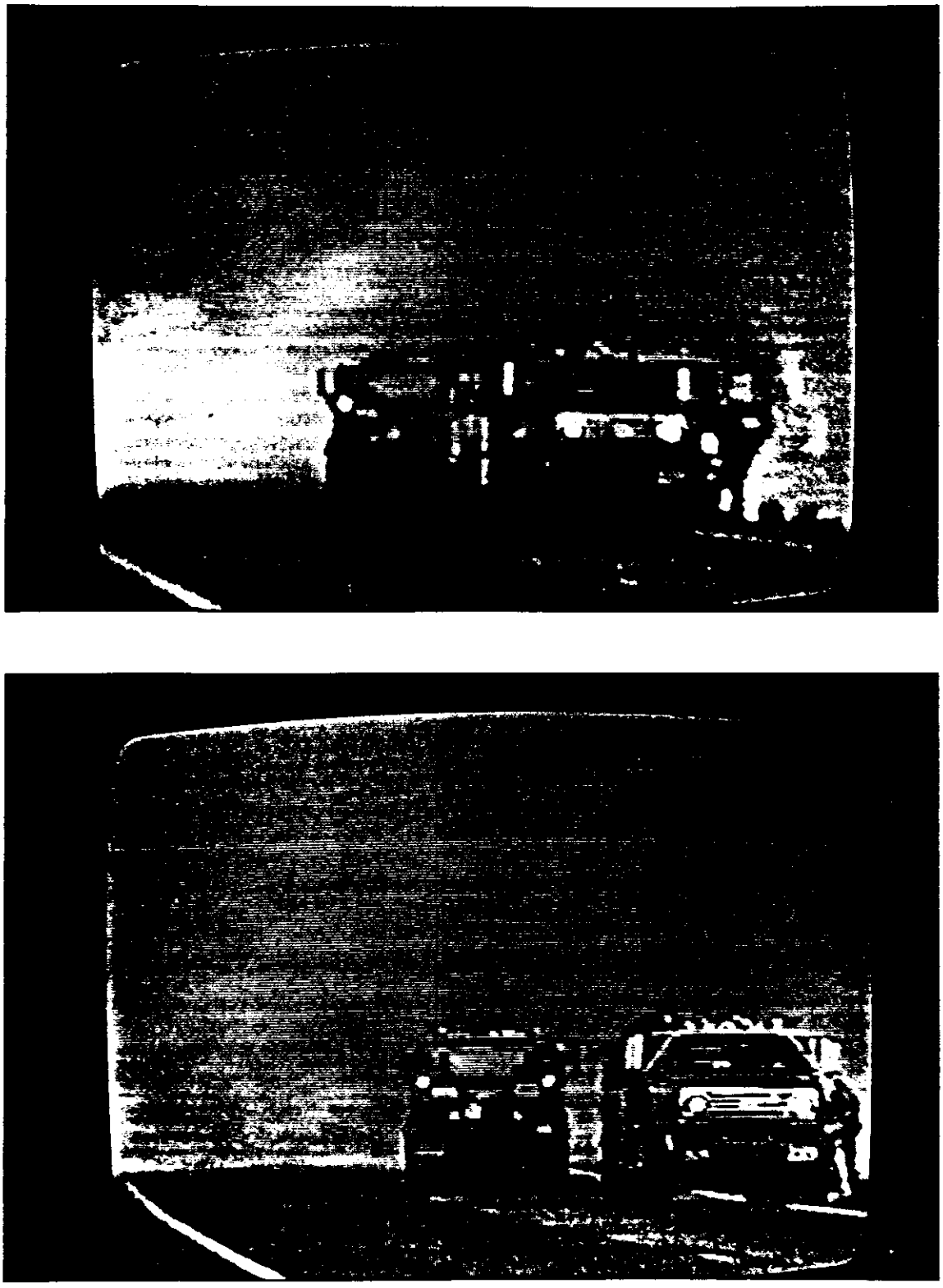

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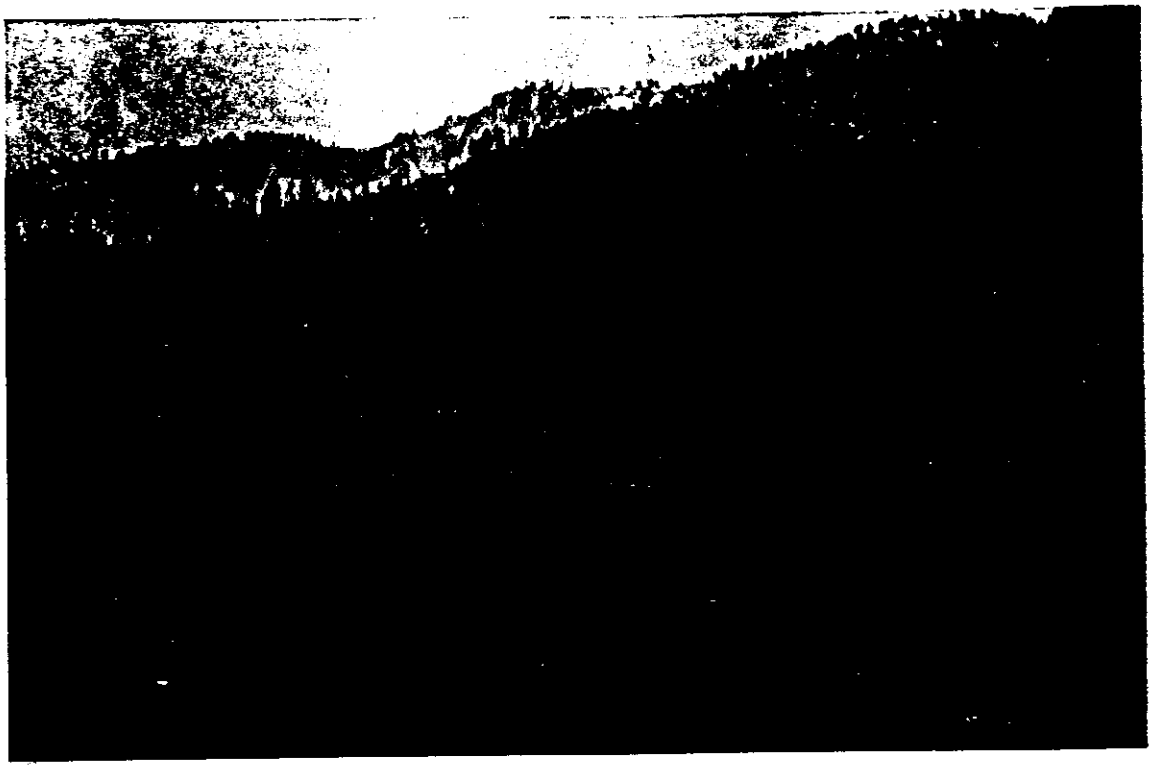
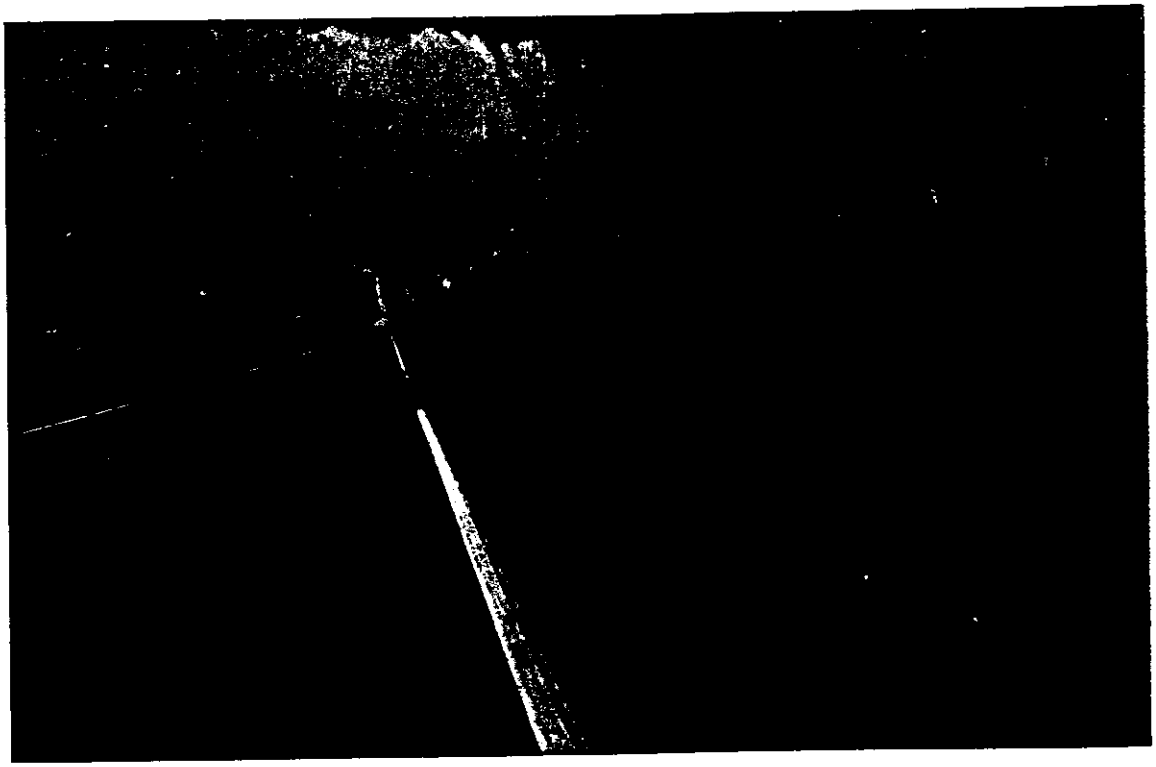
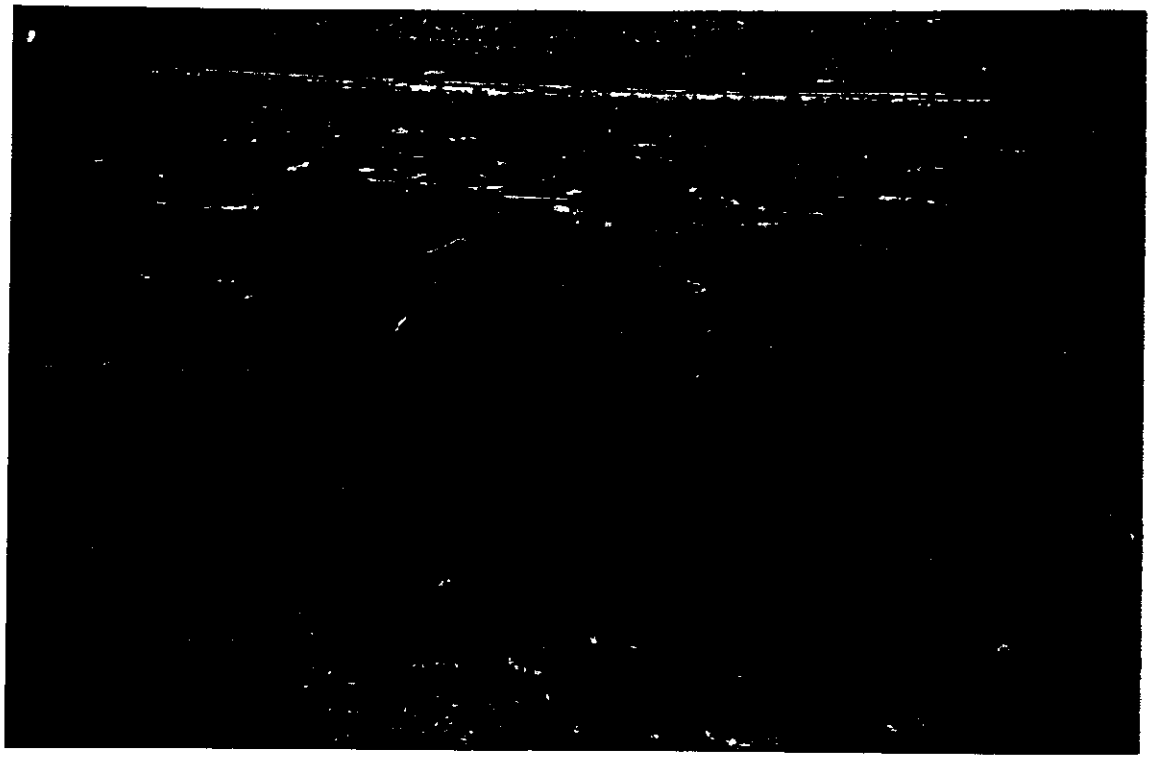


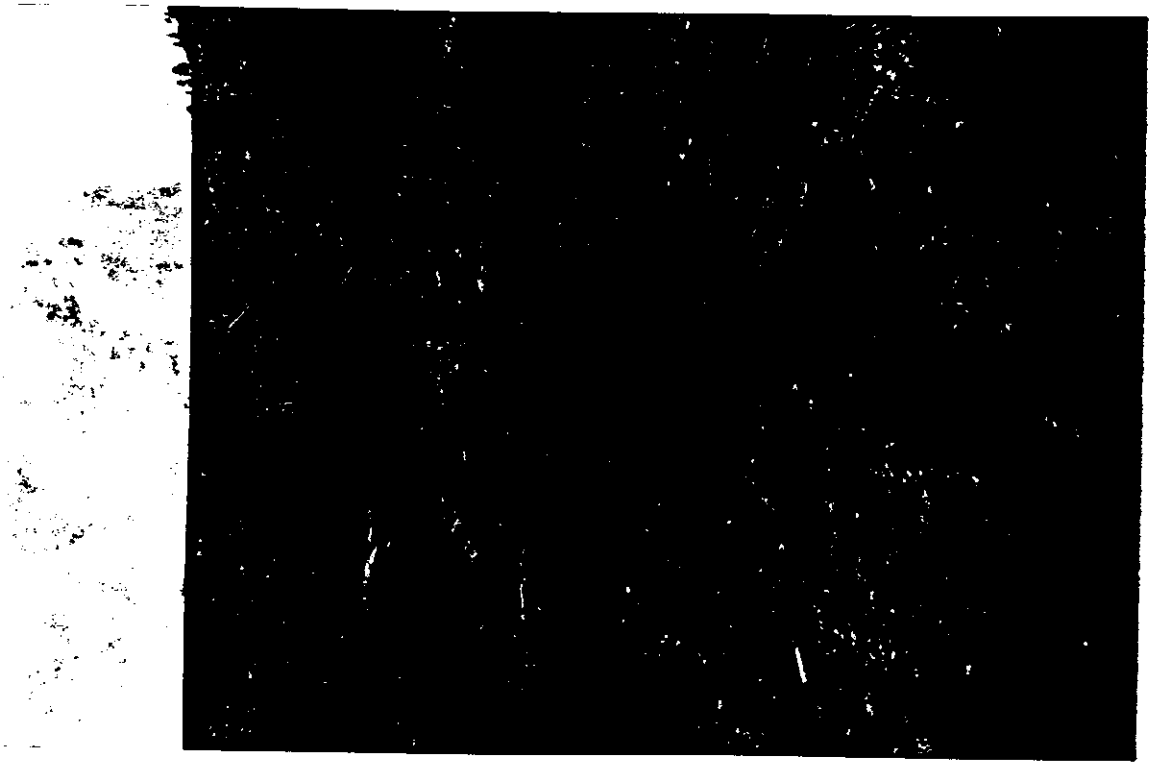
C-6. BURNED OVER AREA WEST OF HWY. 395 AFTER WHIRL DEVELOPMENT.



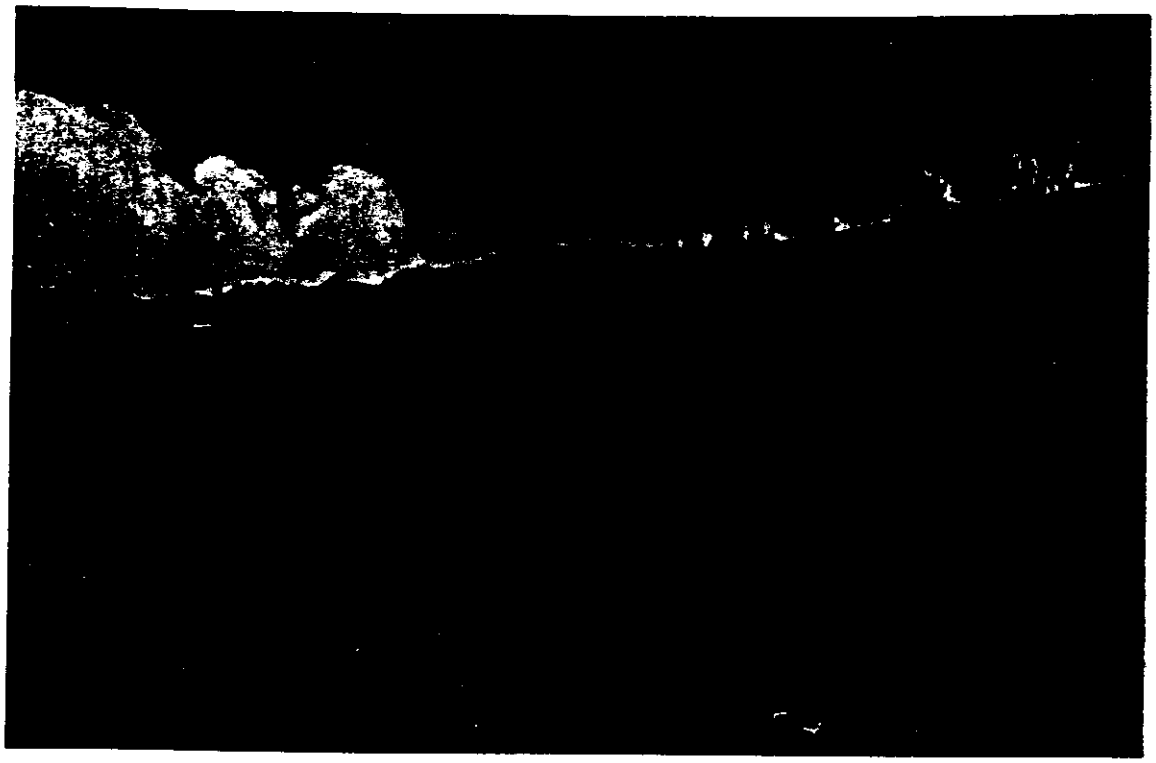
C-7. FIRE WHIRL SCORCH MARKS ON HWY. 395.



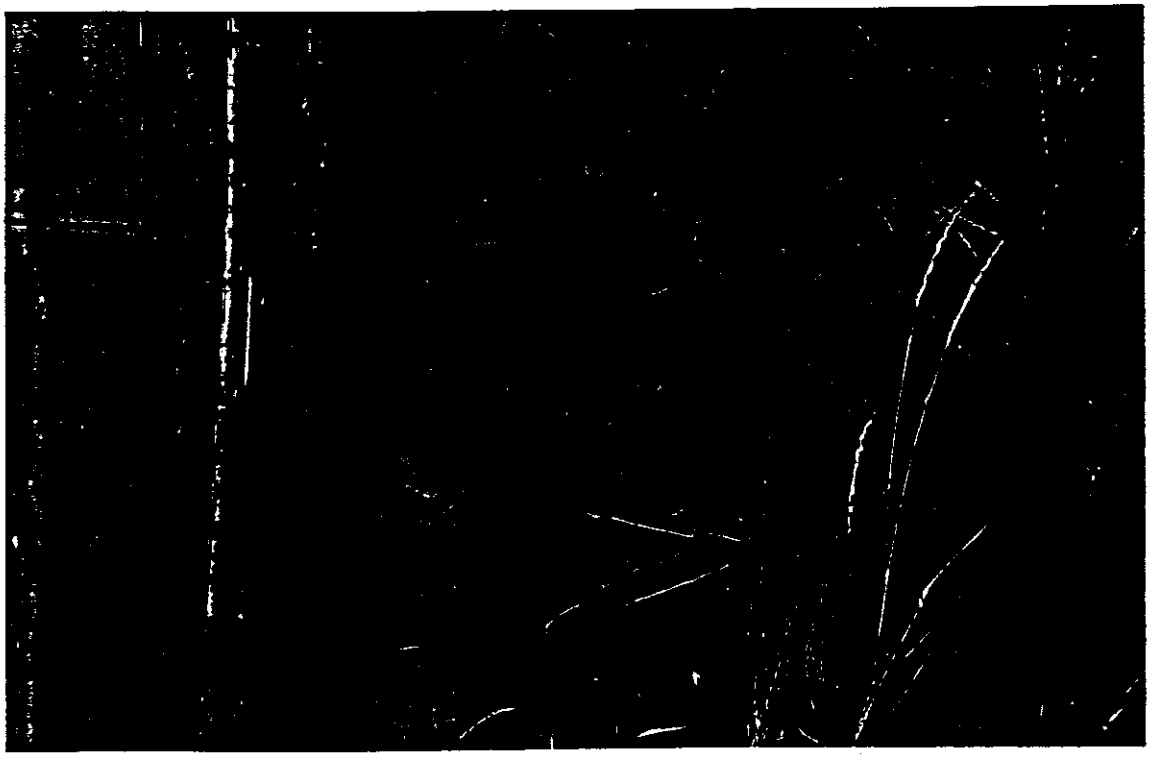
C-8. LOCATION OF ORIGINAL SPOT FIRE THAT WAS NEAR EXTINGUISHMENT, WEST TO EAST.



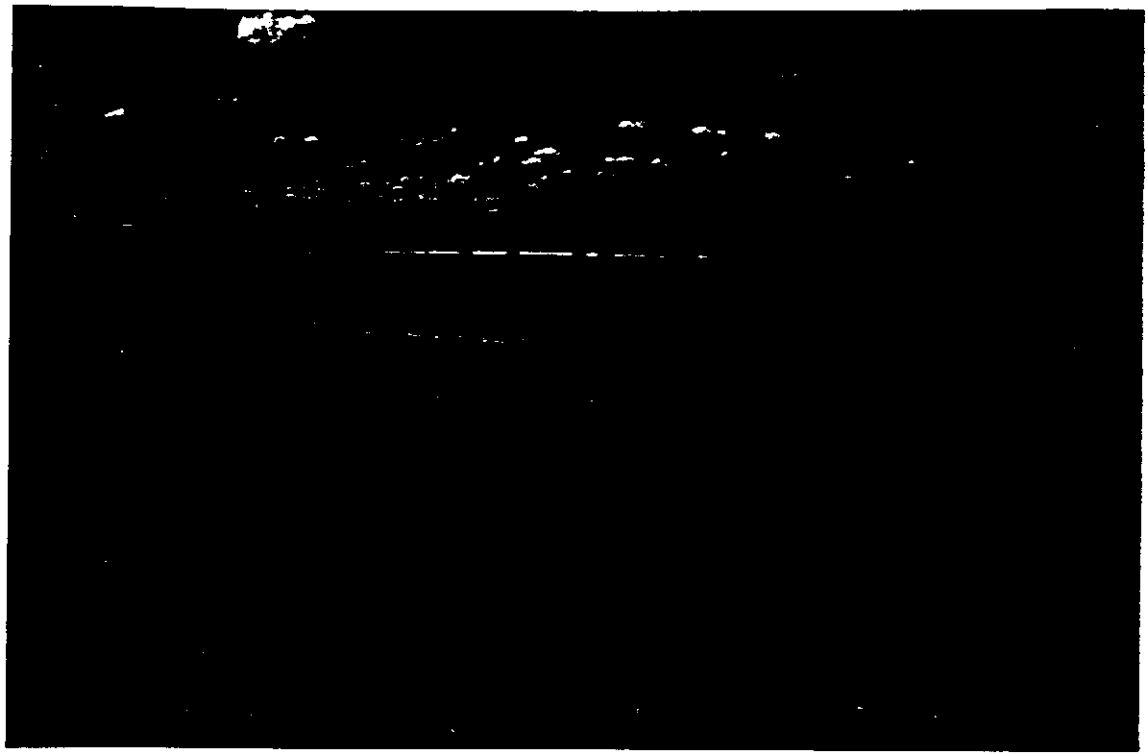
C-9. LOCATION OF ORIGINAL SPOT, EAST TO WEST.



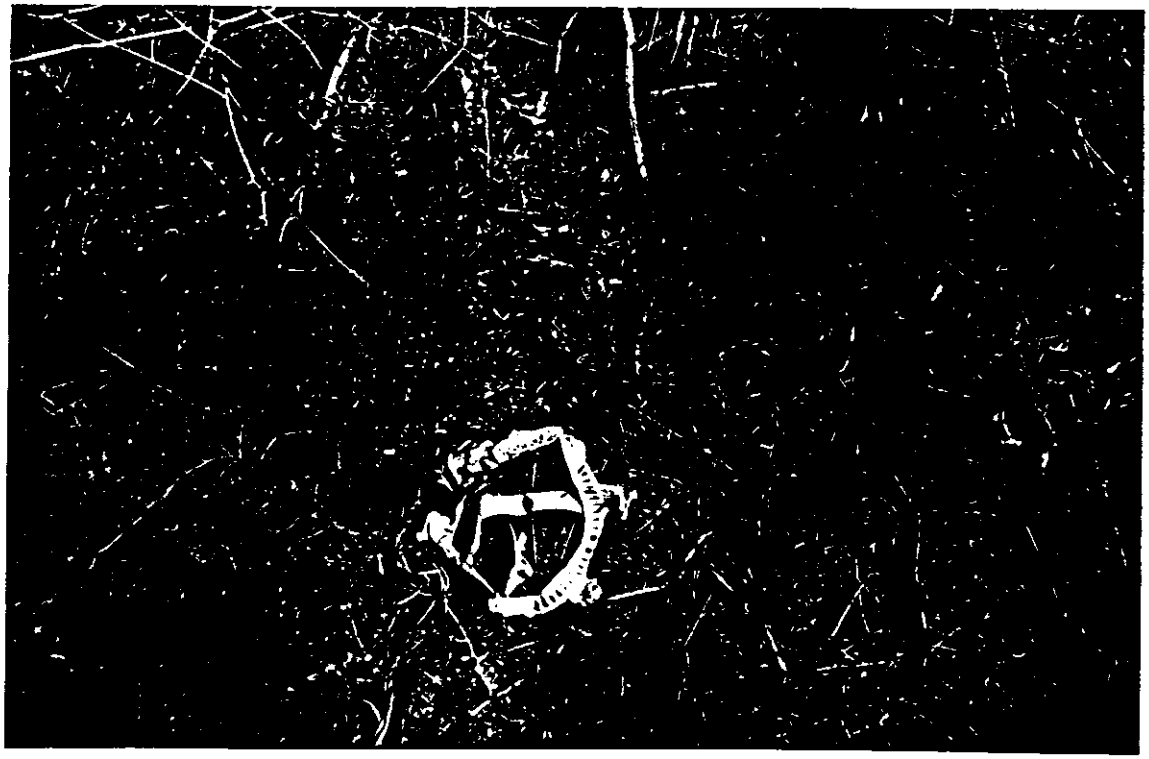
C-10. ORIGINAL SPOT, NORTHEAST TO SOUTHWEST.



C-11. ORIGINAL SPOT SHOWING REMNANTS OF HOSE LAY.



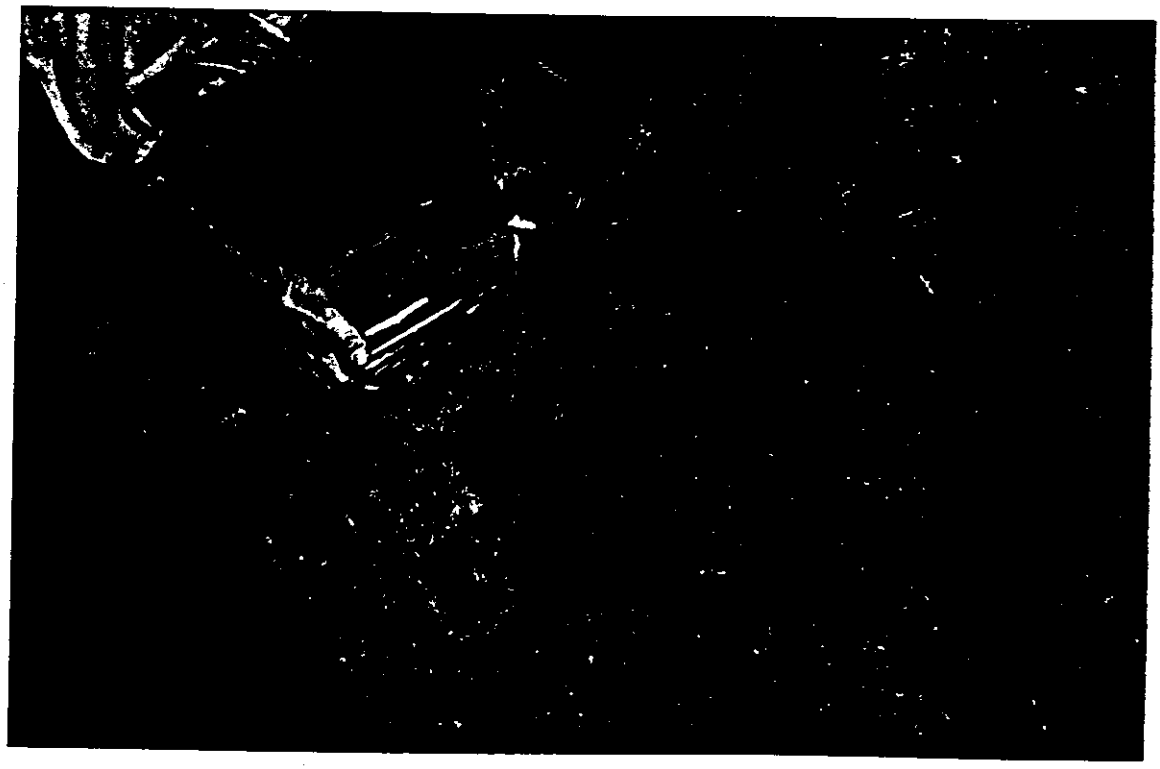
C-12. ORIGINAL SPOT SHOWING AREA OF FIREFIGHTER RETREAT



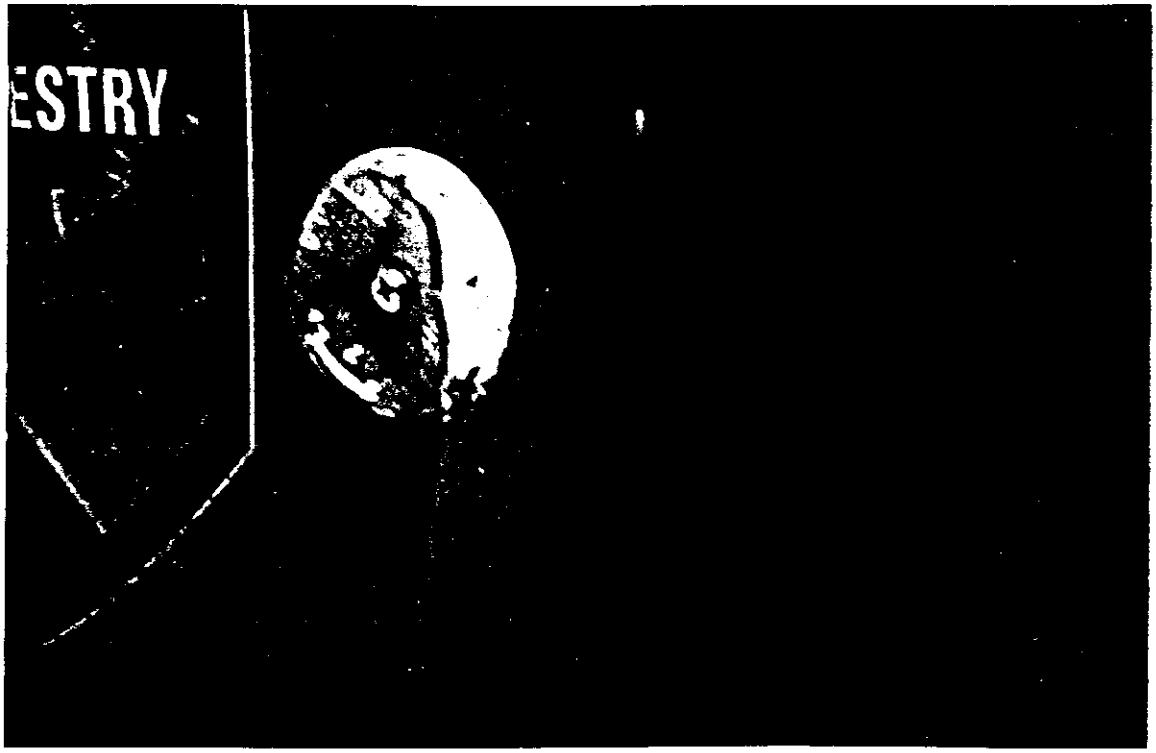
C-13. FF DERBONNES HELMET LINER DISCOVERED NEAR ACCIDENT SITE.

C-14. FF WRIGHTS SHELTER DISCOVERED NEAR ACCIDENT SCENE.

C-15. FF NELSON'S PACKAGED SHELTER DISCOVERED NEAR ACCIDENT SITE.

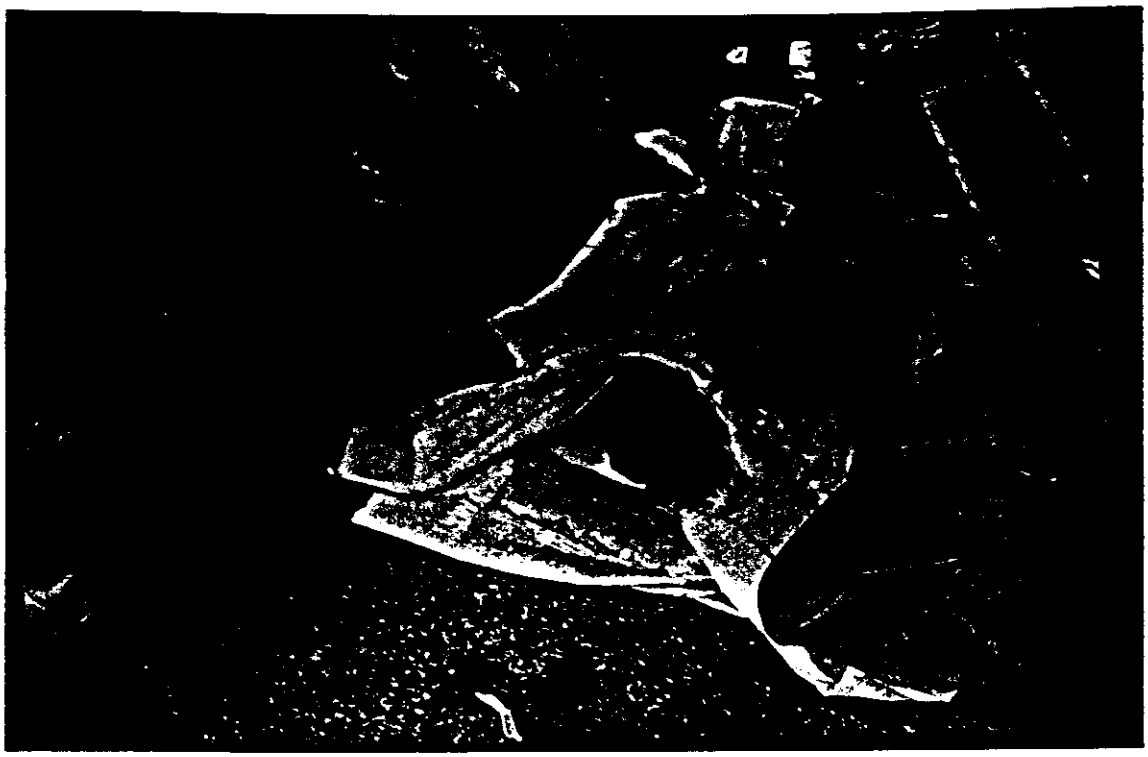


C-16. UNBURNED VEGETATION BENEATH FF NELSON'S SHELTER

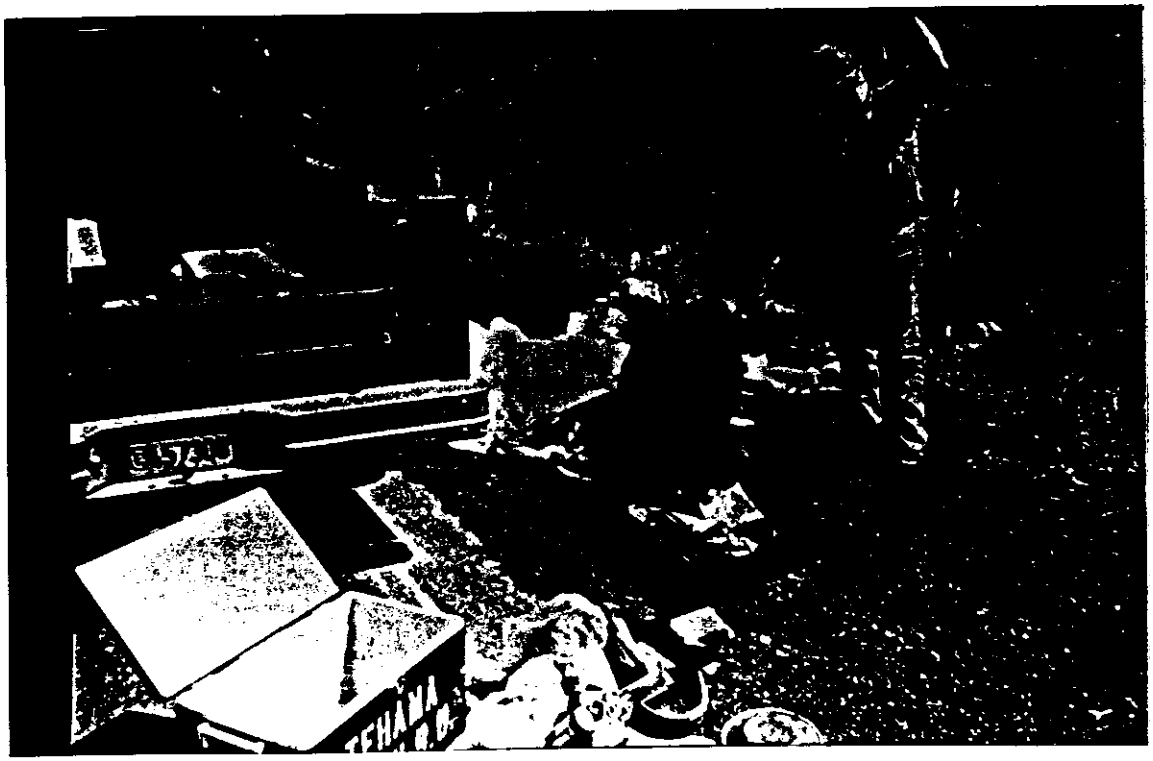


C-17. MINIMAL DAMAGE TO ENGINE 2387

C-18. TRIAGE AND TREATMENT



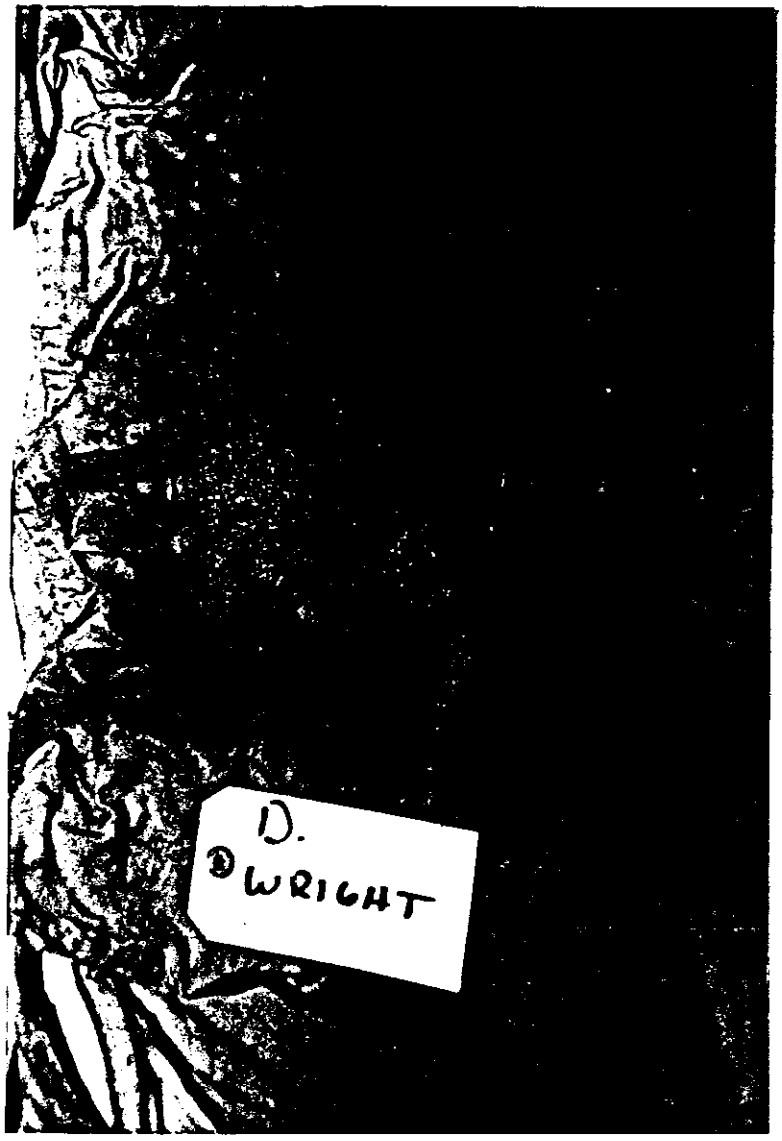
C-18. TRIAGE AND TREATMENT



C-19. PARAMEDIC TREATMENT OF FF WRIGHT AT SAFETY AREA

C-20. REAR VIEW OF FF WRIGHT'S NOMEX SAFETY UNIFORM

C-20. REAR VIEW OF FF WRIGHT'S NOMEX SAFETY UNIFORM



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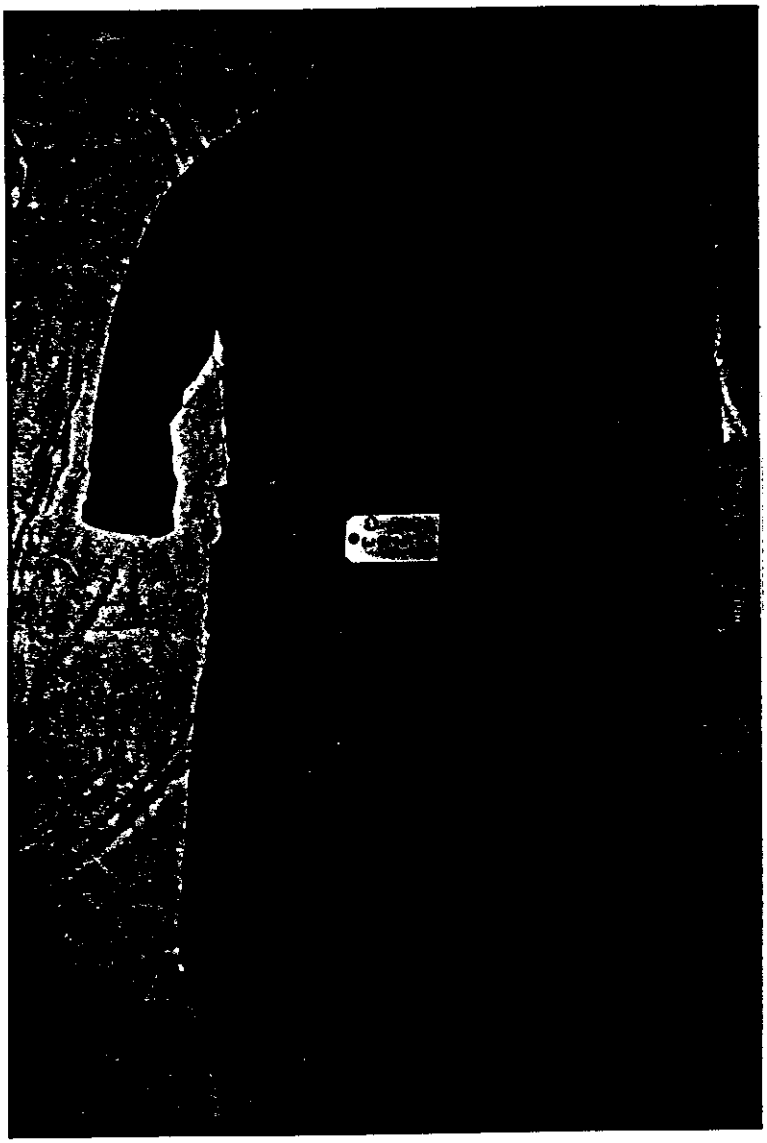
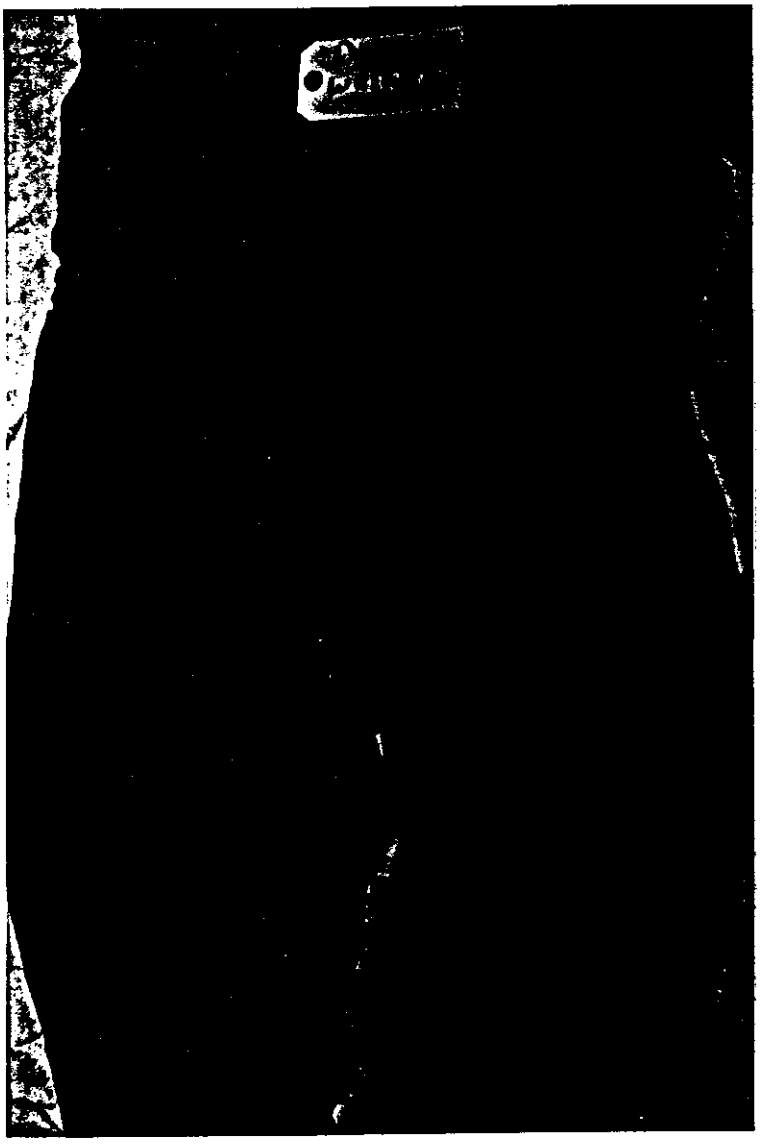
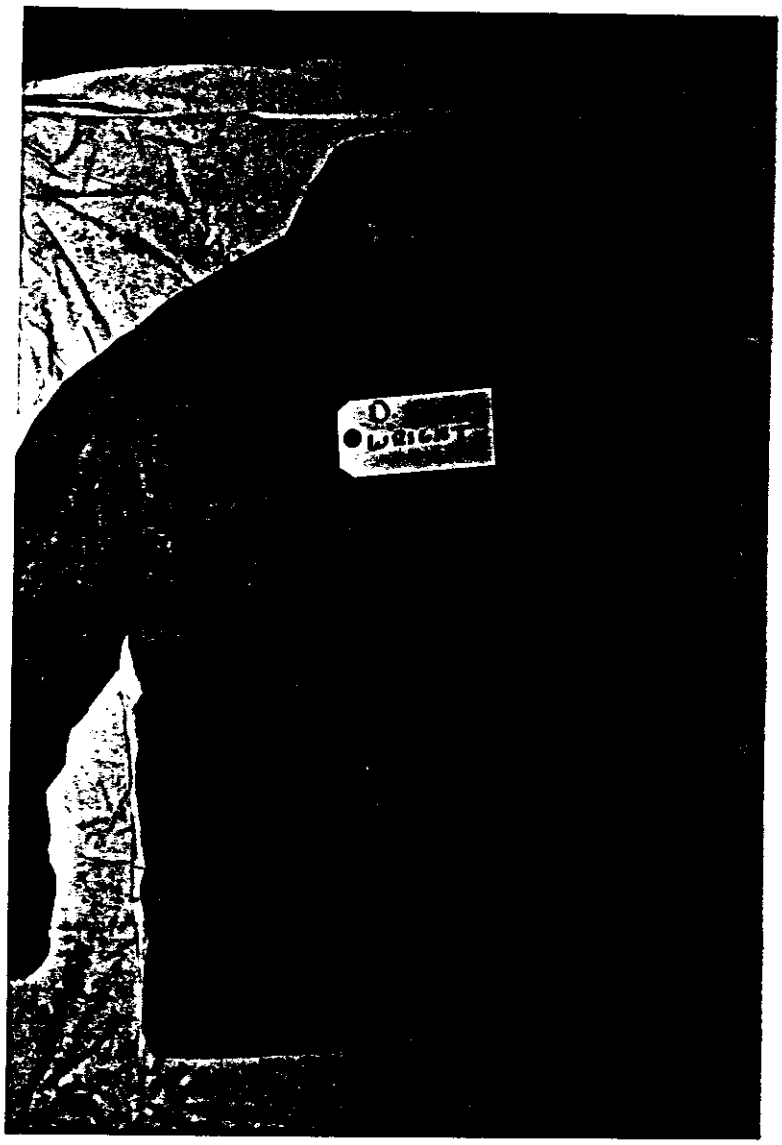


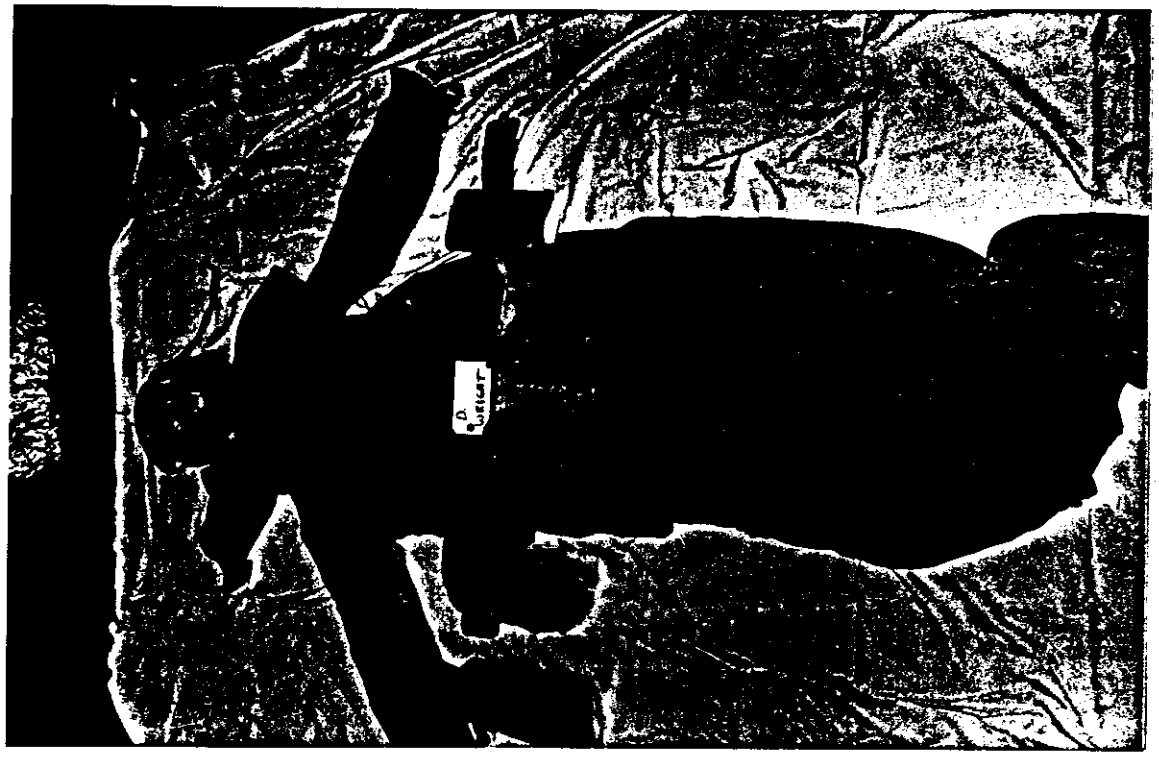
C-21. FRONT VIEW OF FF WRIGHT S NOMEX SAFETY UNIFORM



C-21. FRONT VIEW OF FF WRIGHT'S NOMEX SAFETY UNIFORM

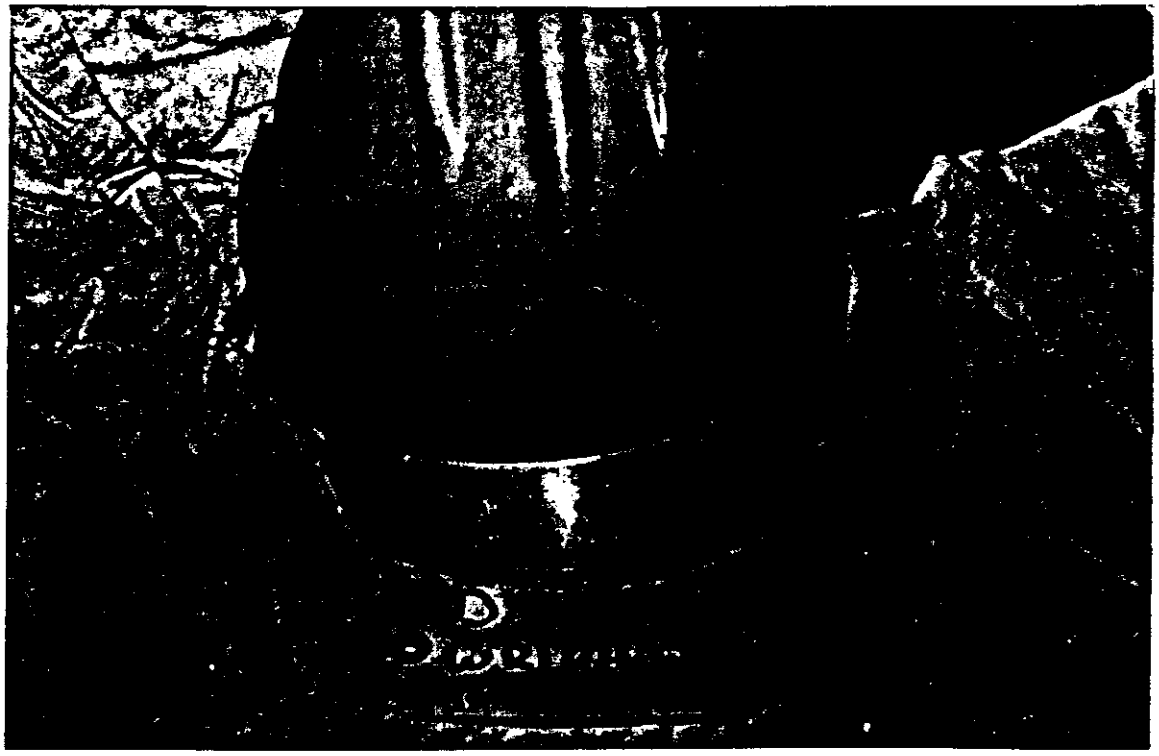


C-21. FRONT VIEW OF FF WRIGHT'S NOMEX SAFETY UNIFORM

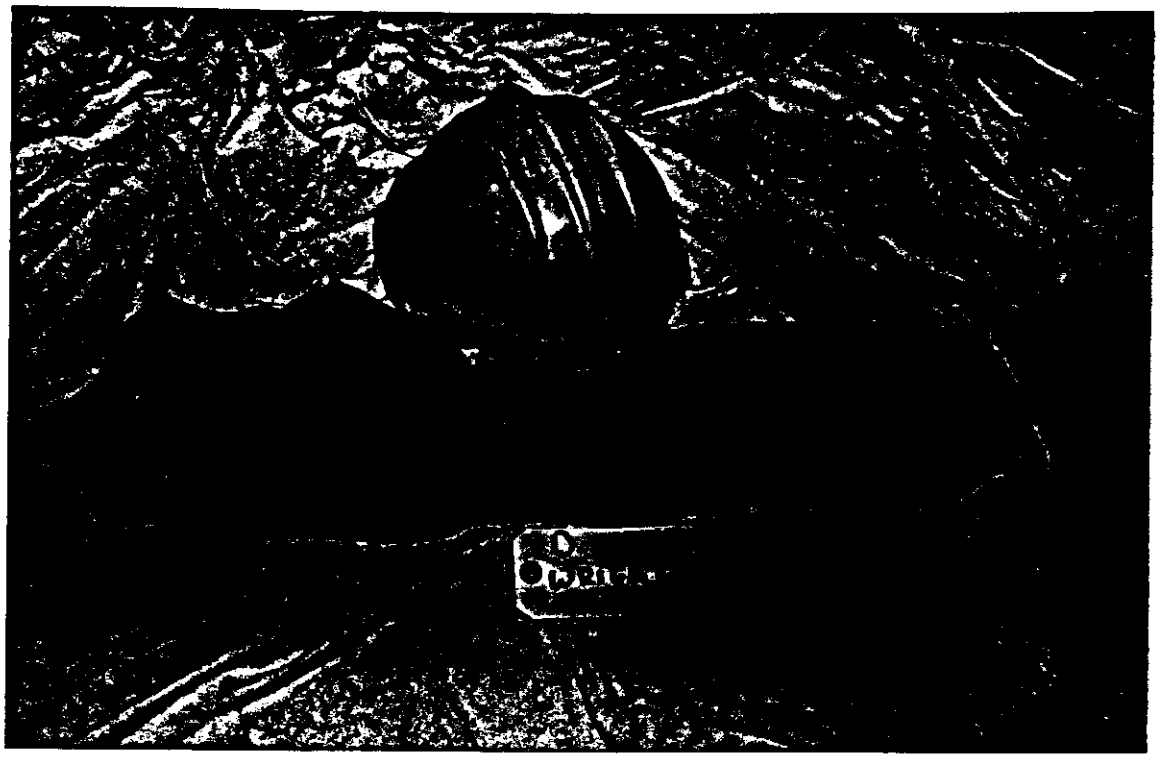


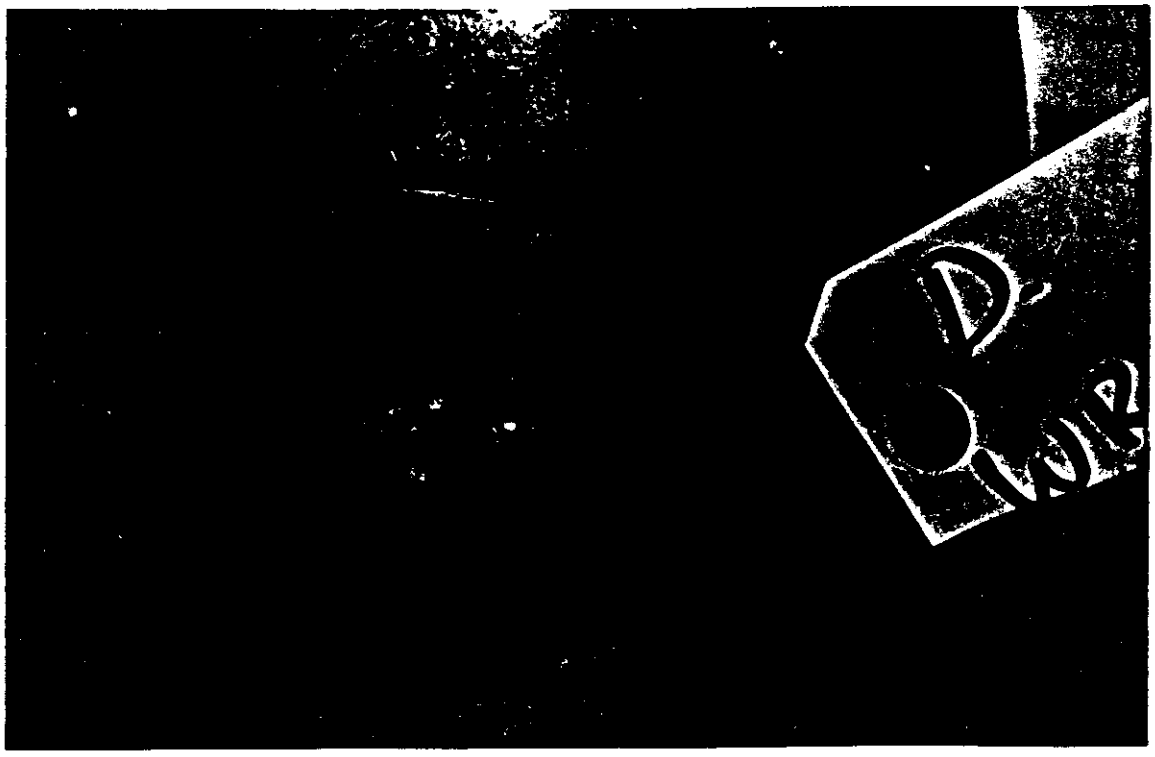
C-23. VIEW OF FF WRIGHT'S FULL SAFETY UNIFORM INCLUDING WEB GEAR

C-23. WRIGHT'S HELMET WITH GOGGLES IN PLACE



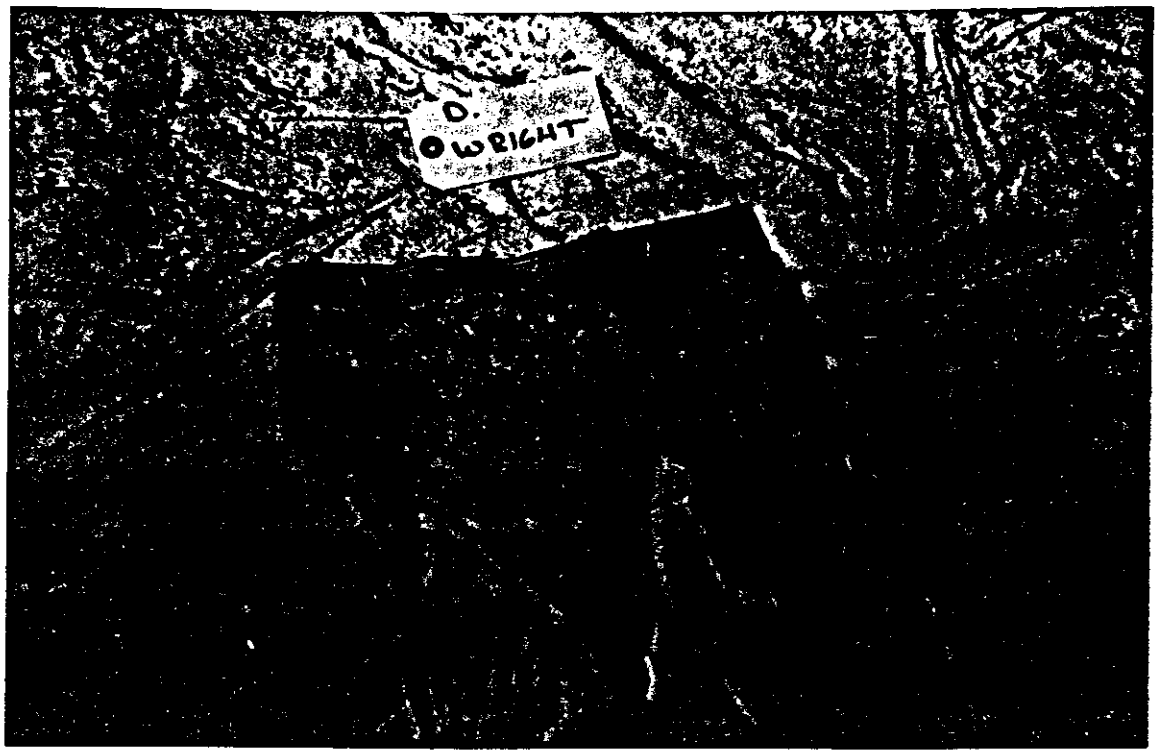
C-24. FF WRIGHT'S HELMET WITH GOGGLES REMOVED. NOTE SCORCH LINE OF DEMARCATION INDICATING PLACEMENT OF GOGGLES AT TIME OF ACCIDENT



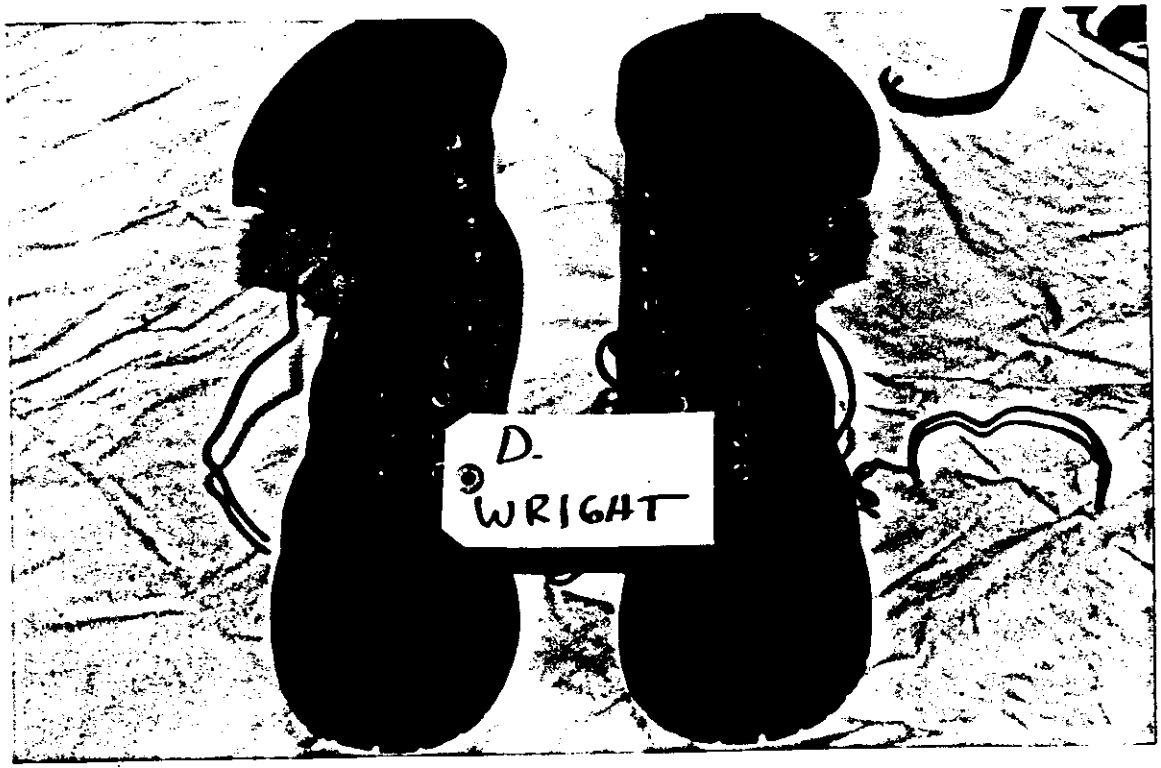


C-25. FF WEIGHTS HELMET AND SHROUD.

C-26 FF WRIGHT'S SCORCHED WORK UNIFORM PANTS

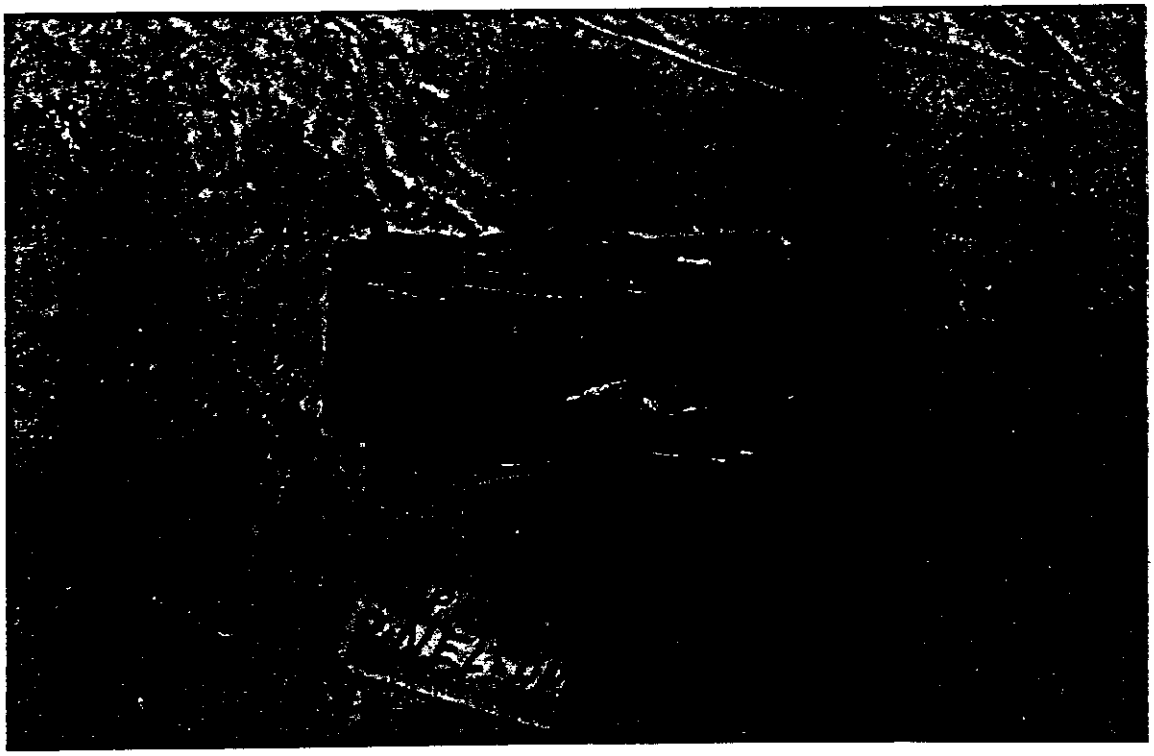


C-27. FF WRIGHT'S SCORCHED UNDER SHORTS



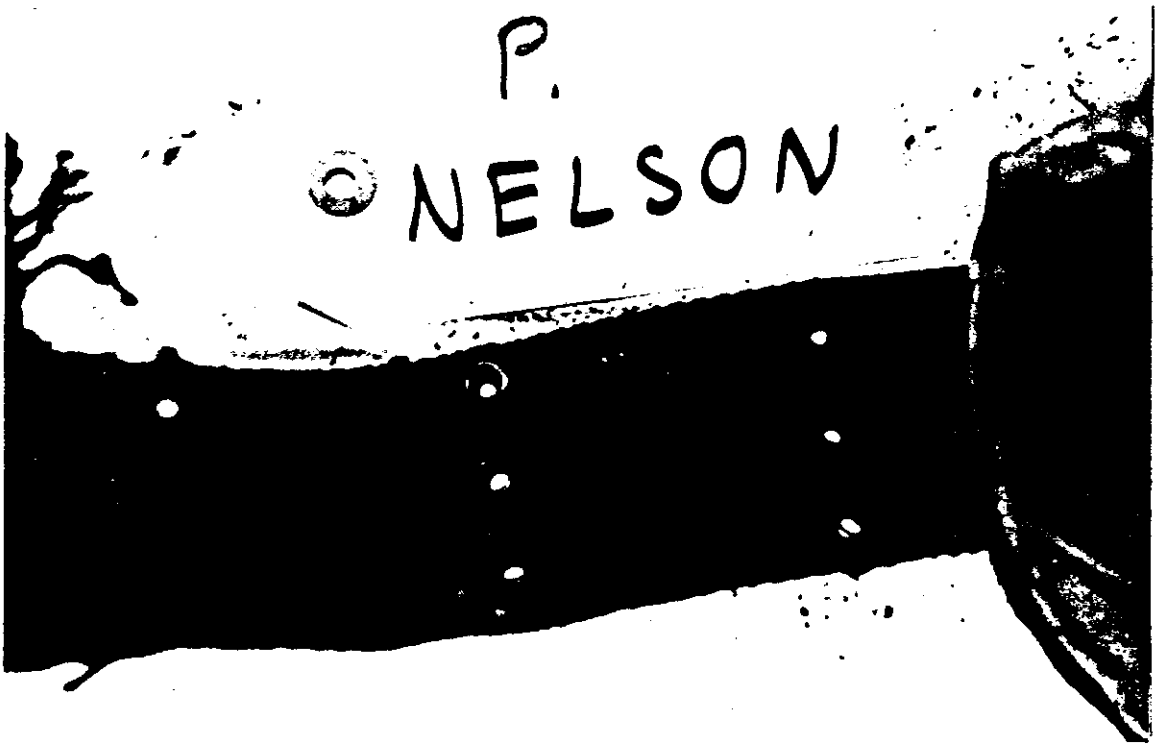
C-28 FF WRIGHT'S BOOTS INDICATING NO DAMAGE

C-29. FF WRIGHT'S FIRE SHELTER

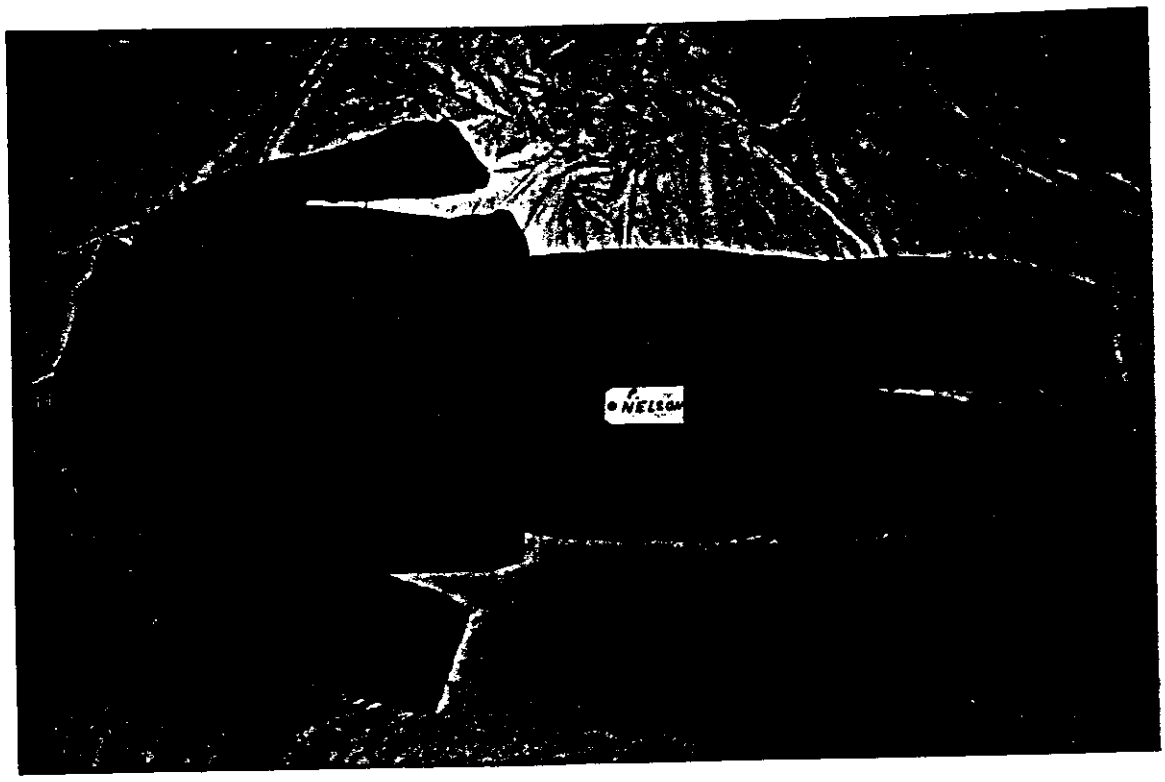


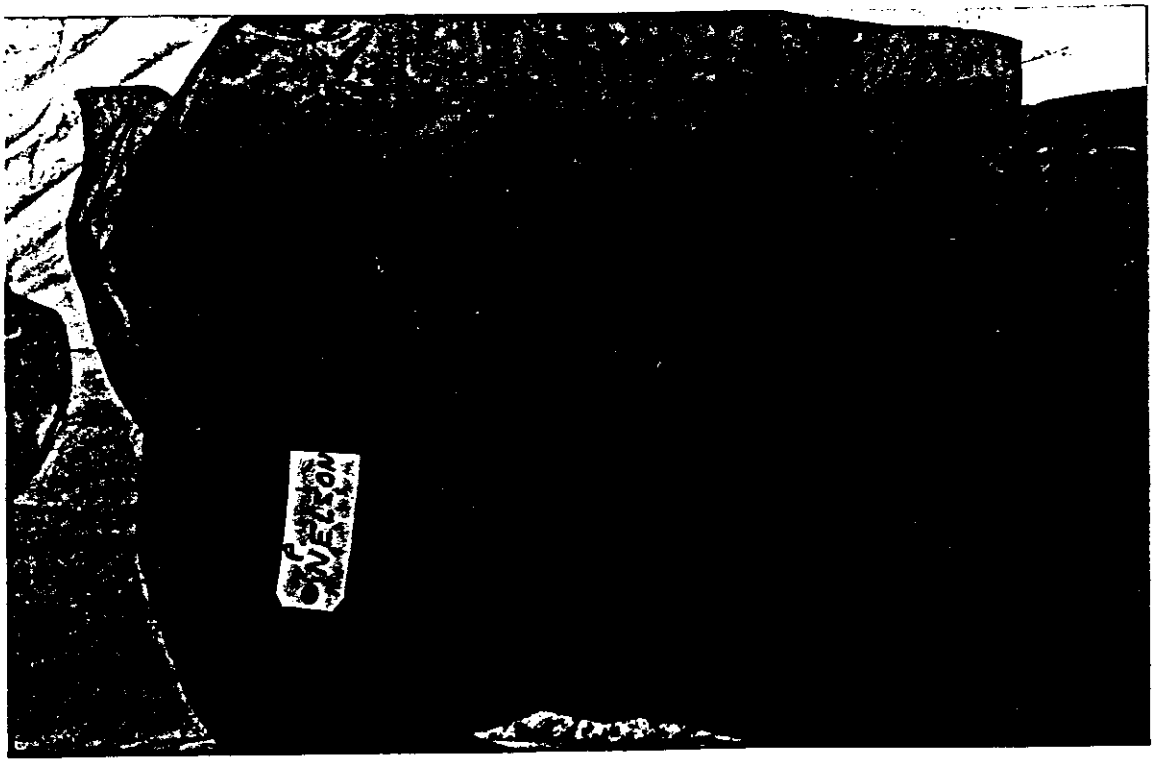
C-30. FF NELSON'S PACKAGED SHELTER

C-31. FF NELSON S UNFOLDED SHELTER



C-32. EE NELSON'S WEB GEAR

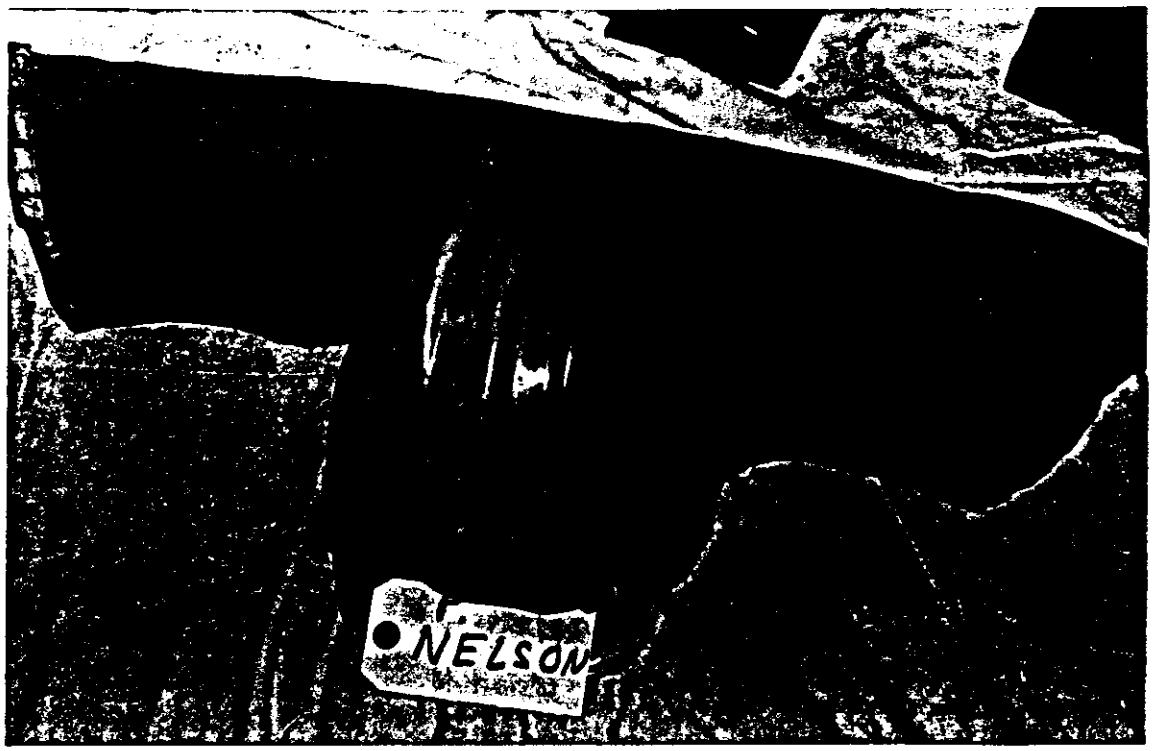




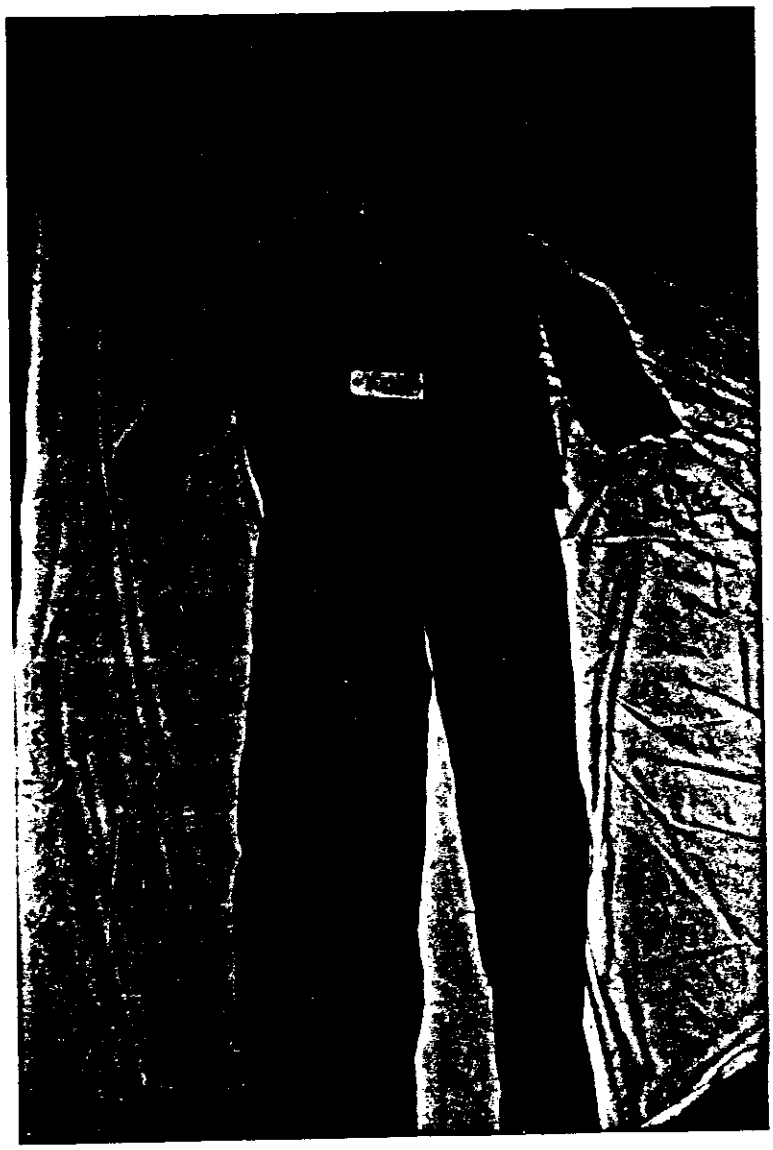
C-33. REAR VIEW OF FF NELSON'S NOMEX SAFETY UNIFORM

C-34. FF NELSON'S MELTED SHELTER POUCH

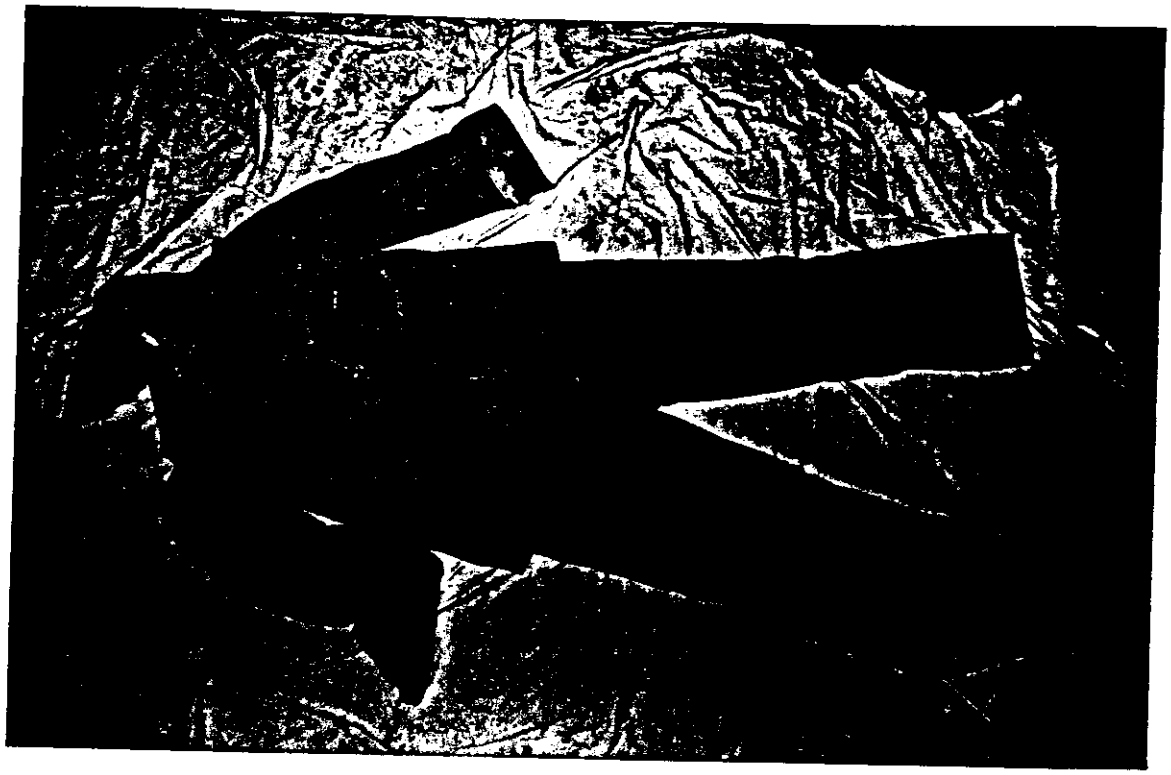
35. REAR VIEW OF FF NELSON'S NOMEX SAFETY UNIFORM SHOWING MELTED SHELTER POUCH MATERIAL STUCK TO POCKET

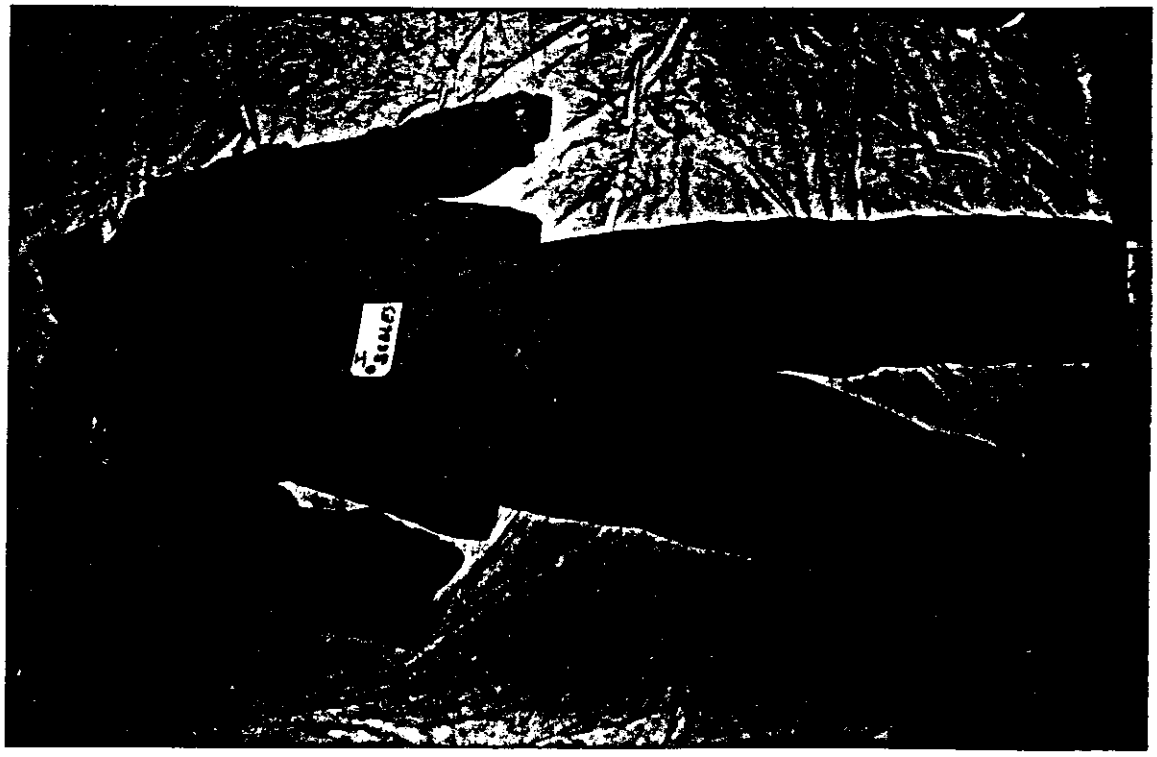


C-36 FF NELSON'S HELMET AND SHROUD

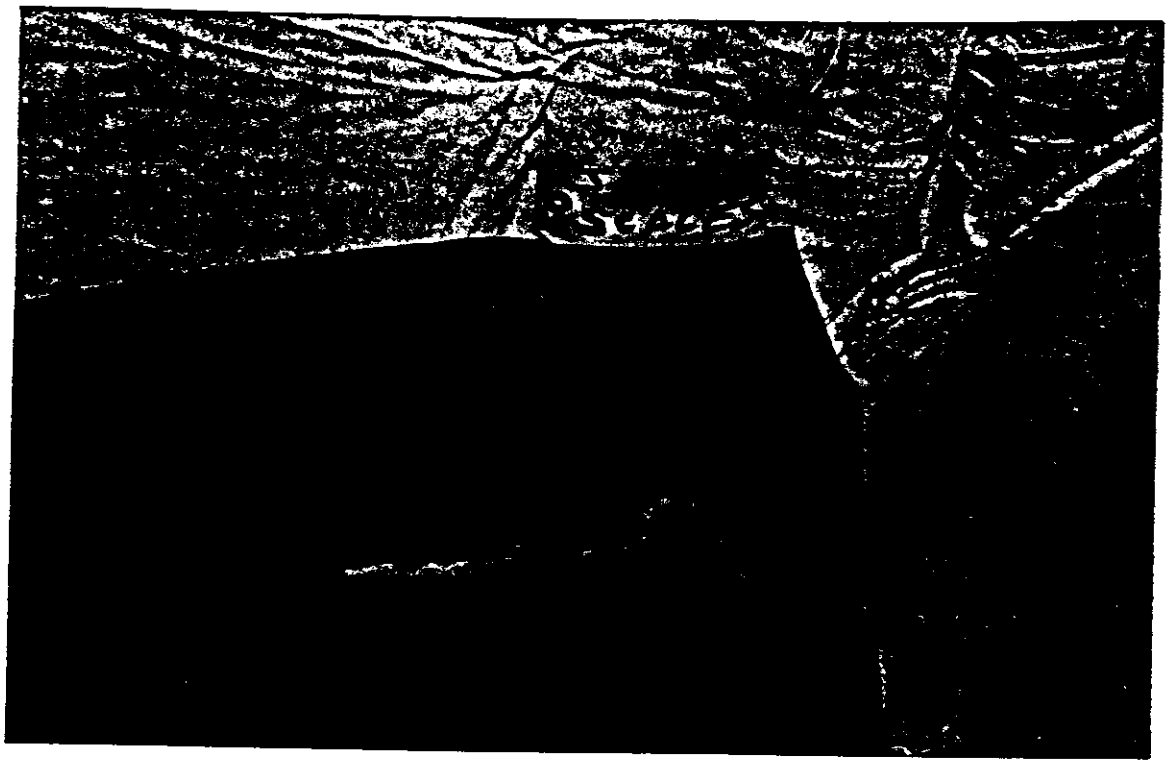


C-37. FRONT VIEW OF FF NELSON'S FULL NOMEX SAFETY UNIFORM



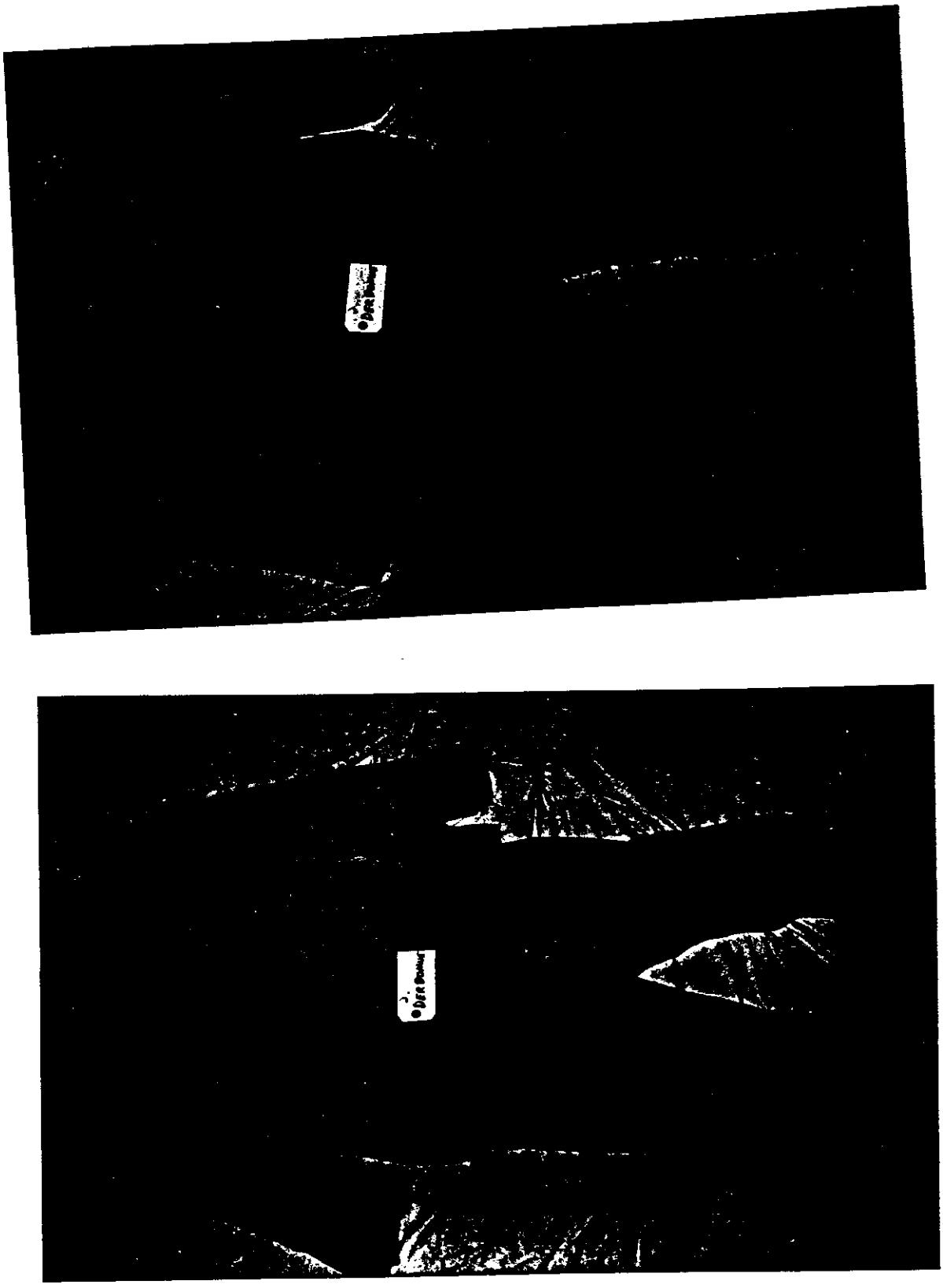


C-38. FRONT AND REAR VIEWS OF FF SCALE'S FULL NOMEX SAFETY UNIFORM



C-39. CLOSE UP OF FF SCALE'S NOMEX SHIRT SLEEVE INDICATING NO BURN DAMAGE

C-40. FF SCALE'S WEB GEAR INDICATING NO DAMAGE



C-41. FRONT AND REAR VIEW OF FF DERBONNE'S NOMEX SAFETY UNIFORM INDICATING NO APPARENT DAMAGE

C-42. FF DERBONNE'S WEB GEAR AND GLOVES INDICATING NO APPARENT DAMAGE

C-43. DERBONNE'S MELTED HELMET LINER

EXHIBIT D

Weather Reports and Observations

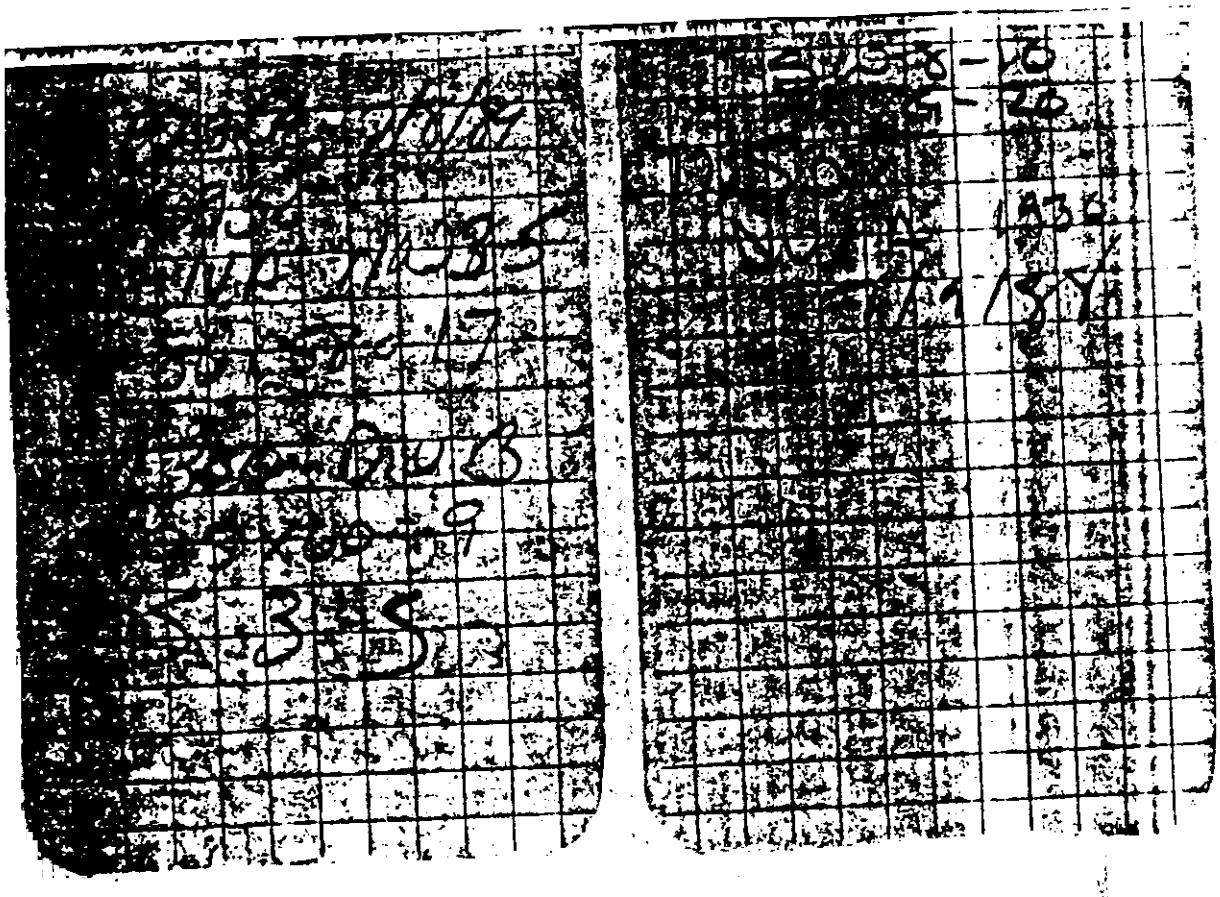
Time	Location	Elev.	Wind Sp	Wind Dir	Temp. Dry	Temp. Wet	Temp. DP	RH	Remarks	By
7-8 0900	NW/NW 17 27N 14E	4600	7	NE	80	55		20		
7-8 1000	SE/SE 8 27N 14E	4100	5	N	85	58		19		
7-8 1120	NE/NE 17 27N 14E	4200	10	S	92	60		15		
7-8 1230	SE/NW 18 27N 14E	5000	17	S	92	58		11		
7-8 1330	SE/SE 8 27N 14E	4100	8	NW	94	60		13		

Forestry Suppliers, Inc. Stock No. 89294

FIRE - WEATHER INFORMATION

Date / Time	Location	Elev.	Wind Sp	Wind Dir	Temp. Dry	Temp. Wet	Temp. DP	RH	Remarks	By
7/9 0800	SE [illegible] Sec 36 [illegible] + N13	4200	0-2	NE	82	55		17		
0900	[illegible]	4800			82	55		17	[illegible]	
1000	SW [illegible] NW [illegible] SC	4860	0-2	NE	87	57		15	Upslope Wind.	
1300	South Sec 36	4400	9-8	SE [illegible]	97	61		12	[illegible]	

Forestry Suppliers, Inc. Stock No. 89294



FIL02I NOW EXECUTING FILE 'FC506

-------------------07/08/89--FCST--23:07GMT------------------------

S	MSGC	DY	WS	WDY	HRB	1H	10	HU	TH	IC	LR	LO	MR	MO	SC	EC	BI	FL	MC	R
FALRVR	G1A3	9	3	167	15	4	5	7	11	22	0	0	50	11	3	64	36	27	3	M – 2
MANZTA	G2A3	9	8	152	47	5	5	13	15	29	0	0	47	14	8	43	45	33	3	H – 2
BOGARD	G1A3	9	15	125	23	3	5	5	12	72	0	0	47	34	21	64	83	64	5	E – 4
COLBY	G2A3	9	11	135	26	4	5	6	13	42	0	0	50	21	13	61	66	49	4	VH – 2
ALMOR	G1A3	9	9	155	34	3	4	8	14	45	0	0	24	11	10	55	55	40	3	H – 3

-----------------------07/08/89--FCST--23:07GMT-----------------------

STAT'N	MSGC	DY	WS	WDY	HRB	1H	10	HU	TH	IC	LR	LO	MR	MO	SC	EC	BI	FL	MC	R
CEDERV	T1A1	9	10	144	4	4	2	5	9	32	0	0	51	16	20	11	36	28	3	M
SUSANV	T1A1	9	12	145	2	2	5	4	8	54	0	0	51	28	32	13	47	39	3	H
SUSANV	C1A1	9	12	145	2	2	5	4	8	68	0	0	51	35	17	21	44	40	3	H
OBSVN	T1A1	9	32	150	3	3	2	4	9	87	0	0	51	44	117	12	86	69	5	E
RAVDLE	T1A1	9	17	155	3	3	4	5	8	59	0	0	51	30	43	12	53	43	3	H
LIKELY	C2P1	9	10	156	85	6	3	9	10	23	0	0	51	12	8	12	24	19	2	M
LIKELY	C1P1	9	10	156	85	6	3	9	10	22	0	0	51	11	7	12	23	18	2	M

REDDING FIRE WEATHER FORECAST 1430 PDT SAT. JULY 8, 1989

DISCUSSION: GUSTY SOUTHWEST WINDS REMAIN A PROBLEM EAST OF CASCADE SIERRAS TODAY IN PRESSURE GRADIENT BETWEEN LOW PRESSURE TROUGH OFFSHORE AND LARGE HIGH OVER SOUTHWEST U.S. WINDS SHOULD SL[illegible] SOMEWHAT SUNDAY AS TROUGHLINE APPROACHES AND EVEN MORE M[illegible]. HUMIDITIES WILL COME UP...BUT ONLY A FEW PERCENT A DAY MOST AREAS.

~~ZONE 560/~~556/~~WESTERN 557~~:

TONIGHT ~~THROUGH MONDAY: MOSTLY~~ FAIR EXCEPT AREAS OF NIGHT AND MORNING LOW CLOUDS NEAR COAST AND IN MAIN DRAINAGES. LALS 1. TEMPS DOWN 2-7 SUNDAY...LITTLE ~~CHANGE MONDAY~~. RH UP 5-12% SUNDAY THEN UP SLIGHTLY MORE MONDAY. WINDS SW TO NW 8-18 MPH...HIGHER RIDGE GUSTS IN MORNING.
OUTLOOK TUESDAY: FAIR TO PARTLY CLOUDY WITH LITTLE TEMP/RH CHG. WINDS WEST TO NORTHWEST TO 15 MPH.

~~ALL OTHER ZONES~~:

TONIGHT: FAIR . LALS 1. WIND SOUTH TO WEST 3-10 MPH...EXCEPT LOCALLY EXPOSED RIDGETOPS SOUTHWEST 8-13 GUSTS 20.

SUNDAY: SUNNY WITH A FEW AFTERNOON CUMULUS OVER HIGH TERRAIN. LALS 1. COOLER 5-10 WITH HUMIDITIES UP 2-8%. WINDS SOUTH TO WEST 5-15 MPH...SOME GUSTS NEAR 20 HIGHER EXPOSED AREAS AND LASSEN COUNTY.

MONDAY: FAIR TO PARTLY CLOUDY. LALS 1 EXCEPT CHANCE ISOLATED AF)ON THUNDERSTORMS OVER HIGH TERRAIN ZONES 597-599. SLIGHTLY C WITH HUMIDITY UP 1-5%. WINDS SOUTH TO WEST 5-15MPH IN AFTERNOON.

OUTLOOK TUESDAY: CONTINUED MOSTLY FAIR AND WARM WITH A SLIGHT CHANCE OF AFTERNOON THUNDERSTORMS ON SIERRAS. LITTLE TEMP CHANGE BUT RH UP 2-6%. WINDS LIGHTER SE TO SW MOST AREAS.

SNOOK

FIRE WEATHER FORECAST
NATIONAL WEATHER SERVICE RENO
1430 PM PDT SAT JULY 8 1989

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**********************************************************************
**  RED FLAG WARNING ZONES 570, 571, 572, 450, WESTERN 451, AND 576  **
**     FOR THE REMAINDER OF THIS AFTERNOON FOR STRONG GUSTY SOUTH-   **
**     WEST TO WEST WINDS COMBINED WITH LOW HUMIDITIES....           **
**                                                                   **
**  RED FLAG WARNING ZONES SOUTH HALF 453, 454, 455, AND     **      **
**       456 TODAY FOR HIGH-BASED THUNDERSTORMS.....                 **
**                                                                   **
**  RED FLAG WATCH ZONES 451, 570, 571, 572, 450, AND 576 SUNDAY FOR **
**     STRONG GUSTY SOUTHWEST TO WEST WINDS, AND LOW HUMIDITIES...   **
**********************************************************************
```

DISCUSSION: The latest forecast charts indicate that the upper level trough of low pressure will once again edge inland over the Pacific northwest. In fact, this is already beginning to happen, and as a result winds are stronger over much of the district this afternoon. Therefore a RED FLAG WARNING has been issued for the remainder of the afternoon for portions of western Nevada, and the California zones for strong gusty winds following several days of high temperatures and low humidities. Also, a RED FLAG WARNING remains in effect for portions of southern and eastern Nevada this afternoon and evening for areas of isolated high-based thunderstorms accompanied by locally strong gusty winds. The increasing southwest flow aloft will tend to keep any thunderstorms restricted to eastern and southern portions of Nevada the next few days, and only isolated activity is expected. Lightning detection equipment is showing some lightning by 2 pm over portions of extreme southern Nevada, and over the southern Sierra south of zone 576. It is expected that the southwest winds will prevent any thunderstorms from reaching zone 576, or further north, today. As the trough moves inland Sunday and Monday, temperatures will trend downward, and that will be most noticable over western and northern Nevada, and the California zones. The long range forecast charts continue to indicate that the flow will become more southerly over the district late this week, which would increase the thunderstorm activity then, and possibly allow the storms to spread into the Sierra zones, and northwest Nevada eventually.

<<<<<<<<<<<<<<<<<<<<<<<<<<<<< ZONE FORECASTS >>>>>>>>>>>>>>>>>>>>>>>>>>>

R DER OF TODAY AND TONIGHT...

ALL ZONES: >>>RED FLAG WARNING FOR ZONES 570, 571, 572, 576, 450, AND WESTERN 451 FOR STRONG GUSTY SOUTHWEST TO WEST WINDS THROUGH EARLY TONIGHT<<<<
 >>> RED FLAG WARNING FOR ZONES 453, 454, AND 456 FOR ISOLATED HIGH BASED THUNDERSTORMS THROUGH SUNSET TONIGHT <<<<
Clear to partly cloudy, with LAL becoming 1 all zones by 10 pm. Decreasing winds after sunset becoming normal drainage winds, except SW winds 25-40 mph continuing upper slopes/ridges in northeast CA/northwest NV zones. Very poor RH recovery 25-45% northern and central zones and 15-25% zone 456. Morning temperatures in the 40s to mid 50s except 60s to mid 70s southern NV. 10,000 ft winds..SW 20-40 mph northeast CA zones and northwest Nevada, otherwise S-SW 5-15 mph.

SUNDAY...

ZONES 570, 571, 572, 576, 450, 451, 453: >>> RED FLAG WATCH FOR STRONG GUSTY AFTERNOON WINDS COMBINED WITH LOW HUMIDITIES<<<<<<
Sunny and not as hot. Lal 1. Winds south to west at 10-20 mph in the afternoon, and locally up to 30 mph in the normally windier locations. Highs in the upper 80s to 90s. Minimum afternoon humidities 7 to 13 percent. 10,000 ft. winds southwest at 25-35 mph.

ZONES 452, 454, 455, 456: Sunny in the morning, with cu building during the afternoon over the higher terrain. A few h. ased, mainly dry thunderstorms developing by mid-afternoon, most numerous in southern Nevada - LAL 2 OR LAL 6. Highs in the 90s to 110 extreme southern Nevada. Minimum afternoon humidities 7 to 15 percent. Winds south to southwest at 10-20 mph and strong gusty winds near any thunderstorms. 10,000 ft winds southeast-south at 10-20 mph.

MONDAY...

ZONES 570, 571, 572, 576, 450, 451, 453, 454: Mostly sunny and cooler. LAL 1. Strong gusty southwest to west winds during the afternoon at 10-20 mph, with gusts to 30 mph in the normally wind prone locations. Highs in the 80s to low 90s. Minimum afternoon humidities 10-20 percent. 10,000 ft. winds southwest at 25-40 mph.

ZONES 452, 455: Partly cloudy with isolated afternoon and evening thunderstorms - lal 2. Not as warm. Winds south to west at 10-20 mph, with locally higher gusts. Highs in the mid 80s to mid 90s. Minimum afternoon humidities 10-20 percent. 10,000 ft. winds southwest at 15-25 mph.

ZONE 456: Partly cloudy with isolated afternoon and evening thunderstorms - lal 2. Winds south to west at 10-20 mph. Highs in the 90s to 108 extreme south. Minimum afternoon humidities 6 to 13 percent. 10,000 ft. winds south to southwest at 5-15 mph.

<<<<<<<<<<<<<<<<<<<<<<<<<<<< EXTENDED FORECASTS >>>>>>>>>>>>>>>>>>>>>>>>

3 / FORECAST FOR TUESDAY THROUGH THURSDAY: S-SE flow will redevelop over eastern and southern Nevada spreading the high-based, mainly dry thunderstorms over eastern and southern Nevada. Cooler early in the period, but warming again to above normal by Thursday. Continued hot through the period southern Nevada.

6-10 DAY OUTLOOK FOR FRIDAY JULY 14 THROUGH TUESDAY JULY 18:
The longer range forecast charts still indicate a south to southeast flow developing and persisting over the district for increased thunderstorm activity next weekend, and into the coming week, along with a return to well above normal temperatures.

David Carman

(TSP) COST: $ 0.92

00027.94 CRU 0000.01 TCH 0010.04 KC

OFF AT 16:07PDT 07/08/89

FILE LIST EAGLE556

FORECAST FOR THE EAGLE FIRE, 2130PDT JULY 7, 1989
REDDING FIRE WEATHER OFFICE

NO OBS AVAILABLE

DISCUSSION: HIGH PRESSURE WILL HOLD OVER THE WESTERN U.S. AS AN UPPER LEVEL LOW PRESSURE TROF DEEPENS OFF THE COAST. THIS WILL CAUSE GUSTY WINDS ON SITE AGAIN SATURDAY WITH THE DIRECTION A LITTLE MORE WEST TO NORTHWEST.

TONITE: WINDS BECOMING DOWNSLOPE 3 TO 5 MPH BY 1100. MIN TEMP 50 TO 55 AT TOP AND 45 TO 50 AT BOTTOM. MAX HUMIDITY 55 TO 65% LOWER ELEVATIONS AND 40 TO 45% AT TOP.

SATURDAY: WINDS INCREASING TO WEST TO NORTHWEST 12 TO 22MPH BY EARLY AFTERNOON WITH SOME GUSTS TO 28MPH. MAX TEMP 88 TO 94. MIN HUMIDITY 18 TO 22%. SATURDAY NIGHT WILL BE A REPEAT OF TONITE.

LOOK SUNDAY: DECREASING WINDS WITH SLIGHTLY HIGHER HUMIDITY AND COOLER TEMPS.

FONTANA

COMMAND:
FONTANA

COMMAND:FILE LIST FWXRDD FWXSAC FWXRNO

REDDING FIRE WEATHER FORECAST 1430 PDT FRI. JULY 7, 1989

DISCUSSION: A STRONG HIGH PRESSURE AREA WILL REMAIN OVER THE WESTERN U.S. THRU THE WEEKEND. LITTLE CHANGE IS EXPECTED SATURDAY. A COOLING TREND WILL BEGIN SUNDAY AS AN WEAK UPPER LEVEL LOW PRESSURE TROF DEVELOPS OFF THE WEST COAST.

ZONE 560
TONITE AND SATURDAY: PATCHY FOG AND LOW CLOUDS ALONG THE COAST. LALS 1. LITTLE CHANGE IN TEMP AND HUMIDITY. WINDS NORTHWEST 8 TO 18MPH..

SUNDAY: INCREASING FOG AND LOW CLOUDS AS MARINE LAYER DEEPENS TO NEAR 2000'. LALS 1. TEMP DOWN 3 TO 6. HUMIDITY UP 5 TO 10%. WINDS WEST TO NORTHWEST 5 TO 15MPH.

ALL OTHER ZONES
TONITE: LALS 1. LIGHT WINDS.

SATURDAY: LALS 1. LITTLE CHANGE TEMP AND HUMIDITY. WINDS NORTHWEST 5 TO 15MPH.

SUNDAY: LALS 1. TEMP DOWN 2 TO 6. HUMIDITY UP 4 TO 12%. WINDS SOUTHWEST TO NORTHWEST 6 TO 12MPH.

****

OUTLOOK MONDAY: SLIGHTLY COOLER WITH HIGHER HUMIDITY AND LIGHT SOUTH WIND.

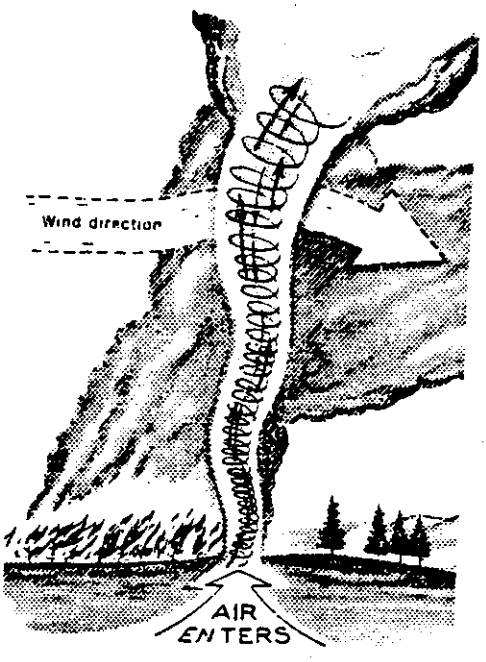
FONTANA

SACRAMENTO FIRE WX FCST FOR TAHO/ELDO/STAN NF AND TBMU/1530 07 JUL 1989

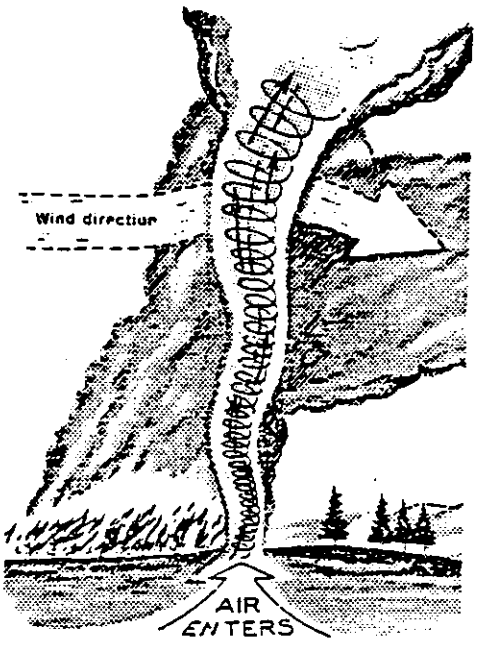
DISCUSSION...FIRST APPEARANCE OF HIGH CLOUDINESS FROM THE SOUTHEAST OF FORESTS IS EVIDENT THIS AFTERNOON. THIS IS THE ADVANCE SCOUT FOR MORE MOISTURE AT MID-LEVEL AND THE INCREASING CHANCES FOR TRW SATURDAY AND SUNDAY. COOLER AND HIGHER R.H. WILL BE THE STORY OVER THIS WEKEND WITH TODAY BEING THE PEAK-OUT DAY ON HOT AND DRY CONDITIONS.

EXHIBIT E

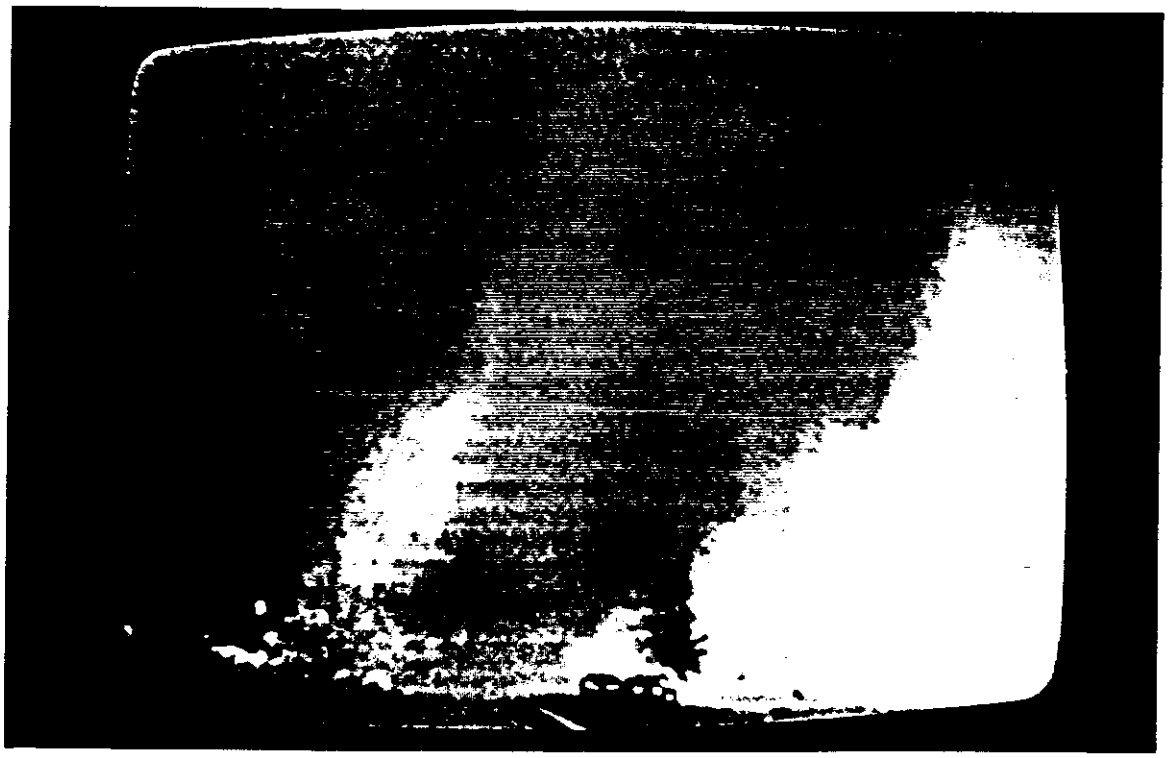
Comparison of Eagle Fire Conditions and Published Illustration Describing Fire Whirls



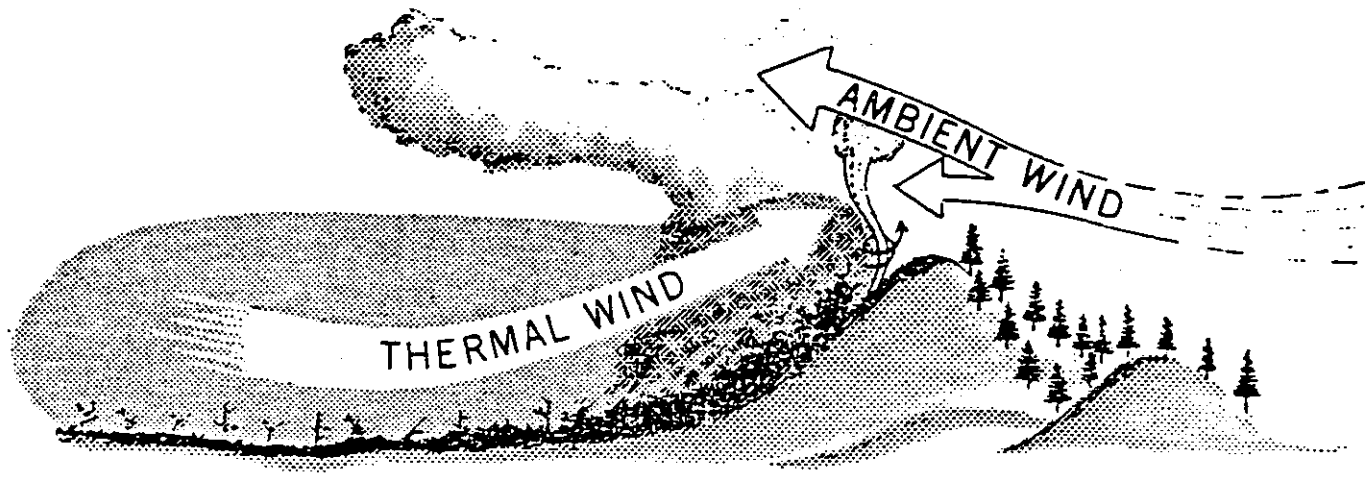
SCHEMATIC ILLUSTRATION SHOWING AIR FLOW IN AND AROUND VORTEX. (PSW FOREST AND RANGE EXP. STA. COUNTRYMAN 1971.)



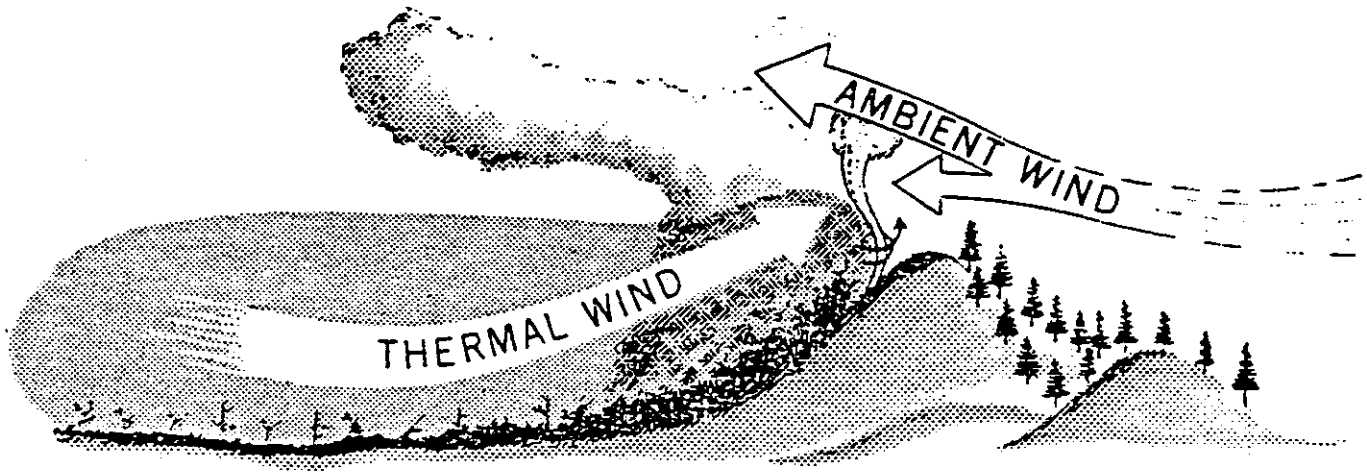
SCHEMATIC ILLUSTRATION FROM COUNTRYMAN REPORT



PHOTOGRAPH OF EAGLE FIRE WHIRL



SCHEMATIC ILLUSTRATION OF FIRE WHIRL DEVELOPMENT WITH AMBIENT WIND BLOWING ACROSS RIDGE LINE (NOAA TECHNICAL MEMORANDUM NWS WR-124. 1978)


AMBIENT WIND
THERMAL WIND

[illegible]

[illegible]