New Jersey. State Planning Board

The proposed New Jersey ship canal

1937. Copy 1.

THE PROPOSED NEW JERSEY SHIP CANAL

New York Bay-Delaware River Section of

the Intracoastal Waterway

A Summary of

Reports and Miscellaneous Data

Applying Thereto

The New Jersey State Planning Board

April, 1937

NOTE:- This is an objective summary of all reports covering this project available up to April, 1937 and does not express the views of the State Planning Board. The Board has since recorded itself in opposition to the canal as being economically unjustified, and as involving hitherto unrecognized serious damages to the State and its future development.

Reviewed and Compiled by: Walter E. Brennfleck

MEMORANDUM

TO: The New Jersey State Planning Board

FROM: Russell VanNest Black, Consultant

SUBJECT: Trans-New Jersey Ship Canal

The Trans-New Jersey Ship Canal has again come to the fore with favorable reports by the Corps of Engineers and Congressional Committee, after public hearings.

The canal is being promoted as a war measure although, almost certainly, it could not be completed and put in operation until years after the end of this war. Congress recently disapproved an appropriation for the proposed Florida Canal at about a quarter the cost of the Jersey Canal because of entailed use of materials and labor more needed elsewhere. It seems probable that, in a show-down, similar action will defeat the Jersey Canal for the same reason. But there is a chance that the project will go through unless greater opposition develops than was expressed at the Congressional hearings.

Beyond the obvious untimeliness of the project and its very questionable economic justification, the following circumstances are among those that should be given special consideration from point of view of safeguarding the best interests of this State:

1. The canal will bisect 45 existing roads - 3 state highways, 26 main local roads and 16 minor rural roads, of which 11 are concrete roads and 7 are hard-surfaced. The project calls for the construction of only 15 bridges meaning re-routing and indirection of the traffic upon the other 30 roads. This leaves out of consideration new roads which would normally be built across the line of the canal in the course of time. Bridging the canal is a costly business - with a 300 foot channel width and a width of cut ranging in places up to nearly 1000 feet.

2. The canal would bisect 5 railroads - 2 double-track and 3 single-track. Two would be re-routed. Three would have vertical lift bridges meaning interruption of rail traffic for passage of canal traffic.

3. The locks would be operated by impounded Raritan River water. The impounding dam would be placed at the confluence of the North and South branches of the River and would create a reservoir flooding about 11,000 acres. Estimated quantity of water required is as much or greater than the entire surplus yield of the Raritan River watershed. This watershed has always been considered one of the most probable sources of a new North Jersey potable water supply. If the canal is built as planned no water will be left for North Jersey and even sufficient local supplies for future development may be threatened.

4. The canal right-of-way would usurp some of the State's best farm land. It would have an undetermined adverse effect upon farmland for an indefinite distance on either side of the right-of-way through lowering of the water table, which, in dry years especially would involve severe crop losses and failure of local wells. The Engineers estimate that the lowering effect upon the water table will extend for a distance of about 2000 ft. beyond the right-of-way.

This would involve about 7600 acres of farm land. The effect may extend for a considerably greater distance,

5. The canal is now estimated to cost in the neighborhood of $200,000,000, including a contribution of some millions by the State of New Jersey for purchase of right-of-way. This total figure does not include the cost of such damages as are indicated above, and does not include the cost of additional bridges which the State and localities may find themselves compelled to build for their own future traffic needs.

6. The canal will have an adverse effect upon the present and future development of extensive neighboring areas and to some extent of the State as a whole. Further, it has never been determined to full satisfaction that the total benefits of the canal may be expected to be anywhere near commensurate with its cost.

7. Need for this canal as the final link in an inland waterway from Boston to Florida is a myth so far as deep-draft traffic is concerned. Long stretches of the present waterway further south have a channel depth of only 12 ft. or less.

4/14/43

Summary of the Board of Engineers for Rivers and Harbors Report. Document No. 93, 74th Congress 2nd session reviewing House Document No. 219 73rd Congress-2nd session, and prior reports on the New York Bay-Delaware River section of the intracoastal waterway.

House document No. 219, 73-2 covers the act directing a survey for the sole purpose of finding and recommending the most desirable route for the waterway together with plans and estimates of costs.

House document No. 93, 74-2 covers the act directing a survey for the purpose of determining the advisability of constructing such a water way at the present time.

The canal as described in House document No. 219, 73-2 would extend from the Delaware River near Bordentown, across New Jersey to Raritan Bay. A dam with locks, across the Delaware River at Bordentown and similar structures across the Raritan River at Sayreville would provide a summit pool 10 ft. above mean low water. Between these structures the excavated channel would have a bottom width of 250 ft. at 17 feet below mean low water, and side slopes of 1 on $2\frac{1}{2}$. The project depth would be 27 feet. The route is fairly straight and is 31.5 statute miles in length between the locks. Provision was made in the plans for four locks in each dam, two 90 ft. wide by 880 ft. long, each divided into two chambers with useable lengths of 450 and 350 ft., and two 50 ft. wide by 370 ft. long, each divided into two chambers. Depths over the mitre sills were to be 35 ft. in the large locks and 28 ft. in the small locks. Bank protection, lighting, night operation, and telephone communication were provided for in the plans. The locks as designed would accommodate approximately twice the volume of traffic that would justify the project.

The plans and estimates include channels 300 ft. wide by 29 ft. deep, extending from the 30 ft. channel already provided in Raritan Bay, to the locks

at Sayreville on the Raritan River, and from the locks at Bordentown down the Delaware River to the 35 ft. channel at Philadelphia.

The Corps of Engineers Report (93,74-2) states that about 60 per cent of the land along the route is waste and woodland and 40 per cent is cultivated. If an area equal to one mile on either side of the canal is considered, these figures would change to about 42.3 per cent waste, marsh and woodland, 50.3 per cent farm land and about 7.4 per cent urban areas. Considering linear miles along the route of the canal, about 19 miles are relatively waste land, the other 12½ miles varying in fertility due to differences in soil characteristics and in retained moisture, a marked feature being the rapid drying out of the soil during times of drought.

It is the opinion of the Army Engineers that consequent lowering of the ground water may extend in decreasing proportions to 2,000 feet each side of the canal cut, furnishing a basis for damage claims. Within this area there is a total of approximately 7600 acres of farm land that might thus be affected.

The population of the various boroughs and townships through which the canal would pass is about 250,000. The metropolitan population of New York Bay area including Greater New York amounts to nearly 9 million. The population of the Delaware River area including Philadelphia amounts to about 2½ million. Within what might be considered the tributary area there is a total population of about 20 million and an industrial development of great magnitude.

Existing barge traffic in the tributary area considered potentially available for movement through the proposed canal consists of coal moving from Philadelphia to New England; of petroleum products from the Delaware River area to the New York and New England areas; of canned goods, sugar, fertilizer materials, iron and steel pipe, and miscellaneous products from the Delaware River area to points in New York, New England, and the Great Lakes region; of auto

parts, pig iron, iron and steel scrap, chemicals, and miscellaneous commodities from points in New England, New York, and the Great Lakes region to the Delaware River and Chesapeake Bay area.

The canal would intersect 45 through roads of which 3 are State and 26 are local highways, and 16 are minor dirt roads. The plan of improvement provides for constructing 15 highway bridges (4 State, 9 County and 2 Township, of which 14 will be fixed and 1 of the vertical lift type) with a high water vertical clearance of 135 ft. and a clear width of 300 ft., and for the rerouting and merging of 14 other roads. The remaining 16 minor dirt roads are to be disregarded. Of the total 45 roads, 11 are concrete, 7 are hard surfaced roads other than concrete and 27 are dirt roads.

The canal would also intersect 2 double and 3 single track secondary rail lines. Three vertical lift roalroad bridges are to be provided and the other two to be rerouted. These lifts to have avertical clearance of 72 ft. when closed and 135 ft. when opened, and a horizontal clearance of 300 ft.

The largest vessels transiting the canal would pass 24 bridges between Philadelphia and New York, 9 of which would be movable. No serious interruptions of railroad or vehicular traffic are anticipated except in the case of the New York and Long Branch Railroad bridge over the Raritan River at Perth Amboy which would have to be replaced by the owners and the Victory Highway Bridge which has already exceeded its normal capacity and will soon have to be replaced regardless of whether or not the canal is built. Replacement costs of both these bridges are not included in the estimates of costs of the canal.

The canal traverses several towns and villages and will encroach to some extent on residential areas therein. Such loss of area is fairly large at South River and less extensive in the villages of Old Bridge, Spotswood, Helmetta and Jamesburg. Acquiescence in these losses of areas will enter into the required

local cooperation.

Data on the prospective commerce for the proposed waterway have been obtained from numerous sources, including records of vessel, rail and truck traffic; from replies to questionnaires, and by interviews and correspondence with shipping interests, public bodies, commercial organizations, yacht clubs and yacht owners. The prospective traffic consists of commerce now moving by rail, steamship, barge and truck and of yacht movements and passenger traffic.

The economy of the traffic that could be diverted to the canal was determined by a comparison of existing rail rates and assumed waterway rates based on existing waterway rates in effect on connecting channels and sums up as follows:

	Item	Estimated savings on actual movements in 1933	Estimated savings in normal 1933
a	Coal: 7,750,000 long tons at an average saving of .21 per ton	$1,610,000	$2,060,000
b	Rail: 3,685,000 long tons at an average saving of .96 per ton	---	3,564,000
c	Vessel: 4700 transits at an average saving of $178 per transit	839,000	1,075,000
d	Barge: 1720 tons at an average saving $159.00 per ton	273,000	349,000
e	Truck: 61,500 tons at an average saving of $1.10 per ton	67,000	85,000
f	Passenger: 180,000 passengers at a saving of $2.89 per	520,000	665,000
g	Yachts: 3400 transits at an average saving of $8.85 per	30,100	39,000
h	Marine	50,000	64,000
i	Fog	45,000	57,000
	Total		$7,958,000

(a) The volume of coal discharged in New York in 1933 on barge, which could have been handled through Philadelphia.

(b) An analysis of traffic movements obtained through interview, questionnaire, and correspondence with concerns and shippers in the tributary area indicate that about 3,185,000 tons could move on the canal at savings of $3,064,000. The commodities included consist principally of fertilizers, iron and steel, pig iron, salt, paper and paper products, auto parts, stone, iron and scrap steel, sugar, chemicals, lumber, iron ore, clay and clay products. The commodities on which no definite information has been obtained include automobile tires, rubber goods, textiles, electrical equipment, porcelain and chinaware, glassware, linoleum and other floor coverings and machinery. It is estimated that about 500,000 tons of these commodities would be diverted to the canal in a normal year, affording a saving of $1.00 per ton. NOTE:- The railroads estimated that the total movement across New Jersey in 1933 amounted to 31,106,952 tons, therefore, the estimated tonnage thus diverted to the canal would amount to only about 11.8% of the total.

(c) Foreign vessel traffic

Northbound	963 transits	
Southbound	1232 "	
	2195 "	at an average saving of $203. per transit = $446,000

Coast and intercoastal steamer and motor vessel traffic

Northbound	1113 transits	
Southbound	1393 "	
	2506	at an average saving of $157 per transit = $393,000

Total vessel traffic:- 4701 transits at an average saving of $178. per transit = $839,000

(d) Barge traffic

Northbound	812 tons		
Southbound	909 "		
	1721 "	at an average saving of $159. per ton	
		=	$273,000

(e) Truck traffic

Miscellaneous -	27,500 tons at a saving of $1.55 per ton	=	42,686
Vegetables	9,000 tons at a saving of		6,600
Gas and oil	25,000 " " " " "		17,500
Total	61,500 tons at an average saving of $1.10 per ton	=	67,000

(f) Passenger traffic is based on 124 transits per month, 62 northbound and 62 southbound, or two transits each way per day.

(g) Yacht traffic

Of the 96,000 documented or numbered yachts and motor boats in the tributary area, it is estimated that 400 transits of large yachts at a saving of $35 per transit or $13,900 and 3000 transits of smaller pleasure craft at a saving of $5.40 per transit or $16,200 could have been provided by the canal had it been in operation in 1933.

(h) Based on reported movements of dredging equipment, floating derricks, salvage scows, etc., showing a possible annual saving of $83,000, it is thought that an average saving of possibly $50,000 would not be exceeded annually for this item.

(i) The elimination of the loss of time by vessels held in fog at the harbor entrances, through use of the inside route is estimated as capable of producing a saving of about $45,000 per year. Fog sufficient to delay vessels occurs on the outside route between Philadelphia and New York about 21 days per year, compared with an average of 6 days per year on the canal route.

NOTE:- The prospective canal traffic was based on records of actual movements in 1933 except for the rail diversions. It is estimated that the subnormal conditions which existed in 1933 reduced the movement of commodities such as are included in the traffic study to about 78 per cent of normal. On this basis, had the year 1933 been a normal year, the estimated total savings would amount to $7,958,000. Making allowance for ice interruptions, which are assumed will exist for a period of one month during each year, these savings would reduce to $7,700,000 for that year (1933). If the canal were constructed and open to traffic in 1940, at least 60 per cent of the estimated possible traffic would develop immediately and that by 1950 the total traffic considered normally available for that year would develop. Therefore, based on normal growth, the total savings on commerce that would move on the canal would be $5,000,000 in 1940, $8,850,000 in 1950 and $9,050,000 in 1960.

If the initial excavations of the canal were limited to a depth corresponding to that recommended by the Chief of Engineers for the Chesapeake and Delaware Canal, the benefits and transportation economies would be reduced to $4,750,000 in 1940, to about $8,530,000 in 1950 and to about $8,700,000 in 1960.

Based on the commerce which may reasonably be expected to develop during the early states of operation, it is indicated that initial construction of two locks 880 ft. long, 90 ft. wide and 35 ft. deep at each end would be adequate for the time being. Thus, the estimated construction and annual fixed and operating costs are as follows:

Construction

Cost to local interests:

(1)	Right-of-way and spoilage-disposal areas	$1,440,000
(2)	Reconstruction of New York & Long Branch R.R. bridge	9,850,000
	TOTAL.....	$11,290,000

Cost to Federal Government

(1)	Locks and dams	$31,300,000
(2)	Land cut including new bridges	157,000,000
(3)	Interest during construction	8,300,000
	TOTAL.....	$196,600,000
	Total project cost.....	207,890,000

Annual Cost

Cost to local interests:

(1)	Interest on expenditure for right-of-way and spoilage-disposal areas at 4 per cent	$ 58,000
(2)	Interest and amortization on expenditure for New York & Long Branch R.R. bridge at 6 per cent	591,000
	TOTAL.....	$ 649,000

Cost to Federal Government

(1)	Annual maintenance and operation	$ 940,000
(2)	Interest on investment 4 per cent	7,864,000
(3)	Amortization 1/2 per cent (50-year period)	983,000
	TOTAL.....	$ 9,787,000
	Total annual fixed and operating cost	10,436,000

Since, neither the annual savings nor the actual construction costs can be exactly determined with any great degree of accuracy, favorable recommendation of such a project can only be considered when the estimated annual savings are considerably in excess of the total estimated annual charges. Therefore, from

the foregoing figures it will be noted that it would be a good many years before the annual savings would even begin to equal the annual fixed and operating costs.

Advantageous modification of construction features could be made by substituting for the necessarily costly dam in the Delaware River, a small earthen dam in Crosswicks Creek, and locating the locks in the high neck of land south of White Horse. This would eliminate the overflow problem at Trenton and present no loss in channel depth up to Trenton as this stretch is soon to be provided with a 25 ft. channel under an approved emergency project. Savings due to this change are estimated at $4,300,000 in construction costs and $200,000 in annual charges. Further modifications could be effected by limiting the canal excavations initially to depths of 25 and 27 ft. (the latter corresponding to the recommendation by the Chief of Engineers for the Chesapeake and Delaware Canal) since it is found that most of the traffic which would use the canal could be carried in vessels having drafts of less than 20 ft. Thus, for the 25 ft. depth the annual costs would be reduced by $445,000 and for the 27 ft. depth a reduction of $370,000 is estimated, while the estimated annual normal savings for 1933 would show a corresponding decrease of $590,000 and $290,000 respectively. The 27 ft. depth would reduce the first cost by $8,200,000. Although these modifications would result in considerable reductions in first cost, such reductions would not be sufficiently large to overcome the difference between annual costs and estimated navigation benefits.

It was estimated in House Document No. 219-73-2 that 650 second-feet would be required to operate the locks at Sayreville. Of this 650 second-feet, 400 would be required for scavaging or sluicing purposes at the Sayreville locks for preventing the intrusion of salt water, 200 would be required for lockage, and 50 to replenish losses. The lockages at the Bordentown Dam would be made by use of the direct flow of the Delaware. One or more reservoirs were to be constructed in the Raritan Basin with a total capacity of 100,000 acre-feet to secure the regulated low-water flow of 650 second-feet at Sayreville during periods of low run

off. Accordingly, there would be no flow in the canal during dry periods, but when the uncontrolled flow of the Raritan exceeds the requirements at Sayreville, water from the Raritan River might be diverted to the Delaware to improve Delaware River flow.

The computed minimum monthly mean discharge at Sayreville, in the period 1922 to 1932 inclusive occurred in August, 1932, and amounted to 122 second-feet. The maximum occurred in February, 1925 and amounted to 5739 second-feet. According to run off records available, the Raritan would contribute to the flow in the Delaware River for an average period of 9 months in each year.

House Document No. 93,74-2 proposes the construction of a dam and reservoir on the North Branch of the Raritan River located about 3/4 mile above North Branch, N. J. The capacity available would be about 130,000 acre-feet. The natural run-off of the Raritan Basin regulated by this proposed reservoir would produce a dependable flow of a little less than 700 second-feet. However, the computations for water requirements for the prospective traffic in this report amount to 1000 second-feet at all times at Sayreville which far exceeds the water supply available thus necessitating modifications in the design of the locks and canal depths. Also, while the construction of this reservoir on the North Branch for the purposes of regulating the flow in the Raritan River at Sayreville does not conflict with the proposed development of a new water supply on the South Branch of the Raritan for the North Jersey Metropolitan District, there is a possibility that it would interfere should the Chimney Rock Project, a favorable thought of alternate supply and of which the flow of the North Branch would be a part, should be preferred for this municipal water supply development.

Diversion of vessel and barge traffic to the outside routes during water shortages would reduce the total water requirements by about 244 second-feet. This, however, also reduces the savings by about $98,700 per month. Assuming

that modifications in the depth and design of locks would be made and that the reservoir would be operated for 700 second-feet of regulation at Sayreville, and that canal traffic diversions to the outside routes are made, it is estimated that the annual reduction in savings would not be more than about $65,000 in 1950 and 1960.

To augment the water requirements at Sayreville and to prevent the inflow of brackish water into the Delaware during dry periods, it is assumed that a draft of water from the Delaware amounting to 200 cubic feet per second in excess of that returned to the Delaware in lockages is possible. Since the low-water flow of the Delaware is 1440 cubic feet per second, the withdrawal of 200 second feet should not have serious consequences. It is in fact substantially the amount diverted through the old Delaware and Raritan Canal during its period of maximum activity.

With such an increment from the Delaware the total water supply would then be adequate for locks of 30 ft. depth but would still be insufficient for the locks as designed in Document No. 219,73-2. Therefore, until the communities in the lower Delaware have provided themselves with water supplies for domestic and industrial purposes independent of the waters of the estuary, there appears to be only sufficient water supply available for a canal limited to a depth sufficient to accommodate vessels of 25 ft. draft.

Modifications of the Delaware dam and locks as recommended would consist of eliminating the dam in the Delaware and constructing an earthern dam in Crosswicks Creek and moving the locks up into the canal just below White Horse. The water requirements (200 second-feet) for operating the locks at this end would be obtained by direct pumping from the Delaware River with the pumped water being returned in full amount each day by lockages.

Advantages

It must be borne in mind that the primary object of the canal is not to

create an artificial waterway between particular cities, but rather to unite disconnected bodies of navigable water serving large districts. The canal itself forms only a very small part of the intra-coastal route and if it were constructed it would provide the last essential link of a through protected inland route from Boston to Wilmington, N.C., a route which is being connected now with the waterways south of Charleston, S.C., to Miami, Fla., and presumably soon will be extended to the Gulf of Mexico by a ship canal across Florida, and there connected with the coastal waterways skirting the Gulf to the ports of Texas. At the New York Bay end, it would connect with the Hudson River-New York State Canal-Great Lakes waterway system, thus joining and combining two great systems into one. At present, voyages on the open ocean are involved between ports on the Delaware side and the New York harbor side, and any potential economic value which inexpensive light-draft inland waterway carriers may have as compared to seagoing vessels is limited to local business either north or south of these points. Besides providing a short inland route for the interchange of commerce between the New York and Philadelphia areas, the canal would be of commercial benefit to such distant points as Buffalo, Albany, Boston, Baltimore and Norfolk, etc., The steaming distance between New York and Philadelphia would be shortened by 187 miles and the time cut to approximately one-half, and between New York and Baltimore by 284 miles with time cut down, a little more than half, creating a saving in the cost of transportation, reduced costs in the type of carriers and their operation and possibly reductions in insurance rates by eliminating to a great extent, the dangers of the outside route off the coast of New Jersey.

The canal would enhance the values of sites along its banks and along the Delaware River for manufacturing industries, creating economic changes as a result of the new commerce thus brought into existance.

The full value of the Chesapeake and Delaware Canal can not be demonstrated or realized until the New Jersey canal is constructed.

In times of emergency, the canal would be of inestimable value in relieving conjestion of traffic on the railroads, and to the Navy in time of war, particularly if the main theater of operations were in the Atlantic Ocean. It would afford a route for commercial shipping into the port of New York from the south, free from the menace of submarines.

The recreational value can not be definitely evaluated in dollars in affording a safe passage for pleasure boats and yachts in their movements from northern to southern waters and vica-versa, but their number is constantly increasing and the elimination of the open sea hazard would prove quite an advantage particularly to the great number of smaller pleasure craft.

The construction of the waterway at the present time would afford a large measure of relief from unemployment. Also, since the Federal Government is investing large sums of money in a great variety of enterprises to establish employment and overcome the existing depression, and has been lending money for other enterprises at rates of interest far below 4 per cent (the rate used in the cost estimates of the canal) in fact as low as 3 and $2\frac{1}{2}$ per cent, such rates if applied would greatly reduce the annual charges as contained in the present estimates.

Disadvantages

Against the advantages of the canal must be balanced its disadvantages. A vital feature affecting the advisability of constructing the waterway is a sufficiency of the available water supply to prevent the intrusion of salt into the Delaware River without withdrawing water from the latter in amounts sufficient to accelerate the intrusion of salt water up the estuary of the Delaware. The effect of the plan on the water supply and sewage at Trenton, N.J. and other municipal and industrial water supplies. That the costs of rights-of-way and disposal areas will probably greatly exceed the estimates and would be a tax burden on the people of the State. That although bridges over the canal as designed would not

create intolerable delays in traffic, there would be quite an inconvenience to these movements during the construction of the canal, which would possibly extend over a period of from eight to ten years. That an adjustment of rail freight rates to meet water competition might well be anticipated, with a consequent reduction in the estimated water traffic, particularly in large volumes of coal in which the unit saving from water transportation is not large. That the amount of water necessary to operate the locks at the Sayreville and for the traffic anticipated, will be insufficient during some of the summer months of dry years, thus necessitating the diversion of some and possibly all of the canal traffic during extreme periods, to the outside routes again. Although it is thought that the water way can generally be kept open to traffic the year round, there will be winters when it will be closed to navigation for at least one month each year.

ESTIMATED COSTS OF THE PROPOSED NEW JERSEY SHIP CANAL

FOR THE RECOMMENDED BORDENTOWN-OLDBRIDGE-SAYREVILLE ROUTE

(10-foot summit pool, 250-foot bottom width by 27-foot deep plus overdepths.)

1	Right of way	$ 1,440,000
2	Canal locks and dams construction	145,487,500
	Highway bridges (15 in number)	17,482,000
	Highway relocations (81,000 feet)	492,000
	Railroad bridges (3 in number)	7,180,000
	Railroad relocations (9-5 miles)	665,000
3	Stream syphon - conduits (5 in number)	350,000
	Capitalized water supply charges at 5%	1,600,000
	Total estimate cost of the project	$ 174,696,500
4	Annual maintenance and operation	1,020,000
	Interest and amortization at 5%	8,654,825
	Total estimated annual charges	$ 9,674,825

1 Includes spoilage - disposal areas, estimated at $400,000 representing the net cost of the required areas, after deducting from the original investment such benefits as might reasonably accrue from land improvement and sale of selected materials to be encountered in the canal prism. Approximately 5200 acres are required for right of way and 4000 acres for spoil-disposal areas.

2 Includes foundation test borings, all excavations, all backfilling, concrete piling, plain and reinforced concrete, structural and reinforcing steel, mechanical and electrical equipment, cofferdams, slope protection, lighting, telephone and fencing, interest during construction, miscellaneous, and engineering and contingencies.

3 Parts of 5 watersheds are to be syphoned namely Cranbury Brook, Millstone River, Bear Brook, Assunpink Creek and Miry Run. The remainder are either disregarded or will flow directly into the canal; namely, Tennents Brook, Deep Run, Matchaponix Brook and Manalapan Brook, all flowing into South River whose general course the canal will follow; a branch of Cranbury Brook, two branches of Assunpink Creek, Pond Run, Back Creek and Crosswicks Creek.

4 Includes dredging, slope protection, lock gates, valves and equipment, bridges, lighting and power, superintendence and police, and water supply charges.

NOTE:- The above estimates are based on prices existing prior to the enactment of the National Industrial Recovery Act, and it is believed that the total costs will reach a figure of about $210,000,000 if the work were to be undertaken under present conditions. This figure is exclusive of the cost of right-of-way and spoil-disposal areas.

SUMMARY OF BRIDGES

(Sayreville-Old Bridge-Bordentown Route)

10 foot summit pool

14	highway bridges and approaches (fixed).....	$16,532,000
1	highway bridge and approaches (vertical lift).....	950,000
1	double track railroad bridge (vertical lift).....	2,144,000
2	single track railroad bridges (vertical lift).....	5,036,000
81,000	ft. of new highway construction.....	492,000
9.5	miles of single track railroad.....	665,000
	Total of land traffic cost	$25,819,000

NOTE:- For estimating purposes the vertical lift type of drawbridge has been selected.

NEW HIGHWAY CONSTRUCTION

Location at or near		Length in feet	Present Crossing at Canal Station
Oldbridge	Connecting 3-R-1 & 3-R-14	4,900	42 + 730
Helmetta Helmetta	Connecting 3-R-14 & 5-R-1) " 5-S-5 & 5-R-1)	37,900	71 + 600
Jamesburg		900	78 + 900
West of Jamesburg	Relocating 5-R-2	2,000	89 + 070
North of Cranbury	Relocating State Route #25	5,300	94 + 640
North of Cranbury	Paralleling Canal	3,200	100 + 430
East of Dutch Neck	Paralleling Canal	4,600	130 + 970
Edinburg	Relocating County road #6	5,400	134 + 350
Edinburg		600	138 + 420
South of Edinburg	Paralleling both sides of canal	3,600	141 + 900
East of Hamilton Sq.	Paralleling canal	3,800	148 + 220
South east of Ham. Sq.	Paralleling canal	2,200	153 + 940
South of Ham. Sq.	East side of canal	1,000	158 + 820
South of Ham. Sq.	East side of canal	900	159 + 930
Hutchinsons Mills	On county road #14	700	171 + 400
South of White Horse	Relocating State route #39	4,200	176 + 840
	TOTAL	81,200	

R and H Doc. 219, 73-2
WEB:AMK

RAILROAD BRIDGES ALONG PROPOSED CANAL ROUTE FROM NORTH TO SOUTH

	Present Crossing at Canal Sta.	New Bridge Crossing at Canal Sta.	Type of Bridge	Number of Tracks
Raritan River Railroad at South River	31 + 060	31 + 060	vert. lift	2
Penna. R.R., Monmouth Jct. & Freehold Br.	82 + 720	82 + 720	" **	1
Penna. R.R., Trenton-Camden Division	none	178 + 340	"	1

* Horizontal clearance.....300 ft.

Vertical clearance closed..... 72 ft.

Vertical clearance open.....135 ft.

** Vertical clearance closed.....115 ft.

RELOCATION OF SINGLE LINE RAILROAD TRACK

	Present Crossing at Canal Station	Length in Feet	Located near
Penna R.R., Camden-Amboy Division	42 + 840	34,300	Oldbridge
Penna R.R., Camden-Amboy Division	72 + 300	13,200	Helmetta
Penna R.R., Trenton-Camden Division	184 + 110	2,700	Bordentown
TOTAL		50,200 = 9.5 miles	

Average and Maximum Daily Traffic on those roads intersecting the Proposed New Jersey Ship Canal which are available from the New Jersey Traffic Survey conducted from August 1932 to August 1933 By the Bureau of Public Roads of the Dept. of Agri. & the N.J. State Highway Comm. Including passenger cars, trucks, buses, and foreign or out-of-State

Traffic Count Station	At	Direc-tion	Route No.	Crossing Canal at Station	Aver. Daily Count	Maxi. Daily Count	New Bridge at Canal Station
#610	-	West	County 3R2	28+830	4562	5465	28+800
#607	-	West	State S-28	46+520	1608	5741))	47+050
#422	Englishtown	North	County 5-R-3	47+550	2701	8332)	
#421	-	North	County 5-R-4	58+100	99	345	None disregarded
#420	Jamesburg	East	County 5-R-1	71+600	1062	2402	None rerouted
#420	Jamesburg	N.W.	County 5-S-5	76+820	1305	1705	76+940
#419	-	South	County 5-R-2	87+870	308	568	88+460
# 46	-	North	State #25	94+640	3436	5808	95+000
# 46	-	West	County 4-R-2	108+040	473	717	107+660
# 45	-	S.E.	County #7	122+500	2056	2670	122+390
#410	Edinburg	East	County#-6	134+350	807	1278	None Rerouted
#410	Edinburg	South	County S-6	138+420	292	532	138+420
#408	Robbinsville	North	County S-5	141+900	366	763	None Rerouted
#408	Robbinsville	West	State #33	153+940	3520	7431	153+880
# 42	White Horse	East	County #14	171+400	3994	5871	171+210
# 43	-	North	State #39	176+840	4422	7447	176+100
TOTAL AVAILABLE COUNT					31,011	57,075	

HIGHWAY BRIDGES ALONG PROPOSED CANAL ROUTE FROM NORTH TO SOUTH

	Present Crossing At Canal Station	New Bridge Crossing Canal Sta.	*Type of Bridge	Latest Approx. Traffic Ct. at these Pts. in 1933	
				Aver.	Maxi.
County road, 3-R-2 at South River	28÷830	28÷880	Ver. Lift	4562	5465
County road, 3-R14 at Oldbridge	46÷520)	47÷050	Fixed	(1608	5741
County road, 5-R-3 at Oldbridge	47÷550)			(2701	8332
County road, 5-S-5 at Jamesburg	76÷820	76÷940	Fixed	1305	1705
County road, 5-R-2 west of "	87÷870)	88÷460	Fixed	(308	568
Township road west of Jamesburg	89÷070)			(**	**
State route 25 north of Cranbury	94÷640	95÷000	Fixed	3436	5808
County road 4-R-2 between Princeton and Cranbury	108÷040	107÷660	Fixed	473	717
County road 4-R-1 between Lawrenceville and Cranbury	113÷280	113÷430	Fixed	**	**
County road 7 between Princeton & Hightstown	122÷500	122÷390	Fixed	2056	2670
Township Road east of Dutch Neck	130÷970	131÷000	Fixed	**	**
County road S-6 at Edinburg	138÷420	138÷420	Fixed	292	532
State Route 33 nr. Hamilton Sq.	153÷940	153÷880	Fixed	3520	7431
Township road bet.Hamilton Sq. and Yardville	159÷930	159÷650	Fixed	**	**
Proposed future State route junct.		163÷940	Fixed	**	**
County road 14 at Hutchinson's Mills	171÷400	171÷210	Fixed	3994	5871
State Route 39 bet. White Horse and Bordentown	176÷840	176÷100	Fixed	4422	7447

* Horizontal clearance of all bridges..... 300 ft.
Vertical clearance of fixed bridges..... 135 ft.
Vertical clearance of lift bridges when closed..... 72 ft.

** No count available.

ANTICIPATED USAGE OF THE WATERWAY
Based on total traffic movement in short tons of cargo per annum
(Including vessels fully loaded, partly loaded and light).
Rivers and Harbors Doc. #219, 73 Congress-2nd Session

	New York Study ** Tons per annum	Philadelphia Study *** Tons per annum
General Cargo:		
Rerouting	5,200,000	---
Future increments	3,000,000	----
Coastwise		
Petroleum products:	2,500,000	1,760,000
Coal:- Anthracite (rerouting)	1,000,000	---
Anthracite	---	3,920,000
Bituminous:- (rerouting from ocean)		
from Phila. and Baltimore	700,000	---
from Baltimore	---	1,400,000
from Philadelphia	---	7,560,000
Anthracite and Bituminous from Phila. and Baltimore (by diversion from rail routes)	4,000,000	---
Bituminous:- From Hampton Roads barges.	---	1,680,000
from Hampton Roads inland colliers	20,000,000	---
Sand and Gravel	500,000	1,500,000
Clay and clay products	---	1,000,000
Lumber and pig iron	---	550,000
Coke	---	400,000
Miscellaneous	---	942,000
General Cargo-coastwise and intercoastal	1,000,000	---
Overseas and intercoastal	---	1,050,000
Trade with interior	3,000,000	300,000
Small craft	---	1,500 *
Navy Yard	---	12,000
GRAND TOTAL	40,900,000	22,075,500

* Number of vessels

** Results of special study made by Col. R.D. Black, consulting engineer for the Board, and Major R.G. Barrows, Corps of Engineers.

*** This study was compiled in the United States Engineer Office, Phila., Pa., and is based on Major Barrows study on special inquiries and interviews, and on current and prospective practice as interpreted by the Phila. office.

Note: Normal tonnage now moving by water to and from Delaware River/or available for immediate development via canal amounts to about 4,621,500 short tons.

Summary of Previous Estimated of Probable Savings Per Ton

Report:	Savings Per Ton
Philadelphia, 1895.....	No Record
Traffic committee, 1911 (between New York and Philadelphia.....	$ 1.00
Special board, 1911	.40
Secretary of Commerce, 1918 (use traffic committee report.)	
Atlantic Deeper Waterways Association, 1927.....	.4387
Barrows, 1928	.2346
Barrows, 1928 (revised).....	.40
Delaware and Raritan Canal.....	~~.50~~

R. and H. Doc. 38, 71-2, pp.38

After consideration of the above estimates, the district engineer's opinion is that the probable savings per ton will be at least 40 cents.

Thus, applying 40 cents saving per ton to the estimated prospective tonnage, developed by the New York District Office of 40,900,000 tons, a total savings of $16,360,000 is indicated which is well over the estimated annual charges. This tonnage, however, includes the debatable Hampton Roads coal item which when deducted, brings the total estimated annual prospective tonnage down to that developed by the Philadelphia District Office (22,075,500 tons). This then indicates a total savings of only $8,830,200 which is less than the estimated annual charges of $9,674,825. Since, neither the annual savings nor the actual construction costs can be exactly determined with any great degree of accuracy, favorable recommendation of such a project can only be considered when the estimated annual savings are considerably in excess of the total estimated annual charges.

Comparative distances and lengths of component channels in Statute miles

	Connecting Route					Outlet to sea for								
	New York to Phila.		New York to Baltimore			Phila. to Balti.		Phila.		Trenton		Baltimore		
	Intracoastal	Ocean	Intracoastal	Ocean & Chesa. & Delaware	Ocean & Chesapeake	Intracoastal	Ocean	Intracoastal	Delaware River	Intracoastal	Delaware River	Intracoastal	Chesapeake & Delaware Canal	Chesapeake Bay
New York Bay-Governors Island to mouth of Ambrose Channel	-	17	-	17	17	-	-	-	-	-	-	-	-	-
Governors Island to Cheesquake	26	-	26	-	-	-	-	-	-	-	-	-	-	-
Cheesequake to mouth of Ambrose Channel	-	-	-	-	-	-	-	18	-	18	0	18	-	-
Atlantic Ocean	-	156	-	156	283	-	144	-	-	-	-	-	-	-
New Jersey Waterway	34	-	34	-	-	-	-	34	-	34	-	34	-	-
Delaware River north of Philadelphia	27	-	27	-	-	-	-	27	-	3	27	27	-	-
Delaware R. & Bay so. of Philadelphia	-	101	41	60	-	41	101	-	101	-	101	41	60	-
Chesapeake and Delaware Canal	-	-	19	19	-	19	-	-	-	-	-	19	19	-
Elks R. & Chesapeake Bay no. of Balt.	-	-	31	31	-	31	-	-	-	-	-	31	31	-
Patapsco R. Channel to Fort McHenry	-	-	13	13	17	13	17	-	-	-	-	13	13	17
Chesapeake Bay so. of Balt.	-	-	-	-	158	-	158	-	-	-	-	-	-	158
TOTAL	87	274	191	296	475	104	420	79	101	55	128	183	123	175
Difference	187		105	179		316		22		73		60		52
			---284---									-----8-----		
Difference as percentage of longer route	68.2		35.5	37.7		75.2		21.8		75.0		32.8		29.7
			59.8									4.37		

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COMPARISON OF DISTANCE AND SAILING TIME

for two vessels with assumed sea speeds of * 14 miles per hour
** 12 miles per hour

OCEAN ROUTE	New York to Philadelphia					New York to Baltimore				
	MILES	SPEED Miles per hr.		TIME Hours		MILES	SPEED Miles per hr.		TIME Hours	
		*	**	*	**		*	**	*	**
New York Bay	17	12	10	1.4	1.7	17	12	10	1.4	1.7
Atlantic Ocean	156	14	12	11.1	13.0	283	14	12	20.2	23.6
Chesapeake Bay	-	-	-	-	-	158	14	12	11.3	13.1
Delaware River	101	12	10	8.4	10.1	-	-	-	-	-
Patapsco River Channels	-	-	-	-	-	17	12	10	1.4	1.7
TOTAL	274	-	-	20.9	24.8	475	-	-	34.3	40.1
INTRACOASTAL ROUTE										
New York Bay	26	12	10	2.2	2.6	26	12	10	2.2	2.6
New Jersey Waterway	34	7	7	4.9	4.9	34	7	7	4.9	4.9
Delaware River	27	12	10	2.3	2.7	68	12	10	5.7	6.8
Cheasp. & Delaware Ca.	-	-	-	-	-	19	7	7	2.7	2.7
Elk River&Cheasp.Bay	-	-	-	-	-	31	12	10	2.6	3.1
Patapsco River Channels	-	-	-	-	-	13	12	10	1.1	1.3
TOTAL	87	-	-	9.4	10.2	191	-	-	19.2	21.4
Difference	187	-	-	11.5	14.6	284	-	-	15.1	18.7
Savings in Percentage	68.3			55.0	58.9	59.8			44.0	46.5

SUMMARY OF PASSAGES TO BE PROVIDED FOR

COMMERCIAL TRAFFIC

	TYPE	Limiting dimensions of craft or tow	Monthly Maxi.	Number of Passages: Week in Maxi. Month Aver.	Week in Maxi. Month Maxi.	Day in Maxi. Week Aver.	Day in Maxi. Week Maxi.
Class I	Tows of harbor barges and canal boats	Tow, 350x70 to 90 feet.	190	47	56	8	13
Class II	Tows of sea barges	Tow, 700x45 ft. or 400x90 ft.	66	14	21	3	4
Class III	Small self-propelled vessels	Under 200 ft long	56	14	28	4	8
Class IV	Mediam sized self-propelled vessels including small coastwise & ocean ships	200 to 350 x 40 to 48 feet.	444	111	140	20	34
Class V	Standard ocean ships	350 to 450 x 45 to 60 feet.	293	73	100	14	29
SUB-TOTAL	- - - - - - - - - - - - -	- - - - - - - -	1049	259	345	49	88
Class VI	Large inland colliers & occasional very large ocean steamers	Dimensions not exceeding 650 x 75 feet.	290	72	90	13	20
TOTAL - - -	- - - - - - - - - - - - -	- - - - - - - -	1339	331	435	62	108
	PLEASURE TRAFFIC						
Item 1	Summer months	Boats under 35 ft. and yachts under 50 ft.	5000	1250	1650	238	600
Item 2	Motor yachts summer months	50 to 79 ft.	160	40	50	7	20
Item 3	ditto	Over 80 ft.	120	30	40	6	10
Item 4	Motor boats and Motor yachts under 50 ft., early spring to late fall	Boats under 35 ft. and yachts under 50 ft.	1200	300	600	86	150

The table presents ordinary useage to be provided for. In addition, there will be numerous passages by lighters, Government craft, contractors' floating plant, and other vessels, including a certain amount of excursion and other purely passenger traffic. It is almost impossible to predict this useage in character or volume, but it is believed to be provided for in the tolerances contained in table 10.

Number of lockages. Table 10 also suggests that on a 20 hour basis and considering commercial traffic only, four lockages per hour must be provided for; and in case the Hampton Roads coal trade is diverted to this route in "Inland colliers" or other large vessels, the number must be increased to five. One to two lockages per hour may be required for motor yachts, and if the motor boats can be locked in fleets of 25, from 1 to 2 additional lockages per hour may be necessary for them. Thus, the total number of lockages required may range from 5 to 9 per hour at each set of locks.

SUMMARY ECONOMIC STUDY
by:
Major R. G. Barrows, Corps of Engineers
May 1928

Based on a 12 ft. deep sealevel barge canal
with 125 ft. bottom width

Costs and Rates for Transportation of Coal

Via Inland Waterways and the Proposed Canal

FROM	TO	Towing time (days) per Round Trip	Total Days Per Round Trip	Cost Per Round Trip	Cost Per Gross Ton	Assummed Rate Per Ton	Distance Statute Miles)	Assumed Rate Per Ton mi.
Norfolk	New York	5	10	$1200	$0.55*	$0.80*	341	$0.0023
Baltimore	"	3	8	810	0.37+	0.60+	186	0.0032
Philadelphia	"	2	7	615	0.29+	0.50+	82	0.0061
Norfolk	Boston	9	14	1980	0.88*	1.20*	607	0.0020
Baltimore	"	7	12	1590	0.69+	1.00+	452	0.0022
Philadelphia	"	5	10	1200	0.53+	0.80+	348	0.0023

* Includes a tipple charge of 5 cents per ton

\+ Includes a trimming charge of 3 cents per ton

Coal movements to the New York metropolitan area amount to about 35,000,000 tons and to the New England area to about 30,000,000 tons annually.

The two principal Philadelphia coal piers, Greenwich (P.RR.) and Port Richmond, (Reading) have a combined annual maximum capacity of about 16,000,000 tons and the present tidewater shipment from Philadelphia normally do not exceed 8,000,000 tons.

Prospective Tonnage, Major Commodities
Based on Assumption That "Inside Capes Rates" Will Apply

	Short Tons	Estimated Aver. Saving Per Ton	Total Estimated Savings
Anthracite Coal	3,920,000	$ 0.11	$ 430,000
Bituminous Coal	2,000,000	.106	212,500
Sand and Gravel	2,000,000	.10	200,000
Oil	1,000,000	.25	250,000
Pig Iron	300,000	1.00	300,000
Coke	400,000	.20	80,000
Clay and Clay Products	1,000,000	.20	200,000
Lumber	250,000	1.25	312,500
Nitrates	200,000	1.00	200,000
Miscellaneous	1,555,000	.50	777,500
TOTAL	12,625,000	$0.2346	$2,962,500

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2/8/34

Estimated Prospective Anthracite Tonnage and Savings

Via the Proposed Canal

TO	FROM	Estimated Prospective Tonnage (Long Tons)	Esti. Saving Per Ton	Esti-mated Total Saving
New York Harbor Hudson River and Long Island Sound Points	Phila. Reading Piers Prepared sizes	1,500,000	$ 0.05	$ 75,000
	Pea & Smaller Sizes	1,000,000	.13	130,000
	Phila. P.R.R. Piers Pea & Smaller Sizes	500,000	.13	65,000
Boston Harbor and Vicinity	Philadelphia	500,000	*.32	160,000
Total	Gross or Long Tons or in Short Tons	3,500,000 3,920,000		$430,000

* The average water rate on coal from Philadelphia to New England points via the outside route is $1.12 per gross ton. It is estimated that an average rate via the proposed canal would be $0.80, thus indicating a saving of 32 cents per gross ton assuming that "outside rail rates" will apply for New England Points.

NOTE: The annual anthracite production is about 90,000,000 gross ton. Therefore, the above estimate is only about 4 per cent of the total production and only about 14 per cent of the annual consumption of the New York metropolitan and New England areas which amounts to about 25,000,000 tons.

The total tonnage handled yearly through the Port of New York is about 15,000,000 tons.

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2/8/37

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Summary of Estimated Prospective Anthracite

Tonnage and Savings

Based on Assumption that "Inside Capes Rates" Will Apply

Gross Ton Freight Rates to New York Harbor Points

Rail Rates f.o.b. Barge				Water Rate	Total	Saving
New York	Reading Piers	Prepared sizes	2.34	$0.30	2.64	
Philadelphia	ditto	" "	2.09	.50*	2.59	$0.05
New York	"	Pea & smaller sizes	2.22	.30	2.52	
Philadelphia	"	" "	1.89	.50*	2.39	0.13
New York	Penna. Piers	Prepared sizes	2.34	.30	2.64	
Philadelphia	ditto	" "	2.60	.50*	3.10	none
New York	"	Pea & smaller sizes	2.22	.30	2.52	
Philadelphia	"	" "	1.89	.50*	2.39	0.13

* Estimated rate via the proposed Canal.

NOTE: A saving of from 5 to 13 cents a gross ton is thus indicated on shipments via the Reading R.R. Piers at Philadelphia and the proposed canal, and a saving ranging from 0 to 13 cents a gross ton via the Pennsylvania R.R. Piers at Philadelphia and the proposed canal depending on rate group, origin and size of the coal.

R. & H. Doc. 38, 71-2

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Estimated Prospective Bituminous Tonnage and Total Savings
If Outside Capes Rail Rates are Applicable

TO	FROM	Estimated Prospective Tonnage (Long Ton	Esti. Saving Per Ton	Estimated Total Saving
New York	Philadelphia	6,000,000	$0.22	$1,320,000
New York	Baltimore	500,000	.19	95,000
New York	Hampton Roads	500,000	.20	100,000
New England	Philadelphia	750,000	.32	240,000
New England	Baltimore	750,000	.32*	240,000
New England	Hampton Roads	1,000,000	.35	350,000
TOTAL	In Long Tons	9,500,000	---	2,345,000
	In Short Tons	10,650,000		

* It is assumed that the saving on shipments from Baltimore would be about the same as that from Philadelphia.

NOTE: The annual consumption of bituminous in the New York Metropolitan and New England areas is about 40,000,000 tons. Therefore, the above prospective tonnage via the proposed canal represents about 25% of the annual consumption and showing a saving of $2,345,000 based on the use of "outside rates." But, until it can be definitely decided whether outside or inside rates are applicable, a more conservative assumption of 2,000,000 tons at a saving of $212,500 was included in Major Barrows' report as follows:

TO	FROM	Short Tons	Esti. Saving Per Ton	Estimated Total Saving.
New England	Philadelphia	750,000	$0.05	$ 37,500
New England	Hampton Roads	1,000,000	.15	150,000
Local Uses	Philadelphia	250,000	.10	25,000
TOTAL		2,000,000	---	212,500

The total bituminous coal handled yearly through the Port of New York is about 20,000,000 tons.

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Summary of Estimated Prospective Bituminous Tonnage and Savings

Freight savings per gross ton over coal shipped via rail routes to New York Harbor Points

If outside rail rates apply.

Rail rates f.o.b. Barges				Total		Savings	
At	Min.	Max.	Water Rates	Min.	Max.	Min.	Max.
New York Piers	$2.74	$3.34	$0.30	$3.04	$3.64		
Philadelphia Piers	2.32	2.89	.50*	2.82	3.39	0.22	0.25
Baltimore Piers	2.25	2.65	.60*	2.85	3.25	.19	.39
Hampton Road Piers	2.52	2.77	.80*	3.32	3.57	none	.07
If Inside Rail Rates Apply							
New York Piers	2.74	3.34	.30	3.04	3.64		
Philadelphia Piers	2.59	3.16	.50*	3.09	3.66	none	none
Baltimore Piers	2.59	2.99	.60*	3.19	3.59	none	.05
Hampton Road Piers	2.72	2.97	.80*	3.52	3.77	none	none

* Estimated rate via the proposed canal.

Freight savings per gross ton over coal via the ocean routes

TO	FROM	Average Outside Water Rate	Estimated rate via canal	Saving
New York and Harbor points	Hampton Roads	$1.00	$0.80	$0.20
New England Points	Hampton Roads	1.55	1.20	.35
" " "	Baltimore	1.32*	1.00	.32
" " "	Philadelphia	1.12	.80	.32

* Not verified.

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Miscellaneous Data on the Proposed New Jersey Ship Canal

The canal would run from the mouth of the Raritan River near Perth Amboy, across the State of New Jersey, a distance of some 38 miles to the Delaware River at Bordentown. The land section of the canal about 31.5 miles long beginning at its point of departure from the Raritan River Channel near Sayreville, runs through Middlesex County for 19.1 miles, thence through Mercer Co. for 11.4 miles, with 1 mile in Burlington Co. intervening near the western end.

* (See page 32 for distribution of distances within minor political subdivisions, also distribution of popula).

The land section of the canal lies in the Raritan River Watershed for 21 miles of its length, and in the Delaware watershed for 10.5 miles.

****

The tidal variation at Bordentown is now about 5 ft. etc.,*(page 35)

For stream crossings, see page 36.

Lockages

Average elapsed time between successive large vessel lockages assumed at 30 minutes and 20 minutes per small ones, using mechanical mules for maneuvering all vessels whose momentum cannot be checked quickly and with precision by snubbing. Power-driven capstans should be considered for handling smaller craft.

From the summary of passages to be provided for the number of lockages required may range from 5 to 9 per hour at each set of locks on a 20 hour day basis. This would necessitate at least 2-90 ft. wide locks and 1-50 ft. wide lock in order to obtain the most economical and practical method of operation.

*H. & R. Doc. 219 - 73-2

Proposed New Jersey Ship Canal

All rail freight movements originating or terminating on the New Jersey side of New York Harbor and shipments to and from points east and northeast including New York City proper, are lightened or car-floated across the Hudson River and other waterways to and from terminals at various points in the harbor.

It is the opinion of the Army Engineers that consequent lowering of the ground water may extend in decreasing proportions to 2,000 ft. each side of the canal cut, furnishing a basis for damage claims.

The right-of-way width varies from a minimum of 970 ft. in the lowland sections to a maximum of 1650 ft. in the highland sections. The lines generally are about 300 ft. outside of the top of slope on either side of the canal cut.

In 1918 the recorded figures for the past 9½ years showed a loss of 251 vessles along with 171 lives, outside the coast line from Boston to Norfolk.

In the single decade from 1900 to 1909 there were over 5700 disasters to shipping on our Atlantic seaboard. Not all losses were reported, but these accidents are known to have destroyed $40,500,000 worth of vessels and cargo and to have caused the loss of over 2200 human lives.

Near Cape Cod during the Period 1875 to 1903 there were 687 wrecks involving property valued at $10,000,000 of which actual losses amount to 197 vessels - 105 lives and $2,179,615 property loss.

Proposed New Jersey Ship Canal

Computed Urban, Farm and Waste Land Acreage
Contained in Length of Canal one Mile on Either Side of Center Line

Sheet	Urban	Farm	Waste	Total	
13	18.14	60.92	54.28	133.34	
12	3.23	123.57	28.37	155.17	
11	.05	121.50	29.49	151.04	
10	.18	101.77	29.10	131.05	
9	23.22	76.39	75.48	175.09	1 sq. in. =
8	13.12	17.98	97.28	128.38	40.812 Acres
14	15.60	.78	108.86	125.24	
sq. inches	73.54	502.91	422.86	999.31	
Acres	3001.3	20,524.7	17,257.8	40,783.8	
Sq.Miles	4.69	32.07	26.96	63.72	
Per-centage	7.36	50.33	42.31	100.00	

Note: Urban areas include subdivisions.
Farm areas include cranberry bogs.
Waste areas include forests, rural industrial sites, marsh-lands and water areas.

"The land for about 19 linear miles of the canal route is relatively waste land, the other 12½ miles vary in fertility due to differences, in retained moisture, a marked feature being the rapid drying out of the soil during times of drought *** A cranberry bog and the extensive Forsgate Farms, both within a few miles of Jamesburg, are examples of valuable agricultural property and will be extensively affected by the canal cut".

R. & H. Doc. 219, 73-2 pp.14

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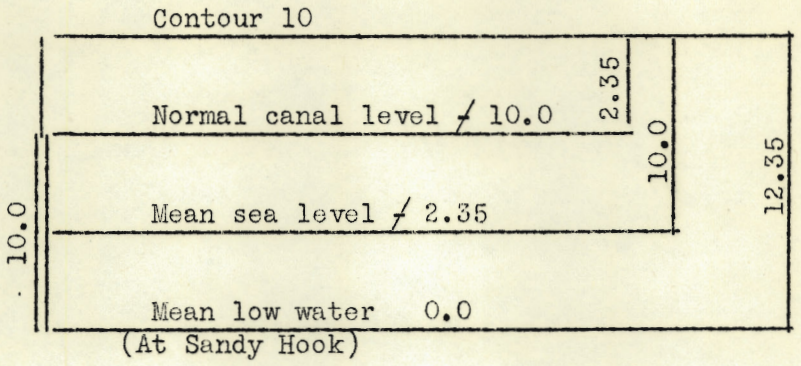
2/10/37

Proposed New Jersey Ship Canal



Lockage water supply for normal use - 400 cfs.

*See page 99 & 100 (10 ft. summit pool)

1550 cfs. required for a 50 ft. summit pool.

The right-of-way varies from 970 ft. to 1650 ft.

* H. & R. Doc. 219 - 73-2

STATEMENT OF CASUALTIES OCCURRING OFF THE NEW JERSEY COAST DURING THE PERIOD 1927 to 1936

(10 fiscal years) That might have been averted had the New Jersey Ship Canal been in operation

DATE	NAME OF VESSEL	LOCALITY OF CASULATY	TON-NAGE	NATURE OF CASUALTY	VALUE OF VESSEL	VALUE OF CARGO	LOSS TO VESSEL	LOSS TO CARGO	PERSONS ON BOARD		LIVES LOST	
									Pass.	Crew	Pass.	Crew
1926												
Nov.16	Seneca, brg.	Margate City, S. of Atlantic City	653	Stranding	$47,000	$20,585	$29,000	$4,000	-	2	-	-
	Cohasset,sc.b	Off Brigantine Gas Buoy	2,226	Rudder Dge,	50,000		750	-	-	5	-	-
1927												
Jan. 4	Eastern Glen st.s	Off Sandy Hook	5,570	Collision	312,000	1,000,000	-	-	8	49	-	-
Jan. 4	Northern No. 16 brg.	Off Sandy Hook	760	Collision	20,000	15,000	20,000	4,000	-	3	-	-
Feb.17	Cecil P.Stewart, brk	Five miles so. of Barnegat Light	1,216	Stranding	50,000	-	50,000	-	-	9	-	-
Feb.19	West Point,sc.b	Little Egg Harbor	1,213	Stranding	25,000	-	-	-	-	3	-	-
May 27	Henry Crocker sch.	Horse Shoe, Sandy Hook	43	Stranding	3,500	780	2,500	780	-	2	-	-
Aug.26	Anna R.Heidritter	Anchored off Jersey Coast	694	Hurricane	20,000	25,000	600	-	-	8	-	-
Dec. 4	Millville,Sc.b	Sea Girt	1,213	Foundering	75,000	9,735	75,000	9,735	-	3	-	-
1928												
Jan.28	Arkansas,sc.b	Off Barnegat L.H.	1,312	Foundering	75,000	9,400	75,000	9,400	-	5	-	5
Jan.28	Catonsville sc.b	Off Barnegat L.H.	1,281	Foundering	75,000	9,520	75,000	9,520	-	4	-	4
Mar.10	Northern No.17, sc.b	7½ miles S.E. Absecon	961	Foundering	40,000		40,000	-	-	4	-	-
Mar.10	Northern No.30 sc.b	4½ miles S.E. Absecon	1,264	Foundering	40,000	-	40,000	-	-	5	-	-
Apr.28	South Shore ol.s	Nr. Atlantic City	516	Wrecked in Storm	25,000	-	25,000	-	-	7	-	3
June23	Edward R.Smith sch.	Off Barnegat Light	565	Collision	10,000	25,000	3,000	-	-	7	-	-
June23	Lake Ellithorpe st.s	Off Barnegat	2,674	Collision	100,000	50,000	1,000	-	-	27	-	-

DATE	NAME OF VESSEL	LOCALITY OF CASUALTY	TON-NAGE	NATURE OF CASUALTY	VALUE OF VESSEL	VALUE OF CARGO	LOSS TO VESSEL	LOSS TO CARGO	PERSONS ON BOARD		LIVES LOST	
									Pass.	Crew	Pass.	Cre
Aug.12	Betty B.ga.s	West Shore, Great Bay	49	Stranding	30,000	-	10,000	-	6	5	-	-
Aug.14	John L. Martino sch.	Five Fathom Bank	257	Heavy Wtr. damage	15,000	20,000	13,000	5,000	-	-	-	-
Dec.21	Lubrico.St.s	2½ mi. S.E. Scotland L	6,956	Collision	902,000	-	1,400	-	-	37	-	-
Dec.21	Woodman towing scow D.S.C.R.	4 mi. S.E. Scotland L.	358	Collision	60,000		6,735	-	-	16	-	-
1929												
Jan. 1	Topila,st.s	Flynn's Knoll, Bouy #14	5,125	Stranding	400,000	50,000	1,020	-	-	35	-	-
Jan.17	Minnie V. ol.s	Sandy Hook	26	Stranding	9,000	250	3,000	-	-	5	-	-
Apr.10	Ray.T.McNally, brg.	Off the Highlands	457	Foundering	10,000	8,000	10,000	8,000	-	3	-	-
1930												
Sept.5	Pocono, sc.b	Atlantic Highlands	698	Struck obs.	30,000	1,350	30,000	1,350	-	3	-	-
Oct.26	Barbadoes	About 50 mi.E.of Atlantic City	93	Foundering	20,000	15,000	20,000	15,000	-	14	-	-
1931												
Mar.25	Pacific Cedar	Off Barnegat	5,237	Collision	300,000	180,000	21,000	40,000	-	33	-	-
Mar.25	Raritan Sun ol.s	Off Barnegat	533	Collision	200,000	23,400	6,315	-	-	7	-	-
Sept.12	Cecilia M. Dunlap brg.	3 mi. s. Scotland Light	835	Foundering	50,000	15,000	50,000	15,000	-	4	-	-
Dec. 9	Charlotte,ga.s	1 mi. s. Sea Girt	77	Stranding	20,000	-	20,000	-	-	7	-	-
1932												
Mar. 6	Glenside, brge.	Off Cape May	974	Hvy.Wtr.	18,000	7,500	500	-	-	3	-	-
Mar. 6	John F. Lewis, st.s	Off Ocean City	148	" "	20,000	-	630	-	-	11	-	-
Apr. 3	Salem, brg.	11½ mi. N. E. Brigantine	703	Foundering	15,000	-	15,000	-	-	3	-	3
May 25	Wayne, sc.b	Off Sea Isle	436	Struck obs.	18,000	5,000	18,000	5,000	-	3	-	-
Sept.7	Brooklyn, brg	Sandy Hook	1,759	Stranding	60,000	-	-	-	-	3	-	-
1933												
Jan.26	Ontario, brg.	Barnegat, 12 mi. N. N. E.	490	Hvy. Water	15,000	-	595	-	-	3	-	-