MONON STUDY

ENGINEERING REPORT

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Consulting Engineers:

Reid, Quebe, Allison, Wilcox & Associates, Inc.

Indianapolis, Indiana

WILLIAM - LYNN - JAMES, INC.

MONON

THE HOOSIER LINE

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EXECUTIVE SUMMARY

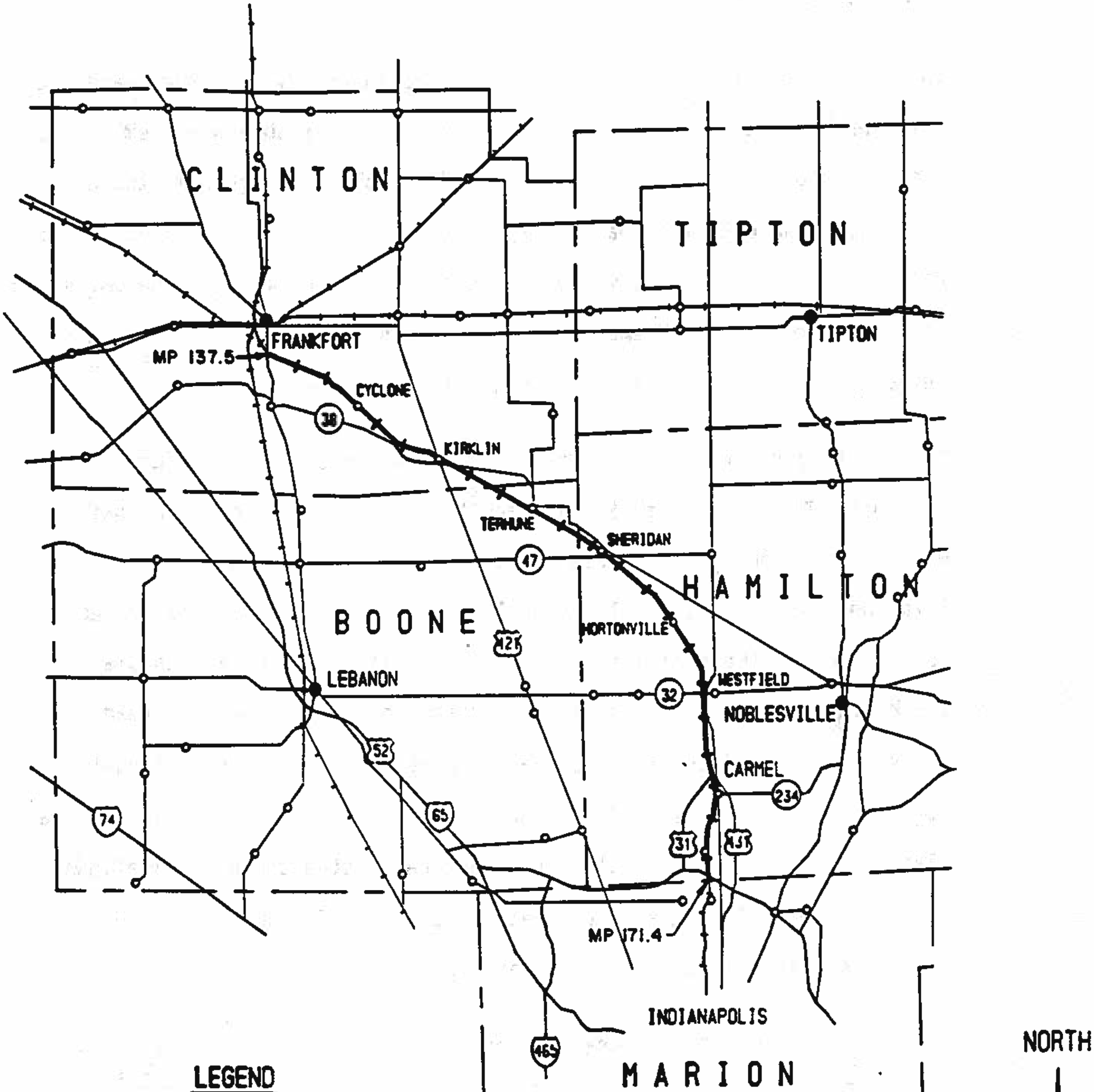
EXECUTIVE SUMMARY

This report describes results of an engineering study to inspect and estimate rehabilitation and maintenance costs for the Seaboard System Railroad (Monon) trackage from 96th Street in Indianapolis (Marion-Hamilton County Line) to Frankfort, Indiana. A map of the study area is included in this report as Exhibit 1. Estimation of construction and maintenance costs for constructing a guided busway over the existing railroad tracks was also included in this study as a possible future alternative.

The existing railroad tracks, turnouts, road crossings and bridges between milepost (MP) 171.4 (96th Street) and MP 137.5 (south side of Frankfort) were field inspected to assess existing conditions and to prepare rehabilitation cost estimates. In general, the existing trackage is suitable for its current Federal Railroad Administration (FRA) rating as Class 1 track after removal of weeds and brush and some repair work at road crossings north of Sheridan, Indiana. However, a significant amount of rehabilitation work is needed to upgrade the entire length of track to a Class 2 or 3 rating. The class of track designates the maximum allowable operating speed limit based on track condition. The operating speed limits for Class 1, 2 and 3 track are as follows:

Class	Max. Operating Speed for Freight Trains	Max. Operating Speed for Passenger Trains
1	10 miles per hour (mph)	15 mph
2	25 mph	30 mph
3	40 mph	60 mph

Track rehabilitation and maintenance cost estimates were prepared in this study for upgrading the trackage and bridges to the following 3 alternative operation levels:



LEGEND

OLD MONON TRACKAGE IN STUDY AREA

RAILROAD TRACKAGE OUTSIDE OF STUDY AREA

SCALE : 1" = 6.6 MILES

EXHIBIT NO. 1
STUDY AREA MAP

RQAW

1. FRA Class 2 track safety standards for freight and occasional passenger service at a maximum speed of 25 mph.

2. FRA Class 3 track standards to provide for mixed commuter service/freight operations with operating speeds between 31 and 40 mph.

3. FRA Class 3 track standards to provide for mixed commuter service/freight operations with operating speeds up to 60 mph for trackage between MP 171.4 and MP 163.0 and operating speeds between 31 and 40 mph for trackage between MP 163.0 and MP 137.5.

A summary of estimated track and bridge rehabilitation costs for the 3 alternative operation levels appears in Table 1 of this report. Rehabilitation costs listed in Table 1 are in terms of current dollars and are based upon unit costs and recommendations obtained from a local short line railroad company and signal contractor.

TABLE 1

SUMMARY OF ESTIMATED REHABILITATION COSTS

Operation Alternative	Track Rehabilitation Track	Track Rehabilitation Crossings	Track Rehabilitation Signal	Bridge Repair	Total Rehab Cost
Class 2	$2,658,000	$1,002,000	0	$79,000	$3,739,000
Class 3 (40 mph)	$2,912,000	$1,341,000	$2,265,000	$79,000	$6,597,000
Class 3 (60/40 mph)	$4,275,000	$1,592,000	$2,265,000	$79,000	$8,211,000

Additional construction costs that need to be considered for the selected operation alternatives are: 1) an approximate current cost of $250,000 to construct a locomotive and car maintenance facility; and, 2) an approximate current cost of $240,000 per passenger station built for commuter service. Note that none of the these costs or the costs in Table 1 include engineering and/or architectural fees.

Annual track and bridge maintenance costs for operation of the trackage after rehabilitation by a short line railroad company were estimated to be approximately $5,000 per mile in current dollars. (Approximately $2,500 per mile for direct labor and materials costs plus $2,500 per mile for administrative, overhead and miscellaneous costs.) For 33.9 miles of main track and 2.1 miles of storage siding tracks, the annual current maintenance cost would be about $180,000.

In order to maintain the trackage in optimum working condition, additional capital expenditures on the average of about every 10 years for track and every 20 years for bridges can be expected. These future expenditures were estimated for the track length considered in this study to be approximately $2,940,000 for track work and $57,000 for bridge work in current dollars. In addition, recommendations are made for replacing three of the six existing bridges, replacing the substructure of a fourth bridge and replacing the wingwalls of a fifth bridge within the next 20 years for an estimated current construction cost of approximately $1,090,000.

Finally, costs were estimated for constructing and maintaining a guided busway over the existing trackage between 16th Street in Indianapolis and the old depot in Carmel. Construction and maintenance cost estimates made in this study for a guided busway were based upon data for a demonstration project in Essen, Germany. The estimated current construction cost for the proposed guideway length in addition to track rehabilitation work is approximately $7,800,000. Projected maintenance costs for just the guideway would be approximately $39,000 per year.

If the construction cost for a guided busway is judged to be excessive, another suggested alternative to consider is the railbus. That alternative would not involve any special construction after track rehabilitation and would only involve an additional expenditure for the railbuses. The cost for railbuses is about one-half the price of comparable commuter train equipment.

CHAPTER I
INTRODUCITON

I. INTRODUCTION (Engineering Report)

This report addresses results of an engineering study as prepared by Reid, Quebe, Allison, Wilcox & Associates, Inc. (RQAW) to perform engineering inspection and cost estimation work for rehabilitation of the Seaboard System Railroad (Monon) trackage between 96th Street in Indianapolis (Marion-Hamilton County Line) and Frankfort, Indiana. The engineering study prepared by RQAW is a part of the overall Monon Economic Impact Study. RQAW is an Indianapolis based, multidiscipline consulting firm with capabilities in transportation, structural, environmental, civil, mechanical, and electrical engineering plus architecture. The firm was established in 1954.

Material in this report supplements a report previously prepared in 1984 by Howard, Needles, Tammen & Bergendoff (HNTB) that was entitled "Engineering Reconnaissance Study of the Monon Railroad for Potential Commuter Rail Service". That study provided an assessment of the existing condition and rehabilitation cost estimates for the Monon Railroad trackage between 16th Street and 96th Street in Indianapolis (MP 181.2 to MP 171.4).

The purpose of this engineering study was to assess the existing track condition and to estimate rehabilitation costs for the Monon Railroad trackage between 96th Street in Indianapolis (MP 171.4) and the abandonment stop sign located on the tracks on the south side of Frankfort, Indiana (approximate MP 137.5). This report also provides a preliminary cost estimate for constructing a guided busway over the existing trackage between Carmel, Indiana and downtown Indianapolis to make it suitable for operating mechanically guided buses over the trackage.

The order of discussion for items included in this report is as follows:

1. Inspection of the existing trackage between MP's 171.4 and 137.5.
2. Cost estimates to rehabilitate the section of trackage between MP's 171.4 and 137.5.
3. Inspection results and rehabilitation cost estimates for bridges along the section of railroad trackage between MP's 171.4 and 137.5.
4. Miscellaneous estimates of costs to construct facilities for operation of a short line railroad and commuter traffic.
5. Estimated annual maintenance costs for the railroad tracks and bridges after rehabilitation along with projected future capital expenditures for track repair.
6. A summary of technical investigation results for a guided busway and preliminary cost estimates for installation and maintenance of a guided busway system.

CHAPTER II
EXISTING TRACK CONDITION

II. EXISTING TRACK CONDITION

General

Current traffic over the trackage within the limits of this study is very light, being limited to occasional excursion traffic and freight train operations by the Indiana Hi-Rail Corporation. The trackage being studied is owned by the Seaboard System Railroad which has recently leased the trackage between downtown Indianapolis and Sheridan, Indiana to the Monon Shippers Association (MSA).

At one time the track length under study was a main line for the Monon Railroad. However, for at least the last 20 years the length of track has served as a branch line with only a light amount of freight traffic. The light traffic over the trackage has helped preserve it with most of the observed problems being due to deterioration and lack of maintenance over time.

The existing railroad tracks, turnouts and road crossings between MP 171.4 and MP 137.5 were field inspected to assess the existing condition and to enable the development of rehabilitation cost estimates. To facilitate the track inspection, track chart and track book information were obtained from the Seaboard System Railroad. The track charts provide information on rail size, road crossing location, track grades, type of ballast, date of surfacing, degree and location of curves, and bridge locations. The track book provides information on siding tracks which includes turnout location, siding length and industries served. Track chart and track book information are included in this report as Chapters XIII and IX.

Background information on the length of track being studied and expert assistance during inspection work was obtained from Mr. Vaughn Nesbitt. Mr. Nesbitt is a retired track roadmaster from the Seaboard System Railroad and was the roadmaster of the trackage being studied prior to its abandonment by the Seaboard System Railroad in 1985.

Track Inspection Procedure

The trackage was inspected at every or every other milepost to collect information on the track structure, condition, defects and to determine required minimum tie replacement to comply with FRA track safety standards for Class 2 and 3 track. In addition, all turnouts and road crossings were inspected. Typical data collected on turnouts were size, type of frog, general condition and defects. Data collected on each road crossing included type of crossing, type of road, number of tracks, type of rail, length of crossing, type of protection device, condition of crossing and protection device, and defects.

Field data sheets for inspection of the trackage, turnouts and road crossings are included in this report as Part Three, Supplemental Appendices I, II and III.

Track Inspection Results

A summary of the inspection results for the main trackage appears in Table 2 of this report. A review of the track chart and the inspection data reveals that the length of main trackage from 96th Street in Indianapolis (MP 171.4) to the south side of Frankfort, Indiana (MP 137.5) has been constructed with 115, 112, 100 and 90 pound rail. (Rail size is described as the approximate weight of rail per 3-foot long section.)

TABLE 2

SUMMARY OF MAIN TRACK INSPECTION RESULTS

Mile-Post	Gage	Line	Surface (Level)	Rail Size	Rail Cond.	Tie Spacing	% Ties Defect.	Recommended Tie Replacement Per Rail Length 40 MPH	60 MPH	Ballast Cond.	% Ties Plated	% Spikes Loose	Joint Cond.	Number Anchors Per Rail Length	Anchor Cond.	Drainage Cond.	Vegetation Condition
171	56½"	Good	OK	115#/39'	Good	24/39'	29	4	6	Good	100	----	Good	12	Good	Good	OK, recently cut & sprayed
170	56½"	OK	OK	112#/39'	Good	24/39'	38	4	6	OK	100	25	Good	12	Good	Good	Trim trees back, recently sprayed
169	56½"	OK	OK	100#/39'	Good	24/39'	58	5	8	Good	96	25	Good	8	OK	Good	Clear brush back
168	56-5/8"	OK	OK	112#/39'	Good	24/39'	42	4	6	Good	100	20	Good	12	OK	OK	Weed growth
167	56-3/8"	OK	OK	100#/39'	Good	24/39'	62	4	7	Good	100	90	Good	12	OK	OK	OK
165	56-3/8"	OK	OK	112#/39'	Good	24/39'	17	1	3	Good	100	48	Good	4	Good	OK	OK
163	56-5/8"	OK	OK	112#/39'	Good	24/39'	38	2	5	Good	96	48	Good	6	OK	OK	OK on main
161	56½"	OK	OK	112#/39'	Good	24/39'	29	2	3	Good	100	58	1 loose nut	8	OK	Good	Weeds along ballast edge
159	56-3/4"	OK	OK	100#/39'	OK	24/39'	25	1	3	Good	100	56	OK (broken bond)	12	Good	Good	Weeds
157	56-3/4"	OK	OK	100#/39'	Good	23/39'	57	5	8	Fair	100	87	Good	11	OK	Good	Weeds & some brush
155	56-3/8"	OK	-----	112#/39'	OK	23/39'	65	5	8	Fair	87 (3 fell off)	67	OK	9	Some loose	OK	Short weeds
153	56½"	OK	Fair, Jt. 1" down	100#/39'	OK	24/39'	54	5	8	Fair	100	73	OK	10	OK	Good	Weeds & brush @ ballast edges

TABLE 2 (Continued)

Mile-Post	Gage	Line	Surface (Level)	Rail Size	Rail Cond.	Tie Spacing	% Ties Defect.	Recommended Tie Replacement Per Rail Length 40 MPH	60 MPH	Ballast Cond.	% Ties Plated	% Spikes Loose	Joint Cond.	Number Anchors Per Rail Length	Anchor Cond.	Drainage Cond.	Vegetation Condition
151	56-5/8"	OK	Unlevel @ bad joint	100#/39'	Good	24/39'	58	5	8	Good	100	56	loose bolt	14	Good	Good	High weeds on both sides of ballast
149	56½"	Good	Good	100#/39'	Good	25/39'	68	6	10	Fair	100	76	Good	10	Good	Good	Weeds & some brush on both sides of ballast
147	56½"	Good	Drop @ joint	100#/39'	Good	25/39'	60	5	8	Good	100	70	Good	11	Good	Fair	Weeds
145	56-3/8"	OK	OK	100#/ welded	Good	22/36'	45	5 (per 36')	8	Good	100	73	-----	2 every other tie	Good	Good	Weeds & some brush
143	56-3/4"	OK	Fair	100#/ welded	Good	22/36'	45	6 (per 36')	8	Good	100	61	-----	2 every other tie	skewed rein-stall	Good	High weeds & brush
141	56-3/8"	Fair	Fair	90#/33'	Fair	19/33'	47	4 (per 33')	--	Good	100	63	Good	None	----	Good	Weeds & brush brush
139	56½"	Fair	Bad	90#/33'	Fair	19/33'	37	3 (for 33')	6	Good	100	100	Loose nuts	None	----	Good	Weeds & brush along ballast edges
138	56-1/8"	Bad	Bad	100#/39'	Fair	25/39'	80	8	12	Good	100	94	Loose nuts	12	Some loose	Good	Weeds & brush along ballast edges

SPIKES LOOSE ODD AVG = 65.7

ANCHORS ODD AVG EXCEPT FOR 90 # RAIL & CWR = 9.8

The 115 pound rail has 6-hole straight angle bar joints and rests on 7-3/4" x 13" double shoulder tie plates. The 112 pound rail has 6-hole and 4-hole straight angle bar joints and rests on 7-3/4" x 13" double shoulder and 7" x 10" single shoulder tie plates. The 100 pound rail has 4-hole straight angle bar joints or is continuously welded (CW) and rests on 7" x 10" single shoulder tie plates. (Jointed rail generally has a joint every 39 feet while CW rail has 36-foot rail sections welded together for a continuous length.) The 90 pound rail has 4-hole straight angle bar joints and rests on 7" x 10" single shoulder composite type tie plates. Only about 20 percent of the joints were found to have loose bolts and all the crossties are plated except where plates have worked their way off defective crossties.

Limits of the rail sizes for the main track length studied are approximately as follows:

MP 171.40 to 170.23 - 1.17 miles of 115# rail
MP 170.23 to 169.45 - 0.78 miles of 112# rail
MP 169.45 to 168.58 - 0.87 miles of 100# rail
MP 168.58 to 167.29 - 1.29 miles of 112# rail
MP 167.29 to 166.40 - 0.89 miles of 100# rail
MP 166.40 to 159.42 - 6.98 miles of 112# rail
MP 159.42 to 155.64 - 3.78 miles of 100# rail
MP 155.64 to 154.69 - 0.95 miles of 112# rail
MP 154.69 to 145.98 - 8.71 miles of 100# rail
MP 145.98 to 144.36 - 1.62 miles of 100# CW rail
MP 144.36 to 144.07 - 0.29 miles of 115# rail
MP 144.07 to 142.00 - 2.07 miles of 100# CW rail
MP 142.00 to 141.38 - 0.62 miles of 112# rail
MP 141.38 to 138.32 - 3.06 miles of 90# rail
MP 138.32 to 137.69 - 0.63 miles of 100# rail
MP 137.69 to 137.50 - 0.19 miles of 115# rail

The 115 pound rail is generally in satisfactory condition and is suitable for freight operations or passenger train service up to 60 mph.

The 112 pound rail is also generally in satisfactory condition and is suitable for freight operations or passenger train service up to 60 mph. However, it should be noted that the 112 pound relay rail installed in 1947 between MP 166.40 and MP 163.51 only has 4-hole joints and small 7" x 10" tie plates. Replacement of the 4-hole joints and the rail are recommended in this report for 60 mph passenger service.

The 100 pound rail is generally in satisfactory condition and is suitable for freight operations or passenger train service up to 40 mph. Replacement of the rail is recommended for sections of the track length where up to 60 mph passenger service may be proposed.

The 90 pound rail is considered to be satisfactory only for the current freight traffic at the FRA Class 1 speed limit. Replacement of the rail is recommended for upgrading to Class 2 or 3 speeds.

The crosstie population for the main track between MP 171.4 and 137.5 consists of both 7" x 9" x 8½' and 6" x 8" x 8' ties. Tie spacing is generally 24 ties per 39 feet of rail length except for the 90 pound rail where the spacing is 19 per 33 feet of rail length. (Note that the industry standard for tie spacing is generally 24 ties per 39 feet of rail length.) Inspection results indicate that approximately 47 percent of the existing ties in the track length are defective. Recommended minimum tie replacement for the track length to comply with FRA standards for Class 2 and 3 track up to 40 mph is approximately 17.4 percent. Recommended minimum tie replacement for 60 mph passenger traffic between MP 171.4 and MP 163.0 is approximately 24.8 percent with approximately 19.2 percent minimum replacement recommended between MP 163.0 and MP 137.5 for Class 2 and 3 speeds up to 40 mph.

Ferrol type anchors are used to anchor the rail to the ties. The standard used for spacing anchors is 12 anchors per rail length for jointed track and 2 anchors on every other tie per rail for continuous welded rail (CWR). Field inspection of the track revealed that no anchors were installed for the 90 pound rail and that on the average about 9.8 anchors per rail length were used for the track other than the 100 pound CWR and the 90 pound rail.

The tie spikes used for the trackage are 6" x 5/8" with one installed on the gage side and one installed on the field side of tie plates with the spikes usually being in staggered holes. Collected field inspection data indicates that approximately 66 percent of the spikes are loose.

The track gage for the length of main track inspected was found to be within the FRA limits of 57 3/4" for Class 2 and 3 track. The excellent condition of the track gage is probably due to the light freight traffic over the track.

Ballast used for the length of main track studied consists of #4 or larger stone. The ballast is in generally good condition with only a small amount of it being fouled. Alignment and surface (level) deficiencies can probably be corrected for Class 2 and 3 track speeds up to 40 mph by tamping and lining without adding ballast. For Class 3 speeds up to 60 mph, surfacing with additional ballast is recommended to get a more level track and to place a superelevation back into the curves. Most of the superelevation that once existed in the curves has been removed.

Drainage over the length of track is generally good. However, use of a Jordan Spreader is recommended for over most of the track length in order to clean out the ditch lines. It is also recommended that the ditches be reestablished in areas where they have been filled in.

Growth of weeds and brush along the track length north of Westfield (approximate MP 163) is becoming extensive and needs to be removed. Weed and brush growth south of Westfield is a much smaller problem because weeds were sprayed and brush was cut back prior to operation of the State Fair train and subsequent freight service by Indiana Hi-Rail Corporation.

Turnout Inspection Results

A summary of information on the turnouts obtained from the track book and field inspection work appears in Table 3 of this report. A total of 18 turnouts off the main track were inspected. All the turnouts were a no. 10 size and the frogs were either rigid rail-bound manganese-steel (RBM) or spring rail types.

In general, all the switches and frogs are in good condition with only a few minor problems. The major problem with some of the turnouts as indicated in Table 3 is defective ties. Also, once outside of the turnouts a significant number of ties for several of the sidings, including the Westfield and Sheridan storage tracks, are defective.

The rail size of the sidings once outside of the turnouts is either 75 or 90 pound rail. Replacement of the 75 pound rail is recommended wherever a passenger train might operate over the siding such as the Westfield storage track.

Condition of the stone ballast in the turnouts is similar to the main line track, but beyond the turnouts it is generally more fouled with cinders and dirt. However, resurfacing of the storage siding tracks is probably not needed unless the adjacent main line track is surfaced.

TABLE NO. 3

SUMMARY OF TURNOUT INSPECTION RESULTS

Mile-Post	Turnout Size	Turnout Rail Size	Frog Type	Turnout Direction	Switch Condition	Frog Condition	Tie Condition	Turnout Use	Siding Length	Other
168.5	#10	100#	Rigid RBM	RH to South	Good, but banner bent	Good	---	IMC & Industrial Park	839'	
168.1	#10	112#	Rigid RBM	RH to North	Good	Good	Fair	Carmel Storage Track & Lumber Mart	2198'	
167.72	#10	112#	Spring-Rail	RH to South	Good	Good	---	Hamilton Co. Elev. & Woods Wire Co.	1003'	
167.6	#10	112#	Rigid RBM	LH to South	OK	OK	---	Carmel storage track	2198'	
164.3	#10	115#	Rigid RBM	RH to North	Good	Good	Good	Wickes Lumber Co.	141' + 388'	Installed 5-6 years ago
163.7	#10	112#	Rigid RBM	LH to South	Good	Good	Good, 10 years old	Truss Mfg.	----	
163.27	#10	112#	Rigid RBM	LH to North	Good	Good	OK in turn-out	Westfield Storage Track	2669'	
162.8	#10	112#	Spring-Rail	RH to North	Good	Good	OK	Lowes Lumber Co.	231'	

TABLE NO. 3 (Continued)

Mile-Post	Turnout Size	Turnout Rail Size	Frog Type	Turnout Direction	Switch Condition	Frog Condition	Tie Condition	Turnout Use	Siding Length	Other
162.76	#10	112#	Spring-Rail	RH to South	Good	Good	Good	Westfield Storage Track	2669'	
159.6	#10	112#	Rigid RBM	RH to South	Good	Good	Good	Hamilton Co. Elev.	141'	Siding is abandoned
155.8	#10	112#	Spring-Rail	LH to North	Good	Good	75% Bad	Wallace Grain & Sheridan Storage Track	1199'	
155.4	#10	112#	Spring-Rail	LH to North	Good	Good	50% Bad	X-Over Switch	----	
154.6	#10	100#	Rigid RBM	RH to South	Good	Good	40% Bad	Hamilton Co. Fert. & Sheridan Storage Track	5133'	
151.7	#10	100#	Spring-Rail	LH to North	Good	Good	Good, less than 10 years old	Terhune Elevator	843'	
146.8	#10	100#	Rigid RBM	LH to South	Good	Good	Good	Precision Truss Mfg & AGMAX Elev. & Fert.	588' + 951' + 199'	
146.6	#10	115#	Spring-Rail	LH to North	Good	Good	50% Bad	Wabash Co. Co-Op	542'	

TABLE NO. 3 (Continued)

Mile-Post	Turnout Size	Turnout Rail Size	Frog Type	Turnout Direction	Switch Condition	Frog Condition	Tie Condition	Turnout Use	Siding Length	Other
146.3	#10	100#	Rigid RBM	RH to South	Good	Good	Good	Clinton Co. Farm Bureau	551'	About 12 years old
142.6	#10	100#	Rigid RBM	RH to North	Good	Good	40% Bad out	Cyclone Grain Elev.	231'	

Road Crossing Inspection Results

A summary of the inspection results for road crossings appears in Table 4 of this report. A total of 60 public crossings and 1 major private crossing were inspected. Several other minor private crossings installed by industry or farmers exist, but were not inspected.

Most of the road crossings are constructed of asphalt with some having timber flanges and guards. Some of the state highway crossings also have concrete headers. One rubber-type crossing for Main Street in Carmel exists and was found to be in excellent condition.

In general, most of the asphalt crossings have some deterioration and potholes. A significant number of the timber flanges and guards are also defective and should be replaced.

Most of the rail through the crossings is jointed with only a few crossings having been upgraded to welded rail. Several of the crossings have joints in the crossings and replacement is recommended because the joints are a road hazard, some are loose and others have dropped.

Existing crossing protection consists of either crossbucks and some stop signs or flashers. The flasher equipment is for the most part still functional and replacement may only be required at a few crossings. A signal contractor has inspected the existing flasher equipment and cost data from him for rehabilitating the equipment are later presented in this report.

Also, most of the road crossings north of Carmel were observed to have the flangeways filled to some degree. The filled flangeways of the crossings which are not replaced should be cleaned in order to eliminate potential derailment problems.

TABLE NO. 4

SUMMARY OF ROAD CROSSING INSPECTION RESULTS

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
171.4	Asphalt with timber flanges	1	Timbers bad & asphalt rough	115# jointed	56½"	96th St., 2-lane asphalt	Medium	22'	2 crossbucks & 2 stop signs	OK
170.6	Asphalt with timber flanges & guards	1	Rough with low spot	115# jointed	57"	Homeplace Road, 2-lane asphalt	Medium	21'	2 flashers	Good
169.7	Asphalt with timber flanges	1	OK - rough spots have been patched	112# jointed	56½"	126th St., 2-lane asphalt	Light	18'	2 crossbucks & 2 stop signs	Good
169.3	Asphalt and in a curve	1	Rough - rebuilt 15 years ago	100# jointed	57½"	2-lane asphalt	Medium	22'	2 flashers	OK
168.9	Asphalt with timber flanges & guards & concrete headers (in a curve)	1	Good (head on rails slightly mashing)	112# jointed	57"	Carmel Drive, 4-lane asphalt	Heavy	63'	2 crossbucks, 1 stop light & 1 stop sign	X-bucks good (need flashers
168.8	Asphalt with timber flanges & guards	2	Timbers bad, asphalt rough & joint in crossing (bad)	100# jointed	56½"	2-lane asphalt (24' wide pavement)	Medium	32'	2 crossbucks & 2 stop signs	OK
167.8	Asphalt with timber flanges & guards	3	OK	112# main 90# siding	57"	2-lane asphalt	Medium	27½'	2 crossbucks	Good

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
167.7	Main - asphalt siding - asphalt with timber flanges	2	Timbers bad & asphalt rough with potholes	112# main 90# siding	56½"	2-lane asphalt	Medium	28'	1 flasher	OK
167.65	Rubber for road & asphalt with timber flanges & guards for side-walk	2	Good	112# main welded 90# siding	56-3/4"	Main St. in Carmel	Heavy	40'-2"	2 flashers	Good
167.6	Asphalt	1	Deteriorated pave-ment & bad ties	112# jointed	56-5/8"	1 St. NW, 1½-lane asphalt	Light	15'	2 crossbucks	OK
167.2	Asphalt and in a curve	1	Slight pavement deterioration	100# jointed	56-7/8"	2-lane asphalt	Medium	19½'	2 crossbucks & 2 stop signs	Good
166.4	Asphalt	1	Good with filled flangeways	112# jointed	56-3/8"	146th St., 2-lane asphalt	Medium	19'	2 crossbucks & 2 stop lights	Good
165.8	Asphalt	1	Slight pavement deterioration	112# jointed	56-3/4"	2-lane asphalt (27½' wide road)	Medium	41'	4 flashers (2 OH) & 1 stop sign	Good
165.3	Asphalt	1	Some pavement deterioration, joint in crossing & filled flangeways	112# jointed	57"	2-lane asphalt	Light	19'	2 crossbucks & 1 stop sign	OK

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
164.5	Asphalt	1	Slight pavement deterioration	112# jointed	56-3/8"	2-lane asphalt	Light	19½'	Nothing	----
163.9	Asphalt	1	Some pavement deterioration, east rail has joint in crossing and filled flangeways	112# jointed	57"	2-lane asphalt	Medium	21'	2 crossbucks & 2 stop signs	Good
163.4	Private crossing, aggregate	1	Fair, stone along flangeways	112# jointed	57"	1-lane gravel	Light	14½'	1 crossbuck	Fair (old)
163.2	Asphalt with timber flanges & guards	2	Rough pavement, bad timbers & need to remove concrete pavement from tie edges	112# main 75# siding	57"	S.R. 32, 2-lane concrete	Heavy	32'	2 flashers	OK
162.7	Asphalt	1	Slight deterioration & filled flangeways	112# jointed	56½"	2-lane asphalt asphalt	Light	17'	2 crossbucks & 2 stop signs	Good
161.7	Asphalt	1	Slight deterioration & filled flangeways	112# jointed	56-5/8"	2-lane asphalt (crosses @ angle)	Light	22'	2 crossbucks	Good
160.7	Asphalt	1	Some deterioration & filled flangeways	112# jointed	56-3/8"	2-lane asphalt (crosses @ angle)	Light	18'	2 crossbucks & 2 stop signs	Good
159.9	Asphalt & in a slight curve	1	OK-recently patched, & filled flangeways	112# jointed	56½"	1-lane asphalt (road curves)	Light	13½'	2 crossbucks	Good

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
159.8	Asphalt & in a slight curve	1	Recently patched, filled flangeways & loose joint on south side	112# jointed	57-1/8"	2-lane asphalt (crosses @ angle)	Medium	22'	2 crossbucks & 1 stop sign	Fair (1 x-buck bent)
159.6	Asphalt	2	Potholes, filled flangeways & joint in crossing (siding abandoned)	112# jointed	56-3/4"	2-lane asphalt (crosses @ angle)	Medium	31½'	2 crossbucks & 1 stop sign	Good
158.7	Asphalt (end of curve)	1	OK, but filled flangeways	100# jointed	57"	1-lane gravel (crosses @ angle)	Light	17'	2 crossbucks & 2 stop signs	Good
158.2	Asphalt	1	Potholes & joint in center of west rail	100# jointed	57"	2-lane asphalt (crosses @ angle)	Medium	22½'	2 crossbucks & 2 stop signs	OK
158.0	Asphalt with timber flanges	1	Potholes & filled & filled flangeways	100# jointed	57"	1-lane gravel (crosses @ angle)	Light	23'	2 crossbucks & 2 stop signs	Good
157.2	Asphalt	1	Recently patched, filled flangeways & joint in west rail	100# jointed	56-3/4"	2-lane asphalt (crosses @ angle)	Light	25'	2 crossbucks	Fair (1 x-buck bent
156.3	Asphalt	1	Recently patched, filled flangeways & joint in east rail	100# jointed	56¼"	2-lane asphalt (crosses @ angle)	Medium	23'	2 crossbucks & 2 stop signs	Good
155.75	Asphalt	2	Rough potholes & joint in west rail of main & east rail of siding (bad problem)	112# main 90# siding	57"	S.R. 47, 2-lane asphalt (crosses @ angle)	Heavy	31'	2 flashers	Good

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
155.5	Main - asphalt with timber flanges & guards sidings - asphalt	3	Potholes along sidings & filled flangeways	112# main 90# siding	56-5/8"	Georgia St.-Sheridan 2-lane asphalt (crosses @ angle)	Medium	50'	2 flashers	OK
(Middle track removed outside of crossing)										
155.4	Main - asphalt with timber flanges siding - asphalt	2	Rough, potholes & filled flangeways	112# main 90# siding	56-3/4"	2-lane asphalt (crosses @ angle)	Medium	40'	2 flashers	OK
155.3	Asphalt	2	Rough, potholes, filled flangeways & joints in main & siding	112# main 90# siding	57-3/8"	Main St.-Sheridan, 4-lane asphalt (crosses @ angle)	Heavy	73'	3 flasher poles	OK
155.2	Asphalt	2	Some deterioration along siding & filled flangeways	112# main 90# siding	56-3/4"	Ohio St.-Sheridan, 2-lane asphalt crosses @ angle)	Medium	30'	2 flashers	OK
155.1	Main - asphalt with timber flanges siding - asphalt	2	Potholes, defective timbers & filled flangeways	112# main 90# siding	57-1/8"	S. California St., 2-lane asphalt (crosses @ angle)	Medium	45'	2 flashers poles & 4 sets of flashers	OK
154.8	Main - asphalt with timber flanges siding - asphalt	2	Potholes, defective timbers & filled flangeways	112# main 90# siding	56-3/4"	W. 2nd St.-Sheridan, 2-lane asphalt (crosses @ angle)	Medium	53'	2 flashers	OK

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
153.7	Asphalt	1	Rough - should be raised up with road	100# jointed	56½"	Boone-Hamilton Co. Line, 2-lane asphalt (crosses @ angle)	Medium	22'	1 crossbuck	OK
153.1	Asphalt	1	Rough, potholes & filled flangeways	100# jointed	57"	2-lane gravel (crosses @ angle)	Light	29'	2 crossbucks	OK
151.5	Asphalt	2	Rough, potholes, filled flangeways & dropped joint in west rail of main	100# main 75# siding	56-3/4"	Main St.-Terhune 2-lane asphalt (crosses @ angle)	Medium	22'	1 flasher pole, 1 bell pole & 1 crossbuck	Fair (damaged x-buck)
151.1	Asphalt	1	Rough along flangeways	100# jointed	56-3/4"	1½-lane asphalt (crosses @ angle)	Light	27'	2 crossbucks	Good
150.9	Asphalt	1	Very rough & filled flangeways	100# jointed	56-3/8"	1-lane gravel (crosses @ angle)	Light	14'	2 crossbucks	Good
150.3	Asphalt with timber flanges	1	Some deterioration	100# jointed		1-lane	Light		2 crossbucks	OK
149.1	Asphalt	1	Rough	100# jointed		1-lane	Light		2 crossbucks	OK
148.1	Asphalt	1	Rough	100# welded		1-lane gravel	Light		2 crossbucks	Good
147.6	Asphalt with timber flanges & guards	1	Rough & timbers bad (need to repair)	115# jointed	57-1/8"	S.R. 38, 2-lane asphalt (crosses @ angle)	Heavy	72'	2 flashers	OK

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
146.9	Asphalt with timber flanges	2	Rough & timbers bad (side track can be removed)	115# main 90# siding		2-lane asphalt (crosses @ angle)	Medium		2 crossbucks	OK
146.8	Asphalt	3	Rough with potholes	115# main 90# siding		2-lane asphalt	Medium		2 crossbucks	Good
146.6	Asphalt with timber flanges	2	Rough & bad timbers	115# main welded, 90# siding		2-lane asphalt	Medium		4 crossbucks	Good
146.5	Asphalt with timber flanges	1	Rough	115# welded		1-lane asphalt	Light		2 crossbucks	Good
146.45	Asphalt with timber flanges	1	Rough	115# jointed		1-lane asphalt	Light		2 crossbucks	Good
146.4	Asphalt with timber flanges & guards plus concrete & rail headers along tie edges	1	Rough, bad timbers, filled flangeways & need to raise	115# welded	57½"	S.R. 421, 2-lane asphalt (crosses @ angle)	Heavy	52½'	2 flashers	OK
145.2	Asphalt with timber flanges	1	Rough & filled flangeways	100# welded		2-lane gravel	Light		2 crossbucks	Bad (shot-up)
144.4	Asphalt with timber flanges	1	Rough & filled flangeways	100# welded		1½-lane gravel	Light		2 crossbucks	Fair (bent)

TABLE NO. 4 (Continued)

Mile-Post	Crossing Type	Number Tracks	Crossing Condition	Rail Size and Type	Track Gage	Type of Road	Traffic Volume	X-ing Length	Crossing Protection Type	Crossing Protection Condition
143.6	Asphalt with timber flanges	1	Bad & need to replace	100# welded		1-lane	Light		2 crossbucks	Good
142.5	Main - asphalt with timber flanges siding - asphalt	2	Need to replace timbers & resurface	100# main welded, 90# siding		Gravel road	Light		2 crossbucks	Good
142.3	Asphalt with timber flanges	1	Rough, need to replace timbers & resurface	100# welded		400E, 2-lane asphalt	Medium		2 flashers	OK
141.4	Asphalt with timber flanges	1	Fair	112# jointed		1-lane asphalt	Light		2 crossbucks	Good
140.4	Asphalt	1	Rough	90# jointed		1-lane gravel	Light		2 crossbucks	Good
139.6	Asphalt	1	Rough	100# jointed		1½-lane gravel	Light		2 crossbucks	OK (1 bullet hole)
139.4	Asphalt	1	Rough - need to resurface	90# jointed		1-lane asphalt	Light		2 crossbucks	Good
137.6	Asphalt with timber flanges	1	OK	115# welded		2-lane asphalt	Medium		2 crossbucks	Poor (need to replace both poles)

Wayside Signal System

No operative wayside signal system was observed during inspection work, although evidence of a prior system does exist. Several telephone poles with fallen wires and some concrete bases for signal lights do exist. However, condition of the poles and wire is so bad that they are not suitable for reuse. Salvaging of existing poles and wire is probably also not worth the cost.

CHAPTER III
TRACK REHABILITATION COST ESTIMATES

III. TRACK REHABILITATION COST ESTIMATES

General

Track rehabilitation cost estimates prepared in this study were designed to complement cost estimates developed in the previous 1984 report by HNTB entitled "Engineering Reconnaissance Study of the Monon Railroad for Potential Commuter Rail Service". However, cost estimates were developed in two different ways in this study. One method utilized assumptions and unit cost data contained in the 1984 report by HNTB. The second method was to develop rehabilitation cost estimates based on cost data from a local short line railroad and signal contractor. Any needed data not available from the local short line railroad or signal contractor were obtained from published information sources.

Developing a cost estimate based on local short line railroad maintenance costs and signal contractor prices was thought to be more realistic of the actual cost to rehabilitate the trackage being studied for later use by a short line railroad. Reasons for this are that short line railroad labor costs are below that of major railroads, some less expensive relay materials such as rail would be used, and rehabilitation methods proposed would be more applicable for the resulting rail use.

Operation alternatives considered in the 1984 HNTB Report were also used in this report to determine cost estimates for different track rehabilitation alternatives. The three alternative operation levels for which rehabilitation costs have been estimated are as follows:

1. Federal Railroad Administration (FRA) Class 2 track safety standards for freight and occasional passenger service at a maximum speed of 25 mph.

2. FRA Class 3 track standards to provide for mixed commuter service/ freight operations with operating speeds between 31 and 40 mph.

3. FRA Class 3 track standards to provide for mixed commuter service/ freight operations with operating speeds up to 60 mph for trackage between MP 171.4 and MP 163.0 and operating speeds between 31 and 40 mph for trackage between MP 163.0 and MP 137.5.

It should be noted that speeds up to 60 mph for passenger traffic after proper rehabilitation work would be allowable for the track length being considered in this study. However, the City of Indianapolis has an ordinance limiting train speeds to 40 mph within Marion County.

Unit Costs

The initial step when preparing rehabilitation cost estimates for this study was to develop unit costs. Unit costs obtained from the 1984 report by HNTB and items included in those costs appear in Table 5 of this report. Because the Engineering News Record Construction Cost Index from the fourth quarter of 1984 to the present has increased less than one percent, no adjustment for inflation was made and the unit costs in Table 5 match those in the 1984 HNTB Report.

TABLE 5

1984 HNTB REPORT TRACK REHABILITATION UNIT COSTS

Item		Unit Cost
1.	Crosstie Replacement - installation of new 7" x 9" x 8'-6" creosote treated, mixed hardwood crossties.	$ 50/ea
2.	Rail Replacement - installation of new continuous welded 115# RE rail, including all other track materials.	$250,000/mi
3.	Track Surfacing - mechanized surfacing of track with a track lift between 2 and 4 inches, including stone ballast as required.	$ 10,000/mi

Item		Unit Cost
4.	Rehabilitate Turnouts - rehabilitation of turnout components including switch point and stock rail repair or replacement, frog repair, tightening of bolts, spot timber replacement, etc.	$ 8,000/ea
5.	Road Crossing Replacement - complete replacement of track through a crossing and installation of flange and guard timber type highway crossing, including paving and detours.	$ 720/ft
6.	Rehabilitate Existing Flashers - rehabilitation of existing flashers including replacement of any worn or defective components.	$ 5,300/set
7.	New Flashers - installation of new flashers similar to existing flashers at other crossings, with island type crossing circuits.	$ 50,000/crossing
8.	New Automatic Gates - installation of half-gate type automatic crossing protection, similar to equipment located at other crossings on the Monon Railroad.	$ 90,000/ea
9.	Wayside Signal System - installation of an automatic block system with controlled passing sidings.	$300,000/mi

Unit cost estimates for track rehabilitation developed in this study which were felt to be more realistic of construction costs to rehabilitate the length of track being considered appear in Table 6. Those unit costs were obtained from the following sources:

1. The Indiana Hi-Rail Corporation (a local short line railroad company) which provided cost estimates for track rehabilitation.
2. Midwest Signal which provided cost estimates for rehabilitation of existing flashers and installation of new road crossing flashers, new road crossing gates and a wayside signal system.
3. Miscellaneous track rehabilitation costs not furnished by Indiana Hi-Rail Corporation were obtained from the January, 1980, issue of "Railway Track and Structures" and adjusted for inflation.
4. Other special work item costs such as concrete header construction for crossings and siding track removal were obtained from the 1985 issue of "Means Construction Cost Data".

It should be noted that both the Indiana Hi-Rail Corporation and Midwest Signal have recently inspected the length of track being studied. Therefore, their cost estimates should be fairly realistic of the actual rehabilitation costs to perform the work because unit costs estimated by them include work tasks needed to repair actual observed defects.

TABLE 6

TRACK REHABILITATION UNIT COSTS DEVELOPED IN THIS STUDY

Item		Unit Cost
1.	Brush Cutting - cutting of trees and brush with a mechanical brush cutter for a distance of ten feet out from center line of track each direction. Brush cuttings to remain on right-of-way.	$ 500/mi
2.	Spray Weeds - application of weed spray by a licensed contractor to a width of eight feet out from center line of track each direction.	$ 250/mi
3.	Main Line Tie Replacement - installation of new 7" x 9" x 8'-6" creosoted hardwood crossties along with new tie plates and spikes.	$ 40.50/ea
4.	Siding Track Tie Replacement - installation of new 6" x 8" x 8' creosoted hardwood crossties along with new tie plates and spikes.	$ 35.50/ea
5	Track Regaging - setting correct track gage and tightening loose spikes.	$ 2,570/mi
6.	Jordan Spreader Operation - use to clean out ditch line and cut, slope and contour the subgrade shoulder.	$ 2,220/mi
7.	Ballast Shoulder Cleaning - clean shoulder ballast to a depth not less than 6 inches below the tie bottom and no greater than the top of the prepared subgrade shoulder. Screenings to be chuted to the side and no additional ballast added.	$ 1,880/mi
8.	Light Ditching - use blade-type equipment following use of Jordan Spreader.	$ 8,960/mi
9.	Track Surfacing - mechanized surfacing of track with a nominal lift of 3 inches, including stone ballast as required.	$ 12,900/mi

Item	Unit Cost
10. Turnout Upgrade - rehabilitation of a no. 10 turnout by replacing defective ties, welding of worn components, adjustment, and tamping and lifting.	$ 7,500/ea
11. Rail Replacement (115# new CWR) - replace existing rail with new 115# continuous welded rail including tie plugs, gaging, and new tie plates and spikes.	$ 207,000/mi
12. Rail Replacement (105# Relay) - replace existing rail with 105# relay rail including tie plugs, gaging, and new tie plates and spikes.	$ 63,400/mi
13. Rail Joint Renewal - tightening of joint bolts in rail line and replacement of damaged or missing bolts.	$ 7.50/ea
14. Rail Joint Replacement - installation of relay quality joint bars to replace broken or worn bars and includes new bolts. Does not include compromise joint bars.	$ 37/ea
15. Anchor Addition/Replacement - installation of rail anchors on existing rail.	$ 1.90/ea
16. Tamping and Lining - includes survey, lining and tamping of track into proper alignment and profile without addition of ballast.	$ 4,000/mi
17. Road Crossing Replacement (115# CWR) - complete replacement of track through crossing with 115# CWR, new crossties, tie plates, spikes and anchors, new or renewed subbase, drainage tile, tamping and lining, and installation of asphalt paving with timber flanges and guards.	$ 530/ft
18. Road Crossing Replacement (105# CWR) - same as above except 105# welded rail used instead.	$ 500/ft
19. Concrete Headers for Crossings - install new 18"W x 30"D concrete headers along outside of ties on both sides of track.	$ 70/ft of track
20. Clean Track Flangeways - clean debris out from along track flangeways on both sides of track. Includes travel costs to and from crossings.	$ 4/ft
21. Track Removal and Road Repair - remove siding track through road crossing and replace removed road pavement.	$ 52/ft
22. Rehabilitate Existing Flashers - rehabilitation of existing flashers including replacement of any worn or defective components.	$ 3,800/set

Item		Unit Cost
23.	New Flashers - installation of 2 new automatic flasher units per crossing. Add $2,800 for each additional track.	$ 16,900/set
24.	New Gates and Flashers - installation of 2 new automatic flasher units with half-gates. Add $2,800 for each additional track.	$ 26,300/set
25.	New Crossbuck Signs and Posts - install new signs and posts where missing or defective.	$ 100/ea
26.	New Crossbuck Signs - install new signs on existing posts where existing signs are missing or defective.	$ 40/ea
27.	Wayside Signal System - install new S-code bidirectional signaling system such as manufactured by the Safe Tram System.	$ 238,000/mi

Rehabilitation Assumptions

Prior to preparing the cost estimates for track rehabilitation, assumptions and criteria were also developed for the proposed work. Assumptions used in the 1984 HNTB Report were identified for reuse in this study and new assumptions and criteria were developed for the cost estimate to be based on the unit prices developed in this study.

Assumption criteria used in the 1984 HNTB Report that were identified and applied to the cost estimate in this study based on the 1984 report unit prices are as follows:

1. For the main track, replace approximately 1/3 of the crossties for rehabilitation to meet FRA Class 2 standards, 2/3 of the crossties for rehabilitation to meet FRA Class 3 standards for up to 40 mph, and all the ties for rehabilitation to meet FRA Class 3 standards for up to 60 mph. These levels of crosstie replacements were also felt to eliminate the need for having to replace any ties for 5 years after track rehabilitation. (These assumptions were modified when preparing cost estimates in this study to replace 1/3 of the crossties on the 3 storage track sidings when rehabilitating to meet FRA Class 2 standards and 2/3 of the crossties when rehabilitating for both Class 3 alternatives.)

2. Replace all 90 pound rail on the main track for rehabilitation to meet FRA Class 2 and 3 standards for up to 40 mph. (This assumption was modified to include replacement of the 75 pound rail on the Westfield storage track siding when rehabilitating for both Class 3 alternatives.)

3. Replace all rail smaller than 115 pound (or 112 pound) on the main track for rehabilitation to meet FRA Class 3 standards for up to 60 mph.

4. Surface the entire length of main track for all 3 rehabilitation alternatives. (This assumption was modified to include the 3 storage track sidings.)

5. Rehabilitate existing turnouts to remain in use for all 3 rehabilitation alternatives. (This assumption was modified to apply only to the storage track turnouts.)

6. Replace all road crossings for all 3 rehabilitation alternatives because the entire length of track is to be surfaced. (This assumption was modified to not replace the rubber crossing in Carmel because of its excellent condition.)

7. Rehabilitate all existing road crossing flashers to be reused for all 3 rehabilitation alternatives.

8. Install flashers at all unprotected road crossings for all 3 rehabilitation alternatives. (This assumption was modified to apply only to crossings with significant enough traffic to warrant flashers for each rehabilitation alternative considered.)

9. Install automatic gates at major road crossings as warranted by traffic for each FRA Class 3 rehabilitation alternative.

10. Install wayside signal system for entire length of track for both FRA Class 3 rehabilitation alternatives. (This assumption was modified to only apply to the length of track where commuter traffic is proposed.)

Assumptions and criteria developed in this study were based on field inspection work and recommendations from Mr. Vaughn Nesbitt (former Seaboard System Railroad roadmaster for trackage being studied), the Indiana Hi-Rail Corporation and Midwest Signal. The developed assumptions and criteria were used when preparing rehabilitation cost estimates based on unit cost data developed in this study and are as follows:

1. Cut brush along entire length of main track and storage sidings to be used for all 3 rehabilitation alternatives based on field inspection results. (Approximately 50% of track length was found to have brush problems.)

2. Spray weeds along entire length of track for all 3 rehabilitation alternatives.

3. Replace number of defective crossties as determined during track inspection for compliance with minimum FRA standards plus an additional 20 percent for each rehabilitation alternative. (Additional 20 percent replacement is to avoid tie replacement for 5 years after track rehabilitation based on an average 25-year crosstie life.)

4. Use 7" x 9" x 8½' crossties for main line rehabilitation and 8" x 6" x 8' crossties for storage track rehabilitation for all 3 rehabilitation alternatives.

5. Regage entire length of track where rail is not replaced in order to tighten loose spikes for all 3 rehabilitation alternatives.

6. Clean out ditch lines along entire length of track for all 3 rehabilitation alternatives.

7. Clean shoulder ballast where track surfacing is recommended.

8. Track surfacing is only needed where the track is rehabilitated to meet FRA Class 3 standards for up to 60 mph. Tamping and lining of the track without ballast addition should be sufficient for rehabilitation to meet FRA Class 2 and 3 standards for up to 40 mph.

9. Only a minimal amount of ditching work will be required for all rehabilitation alternatives (10% of track length assumed to require light ditching work for all 3 rehabilitation alternatives).

10. Only turnouts for 3 storage track sidings need to be upgraded based on projected use and inspection results. Rehabilitate the turnouts and entire length of track for the 3 storage track sidings located in Carmel, Westfield and Sheridan for the 3 rehabilitation alternatives.

11. Replace 75 pound rail in Westfield storage track siding for both FRA Class 3 alternatives.

12. Use 105 pound relay rail to replace less than 100 pound rail for rehabilitation to meet FRA Class 2 and 3 standards for up to 40 mph.

13. Use 115 pound continuous welded rail to replace less than 112 pound rail for rehabilitation to meet FRA Class 3 standards for up to 60 mph. Also replace 112 pound rail that only has 4-hole joints and rests on 7" x 10" plates when rehabilitating to meet FRA Class 3 standards for up to 60 mph.

14. Check and tighten all loose rail joints where rail is not replaced.

15. Replace all existing joints when installing 105 pound rail.

16. For all 3 rehabilitation alternatives, add or replace anchors to increase number of anchors per rail length to 12 for jointed rail and to 2 anchors for every other tie per rail for welded rail.

17. Replace road crossings based on degree of deterioration and estimated road traffic for rehabilitation to meet FRA Class 2 and 3 standards for up to 40 mph. Because track surfacing is recommended for rehabilitation to meet FRA Class 3 standards for up to 60 mph, replace all road crossings with the exception of the rubber crossing in Carmel for that rehabilitation alternative. The rubber crossing in Carmel is too new and in too good of a condition to justify replacing it.

18. Use welded 105 pound rail for road crossing replacement except where new 115 pound rail is to be installed. Use 115 pound welded rail for road crossings in track sections where new 115 pound rail is proposed.

19. Install concrete headers where missing along both edges of the crossties for all state highway road crossings to be replaced.

20. Clean track flangeways where observed to be filled and are not proposed to be replaced.

21. Remove abandoned siding tracks at road crossings to be replaced.

22. Rehabilitate all existing road crossing flashers except those to be replaced.

23. Replace existing flasher systems where only one pole exists at a crossing.

24. Install flashers at road crossings not having flashers where traffic conditions warrant it for each rehabilitation alternative.

25. Install automatic gates at major road crossings as warranted for each FRA Class 3 rehabilitation alternative.

26. Install new crossbuck poles and signs where missing and flashers are not proposed.

27. Replace crossbuck signs where damaged and flashers are not proposed.

28. Install wayside signal system on length of track where commuter traffic is proposed for both FRA Class 3 rehabilitation alternatives.

Rehabilitation Cost Estimate Calculations

Calculations for track rehabilitation costs for the track length between MP 171.4 and MP 137.5 for each of the 3 rehabilitation alternatives based on unit prices and assumptions obtained from the previous 1984 HNTB report appear in Part Three, Supplemental Appendix IV of this report. A summary of those estimated rehabilitation costs in current dollars for the trackage, road crossings and signaling is as follows:

1. Rehabilitation to FRA Class 2 standards:

Track Rehab.	$ 3,736.000
Road Crossing Rehab.	2,034,000
Signal Installation	0
Total	$ 5,770,000

2. Rehabilitation to FRA Class 3 standards for 40 mph maximum:

Track Rehab.	$ 6,214,000
Road Crossing Rehab.	2,524,000
Signal Installation	2,595,000
Total	$11,333,000

3. Rehabilitation to FRA Class 3 standards for 60 mph maximum between MP 171.4 and MP 163.0 and 40 mph maximum elsewhere:

Track Rehab.	$ 8,182,000
Road Crossing Rehab.	2,743,000
Signal Installation	2,595,000
Total	$13,520,000

Prior to performing cost estimates for track rehabilitation based on unit costs developed in this study, additional calculations were performed to determine the number of crossties to replace and amount of different road crossing rehabilitation tasks to perform for each rehabilitation alternative. Calculations for crosstie replacement to use for each main track rehabilitation alternative plus rehabilitation of 3 siding storage tracks appear in Part Three, Supplemental Appendix V of this report. A list of the proposed rehabilitation work tasks to perform at each road crossing for each rehabilitation alternative appears in Table 7 of this report.

TABLE NO. 7

PROPOSED ROAD CROSSING REHABILITATION WORK TO USE WITH UNIT COSTS DEVELOPED IN THIS STUDY

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
171.4	28' of new asphalt & timber X-ing	-----	28' of new asphalt & timber X-ing	Add 2 flashers	28' of new asphalt & timber X-ing	Add 2 flashers
170.6	-----	Rehab. 2 flashers	28' of new asphalt & timber X-ing	Rehab. 2 flashers	28' of new asphalt & timber X-ing	Rehab. 2 flashers
169.7	-----	-----	-----	Add 2 flashers	28' of new asphalt & timber X-ing	Add 2 flashers
169.3	28' of new asphalt & timber X-ing	Rehab. 2 flashers	28' of new asphalt & timber X-ing	Rehab. 2 flashers	28' of new asphalt & timber X-ing	Rehab. 2 flashers
168.9	-----	Add 2 flashers	-----	Add 2 flashers & gates	63' of new asphalt & timber X-ing	Add 2 flashers & gates
168.8	32' of new asphalt & timber X-ing for 2 tracks	-----	32' of new asphalt & timber X-ing for 2 tracks	Add 2 flashers	32' of new asphalt & timber X-ing for 2 tracks	Add 2 flashers
167.8	-----	-----	-----	Add 2 flashers	28' of new asphalt & timber X-ing for 3 tracks	Add 2 flashers
167.7	32' of new asphalt & timber X-ing for 2 tracks	Add 2 flashers (only one now)	32' of new asphalt & timber X-ing for 2 tracks	Add 2 flashers	32' of new asphalt & timber X-ing for 2 tracks	Add 2 flashers

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
167.65	-----	Rehab. 2 flashers	-----	Rehab. 2 flashers	-----	Add 2 gates
167.6	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	Add 2 flashers
167.2	Clean 20' of track flangeways	-----	Clean 20' of track flangeways	Add 2 flashers	24' of new asphalt & timber X-ing	Add 2 flashers
166.4	Clean 19' of track flangeways	-----	Clean 19' of track flangeways	Add 2 flashers	28' of new asphalt & timber X-ing	Add 2 flashers
165.8	Clean 41' of track flangeways	Rehab. 4 flashers	Clean 41' of track flangeways	Rehab. 4 flashers	32' of new asphalt & timber X-ing	Rehab. 4 flashers
165.3	24' of new asphalt & timber X-ing	-----	24' of new asphalt & timber X-ing	Add 2 flashers	24' of new asphalt & timber X-ing	Add 2 flashers
164.5	-----	Install 2 cross-bucks	-----	Add 2 flashers	24' of new asphalt & timber X-ing	Add 2 flashers
163.9	28' of new asphalt & timber X-ing	-----	28' of new asphalt & timber X-ing	Add 2 flashers	28' of new asphalt & timber X-ing	Add 2 flashers
163.4	Clean 15' of track flangeways	Install 2 cross-bucks	20' of new asphalt & timber X-ing	Install 2 cross-bucks	20' of new asphalt & timber X-ing	Install 2 cross-bucks

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
163.2	32' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers	32' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers	32' of new asphalt & timber X-ing for 2 tracks	Add 2 gates
162.7	Clean 17' of track flangeways	-----	Clean 17' of track flangeways	-----		
161.7	Clean 22' of track flangeways	-----	24' of new asphalt & timber X-ing	-----		
160.7	Clean 18' of track flangeways	-----	24' of new asphalt & timber X-ing	-----		
159.9	Clean 14' of track flangeways	-----	Clean 14' of track flangeways	-----		
159.8	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign		
159.6	32' of new asphalt & timber X-ing & remove 32' of siding	-----	32' of new asphalt & timber X-ing & remove 32' of siding	-----		
158.7	Clean 17' of track flangeways	-----	Clean 17' of track flangeways	-----		
158.2	28' of new asphalt & timber X-ing	-----	28' of new asphalt & timber X-ing	-----		

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
158.0	Clean 23' of track flangeways	-----	Clean 23' of track flangeways	-----		
157.2	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign		
156.3	28' of new asphalt & timber X-ing	-----	28' of new asphalt & timber X-ing	-----		
155.75	New asphalt & timber X-ing with concrete headers, 32' - main & 42' - siding	Rehab. 2 flashers	New asphalt & timber X-ing with concrete headers, 32' - main & 42' - siding	Rehab. 2 flashers		
155.5	Clean 100' of track flangeways	Rehab. 2 flashers	Clean 100' of track flangeways	Rehab. 2 flashers		
155.4	Clean 80' of track flangeways	Rehab. 2 flashers	40' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers		
155.3	74' of new asphalt & timber X-ing for 2 tracks	Rehab. 3 flashers	74' of new asphalt & timber X-ing for 2 tracks	Rehab. 3 flashers		
155.2	Clean 60' of track flangeways	Rehab. 2 flashers	32' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers		
155.1	45' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers	45' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers		

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
154.8	53' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers	53' of new asphalt & timber X-ing for 2 tracks	Rehab. 2 flashers		
153.7	28' of new asphalt & timber X-ing	Add 1 cross-buck	28' of new asphalt & timber X-ing	Add 1 cross-buck		
153.1	Clean 29' of track flangeways	-----	32' of new asphalt & timber X-ing	-----		
151.5	30' of new asphalt & timber X-ing for 2 tracks	Install 2 new flashers	30' of new asphalt & timber X-ing for 2 tracks	Install 2 new flashers		
151.1	30' of new asphalt & timber X-ing	-----	30' of new asphalt & timber X-ing	-----		
150.9	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
150.3	Clean 16' of track flangeways	-----	Clean 16' of track flangeways	-----		
149.1	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
148.1	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation		Class 3 (40 mph) Rehabilitation		Class 3 (60 mph) Rehabilitation	
	Grade Crossing	Protection	Grade Crossing	Protection	Grade Crossing	Protection
147.6	72' of new asphalt & timber X-ing with concrete headers	Rehab. 2 flashers	72' of new asphalt & timber X-ing with concrete headers	Rehab. 2 flashers		
146.9	32' of new asphalt & timber X-ing & remove siding	-----	32' of new asphalt & timber X-ing & remove siding	-----		
146.8	32' of new asphalt & timber X-ing for 3 tracks	-----	32' of new asphalt & timber X-ing for 3 tracks	-----		
146.6	32' of new asphalt & timber X-ing for 2 tracks	-----	32' of new asphalt & timber X-ing for 2 tracks	-----		
146.5	Clean 16' of track flangeways	-----	Clean 16' of track flangeways	-----		
146.45	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
146.4	53' of new asphalt & timber X-ing	Rehab. 2 flashers	53' of new asphalt & timber X-ing	Rehab. 2 flashers		
145.2	Clean 28' of track flangeways	Replace 2 cross-buck signs	Clean 28' of track flangeways	Replace 2 cross-buck signs		
144.4	Clean 24' of track flangeways	Replace 2 cross-buck signs	Clean 24' of track flangeways	Replace 2 cross-buck signs		

TABLE NO. 7 (Continued)

Mile-Post	Class 2 Rehabilitation Grade Crossing	Class 2 Rehabilitation Protection	Class 3 (40 mph) Rehabilitation Grade Crossing	Class 3 (40 mph) Rehabilitation Protection	Class 3 (60 mph) Rehabilitation Grade Crossing	Class 3 (60 mph) Rehabilitation Protection
143.6	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
142.5	28' of new asphalt & timber X-ing for 2 tracks	-----	28' of new asphalt & timber X-ing for 2 tracks	-----		
142.3	32' of new asphalt & timber X-ing	Rehab. 2 flashers	32' of new asphalt & timber X-ing	Rehab. 2 flashers		
141.4	Clean 16' of track flangeways	-----	Clean 16' of track flangeways	-----		
140.4	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
139.6	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign	28' of new asphalt & timber X-ing	Replace 1 cross-buck sign		
139.4	20' of new asphalt & timber X-ing	-----	20' of new asphalt & timber X-ing	-----		
137.6	Clean 20' of track flangeways	Replace 2 cross-buck signs	Clean 20' of track flangeways	Replace 2 cross-buck signs		

Calculations for track rehabilitation costs for the track length between MP 171.4 and MP 137.5 for each of the 3 rehabilitation alternatives based on unit costs developed in this study from the local short line railroad and signal contractor prices and recommendations appear in Part Three, Supplemental Appendix VI of this report. A summary of those estimated rehabilitation costs in current dollars for the trackage, road crossings and signaling is as follows:

1. Rehabilitation to FRA Class 2 standards:

Track Rehab.	$ 2,658,000
Road Crossing Rehab.	1,002,000
Signal Installation	0
Total	$ 3,660,000

2. Rehabilitation to FRA Class 3 standards for 40 mph maximum:

Track Rehab.	$ 2,912,000
Road Crossing Rehab.	1,341,000
Signal Installation	2,265,000
Total	$ 6,518,000

3. Rehabilitation to FRA Class 3 standards for 60 mph maximum between MP 171.4 and MP 163.0 and 40 mph maximum elsewhere:

Track Rehab.	$ 4,275,000
Road Crossing Rehab.	1,592,000
Signal Installation	2,265,000
Total	$ 8,132,000

A comparison between the two different sets of cost estimates reveals the following differences.

1. For rehabilitation to FRA Class 2 standards, the total cost from calculations in Part Three, Supplemental Appendix IV (based on 1984 HNTB Report unit costs) is about 58 percent greater than the total cost determined from calculations in Part Three, Supplemental Appendix VI (based on unit costs developed in this study).

2. For rehabilitation to FRA Class 3 standards for 40 mph maximum, the total cost determined from calculations in Part Three, Supplemental Appendix IV is about 74 percent greater than the total cost determined from calculations in Part Three, Supplemental Appendix VI.

3. For rehabilitation to FRA Class 3 standards for 60 mph maximum between MP 171.4 and MP 163.0 and 40 mph maximum elsewhere, the total cost determined from calculations in Part Three, Supplemental Appendix IV is about 66 percent greater than the total cost determined from calculations in Part Three, Supplemental Appendix VI.

CHAPTER IV
BRIDGE INSPECTION AND REHABILITATION COST ESTIMATES

IV. BRIDGE INSPECTION AND REHABILITATION COST ESTIMATES

General

Six bridge structures exist along the track length being considered in this study (MP 171.4 to MP 137.5) and all are located north of Terhune, Indiana. The bridges were field inspected and bridge sketches and rating calculations obtained from Seaboard System Railroad were reviewed to identify the following for each bridge:

1. Description and general condition of the bridge;
2. Recommended repairs to maintain FRA Class 2 or Class 3 operations without weight limitations and the cost of the repairs;
3. The need for future maintenance and the cost of this maintenance in current dollars; and
4. A determination of whether the bridge or major components will probably have to be replaced within the next 20 years and the estimated cost for replacement in current dollars.

Sketches and rating calculations obtained from the Seaboard System Railroad for bridges at mileposts 150.6, 145.9, 145.6, 145.1 and 137.8 are included in Part Three, Supplemental Appendix VII of this report. No information was available from the Seaboard System Railroad for a culvert and concrete box structure located at MP 140.8.

In general, the bridges were found to be in operable condition, but additional inspection and repair of some of the bridges should be performed for continued safety of train operations. Bridge inspection and analysis work performed in this study were done to develop preliminary budget figures for repair work only.

A narrative for each bridge structure which provides a description, reviews the general condition, recommends immediate repairs with estimated costs, recommends future maintenance with estimated costs, and recommends whether or not the structure should be replaced within the next 20 years follows. A summary of the estimated current costs to perform recommended repairs, maintenance and replacement for each bridge appears in Table 8 of this report.

TABLE 8

SUMMARY OF BRIDGE RECOMMENDATION COSTS

Bridge (Milepost)	Estimated Age (Years)	Cost of Immediate Repairs	Cost of Future Maintenance*	Recommended Replacement Within Next 20 Years	Cost of Replacement
150.6	75	$ 6,000	$ 4,000	No	N.A.
145.9	60	$ 15,000	$ 13,000	Yes	$ 300,000
145.6	80	$ 15,000	$ 15,000	Yes	$ 540,000
145.1	75	$ 18,000	$ 17,000	No	$ 70,000
140.8		$ 10,000		Yes	$ 150,000
137.8	60	$ 15,000	$ 8,000	No	$ 30,000
		$ 79,000	$ 57,000		$1,090,000

* It is estimated that the timber ties will be replaced every 20 years, and that the steel superstructure will be painted every 20 years. Costs for this work are also in current dollars.

Notes:

1. Replacement costs do not include temporary run around embankments, trestles or tracks.
2. Replacement cost for bridge at MP 145.1 is only for the substructure.
3. Replacement cost for bridge at MP 137.8 is only for wingwalls.

Inspection of the Monon bridge across Kessler Boulevard in Indianapolis (Marion County) was added to the scope of work for this study because it was hit and knocked off its abutments twice by trucks during September and October of this year. A summary of the inspection results for that bridge follows the narratives on the other bridges inspected in this study.

BRIDGE AT MILEPOST 150.6

General Description

This structure is a single span, single track, steel beam bridge with a ballasted deck retained by 4" x 8" floor planks. The center to center bearing is approximately 22'-0. The end bents are composed of timber piles with a concrete cap. There are retaining walls directly behind the pile bents. The retaining walls are composed of timber. There are three beams under each rail (6 total). The four interior beams are 24" deep and have 14" wide flanges. The two outside beams are 24" deep and have 8½" wide flanges.

Existing Conditions

Substructure: The end bents are in good condition. The retaining walls are in very good condition and look to be less than 10 years old.

Superstructure: The floor planks and ballast are in very good condition. It appears the flooring, ballast and waterproofing membrane have been replaced recently. The structural steel is moderately rusted. There is no steel guard rail on the trackage.

Recommendations (to maintain Class 2 or 3 operations)

1. Sandblast and paint superstructure.

2. Add steel guardrail to the trackage.

Estimated Construction Cost (for repairs)

$ 6,000

Maintenance Cost

Future maintenance costs reflect the repainting of the superstructure every 20 years, and maintenance of ballast and ties. The current cost for repainting is estimated to be $4,000 and the maintenance cost for ballast and ties is included in track maintenance costs discussed later in this report.

Statement of Need to Replace Within Next 20 Years

With the recommended repairs and periodic maintenance, this bridge should give many more years of service. There is no need to replace this bridge.

BRIDGE AT MILEPOST 145.9

General Description

This structure is a two-span, single track, steel beam bridge with a ballasted deck retained by timber ties placed side by side. The northern most span (35' center to center bearing) is composed of six beams 30" deep. The flanges on the exterior beams are 10½" wide while the four interior beams have flanges 14" wide. The southern span (14' center to center bearing) is composed of five pairs of beams called car sills. The beams are 18" deep with 6" wide flanges. The substructures are cast-in-place concrete. The backwalls and the ballast retainers are constructed of timber. The trackage is on a one degree curve.

Existing Conditions

Substructure: The abutments and pier are in relatively good condition. There is erosion adjacent to the existing foundations. The ballast retainer and backwall at the south abutment is rotted and deteriorated. The ballast retainer and backwall at the north abutment is in good to fair condition.

Superstructure: The structural steel has some lamilar rust. The timber ties are moist and rotting. This bridge appears to have been put together from available materials. The bearing for the south span at the interior pier is composed of 8" x 10" timber ties, three high. The bearing for the north span is one set of car sills at each end of the steel beam.

Recommendations (to maintain Class 2 or 3 operations)

1. Sandblast and paint superstructure.

2. Replace timber ties and ballast. Incorporate waterproofing membrane over new ties.

3. Replace ballast retainers and backwall.

4. Analyze superstructure for live load carrying capacity.

Estimated Construction Cost (for repairs)

$ 15,000

Maintenance Cost

Future maintenance costs reflect the replacement of ties and repainting of the superstructure every 20 years. The current cost for this work is estimated to be approximately $13,000.

Statement of Need to Replace Within Next 20 Years

Due to the method of construction for the superstructure, the remaining service life is probably less than 20 years. Therefore, replacement of the entire structure would be necessary. Estimated current replacement cost is $300,000.

BRIDGE AT MILEPOST 145.6

General Description

This is a three-span, riveted steel, open timber deck bridge. Spans #1 and #3 are deck girder spans approximately 34'-0 center to center of bearing. The center span is a through-girder span approximately 51'-8 center to center bearing. The abutments and piers are constructed of stone block mortared in place.

Existing Conditions

Substructure: The stone blocks are in good to fair condition. The mortar joints are in fair to poor condition. Some of the stone blocks have separated. The piers have had some rehabilitation since being constructed in the form of metal straps at each end tied together with tie rods on each side. These ties are placed at each horizontal mortar joint. There is a crack in the massive foundation of one interior pier.

Superstructure: The structural steel is in good to fair condition. There is some rust on the main members while the secondary members are more heavily rusted. The timber ties are in fair condition.

Recommendations (to maintain Class 2 or 3 operations)

1. Sandblast and paint superstructure.

2. Repoint mortar joints in the substructure.

3. Replace 25% of existing ties.

4. Replace 50 lineal feet of timber spacers.

5. Repair foundation crack.

Estimated Construction Cost (for repairs)

$ 15,000

Maintenance Cost

Future maintenance costs reflect the replacement of ties and the repainting of the superstructure every 20 years. The current cost for this work is estimated to be approximately $15,000.

Statement of Need to Replace Within Next 20 Years

The remaining life of the substructures limits the life of the structure to something less than 20 years. Constructing new substructures and using the present superstructure is possible. But due to the age of the superstructure, it is likely to need replacement within a few years of replacing the substructure. Therefore, it is recommended that the superstructure be replaced at the same time the substructure is replaced. Estimated current replacement cost is $540,000.

BRIDGE AT MILEPOST 145.1

General Description

This is a three-span, single track, open timber deck, rolled beam bridge. The spans are 27 feet center to center of bearing (typical). There are eight beams, four beams per rail. The abutments and piers are constructed of stone blocks mortared in place. The piers have concrete encasement around their base. The south pier has metal straps and tie rods at each horizontal mortar joint to help hold it together. There are steel guard rails on this bridge.

Existing Conditions

Substructure: The stone blocks are spalled and deteriorated. The mortar joints at both abutments are in fair to poor condition. The mortar joints at the north pier have been repaired and are in good condition. There is erosion at the base of the piers (minor). The concrete pier encasements are in good condition. The metal straps and tie rods used at the south pier were apparently used to tie the stone together. The rods are taut.

Superstructure: The structural steel is in fair to good condition with light surface rust. The ties typically are in fair condition. One tie is missing near the south pier. It appears that the missing tie has been burned out. The ties adjacent to the missing one have been damaged due to fire.

Recommendations (to maintain Class 2 or 3 operations)

1. Replace 25% of existing ties.

2. Repoint mortar joints.

3. Replace 40 lineal feet of timber spacers.

4. Repair erosion.

5. Sandblast and paint superstructure.

Estimated Construction Cost (for repairs)

$ 18,000

Maintenance Cost

Future maintenance costs reflect tie replacement and repainting the superstructure every 20 years. The current cost for this work is estimated to be $17,000.

Statement of Need to Replace Within Next 20 Years

Due to the condition of the abutments and piers, it will be necessary to replace the substructures within the next 20 years. However, the structural steel is salvageable and complete replacement of the bridge is not necessary. Estimated current cost of replacing only the substructures is $70,000.

BRIDGE AT MILEPOST 140.8

General Description

This is a two-span, single track, ballasted, concrete slab bridge. The spans are approximately 10 feet from face to face of supports. There is a corrugated metal pipe encased in concrete under each span. The abutments are cast-in-place concrete. The interior pier and the wings are constructed of stone blocks mortared in place.

Existing Conditions

Substructure: The abutment walls are in fair condition. The face of the stone blocks is spalling at the interior pier. Some of the mortar is missing from the joints. The wingwalls are in fair to poor condition. Some of the stone blocks are spalled and broken. The mortar is missing from several of the joints.

Superstructure: The concrete slab is in good to fair condition. There are some cracks and spalling along the coping.

Recommendations (to maintain Class 2 or 3 operations)

1. Repoint mortar joints.
2. Replace 20% of existing ties.
3. Analyze superstructure for live load carrying capacity.
4. Patch superstructure coping.
5. Add steel guardrail to trackage.

Estimated Construction Cost (for repairs)

$ 10,000

Maintenance Cost

Future maintenance costs reflect the maintenance of ballast and ties. Cost for this work is included in track maintenance costs discussed later in this report.

Statement of Need to Replace Within Next 20 Years

Replacement of this structure is recommended within the next 20 years. However, it may be possible to extend the existing culvert pipes on each end, remove the existing slab and fill in the area between the abutments. This alternative would reduce periodic maintenance costs and would be less expensive than replacing the structure. Estimated current replacement cost for the structure is $150,000.

BRIDGE AT MILEPOST 137.8

General Description

This is a single span, single track, open timber deck, rolled beam bridge approximately 31 feet long. It has four beams, two beams per rail. The north and south abutments are constructed of stone blocks mortared in place and a cast-in-place concrete wall (18" ± thick) in front of the stone blocks. The wingwalls are constructed of stone blocks mortared in place. The backwall and bearing seat are of timber construction.

Existing Conditions

Substructure: The stone blocks are in relatively good condition. The mortar joints are in fair condition. The west wingwall of the north abutment is cracked and has settled. The wingwall foundations at the north abutment have been undermined. The abutments are in good condition.

Superstructure: The steel beams are in good condition. There is no existing lateral bracing or diaphragms. The oak timber ties are in good to fair condition. The timber guard rail is in fair to good condition.

Recommendations (to maintain Class 2 or 3 operations)

1. Repair undermined and settled wingwalls.

2. Repoint mortar joints.

3. Replace 20% of existing ties.

4. Install diaphragms at each end of the structure.

5. Replace timber bearing seat with concrete.

6. Replace 20 lineal feet of timber spacers.

7. Sandblast and paint superstructure.

Estimated Construction Cost (for repairs)

$ 15,000

Maintenance Cost

Future maintenance costs reflect tie replacement and repainting the superstructure every 20 years. The current cost for this work is estimated to be $8,000.

Statement of Need to Replace Within Next 20 Years

With proper maintenance and periodic inspection the remaining service life could extend well beyond 20 years. However, the wingwalls would need to be replaced in the next 20 years at an estimated current cost of $30,000.

BRIDGE OVER KESSLER BOULEVARD (MP 175.9)

During the months of September and October of 1985 the Monon bridge across Kessler Boulevard in Indianapolis was hit twice by trucks and knocked off its abutments. The bridge was repaired and reset back on its abutments by the Seaboard System Railroad each time shortly after it was hit. Results of a visual inspection of the bridge on December 5, 1985, are as follows:

General Description

This structure is a single span, single track, open timber deck rolled beam bridge and is approximately 38 feet long with a clearance over the pavement of approximately 11 feet 4 inches. There are four steel beams, two beams under each rail. The abutments are of stone block construction. The bridge seat and backwall are cast-in-place concrete. There is no steel guard rail on the bridge. (See Exhibit 2)

Existing Conditions

The general condition of the abutments is fair to good. The outside steel beams have both been damaged by being hit by road traffic below. The damage to the outside beam on the east side is minute. The damage to the outside beam on the west side is more extensive but minor with respect to its structural capacity. The bottom of the beam (west-outside) is bowed approximately 3 inches where it has been hit. The bottom flange has not been cut and there appears to be no loss of beam section. The beams are not attached to the substructure. The rail and ties near each end of the bridge are loose and are not resting on or supported by the ballast. In summary, the damage to the beams is minor and does not significantly affect the structural capacity. The beams do need to be secured to the substructure. Ballast should also be added at each end of the bridge to support the ties and rails.

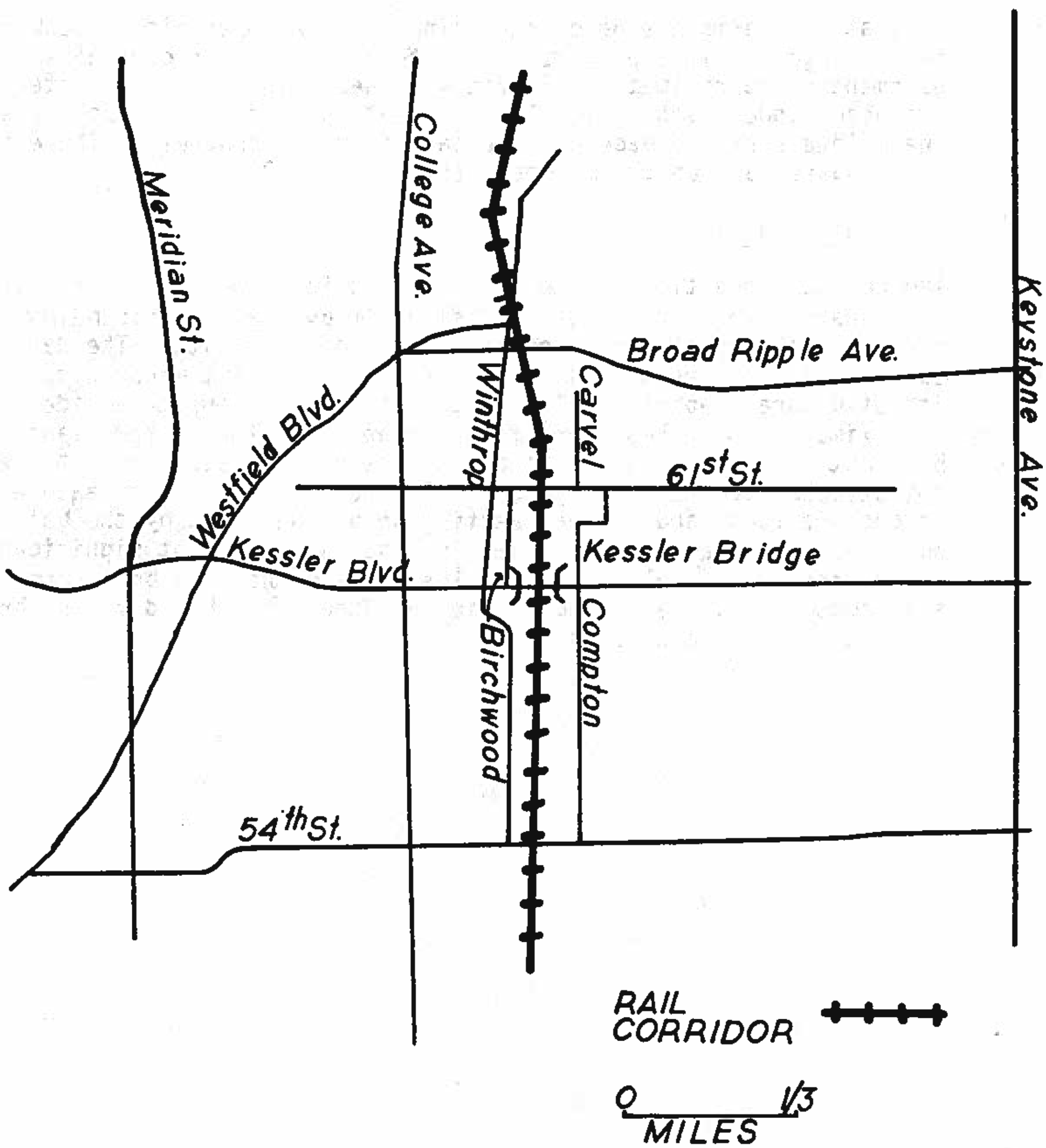


EXHIBIT 2:

KESSLER BRIDGE

CHAPTER V
MISCELLANEOUS CONSTRUCTION COSTS

V. MISCELLANEOUS CONSTRUCTION COSTS

Construction costs for maintenance facilities and passenger station facilities were estimated prior to this study and are included in this report as supplemental information. Construction of a maintenance facility would be very desireable for operation of the trackage by a short line railroad for both freight and passenger service. Construction of one or more passenger stations would be necessary for trackage in this study if it is decided to upgrade for commuter traffic.

The previously estimated construction cost for a 60' x 150' maintenance facility with a 30' x 150' attached office would be approximately $250,000. Such a facility would enclose two tracks and would allow work on four locomotives or passenger cars.

The maintenance building could be constructed anywhere that is convenient along the trackage. However, if passenger service is provided, then location of the facility within the passenger service limits would be desireable.

The previously estimated construction cost for a passenger station is approximately $240,000 and is broken down as follows:

Item		Cost
1.	20' x 30' concrete block building (including a newstand, place for an automatic ticket vending device and employee restrooms) and an 8' x 400' paved boarding area	$ 45,000
2.	Automatic ticket vending device	17,000
3.	Four turnstiles	28,000
4.	Parking lot (accommodating 200 cars)	150,000
	Total	$240,000

Location of such passenger stations for trackage considered in this study would be in Carmel and Westfield (if it is decided to extend passenger service as far north as Westfield). Other previously proposed locations for construction of such passenger stations include Nora, Broad Ripple and the State Fairgrounds in Indianapolis.

Neither of the previously estimated construction costs for a maintenance facility or a passenger station include costs for land acquisition. Sufficient existing right-of-way may be available at some locations along the trackage to construct such facilities. However, additional land would most likely be needed to construct parking lots for the passenger stations.

An additional capital cost to consider that is not included in construction and rehabilitation cost estimates presented in this report is for engineering services. The cost of engineering services for preliminary design work, preparation of plans and specifications, and provision of engineering services during construction usually runs from 8 to 15 percent of the construction cost. The actual fee would be somewhat dependent on task difficulty and type of method used to select contractors for construction.

CHAPTER VI
MAINTENANCE COSTS

VI. MAINTENANCE COSTS

Annual Costs

The nature of railroad operations requires that annual maintenance be performed to help prevent deterioration of the trackage and bridges. This annual maintenance would include spot corrections of track and bridge items such as loose bolts, broken rails, poor track surface, brush cutting, weed spraying and track regaging. Estimated approximate annual maintenance costs previously presented in 1984 HNTB Report are as follows:

1. For Class 2 freight operation: $8000/mi
2. For Class 3 passenger/freight operation up to 40 mph: $13,200/mi
3. For Class 3 passenger/freight operation up to 60 mph: $16,700/mi

Representatives at the Indiana Transportation Museum and the Indiana Hi-Rail Corporation were contacted regarding their estimate of annual track maintenance costs. Comments from both of those organizations were that the maintenance costs listed in the 1984 HNTB Report were much higher than they expected for operation of the track after rehabilitation by a short line railroad with some commuter traffic. A more realistic annual track and bridge maintenance cost estimate proposed by them was around $5,000 per mile for the track length being considered. (Approximately $2,500 per mile for direct labor and materials costs plus $2,500 per mile for administrative, overhead and other miscellaneous costs.) For the 33.9 miles of main track and 2.1 miles of siding storage track being considered in this study and an annual maintenance cost of $5,000 per mile, the current annual maintenance cost is estimated to be approximately $180,000.

Future Capital Expenditures

It should be noted that the annual maintenance costs discussed above would not include future capital expenditures. These capital expenditures would include tie replacement, rail replacement, surfacing and lining of track, bridge improvements, signal improvements and various other outside of normal annual maintenance practices. The level of expenditures for these anticipated capital improvements is dependent on both the level of initial rehabilitation work and the rail traffic density.

The previous 1984 HNTB Report listed the future capital expenditure costs as being in the range of two and one-half times the annual maintenance expense ten years after the operation commences and would occur on a repeating cycle of approximately every 10 years. For an annual maintenance cost of $8,000/mi and 36 miles of main and siding track, the estimated capital expenditures every ten years would be about $720,000.

A determination of future capital expenditures on a 10 year repeating cycle was made in this study by making the following assumptions for major cost item expenditures:

1. Expected crosstie life is 25 years with 40 percent of the crossties having to be replaced every 10 years.
2. Expected useable rail life is 50 years with 20 percent of length having to be replaced every 10 years.
3. Approximately 1/3 of the track length will have to have the shoulder ballast cleaned and be surfaced every 10 years.
4. Approximately 1/3 of the road crossings will have to be replaced every 10 years.

Calculations for estimation of the current construction costs for future capital expenditures every 10 years based on the above assumptions are as follows:

1. Main line tie replacement:

   33.9 mi x 3,249 ties/mi x .4 x $40.50/tie = $1,784,000

2. Siding tie replacement:

   2.1 mi x 3,249 ties/mi x .4 x $35.50/tie = $ 97,000

3. Rail replacement:

   .2 x 36 mi x $63,400/mi = $ 456,000

4. Shoulder ballast cleaning and track surfacing:

   1/3 x 36 mi x ($1,880 + $12,900)/mi = $ 177,000

5. Road crossing replacement:

   1/3 x 2,546' x $500/ft = $ 424,000

   Total $2,938,000

The estimated current construction cost in this study for future capital expenditures to keep the track length being considered in optimum condition is approximately $2,940,000. That cost can be expected to be expended within 10 years after initial track rehabilitation work and repeated every 10 years thereafter.

CHPATER VII
GUIDED BUSWAY EVALUATION AND COST ESTIMATE

VII. GUIDED BUSWAY EVALUATION AND COST ESTIMATE

General

An investigation of guided bus system technology and costs associated with installation of such a system were included in the scope of this study as an alternative use to consider for the Monon Railroad trackage. The concept considered in this study would be to utilize modified city buses that would travel over the existing railroad trackage after it was modified for guided bus traffic. Potential advantages to this alternative are as follows:

1. Freight train traffic and commuter bus traffic would be able to share the same right-of-way.

2. Because existing city buses could be utilized, expensive investment in new rolling stock to provide passenger service over the railroad trackage would not be required.

3. A limited access corridor between Carmel and downtown Indianapolis for bus traffic could be provided without having to construct a separate busway. This limited access corridor would allow buses to travel around traffic congestion.

4. Existing narrow railroad bridges could probably be used for bus traffic because a guidance system would reduce road width required for safe bus operation to 10 feet.

Potential disadvantages of such an alternative are as follows:

1. Capital expenditures would be required to modify both the trackage and buses.

2. Traffic would be limited to one direction at a time because only a single lane route would be available.

3. Some technical problems as discussed next would need to be solved.

Technology Evaluation

Investigation of the existing guided bus technology reveals that there are currently two different types of guidance systems being developed. One system uses mechanical guidance equipment that consists primarily of two feeler arms with rollers which contact vertical guide rails on both sides of the guideway. The arms, mounted just ahead of the front wheels of a bus, would transmit motion to the bus steering mechanism. Once in guideway operation, the driver would only be responsible for acceleration and braking.

The second system utilizes electronic guidance equipment in which an antenna, mounted in the front bumper of the bus, receives control signals from a pilot cable buried in the roadway along the desired route. The cable carries audio frequency alternating current which generates an electro-magnetic field to be detected by the bus antenna. The hydraulic steering on the bus is controlled by signals received through this antenna.

A demonstration project for the mechanical guidance system has been constructed over about 900 meters of light rail (LR) trackage in Essen, Germany. That project allows both buses and commuter rail cars to pass over the same rail trackage. Technological considerations which would need to be addressed that were raised when reviewing reports on that project are as follows:

1. The narrow gage of the LR system in Essen facilitated development of the concept. For standard track gage, the design would be more complicated because the inside tires on the four-tire bus axles would be over and inside of the rails. (The distance between tires on the middle axle of an articulated M.A.N. bus is only 44½" while standard track gage width is 56½".)

2. Snow and ice would need to be removed from the guideway during the winter before operating safely.

3. A mechanical guidance system does not work when traveling through road crossings at grade. At grade crossings the driver would have to resume steering because the guidance rails cannot pass through a crossing. There are in excess of 20 grade crossings between Carmel and downtown Indianapolis for the Monon trackage, so effectiveness of a guidance system might be reduced.

4. Existing warning flashers at grade crossings would not be activated by guided bus traffic unless the flashers were modified to be activated by means other than a short in the electrical current flow through the rails.

The electronic guidance system technology is not as fully developed as the mechanical system technology and, to date, there is no information available on operational systems. Information currently available about electromagnetic guidance systems also suggests that the nearby presence of a metallic mass (such as steel rails) may distort the electromagnetic field used for guidance. Therefore, installation of an electronic guidance system for bus travel over the Monon trackage was not further considered in this study.

Cost Estimates

Cost data for a mechanical guidance system for the demonstration project in Essen, Germany was obtained from a March, 1984 report entitled "Evaluation of European Guided Bus Technology, Task 2 Technical Memo" as prepared by Lea, Elliott McGean & Company in Washington, D.C. for the municipality of Metropolitan Seattle. Capital costs in that report were in terms of mid 1983 dollars and an exchange rate of 2.84 Deutch Marks per dollar. Costs obtained from that report were adjusted for an approximate 2 percent inflation in the ENR Construction Cost Index since mid 1983 and a current exchange rate of about 2.61 Deutch Marks per dollar. Adjusted cost data from that report as applicable to this study are as follows:

1.	Prefabricated road strips laid on level ground	$ 44/ft
2.	Installation of steel guidance rails (both sides)	$ 43/ft
3.	Mechanical guidance system for buses	$ 3,000/bus
4.	Annual track maintenance cost - replace .5% of track length per year	
5.	Annual maintenance cost for guidance system on buses	$ 500/bus

The above capital cost for installation of prefabricated road strips would probably have to be increased by at least 50 percent to cover the additional cost for installing the prefabricated road strips between the rails of standard gage track. Based on that assumption, a construction cost estimate can be prepared for installing a bus guideway over the railroad tracks between approximate MP 181.2 (16th Street in Indianapolis) and MP 167.7 (old depot location in Carmel). An approximate construction cost estimate for constructing the guideway after the track has been rehabilitated to FRA Class 2 or 3 standards is as follows:

1. Prefabricated road strip cost:

   13.5 mi x 5,280'/mi x 1.5 x $44/ft = $ 4,704,000

2. Steel guidance rail cost:

   13.5 mi x 5,280'/mi x $43/ft = 3,065,000

   Total $ 7,769,000

The estimated preliminary construction cost to construct a single lane guideway over the railroad trackage between Carmel and downtown Indianapolis is approximately $7,800,000. The resulting applicable annual maintenance cost for the guideway and not the track structure based on cost information from the Essen project would be approximately $39,000 per year. Additional maintenance and future capital expenditures previously described in this report for railroad trackage would need to be added to the guideway maintenance cost along with costs for snow removal to determine the total maintenance cost for the guideway.

Railbus Alternative

If the technological problems and construction costs associated with a guided busway are felt to be excessive, then consideration should be given to utilizing railbuses as another alternative for commuter service. The railbus is a bus shell mounted on a two-axle self-powered rail car underframe. The railbus can be provided in one, two or three car units and can be run over standard gage track.

Potential advantages of railbuses are as follows:

1. Rolling stock costs approximately one-half the price of comparable commuter train equipment.
2. Can utilize the existing Monon trackage after rehabilitation without any special modifications such as required for a guided busway.
3. Light weight of the vehicles would reduce the amount of maintenance work that would need to be done on the trackage for commuter traffic.
4. Fuel consumption due to light weight is excellent. Specification data available lists consumption capability of 7.5 miles per gallon for a single car unit.
5. A successful demonstration project has already been conducted in the United States. (Revenue testing service between Lowell, Massachusetts and Concord, New Hampshire was completed in 1981.)

Potential technical problems and disadvantages of railbuses are as follows:

1. Reliability of vehicles to shunt block signals and activate crossing warning devices is not yet proven.
2. Due to the relative light weight, it is questioned if the vehicles are strong enough to offer reasonable protection to passengers in the event of a collision or grade crossing accident.

3. Light weight and single axle design also raises questions about capability to operate over icy crossings.

The lack of additional construction expenditures once the existing trackage is rehabilitated and passenger stations are constructed probably makes the railbus alternative more attractive than the guided busway. The technical problems and disadvantages of a railbus are similar to those for a guided busway, but appear to be of less magnitude because the railbus actually uses the existing rails. Problems with reliable signal shunting and activation of crossing warning devices are being investigated by manufacturers and should be solveable. Safety problems at crossings could also be reduced by using gate protection at all major traffic grade crossings.

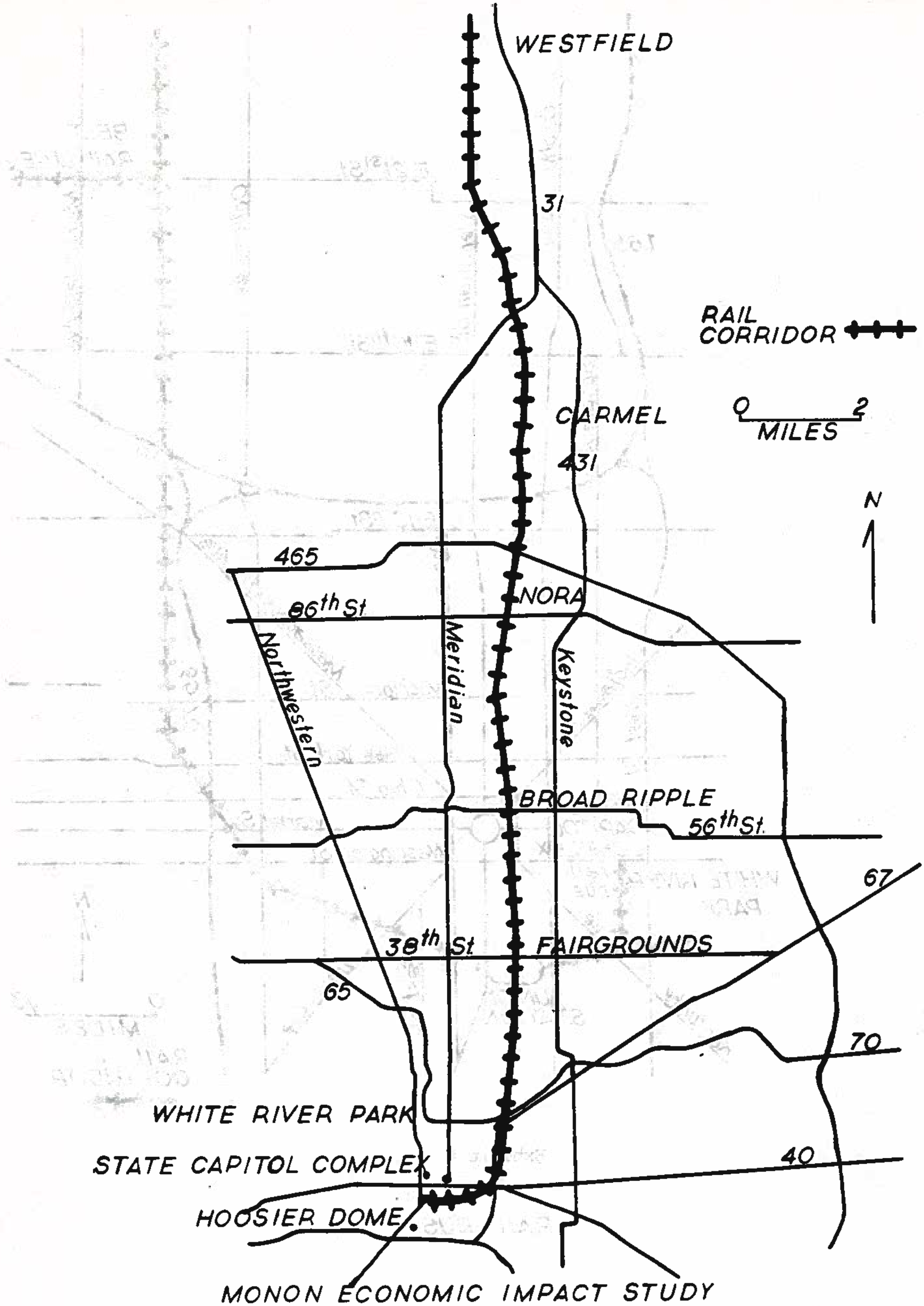


EXHIBIT 3: METROPOLITAN AREA MAP

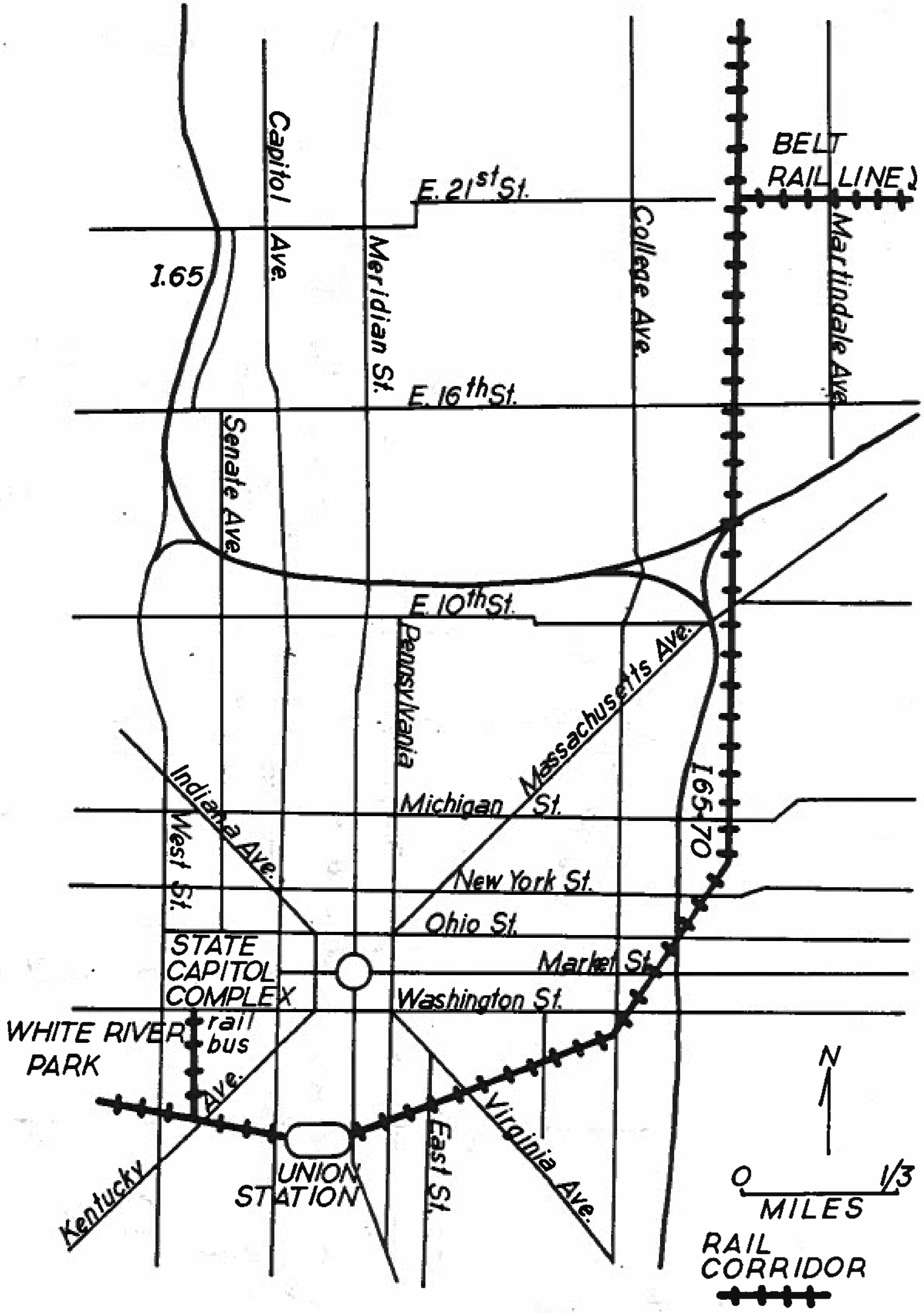


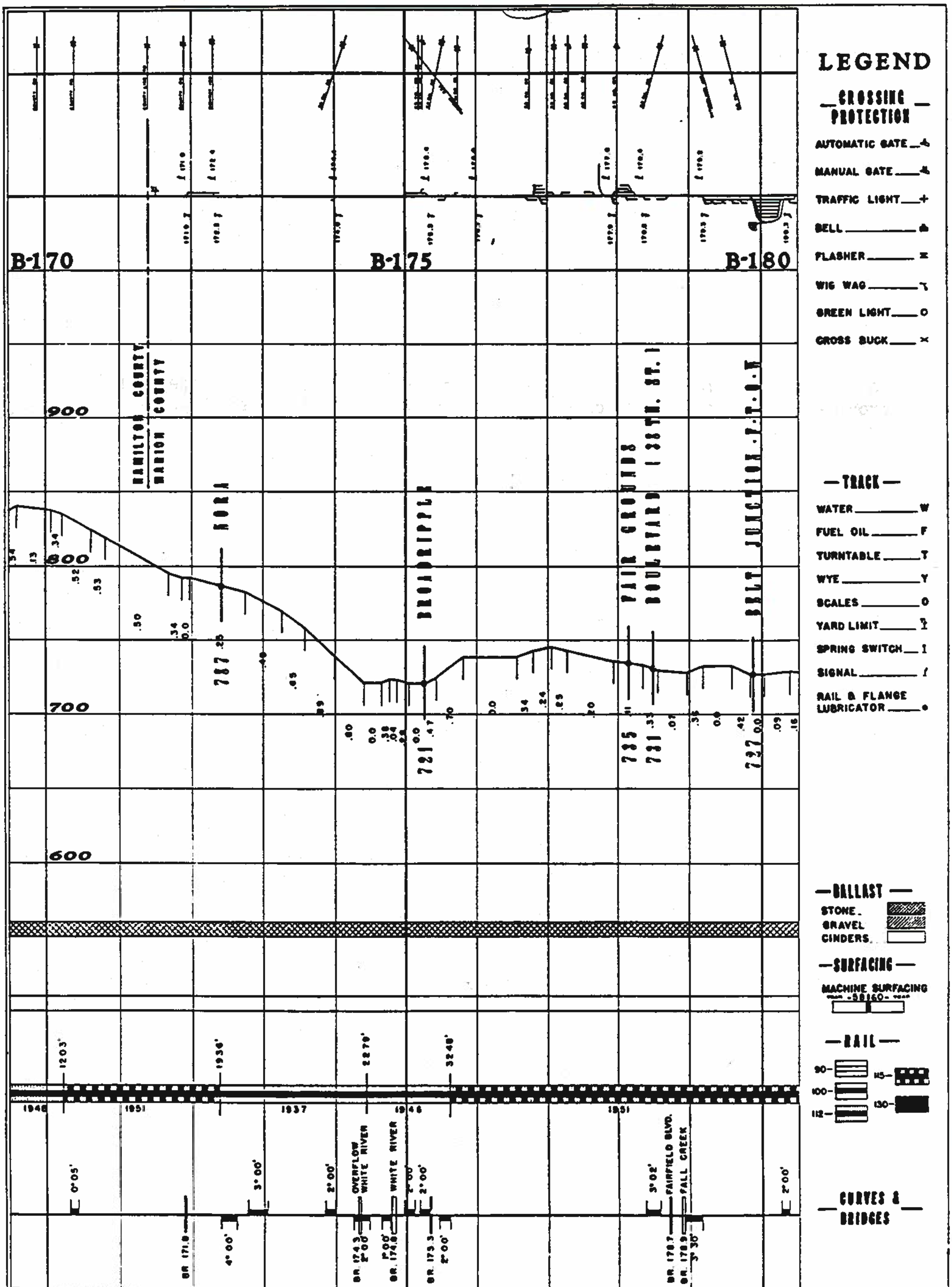
Exhibit 4

RAIL BUS

CHAPTER VIII
TRACK CHART INFORMATION

VIII. TRACK CHART INFORMATION

This chapter provides a breakdown of the track charts of the Monon Line. It is provided so that the reader can have a better understanding of the line's topography.



B-170
B-175
B-180
HAMILTON COUNTY
MARION COUNTY
NORA
BROADRIPPLE
FAIR GROUNDS
BOULEVARD (38TH. ST.)
BELT JUNCTION-F.T.O.W.
900
800
700
600
787
721
785
781
797
1203'
1936'
2279'
3248'
1946
1951
1937
1946
1951
0°05'
3°00'
2°00'
OVERFLOW WHITE RIVER
WHITE RIVER
2°00'
3°02'
FAIRFIELD BLVD.
FALL CREEK
2°00'
BR. 171.8
4°00'
BR. 174.3
2°00'
BR. 174.6
BR. 175.3
2°00'
BR. 178.7
BR. 178.9
3°30'
LEGEND
CROSSING PROTECTION
AUTOMATIC GATE
MANUAL GATE
TRAFFIC LIGHT
BELL
FLASHER
WIG WAG
GREEN LIGHT
CROSS BUCK
TRACK
WATER
FUEL OIL
TURNTABLE
WYE
SCALES
YARD LIMIT
SPRING SWITCH
SIGNAL
RAIL & FLANGE LUBRICATOR
BALLAST
STONE
GRAVEL
CINDERS
SURFACING
MACHINE SURFACING
RAIL
90
100
112
115
130
CURVES & BRIDGES

LEGEND

CROSSING PROTECTION

- AUTOMATIC GATE
- MANUAL GATE
- TRAFFIC LIGHT
- BELL
- FLASHER
- WIG WAG
- GREEN LIGHT
- CROSS BUCK

TRACK

- WATER — W
- FUEL OIL — F
- TURNTABLE — T
- WYE — Y
- SCALES — O
- YARD LIMIT
- SPRING SWITCH
- SIGNAL
- RAIL & FLANGE LUBRICATOR

BALLAST

- STONE
- GRAVEL
- CINDERS

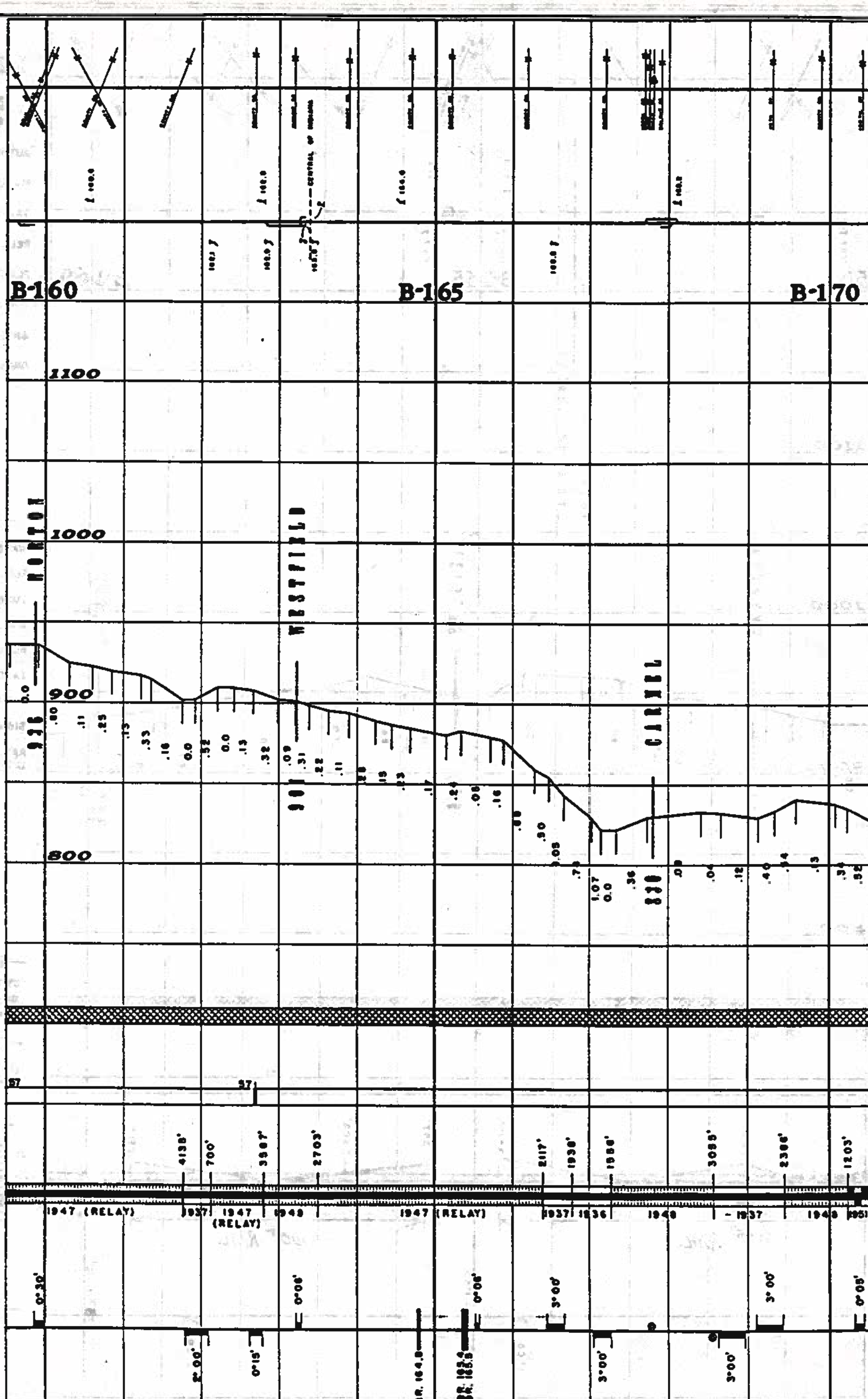
SURFACING

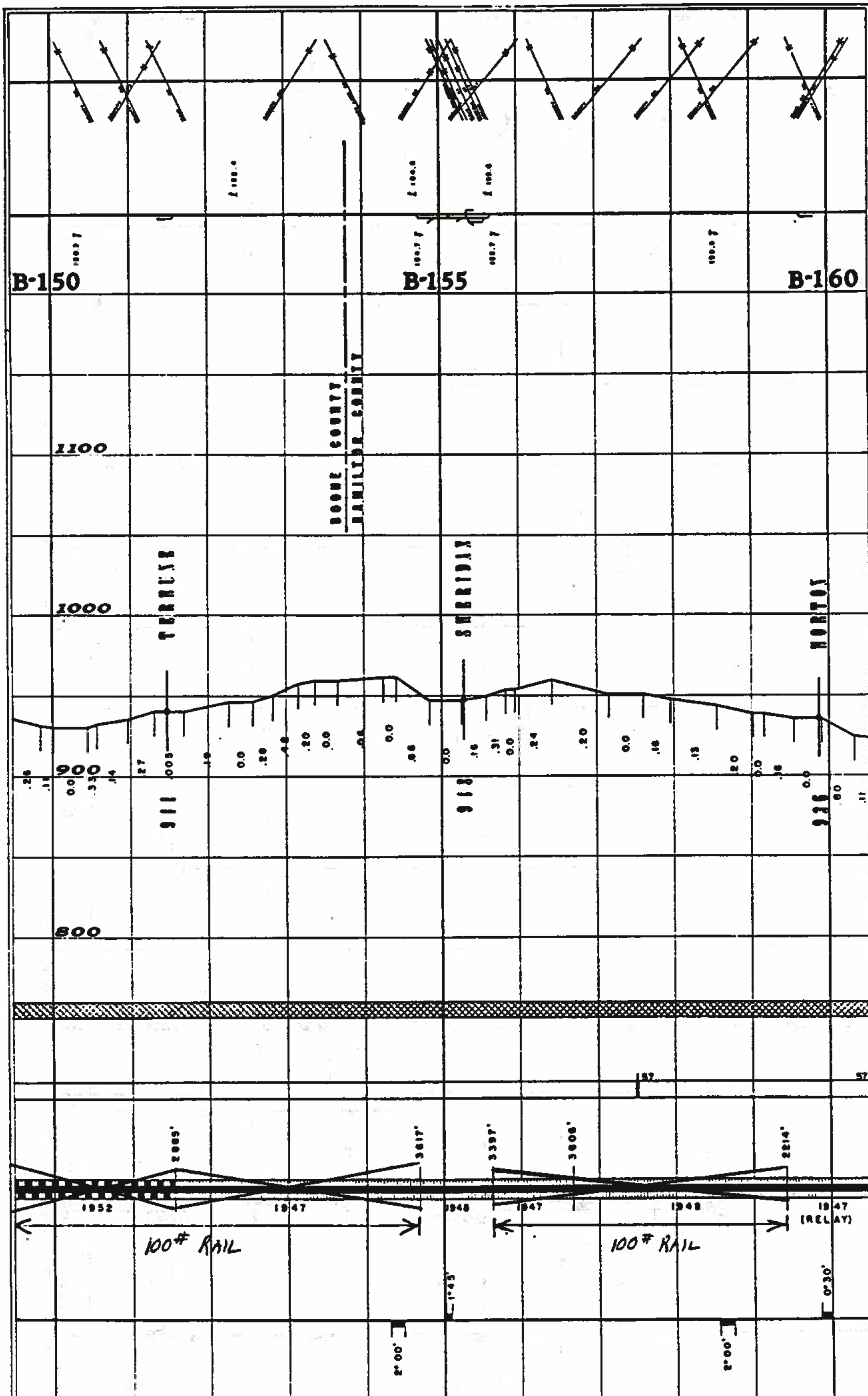
MACHINE SURFACING
-56160-

RAIL

- 90
- 100
- 112
- 115
- 130

CURVES & BRIDGES





LEGEND

CROSSING PROTECTION

- AUTOMATIC GATE
- MANUAL GATE
- TRAFFIC LIGHT
- BELL
- FLASHER
- WIG WAG
- GREEN LIGHT
- CROSS BUCK

TRACK

- WATER — W
- FUEL OIL — F
- TURNTABLE — T
- WYE — Y
- SCALES — O
- YARD LIMIT
- SPRING SWITCH
- SIGNAL
- RAIL & FLANGE LUBRICATOR

BALLAST

- STONE
- GRAVEL
- CINDERS

SURFACING

MACHINE SURFACING

RAIL

90 — 100 — 112 — 115 — 130

CURVES & BRIDGES

LEGEND

CROSSING PROTECTION

- AUTOMATIC GATE
- MANUAL GATE
- TRAFFIC LIGHT
- BELL
- FLASHER
- WIG WAG
- GREEN LIGHT
- CROSS BUCK

TRACK

- WATER — W
- FUEL OIL — F
- TURNTABLE — T
- WYE — Y
- SCALES — O
- YARD LIMIT
- SPRING SWITCH
- SIGNAL
- RAIL & FLANGE LUBRICATOR

BALLAST

- STONE
- GRAVEL
- CINDERS

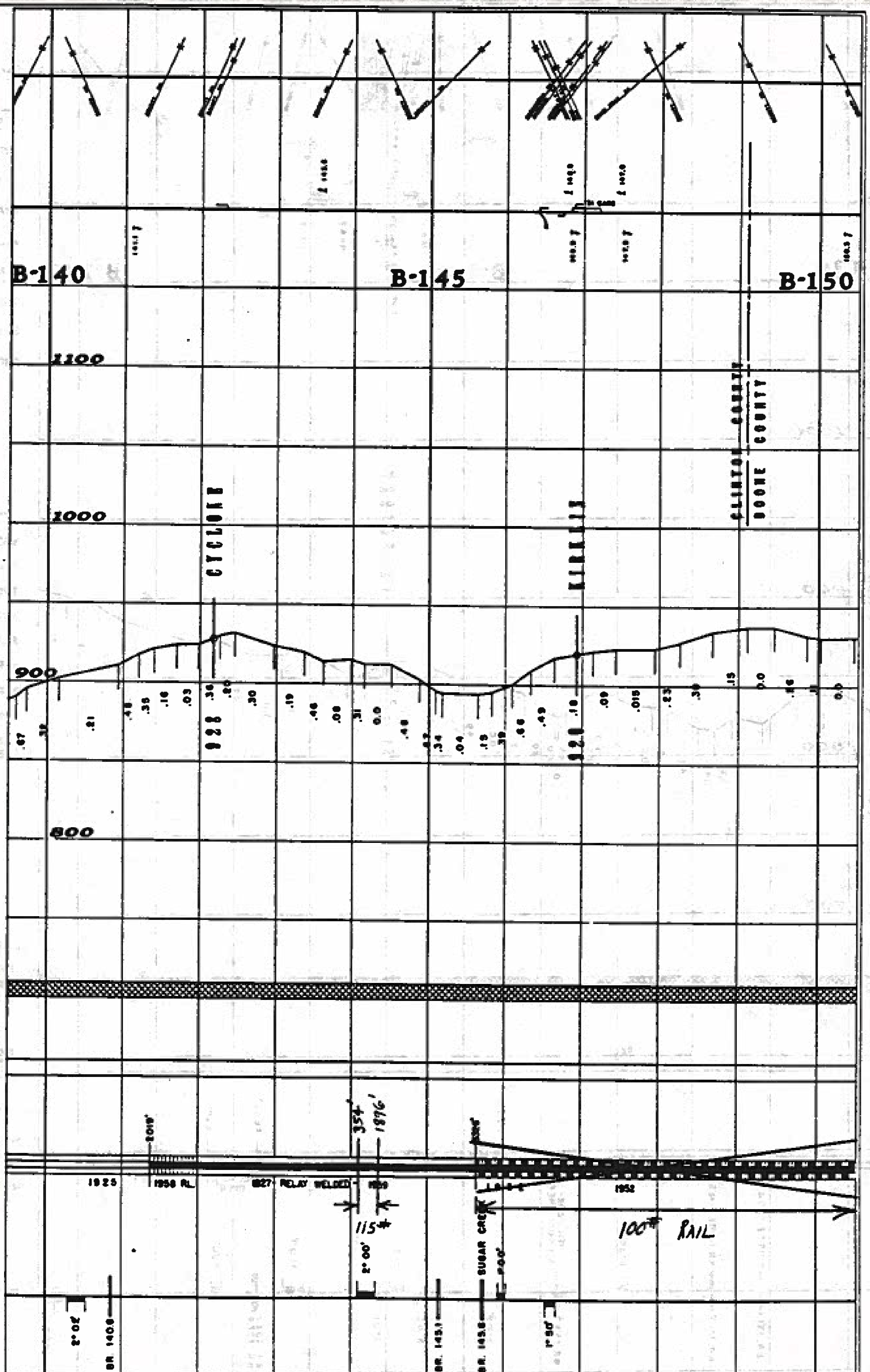
SURFACING

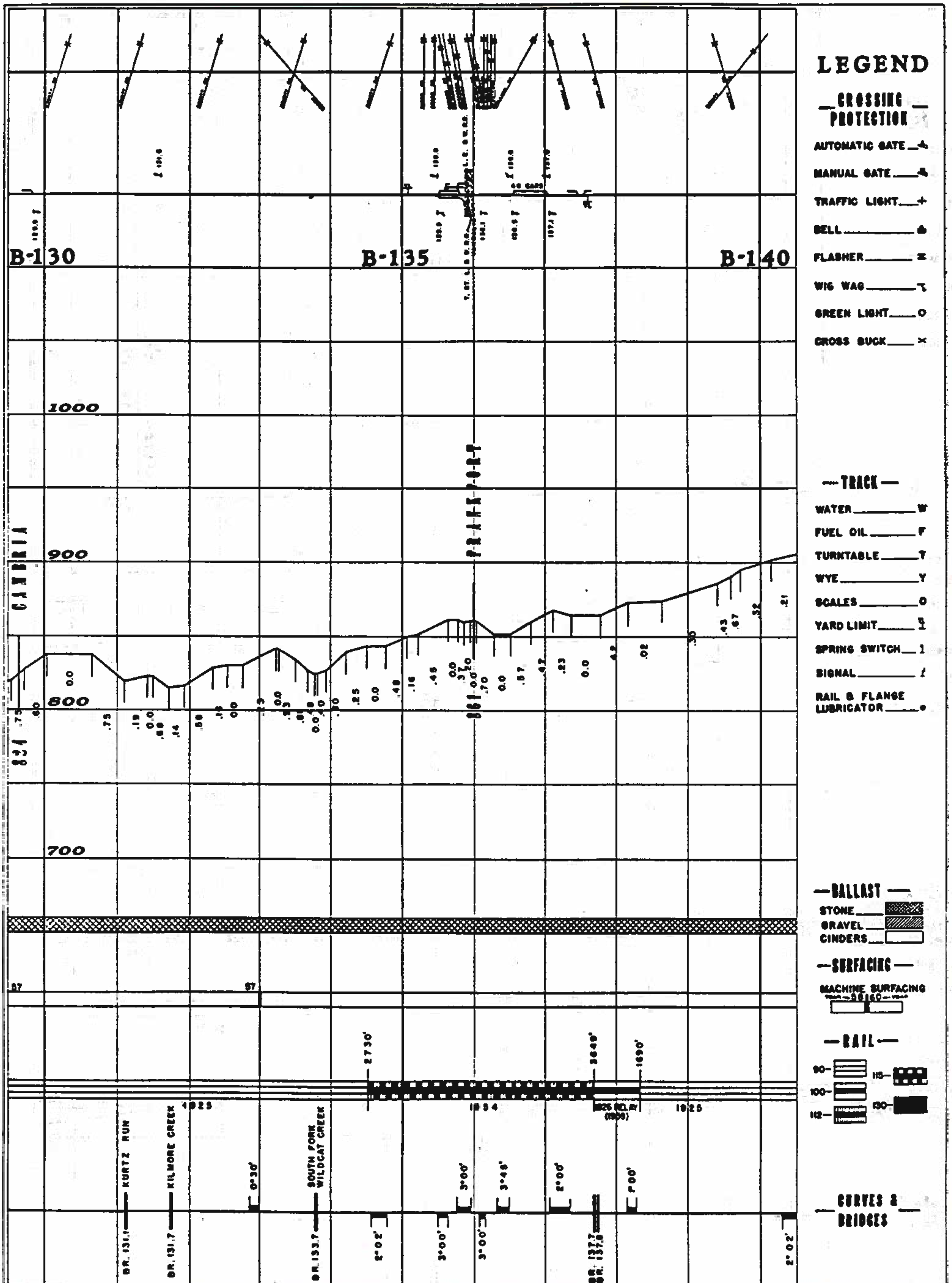
MACHINE SURFACING

RAIL

- 90
- 100
- 112
- 115
- 130

CURVES & BRIDGES

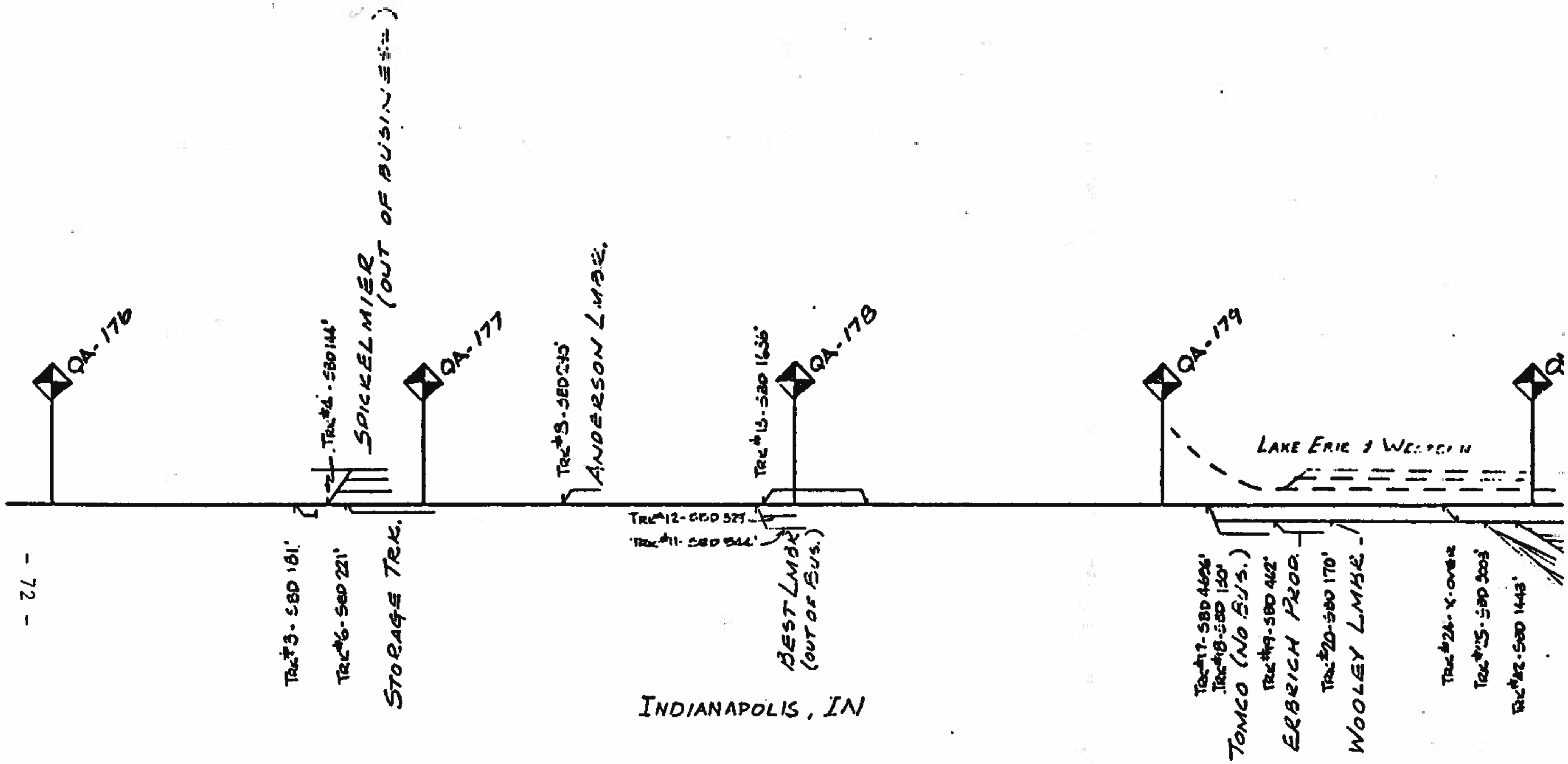



B-130
B-135
B-140
1000
900
800
700
CAMBRIA
FRANKPORT
KURTZ RUN
KILMORE CREEK
SOUTH FORK WILDCAT CREEK
BR. 131.1
BR. 131.7
BR. 133.7
BR. 137.7
BR. 137.8
2730'
3649'
1690'
1925
1954
1925
0°30'
3°00'
3°45'
2°00'
1°00'
2°02'
3°00'
3°00'
2°02'
LEGEND
CROSSING PROTECTION
AUTOMATIC GATE
MANUAL GATE
TRAFFIC LIGHT
BELL
FLASHER
WIG WAG
GREEN LIGHT
CROSS BUCK
TRACK
WATER
FUEL OIL
TURNTABLE
WYE
SCALES
YARD LIMIT
SPRING SWITCH
SIGNAL
RAIL & FLANGE LUBRICATOR
BALLAST
STONE
GRAVEL
CINDERS
SURFACING
MACHINE SURFACING
RAIL
90
100
112
115
130
CURVES & BRIDGES

CHAPTER IX
TRACK BOOK INFORMATION

IX. TRACK BOOK INFORMATION

This chapter further defines physical aspects of the Monon Line as shown by Seaboard's track book.



V245A 23	SEABOARD SYSTEM RAILROAD	TRACK BOOK	OFFICE OF Asst. Engineer	SHEET OF
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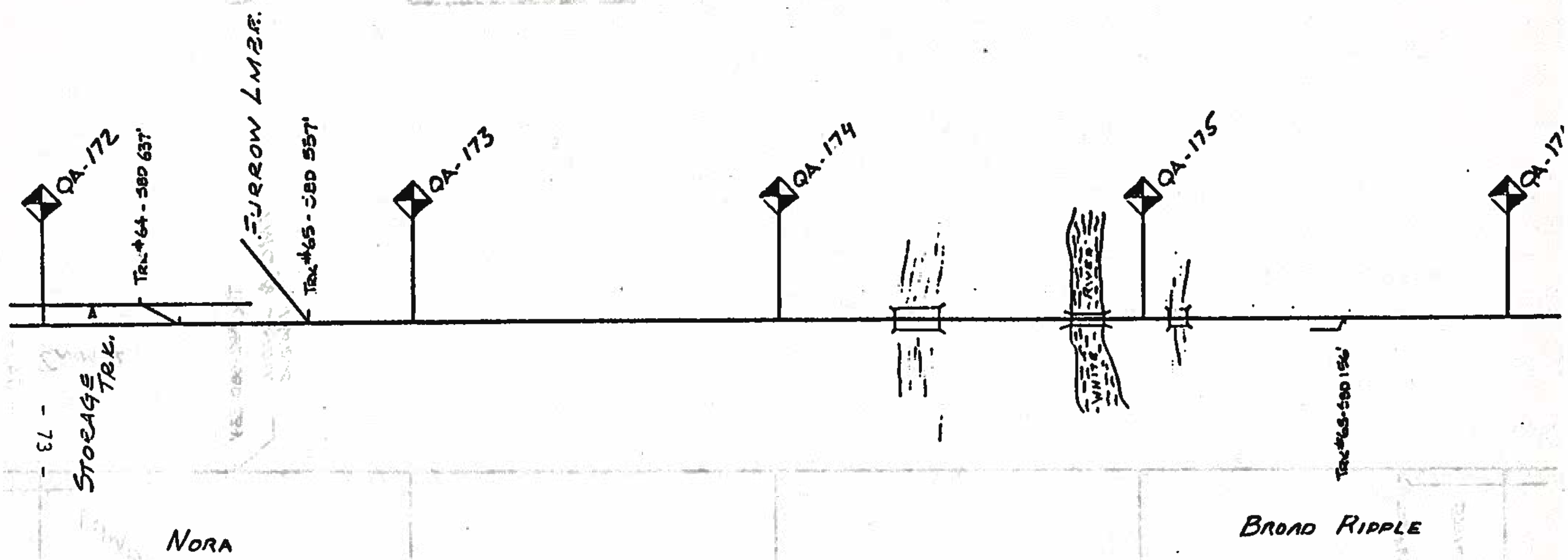

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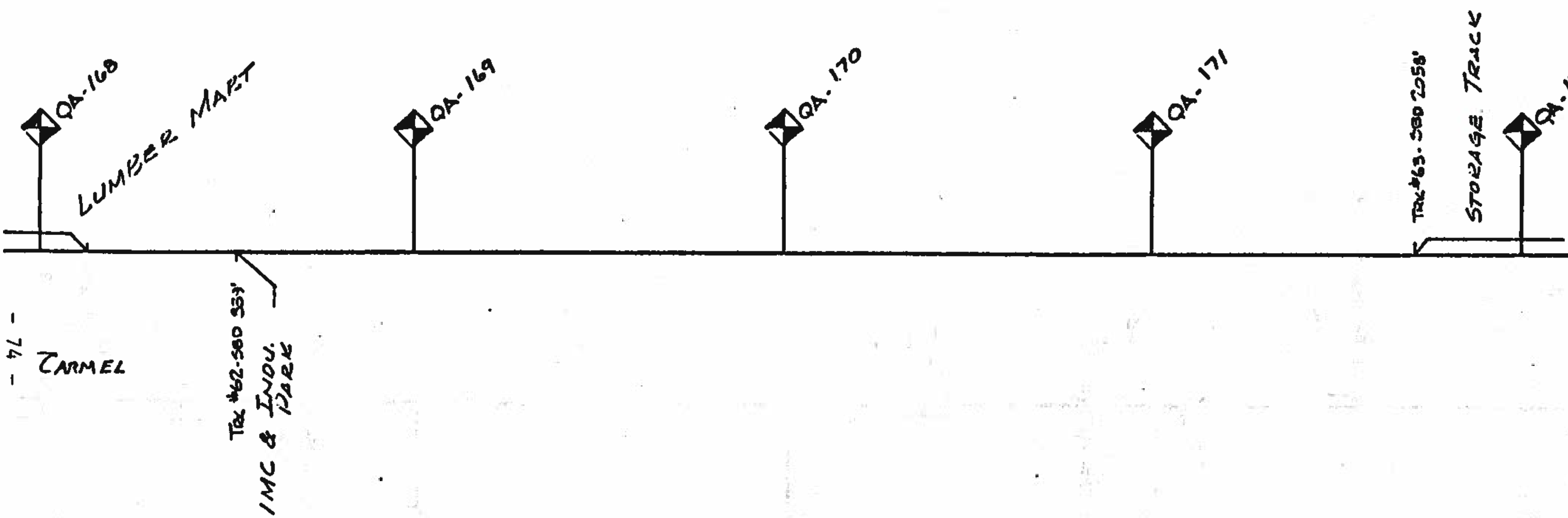

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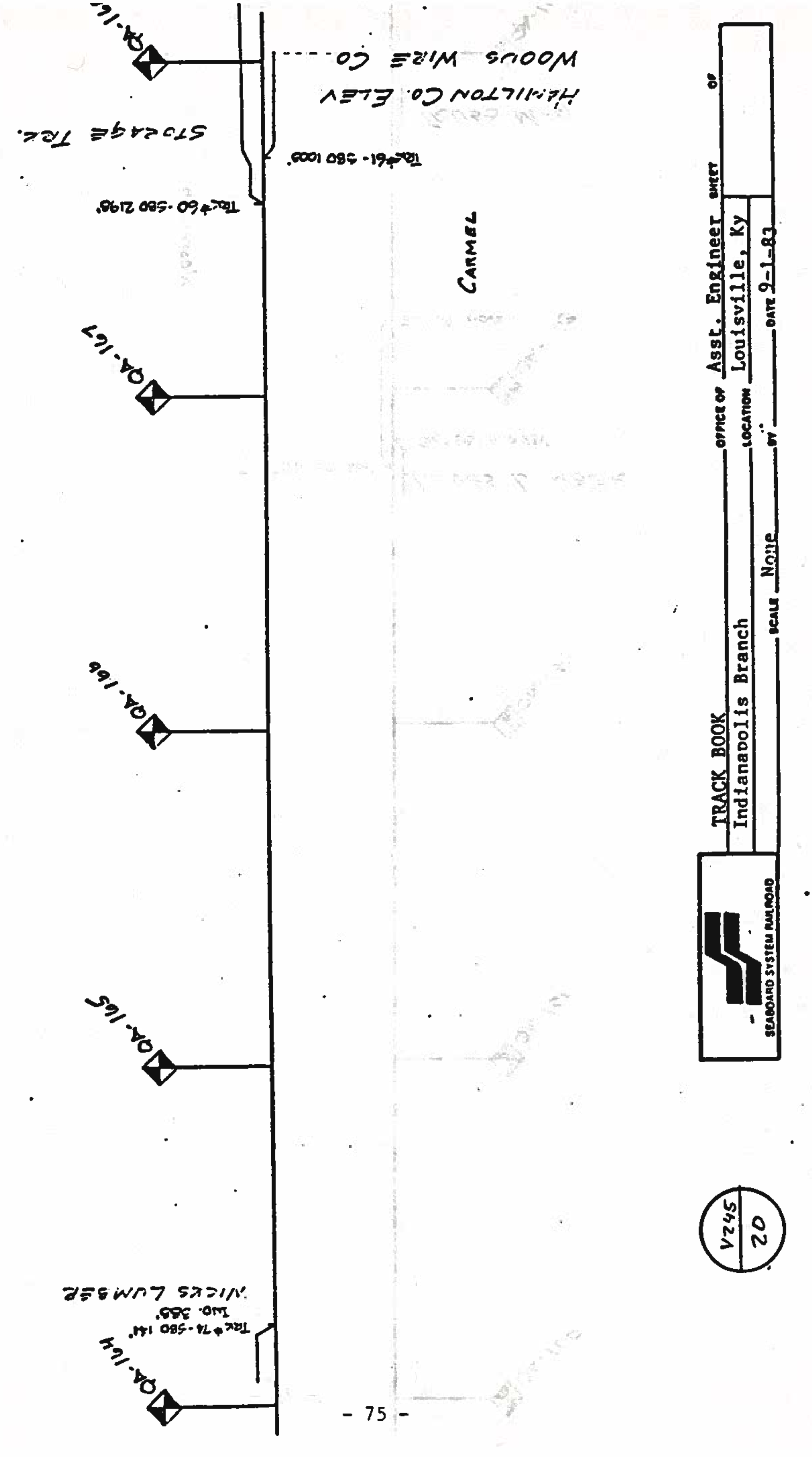

QA-164
QA-165
QA-166
QA-167
Woods Wire Co.
Hamilton Co. Elev
Storage Trk.
Trk#61-580 1009'
Trk#60-580 2198'
Carmel
Nicks Lumber
Trk#74-580 144'
TRACK BOOK
Indianapolis Branch
OFFICE OF Asst. Engineer
LOCATION Louisville, Ky
SCALE None
DATE 9-1-83
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SEABOARD SYSTEM RAILROAD
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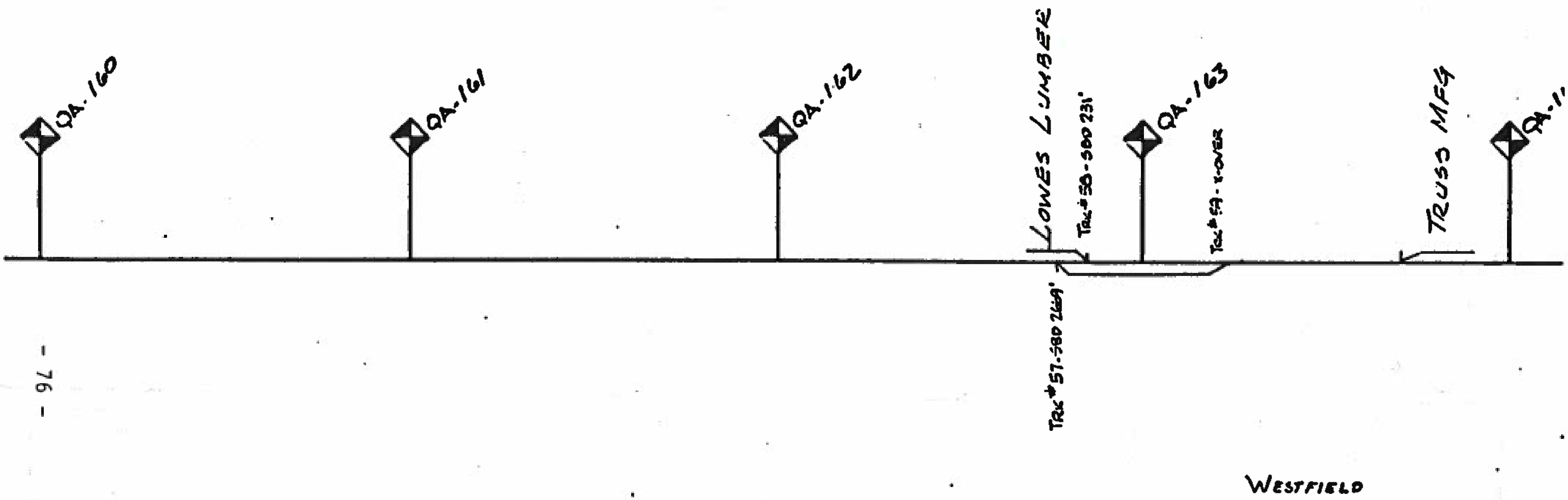

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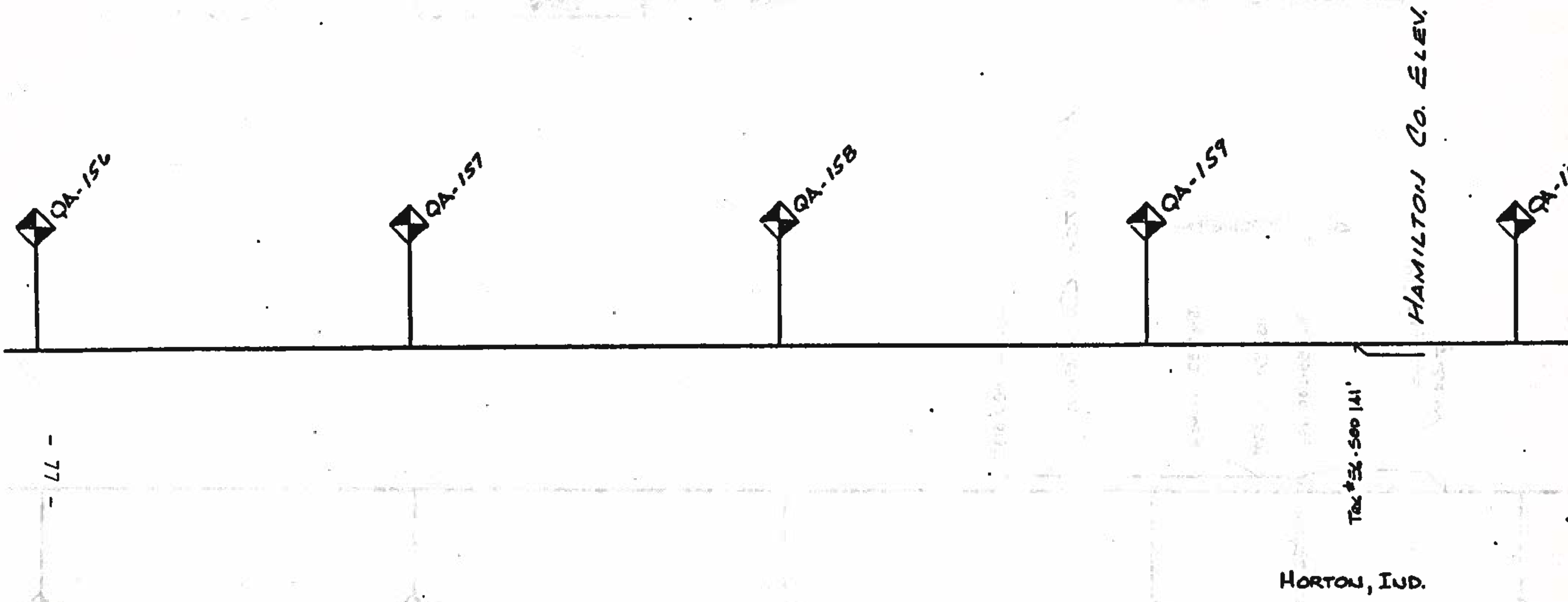

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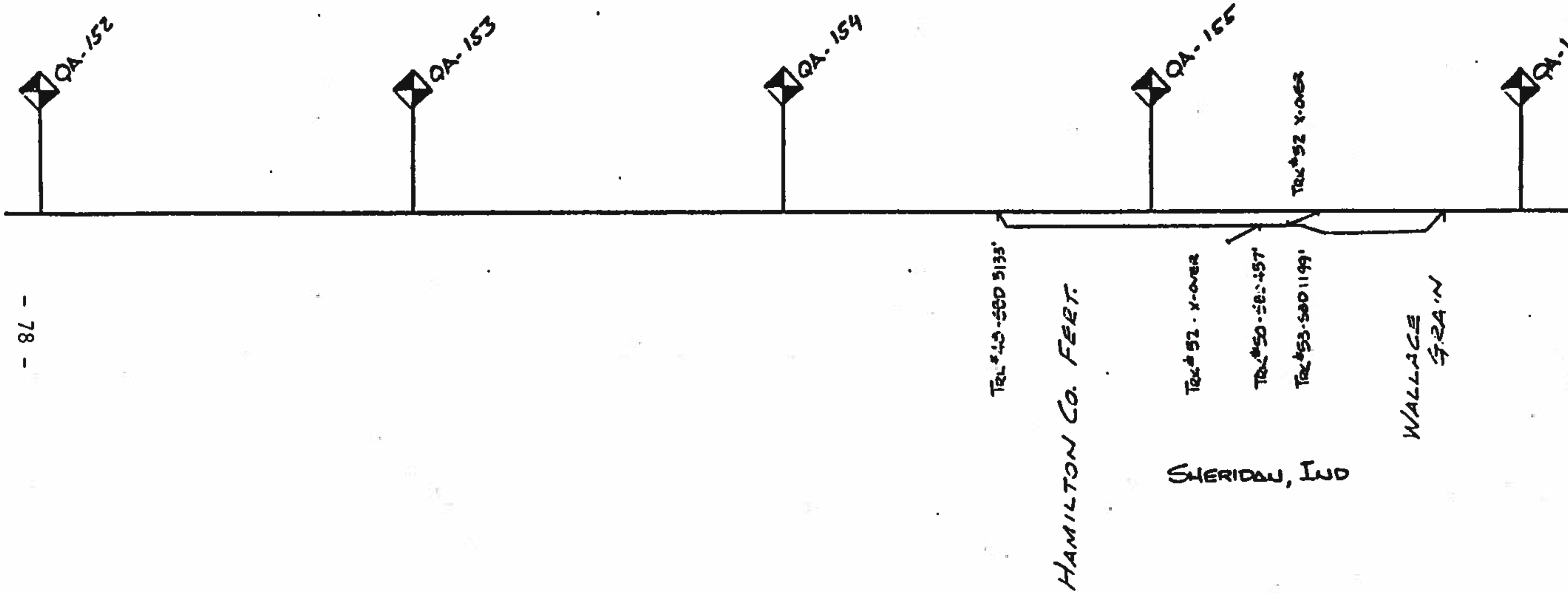

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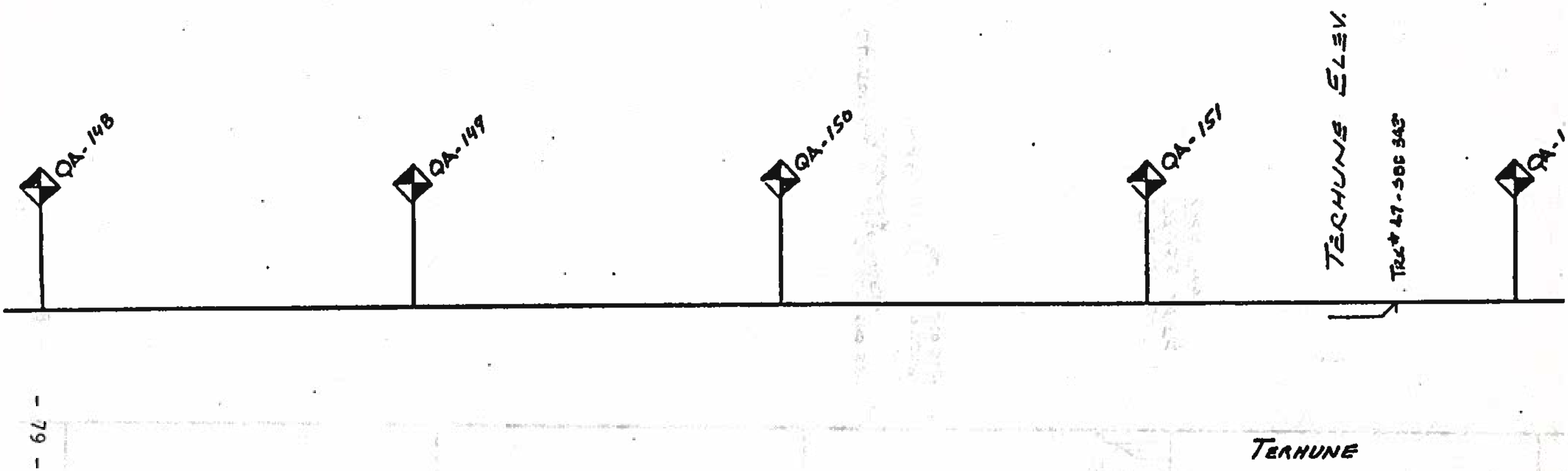

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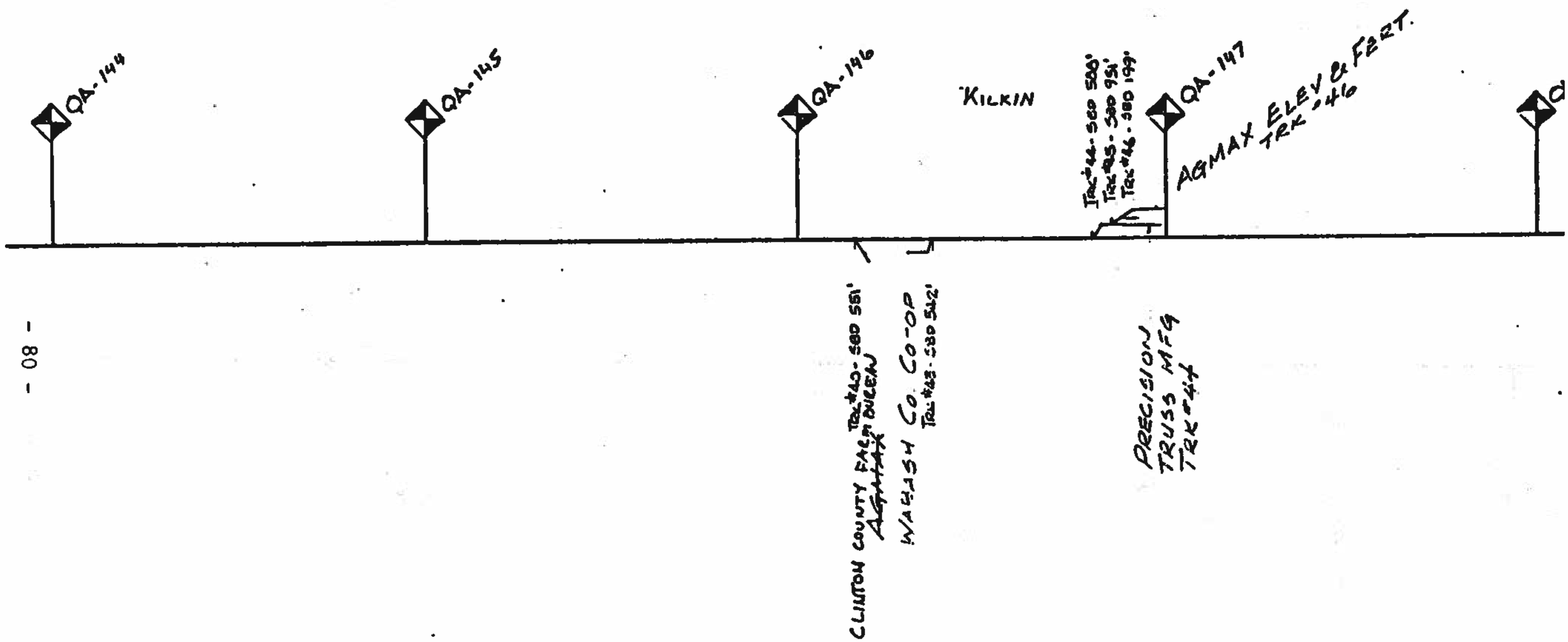

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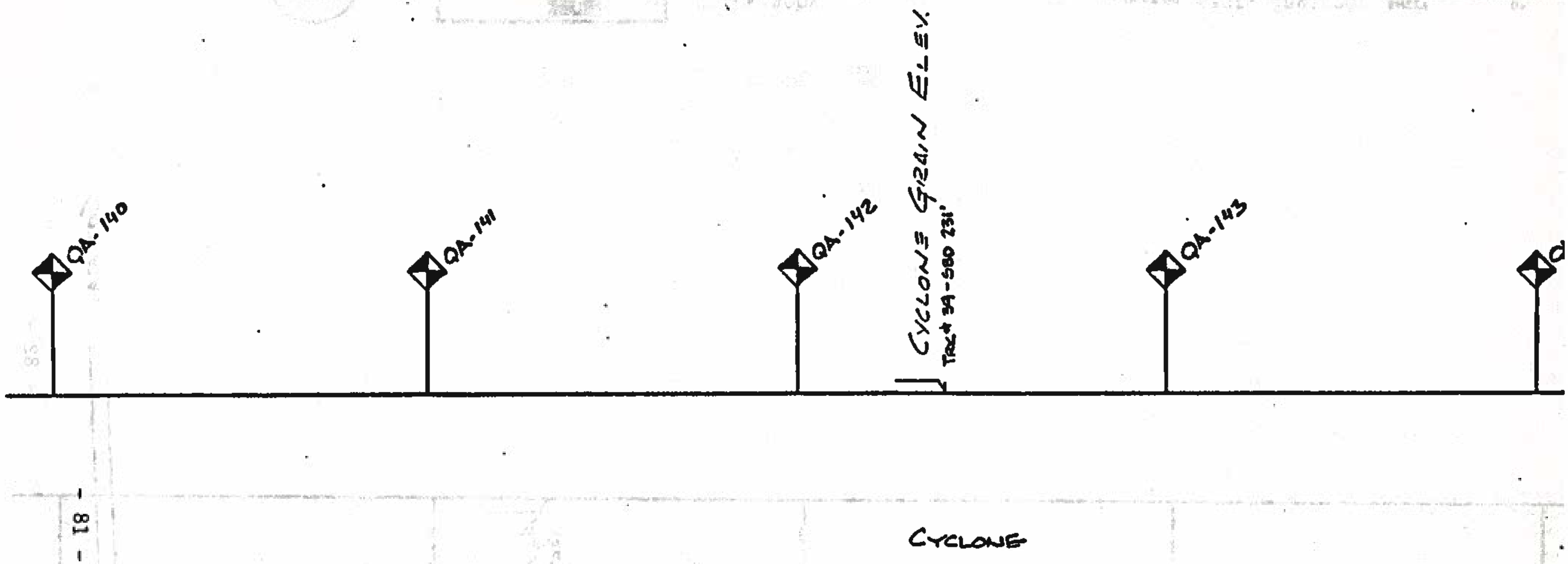

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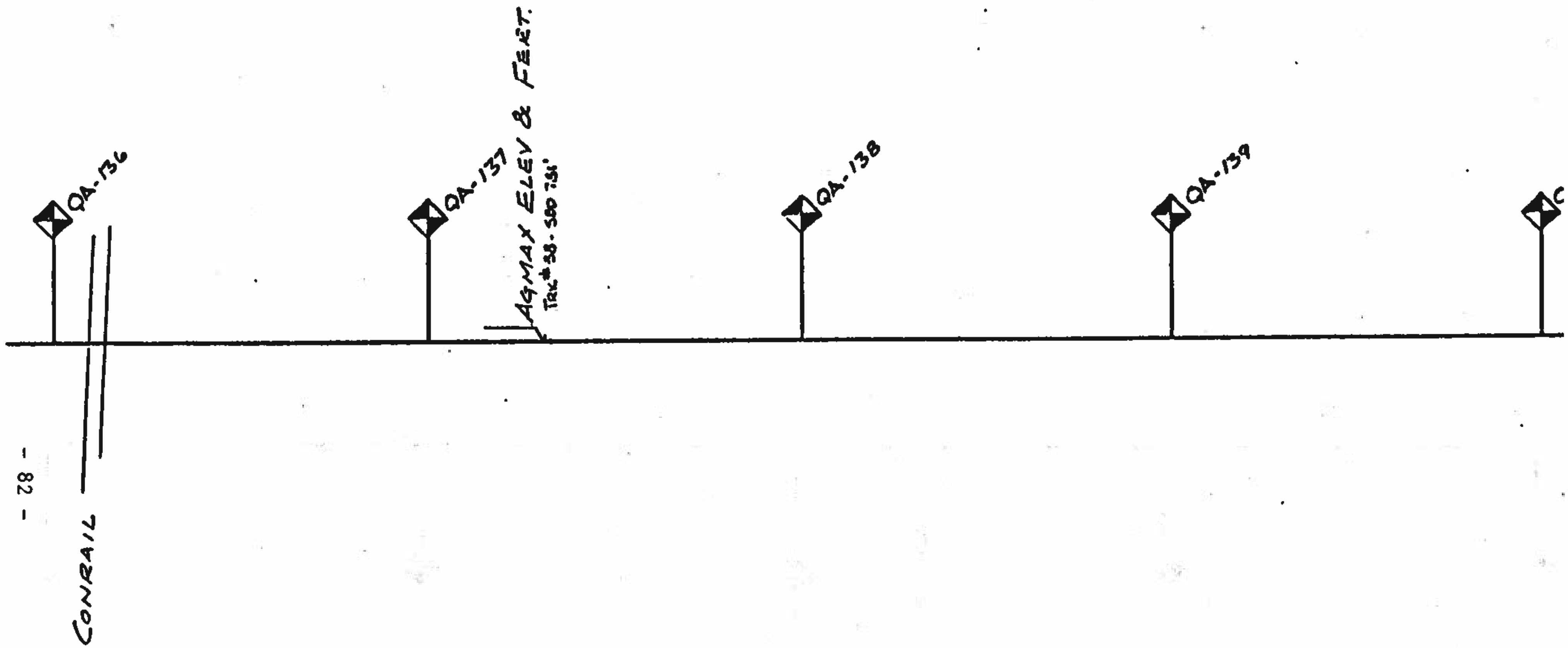

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TRACK BOOK
Indianapolis Branch

OFFICE OF Asst. Engineer SHEET OF
LOCATION Louisville, Ky
SCALE None BY DATE 9-1-83