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BRITISH VIRGIN ISLANDS .

Technical report: Feasibility study for a medium-scale fishing industry .

Prepared for the Government of the British Virgin Islands
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of J.H. Klausing, expert in fishing industry

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Vienna

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Explanatory notes

The following abbreviations have been used in this report:

BVI	British Virgin Islands
CDB	Caribbean Development Bank
CFTC	Commonwealth Fund for Technical Cooperation
CPE	catch per effort
IRR	internal rate of return
MSY	maximum sustainable yield
NPV	net present value
USVI	United States Virgin Islands

SUMMARY

This is a feasibility study for a medium-scale fishing industry in the British Virgin Islands (BVI).

It was estimated that the total fish catches will amount to 1.5 million lb of fish per year. The estimation was made on the basis of information obtained from the fishermen and of surveys and research work made by the United States Virgin Islands (USVI) authorities.

The local demand for fish was estimated at 890,000 lb per year. However, it was estimated that 952,000 lb were sold to USVI either directly by BVI fishermen at St. John or St. Thomas, or through middle men at Tortola and Anegada. The shortage of fish was partly covered by imports (valued at $469,000.

The fish terminal at Tortola, once it is established, could handle all the fish landed, which would cover the entire local demand and leave some surplus for export to the USVI. The facilities at the fish terminal would permit the increase of fish catches by 50%.

In order not to increase the prices to the consumers it is proposed that the fishermen cover the handling costs of the terminal and receive 10% less for their fish. However, with the increased catches they would not suffer a loss in income.

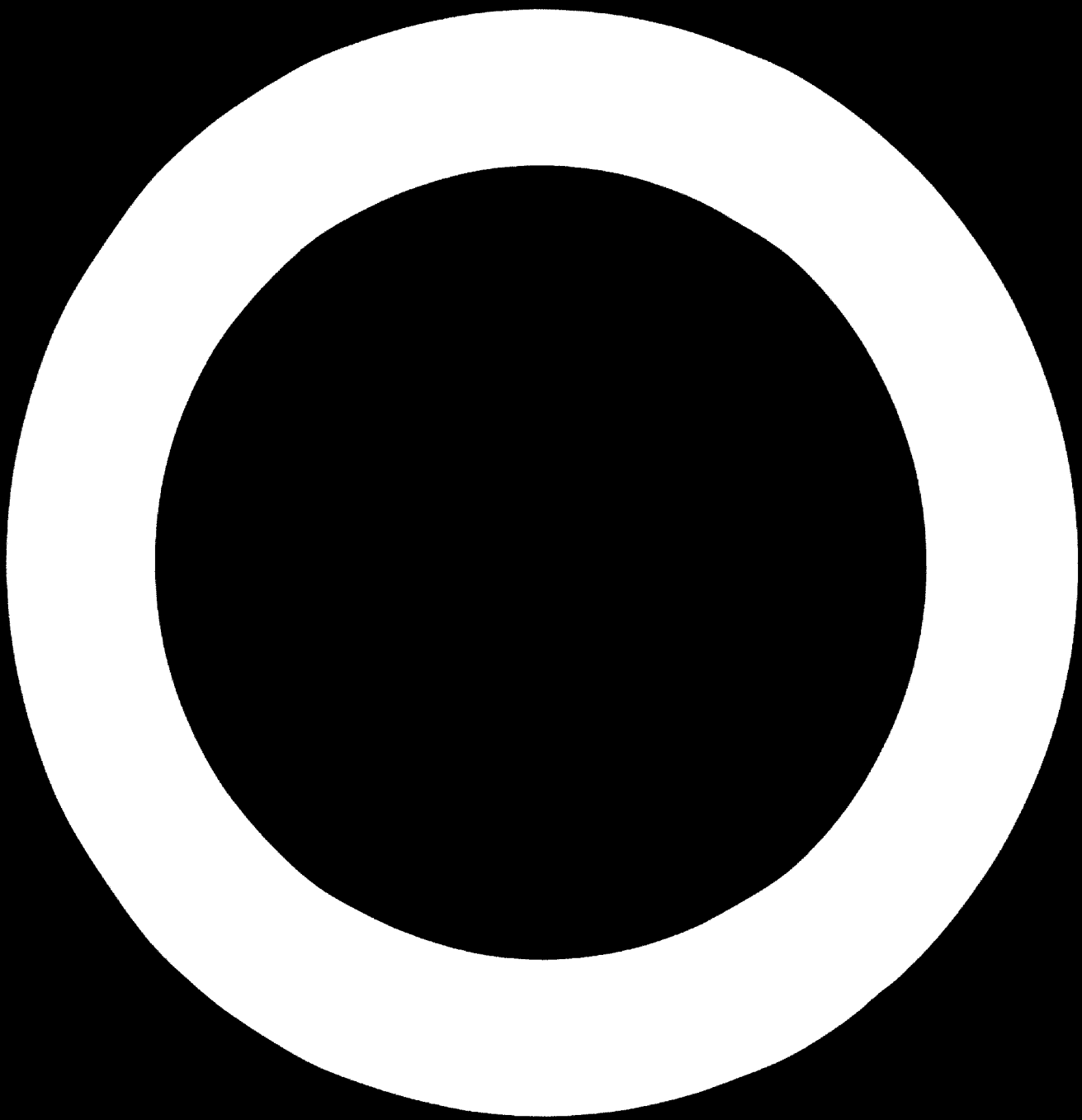
The site selected is near Roadtown, Tortola. For dock construction, reclamation of land will be necessary.

Plans for the building with offices, an ice plant, storage rooms for ice and for iced fish, six lobster tanks, stores for fishing equipment and a workshop are shown in figures IV-VI.

It is recommended that the Roadtown fish terminal be set up as an autonomous body under government surveillance.

Investment outlay and working capital are estimated at $600,000, which could be reduced to $500,000 if the land were donated.

The realization of the project would result in increased earnings and new employment possibilities for the fishermen. By covering the local consumption demand the imports could be eliminated and a savings of about $450,000 per year could be realized.



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INTRODUCTION

The British Virgin Islands (BVI) are situated 75 miles east from Puerto Rico. They are part of the curving chain that separates the Caribbean and the Atlantic and are situated on the same shelf as Puerto Rico, Isla de Vieques, Culebra, St. Thomas (USVI) and St. John (USVI). Depths of 1,000 to 1,500 fathoms have been recorded close to the shelf edges. The distance to the Leeward Islands (St. Martin, Anguilla, Saba and the others) is about 65 nautical miles and the waters are up to 1,000 fathoms deep.

The BVI consist of four main islands, Tortola, with the capital Roadtown, Virgin Gorda, Jost van Dyke and Anegada, and about 100 small islets and cays which are mostly uninhabited or have a very small population. The BVI economy is based on tourism, i.e. hotels, restaurants, yacht marinas and charter boats and yachts. The surrounding waters and bays are favorite with yachtsmen, divers and underwater and surface sportfishermen.

Fishing provides employment for many people in the BVI. There are 91 full-time fishermen (including the crews of the sloops) and 75 part-time fishermen. (Peacock: Marine Resources of the BVI 1975).

The total catch for 1976, was estimated at 983,000 lb of fish and 60,000 lb of lobsters, of which 874,000 lb were caught by traps (on the reef), 69,000 lb were caught by beach seines (pelagic fish), 40,000 lb were caught by reels (snapper and grouper).

Part of the catch is landed at St. John and St. Thomas, USVI, where prices are much better than in the BVI. In the BVI there is no organized market and all the fish is sold directly to the consumers or to the middlemen from the USVI. During the peak touristic season (in winter) fresh fish must be imported from the USVI in order to satisfy the demand.

I. CATCH ESTIMATES

The estimates were based on data from surveys and research carried out for the USVI by USA agencies Bureau of Fish and Wildlife, the Caribbean research Institute, the Caribbean Fishery Management Council, the Marine biology section section of the University of Puerto Rico; and on the information received from fishermen during interviews.

In the opinion of Caribbean Fishery Management Council (Dr. Dammann) started the USVI catches (St. Croix, St. Thomas and St. John) are near the maximum sustainable yield. According to the BVI fishermen the same is true for the BVI (Jost van Dyke, Anegada, Virgin Gorda and east end and Roadtown on Tortola).

It is not clear whether the fish population is moving away from the traditional fishing grounds, or whether they are overfished, and the other grounds, where no fishing is done, could yield much more. Most of the sloops are fishing with traps. It is not so easy to move a bulky load of 40 traps on a 15-ft vessel and fishermen are unwilling to do it without the certainty of higher catches.

A survey carried out by the Caribbean Research Institute shows that the best area for fishing with the highest catch per effort (CPE), 11,250 lb per fisherman per year, is between St. Thomas and north of Jost van Dyke. The results for the neighbouring sectors were much lower (see annex I).

By extrapolating the CPE to the number of fishermen the following estimated total catch for 1975 in the BVI is calculated:

91 full-time fishermen (3 pot hauls per week)		
	91 x 11,250 lb	1,023,750 lb
75 part-time fishermen (1 pot haul per week)		
	$\frac{75 \times 11,250}{3}$ lb	281,250 lb
Reel and sport fishing:		50,000 lb
Total estimated catch (only fish):		1,355,000 lb

The estimates of the catches for 1977/78 were based on data obtained from the fishermen during interviews at the time of this survey (July-September 1978).

Jost van Dyke. 20 part-time fishermen with 10 small 15-ft boats. Traps are hauled every 2 days, catch per haul per boat is estimated at 50 to 100 lb, average: 75 lb. The total estimated catch would be: 75 lb x 3 x 50 (weeks) x 10 (boats) = 112,250 lb per year. But if the estimates were based on the results of the USVI survey made in 1975 they would be: 11,250 lb x 20 fishermen = 225,000 lb per year.

The difference between the two estimates may be due to the fact, that the statements were intentionally lower because of the income tax. Therefore, it would be more realistic to estimate that the catch per haul per boat is 125 lb and that the total catch would be:

125 lb x 3 (hauls) x 50 (weeks) x 10 (boats) = 187,500 lb per year.

West end and northwest Tortola (Cappoons Bay, Little and Great Carrot Bays). 3 full-time fishermen at west end. In the northwest Tortola 20 boats have been counted but it was not possible to obtain any information about their catches. It was assumed that they are operated by part-time fishermen and that on the average there are 2 hauls per week, with the same catch as at Jost van Dyke (same fishing grounds) and that the total estimated catch would be:

125 lb x 2 (hauls) x 50 (weeks) x 23 (boats) = 287,500 lb per year.

Anegada. There are 30 fishermen, operating 12 small (15 ft) boats. The traps are emptied 2 times per week and each time the total catch from all the boats is around 2,000 lb. The total catch could be estimated at 2 x 50 x 2,000 lb, = 200,000 lb per year. But if the estimates were based on USVI data the total catch from the Anegadan fishermen would be: 11,250 lb x 30 = 337,500 lb per year. However, it was stated during the interviews that the fish catches were declining. Taking the possibility of intentional underestimates into account it could be estimated that the total catch would be:

250,000 lb per year.

Virgin Gorda. Ten part-time fishermen, with ten small outboard powered boats. Four full-time fishermen, operating two sloops (30 ft, inboard diesel, pot hauler, well and ice box). The sloops haul the pots 2 to 3 times per week, depending on the weather. The daily catch per sloop is around 200 lb. The total catch of the sloops can thus be estimated at:

200 lb x 2 (sloops) x 2 (hauls per week) x 50 = 40,000 lb per year.

Part-time fishermen empty the pots once a week. It is estimated that each haul gives about 100 lb. Total estimated catch would be:

100 lb x 50 (hauls) x 10 (boats) = 50,000 lb per year.

Tortola, east end. Twenty-five to thirty part-time fishermen are fishing near the northeast end of Virgin Gorda, with small outboard powered boats. Each boat has about 20 traps, which are hauled 2 times per week, giving between 50 to 100 lb of fish per haul. Total catch is estimated at:

75 lb x 2 (hauls) x 25 (fishermen/boats) x 50 (weeks) = 187,500 lb per year.

Tortola, Roadtown, Sea-Cow Bay, Baughers Bay. There are about 12 full-time fishermen in Baughers Bay and Sea-Cow Bay and about 15 part-time at Roadtown. It is estimated that each haul gives 75 lb and that the full-time fishermen are hauling twice a week and the part-time only once. Total catch is estimated at:

$$\left[75 \text{ lb} \times 2 \text{ (hauls)} \times (24 \text{ fishermen}) + 75 \text{ lb} \times 1 \text{ (haul)} \times 15 \text{ (fishermen)}\right] \times 50 \text{ (weeks)} = 236{,}250 \text{ lb per year.}$$

There are three sloops at Roadtown (over 30 ft, inboard diesel, well, ice box, pot hauler, and hydraulic reels, not used). The average catch per trip is estimated at between 400 and 500 lb. There is one haul per week. The boats are leaving Tuesday nights and returning Friday afternoons. Total catch estimate is:

450 lb x 3 (boats) x 50 (weeks) = 67,500 lb per year.

Two large boats, equiped for reel-fishing (hydraulic line haulers, fathom-meter, ice box, inboard diesel, over 30 feet) are fishing on the shelf edge east of Virgin Gorda for snappers and groupers. The average catch is 50 lb per night. Each boat makes 2 to 3 trips per week. Total catch is estimated at 30,000 lb per year.

A number of people living on the BVI and tourists practise sport-fishing. It is estimated that their number is 50 and that they land 75 lb of fish per week.

Total catch is estimated at 187,500 lb per year.

Table 1. Total estimated catch for 1977/78 (fish only)
(Pounds)

Jost van Dyke		187 500
Tortola; west end and north west		287 500
Anegada		250 000
Virgin Gorda	Sloops	40 000
	Part-timers	50 000
Tortola; east end		187 500
Tortola; Roadtown	Small craft	236 250
	Sloops	67 500
	Reel-fishing	30 000
Sport-fishing		187 500
	Total	1 523 500

If the catches of the sport-fishermen were deducted the total would be 1,336,250 lb, which is close to the estimate of 1,355,000 lb based on USVI and N. Peacocks data. The data have been collected during the summer period (July/August 1978). The rough weather conditions in winter have been taken into account in the total computation of estimating the average catch per haul.

It would be impossible to conclude from these results that the yields of the BVI fishing grounds are declining. But, taking into consideration the findings of Dr. Dammann (Caribbean Fishery Management Council) it would not be advisable to increase the fishing effort until much more is known about the fish stock on the BVI shelf.

It has also been noted during the survey that some part-time fishermen (Jost van Dyke) are making three hauls per week while full-time fishermen (Anegada) make only two hauls per week. This may be caused by the fact that the fishermen from Jost van Dyke have a ready market nearby at St. John, while the fishermen from Anegada must wait for the middlemen from the USVI who come twice a week to collect the fish.

Table 2. Estimated number of fishermen and boats

	Small boats	Larger boats	Fishermen	
			Part-time	Full-time
Jost van Dyke	10	-	20	-
Tortola; west end and northwest	23	-	20[a]	3
Anegada	12	-	-	15
Virgin Gorda	12[a]	2	10[b]	4
Tortola; east end	25	-	25	-
Baughers Bay	12	-	-	12[a]
Sea-cow Bay	12	-	-	12[a]
Roadtown	15	3	15	12
Reel-fishing	-	2	-	3
Total	123	7	90	61

a/ No exact data are known.

b/ As communicated by the fishermen (more boats than crew).

c/ One boat from Roadtown, one from Anegada.

II. MARKETS AND PRICES

The fish consumption in the BVI is estimated at 65 to 75 lb per person per year. It is assumed that the demand for fresh fish in the small villages is satisfied and that only Roadtown (population: 9,000) will have a real need for more fish. At the estimated consumption of 70 lb per year per person, the total demand would be 630,000 lb per year. This figure does not include the demand of the tourist industry.

In 1977, about 85,000 tourists, with an average length of stay of 7,5 days were visiting the BVI. This represents 637,500 days or 1,746 persons per year. From interviews with hotels and restaurants we may assume that the demand for fresh local fish by tourists is at least twice as high as by the local population. The consumption is estimated at 150 lb per year per person that is 260,000 lb per year. Therefore, the estimated consumption for the BVI would be 630,000 lb (local population) + 260,000 lb (tourists) = 890,000 lb per year.

It has been observed that the summer period is best for fishing and that the catches decline in winter. On the other hand, the tourist season and, therefore, the demand is at its peak during the winter. That is the reason why hotels and wholesalers are importing fresh and frozen fish (frozen grouper filets at $2,89 per lb and frozen red snapper at $3,49 per lb.

The unbalance in offer and demand occurs because too much fish is landed in the USVI, especially during the winter. The projections in table 6 show that this unbalance can be remedied by setting up a fish terminal at Roadtown. The terminal will be a market moderator and will export only the surplus after the demands of the population and the tourist industry were satisfied.

The total catch for 1978 was estimated at 1,532,750 lb of fish. The imports for this year, based on the data for 1976, were estimated at 111,736 lb, of which 27,607 lb were fresh, chilled and frozen and 28,043 lb were dried, smoked and pickled, or equivalent to 84,129 lb of fresh fish. The exports (direct landings) to the USVI amounted to 952,500 lb. The total shortage that should be covered by imports is estimated at 318,750 lb of fish, with an approximate value of $486,560 (average price, $1.46 per lb).

The fishermen could make more hauls per week if there were ready markets. If the weekly hauls were doubled it is estimated that the catch would increase by 50%. If the fishermen were to set another set of traps that would be emptied every second haul, the catch could increase between 50 and 100%. It is estimated that the catch will increase, provided the fish stocks are sufficient, by 75% and that the total catch available for the Roadtown fish terminal will be as follows:

	lb
Anegada	437 500
Virgin Gorda (sloops)	70 000
Tortola, east end	328 125
Tortola, Roadtown	
Small craft (full-timers)	315 000
Sloops	118 125
Reel-fishing	50 000
Sport-fishing	187 500
Total	1 506 250

The data for Jost van Dyke and Tortola, west end and northwest are not included because it is expected that the fish from this area will be sold at St. John, USVI, where the prices are higher.

This quantity would satisfy all demands of the BVI for fresh fish. It is estimated that 60% of the total projected quantities will be caught in summer, and 40% in winter. The demand of the local population will be the same during winter and summer, while the demand of the tourist industry will be 25% in summer and 75% in winter.

Table 3. Projected offer and demand during summer and winter (lb)

	Offer	Local population	Tourist industry	Surplus
Summer	900 000	315 000	65 000	520 000
Winter	600 000	315 000	195 000	90 000
Total	1 500 000	630 000	260 000	610 000

Surplus can be easily sold in USVI at $1.25 per lb, which compares favourably to the prices paid now ($0.90 per lb). Thus realizing an additional profit of $213,500 in foreign currency (0,35 x 610,000).

At present, there is a well-equipped fresh-meat and -fish market in Roadtown (buying fresh fish at $1 per lb and selling at $1,35 per lb). The other fresh fish is sold at the Government jetty on Friday nights, when the sloops are coming. It is very seldom that fresh fish (uniced) could be bought at the Saturday market. A fish terminal with a daily supply of fresh fish would improve the retail marketing. Two most important wholesalers (one is catering to hotels and restaurants, the other is running 4 supermarkets at Roadtown and Tortola, east end) would be interested in buying fish from the fish terminal. They have adequate freezing units, which would eliminate the necessity of installing a freezing unit at the fish terminal.

In the BVI there are 25 hotels, 8 guest houses, 12 yacht marinas and 22 restaurants catering to tourists. All these establishments will be happy to have a ready fish market and not to wait for the arrival of fishermen. However, they are not willing to pay more than $1,25 per lb for snapper and grouper, $1,00 per lb for other fish and $2,25 to $2,50 per lb for lobster.

In the BVI, as in many tropical countries, most of the consumers dislike iced fish, which they consider as "unfresh". Considering that at the fish terminal all the fish will be kept on ice it would be advisable to start a campaign to promote the idea that iced fish is well kept fresh fish.

Ciguatera poisoning is one of the major deterrents to efficient and wide-spread marketing of most species of shallow water fish in the Caribbean. Therefore, the Roadtown fish terminal will have to take some measures for detection of ciguatoxic fish. In this connexion, the following publication merits a special attention: Hokama, Banner and Boylan, A radioimmunoassay for the detection of ciguatoxic fish (1977) Toxicon Val./Pergamon Press, United Kingdom.

For the consumer, the prices at the fish terminal should not be higher than the present ones. For this reason, the operational costs of the fish terminal should be charged to the fishermen. These charges are estimated at 10% of the prices paid now to the fishermen at Roadtown. Thus, the prices would be $1.10 per lb for snapper and grouper, $0.90 per lb for other fish and $2.25 per lb for lobster, which are equivalent to the prices paid now by the middlemen from USVI. The fish terminal will be a ready market for all the fish, thus the fishermen could make more catches and increase their income. Also, at the terminal, they could buy the fishing equipment at cost price.

III. FISH TERMINAL

Location

The fish terminal will be built near Roadtown, Tortola, between Wickhams Cay 2 and Port Purcell (see figures I and II). The site has good road connexions to all parts of the island and is readily accessible to all type of vessels. The main part of the customers will be from Roadtown, but a carrier service by van can be organized to cover the whole island of Tortola. Virgin Gorda, Peter Island, St. Thomas and Anegada (25 nautical miles) could be reached easily by a fast boat.

The site selected will not spoil the environment of the town and touristic centres.

The waterfront is very shallow and the area will have to be reclaimed up to the point where a depth of 10 ft can be obtained by dredging.

The area belongs to a private company which is willing to rent or to sell it to the Government.

It is recommended that the site be bought because of high costs of reclaiming and construction.

Planned facilities

The dock side, will be 170-ft long (figure III). It is planned to use 120 ft for the buildings of the fish terminal and leave the rest for future expansion (figures IV and V). A covered dock with moorings, is planned for unloading the catches. From there the fish will be transferred to a reception area where it will be weighed, sorted, cleaned and dressed. Special concrete work tables for cleaning and dressing will be provided. Cleaned and dressed fish will be iced and stored in the cold storage room. For live lobsters, special tanks should be constructed. The reception area will be used also for packing the fish for shipment.

A store for retail sales of fishing equipment, a repair shop for outboard motors, offices for staff and manager and offices for the Fisheries Department are also planned.

Figure I. Location of the fish terminal

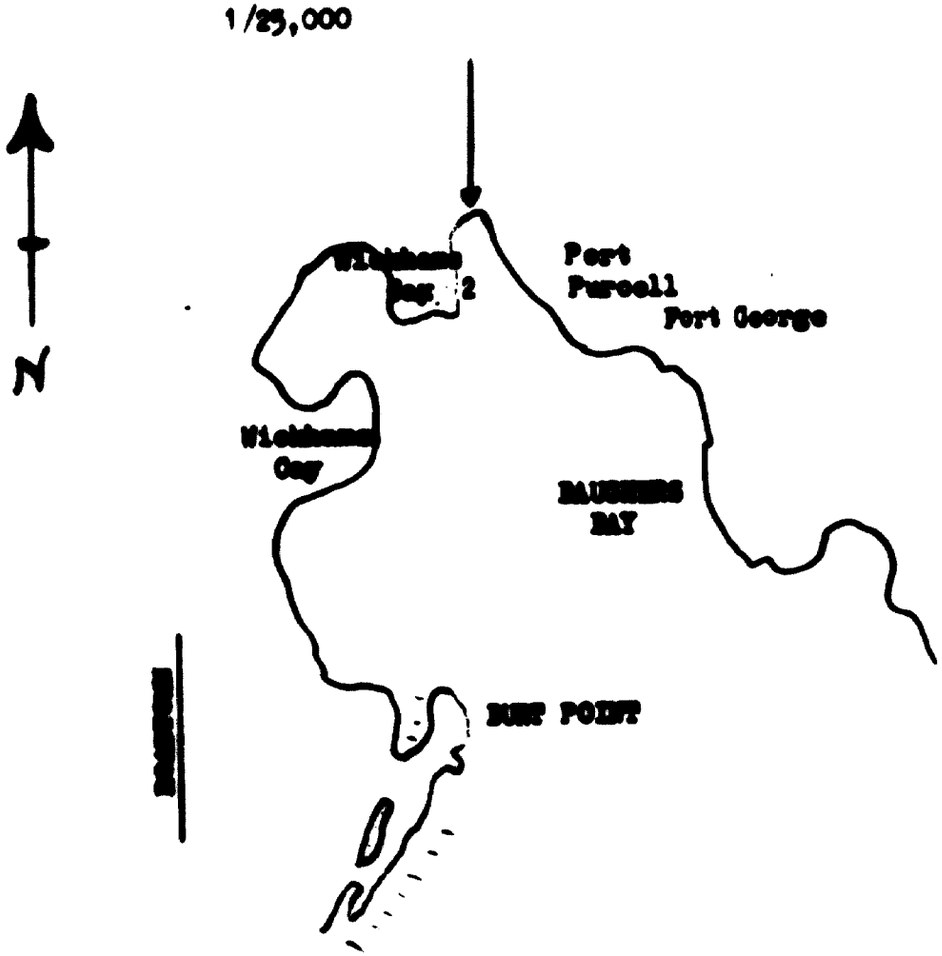
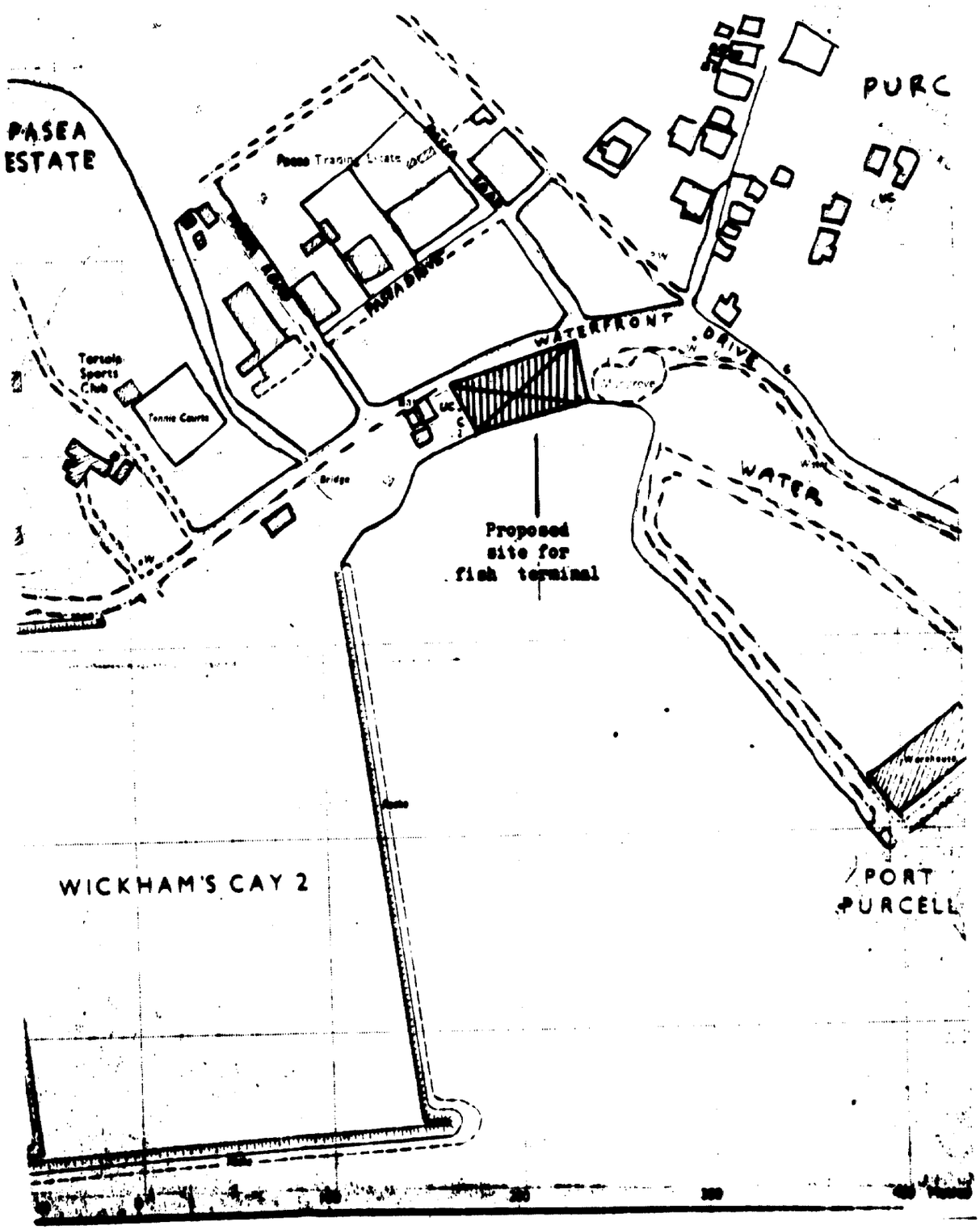


Figure II. Location of the fish terminal



Source: D.O.S. 046 - Sheet TORTOLA 2838 - Edition I.D.O.S. 1972.

Key:

UC	Under construction	FP	Footpath
P	Post, pole or pylon	C	Culvert
Ter	Terraces	Dr	Drain
Tk	Tank	WDr	Wide Drain
oW	Well	Str	Stream
▲	Trigonometrical station	WStr	Wide Stream
47	Spot height		
	Bench mark		Wall, fence or hedge

Figure III. Plan of the site

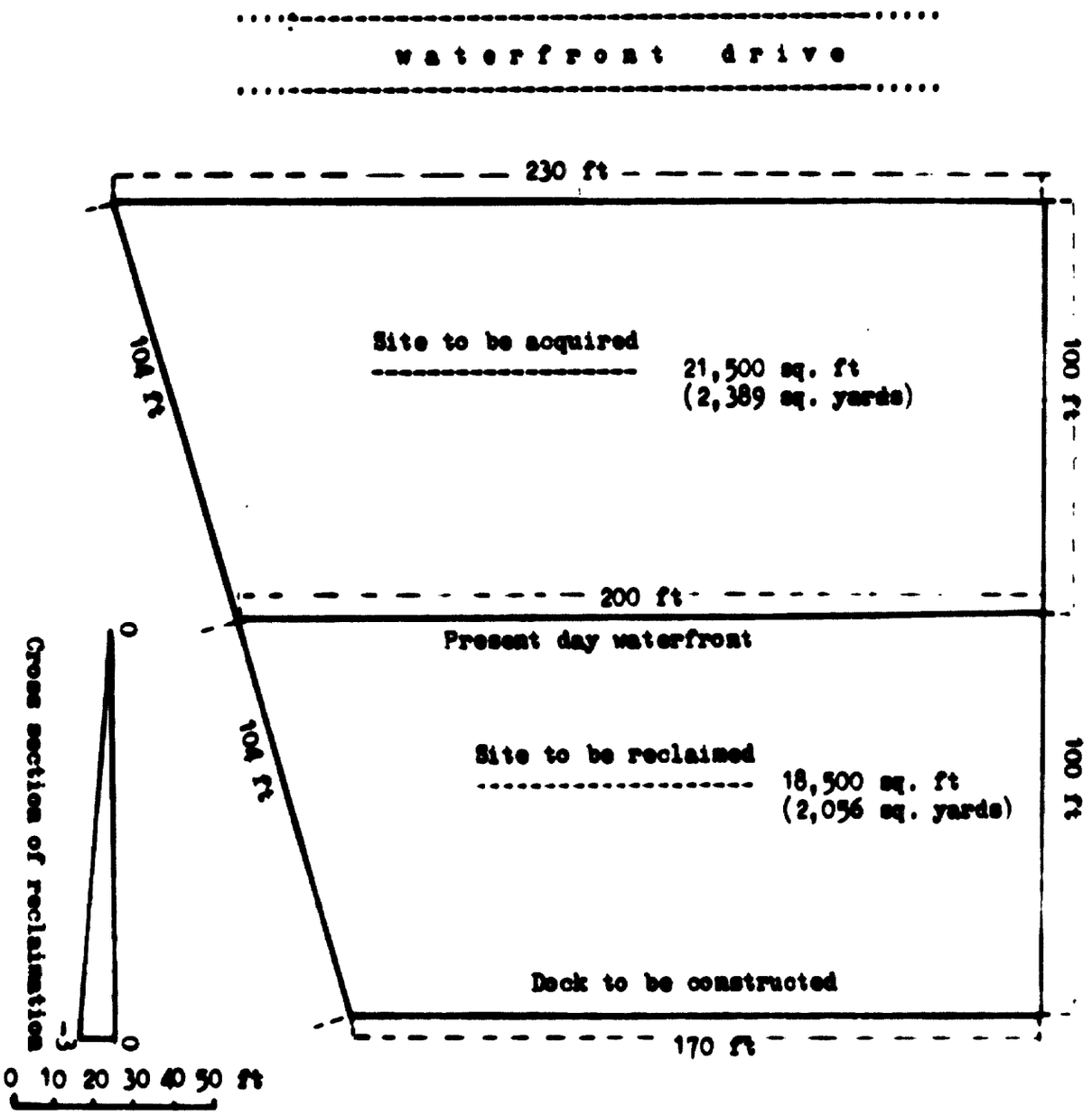
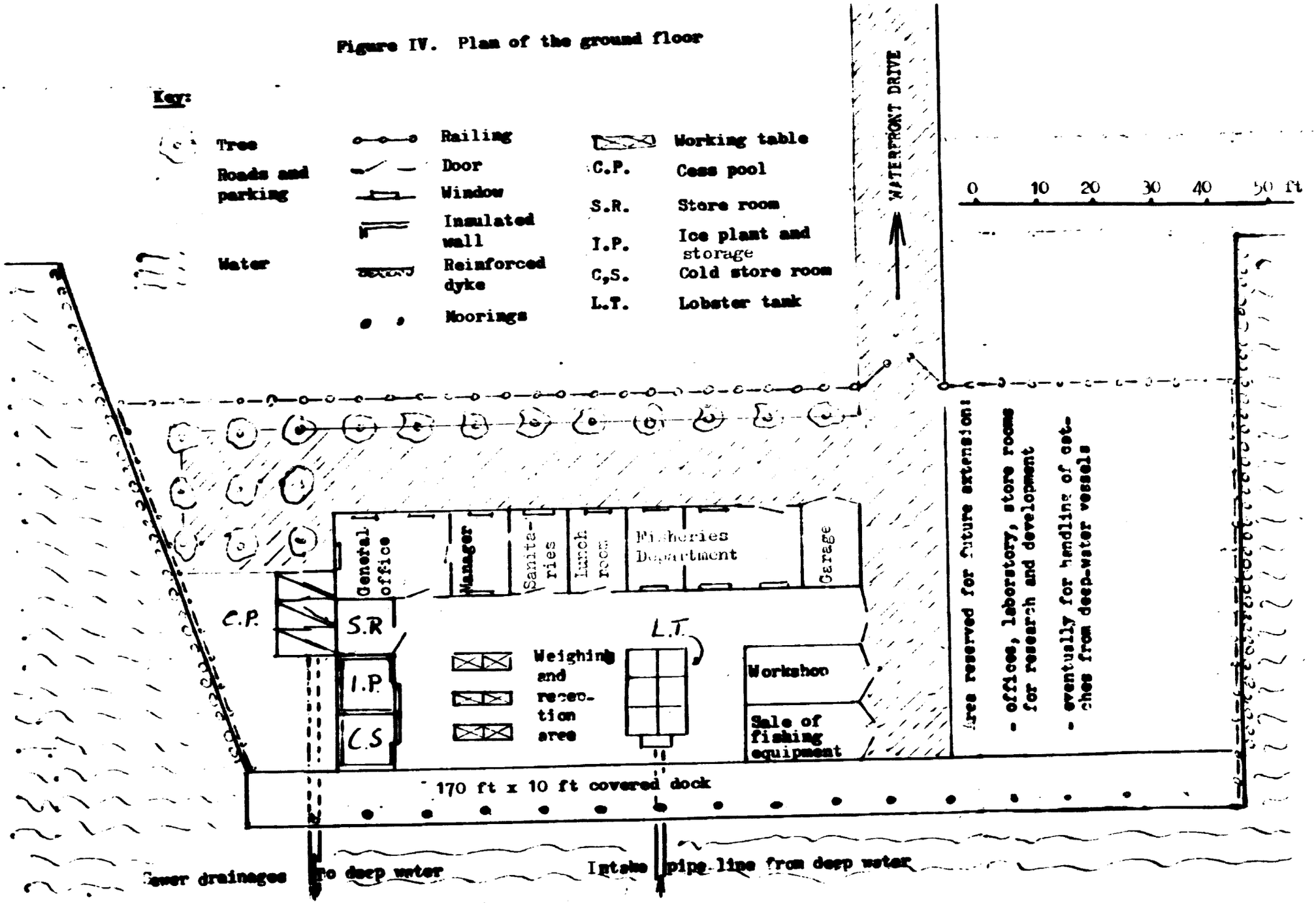
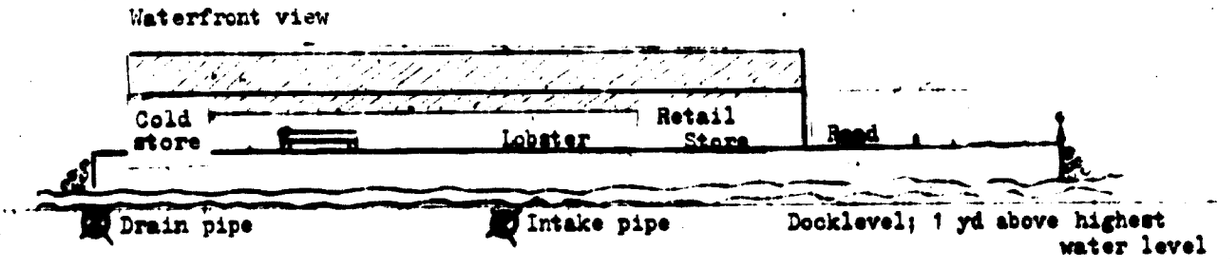


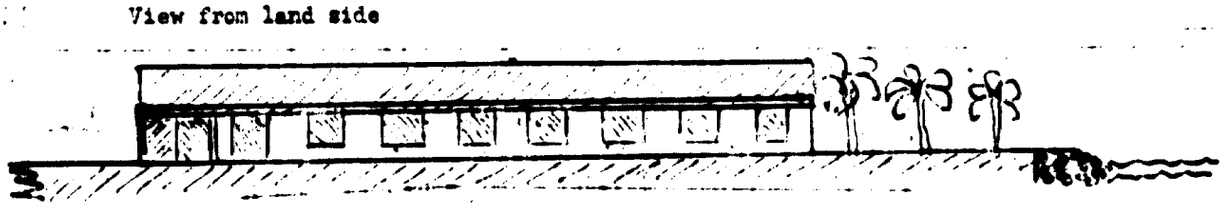
Figure IV. Plan of the ground floor

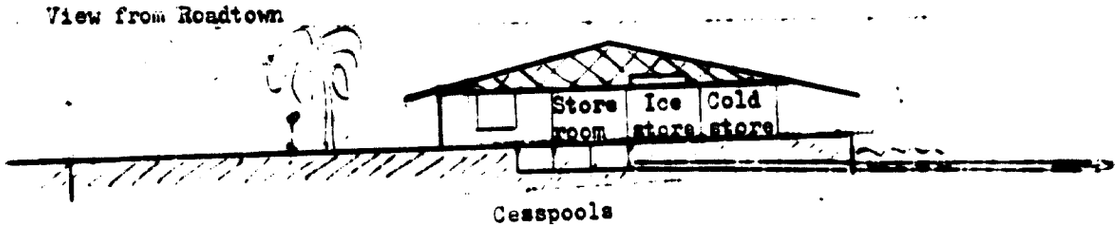


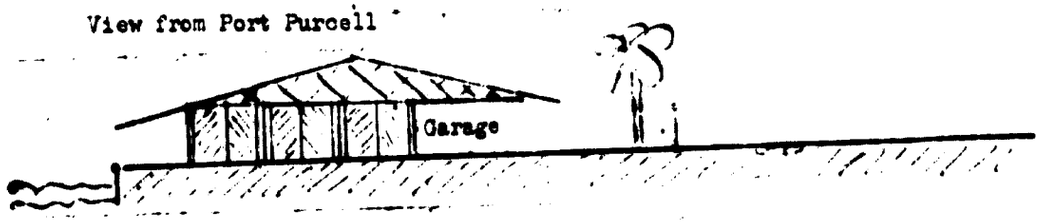
0 10 20 30 40 ft

Figure V. Fish terminal









The work tables (figure VI) will have fresh-water wash bassins, with drains.

When in full operation, the fish terminal will handle 4,800 lb of fish per day. To ice the fish the same amount of ice will be needed.

The proposed automatic ice plant will work 7 days a week and will have a production capacity of 2,000 kg (4,400 lb) of ice per day equal to 6,000 lb per working day. The ice maker should be built over the storage room for ice. The capacity of the ice storage room should be about 16 m^3, which would permit to store much more than the 6 t of ice, which are suggested in case of plant breakdown or stoppage for maintenance (figures VII and VIII).

The capacity of the cold store-room for iced and boxed fish should be 25 m^3, which would permit to store over 5 tons of fish. The temperature in the store-room should be between 1° and 5°C (34° and 41°F). For storing the fish in the cold store-room, 100 plastic boxes, each with a capacity of 50 lb of fish and 50 lb of ice will be needed. For transportation of fish to consumers and from Anegada, 50 insulated containers ("IGLO" type) with lid, each for 50 lb of fish and 50 lb of ice will be needed.

It is expected that 160 lb of live lobster per day will have to be stored at the fish terminal. For that, six tanks, each with a capacity of 150 to 200 lb of lobster will be provided (figure IX). A suction/pressure pump will pump the clean sea-water through a pipeline from the bay and spray it over the tanks. An overflow in the tanks will keep the water at a constant level.

Two handcarts will be needed, one for transportation of fish to the reception area and one for transportation to the van. For sanitary reasons, the carts should not enter the handling hall.

A store-room for empty (oleaned!) fish boxes and for other equipment (handcarts, weighing machines, etc.) will be needed.

A 1.5-t van will be needed for transportation of fish to the customers. The fish will be transported in insulated containers, therefore no insulation of the van will be necessary.

Transportation to other islands (Peter Island, Virgin Gorda, St. Thomas) and collection of fish and lobsters from Anegada, should be done by a 21-ft boat, with a 135-hp outboard engine and a covered deck. It should have a spare engine in case of breakdown. When sailing to Anegada, it should carry ice in insulated boxes for transportation of collected fish.

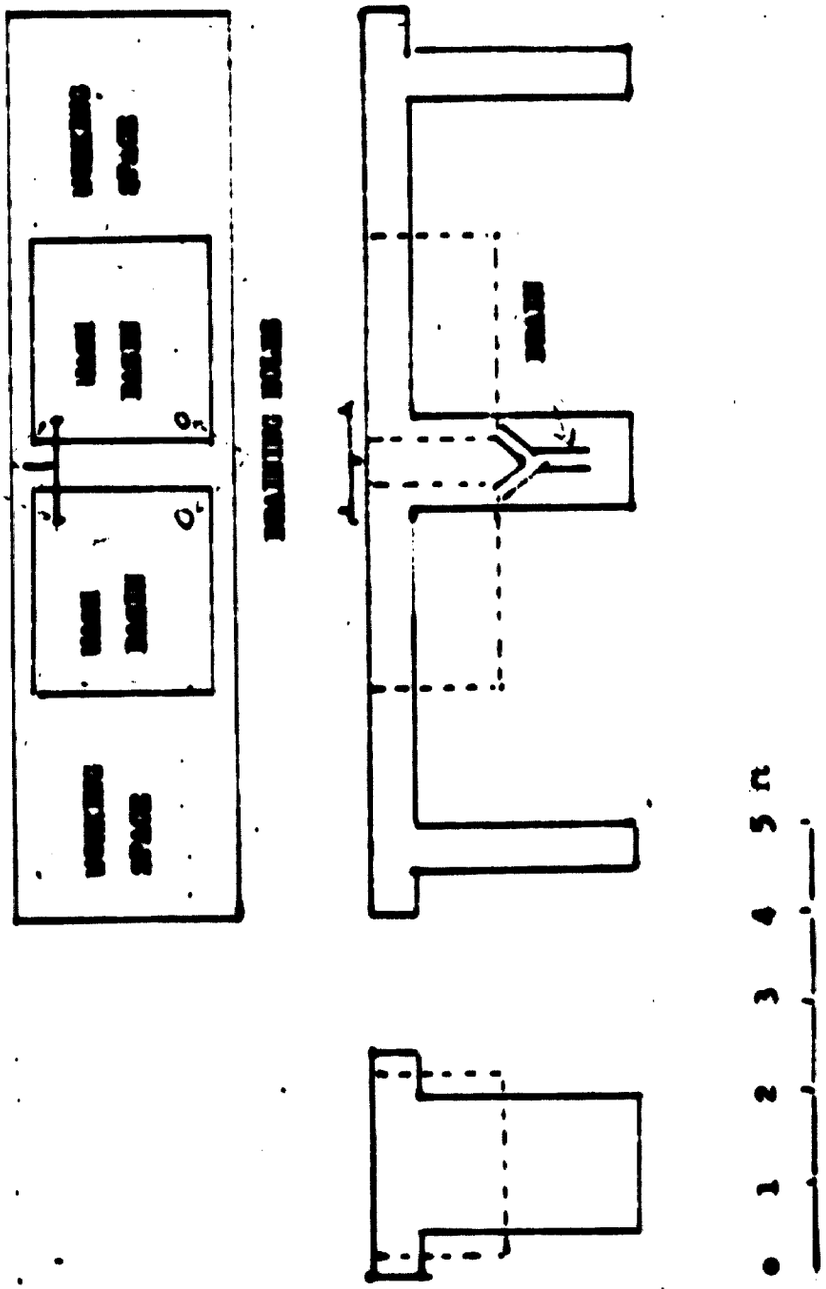


Figure VI. Work tables for cleaning and dressing

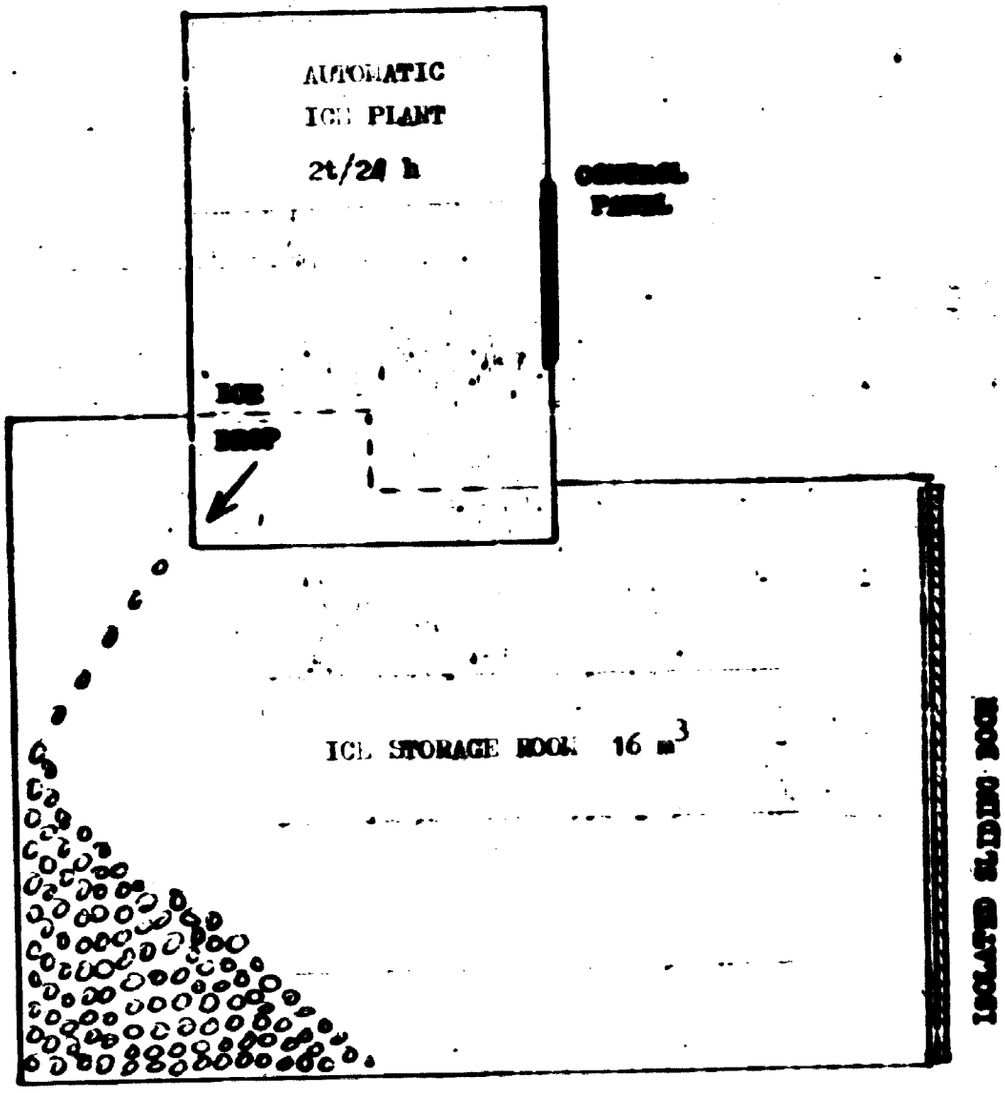


Figure VII. Ice plant and ice storage. Waterfront view

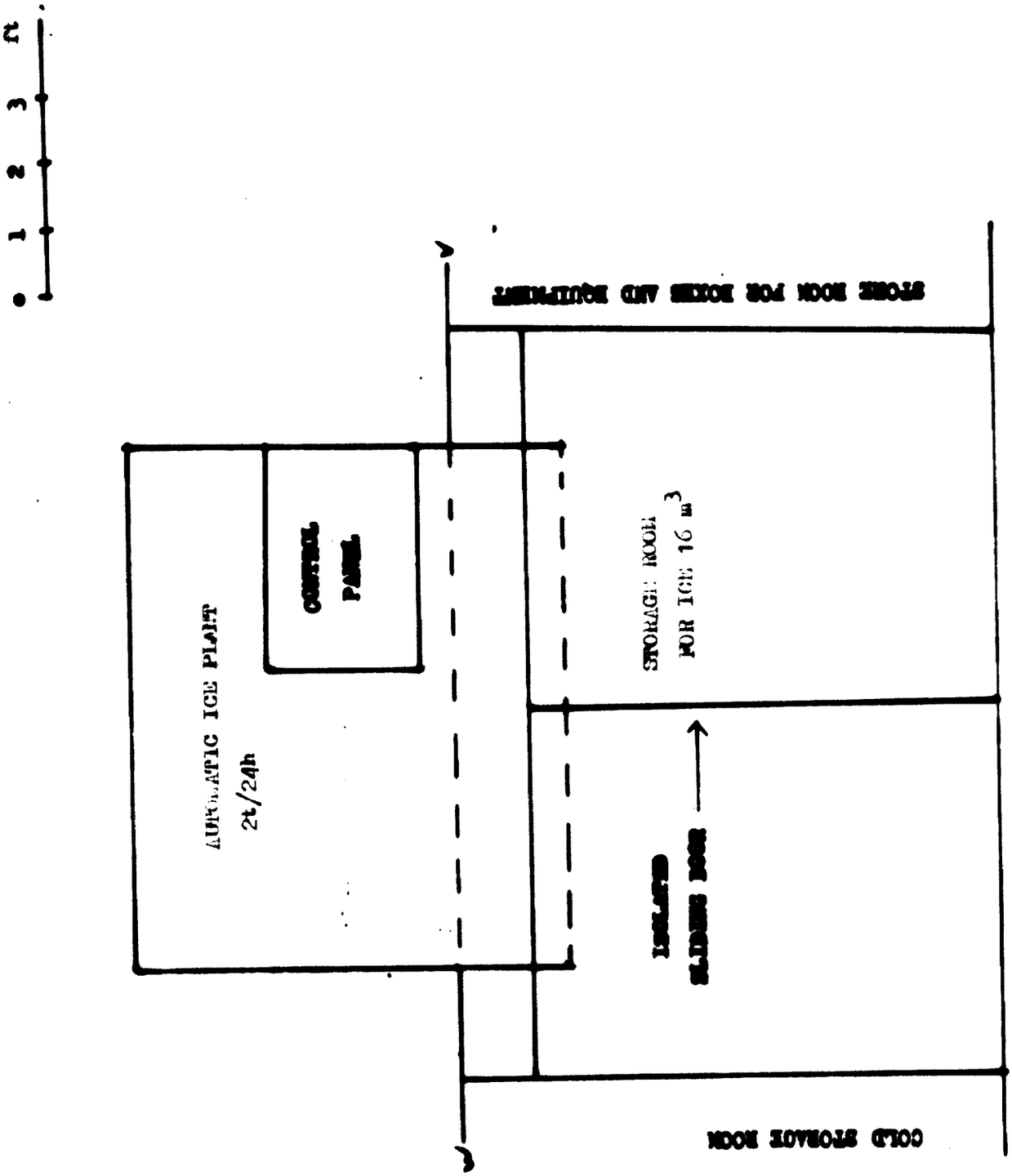
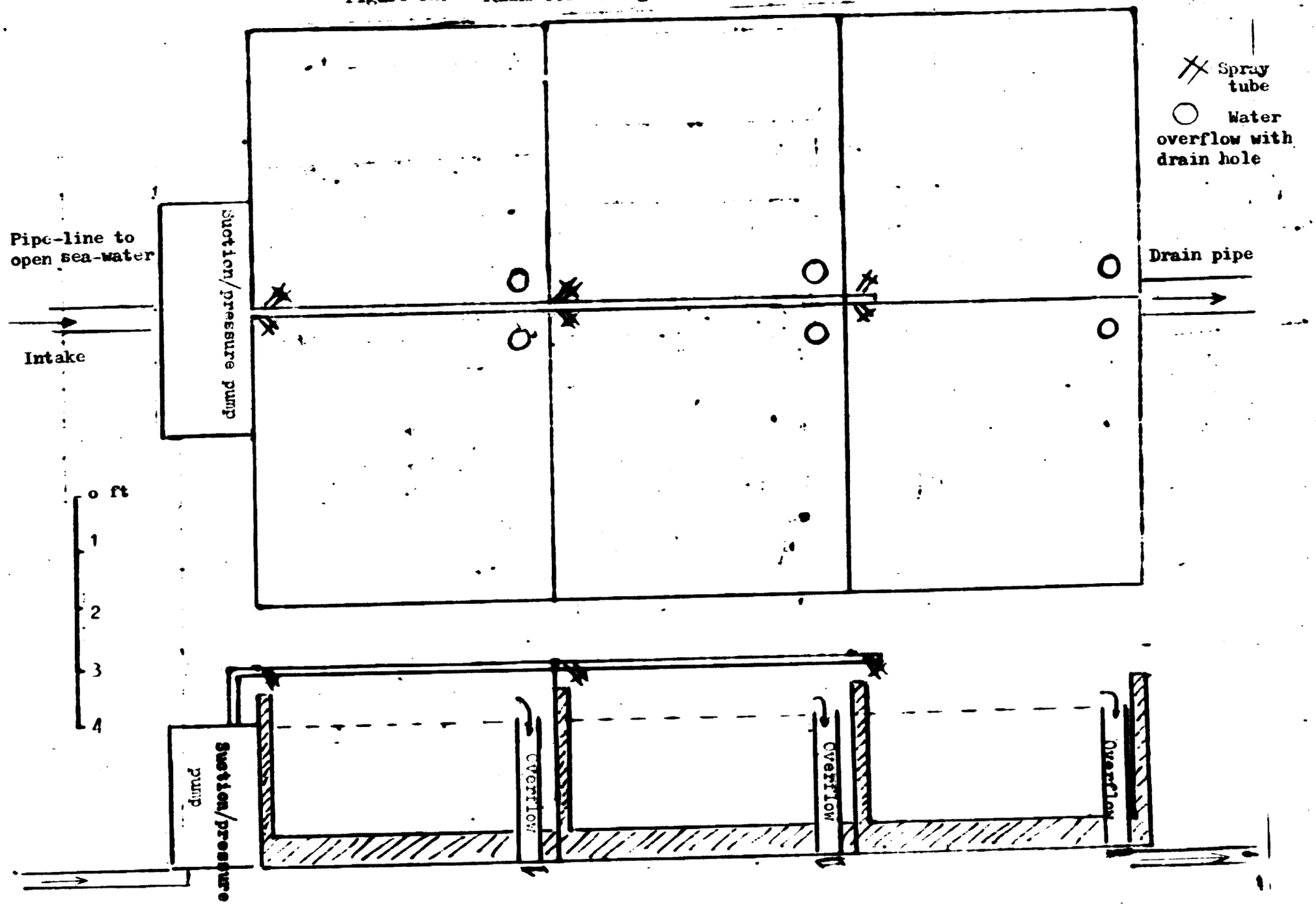


Figure VIII. Ice plant and ice storage. View from the hall

Figure IX. Tanks for storage of live lobsters



A set of spare outboard engines should be kept at the fish terminal. They could be used by fishermen during the time their engines are in repair and maintenance.

Special attention should be given to the sewer system. The water used for cleaning should not be discharged directly into the sea; it should pass through a system of cesspools and then piped into deeper waters. Offal should be collected in special lidded plastic vats and disposed of by the Public Health Department.

Parking area and access roads will be planted with trees. The complete area will be encircled by a railing fence.

It is recommended that a cold store-room be constructed at Anegada (figure X). The ice could be brought over by the boat that will collect the fish. A scale, a cold generator, working tables and offal vats should also be provided.

Operation scheme and personnel requirements

The following operation scheme is recommended:

(a) Fish should be sorted and weighed. Small fish (under 0.5 lb) female lobsters carrying eggs and fish suspected to be ciguatoxic should not be accepted. A receipt for payment purposes should be given to the fishermen;

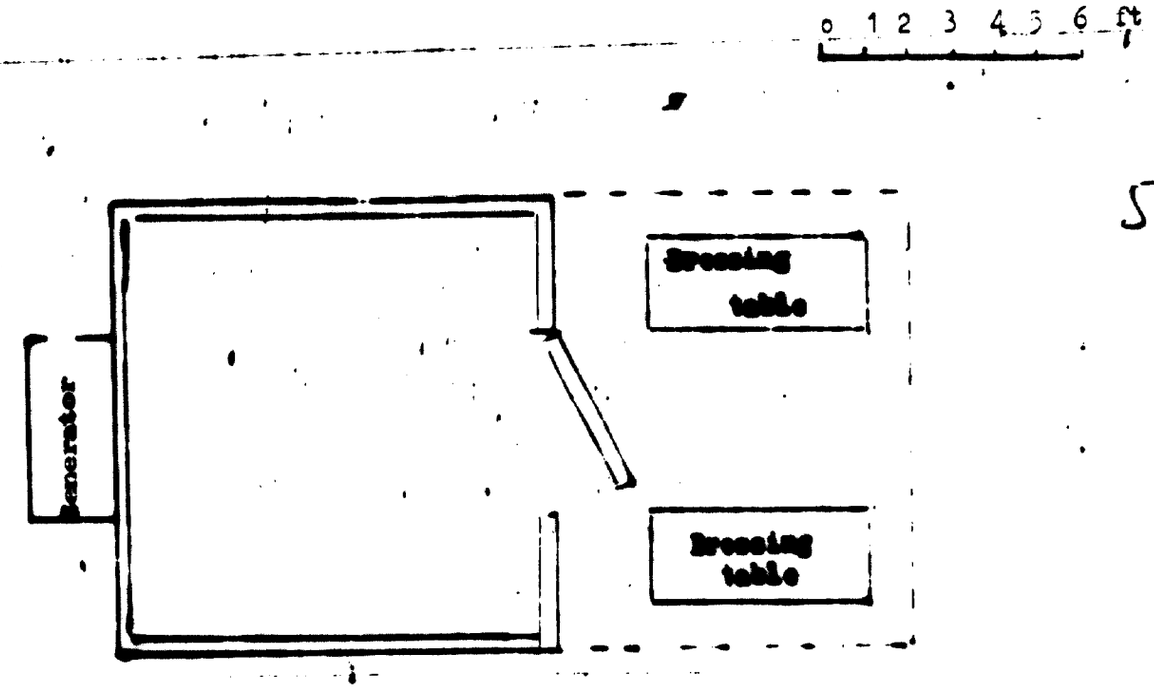
(b) The accepted fish should be transferred to the dressing tables where it will be cleaned, scaled and packed in ice into plastic fish boxes. Net weight of fish, type and date of storage should be marked on each box, then the fish should be stored in the cold store-room;

(c) At Anegada, the fish should be, weighed, iced and packed into special insulated boxes and then stored in cold store-room until it could be transported by a boat to the fish terminal where it will be repacked as described under (b). The fishermen should be paid upon delivery at Anegada.

The weight of incoming and outgoing fish, by species, should be noted in a special register, in order to be able to tell at each moment how much and what kind of fish is available for sale.

At the end of each week the surplus fish should be transported by boat to St. Thomas where it could be sold either to middlemen or to the fishermen's co-operative.

Figure X. Cold store room at Anegada



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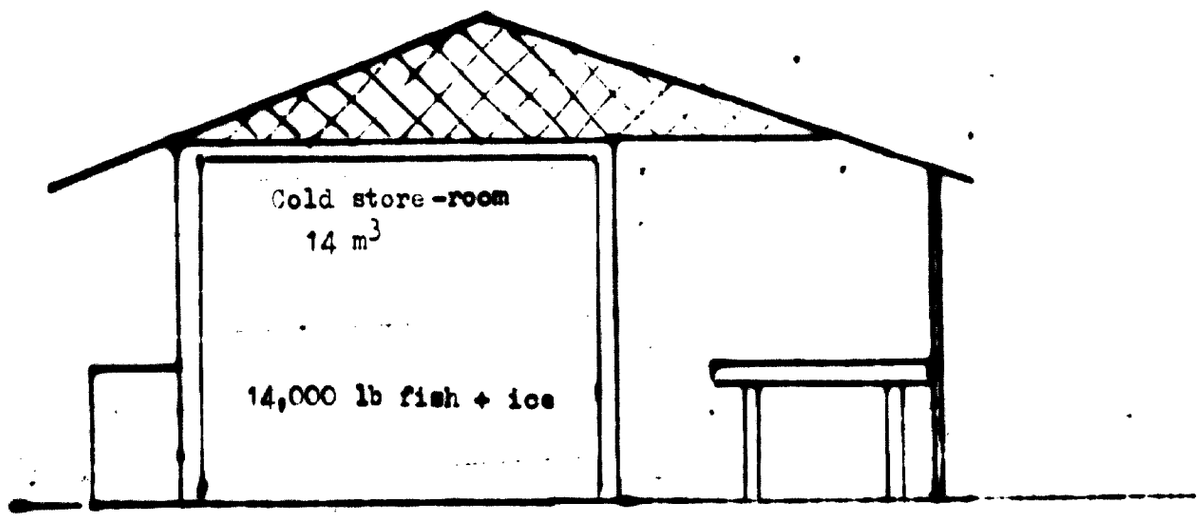
Ground plan



Side view

The staff requirements are estimated as follow:

Number	Capacity	Duties
1	Manager	Supervises all operations; notes weight and species of accepted fish, controls cleaning and storage, notes orders from the customers and gives orders to carry them out. Keeps in touch with fishermen and clients. Is responsible for good management and running of the fish terminal. Reports periodically to the Government
1	Bookkeeping clerk/cashier	Takes account of all incoming and outgoing fish and equipment. Pays for the fish. Sends and collects invoices
1	Typist/ secretary	Types letters, invoices, etc. and files the documents. Assists manager and bookkeeper
2	Mechanics	Repair and maintenance of engines, especially outboard motors. One will drive the van and take care of the ice machine, the other will sail the boat
1	Skilled workman	On the boat, takes charge of deliveries to and sales at St. Thomas (USVI). Collects the fish from Anegada (weighs and registers the fish, and pays the fishermen)
4	Labourer	Cleaning, scaling and packing of fish for storage and for delivery. Keeping the premises and equipment clean and in good order
2	Nightwatchmen	Guarding the terminal at night and during the holidays.

IV. FINANCIAL ANALYSIS

It is proposed that the Roadtown fish terminal be established as an autonomous body, under the direct control of the Ministry of Natural Resources and Health.

The life of the project is expected to be 20 years (construction year not included). An important part of the equipment should be replaced after 10 years. It is planned that the project be financed by a loan from an international financial organization. A repayment period of 10 years with 5 years grace is envisaged. The 5 years operation after discharge of the loan should bring high profits which could be used for extension of the operations beyond the shelf. The total capital requirements are estimated at $600,000, of which $533,000 would be for investment costs (table 4) and $67,000 for working capital. The capital requirements could be covered either completely by a loan or partly by a loan and partly by a grant.

Investment costs

Land and site preparation

The selected site is on the northern part of the bay between Wickhams Cay 2 and Port Purcell (figures I and II). The estimated area of the land between the Waterfront drive and the waterfront is 21,500 ft^2 (figure III). The waterfront is very shallow and it is proposed to reclaim more land in order to reach a depth of 3 ft at which the dockside can be dredged up to 10 ft, which would permit the larger fishing boats to moor. Because of a very slack tide, the dockside and its approaches should be dredged every year.

The waterfront dock, 1 yard above highest water level, will have a length of 170 ft, of which 120 ft will be used now and the remaining 50 ft will be reserved for future development. Cost estimates (based on August 1978 prices) for land and site preparation are as follows:

	Dollars
Land (21,500 ft^2 at $5)	107,500
Dock (120 ft at $750)	90,000
Reinforced dikes (131 yd^3 at $10)	1,310
Reclamation (5,140 yd^3 at $4)	20,560
Dredging	1,000
Total	220,370

Table 4. Capital investment, depreciation and residual value

	Depreciation period (years)	Capital investment ($)	Annual depreciation ($)	Capital expenditures for replacement ($)						Residual value	
				Oy[a] = 5	RV[b]	OY=10	RV	OY=15	RV ($)	% of cost	Value ($)
Land acquisition[c]	20	107,500	-	-	-	-	-	-	-	-	200 000
Site preparation[c]	20	112 870	-	-	-	-	-	-	-	-	
Building	20	101 250	5 063	-	-	-		-		10	10 125
Landscaping	20	78 000	3 900	-	-	-	-	-		10	7 800
Anegada cold store-room	20	2 820	141	-	-	-	-	-		10	282
Water, telephone, electricity[d]	20	1 500	75	-	-	-	-	-		-	-
Office equipment	10	2 000	200	-	-	2 000	200	-		10	200
Ice maker	10	20 000	2 000	-	-	20 000	1 000	-		5	1 000
Generators	10	10 500	1 050	-	-	10 500	525	-		5	525
Lobster-tank pump	5	2 000	400	2 000	100	2 000	100	2 000	100	5	100
Pipe lines	20	10 000	500	-		-		-		-	-
Van	5	5 000	1 000	5 000	250	5 000	250	5 000	250	5	250
Boat: Hull	10	3 000	300	-		3 000	300	-		10	300
2 outboard engines[e]	10	5 500	550	-		5 500	275	-		5	275
Plastic fish boxes	5	3 000	600	3 000	150	3 000	150	3 000	150	5	150
Insulated fish boxes	5	5 000	1 000	5 000	250	5 000	250	5 000	250	5	250
Offal vats	5	300	60	300	15	300	15	300	15	5	15
Handcarts	5	300	60	300	15	300	15	300	15	5	15
Scales	5	1 500	300	1 500	75	1 500	75	1 500	75	5	75
Spare outboard engines (5)[f]	10	8 750	875	-		8 750	438	-		5	438
Work shop equipment	10	4 000	400	-		4 000	200	-		5	200
Contingencies[g]		48 210	-	-	-	-	-	-	-		-
Total		533 000	18 474	17 100	855	70 850	3 793	17 100	855		222 000

a/ Operation year.

b/ Residual value.

c/ No depreciation computed. It is expected that the value will

d/ No residual value.

e/ Expected life time of an engine is 5 years. The engines will be used alternately.

f/ Expected life time of each is 2 years.

g/ Including on building and equipment $26,500.

Building and equipment

The proposed building (figures IV and V) will cover an area of 4,050 ft^2. Cost estimates for building and equipment are as follows:

	Dollars
Construction (4,050 ft at $25)	101,250
Landscaping, roads, parking and cesspools fencing (7,800 ft^2 at $10)	78,000
	2,820
Water, telephone and electricity hook-up	1,500
Office furniture and equipment	2,000
Ice plant	20,000
3 generators (cold storage, ice storage and cold storage at Anegada)	10,500
Suction/pressure pump for the lobster tanks	2,000
Pipe line for fresh water for lobster tanks and disposal of sewage into deep water (2 x 1,000 ft at $5)	10,000
Van, 1.5 ton	5,000
Transport boat, sheltered, 23 ft length	3,000
2 outboard engines, for transport boat, each 115 hp (at $2,748 each)	5,500
100 plastic fish boxes, 60 litres (at $30 each)	3,000
50 insulated fish boxes with lid, 60 litres (at $100 each)	5,000
10 vats for fish offal with lid, 100 litres (at $30 each)	300
2 handcarts	300
3 scales (at $500 each)	1,500
5 spare outboard engines, 45 hp (at $1,750 each)	8,750
Equipment for the work shop	4,000
Contingencies (10% on building and equipment costs)	26,500
Total	290,920

Table 4 gives the estimated depreciation for buildings, land-scaping, and equipment. No depreciation is computed for the land and the reclamation for it is supposed that at the end of the project life they will have the same value ($5/$ft^2$) as at the start of the project.

Operating costs

Operating costs include: labour costs, expenditures, cost of fish and cost of equipment for resale to fishermen.

Labour costs	Dollars/year
Manager ($9,000 per year plus 20% fringe benefits)	10,800
Accountant/cashier ($7,000 per year plus 20% fringe benefits)	8,400
Clerk/typist ($4,000 per year plus 20% fringe benefits)	4,800
2 mechanics (each $20 per day plus 20% fringe benefits plus $50 per month allowance)	15,600
1 skilled foreman ($20 per day plus 20% fringe benefits plus $50 per month allowance)	7,800
4 labourers (each $15 per day plus 20% fringe benefits plus $50 per month allowance)	24,000
Nightwatchman ($12 per night plus 20% fringe benefits plus $50 per month allowance)	5,856
Total	77,256

It was assumed that the labour costs will remain the same over the operation period, regardless of the production capacity of the terminal.

Expenditures	Dollars/year
Water, (for ice plant, 730 m^3; for cleaning, 600 m^3) (1,330 m^3 = 293,000 gal at $0.02 per gal)	5,360
Electricity ($600 per month)	7,200
Van: maintenance and repair (5% of value)	250
petrol and oil	2,000
Boat: maintenance and repair of hull and engines (5% of value)	425
petrol and oil (20 gal per day at $1)	6,000
Ice plant: maintenance and repair (5% of value)	1,000
Generators: maintenance and repair (5% of value)	525
Office costs (stationery, telephone, etc.)	1,000
General maintenance of building (1% of value)	1,000
Advertisements, audit, etc.	500
Insurance (against accidents and fish poisoning)	3,000
Dredging	1,000
Contingencies (10% expenditures)	3,000
Total	32,760

For expenditures, it was assumed that only the costs for water, electricity, petrol and oil ($13,600 per year) will vary according to the production capacity. Therefore the following deductions should be made: $2,040 for purchases of 50% of total estimated catch; $1,360 for60% and $680 for 70%.

Table 5 shows estimated costs of fish and equipment for resale to fishermen. The table gives four estimates, assuming the fish purchases of 50, 60, 70 and 80% of total estimated catch of 1.5 million lb. It was assumed that 10% of the catch will be snapper and grouper and 90% other fish species. Except for snapper and grouper a ratio 1:3 is expected for cleaned:uncleaned fish. It is estimated that $70,000 worth of equipment will be needed for total catch of 1.5 million lb of fish.

Capital and capital costs

Two interest rates have been assumed and computed in the analysis:

(a) 4% as proposed by CDB to participating Governments in the "Leewrd Islands joint venture fishery";

(b) 8% as assumed by Mr. Kapur, CFTC planning advisor to the Government of the BVI.

Computations have also been made on the assumption that an external donor granted the cost of acquisition of the site (107,500$) to the Government of the BVI.

In such a case the loan would be $500,000 ($425,500 investment cost and $74,500 for working capital.

The same assumptions have been made as for the $600,000 loan: 5 years grace and 10 years for discharge in equal parts, with two computations for interest: at 4% and at 8%.

Projected revenue

Projected sales and revenues of the fish terminal are shown in table 6. It is projected that the fisheries equipment be sold with a benefit of 15% in order to cover the handling costs.

Table 5. Estimated costs of fish and equipment for resale

	Quantity (lb)	Price paid ($/lb)	Total price ($)
At 80% of the total estimated catch[a] (full capacity)			
Snapper/grouper	120 000	1.10	132 000
Other cleaned fish	270 000	0.90	243 000
Other uncleaned fish	810 000	0.80	648 000
Lobster	48 000	2.25	108 000
Equipment for resale[b]			56 000
			1 187 000
At 70% of the total estimated catch			
Snapper/grouper	105 000	1.10	115 500
Other cleaned fish	236 250	0.90	212 625
Other uncleaned fish	708 750	0.80	567 000
Lobster	42 000	2.25	94 500
Equipment for resale			49 000
			1 038 625
At 60% of the total estimated catch			
Snapper/grouper	90 000	1.10	99 000
Other cleaned fish	202 500	0.90	182 250
Other uncleaned fish	607 500	0.80	486 000
Lobster	36 000	2.25	81 000
Equipment for resale			42 000
			890 250
At 50% of the total estimated catch			
Snapper/grouper	75 000	1.10	82 500
Other cleaned fish	168 750	0.90	151 875
Other uncleaned fish	506 250	0.80	405 000
Lobster	30 000	2.25	67 500
Equipment for resale			35 000
			741 875

a/ Total estimated catch is 1.5 million lb per year.

b/ Total estimated needs are $70,000.

Table 6. Projected sales and revenue of the fish terminal

	Local sales			USVI sales			Total revenue ($)
	Quantity (lb)	Selling price ($/lb)	Total ($)	Quantity (lb)	Selling price ($/lb)	Total ($)	
At 80% of the total estimated catch [a]							
Snapper/grouper	71 200	1.25	89 000	48 800	1.50	73 200	162 200
Other fish [b]	640 800	1	640 800	382 500	1.25	478 125	1 118 925
Lobster	48 000	2.50 [c]	120 000				120 000
Equipment, resold at a 15% profit							64 000
							1 465 125
At 70% of the total estimated catch							
Snapper/grouper	62 300	1.25	77 875	42 700	1.50	64 050	141 925
Other fish [b]	560 700	1	560 700	334 738	1.25	418 423	979 123
Lobster	42 000	2.50	105 000				105 000
Equipment, resold at a 15% profit							56 350
							1 282 398
At 60% of the total estimated catch							
Snapper/grouper	53 400	1.25	66 750	36 600	1.50	54 900	121 650
Other fish [b]	480 600	1	480 600	286 875	1.25	358 594	839 194
Lobster	36 000	2.50	90 000				90 000
Equipment, resold at a 15% profit							48 300
							1 099 144
At 50% of the total estimated catch							
Snapper/grouper	41 500	1.25	51 875	33 500	1.50	50 250	102 125
Other fish [b]	396 000	1	396 000	243 563	1.25	304 454	700 454
Lobster	30 000	2.50	75 000				75 000
Equipment, resold at a 15% profit							40 250
							917 829

[a] Total estimated catch per year is 1.5 million lb of fish; of which 60% will be caught during the summer and 40% during the winter.

[b] Including 7% of shrinkage for cleaned and scaled fish.

[c] Same as in USVI.

Table 7 shows the cash flow by week for the first trimester of operations. It was assumed that the total investment cost and working capital will be covered by a loan, at an interest rate of 8%.

Financial evaluation

Table 8 gives the financial evaluation for two hypothetical cases:

(a) When the total cost of the project plus working capital is covered by a loan (table 8 A);

(b) When the land is donated but the remaining investment capital and working capital is covered by a loan (table 8 B).

For both cases, the conditions of the loan are a 5 years grace period and 10 years discharge in equal parts. Two sets of computations are given, for an interest rate of 4% and 8%, respectively.

For case (a) the required loan would be $600,000 and the results would be as follows:

At 4% interest

Net present value of the project	$1,047,000
Internal rate of return	19.12%
Total cash at the end of the project (including residual value and value of the site at actual cost)	$2,022,080

Pay back period

Capital investment during 5th year of operation
Capital investment and working capital during 6th year of operation

At 8% interest

Net present value of the project	$ 394,000
Internal rate of return	15.71%
Total cash at the end of the project (including residual value and value of the site at actual cost)	$1,794,080

Pay back period

Capital investment during 7th year of operation
Capital investment and working capital during 6th year of operation

Table 7. Projected cash flow
(Dollars)

	Operation at 50% of the total estimated catch				Operation at 60% of the total estimated catch			
	Week of operation				Week of operation			
	1	2, 3, 5, 6, 7, 9, 10, 11, 12	4, 8, (end of month)	13 (end of trimester)	1	2, 3, 5, 6, 7, 9, 10, 11, 12	4, 8 (end of month)	13 (end of trimester)
Purchase of fish a/	13 504	13 504	13 504	13 504	16 313	16 313	16 313	16 313
Stock of fishing equipment	-	-	-	7 000	-	-	-	10 500
Salaries:								
Weekly	1 024	1 024	1 024	1 024	1 024	1 024	1 024	1 024
Monthly	-	-	2 000	2 000	-	-	2 000	2 000
Interest on loan	-	-	-	12 000	-	-	-	12 000
Expenditures	501	501	501	501	604	604	604	604
Set aside for replacements								
Over 5 years b/	-	-	-	855	-	-	-	855
Over 10 years b/	-	-	-	1 344	-	-	-	1 344
Total costs	15 029	15 029	17 029	38 408	17 941	17 941	19 941	44 610
Expected revenues from sales c/	-	17 650	17 650	17 650	-	21 137	21 137	21 137
Net benefit/loss	-15 029	+2 441	+ 441	-20 758	-17 941	+ 3 196	+1 196	-23 503
Total cash flow								
1 week at	-15 029							
9 weeks at 441	+21 969							
2 weeks at 441	+ 882							
1 week at	-20 758							
	-13 126							
Plus 1 week's sales revenues c/	+17 650							
Net benefit for first trimester	4 524							
Total cash flow 1 week at					-17 941			
9 weeks at 3,196					+28 764			
2 weeks at 1 196					+ 2 392			
1 week at					-23 503			
					-10 288			
Plus 1 week's sales revenues c/					+21 137			
Net benefit for first trimester					10 849			

a/ Based on estimates given in table 5.

Residual value is not included. Value of replacements over 5 years is deducted from that over 10 years (see table 4).

It is expected that the fish will be sold during the week after its landing, that would delay the sales revenue for one week.

Table 8. Financial evaluation
(Dollars)
A. Loan - [illegible] [a/]

Year of operation	Production capacity (%) of total catch	Capital investment and replacements [b/]	Operating costs: Labour	Operating costs: Expenditures	Operating costs: Purchases	At 4% interest: Capital costs: Interest	At 4% interest: Capital costs: Discharges	At 4% interest: Total costs	At 4% interest: Revenues from sales	At 4% interest: Net benefit or loss	At 4% interest: Cumulative cash flow	At 4% interest: Net present value: at 8%	At 4% interest: Net present value: at 2[illegible]%	At 4% interest: Net present value: at 18%	At 8% interest: Net benefit or loss	At 8% interest: Cumulative cash flow	At 8% interest: Net present value: at 8%	At 8% interest: Net present value: at 15%	At 8% interest: Net present value: at 17%
0	-	533 000	-	-	-	-	-	533 000	-	-533 000	-533 000	-512	-444	-452	-533 000	-533 000	-494	-463	-456
1	60	-	77 256	31 400	800 250	24 000	-	1 022 906	1 089 144	+76 238	-456 762	+70	+ 53	+ 55	+ 52 238	-480 762	+ 45	+ 39	+ 38
2	70	-	77 256	32 080	1 038 625	24 000	-	1 171 961	1 202 398	+110 437	-346 325	+98	+ 64	+ 67	+ 86 437	-394 325	+ 69	+ 57	+ 54
3	80	-	77 256	32 760	1 187 000	24 000	-	1 321 016	1 465 125	+144 125	-202 216	+123	+ 69	+ 74	+120 109	-274 216	+ 98	+ 69	+ 64
4	80	-	77 256	32 760	1 187 000	24 000	-	1 321 016	1 465 125	+144 109	- 58 107	+118	+ 59	+ 63	+120 109	-154 107	+ 82	+ 60	+ 55
5	80	16 245	77 256	32 760	1 187 000	24 000	60 000	1 397 261	1 465 125	+ 67 864	+ 9 757	+ 53	+ 23	+ 25	+ 43 864	-110 123	+ 28	+ 19	+ 17
6	80		77 256	32 760	1 187 000	21 600	60 000	1 378 616	1 465 125	+ 86 508	+ 86 508	+ 66	+ 24	+ 27	+ 64 908	- 45 334	+ 38	+ 24	+ 22
7	80	-	77 256	32 760	1 187 000	19 200	60 000	1 376 216	1 465 125	+ 88 909	+185 175	+ 65	+ 21	+ 24	+ 69 708	+ 24 375	+ 38	+ 23	+ 20
8	80	-	77 256	32 760	1 187 000	16 800	60 000	1 373 816	1 465 125	+ 91 309	+276 484	+ 64	+ 18	+ 21	+ 74 508	+ 98 884	+ 37	+ 21	+ 18
9	80	-	77 256	32 760	1 187 000	14 400	60 000	1 371 416	1 465 125	+ 93 709	+370 193	+ 63	+ 15	+ 18	+ 79 308	+178 193	+ 37	+ 20	+ 16
10	80	67 867	77 256	32 760	1 187 000	12 000	60 000	1 436 083	1 465 125	+ 29 042	+399 235	+ 19	+ 4	+ 5	+ 17 042	+195 235	+ 7	+ 4	+ 3
11	80	-	77 256	32 760	1 187 000	9 600	60 000	1 366 616	1 465 125	+ 98 509	+497 744	+ 62	+ 11	+ 14	+ 88 908	+284 144	+ 35	+ 17	+ 14
12	80	-	77 256	32 760	1 187 000	7 200	60 000	1 364 216	1 465 125	+100 909	+598 653	+ 61	+ 9	+ 12	+ 93 708	+377 853	+ 34	+ 15	+ 12
13	80	-	77 256	32 760	1 187 000	4 800	60 000	1 361 816	1 465 125	+103 309	+701 862	+ 60	+ 8	+ 10	+ 98 508	+476 362	+ 34	+ 14	+ 11
14	80	-	77 256	32 760	1 187 000	2 400	60 000	1 359 416	1 465 125	+105 709	+807 671	+ 59	+ 7	+ 9	+103 308	+579 671	+ 33	+ 13	+ 10
15	80	16 245	77 256	32 760	1 187 000	-	-	1 313 261	1 465 125	+151 864	+959 535	+ 81	+ 8	+ 11	+151 864	+731 535	+ 44	+ 16	+ 12
16	80	-	77 256	32 760	1 187 000	-	-	1 297 016	1 465 125	+168 109	+1 127 644	+ 86	+ 8	+ 10	+168 109	+899 644	+ 45	+ 16	+ 12
17	80	-	7 256	32 760	1 187 000	-	-	1 297 016	1 465 125	+168 109	+1 295 753	+ 83	+ 6	+ 9	+168 109	+1 067 753	+ 42	+ 14	+ 10
18	80	-	77 256	32 760	1 187 000	-	-	1 297 016	1 465 125	+168 109	+1 463 862	+ 80	+ 5	+ 7	+168 109	+1 235 862	+ 39	+ 12	+ 9
19	80	-	77 256	32 760	1 187 000	-	-	1 297 016	1 465 125	+168 109	+1 631 971	+ 77	+ 4	+ 6	+168 109	+1 403 971	+ 36	+ 10	+ 7
20	80	-	77 256	32 760	1 187 000	-	-	1 297 016	1 465 125	(+168 109)	+1 800 080	+171	+ 8	+ 12	(+168 109)	+1 572 080	+ 77	+ 21	+ 14
										(222,000) [c/]		1 047	-21	+27	(222 000) [c/]	+1 794 080	+394	+ 21	- 38

B. Loan - $500,000[d]

Year of operation	Production capacity (% of total catch)	Capital investment and replacements[b]	Operating costs: Labour	Operating costs: Expenditures	Operating costs: Purchases	Capital costs: Interest	Capital costs: Discharges	Total costs	Revenues from sales	Net benefit or loss	Cumulative cash flow	Net present value at 4%	Net present value at 25%	Net present value at 26%	Net benefit or loss	Cumulative cash flow	Net present value at 8%	Net present value at 22%	Net present value at 21%
0	-	425 500	-	-	-	-	-	425 500	-	425 500	-425 500	-409	-340	-338	-425 500	-425 500	-394	-349	-352
1	60	-	77 256	31 488	890 250	20 000	-	1 018 986	1 099 144	+ 80 238	-345 262	+ 74	+ 51	+51	+ 60 238	-365 262	+52	+ 40	+ 41
2	70	-	77 256	32 880	1 038 625	20 000	-	1 167 951	1 282 938	+ 114 437	-230 825	+102	+ 59	+57	+ 94 437	-270 825	+75	+52	+ 53
3	80	-	77 256	32 760	1 187 080	20 000	-	1 317 096	1 465 125	+ 148 109	- 82 716	+127	+ 61	+58	+128 109	-142 716	+94	+58	+ 60
4	80	-	77 256	32 760	1 187 080	20 000	-	1 317 096	1 465 125	+ 148 109	+ 65 393	+122	+ 49	+47	+128 109	- 14 607	+87	+47	+ 50
5	80	16 245	77 256	32 760	1 187 900	20 000	50 000	1 383 261	1 465 125	+ 81 864	+147 257	+ 65	+ 21	+20	+ 61 864	+ 47 257	+39	+19	+ 20
6	80	-	77 256	32 760	1 187 080	18 000	50 000	1 365 096	1 465 125	+ 100 109	+347 366	+ 76	+ 21	+20	+ 82 109	+129 366	+48	+20	+ 21
7	80	-	77 256	32 760	1 187 080	16 000	50 000	1 363 096	1 465 125	+ 102 109	+349 475	+ 75	+ 17	+16	+ 86 109	+215 475	+47	+18	+ 19
8	80	-	77 256	32 760	1 187 080	14 000	50 000	1 361 096	1 465 125	+ 104 109	+453 584	+ 73	+ 14	+13	+ 90 104	+305 584	+45	+15	+ 16
9	80	-	77 256	32 760	1 187 080	12 000	50 000	1 359 096	1 465 125	+ 106 109	+559 693	+ 72	+ 11	+11	+ 94 108	+399 693	+44	+13	+ 14
10	80	67 067	77 256	32 760	1 187 080	10 000	50 000	1 424 083	1 465 125	+ 41 042	+600 735	+ 27	+ 4	+ 3	+ 31 042	+430 735	+13	+ 3	+ 4
11	80	-	77 256	32 760	1 187 080	8 000	50 000	1 355 096	1 465 125	+ 110 109	+710 844	+ 69	+ 8	+ 7	+102 109	+532 844	+41	+ 9	+ 10
12	80	-	77 256	32 760	1 187 080	6 000	50 000	1 353 096	1 465 125	+ 112 109	+822 953	+ 67	+ 6	+ 6	+106 109	+638 953	+39	+ 8	+ 9
13	80	-	77 256	32 760	1 187 080	4 000	50 000	1 351 096	1 465 125	+ 114 109	+937 062	+ 66	+ 5	+ 4	+110 109	+749 062	+37	+ 7	+ 8
14	80	-	77 256	32 760	1 187 080	2 000	50 000	1 349 096	1 465 125	+ 116 109	+1 053 171	+ 64	+ 4	+ 4	+114 109	+863 171	+36	+ 6	+ 7
15	80	16 245	77 256	32 760	1 187 080	-	-	1 313 261	1 465 125	+ 151 864	+1 205 035	+ 81	+ 4	+ 4	+151 864	+1 015 035	+44	+ 6	+ 7
16	80	-	77 256	32 760	1 187 080	-	-	1 297 096	1 465 125	+ 168 109	+1 373 144	+ 86	+ 4	+ 3	+168 109	+1 183 144	+45	+ 6	+ 7
17	80	-	77 256	32 760	1 187 080	-	-	1 297 096	1 465 125	+ 168 109	+1 541 253	+ 83	+ 3	+ 3	+168 109	+1 351 253	+42	+ 5	+ 5
18	80	-	77 256	32 760	1 187 080	-	-	1 297 096	1 465 125	+ 168 109	+1 709 362	+ 80	+ 2	+ 2	+168 109	+1 519 362	+39	+ 4	+ 4
19	80	-	77 256	32 760	1 187 080	-	-	1 297 096	1 465 125	+ 168 109	+1 877 471	+ 77	+ 2	+ 2	+168 109	+1 687 471	+36	+ 3	+ 4
20	80	-	77 256	32 760	1 187 080	-	-	1 297 096	1 465 125	(+ 168 109)	+2 045 580	+ 171	+ 6	+ 4	(+168 109)	+1 855 580	+77	+ 6	+ 7
										(222 000)[c]	+2 267 580				(222 000)[c]	2 077 580			
												+1 248	+10	- 3			586	- 4	+ 14

a/ 5 years grace, 10 years discharge. Covering the price of the land, capital investment and working capital.

b/ Including residual values.

c/ Total residual value.

d/ 5 years grace, 10 years discharge. Land donated.

For case (b) the required loan would be $500,000 and the results would be as follows:

At 4% interest

Net present value of the project	$1,248,000
Internal rate of return:	25,77%
Total cash at the end of the project (including residual value and value of the site at actual cost)	$2,267,580

Pay back period

Capital investment during 4th year of operation
Capital investment and working capital during 5th year of operation

At 8% interest

Net present value of the project	$ 586,000
Internal rate of return	21.78%
Total cash at the end of the project (including residual value and value of the site at actual cost	$2,267,580

Pay back period

Capital investment during 6th year of operation
Capital investment and working capital during 7th year of operation

Sensitivity tests

Break even point of the project would be

$$\frac{96,416}{1,465,125 - 1,200,600} = 36\%$$

and with depreciation (as shown in table 4) it would be:

$$\frac{96,416 + 18,474}{1,465,125 - 1,200,600} = 43\%$$

In computations it was assumed that a rise in salaries will be compensated by a rise in sale prices and that the required loan will be $600,000 at 3% per annum. Computations were made for two hypothetical cases:

Table 9. Financial evaluation in case of a 20% rise in costs
(Dollars)

Year of operation	Production capacity and replacement	Capital investment and replacement	Operation costs			Capital costs		Total costs	Revenues from sales	Net benefit or loss	Cumulative cash flow	Net present value		
			Labour	Expenditures	Purchases	Interest[a]	Discharges					at 8%	at 15%	at 13%
0	-	533 000	-	-	-	-	-	533 000	-	-533 000	-533 000	-494	-463	-472
1	60	-	77 256	37 680 x	960 250	48 000	-	1 053 186	1 099 144	+ 45 958	-487 042	+ 39	+ 35	+ 36
2	70	-	77 256	38 496	1 038 625	48 000	-	1 202 377	1 282 398	+ 80 021	-407 021	+ 64	+ 53	+ 55
3	80	-	77 256	39 312	1 187 000	48 000	-	1 351 568	1 465 125	+113 557	-293 464	+ 83	+ 65	+ 70
4	80	-	77 256	39 312	1 187 000	48 000	-	1 351 568	1 465 125	+113 557	-179 907	+ 77	+ 56	+ 62
5	80	19 494	77 256	39 312	1 187 000	48 000	60 000	1 431 062	1 465 125	+ 34 063	-145 844	+ 21	+ 15	+ 16
6	80	-	77 256	39 312	1 187 000	43 200	60 000	1 406 768	1 465 125	+ 58 357	- 87 487	+ 34	+ 22	+ 25
7	80	-	77 256	39 312	1 187 000	38 400	60 000	1 401 968	1 465 125	+ 63 157	- 24 330	+ 34	+ 21	+ 24
8	80	-	77 256	39 312	1 187 000	33 600	60 000	1 397 168	1 465 125	+ 67 957	+ 43 627	+ 34	+ 19	+ 23
9	80	-	77 256	39 312	1 187 000	28 800	60 000	1 392 368	1 465 125	+ 72 757	+116 384	+ 34	+ 18	+ 21
10	80	80 468	77 256	39 312	1 187 000	24 000	60 000	1 468 036	1 465 125	+ 2 911	+113 473	- 1	- 1	- 1
11	80	-	77 256	39 312	1 187 000	19 200	60 000	1 382 768	1 465 125	+ 82 357	+195 830	+ 33	+ 15	+ 19
12	80	-	77 256	39 312	1 187 000	14 400	60 000	1 377 968	1 465 125	+ 87 157	+282 987	+ 32	+ 14	+ 18
13	80	-	77 256	39 312	1 187 000	9 600	60 000	1 373 168	1 465 125	+ 91 957	+374 944	+ 31	+ 13	+ 17
14	80	-	77 256	39 312	1 187 000	4 800	60 000	1 368 368	1 465 125	+ 96 757	+471 701	+ 31	+ 12	+ 15
15	80	19 494	77 256	39 312	1 187 000	-	-	1 323 062	1 465 125	+142 063	+613 764	+ 41	+ 15	+ 20
16	80	-	77 256	39 312	1 187 000	-	-	1 303 568	1 465 125	+161 557	+775 321	+ 44	+ 15	+ 20
17	80	-	77 256	39 312	1 187 000	-	-	1 303 568	1 465 125	+161 557	+936 878	+ 40	+ 13	+ 18
18	80	-	77 256	39 312	1 187 000	-	-	1 303 568	1 465 125	+161 557	+1 098 435	+ 37	+ 11	+ 16
19	80	-	77 256	39 312	1 187 000	-	-	1 303 568	1 465 125	+161 557	+1 259 992	+ 35	+ 10	+ 14
20	80	-	77 256	39 312	1 187 000	-	-	1 303 568	1 465 125	(+161 557)	+1 421 549	+ 85	+ 23	+ 33
										(266 400)[b]	1 687 949			
												+334	- 19	+ 49

a/ 8% per annum.

b/ Total residual value.

Table 10. Financial evaluation in case of a drop in production capacity to 70% of the total estimated catches

(Dollars)

Year of operation	Production capacity and replacement	Capital investment and replacement	Operation costs			Capital costs		Total costs	Revenues from sales	Net benefit or loss	Cumulative cash flow	Net present value	
			Labour	Expenditures	Purchases	Interest[a]	Discharges					at 8%	at 10%
0	-	533 000	-	-	-	-	-	533 000	-	-533 000	-533 000	-494	-485
1	50	-	77 256	30 720	741 875	48 000	-	897 851	917 825	+ 19 974	-513 026	+ 17	+ 17
2	60	-	77 256	31 400	890 250	48 000	-	1 046 906	1 099 144	+ 52 238	-460 788	+ 41	+ 39
3	70	-	77 256	32 080	1 038 625	48 000	-	1 195 961	1 282 398	+ 86 437	-374 351	+ 64	+ 59
4	70	-	77 256	32 080	1 038 625	48 000	-	1 195 961	1 282 398	+ 86 437	-287 914	+ 59	+ 54
5	70	16 245	77 256	32 080	1 038 625	48 000	60 000	1 272 206	1 282 398	+ 10 192	-277 722	+ 6	+ 6
6	70	-	77 256	32 080	1 038 625	43 200	60 000	1 251 161	1 282 398	+ 31 237	-246 485	+ 18	+ 16
7	70	-	77 256	32 080	1 038 625	38 400	60 000	1 246 361	1 282 398	+ 36 037	-210 448	+ 19	+ 17
8	70	-	77 256	32 080	1 038 625	33 600	60 000	1 241 561	1 282 398	+ 40 837	-169 611	+ 20	+ 17
9	70	-	77 256	32 080	1 038 625	28 800	60 000	1 236 761	1 282 398	+ 45 637	-123 974	+ 21	+ 18
10	70	67 067	77 256	32 080	1 038 625	24 000	60 000	1 299 028	1 282 398	- 16 630	-140 604	- 7	- 6
11	70	-	77 256	32 080	1 038 625	19 200	60 000	1 227 161	1 282 398	+ 55 237	- 85 367	+ 22	+ 18
12	70	-	77 256	32 080	1 038 625	14 400	60 000	1 222 361	1 282 398	+ 60 037	- 25 330	+ 22	+ 17
13	70	-	77 256	32 080	1 038 625	9 600	60 000	1 217 561	1 282 398	+ 64 837	+ 39 507	+ 22	+ 17
14	70	-	77 256	32 080	1 038 625	4 800	60 000	1 212 761	1 282 398	+ 69 637	+109 144	+ 22	+ 17
15	70	16 245	77 256	32 080	1 038 625	-	-	1 164 206	1 282 398	+118 192	+227 336	+ 34	+ 26
16	70	-	77 256	32 080	1 038 625	-	-	1 147 961	1 282 398	+134 437	+361 673	+ 36	+ 27
17	70	-	77 256	32 080	1 038 625	-	-	1 147 961	1 282 398	+ 134 437	+496 110	+ 34	+ 24
18	70	-	77 256	32 080	1 038 625	-	-	1 147 961	1 282 398	+134 437	+630 547	+ 31	+ 22
19	70	-	77 256	32 080	1 038 625	-	-	1 147 961	1 282 398	+134 437	+764 984	+ 29	+ 20
20	70	-	77 256	32 080	1 038 625	-	-	1 147 961	1 282 398	(+134 437)	+899 421	+ 71	+ 48
										(222 000[b])	1 121 421		
												87	- 12

a/ 8% per annum.

b/ Total residual value.

(a) A rise of expenditure and replacement costs by 20% (excluding salaries and purchase of fish and fishing equipment for resale) (table 9);

(b) A drop in production capacity to 70% of the total estimated catches (table 10).

The results were as follows: for case (a):

Net present value	$334,000
Internal rate of return	14,44%
Total cash at end of project	$1 687 949
Capital investment pay back period	During 8th year of operation
Capital investment and working capital	During 9th year of operation

and for case (b):

Net present value	$87,000
Internal rate of return	9,76%
Total cash at end of project	$1,121,421
Capital investment pay back period	During 13th year of operation
capital	During 14th year of operation

V. DEVELOPMENT POSSIBILITIES

The small-scale fisheries sector provides employment at a relatively low level of capital input. In the BVI, with an adequate infrastructure and expertise, it may support 91 full-time and 75 part-time fishermen. (N. Peacock: Marine resources of the British Virgin Islands 1975).

In order to protect the fish stocks on the BVI shelf from overfishing, a stock management programme should be implemented. For that, more data on fish stocks would be needed. Therefore it is recommended that a survey be started as soon as possible. For such a work a biologist would be needed.

Fishing methods could be improved and new fishing methods could be introduced, e.g. reel fishing on the shelf's edges. Better fishing grounds could be indicated, especially when the grounds fished traditionally show signs of exhaustion. Such work should be done by an experienced fishermaster in co-operation with the biologist.

A small vessel for research, survey and demonstration would be needed. The boat should not be larger than 21 ft. It should have 2 outboard engines, a well, an ice box, a mechanical pot hauler, hydraulic reels, a fathommeter and other small equipment. Its price would be around $11,000.

Annex

FISHING GROUNDS IN THE WATERS OF THE VIRGIN ISLANDS SHELF

The following map of the Virgin Islands shelf divides the area into 7 zones according to the catch per effort (CPE) ratio. Zones T.4 and T.5 are best for line fishing while whale banks (zone B.1) and Barracuda banks (zone T.4) are best for trap fishing.

Landings data (1974/75)

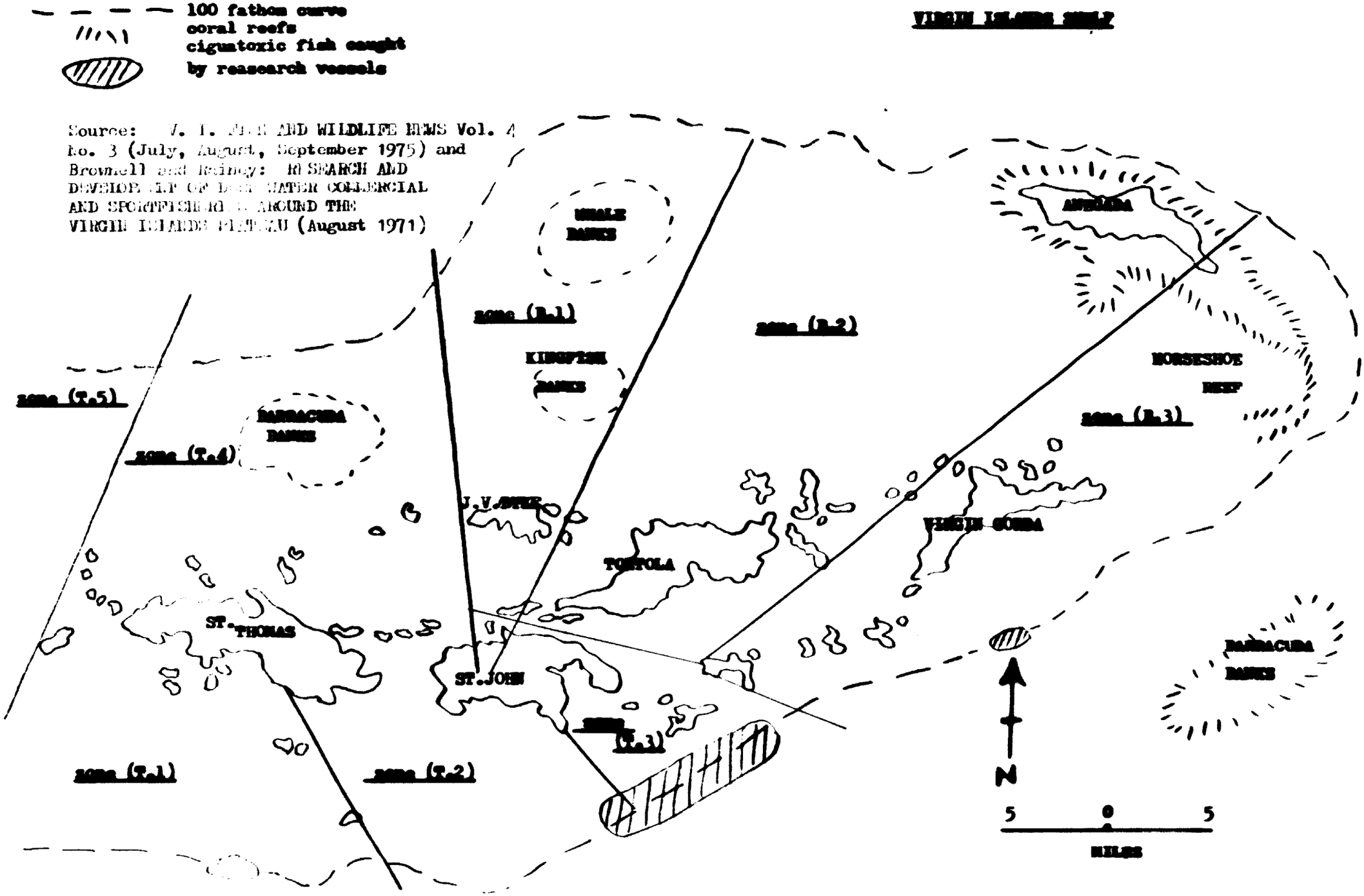
Zone	Number of interviews a/	Total fish landings (lbs)	CPE b/ (lb)	Lobster landings (lbs)
T.1	97	394 000	3 000	12 000
T.2	31	165 000	5 300	900
T.3	12	54 000	4 500	600
T.4	33	137 000	4 150	8 600
B.1	4 b/	45 000	11 250	-
B.2	0	-	-	-
B.3	6	23 000	4 670	3 800

Source: Olsen, Dammann and La Place: Analysis of catch data for the Virgin Islands commercial fisheries (1975).

a/ Fishermen from USVI.

b/ Catch per effort per fishermen per year.

c/ Fishermen from BVI have also been interviewed.


100 fathom curve
coral reefs
ciguatoxic fish caught
by research vessels
VIRGIN ISLANDS SHELF
Source: V. I. FISH AND WILDLIFE NEWS Vol. 4
No. 3 (July, August, September 1975) and
Brownell and Rainey: RESEARCH AND
DEVELOPMENT OF DEEP WATER COMMERCIAL
AND SPORTFISHERY AROUND THE
VIRGIN ISLANDS PLATEAU (August 1971)
WHALE BANKS
ZONE (T.1)
ZONE (T.2)
KINGFISH BANKS
ZONE (T.5)
BARRACUDA BANKS
ZONE (T.4)
ZONE (T.3)
ANEGADA
HORSESHOE REEF
ZONE (T.3)
J.V.DYKE
TORTOLA
VIRGIN GORDA
ST. THOMAS
ST. JOHN
ZONE (T.3)
ZONE (T.1)
ZONE (T.2)
BARRACUDA BANKS
N
5 0 5
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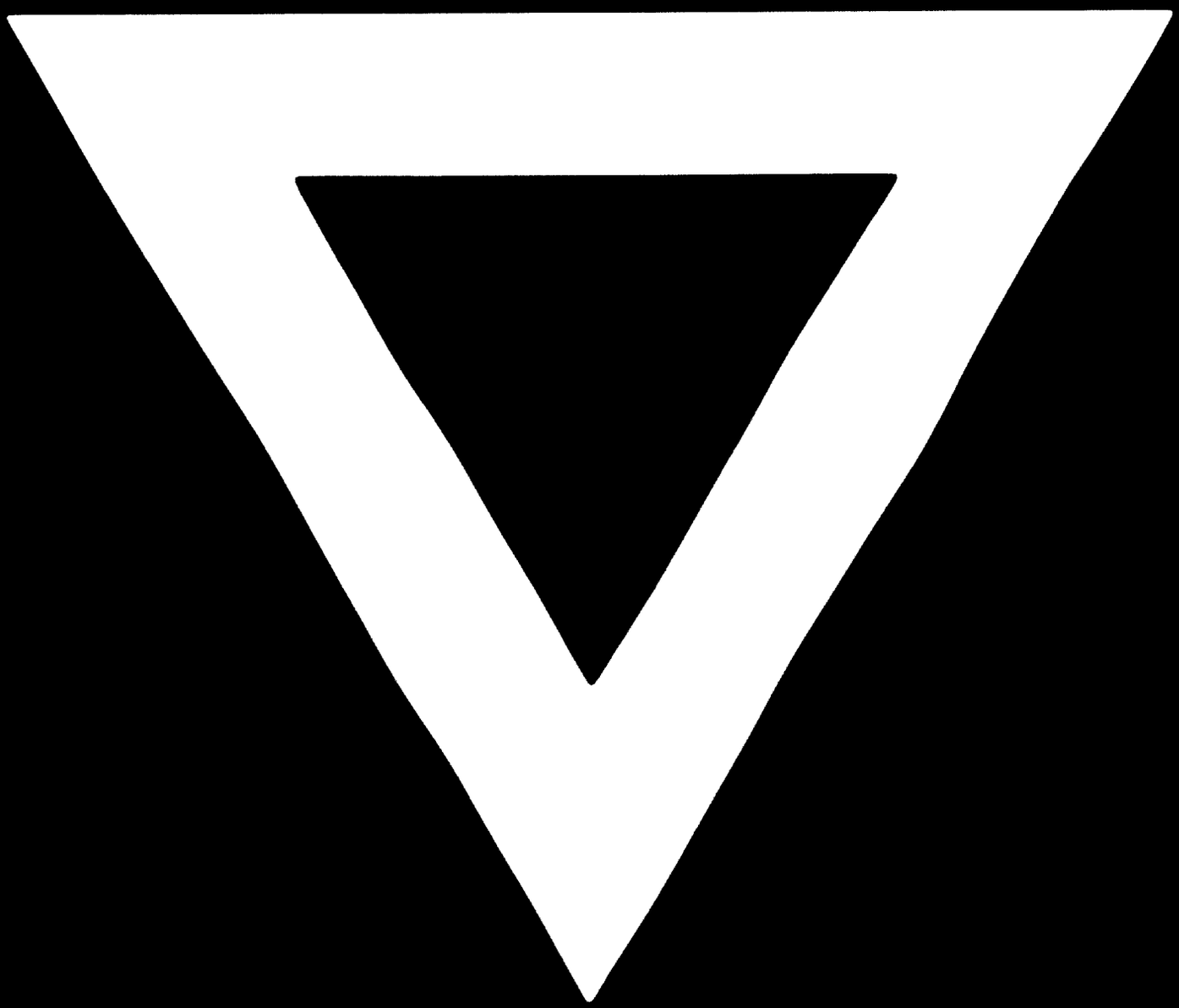

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