

SCIENTIFIC LOCATION OF CARHOUSES
IN THE CALUMET DISTRICT
CHICAGO, ILLINOIS

BY
T. J. FERRENZ

ARMOUR INSTITUTE OF TECHNOLOGY

1915

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LOCATION OF CARHOUSES



A
THESIS

BY
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SCIENTIFIC LOCATION OF CARHOUSES

IN

THE CALUMET DISTRICT

CHICAGO

A THESIS

PRESENTED BY

TIRRELL JOHN FERRENZ

TO THE

PRESIDENT AND FACULTY

OF

ARMOUR INSTITUTE OF TECHNOLOGY

FOR THE DEGREE OF

CIVIL ENGINEER

HAVING COMPLETED THE PRESCRIBED COURSE OF STUDY

IN CIVIL ENGINEERING

1915

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SCIENTIFIC LOCATION OF CARHOUSES
IN
THE CALUMET DISTRICT
CHICAGO

I. INTRODUCTION

The object of this investigation is the determination of the most advantageous locations for carhouses in the Calumet District.

The recent growth of this District, both in population and in commercial activities, and its extension over a large area, have rendered the present Burnside Carhouse inadequate to care for the existing traffic in an economical and efficient manner. The proposed harbor improvements at South Chicago and the completion of the Sag Drainage Canal, assuring a sanitary water supply, will give added impetus to the development of this District, thus further aggravating the present unsatisfactory conditions.

The investigation hereinafter set forth is based on the operation of all car lines in the Calumet District as one independent system. This is essentially true at the present time, although certain modifications have been introduced since the recent unification of all street car companies operating within the corporate limits of the City of Chicago.

(See Ordinance of November 13th, 1913.)

II. GENERAL PREMISES

In selecting the location for a carhouse, there are five important factors which should be given careful consideration, namely:

1. Size and Fitness of Lot. A lot should be of sufficient size to permit double-ended operation of the carhouse, it should afford ample provision for future requirements, its shape should be suitable for a proper and economical layout of tracks, and its fitness should not be impaired by restrictions that might hurt its use for railway purposes.
2. Fire Risk and Water Supply. Proximity to buildings of inflammable material, or having contents that burn easily, should be avoided. A location should be chosen where a good hydrant service is obtainable and as near to a fire station as possible.

3. Economy of Construction. A firm bearing material together with a minimum amount of excavation or fill will assist considerably in reducing the cost of construction.
4. Facilities for Drainage and Sewerage. The use of car repair pits makes this of especial importance. Good natural drainage of surface and sub-soil is desirable in order to keep the carhouse free from moisture. The presence of dampness is injurious to the health of the men and accelerates the deterioration of cars and building.
5. Convenience and Economy of Operation, that is, minimizing of maintenance and non-revenue mileage. The selection of a location is largely a matter, in its last analysis, of reducing the dead mileage of revenue cars to the lowest possible point consistent with econom-

ical operation of the system as a whole,-
by dead mileage being meant that portion
of the total operated mileage used to
enable cars to reach the origin of their
first trip and to return them to the
carhouse after completing their last
trip. This dead or non-revenue mileage
is influenced by three distinct consider-
ations: *

a. In order to serve best the all-
day cars, carhouses should be located
practically at the outer extremity of
the route.

b. In order to serve best the rush-
hour cars, storage should be provided
reasonably near the center of traffic.

c. As the length of the route in-
creases, these opposing conditions evi-
dently become greater.

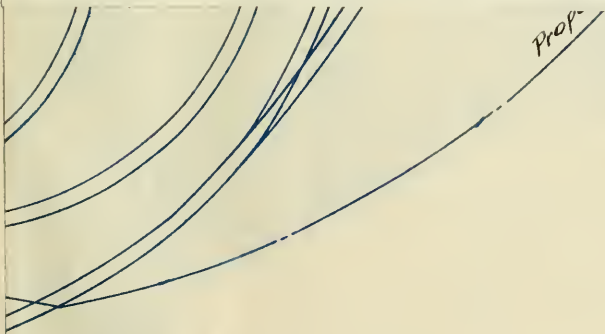
*See Fourth Annual Report,
Board of Supervising Engineers, Chicago
Traction, p.301

III. BURNSIDE CARHOUSE

An inspection of Map No. 2, showing the location of all car lines operated in the Calumet District, illustrates in a striking manner the disadvantageous situation of the present Burnside Carhouse with respect to the system as a whole. This is due to the fact that in recent years the trend of development of the territory served has been almost entirely far to the southwest and southeast.

It is evident, therefore, that to attempt to care for the entire District by increasing the capacity of the Burnside plant would not be advisable. This view was advocated by A. L. Drum & Co., Consulting Engineers, as far back as January 7th, 1909, in a report on "Calumet & South Chicago Railway Company Car Barn Development", wherein they stated "It is our judgment that you will eventually require an operating barn near 92nd Street and South Chicago Avenue" and advised the rehabilitation only of the Burnside Carhouse.

In order, however, to obtain a basis of comparison between each of the plans hereinafter outlined, the present Burnside Carhouse will be investigated to determine the existing investment, annual charges, and non-revenue mileage.



BURNSIDE PLANT

NORTH

DREXEL AVE.

93RD ST.

352'-10"

124'-0"

124'-0"

BARN #1 51 CARS

ALLEY BARN 14 CARS

Supply Room
Wreck wagon
Boiler Rm

office

Abandoned Power House

I. C. R. R.

Property Line

TOTAL CAPACITY
Inside 65 DT Cars
Outside 45 DT Cars

BURNSIDE PLANT

INVESTMENT AND ANNUAL CHARGES.

PRESENT INVESTMENT. The present value of buildings and other property was obtained as follows: Where cost records were not available, quantities of material were computed, and prices for labor and material then applied. To the cost thus obtained, was added 15% for organization, engineering, and incidentals, and the total taken as cost new. The property was then depreciated at a rate depending on the material used in its construction, the use to which it was put, and exposure to deteriorating surroundings, due allowance being made in each case for cost of additions and rehabilitation.

INSURANCE. In determining the proper amount of insurance to be carried on any building, it is considered good business practice to reduce the insurable value by deducting such portions of the structure as cannot be damaged by fire. In the present case, the full insurable value was computed in accordance with the list of deductions compiled by the Board of Super-

vising Engineers, Chicago Traction,* of which the following is an extract:

- a. Wrecking old buildings and preparation of site.
- b. Excavation.
- c. Sidewalks, curbs and gutters, and paving outside of buildings.
- d. Outside electric line work.
- e. Track work, including excavation. Exceptions - car storage tracks with ties laid above ground.
- f. Foundations and footings below brick work or cut-stone water tables.
- g. Concrete floors on ground.
- h. Smoke-stacks and their foundations.
- i. Water supply and sewer systems buried.
- j. Pit retaining walls, open or closed. Exceptions - concrete floors over pits, cast-iron columns, track rails, pipes, conduits, etc., when exposed.

* See Third Annual Report, p. 237.

k. Concrete and other fireproof heating ducts.

Note---Building fixtures such as boilers, heating apparatus, trolley sectionalizing switches, etc., and inside electric line material not a part of the building, to be insured as "Contents."

INTEREST AND TAXES. These two items, which are practically standard, will be considered at the following rates:

Interest - - - - - 5%

Taxes - - - - - 1-1/2%

DEPRECIATION. Various rules and methods have been evolved for the determination of depreciation, nearly all of which begin with an assumption as to the probable life of the property to be depreciated. The two most widely used methods are:

1. The Straight Line Method. This assumes a definite life and a uniform rate of depreciation during that time.

2. The Sinking Fund Method. This assumes a definite life and by means of a sinking fund formula, with any percentage of accrual, provides for a fixed annual sum, with interest, which will offset the value of the property in the assumed period.

The fund that will accumulate at the end of any number of years, through the laying aside of a uniform annual amount drawing compound interest, is determined by the following formula:

$$F = \frac{(1 + R)^n - 1}{R}$$

The sum to be laid aside annually at compound interest to accumulate a given amount at the end of a given period is found by the formula:

$$D = \frac{FR}{(1+R)^n - 1}$$

Where F = accumulated fund at the end of n years.

D = annual sum set aside.

R = annual rate of interest expressed
as hundredths of a dollar.

n = number of years the amount is
annually set aside.

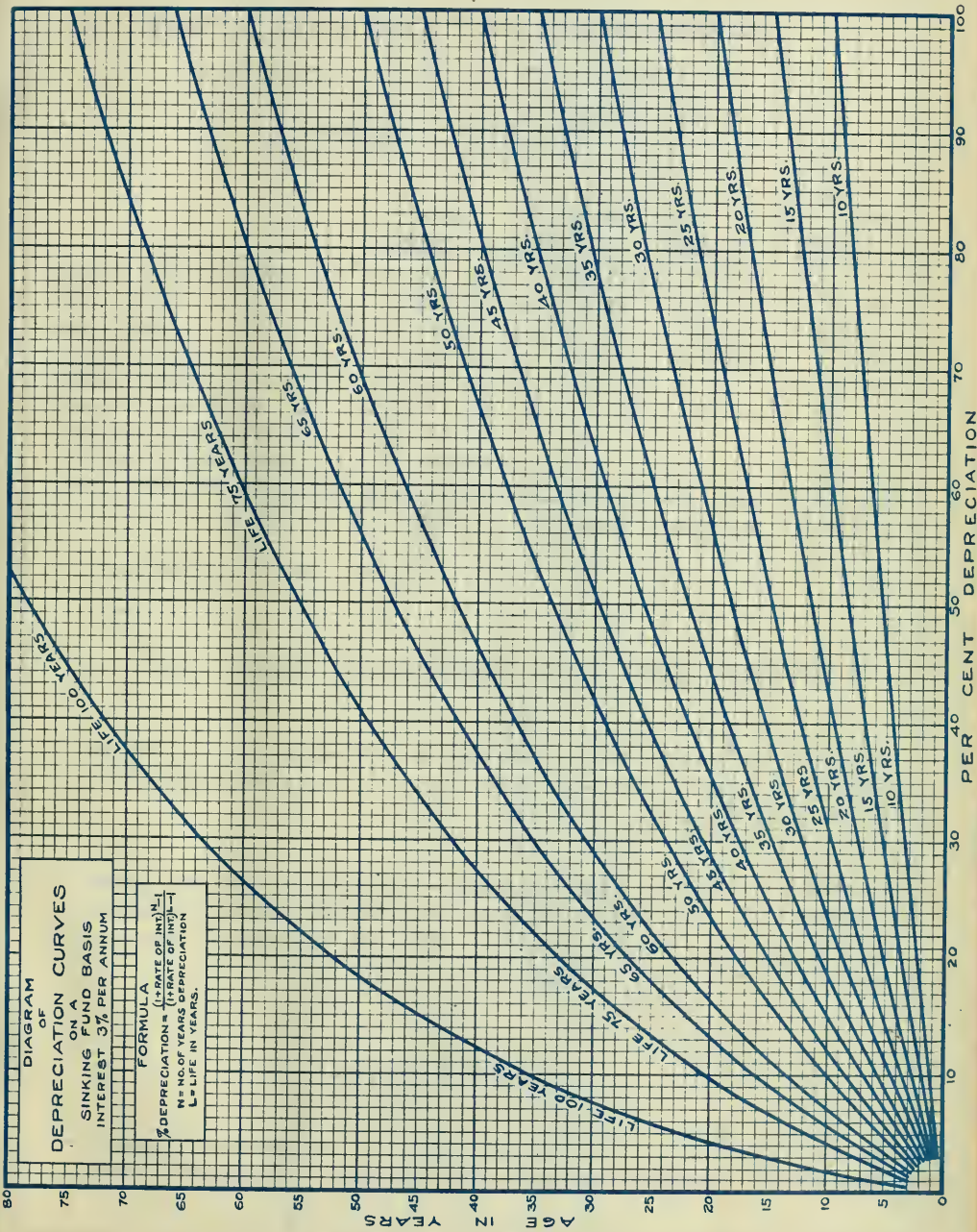
The Board of Supervising Engineers* has recommended that, in general, buildings should be depreciated for a life of 66 years. This corresponds to an actual depreciation of about $1-1/2\%$ per year considered at a uniform rate, but if depreciated values were written off in this manner no consideration would be given to the fact that depreciation funds draw interest. The Board has, therefore, adopted the sinking fund method with an interest rate of 3% . The net result is that at any future time the present value of the structure plus the accumulated depreciation fund thereon equals cost new. The accompanying diagram illustrates how this sinking fund method applies.

* Third Annual Report, p.239

DIAGRAM
OF
DEPRECIATION CURVES
ON A
SINKING FUND BASIS
INTEREST 3% PER ANNUM

FORMULA

$$\% \text{ DEPRECIATION} = \frac{(1 + \text{RATE OF INT})^N - 1}{N \times \text{RATE OF INT}}$$
 N = NO. OF YEARS DEPRECIATION
 L = LIFE IN YEARS.



PRESENT INVESTMENT & ANNUAL CHARGES

BURNSIDE CARHOUSE

	Present Value	Insurable Value	Premium	Interest Depreciation Taxes
Office & Trainmen's Room -- \$	2,969.77	2,576.25	36.33	237.58
Barn N ^o 1 -----	34,885.76	24,200.00	252.52	2,790.86
Alley Barn -----	5,771.04	4,955.28	35.18	461.68
Heating Plant -----	5,000.00	5,000.00	58.00	460.00
Track in Building -----	9,982.00	—	—	798.56
Special Track Work -----	11,041.00	—	—	883.28
Overhead Trolley System -----	2,000.00	—	—	160.00
Outside Storage Track -----	7,500.00	—	—	600.00
Real Estate, 144,900 sq.ft.* -----	32,000.00	—	—	1,920.00
Total -----	\$ 111,149.57	36,731.53	382.03	8,251.96

* 200,922 sq.ft. surplus omitted.

77TH ST. PLANT - ADDITIONAL FACILITIES RENTED

800 ft. of Track complete @ \$25.00 -----	\$ 20,000.00
Real Estate for same -----	5,600.00
Total -----	\$ 25,600.00

Interest, Depreciation, & Taxes on Buildings @ 8% -----	\$ 1,600.00
Interest & Taxes on Real Estate @ 6% -----	336.00
Insurance Premium on Buildings -----	40.00
Total -----	\$ 1,976.00

GRAND TOTAL

Present Investment -----	\$ 136,749.57
Annual Charges -----	\$ 10,609.99

VALUE OF ROLLING STOCK
PASSENGER CARS

N ^o CARS	TYPE	BODIES	MOTORS	TRUCKS	AIR BRAKES	HEATERS	TOTAL PER CAR	TOTAL PER GROUP
11	Double Truck Closed	3152.00	2489.00	625.00	321.60	128.70	6,716.30	73,879.30
5	"	2822.00	1827.50	584.10	321.60	128.70	5,683.90	28,419.50
5	"	2752.24	2489.00	625.00	321.60	128.70	6,316.54	31,582.70
2	"	3441.00	2489.00	575.00	264.00	124.20	6,893.20	13,786.40
1	"	3173.24	2364.55	575.00	264.00	124.20	6,500.99	6,500.99
14	"	2933.60	2364.55	575.00	264.00	124.20	6,261.35	87,658.90
8	"	2522.33	2489.00	575.00	264.00	124.20	5,974.53	47,796.24
15	"	—	—	—	—	—	5,000.00	75,000.00
2	Double Truck Open	1240.15	852.80	467.50	—	—	2,560.45	5,120.90
1	"	1816.92	1827.50	617.40	—	—	4,261.82	4,261.82
5	"	1816.92	1827.50	584.10	—	—	4,228.52	21,142.60
14	Single Truck Closed	1278.40	852.80	220.00	—	20.92	2,372.12	33,209.68
2	"	1848.40	852.80	220.00	—	101.20	3,022.40	6,044.80
13	"	1344.40	852.80	220.00	—	20.92	2,438.12	31,695.56
11	Single Truck Open	984.80	852.80	200.00	—	—	2,037.60	22,413.60

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VALUE OF ROLLING STOCK
UTILITY CARS

N ^o CARS	TYPE	BODIES	MOTORS	TRUCKS	TOTAL PER CAR	TOTAL PER GROUP
1	Single Truck Line Car	1,383.20	852.80	200.00	2,436.00	2,436.00
1	Single Truck Snow Plow	1,466.10	1,244.50	200.00	2,910.60	2,910.60
1	"	1,497.60	3,150.00	637.00	5,284.60	5,284.60
1	"	1,357.55	852.80	132.00	2,342.35	2,342.35
1	"	1,357.55	1,244.50	132.00	2,734.05	2,734.05
2	Single Truck Snow Sweepers	1,156.92	1,670.90	Included	2,827.82	5,655.64
1	"	991.80	1,670.97	"	2,662.77	2,662.77
1	"	1,181.80	2,097.30	"	3,279.10	3,279.10
2	Single Truck Sprinklers	947.76	852.80	200.00	2,000.56	4,001.12
1	Double Truck Sprinkler	1,512.00	—	637.00	2,149.00	2,149.00
1	"	1,237.00	—	650.00	1,887.00	1,887.00
2	Single Truck Salt Cars	159.60	—	132.00	291.60	583.20
1	Double Truck Cupola	1,045.66	—	686.00	1,731.66	1,731.66
1	Single Truck Sand Blast	2,046.24	—	168.00	2,214.24	2,214.24
1	Single Truck Sand Supply	144.50	—	132.00	276.50	276.50
1	Single Truck Rail Grinder	500.00	—	200.00	700.00	700.00
1	Single Truck Track Digger	237.50	—	200.00	437.50	437.50
1	Single Truck Wreck Car	979.00	—	245.00	1,224.00	1,224.00
1	Double Truck Gondola	82.60	—	132.00	214.60	214.60
2	"	165.20	—	132.00	297.20	594.40
1	"	150.50	—	132.00	282.50	282.50
3	Single Truck Flat Cars	115.50	—	132.00	247.50	742.50
8	Single Truck 3-yd. Dump	75.60	—	132.00	207.60	1,660.80
2	Single Truck Dump & Flat	432.75	—	318.50	751.25	1,502.50
2	Single Truck Flat	117.30	—	132.00	249.30	498.60
1	"	117.30	—	168.00	285.30	285.30
1	"	127.50	—	Included	127.50	127.50
1	Single Truck Push	127.50	—	132.00	259.50	259.50
1	"	64.00	—	Included	64.00	64.00
1	Single Truck Work Car	1,099.20	1,244.50	200.00	2,543.70	2,543.70

DISTRIBUTION OF ROLLING STOCK

Location	Active Cars		Inactive Cars		Track Feet	
	Single Truck	Double Truck	Passenger	Utility	Required	Available
Barn No 1	41	25	—	—	2768	2768
Alley Barn	14	—	—	—	672	712
Open Storage	—	—	11 S.T	45	1204	3568
77 th St. Plant	6	4	8 D.T	—	800	800
Total	61	29	19	45	5444	7848

INSURANCE PREMIUMS ON ROLLING STOCK

Location	Cars	Insurable Value	Rate	Premium
Barn No 1	41 Double Truck Closed	\$ 261,205.00	1.41	\$ 1,850.00 *
"	25 Single Truck Closed	61,462.00	1.41	439.00 *
Alley Barn	14 Double Truck Closed	70,000.00	1.05	399.00 *
Open Storage	11 Single Truck Open	22,413.00	0.25	56.00
"	45 Utility	51,560.00	0.25	129.00
77 th St. Plant	6 Double Truck Closed	33,419.00	0.67	140.00 *
"	4 Single Truck Closed	9,488.00	0.67	40.00 *
"	8 Double Truck Open	30,525.00	0.67	127.00 *
Total		\$ 540,072.00		\$ 3,180.00

* Premium calculated on a basis of 40% in and 60% out.

TOTAL ANNUAL CHARGES

Carhouse	\$ 10,609.99
Rolling Stock †	3,180.00
Total	\$ 13,789.99

† Interest, depreciation and taxes omitted inasmuch as these items are in general independent of carhouse.

Table 1. Summary of the data used in the analysis.

Year	Country	Population (millions)	Urban population (millions)	Urban population (%)	Urban population (thousands)
1980	USA	226	113	49.9	113,000
1980	UK	56	28	49.9	28,000
1980	FR	54	27	49.9	27,000
1980	DE	61	30	49.9	30,000
1980	IT	57	28	49.9	28,000
1980	ES	40	20	49.9	20,000
1980	JP	123	61	49.9	61,000
1980	IN	85	42	49.9	42,000
1980	BR	130	65	49.9	65,000
1980	MX	80	40	49.9	40,000
1980	RU	250	125	49.9	125,000
1980	UN	4500	2250	49.9	2250,000

Table 2. Summary of the data used in the analysis (continued).

Year	Country	Population (millions)	Urban population (millions)	Urban population (%)	Urban population (thousands)
1985	USA	233	116	49.9	116,000
1985	UK	56	28	49.9	28,000
1985	FR	54	27	49.9	27,000
1985	DE	61	30	49.9	30,000
1985	IT	57	28	49.9	28,000
1985	ES	40	20	49.9	20,000
1985	JP	123	61	49.9	61,000
1985	IN	85	42	49.9	42,000
1985	BR	130	65	49.9	65,000
1985	MX	80	40	49.9	40,000
1985	RU	250	125	49.9	125,000
1985	UN	4500	2250	49.9	2250,000

Table 3. Summary of the data used in the analysis (continued).

Year	Country	Population (millions)	Urban population (millions)	Urban population (%)	Urban population (thousands)
1990	USA	248	124	49.9	124,000
1990	UK	56	28	49.9	28,000
1990	FR	54	27	49.9	27,000
1990	DE	61	30	49.9	30,000
1990	IT	57	28	49.9	28,000
1990	ES	40	20	49.9	20,000
1990	JP	123	61	49.9	61,000
1990	IN	85	42	49.9	42,000
1990	BR	130	65	49.9	65,000
1990	MX	80	40	49.9	40,000
1990	RU	250	125	49.9	125,000
1990	UN	4500	2250	49.9	2250,000

NON-REVENUE MILEAGE

As stated under "General Premises", page 5, non-revenue mileage is that portion of the total operated mileage which is used to enable cars to reach the origin of their first trip and to return them to the carhouse after the completion of their last trip. While it is true that the old custom of running cars in a closed condition between the carhouses and their individual routes has been abandoned, and that passengers are now accepted at any point, yet it must not be overlooked that such fares as are collected by a car, in running along a certain street to and from its own route, are merely withdrawn from the regular cars delegated to serve that street.

In computing the non-revenue mileage, as hereinafter tabulated, the following factors were considered:

1. The present schedule of cars on each line.
2. Changes in schedule or routing which might be made in the near future.

3. Probable business expansion in different localities and the effect of increasing various schedules to accomodate the same.

Factors "2" and "3" were developed primarily by assuming the construction of four extensions which will soon be warranted by the increased density of traffic. These are:

87th St., from Cottage Grove Ave. to Commercial Ave.

95th St., from Michigan Ave. to Vincennes Rd.

103rd St., from Cottage Grove Ave. to Torrence Ave. and 104th St.

Torrence Ave., from 112th St. to Ontario Ave. and 138th St. (Hegewisch)

With the 95th Street extension in use, the number of cars operating on 93rd Street will be increased from eleven to thirteen, nine of these being routed south on Cottage Grove Avenue and four west on 95th Street. The 103rd Street extension will make advisable the consolidation of the 106th Street and 103rd Street lines, operating a total of eight cars instead of four as at present. The 87th Street extension and

the Torrence Avenue extension will be operated as individual lines.

In addition to these changes, it might be observed here, that further benefits may be obtained by through-routing cars on certain trunk lines, the ones most susceptible to economical treatment of this character being South Chicago Avenue, Stony Island Avenue, Cottage Grove Avenue, and State Street, assuming the proposed extension from 79th Street to 95th Street is built. This, however, introduces numerous complications and problems which are without the scope of the present investigation.

EXTRACT OF TIME TABLES

LINES	Round Trip Mileage	Maximum Number Cars	Headway in Minutes				Running Time	First and Last Car
			A. M. Rush	Noon	P.M. Rush	Owl		
South Deering	17.32	13	7.5	14.0	7.0	50	45	—
Windsor Park	16.42	11	8.5	14.0	8.5	50	44	—
Hammond	15.34	4	20.0	20.0	20.0	—	41	5:25 11:30
Whiting	6.20	2	20.0	20.0	20.0	—	17	5:56 1:16
Stony Island	8.04	2	20.0	20.0	20.0	—	18	5:12 12:32
West Pullman	20.70	19	6.0	10.0	6.0	40	54	—
Riverdale	5.35	2	15.0	30.0	15.0	—	14	5:11 10:55
93 rd & Pullman	13.22	11	9.0	17.5	9.0	50	42	—
103 rd Street	4.88	3	10.0	15.0	10.0	—	13	5:19 1:09
106 th Street	2.52	1	20.0	20.0	20.0	—	8	5:25 11:05
111 th Street	2.20	1	15.0	15.0	15.0	—	5	5:55 10:55
115 th Street	3.00	2	10.0	20.0	10.0	—	8	5:40 11:40
119 th Street	2.59	1	15.0	15.0	15.0	—	6	5:40 11:10

See Map No 2 for Routes Traversed by These Lines

PRESENT AND PROPOSED CAR SCHEDULES

SHEET No 1

LINE	TERMINAL	Daily Number of Cars					
		Pulling Out			Pulling In		
		A.M.	P.M.	Total	A.M.	P.M.	Total
South Deering	63 rd St. & Stony ls. Av.	5	4	9	0	0	0
	112 th St. & Torrence Av.	8	2	10	9	10	19
Windsor Park	63 rd St. & Stony ls. Av.	3	1	4	0	0	0
	108 th St. & State Line	8	3	11	6	9	15
Hammond	63 rd St. & Stony ls. Av.	3	0	3	0	3	3
	92 nd St. & Commercial Av.	1	0	1	0	1	1
Whiting	92 nd St. & Commercial Av.	2	0	2	0	2	2
	Indianapolis Av. & State Line	0	0	0	0	0	0
Stony Island	63 rd St. & Stony ls. Av.	0	0	0	0	0	0
	93 rd St. & Stony ls. Av.	2	0	2	0	2	2
West Pullman	63 rd St. & South Park Av.	8	0	8	0	0	0
	120 th St. & Morgan St.	11	9	20	12	16	28
Riverdale	119 th St. & Michigan Av.	2	0	2	0	2	2
	138 th St. & Leyden Av.	0	0	0	0	0	0
93 rd & Pullman	89 th St. & The Strand	5	3	8	5	5	10
	115 th St. & Cott. Grove Av.	6	3	9	3	4	7
103 rd Street	103 rd St. & Michigan Av.	3	1	4	0	0	0
	103 rd St. & Vincennes Rd.	0	0	0	1	3	4

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PRESENT AND PROPOSED CAR SCHEDULES

SHEET N^o 2

LINE	TERMINAL	Daily Number of Cars					
		Pulling Out			Pulling In		
		A.M.	P.M.	Total	A.M.	P.M.	Total
106 th Street	106 th St. & Ewing Av	1	0	1	0	0	0
	106 th St. & Torrence Av	0	0	0	0	1	1
111 th Street	111 th St. & Michigan Av.	1	0	1	0	0	0
	111 th St. & Stewart Av.	0	0	0	0	1	1
115 th Street	115 th St. & South Park Av.	0	0	0	1	2	3
	115 th St. & Michigan Av	2	1	3	0	0	0
119 th Street	119 th St. & Morgan St.	1	0	1	0	1	1
	119 th St. & Vincennes Rd.	0	0	0	0	0	0
West Pullman Proposed Schedule	63 rd St. & South Park Av.	11	3	14	0	0	0
	120 th St. & Morgan St.	8	6	14	12	16	28
Hegewisch Proposed Extension	106 th St. & Torrence Av.	5	2	7	2	5	7
	138 th St. & Ontario Av.	0	0	0	0	0	0
87 th Street Proposed Extension	87 th St. & Commercial Av.	2	0	2	0	2	2
	87 th St. & Cott Grove Av.	1	1	2	1	1	2
95 th Street Proposed Extension	89 th St. & The Strand	2	1	3	1	2	3
	95 th St. & Vincennes Rd.	2	0	2	0	2	2
93 rd & Pullman Proposed Operation with 95 th St. Extens.	89 th St. & The Strand	4	2	6	4	4	8
	115 th St. & Cott. Grove Av.	5	3	8	3	3	6
103 rd -106 th Sts. Joint Operation	106 th St. & Ewing Av.	5	1	6	2	3	5
	103 rd St. & Vincennes Rd.	3	2	5	1	5	6

MILEAGE
FROM BURNSIDE CARHOUSE TO VARIOUS TERMINALS

TERMINAL	Mileage	
	One Way	Round Trip
63 rd St. & South Park Av.	4.2062	8.5424
63 rd St. & Stony Island Av.	4.8507	9.7014
87 th St. & Commercial Av.	3.5546	7.1092
87 th St. & Cottage Grove Av.	0.9400	1.8800
89 th St. & The Strand	3.8784	7.7568
92 nd St. & Commercial Av.	2.9755	5.9510
93 rd St. & Stony Island Av.	1.0800	2.1600
95 th St. & Vincennes Road	2.8125	5.6250
103 rd St. & Michigan Av.	2.2737	4.5474
103 rd St. & Vincennes Road	4.0712	8.1424
106 th St. & State Line via 93 rd St.	6.1831	12.3662
106 th St. & State Line via 103 rd St.	6.1090	12.2180
Indianapolis Av. & State Line via 93 rd St.	5.3680	10.7360
Indianapolis Av. & State Line via 103 rd St.	6.1090	12.2180
106 th St. & Ewing Av. via 93 rd St.	5.1567	10.3134
106 th St. & Ewing Av. via 103 rd St.	5.6403	11.2806
106 th St. & Torrence Av. via 93 rd St.	4.6292	9.2584
106 th St. & Torrence Av. via 103 rd St.	4.3936	8.7872
108 th St. & State Line via 93 rd St.	6.1599	12.3198
108 th St. & State Line via 103 rd St.	6.4600	12.9200
111 th St. & Michigan Av.	3.2926	6.5852
111 th St. & Stewart Av.	3.9176	7.8352
112 th St. & Torrence Av. via 93 rd St.	5.3356	10.7712
112 th St. & Torrence Av. via 103 rd St.	5.1000	10.2000
115 th St. & Cottage Grove Av	Out 3.0816	—
do.	In 3.3112	6.3928
115 th St. & Michigan Av.	3.7979	7.5958
115 th St. & South Park Av	4.1926	8.3852
119 th St. & Morgan St	5.6729	11.3458
119 th St. & Vincennes Road	6.8929	13.7858
119 th St. & Michigan Av.	4.2979	8.5958
120 th St. & Morgan St.	6.7633	13.5266
138 th St. & Ontario Av. via 93 rd St.	9.2542	18.5084
138 th St. & Ontario Av. via 103 rd St.	9.0186	18.0372
13E th St. & Leyden Av.	6.9729	13.9458

TABLE I

Summary of the results of the experiments on the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide

Temperature (°C)	Time taken for reaction to complete (min)	Rate of reaction (1/time)
10	120	0.0083
15	90	0.0111
20	70	0.0143
25	55	0.0182
30	45	0.0222
35	35	0.0286
40	28	0.0357
45	22	0.0455
50	18	0.0556
55	15	0.0667
60	12	0.0833
65	10	0.1000
70	8	0.1250
75	7	0.1429
80	6	0.1667
85	5	0.2000
90	4	0.2500
95	3	0.3333
100	2	0.5000

DAILY NON-REVENUE MILEAGE

FROM BURNSIDE CARHOUSE

SHEET No 1

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
South Deering Via 93 rd St.	63 rd St. & Stony Island Av.	43.66	0.00	198.40
	112 th St. & Torrence Av.	53.36	101.38	
Windsor Park	63 rd St. & Stony Island Av.	19.40	0.00	179.56
	108 th St. & State Line	67.76	92.40	
Hammond	63 rd St. & Stony Island Av.	14.55	14.55	35.06
	92 nd St. & Commercial Av.	2.98	2.98	
Whiting	92 nd St. & Commercial Av.	5.95	5.95	11.90
	Indianapolis Av. & State line	0.00	0.00	
Stony Island	63 rd St. & Stony Island Av.	0.00	0.00	4.32
	93 rd St. & Stony Island Av.	2.16	2.16	
West Pullman	63 rd St. & South Park Av.	33.65	0.00	358.29
	120 th St. & Morgan St.	135.27	189.37	
Riverdale	119 th St. & Michigan Av.	8.60	8.60	17.20
	138 th St. & Leyden Av.	0.00	0.00	
93 rd & Pullman	89 th St. & The Strand	31.03	38.78	120.72
	115 th St. & Cott. Grove Av.	27.73	23.18	
103 rd Street	103 rd St. & Michigan Av.	9.09	0.00	25.37
	103 rd St. & Vincennes Rd.	0.00	16.28	
106 th Street	106 th St. & Ewing Av.	5.16	0.00	9.79
	106 th St. & Torrence Av.	0.00	4.63	
111 th Street	111 th St. & Michigan Av.	3.29	0.00	7.21
	111 th St. & Stewart Av.	0.00	3.92	

DAILY NON-REVENUE MILEAGE

FROM BURNSIDE CARHOUSE

SHEET No. 2

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
115 th Street	115 th St. & South Park Av.	0.00	12.58	23.97
	115 th St. & Michigan Av.	11.39	0.00	
119 th Street	119 th St. & Morgan St.	5.67	5.67	11.34
	119 th St. & Vincennes Rd.	0.00	0.00	
West Pullman Proposed Schedule	63 rd St. & South Park Av.	58.89	0.00	342.95
	120 th St. & Morgan St.	94.69	189.37	
South Deering Via 103 rd St.	63 rd St. & Stony Island Av.	43.66	0.00	191.56
	112 th St. & Torrence Av.	51.00	96.90	
Hegewisch Proposed Extension via 103 rd St.	106 th St. & Torrence Av.	30.76	30.76	61.52
	138 th St. & Ontario Av.	0.00	0.00	
Hegewisch Proposed Extension via 93 rd St.	106 th St. & Torrence Av.	32.40	32.40	64.80
	138 th St. & Ontario Av.	0.00	0.00	
87 th Street Proposed Extension	87 th St. & Commercial Av.	7.11	7.11	17.98
	87 th St. & Cott. Grove Av.	1.88	1.88	
95 th Street Proposed Extension	89 th St. & The Strand	11.64	11.64	34.54
	95 th St. & Vincennes Rd.	5.63	5.63	
93 rd & Pullman Proposed Operation with 95 th St. Extens.	89 th St. & The Strand	23.27	31.03	98.82
	115 th St. & Cott. Grove Av.	24.65	19.87	
103 rd -106 th Sts. Joint Operation	106 th St. & Ewing Av.	30.94	25.78	101.51
	103 rd St. & Vincennes Rd.	20.36	24.43	

TOTAL NON-REVENUE MILEAGE

DAILY MILEAGE

Present Operation - - - - -	1003.13	car-miles	
Proposed Schedule on West			
Pullman Line - - - - -	987.79		"
87th Street Line - - - - -	1021.11		"
95th Street Extension - - -	1015.77		"
103rd Street Extension + - -	1061.64		"
Hegewisch Line - - - - -	1067.93		"
All Proposed Changes - - - -	1131.60		"
Present Operation Doubled			
and all Proposed Changes			
Included - - - - -	2134.73		"

ANNUAL MILEAGE

In computing the annual non-revenue mileage, an allowance must be made for fifty-two Sundays and eight holidays, the reduction in mileage for these days averaging close to 50% for all lines. This gives for

Present Operation - - - -	336,048	car-miles	
All Proposed Changes - - -	379,086		"
Operation Doubled - - - -	715,134		"

COST OF NON-REVENUE MILEAGE.

The cost per car-mile of non-revenue mileage is made up of three items as follows:

1. Platform Expenses.
2. Maintenance and Inspection
3. Power.

1. PLATFORM EXPENSES

Platform expenses cover the wages paid motor-men and conductors. These wages are not constant but form a sliding scale varying from twenty-three cents per hour to thirty-two cents per hour depending upon length of service. The scale of wages, in accordance with the contract between the Calumet and South Chicago Railway Company and the Amalgamated Association of Street and Electric Railway Employees, is given herewith:

First three months - - - -	23 cents per hour	
Second three months- - - -	25	"
Next six months - - - - -	26	"
Next six months - - - - -	27	"

Next six months - - - - -	28 cents per hour
Third year - - - - -	29 "
Fourth year - - - - -	30 "
Fifth year and after- - -	32 "

During the past fiscal year these various rates totaled as follows:

Motormen - - - - -	\$132,028.45
Conductors - - - - -	<u>129,475.46</u>
Total	\$261,503.91
Total Passenger Car-miles operated	4,818,863
Platform Expense per car-mile	5.43 cts.

2. MAINTENANCE AND INSPECTION

Car Maintenance:

Bodies, Trucks, Fixtures	\$49,284.19
Electrical Equipment - -	<u>40,715.68</u>
Total	\$ 89,999.87

Carhouse Expenses:

1 Foreman, per month - -	\$ 85.00
2 Car Placers - - - - -	142.04
26 Car Repairers - - - -	1,900.34
9 Car Cleaners - - - - -	658.71
1 Other Employe	<u>81.21</u>
Total per month	\$2867.30
Total per year	<u>34,407.60</u>
Total Maintenance & Inspection	\$124,407.47

Maintenance & Inspection per car-mile 2.58 cts.

It is to be noted here that car service employees, such as the division superintendent, assistant superintendent, supervisors, clerks, janitors, and watchmen, are not taken into consideration inasmuch as their wages form no part of the cost of non-revenue mileage.

3. POWER.

The energy consumed, and consequently the cost of same, varies directly as the tonnage moved. In order, therefore, to obtain an accurate unit figure to apply on the cost of non-revenue mileage, it will be necessary to compute the total tonnage of passengers, cars, and materials handled during a period covering the consumption of a definite amount of energy. The past fiscal year will be considered.

CAR-MILES

Passenger Cars - - - - -	4,814,863	car-miles
Work and Supply Cars - - - - -	49,509	"
Sprinklers & Snow sweepers - -	<u>23,875</u>	"
Total - - - - -	4,888,247	car-miles

Ratio of Double Truck Passenger car-miles
to Single Truck Passenger car-miles -69% to 31%

WEIGHT OF ROLLING STOCK

<u>Type of Car</u>	<u>Average Weight</u>	<u>Ton-Miles</u>
Double Truck Passenger	53,200 lbs.	88,039,784
Single Truck Passenger	19,500 "	14,552,916
Work and Supply	48,100 "	1,190,691
Sprinkler & Snow Sweeper	50,000 "	<u>596,875</u>
Total Weight in Ton-Miles		104,380,266

WEIGHT OF PASSENGERS AND TRAINMEN.

Passengers Carried:

5 cent fares - - - - -	19,264,496
3 cent fares - - - - -	116,051
Transfers - - - - -	7,529,861
Employes - - - - -	<u>1,240,058</u>
Total Passengers Carried	28,150,466

Average Length of Travel Per Passenger:

Actual traffic counts show that each passenger rides an average distance of three miles.

Weight of Passengers and Trainmen:

Average weight of passengers - - -	140 lbs. ea.
Average weight of trainmen - - - -	155 lbs. ea.
Weight of passengers in ton-miles-	5,911,500
Weight of trainmen in ton-miles- -	<u>757,640</u>
Total Weight in Ton-miles - -	6,669,140

WEIGHT OF MATERIAL HANDLED

Total Tonnage handled - - - - -	40,474
Total number of loads - - - - -	2,023
Tons per load - - - - -	20
Average haul of load in miles - - - -	4
Total weight in ton-miles	
4 x 20 x 2,023 - - -	-161,840

SUMMARY OF WEIGHT IN TON-MILES

Rolling Stock- - - - -	104,380,266
Passengers and Trainmen- - - - -	6,669,140
Materials - - - - -	<u>161,840</u>
Total Ton-Miles- - - -	111,211,246

POWER OUTPUT

Total output in kilowatt hours -	21,064,403
Power used in carhouses, etc.	
802,142	
Power sold - - - <u>-3,265,995</u>	<u>4,068,137</u>
Net output to Trolley	16,996,266
Kilowatt-hours per ton-mile - -	0,153

COST OF POWER PER CAR-MILE

Ton-miles, Double Truck Passenger	
Cars	88,039,784
Ton-miles, Single Truck Passenger	
Cars	<u>14,552,916</u>
Total Passenger Ton Miles -	102,592,700

Passenger Car-Miles - - - - - 4,814,863
 Average Weight of Empty Passenger
 car per Car-mile - - 21.3 tons
 Kilowatt-hours per Car-mile, 21.3 x 0.153 = 3.25
 Average Cost of Power per Kilowatt-hour 0.89 cents
 Cost of Power per car-mile - - - - - 2.89 "

SUMMARY - COST OF NON-REVENUE MILEAGE PER CAR-MILE

Platform Expenses - - - - - 5.43 cents
 Maintenance and Inspection- - - - - 2.58 "
 Power - - - - - 2.89 "
 Total Cost of Non-Revenue Mileage 10.90 cents

ANNUAL COST OF NON-REVENUE MILEAGE - BURNSIDE CARHOUSE

Present Operation - - - - - \$36,629.23
 All Proposed Changes - - - - - \$41,320.37
 Operation Doubled - - - - - \$77,949.60

CAR SERVICE EXPENSES - LABOR

Division Superintendent- - -	1	at \$166.66	-	\$166.66
Assistant Superintendent - -	1	at 120.00	-	120.00
Supervisors - - - - -	2	at 101.92	-	203.84
Clerks - - - - -	4	at 84.28	-	337.12
Janitor- - - - -	1	at 59.84	-	59.84
Other Employes - - - - -	1	at 50.26	-	50.26
				<hr/>
Per Month- - -	10	- - - - -	-	-\$ 937.72
Total Annual Car Service Expenses - - -				\$11,252.64

CARHOUSE EXPENSES - LABOR

Foreman - - - - -	1	at \$ 85.00	-	\$ 85.00
Car Placers - - - - -	2	at 71.02	-	142.04
Car Repairers - - - - -	26	at 73.09	-	1,900.34
Car Cleaners- - - - -	9	at 73.19	-	658.71
Watchman - - - - -	1	at 48.00	-	48.00
Other Employes- - - - -	1	at 81.21	-	81.21
				<hr/>
Per Month - - -	40	- - - - -	-	\$2,915.30
Total Annual Carhouse Expenses- - - - -				\$34,983.60

ANNUAL COST OF OPERATION

Total Annual Charges (p. 17) - - - - -	\$13,789.99
Cost of Non-Revenue Mileage (p. 33)* -	36,629.23
Car Service Expenses (p.34)- - - - -	11,252.64
Carhouse Expenses (p. 34)- - - - -	<u>34,983.60</u>
Annual Cost of Operation- - -	\$96,655.46

* This figure represents the present practice in the operation of cars.

IV. PROPOSED LOCATIONS

The Calumet District, with its various street car lines, is divided into two natural sections by Lake Calumet, namely: the South Chicago territory to the northeast of the Lake, and the Pullman territory to the west of the Lake. It is evident from an inspection of Map No. 2, that the most economical operation of cars can be obtained only by the use of two carhouses, one in each of these territories.

Plan No. 1, therefore, contemplates the operation of two carhouses, one of which shall be located in the immediate vicinity of 93rd Street and Anthony Avenue and shall serve the South Chicago territory. The present Burnside Carhouse shall be retained for the purpose of serving the Pullman territory.

Plan No. 2 includes the present Burnside Carhouse and a new carhouse to be located in the immediate vicinity of 103rd Street and Torrence Avenue.

However, inasmuch as the discussion nowhere advocates the retention of the Burnside Carhouse, the two plans outlined above constitute only a temporary mode of operation. The street car traffic within the City of Chicago is increasing at the rate of 5% per annum; this means that traffic will be practically doubled within seventeen years. Figured upon such a basis, the Burnside Carhouse will reach the limit of its economic usefulness in approximately eight years from date, after which time it will become necessary to construct an additional new carhouse.

Plan No. 3, therefore, contemplates the abandonment of the present Burnside Carhouse and the construction of two new carhouses, one at 93rd Street and Anthony Avenue as noted in Plan No. 1, and the other in the immediate vicinity of 119th Street and Michigan Avenue.

Plan No. 4 provides for new carhouses at 103rd Street and Torrence Avenue and at 119th Street and Michigan Avenue. The similarity between the two plans first outlined is therefore retained in the latter two.

It might be observed that either 115th Street and Michigan Avenue or 111th Street and Michigan Avenue would provide at present a more central location for the Pullman territory. These locations are open to the following serious objections:

1. Future growth of this territory will be toward the west and south.
2. Both locations mentioned fall within business districts and would entail a disproportionate expenditure of capital for real estate and preparation of site.

PLAN NO. 1.

As previously outlined, this plan provides
for

1. A new carhouse at 93rd Street and Anthony Avenue of sufficient capacity to care for the following lines:

South Deering 87th Street

Windsor Park 93rd & Pullman

Hammond 95th Street

Whiting 106th Street

Hegewisch Stony Island

2. The present Burnside Carhouse at 93rd Street and Drexel Avenue to care for the following lines:

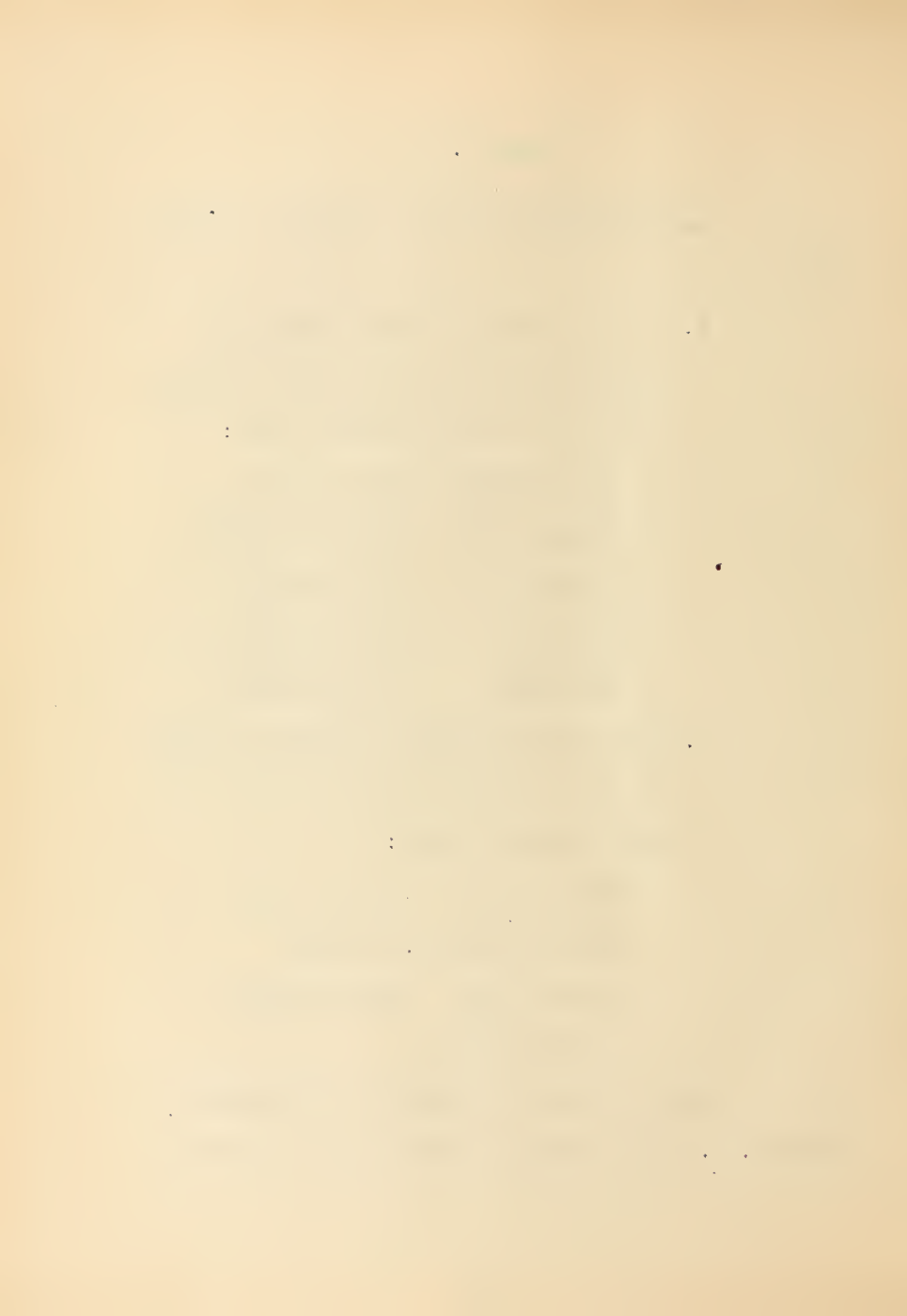
103rd Street 119th Street

103rd-106th Sts. Riverdale

111th Street West Pullman

115th Street

This division of service is illustrated by
Map No. 3. It is evident from the same that some



saving in mileage could be effected by the operation of certain lines, notably the 93rd & Pullman Line, from two carhouses jointly. Such a mode of operation has been objected to, however, on the ground of confusion of authority between division superintendents and carhouse foremen, and because of difficulties in disciplining trainmen.

MILEAGE

FROM 93rd ST. & ANTHONY AV. TO VARIOUS TERMINALS

TERMINAL	Mileage	
	One Way	Round Trip
83 rd St. & Stony Island Av.	4.5278	9.0556
87 th St. & Cottage Grove Av.	3.4047	6.8094
87 th St. & Commercial Av.	0.7901	1.5802
89 th St. & The Strand	1.2177	2.4354
92 nd St. & Commercial Av.	0.1875	0.3750
93 rd St. & Stony Island Av.	1.6200	3.2400
95 th St. & Vincennes Av.	5.4112	10.8224
106 th St. & Torrence Av.	2.1838	4.3676
106 th St. & Ewing Av.	2.3960	4.7920
Indianapolis Av. & State Line	2.7073	5.4146
108 th St. & State Line	3.3112	6.6224
112 th St. & Torrence Av.	2.8902	5.7804
115 th St. & Cottage Grove Av.	Out 5.7816	—
do.	In 6.0113	11.7929
138 th St. & Ontario Av.	6.8088	13.6176

DAILY NON-REVENUE MILEAGE - PLAN No 1
FROM BURNSIDE CARHOUSE

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
103 rd Street	103 rd St. & Michigan Av.	9.09	0.00	
	103 rd St. & Vincennes Rd.	0.00	16.28	
103 rd -106 th Sts. Joint Operation	106 th St. & Ewing Av.	30.94	25.78	101.51
	103 rd St. & Vincennes Rd.	20.36	24.43	
111 th Street	111 th St. & Michigan Av.	3.29	0.00	7.21
	111 th St. & Stewart Av.	0.00	3.92	
115 th Street	115 th St. & South Park Av.	0.00	12.58	23.97
	115 th St. & Michigan Av.	11.39	0.00	
119 th Street	119 th St. & Morgan St.	5.67	5.67	11.34
	119 th St. & Vincennes Rd.	0.00	0.00	
Riverdale	119 th St. & Michigan Av.	8.60	8.60	17.20
	138 th St. & Leyden Av.	0.00	0.00	
West Pullman	63 rd St. & South Park Av.	33.65	0.00	358.29
	120 th St. & Morgan St.	135.27	189.37	
West Pullman Proposed Schedule	63 rd St. & South Park Av.	58.89	0.00	342.95
	120 th St. & Morgan St.	94.69	189.37	

NOTE - This table based on Car Schedules given on pp. 22 & 23.

DAILY NON-REVENUE MILEAGE - PLAN No 1
FROM CARHOUSE AT 93rd ST & ANTHONY AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
South Deering	63 rd St. & Stony Is. Av.	40.75	0.00	124.56
	112 th St & Torrence Av.	28.90	54.91	
Windsor Park	63 rd St. & Stony Is. Av.	18.11	0.00	104.20
	108 th St. & State Line	36.42	49.67	
Hammond	63 rd St. & Stony Is. Av.	13.58	13.58	27.54
	92 nd St. & Commercial Av.	0.19	0.19	
Whiting	92 nd St. & Commercial Av.	0.38	0.38	0.76
	Indianapolis Av. & State Line	0.00	0.00	
Hegewisch Proposed Extension	106 th St & Torrence Av.	15.29	15.29	30.58
	138 th St & Ontario Av.	0.00	0.00	
87 th Street Proposed Extension	87 th St. & Commercial Av.	1.58	1.58	16.78
	87 th St. & Cott. Grove Av.	6.81	6.81	
93 rd & Pullman	89 th St & The Strand	9.74	12.18	116.03
	115 th St. & Cott. Grove Av.	52.03	42.08	
93 rd & Pullman, Proposed Operation with 95 th St. Extens.	89 th St. & The Strand	7.31	9.74	99.37
	115 th St & Cott. Grove Av.	46.25	36.07	
95 th Street Proposed Extension	89 th St & The Strand	3.65	3.65	28.94
	95 th St. & Vincennes Rd.	10.82	10.82	
106 th Street	106 th St. & Ewing Av.	2.40	0.00	4.58
	106 th St. & Torrence Av.	0.00	2.18	
Stony Island	63 rd St. & Stony Is. Av.	0.00	0.00	6.48
	93 rd St & Stony Is. Av.	3.24	3.24	

NOTE - This table based on Car Schedules given on pp. 22 & 23

TOTAL NON-REVENUE MILEAGE

DAILY MILEAGE

Present Operation - - - - -	827.53	Car-miles
Proposed Schedule on West		
Pullman Line - - - - -	812.19	"
87th Street Line- - - - -	844.31	"
95th Street Extension - - - - -	839.81	"
103rd Street Extension- - - - -	899.09	"
Hegewisch Line - - - - -	858.11	"
All Proposed Changes - - - - -	943.39	"
Present Operation Doubled and All		
Proposed Changes Included- - - - -	1770.92	"

ANNUAL MILEAGE

Present Operation - - - - -	277,222	Car-miles
All Proposed Changes- - - - -	316,036	"
Operation Doubled - - - - -	593,258	"

ANNUAL COST OF NON-REVENUE MILEAGE

Present Operation - - - - -	\$30,217.20
All Proposed Changes- - - - -	\$34,447.92
Operation Doubled - - - - -	\$64,665.12

DESIGN OF NEW CARHOUSE.

In considering the design of the proposed carhouse to be located at 93rd Street and Anthony Avenue, the standards as developed by the Chicago City Railway Company will be followed in their essential features. These may be outlined as follows:

General.- The carhouse should be of the double-end type and should be divided into bays or sections of fireproof construction. Each bay should be limited in storage capacity to about \$200,000.00 worth of rolling stock; this provides for three tracks per bay, giving a space of 37'-7" for roof girders.

Floors.- Concrete floors should be used throughout, and should be so graded that water will flow readily to the drains.

Pits.- About half of the trackage should be built with inspection pits with a reinforced concrete floor between rails of the adjoining tracks and with well-drained concrete sub-floors in all pits.

Roofs.- A flat type of roof is greatly to be desired on account of the large area to be covered.

Reinforced concrete slab construction has been found to be the most desirable. The Board of Supervising Engineers insists upon a uniform height of 18 feet to the underside of the girders, as this gives a straight line entrance into the building for trolley overhead construction. A height of 16 feet is here advocated. This allows a substantial reduction in the cost of walls, piers, columns, and doors, and does not materially increase the possibility of the trolley wheel leaving the wire. In this connection, note that the standard height of subways and viaducts in the City of Chicago is 13'-6".

Skylights.- The skylight area should include about one-fifth of the total roof area. In the latest designed carhouses, skylights have been placed in the center of the bay and have been extended to within 16 feet from each end. Single-deck monitors are used. The skylights should be glazed with wire glass and the monitor windows with ribbed glass.

Fire-Doors.- All openings in walls between bays and at ends of bays should be provided with roll-

ing steel fire-doors.

Heating System.- During the winter heat should be supplied by either an indirect hot blast system, or by a direct radiation system. The latter has a great advantage in that the pipes can be laid in the pits where they are out of the way and provide a more even heating with less inconvenience to the men working in the pits. Steam coils should also be placed around the walls and directly over the doors to temper the incoming air.

Car Repairing.- One bay in the carhouse should be equipped for the general repairing of cars. Two overhead traveling cranes spanning the entire bay should be provided; also general repair tools such as motor-driven lathes, drill presses, emery wheels, etc. However, if a car is in need of extensive repairs, it should be taken to the main shops.

Offices.- Separate offices should be apportioned to the Division Superintendent and carhouse foreman, in addition to ample accommodations for clerks, receivers, and dispatchers. It is preferable to have

these rooms face on a large well lighted hall, provided with suitable counters where trainmen can make out their reports.

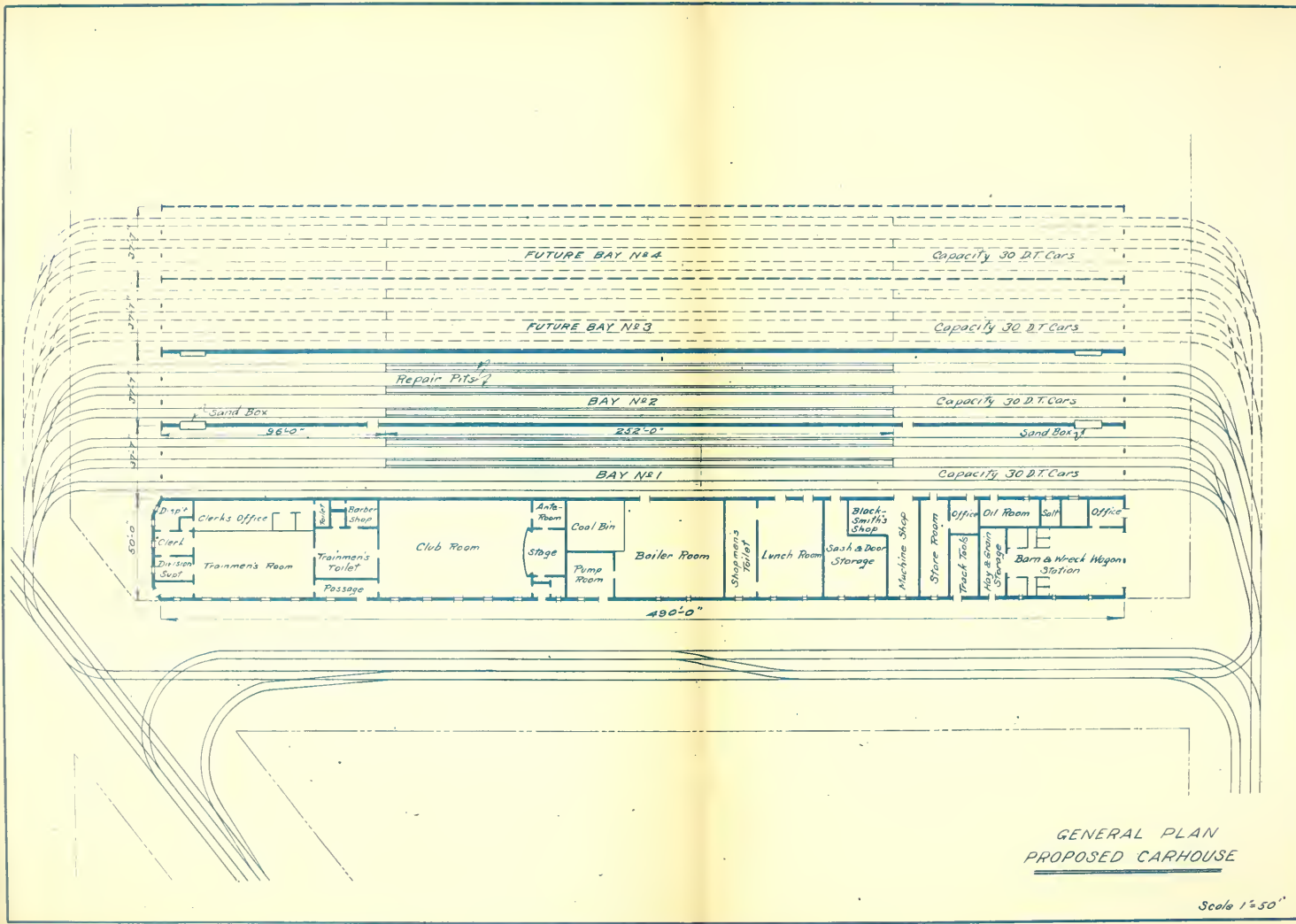
Club Rooms.- Club rooms consisting of a large hall with a stage at one end and one or two ante-rooms are highly appreciated by the trainmen.

Toilet Facilities.- Ample toilet facilities should be provided for carhouse employes and trainmen. Barber chairs and shoe shining stands are conveniences which tend to improve the appearance of trainmen when on duty.

The following tentative design embraces the features outlined above.



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GENERAL PLAN
PROPOSED CARHOUSE

Scale 1"=50'

PROPOSED INVESTMENT AND ANNUAL CHARGES

The cost of the proposed carhouse, as previously outlined, will be approximately \$181,185.00. This estimate is based on cost records of the construction of the Archer Avenue and Rockwell Street Carhouse and the 67th Street and Ashland Avenue Carhouse of the Chicago City Railway Company, and is made up as follows:

Proposed Carhouse to consist of

- 1 Service Bay and
- 2 Storage Bays

Capacity - Service Bay - - - 0	Double Truck Cars
Storage Bays - - 60	
Total	60 Double Truck Cars

SERVICE BAY

Office Quarters - - - - -	-\$11,770.00
Club Room and Toilet - - - - -	11,100.00
Storeroom - - - - -	3,200.00
Lunch Room and Toilet - - - - -	4,800.00
Boiler Room and Pump Room - - - - -	5,000.00
Boiler and Setting - - - - -	2,400.00
Smoke Stack 54" x 100' - - - - -	1,790.00
Vacuum Pump and Boiler Feed Pumps -	875.00
Switch Board - - - - -	1,450.00
Wreck Wagon Station - - - - -	<u>6,500.00</u>
Total - - - - -	\$48,885.00

CAR STORAGE BAYS

1 Bay complete - - - - -	\$35,500.00	
Track and Trolley inside- - -	<u>6,000.00</u>	
Total	\$41,500.00	
Total for 2 Bays - - - - -		\$83,000.00

MISCELLANEOUS

Two 3-motor 10-ton Traveling Cranes - - - - -	\$ 6,000.00	
Track and Trolley Outside, in- cluding Paving, Sidewalks, etc. - - - - -	<u>28,300.00</u>	
Total - - - - -		\$34,300.00

Total for Building, Track and Trolley- -	\$166,185.00	
Real Estate, including allowance for 2 additional bays - - - - -	<u>15,000.00</u>	
Total Proposed Investment- - - - -		\$181,185.00

ANNUAL CHARGES

Value of Rolling Stock to be housed in new Carhouse - - - - -	\$334,841.54	
Insurance Premium on Rolling Stock - - -	1,395.20	
Insurance Premium on Building, etc.- - -	332.37	
Interest, Depreciation, and Taxes on Building at 8% - - - - -	13,294.80	
Interest and Taxes on Real Estate at 6%-	<u>900.00</u>	
Total Annual Charges on New Carhouse - -		\$ 15,922.37

CAR SERVICE EXPENSES

Division Superintendent - - -	1 at	\$150.00	-	\$150.00
Assistant Superintendent- - -	1 at	110.00	-	110.00
Supervisor - - - - - - - - -	1 at	101.92	-	101.92
Clerks - - - - - - - - - - -	2 at	84.28	-	168.56
Janitor- - - - - - - - - - -	1 at	59.84	-	59.84
Per Month - - - 6 - - - - -			-	\$ 590.32
Per Year- - - - - - - - - - -			-	7,083.84
Annual Car Service Expenses for 2 Carhouses				\$14,167.68

CARHOUSE EXPENSES

Foreman - - - - - - - - - - -	1 at	\$ 85.00	-	\$ 85.00
Car Placer - - - - - - - - - -	1 at	71.02	-	71.02
Car Repairers - - - - - - - - -	13 at	73.09	-	950.17
Car Cleaners - - - - - - - - -	5 at	73.19	-	365.95
Watchman - - - - - - - - - - -	1 at	48.00	-	48.00
Per Month - - - 21 - - - - -				\$ 1,520.14
Per Year - - - - - - - - - - -				\$18,241.68
Annual Carhouse Expense for 2 Carhouses				\$56,483.36

ANNUAL COST OF OPERATION

Annual Charges - New Carhouse (p.50) - -	\$15,922.37	
Annual Charges - Burnside Carhouse (p.17) - -	\$13,789.99	
Deduct account shift of portion of equipment to new carhouse - - -	<u>3,947.60</u>	9,842.39
Car Service Expenses (p. 51) - - - - -		14,167.68
Carhouse Expenses (p. 51) - - - - -		36,483.36
Cost of Non-Revenue Mileage (p.44) - - -		<u>30,217.20</u>
Annual Cost of Operation - - - - -		<u>\$106,633.00</u>

PLAN NO. 2.

This plan provides for

1. A new carhouse at 103rd Street and Torrence Avenue of sufficient capacity to care for the following lines:

South Deering	Hegewisch
Windsor Park	93rd & Pullman (with 103rd St. extension)
Hammond	106th Street
Whiting	103rd - 106th Sts.

2. The present Burnside Carhouse at 93rd Street and Drexel Avenue to care for the following lines:

87th Street	119th Street
95th Street	Stony Island
103rd Street	Riverdale
111th Street	West Pullman
115th Street	93rd & Pullman (without 103rd St. Extension.)

This plan is illustrated by Map No. 4.

MILEAGE

FROM 103rd ST. & TORRENCE AV. TO VARIOUS TERMINALS

TERMINAL	Mileage	
	One Way	Round Trip
63 rd St. & Stony Island Av.	7.8160	15.6320
87 th St. & Cottage Grove Av.	5.0436	10.0872
87 th St. & Commercial Av.	2.4290	4.8580
89 th St. & The Strand	2.8566	5.7132
92 nd St. & Commercial Av.	1.9400	3.8800
103 rd St. & Vincennes Av. via 103 rd St.	4.9232	9.8464
106 th St. & Torrence Av.	0.3752	0.7504
106 th St. & Ewing Av.	1.6323	3.2646
Indianapolis Av. & State Line	2.1010	4.2020
108 th St. & State Line	2.4520	4.9040
112 th St. & Torrence Av.	1.0816	2.1632
115 th St. & Cott. Grove Av. via 103 rd St.	Out 4.0578	—
do.	In 4.2875	8.3453
138 th St. & Ontario Av.	5.0002	10.0004

DAILY NON-REVENUE MILEAGE - PLAN N^o2
FROM BURNSIDE CARHOUSE

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
87 th Street <i>Proposed Extension</i>	87 th St. & Commercial Av.	7.11	7.11	
	87 th St. & Cott. Grove Av.	1.88	1.88	17.98
95 th Street <i>Proposed Extension</i>	89 th St. & The Strand	11.64	11.64	
	95 th St. & Vincennes Rd.	5.63	5.63	34.54
93 rd & Pullman	89 th St. & The Strand	31.03	38.78	
	115 th St. & Cott. Grove Av.	27.73	23.18	120.72
93 rd & Pullman <i>Proposed Operation with 95th St. Extens.</i>	89 th St. & The Strand	23.27	31.03	
	115 th St. & Cott. Grove Av.	24.65	19.87	98.82
103 rd Street	103 rd St. & Michigan Av.	9.09	0.00	
	103 rd St. & Vincennes Rd.	0.00	16.28	25.37
111 th Street	111 th St. & Michigan Av.	3.29	0.00	
	111 th St. & Stewart Av.	0.00	3.92	7.21
115 th Street	115 th St. & South Park Av.	0.00	12.58	
	115 th St. & Michigan Av.	11.39	0.00	23.97
119 th Street	119 th St. & Morgan St.	5.67	5.67	
	119 th St. & Vincennes Rd.	0.00	0.00	11.34
Stony Island	63 rd St. & Stony Island Av.	0.00	0.00	
	93 rd St. & Stony Island Av.	2.16	2.16	4.32
Riverdale	119 th St. & Michigan Av.	8.60	8.60	
	138 th St. & Leyden Av.	0.00	0.00	17.20
West Pullman	63 rd St. & South Park Av.	33.65	0.00	
	120 th St. & Morgan St.	135.27	189.37	358.29
West Pullman <i>Proposed Schedule</i>	63 rd St. & South Park Av.	58.89	0.00	
	120 th St. & Morgan St.	94.69	189.37	342.95

NOTE - This table based on Car Schedules given on pp. 22 & 23

DAILY NON-REVENUE MILEAGE - PLAN N^o 2
FROM CARHOUSE AT 103rd ST. & TORRENCE AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
South Deering	63 rd St. & Stony Island Av.	70.34	0.00	101.71
	112 th St. & Torrence Av.	10.82	20.55	
Windsor Park	63 rd St. & Stony Island Av.	31.26	0.00	95.01
	108 th St. & State Line	26.97	36.78	
Hammond	63 rd St. & Stony Island Av.	23.45	23.45	50.78
	92 nd St. & Commercial Av.	1.94	1.94	
Whiting	92 nd St. & Commercial Av.	3.88	3.88	7.76
	Indianapolis Av. & State Line	0.00	0.00	
Hegewisch Proposed Extension	106 th St. & Torrence Av.	2.63	2.63	5.26
	138 th St. & Ontario Av.	0.00	0.00	
93 rd & Pullman	89 th St. & The Strand <small>via 103rd St</small>	22.85	28.57	117.95
	115 th St. & Cott. Grove Av.	36.52	30.01	
93 rd & Pullman Proposed Operation with 95 th St. Extens	89 th St. & The Strand <small>via 103rd St</small>	17.14	22.85	98.18
	115 th St. & Cott. Grove Av.	32.46	25.73	
106 th Street	106 th St. & Ewing Av.	1.63	0.00	2.01
	106 th St. & Torrence Av.	0.00	0.38	
103 rd -106 th Sts. Joint Operation	106 th St. & Ewing Av.	9.79	8.16	72.11
	103 rd St. & Vincennes Rd.	24.62	29.54	

NOTE- This table based on Car Schedules given on pp. 22 & 23

Table 1.
Number of cases of diphtheria and
carriage of diphtheria bacilli in
London, 1926-27.

Year	Number of cases	Number of carriers	Notes
1926	1	1	...
1927	2	2	...
1928	3	3	...
1929	4	4	...
1930	5	5	...
1931	6	6	...
1932	7	7	...
1933	8	8	...
1934	9	9	...
1935	10	10	...
1936	11	11	...
1937	12	12	...
1938	13	13	...
1939	14	14	...
1940	15	15	...
1941	16	16	...
1942	17	17	...
1943	18	18	...
1944	19	19	...
1945	20	20	...
1946	21	21	...
1947	22	22	...
1948	23	23	...
1949	24	24	...
1950	25	25	...
1951	26	26	...
1952	27	27	...
1953	28	28	...
1954	29	29	...
1955	30	30	...
1956	31	31	...
1957	32	32	...
1958	33	33	...
1959	34	34	...
1960	35	35	...
1961	36	36	...
1962	37	37	...
1963	38	38	...
1964	39	39	...
1965	40	40	...
1966	41	41	...
1967	42	42	...
1968	43	43	...
1969	44	44	...
1970	45	45	...
1971	46	46	...
1972	47	47	...
1973	48	48	...
1974	49	49	...
1975	50	50	...
1976	51	51	...
1977	52	52	...
1978	53	53	...
1979	54	54	...
1980	55	55	...
1981	56	56	...
1982	57	57	...
1983	58	58	...
1984	59	59	...
1985	60	60	...
1986	61	61	...
1987	62	62	...
1988	63	63	...
1989	64	64	...
1990	65	65	...
1991	66	66	...
1992	67	67	...
1993	68	68	...
1994	69	69	...
1995	70	70	...
1996	71	71	...
1997	72	72	...
1998	73	73	...
1999	74	74	...
2000	75	75	...

(continued from previous page)

TOTAL NON-REVENUE MILEAGE

DAILY MILEAGE

Present Operation - - - - -	825.69	Car-miles
Proposed Schedule on West		
Pullman Line - - - - -	810.35	"
87th Street Line - - - - -	843.67	"
95th Street Extension - - - - -	838.33	"
103rd Street Extension - - - - -	867.65	"
Hegewisch Line - - - - -	830.95	"
All Proposed Changes - - - - -	887.53	"
Present Operation Doubled and		
All Proposed Changes In-		
cluded - - - - -	1713.22	"

ANNUAL MILEAGE

Present Operation - - - - -	276,606	Car-miles
All Proposed Changes - - - - -	297,323	"
Operation Doubled - - - - -	573,929	"

ANNUAL COST OF NON-REVENUE MILEAGE

Present Operation - - - - -	\$30,150.05
All Proposed Changes - - - - -	\$32,408.21
Operation Doubled - - - - -	\$62,558.26

ANNUAL COST OF OPERATION

Annual Charges - New Carhouse (p.50) - -	\$15,922.37
Annual Charges - Burnside Carhouse (p.52)	9,842.39
Car Service Expenses (p. 51) - - - - -	14,167.68
Carhouse Expenses (p. 51) - - - - -	36,483.36
Cost of Non-Revenue Mileage (p.57) - - -	<u>30,150.05</u>
Annual Cost of Operation- - - -	\$106,565.85

Note - All of the above items, except Cost of
Non-Revenue Mileage, are the same as
for Plan No. 1.

PLAN NO. 3.

As illustrated by Map No. 5, this plan provides for

1. A new carhouse at 93rd Street and Anthony Avenue of sufficient capacity to care for the following lines:

South Deering	87th Street
Windsor Park	93rd & Pullman
Hammond	95th Street
Whiting	106th Street
Hegewisch	Stony Island

2. A new Carhouse at 119th Street and Michigan Avenue to care for the following lines:

103rd Street	119th Street
103rd-106th Sts.	Riverdale
111th Street	West Pullman
115th Street	

MILEAGE

FROM 119TH ST. & MICHIGAN AV TO VARIOUS TERMINALS

TERMINAL	Mileage	
	One Way	Round Trip
63 rd St. & South Park Av.	8.1284	16.2568
89 th St. & The Strand	7.9418	15.8836
103 rd St. & Michigan Av.	2.0242	4.0484
103 rd St. & Vincennes Rd.	3.8217	7.6434
106 th St. & Ewing Av. via 103 rd St.	6.1211	12.2422
111 th St. & Michigan Av.	1.0053	2.0106
111 th St. & Stewart Av.	1.6133	3.2266
115 th St. & South Park Av.	0.8947	1.7894
115 th St. & Michigan Av.	0.5000	1.0000
115 th St. & Cottage Grove Av.	0.9818	1.9636
119 th St. & Morgan St.	1.3750	2.7500
119 th St. & Vincennes Rd.	2.5950	5.1900
119 th St. & Michigan Av.	0.0000	0.0000
120 th St. & Morgan St.	1.4654	2.9308
135 th St. & Leyden Av.	2.6750	5.3500

DAILY NON-REVENUE MILEAGE - PLAN No 3
FROM CARHOUSE AT 93rd ST. & ANTHONY AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
South Deering	63 rd St. & Stony Is. Av.	40.75	0.00	124.56
	112 th St. & Torrence Av.	28.90	54.91	
Windsor Park	63 rd St. & Stony Is. Av.	18.11	0.00	104.20
	108 th St. & State Line	36.42	49.67	
Hammond	63 rd St. & Stony Is. Av.	13.58	13.58	27.54
	92 nd St. & Commercial Av.	0.19	0.19	
Whiting	92 nd St. & Commercial Av.	0.38	0.38	0.76
	Indianapolis Av. & State Line	0.00	0.00	
Hegewisch Proposed Extension	106 th St. & Torrence Av.	15.29	15.29	30.58
	138 th St. & Ontario Av.	0.00	0.00	
87 th Street Proposed Extension	87 th St. & Commercial Av.	1.58	1.58	16.78
	87 th St. & Cott. Grove Av.	6.81	6.81	
93 rd & Pullman	89 th St. & The Strand	9.74	12.18	116.03
	115 th St. & Cott. Grove Av.	52.03	42.08	
93 rd & Pullman, Proposed Operation with 95 th St. Extens.	89 th St. & The Strand	7.31	9.74	99.37
	115 th St. & Cott. Grove Av.	46.25	36.07	
95 th Street Proposed Extension	89 th St. & The Strand	3.65	3.65	28.94
	95 th St. & Vincennes Rd.	10.82	10.82	
106 th Street	106 th St. & Ewing Av.	2.40	0.00	4.58
	106 th St. & Torrence Av.	0.00	2.18	
Stony Island	63 rd St. & Stony Is. Av.	0.00	0.00	6.48
	93 rd St. & Stony Is. Av.	3.24	3.24	

NOTE - This table based on Car Schedules given on pp. 22 & 23

DAILY NON-REVENUE MILEAGE - PLAN N^o 3
FROM CARHOUSE AT 119th ST. & MICHIGAN AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
103 rd Street	103 rd St. & Michigan Av.	8.10	0.00	
	103 rd St. & Vincennes Rd.	0.00	15.29	
103 rd -106 th Sts. Joint Operation	106 th St. & Ewing Av.	36.73	30.61	109.38
	103 rd St. & Vincennes Rd.	19.11	22.93	
111 th Street	111 th St. & Michigan Av.	1.01	0.00	2.62
	111 th St. & Stewart Av.	0.00	1.61	
115 th Street	115 th St. & South Park Av.	0.00	2.68	4.18
	115 th St. & Michigan Av.	1.50	0.00	
119 th Street	119 th St. & Morgan St.	1.38	1.38	2.76
	119 th St. & Vincennes Rd.	0.00	0.00	
Riverdale	119 th St. & Michigan Av.	0.00	0.00	0.00
	138 th St. & Leyden Av.	0.00	0.00	
West Pullman	63 rd St. & South Park Av.	65.03	0.00	135.37
	120 th St. & Morgan St.	29.31	41.03	
West Pullman Proposed Schedule	63 rd St. & South Park Av.	113.80	0.00	175.35
	120 th St. & Morgan St.	20.52	41.03	

NOTE - This table based on Car Schedules given on pp. 22 & 23

TOTAL NON-REVENUE MILEAGE

DAILY MILEAGE

Present Operation - - - - - 552.47 Car-miles
Proposed Schedule on West Pullman
Line- - 592.45 "
87th Street Line - - - - - 569.25 "
95th Street Extension - - - - - 564.75 "
103rd Street Extension,- - - - - 633.88 "
Hegewisch Line - - - - - 583.05 "
All Proposed Changes - - - - - 733.50 "
Present Operation Doubled and All
Proposed Changes Included- - -1285.97 "

ANNUAL MILEAGE

Present Operation - - - - - 185,077 Car-miles
All Proposed Changes- - - - - 245,723 "
Operation Doubled- - - - - 430,800 "

ANNUAL COST OF NON-REVENUE MILEAGE

Present Operation - - - - - \$20,173.39
All Proposed Changes- - - - - \$26,783.80
Operation Doubled - - - - - \$46,957.19

INVESTMENT AND ANNUAL CHARGES.

The proposed investment for Plan No. 3, contemplates the construction of two new Carhouses, each similar to the one outlined under Plan No. 1.

Two New Carhouses, capacity 60 cars each:

93rd St. and Anthony Ave. - - \$181,185.00

119th St. and Michigan Ave. - 181,185.00

Total Proposed Investment- \$362,370.00

Interest, Depreciation, and Taxes on

Building at 8% - - - - - \$ 26,589.60

Interest and Taxes on Real Estate at 6% - 1,800.00

Insurance Premium on Building - - - - - 664.74

Insurance Premium on Rolling Stock- - - - 2,250.31

Total Annual Charges - - - \$ 31,304.65

ANNUAL COST OF OPERATION.

Annual Charges (p. 64) - - - - -	\$31,304.65
Car Service Expenses (p.51)*- - - - -	-14,167.68
Carhouse Expenses (p. 51)*- - - - -	36,483.36
Cost of Non-Revenue Mileage (p. 63)- -	<u>20,173.39</u>
Annual Cost of Operation- - -	- <u>\$102,129.08</u>

* These two items are the same as for Plan No. 1.

PLAN NO. 4.

The fourth and final plan considered in this investigation provides for

1. A new carhouse at 103rd Street and Torrence Avenue of sufficient capacity to care for the following lines:

South Deering	87th Street
Windsor Park	95th Street
Hammond	106th Street
Whiting	103rd-106th Sts.
Hegewisch	93rd & Pullman (with 103rd St. Extension)
Stony Island	

2. A new carhouse at 119th Street and Michigan Avenue of sufficient capacity to care for the following lines:

103rd Street	Riverdale
111th Street	West Pullman
115th Street	93rd & Pullman (without 103rd St. Extension.)
119th Street	

This division of service is illustrated by Map No. 6.

DAILY NON-REVENUE MILEAGE—PLAN NO 4
FROM CARHOUSE AT 103RD ST. & TORRENCE AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
South Deering	63 rd St & Stony Is. Av.	70.34	0.00	
	112 th St. & Torrence Av.	10.82	20.55	
Windsor Park	63 rd St & Stony Is. Av.	31.26	0.00	
	108 th St. & State Line	26.97	22.07	
Hammond	63 rd St & Stony Is. Av.	23.45	23.45	
	92 nd St. & Commercial Av.	1.94	1.94	
Whiting	92 nd St. & Commercial Av.	3.88	3.88	
	Indianapolis Av. & State Line	0.00	0.00	
Hegewisch Proposed Extension	106 th St. & Torrence Av.	2.63	2.63	
	138 th St. & Ontario Av.	0.00	0.00	
Stony Island	63 rd St. & Stony Is. Av.	0.00	0.00	
	93 rd St. & Stony Is. Av.	6.88	6.88	
87 th Street Proposed Extension	87 th St. & Commercial Av.	4.86	4.86	
	87 th St. & Cott. Grove Av.	10.09	10.09	
93 rd & Pullman	89 th St. & The Strand	22.85	28.57	
	115 th St. & Cott. Grove via 103 rd	36.52	30.01	
93 rd & Pullman Proposed Operation with 95 th St. Extens.	89 th St. & The Strand	17.14	22.85	
	115 th St. & Cott. Grove via 103 rd	32.46	25.72	
95 th Street Proposed Extension	89 th St. & The Strand	8.57	8.57	
	95 th St. & Vincennes Fd.	14.46	14.46	
106 th Street	106 th St. & Ewing Av.	1.63	0.00	
	106 th St. & Torrence Av.	0.00	0.37	
103 rd - 106 th Sts. Joint Operation	106 th St. & Ewing Av.	9.79	8.16	
	103 rd St. & Vincennes Fd.	24.62	29.54	

NOTE - This table based on Car Schedules given on pp. 22 & 23 and Mileage table on p. 54

DAILY NON-REVENUE MILEAGE - PLAN NO 4

FROM CARHOUSE AT 119TH ST. & MICHIGAN AV.

LINE	TERMINAL	MILEAGE		
		Pulling Out	Pulling In	Total
103 rd Street	103 rd St. & Michigan Av.	8.10	0.00	27.39
	103 rd St. & Vincennes Rd.	0.00	19.29	
111 th Street	111 th St. & Michigan Av.	1.00	0.00	2.61
	111 th St. & Stewart Av.	0.00	1.61	
115 th Street	115 th St. & South Park Av.	0.00	2.68	4.18
	115 th St. & Michigan Av.	1.50	0.00	
119 th Street	119 th St. & Morgan St.	1.37	1.37	2.74
	119 th St. & Vincennes Rd.	0.00	0.00	
Riverdale	119 th St. & Michigan Av.	0.00	0.00	0.00
	138 th St. & Leyden Av.	0.00	0.00	
West Pullman	63 rd St. & South Park Av.	65.03	0.00	135.37
	120 th St. & Morgan St.	29.31	41.03	
West Pullman Proposed Operation	63 rd St. & South Park Av.	113.80	0.00	175.35
	120 th St. & Morgan St.	20.52	41.03	
93 rd & Pullman	89 th St. & The Strand	63.53	79.42	158.66
	115 th St. & Cottage Grove Av.	8.84	6.87	
93 rd & Pullman Proposed Operation with 95 th St. Extens	89 th St. & The Strand	47.65	63.53	124.92
	115 th St. & Cottage Grove Av.	7.85	5.89	

NOTE - This table based on Car Schedules given on pp. 22 & 23 and Mileage Table on p. 60.

TOTAL NON-REVENUE MILEAGE.

DAILY MILEAGE

Present Operation - - - - -	587.26	Car-miles
Proposed Schedule on West		
Pullman Line - - - - -	627.24	"
87th Street Line - - - - -	617.16	"
95th Street Extension - - - - -	579.53	"
103rd Street Extension- - - - -	629.98	"
Hegewisch Line - - - - -	592.52	"
All Proposed Changes - - - - -	670.69	"
Present Operation Doubled and All		
Proposed Changes Included- -	1257.95	"

ANNUAL MILEAGE

Present Operation - - - - -	196,732	Car-miles
All Proposed Changes- - - - -	224,681	"
Operation Doubled- - - - -	421,413	"

ANNUAL COST OF NON-REVENUE MILEAGE

Present Operation - - - - -	\$21,443.79
All Proposed Changes- - - - -	\$24,490.23
Operation Doubled - - - - -	\$45,934.02

ANNUAL COST OF OPERATION.

Annual Charges (p. 64)*- - - - -	\$31,304.65
Car Service Expenses (p. 51)*- - - - -	14,167.68
Carhouse Expenses (p. 51)*- - - - -	36,483.36
Cost of Non-Revenue Mileage (p. 69)- -	<u>21,443.79</u>
Annual Cost of Operation- - -	\$103,399.48

*These three items are the same as for Plan No. 3.

V. SUMMARY.

SUMMARY OF INVESTMENT AND ANNUAL CHARGES

<i>Total Investment And Annual Charges</i>	<i>Burnside</i>	<i>Plan N^o1</i>	<i>Plan N^o2</i>	<i>Plan N^o3</i>	<i>Plan N^o4</i>
<i>Total Investment</i>	\$ 136,749.57	\$ 292,334.57	\$ 292,334.57	\$ 362,370.00	\$ 362,370.00
<i>Int, Dep. & Taxes on Bldg.</i>	\$ 7,931.96	\$ 19,626.76	\$ 19,626.76	\$ 26,589.60	\$ 26,589.60
<i>Int. & Taxes on Real Estate</i>	2,256.00	2,820.00	2,820.00	1,800.00	1,800.00
<i>Insurance on Building</i>	422.03	714.40	714.40	664.74	664.74
<i>Insurance on Rolling Stock</i>	3,180.00	2,603.60	2,603.60	2,250.31	2,250.31
<i>Total Annual Charges</i>	\$ 13,789.99	\$ 25,764.76	\$ 25,764.76	\$ 31,304.65	\$ 31,304.65

SUMMARY OF DAILY NON-REVENUE MILEAGE

EXPRESSED IN CAR-MILES

<i>Method of Operation</i>	<i>Burnside</i>	<i>Plan N^o 1</i>	<i>Plan N^o 2</i>	<i>Plan N^o 3</i>	<i>Plan N^o 4</i>
<i>Present Operation</i>	1003.13	827.53	825.69	552.47	587.26
<i>Proposed Schedule on W. Pillman Line</i>	987.79	812.19	810.35	592.45	627.24
<i>87th Street Line</i>	1021.11	844.31	843.67	569.25	617.16
<i>95th Street Extension</i>	1015.77	839.81	838.33	564.75	579.58
<i>103rd Street Extension</i>	1061.64	899.09	867.65	633.88	629.98
<i>Hegewisch Line</i>	1067.93	858.11	830.95	583.05	592.52
<i>All Proposed Changes</i>	1131.60	943.39	887.53	733.50	670.69
<i>Operation Doubled</i>	2134.73	1770.92	1713.22	1285.97	1257.95

SUMMARY OF ANNUAL NON-REVENUE MILEAGE

EXPRESSED IN CAR-MILES

<i>Method of Operation</i>	<i>Burnside</i>	<i>Plan N^o1</i>	<i>Plan N^o2</i>	<i>Plan N^o3</i>	<i>Plan N^o4</i>
<i>Present Operation</i>	336,048	277,222	276,606	185,077	196,732
<i>All Proposed Changes</i>	379,086	316,036	297,323	245,723	224,681
<i>Operation Doubled</i>	715,134	593,258	573,929	430,800	421,413

ANNUAL COST OF NON-REVENUE MILEAGE

<i>Method of Operation</i>	<i>Burnside</i>	<i>Plan N^o1</i>	<i>Plan N^o2</i>	<i>Plan N^o3</i>	<i>Plan N^o4</i>
<i>Present Operation</i>	\$36,629.23	\$30,217.20	\$30,150.05	\$20,173.39	\$21,443.79
<i>All Proposed Changes</i>	41,320.37	34,447.92	32,408.21	26,783.80	24,490.23
<i>Operation Doubled</i>	77,949.60	64,665.12	62,558.26	46,957.19	45,934.02

Name	Address	City
John Doe	123 Main St	New York
Jane Smith	456 Elm St	Los Angeles
Bob Johnson	789 Oak St	Chicago
Alice Brown	101 Pine St	Houston
Charlie White	202 Cedar St	Phoenix
Diana Green	303 Birch St	Philadelphia
Ethan Black	404 Spruce St	San Antonio
Fiona Grey	505 Willow St	San Diego

SUMMARY OF ANNUAL COST OF OPERATION
BASED ON PRESENT OPERATION OF CARS

Item	Burnside	Plan N ^o 1	Plan N ^o 2	Plan N ^o 3	Plan N ^o 4
Annual Charges	\$ 13,789.99	\$ 25,764.76	\$ 25,764.76	\$ 31,304.65	\$ 31,304.65
Car Service Expenses	11,252.64	14,167.68	14,167.68	14,167.68	14,167.68
Carhouse Expenses	34,983.60	36,483.36	36,483.36	36,483.36	36,483.36
Non-Revenue Mileage	36,629.23	30,217.20	30,150.05	20,173.39	21,443.79
Total	\$ 96,655.46	\$ 106,633.00	\$ 106,565.85	\$ 102,129.08	\$ 103,399.48

SUMMARY OF ANNUAL COST OF OPERATION
BASED ON PROPOSED OPERATION OF CARS

Item	Burnside	Plan N ^o 1	Plan N ^o 2	Plan N ^o 3	Plan N ^o 4
Annual Charges	\$ 13,789.99	\$ 25,764.76	\$ 25,764.76	\$ 31,304.65	\$ 31,304.65
Car Service Expenses	11,252.64	14,167.68	14,167.68	14,167.68	14,167.68
Carhouse Expenses	34,983.60	36,483.36	36,483.36	36,483.36	36,483.36
Non-Revenue Mileage	41,320.37	34,447.92	32,408.21	26,783.80	24,490.23
Total	\$ 101,346.60	\$ 110,863.72	\$ 108,824.01	\$ 108,739.49	\$ 106,445.92

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE
FOR THE YEAR 1881

The following table shows the amount of land sold by the General Land Office during the year 1881, and the proceeds therefrom. It also shows the amount of land sold during the year 1880, and the proceeds therefrom, for comparison.

Year	Amount of land sold, in acres	Proceeds, in dollars
1881	1,234,567	12,345,678
1880	1,123,456	11,234,567

STATEMENT OF THE RECEIPTS AND DISBURSMENTS OF THE GENERAL LAND OFFICE
FOR THE YEAR 1881

Item	Amount
Land sold	12,345,678
Interest on bonds	1,234,567
Proceeds from sales	2,345,678
Other receipts	3,456,789
Total Receipts	19,382,512
Salaries	1,234,567
Expenses	2,345,678
Interest on bonds	3,456,789
Other disbursements	4,567,890
Total Disbursements	11,604,924
Balance on hand	7,777,588

VI. CONCLUSION.

ANALYSIS OF SUMMARIES

NON-REVENUE MILEAGE

As stated under General Premises, pg. 5, the selection of the location for a Carhouse is largely a matter, in its final analysis, of reducing the non-revenue mileage of revenue cars to the lowest possible amount consistent with the economical operation of the system as a whole. From an inspection of the preceding summaries of non-revenue mileage, it is apparent that each of the plans considered will result in substantial savings in comparison with the present Burnside Carhouse.

Under existing methods of car operation, these savings vary in amount as follows:

<u>Plan No. 1</u>	<u>Plan No. 2</u>	<u>Plan No. 3</u>	<u>Plan No. 4</u>
\$6,412.03	\$6,579.18	\$16,455.84	\$15,185.44

It is seen that Plan No. 3 represents the largest saving in cost of non-revenue mileage, being \$1,270.40

greater than Plan No. 4.

Considering all proposed changes in routes and methods of operation under conditions that will soon be realized, the following reductions result:

<u>Plan No. 1</u>	<u>Plan No. 2</u>	<u>Plan No. 3</u>	<u>Plan No. 4</u>
\$6,872.45	\$8,912.16	\$14,536.57	\$16,830.14

In this case, Plan No. 4 gives a reduction in cost of \$2,293.57 in excess of the reduction obtained by Plan No. 3. This annual saving of \$16,830.14, capitalized at 5%, is equivalent to an investment of \$336,500.00, a sum sufficiently large to build complete two modern Carhouses as contemplated under Plan No. 4 (real estate excluded).

ANNUAL CHARGES

Owing to the large increases in the total investment which is necessary under the various plans considered, the annual charges are much larger than at present. These increases, however, are in proportion to the increased housing capacity which each plan contemplates.

Interest, Depreciation, and Taxes on Buildings are accordingly increased in all cases. Interest and Taxes on Real Estate are increased in Plans No. 1 and No. 2, but show a decrease in Plans No. 3 and No. 4, this being due to more efficient and intensive development of smaller plats of ground. In this connection, compare the layout of the Burnside Plant with the proposed design.

Insurance rates on the new buildings are smaller on account of better design and compliance with the Underwriters' Specifications regarding fire walls, steel doors, size of bays, fire prevention apparatus, and various items of construction. The increases in the total investment, however, are sufficiently large to raise the total Insurance on Buildings considerably above the present premiums. Plans No. 3 and No. 4 represent a slightly greater saving than Plans No. 1 and No. 2.

Regarding Insurance on Rolling Stock, a substantial saving is shown by all plans, the greatest reduction amounting to \$929.69 for Plans No. 3 and No. 4.

This is due to better housing facilities and greater protection against fire.

CAR SERVICE AND CARHOUSE EXPENSES

These items which are the same for all plans, show an increase of \$2,915.04 in Car Service Expenses and \$1,499.76 in Carhouse Expenses, both on account of the use of two operating houses instead of one as at present.

TOTAL COST OF OPERATION

Referring to the Summary of Annual Cost of Operation based on present operation of cars, it is seen that Plan No. 3 requires the smallest annual outlay, the total amount being \$102,129.08. The total for Plan No. 2, \$106,565.85, is slightly smaller than for Plan No. 1, and the total for Plan No. 4 is \$1,270.40 greater than for Plan No. 3.

Based on the proposed operation of cars, the total annual cost of operation is smallest for Plan No. 4, amounting to \$106,445.92. This is \$2,293.57 smaller than Plan No. 3, and only \$5,099.32 greater

than the present Burnside Carhouse, notwithstanding the fact that it represents a total investment more than two and one-half times greater.

It should also be noted here, that the two new carhouses proposed under Plan No. 4, provide a total storage capacity of 120 double truck 48 ft. passenger cars in comparison with the present storage capacity of 65 double truck cars at the Burnside Carhouse. When this additional capacity has been utilized by the natural increase of traffic, the total annual cost of non-revenue mileage under Plan No. 4 will then amount to \$45,934.02, and for the present Burnside location the non-revenue mileage would be \$77,949.60, thus giving an annual saving in non-revenue mileage of \$32,015.55.

RECOMMENDATIONS

Based on the preceding analysis, the adoption of Plan No. 4 is here recommended, with the following provisions as to its installation:

1. First construct the proposed extension of tracks on 103rd Street from Cottage Grove Avenue to 104th Street and Torrence Avenue. The Illinois Central Railroad is at present elevating its tracks across 103rd Street West of Cottage Grove Avenue, and will begin the construction of a subway early in 1915, thus permitting a safe and inexpensive crossing at this point. The City of Chicago is proceeding with the adjustment of the riparian rights in Lake Calumet and it is expected that in the near future 103rd Street will be opened up across the northern end of the Lake.

2. Construct the proposed new Carhouse to be located at 103rd Street and Torrence Avenue, at the same time retaining the present Burnside Carhouse temporarily in service. This represents Plan No. 2

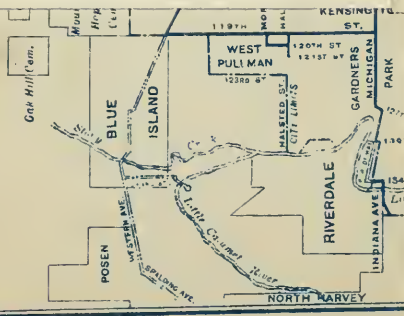
and will result in the greatest immediate reduction in non-revenue mileage. It is to be noted here that a further substantial reduction will be obtained by the construction of a new car-line on Yates Avenue from 67th Street to 103rd Street, a portion of which will probably be built within the next two years.

3. After the Burnside Carhouse has reached the limit of its economic usefulness due to depreciation and inability to properly handle increase of traffic, as outlined under Proposed Locations, page 37, abandon it and construct a new carhouse at 119th Street and Michigan Avenue. This will complete the installation of Plan No. 4, thus providing two modern carhouses at strategic points best fitted to minimize operating costs, handle present traffic, and care for future growth.

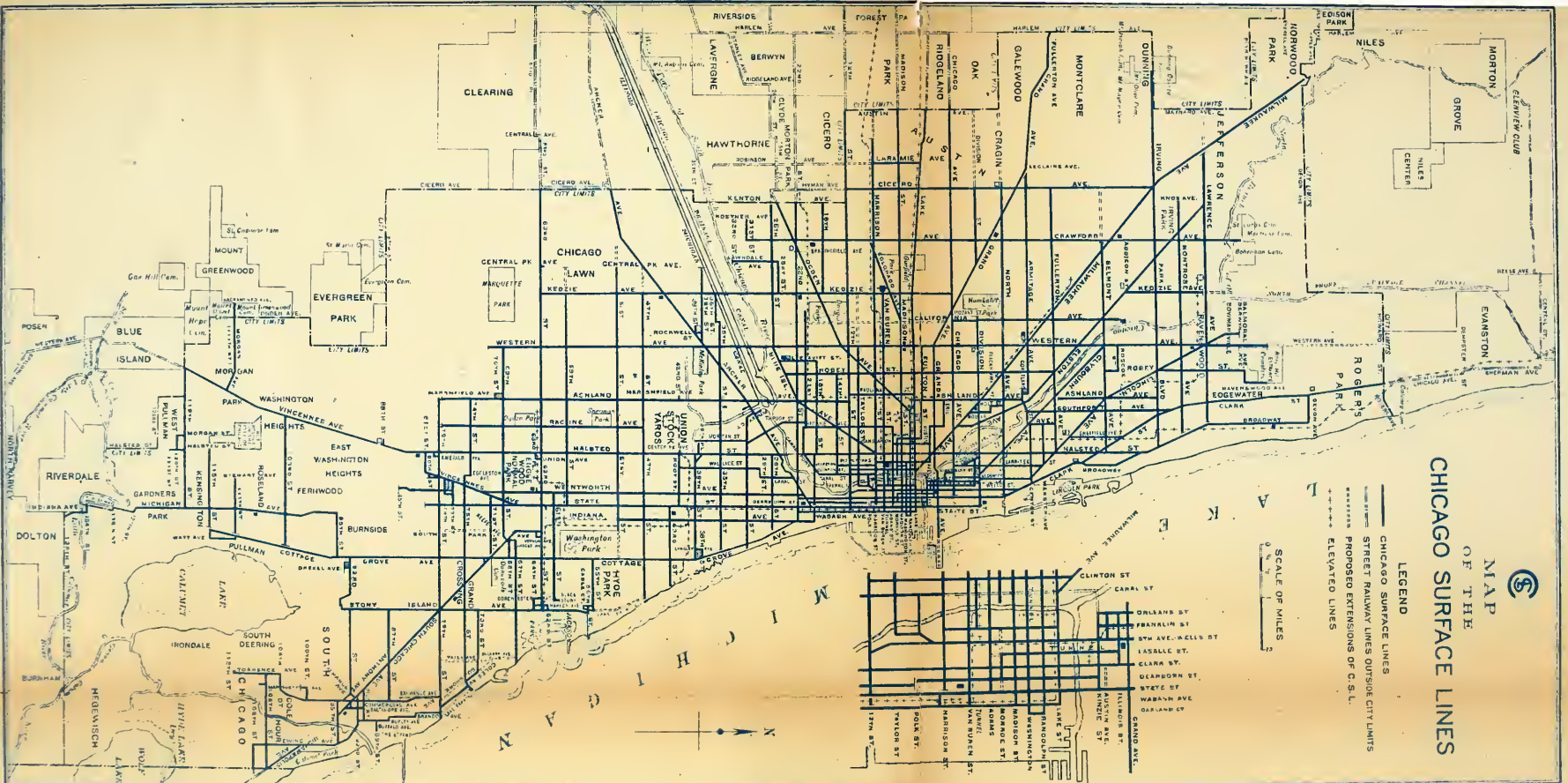
Dated as of May 1st, 1914.

Turrell J. Terrenz
April 29th, 1915

VII MAPS



MAP No. 1
CHICAGO SURFACE
LINES




MAP
 OF THE
CHICAGO SURFACE LINES

- LEGEND**
- CHICAGO SURFACE LINES
 - STREET RAILWAY LINES OUTSIDE CITY LIMITS
 - PROPOSED EXTENSIONS OF C. S. L.
 - ELEVATED LINES

SCALE OF MILES
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MAP No 2

SHOWING LINES IN THE CALUMET DISTRICT



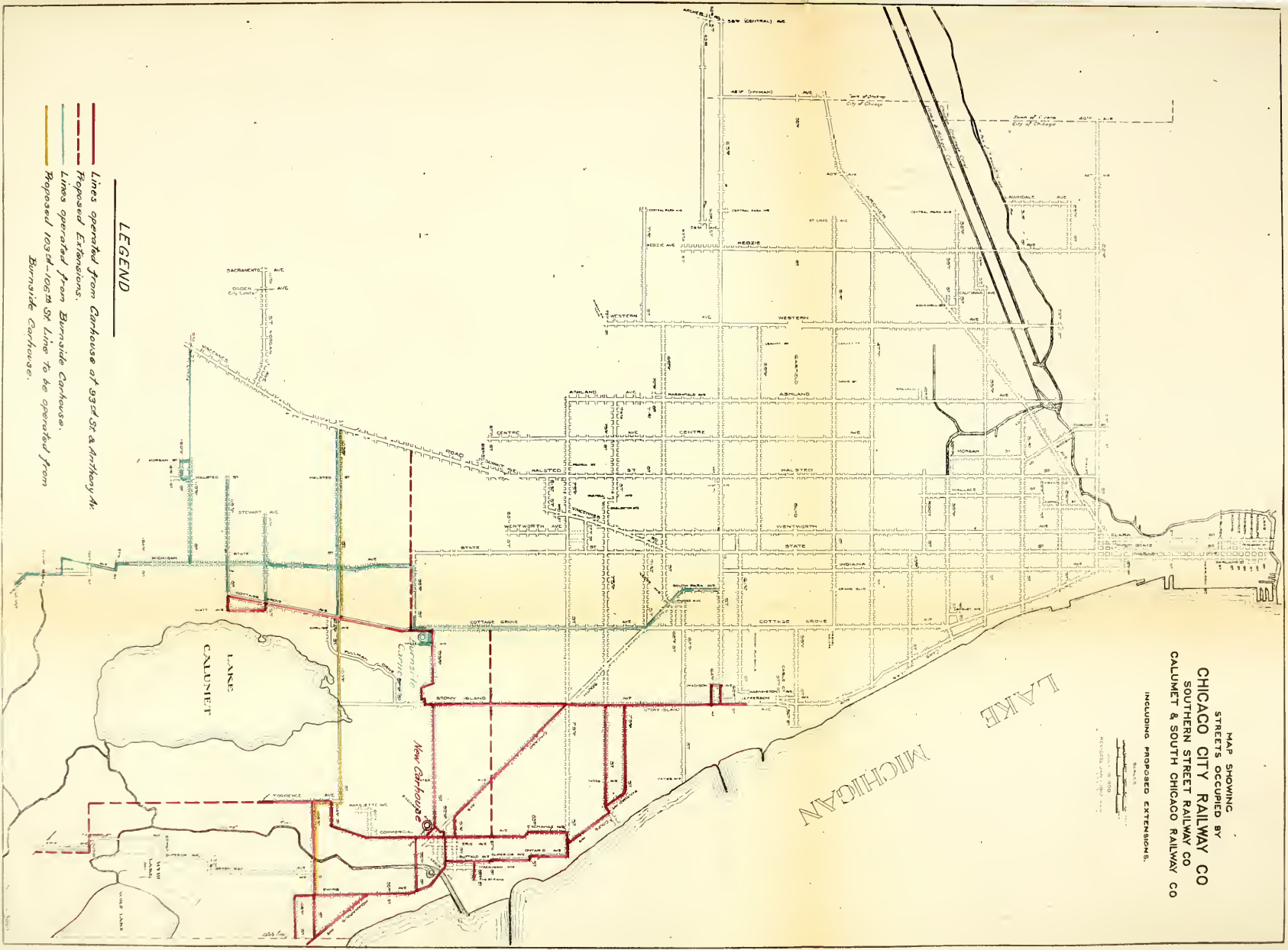
MAP SHOWING
STREETS OCCUPIED BY
CHICAGO CITY RAILWAY CO
SOUTHERN STREET RAILWAY CO
CALUMET & SOUTH CHICAGO RAILWAY CO
INCLUDING PROPOSED EXTENSIONS.



MAP No 3
ILLUSTRATING PLAN No 1

MAP SHOWING
STREETS OCCUPIED BY
CHICAGO CITY RAILWAY CO
SOUTHERN STREET RAILWAY CO
CALUMET & SOUTH CHICAGO RAILWAY CO

INCLUDING PROPOSED EXTENSIONS.



LEGEND

- Lines operated from Carhouse at 93rd St & Anthony Av.
- - - Proposed Extensions.
- Lines operated from Burnside Carhouse.
- Proposed 1934-1935 St Line to be operated from Burnside Carhouse.

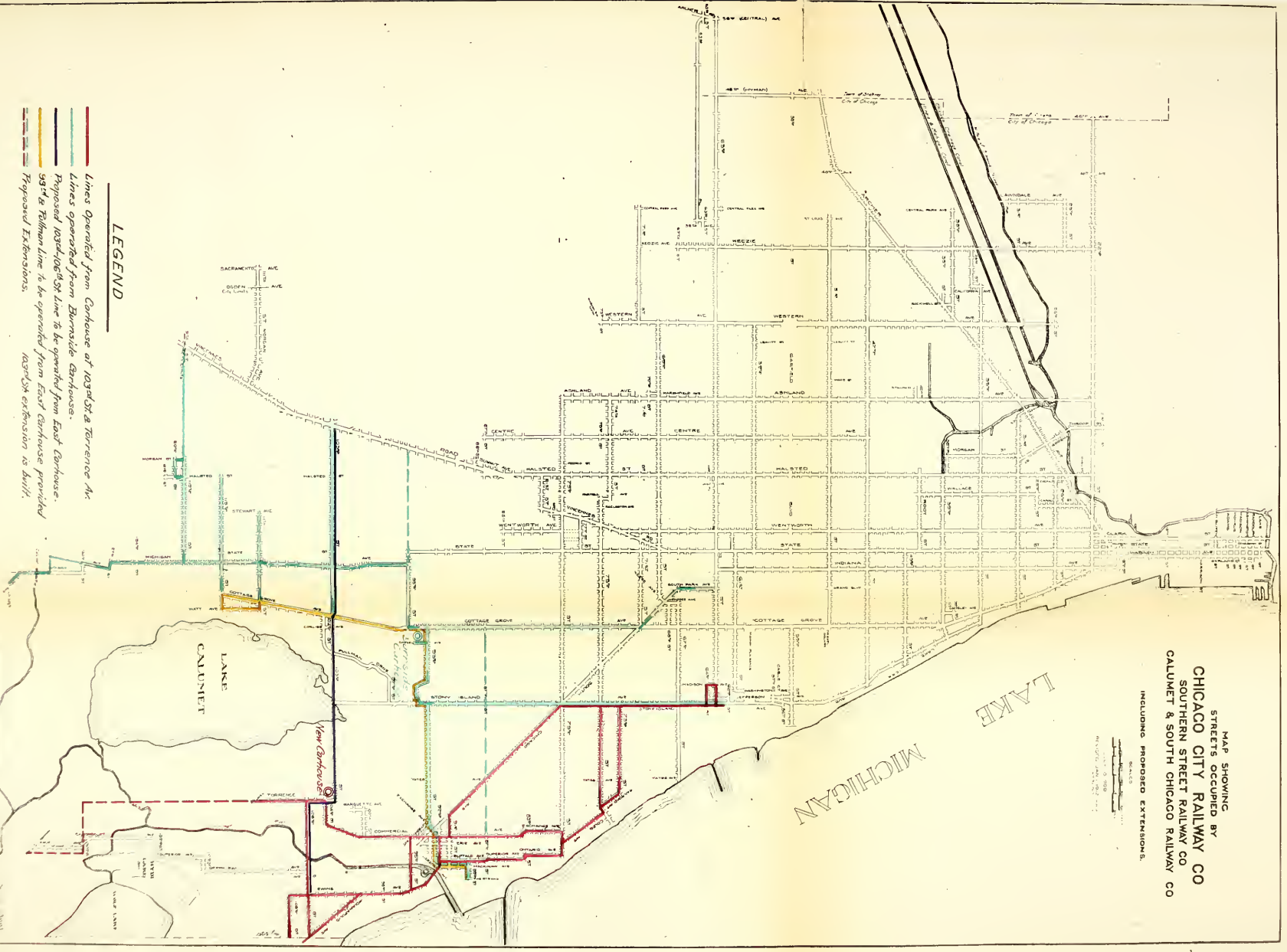


MAP N^o 4
ILLUSTRATING PLAN N^o 2



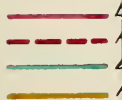
MAP SHOWING
STREETS OCCUPIED BY
CHICAGO CITY RAILWAY CO
SOUTHERN STREET RAILWAY CO
CALUMET & SOUTH CHICAGO RAILWAY CO
INCLUDING PROPOSED EXTENSIONS.

SCALE
1" = 1000'
1" = 1000'



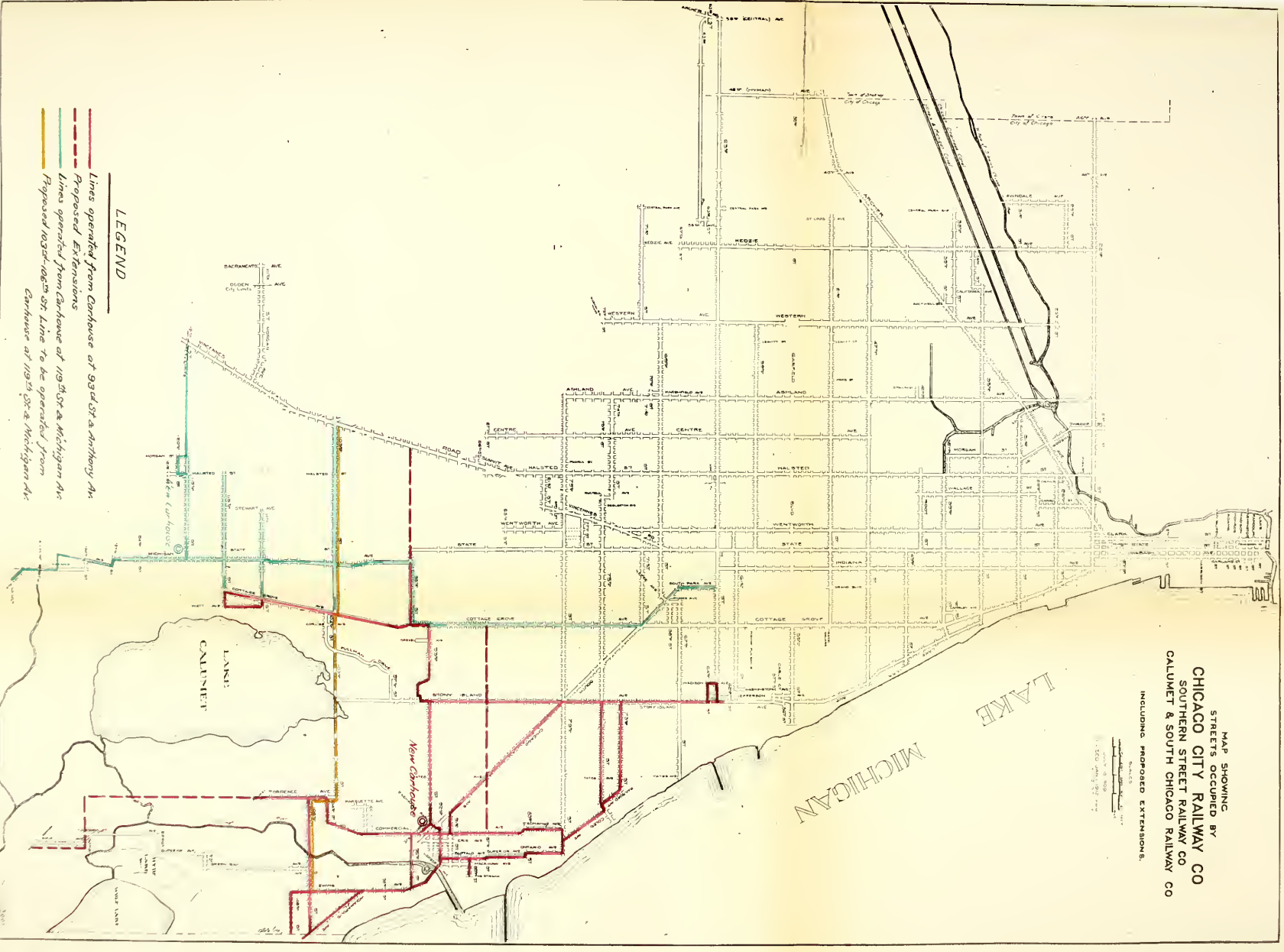
LEGEND

- Lines Operated from Carhouse at 103rd St & Torrence Av.
- Lines operated from Burnside Carhouse.
- Proposed 103rd-106th St Line to be operated from East Carhouse.
- 93rd & Pullman line to be operated from East Carhouse provided 103rd St extension is built.
- - - Proposed Extensions.



MAP N°5
ILLUSTRATING PLAN N°3

MAP SHOWING
STREETS OCCUPIED BY
CHICAGO CITY RAILWAY CO
SOUTHERN STREET RAILWAY CO
CALUMET & SOUTH CHICAGO RAILWAY CO
INCLUDING PROPOSED EXTENSIONS.



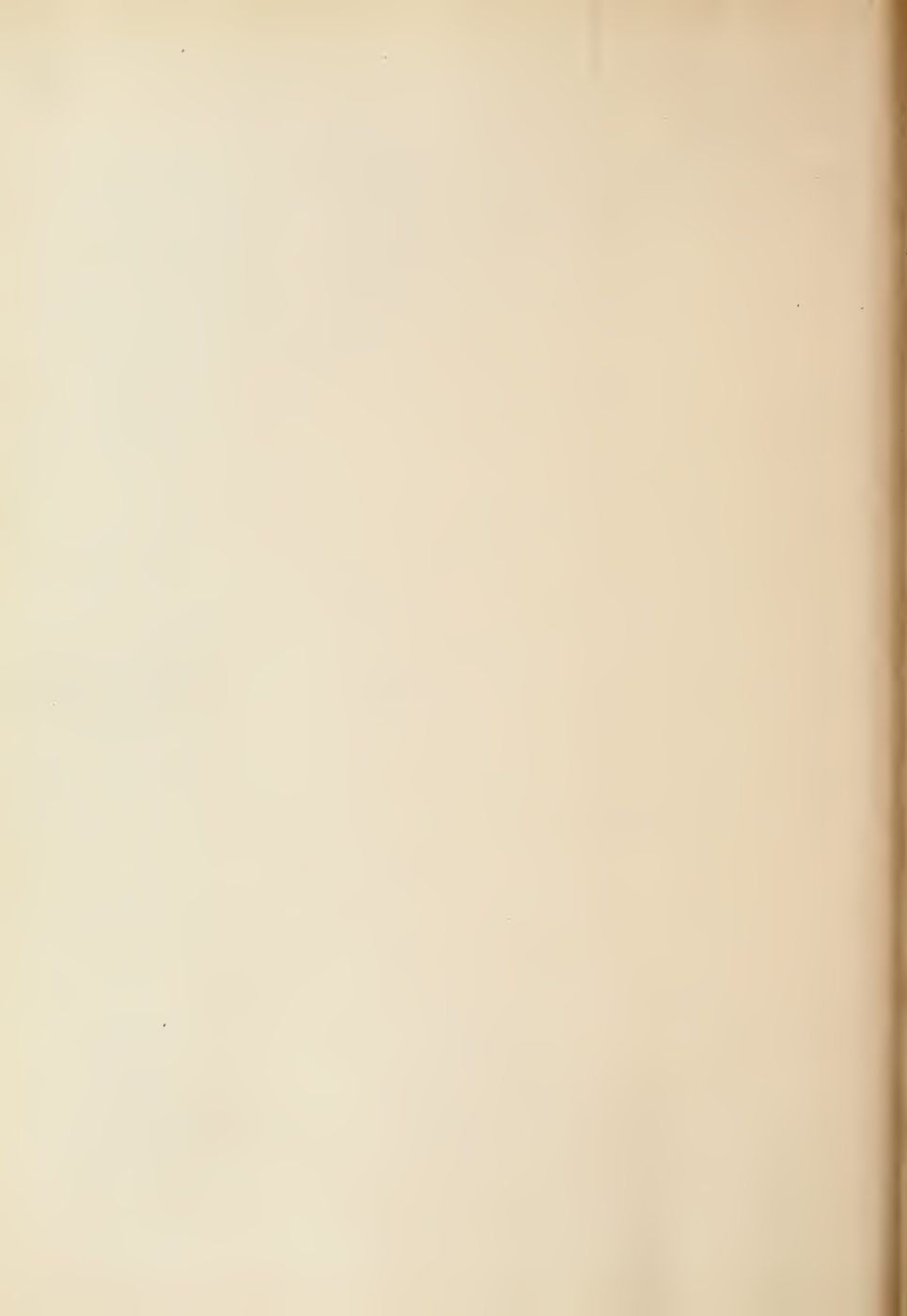
LEGEND

- Lines operated from Carhouse of 93d St & Anthony Av.
- - - Proposed Extensions
- Lines operated from Carhouse of 119th St & Michigan Av.
- Proposed 119th-166th St. Line to be operated from Carhouse at 119th St & Michigan Av.





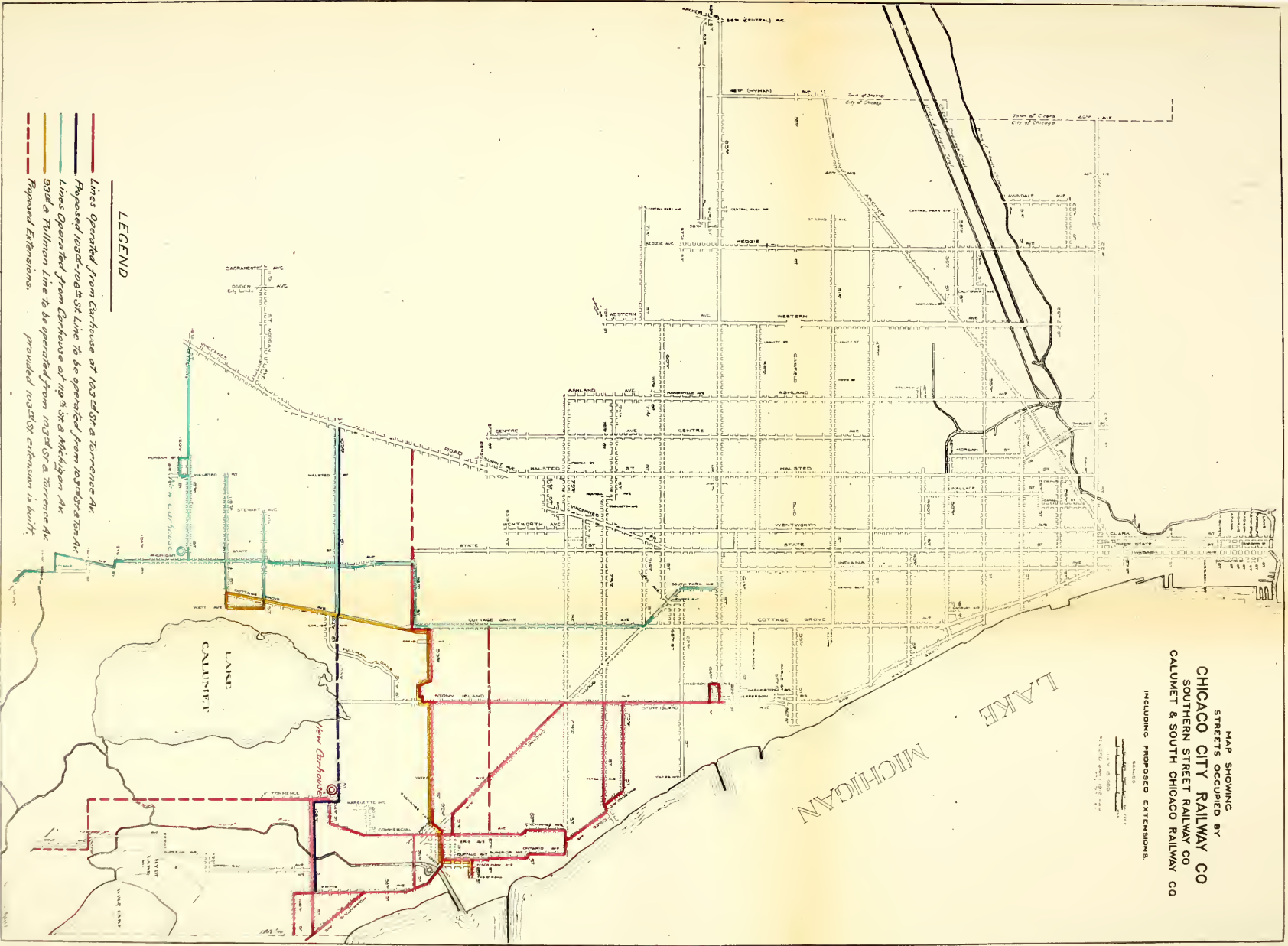
MAP N^o 6
ILLUSTRATING PLAN N^o 4



MAP SHOWING
STREETS OCCUPIED BY
CHICAGO CITY RAILWAY CO
SOUTHERN STREET RAILWAY CO
CALUMET & SOUTH CHICAGO RAILWAY CO

INCLUDING PROPOSED EXTENSIONS.

Scale: 1" = 1000'



LEGEND

- Lines Operated from Carhouse at 103rd St & Torrence Av.
- Proposed 103rd-106th St. line to be operated from 103rd St & Torrence Av.
- Lines Operated from Carhouse at 119th St & Michigan Av.
- 93rd & Fullman line to be operated from 103rd St & Torrence Av.
- - - Proposed Extensions. provided 103rd St extension is built.

T	25758	
q625.1		F41
Ferrenz, T. J.		
Scientific location of cat ²¹⁶		
houses in Calumet dist....		

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