


FLUSHING BAY AND RIVER WATERFRONT STUDY



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1964 - 1965 CORPORATION



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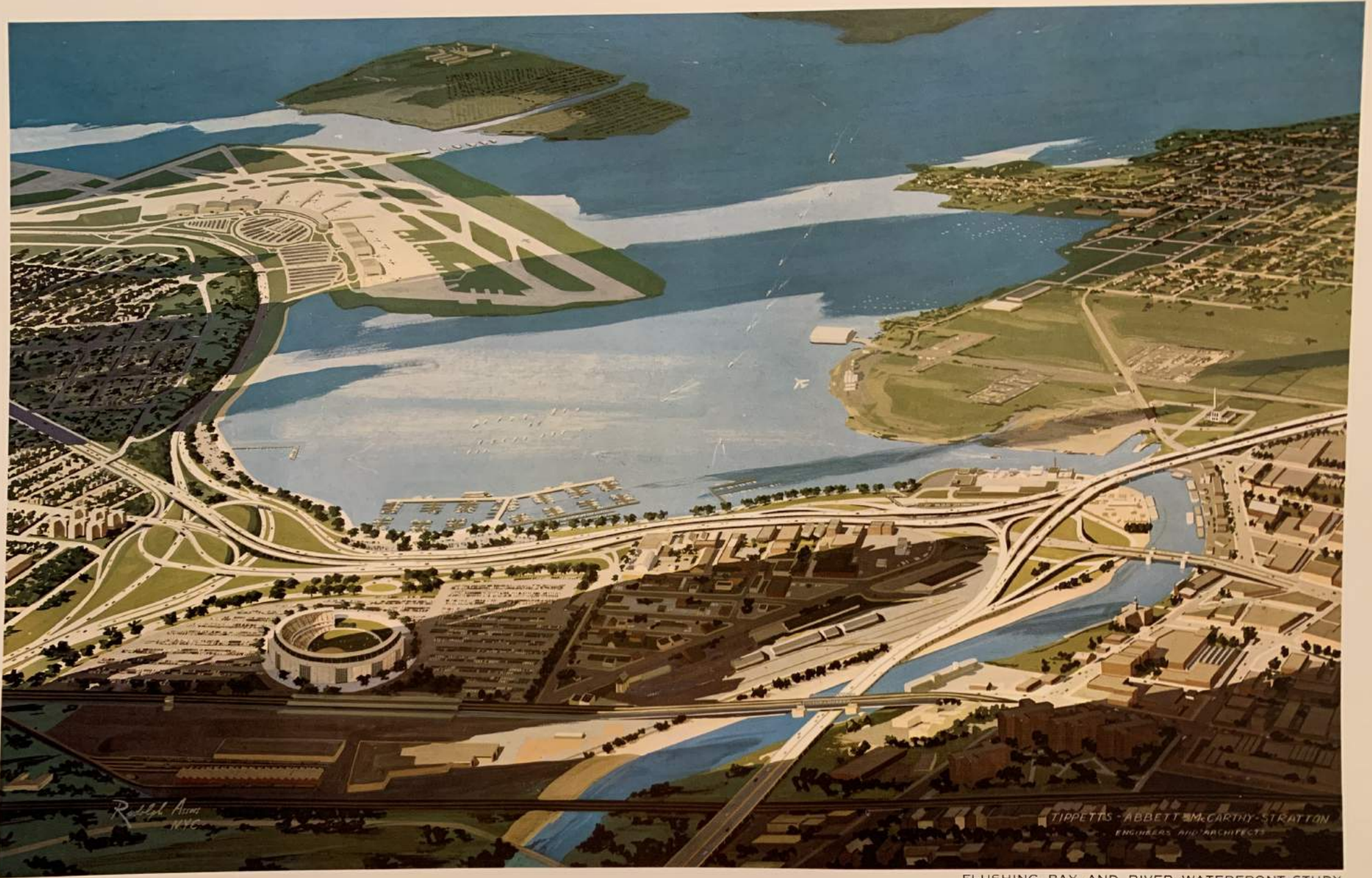
NEW YORK

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NEW YORK WORLD'S FAIR 1964 - 1965 CORPORATION

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*Ralph Avero
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May 29, 1961

Mr. Robert Moses, President
New York World's Fair 1964-1965 Corporation
Flushing Meadow Park
P.O. Box 270
Flushing 52, New York

Subject: Flushing Bay and River Waterfront Study
REPORT

Dear Mr. President:

Under the terms of our Agreement of November 1, 1960, we have prepared a report, attached hereto, on the proposed marine and upland improvements in the Flushing Bay and River Area. The obligation of meeting the marine transportation requirements of the 1964-1965 World's Fair resulted in authorization of planning studies of the marine and waterfront areas contiguous to the Fair site for immediate improvement and long range development. Our report demonstrates that these basic requirements can be met and that the proposed marine facilities and upland development will provide not only for the World's Fair needs but will also make available to the citizens of the New York Metropolitan Area and the pleasure boating populace on the Eastern Seaboard, a permanent marina facility of unusual character.

The area for the proposed marina development consists of the waters in Flushing Bay and River and the shoreline directly north of the World's Fair and the proposed new Municipal Stadium. The recommended marine and waterfront development, together with the pollution control also to be established, will meet fully the requirements imposed by the large public interest that will be shown in the World's

Fair and also the anticipated long range recreational needs made possible by the adjoining Flushing Meadow Park and those stemming from the new Municipal Stadium. The Flushing Marina and Flushing Meadow Park will provide combined recreational facilities of exceptional character virtually in the center of population of the New York Metropolitan Area. The marina will provide well developed facilities for the boating populace who will choose to attend sports and other events in the new Municipal Stadium to be built adjacent to Flushing Meadow Park in the years to come.

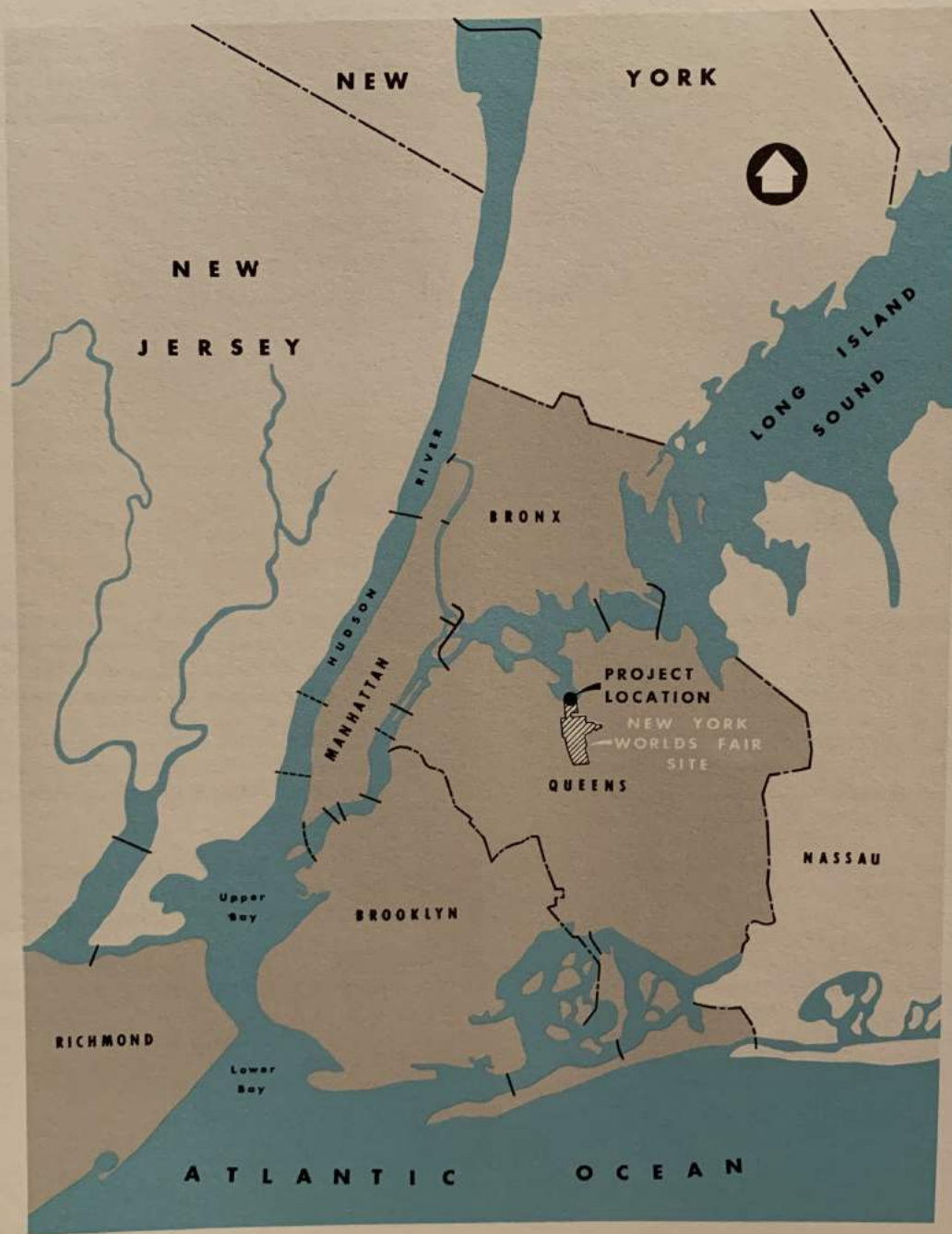
Because of the character of the proposed development and the wide interest shown therein, it is clearly evident that financial participation by municipal, state and federal agencies is justified.

Details of our recommendations are set forth in the report, during the preparation of which ready cooperation was received not only from your representatives but from numerous public bodies, private business organizations and boating associations and clubs. Their assistance is gratefully acknowledged.

Very truly yours,

TIPPETTS-ABBETT-McCARTHY-STRATTON


James H. Stratton



LOCATION PLAN

FOREWORD

The program of marine developments described in this report consists essentially of enlargements and improvement of existing facilities provided in conjunction with pleasure boating and commercial needs in the Flushing Bay Area, New York, at the time of the first New York World's Fair in 1939-1940. The proposed marine developments will be carried out in the waterfront and adjacent upland area extending generally from the easterly end of LaGuardia Airport along the Flushing Bay and Flushing River to the tide gate at the edge of the World's Fair Site.

The existing permanent pier constructed at the time of the first World's Fair for the use of pleasure craft and excursion boat mooring will be enlarged to provide fixed tie-up berthing for 430 pleasure craft and berthing for two or more excursion boats. In addition the buoy mooring area will be increased in size to care for 350 pleasure craft. It is expected that the average daily transits (inbound plus outbound) of 880 pleasure craft and 120 commercial craft will occur with the opening of the World's Fair in 1964 and thereafter will increase steadily throughout the years. The commercial craft transits of the excursion class are estimated at 20 per day during the Fair and it is possible that a reduced number of trips will be made in the Post-Fair years. The existing Federal channels which have contributed materially to the economy of the Flushing River area will

be further improved to meet commercial requirements and in addition the existing channel connections to serve the enlarged pleasure craft and excursion boat pier and the pleasure craft anchorage area will be improved.

The facilities provided at the time of the 1939-1940 World's Fair have since been taxed to capacity. Since the time of the first World's Fair the total pleasure craft in the U.S. have increased in numbers by 300%. The increase of craft in the New York Metropolitan Area has kept pace in the same period and there are at present heavy demands which call not only for permanent marina facilities in the Flushing Bay area for based pleasure craft but also for facilities to serve transient craft calling in the Metropolitan Area.

In the period of the 1964-1965 World's Fair there will be a peak demand both for pleasure craft, particularly for transient facilities and services, and for the excursion boat landings proposed. With the construction of the Municipal Stadium and waterfront and park improvements contemplated in the immediate vicinity of the World's Fair site, the requirements of permanently based and transient pleasure craft use of the proposed marina facilities will create demands closely approaching those during the 1964-1965 World's Fair. The estimated cost of the improvements is \$2,300,000 for the Federal channels and waterways. For the marina including the ancillary facilities such as promenade, landscaping and car parking the estimated cost is \$3,500,000.

Our studies show that the proposed marine and upland developments in conjunction thereto, financed in the initial stage by the City of New York and the New York World's Fair Corporation and in the later development by the City of New York, will meet the demands of pleasure boating and the anticipated increases in commercial use. Further, these demands amply justify the proposed Federal channel improvements as outlined.

FLUSHING BAY AND RIVER WATERFRONT STUDY

TABLE OF CONTENTS

Chapter		Page
	FOREWORD	I
I.	SCOPE OF WORK	1
II.	DESCRIPTION OF PROJECT SITE	1
	A. General	
	B. Wind and Tides	
	C. Geology and Subsurface Conditions	
	D. Channels and Water Access—Flushing Bay and River	
III.	DEVELOPMENTS IN THE NEARBY AREA RELATED TO THE FLUSHING BAY AND RIVER WATERFRONT DEVELOPMENT	6
	A. Major Highway Improvements	
	B. LaGuardia Airport Improvement	
	C. Stream Pollution	
IV.	DEVELOPMENT OF FACILITIES FOR PLEASURE CRAFT AND EXCURSION BOAT SERVICE	8
	A. Growth of Recreational Boating	
	B. Analysis of Boat Berthing Space in Metropolitan Area	
	C. Present Accommodations and Future Boat Basin Requirements at Flushing Bay	
	D. Excursion Boat Service	

Chapter		Page
V.	COMMERCIAL USE OF THE FLUSHING BAY AND RIVER	14
VI.	RECOMMENDED WATERFRONT & WATERWAY DEVELOPMENT	14
	A. Facilities for the 1964-1965 World's Fair Requirements	
	B. Marina Development Subsequent to the 1964-1965 World's Fair	
	C. Waterway Requirements	
VII.	ANALYSIS OF BOAT CHARGES AND REVENUES	20
	A. Revenue from Pleasure Boat Berthing Charges during Fair	
	B. Revenue from Pleasure Boat Berthing Charges after Fair	
	C. Income from Other Than Mooring Sources	
	D. Excursion Service during Fair	
	E. Summary of Anticipated Annual Revenues from Pleasure Boat Facilities	
VIII.	OPERATION AND MAINTENANCE	24
IX.	COST OF PROPOSED IMPROVEMENTS	25
	A. Dredging Quantities and Spoil Area	
	B. Cost Estimates	
	Phase I — Initial Construction	
	Phase II — Post-Fair Construction	
X.	SUMMARY AND CONCLUSIONS	27
XI.	ACKNOWLEDGMENTS	28

PLATES, CHARTS AND TABLES

RENDERING OF FLUSHING BAY AND RIVER

PLATES

Table Number		Page
1	LOCATION PLAN	A
2	EXISTING CONDITIONS—WATERWAYS AND WATERFRONT STRUCTURES	4
3	PROPOSED WATERWAY IMPROVEMENTS	5
4	PROPOSED WATERFRONT IMPROVEMENTS	13
5	EXTENSION TO EXISTING BOAT BASIN	15
6A	SECTION A-A—RELOCATED FLUSHING BAY PROMENADE	16
6B	SECTION B-B BANK IMPROVEMENT—FLUSHING RIVER	16
6C	SECTION C-C—BANK IMPROVEMENT FLUSHING RIVER	17
7	TYPICAL TRAFFIC—MAIN CHANNEL	19
8	ALTERNATIVE SPOIL AREA	26

CHARTS

Chart Number		Page
1	GROWTH IN RECREATIONAL BOATS AND AUTOMOBILES—NATIONWIDE	8
2	RETAIL EXPENDITURES ON BOATING—NATIONWIDE	9
3	RECREATIONAL BOATING BY TYPES—NATIONWIDE	10
4	POWER BOAT FORECAST—NEW YORK AREA	11
5	BERTHING SPACE FORECAST—NEW YORK AREA	11

TABLES

Plate Number		Page
I	FLIGHT ZONE CLEARANCES	7
II	RESIDENCE OF PERMANENT USERS OF FLUSHING BOAT BASIN	12
III	SIZE COMPOSITION OF FLEET AT PRESENT FLUSHING BOAT BASIN	20
IV	FUTURE ALLOTMENT—FLUSHING BAY BOATING FACILITIES	20
V	WORLD'S FAIR BOAT CHARGES AND REVENUES	21
VI	POST-FAIR BOAT CHARGES AND REVENUES	22
VII	PERCENT OF GROSS INCOME FROM VARIOUS SOURCES	23

I

SCOPE OF STUDY

The scope of this study is defined in the Agreement between the New York World's Fair 1964-1965 Corporation and Tippetts-Abbett-McCarthy-Stratton dated 1 November 1960 and quoted as follows:

"... a preliminary study of waterfront development of Flushing Bay and River at the north end of Flushing Meadows, including economic analyses, anticipated revenues from boat arrivals to the World's Fair site, proposed Federal dredging for improved entrance channel and basins, coordination with proposed runway extensions at LaGuardia Airport, development of Flushing River from Flushing Bay to the World's Fair site, waterfront development to be included as part of improvement of Grand Central Parkway, Northern Boulevard and Van Wyck Expressway by the State Department of Public Works, as well as cost estimates, subsurface analysis, coordination with pollution study of Flushing Bay and River by the City, preliminary sketches and designs, boat usage and capacities and related matters."

The area of interest was defined subsequently to include the waterfront along Flushing Bay commencing on the east side of the existing Overlook Area which is presently located on the extension of 31st Road in an easterly direction along Flushing Bay and continuing up the westerly side of Flushing River to the property line of the land which is to be used for the 1964-1965 World's Fair.

II

DESCRIPTION OF PROJECT SITE

A. General

In the waterfront within the limits of this study there is a paved promenade approximately 30 feet wide extending from the westerly limit to a joint just west of the New York City Asphalt Plant. The promenade, with railing along the seawall coping, has park benches and although generally in good repair, in a few places, particularly along the westerly 1,400 feet, the surfacing and the riprap bank protection are in need of restoration.

The existing Flushing Meadow Park boat basin consisting of a steel sheet-pile cellular bulkhead and a timber pile supported structure extending 400 feet seaward from the bulkhead and 700 feet westerly from the approach trestle, constructed in connection with the 1939-1940 New York World's Fair, is in good repair. Its use is now restricted by the silting that has occurred within the basin, the maneuvering area and the nearby anchorage area. Pleasure craft are berthed within the basin and adjacent to the approach trestle, and utilize floating barges connected to the fixed structures by ramps and walkways. Other pleasure craft are accommodated at fixed buoy moorings. The basin is presently owned by the New York City Department of Parks and operated under a leasing arrangement.

The New York City Asphalt Plant area at the entrance to the Flushing River channel, which is in part pile supported, shows apparent signs of substantial settlement. A wooden pile supported pier, owned by the Precast Company, is located on the River just upstream of the Asphalt Plant. The remaining area along the River which is

undeveloped, consists in part of upland which is flooded by storms of two-year and lesser frequency; the remainder is marsh land which is flooded at normal high tides.

B. *Winds and Tides*

The Flushing Bay area by reason of its configuration is protected from the open sea and is therefore not subjected to severe wave action. Winds which disturb the water surface and create mild wave action occur from almost all directions; however, the winds over 15 m.p.h. occur predominantly from the northwest. Records covering a 37-year period show that the maximum wind velocity of record for each month of the boating season (May through October) has been from the northwest except for the month of September, when the maximum wind of record was from the north.

The mean tidal range is 6.8 feet, with extreme high having been observed 7.6 feet above mean high water, and extreme low having been observed 4.0 feet below mean low water.

C. *Geology and Subsurface Conditions*

Considerable geologic and subsurface information covering the proposed waterfront development area is available, including borings and subsurface investigations made in connection with the boat basin constructed for the 1939-1940 World's Fair as well as borings made for the construction of highways and bridges in the immediate vicinity. Subsurface investigations and laboratory tests and special records for structures for the neighboring 1939-1940 World's Fair site and LaGuardia Airport are also of value. The general sequence of deposits at the site from the surface downward consists of miscellaneous fill, organic silt, at times accompanied by an overlying thin layer of decayed meadow mat, and granular glacial deposits; all these of varying thickness.

The critical soil at the site is the organic silt; at the west end of the site this stratum is approximately 30 feet deep; easterly along the bay waterfront, the thickness gradually increases to a depth of 50 feet

at the mouth of the Flushing River. At one point in the vicinity of the existing sheet-pile cellular bulkhead the depth of the organic silt diminishes to 15 feet. The thickness of organic silt along the western bank of Flushing River extending from the Whitestone Parkway Bridge to the proposed crossing of the Van Wyck Expressway Extension is relatively constant at 50 feet; south of this crossing its thickness decreases somewhat.

Laboratory tests indicate that the natural moisture content of the silt is approximately equal to the liquid limit; the plastic limit is also high for a silt soil. In the undisturbed state the strength of the silt is much greater than in the remolded state. Its compressibility is high and shear strength low and, in general, the silt must be rated as poor foundation soil. There is bare equilibrium with the existing fill loads and it may be expected that additional loading will cause appreciable settlements, and if heavy loads are imposed mud waves will develop. Where fills of over a few feet in height are to be constructed, counterweight berms are required in order to prevent mud waves.

Underlying the organic silt are deposits of sorted and stratified inorganic silt, sand, and gravel which were spread out by melt waters flowing from the edge of a glacier during the Pleistocene. These deposits generally are quite competent.

It will be necessary to support structures of any significant weight on piles driven through the organic silt and into the underlying glacial deposit. Excavation of the silt and replacement with granular material are generally not feasible because of the general great depth of the silt.

D. *Channels and Water Access—Flushing Bay and River*

The Flushing Bay Harbor Federal project, authorized in 1925 and subsequently modified in 1937 and 1938, provides for a 1.75-mile, 200-foot wide by 12-foot deep, channel from the East River to a point in Flushing Bay where a branch channel of equal dimensions services the maneuvering area with a depth of 12 feet in front of the existing boat basin. An anchorage area with an authorized depth of 8 feet and approximately 700 feet long borders on the maneuvering

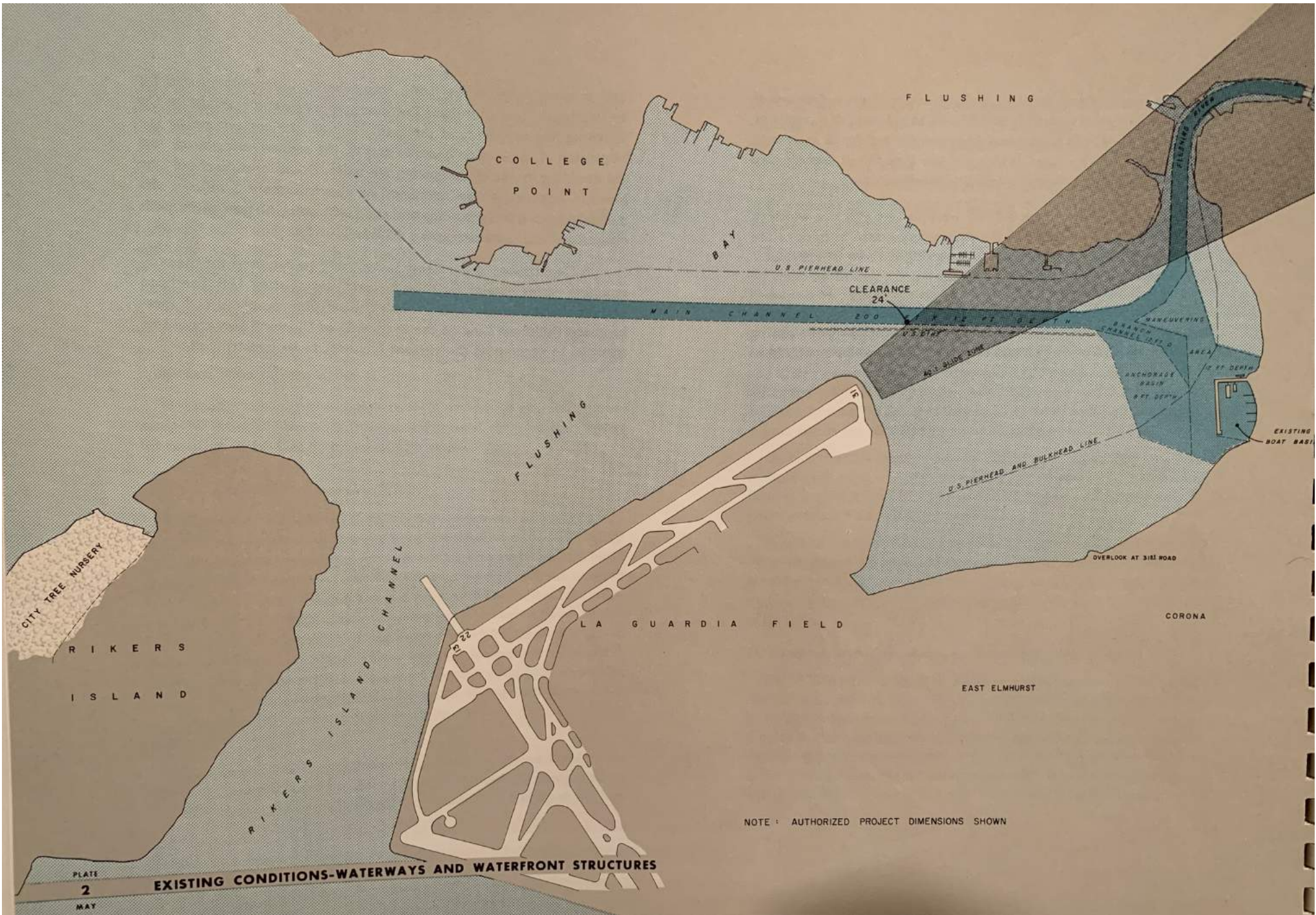
area. The main channel extends up the Flushing River a distance of 1.5 miles, narrowing uniformly to 160 feet, to the head of navigation. The river channel will be shortened at its upper end by $\frac{1}{4}$ mile with the construction of a fixed bridge for the Van Wyck Expressway Extension, near the existing Roosevelt Avenue bridge.

Shoaling in the main channel has decreased its effective width to approximately 100 feet and in the maneuvering area in front of the boat basin and in the branch channel serving it there is less than 7 feet of water. The anchorage area depth has shoaled to 4.5 feet.

The proposed waterfront development in Flushing Bay to accommodate several hundred pleasure boats and excursion boats during the 1964-1965 World's Fair and the subsequent development to pro-

vide mooring facilities for 1,000 boats clearly indicate the need for an improved Federal project. The new project should provide for the widening and deepening of the main channel, the corresponding enlargement of the branch channel and of the maneuvering area, and the doubling in size of the anchorage basin. Consideration should be given in addition, to the relocation of approximately 1 mile of the main channel in order to improve the LaGuardia Airport glide path clearance along the new runway 13-31.

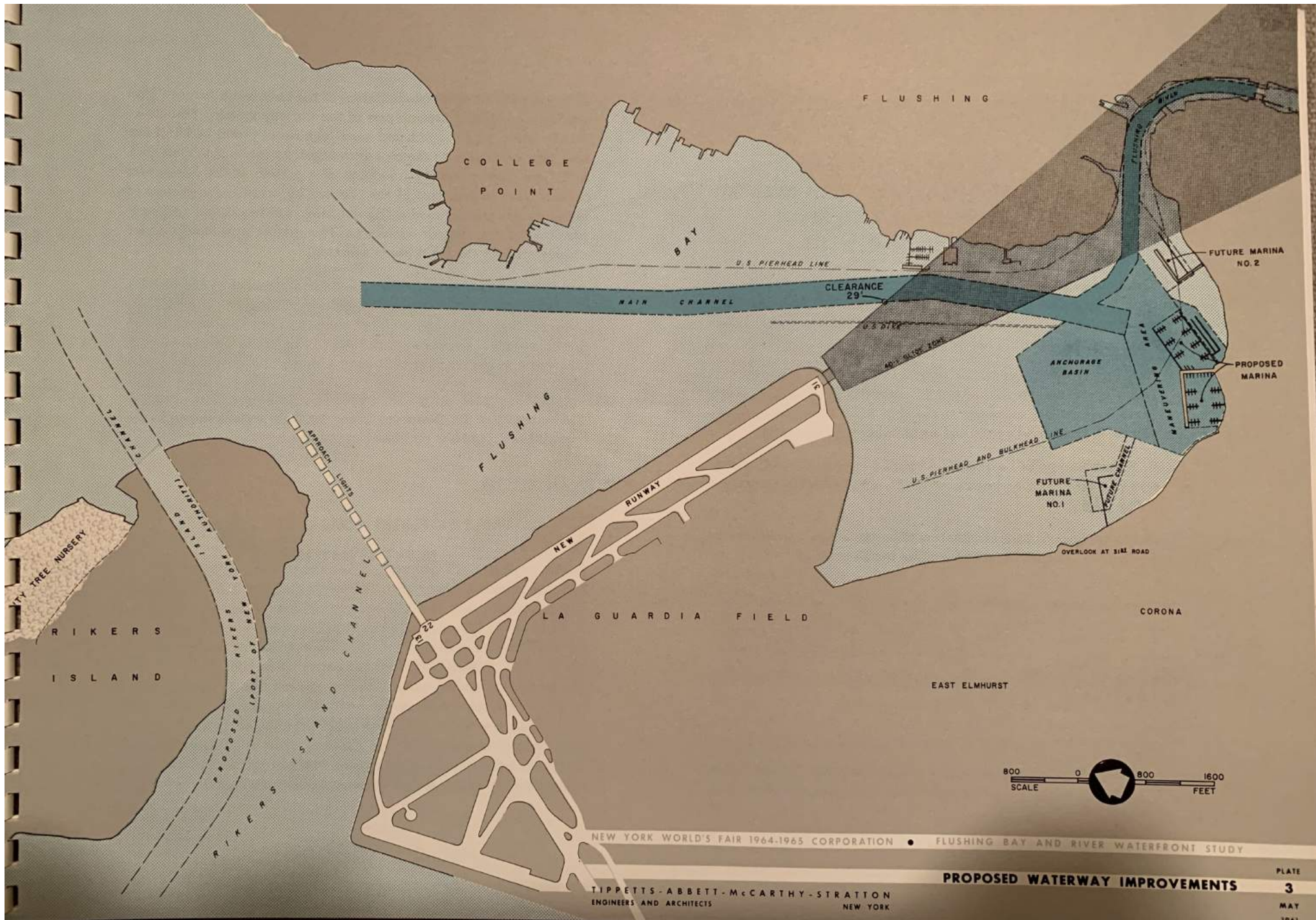
A Department of the Army permit will be required for the construction of permanent facilities beyond the existing U.S. Pierhead and Bulkhead Line and in the future the existing combined U.S. Pierhead and Bulkhead Line on the south side of Flushing Bay should be adjusted to encompass the various facilities to be constructed.



NOTE: AUTHORIZED PROJECT DIMENSIONS SHOWN

PLATE
2
MAY

EXISTING CONDITIONS-WATERWAYS AND WATERFRONT STRUCTURES



NEW YORK WORLD'S FAIR 1964-1965 CORPORATION • FLUSHING BAY AND RIVER WATERFRONT STUDY

PROPOSED WATERWAY IMPROVEMENTS

TIPPETTS-ABBETT-McCARTHY-STRATTON
ENGINEERS AND ARCHITECTS
NEW YORK

PLATE
3
MAY
1961

III

DEVELOPMENTS IN THE NEARBY AREA RELATED TO THE FLUSHING BAY AND RIVER WATERFRONT DEVELOPMENT

Developments now under way or planned for the near future, supplementing those being provided at a cost of 600 million dollars as a part of the World's Fair, will have a direct impact on the proposed waterfront development. These are:

- a. Enlargement of the major highway system, including the proposed improvements to the Grand Central Parkway and Northern Boulevard and the extension to the Van Wyck Expressway which will serve the World's Fair and future metropolitan needs.
- b. Rehabilitation of LaGuardia Airport, particularly the construction of a new runway, known as 13-31, scheduled for completion before 1964.
- c. The program for the elimination of marginal pollution in Flushing River and water areas in Flushing Meadow Park.

A. Major Highway Improvements

The extension to the Van Wyck Expressway and the improvements to the Grand Central Parkway and to Northern Boulevard will afford access to the Flushing Bay waterfront, the promenade on the Bay front and marina parking lots.

B. LaGuardia Airport Improvement

The Port of New York Authority is now constructing a new runway, known as 13-31, paralleling the existing runway 13-31, as part

of a multimillion-dollar rehabilitation of the LaGuardia Airport. The existing runway will become part of the taxiway system. The clearance between the glide path and mean high water would be 24' if the main channel alignment remains unchanged. An increase in clearance to 29' can be obtained by relocation of a portion of the navigation channel. Unrestricted use of the channel by commercial vessels of the types and sizes now using the waterway will require navigational coordination with airport operations. This matter is presently under consideration by the appropriate agencies.

It is therefore important that the Federal channel in the vicinity of runway 13-31 be relocated to provide more facility in the unrestricted use of the channel. The cost of the channel relocation in this limited area is not prohibitive and will be discussed elsewhere in this report in conjunction with the widening and deepening of the main channel.

A summary of the clearances under the flight zone is shown in the following table and also on Plate Nos. 2 and 3.

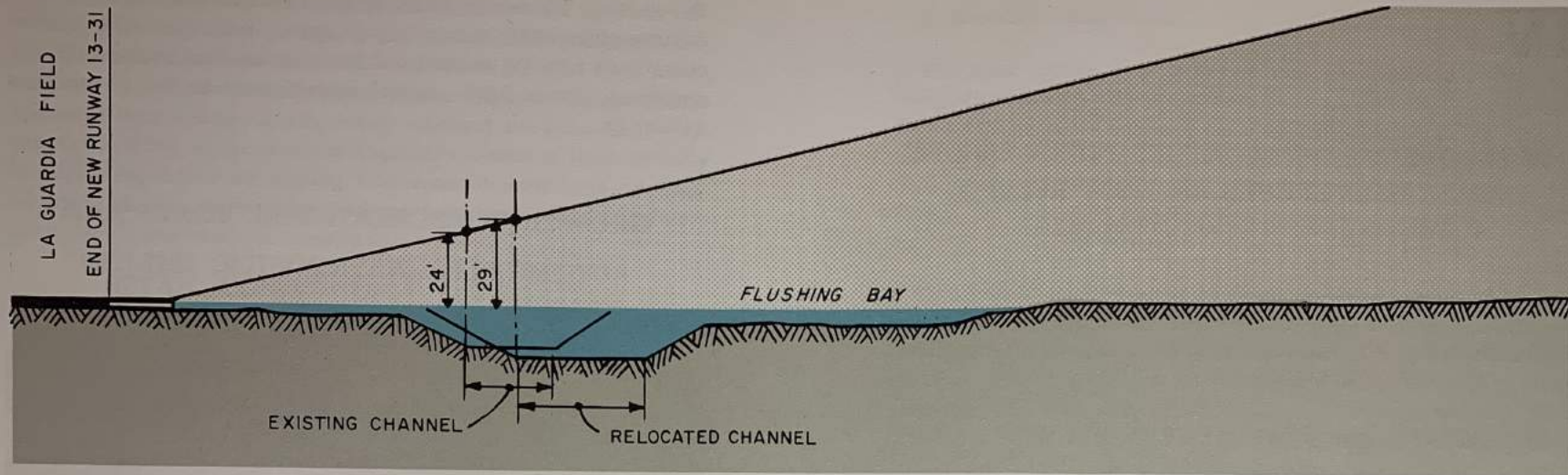
TABLE I — FLIGHT ZONE CLEARANCES*

NEW RUNWAY 13-31

40:1 GLIDE ZONE

EXISTING CHANNEL	
ALIGNMENT	24'
RELOCATED CHANNEL	
	29'

* Maximum Height of Boat above Mean High Water.



GLIDE PATH CLEARANCE DIAGRAM

C. Stream Pollution

The two programs proposed for the Flushing Bay and River waterfront pollution abatement will, when completed, materially enhance the attractiveness of this waterfront. One of the programs being undertaken by the Borough President of Queens will eliminate marginal pollution. This work, scheduled for completion before the 1964-1965 World's Fair at an estimated cost of \$710,000, will prevent the discharge of raw sewage into the River during periods of dry flow and normal rainfall. The 32nd Avenue combined sewer will be modified in such a manner as to have the present sewer act as a storm sewer only. Also, at seven locations in the Borough of Queens, weir chambers will be replaced with regulator chambers, special chambers and other alterations, thus eliminating the discharge of raw sewage

into the River during dry flow or normal rainfall. During heavy storms the combined storm and sanitary sewers will discharge into Flushing River.

The second program will eliminate pollution in the lakes within the World's Fair grounds by chemical treatment of the lake water, by deepening and cleaning of the lakes and by modifications to the tide gates at the head of Flushing River. The implementation of this program prior to the commencement of the 1964-1965 World's Fair will free the water discharging into the River of all pollution and at peak flow will tend to dilute further the effluent from the combined sewers discharging into the River at those times.

These two programs will enhance the attractiveness of the waterfront area planned for development.

IV

DEVELOPMENT OF FACILITIES FOR PLEASURE CRAFT AND EXCURSION BOAT SERVICE

The pronounced upward trend in pleasure boating evidenced in recent years, the acute general shortage of berthing space for pleasure craft in the New York area, and the use of the existing basin and other boating facilities in the immediate area to 100% capacity and the large number of pending applications for residence berthing space clearly warrant further development of pleasure craft facilities in Flushing Bay, to meet public demand. The stimulus of the World's Fair will create extraordinary demands for both itinerant and resident berthing space in close proximity to the site of the Fair. A precise assessment of the total future need for additional marinas in the general New York City area is not possible, however, the general trends and the use to full capacity of the marinas in the Flushing Bay and contiguous areas and the current pressing demand for additional facilities clearly support the development proposed.

A. Growth of Recreational Boating

1. Increase in Number and Popularity

Recreational boating in the nation has grown considerably in the last several years. Once considered a rich man's indulgence, boating has now become widespread. Whereas in 1947 only 8% of the population participated in boating, by 1960 participation had risen to 23%.

The number of recreational boats in use nationally has been estimated by the National Association of Engine and Boat Manufacturers at 8,200,000 in 1960, compared with 1,500,000 in 1930 and 2,440-

000 in 1947. The annual rate of increase has generally exceeded that of automobiles in use in the post-war period; in the 1947-1960 period the growth rate for recreational boats in use has averaged 9.7%, compared with a 5.5% annual rate of increase for automobiles (Chart 1).

GROWTH IN RECREATIONAL BOATS AND AUTOMOBILES (NATIONWIDE) 1947-1960

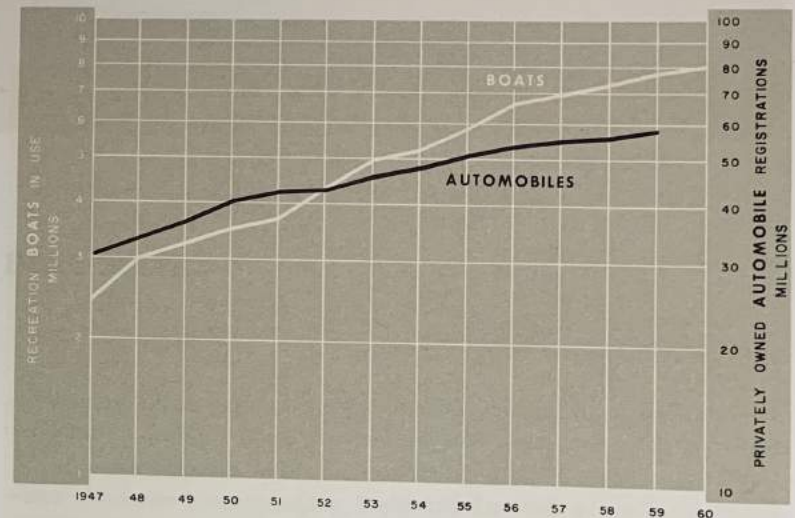


CHART 1

The boating industry in the United States has become a major business with retail expenditures in 1959 at an estimated \$2.5 billion, compared with a \$1 billion expenditure in 1954 (Chart 2).

RECREATIONAL BOATING BY TYPES (NATIONWIDE) 1947-1960

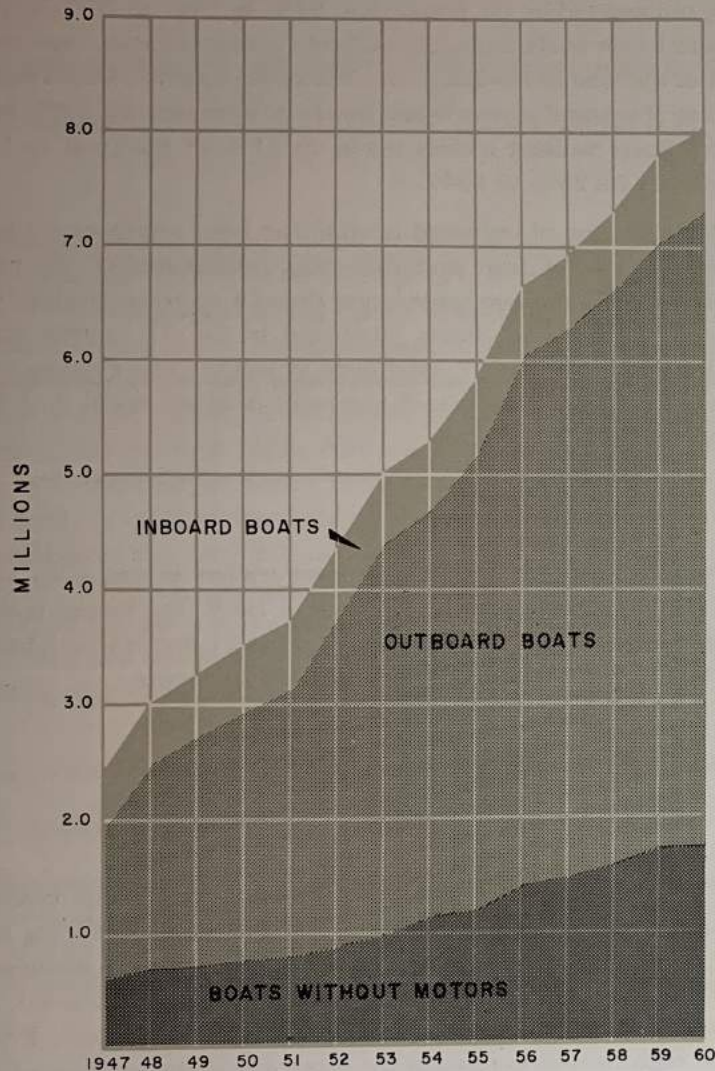


CHART 3

new law, of which approximately 338,000 boats are based in the New York City—Long Island area. This total does not include boats based in neighboring New Jersey, Connecticut and Rhode Island.

2. Boats in the Metropolitan Area

The number of outboard boats in the Metropolitan Area can be estimated only from the number of outboard motors in use. An estimated 368,500 outboard motors were in use in the New York-Northeastern New Jersey Metropolitan Area at the end of 1959, or 6.2% of the national total. Of this number there were an estimated 355,000 outboard boats based in the New York Metropolitan Area at the end of 1959. If the ratio of all outboard boats in tidal and Great Lakes states to the nation's total inboard motor boats is applied to the New York Metropolitan Area, then 57,000 inboard boats are located there. These added to the estimate of outboard motor boats give a total motor-boat population of 412,000 in the Metropolitan Area at the close of 1959, or some 430,000 to 440,000 boats at the end of 1960. These may increase to some 515,000 by 1964-1965, the period of the World's Fair (Chart 4). The total marina space in the Metropolitan Area can accommodate only some 60,000 boats in 1960.

3. Shortage of Berthing Space

There is a marked shortage of mooring space not only in the Metropolitan Area but throughout the country. A survey in 1958 for the National Association of Engine and Boat Manufacturers, Inc., indicated there were 4,905,000 recreational craft in use (excluding miscellaneous small craft like rowboats, dinghies and prams), of which only 3,000,000 were provided with slips or moorings. More than 1,250,000 applications for moorings were rejected and 575,000 applicants for mooring space were "wait-listed". It is estimated that an additional 2,260,000 boats could have been sold had there been slips and moorings to meet the demands.

Time Magazine estimated in the August 1, 1957 issue that 300,000 small craft in the New York City area were without mooring space. The Commissioner of Public Works of New York City considered this an understatement. Business Week, issue of July 16, 1960, stated: "Metropolitan New Yorkers have to travel miles to Long

**RECREATIONAL BOATS
(NEW YORK CITY METROPOLITAN AREA)
1955-1970**

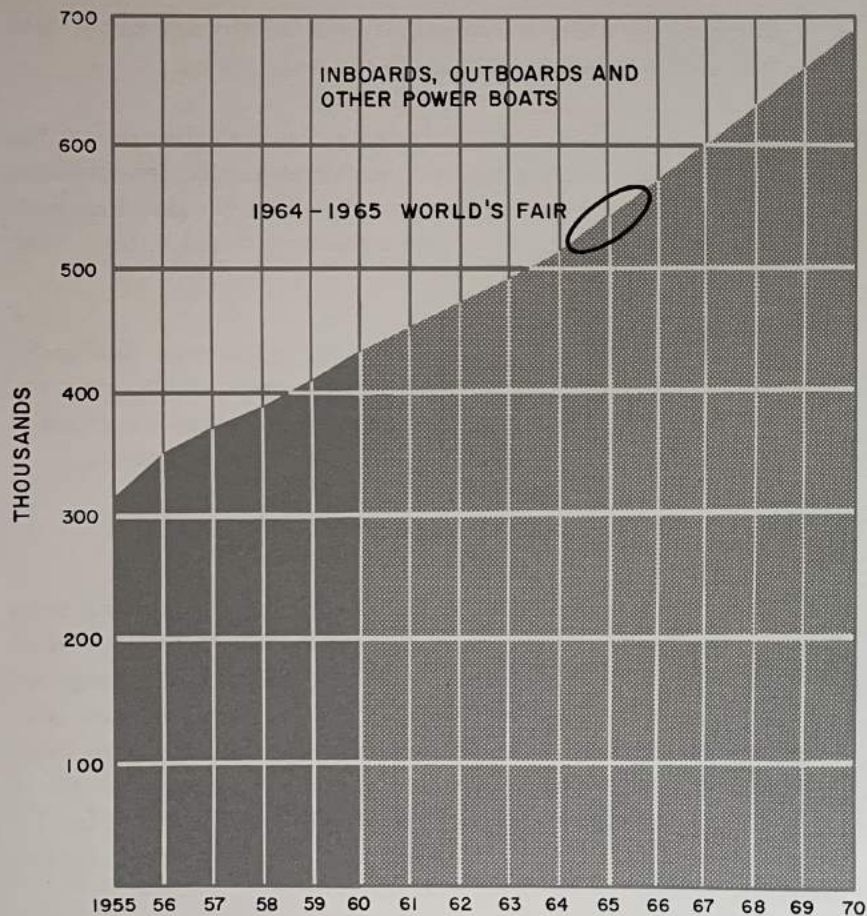


CHART 4

Island Sound harbors, up the Hudson River and down the New Jersey shore to find a snug harbor." The New York Metropolitan Region, an area somewhat larger than the Metropolitan Area, had an estimated 50,000 berths and moorings in 1958, according to the Regional Plan Association. These were found in 658 marinas, yacht clubs, and boatyards. In 1950, the number of berths and moorings were some 25,000. Projecting from these data would give 88,000 accommodations by 1964-1965, clearly inadequate for the 515,000 power boats expected (Chart 5).

**BERTHS AND MOORINGS
(NEW YORK METROPOLITAN REGION)*
1950-1970**



* INCLUDES THE NEW YORK METROPOLITAN AREA (CENSUS) PLUS THE COUNTIES OF ORANGE, PUTNAM AND DUTCHESS IN NEW YORK, FAIRFIELD IN CONNECTICUT, AND MONMOUTH IN NEW JERSEY

CHART 5

C. *Present Accommodations and Future Boat Basin Requirements at Flushing Bay*

The pleasure boating populace basing at a major marina may be drawn from an area defined by a two-hour motoring radius or less. Non-local residents form a large part of users of Long Island Sound marinas outside the City limits. The Flushing Bay Boat Basin is presently used both by residents in the immediate vicinity and environs as shown in the following table, as well as by transients. Detailed information on residence of transient users is not available.

TABLE II—RESIDENCE OF PERMANENT USERS OF FLUSHING BOAT BASIN

Location	Total Boats	Under 20'	Boats 20'-39'	Boats 40'+	Unspecified
Queens	81	26	38	6	11
Brooklyn	3	—	3	—	—
Manhattan	21	1	5	15	—
Nassau	1	—	1	—	—
Elsewhere*	5	—	1	4	—
	—	—	—	—	—
TOTALS	111	27	48	25	11

* Excludes Bronx, Staten Island, Westchester, which have no user-residents.

The location of the Flushing Bay basin at the intersections of several major limited-access routes and bridge crossings to Manhattan and the Bronx facilitates its use by City boat owners; its

close proximity to the East River and to Manhattan strongly favor its further development to meet local needs.

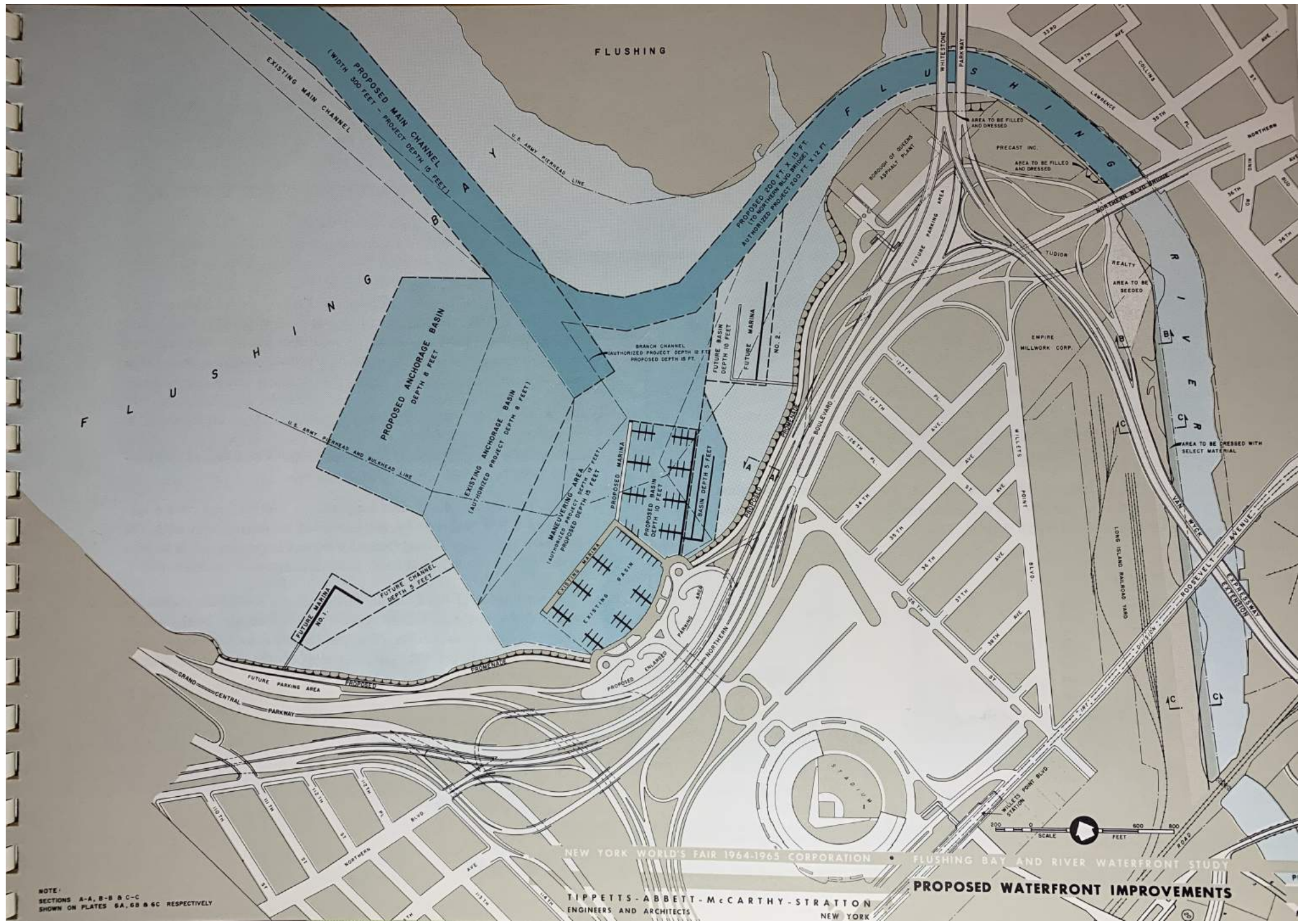
The proposed development at Flushing Bay will have strong attraction for "transient" users, particularly from out-of-state, in the two categories:

1. Seasonal coastwise transients on trips southward in the late Fall and returning northward in the early Spring.
2. Spring, Summer and Fall transients drawn to the area by the Fair, by the sports and other activities at the new stadium adjacent to the Flushing Bay Boat Basin, by the post-Fair park development and by the many attractions found in New York City.

It is anticipated that approximately 80% of the users during the 1964-1965 period will be transients; subsequent to the Fair the percentage will average 50%. The berthing arrangements planned will accommodate both permanently based craft and transients.

D. *Excursion Boat Service*

Excursion boat operators and others interested in providing mass waterborne transportation have expressed an interest in providing services to the 1964-1965 New York World's Fair. The proposed plan of development provides for the berthing of excursion boats with lengths up to 160 feet on the outshore face of the existing boat basin and on the outshore face of the extension to this basin. Subject to final determination, two or three such berths will be provided for vessels accommodating up to 500 passengers and operating on regular schedules.



FLUSHING

NEW YORK WORLD'S FAIR 1964-1965 CORPORATION • FLUSHING BAY AND RIVER WATERFRONT STUDY

TIPPETTS-ABBETT-McCARTHY-STRATON
ENGINEERS AND ARCHITECTS
NEW YORK

PROPOSED WATERFRONT IMPROVEMENTS



NOTE:
SECTIONS A-A, B-B & C-C
SHOWN ON PLATES 6A, 6B & 6C RESPECTIVELY

V

COMMERCIAL USE OF THE FLUSHING BAY AND RIVER

The Flushing Bay and River channels are used principally for the movement of building materials and petroleum products. Most of the movements are inbound. Annual tonnages have varied between 1,000,000 and 2,800,000 tons per year. In 1938 and 1939, the annual tonnage was increased by about 900,000 tons due to the receipt of materials for the World's Fair. The average annual tonnage for the last five years for which records are currently available (1954-1958 inclusive) shows an average tonnage of 2,500,000 tons. This tonnage is expected to total 4,000,000 tons per annum prior to and during the 1964-1965 World's Fair.

Vessel transits in 1958 totaled 13,790 inbound and outbound. The number of transits will be materially increased during and subsequent to the 1964-1965 World's Fair.

VI

RECOMMENDED WATERFRONT & WATERWAY DEVELOPMENT

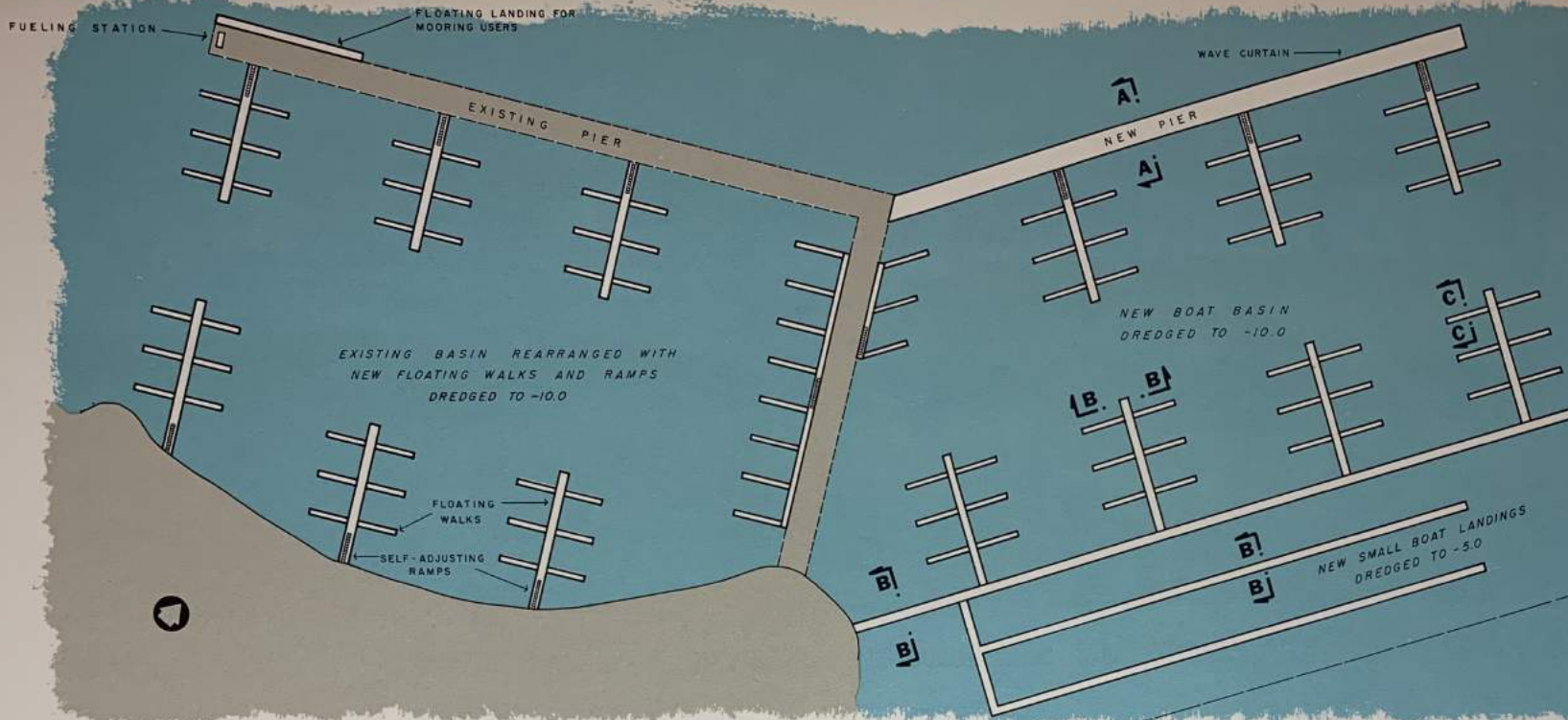
A. Facilities for the 1964-1965 World's Fair Requirements

The existing Boat Basin is fully occupied by pleasure craft, ranging in size from 16 feet to 110 feet in length, during the May to October season. The proposed expansion and rearrangement of accommodations will provide for simultaneous use by 430 pleasure boats at slips and an additional 350 at buoy moorings. Launch service to the buoy moorings will be provided. Berthing facilities for excursion craft will also be provided. The proposed development is shown on Plate No. 5.

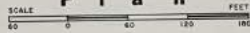
The parking facilities near the existing boat basin will be enlarged from 150 car capacity to 375 car capacity.

The promenade, 4,400 feet long, will be restored and over a distance of 1,100 feet will be reconstructed in conjunction with the Northern Boulevard-Grand Central Parkway improvement. A section of the new promenade and bank protection is shown on Plate 6A.

The west side of the Flushing River will be seeded after clearing and grubbing and a protective blanket will be provided in the marsh area. A typical cross-section along the River where high land exists is shown on Plate No. 6B. A typical section within the tidal area is shown on Plate No. 6C.

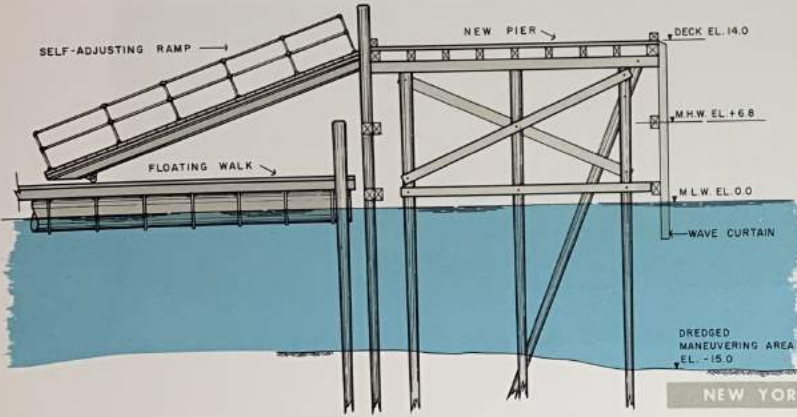


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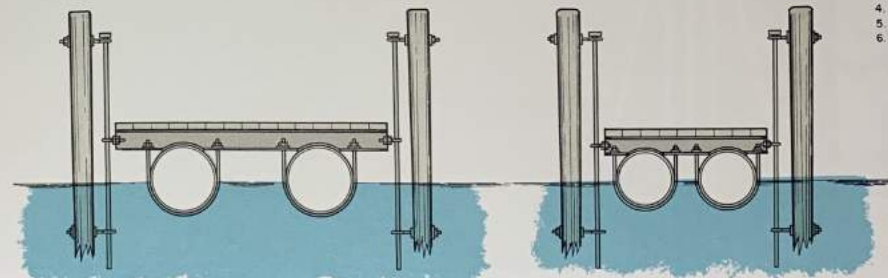


NOTES

- THE FOLLOWING SERVICES ARE TO BE PROVIDED:
1. FIRE ALARM SYSTEM AND FIRE FIGHTING EQUIPMENT
 2. FRESH WATER OUTLETS FOR BOAT SERVICING
 3. LIGHTING, TELEPHONE AND ELECTRIC SERVICE
 4. BOAT FUELING STATION
 5. COMFORT STATIONS (ON SHORE)
 6. AUTOMOBILE PARKING FACILITIES



Section A-A



Section B-B

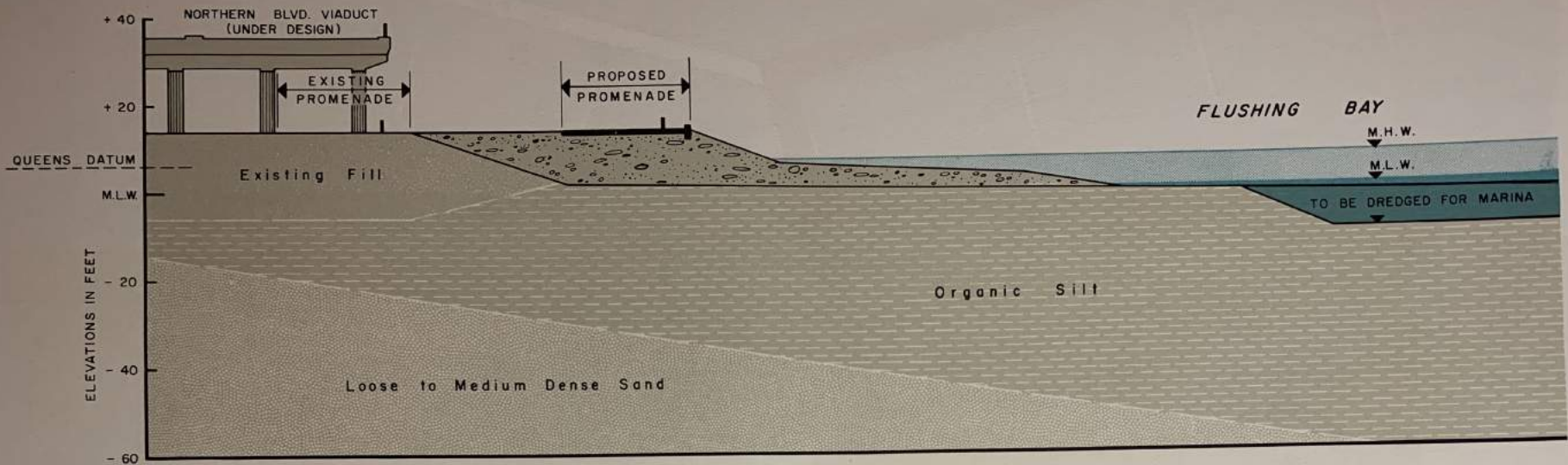
Section C-C



NEW YORK WORLD'S FAIR 1964-1965 CORPORATION FLUSHING BAY AND RIVER WATERFRONT STUDY

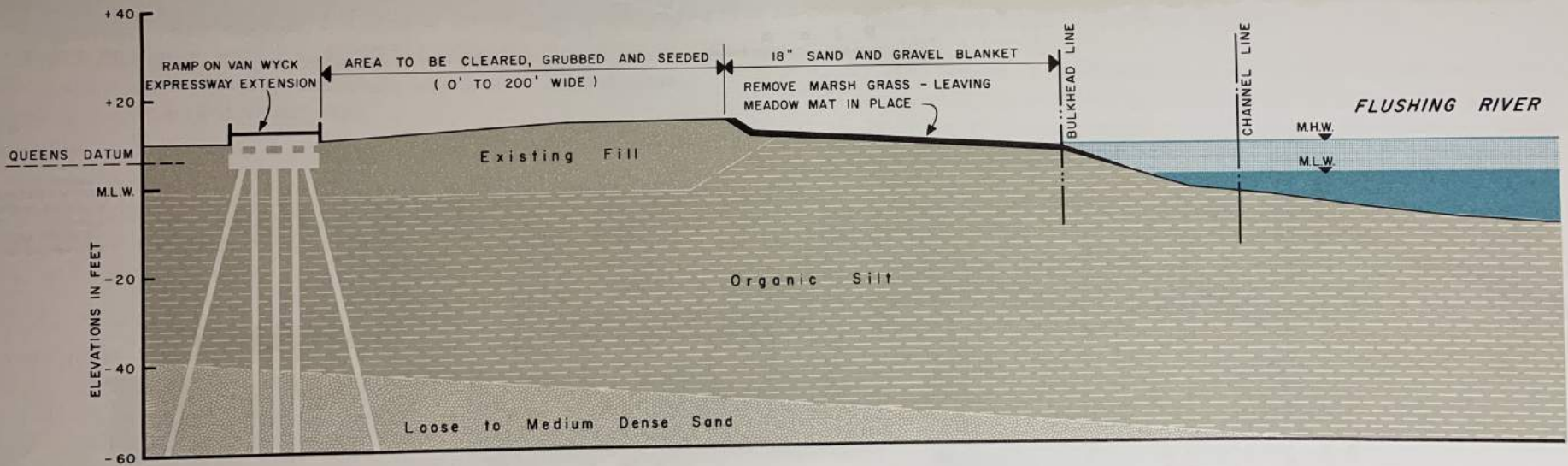
EXTENSION TO EXISTING BOAT BASIN

TIPPETTS-ABBETT-McCARTHY-STRATTON
ENGINEERS AND ARCHITECTS
NEW YORK



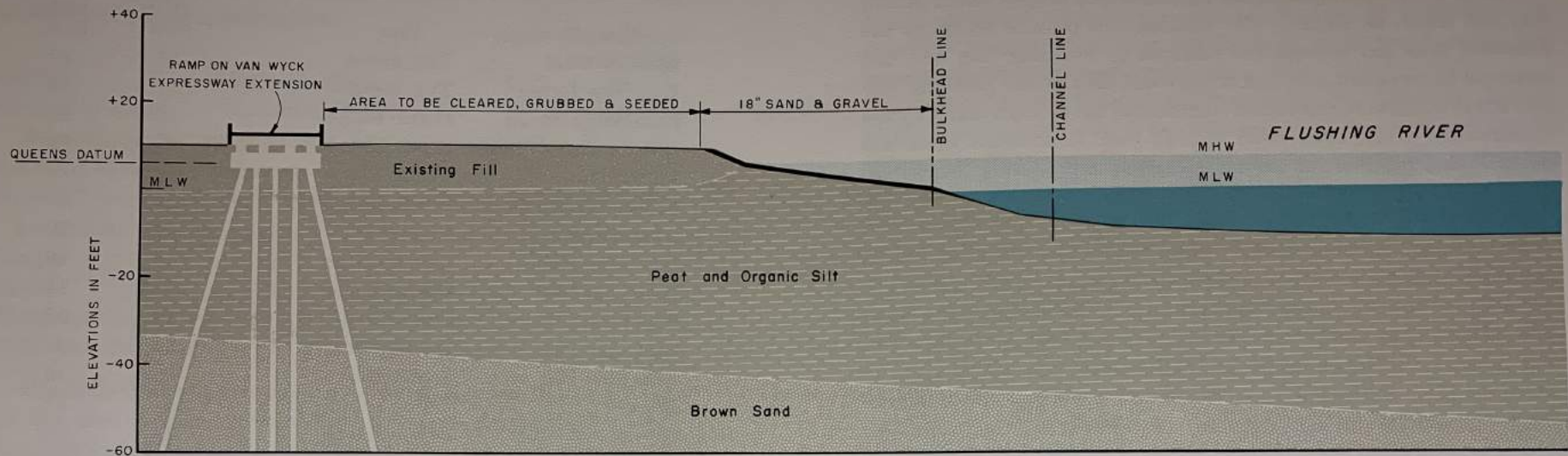
SECTION A-A — RELOCATED FLUSHING BAY PROMENADE

PLATE 6A



SECTION B-B — BANK IMPROVEMENT — FLUSHING RIVER

PLATE 6B



SECTION C-C — BANK IMPROVEMENT — FLUSHING RIVER

PLATE 6C

B. Marina Development Subsequent to the 1964-1965 World's Fair

The Flushing Bay marina will be operated under the direction of the New York City Department of Parks and as the need materializes, additional facilities for small and medium sized pleasure craft up to 40 feet will be increased to the west and to the east of the present basin from 430 to 650. Parking facilities will be increased to accommodate 925 cars. These additional post-Fair facilities are shown on Plate No. 4, and indicated as "FUTURE".

It is anticipated that the Flushing River area between the Northern

Boulevard Bridge and the Roosevelt Avenue Bridge will be developed for the winter storage of pleasure craft and for marine repair complete with suitable marine lifts.

There is available in the area at the existing boat basin space suitable for construction of a combined marine supply shop, snack bar and restaurant. The development of these facilities is fully anticipated, however, the immediate development plan is limited to the mooring of pleasure craft with supplementary ancillary services such as ship's service, fuel and oil.

C. Waterway Requirements

The present main channel has an authorized project width of 200 feet and depth of 12 feet. The channel will provide access to the proposed enlarged recreational facilities in Flushing Bay and will continue to serve not only the commercial uses of the Flushing Bay and River but also the increased commercial use brought about by the construction of the 1964-1965 World's Fair. In addition, there will be increased commercial use by excursion craft during and subsequent to the Fair.

The average number of daily transits at the present time is in the order of 60 commercial craft, plus 100 pleasure boats during the recreational boating season. The number of average daily transits will increase materially with the construction of the World's Fair and with the enlargement of the recreational boating facilities in Flushing Bay. The anticipated increased tonnage of commercial cargo as well as the establishment of commercial excursion boat service will increase the average daily number of commercial transits to approximately 120. Similarly, the pleasure craft using the main channel will increase from something in the order of 100 transits per day to about 880 transits per day.

Commercial craft using the Flushing Bay channel at the present time would benefit from a deeper and wider channel. The main channel, entering the Flushing River, is proposed to be deepened for use by commercial craft. Several of the commercial craft which presently use the channel are restricted to limited use because of the presently authorized depth. Also, some of the major excursion boat concerns in the New York area presently operate vessels which require a channel of greater depth than 12 feet in order to permit unrestricted use, i.e., regular service without regard to condition of the tide.

Vessels operating in the Flushing Bay and River, which could make economically sound use of a deeper channel, are typified by the following:

Vessel Name	Type	Loaded Draft (feet)	Highest Fixed Point Above Water When Light (feet)
Esso Vermont	Tug, diesel	11	32
Esso New Jersey	Tug, diesel	11	32
Esso Barge No. 23	Dumb Barge	12.5	36
Pittston Barge No. 2	Dumb Barge	12.5	19*
Pittston Barge No. 40	Dumb Barge	12.5	19*
Pittston Barge No. 20	Dumb Barge	12.5	19*
Seneca	Tug, diesel	11	40
Blue Line 103	Dumb Barge	13	18
Blue Line 104	Dumb Barge	13	15
Blue Line 106	Dumb Barge	14	25
Blue Line 107	Dumb Barge	13	20
Blue Line 108	Dumb Barge	13	18
Atlantic	Dumb Barge	13	25
Huron	Dumb Barge	13	25
Craig Reinauer	Motor Tanker	12	28
Celtic	Tug, Motor	11.2	23
G. B. Schroeder	Dumb Barge	11	24
Franklin Reinauer II	Tanker, Diesel Electric	12	30
Sarah Pinser II	Tanker, Diesel Electric	12	30
R.T.C. No. 200	Dumb Barge	14	25
R.T.C. No. 300	Dumb Barge	14	25
Norwalk	Tug	12	38**
Flushing	Tug	11	32**
Huntington	Tug	12.3	36**
Ocean King	Tug	12	44
Poling Bros. 15	Dumb Barge	14.1	14
Russell 22	Dumb Barge	14.1	15
Russell, Poling 24	Dumb Barge	14.1	15
Russell, Poling 21	Dumb Barge	12.2	14
Russell, Poling 28	Dumb Barge	12	20
Russell, Poling 30	Dumb Barge	14	15
Russell Poling 31	Dumb Barge	14	15

*Folded mast.

**Can be lowered.

Excursion boats operated in the New York area, which are being considered for service to the Fair and which could make economically sound use of a deeper channel are:

		Draft	Highest Point Above Water
Circle V	Excursion Boat	11.6	23
Peter Stuyvesant	Excursion Boat	12	59

Also, one of the excursion boat companies in the New York area is adding to its fleet two boats which may be used for World's Fair service. These boats have the following dimensions:

1st Boat—600 Passengers		2nd Boat—1500 Passengers	
Length	165 ft.	Length	185 ft.
Beam	26 ft.	Beam	35 ft.
Maximum Draft	10 ft.	Maximum Draft	15 ft.
Height above Water line	24 ft.	Height above Water Line	35 ft.

The main Flushing Bay channel, if increased to a project depth of 15 feet, with suitable allowance for over-depth dredging, will be able to accommodate the above listed vessels. The present channel width of 200 feet would limit the simultaneous passage of commercial vessels, when intermingled with the heavy volume of recreational craft using the channel. A typical condition in the channel, which could occur many times each day during the May to October boating season, is shown on Plate No. 7. Although this is an assumed condi-

tion, it is considered conservative, because it is not possible to account fully for the ineptitude of pleasure craft operators to maintain course. Amateur navigators cannot be expected to appreciate the potential dangers of varying conditions of wind, wave, swell and suction effects of adjacent large craft.

The short branch channel which connects the main bay channel to the maneuvering area at the Flushing Boat Basin should also be enlarged to 300 feet width by 15 feet depth. Likewise, the maneuvering area should be increased in depth to 15 feet and its dimensions slightly modified to permit the safe maneuvering of the commercial excursion boats calling at the pier. These recommended modifications in the waterways of Flushing Bay and River are shown on Plates 3 and 4. A modification to the alignment of the main channel is also shown on these plates, which is recommended to alleviate the glide path clearance problem at the new Runway 13-31 at LaGuardia Airport.

Upstream improvements to the Flushing Bay harbor channel beyond the point at which the branch channel departs from the main channel, that is, the Flushing River portion of the channel, are limited to deepening. However such deepening from 12' to 15' will entail local cooperation. The cost of deepening the Flushing River portion of the channel, contained in this report, includes dredging between pierhead and bulkhead lines only.

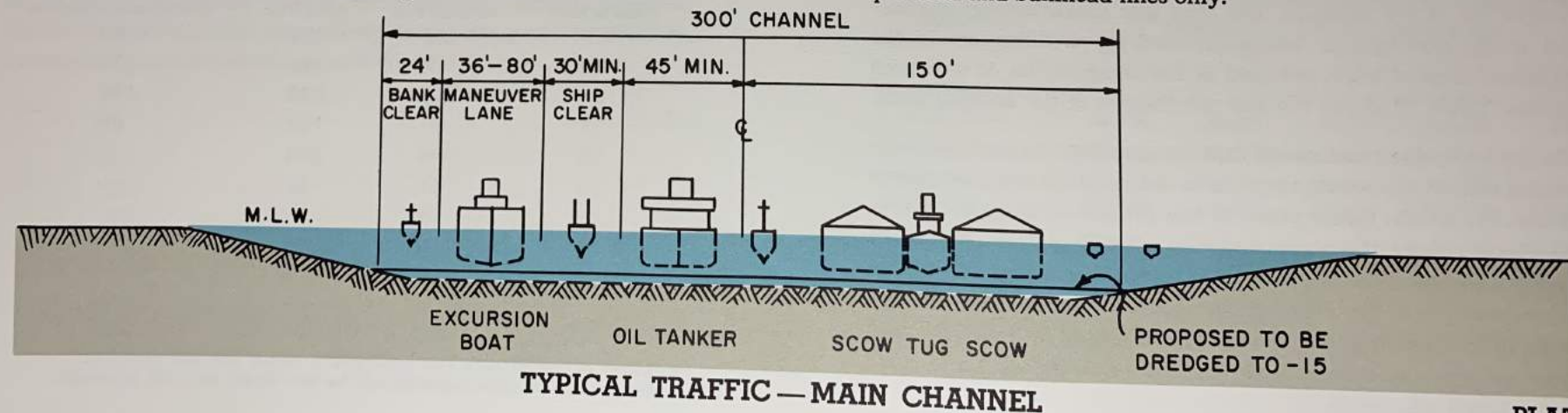


PLATE 7

VII

ANALYSIS OF BOAT CHARGES AND REVENUES

Marina pleasure boat charges are fixed by either of two methods: the first is related to the size of craft on a per foot of length basis; the second is related to the facility provided without distinction as to size of boat. Since the recommended Flushing Bay facility will permit berthing of both small and large vessels (16 feet to 120 feet), the first method of charging is preferred.

Recommended charges for the Flushing Bay marina were established, for the purposes of this study, on the basis of rate structures of several nearby municipal and private marinas. Transient rates were similarly computed.

The estimates of revenues to be derived from pleasure boat charges used in this report are based on an assumed, but reasonable and conservative use of the facilities. The boat size characteristics encountered at the existing boat basin, adjusted for modifications in the anticipated sizes of boats, are used in the computation of estimated revenues. Table III shows the size distribution at the existing basin.

On the basis of our analysis of fleet composition, the facilities to be provided will accommodate the craft in the numbers and sizes shown in Table IV. In the initial phase of the project (during the 1964-1965 World's Fair) slip accommodation for 430 craft are provided; the ultimate capacity of 650 boats can be accommodated in the final development (after the Fair). Buoy moorings in the period of the World's Fair and subsequent thereto are estimated at 350. The total number at slips and at moorings, therefore will be 780 boats initially, and 1,000 ultimately.

TABLE III
PRESENT AND FUTURE SIZE COMPOSITION
OF FLEET AT FLUSHING BOAT BASIN

Class of Boat	Number of					
	Slips and Docks			Moorings		Future Percent
	Current Number	Percent	Future Percent	Current Number	Percent	
16'	4	5.6	3.2	9	39.1	17.0
18'	9	12.7	14.2	3	13.0	22.6
25'	23	32.4	36.4	11	47.9	41.5
35'	10	14.1	15.8	—	—	18.9
45'	10	14.1	15.8	—	—	—
55'	6	8.5	9.5	—	—	—
65'	4	5.6	3.2	—	—	—
85'	3	4.2	1.2	—	—	—
120'	2	2.8	0.8	—	—	—
TOTALS	71	100.0	100.0	23	100.0	100.0

Note: The future composition of the fleet shows the percentage share of the different boat classes during and after the World's Fair. The location of the facilities will prove less attractive to the smallest boats, and the number of boats of 65 feet and over is limited. Hence, a larger share of the boats will fall in the 18 to 55 foot length.

TABLE IV
FUTURE ALLOTMENT — FULL CAPACITY
FLUSHING BAY BOATING FACILITIES

Class of Boat	Number of Boats		
	At Slips		At Moorings
	During Fair	After Fair	During and After Fair
16'	14	21	60
18'	62	92	79
25'	155	235	145
35'	68	103	66
45'	68	103	—
55'	41	62	—
65'	14	21	—
85'	5	8	—
120'	3	5	—
TOTALS	430	650	350

Capacity during World's Fair will be 430 berths and 350 moorings. Subsequent to the Fair, capacity will be 650 berths and 350 moorings.

A. Revenue from Pleasure Boat

Berthing Charges during Fair

For purposes of comparison, the anticipated annual revenues during the 1964-1965 Fair have been computed on two bases: one at a charge of 10¢ per foot per day and the other at 12¢ per foot. Under each reckoning there are minimum charges of \$4.00 per boat at slip mooring. The charge at anchorage moorings is \$3.00 per day. It has been conservatively assumed that a berth or mooring, when occupied, will be used by one boat per day. The assumed boating season of 160 days per year used for the purposes of revenue computation coincides with the period that the Fair will be opened. Since moorings generally will be less in demand because of the inconvenience of passenger movements from boat to shore than slip berthing, it may be expected that when slip occupancy is low, the mooring occupancy will be even lower. For this reason, the assumptions as to revenue from moorings is based on a shorter occupancy season.

The income from pleasure boat berthing charges, assuming full occupancy, would amount to \$343,000 on the basis of the 10¢ per foot charge and \$361,000 at the 12¢ per foot charge. A reasonable occupancy assumption of 70% for the slip and 40% for the moorings would show an annual income, from berthing charges alone, of \$225,000 and \$237,000 respectively during the period of the Fair. Income computations are shown in Table V.

TABLE V
1964-1965 BOAT CHARGES AND REVENUES

(Capacity—430 at Berths, 350 at Moorings)

160-DAY OCCUPANCY SEASON—One Transient Boat/Berth/Day

BERTHS	PERCENT CAPACITY OCCUPANCY				
	100%	90%	80%	70%	60%
	\$	\$	\$	\$	\$
A. Daily Charge:					
10¢/ft., \$4.00 min.					
120' — 3	6,000				
85' — 5	7,000				
65' — 14	15,000				
55' — 41	23,000				
45' — 68	49,000				
- — 299	191,000				
TOTALS	291,000	262,000	233,000	204,000	175,000
B. Daily Charge:					
12¢/ft., \$4.00 min.					
120' — 3	7,000				
85' — 5	8,000				
65' — 14	17,000				
55' — 41	27,000				
45' — 68	59,000				
- — 299	191,000				
TOTALS	309,000	278,000	247,000	216,000	185,000

50-DAY OCCUPANCY SEASON—One Transient Boat/Mooring/Day

MOORINGS	PERCENT CAPACITY OCCUPANCY				
	100%	60%	50%	40%	30%
	\$	\$	\$	\$	\$
C. Daily Charge:					
\$3.00/Boat					
	52,000	32,000	26,000	21,000	16,000
TOTAL INCOME PER YEAR (BERTHS & MOORINGS)					
A and C	343,000	294,000	259,000	225,000	191,000
B and C	361,000	310,000	273,000	237,000	201,000

B. Revenue from Pleasure Boat Berthing

Charges After Fair

A similar analysis has been made of anticipated annual revenues for the post-Fair years using an occupancy factor of 90% for slips, and 70% for moorings on the basis of experience in marinas in the area. Season charges are comparable with those levied by the Department of Parks Marina at its 79th Street Marina on the North River. Transient rates are comparable to those of commercial marinas. It is customary to re-rent seasonal space when the season user is away on a short or long cruise and, on this basis, some of the berths occupied by seasonal users will be also occupied by short-term users, such as weekly, semi-weekly and weekend boats. An annual income of \$230,000 from pleasure craft subsequent to the 1964-1965 World's Fair is estimated as shown in Table VI.

TABLE VI
POST-FAIR BOAT CHARGES AND REVENUES

(Capacity: 651 at Berths, 349 at Moorings)

SLIPS	Capacity Number	Occupancy Ratio	Actual Number	Rate	Revenue for Boat	Revenues All Boats per Unit of Time	Time Factor	Total Revenues
Season Boats								
120'	5	90%	4.5	\$3.75/ft.	\$450	\$ 2,025		\$
85'	8	90%	7.2	\$3.75/ft.	318	2,290		
65'	21	90%	18.9	\$3.75/ft.	244	4,612		
55'	62	90%	55.8	\$3.75/ft.	206	11,495		
45'	103	90%	92.7	\$200 min.	200	18,540		
35' and less	451	90%	405.9	\$200 min.	200	81,180		
SUBTOTAL						\$120,142	1.0	\$ 120,000
Monthly Boats (30 days)								
120'	5	2%	0.1	7.5¢/ft/day	270	\$ 27		\$
85'	8	2%	0.2	7.5¢/ft/day	191	38		
65'	21	2%	0.4	7.5¢/ft/day	141	56		
55'	62	2%	1.3	7.5¢/ft/day	124	161		
45' and less	554	2%	11.1	\$3.75/day min	112	1,243		
SUBTOTAL						\$ 1,525	5.0	\$ 8,000
Weekly Boats (7 days)								
120'	5	3%	0.2	7.5¢/ft/day	63	\$ 13		\$
85'	8	3%	0.2	7.5¢/ft/day	45	9		
65'	21	3%	0.6	7.5¢/ft/day	34	20		
55'	62	3%	1.9	7.5¢/ft/day	29	55		
45' and less	554	3%	16.6	\$3.75/day min	26	432		
SUBTOTAL						\$ 529	21.0	\$ 11,000
Semi-Weekly Boats (3 days)								
120'	5	5%	0.2	7.5¢/ft/day	27	\$ 5		\$
85'	8	5%	0.4	7.5¢/ft/day	19	8		
65'	21	5%	1.0	7.5¢/ft/day	14	14		
55'	62	5%	3.1	7.5¢/ft/day	12	37		
45' and less	554	5%	27.7	\$3.75/day min	11	305		
SUBTOTAL						\$ 369	50.0	\$ 18,000
Week-End Boats (2 days)								
120'	5	10%	0.5	7.5¢/ft/day	18	\$ 9		\$
85'	8	10%	0.8	7.5¢/ft/day	13	10		
65'	21	10%	2.1	7.5¢/ft/day	10	21		
55'	62	10%	6.2	7.5¢/ft/day	8	50		
45' and less	554	10%	55.8	\$3.75/day min	8	443		
SUBTOTAL						\$ 533	21.0	\$ 11,000
MOORINGS								
Seasonally	350	70%	245.0	\$100	100	\$ 24,450	1.0	\$ 25,000
Monthly								
(30 days)		5%	17.5	\$2.50/day	75	1,312	5.0	7,000
Weekly								
(7 days)		7%	24.5	\$2.50/day	18	441	21.0	9,000
Semi-Weekly								
(3 days)		10%	35.0	\$2.50/day	8	280	50.0	14,000
Week-ends								
(2 days)		20%	70.0	\$2.50/day	5	350	21.0	7,000
SUBTOTAL								\$ 62,000
GRAND TOTAL								\$ 230,000

Retail spending on boating in relationship to total personal disposable income grew from 0.29% in 1951 to 0.73% in 1959. Expenditures per boat rose from \$166 in 1952 to \$317 in 1959. Since the boating public is drawn from the middle and upper income groups the expenditures when appropriately adjusted are estimated to approximate 2.5% of the personal disposable income of those actually participating in pleasure boating. The expenditures include purchases of boats, engines, accessories, docking, launching, storage, maintenance, repair, and boat club membership.

RETAIL EXPENDITURES ON BOATING (NATIONWIDE) 1947-1960

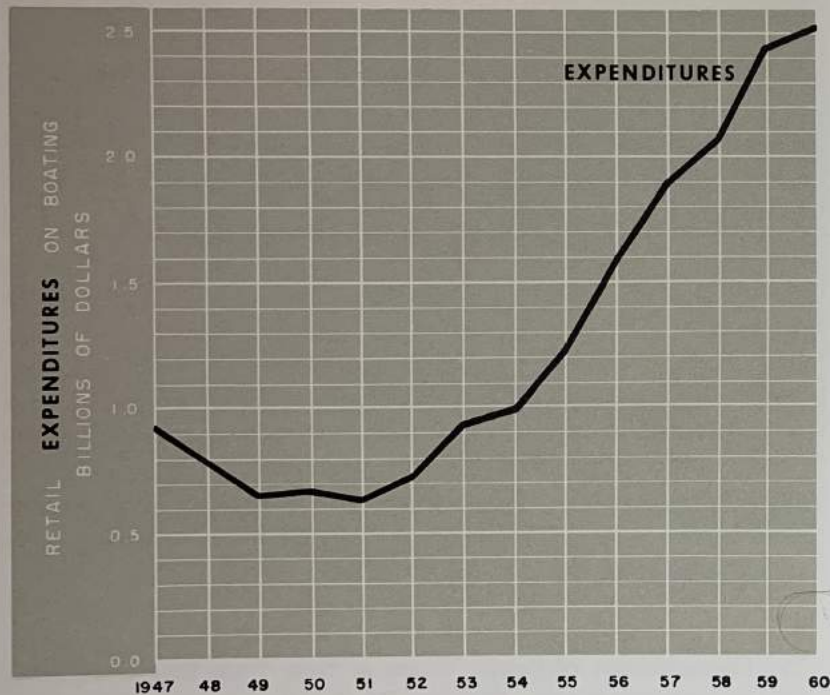


CHART 2

2. Growth by Boat Types

The most popular boat type is clearly the outboard (Chart 3), being represented by the proportion; 54% in 1947 to 70% in 1960. Inboard motor boats, including sailboats with auxiliaries, represented 21% of the total in 1947 and only 9% of the total in 1960. The total number of inboard motor boats, however, increased by 29% in the period. Boats without motors made up 21% of the total in 1960, compared with 25% in 1947.

The expansion of outboard boating has been accompanied by an increase in size of boat and increasing horsepower of the motor. Whereas a few years ago boats larger than 15' were uncommon, some 25% of the outboard boats purchased in the 12 months ending April 1, 1959 were 15'-7" and over in length. The average horsepower of outboard motors sold increased from 4.7 hp to 23.7 hp in the period 1947 to 1959.

3. Boat Trailers

In 1959, there were 1,750,000 boat trailers in use, sales having grown from 3,790 in 1947 to 175,000 in 1959. The largest boat size that can be readily hauled, however, is about 21-feet in length because of limitations on sizes of trailers and in storage space.

B. Analysis of Boat Berthing Space in Metropolitan Area

1. Boat Registration

Effective January 1, 1959, registration of all pleasure boats was required by the State of New York, including those operating in the area south of 41° Lat. previously exempt, which area includes the waters of the lower Hudson (south of Hastings-on-Hudson), New York Harbor, Long Island Sound and the Atlantic Ocean. Prior to 1959, registrations were valid for three years; the total registration in the period 1956 to 1958 was 112,000. It is now estimated that 450,000 boats, exclusive of sailboats, will be registered under the

C. Income from Other than Mooring Sources

Pleasure boat marinas derive income from many sources in addition to berth rentals. The number of additional services offered varies depending on the location and size of the undertaking and the availability of such services in the immediate area of the marina. The additional income (percentage of the gross income of the marina) can be approximated from the following tabulation prepared from a study by the National Association of Engine and Boat Manufacturers based on the analysis of 190 installations.

**TABLE VII
PERCENT OF GROSS INCOME FROM VARIOUS SOURCES**

No. Item	Source of Income	Number of Installations Offering the Service	Percent of Total Installations Analyzed	Approximate Percent of Revenues
1	Slip and mooring rentals	171	90	19.4
2	Fuel and oil sales	164	86	10.2
3	Winter storage	143	75	10.0
4	Accessory and equipment sales	73	73	13.0
5	Repairs	135	71	11.7
6	Ice, grocery sales	130	68	2.1
7	Used boat and engine sales	118	62	8.2
8	New boat and engine sales	108	57	10.5
9	Bait and tackle sales	70	37	3.7
10	Boat rentals	68	36	4.2
11	Restaurants, bars	61	32	4.4
12	Sleeping quarters rental	29	15	2.6
				100.0

The Flushing Bay Marina will furnish initially only fuel and oil services (Item 2) in addition to mooring accommodations (Item 1). The gross revenues can be increased if other services are offered.

Income from fuel and oil ordinarily would add 50% to the gross income from slip and mooring rentals. This rate is not applicable, however, since the Flushing Bay facilities will be used by large numbers of transients who, ordinarily, will service their craft with oil and fuel at their home ports. It is estimated that income from fuel and oil purchases will increase 20% the annual gross income during the period of the Fair and 35% subsequent to the Fair.

If additional services are offered at Flushing Bay, an increase in mooring rates would be warranted on the basis of a survey of 445 privately owned facilities by the National Association of Engine and Boat Manufacturers in June 1958. This survey revealed that the average seasonal rate for open slips offering rather complete services ranged up to 100% higher than the rate at facilities with minimum service. Rate increases are related to the character of the additional services provided.

D. Excursion Service During Fair

It is not feasible at this time to estimate the income to be derived from excursion boat service since alternative schemes are currently under study. The passenger traffic to the Fair by water-borne means will depend on the type and frequency of service but since there is no present determination of the extent of the services to be provided, no estimates of income from excursion boats are included in this economic analysis.

E. Summary of Anticipated Annual Revenues from Pleasure Boat Facilities

A summary of annual gross income from revenue producing services is tabulated as follows:

Source of Income	During Fair Range Per Annum	Post Fair Per Annum
Boat Rentals	\$225,000 to \$237,000	\$230,000
Fuel and Oil	45,000 to 47,000	80,000
Total Estimated Gross Income	\$270,000 to \$284,000	\$310,000

VIII

OPERATION AND MAINTENANCE

The present boat basin is operated under the terms of a leasing arrangement with the New York City Department of Parks. Other Department of Parks' boating facilities in New York City are operated under similar arrangements. It is proposed that enlarged facilities at Flushing Bay will be operated in the same fashion by the World's Fair Corporation during the Fair and by the New York City Department of Parks thereafter. During the summer season a Harbor Master and a staff of six handle the berthing and securing of boats, dispensing of fuel, oil and services, and the safeguarding of boats at slips and at moorings. The enlarged facilities will require a staff of approximately 20 during the season. Space assignments will be handled by the Harbor Master and fuel dispensing schedules will be established to encourage the practice of refueling of permanent resident boats on weekdays and during offhours; transients will be refueled on demand. Launch service will be provided by the Harbor Master and craft assigned will be sufficient to expedite transfer between boat and the fixed pier. Comfort station facilities, ice, fresh water and electricity will be available to the users.

Information service concerning bus schedules to the Fair, taxi service, and marine repair facilities in the area will be handled by an assistant to the Harbor Master. Both qualified technicians for light repairs and handymen will be on duty during daytime hours. Public telephones, a fire alarm system as well as a fire protection system, flood lighting and weather forecast service will be provided.

The mass water transportation system will be operated as a con-

cession during the Fair and, if attractive, subsequent to the Fair. The concessionaire will establish facilities for the safe transfer of passengers from the excursion boats to the bus loading station on shore. Fueling facilities for excursion craft is not envisioned.

A maintenance fund will be created by the owner and suitable arrangements will be made within the terms of the leasing arrangement to provide the necessary funds for maintenance and repairs. Annual maintenance reserve is estimated at \$40,000 per year to permit such work as pile replacement, float repairs, maintenance dredging within the basin and painting.

IX

COST OF PROPOSED IMPROVEMENTS

A. *Dredging Quantities and Spoil Areas*

Dredging quantities computed on the basis of 1 on 7 side slopes will depend on the new project authorized. An approximate and conservative estimate is as follows:

1. Dredging to authorized depths and widths 375,000 yd³
2. Enlarging the main and branch channels to 300' by 15', deepening the river channel as far as the Northern Blvd. Bridge to 15', deepening the present maneuvering area to 15' depth and increasing the present anchorage area to approximately twice its authorized dimensions (shown on Plates No. 3 & 4) 1,490,000 yd³
3. Additional dredging for relocating, widening and deepening the portion of the main channel in the vicinity of runway 13-31 (shown on Plate No. 3) 105,000 yd³

Dredging spoil from the Flushing Harbor has been deposited in recent years at a location known as Eaton's Neck, along the north shore of Long Island, near Huntington, a distance of 34 miles. In the course of these studies an examination has been made of a disposal site close to Flushing Harbor of vacant land approximating 460 acres owned by the City of New York which would reduce the

cost of removal of the dredged material. This prospective disposal area is bounded by: 28th Avenue from Flushing Bay to 127th Street; north on 127th Street to 15th Avenue; East on 15th Avenue to the Whitestone Parkway; along the west side of Whitestone Parkway to Flushing Bay, shown on Plate No. 8. Within this site, is an area which is being considered for additional World's Fair parking. This portion of the site will not be filled with dredging spoil.

The spoil from Flushing Bay will be mostly organic silt, which should pose no problems in hydraulic pumping. However, the spoil when dredged will give off a noticeable odor and because of its structural nature is inadequate as foundation material. In the absence of a detailed survey and boring program the quantity of usable material that can be deposited at this nearby spoil area cannot be accurately determined. On the assumption that 2 to 3 feet of fill could be placed in the area, approximately 1.5 million cubic yards could be spoiled by hydraulic pumping, which quantity is approximately the quantity to be dredged.

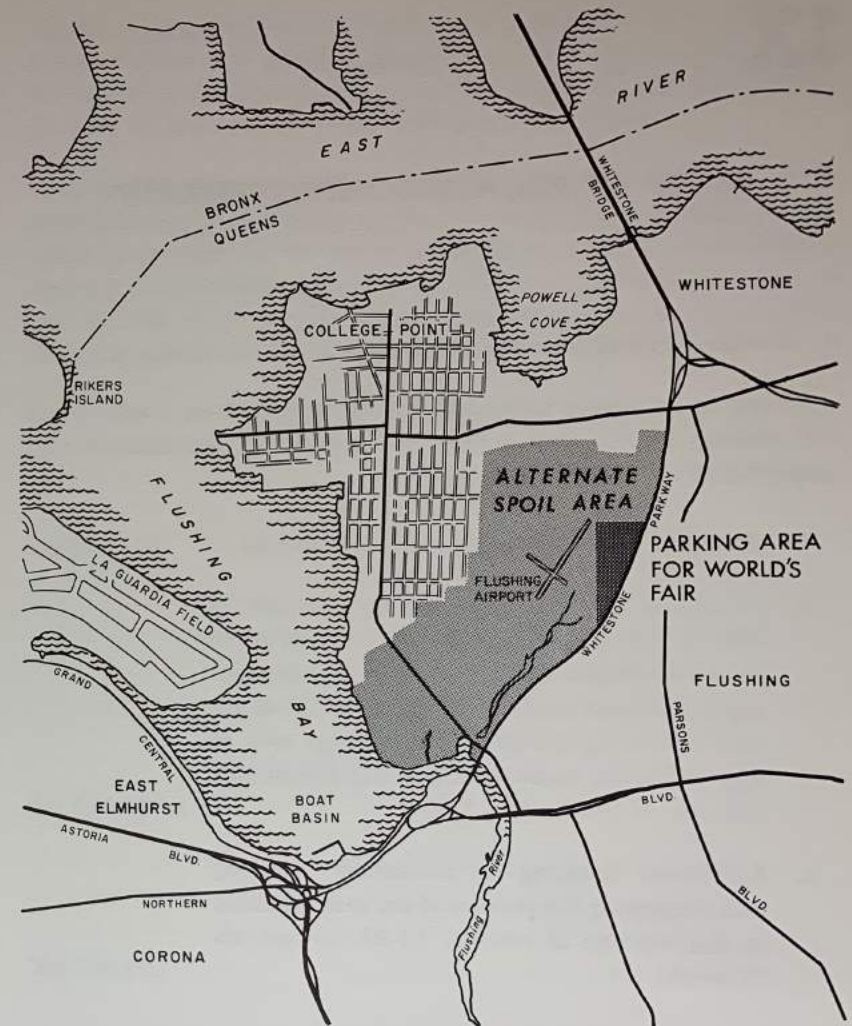
In the design period studies will be made of methods to overcome the offensive odor from the dredged materials by chemical treatment or by covering with clean fill.

B. *Cost Estimates*

The proposed development of the Flushing Bay and River will be undertaken in two phases. The first phase prior to the 1964-1965 Fair includes major navigation improvements, enlarged boating facilities, restoration of the waterfront and parking facilities. The second phase after the Fair includes additional boating facilities, including some navigational improvements and additional parking areas. A summary of the estimated cost of construction of the entire program divided into these two phases is as follows:

	Phase I Prior to 1964-1965 Fair	Phase II <u>After Fair</u>
Restoration of Existing Promenade and Parking Area at Flushing Bay and Clean-up along Flushing River	\$1,000,000	
Navigational Improvements in Flushing Bay	2,300,000	
Extension to Existing Boat Basin and Rearrangement within Basin	1,000,000	
<hr/>		
Future Marina No. 1 with Parking Area		\$ 400,000
Future Marina No. 2 with Parking Area		1,100,000

The cost of engineering and contingencies is included; however, the cost of land acquisition is excluded. The cost of maintenance dredging to presently authorized depths and widths is also excluded.



ALTERNATE SPOIL AREA

PLATE 8

X

SUMMARY AND CONCLUSIONS

The plan for immediate and long range development of the Flushing Bay and River area presented in this report consists of the following:

- A. Provision for the long term development of the Flushing Bay area for pleasure boating. These long range plans include the future construction of additional marinas adjacent to the enlarged boat basin and additional parking facilities.
- B. Provision for the accommodation of excursion boats which will call at Flushing Bay in connection with the 1964-1965 World's Fair.
- C. Enlargement of the present boat basin in Flushing Bay to provide accommodations for the increased number of pleasure boats which will be attracted to the area by virtue of the 1964-1965 World's Fair, the Municipal Stadium and the post-Fair park. These facilities will also aid in fulfilling the long range need for berthing space for pleasure craft which is sorely needed in the New York Metropolitan Area.
- D. Modification to the existing Federal project to provide suitable channel dimensions and alignment, anchorage area, branch channel and maneuvering area to accommodate the increased number of boats which will be attracted to Flushing Bay.
- E. Restoration and landscaping of the area along the Bay contiguous to existing marina which is to be expanded and along the

west side of the Flushing River. This restoration includes rehabilitation, where necessary, of the existing promenade as well as a relocation of a limited portion of the promenade immediately east of the existing boat basin. Increased parking facilities are also to be provided.

It is concluded that the improvements proposed in this report will contribute to the immediate and long range development of the Flushing Bay and River area and will also contribute toward the fulfillment of the present needs of the people of the City of New York interested in pleasure boating and will serve as an impetus to similar developments in the Metropolitan Area. Further, this development will stimulate the growth of the boating industry and ancillary fields, including boat yards and other supporting services. The project outlined in this report will require the cooperation and participation of Federal, State and City agencies as well as by the World's Fair Corporation.

XI

ACKNOWLEDGMENTS

Many public and private agencies have cooperated in providing helpful data and assistance for the preparation of this report. Their assistance is most appreciated. A list of some of the agencies which cooperated, in addition to many yacht clubs and marinas in the Metropolitan Area and several hundred yacht clubs along the Atlantic seaboard, are the following:

President, Borough of Queens
Corps of Engineers
National Association of Engine and Boat Manufacturers
Department of Marine and Aviation, City of New York
Department of Parks, City of New York
Department of Public Works, City of New York
Long Island State Park Commission
Port of New York Authority
Triborough Bridge and Tunnel Authority



EXCURSION BOAT — 11.6' DRAFT