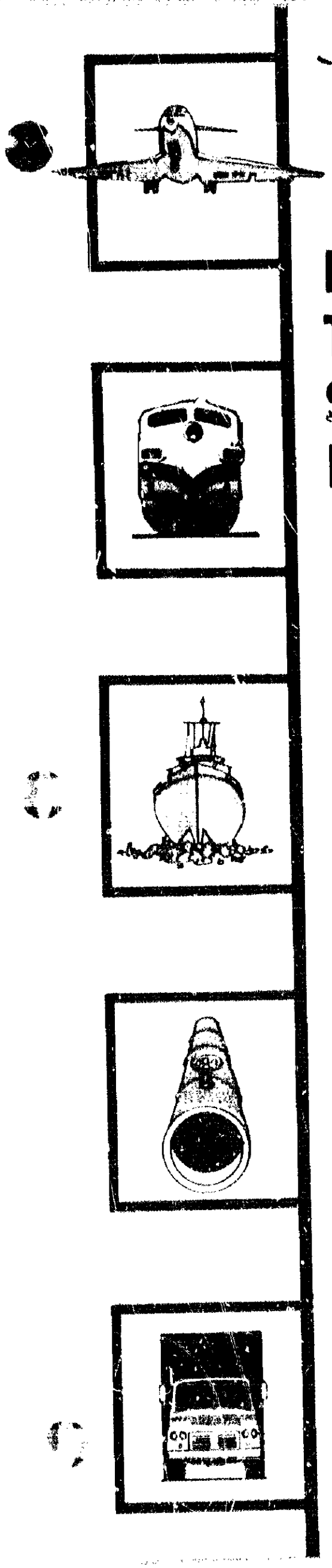

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

DERAILMENT OF
WESTERN PACIFIC RAILROAD COMPANY
FREIGHT TRAIN EXTRA UP 3734 WEST
(SEALAND 6)
HAYWARD, CALIFORNIA
APRIL 9, 1980

NTSB-RAR-80-10

UNITED STATES GOVERNMENT

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16. Abstract

About 6:55 p.m., P.s.t., on April 9, 1980, Western Pacific Railroad Company westbound freight train Extra UP 3734 West (Sealand 6), had its caboose, a pusher locomotive behind the caboose, and seven freight cars derailed while crossing the Industrial Parkway overpass at Hayward, California. Of the nine crewmembers, two train crewmembers were killed and two were injured. Three locomotive units and the caboose were destroyed. Damage was estimated at $1,382,000.

The National Transportation Safety Board determines that the probable cause of this accident was the derailment of the caboose, which was caused by compressive forces resulting from excessive locomotive power applied behind the caboose on an undulating gradient. The derailment was the result of the failure of the responsible supervisors to insure that the train was powered and managed in a manner consistent with the rules, timetable instructions, and conventional operating practices; the failure of the assistant superintendent to insure that the crewmembers knew their train's correct tonnage and speed classification; and the failure of the Western Pacific Railroad management to insure that supervisors responsible for making critical operating decisions were properly trained for their roles. Contributing to the accident was the excessive speed of the train and the failure of the director of train operations to insure that the train had adequately fueled locomotive power.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

Adopted: September 30, 1980

DERAILMENT OF WESTERN PACIFIC RAILROAD COMPANY FREIGHT TRAIN EXTRA UP 3734 WEST (SEALAND 6), HAYWARD, CALIFORNIA APRIL 9, 1980

SYNOPSIS

About 6:55 p.m., P.s.t., on April 9, 1980, Western Pacific Railroad Company westbound freight train Extra UP 3734 West (Sealand 6), had its caboose, a pusher locomotive behind the caboose, and seven freight cars derailed while crossing the Industrial Parkway overpass at Hayward, California. Of the nine crewmembers, two train crewmembers were killed and two were injured. Three locomotive units and the caboose were destroyed. Damage was estimated at $1,382,000.

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INVESTIGATION

Pre-Accident Events

Western Pacific Railroad (WP) freight train Extra UP 3734 West (Sealand 6) had been delivered by the Union Pacific Railroad (UP) to the WP at Salt Lake City, Utah, for movement to Oakland, California. It departed from Salt Lake City with 3 Union Pacific locomotive units, 66 cars, and a caboose at about 6:00 a.m., on April 8, 1980.

About 3 1/2 hours before the Sealand 6 arrived at Stockton, 87 miles east of Oakland, the engineer notified the train dispatcher by telephone that, in his opinion, the fuel level gauges on the locomotive units' 4,000-gallon tanks indicated

they contained approximately 600, 500, and 1,000 gallons, respectively, for the lead, middle, and trailing units, and that he did not think the train could reach Oakland without being refueled. The dispatcher notified the chief train dispatcher of the fuel shortage. The chief train dispatcher passed the information to the director of train operations, who was responsible for deciding what to do. After being told by the shop superintendent at Stockton that he believed the Sealand 6 could make Oakland with the amounts of fuel reported by the engineer, the director of train operations decided not to refuel the locomotive or exchange it for other available power at Stockton. No arrangement was made to check the train's fuel supply when it reached Stockton.

The crew of the Sealand 6 was changed on arrival at Stockton, and the relieving engineer checked the fuel gauges and estimated that the tanks held 100, 350, and 1,450 gallons, respectively. The engineer informed the shop foreman, the yardmaster, and the dispatcher of his findings. The shop foreman sent a diesel mechanic to check out the fuel and he confirmed the engineer's report except that he thought the lead unit's gauge indicated empty; the yardmaster told the engineer to leave as soon as he was given a signal to proceed, and the dispatcher told the engineer he would notify the chief train dispatcher of the problem.

The Sealand 6 was delayed at Stockton for 1 hour 20 minutes to allow two eastbound trains to arrive. The dispatcher was not given new instructions, and as soon as the second eastbound train arrived, he gave the Sealand 6 a proceed signal. The engineer was required to obey the yardmaster's instructions (see appendix B), and he responded to the signal by departing Stockton at about 1:50 p.m., on April 9, 1980. Prior to that time, none of the officers who were informed of the low fuel took action to correct the train's fuel deficiency.

Both the train progress report on the Sealand 6 and the dispatcher's train sheet of April 9 indicated the Sealand 6 had trailing weight in excess of 5,000 tons. However, the engineer and conductor, who boarded the train at Stockton, were given erroneous reports with their waybills and train orders indicating the Sealand 6 had a trailing weight of 3,956 tons.

At Tracy, California, 19 miles west of Stockton, the Sealand 6 was held for about 45 minutes to meet an eastbound train consisting of 4 locomotive units and 37 cars with a trailing tonnage of 1,212 tons. After the eastbound train passed, the Sealand 6 was allowed to proceed.

As the train was ascending the 1.00 percent grade leading to Altamont Pass, 36 miles east of Stockton, the two lead locomotive units become ineffective and caused the train to stall. The first unit ran out of fuel and the second unit developed electrical problems. The train stopped with the ends about 4 1/2 miles west and 2 1/4 miles east of the passing tracks at Midway and Altamont, respectively. The engineer attempted to "double" the hill, that is to take the train to the Altamont passing track one half at a time, but he was unable to start the forward half on the grade.

Extra 3540 West (RBW-9), consisting of three locomotive units, seven cars, and a caboose, left Stockton for Oakland at 4:05 p.m., shortly after the dispatcher realized from the indications on the track occupancy board that the Sealand 6 had apparently stalled on the hill east of Altamont Pass. About 4:25 p.m., the dispatcher instructed the RBW-9 to proceed to the rear of the Sealand 6, to determine the nature of the train's problem and, if necessary, to push the train to Altamont. After arriving at the rear of the Sealand 6, the RBW-9 coupled to the rear and pushed the Sealand 6 over Altamont Pass. After the Sealand 6 was stopped at the west end of Altamont passing track, RBW-9 was uncoupled from the rear of the train as the Sealand 6 would not need help on the 36-mile downgrade from Altamont to Fremont, California, and into Oakland, with the possible exception of a short grade at Hayward, California.

Meanwhile, the assistant superintendent at Sacramento, California, ordered the terminal superintendent at Stockton and a trainmaster at Fremont to take portable radios and to go to the Sealand 6 as quickly as possible. The two supervisors arrived at Altamont at about 5:30 p.m., just as the Sealand 6 arrived with the RBW-9's locomotive pushing from behind. After being apprised of the problem, the terminal superintendent suggested to the assistant superintendent that the trains exchange locomotives. However, the assistant superintendent was the senior officer on duty, and he decided to combine the trains with the RBW-9 employed as a "helper" coupled behind the caboose of the Sealand 6 all the way to Oakland. The combined train was referred to as the Sealand 6, but the officers at the scene made no determination as to which of the two conductors was in charge nor did the two conductors converse with each other.

The terminal superintendent gave his portable radio to the Sealand 6 engineer and went to the rear of the train where he instructed the Sealand 6 conductor and the RBW-9 engineer that their trains were to be combined. The trainmaster gave his portable radio to the RBW-9 engineer inasmuch as the radio on his lead unit had not been working properly. The assistant superintendent had instructed the terminal superintendent to tell the helper engineer not to work his locomotive unless the head-end engineer asked for power. When this instruction was passed to the helper engineer, he inquired, "Then why am I here?" to which the terminal superintendent replied, "Okay you handle it." The supervisors did not give the train crews any other instructions and they placed no restrictions on the train. No radio test was performed between the ends of the train. Before the train left Altamont, the trainmaster discovered that the head-end engineer was not able to communicate with the helper engineer because the distance between them was greater than the effective transmitting range of the portable radio the engineer had been given. But, the trainmaster took no action. The supervisors never told the helper conductor what was to be done, although there was a functioning WP radio in his caboose. The Sealand 6 conductor was told that his train was to be pushed to Oakland, but he was allowed to remain with his rear brakeman in the caboose ahead of the helper locomotive without a radio which would function on the WP frequency. As a result, he was not able to communicate with the helper conductor or the two engineers.

The Accident

With power applied by both locomotives, the Sealand 6 left Altamont at 5:50 p.m., and accelerated to 50 miles per hour (mph) in about 5 miles. For the rest of the trip to Fremont, the train's speed was kept around 50 mph, except for a short distance where it reached 56 mph. A 10-minute stop was made at Fremont where the head-end engineer used the radio in the station to tell the helper engineer to assist him whenever the train "bogged down." It was also understood that the head-end engineer would initiate any braking.

The Sealand 6 left Fremont at 6:45 p.m. Again, acceleration was rapid with both engineers ultimately operating their locomotives in full throttle. By the time the helper locomotive reached Milepost 25.8, 4 miles from Fremont, the train's speed had reached 60 mph. The Sealand 6 was then in a 3.3-mile section of undulating gradient, and during the next 90 seconds, the train experienced several episodes of severe slack action. First, a run-out of slack occurred when the lead helper unit had the ground relay open with consequent loss of power. And then, after the relay had reset automatically and full power had been restored, there was a severe run-in of slack.

At Milepost 24.2 the head-end started down a 0.91 percent grade 0.7 mile long. The head-end engineer said he continued to run in full throttle but at this point made an automatic brake application to keep from accelerating beyond 60 mph. At the bottom of the grade, the engineer released the brake application and the head end started to ascend a 1-mile grade varying from 0.78 to 1.00 percent. Shortly afterward, the helper locomotive started down the 0.91 percent grade. When the helper reached Milepost 24 and the Industrial Parkway overpass, the forward two-thirds of the Sealand 6 was on the ascending grade and the rear one-third was on the descending grade. (See figure 1.) Indicated speed at the rear helper unit had reached 63 mph whereas, according to the engineer, the indicated speed of the lead unit at the head-end had dropped to 52 mph. The train experienced a severe run-in of slack at both ends, followed by the lead end of the caboose ahead of the helper locomotive raising up from the track and derailing to the left. Separated from the car ahead and the locomotive behind, the caboose left the track structure at or near the south end 1/ of the overpass and came to rest on Industrial Parkway west of the overpass. The train brakes went into emergency simultaneously with or immediately after the caboose derailed.

The rear truck of the car ahead of the caboose derailed to the left and the car was struck by the lead unit of the locomotive. Both vehicles left the track structure at or near the north end of the 230-foot overpass and came to rest on the west embankment north of Industrial Parkway. The second and third helper locomotive units derailed to the west and fell 30 feet from the overpass onto the highway. The second unit fell on the caboose. The third unit came to rest on the

1/ Western Pacific designates its mainline as running west to east. At the accident location, however, a westbound train is actually running from south to north. Industrial Parkway runs on an east-west axes. References to direction at the accident location are given on the basis of the actual compass direction.

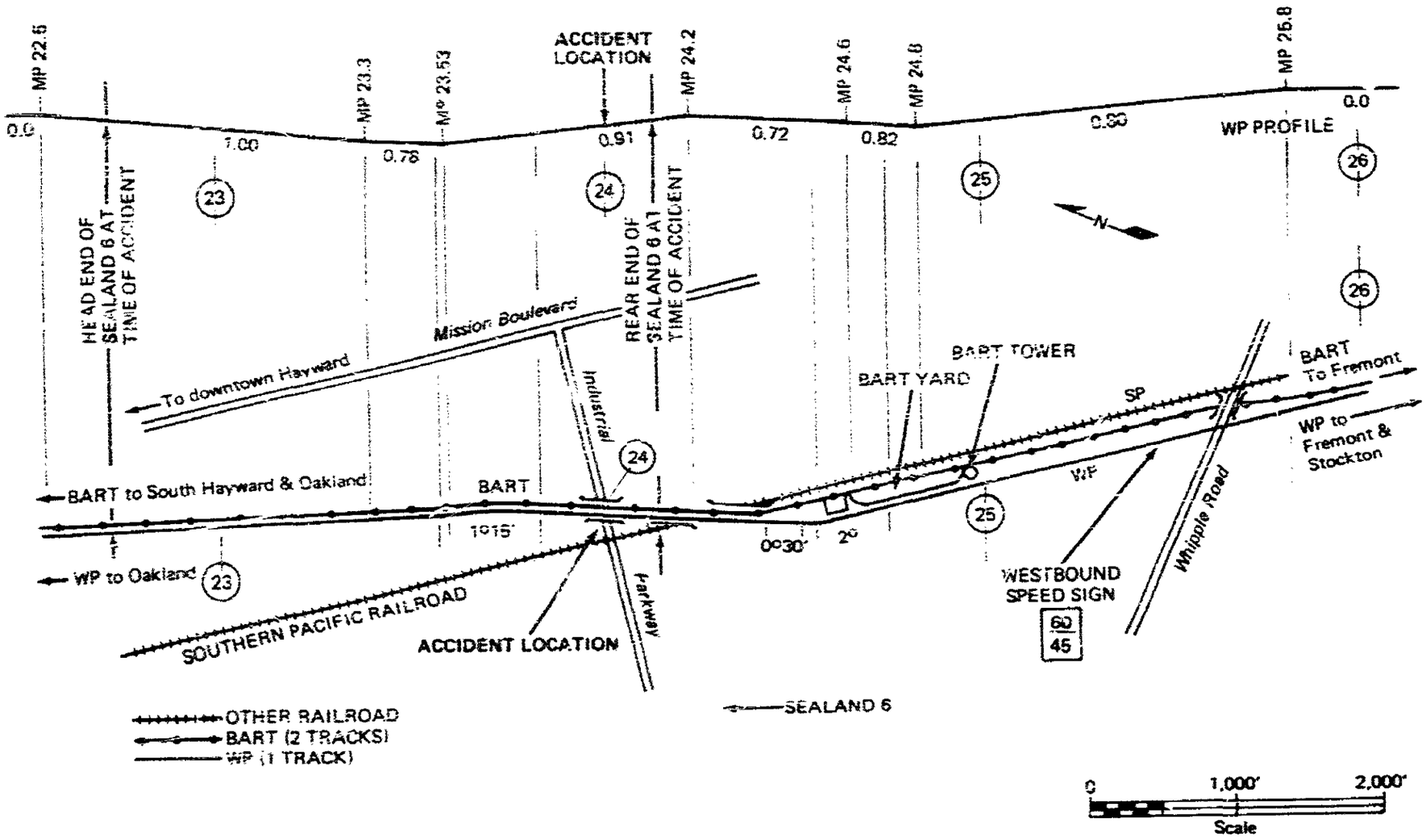

Figure 1.--Diagram and profile of accident location and approach from Milepost 25.8.

eastbound traffic lane. (See figure 2.) The fuel tanks of all three units were ruptured in the derailment and escaping fuel was ignited immediately by the arcing of 15,000-volt Pacific Gas and Electric (PG & E) powerlines that had been severed in the derailment. (See figure 2.)

When the head-end engineer of the Sealand 6 realized that his train had derailed and was on fire, he alighted from his locomotive and proceeded to an adjacent street on the same level as the tracks. He stopped an automobile on the street and had the driver take him to a public telephone about 1/2 mile away. He then called the Oakland yardmaster and informed him of the accident.

Injuries to Persons

Injuries	Crewmembers
Fatal	2
Serious	1
Minor/None	6
Total	9

Damage

The caboose and the rear car of the Sealand 6 and the three locomotive units and six head cars of the RBW-9 derailed. The caboose and the locomotive units were destroyed by fire. Three derailed cars and two container trailers were destroyed, and the other derailed cars were damaged.

About 320 feet of track was destroyed, and the walkway, handrails, girders, abutments, and retaining walls of the overpass bridge were damaged extensively. Impacts from derailed equipment and fire damaged the pavement, curbing, sidewalks, and median strip of Industrial Parkway. The road was closed to traffic for several days after the accident. Two 15,000-volt power transmission lines of PG & E were severed, resulting in the shutdown of a substation and widespread power outages in Hayward and the vicinity.

Damage was estimated as follows:

Train equipment	$1,093,050
Train lading	37,000
Track	18,250
Bridge 23.93	81,000
Industrial Parkway	42,700
PG & E powerlines	15,000
Removal of wreckage	80,000
Emergency response	15,000
TOTAL	$1,382,000

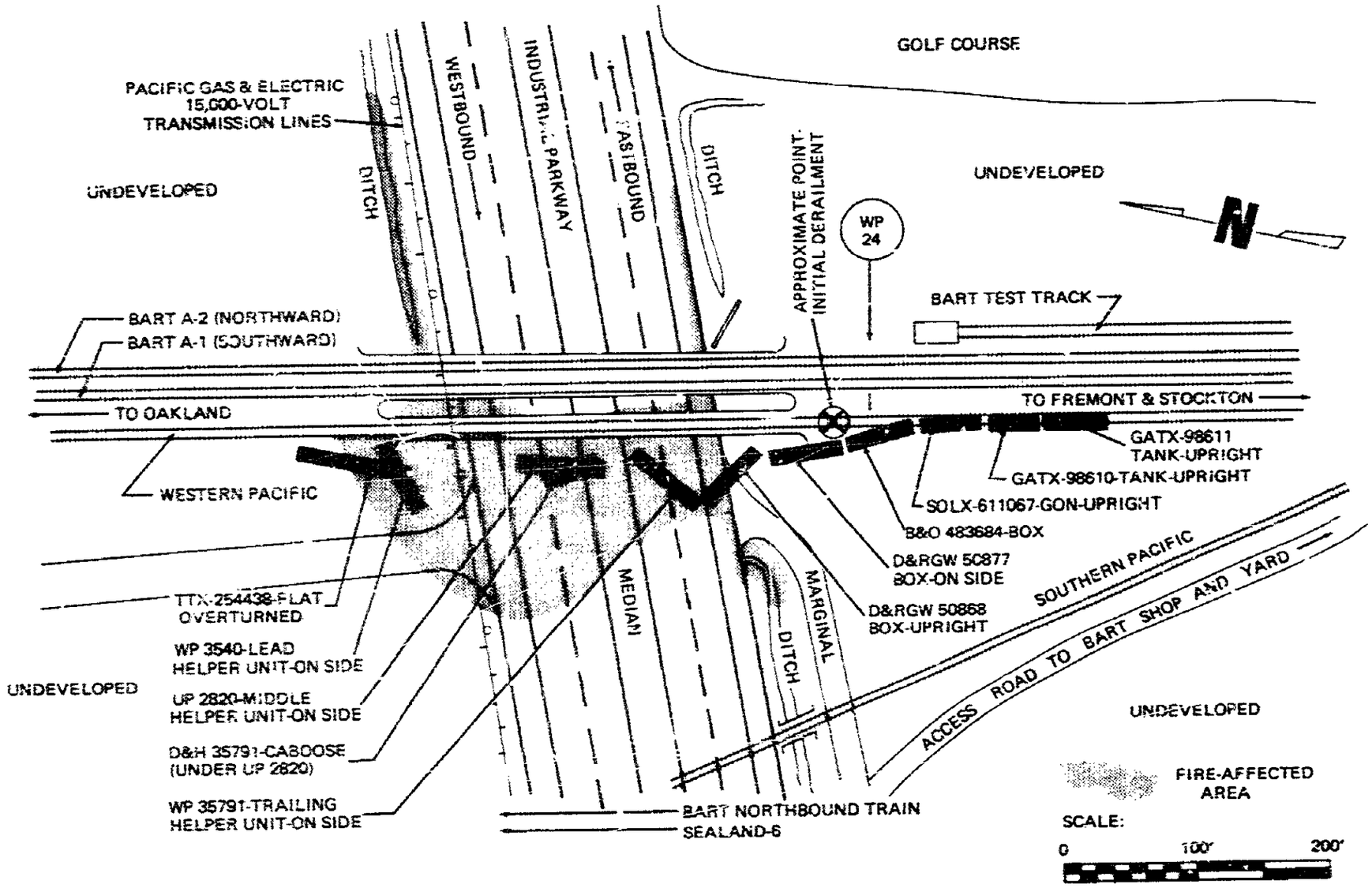

Figure 2.--Plan view of accident site and wreckage distribution.

Crewmember Information

The crew of the Sealand 6 consisted of an engineer, a conductor, and two brakemen. The crew of the RBW-9 consisted of an engineer, a conductor, two brakemen, and an apprentice engineer. All were qualified under WP operating rules without restriction. The apprentice engineer had been in the WP's 3-year training program for road engineers since January 21, 1980. In 1978, he had entered service as a hostler/fireman and in 1979 was promoted to yard engineer. All other crewmembers were regularly assigned to pool freight service between Stockton and Oakland. However, the head brakeman on the Sealand 6 was making only his second trip as a brakeman in road service. He had previously worked for about 18 months as a yard brakeman. The conductor of the RBW-9 was making his second trip as a regularly-assigned road conductor. Previously, he had worked as a road brakeman and had been used infrequently as an extra conductor.

The crewmembers of the Sealand 6 and the RBW-9 reported for duty at Stockton at 12:15 p.m., and 3:15 p.m., respectively, on April 9. The two crews had been on duty 6 hours 40 minutes and 3 hours 40 minutes, respectively, when the train derailed. All crewmembers had been off duty for 8 hours or longer before reporting for duty. (See appendix C.)

Supervisor Information

The WP mainline between Stockton and Oakland is part of the railroad's Western Division. At the time of the accident, the senior division operating officers were the superintendent and assistant superintendent at Sacramento. The superintendent reported directly to the senior vice-president of operations and was responsible for more than 900 miles of railroad. He joined WP as a management trainee in 1973 and was appointed superintendent in 1978. In the interim, he had served as assistant trainmaster, terminal superintendent, and assistant division engineer. On April 9, the superintendent left for home about 4:30 p.m. He monitored the radio communications to and from Altamont in his auto and was later updated on the situation by telephone.

The assistant superintendent remained on duty after the superintendent departed. When the decision was made to push the Sealand 6, he was the senior operating officer on duty. The assistant superintendent's railroad career began in 1946, and he was appointed assistant superintendent in February 1980.

The mainline from Stockton to Altamont was supervised by the terminal superintendent at Stockton and from Altamont to Oakland by the division trainmaster at Fremont. The men started as switchmen and were made yardmasters in 1969. The terminal superintendent had held that position since 1975. The trainmaster had been terminal superintendent at Oakland before becoming division trainmaster in 1979.

The director of train operations in San Francisco was responsible for the distribution and utilization of locomotive power, coordination of run-through trains with connecting railroads, and reporting of accidents to Government agencies and

other involved parties. He had no authority over division operating officers. The director of train operations worked days and had a counterpart who worked nights. However, there were times when the office was left unattended.

On December 7, 1979, WP's senior vice-president of operations issued written instruction's specifically detailing various mandatory efficiency checks to be conducted by operating department supervisors, including assistant superintendents, terminal superintendents, and trainmasters. Each supervisor was required to conduct a minimum of 20 of these prescribed checks each month. During the first 3 months of 1980, the assistant superintendent had not conducted any checks, the Stockton terminal superintendent had conducted 20 checks, and the division trainmaster had conducted 10 checks.

The WP retrains supervisors and evaluates their knowledge of rules and instructions through an annual written examination. However, the supervisors had not been examined since 1977.

Train Information

The three UP locomotive units of the Sealand 6 were General Motors type SD40 each having 3,000 horsepower (hp). The lead locomotive unit was equipped with a UP radio, a speed indicator, a Pulse Electronics 8-event recorder, an overspeed control, and a floor-mounted safety control (deadman). The event recorder registered elapsed time, distance, speed, throttle position, automatic and independent braking, and direction of travel. It recorded continuously, maintaining information for the previous 48 hours. The recorder cassette was not removed from the locomotive unit until April 14, 8 days after the accident, and all information recorded before the accident had been erased. The two trailing units had speed recorders, but the tape supply of each had been exhausted before the accident.

As originally constituted, the cars of the Sealand 6 were all standard 89-foot piggy-back flatcars equipped to carry trailers, containers, or automobiles. The average gross weight per car was about 81 tons. The Delaware and Hudson Railway caboose, an all-steel cupola type, was 39 feet 1 inch long, was 28 feet between truck centers, and weighed about 25 tons. Although, it was provided with a radio, it would not operate on UP or WP frequencies.

The RBW-9 originated at Stockton and consisted of three 3,000-hp locomotive units, seven cars, and a WP caboose. The lead and trailing units were WP General Motors Model GP40 and the middle unit was a UP General Electric Model U30C. Both WP units had WP radios but the lead unit's radio worked only intermittently after the train left Stockton. The UP unit had a radio using the same frequency as the units on the Sealand 6. The lead unit had a functioning speed indicator and the trailing unit had a functioning speed recorder. All three units had been serviced with fuel and made ready for the RBW-9 before the Sealand 6 left Stockton.

After the locomotive units and cars of the RBW-9 were added to the rear of the Sealand 6 at Altamont, the combined train had a trailing weight of 5,800 tons and a nominal length of 7,000 feet. The distance between the lead units of the two locomotives was approximately 6,400 feet, or 1.2 miles.

Track Information

A westbound train approaching the derailment point moved over straight track for a considerable distance to a 2° 0' curve to the right for 1,169 feet; it then moved on straight track for 258 feet to a 0° 3' curve to the right for 567 feet. The train then entered straight track for 2,019 feet leading to the derailment point and for 1,064 feet westward.

The undulating grade of the main track varied as follows:

> Beginning at mile 27, the grade was ascending 0.33 percent to mile 26.2, level to mile 25.8, and then descending 0.80 percent to mile 24.8. It then ascended at about 0.82 percent to mile 24.2 where it became descending at 0.91 percent to the derailment point and beyond to mile 23.5. The grade then became ascending between 0.78 and 1.00 percent to mile 22.5.

The 230-foot overpass over Industrial Parkway is a prestressed concrete ballast deck bridge with concrete backwalls and a center pier. The track is about 30 feet above the highway and approaches the bridge on long fills. The track was maintained according to FRA Class 4 standards and was in good condition. The rail was jointed 119-pound in 78-foot lengths laid in double-shoulder tie plates on 7-inch by 9-inch by 9-foot treated crossties. There were no guard rails. The right-of-way is shared with the double-track line of the Bay Area Rapid Transit District (BART) between Fremont and Oakland. At Industrial Parkway, the WP and BART tracks are about 20 feet apart, with each railway having its own bridge. (See figure 3.)

Method of Operation

Trains are operated on the single main track between Stockton and Oakland by automatic wayside signals of a centralized traffic control system. The dispatcher also uses radio to direct traincrews in their duties. Between Stockton and Oakland, there are eight passing tracks, about 10 miles apart. Only two of the sidings - Tracy and Hayward - were long enough to hold the Sealand 6 as it was originally constituted. After the train left Tracy, only the 5,540-foot siding at Altamont could be used in a doubling operation or to move the RBW-9's locomotive to the head portion of the Sealand 6 inasmuch as the siding at Midway was blocked with cars.

The effective WP timetable indicated that the highest authorized speed for any freight train between Oakland and Stockton was 60 mph. However, the timetable provides three separate sets of speeds in column form. Certain

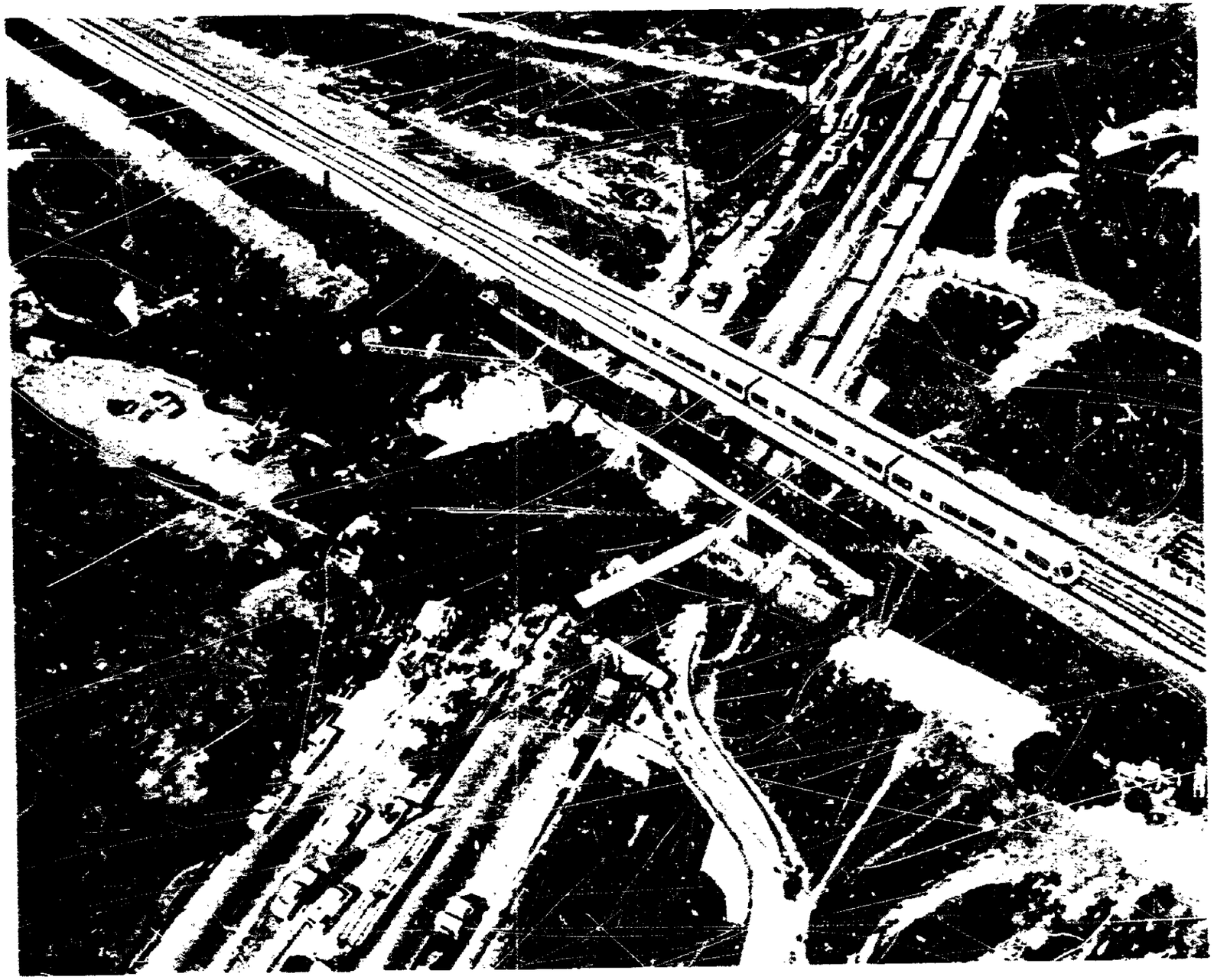

Figure 3.--Aerial view of the accident location viewed to the northeast. The BART train is southbound en route from Oakland to Fremont.

designated symbol trains of 70 cars or less in the "special" column were permitted the maximum 60 mph speed between Fremont and Hayward. The Sealand 6 was never designated as a "special" column train. It was governed by Column 1, "Trains not exceeding 100 cars or 5,500 tons," which authorized maximum speeds of 60 mph from Fremont to Milepost 24.8, 45 mph from Milepost 24.8 to the accident location and beyond to Milepost 23.93, and 60 mph west of Milepost 23.93. The RBW-9 was also a Column 1 train with the same authorized speeds as the Sealand 6. However, the train resulting from the combination of the Sealand 6 and the RBW-9 was governed by Column 2, "Trains exceeding 100 cars or 5,500 tons," and was authorized only 50 mph from Fremont to Milepost 24.8, 35 mph from Milepost 24.8 to Milepost 23.93, and 50 mph beyond Milepost 23.93. Between Altamont and Fremont, the highest permissible speed for any train is 45 mph. (See appendix D.)

The WP operating rules define track speed as "The highest speed authorized observing all rules and restrictions, not exceeding the maximum allowed by timetable or timetable bulletin." (See appendix B.)

At the time of the accident, a speed control sign for westbound trains was located to the north of the main track, about 4,000 feet east of the beginning of the reduced speed section at Milepost 24.8. This board displayed the number 60 above the number 45 in black on a white field. As prescribed in the timetable, the higher number was the speed allowed for designated "special" column trains; the lower number was the Column 1 speed. The WP makes no provision for indicating Column 2 speeds on its speed control boards.

WP Operating Rule No. 825(T) stipulates that the use of helper engines behind an occupied caboose must be restricted to not more than two units or 3,600 hp. (See appendix B.)

WP Operating Rule No. 41 (TRM) requires testing of radios, including portable radios, used in train operations and that test must consist of an exchange of voice communication to determine quality and readability of transmission. Operating Rule No. 102(T) requires that adjacent tracks must be immediately protected by flag when a train is disabled or makes an emergency stop until it is ascertained that there is no obstruction and that the tracks are safe for passage of trains. (See appendix B.)

Meteorological Information

It was dusk when the accident occurred. At 7:00 p.m., the weather station at the Oakland airport, about 15 miles northwest of the accident site, recorded overcast at 25,000 feet and northwesterly winds of 4 mph. The temperature was 58° F.

Survival Aspects

After derailing and separating from the rest of the train, the caboose remained upright as it traveled down the west embankment and crossed the eastbound traffic lanes of Industrial Parkway. It stopped on the westbound traffic

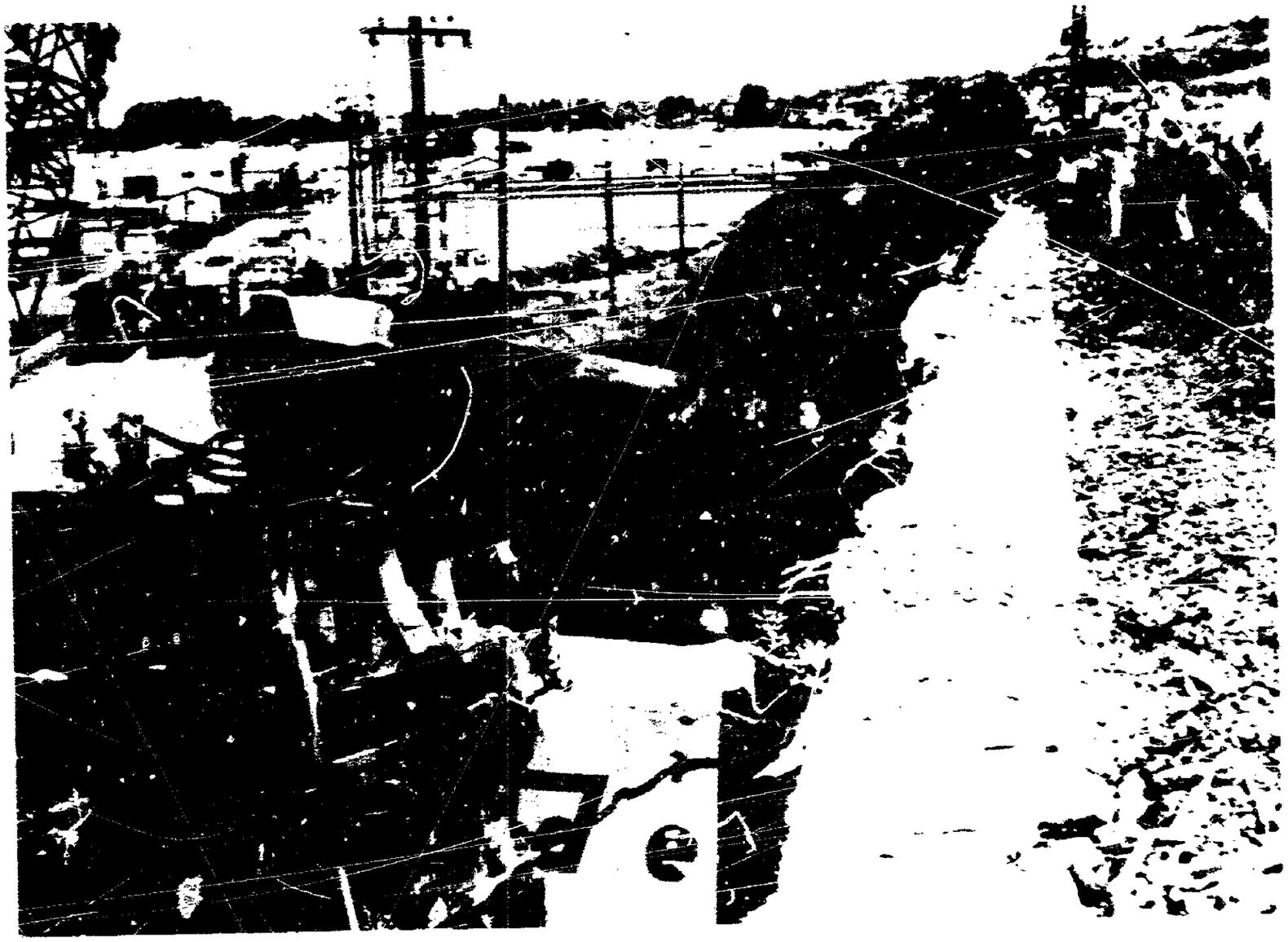

Figure 4.--Derailed locomotive units and cars viewed from Bridge 23.93.
The lead RBW-9 unit is at the far end of the bridge as it came to rest after derailing.

lanes more or less parallel to the track about 25 feet west of the overpass. At this point, the caboose was probably relatively undamaged and the conductor and rear brakeman probably could have evacuated the caboose and survived the accident. However, before they had a chance to leave the caboose, it was crushed by the middle locomotive unit, which fell on it from the overpass.

The lead helper unit turned onto its left side and came to rest on the west embankment. When the train derailed, the engineer was seated on the right side, but as the unit overturned, he fell from his seat, against the back cab wall. The head brakeman had been seated on the left side of the cab, and after the unit came to rest, he was lying unseated against the broken left side window. The engineer sustained severe back injuries and while conscious, he was unable to get up unassisted. The head brakeman was able to stand up and open the front cab door on the left side. As leaking diesel fuel was burning under the cab and at the back wall of the cab, the brakeman pulled the engineer through the door and down the embankment to a safe place. Shortly thereafter, the entire unit was on fire and the cab was completely burned. The brakeman attempted to go to the location of the caboose to assist the conductor and rear brakeman. However, the caboose and the other locomotive units were also ablaze from burning diesel fuel and the brakeman was driven back by flames.

Fire and Emergency Response

The leaking diesel fuel was ignited almost instantly by arcing powerlines that had been severed in the derailment. Witnesses reported an explosion followed by a fireball 150 feet high. More than 10,000 gallons of diesel fuel were consumed in the fire which engulfed the 200-foot width of Industrial Parkway and produced a dense cloud of black smoke.

The Hayward, California Fire and Police Communications Center received report, without mention of fire, 2 minutes after the derailment. Response from the Hayward police and fire units was immediate. Initially, two engines and a ladder truck were dispatched, but as the battalion chief left his station, 4 or 5 miles north of the derailment, he observed the heavy smoke and called for a second alarm. Ultimately, four engines and two ladder trucks responded and the first of these arrived on the west side of the overpass at 7:00 p.m.

As soon as the firemen arrived, they began to assist the injured crewmembers. The engineer was strapped to a backboard and fitted with a cervical collar while the brakeman received first aid treatment for minor burns. Both men were en route to a Hayward hospital in an ambulance 20 to 25 minutes after the accident.

The Hayward police immediately set up security lines across Industrial Parkway on each side of the overpass to inhibit access to it. There was no evacuation inasmuch as the accident site was in an industrial area with no residences or other buildings near the relatively confined fire area.

The battalion chief arrived at the east side of the overpass at 7:06. He found the fire spanning the parkway and extending 150 feet into the air. Almost at once, he began looking for a crewmember who might know if the train contained any hazardous commodities. The rearmost derailed cars, two tank cars containing molasses, were standing on the embankment at track level, upright and within 150 to 200 feet from the fire. Finding no one at the rear of the train, the chief examined the cars for placards or other evidence of their contents. He found nothing, but about 40 minutes elapsed before he was able to locate a crewmember and determine that no hazardous commodity was involved.

After the application of water from unmanned mon' r units failed to check the fire, the firemen extinguished it with foam.

BART's Response to the Emergency

At the time of the accident, two supervisors in the BART tower at Hayward Yard, about 1 mile south of Industrial Parkway, heard two loud explosions and saw a fireball and smoke to the north. At 6:55:10, one of the supervisors notified the train controller at the BART's central control facility by "hot line" telephone of what he had heard and seen and gave the location as being between BART's yard and South Hayward station. Shortly afterward, the other supervisor succeeded in contacting the Hayward fire department and was told the fire was the result of a derailment of a WP freight train. This was relayed to the train controller and her supervisor at the central control facility located at Oakland at 6:58:10. At the same time, the tower supervisor commented that the explosions had been severe and that the fire appeared to be burning oil.

When BART Central first learned of the fire and explosions, trains were approaching the accident area from both directions. A southbound train running on the track closest to the WP track was stopped north of the South Hayward station, about 1 mile from Industrial Parkway. However, a five-car northbound train was advanced past the Union City station to a point about 1/2 mile from the fire area. The operators of both trains saw the fire and smoke, and the southbound operator at first reported that the fire did not appear to be on the BART tracks. Later, the operator reported that both BART tracks appeared to be involved.

At 7:01:20, Hayward police contacted BART Central and requested that all train traffic be stopped. At 7:02:40, the BART northbound train was advanced to within 1/4 mile of the fire area, and at 7:04:30, the train was ordered to proceed in the manual mode to the fire location and advise Central of the situation. No restrictions were placed on the train. The orders were transmitted by the train controller on instructions from her supervisor.

The northbound train proceeded to the fire area where the operator observed two derailed tank cars at track level and powerlines sagging across his track at the overpass. The operator tried to contact Central but, after receiving no response, decided to proceed across BART's Industrial Parkway overpass. He stated that he considered it too dangerous to stay in the area and that the powerlines were still high enough for his train to pass under them safely.

The Hayward battalion fire chief arrived at the east side of the overpass in time to see the northbound train cross the parkway silhouetted by fire he described as 150 feet high. At the time, he also observed burning oil in the north gutter of the parkway extending under and well beyond the BART overpass. The chief immediately called his dispatcher and instructed him to advise BART to shut down their operations.

There was no damage to the BART train or injury to the passengers on board. At 7:09:40, the train controller contacted the operator and ordered him to reverse ends and return toward Hayward yard. The operator informed the controller that his train was already north of the fire area and he recommended that no trains be operated through the area due to the intensity of the fire and the sagging powerlines. Subsequently, the southbound train was off-loaded at South Hayward station and all operations were suspended.

The accident occurred on a weekday toward the end of the evening rush hour at which time the BART operates on a headway varying from 4 1/2 to 7 1/2 minutes. During peak traffic hours, trains may have 9 to 10 cars and 1,500 passengers. Maximum operational speed is 80 mph in the automatic mode.

Tests and Research

After the accident, an inspection of the lead helper locomotive unit disclosed the throttle was in the eighth position, the independent brake valve was in the release position, and the brakepipe angle cock on the lead end was open. The automatic brake valve and stand, the control panels, and the electrical cabinets had been melted by fire. The brake pipe angle cock on the rear of the Sealand 6 caboose was closed. However, the T-shaped rod, attached to the handle to permit the angle cock to be turned from the caboose platform, was bent in a way that indicated the angle cock had been closed as a result of impact.

After the accident, the three locomotive units of the Sealand 6 were taken to Oakland and inspected and tested. The lead unit would start, but each attempt to load the unit resulted in a ground relay operation. An inspection disclosed blown diodes on one side of the main generator. It was determined that about 290, 275, and 1,240 gallons of fuel remained in the tanks of the lead, middle, and trailing units, respectively. It was also determined that this model of locomotive unit could be expected to experience fuel starvation with less than 300 gallons of fuel in its tank on grades of 0.65 percent or greater.

Although the trailing helper unit was destroyed by fire, the speed recorder on this unit yielded a legible and undamaged tape. The recorder was calibrated and found to be accurate within 0.1 mph.

The portable radio given to the head-end engineer of the Sealand 6 by the Stockton terminal superintendent was recovered after the accident. It was a Motorola Handi-Talkie Model HT-220, 1.8-watt set with a rechargeable 15-volt battery. The terminal superintendent stated he had installed a fully-charged battery in the radio before leaving Stockton for Altamont. A bench test of the

radio and battery on April 11, 1980, indicated the radio had 1.2 watts transmitting power and the battery measured 14.3 volts under load. A field test was made on April 16 at the accident site and during the test, the radio failed to transmit over its prescribed distance of 2 miles. The failure was attributed to a faulty magnetic relay in the radio.

Other Information

At the time of the accident, WP had no procedure for notifying BART in the event an accident occurred between Fremont and Oakland where the two railways occupy the same right-of-way. Responsibility for notifying Federal and State agencies as well as local emergency forces in the event of an accident was assigned to the Office of the Director of Train Operations, in San Francisco. When no one was on duty there, the chief train dispatcher at Sacramento was responsible. However, no one at the Sacramento office knew who to call at the BART in the event of an emergency involving the joint right-of-way. As far as could be determined, WP made no timely notification of the Hayward accident to the BART or to the Hayward fire and police departments.

The BART and the Hayward fire and police departments had jointly developed a well-organized program for emergency notification and response, but WP was not a party to the program. The supervisor at BART central control was not sure of the name of the railroad his line paralleled between Oakland and Fremont. He had a Rollex file containing emergency telephone numbers including two listed for the WP -- one for the Oakland Yardmaster and one for the Sacramento chief train dispatcher. However, the number listed for the train dispatcher was not correct.

ANALYSIS

Train Operation

The train dispatcher was informed by the engineer that the Sealand 6 might not have sufficient fuel to reach Oakland when the train was still 3 1/2 hours from Stockton, where the WP had refueling facilities and available replacement locomotives. The director of train operations was responsible for deciding what to do, and he was given timely notification of the situation. In his position, he should have known that a locomotive unit with as much as 300 gallons of fuel in its tank could experience fuel starvation while ascending a heavy grade, such as that leading to Altamont Pass. He knew that two of the three units reportedly had only 500 to 600 gallons of fuel when they were still 100 miles from the pass and that there was the chance that they might have even less than that amount of fuel. The director of train operations should have known, too, that the Sealand 6 was too heavy a train for a single unit to cross the pass unassisted. There were several options available to the director of train operations, none of which would have materially delayed the Sealand 6. There was ample time to arrange for an inspection by a qualified mechanic and, if necessary, to refuel the units that were low on fuel. Another option was to have simply ordered the locomotive replaced with a fully-serviced set of units. After being told by the Stockton locomotive shop superintendent, that in his opinion, the train could reach Oakland with the reported amount of fuel, the director of train operations decided to run the train to Oakland without refueling.

The Sealand 6 was delayed at Stockton for 1 hour 20 minutes, and during that time, the relieving engineer determined that the two units now had only 100 and 350 gallons of fuel. Although unable to communicate by radio, he telephoned his findings to the yardmaster, the dispatcher, and the locomotive foreman. A qualified diesel mechanic confirmed the 350-gallon reading but thought the other unit's fuel tank was empty. His findings were ultimately passed on to the chief train dispatcher and the director of train operations. However, the yardmaster ordered the engineer to leave when a proceed signal was displayed for his train, and after he was given the proceed signal, the engineer had no choice but to leave Stockton.

When the Sealand 6 left Stockton, its fuel supply had been reduced to the extent that the train could not cross Altamont Pass without assistance. Further, the Sealand 6 was held at Tracy to meet an eastbound train with four locomotive units and light tonnage. Meanwhile, the RBW-9 with three fully-service locomotive units and only eight cars had been ordered at Stockton to follow the Sealand 6 to Oakland. All of this was known to and should have been understood by the senior division operating officers, the chief train dispatcher, and the director of train operations. They could have ordered locomotive units taken from the eastbound train and added to the Sealand 6 without materially delaying either train. Failing to have done this, they could have held the Sealand 6 at Tracy until the RBW-9 arrived and could have traded locomotives or could have added units from the RBW-9 to the Sealand 6 locomotive. However, no action was taken to correct the situation, and the Sealand 6 was allowed to leave Tracy after the eastbound train passed.

After the lead unit stopped running because of fuel starvation, the Sealand 6 stalled on the hill between Midway and Altamont. The nearest trackside telephones were too far away for timely use and neither the engineer nor the conductor could notify anyone with the radios they had. The only action the engineer could take was to double the hill, but in his first attempt to do so, the one functioning unit could not start even a portion of the train.

In the meantime, the assistant superintendent at Sacramento was aware that the Sealand 6 had left Stockton with two units low on fuel. He probably realized the train was blocking the railroad and the crew was without communicating ability. He personally took command in the dispatcher's office and had the RBW-9 brought up behind the Sealand 6 to push it to Altamont. He also ordered the two supervisors directly in charge of that part of the division to take radios and to go to the scene. When the Sealand 6 and the supervisors arrived at Altamont, the train had traveled only 36 miles in the 5 hours since it had arrived at Stockton and was then 11 1/2 hours overdue at Oakland.

Using the RBW-9's three 3,000-hp locomotive units to push the Sealand 6 to Altamont was a violation of a WP rule which limited the use of locomotive power behind an occupied caboose to two units, or 3,600 hp. The procedure would not have been a literal violation had the conductor and rear brakeman of the Sealand 6 vacated their caboose. However, if the practice of using excessive power to push a train is a hazard to men in a caboose ahead of the pusher locomotive, it could also be a hazard to the train itself.

After learning that the Sealand 6 had only one unit running, the assistant superintendent decided to have the RBW-9 push the train to Oakland. The Sealand 6 could have proceeded unassisted to Fremont and could have been helped through the "sags" at Hayward by the Fremont yard engine or by the RBW-9, if necessary. This would have been the normal operating procedure. However, with only one operating unit, the train could not maintain track speed and was certain to be further delayed as a result. The terminal superintendent suggested having the two trains exchange power. It was also feasible to combine the trains and place the RBW-9's locomotive at or near the head end. Either option would have cost time, and it appeared from the investigation that getting the Sealand 6 to Oakland as soon as possible seemed to be the overriding consideration.

Train Communication

Although the head-end engineer of the Sealand 6 was furnished a portable radio by the terminal superintendent, the radio's transmission could not be heard by the helper engineer or conductor. The terminal superintendent assumed the radio would transmit properly and did not require that an end-to-end transmission test be made. As a result, he probably was not aware that the radio was defective. However, the trainmaster was aware of the problem, and he could have ordered the helper engineer to operate from his middle unit since it was a UP unit which was equipped with an operable radio set up on the same frequencies as the radio equipment on the lead unit on the head end. The two engineers would have then had the ability to communicate with each other. However, the trainmaster took no action.

After the assistant superintendent decided to have the RBW-9 push the Sealand 6 from Altamont, only the conductor of the Sealand 6 and the engineer of the RBW-9 were told what was to be done. There was no communication between the two conductors and neither knew anything about the other's train. The WP rules and timetable instructions do not stipulate who is in charge of a train manned by two on-duty crews and no one was designated as being in charge of the Sealand 6 after it left Altamont. Although the assistant superintendent instructed the terminal superintendent to tell the helper engineer not to power unless the Sealand 6 engineer asked him for power, the terminal superintendent ultimately authorized the helper engineer to use his own judgment in the matter.

Train Speed

No crewmember was ever advised of the Sealand 6's correct tonnage. The assistant superintendent was in a position to determine the correct tonnage, and he could have advised the terminal superintendent that the combined train was restricted to Column 2 timetable speeds. No restrictions were put on the train, and the crewmembers were allowed to proceed at whatever they perceived to be track speed. Both engineers thought the train was governed by the maximum special column speeds and, if their supervisors knew differently, they did nothing to insure that the crews had the proper understanding.

The head-end engineer of the Sealand 6 had no way of knowing how much locomotive power was pushing his train. However, the helper engineer, the conductor, and the head-end conductor should have known that they were in violation of WP Operating Rule No. 825(T). It is apparent that these men were no more familiar with the rule's requirements than the terminal superintendent and trainmaster who were at Altamont, the assistant superintendent who ordered the procedure, or the superintendent who knew of the procedure being followed and took no exception to it.

The helper engineer used power to help start the train leaving Altamont and continued to do so most of the way to Fremont. Over this distance, the train operated 5 to 10 mph in excess of the allowable special column speeds. The head-end engineer was powerless to control the speed short of applying the brakes and risking slack action problems while power was being applied from the rear. However, he was concerned enough to use the station radio at Fremont to tell the helper engineer not to power unless it appeared the train would stall. Nevertheless, the helper engineer applied full power from the time the train left Fremont to the time it derailed to maintain the 60-mph speed prescribed by the special column in the timetable.

At the time of the derailment, the rear of the Sealand 6 was moving 28 mph faster than the allowable timetable speed for the train at a location where a series of relatively short and steep undulating grades were known to create slack action problems for trains of ordinary length with all the locomotive power on the head end. The Sealand 6 was uncommonly long. In the "sags" at Hayward, the train was, at times, in two ascending grades and one descending grade at the same time. When the head-end engineer applied the brakes to control speed, the helper engineer should have reduced throttle. But with the forward two-thirds of the train ascending and slowing down, the rear one-third was descending and accelerating, with the helper locomotive in full throttle. As train resistance increased, the compressive buff forces being applied directly to the short and relatively light caboose increased to the point where the caboose could no longer resist them and it was literally lifted out of the train.

Insofar as the Sealand 6 was concerned, the effect of the derailment was maximized because it occurred on an elevated right-of-way at a highway overpass. Moreover, occurring as it did during the evening rush hour, the accident was potentially catastrophic to highway and BART traffic. Fortunately, derailed equipment did not intrude on BART's tracks or fall toward its overpass, and no highway vehicles were struck. Although BART trains operated as often as every 5 minutes, or less, at speeds up to 80 mph, no member of the train crews thought to protect the BART tracks as required by WP Operating Rule No. 102(T).

Train Supervision

Western Pacific required its train-service employees to know and obey the operating rules and the timetable instructions. They were expected to master the complex speed tables in the timetable which, at the accident location, provided for no less than three different speeds depending on the classification and

characteristics of a given train. Based on their prior experience, the crewmembers assumed that the Sealand 6 was an expedited special column train, and they were never told otherwise. With the information they had been given, there was no way they could know that it was subject to Column 2 speed restrictions. There would have been no misunderstanding if the supervisors who had access to the correct information had advised the crewmembers which speed column applied to their train. Once the highly unusual arrangement of moving a very long train with 75 percent of its operating locomotive power at the rear, over a relatively long distance across undulating terrain was decided upon, detailed instructions were necessary. The officers who were in direct control of the situation should have made certain that the crewmembers vacated the caboose; the engineer understood how the train was to be powered and that adquate communications were available. The responsibility for complying with Operating Rules No. 825(T) and No. 41(TRM) was shared by the officers who were in a position to insure compliance and who were as bound by the rules as the crewmembers.

The investigation of this accident indicated that the supervisors who were directly involved lacked a thorough knowledge of the rules and the timetable. Not one of the officials was intimately familiar with the day-to-day train operation between Stockton and Oakland. The two supervisors who went to Altamont did not have the necessary background, experience, or knowledge to handle the situation without guidance from higher authority. The assistant superintendent had long and varied service in railroading and should have had the expertise required by the situation, yet he seemed motivated principally by a desire to avoid further delay to the Sealand 6. The superintendent, although aware of what was occurring, took no corrective action.

Supervisors who are responsible for maintaining the safe and efficient operation of a railroad division must know what is required for safe and efficient operation if they are to insure that the men they supervise know and comply with those requirements. In the past, the WP annually examined operating department supervisors on their knowledge of the rules and instructions. Aside from their value to management, such examinations gave the supervisors an opportunity to periodically refresh their knowledge. Unfortunately, the WP allowed the program to lapse. As for rules enforcement, management had, as recently as December 1979, written detailed instructions for testing by supervisors, with a mimimum of 20 required checks to be made monthly by each supervisor. However, this policy was never fully implemented on the Western Division, and the three supervisors directly involved in this accident conducted no checks during January 1980 and collectively conducted only 30 checks during the entire first quarter of the year, or about 17 percent of the 180 checks that should have been conducted during this period.

The BART's Central Control was advised immediately by a BART supervisor that explosions had been heard and a fireball had been seen on or near the BART tracks between South Hayward station and Hayward Yard. Three minutes after the accident, the supervisor at BART Central was told a freight train had derailed next to the BART tracks, and 6 minutes after the accident, Hayward police advised BART Central to stop running trains through the fire area. The BART had supervisors nearby and through them could have determined the seriousness of the

situation. Nevertheless, the BART central supervisor allowed a northbound train to pass the Union City station and the Hayward Yard without off-loading the passengers and then directed the train operator to proceed into the fire area without restrictions. Once in the fire area, the operator decided it was too dangerous to remain there. He could have easily reversed ends and returned to the yard, but elected instead to proceed through and beyond the fire area.

Emergency Response

Neither the BART nor the WP had set up a plan of joint notification and response to an emergency although they occupied a common right-of-way over a relatively long distance and there was always the possibility of an emergency situation occurring which would affect both operations. The WP office of the director of train operations was responsible for emergency notification, but the office did not know who to call at the BART, and the BART's Central Control was not aware of who to called at the WP.

CONCLUSIONS

Findings

1. Although the director of train operations was informed long before the Sealand 6 reached Stockton that the train did not have sufficient fuel to reach Oakland, he took no action to have the problem corrected.

2. The relieving engineer at Stockton checked the fuel situation as required and reported to the locomotive foreman that two of the three units were critically low on fuel. The report was confirmed by a qualified diesel mechanic, but no action was taken to refuel or replace the units.

3. Although the engineer of the Sealand 6 was aware that his locomotive had an insufficient amount of fuel to get the train over Altamont Pass, he had the choice of leaving Stockton on the yardmaster's instructions or not leaving and facing a charge of insubordination.

4. A single locomotive unit could not pull the Sealand 6, which was a long, heavy train, up the grade to Altamont Pass. After it left Stockton, the director of train operations and the responsible division officers had opportunities to provide the train with adequate power but chose not to do so.

5. The Sealand 6 was not equipped with a radio which would transmit on the WP frequency. Although the head-end engineer was ultimately furnished a portable WP radio, this was defective and would not transmit effectively.

6. The terminal superintendent, who furnished the portable radio, failed to require that a transmission test was made before the Sealand 6 left Altamont. As a result, he was probably not aware that the head-end engineer was still without communicating ability.

7. Although the trainmaster was aware of the communication problem, and he could have ordered the helper engineer to operate from a unit which had a radio compatible with that on the lead head-end unit, he took no action to do so.

8. The RBW-9 could have followed the Sealand 6 to Oakland and assisted the train when and if necessary. Also, the trains could have been combined at Altamont with the RBW-9's locomotive placed at or near the head-end of the train. Either option would have further delayed the Sealand 6, and the procedure ultimately followed was chosen because the assistant superintendent wanted to prevent additional delay.

9. The assistant superintendent ordered the RBW-9 added to the rear of the Sealand 6 to assist where necessary between Altamont and Oakland. He instructed the terminal superintendent to insure that the helper engineer used power only when requested to do so by the head-end engineer. However, he failed to have the crewmembers vacate the caboose as required by Operating Rule No. 825(T).

10. The terminal superintendent did not follow the assistant superintendent's instructions but authorized the helper engineer to use his own judgment in the operation of his locomotive.

11. Neither the RBW-9 conductor or the Sealand 6 engineer were informed that the trains were to be combined west of Altamont. The terminal superintendent and trainmaster failed to require that Operating Rule No. 825(T) was complied with.

12. The WP operating rules do not stipulate who is in charge when a train is manned by two on-duty crews with qualified conductors. The officers failed to make a determination and notify the crewmembers accordingly.

13. No restrictions were placed on the combined train. The crews were not told the train's correct tonnage or what speed classification applied to the train.

14. The Sealand 6 left Altamont with the helper locomotive using power. Over much of the distance to Fremont, the train operated at speeds above the maximum authorized speed for any train.

15. At Fremont, the head-end engineer used the station radio to tell the helper engineer not to use power unless the train was about to stall. However, after leaving Fremont, the helper engineer operated his locomotive in full power and continued to do so until the train derailed.

16. At the time the train derailed, the helper locomotive was operating at a speed of 63 mph, 28 mph faster than the maximum authorized speed for the train.

17. The derailment occurred when the forward two-thirds of the train was ascending a grade and the rear one-third of the train was descending a grade. The caboose lifted out of the train when it could no longer resist the compressive buff forces being applied by the locomotive behind it.

18. The conductor and rear brakeman did not survive the accident because they were not able to evacuate the caboose before it was crushed beneath the middle unit of the helper locomotive.

19. The head brakeman on the helper locomotive saved the life of the engineer who was unable to evacuate the locomotive unassisted before fire consumed it.

20. The surviving uninjured crewmembers of the train failed to protect the adjacent BART tracks as required by the WP rules.

21. The officers involved in the decision to combine the trains at Altamont were responsible for the safe operation of the train and the crewmembers' compliance with the rules and timetable. Their failure to do so indicated that they did not thoroughly understand what was required by the rules.

22. The BART central supervisor disregarded the timely warnings of BART supervisors and the Hayward police and allowed a train to be operated into the fire area without proper safeguards.

23. The action of the BART central supervisor unnecessarily exposed passengers and the train operator to a hazardous environment.

24. The BART and the WP had no emergency notification procedure to be followed in the event a derailment or other problem on one line created a hazard to trains on the other line.

25. The Hayward police and fire personnel responded immediately and effectively to the emergency despite an early inability to determine the exact nature of the accident.

26. Sufficient information about the lading carried in the train was not promptly available to the fire department personnel involved with handling the emergency.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the derailment of the caboose, which was caused by compressive forces resulting from excessive locomotive power applied behind the caboose on an undulating gradient. The derailment was the result of the failure of the responsible supervisors to insure that the train was powered and managed in a manner consistent with the rules, timetable instructions, and conventional operating practices; the failure of the assistant superintendent to insure that the crewmembers knew their train's correct tonnage and speed classification; and the

failure of the Western Pacific Railroad management to insure that supervisors responsible for making critical operating decisions were properly trained for their roles. Contributing to the accident was the excessive speed of the train and the failure of the director of train operations to insure that the train had adequately fueled locomotive power.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

-- to the Western Pacific Railroad Company:

Take action with employees to determine that train operations are conducted according to operating rules. (Class II, Priority Action) (R-80-41)

Provide supervisors and employees periodic, supervised training based on a uniform understanding of the operating rules, timetable instructions, and bulletin instructions. (Class II, Priority Action) (R-80-42)

Review and amend its rules and instructions to provide comprehensive procedures for the safe operation of locomotives in helper service. (Class II, Priority Action) (R-80-43)

Provide crewmembers with the proper classification of their train for speed purposes and the correct trailing tonnage of their train. (Class II, Priority Action) (R-80-44)

Provide radios that operate on the Western Pacific frequency and which can adequately provide communication between both ends of the trains to crews of trains with foreign locomotive and/or caboose equipment. (Class II, Priority Action) (R-80-45)

Develop and maintain on a current basis with the Bay Area Rapid Transit District a plan for immediate notification of any emergency occurring on the common right-of-way between Oakland and Fremont. (Class II, Priority Action) (R-80-46)

-- to the Bay Area Rapid Transit District:

Establish procedures to prevent trains from being operated into an area where an emergency exists until it is known that it is safe to do so. Develop and maintain on a current basis with the Western Pacific Railroad Company a plan for immediate notification of any emergency occurring on the common right-of-way between Oakland and Fremont. (Class II, Priority Action) (R-80-47)

-- to the Urban Mass Transportation Administration:

Require other rapid transit operations to establish adequate mutual emergency notification procedures in instances where rapid transit trains operate in close proximity to an operational railroad line. (Class II, Priority Action) (R-80-48)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

G.H. PATRICK BURSLEY, Member, did not participate.

September 30, 1980

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

Investigation

The National Transportation Safety Board was notified of the accident about 2:15 a.m., on April 10, 1980. The Safety Board immediately dispatched an investigator from the Denver Field Office to the scene and subsequently dispatched an investigative team from Washington, D.C., to the scene. Investigative groups were established for operations, vehicle factors, and human factors.

Hearing

The Safety Board convened a 3-day public hearing as part of its investigation of this accident on July 1, 1980, in Oakland, California. Parties to this hearing included The Western Pacific Railroad Company, the Bay Area Rapid Transit District, the Federal Railroad Administration, the California Public Utilities Commission, the City of Hayward, the Brotherhood of Locomotive Engineers, the United Transportation Union, and the American Train Dispatchers Association. Testimony was taken from 26 persons, and 50 exhibits were accepted into the record.

APPENDIX B

EXCERPTS FROM WESTERN PACIFIC OPERATING RULES

APPLICATION OF RULES

Rules will apply as follows:

Without Prefix—To both signaled and non-signaled territory.

Prefix T—To territory outside T.C.S. limits only.

Suffix (A)—To all employees.

Suffix (T)—To all transportation department employees.

Suffix (R)—To all maintenance-of-way department employees.

Suffix (D)—To train dispatchers only.

Suffix (M)—To all mechanical department employees.

All rules are single track rules unless otherwise indicated.

Prefix integral part of rule number identification. Suffix in parentheses specifies employees governed by rule and is *not* part of rule number identification. Example:

T-83-B. (T) is

RULE T-83-B.

governing all transportation department employees.

Speed—

Track Speed: The highest speed authorized, observing all rules and restrictions, not exceeding the maximum allowed by timetable or timetable bulletin.

10-J. (TR) Speed-control boards that prescribe reduction in speed will be located to the right of track in the direction of approach 4000 feet in advance of point of restriction.

Speed-control boards that authorize an increase in speed will be located at the point where higher speed is permissible and speed may be increased accordingly as soon as rear of train has passed such speed-control board.

Speed prescribed by timetable or otherwise must not be exceeded.

41. (TRM) During each tour of duty, engineers and conductors are responsible for verifying that engine and caboose radios are working.

Radios used in train operation outside yards must be tested at the point where train is originally made up.

Portable or packset must be tested in accordance with these requirements.

Radio test must consist of an exchange of voice communication, determining quality and readability of transmission.

102. (T) When a train is disabled or makes an emergency stop, radio communication must immediately be used to stop trains on any adjacent track. Also, such tracks must immediately be protected by flag until it is ascertained there is no obstruction and that they are safe for passage of trains. The train must be inspected before it is moved. When a train air brake system goes into emergency application and the cause is not known, no movement will be made until hand, lamp, or radio signal is given.

825. (T) Helper engines must not be detached from a train while it is in motion. The use of helper engines behind occupied cabooses must be restricted to not more than two units or 3600 HP. Helper engines must not be used behind wooden cabooses.

Helper engines must be cut in ahead of any wooden underframe cars in a train.

887. (T) Yardmasters are responsible for conditions within yards. Trains and engines will be under the control of the yardmasters, and all employees in train, engine or yard service will be subject to their direction as to movements within yards.

890. (T) Unless otherwise provided, enginemen must know before starting each trip or day's work that their engine is furnished with sufficient fuel, water, sand and other supplies and equipment.

APPENDIX C

TRAIN CREWMEMBER INFORMATION

Extra UP 3734 West (Sealand 6)

Conductor Eugene R. Obenshain

Conductor Obenshain, 45, was employed as a brakeman by the Western Pacific Railroad Company on April 5, 1955, and he was promoted to conductor on November 18, 1960. He passed a company physical examination on March 3, 1978, and he was last examined on the operating rules on January 15, 1980. He was not restricted.

Engineer Charles R. Barnes

Engineer Barnes, 51, was employed as a fireman by the Western Pacific Railroad Company on August 24, 1971, and he was promoted to engineer on October 26, 1971. Mr. Barnes passed a company physical on March 21, 1980. He was not restricted. The Western Pacific records did not reveal nor could Barnes remember when he was last examined on the operating rules. Before his Western Pacific employment, Barnes was employed for 13 years as a fireman and engineer by the Atchison, Topeka and Santa Fe Railway Company.

Rear Brakeman Mark E. Shipman

Brakeman Shipman, 30, was employed as a brakeman by the Western Pacific Railroad Company on June 30, 1968, and he was promoted to conductor on January 24, 1972. Shipman passed a physical examination on February 2, 1973, and he was last examined on the operating rules on January 14, 1980. He was not restricted.

Head Brakeman William M. Yarletz

Brakeman Yarletz, 27, was employed as a brakeman by the Western Pacific Railroad Company on August 7, 1978. Yarletz passed a company physical examination on March 14, 1979, and he was last examined on the operating rules on November 27, 1979. He was not restricted.

Extra 3540 West (RBW-9)

Conductor Calvin D. Tillery

Conductor Tillery, 37, was employed as a brakeman by the Western Pacific Railroad Company on October 9, 1970, and he was promoted to conductor on October 25, 1974. Mr. Tillery passed a company physical examination on November 21, 1979, and he was last examined on the operating rules on January 14, 1980. He was not restricted.

Engineer James H. Johnson

Engineer Johnson, 37, was employed as a fireman by the Western Pacific Railroad Company on December 10, 1971, and he was promoted to engineer on March 15, 1972. Mr. Johnson passed a company physical examination on March 2, 1976, and he was last examined on the operating rules on January 14, 1980. He was not restricted. From 1962 to 1970, Johnson was employed as a fireman by the Southern Pacific Transportation Company and the Atchison, Topeka and Santa Fe Railway Company.

Rear Brakeman Harold Grigsby

Brakeman Grigsby, 31, was employed as a brakeman by the Western Pacific Railroad Company on October 10, 1971, and he was promoted to conductor on October 25, 1974. He passed a company physical examination on November 14, 1979, and he was last examined on the operating rules on January 14, 1980. He was not restricted.

Head Brakeman Kenneth E. Niemeyer

Brakeman Niemeyer, 43, was employed as a brakeman by the Western Pacific Railroad Company on April 13, 1959, and he was promoted to conductor on July 25, 1977. Niemeyer passed a company physical examination on February 2, 1979, and he was last examined on the operating rules on November 20, 1979. He was not restricted.

Apprentice Engineer Harvey G. Dopp

Apprentice Engineer Dopp, 36, was employed as a clerk by the Western Pacific Railroad Company on March 5, 1962. On April 17, 1978, he assumed the position of hostler/yard fireman and on September 20, 1979, he was promoted to yard engineer. On January 21, 1980, he entered the WP's 3-year training program for road engineers. Dopp passed a company physical examination on May 6, 1965, and he was last examined on the operating rules on November 21, 1979. He was not restricted.

APPENDIX D

EXCERPTS FROM WESTERN PACIFIC TIMETABLE NO. 5

FIRST SUBDIVISION

EASTWARD ↓ ↑ WESTWARD

Miles from Oakland	Station Numbers	Mile Post	TIME TABLE NO. 5 STATIONS RULE 6-A		Sidings in Feet	Miles from Stockton
				TO BKFYPO		
.0	5	4.7	OAKLAND (YL)			87.3
			1.1			
1.1	6	5.8	SP CROSSING (Magnolia)			86.2
			0.1			
1.2	6	5.9	CHESTNUT JCT. (SP Conn.)	P		86.1
			1.3			
2.5	7	7.2	OAK ST. (SP X'ing.)	P		84.8
			0.5			
3.0	8	7.7	CLINTON			84.3
			1.9			
4.9	10	9.6	FRUITVALE	P		82.4
			1.0			
5.9	11	10.6	MELROSE (SP X'ing.)	P		81.4
			0.7			
6.6	12	11.3	KOHLER	P	3524	80.7
			2.4			
9.0	14	13.7	ELMHURST (SP X'ing.)	P		78.3
			6.4			
15.4	20	20.1	HAYWARD	BP	6922	71.9
			9.6			
25.0	30	29.7	FREMONT	P	4042	62.3
			0.6			
25.6	31	30.3	NILES TOWER (SP X'ing.)	YP		61.7
			0.2			
25.8	31	30.5	NILES JUNCTION	P		61.5
			7.6			
33.4	39	38.1	HEARST	AP	4423	53.9
			4.6			
38.0	43	42.7	RADUM (SP X'ing.)	A		49.3
			0.27			
38.27	43	42.97	RADUM (SP X'ing.)	P		49.03
			4.03			
43.3	47	47.0	LIVERMORE	P	4117	45.0
			9.2			
51.5	56	56.2	ALTAMONT	P	6560	35.8
			7.1			
58.6	63	63.3	MIDWAY	YP	5518	28.7
			9.1			
68.1	73	72.6	TRACY	A	10692	19.2
			1.25			
69.35	74	74.06	SP CROSSING (Lyoth)	P		17.95
			8.05			
77.4	82	82.1	WYCHE		5595	9.9
			2.35			
79.75	84	84.45	SP CROSSING (Lathrop)			7.55
			7.55	TO YBKFTPO		
87.3	93	92.0	STOCKTON (Yard)			0.0

Double Track Chestnut Jct. to Clinton.
Traffic Control System in effect Clinton to Stockton Yard inclusive. See Rule 540.

MAXIMUM SPEEDS IN MILES PER HOUR Between	OMW, GGV, B-PBF, TOF, COFC, and Other Designated, Not Over 70 Cars, Not Over 90 Tons Per Operative Brake	1 Trains Not Exceeding 100 Cars or 5000 Tons	2 Trains Exceeding 100 Cars or 5000 Tons
First Subdivision			
Chestnut Jct. and SP Crossing MP 7.2	15	15	15
Over SP Crossing MP 7.2	10	10	10
SP Crossing MP 7.2 and MP 7.7 Clinton	15	15	15
MP 7.7 Clinton and SP Crossing MP 10.6	20	20	20
SP Crossing MP 10.6 and MP 15.2 Williams St. San Leandro	35	35	35
MP 15.2 Williams St. San Leandro and MP 23.93	60	60	50
MP 23.93 and MP 24.8	60	45	35
MP 24.8 and MP 29.25	60	60	50
MP 29.25 and MP 32.0	40	40	30
MP 32.0 and MP 33.0	25	25	25
MP 33.0 and MP 34.4	40	40	30
MP 34.4 and MP 38.8 curve at SP underpass	45	45	35
MP 38.8 and MP 52.3	45	45	45
MP 52.3 and MP 58.2	40	40	30
MP 58.2 and MP 67.0	45	45	35
MP 67.0 and MP 74.05 SP Crossing	60	50	50
Over MP 74.05 SP Crossing	50	50	50
MP 74.05 SP Crossing and MP 84.45 SP Crossing	60	50	50
Over MP 84.45 SP Crossing	30	30	30
MP 84.45 SP Crossing and MP 90.4	60	50	50
MP 90.4 and MP 90.85	45	45	35
MP 90.85 and MP 94.2	20	20	20
Other Tracks	10	10	10

RULE 10-J. Where two speeds are shown on speed control boards, higher speed will be that authorized by column headed OMW, GGV, B-PBF, TOF, COFC, etc., and the other, Column 1.

Trains approaching interlocked crossings must reduce to speed shown before engine passes home signal.

On curves speed will be reduced below the maximum or restrictions provided, where necessary, on all Subdivisions and branches, to insure safety.

Southern Pacific Trains handling empty cars, do not exceed 55 MPH on WP track. Caboose will qualify as a load.

Southern Pacific Trains handling *mty.* bulkhead flats, do not exceed 45 MPH.

Southern Pacific Trains not authorized Column 1 speed on Southern Pacific by Southern Pacific Train Order are restricted on Western Pacific to a maximum speed of 55 MPH.

Southern Pacific Trains designated as RVOGP, OAOGF and RVNPP are permitted to operate at speeds shown in column headed "OMW, GGV, B-PBF, TOF, COFC and other designated" when they qualify with conditions in column heading, subject to other applicable speed restrictions.

Southern Pacific trains with UP units 3123 through 3599, do not exceed 50 MPH.

B-PBF is not authorized speeds shown in column headed OMW, GGV, B-PBF, TOF, COFC, etc., when it is consolidated with other trains including S-PBF.

APPENDIX E

SPEED RECORDER TAPE REMOVED FROM THE LOCOMOTIVE OF RBW-9