

REPORT: FE-31-97

RAILROAD: National Railroad Passenger Corporation (ATK)

LOCATION: Concord, Massachusetts

DATE, TIME: Oct. 10, 1997; 12:01 p.m., EST

PROBABLE CAUSE: The Track Crew used a procedure not provided for in the carrier's operating or safety rules to foul the track.

POSSIBLE CONTRIBUTING FACTOR:

The incomplete communication between the Track Foreman and the Inspection Foreman holding the movement authority on the affected track.

EMPLOYEE:

Craft..... MOW

Activity..... Track maintenance: adding rubber panels to the east edge of a highway-rail grade crossing.

Occupation..... Machine Operator

Age..... 51 years

Length of Service..... 27 years

Last Rules Training..... May 20, 1997

Last Safety Training..... March 25, 1997

Last Physical Examination..... No Record

Circumstances Prior to the Accident

Location Description

The accident occurred at milepost 20.0 on Track No. 1 of the Fitchburg Route Main Line in Concord, MA. There were two tracks at milepost 20.0 numbered 1 and 2, north to south. Both were signaled for traffic in one direction (NORAC Rule 251) as established by ATK New England Division Commuter Lines Timetable Number 7, effective July 28, 1997. The normal direction of traffic was westbound on Track No. 1 and eastbound on Track No. 2. The maximum authorized speed for passenger trains on the Fitchburg Route Main Line was 60 mph. There was

a permanent speed restriction of 40 mph between milepost 19.80 and milepost 20.30 on Track No. 1.

ATK provides commuter rail service under contract to the Massachusetts Bay Transportation Authority on the Fitchburg Route Main Line.

Track Maintenance Crew

On Oct. 10, 1997, an ATK Track Crew reported for duty at 7:30 a.m. at Fitchburg Yard, Fitchburg, MA. The Crew comprised a Foreman, Machine Operator, and a Trackman. Normally, this Crew had two additional Laborers, who were absent on the day of the accident.

When the Track Foreman had talked with the Roadmaster-In-Charge at approximately 7:30 a.m. by telephone, he received instructions to add rubber panels to the east edge of the Sudbury Road highway-rail grade crossing in Concord. The panels were being installed because the town of Concord was improving the sidewalk along the east edge of Sudbury Road in the vicinity of the crossing.

After discussing the work activities to be performed, the Track Foreman and Laborer departed for Concord. The Machine Operator departed independently to deliver a roadway maintenance machine to the site on a flatbed trailer truck. The machine was a "Swingmaster," a payload-like device used in many types of work activities. The Swingmaster has various attachments, including a digging bucket and forks, which were used in this sequence at the work site.

The Track Foreman was under the impression that an ATK Construction Supervisor was to meet him at the site for additional instructions. Upon arrival at the site, the Track Foreman did not see a railroad Construction Supervisor. The Track Foreman, however, found at the site a Civil Engineer, employed by the town of Concord, who discussed the details of the project.

After discussing the project with the town Engineer, the Track Foreman contacted the Waltham, MA Tower Train Director by radio to obtain foul time. The Train Director, after authorization from the Boston West Train Dispatcher, issued foul time on both tracks at Concord at approximately 10:35 a.m. The Track Foreman initiated the radio communication on ATK Road Channel 2. Due to congestion on this channel, the Waltham Tower Train Director and Track Foreman switched to Engineering Channel 6. All radio communication from this point forward between the Track Foreman and Train Director occurred on Engineering Channel 6, which was not recorded.

At approximately 11 a.m., the foul time was released to allow eastbound trains to operate through the area on Track No. 2. At the same time, foul time was re-issued to the Track Foreman to continue work on Track No. 1. At approximately 11:33 a.m., the Track Foreman relinquished

the foul time on Track No. 1. At this point, the Swingmaster was clear of the track, and the

Swingmaster Operator replaced the digging bucket on the machine with forks.

Inspection and Repair Foreman and Assistant

An Inspection and Repair (I&R) Foreman and an Assistant reported for duty at West Concord, MA at 7:30 a.m. The I&R Foreman called the Roadmaster and discussed the itinerary for the day, which was to inspect the Fitchburg Route Main Line from Somerville, MA to South Acton, MA. They departed West Concord and drove by highway to Somerville.

The I&R Foreman and his Assistant began their hi-rail track inspection (patrol) in Somerville and upon arrival at Waltham (milepost 9.90), they cleared their hi-rail pickup truck off the main track by operating it onto the Bemis Industrial Track.

Both the I&R Foreman and his Assistant departed the truck at approximately 11:30 a.m. and walked up into the tower to obtain a movement authority (Form D) to continue patrolling west beyond Waltham. At 11:47 a.m., the I&R Foreman had obtained a movement authority directly from the Waltham Tower Operator by physically visiting the structure. The authority was a Form D issued by the Boston West Train Dispatcher and delivered to the I&R Foreman via the Waltham Tower Train Director. The movement authority included line two information for operation in the westward direction between Waltham and South Acton. The authority also included line three information that indicated Train 421 (Engine 1028) was ahead.

While in the tower, the I&R Foreman briefly discussed the work activity occurring at milepost 20.0. According to various statements, the I&R Foreman indicated to the Waltham Tower Train Director that it was acceptable for the Foreman working at Concord to “work with him up country.”

After the passage of Train 421, the I&R Foreman and his Assistant departed the tower and returned to their vehicle. The vehicle was operated back into Waltham Interlocking by verbal permission from the Waltham Tower Train Director. The patrol vehicle cleared west of Waltham Interlocking onto Track No. 1 at approximately 11:50 a.m.

Waltham Tower Train Director

After having received the required statutory off-duty period, the Train Director and a Trainee began their tour of duty at 7 a.m. at Waltham Tower (milepost 9.9) in Waltham. The Train Director communicated with the Boston West Train Dispatcher throughout the morning by block line phone and relayed foul time via radio to the Track Foreman who was working at Sudbury Road (milepost 20.0). The Student Operator, under the direct supervision of the regular Train Director, manipulated the Waltham Tower control devices throughout the morning.

At approximately 11:35 a.m., the Student Train Director departed Waltham Tower to take a lunch break. Subsequent to that time, the Train Director conducted all activities in Waltham Tower.

Train 421

After having received the required statutory off-duty period, the Crew of the passenger train, comprising an Engineer, Conductor, and Assistant Conductor, reported for duty at Fitchburg, MA at 4:55 a.m. on Oct. 10, 1997. Prior to changing the train's number from 420 to 421, the Crew had operated one eastbound train into Boston, MA and one round trip between Boston and South Acton.

Train 421, operating in push/pull service, comprised a diesel electric locomotive on the front of the train (Engine 1028), five coaches (Nos. 1600, 1606, 1613, 355, and 504), and a cab control car (No. 1650) on the rear.

Train 421 originated in North Boston Station at 11:20 a.m., and the Crew took no exceptions to the equipment at any time prior to the accident.

Train 421 passed Waltham Interlocking at 11:41 p.m.

Weather conditions included a clear sky and a temperature of 70° F.

The Accident

At approximately 11:50 a.m., the Waltham Tower Train Director initiated a radio call to the Track Foreman at Sudbury Road on Engineering Channel 6. The Tower Operator, according to his statements, informed the Track Foreman that it was acceptable to *work with the I&R Foreman* holding the movement authority on Track No. 1 to foul that track. The Track Foreman at Sudbury Road, according to his statements, understood that this communication implied that it was acceptable to immediately foul the track. There was no direct communication or relay between the I&R Foreman and the Foreman at Sudbury Road. The I&R Foreman, while patrolling west on Track No. 1, was monitoring Road Channel 2 during this period.

During this period, the Roadmaster in charge of the Work Crew arrived at the site. The Roadmaster got out of his truck and told the Track Foreman that the Train Director was calling him on the radio. After this point, the Roadmaster was out of his vehicle; he did not hear the subsequent communication between the Track Foreman and Train Director about using the I&R Foreman's movement authority to foul Track No. 1. At approximately 11:52 a.m., the Track Foreman at Sudbury Road directed the Swingmaster Operator to foul Track No. 1 to install new crossing panels.

As Train 421 entered the beginning of the curve at milepost 19.80, the Engineer had already

initiated a service reduction of the train brake to reduce the train speed to the required civil speed of 40 mph at milepost 19.80 and in anticipation of making a scheduled stop at Concord station at milepost 20.10. As the train entered the curve and the Swingmaster came into view, approximately 735 feet from the point of impact, the Engineer began sounding the locomotive horn. He then placed the locomotive automatic brake valve into the emergency position.

Based on subsequent analysis of the locomotive event recorder information, the brake valve was placed into the emergency position 404 feet east of the point of impact at a speed of approximately 43 mph, giving the Operator approximately five seconds to respond. The speed of the train at the point of impact was approximately 30 mph.

At the crossing, the Track Foreman, Track Laborer, and the Roadmaster heard and saw Train 421 approaching. The personnel on the ground shouted to the Swingmaster Operator to jump off of the machine. All personnel on the ground cleared the track prior to impact. At 12:01 p.m., Train 421 struck the Swingmaster, which was shoved down the track approximately 172 feet and thrown across Track No. 2. Train 421 stopped 335 feet west of the point of impact, which was approximately 400 feet east of the point where the locomotive otherwise would have been positioned for a regular stop at Concord station.

The Engineer of Train 421 initiated an emergency radio call immediately after the impact, and he informed the Train Dispatcher of the situation. The Train Dispatcher contacted a Boston and Maine Railroad extra freight train, which was located west of the area and operating eastbound on Track No. 2. The freight train was brought to a safe stop approximately one mile west of the accident site.

The ATK employees at the site attempted to assist the Machine Operator. The Roadmaster called for local medical assistance immediately after it was determined that the Operator had been crushed under the operating compartment of the Swingmaster. At 2:07 p.m., the local Medical Examiner pronounced the Swingmaster Operator dead at the scene.

The I&R Foreman was in the vicinity of milepost 12 when the accident occurred and he heard the radio emergency communications originating from the accident site. The Train Dispatcher contacted the I&R Foreman and directed him to clear the track in Lincoln, MA (Milepost 16.7).

(Please see the attached diagrams of the Fitchburg Route Main Line in Concord, Massachusetts, to better visualize the accident scene and the chain of events that led up to the fatality.)

Post-Accident Investigation

Post-Accident Toxicological Test

Post-accident toxicological tests under FRA authority were performed on the Train Crew (Engineer, Conductor, and Assistant Conductor), Train Director, Train Director Trainee, Boston West Train Dispatcher, and the deceased Swingmaster Operator. The Track Foreman at Sudbury Road, the I&R Foreman, and the Assistant I&R Foreman were tested under ATK's authority. The results of the post-accident toxicological tests for all individuals were negative for drugs and alcohol.

Sudbury Road Highway-Rail Grade Crossing

Sudbury Road was a 2-lane municipal thoroughfare extending through the central commercial area of Concord. Active warning devices at the crossing included flashing lights and gates. Due to a local whistle ban ordinance, engine whistles were not sounded in either direction approaching the crossing, unless an emergency situation occurred. The crossing surface was constructed with full depth rubber panels.

ATK conducted a test of the relays of the automatic warning devices associated with Sudbury Road on the day of the accident and again on Oct. 11, 1997. No exceptions were noted. Witness statements by motorists in the area confirmed that warning devices were functioning at the time of the accident.

Track Characteristics

Track No. 1 in the vicinity of the accident comprised 115 RE jointed rail. The geometry in the vicinity of the accident included a 3-degree, 20-minute curve to the left as viewed from the operating compartment of a westbound train. The sight distance was determined to be 725 feet in advance of the point of impact. There was a 0.66 percent sustained descending grade for 1.2 miles that westbound trains negotiated while approaching milepost 20.

Train 421 Equipment

The lead locomotive of Train 421 at the time of the accident was a 3000 horsepower, F40 PHM diesel-electric type manufactured by the Electromotive Division of General Motors in 1991. The locomotive suffered virtually no damage as a result of the collision.

The railroad reported that the maintenance history of Locomotive 1028 indicated no problems. The railroad gave special attention to defects that could have affected braking effort and warning devices. No exceptions were noted.

The event recorder on Locomotive 1028 was found to be out of calibration which resulted in deviations from the actual speed. For example, when a speed of 60 mph appeared on the speedometer, the speed event recorder showed 69 mph, while the actual speed was 66 mph. When a speed of 40 mph appeared on the speedometer, the speed event recorder showed 47 mph, and the actual speed was 45 mph.

Because of the problems with the event recorder of Engine 1028, data from the control car event recorder at the rear of the train were also obtained to provide additional information for the post-accident analysis.

Swingmaster

The machine used at the accident site was a Swingmaster Model 181. The machine was a device similar to a payloader with a rotating arm that could be used with various attachments. Swingmaster Corporation, located in Elmhurst, Illinois, manufactured the Model 181. The unit involved in the accident was assigned the number T47944 and weighed approximately 23,000 pounds.

The Swingmaster had retractable steel rail wheels that enabled it to travel on the track or highway. On the day of the accident, the Swingmaster was not placed directly on the rails. It was positioned with its rubber tires straddling the rails of the track.

In documents obtained from the railroad, it was revealed that Swingmaster T47944 had a few minor mechanical defects. However, none of the defects were severe enough to make it necessary to remove the machine from service. In addition, the defects did not have any bearing on the accident.

As a result of the collision with Train 421, Swingmaster T47944 received significant damage. The damage to the unit consisted of the following:

- Left and right doors missing;
- Rear frame severely twisted;
- Engine pushed forward and to the right;
- External damage to the cab, with the internal part of the cab intact;
- Front and both rear windows smashed; and
- The backrest of the Operator's seat bent back and sticking out of the cab by five inches.

At the time of the accident, the Swingmaster was facing west while straddling the rails of Track No. 1. The train struck the machine in the rear, and it was shoved down the track, then thrown across Track No. 2. When it came to a rest, the machine was on its side approximately 180 degrees from its original position and was fouling Track No. 2.

ATK documents indicated that the Swingmaster Operator was not using the seat belts. They were found latched at the rear of the seat. ATK documents further indicated that seat belts were not used because they bothered the Operator when the machine was traveling. This was due to the limited shock absorbing capability of the seat assembly.

ATK also noted that the Operator may have been delayed in departing the machine due to the configuration of the seat. A seat with armrests was installed in Swingmaster T47944. The Operator had to lift the armrests to depart the cab, which may have increased the time it took the Operator to attempt to depart the cab of the machine upon the approach of Train 421.

Communication Procedures

As determined by interviews with personnel associated with the accident, the critical radio communications immediately prior to the accident occurred on Engineering Channel 6. This was confirmed by the lack of recorded radio conversation between the Track Foreman at Sudbury Road and the Waltham Tower Train Director.

An ATK memorandum dated March 8, 1990 stated that “All information governing permission to use track (foul time, movements via signal indication within interlockings, and form “D” permits) will be issued on the Road Radio Channel.” This memorandum listed various operational locations, including Waltham Tower, as places where the document was posted.

Communication Equipment

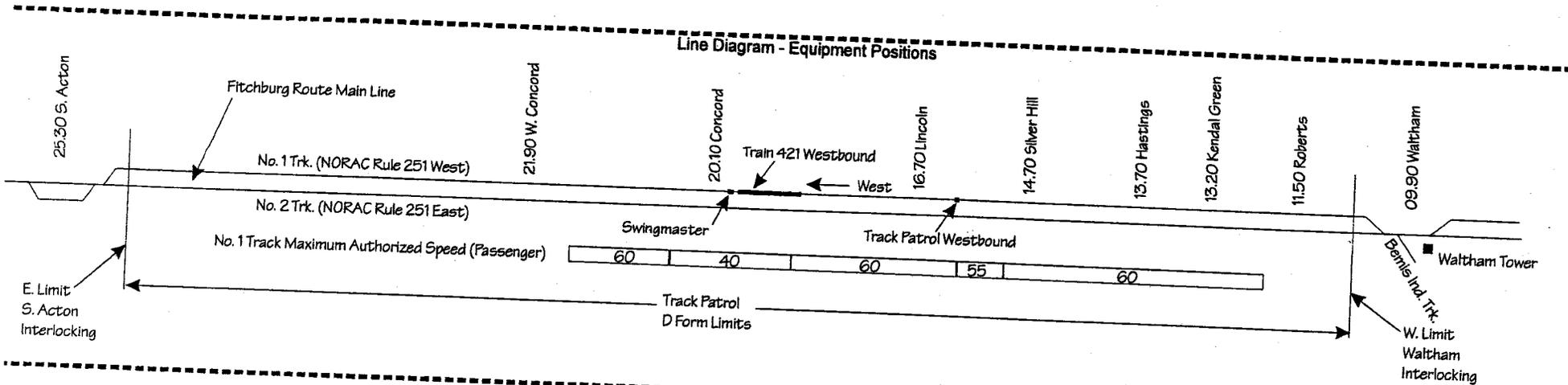
ATK conducted tests of radio equipment at the following locations associated with the accident:

- Locomotive 1020;
- Swingmaster T47944;
- Hi-rail pickup 27383 (I&R patrol);
- Pickup truck (with the capacity for six people); and
- Waltham Tower.

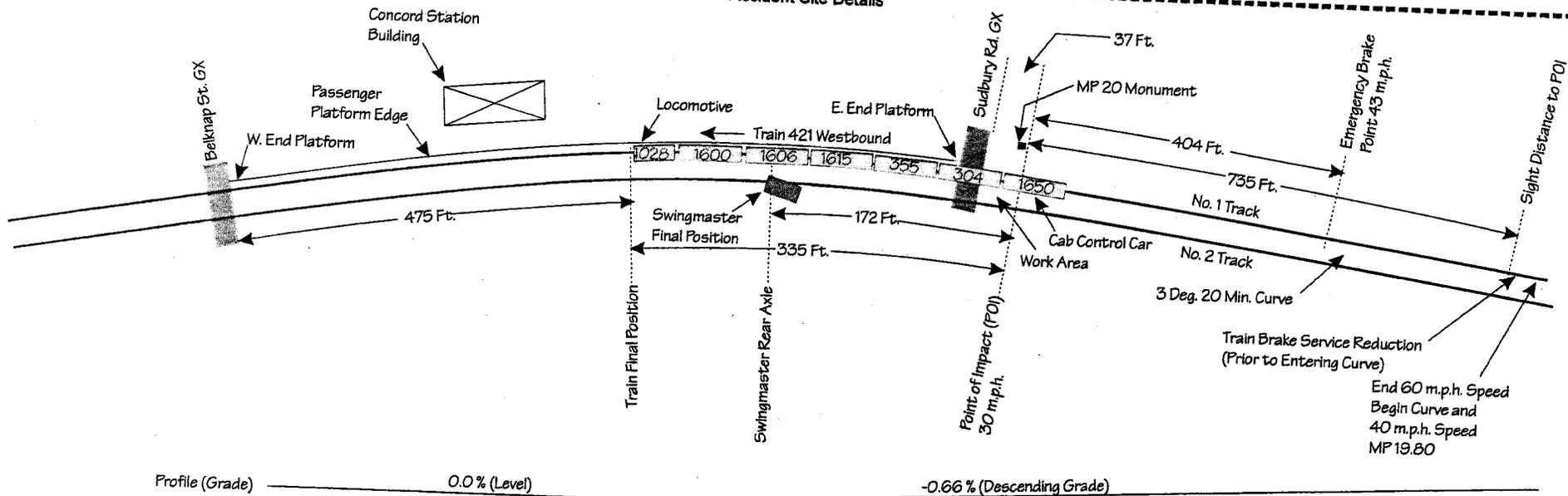
Tests of the above equipment included analysis of 2-way transmission on the Road Channel 2 and Engineering Channel 6. No exceptions were taken as the equipment met or exceeded the manufacturer’s performance specifications.

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Line Diagram - Equipment Positions



Accident Site Details



Profile (Grade) 0.0% (Level)

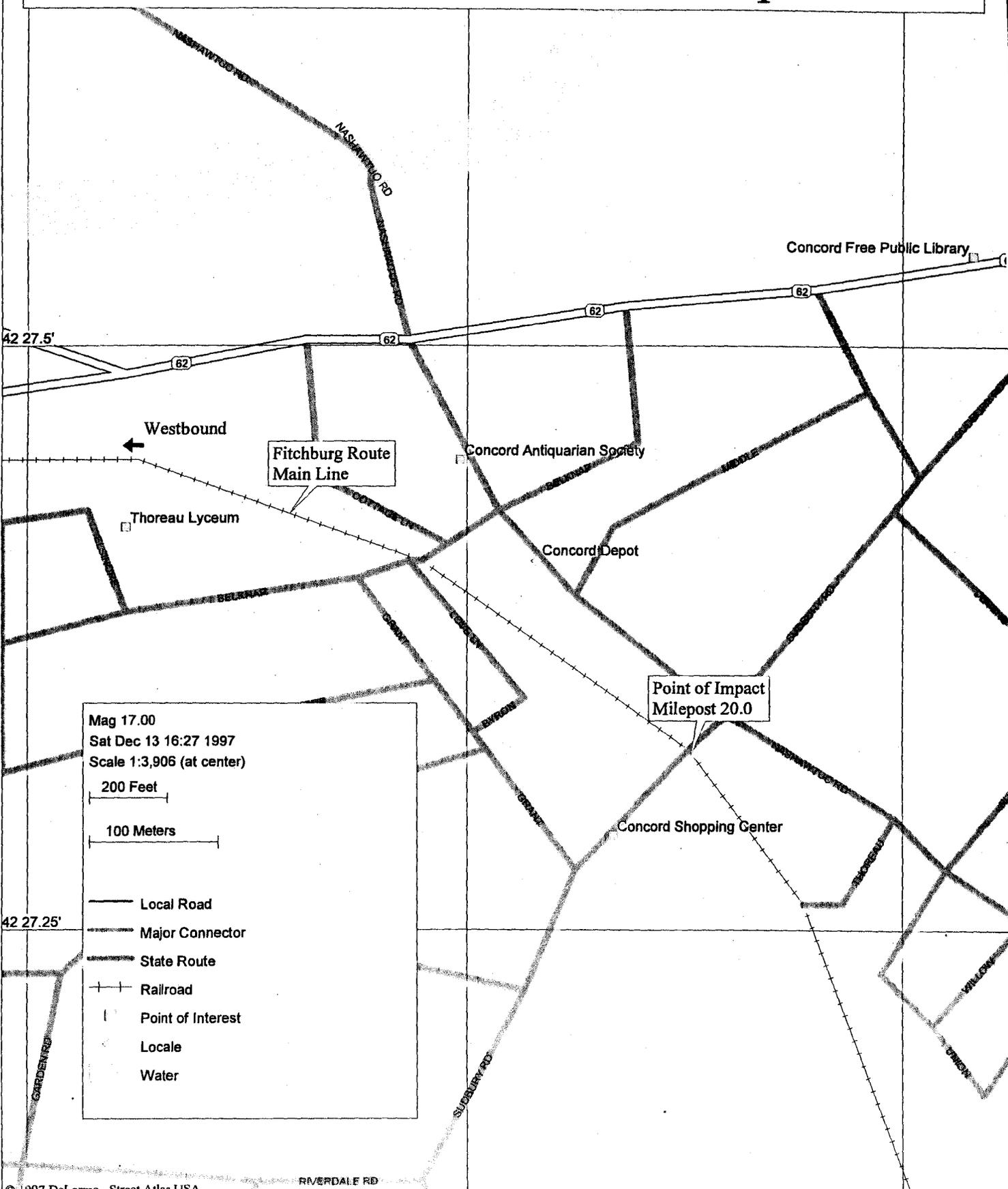
-0.66% (Descending Grade)



FEDERAL RAILROAD ADMINISTRATION
ACCIDENT FE-31-97
CONCORD, MA 10/10/97 12:01 P.M.
NOT TO SCALE



FE-31-97 Local Area Map



Mag 17.00
 Sat Dec 13 16:27 1997
 Scale 1:3,906 (at center)

200 Feet

100 Meters

- Local Road
- Major Connector
- State Route
- + + Railroad
- Point of Interest
- ◁ Locale
- ◊ Water