

ALTAMONT FIRE

ACCIDENT INVESTIGATION REPORT

INJURIES

STEVE BARRETT

RONALD ARMIJO

DAVID STEVENSON

INVESTIGATING TEAM

HAROLD LEWIS - CDF

AARON BULLOCK - CDF

DICK MAULDIN - CDF

RICHARD HUPP - CDFEA

NOVEMBER 14, 1988

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INTRODUCTION

What follows is the report of the investigation team on the injuries sustained on the Altamont fire, Santa Clara Ranger Unit.

SUMMARY

On July 11, 1988, at approximately 1454 hours Morgan Hill ECC received a report of a grass fire at Midway South of Highway 580. Confirming reports from Mt. Oso Lookout indicated multiple fires. The Emergency Command Center proceeded with a medium level dispatch. Engines 1680 and 1661 were among the initial attack units dispatched. Upon arrival the Incident Commander confirmed multiple fires under severe wind conditions.

Engine 1661 was assigned to the western most fire north of Highway 580. Upon evaluating the situation, proceeded to a knoll above the fire in an unburned area, where the burn incident occurred.

Engine 1680 was assigned structure fire protection off Old Altamont Road. During this assignment, FAE Douthit observed a metal building in the path of the fire. In his efforts to suppress the spread of the fire, he spotted the engine in an unburned area above the fire where the burn incident occurred.

SEQUENCE OF EVENTS

On July 11, 1988, Sunol Forest Fire Station Engines 1661 and 1680 were working a series of fires in the Altamont Pass area of Santa Clara Ranger Unit. Two separate accidents resulted in injury to three fire fighters.

Engine 1661, composed of three crew members, Fire Captain Steve Barrett, Fire Fighter Sandy McCallum and Ron Armijo, arrived at the scene at approximately 1526 hours. After a short briefing with Incident Commander Chris Parker (SFR I), Engine 1661 was assigned to the western most fire north of Highway 580. Captain Barrett evaluated the fire which was burning in 10-12 inch annual grass up a cut ban, approximately 50% slope. The easterly rate of spread during size-up was estimated at less than .5 miles per hour and extended over a knoll to the north out of his line of sight. The low rate of spread to the east was due to a strong wind from the south estimated at 42 miles per hour.

Barrett proceeded up a knoll about 200 yards east of the fire across an unburned area to a point approximately 15 feet from the right flank of the fire. Barrett instructed Armijo and McCallum to attack the fire with 3/4 inch hardline using 1/4 inch smooth bore tips. As Armijo made his attack from the left side of the engine (driver's side), the south wind changed to a west wind causing the fire to sheet under him and the engine. Armijo dropped the hose and retreated eastward behind the engine.

Barrett observed this, exited the engine, picked up the hardline and applied water toward Armijo and the engine as he stepped into the burned area. Barrett then checked with both crew members to determine if they were injured. Both indicated they were all right. At this point, Barrett became aware he was burned on both hands and face. He advised the Incident Commander and proceeded to the incident base at Grant Line Road and Highway 580. At 1541 hours, Parker notified Morgan Hill of one burn victim. Upon arrival, Armijo discovered he had received burns to his nose and left ear. Santa Clara Ranger Unit was notified of two burn victims, 1st and 2nd degree, at approximately 1547 hours.

Both Armijo and Barrett were given first aid by ambulance personnel and transported to Tracy Memorial Hospital at approximately 1600 hours. Sandy McCallum, due to her location northeast of the engine was not injured during the incident.

Engine 1680, composed of two crew members, FAE Shelton Douthit and Firefighter David Stevenson, arrived on the scene from Sunol Station at approximately 1522 hours. Douthit was assigned structure protection on the northeast portion of the fires off Old Altamont Road. Upon arrival near a structure on Old Altamont Road, the crew made a direct attack in 1/2 to 1 inch grass suppressing the fire with 3/4 inch hardline. After the structure was secure, Douthit contacted the Incident Commander for a new assignment. He was assigned to work with E1678 to continue structure protection. After evacuating mobile homes in the area,

he started a flanking action to the southwest across low rolling hills. Firefighter Stevenson was using a 3/4 inch hardline with a combination nozzle off the right side of the engine. Douthit observed a metal building southeast of his location in the path of the fire. He continued a mobil attack toward the structure proceeding east along a barbed wire fence. The wind changed from a south to a westerly direction at 38-42 mph. This resulted in a significant increase in fire intensity and near zero visibility. The fire south of the fence was burning in 10-12 inch annual grass on a 50% slope. FAE Douthit call Firefighter Stevenson on the P.A. system when he could no longer see him. Stevenson got into the engine coughing. After several minutes Douthit attempted to move the engine out of the smoke. After moving the engine approximately 80 feet northeast he collided with Dozer 1641 operated by HFEO Henry Agundez. The left front fender of 1680 was damaged to the point the engine would not steer. Douthit got out of the engine to determine the cause. At this time Firefighter Stevenson got out of the engine coughing. He went to the front right of the engine and began to vomit bloody mucous. Douthit advised the Incident Commander his firefighter had suffered smoke inhalation and requested oxygen and an ambulance. He examined Stevenson for superficial burns and found none. A local agency vehicle was flagged down and used to transport Stevenson and Douthit to the incident base.

Stevenson's condition continued to deteriorate rapidly enroute to the incident base. Upon arrival, Stevenson was treated by ambulance personnel and transported to Tracy Hospital. The exact time of injury and transport to the hospital is not known but estimated to be approximately 1610 hours.

SFR I Bill Maison was committed to the incident at approximately 1517 hours. He responded from the Smith Creek Station (Santa Clara Ranger Unit). Based on a review of tapes from the ranger unit ECC, Maison was advised while enroute to the incident that he would be the liaison for the burn victims at Tracy Hospital. The exact time cannot be established. Maison arrived on scene at the incident at approximately 1623 hours and was assigned as Operations Chief by the Incident Commander Chris Parker. At approximately 1640, Chief 1601, Jim Bliss, directed Incident Commander Parker to "send 1612 to Tracy Hospital for liaison; use a Fire Captain for operations." Maison arrived at Tracy Hospital at approximately 1700 hours. Between 1545 and 1700, Tracy Hospital was contacted by Morgan Hill Emergency Command Center and advised that two burn victims and a CDF Liaison Officer were enroute. In subsequent conversations between Tracy Hospital and Morgan Hill, SFR II Bliss became aware of Stevenson's injury and the third victim.

THE INVESTIGATION

A. Team Members

Region I Assistant Chief Harrington became aware of the serious accident involving Engines 1680 and 1661 at approximately 1600 hours on July 11, 1988. In accordance with the Manual of Instructions, he assembled an investigation team consisting of:

Harold D. Lewis, SFR II	-	Region I
Aaron Bullock, FC	-	Fire Academy
Dick Mauldin, FPO I	-	Santa Clara R.U.
Richard Hupp, FC (CDFEA Rep)	-	San Mateo/Santa Cruz Ranger Unit

B. Chronology of Events

July 12, 1988:

Lewis, Mauldin and Hupp met at the Sunol Forest Fire Station at 1100 hours. Team members met with the station crew and explained the purpose of the investigation. Armijo was interviewed at 1230 hours. Fire Captain Aaron Bullock joined the team at approximately 1300 hours. Sandy McCallum, Sheldon Douthit and Incident Commander Chris Parker were interviewed between 1300 hours and 1600 hours. A Graphic Artist and a Fire Behavior Specialist were ordered to assist with the investigation.

The team traveled to Morgan Hill Headquarters and interviewed Bob Teal, Emergency Command Center Officer, at 1730 hours.

July 13, 1988:

The team reconvened at 580 and Grant Line Road at 0900 hours. The Fire Behavior Specialist, Forester I Dave Wachtell, Santa Clara Ranger Unit and Graphic Artist Gary Allen, Fire Academy in Ione were briefed on the needs.

At 0930, the full team proceeded to the accident site of engine 1680. FAE Douthit placed the engine at the site and explained the sequence of events. Photographs were taken and sketches made of the area. Captain Barrett was interviewed at the incident site and released.

At 1400 hours the team traveled to Del Puerto Station to interview HFEO Henry Agundez and obtain a written statement.

At 1500 hours the team traveled to Sunol Station and interviewed SFR I Bill Maison, the assigned Liaison Officer, with the burn victims.

July 14, 1988:

The team convened at Morgan Hill Headquarters at 0900 and interviewed Jim Bliss, Ranger Unit Operations Officer. At 1100 hours they traveled to Sunol Station and interviewed Firefighter David Stevenson who had been released from the hospital.

At 1410 hours the team met at Sunol Station to go over findings and compare notes. Team members were released to their respective units at 1600 hours.

CAUSE

Engine 1680:

Engine 1680 was deployed in an unburned area above the fire. A sudden change in wind direction resulted in the rapid build up of heat and smoke which enveloped the engine and crew. One 3/4 inch hardline with a combination nozzle was deployed which proved insufficient to provide adequate protection. The firefighter who suffered from smoke inhalation was wearing a painter's mask and a bandana over his mouth and nose. His Nomex hood was not fastened over his face.

Engine 1661:

Engine 1661 was deployed in an unburned area above the fire. A sudden change in wind direction caused the fire to overrun the engine crew. Two 3/4 inch hardlines with 1/4 inch smooth bore tips were deployed which proved inadequate to suppress the fire. Firefighter Armijo dropped the nozzle and retreated when the fire overran his position. Captain Barrett in an attempt to assist Armijo left the cab, retrieved the nozzle and continued suppression efforts. Barrett was not wearing gloves, helmet, goggles or a shroud. Armijo was not wearing a shroud but substituted a bandana. The lack of safety gear contributed to the injuries.

STATEMENT OF FINDINGS

Engine 1680:

1. Firefighter Stevenson was wearing all safety gear. His Nomex Shroud was not fastened around his face. He was wearing a bandana and a painter's mask over his nose and mouth.
2. Firefighter Stevenson was using a 3/4 inch hardline with a combination nozzle, which was inadequate for the situation. Suppression efforts were made from an unburned area above the fire.
3. There was a sudden wind shift from the south to the west an estimated 38-42 miles per hour.
4. Heavy smoke prevented visual contact with the firefighter.
5. Firefighter Stevenson had two months experience. CDF training records indicate 36.5 hours of training.
6. Injury occurred while fighting fire in 10 to 12 inch annual grass.

Engine 1661:

1. Both Armijo and McCallum were using 3/4 inch hardlines equipped with 1/4 inch smooth bore tips. The hardline proved inadequate to suppress the fire.

2. Suppression efforts were made from an unburned area above the fire.
3. There was a sudden wind shift from the south to west at an estimated 38-42 miles per hour.
4. Firefighter Armijo unexpectedly retreated into the unburned area behind the engine.
5. Fire Captain Barrett did not expect to engage in direct fire suppression efforts. Armijo's actions prompted his involvement.
6. Armijo was not wearing a Nomex shroud. He substituted a bandana across his face.
7. Barrett was not wearing a helmet, gloves, goggles or shroud.

INJURIES RECEIVED

Engine 1680: (David Stevenson)

Stevenson apparently suffered inhalation of hot fumes which irritated his larynx causing inflammation in that area so that he became dyspneic or unable to breathe. He was seen at Tracy in the Emergency Room where fortunately Dr. Michael Davis, a pulmonary specialist was available, who intubated Stevenson. Stevenson was then flown to UC Davis Medical Center where he remained with a tube in his larynx for about two days on the respirator. He had no other burn. When the tube was removed he was bronchoscoped and there were no problems seen and he was discharged.

Subsequently he was referred to Dr. Michael Cohen, a pulmonary specialist in Walnut Creek so that there could be a close supervision of his progress.

Some months later Stevenson had an episode when he coughed so much that he again became very short of breath and he was hospitalized overnight in Castro Valley.

Subsequent to that he was re-evaluated by Dr. Michael Cohen and by Dr. Schroff, an otolaryngologist who looked directly at the larynx and who found that all those areas were normal at that time. It is not immediately apparent just why Stevenson had the second coughing spell but one presumes the original injuries had caused some residual irritation of the larynx.

When last seen by Dr. Michael Cohen it was thought that all his problems had resolved and that there was no residual airway or lung damage.

Stevenson has thus been released to work with no restriction and there are no residual problems.

INJURIES RECEIVED

Engine 1661: (Ronald F. Armijo)

Armijo received second degree burns of parts of the nose, ears and cheeks. He was put on light duty, treated with burn creams and debridement of the burnt areas. By July 21, 1988, Dr. Iverson described all wounds as being healed with no adverse effects and Armijo was released to work.

Engine 1661: (Steven Barrett)

Barrett received second degree burns of the hands and face involving a majority of the right side of the cheek under the ear. There were also burns on the back of the hands and some burns on the wrist, also second degree. These were treated with creams and local hygiene.

By July 21, 1988, the face was healed without residual ill effects. The hands were much improved. He was returned to light duty on July 25, 1988.

By July 28, 1988, he was doing light work but had been prescribed Jobst gloves. These are tight fitting gloves which will decrease the swelling and scarring from burns.

Final visit, September 1, 1988, Barrett was recovered for all practical purposes and was released to regular duty without restriction.

SUMMARY REPORT

BURN INJURIES

STEVE BARRETT, FIRE CAPTAIN
RON ARMIJO, FIREFIGHTER I
DAVID STEVENSON, FIREFIGHTER I

SUNOL FOREST FIRE STATION
SANTA CLARA RANGER UNIT

Slope of the highway cutbank generally had very little influence on the direction of the fire spread due to the wind vector being so predominating.

SEQUENCE OF EVENTS

CDF Engine 1661, with Fire Captain Steve Barrett, Fire Fighters I Ron Armijo and Sandy McCallum, responded to a series of fires in the Altamont Pass area of the Santa Clara Ranger Unit. Upon arrival at approximately 1526, they proceeded to the incident command post at highway 580 and Grantline Road. Captain Barrett received instruction from Incident Commander Chris Parker and proceeded to the western most fire on the north side of Highway 580. Captain Barrett observed the fire moving slowly to the east on the cut bank. He then proceeded up the knoll above the fire. Captain Barrett started the auxiliary pump from inside the cab, then directed Fire Fighter I McCallum to pull the right hardline (passenger side) and work the fire on that side while Fire Fighter I Armijo was directed to pull the left hardline (driver side) and work that side. At approximately 1535, suppression efforts began. Fire Fighter I Armijo pulled the left hardline and advanced towards the fire. Upon opening the nozzle, he discovered there was no water pressure. Captain Barrett observed the deficiency, exited the cab and proceeded to open the valve controlling the left hardline and returned to the cab. Fire Fighter I Armijo applied water on the fire continuing his advance. At this point the wind, 38-42 mph, changed direction from south-southwest to west, significantly increasing the fire intensity, causing the right flank to become the head.

Superheated air and flame, approximately 3-4 feet in length, overcame Fire Fighter I Armijo. He dropped the nozzle and retreated towards the rear of the engine into the green. Captain Barrett observed, immediately exited the cab, picked up the nozzle and directed water towards Armijo. Captain Barrett then turned towards the oncoming fire which was sheeting around him and the engine, and applied water as he stepped into the burned area. After the fire had passed, Captain Barrett made immediate contact with his crew and found that they were okay. Knowing he was burned, Captain Barrett advised the Incident Command Post by radio where two ambulances were standing by. Upon arrival at the Command Post Fire Fighter I Armijo discovered that he had received burns to his nose and ear. He was sent with Captain Barrett to the Tracy Hospital where they were both flown to University of California, Davis Medical Center (UCDMC), treated and released that same evening.

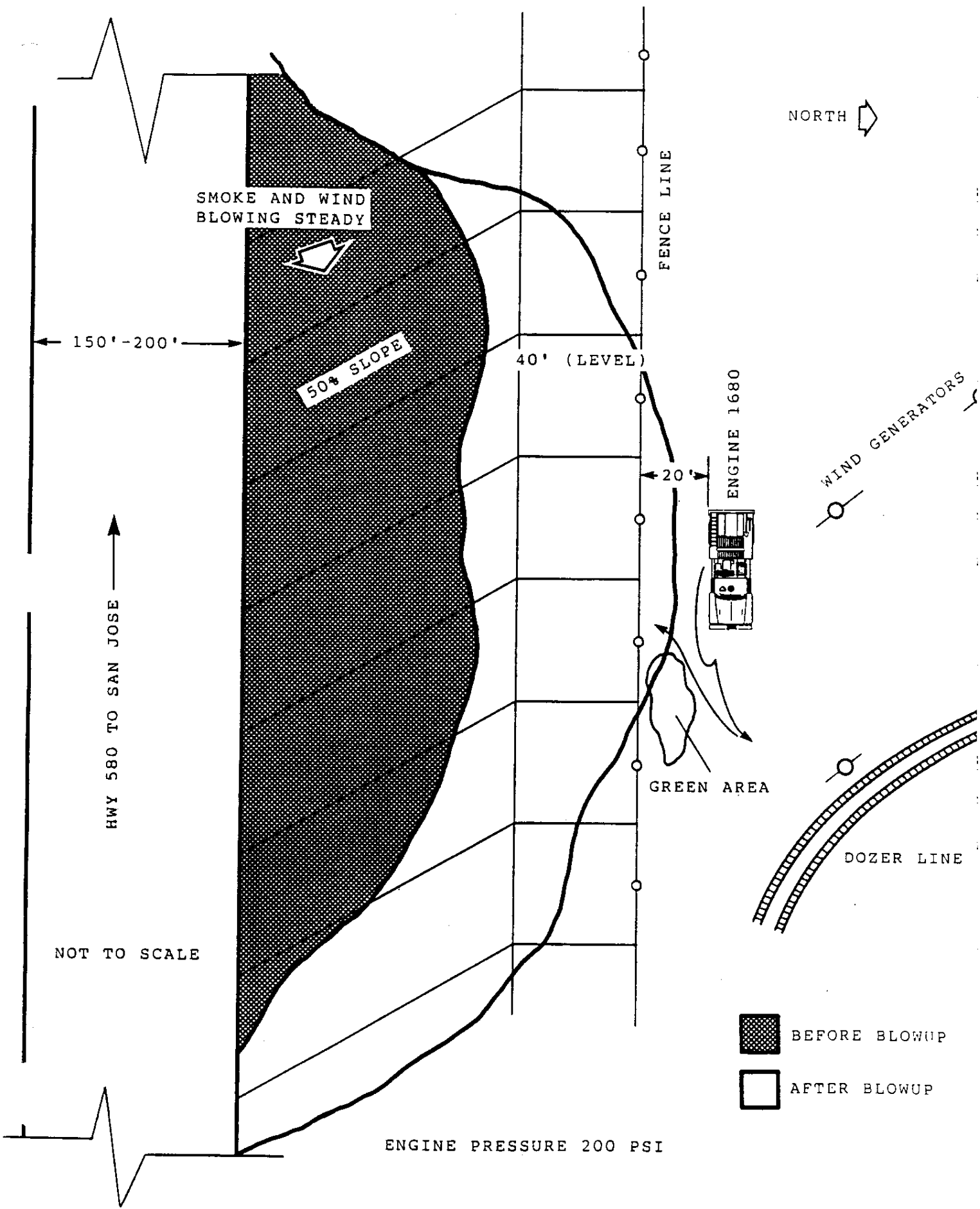
Engine 1661:

1. Captain Barrett did not have gloves, helmet, goggles or shroud on at the time of accident.
2. Firefighter I Armijo was wearing all safety clothing except his shroud. He was wearing a bandanna across his face.
3. Engine was working on the uphill side of fire in the green.
4. Firefighters were using 3/4 inch hardline with 1/4 inch (12 gpm) tip.

pulmonary edema. After being stabilized, he was flown to UCDCMC where he stayed until being released at approximately noon on July 14, 1988.

Engine 1680:

1. Firefighter I Stevenson was wearing all safety gear except shroud. He was wearing a dry dust mask (painters mask) over his nose and mouth.
2. Firefighter using 3/4 inch hardline with combination nozzle.
3. Engine was working on the uphill side of fire in the green.
4. Average slope below Engine was 50% in heavier fuel.
5. Average 20 foot wind speed 38-42 mph.
6. Uneven terrain (leeward side, physical barriers), eddies, etc., caused wind to be erratic.
7. Wind conditions at the location are common and expected.



SMOKE AND WIND
BLOWING STEADY

150'-200'

50% SLOPE

40' (LEVEL)

FENCE LINE

ENGINE 1680

GREEN AREA

WIND GENERATORS

DOZER LINE

NORTH

HWY 580 TO SAN JOSE

NOT TO SCALE

ENGINE PRESSURE 200 PSI

- BEFORE BLOWUP
- AFTER BLOWUP

12

SMOKE AND WIND
BLOWING STEADY



HOSE PRESSURE
200 GPM

TOWER
LINE

Hwy 580

SAN JOSE

BURN AREA
5' FROM
FENCE

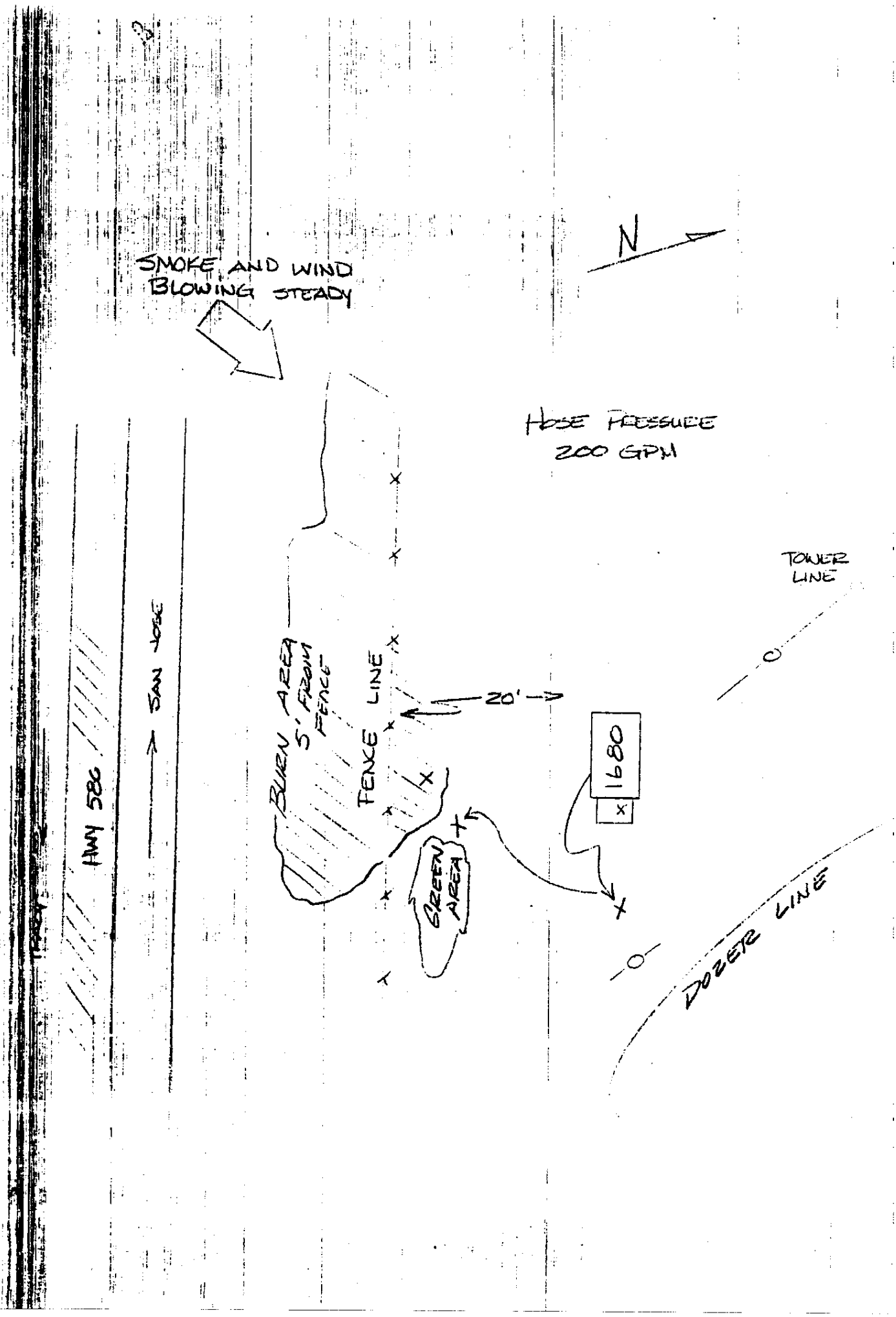
FENCE LINE

20'

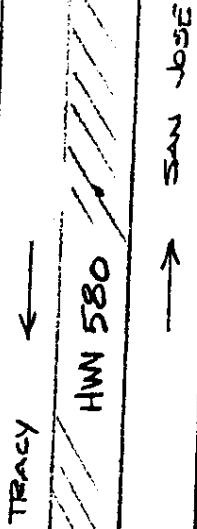
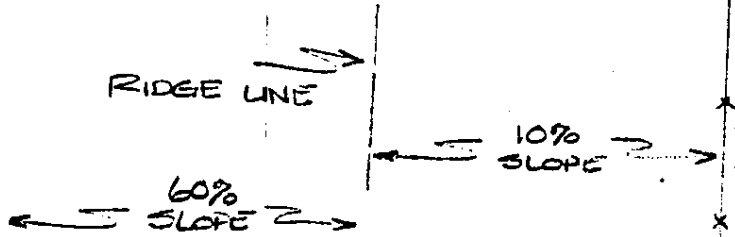
1680
x

GREEN
AREA

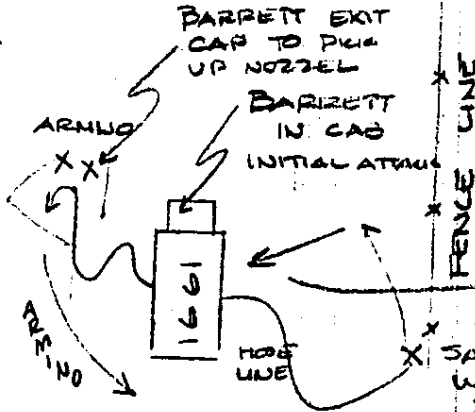
DOZER LINE



NOZZEL PRESSURE
100-120 1/4" TIP



APPROX 50 YDS.



WIND OUT OF THE SOUTH (STEADY)

ASSISTING BARRETT ON FIRE AROUND STONE

SANDRA WORKING FENCE LINE

15'-20'

UPHILL

CANYON OR GULLEY



Fire Behavior → Altamont Series

Conditions at site of injuries

Weather

Temp: 76-80°F (Estimated)

Humidity: 32-38% (Estimated)

Wind: West 35-40 MPH, erratic @ 9

Fuel

Fuel Model "1" (NFFL)

Fuel Moisture: 5% (1 hour Fuel)

Fuel Loading: .5 TPA north side of fence
1.5 TPA south side (freeway) of 1

Terrain

Elevation: 450'

Slope: 5-10% at location of injuries
50% of freeway cutbank

Fire Behavior Characteristics

Rate of spread: 297 chains per hour

Fireline Intensity: 504 Btu/Ft/sec

Heat per Unit Area: 92 Btu/Ft²

Slope of freeway ~~cutbank~~ cutbank probably had very little effect on fire behavior due to wind vector being so predominant

Potential F.L 8'

Looking at fuel loading it was variable. It was heavier on the freeway side ~~to~~ due to lack of grazing. The heat was from this fuel that affected the firefighters.

Topography effects probably had very little effect of fire direction or spread due to wind vector being predominant. (The only topography effects seem to be on wind modification as discussed earlier.) For example, Engine 1661 was at the top of a freeway cutbank with slope of approximately 50%. However, with the wind, ~~a~~ fire burned across slopes. ~~A~~ slight wind shift would have caused fire to burn more rapidly upslope; putting more heat and smoke to Engine 1661. This is probably the case.

In E1680 case, he was parked in the block of very grazed fuel. His firefighter working the fence line was affected by fuels burning on the ungrazed side. Again a slight change in wind would have caused as more upslope spread than side slope spread of fire on the freeway cutbank.

Looking at a Fire Behavior Characteristics Chart (attached); taking into consideration the variables plotted, we are right on the edge of ~~control~~ control with engines at head from

Table 2. — Fire suppression interpretations.* CAUTION: These are not guides to personal safety. Fires can be dangerous at any level of intensity. Wilson (1977) has shown that most fatalities occur in light fuels on small fires or isolated sectors of large fires

Flame length	Fireline intensity	Interpretations
Feet <4	Stuffs <100	Fire can generally be attacked at the head or flanks by persons using handtools. Hand line should hold the fire.
4-8	100-500	Fires are too intense for direct attack on the head by persons using handtools. Hand line cannot be relied on to hold fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8-11	500-1,000 504	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
>11	>1,000	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Using Fireline Intensity as a variable by itself, we may conclude that we are between effective control at head to in effective control at head

*Based on: Roussopoulos, Peter J.; Johnson, Van J. Help in making fuel management decisions. Res. Pap. NC-112. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1975. 16 p.

WIND ADJUSTMENT MODULE

(KEYWORDS: INPUT, LIST, QUIT)

INPUT (INPUT, LIST)

- 1 20'V WIND SPEED (0-99 MI/M) 44
- 2 EXPOSURE EXPOSURE TO WIND (1-5) 1
- 3 WAF WIND ADJUSTMENT FACTOR (0-1) 1
- 4 MODEL # FUEL MODEL NUMBER (1-99) 16
- 5 WWS WINDLAME WINDSPEED MI/M 16

OUTPUT (OUT)

- 1 INPUT ONLY FOR EXPOSURE = 5.
- 2 INPUT ONLY FOR EXPOSURE = 1.

SLOPE MODULE

(KEYWORDS: INPUT, LIST, QUIT)

FROM POINT TO POINT

- 1 SCL OPT SCALE OPTION (1 OR 2)
- 2 06/1000 REPRESENTATIVE FRACTION PER HUNDRED (1-100)
- 3 06/1000 REPRESENTATIVE FRACTION PER HUNDRED (1-100)
- 4 CON INT CONTOUR INTERVAL (10-500 FT)
- 5 MAP DIST MAP DISTANCE (1 - 10 MI)
- 6 # INTERVALS NUMBER OF CONTOUR INTERVALS (1-100)

OUTPUT (OUT)

- 1 SLP S SLOPE STEEPNESS %
- 2 SLP DEG SLOPE STEEPNESS DEGREES
- 3 EL DIFF ELEVATION CHANGE FEET
- 4 HORIZ DIST HORIZONTAL DISTANCE FEET

- 1 INPUT ONLY FOR SCALE OPTION = 1.
- 2 INPUT ONLY FOR SCALE OPTION = 2.

RH MODULE

(KEYWORDS: INPUT, LIST, QUIT)

INPUT (INPUT, LIST)

- 1 DRYB DRY BULB TEMPERATURE (33-120 °F)
- 2 WETB WET BULB TEMPERATURE (0-120 °F)
- 3 EL ELEVATION (0-12000 FT)
- 4 RH RELATIVE HUMIDITY %
- 5 DEWP DEW POINT °F

OUTPUT (OUT)

- 000 - WET BULB TEMPERATURE GREATER THAN DRY BULB TEMPERATURE
- 999 - DEW POINT TOO COLD FOR VALID CALCULATIONS

OUTPUT TABLES

TABLE NO. TABLE ITEM ROW ITEM COL ITEM

COLUMN VALUES:

ROW NO.	ROW VALUE	TABLE VALUES
1		
2		
3		

TABLE NO. TABLE ITEM ROW ITEM COL ITEM

COLUMN VALUES:

ROW NO.	ROW VALUE	TABLE VALUES
1		
2		
3		

OUTPUT TABLES

NAME OF FIRE Altamont SHEET 3 OF 3
 FIRE BEHAVIOR ANALYST D. WACHTEL
 DATE 7-14-88 TIME 0900
 PROJ PERIOD DATE 7-11-88 PROJ TIME FROM 1530 TO 1600

LIST NUMBER _____
 TABLE NO. 3 TABLE ITEM FLI ROW ITEM SIP COL. ITEM W.DIP
 COLUMN VALUES: 0 45 90

ROW NO.	ROW VALUE	TABLE VALUES
1	<u>5</u>	<u>504</u> <u>504</u> <u>504</u>
2	<u>50</u>	<u>504</u> <u>504</u> <u>504</u>
3		

TABLE NO. 7 TABLE ITEM Moist ROW ITEM SIP COL. ITEM W.DIP
 COLUMN VALUES: 0 45 90

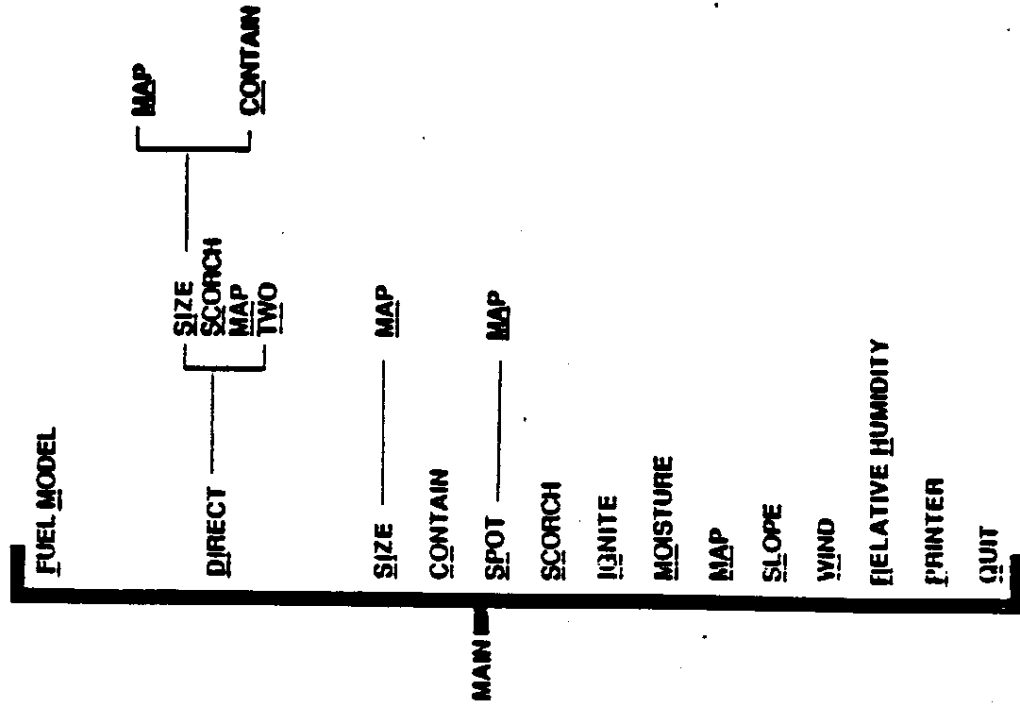
ROW NO.	ROW VALUE	TABLE VALUES
1	<u>5</u>	<u>0</u> <u>45</u> <u>90</u>
2	<u>50</u>	<u>0</u> <u>43</u> <u>88</u>
3		

TABLE NO. _____ TABLE ITEM _____ ROW ITEM _____ COL. ITEM _____
 COLUMN VALUES: _____

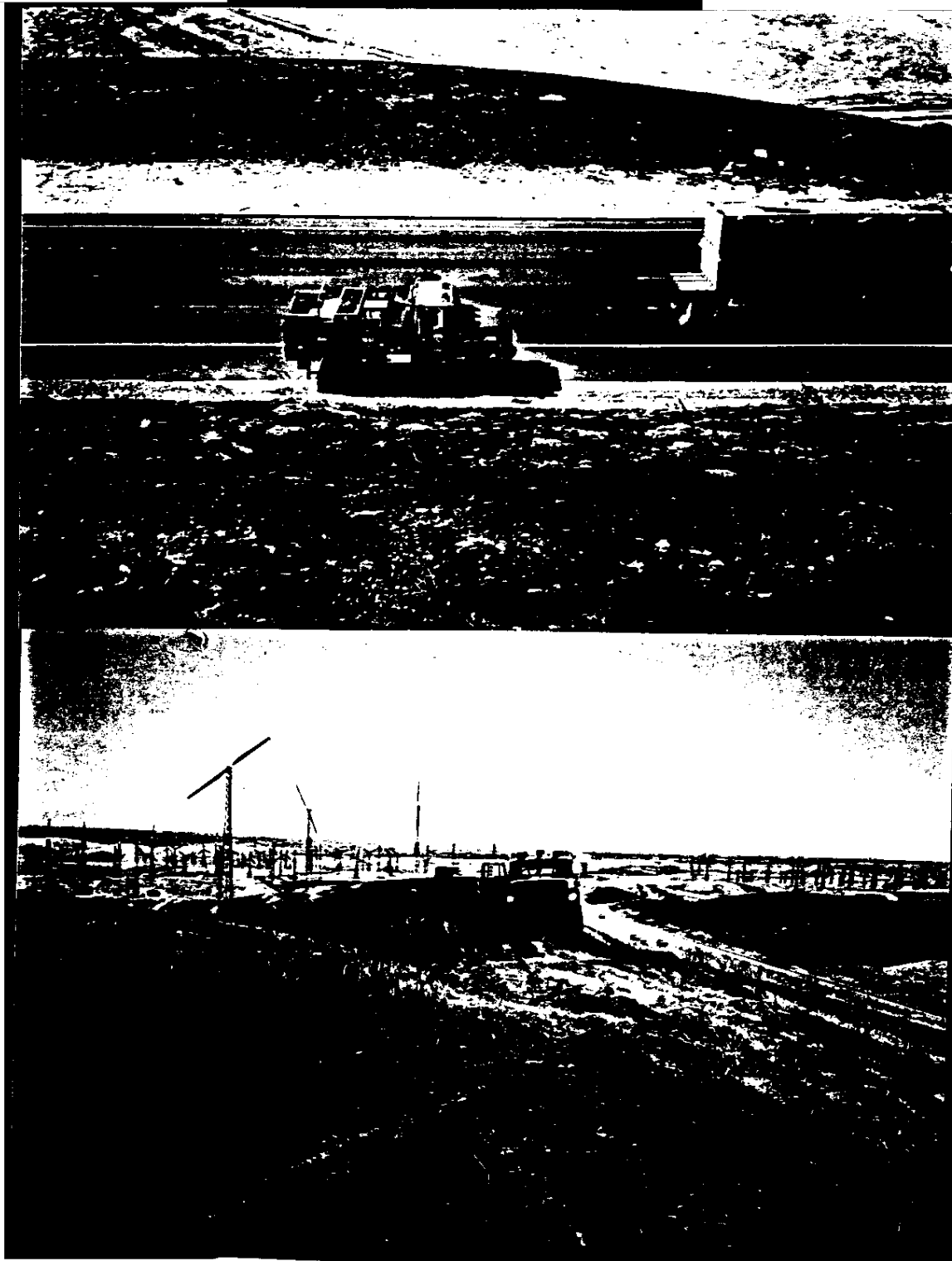
ROW NO.	ROW VALUE	TABLE VALUES
1		
2		
3		

HP-71B FIRE BEHAVIOR PROGRAM STRUCTURE

LEVEL 1 LEVEL 2 LEVEL 3



Point from which fire
evaluation was made.

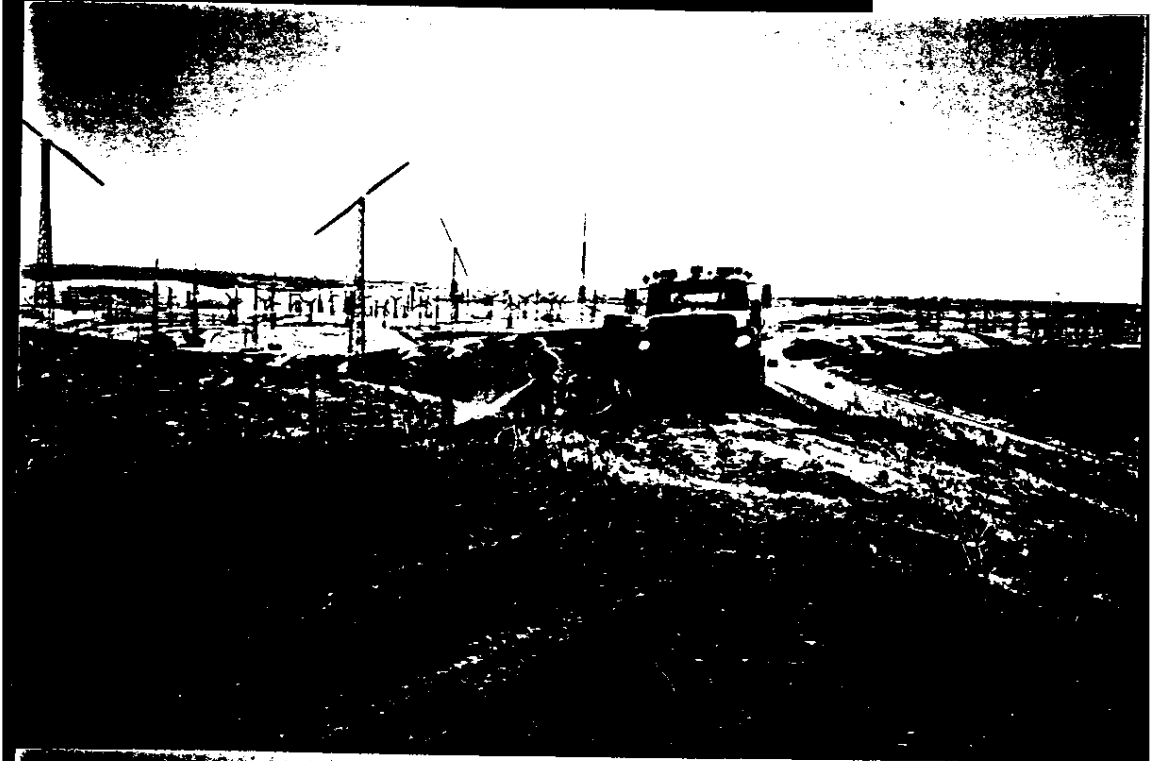


ENGINE 1661
SEQUENCE OF EVENTS

Access to the burn
from the east.

Sandy McCullam

Initial attack #1

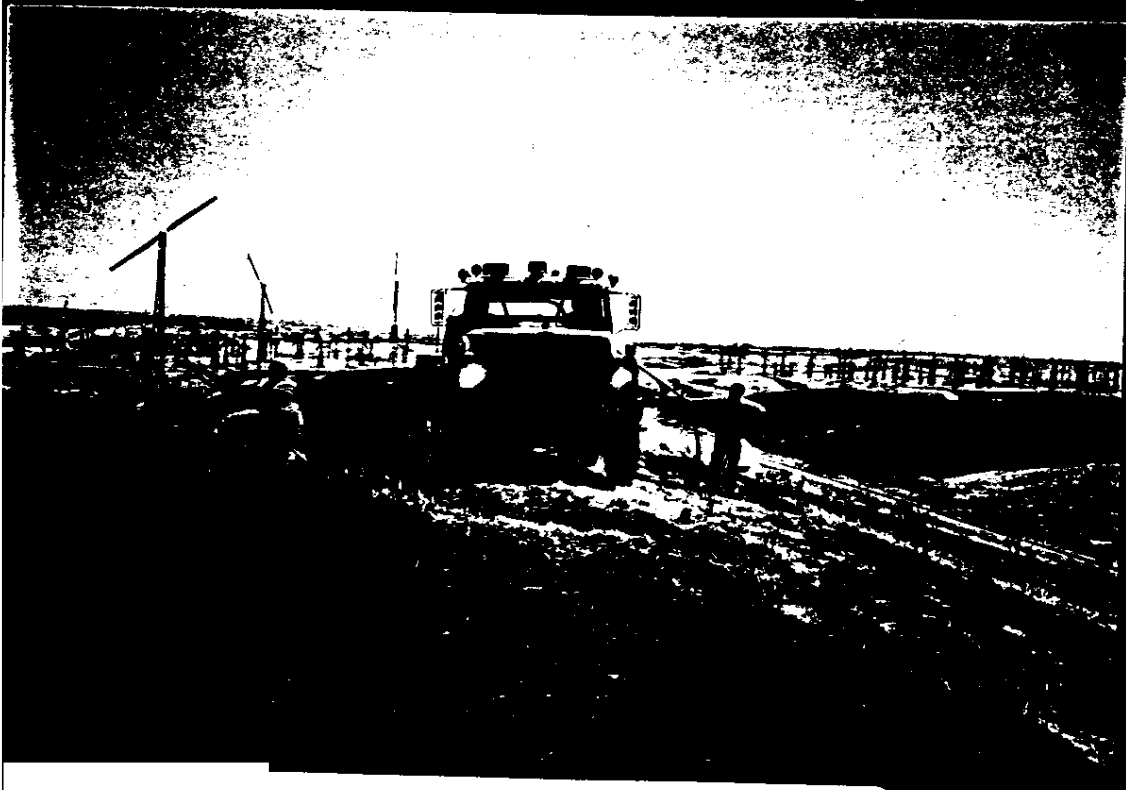


Sandy McCullam

Initial attack continues #2

Sandy McCullam

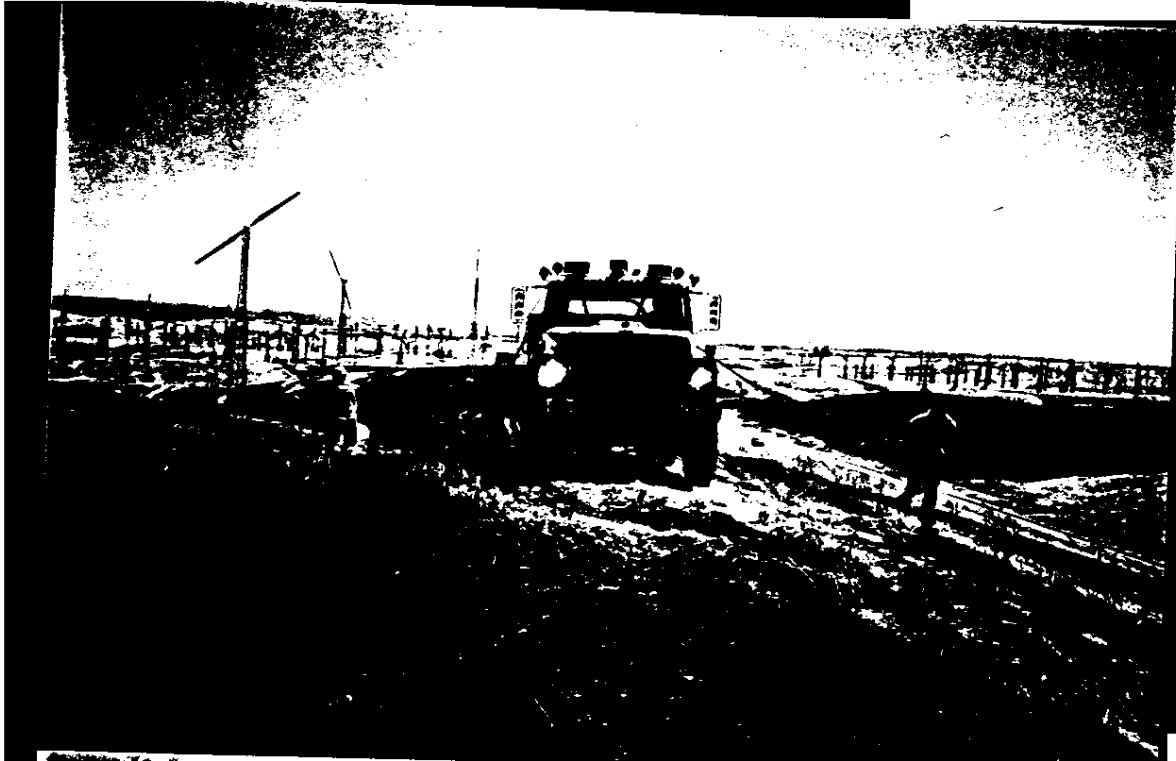
Initial attack continues #3



Ron Armijo

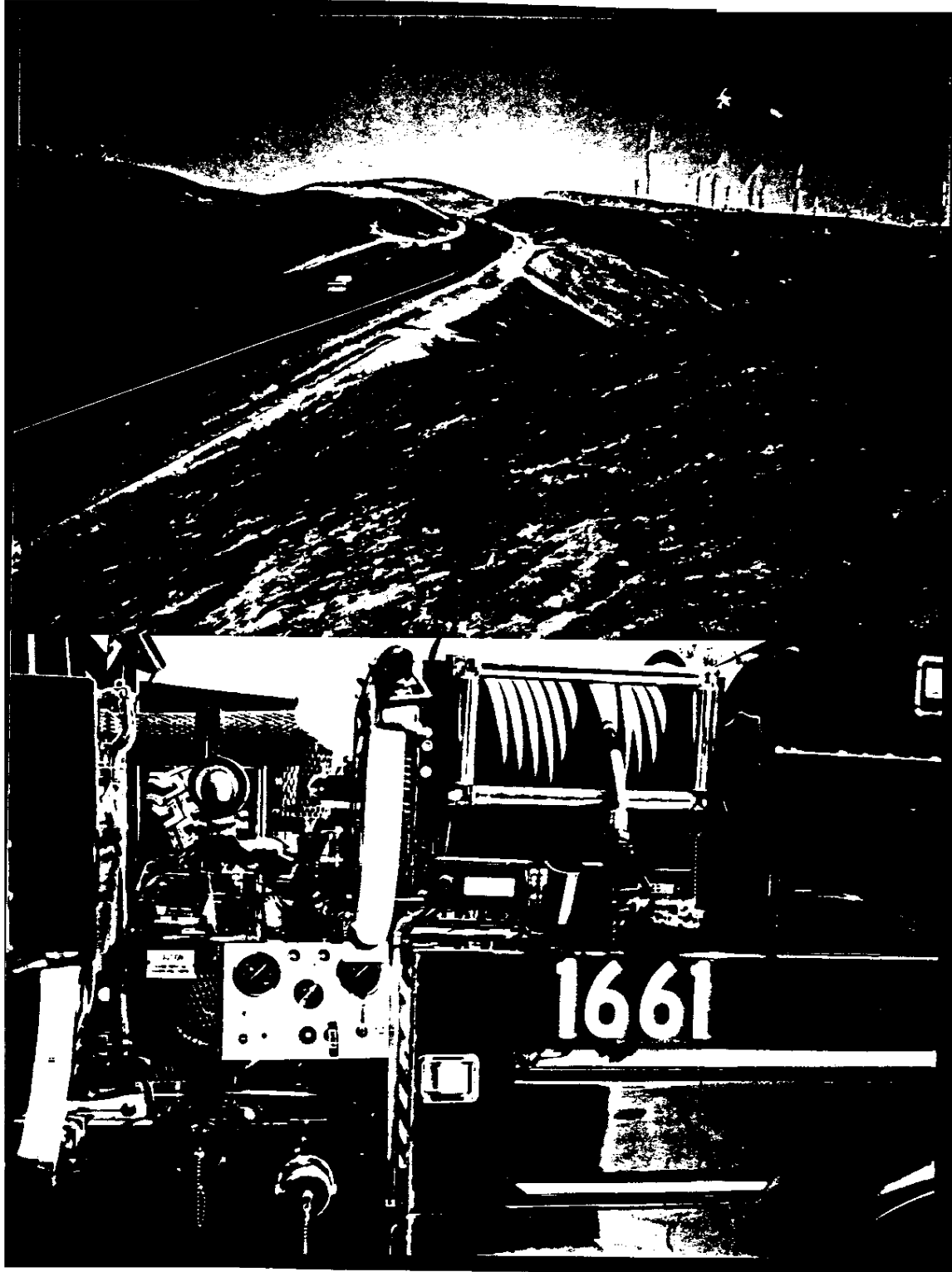
Initial action

Armijo extending 3/4"
hardline.



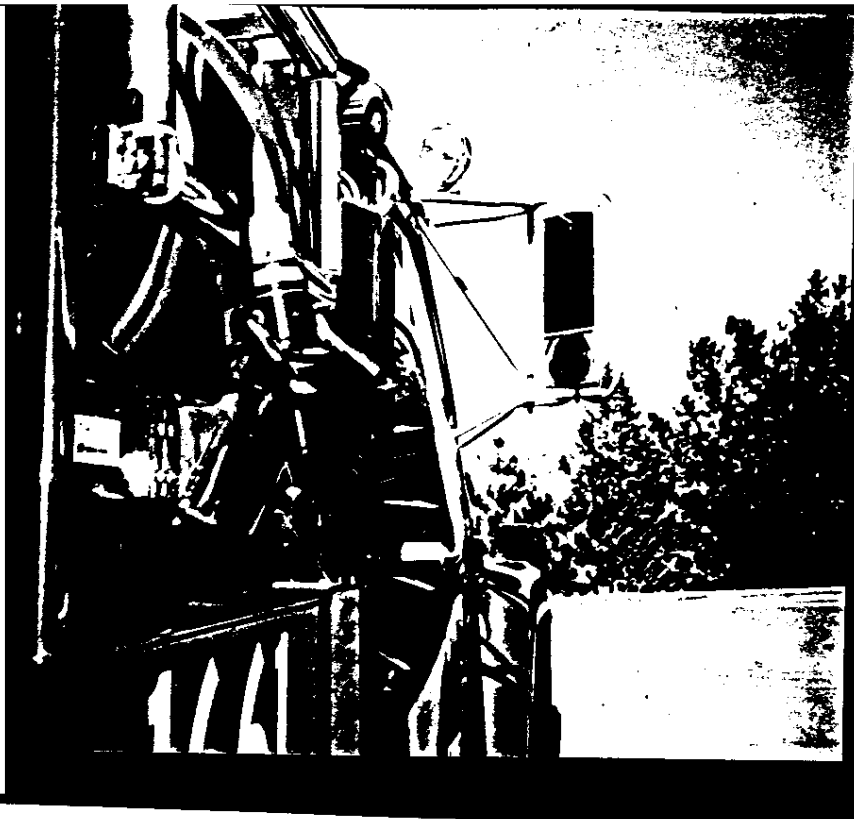
Point at which the flashover
occured.

View looking east, Engine 1661
accident occurred at the top
of the farthest burned knoll.



1/4" smooth bore tip used
during flashover

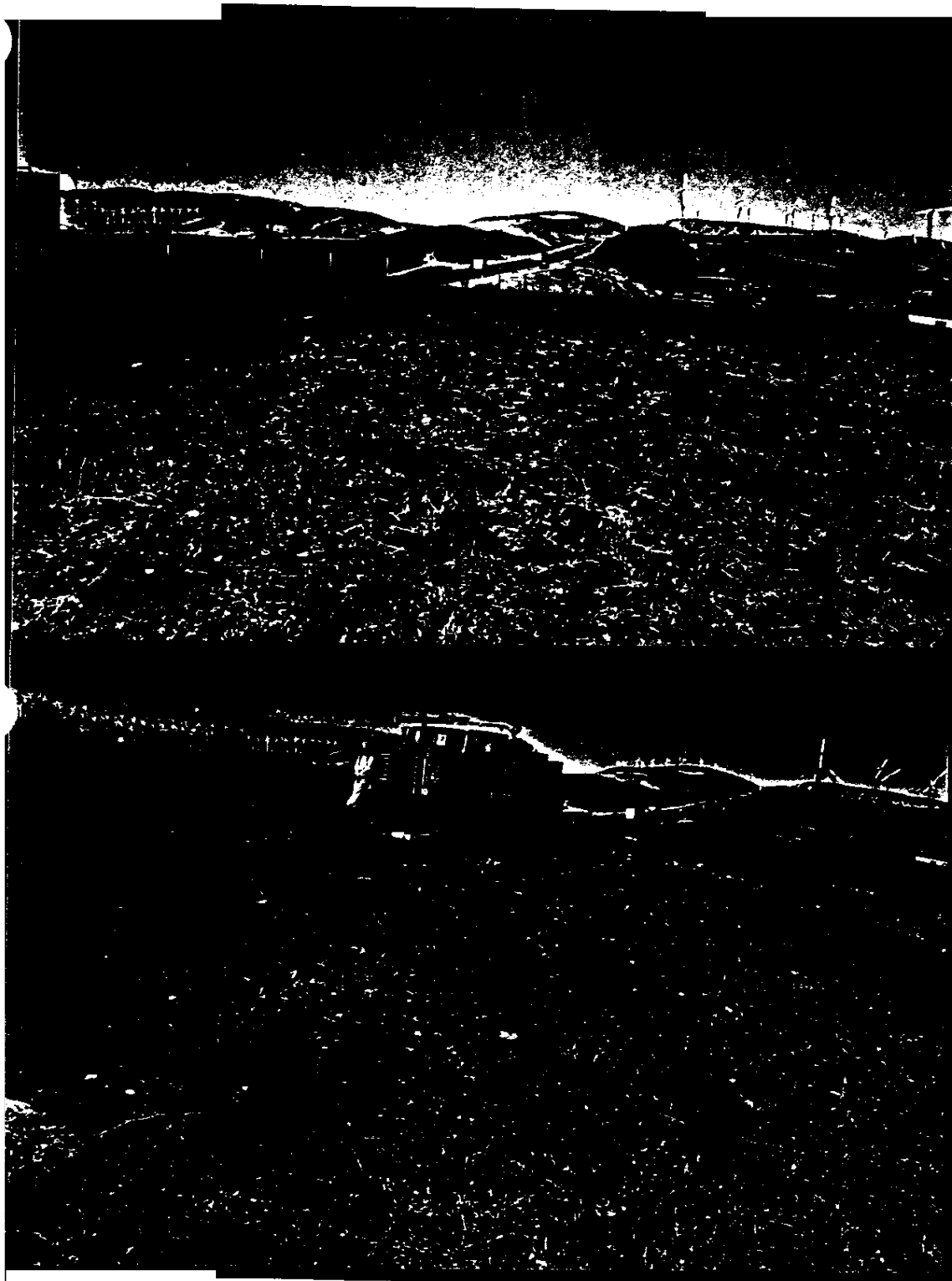
#1



1/4" smooth bore tip used
during flashover

#2

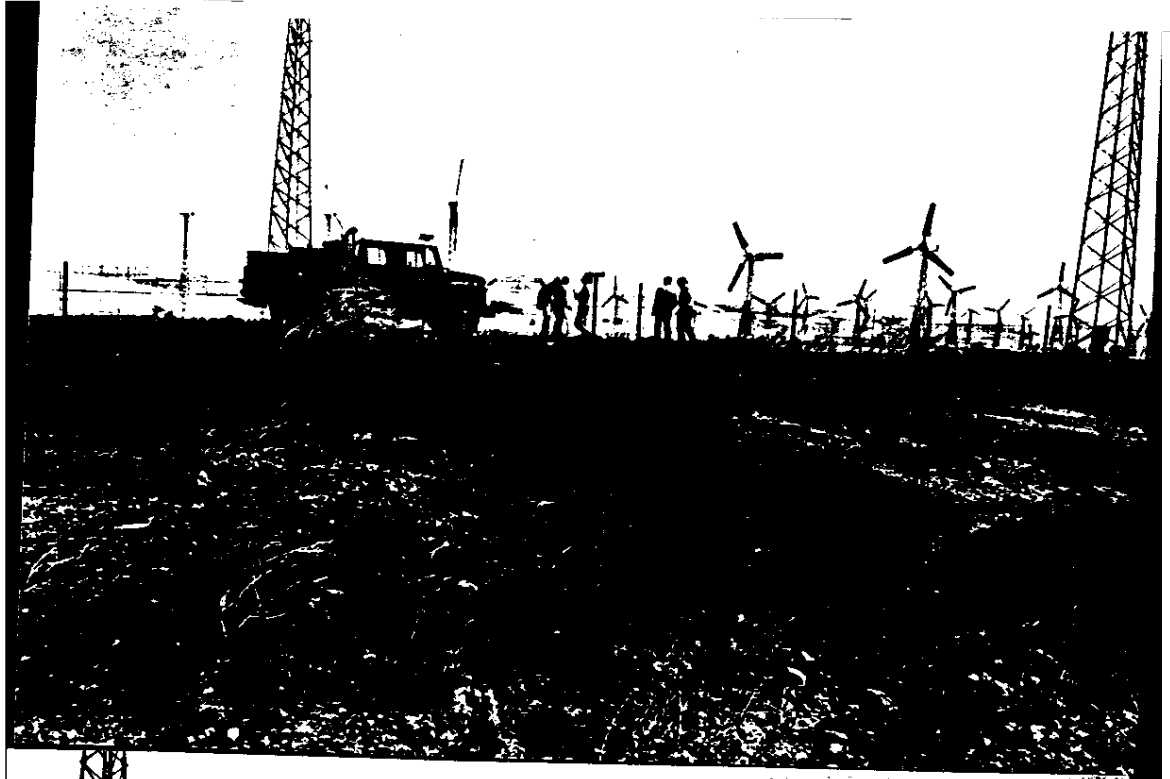
Burned area where accident
occured.



ENGINE 1680

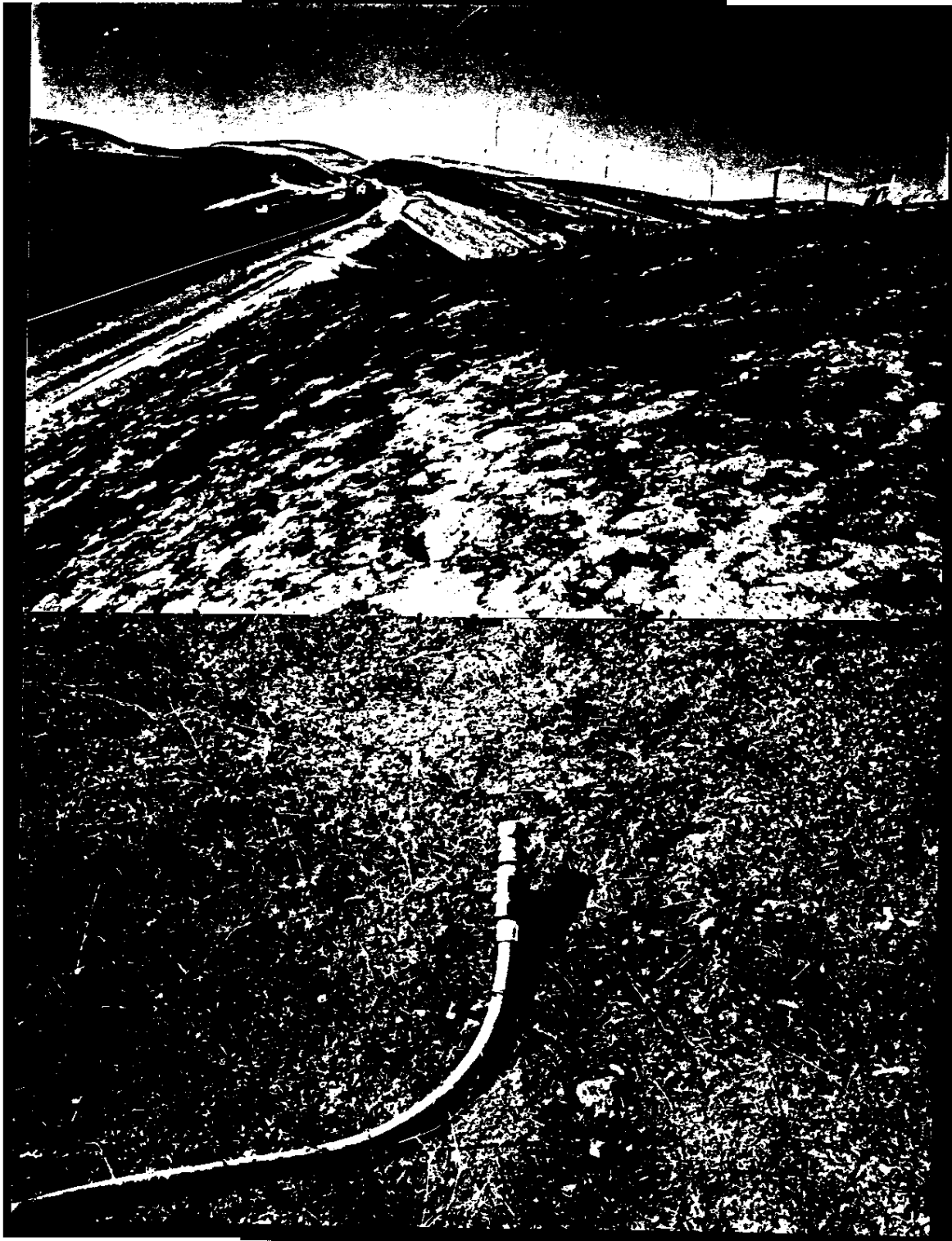
Actual placement of
Engine 1680.

Placement of engine looking
from the Southeast.



David Stevenson's location
at the time of injury.

Cut bank below location
of engine 1680.



3/4" hardline and nozzle
used by David Stevenson

Damage to 1680 as a result
of collision with Dozer
1641.



Point of impact of Dozer 1641
and Engine 1680.