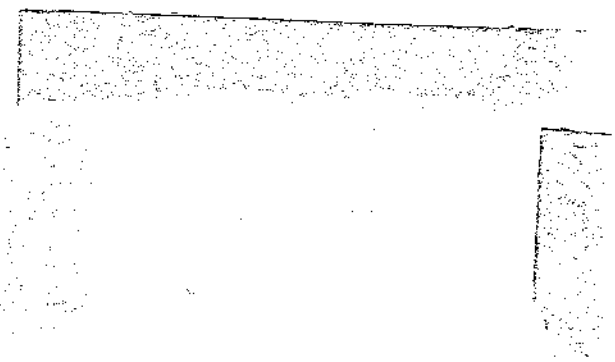
HIGHLANDS AND ISLANDS DEVELOPMENT BOARD

Development in the Moray Firth Area

CREDIBILITY STUDY

1966



PRODUCT PLANNING LIMITED
Carolyn House Dingwall Road Croydon Surrey

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August 1966

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A CREDIBLE PATTERN FOR MORAY FIRTH DEVELOPMENT

CREDIBLE ACTIVITY	PROPOSED OPERATORS	POSSIBLE SPONSORS
Food Freezing: (fish, peas, raspberries)	Fropax	J. Lyons Union International (Vesty) Associated Fisheries (Fraser)
Production of board by new processes from Highland timber and/or West Indian sugar cane fibre	Bonawood Henckell Du Buisson	Consolidated Goldfields Salvesen John Laing
Mineral processing:using imported and local ores (aluminium; iron; ferro-alloys, etc) Mining local ores	Rio Tinto Zinc Consolidated Goldfields Continental Mining Robertson Research	Rio Tinto Zinc Consolidated Goldfields HIDB Continental Mining Robertson Shipping
Manufacturers of petrochemicals and derivatives: fertilisers, plastics	Invergordon Chemical Enterprises	F.G. Thomson & Associates Rexall Chemical Consolidated Goldfields Rio Tinto Zinc Hamilton Brothers HIDB
Development & manufacture of special purpose machinery: welding; conveying; laminating	A.I. Welders Cable Belt Graviner (Gosport)	Industrial Reorganisation Corporation Solar Industries Graviner (Gosport) UKAEA
Supply of natural gas or crude oil (imported initially but later taken from Moray Firth if drilling successful	Total Hamilton Brothers	Total Rio Tinto Zinc HIDB
Recruitment and supply of unskilled and semi-skilled labour;production of electricity and steam; provision of local storage, handling and transport; fuels, water, effluent disposal facilities etc.	Highlands and Islands Development Corporation	HIDB

SECTION I

A CREDIBLE PATTERN

The Highlands and Islands Development Board (HIDB) invited Product Planning Limited (Proplan) to study the credibility of major industrial development in the Moray Firth area. The conclusions reached are that development is credible following a pattern shown opposite and that with growth at a manageable pace the area could have a population of 250,000 within 15-20 years.

To establish this Proplan analysed the existing human and material assets of the area. Activities were then listed which prima facie might be introduced into the area or if already established on a modest scale be expanded. The credibility of such developments was assessed mainly by interviewing individuals who were in a position to promote them through the organisation they represented or by their own actions. If those approached were sufficiently interested in the possibility outlined to them that they sought discussions with HIDB then credibility was established for the purposes of this study.

The proposed industrial developments are outlined in section 2 with proposals for action by HIDB to promote them. In section 3 the setting up of an Industrial Development Corporation is proposed to take shares in local enterprise and provide a comprehensive service to local industry.

The actions that it is suggested be taken towards providing the requisite infrastructure are summarised in section 4. These are mainly based on an examination set out in Appendix 1 of the problems involved in providing for the build-up of labour and services that developing industries will require.

Appendices 2 and 3 contain more detailed analyses and descriptions of the opportunities in the food and petrochemical industries drawn in part from earlier studies.

SECTION 2.

2. PROPOSED INDUSTRIAL DEVELOPMENTS

In this section, the principal industrial developments whose credibility has been established are outlined and the action it is proposed be taken to promote them is summarised.

In most cases, it is suggested that the Board's first step should be to make contact with all those who have expressed interest in a particular development with the object of agreeing how its feasibility should be established and what contribution HIDB and the interested parties should make to such a study.

2.1 Food Processing

Food in the form of meat and fish is perhaps the most widely recognised asset of the Scottish Highlands and as such has formed the main plank of past diversification studies. However, no significant developments have yet taken place in the introduction of large scale food processing in this area. The nearest approach to this was Lord Leverhulme's unfortunate venture which was sound in concept but failed primarily because of personality conflicts and the country's economic situation at that time.

In more recent years the fragmented pattern of production and the distance from the main markets have militated against the establishment of large scale ventures in the food field. Despite this, developments have been taking place in adjacent areas such as the continued build up of the Baxter Organisation at Fochabers, Unilever at Fraserburgh, Nestle at Peterhead and Ross Group at Stornoway.

Ventures taking place nearer the "centre" of the Highland area viz Inverness, have been small and entrepreneurial in character. Despite the interest and enthusiasm of their promoters, these small operations have not been conspicuously successful and appear to have suffered from poor management, lack of capital and the drawbacks of size.

Proplan consider that successful development of the food industry in the Moray Firth area will depend on the attraction of larger food companies who, in turn, need to be convinced that the raw materials are present in sufficient quantities to meet their scale of operations.

2.1 1. Resources

Examination of the agricultural and fishery resources of the Highlands and Islands shows that the total value of fish and meat is currently of the order of £4 million and £2 million per annum respectively. In addition there are significant quantities of potatoes, barley and oats.

2.1. 1. (Resources, cont.)

Closer scrutiny of these materials indicates that the basis for large scale food processing can best be found in white fish and shell fish. The scattered distribution of these foodstuffs could be overcome by siting processing facilities in the Beauly Firth area through which most of the fish and meat moving from the North West and North East must pass. Furthermore, the surrounding arable land has the potential to support a quick freezing and canning industry of a similar nature to that located in North Lincolnshire and East Anglia.

These resources, therefore, could, with the encouragement and support of the HIDB, form the basis for a number of developments. Proplan have contacted a number of successful companies; details of those who have expressed interest in pursuing opportunities further are given below.

2.1 2. W.A. Baxter & Sons Limited

This privately-owned company manufactures a wide range of canned and bottled food products. They have concentrated on developing the Highland image by the utilisation of local produce in traditional Scottish recipes. They have been highly successful and have gained widespread recognition for quality foods which are exported to 70 overseas markets.

At present, this company needs further products to add to their range and have, for some time now, been considering the processing of shell fish.

Baxters have indicated their keen interest in working with the HIDB in setting up a separate processing unit in the Inverness area and consider it feasible to transfer some of their supervisory staff on a temporary basis. It is understood that a preliminary meeting has already been held with HIDB.

2.1 3. Eskimo-Fropax-Frood

This group is one of the largest frozen food producers in the U.K. and is jointly owned by J. Lyons (the caterers), Associated Fisheries and Union International (who have meat interests). Their frozen product range extends from ice-cream, frozen fish, vegetables, meat and desserts for the consumer market to frozen dinners for catering interests and ships' crews.

Eskimo-Fropax-Frood have expressed interest in principle in the possibility of establishing a frozen food plant in the area. This plant would use white fish as a nucleus but would also freeze peas, beans, sprouts, soft fruit, potatoes and other products.

As a first step they would welcome a meeting with HIDB, once the latter's overall plans have been established.

2.1 4. Long Term Opportunities

Long term opportunities lie in the field of glasshouse horticulture, meat packing and fish farming.

The most promising of these opportunities lies in glasshouse horticulture since studies have shown that a glasshouse industry could be established in the Moray Firth area with excellent prospects. Such a scheme would be based on intensive cultivation using the advanced horticultural techniques including the use of carbon dioxide enrichment. As the trend towards vertical integration in the food industry continues, a large company with retail outlets in the greengrocery trade could be interested in a project of this kind.

Meat packing is another promising opportunity which could be explored. At present, the meat industry in the U.K. is not ready for the supply of portions to the wholesale, retail or consumer trade. This has been demonstrated by the breakdown in

2.1. 4. (Long Term Opportunities, cont.)

negotiations between FMC and Marks and Spencers. However, continued pressure from the large retailing organisations is slowly causing change.

Successful local meat packers e.g. Buchan Meat Producers, assisted by HIDB, would be in an excellent position to take advantage of these forthcoming opportunities.

2.2 Fibres

Chipboard is already made from Highland timber at a factory in Inverness operated by Bonawood Limited. Two possibilities for increasing production of board in the area are outlined below:-

2.2 1. Bonawood Limited

This company, a wholly-owned subsidiary of North-Eastern Timber, employs 100 people directly and it is estimated that it provides direct employment for at least a further 100. Confidential discussions about the future of this company are currently taking place, which are outside the scope of this report. However, the following possible development is still credible. Bonawood have developed and patented a process for producing chipboard with a glazed finish; this is not yet in production but they claim it has been proved. North-Eastern Timber have in mind to operate this process at the Inverness plant: this would necessitate an investment of some £200,000. North-Eastern Timber are interested to discuss with the Board the possibility that some other industrial company who are interested in the manufacture of chipboard might come into partnership with them. John Laing Research and Development Limited, E.S. & A. Robinson of Bristol, ICI Building Development Group and the Reed Paper Group's subsidiary, L.& P. Plastics, have all expressed varying degrees of interest in being provided with further information about the Bonaglaze process.

2.2 2. Henckell Du Buisson

Apart from the above operation based on local raw material, Proplan have been informed of an entirely new process of extracting sugar from cane, without destroying

2.2 2. (Henckell Du Buisson, cont.)

the fibre, and yet at the same time completely cleaning and removing all impurities from the fibre. This fibre is claimed to be a first class grade material for making board of all descriptions.

The fibre compares favourably in terms of strength, durability and cost with wood chips used in the chipboard process. This process is the property of Henckell Du Buisson, a Carribean sugar producer, who are interested to co-operate with HIDB and/or another UK manufacturer, to set up a plant in the Highlands. In parallel with this, the wax and pith from the sugar cane can be refined and sold: The Leith company, Salvesen, has expressed interest in principle in this side of the operation.

Until future developments at Bonawood are known, no approach is being made to any company who might be interested in what would be a rival to the Bonaglaze process. However the Henckell Du Buisson process could be put to the four companies.

2.3 Minerals

Though British geologists are acknowledged to be the finest in the world, little serious attention has been paid to the exploitation of British minerals in the last century. The mining and metallurgical industries have become so accustomed to operating the huge, high-grade deposits abroad that little study has been made of the possibilities of exploiting smaller, lower grade deposits at home. It is often tacitly assumed that, in such a developed country as Great Britain, anything of value would already have been worked out.

However, in the last few years the viability of low-grade deposits has increased: firstly, because technological advances has made the mining and extraction of low-grade ores more economic. Secondly, many ores have increased in value because of scarcities and, as the better overseas deposits are being worked out, those nearer home become more attractive. Proof of this can be seen in the considerable build-up of mining activity in Eire. One international mining group, Rio Tinto Zinc are known to have been attracted there mainly because the Irish Government gave much more encouragement to mining than did the British Government.

It is therefore proposed that the Board should promote geological surveys in the Highlands with a view to encouraging the development of its mineral potential. Ways in which it might do this are discussed below.

2.3 1. Geological Survey

The Geological Survey in Edinburgh has one of the most complete collections of information on Highland minerals and resources, much of which is not correlated or published. Though some is confidential, we suggest that it might all be made available to HIDB who could use it as their contribution to any exchange of information that may take place with mining companies.

2.3 1. (Geological Survey, cont.)

The Geological Survey consider that the future for minerals in the Highlands may lie in the simultaneous development of several deposits and the simultaneous working of these deposits for several minerals, e.g. silver, zinc and lead which frequently occur together. At least ten such deposits are known in the Highlands, but the surface indications are that there are only small ore bodies. If these ores were mined and then processed centrally, the whole process might become an economic proposition; mining one deposit for a single mineral would probably not be.

Attention should also be paid, in the Geological Survey's view, to off-shore deposits where minerals may be recovered by dredging. It is known, for example, that certain minerals are concentrated by sea erosion; in particular, certain minerals such as iron, chromium and platinum which are heavier than the average rocks and which are also insoluble. These might be concentrated in sands in areas where they are known to occur, e.g. off the Isle of Unst in the Shetlands or in the sands on the Isle of Raasay (a simple examination of these sands indicated they contain up to 30% iron oxide: this concentration could be increased by simple techniques of concentration).

The Geological Survey have a programme of research which includes the possibility of a pilot geo-chemical survey of the Highlands before covering the rest of the United Kingdom. It is suggested that HIDB encourage that such a survey be undertaken in collaboration with mining companies who have expressed interest in the area. Details of these are given below.

2.3 2. Consolidated Goldfields Limited

Consolidated Goldfields are in the midst of a large diversification programme away from their original interests in South African gold. They have moved into many minerals and, more important, are prepared to process them, i.e. to move into the metallurgical industries.

The company have, for some while, been trying to extend its activities in the UK: recent tax changes have caused them to intensify their efforts. They are currently exploring deposits around Strontian (Inverness).

Consolidated Goldfields have indicated a provisional interest in the following possibilities:-

(1) investment in a petro-chemical complex at Invergordon

(2) production of ferro-chrome if electric power is available at less than 0.5d/kwh.

(3) aluminium die casting

(4) olivine sand on Skye

(5) zircon sand/ilmenite sand

(6) lead and zinc deposits near Lossiemouth

(7) syenite, near Loch Torridon - an igneous rock containing felspar

Consolidated Goldfields could make available the necessary technical resources for survey work and would be able to finance any mining operations which may subsequently be judged worth undertaking. It is therefore suggested that this wide range of possibilities be further discussed with them.

2.3 3. Continental Mining

Continental Mining is a small company recently set up specifically to promote the development of Highland mineral resources using the latest techniques for upgrading and concentrating minerals, e.g. solvent extraction. The company is partly owned by the Continental Ore Corporation of New York which is a substantial mineral marketing organisation with offices in some fifteen countries. Continental Mining are interested to discuss with the Board the marketing of any minerals produced in the Highlands.

If minerals such as the Serpentine owned by Balmacaan Quarries Limited at Milton, Inverness, can be shown by a feasibility study to be worth exploiting, Continental Mining would find a suitable company to work the deposit, with whom it would set up a joint mining and marketing exploration. Serpentine in the Shetlands is already being mined. It is suggested that the HIDB might arrange for the evaluation of the Milton deposit.

2.3 4. Robertson Research Company Limited

This company is a subsidiary of the Robertson Shipping Group of Glasgow. It is probably the company most active in the development of Highlands minerals. As a result of their work the Robertson Group are currently extracting an anorthosite in the Hebrides and separating magnesia from dolomite and brucite at Ledbeg, Sutherland. Apart from working for its parent company it undertakes contract work for other companies both in the Highlands and abroad. This company is particularly interested to expand its Highlands activities and will be prepared to co-operate with other mining companies or HIDB in joint operations. Their parent company could provide shipping services from the Highlands. One of its Directors is also a Director of a subsidiary company of Consolidated Goldfields, Tharsis Sulphur and Copper Company.

2.3 5 Rio Tinto Zinc

The £215m London-based international mining group, Rio Tinto Zinc, are, like Consolidated Goldfields, attempting to expand their operations in the country. They are interested to explore further with HIDB the following potential substantial investments in the Highlands:-

(1) 250 megawatts of electricity at about 4 mil/kwh for use in a £50m metallurgical smelting operation at Invergordon that would employ about 1,000 men

(2) To make a detailed geological survey in the Moray Firth area at their own expense and subsequently in collaboration with HIDB exploit any deposits proved to be economic.

(3) To drill for gas or oil in the Moray Firth, through Hamilton Brothers, jointly with Total Oil Marine and HIDB

(4) To bring iron ore in bulk from their Australian subsidiary and operate an ore pelletising plant at Invergordon

(5) To produce a complete range of refractories: alumina, magnesia, silica

If such a substantial and professionally-managed group is prepared, after further study, to start one or more operations in the Highlands, the prospect for sustained development in the area could be significantly improved. RTZ are experienced in setting up operations from grass roots and could probably give HIDB some of the benefit of their first-hand experience of the problems involved in providing the build-up of the infra-structure. It is particularly important therefore that HIDB do all it can to assist RTZ in its dealings with local authorities, land owners and Government agencies and to press for the revision of taxation on UK mining operations.

2.3. 6. British Carbo Norit

British Carbo Norit manufactures activated carbon in the U.K.: it is owned by Pittsburgh Activated Carbon, one of the world's largest carbon companies. The company is currently examining samples of peat from Altnabreac in Caithness to determine their suitability for making active carbon. They have stated that, if the tests are satisfactory, they would be interested to discuss with the Board the establishment of an active carbon plant in the area and could be discussing a project using up to half a million tons of peat per annum.

A French company is already making activated carbon from Irish peat.

British Carbo Norit may also be interested in the development of the diatomite as a means of diversification within the filtration and absorption field in which they work. This is known to occur under certain parts of Altnabreac peat and elsewhere in the crofting counties. They would have available quantities of by-products from the distillation of the peat which could form a basis of smaller secondary industries.

It is possible that the most economical way of establishing a peat/carbon facility (which, incidentally would have considerable export potential) would be to operate it in conjunction with a horticultural peat plant, since not all the peat would be suitable for making active carbon, for which a low ash content is required. The production of horticultural peat would find welcome buyers amongst the horticultural and agricultural agents who currently rely on Dutch, German and Irish peat.

2.3.7. Brora Coal Mine

Interest has been shown in extracting oil from the Brora shale because processes to do this economically have recently been developed by the US Bureau of Mines and by associates of the Rexall Chemical Company in California. The shale said to have oil content nearly twice that of the Midlothian worked until fairly recently. Samples are currently being evaluated both by Rexall and at the University of Newcastle in this country.

A by-product from the oil production is a lightweight aggregate from which a high strength concrete block can be made.

It is suggested that considerable economies might be made if the coal and shale were mined together, giving an approximately 6 or 7 feet working face. The ore reserves would have to be proved by boring and a new drift mine opened up. It has been estimated by National Coal Board consultants that coal and shale could with modern machinery be brought to the surface for about 20s per ton. This would open up the possibility of generating power on a small scale locally which might be used for example, to operate a ferro silicon plant based on the quartzite which occurs nearby.

Consideration should also be given to the recovery of sulphur from this coal: even a small power plant could theoretically produce 80 tons of sulphur per day currently worth about £400,000 per annum.

It is proposed that a technical and commercial feasibility study be undertaken of the Brora hydrocarbons.

2.3.8 Sponsorship of Development

In certain instances the economic exploitation of Highland minerals is only likely to become attractive if further development work is undertaken on suitable processes. Imperial Chemical Industries have been carrying out development work on a process for extracting potash from the anduluria shale in the North-West. This process would make use of the other materials in the shale, alumina and silica. ICI would be interested in discussing with the Board how this process might be commercialised.

2.4 Chemicals

The natural assets of Invergordon (ample fresh water; a good site; and a deep water harbour) make it nearly ideal for large scale process industry competing in world markets. The problems of labour and communication are potentially soluble as has been shown by the establishment over the last few years of a large grain whisky distillery.

Large-scale process industry is capital-intensive. If promoters are expected to fund the development of the infra-structure as well as plant purchase, they are likely to be drawn to sites where such facilities already exist or are offered. Therefore, in order to attract industrial capital from large process industries, it is desirable that HIDB promote the development of existing harbour facilities at Invergordon and provide the necessary funds to build up the infra-structure.

2.4 1 Invergordon Complex

Studies made by Proplan prior to the commissioning of this Report established the feasibility of a petrochemical complex at Invergordon. It was proposed that fertilizer, plastics and feedstocks for secondary chemical manufacture be produced starting from crude oil, and, if available, natural gas. This scheme, which is outlined below, requires up to £40 million in the first three years and possibly up to £95 million over ten years and could employ at least 2,000 people.

2.4 2 Refinery

It was proposed that a Refinery be built with an annual capacity of up to 5 million tons of crude oil and use be made of the existing oil handling and storage facilities at Invergordon. Units within the Refinery would include a sulphur recovery plant, an aromatics plant, an asphalt making plant and a petroleum coke plant. The latter would become more important if a metallurgical smelting operation requiring petroleum coke were set up at Invergordon.

The large natural gas finds in the North Sea and the prospect of finding gas in the Moray Firth would make a difference to the Refinery design and reduce crude oil imports.

2.4 3 Power

The petrochemical complex would call for up to 200 megawatts of electrical power; generating capacity based on economical modular gas turbine units and waste heat boilers were proposed to provide this. This or a conventional scheme would, it is now envisaged, be installed by the proposed Development Corporation and serve not only the chemical complex but also other major power users that are attracted to the area by the price at which power is offered (see Section 3 "Cromarty" Electrical Company).

2.4 4 Fertilizer Plant

Proposals were for a 1,000 ton a day ammonia plant and a phosphoric acid plant which, with the production of potassium nitrate/phosphate, will allow a complete range of high nutrient value fertilizer to be offered to the sophisticated markets of Western Europe and also straight Nitrogenous fertilizers for export to developing countries. Cement can be produced as a by-product at this stage if additional plant is incorporated. In this way, sulphur is re-cycled and therefore none needs to be imported.

2.4 5 Polymers

Growing world demand for plastics encourages the production of monomers and polymers. It is currently envisaged that a 350,000 ton per year ethylene cracker will be the centre of operation. It would provide not only ethylene for making PVC and Polyethylene but also make available Propylene for more sophisticated products in due time.

2.4 6 Secondary Products

Numerous intermediate chemicals could be made available from the Complex. Tentative discussions have revealed that this would attract a number of companies to the area. These are likely to include Polymer processors and manufacturers of speciality chemicals such as plasticisers and solvents. When further details of the proposed Invergordon Complex become available, it is suggested that

2.4. 6. (Secondary Products, cont.)

HIDB initiate discussions with chemical manufacturers with a view to encouraging them to set up in the Moray Firth area and draw one or more feedstocks from the Complex.

2.5 Engineering

In areas remote from the principal engineering centres of the U.K., companies can succeed provided they add sufficient value to make additional freight costs insignificant. Sophisticated products, not produced quantity, can be made almost anywhere provided the requisite specialist technical staff can be attracted to and held, in the area. Within 15-20 years, increasing congestion in existing industrialised areas may force many such specialised companies to the Moray Firth or other now predominantly rural areas. However, in the immediate future, it is proposed that growth be linked with expertise already in the Highlands. By widening opportunities, this would make the area more attractive to technical staff now settled there. It also reduces the risk that some operation based on skills now foreign to the area might fail because the one or two key men cannot settle in the Highlands.

Firstly therefore it is proposed that the two special purpose engineering businesses in Inverness, A.I. Welders and Cable Belt, serve as nucleii round which might be built network of companies applying comparable or complementary skills. Secondly, that Graviner (Gosport) Ltd., who already have contacts from the UK Atomic Energy Authority be encouraged to move into the area and expand its operations jointly with the Authority, taking advantage of the existence at Dounreay of a large group of highly qualified people some of whom have come to accept Highlands conditions. Brief details of these three proposals are outlined below.

2.5 1. A.I. Welders

In many discussions with knowledgeable people in the Lowlands, this Inverness company which specialises in resistance welding equipment is often instanced as the one example of a successful technically based business in the Highlands. A.I. Welders has recently secured an order from the United States for welding machinery that is to be used to weld rails for the experimental

2.5 1. (A.I. Welders, cont.)

$90 m high-speed rail track which the American Government are putting down as a first step towards reducing congestion on the present car and road routes on the Eastern seaboard between Boston and Washington. This is a good indication of A.I. Welders' ability to compete in international markets.

It is suggested that the HIDB jointly with A.I. Welders approach the recently formed Industrial Reorganisation Corporation and seek their assistance to bring special purpose welding machine companies to Invemess. A.I. Welders informed Proplan that one company had let it be known that they were interested to explore the possibilities of joint working. The name of this company and one other would be revealed to the Board by Major Hunter Gordon if this proposal is accepted.

2.5 2. Solar Industries

Solar Industries of Glasgow, which wholly owns the Cable Belt Company in Inverness, have indicated that they would be prepared to back jointly with HIDB a search for other special purpose conveying equipment manufacturers that might be acquired and moved to Inverness. Subsequent discussions with the owner of a small mechanical handling business in the South-East confirmed that there were at least half-a-dozen companies in the Home Counties which might be worth considering.

Financial assistance might again be provided by the Industrial Reorganisation Corporation. This Corporation has only recently come into being and may not yet have any urgent items on its agenda. This could therefore be an opportune moment to discuss both conveying and welding with them in the hope that they would anyhow assist with one.

2.5 2. (Solar Industries, cont.)

It may be questioned whether development engineers based in Inverness could do sufficient desk research in a town remote from the main accumulations of data about welding technology. This it is suggested could be overcome by companies in Inverness jointly paying for information scientists to be based near the appropriate libraries and research institutes. They could ensure an adequate supply of technical and commercial information which could initially be despatched by mail and later, if necessary, by data link for storage in Inverness.

2.5 3. Graviner (Gosport) Limited

Graviner (Gosport) Limited have two separate activities:-

1. The manufacture of special purpose machinery e.g. laminating; conveying.
2. The fabrication of graphite.

One of its principal customers is the United Kingdom Atomic Energy Authority. The Authority is under the control of the Minister of Technology who was recently charged with diversifying the activities of the Authority, partly because its large technical staff is underloaded. It is therefore suggested that some of the professional staff at Dounreay be made available full time or part time to serve in some joint operation with Graviner (Gosport). The latter company wish to move their entire operation, employing 300 people, away from their present site at Gosport in Hampshire, where they have recently lost key staff to the Plessey Company who came to the area after Graviner and seriously underestimated the amount of labour available.

2.5 3. (Graviner Gosport, cont.)

Graviner (Gosport) are interested to discuss with the Board the possibility of a joint approach to the Atomic Energy Authority with a view to their moving either adjacent to Dounreay or in the Moray Firth area.

Any engineering activities should, in Proplan's view, only be encouraged if the design is done in the Highlands. If this is accepted, and proposals made elsewhere in the report for an applications institute are taken up, it is possible to envisage adding other engineering activities to this short list.

2.6 Service Industries

No special study was made of the possibility of setting up service activities in the Moray Firth area. In the course of Proplan's enquiries, however, a number of possible opportunities were discovered but credibility was not formally established.

2.6. 1. Mail Order

The Post Office provides the Highlands and Islands with freight equalisation on any items that it will accept. Mail order is becoming increasingly popular particularly with the middle classes offering, as it does, a source of private credit. It is expanding faster than any other form of retailing.

Proplan was informed by Highland Home Industries Limited that most of their mail order business is done through a retired officer living near Lyndhurst in Hampshire.

It is proposed that a small company might be set up in Inverness to promote mail ordering of consumer products produced in the Highlands and Islands. This might be backed by Scottish Central Finance who informed Proplan that they were short of opportunities for investing funds in commercial undertakings in the area.

2.6. 2. Boutique Co-operative

One successful boutique in the area carries a high proportion of items imported into Scotland some of which come from rural craft

2.6. 2. (Boutique Co-operative, cont.)

industries in other parts of British Isles. It is suggested that a Co-operative be set up in Inverness to buy boutique items from outside Scotland on behalf of all the boutiques in the area and also promote the sale of Highland rural industry products in shops and boutiques in other parts of the country and abroad. This might be a second activity for the mail order company as suggested above.

2.6. 3. Public Relations and Advertising Design Services

The space which influential newspapers will give to HIDB policies and activities will be limited especially since it has recently been featured in a number of them. There is considerable skill in drafting and placing items for which editorial mention is sought. If such skill were available to the Board and industries in the area, it could have a significant effect on the national and international promotion of their general and specific aims. Similarly, the local products could benefit from the application of design skills in packaging and advertising.

Proplan has made contact with a specialist in each field during the course of their study; one is a very experienced industrial public relations man and the other an advertising copy writer-cum design consultant. Both are Scots and have shown considerable interest in contributing to HIDB work. One of them would consider basing himself in the area and the other would be prepared to spend sufficient time in Inverness to provide proper service. Proplan is not recommending that any particular preference be given to the individuals with whom they have had contact but proposes that advantage

2.6. 3. (Public Relations and Advertising Design Services, Cont.)

be taken of their interest to explore the feasibility of some small operation in Inverness offering the services, which in Proplan's view, the area badly needs.

SECTION 3.

3. Proposed Development Corporation

It is proposed that HIDB set up a Development Corporation whose principal objectives are:-

1. To provide a comprehensive range of services to incoming industrialists such as recruitment of labour, supply of fuel and transport.
2. To generate electricity thermally at Invergordon for sale at an internationally competitive price particularly to electro-intensive industries that establish operations there.
3. To promote development by taking an equity share in any industrial and commercial undertakings that can show a reasonable prospect of increasing the regional income.
4. To acquire land, for leasing to industrial companies expanding or setting up in their area.

It is suggested that separate companies rather than departments be set up to discharge these four functions; these are outlined in greater detail below and named for purpose of easy identification.

It is considered likely that many companies will be attracted far more by the offer of efficient competitively priced local services than of cheap loans or direct subsidies. The Managing Director of the New Brunswick Development Corporation in Canada told Proplan that his experience had been that subsidies attracted marginal operations and "sharks".

3.1. "Cromarty" Industrial Services Limited

Companies contemplating an investment in an unfamiliar area may initially be attracted by some special feature, e.g. deep water harbour. But, before committing themselves, they will generally seek to establish that their more ordinary but nonetheless essential, requirements for (e.g.) non-specialist labour, housing, local transport, water, effluent disposal can be fully satisfied at acceptable costs and without unreasonable expenditure of their own administrative time.

Any company has some unique technical and commercial knowledge and profits from applying this as effectively as possible: the less time it has to spend dealing with general non-specialist problems, the better.

It is therefore suggested that a company be set up to provide a comprehensive range of services to industry. The existence in the area of such a company, particularly if it were patently efficient, and unquestionably reliable, could prove a significant inducement.

It is suggested that it should be so organised that an incoming industrialist can discuss and agree his local requirements with the managing director of the company who would then be responsible for meeting these needs somehow on agreed terms (prices, dates, etc.). The incoming industrialist would have no need to deal directly with anyone else locally. The service company would have to decide for each particular service whether to subcontract to an existing private or public undertaking, or equip itself to provide it.

Services that industrialists should be able to buy from the service company include:

1. Recruitment of unskilled and semi-skilled labour

2. Supply and storage of fuel

3. Warehousing

4. Road transport

5. Effluent disposal and water supplies

6. Wharfing and bulk handling in local harbours

The staff of the company should become sufficiently skilful in buying or providing services in the area that it is evidently cheaper for an operating company to work through them, rather than staff itself to deal direct with all local organisations on whom it is obliged to rely.

3.2. The "Cromarty" Power Company

In many process industries, the price of electricity is one of the most important factors in determining where they are sited. Companies to whom this is particularly significant are those engaged in the production of:-

aluminium and magnesium (smelting)
iron (direct reduction)
alloy steels
ferro-alloys
phosphorous and other chemicals
fused refractories
graphite

In some parts of the world (e.g. Norway, New Zealand & Canada), electricity for such operations is available at or below 0.25 d/kwh. But this cheap power may not always be attractive because:-

(1) It is too far from raw materials being processed and/or the market for the processed product.
(2) Insufficient is available at the right time.

Proplan has established that a number of electro-intensive industries would at present give serious consideration to setting up an operation in the Moray Firth area if electricity were available there at a busbar cost of less than 0.5d/kwh. These include large aluminium and ferro-alloy groups whose names have been given in confidence to the chairman of HIDB.

It is therefore proposed that HIDB sponsor the setting up of a company to own a power station at Invergordon to supply electricity to industries that set up there. It is suggested that the plant should be managed by the North of Scotland Hydro Board.

The reasons for considering that this is economically and technically credible are set out below:-

If electricity is used exclusively for industry at one location in large quantities and with a uniform load, considerable economies can be secured because of:

(1) High load factors and the absence of peak loads
(2) Known proportion of interruptable loads, so that investment in standby generating capacity can be substantially reduced
(3) Flexibility of design to enable a variety of fuels to be burned especially when connected with a refinery/petrochemical complex
(4) Negligible transmission expenses
(5) Scope for selling by-products; pass-out steam; waste heat and possibly sulphur
(6) Reduced overheads: no research, development, head office etc.

In addition, Invergordon has the following advantages:

(1) A deepwater harbour
(2) The existing ¾m ton bunkering facility
(3) Cheap land
(4) Substantial quantities of cooling water
(5) Low ambient temperatures
(6) Relative freedom from any particularly onerous restriction placed on operations in heavily settled areas (noise, effluent, type of construction etc.).

3.2.2. The Price of Electric Power

When the requirements of various companies interested in cheap power are firm and Government attitude towards taxes, duties, and interest rates determined, considerable further study will be required to optimise the design

of the power station and prepare detailed costings. Meanwhile, as a basis for discussion with the Government agencies concerned and interested industrial companies, some tentative cost calculations have been made based on stated assumptions and are set out in Appendix 4. These show the costs of electricity at the busbar to be between 0.22-0.35d/kwh The company's customers will be responsible for any transformers, rectifiers or high voltage switch geat that may be required before the electricity is fed into their plant. It should be noted that the price of fuel is far more significant than all other cost components added together. As the duty on imported fuel can represent 0.1d/kwh, Government policy on duty on oil used wholly within an industrial complex could considerably influence the choice of feedstock (oil or gas) and thus plant. It is suggested, when the feasibility of this proposed power station is investigated, it should be assumed that no duty is payable. In this way, the real cost of the various alternative schemes can be compared. The cost of the scheme to the Government will then be whatever grants and loans are required plus any implied loss of oil duty. It may for example be worth considering the creation of a free port at Invergordon inside which duty-free oil would be available for any industrial purposes and which energy would not be sold.

The initial exchequer cost of the proposed power station can be kept down by means of plant supplier credits; those offered by foreign companies may be cheaper but may not be acceptable for balance of payments reasons. Privately financed power plant is also a possibility which would minimise exchequer costs

3.3 "Inverness" Holdings Limited

It is suggested that any investment in local industrial or commercial undertakings by the HIDB be made through a holding company staffed and run as far as possible on the same lines as other industrial holding companies with facilities for conceiving co-ordinated industrial developments and undertaking techno-commercial feasibility studies.

They might follow the example of the New Brunswick Development Corporation and actually launch operations of whose feasibility they were convinced, but others were not, with the object of selling them in part later.

Also, apart from investing Government money, they might usefully build up knowledge of sources of risk capital and thus be able to assist would-be Highland entrepreneurs to get all or part of their backing on reasonable terms from a reliable source in the private sector.

3.4 "Highlands" Industrial Sites Limited

One of the advantages of the Moray Firth area is that land is available for industrial use at prices significantly below other sites further south. It is suggested that this might prove an even greater attraction if it were available on long lease since it would reduce the amount of capital that an incoming industry would have to invest.

It is therefore suggested that the Development Corporation's subsidiary acquire land for leasing for industrial and commercial use; they initially could operate only in the Moray Firth area but would later serve other parts of the Highlands and Islands.

SECTION 4.

PROVISION OF INFRA STRUCTURE

If the development opportunities in Section 3 are to be realised, HIDB must take (and be seen to be taking) action to provide for the necessary build-up of the Infra Structure of the Moray Firth. An outline of the problems involved and some suggested solutions are set out in this Section. Fuller details are in Appendix 1.

SECTION 4.

4. INFRA STRUCTURE

If management and labour can be attracted to, and held in, the Moray Firth area, development could become self-generating. At present, the reverse seems to be happening. Businesses in the area experience difficulties arising particularly from:

either (a) lack of realisation of their own needs for professional management, especially marketing.

or (b) inability to recruit, and retain, such staff.

Assuming these difficulties are overcome, an incoming entrepreneur still needs assuring that his requirements for labour and local services can be satisfied. If he twice fails to get on the Inverness plane, reads about difficulties with Highland labour in the annual statement of the Chairman of North Eastern Timber and gets in a tourist traffic jam on his way to Dalcross, he could rapidly come to question the wisdom of coming so far north.

4.1. MANAGEMENT

Before substantial sums are spent on making the area more attractive to managers and their families, HIDB might usefully contact those known to have left the area or who are openly expressing the wish to do so and find out from them the reasons for their dis-affection.

Meanwhile, as a result of Proplan's investigations, it is suggested that the following action be considered:

(1) Endeavour to increase the probability that business visitors can get in and out of the area when they want.

BEA are planning to increase services, and an independent airline is planning to introduce a service to Inverness. These might be accelerated or extended if HIDB offered to take some of the financial risk for say the next two years, which are so critical in establishing the feasibility of worthwhile development.

(2) Urgently promote any road improvements which could within two or three years have a significant effect on tourist season congestion.

(3) Establish a screened list of hotel and house agents to ease initial search for accommodation and encourage the Hotel Groups with investments in the area.

In support of this, HIDB should encourage the improvement and expansion of hotel staff training facilities and the setting up of one or two competent and comprehensive Hotel Service Companies.

Though this would mainly benefit tourism, its object would also be to provide management with a choice of pleasant bases while house hunting and somewhere to go for an evening out when they are settled.

(4) Gather information about existing schools (e.g. class size and particularly any support for the assertion that the academies at Dingwall and Inverness are good even by Scottish standards) and the ease with which medical and dental treatment can be obtained.

HIDB should not credit business men with being unusually rational in their location decisions: whatever useful work their analysts may do, intuition will still play a large part. Intuition feeds on careful but nonetheless random observations of what appears on the surface. In this context, the Board should do all it can to dispel any impression that the area has a jinx on it which may be created by stories now circulating about local businesses currently in difficulties. Where there is scope for initiative by the Board, it is important that it should be taken. In a failing operation, if there is a good product, a good labour force or good management, ways should be sought of keeping what is good in the Highlands, probably by attracting new backers. Detailed recommendations on this subject are beyond the scope of this report.

4.2. LABOUR

It must first be stressed that, unlike many areas to which industry is being attracted, there is no substantial pool of unemployed in the Moray Firth area on which nascent industry can draw. Furthermore, would-be employers are at present likely to experience difficulty in getting reliable information about what little labour is available (see Appendix 1. p. 9).

HIDB should forthwith survey sources of additional labour, (male/female; unskilled semi-skilled/skilled; professional managerial) and keep this up to date. Objectives would be to:

(a) Avoid an imbalance between the rate of build-up of the labour force and industrial activity (Table opposite p. 10 in Appendix 1).

(b) To avoid a large demand for labour in the Moray Firth area being satisfied by the further depopulation of the Islands and Western Highlands.

(c) To avoid unemployment among previously employed wives and children of immigrant male labour.

Development boards easily get a bad name by encouraging companies to set up in their areas that subsequently fail to find enough labour or transfer their labour shortage to another company that may have been in the district for years.

4.3. RESIDENTIAL AND INSTITUTIONAL BUILDING

Assuming that industrial growth in the Moray Firth moves from credibility to feasibility and decisions are taken to go ahead with the building of towns, it will still take at least two years before much immigrant labour could be accommodated. In the critical build-up stages therefore, HIDB must look to existing towns and villages to provide accommodation for all those involved in planning and executing the build-up, both of the Infra-Structure and of industry. For this reason, it is important that HIDB should associate themselves with existing plans for limited development of the infra structure of existing towns and villages.

Subsequent development might be achieved either by treating the existing towns and villages as nuclei for expansion or by creating a number of entirely new towns. A bias towards the latter is recommended except that the Burgh of Inverness should continue its planned expansion.

With development proceeding at a manageable pace, it is considered that the population of the area could be increased from the present figure of 75,000 to 250,000 within 15 to 20 years.

This assessment is based mainly on the availability of sites suitable for garden city development and on credible building and civil engineering programmes.

Assuming a small net population increase in existing towns and villages of 7,500, provision should be made to accommodate 167,500 people in new towns. With 3.75 people to a house, four new towns with 44,500 houses each and one new town of 4,500 houses are proposed.

Areas suggested are:

A. Around KIRKHILL
B. West of CONON BRIDGE i.e. towards MARYBANK
C. Immediately adjacent to and north of ALNESS
D. Around LAMINGTON south of TAIN
E. North west of DORNOCH

The criteria applied in selecting these areas were: climate, slope and aspect of ground; availability of potable water; good drainage and access to road and rail. To avoid one continuous ribbon of mixed residential and industrial buildings, towns are interspersed with agricultural land, the best of which is retained in that use. The Black Isle designated the "green centre" of the area is excluded.

4.4 INDUSTRIAL BUILDING

Areas in which it is proposed that industrial building should take place are:

(1) North of INVERGORDON
(2) Between MUIR OF ORD and CONON BRIDGE
(3) Near DALCROSS AIRPORT where restrictions permit building
(4) The SANDS OF NIGG reclaimed
(5) ALNESS SAND reclaimed

The large-scale industrial processes (petrochemicals; minerals, cane fibre; ferro-alloy) should be to the North of Invergordon with over-spill on reclaimed land firstly on the Sands of Nigg and later on Alness Sand.

Food processing and small-scale speciality chemical or metallurgical processes could be sited at Muir of Ord.

Engineering could be either near Dalcross or also at Muir of Ord.

4.5. LAND USE

As indicated above, development of large-scale process industries may necessitate reclaiming the Sands of Nigg and Alness Sand. The feasibility of this should be established in order to reassure industrialists of the scope that exists for expansion adjacent to the proposed main site north of Invergordon.

It is further recommended that HIDB commission studies of the feasibility of:

(1) recovering land at the top end of the Cromarty and Beauly Firths; this might prove to be suitable for agricultural/horticultural activities which would provide employment for some of those whose land is forfeit as a result of the residential and industrial developments outlined above.

(2) using the land in the area above the 500 ft. contour for industrial purposes, taking advantage of modern site preparation techniques; this would obviate the need to sacrifice agricultural land in the cause of industrial development in the lower lying areas such as Muir of Ord.

4.6. TRANSPORT

The importance of improved air services and removal of traffic congestion was stressed in Section 4.1. under Management. No specific proposals can usefully be made about the development of the transport system until the nature and extent of the increased load is known and a suitable model can be constructed. However, in preparation for this, it is suggested that HIDB should:

1. Commission study of existing travel patterns in the area. Proplan's limited enquiries suggested little data is immediately available.

2. Gather available information and trends elsewhere in Great Britain that would assist in determining where to strike the balance between the provision of public transport facilities and private car parking facilities "at home" and "at work".

3. Establish, in cooperation with the Admiralty, the up to date position of shoals in the Cromarty Firth and its approach lane and survey the sea bed in the immediate area of Invergordon harbour; this to prepare for development of Invergordon as a centre for bulk processing of sea borne materials.

4. Be advised of all plans to build-up/run down transport facilities in the area so that they can decide how they fit into the emerging requirements of the industries that commit themselves to investing in the area.

4.7 Higher Education

Ministers and leading business men constantly stress the need to improve the application of technology in the United Kingdom. It is therefore suggested that an institute be established which does this and nothing else. All, or most universities so far set up engage either in pure science or theoretical technology. Few consider that the various research associations make sufficient impact on the industries they serve. Most technical colleges necessarily concentrate on running courses for established technical qualifications. Britain lacks the equivalent of the American institutes, like Stanford and MIT. It is therefore proposed that the Highlands and Islands Development Board promote the setting up in Inverness of an educational establishment with the following objectives:

(1) To fill the national need spelt out above and become a unique institution.

(2) Establish an international reputation in the application of technology.

(3) Provide a means of training and also a source of skilled technical management for industries in the area.

We suggest that the institute should initially specialise in a few fields, particularly relevant to the Highland situation. A parallel may be drawn with the Tennessee Valley Authority whose first activity was to set up a research institute to evaluate and solve the problems of the area, particularly those concerned with establishing industries suited to its natural resources.

Professorial chairs could be established each to specialise in the application of research and development in a different field e.g. mineral exploitation; regional planning; welding; forestry products.

We suggest that this institute be at least initially directly responsible to the Board, though it should have its own governing body and be associated with

existing universitites who are willing to participate. It should be a non-profit organisation but be allowed to accept outside contracts for payment.

Although the institute would work on specific problems of Highland Development, it is important that it should not be limited to these since its value in reputation will depend on the cross-fertilisation of ideas throughout the world. The best method of building up an international reputation is to have a programme of work that attracts the best people to Inverness. The purpose should be to couple the best commercial and technical brains on real problems which demand economical solutions in the interests of the British economy; a guiding feature could be studies likely to lead to substantial improvement in balance of payments.

HIGHLANDS AND ISLANDS DEVELOPMENT BOARD

Development in the Moray Firth Area

CREDIBILITY STUDY

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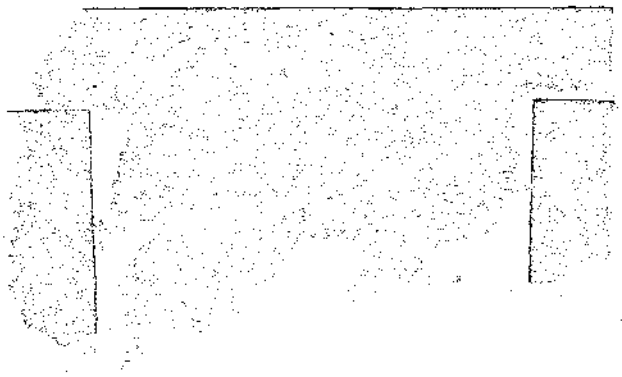


August 1966

PRODUCT PLANNING LIMITED

Carolyn House Dingwall Road Croydon Surrey

APPENDIX 1.

INFRA STRUCTURE

APPENDIX 1.

INFRA STRUCTURE

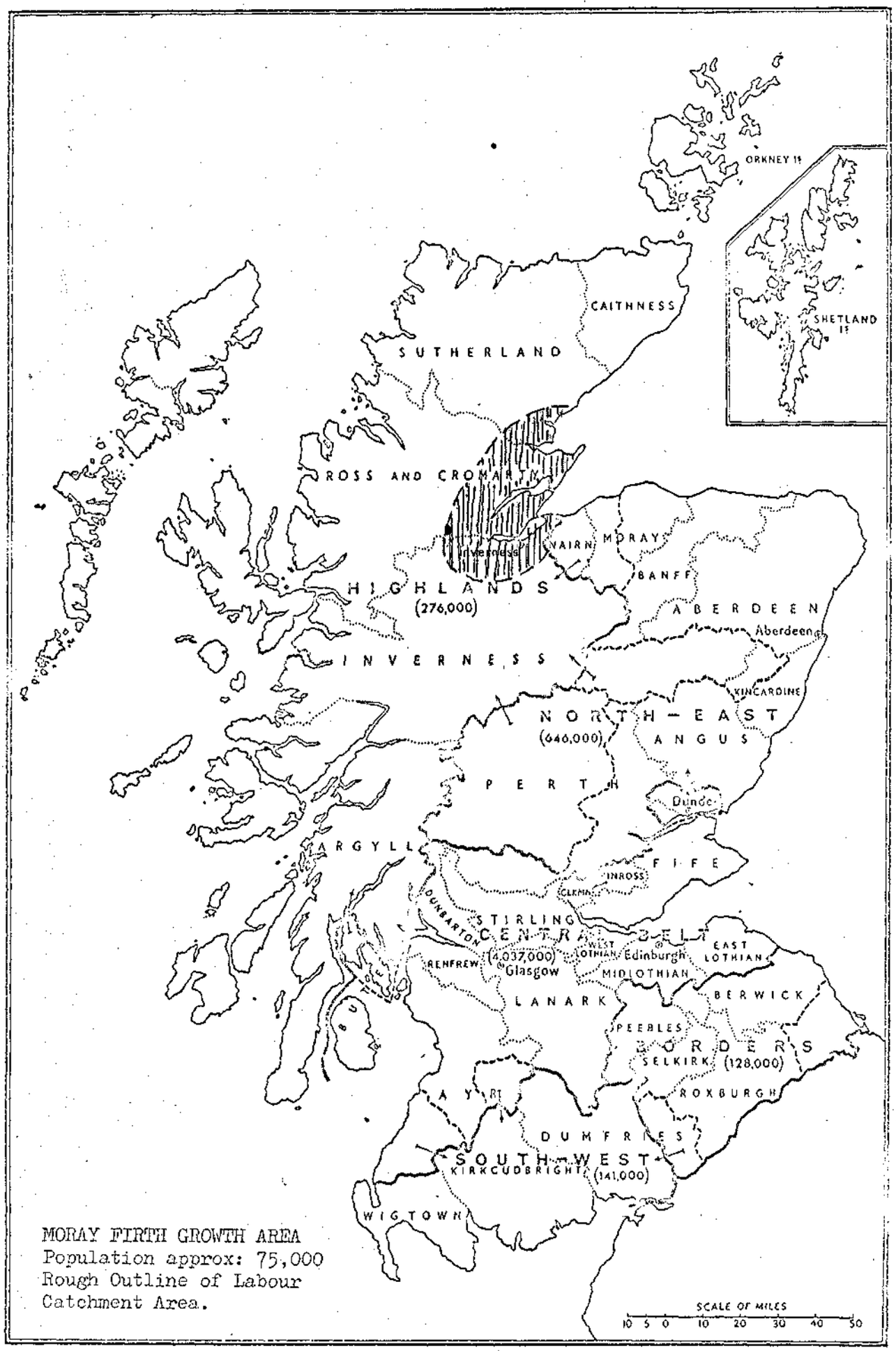
CONTENTS PAGE

APPENDIX 1.

INFRA STRUCTURE

AN APPRAISAL OF THE PROBLEMS INVOLVED IN DEVELOPING THE INFRA STRUCTURE OF THE MORAY FIRTH GROWTH AREA

The present population of the area is estimated to be about 75,000. It is suggested that over a period of 15 - 20 years the population might, with development at a managable pace, be increased to 250,000. This study examines the problems involved in meeting this target.



MORAY FIRTH GROWTH AREA
Population approx: 75,000
Rough Outline of Labour
Catchment Area.

Definition of the Moray Firth Growth Area

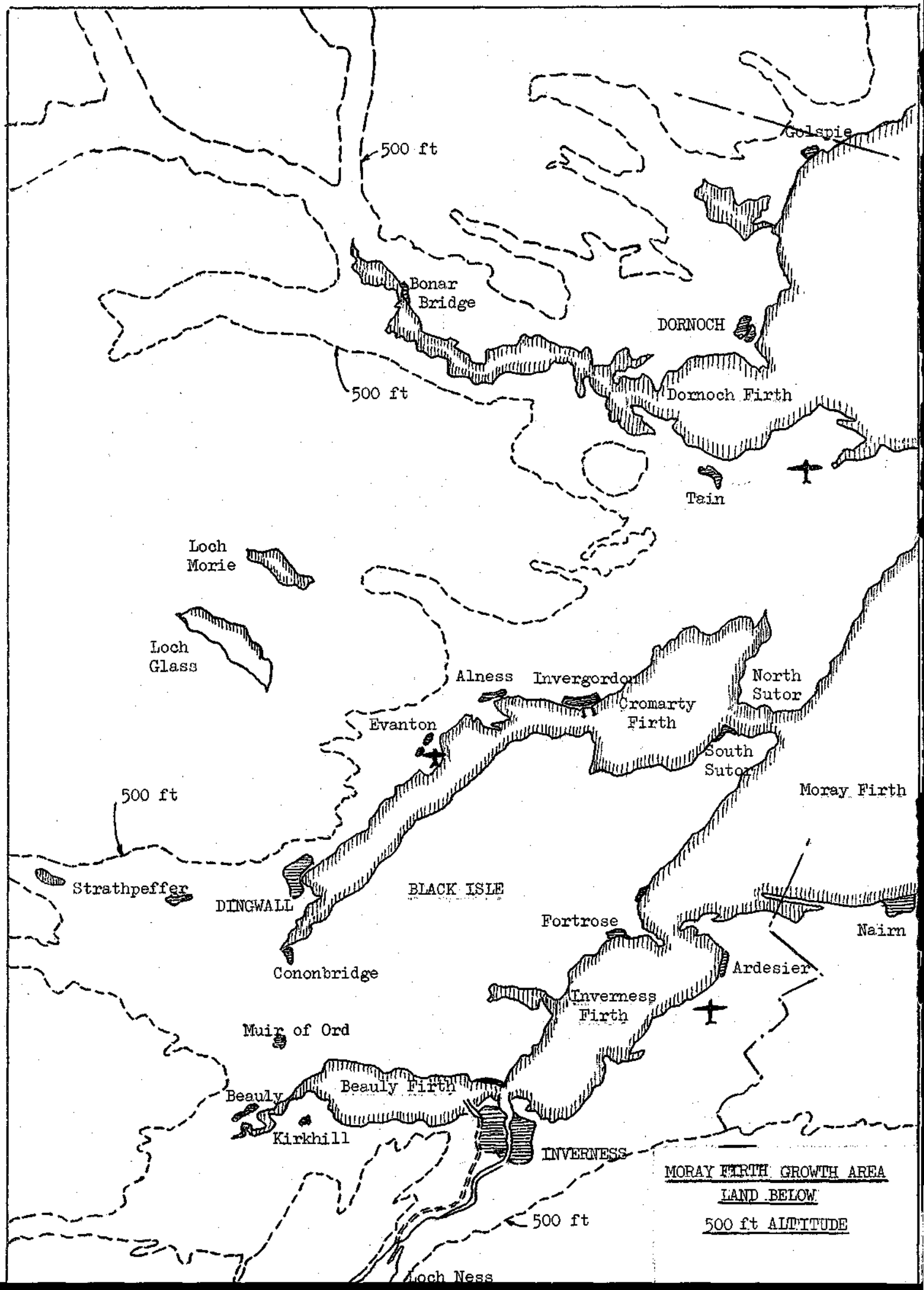
The area consists of the coastal belt starting in the south-eastern part of Sutherland passing through Easter Ross including the Black Isle and ending at the Inverness/Nairn border. It reaches inland only to the extent of the catchment areas for labour and water employed in the coastal plains.

This appraisal does not, for the time being, deal with any other parts of the seven Crofting Counties, except to mention them when they have any influences on development of the easter regions.

The area's length and comparatively narrow width suggests that large scale industrial and residential development might be planned in the form of a linear conurbation. However, to avoid spoiling the natural beauty of the region with one continuous ribbon of mixed residential and industrial buildings, we propose that residential areas should, if possible, be grouped in a number of reasonably sized towns interspersed with agricultural lands and that industrial sectors be similarly separated from residential areas.

The curved shape of the area leads to the suggestion that the two extremes should be brought nearer to each other by one or more fast road communications across the Black Isle.

The Black Isle itself, flanked as it is by water on both sides, seems ideally suitable for the functions of a "green centre". We propose therefore that the Black Isle be excluded from any plans for industrial development or close urban residential development. We propose that also the peninsula east of Tain be excluded. The latter on account of its high potential for agriculture.


500 ft
Golspie
Bonar Bridge
DORNOCH
500 ft
Dornoch Firth
Tain
Loch Morie
Loch Glass
Alness
Invergordon
Cromarty Firth
North Sutor
Evanton
South Sutor
500 ft
Moray Firth
Strathpeffer
DINGWALL
BLACK ISLE
Fortrose
Nairn
Cononbridge
Ardesier
Inverness Firth
Muir of Ord
Beauly
Beauly Firth
Kirkhill
INVERNESS
500 ft
Loch Ness
MORAY FIRTH GROWTH AREA
LAND BELOW
500 ft ALTITUDE

Siting the residential and industrial areas as proposed does mean that most employees will live between two and ten miles from their place of work. Our investigations into existing customs in Scotland have led to the conclusion that this will be acceptable. We propose however that a number of minor industries which employ principally female workers be sited near to the appropriate residential areas so that married women can take up work within reasonably short distances from their homes.

We suggest also that educational institutions be sited so that primary schools involve very little travelling for the younger children, while secondary and trade education should be concentrated in suitable centres. Higher and university education will benefit from grouping in close proximity. Inverness appears the obvious centre for any development of higher education except that an agricultural and/or veterinary faculty of a university might more sensibly sited in, for instance, the Black Isle, with its admirable opportunities for experimental farming.

It is easier to site residential development areas than to plan in advance major industrial sites before the nature of the activities to be undertaken on the latter are known.

We suggest that the criteria, which need taking into account when land is selected for close residential development, are mainly:

> climate; slope and aspect of the ground, availability of potable water; good drainage and access to road and rail.

When one or more areas are to be selected for industrial development, geographical considerations are of greater importance. Access to process water, deep sea harbour, railhead, become significant.

In this study outline indications are given of where various types of industries might be sited.

Detailed recommendations on specific locations should take account of the following factors:

(1) Labour requirements: male/female; unskilled/semi-skilled/skilled; managerial/professional.

(2) Land area at outset for production, storage, offices, parking, etc.

(3) Land area ultimately if reasonable ambitions are achieved.

(4) Access to local raw materials and process water.

(5) Access to deep sea harbour, rail heads, trunk roads and airport.

(6) Nuisance potential of process; noise, dust, fumes, etc.

(7) Effluent and waste for disposal.

It will be necessary to take account of the effects of the new "Rivers (Prevention of Pollution) Act, 1965" which now includes in its schedule the sea lochs in the Moray Firth area.

We note that the land situated between Beauly, Muir of Ord, and the top end of Cromarty Firth presents problems as regards drainage and sewage. We have been informed that although there is as yet only small scale urban development in this area, sewage must be disposed of by pumping. This may mean that major pumping installations for both sewage and surface water drainage will probably have to be constructed when the built-up area is substantially increased. This should in our opinion not deter planners from choosing this area for industrial sites if other factors lead them to do so.

Existing Urban Development

A number of towns and villages exist in the growth area. These might be used either as nucleii for expansion, or entirely new towns might be created. We suggest a bias towards the latter, except in respect of the Burgh of Inverness, which we propose could be permitted to expand to the extent and on the lines already being followed by the Burgh Council, i.e. up to 45,000 people. Other towns and villages should, we suggest, be stabilised. During the initial construction period they will offer accomodation for personnel and offices for contractors and for service industries. Some, but not all of which, may later move to new town areas.

The old towns can continue to serve their historic roles as cross-roads of commerce and market places for produce and livestock; they can also develop their tourist operations for which new towns are less suitable.

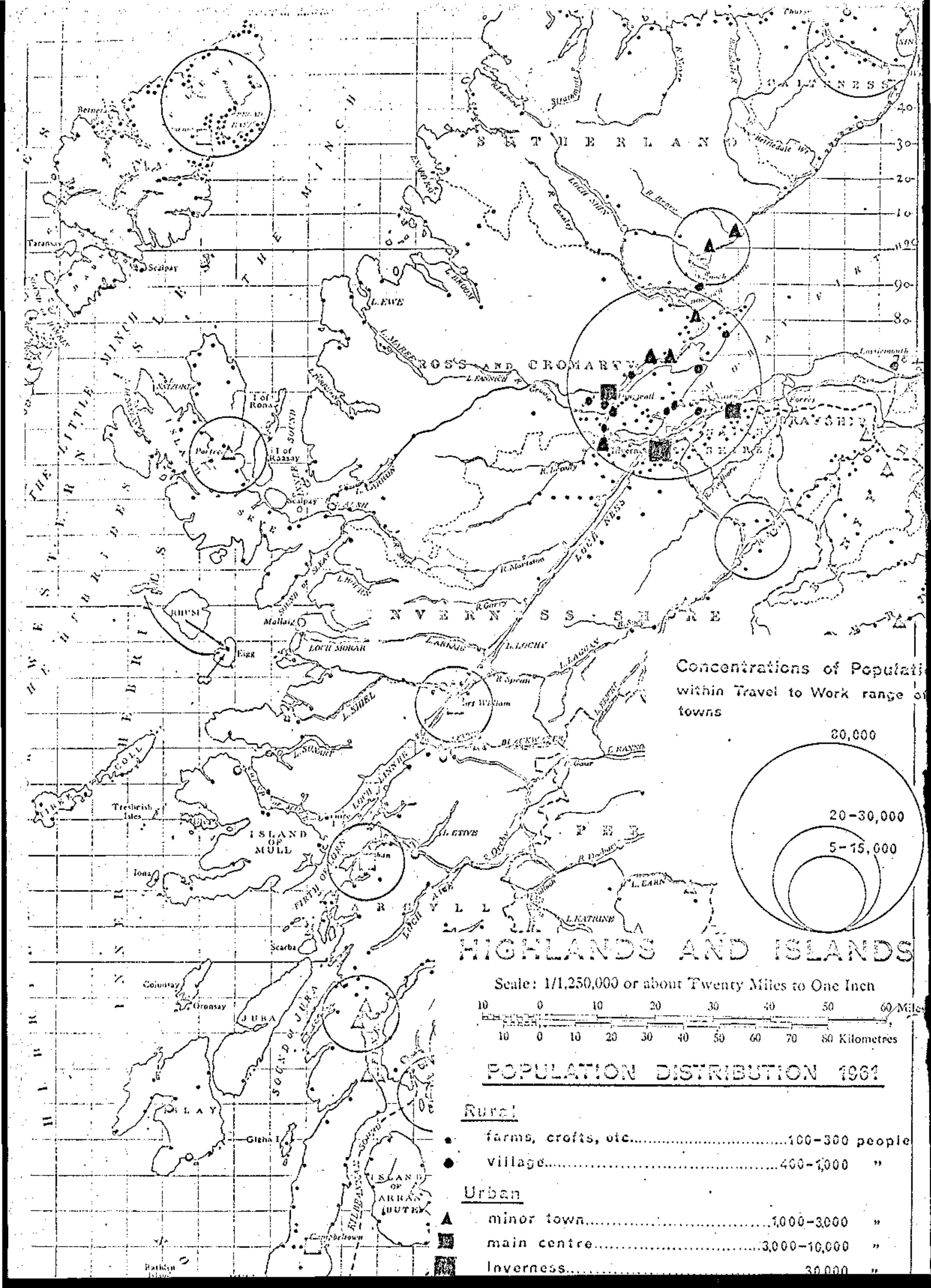
Occasionally, if a small scale for industrial or commercial operation of a unique or specialised nature is proposed having little relation with any other undertaking in the area, it could be encouraged to set up in an old town or village ot inject a little new life, particularly for example if it called for labour that happened to be available.

We consider that in this way the existing towns will play a very effective role in the new infra-structure and that in fifteen years time their combined population will grow from approximately 45,000 to 65,000.

We are aware of doubts expressed regarding the bearing capacity of the sub-soil in the Dingwall area and subject to further investigations into this matter, we should for the time being express our reservations regarding the possibilities of any substantial building construction in this town. We have not heard of similar conditions elsewhere, but this may be due to lack of data as probably there has hitherto been no reason to investigage the matter.

Several townships would entirely loose their present character if for instance attempts were made to put major roads through the centre.

Policy decisions regarding the future of existing towns should be taken very early as delay might seriously impede the present rate of progress. Such public buildings and utilities as are in existence are not designed for expansion. In some cases plans for example for a new school, or hospital or for a new sewer or water supply system might well be held up indefinitely if there were no firm decision at the start of the first 5 year development period.



Concentrations of Populati
within Travel to Work range of
towns
80,000
20-30,000
5-15,000
HIGHLANDS AND ISLANDS
Scale: 1/1,250,000 or about Twenty Miles to One Inch
POPULATION DISTRIBUTION 1961
Rural
farms, crofts, etc. .... 100-300 people
village .... 400-1,000 "
Urban
minor town .... 1,000-3,000 "
main centre .... 3,000-10,000 "
Inverness .... 30,000 "
SUTHERLAND
ROSS AND CROMARTY
INVERNESS-SHIRE
ARGYLL
ISLAND OF MULL
JURA
ISLAY
ISLAND OF ARRAN
THE LITTLE MINCH
THE MINCH
LOCH NESS
Inverness
Dingwall
Fort William
Portree
Mallaig
Eigg
Campbeltown

The Increases in the Existing Population in Fifteen Years

In the table below we have assumed that the rural population will first decrease and that, after reaching a minimum, it will begin to increase again.

There is already a steady reduction in the number of people employed in agriculture due to improvements in efficiency. Conversion of agricultural land into residential and industrial sites will increase this trend. Eventually we expect that the rural population may increase albeit, rather slowly as more land is reclaimed both on hillsides and the foreshore and particularly if the proposed intensive horticultural activities are introduced on a wide scale.

Area	1966	1981	ultimate
Inverness	30,000	45,000	60,000
Other towns	15,000	20,000	25,000
	45,000	65,000	85,000
Rural villages, farms, estates	25,000	17,500	20,000
Total:	75,000	82,500	105,000

The overall increase in numbers is based on the assumption that industrial development will take place in the Moray Firth. Unless, and until it does, many will, as at present, emigrate after education and training.

The Burgh of Inverness is engaged on a programme of expansion, which for geographical reasons seems limited to a total area suitable for a population of 45,000 persons. Expansion beyond that limit may be difficult because sewerage of the additional sectors is said to need rather expensive engineering works. The very centre of the Burgh can be improved considerably, both as regards traffic circulation and accomodation for offices and shopping areas, by removing the existing railway passenger station to a site adjacent to the through-line to Dingwall.

THE DIMENSIONS OF THE INFRA STRUCTURE

Several sizes for the total population, as it might be at the end of 15 years of planned and successful development, were investigated with a view to assessing the scale of the components of the infra structure needed to support such a population and the industries, which would enable them to earn their living.

We selected eventually 250,000 as a fair target to aim for and the title to this section of our Report mentions this figure.

This community of 250,000 will probably consist of the following:

1. 120,000 males
   130,000 females
   250,000

   assuming that after the year 0 + 15 the numbers of males and females will compare as they now do in the rest of Scotland. (At present males out-number females in the Highlands by a small margin).

2. It is much more difficult to estimate the number of persons who would be in employment. Taking 1964 statistics of "insured" employees for the Highlands as our base for comparison, we may expect at least:

   57,000 male employed persons over 15 years

   46,000 female employed persons over 15 years

   103,000 employed persons including seasonal employed.

3. A very rough estimate shows the numbers of children of school-going ages requiring places as:

43,500 at primary schools
25,500 at secondary schools
69,000 children at schools

4. 69,000 children attending schools whole time
103,000 persons in employment
78,000 others : aged, below 6 years, disabled, etc.
250,000

5. Assuming that after 15 years of planned industrial development conditions in the M.F.G.A. will be similar to those which existed in 1964 in Scotland as a whole and applying minor modifications to distribution percentages for known conditions as regards agriculture and mining, we would have the following numbers of persons employed in:

Primary Industries	%	No.	
Agriculture, Forestry & Fisheries	4.8	5,000	+
Mining & Quarrying	1	1,000	
	5.8	6,000	
Manufacturing Industries	35	36,000	—
Construction Industry	8	8,000	+
Service Industries	51.2	53,000	+
TOTAL:	100	103,000	

These proportions will not be attained until towards the end of the 15 year development period.

In the early stages when many engineering works are in progress as well as house building rather large numbers (mainly men) will be employed in construction, may be up to 40,000, but at that time not so many will be employed in the primary, manufacturing and service industries. It is noteworthy that for example at Thurso and Dounreay, the construction labour force was about equal to the number of persons afterwards in full time employment at the power station and in other industries in that area.

The size and rate of immigration

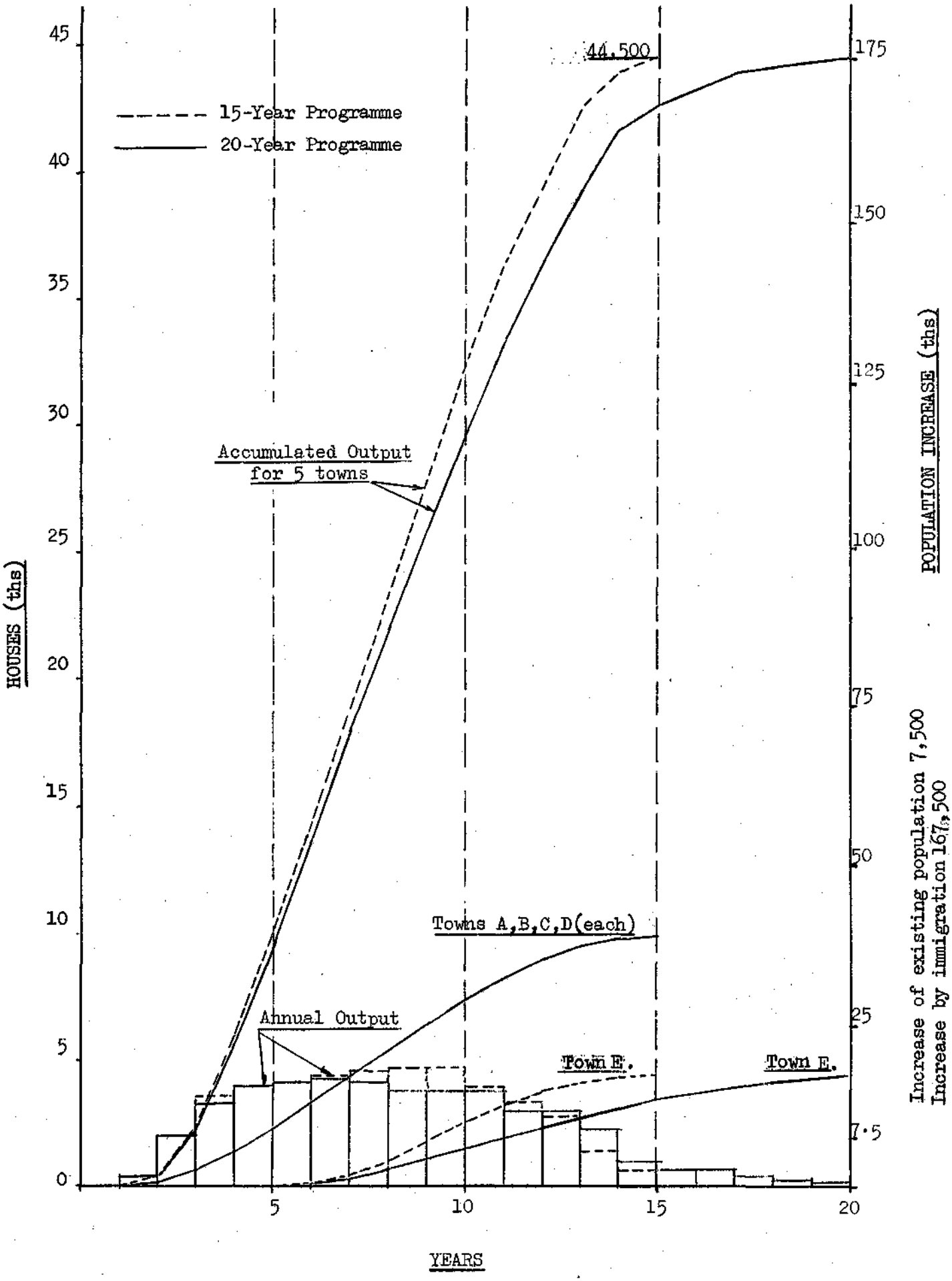
The population of the Moray Firth area will, after the year 0 + 15 be a combination of those who live there at present and their natural increase, plus those who by that time have migrated into the area and their natural increase.

In Scotland at present the rate of natural increase is approximately 7% for the ten year period from 1954 to 1964. This is above the national average (5.26% for the United Kingdom). Assuming such a rate of natural increase for the natives of the area, the population excluding migration should reach 82,500 in the year 0 + 15. Immigrants and their natural increase must provide therefore 167,500 plus whatever is necessary to compensate taking account of the year of arrival; natural increase (this is likely to be less than the average for Scotland since it is anticipated that many of the immigrants will be from outside Scotland), but assuming new towns in the area follow the national pattern it will be higher than the national average by about 5%); emigration of natives; loss of immigrants, etc. Such calculations are beyond the scope of this study.

The rate at which immigration will take place will be determined by several factors, for instance:

- the requirements of industries
- the rate at which accomodation can be completed
- the rate at which services can be developed
- and, very important:
- the willingness of people to come to the area

OUTPUT OF HOUSE CONSTRUCTION INDUSTRY



All we need say at this moment is:

1. immigrants can be taken in only as fast as houses are built, as we assume that all other construction work can be carried out more quickly.

2. immigrants will be needed according to the rate at which industries are set up and grow.

3. immigrants will be needed only when there are within the area insufficient suitable persons to fill available vacancies.

We should make clear that our suggestion that the building of housing will probably prove to be the determining factor in this exercise, is based on information obtained regarding rates of construction in new towns elsewhere. The national average is probably not much higher than 600 - 750 houses per annum. The highest outputs have been attained in East Kilbride (about 1,300 p.a.) and Basildon (about 1,200 p.a.). These figures were achieved after the respective programmes had been worked on for from two to three years or more.

The reason for these levels of annual output are varied. The annual financial budget plays a major role. The rate at which industries can be drawn to the new towns is another important factor, as well as the rate at which people can be induced to move. In addition, there are, of course, the technical facts, the time it takes to lay a sewer, construct a road, prepare a site and the impossibility of carrying out more than a limited number of operations in a particular area or space at any one time. Much time is in some cases needed for lengthy procedures for acquiring the land itself.

We have no reason to anticipate that records will be broken in the Moray Firth area, but as building techniques are continually being improved and as there is evidence to show that there are on average few weeks in any year when in this region all building has to cease on account of the weather, clever planning and good operational supervision and management should make an output of 1,000 houses per new town per year possible, after a running-up period of say 2 years. Even if these two years were entirely wasted, which is unlikely, the total number of houses which could be built in theory in the 15 year period would be 13 x 1,000 x number of new towns (say 4) = 52,000 houses, which would be adequate for 52,000 x 3.75 = 195,000 persons. (At present the numbers of persons per household is approximately 3.75)

The number of houses needed for the new population of 167,5000 persons will depend on the number of persons in hostels, boarding houses. The largest number of houses which might be needed would be of the order of 44,500.

In view of the geography of the area, we suggest that the design-population of a town should be limited to 40,000 persons. Four of these towns would be not quite adequate for 167,5000 immigrants. It is advisable to make provision for a fifth town, as account must be taken also of increase of population after the development period.

However, land for towns is very limited and it would be difficult to accomodate more than four new towns south of the Dornoch Firth, assuming it is acceptable that the "east of Tain" peninsula and the Black Isle should be free of close urban development and that no development by the Board will take place at Nairn. In that case a fifth town should be sited north of the Dornoch Firth, which would be particularly useful if industrial expansion were to seek new terrain in that direction.

The fifth site can be included in the construction programme from the beginning, or alternatively introduced at the start of either the second or third planning period. Too early a start would create a tendency to spread efforts and forces with the result that the programmes for the four other towns could drag on into the fourth period. This is not desirable, as too large a proportion of housing would be occupied for too long by employees of the construction industry.

At this stage we must make a number of assumptions, viz:

1. New towns will be planned as Garden Cities, that is with really low densities, thus creating a superior urban environment in keeping with the natural surrounding. This amenity is in our opinion essential if people are to agree to migrate into the area and to settle permanently. Our investigations and interviews lead us to stress this point as it is likely that many may not be prepared to come so far north unless there are distinct attractions such as spacious towns.

We suggest as a basis for arriving at a scale an average density of 100 acres per 1,000 persons gross, that is including open spaces, public buildings, institutions, shopping areas, minor service industries, way-leaves, roads, etc., but excluding motorways (throughways) and railway reserves.

2. No new town will extend above the 500 feet contour and shall preferably also not extend to seaward of the 150 feet contour.

   The former limit is dictated by water supply requirements and the latter by the fact that in the lowest regions land is generally of high value for agriculture.

3. Sites for new towns will avoid the use of the better quality agricultural land, for instance the penninsular east of Tain.

4. The Black Isle will be excluded. We have given our reasons earlier, but we must add that we expect that this area will prove invaluable for choice sites for houses for top management, as well as for recreational amenities at suitable places along the shores.

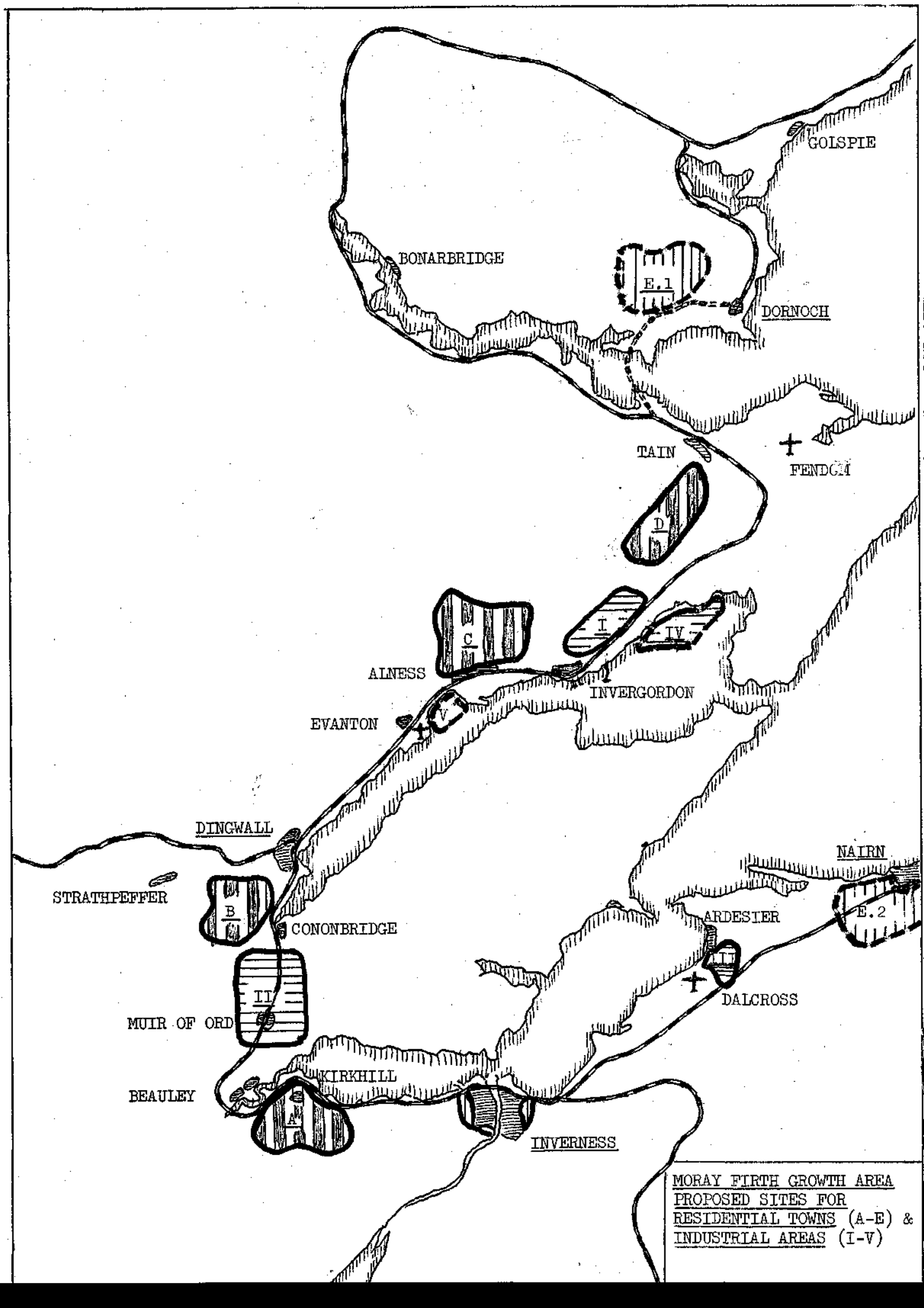
5. The combined areas of new towns will not exceed one fifth of the land excluding that mentioned under items 3. and 4. above.

   This means that four or five towns will have to fit into some 33,500 acres. This will at the density mentioned under item 1. be sufficient for 335,000 persons and ensure adequate space for increases of population after the 15 year development period.

   The loss of agricultural and forestry output from this land will, we suggest, be more than compensated by increased output from the remaining 210 square miles when improved techniques are employed to satisfy the needs of the rapidly growing population. We estimate that about one third of the remaining land, 70 square miles, is covered with forest plantations.

6. New towns will not be designed to perform the functions of existing towns. We stated our policy in the first few pages of this survey. (Markets and rural commerce).

7. New towns will also not be designed in the first instance to provide services for the tourist industry. It is hoped that the authorities of existing towns will vigorously pursue policies aimed at improvement of these services.


GOLSPIE
BONARBRIDGE
E.1
DORNOCH
TAIN
FENDOM
D
C
I
IV
ALNESS
INVERGORDON
V
EVANTON
DINGWALL
NAIRN
STRATHPEFFER
B
E.2
CONONBRIDGE
ARDESIER
III
II
DALCROSS
MUIR OF ORD
KIRKHILL
BEAULEY
A
INVERNESS
MORAY FIRTH GROWTH AREA
PROPOSED SITES FOR
RESIDENTIAL TOWNS (A-E) &
INDUSTRIAL AREAS (I-V)

8. We visualize each new town as an entirely separate entity complete within itself as regards administration and most types of social amenities and services.

Keeping the above assumptions in mind, we suggest the following areas as sites for new towns: from south to north -

A. The area around KIRKHILL in Inverness-shire.

B. The area west of CONON BRIDGE i.e towards MARYBANK in Ross and Cromarty.

C. The area immediately adjacent to and north of ALNESS.

D. The area around LAMINGTON south of TAIN.

E.1. The area situated north west of DORNOCH.

We considered an area near ARDESIER in easter Inverness-shire, but the severe restrictions imposed within a circle with a 3 mile radius, measured from the centre of DALCROSS AIRPORT, rules this out.

If a new town is wanted on that side of INVERNESS, then the area around NAIRN seems the only suitable suggestion (E.2). We have not included this in our present list because Nairn County does not come within the sphere of activities of the Highlands and Islands Development Board.

Industrial development makes demands different from those of residential towns.

We propose that in the first instance the following be considered:

I. The area north of INVERGORDON for industrial enterprise, which need access to a harbour suitable for major sea-going vessels or which need large quantities of fresh water for processing. This area has already been earmarked for industrial development by the Chief Planning Officer at St. Andrew's House in Edinburgh.

II. An area between MUIR of ORD and CONON BRIDGE for industries requiring mainly rail and road transport.

III. The areas near DALCROSS AIRPORT where restrictions permit building. There is adequate land for quite a number of light-engineering enterprises, particularly those manufacturing high added-value products and for firms who specialise in process research.

IV & V. Land recovered from the sea, such as part of the Sands of Nigg and Alness Sand. The former may prove ideally suitable as an overspill area for the Invergordon industrial area.

Adjacent to a number of old and new towns, areas of modest proportions where industries needing principally female labour can be sited, provided they use "clean" processes and cause no noxious fumes and dusts to waft across the towns. It is noted that winds in the region vary considerably in direction. We suggest that suitable Regulations be prepared at an early stage and strictly adhered to when negotiations with industrialists take place.

It is, of course, quite possible that a major industrial concern, for instance, one using smelting processes would wish to set up in the region. In that case, its particular requirements must be measured against the assets of the areas already mentioned and if need be yet another site selected.

On page 2 we proposed that residential towns and the principal industrial areas be separated from each other by belts of agricultural land. This carries with it the implication that all personnel will travel to their home by some form of mechanised transport.

Many of the people immigrating to the Moray Firth will have been used to communicating to and from work; many will have used public transport, trains, buses and the underground. Against this, more and more people in urban areas are preferring their own cars to any form of public transport. The examination of these two conflicting trends is outside the scope of this study, but we suggest that some research be undertaken on this matter so that a reasonable balance may be struck in the area between the provision of public transport facilities and the provision of "at home" and "at work" parking for private cars.

There may be fluctuations between summer and winter, and there may be differences between categories of workers. Nevertheless, we suggest that it would be unwise if industrial estates were not laid out so that each enterprise has its own private car park. Reference to a new factory situated in a rural area near Redhill in Sussex (Foxboro) lead us to propose that parking areas should be of the order of half the size of the floor area of a factory, unless machinery in the factory is large, highly automated and attended to by only a small number of operatives.

Our suggestion means also that in residential towns, houses will have to be provided with garages.

Bus services within towns will be needed for the non-working members of families, and we propose also that a fast train service from one end of the growth area to the other will be needed for those who do not wish to use their own cars. We have in mind short trainsets driven by electric or diesel power. For them it will be necessary to install a dual track system throughout the region.

Before final recommendations with regard to roads and rail are made, it will be necessary to build a model of the situation as it will eventually be. To do this, data regarding existing travel patterns will be needed. We understand that statistics may at present not be available.

Early study of these matters is advisable.

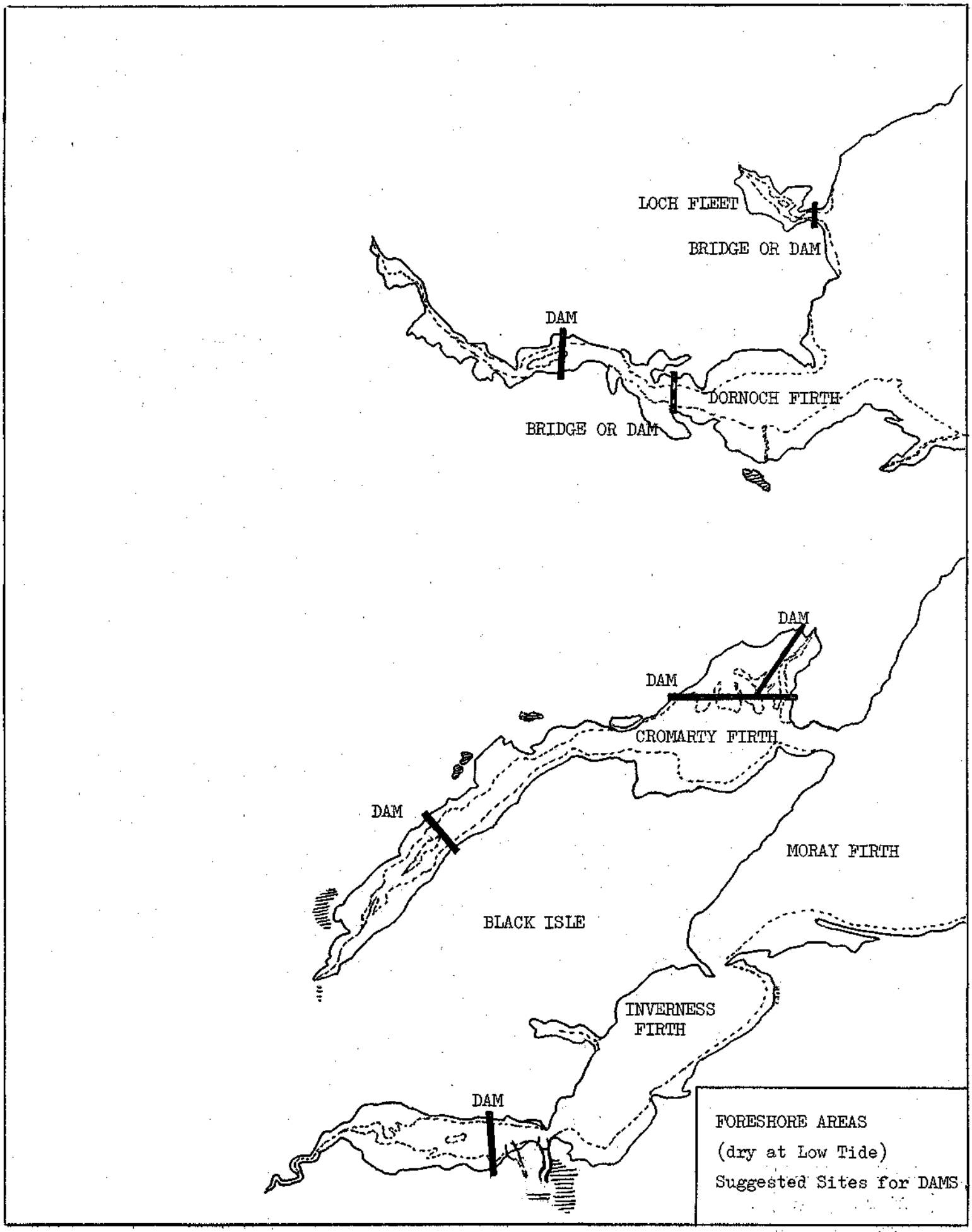
The use of non-agricultural land for industries

We have thus far adhered to the generally accepted principle that industries shall be sited in the coastal plain. We do suggest, however, that as a matter of urgency investigations be carried out to ascertain whether a suitable area for industrial development can be located on land, which is at present not regarded as suitable for agriculture. This will mean going to rather higher altitudes, and we feel obliged to question whether this is really ruled out. In the uplands behind Inverness and in easter Ross, opportunities may exist to site groups of enterprises and thereby save for agriculture substantial acreages of land. We feel that some major thinking is needed at this stage in Scotland's history. The scene has been set by the advent of large columes of natural gas, the development of new techniques for site preparation and the pressure on agricultural land in many parts of Great Britain.

Reclamation of foreshore

We propose that wherever this is economically possible the foreshore in the Beauly, Cromarty, Dornoch Firths and Loch Fleet be made safe from ingress of salt water.

> Soil surveys, both as to quality and to depth, should help deciding whether the land is valuable for use for grazing, or horticulture. This is a matter of some urgency and should be followed by an engineering survey. Where the reclaimed land consists of sand, it would after filling in with more sand to a higher level, be useful for industrial sites: (iv and v).


LOCH FLEET
BRIDGE OR DAM
DAM
DORNOCH FIRTH
BRIDGE OR DAM
DAM
DAM
CROMARTY FIRTH
DAM
MORAY FIRTH
BLACK ISLE
INVERNESS
FIRTH
DAM
FORESHORE AREAS
(dry at Low Tide)
Suggested Sites for DAMS

Protective sea-walls can serve in the case of the Sands of Nigg as a causeway giving ready access to the arable land on the other side.

The "top-ends" of both the Beauly and Cromarty Firths are said to consist of silt which after desalination and drying out may be suitable for horticulture. We would recommend that causeways be constructed at convenient points and that these crossings be used as the north and south ends of a fast road across the Black Isle.

A very rough estimate indicates that some eight to ten thousand acres could be claimed from the sea, but we suggest that perhaps only for about three to four thousand acres a case can be made out. Even at a low value of £100 per acre, this represents some £350,000 in land value, while if the quality of the soil is good, the value should be at least as high as other land in the region (£200 per acre = £¾ m. total).

Having as yet no particulars of conditions in the various areas, we must refrain from making suggestions regarding costs.

Bridges will be needed to span the waterways to be left for rivers flowing through these lowlands. A system of sluices will also be needed to prevent the sea from entering the dry areas. It is probable that pumping installations will be needed to maintain the water levels behind seawalls.

While land so reclaimed will, of course, not be adequate to replace the land used for urban development, it will at least serve to provide work for some of the labour which is displaced. It will also probably more than compensate farmers who will be losing tracts of land near the shore for the widening of roads. It will probably prove useful to take a Dutch expert in this field into our confidence, but this should wait till research has provided the basic data.

Water

We have enquired into the potential resources of fresh water.

We estimate the ultimate demand for potable water for domestic use at some 15 million g.p.d. for the whole area (300,000 x 50 g.p.d.)

Irrigation may require a further 5 m.g.p.d. (1" on 2,000 acres on a 10 day cycle) i.e. when market gardening and growing of vegetables and fruit for processing have been fully developed. The combined requirements of industries are difficult to forecast, but we suggest that the order of magnitude of requirements can be 50 m.g.p.d. These three demands add up to say 70 m.g.p.d.

The estimated volume of water which can be made available from high level catchments at economical cost is of the order of 110 m.g.p.d. Most of this would come from Loch Glass and Loch Morie in easter Ross. In addition, Loch Ness can probably be made to give up substantial quantities at higher cost (all water will have to be pumped).

The margin of supplies from high level sources is not so great that promises to prospective industrial entrepreneurs can be made without careful thought.

It is understood that the Government is considering the grouping in each County of all supplies under one controlling authority.

Solely as a matter for further thought, we suggest that depending on the quantities of water brought down from high level catchment areas, it may be possible to extract a certain amount of electric power. Although this would be mainly of the "base-load" category, it seems worthwhile to ascertain whether some use cannot be made of this power potential, for instance, for pumping sewage or for draining low lying land. There may be merit in the suggestion that this power might be useful for pumping water from Loch Ness to a reservoir at higher level, where it could be made available to industrial enterprises if any were set up above the 500 foot contour.

Roads

Intensive development of the Moray Firth area will be possible only when all trunk roads are improved at a very early stage. In fact, we propose that such plans as are already " in the pipeline" shall be put into effect as soon as the principles of a development plan are approved by Government. A period of seven or eight years will be needed to construct dual carriageways from Inverness to Invergordon via Dingwall, and to widen the remainder of the A9 and the A96 to a standard which will ensure that during the tourist season traffic remains fluid.

The Local Authorities in the region would not be able to undertake a large road construction programme without employing consultants. It may be worthwhile to consider setting up a central Road Construction Bureau for the duration of the development period, which would enable the County Surveyors to give their full attention to other roads in their counties.

The Civil Administration of the M.F.G.A.

Our investigations lead us to suggest that the Government should consider the regrouping of administration of the region under one county.

> The existing dividing lines between Counties cause the west coast areas and islands to be physically remote from the County Headquarters. When, for example, a senior officer has to give his personal attention on the spot to a problem in the west, he is away from his office for a considerable period of time. Increased development in the west will aggravate this situation. We feel that both east and west will suffer unless a change is made.

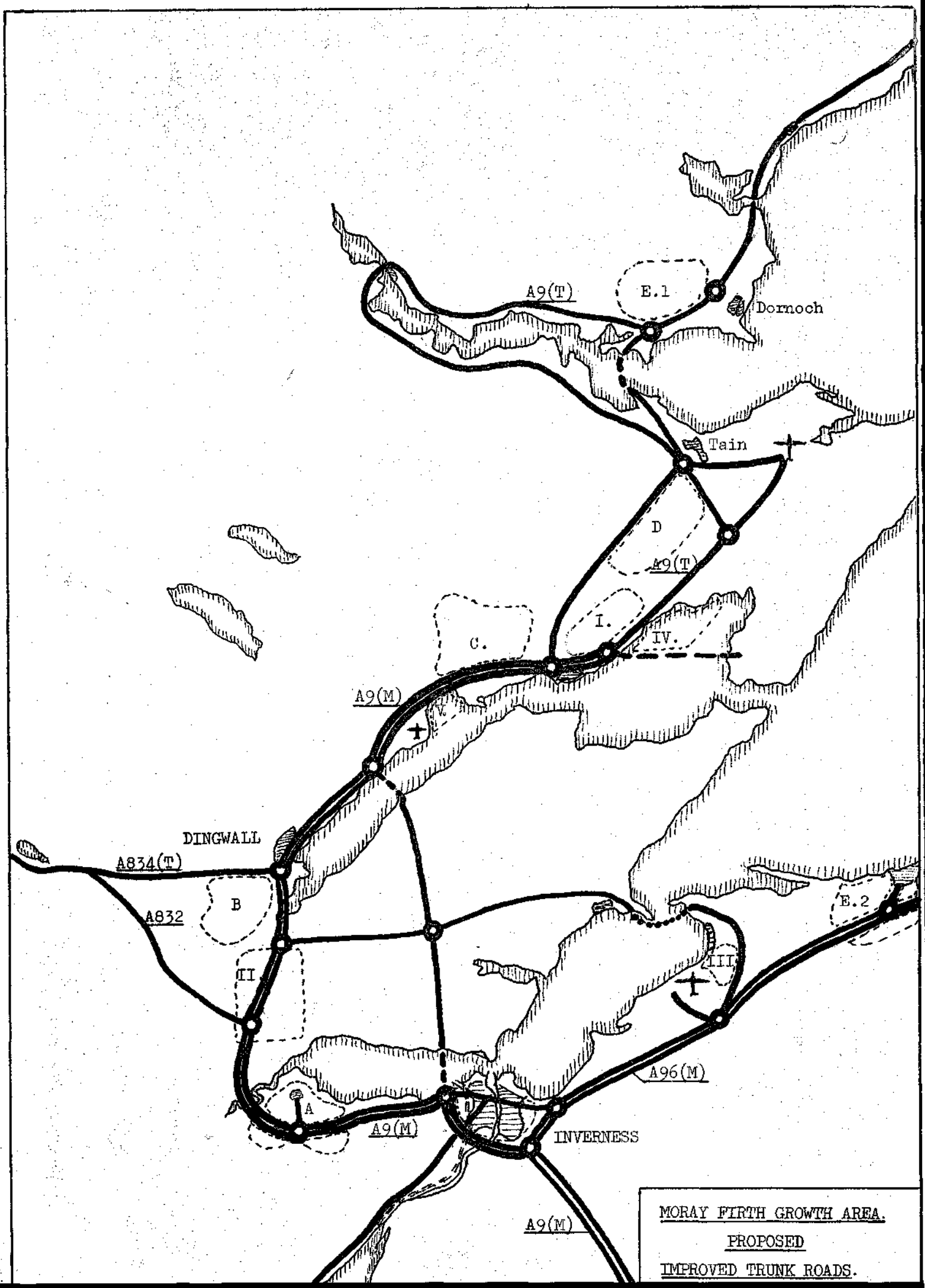
Perhaps our suggestion seems rather drastic. It may be thought, however, that a major change in the Moray Firth area must of necessity bring with it changes in other respects and that a new dividing line between counties will bring benefit to all. In particular, the western areas would gain by being given henceforth closer attention by officers who would live in the area rather than separated from it by the width of the Highlands.

Observations regarding existing man-made assets

Transport

1. Roads A road system exists which is quite adequate for traffic densities during the winter months, but which cannot cope with peak traffic densities in the tourist season.

> Recent improvements have included a major new bridge in Inverness and a steady programme of road widening. Each year some funds are being allocated for the most urgent selected items. These works are carried out under the supervision of the various County Surveyors who are also responsible for planning and design.



MORAY FIRTH GROWTH AREA.

PROPOSED

IMPROVED TRUNK ROADS.

Plans are going ahead for the construction of a new bridge at Conon Bridge to by-pass the present temporary Bailey structure. When we first heard of this plan in May, 1966 we were struck by the seemingly unwarranted nature of this expenditure (some £100,000) when seen against the long-term plan for a dual carriageway, which is eventually to be built some distance away from the site now proposed. However, if we consider that a dual carriageway with major bridge over the same river should preferably not be used by the local traffic between the two rural townships, there seems to be justification for the present proposal. This would be particularly so if our proposal for a new town west of Conon Bridge - Maryburgh comes to reality. It will then be indeed very necessary to keep local traffic off the highway to Dingwall and the north. We are informed that a by-pass and bridge would cost of the order of £500,000. This will now doubtless form part of the cost of the proposed dual carriageway road from Inverness to Dingwall.

Plans are also being processed for the construction of a dual carriageway road on a partly new alignment in Ross-shire between Beauly and Dingwall. Approval has already been obtained from Government for the alignment. Details still need working out.

Work is about to start on a major re-alignment (some $1\frac{1}{2}$ miles of the A96 trunk road) east of Inverness.

The M.F.G.A. is connected with the network of roads in the central belt of Scotland via the:

A9	leading to Perth
A96	leading to Aberdeen
A82	leading to Fort William

We suggest that of these three roads the A9 is the one to be selected for major improvements, eventually up to motorway standard.

It is vitally necessary that industrialists are assured of fast all-weather communications with the south. One of the main objections to moving to this development area, uttered repeatedly by industrialists, whom we interviewed, concern the inadequate road, rail and air communications now existing. We fear that the Board's endeavours will be much hampered if improvements, particularly to roads are not seen to be carried out as soon as the development scheme is approved.

2. Railway The area is connected with central Scotland via two railway lines, one leading to Aberdeen and one to Perth. Both are single track lines. A single line runs from Inverness to Dingwall and further north along the east coast, with a single line spur from Dingwall to the west coast.

Inverness Station serves both as railhead and as through-station. The passenger station is a terminus and the marshalling yards are triangular in shape and take up a fairly large area. The station is at present quite capable of coping with existing traffic. Approval has very recently been given to plans for rebuilding the station - facade. Parking areas adjacent to the passenger station are at present entirely inadequate. There are no plans to improve this aspect. Elsewhere in this appraisal we have suggested that this station be removed so as to free the centre of Inverness for development.

3. Air Dalcross Airport is some 8 miles east of Inverness and can be reached by road (A96) in approximately 20 minutes. Road improvements will reduce this time by some 5 minutes in the near future (1967 - 1968). The Airport is used by B.E.A. (one flight each way on weekdays) for its feeder-service which is based on Glasgow and flies on to Wick and the northern islands.

The Airport facilities for passenger and freight are adequate for this traffic. There are no permanent customs facilities.

There will probably be a case for redeveloping the now disused war-time airfield near Fendom, east of Tain, for use by private aircraft and by small freight aircraft, serving the large industrial enterprises in the Invergordon area.

4. Harbour, Dock and Canal Facilities

4.1 Cromarty Firth

This is an excellent natural harbour, reasonably sheltered and providing good anchorage. Depths in the channel within the harbour area vary from 45 to deeper than 100 feet. In the vicinity of Invergordon the depth is between 50 and 70 feet and there is adequate room for turning vessels 1,000 foot in length and longer.

The channel between North and South Sutor is from 125 to 170 feet deep. Outside this entrance, in the Moray Firth, the sea floor is subject to some shoaling and requires periodically a survey to ascertain the maximum safe draft of vessels entering at low tide. At present this is conservatively estimated at 45 feet which should be sufficient for most vessels up to 100,000 d.w.t. The most recent survey was carried out rather a long time ago and it is recommended that the Admiralty be approached as soon as possible with a request for a re-survey so that a more authoritative statement can be given to shippers, some of who may consider 45 foot and 100,000 inadequate.

At INVERGORDON two jetties, belonging to the Admiralty, have been in existence for many years. One is used regularly by the Royal Navy as an oil jetty serving a tank farm with a capacity of some ¾ m. ton. The other can be used by private enterprise by arrangement with the Admiralty. It was recommened that for the use of major industries in the Invergordon area the Government provide a third jetty some 400 yards or further east of the present structures, so that traffic can be kept away from the town. The new jetty should be designed to suit the industries which settle in the area. It will have to be some 1,800 feet long to reach 50 foot depth of water.

A survey is urgently needed to provide planners with data needed for designing foundations and to decide on the most suitable site. Estimates can not be made until it is for instance decided whether a floating or a piled jetty is the more appropriate.

A survey may also reveal that for really large-scale use of the harbour a number of quays and storage sheds for handling general cargo are feasible. Such quays could for instance form part of a dam to be constructed for reclaiming part of the Sands of Nigg for industrial use.

4.2 INVERNESS HARBOUR

is suitable for sea-going vessels up to 2,500 d.w.t. only(or up to 3,000 d.w.t. depending on draft and beam). Access is through a 20 foot deep channel in the River Ness during high tides. The quay is equipped with only one mobile 10-ton crane. The quay is rarely used to full capacity. The harbour is administered by a Board of Trustees who employ a full-time Harbour Master.

4.3 CALEDONIAN CANAL

The canal is suitable for small coastal vessels of up to some 500 d.w.t. Lock gates are being mechanised. Operation is between dawn and dusk (and from 6.30 am to 7.30 pm in the summer). The sea lock at the Corpach end has been enlarged to take vessels up to 1,000 d.w.t. for the benefit of the Pulp Mill at Fort William, who have had to guarantee the return on capital invested in this improvement. The canal is administered by a Manager at Inverness on behalf of the Inland Waterways Board. The canal has considerable spare capacity for vessels up to 500 d.w.t.

4.4 CRINAN CANAL

This is part of the inland waterway between Inverness and the Clyde. It can be used by vessels of up to 150 d.w.t. who wish to avoid a passage to the sea-ward of the Mull of Kintyre.

Note: Both canals could be enlarged to take vessels of up to 1000 d.w.t. There would in both cases be adequate "summit-water". However the improvements would involve major reconstruction of locks or building of new locks. The former would mean that the canals would be completely closed for quite some time.

It is unlikely that the Waterways Board would be prepared to undertake improvements of this kind unless finance were guaranteed by the Development Board and/or private enterprise.

Under-used (spare) capacities of existing assets

For the purpose of devising a time table for operations in the future, it is of course, of great importance for the Board to know how much spare capacity there is at present as regards transport facilities, housing and the other components of the infra structure.

We have attempted to form an opinion rather than arrive at specific quantities, as we found that very often statistics did not exist in a form which we could use. Until now, the M.F.G.A. has, of course, not been regarded as a separate entity for statistical purposes.

Our remarks concerning spare capacities must, therefore, be read with some reserve.

Rail, Water, Air

Fixed assets for traffic using these three means are at present considerably under-used throughout the year.

Roads

Outside the tourist season the majority of roads of all classes outside townships can carry greater densities of traffic, though not at any great speeds due to narrow road widths in many places. Bottle necks exist in most townships.

In the tourist season local traffic suffers badly through hold ups, as the combined densities of tourist and local traffics are more than roads of all classes have been designed for.

Housing

There is little or no spare capacity anywhere in the area. That which is not now in use is generally of a standard which might not be acceptable to immigrant families.

> Under-used capacity is difficult to assess. It is alleged that quite some space is in fact available for small scale "bed and breakfast" accomodation. Whenever engineering construction works are to be carried out, personnel usually manage to find short term accomodation, though not for their families.

Education

Facilities are at present adequate. Where necessary the Scottish Education Department is normally well in time with plans for expansion. The Department is confident that by the time houses are ready for occupation in a new town, they will have the schools ready for accepting pupils. The extensions to the Technical College at Inverness (very recently funds have been authorised) will have quite some spare capacity.

Medical

A new mental hospital is being planned for Inverness and a site is being reserved for a new general hospital. Also in this field the authorities are expected to keep pace with development.

Social Equipment

Man-made facilities for amusement are scarce and said to be not attractive to the non-resident. With increasing leisure time, the younger sector of the existing population find not enough facilities to occupy themselves. Arrangements for dancing at Strathpeffer are said to be the only available in the entire Moray Firth area.

> Plans for a swimming pool at Tain were shelved due to lack of funds.

The area, although near to the Ben Wyvis mountains, where snow is said to be suitable for skiing for several months each year, has no facilities for winter sports and so far the tourist industry has paid little or no attention to attracting customers outside the summer season.

All tourist hotels close for six months each year.

Considerable attention will need focussing on to the matter of social equipment of all types as with a proposed inflow of a new population which itself would be some three to four times larger in numbers than the existing inhabitants, there will be no question of absorbtion and adaption. The newcomers will set and demand their own standards of amusement and entertainment. To disregard this aspect of communal life would be to court dissatisfaction and worse.

In this respect, the region will have to make a start from the bottom up.

> A study of experience gained in other parts of the United Kingdom might help a great deal, but as basic conditions are probably nowhere quite similar, one may have to go to countries on the Continent. It is suggested that in particular in part of Holland a situation has existed which in many ways was originally very similar to that now obtaining in the Highlands. A study of success and/or failures of efforts in that area is recommended. Similarly the Swedes have succeeded in creating new communities in their northern regions. Also there may be useful hints for the observing investigator.

Team Sports

Local initiative has been successful in livening up the interest in soccer in the Easter Ross area.

Skiing

Ben Wyvis is recognised as a skiing area :
more needs to be investigated about :

1. Land ownership and willingness to see this developed.

2. Capacity of hotels and communications serving the area.

3. Consistency of snow cover and physical properties.

Forest Parks

Except for Glenmere Forest Park near Aviemore, there do not appear to be parks of this nature in the whole of the Highlands.

Green Belt Areas (proposed)

The nearest proposed reserve (Culbin Forest) lies between Forres and the coast, i.e. some 25 miles east of Inverness.

Outward Bound Schools

The Moray Sea School lies on the north coast of Moray County near Burghead. A new mountain school has recently been started near Fort William.

Sailing

Findhorn Bay, Beauly Firth and the area near Avoch as well as Cromarty Firth are known to be good sailing areas, although activities are at present limited. Sailing Clubs exist at Findham and at Fort Rose. A club at Inverness is dormant. We were told that there are no Sea Scout troops or similar nautical training facilities for the young in the area. Neither are there facilities for young tourists.

The situation in the Highlands is perhaps somewhat unique in that here may be an opportunity to do what in other new towns is usually not possible.

Where elsewhere, the expenditure of funds for social equipment is often deferred until at least a number of immigrants have come to live in the new town, in the Highlands one has quite valid justification for making the provision of equipment precede the arrival of immigrants. The grounds for this argument are two-fold: firstly the existing population is seriously starved of amenities for recration for all age levels and all walks of life, and secondly the tourist industry has already reached proportions which make it vitally necessary that amenities be created to give the non-hill climber and non-fisherman a happy holiday.

Thus a plan can be drawn up as of now indicating the pattern which the development of social equipment will take in the next three 5 year periods and the economical aspects of each item and sphere of activities quite sensibly assessed.

The very great advantage of being able to offer newcomers the use of existing equipment as of the date of their arrival in the area are, of course, readily appreciated. Instead of making vague promises, the recruiting agent will be able to state facts, and select his candidates according to their known hobbies in the knowledge that they will find in the area the amenities which they expect. This will probably narrow the field of selection, but picking the eventually successful candidate will be done on more secure grounds.

AVERAGE NUMBER OF HOURS OF SUNSHINE PER DAY

	J	F	M	A	M	J	J	A	S	O	N	D	Daily Ave
Aberdeen	1.5	2.4	3.4	4.5	5.5	6.1	4.9	4.6	4.1	3.1	1.9	1.2	3.6
Birmingham	1.3	2.0	3.2	4.4	5.4	6.1	5.4	5.2	4.0	2.9	1.6	1.2	3.6
Bradford	0.9	1.7	2.8	4.3	5.3	6.3	5.4	4.9	3.7	2.5	1.3	0.8	3.3
Glasgow	1.0	1.9	3.0	4.5	5.5	6.1	4.9	4.3	3.7	2.4	1.5	0.9	3.3
INVERNESS	1.5	2.4	3.5	4.4	5.3	5.6	4.5	4.4	3.6	2.8	1.7	1.0	3.4
Liverpool	1.6	2.3	3.7	5.3	6.4	7.0	5.9	5.5	4.4	3.1	1.9	1.3	4.1
London	1.1	1.8	3.4	4.4	5.9	6.6	6.2	5.8	4.5	3.1	1.4	0.9	3.8
Luton	1.5	2.3	3.9	4.8	6.1	6.8	6.2	5.9	3.7	3.4	1.9	1.4	4.1
Manchester	0.7	1.3	2.6	3.9	5.1	5.5	4.5	4.5	3.4	2.1	1.0	0.5	2.9

AVERAGE RAINFALL IN INCHES

													Total for year
Aberdeen	2.8	2.1	2.0	2.2	2.6	2.1	3.3	2.9	3.0	3.4	3.4	3.1	32.9
Birmingham	3.0	2.2	1.9	2.3	2.6	1.9	2.9	2.8	2.5	2.9	3.2	2.7	30.7
Bradford	3.5	2.8	2.1	2.3	2.5	2.0	2.9	3.0	2.6	3.3	3.5	3.0	33.6
Glasgow	4.7	3.2	2.5	2.3	2.6	2.4	3.1	3.3	3.6	4.7	4.1	4.2	40.7
INVERNESS	2.7	1.9	1.5	1.8	2.1	2.0	2.9	3.1	2.6	2.9	2.5	2.3	28.4
Liverpool	3.2	2.4	2.0	2.0	2.6	2.3	3.2	3.7	3.2	3.7	3.5	3.3	35.1
London	2.1	1.6	1.5	1.9	1.8	1.7	2.3	2.3	1.9	2.2	2.5	2.1	24.0
Luton	2.4	1.7	1.6	1.9	1.9	1.6	2.4	2.3	2.0	2.4	2.7	2.2	25.1
Manchester	3.3	2.5	1.9	2.0	2.5	2.4	3.2	3.5	2.9	3.4	3.3	3.0	33.8

AVERAGE TEMPERATURES IN DEGREES CENTIGRADE

Aberdeen	4	4	5	7	9	12	14	14	12	9	6	4
Birmingham	4	4	6	8	11	14	16	16	14	10	6	4
Bradford	3	3	5	7	11	13	16	15	13	9	6	4
Glasgow	3	4	6	7	10	13	15	14	12	9	6	4
INVERNESS	3	4	5	7	9	12	14	14	12	8	6	4
Liverpool	4	4	6	8	11	14	16	16	13	10	7	5
London	4	4	7	9	12	16	18	17	15	11	7	4
Luton	3	4	6	8	11	14	17	16	14	10	6	4
Manchester	4	4	7	9	12	15	17	16	14	11	7	5

Observations regarding natural assets

1. Water The Loch Glass scheme in easter Ross and the Beauly scheme in Inverness-shire both have some spare built-in-capacity in their present designs.

   The Burgh of Inverness operates its own water supply and has some spare capacity. On the other hand, the Burgh of Invergordon is at present operating near the upper margin of its resources. It supplies a great deal of water to the distilleries.

   It is understood that the Government intends to bring all water resources and supplies under one controlling authority, a move which is being resisted by the Inverness Burgh Council, who feel that their rate payers will be asked to pay more than they do at present.

   The total quantities of water economically available in the area are not unlimited in the sense that one can without careful planning site major industries which need volumes of processing water of the order of twenty million gallons per day or more.

   From the Loch Glass/Loch Morie catchments some 100 m.g.p.d. might be obtainable. Further south in Inverness-shire there may be quantities of the order of up to 10 m.g.p.d. in more than one place, but only some 10 m.g.p.d. in total is at present "on tap" and probably a further 10 m.g.p.d. could be made available without great expenditure and/or litigation. It is said that Loch Ness could provide very large quantities of water.

   An overall water budget will help to plan future development.

   It would appear at this stage that taken overall, water will be adequate, but it will probably be more expensive in one area than in another.

2. Deep Anchorages The Cromarty Firth provides excellent facilities. Elsewhere in the Moray Firth and Beauly Firth the depth of water is less, and major sea going vessels cannot be used.

3. Climate The area has a good record for hours of sunshine. Average hours of sunshine, rainfall and temperatures are comparable with those of other industrial centres in Great Britain. (see tables on opposite page).

The so-called "snow-line" lies at some 700 to 1,000 feet altitude. There are few days in any year on which fog occurs and the Dalcross Airport has been closed on only one or two days in recent years.

Rain-fall amounts to less than 30 inches per year.

4. Contours - Altitude The coastal plain slopes in most areas quite gently with falls of more than one foot in fifty. The plain is never very wide and near Dingwall quite narrow. Land above the 500 feet contour is thought unsuitable for large scale urban development. It is questionable, however, whether the same can be said for industrial use and it is suggested that more investigations be carried out before it is decided that agricultural land of considerable acreages is to be given up for use by industries.

   This research is warranted in particular if, as is suggested at this stage, residential and industrial areas be planned as separate urban units. The question can now be asked: Is there not at a higher altitude a stretch of land, little used for agriculture, but level enough for use as an industrial estate. Such an area may be remote from a railway line, but does that really matter? It may in the winter be colder, and there may be more snow and wind. Again does this matter?

5. Reclaimable sectors of the fore-shore Some 10,000 acres could perhaps be added to the dry land of the area if all areas between low water level and high water mark were made safe from the ingress of the sea.

   > For some areas this would probably be too expensive, while for others the operation may not be worthwhile because the soil is useless.

   Nevertheless, the whole extent of this potential gain in land needs investigating and plans prepared based on the latest experiences in other parts of Europe, particularly in Holland.

   It is unlikely that land would be available very soon. An early start with research is indicated.

   Reduction of the areas flooded at high tide will mean less water passing to and fro through the narrow entrances of the Cromarty and Beauly Firths and consequent easier passages for ferries and other vessels.

In all cases passages will have to be allowed for discharge of rivers flowing into the top end of the firth. This will also ensure unimpeded entry by fish to the upper reaches of rivers. In the case of the Sands of Nigg a dam, cutting off the shallows from the deeper waters, will provide a useful base for a roadway which will prove to be a substantial asset.

Some observations with regard to "Labour"

It will have been observed that our approach to the ultimate goal is through industry. We believe that the population of an under-developed area derives more and longer lasting benefits from improvements which result from the setting up of economically viable industries than from injections of financial aid aimed mainly at improving living conditions and social equipment.

We have in this case an additional reason for our approach, in the fact that the area now supports too small a population to provide labour for any but very small new enterprises.

Potential labour force

It is difficult, if not impossible, to assess the number of the existing population, both male and female, who would be available for employment when demand for labour improves.

The Ministry of Labour's statistics of unemployed do not reveal persons who do not yet qualify for unemployment benefits. The Ministry of Pensions and National Insurance's statistics of employment card holders, now working intermittently, do not differentiate between those who would like continuous work and those who prefer seasonal jobs of comparatively short duration. Many holders of employment cards do not qualify for unemployment relief and are not contained in the Ministry of Labour's statistics. Some occasional workers do not bother to register for unemployment benefit, even when they qualify.

There are understandably no statistics to indicate persons who would for the first time take up employment if it were conveniently near their homes. In addition, there are probably a number of persons at present "under employed". For instance, improved techniques in agriculture are helping to reduce the labour needed from two per hundred acres to one per hundred acres.

One can, therefore, only guess, and base rough assumptions on situations elsewhere. It then becomes, however, of great importance to know whether behaviour of the population of the Highlands would be similar to that in other areas.

For instance, a major question is: will the married women of the region want to take up permanent jobs in similar percentages as they do elsewhere ? Here we have two possible variations: firstly, those who used to work in industries in their area of origin and secondly, those who did not. Both may have very good reasons for changing their minds when they move into the new area.

We have been informed that there is in parts of Scotland still considerable objection to married women and girls working in factories, but that the younger generation in the neighbourhood of the larger towns takes increasingly less notice of such prejudices. There is evidence of this change of attitude in Inverness and the recently closed box factory at Evanton employed some 200 women when production was at its peak.

We have noted that in the catchment area for labour, males outnumber females by between 0 - 5% of the population. Although a number of both sexes doubtless remain single, these figures show no large resources of independent females who have to earn their own living throughout their lives.

At present, the hotel industry suffers from this shortage of wage earning women and is obliged to recruit staff as far away as Ireland and Wales.

It is easier to get women to work in retail shops during the tourist season.

A more detailed analysis of the pattern of employment is needed before prospective employers can be given any assurances regarding availability of female labour.

Similarly, a survey of male employment (both existing and potential) is to be made before estimates can be made of the numbers needed by immigration.

We are aware of the possible undesirable consequences of creating a large demand for labour in a particular region without balancing it by similar action elsewhere. We were informed that the starting up of new industries in the central belt of Scotland has drawn away from the Highlands and Islands numbers of people, who the Government would have wanted to remain there.

Remedies against this occurring in the Moray Firth area might be the setting up of industries in the western regions prior to, or concurrently with development in the east and (2) the selective encouragement of industries which recruit skilled immigrants from the South rather than unskilled and semi-skilled labour from the hinterland of the area.

Much can probably be learned by studying the events which have occurred in recent years in north east Scotland. Here when new jobs were filled by immigrant male labour, the number of persons registered as drawing unemployment benefit rose unexpectedly sharply, because the men's wives and dependent children did not immediately find employment which they had been used to in their area of origin.

Considerable attention will have to be given to the proper timing of bringing into the region industries which require female workers. At present the number of women in paid employment in this area as compared to men is only about as 0.5 is to 1. In the Central Belt of Scotland it is said to be about as 1.4 is to 1. These relative proportions may never develop here but nevertheless it is necessary to see to it that one does not create an increase in the registered number of unemployed women when men immigrate into the area as it may impede recruitment. Much will depend on the type of industry introduced. Each will need analysing as regards its own labour requirements and as regards the effects on the market for female workers.

We are informed that the region is at present short of persons suitable for managerial and executive jobs. From a number of interviews we have gained the impression that there will be no shortage of applicants for employment of that nature, and that not in all cases special terms need be offered. We were warned, however, that many of those who accept employment leave the area again when they have been there for a few years. Their reasons for leaving have not been statistically recorded, but are thought to be based in the main on dissatisfaction with the social amenities in existence. An analysis of these reasons would be helpful to those responsible for planning social equipment.

Language

The Moray Firth Growth area will probably present less difficulties from the point of view of integrating immigrants into the existing population, because the area has at present a lower percentage (less than 10%) of Gaelic speaking people than for instance the west coast (30% - 70%) and the outer isles (over 70%).

Probably no one in M.F.G.A. speaks Gaelic as first language.

Some of the alleged difficulties now being experienced at Fort William may have a base in language difference. Statistics show that between 10% and 30% of the population speak Gaelic.

On the other hand, the rather easier integration of newcomers into the existing community at Thurso and in Caithness in general may well be due to the fact that less than 10% of the population spoke Gaelic before the influx started.

EXAMPLE OF CREDIBLE HOUSE CONSTRUCTION PROGRAMME

OUTPUT (th.s)

Year	TOWNS:A,B,C,D				15-year programme				20-year programme			
					TOWN:E		5 TOWNS		TOWN:E		5 TOWNS	
	EACH		4 TOWNS			Accum		Accum		Accum		Accum
	p.a.	Accum Total	p.a.	Accum Total	p.a.	Total	p.a.	Total	p.a.	Total	p.a.	Total
1	0	0	0	0	-	-	0	0	-	-	0	0
2	.1	.1	.4	.4	-	-	.4	.4	-	-	.4	.4
3	.5	.6	2	2.4	-	-	2	2.4	-	-	2	2.4
4	.9	1.5	3.6	6	-	-	3.6	6	-	-	3.6	6
5	1	2.5	4	10	-	-	4	10	-	-	4	10
6	1	3.5	4	14	.1	.1	4.1	14.1	.1	.1	4.1	14.1
7	1	4.5	4	18	.3	.4	4.3	18.4	.2	.3	4.2	18.3
8	1	5.5	4	22	.6	1.	4.6	23.	.4	.7	4.4	22.7
9	1	6.5	4	26	.7	1.7	4.7	27.7	.4	1.1	4.4	27.1
10	1	7.5	4	30	.7	2.4	4.7	32.4	.4	1.5	4.4	31.5
11	.8	8.3	3.2	33.2	.7	3.1	3.9	36.3	.4	1.9	3.6	35.1
12	.7	9	2.8	36	.7	3.8	3.5	39.8	.4	2.3	3.2	38.3
13	.6	9.6	2.4	38.4	.4	4.2	2.8	42.6	.4	2.7	2.8	41.1
14	.3	9.9	1.2	39.6	.2	4.4	1.4	44	.4	3.1	1.6	42.7
15	.1	10.	.4	40.	.1	4.5	.5	44.5	.4	3.5	.9	43.5
16									.3	3.8	.3	43.8
17									.2	4.0	.2	44
18									.2	4.2	.2	44.2
19									.2	4.4	.2	44.4
20									.1	4.5	.1	44.5
TOTAL	10.			40.		4.5		44.5		4.5		44.5

Some observations regarding a "TIME-SCALE"

It is now common practice to divide a lengthy development scheme into a number of equal periods. In view of our remarks about the speed at which houses can be constructed, we propose a total scheme-duration of 20 years divided into four 5 year development periods (I, II, III & IV).

Prior to the first 5 year period some time will be available for collecting data, carrying out research and for preliminary negotiations with industrialists and government departments. As soon as the basic principles of a development scheme have been agreed by Government and the overall size of funds to be allotted approved, urgent measures must be taken to get the trunk-road reconstruction programme off the ground. Unless this is done, all other planning will run into difficulties.

Period I — The start of the first 5 year period will be the date on which Parliament approves the Scheme.

The first 2 years will probably be used mainly for drawing up detailed plans and for getting constructions programmes up to full production (housing, water, education etc. etc.).

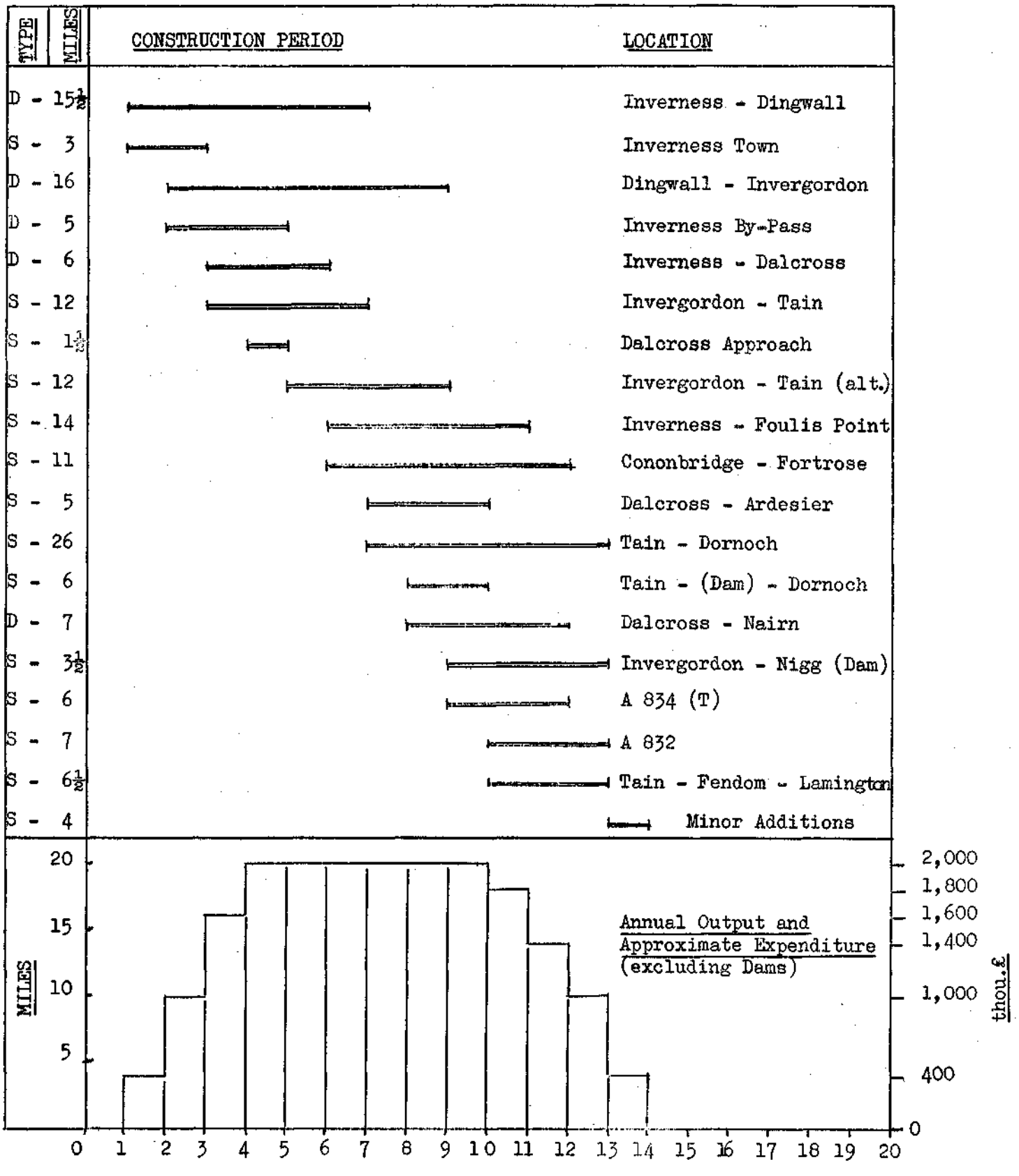
The last 3 years will see a number of substantial industries coming into the area and starting operations.

Period II — House construction will be at full ouput. Construction of trunk roads will be largely complete by the end of this period unless a fifth new town has meanwhile been agreed to for the Dornoch area.

Water supply construction will consist mainly of laying reticulation and of providing special supplies for major industries of the engineering side and reclamation will be completed.

These two 5-year periods together should represent the time of the most spectacular action (a controlled explosion of development).

EXAMPLE OF A CREDIBLE ROAD CONSTRUCTION PROGRAMME.



The subsequent two 5-year periods should be as follows:

Period III	The completion of construction schemes except that of the fifth new town. The filling in of industrial areas with more enterprises. The completion of land reclamation for agricultural purposes.
Period IV	The completion of the fifth new town. The normal operation of the fully developed area.

APPENDIX 2.

FOOD PROCESSING

APPENDIX 2

FOOD PROCESSING

Contents

2.1 FOOD PROCESSING

Examination of the agricultural and fishery resources of the Highlands and Islands shows that a considerable proportion of the excess produce is exported to the south without any value being added by processing. This proportion is as high as 90 per cent in the case of the two main assets, meat and fish. This is not so much due to the inadequacy in the quantities produced but rather to the fragmentation of the producers. Whether it is beef, lamb, shell fish, white fish, herring or cereals, the picture is one of a large number of relatively small "producer units" (i.e. farms and ports etc.) scattered over a wide area with totally inadequate marketing arrangements. The few units which are producing on any scale are still insufficient in themselves to form the basis of a food processing industry on the scale which is necessary if it is to play its part in the industrial development of an area relatively remote from the centres of population and, therefore the main markets.

Every panel, board, enquiry and committee which has ever considered the problems of this area has said there are opportunities for food processing in the Highlands and Islands. Yet, with one or two exceptions, nothing significant has ever resulted from these statements. Why ?

Proplan considers that many of the ventures that have been made have lacked critical elements of success such as capital, economic scale of operations sited in the right places and good management. An exception to this is perhaps the firm of W.A. Baxter & Sons of Fochabers. From its beginnings as an entrepreneurial venture this firm has developed both is size and reputation and is now widely recognised as a successful commercial organisation.

However, this growth has not been without problems and it is evident that this strength in recent years has stemmed from a good management team using modern methods.

In other cases patrician promoters venturing into the food processing business have not been sufficiently dependant on it for their livelihood but have rather regarded it as a sideline to other activities, e.g. land owning. Despite the interest and enthusiasm which these people undoubtedly had, nevertheless the hard fact remains that these days enthusiasm and interest alone are not sufficient to build a successful business, let alone an industry. As a result, the attempts made so far have not been successful in securing the confidence of the farmers, crofters and fishermen, nor have they been sufficiently large in scope to overcome the variations in supplies of raw materials. The outcome of this situation has been a certain amount of disillusionment on both sides.

From the foregoing it is apparent that the successful development of a food industry in the Highland and Islands will depend on the attraction of the larger food companies who have the finance and organisation to overcome the problems which have handicapped the entrepreneur. In turn, whether suitable companies can be attracted depends on the case which can be presented. It is not within the scope of this enquiry to present detailed cases for various food industries but rather to examine the assets of the area to determine whether there is a prima facie case for approaching companies who might be suitable and in securing their interest.

2.1 1 The Case for Development of Food Processing in the Moray Firth Area

The main foodstuffs produced in significant quantities in the Highlands and Islands are as follows:

(a) Fish - shellfish (3940 tons worth £776,799 in 1964)
whitefish (42,335 tons worth £2,111,883 in 1964)
herring (55,797 tons worth £1,243,404 in 1964)

(b) Meat - beef (12,200 carcases worth £975,000)
mutton (100,650 carcases worth £805,200)
venison (1,200 tons worth £250,000)

(c) Crops - potatoes (9871 acres i.e. approx 80,000 tons)
barley (28,857 acres i.e. approx 37,500 tons)
oats (85,051 acres i.e. approx 85,000 tons)

Reference has already been made to the current fragmented structure of production of these products in this area. Consideration of the quantities of fish, cereal, meat etc. produced shows that there is an insufficient and sometimes inconsistent supply of raw materials to warrant the establishment of food processing facilities close to any one particular port of landing or unit of operations. As a result, produce is transported away from the area for processing. (At this point it should be emphasised that this survey is concerned mainly with large scale food processing rather than the small scale processing of luxury foods which could take place at various places which would be unable to support large factories).

A rough distinction can be drawn between the West and the East in terms of agricultural and fishery assets. Fishing (i.e. inshore) is in general confined to the West and North West while cattle and sheep farming are predominant in the North East with the addition of crops in the Moray Firth area.

In between (not necessarily geographically) is the crofter with very small quantities of all these commodities. In the case of fish, a dividing line can be said to exist between two major areas which comprise the Crofting Counties. This line exists as a result of present lines of communication and the food processing facilities which already operate. It can be drawn from Stornoway through Mallaig and Oban to Glasgow.

North of Mallaig and west of this line, fish is taken to Stornoway for processing while the Mallaig catch goes by road or rail to Glasgow - a very small proportion being processed in Mallaig itself. On the other hand, east of this imaginary line from Kyle northwards, the small ports where shellfish are landed, and Ullapool, which is becoming an increasingly important port for fish landings, are somewhat isolated and bereft of processing facilities. All shellfish, herring and whitefish landed in this area must therefore travel by road to Inverness and onward to Aberdeen or the South. This is particularly disadvantageous for crab, which trend to travel badly and the resulting prices fetched in Aberdeen and London are insufficient to encourage fishermen to catch more.

In the case of meat, the position is equally complicated and equally lacking in advantage for the areas of production. The areas north of Inverness through Easter Ross and Caithness have a fine reputation for high quality beef. Since the main market for beef of this quality is in the South of England, considerable quantities of meat are sent south. However, during the tourist season, beef has to go <u>into</u> the Highlands, thus creating a net <u>import</u>. The position is further complicated in that locally produced beef is generally too good and too expensive for the local retail trade.

There are also large quantities of lamb, mainly from the Shetlands, but also from other parts of the Highlands and Islands, which cannot be disposed of to full advantage under present arrangements. The distance from Smithfield market by conventional transport is too great to allow the lamb to be marketed in a first class condition. On the other hand, if the lamb is frozen to facilitate transit, it has to compete with its cheap New Zealand counterpart. Consequently, the producer loses both ways.

The two main food assets of the Highlands and Islands capable of being commercially exploited on a large scale are therefore meat and fish and unfortunately, under present conditions, neither are being exploited to the full advantage of the producer or of regional development. The picture is very simply one of a westward movement of fish and an eastward movement of meat, and fish which for transportation reasons cannot go west, with the area in between being denuded of its basic assets.

There is, however, one common factor in the movement of these assets, and that is that most of the fish and meat moving from the North West and North East must pass through the Beauly Firth area. It is at this point that relatively small quantities of produce accumulate to produce a volume sufficiently large to support food processing facilities. Taken in conjunction with meat and particularly fish, the surrounding arable land has the potential to support a food industry of a similar nature to that located in North Lincolnshire and East Anglia. The quantities of raw materials available would of course be very much smaller, but these are still significant as can be seen from the following figures:

Herring	32,327 tons	Beef	3,000 tons
White Fish	28,940 tons	Mutton	2,500 tons
Shell Fish	2,500 tons (est'd)	Venison	1,200 tons

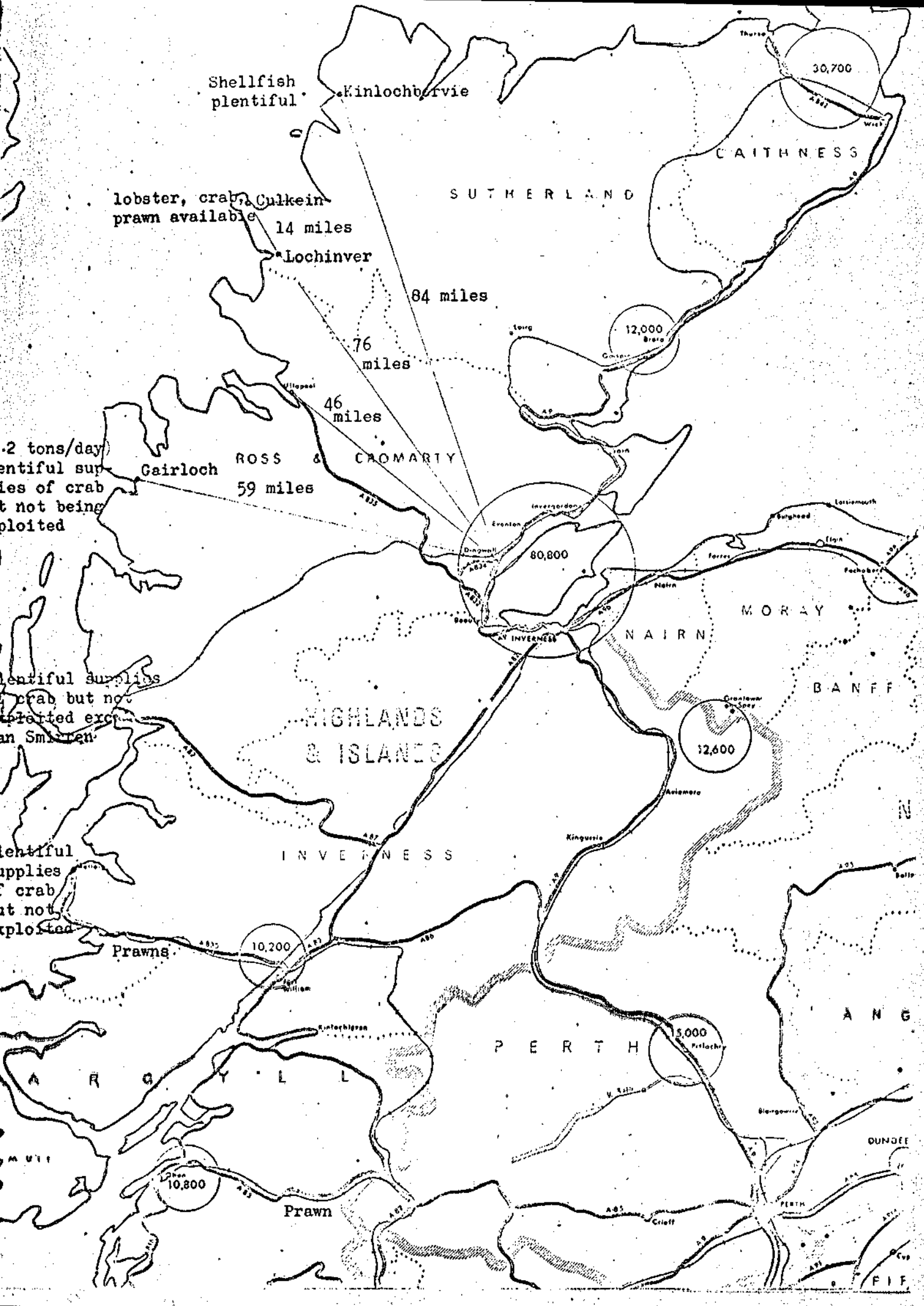
These are for the counties of Inverness, Caithness, Sutherland and Ross and Cromarty. In addition, the quantity of arable land in the Moray Firth area is more than sufficient to accommodate a minimum of 1,000 acres producing some 2,500 tons of peas, beans, sprouts and soft fruit per annum.

2.12 Short Term Opportunities

In the short term, a commercially viable food industry could be built around fish which would form the basis for an even larger development in the long term. There are two main opportunities in fish processing - shellfish and whitefish. Herring has been excluded because of its concentration in the main ports along the coast of Moray, Banff and Aberdeenshire from Lossiemouth to Aberdeen, and because it is known that there are currently insufficient quantities of herring to satisfy even the existing processors in that area.

In the case of shellfish there is evidence that a canning and/or freezing plant would be a viable proposition if established in the Beauly/Muir of Ord area. Figure 1 opposite shows the main supply lines from the ports and the distance by road to Inverness. [1] The exact products to be processed would need careful investigation from the point of view of

1 Figures and details quoted are taken from the 1962 report of the Fisheries Group of the Advisory Panel on the Highlands and Islands. They may, therefore, be slightly out of date and in need of revision.


Shellfish plentiful
Kinlochbervie
30,700
CAITHNESS
SUTHERLAND
lobster, crab, Culkein
prawn available
14 miles
Lochinver
84 miles
76 miles
12,000
46 miles
·2 tons/day
entiful sup-
ies of crab
t not being
ploited
ROSS & CROMARTY
Gairloch
59 miles
80,800
Inverness
MORAY
NAIRN
lentiful supplies
crab but not
ploited exc
an Smirren
HIGHLANDS & ISLANDS
12,600
BANFF
INVERNESS
lentiful
upplies
crab
t not
ploited
Prawns
10,200
PERTH
15,000
ARGYLL
10,800
Prawn
DUNDEE
PERTH
FIF

markets and supplies but it would appear that processing would be centred on crab, which offers perhaps more potential than any other shellfish because of the availability of supplies and the difficulty of transportation to the main market for consumption in the fresh state. Messrs. W.A. Baxters & Sons Limited of Fochabers have expressed keen interest in such a project to Proplan and are anxious to go ahead with more detailed planning. In addition, John West Foods Limited, who import canned crab, prawns etc., have told Proplan that they would be interested in buying similar U.K. products providing price and quality are right.

So far as whitefish are concerned, considerable quantities are already purchased for quick freezing in Fraserburgh, Aberdeen and the South and there is no doubt that similar processing could take place in the Inverness area. However, it should be pointed out that the quantities of such fish suitable for freezing vary according to landings and are limited by the demand for fresh fish which is currently high. In addition, the size of the fish, e.g. haddocks is smaller than that which is quick frozen in South East of England and there are problems associated with market acceptance and processing machinery.

Consequently, the case for a quick freezing plant should be based on whitefish as a nucleus rather than on it as the only commodity. This in fact works in very well indeed with the diversified operations of the major quick freezing companies. In this context it should also be noted that these companies are facing the future with great confidence as the boom in frozen foods shows no signs of levelling out.

(The total current market of £88 million per year is expected to grow to £350 million per year in 20 years time.) Moreoever, existing quick freezing capacity in the U.K. is reputed to be already nearing its maximum and this is therefore a particularly good time to attract the interest of the major companies.

Discussions have been held with the Eskimo - Fropax - Frood group of companies - jointly owned by J. Lyons, Associated Fisheries and Vesty - and expressions of interest in principle have been obtained. This group are particularly interested in the fact that peas, which form 30 - 40 per cent of their trade, could be grown in the surrounding area, while supplies of potatoes already available would fit in well with the present development taking place in the frozen potato product market. The minimum economic size of unit which could compete in production costs with the larger plants in South East England would handle approximately:

Fish	3,000 tons per annum
Peas	1,000 tons per annum (5 week season)
Beans	500 tons per annum
Sprouts	500 tons per annum
Other products (Potatoes, raspberries, meat etc).	500 tons per annum

These quantaties should be well within the capability of the region.

Consideration was also given to the possibility of establishing a petfood processing plant in the region as considerable quantities of fish [1] are presently being purchased in the area by petfood manufacturers in the

1 In 1964 almost 3500 tons of herring from Ullapool and Kyle alone.

South and, in addition, large quantities of offal are available from the local abattoirs [1]. However, further investigation showed that the major petfood manufacturers have already considered this possibility but were deterred by the high transport costs. (A tin of finished petfood product contains only $\frac{1}{3} - \frac{1}{2}$ its weight in actual fish or offal, the remainder being gravy, cereal etc. Transport costs on the finished product would therefore be considerably more than on the raw material alone.) Furthermore, there is currently a trend towards concentration of production facilities and any expansion away from existing sites is more likely to take place in the Midlands. Nevertheless, although not an immediate opportunity, further investigation is believed to be worthwhile in view of the continued development of the petfood market which is currently approaching £50 million per annum. It is possible that the specialty portion of this market which is believed to be of the order of £1 - $2\frac{1}{2}$ million per annum, could be tapped by a small company formed by interested parties in the area, e.g. Buchan Meat Producers have already indicated their interest in a petfood venture.

2.13 Long Term Opportunities

There are three longer term opportunities which should be taken into account in considering the development of a food processing industry.

The most promising of these opportunities lies in glasshouse horticulture. Studies carried out on the possibility of salad crop production under glass have shown that a glasshouse industry could be established in the Moray Firth area with excellent prospects.

1 More than 750 tons per annum from Buchan Meat Producers' abattoirs (including the ones outside the Highland and Islands area)

Table 1 Averages of accumulated temperature below 60°F (degree - days)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Fortrose	660	584	564	438	313	171	84	102	192	366	528	626	4628
Renfrew	670	584	561	438	298	153	74	95	189	359	540	632	4593
Rothamsted	688	613	564	414	258	100	49	64	137	325	525	663	4400

The value of glasshouse crops produced in the United Kingdom is approximately £25 million per annum and a similar amount of money is spent each year in imported crops.

At present, with one or two notable exceptions, British growers are hampered by the smallness of the holdings and severe under-capitalisation. Consequently, they have lagged behind their Continental counterparts in business management and productivity.

It is apparent that substantial improvements can be gained from increasing the scale of operations and employing the latest advances in horticultural operations.

Although heating costs will generally be higher in the North of Scotland than in the main glasshouse areas of the U.K., the difference will not be as great as expected in view of the relatively mild climate of the Moray Firth area. This can be seen from the figures tabulated opposite. Furthermore, it may be possible to utilise waste heat from power stations and distilleries to offset a portion of the costs. (A power station producing 500 MW (thermal) could theoretically support 1250 acres under glass !) In addition, the waste carbon dioxide from distilleries would be extremely beneficial when introduced into glasshouse atmospheres. Not only has this been proved to increase the yield, but also "earliness". Consequently, the profitability of most crops is improved - in the case of tomatoes, the added revenue may be as high as £1,000 - £2,000 per acre !

Intensive cultivation using adequate capital investment and advanced horticultural techniques would be necessary and the marginal investment per acre would be of the order of £26,000. Sound commercial operation requires a minimum of five acres under glass and this would provide permanent employment for 20-25 persons with substantial additional seasonal work.

If the trend towards vertical integration in the food industry continues it may well be that a large company with retail outlets in the greengrocery trade would be interested in a project of this type. Furthermore, the market resulting from a build up of population in the area would be sufficient to provide such a venture with a good base. From this it could develop a large export trade to the main Scottish market in the "Central Belt" as well as to England.

The second opportunity lies in the field of meat production. The output from slaughterhouses in the Moray Firth area, the new abattoir at Inverness and the planned increase in cold storage facilities could provide an opportunity in the utilisation of meat supplies by adding value from meat packing, i.e. the cutting up of meat supplies carcases into portions suitable for wholesale, retail or consumer trade in the U.K. Although a number of attempts have been made in recent years to develop such a business, (e.g. FMC/Marks & Spencer etc.), these have not succeeded and it would appear that this is not possible at the moment in view of the structure of the meat trade in the U.K. However, informed opinion in the meat business believe that rationalisation will eventually take place and when it does there will undoubtedly be opportunities in meat packing along similar lines to that in the U.S.A. and Canada. The Moray Firth area could well be in a position to take advantage of such opportunities.

There is no doubt that beef production in the area could be increased significantly given the incentive, e.g. by a change in the government price policy which must come eventually, particularly if we enter the Common Market. A pig industry, currently absent north of Inverness could also be developed successfully since it is a barley producing area. Any meat packing operation could be based on beef, pork, lamb and venison - which is currently sent out of the area to Fraserburgh and Perth. The current problem of disposal of the poorer cuts of meat would be overcome by sales to canners and freezers, locally and elsewhere in Scotland. In this respect Proplan have already received an "informal" expression of interest from a firm of meat canners in Southern Scotland, while meat would also be utilised by the quick freezing operation already mentioned.

Finally, the work which is presently being carried out on fish farming could well result in the establishment of a new industry. At present studies are very much in the experimental stage but already encouraging results have been obtained with plaice and sole. Experiments are taking place in Scotland in a loch at Ardtoe (Argyll) and Hunterston nuclear power station under the auspices of the White Fish and Electricity Authorities. In addition, Unilever are also experimenting in Scotland with trout. The Highlands and Islands will be in a position to benefit from such developments particularly in view of the warm water resulting from existing power stations such as Dounreay and from any industrial complex which might be established.

2.14 Some Observations Regarding Water Requirements for Horticulture

A general look has been taken at the water requirements of large scale horticulture if established in the Moray Firth area.

It can be said that irrigation is generally required where the average rainfall is less than the average potential transpiration of the crops over specified periods. The quantity of additional water required can be calculated for most crops and for specified periods which are generally during the summer months.

Over the six months from April to October, the rainfall in the Moray Firth area is virtually the same as the average potential transpiration so that major irrigation schemes would not be required. A quick calculation has been carried out for peas and the following results were obtained:

Average rainfall (during June, July and August)	8.0"
Average potential transpiration	8.3"

Irrigation would probably be required some 3 years out of 10 and the maximum need in the driest year would be 4.4 inch-acres. This is equivalent to 90,500 gallons per acre over the three months. As a pea crop would be of the order of 300 acres, the water requirements would, therefore, be approximately 27 million gallons for 3 months or 300,000 gallons per day.

2.1 5 Problems Facing the Establishment of a Food Processing Industry

During the course of discussions with interested parties, Proplan found that a number of points were raised about the likely difficulties which would arise in setting up food processing plants on a large scale. As with many other manufacturing industries, the most significant problems appear to be the attraction of middle management to an area with an

image of remoteness, recruitment of labour, particularly female which is already in short supply, and methods and cost of transportation.

Potential solutions to these problems are outwith the scope of this particular chapter but it is nonetheless worthwhile to point out that development of jet-air-freight services would be of particular advantage to the food industries proposed, being ideally suited to the transportation of fresh fruit, horticultural produce, shellfish and prime cuts of meat.

2.1 6 Action

It is significant that many of those approached by Proplan, with a view to interesting them in the development of the area, commented on the lack of detailed follow-up by Development Authorities who "had dangled the original carrots". In this context therefore it is essential that the following action points be noted if the work so far is to be exploited fully.

a) A more detailed study be made of the various opportunities uncovered so as to present the best possible case to industrialists.

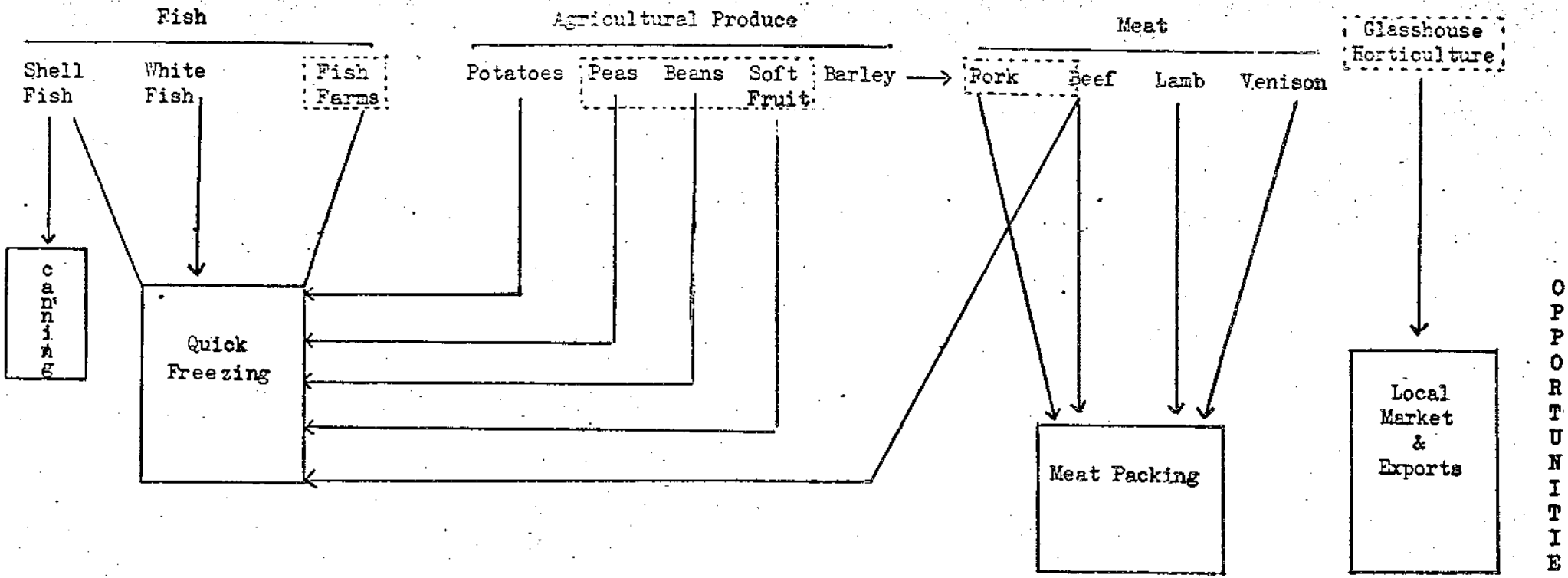
b) Meeting between the Highlands and Islands Development Board and interested companies.

c) Follow-up on any outstanding points arising from the meeting.

The chart opposite illustrates the opportunities uncovered and the chronological order in which they are likely to develop, together with their relationship within the overall structure of the food industry.

DEVELOPMENT OF FOOD PROCESSING IN MORAY FIRTH AREA

(..... = Potential Assets)



1
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10 years

SCHEDULE

OPPORTUNITIES

APPENDIX 3.

CHEMICALS

PETRO CHEMICAL COMPLEX AT INVERGORDON

APPENDIX 3.

CHEMICALS

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BACKGROUND

In summary Invergordon's natural assets are nearly ideal for the establishment of large scale process industry competing in world trade, i.e. a good site, a deep water harbour and ample fresh water. The problems of labour and communication are potentially soluble as has been shown by the establishment of a large whisky distillery there over the last few years.

However, to make maximum use of the capital available for manufacturing plant and also to make maximum use of the area for continued and other developments, HIDB should sponsor the development of the harbour and other services.

OUTLINE OF TECHNICAL PROPOSALS

The Invergordon Chemical Complex is based on integrated units of such a size as to be competitive in world trade. The units chosen are already operating or about to operate thus minimising risks but considerable economic edge is obtained from the integration of the various units.

1. Refinery Section

The refinery section will be built first, since crude oil is the primary feedstock and the refinery will make use of the existing oil handling and oil storage depot at Invergordon and will be designed to be able to accept a variety of feedstocks and have a reasonable flexibility.

The capacity will be in the region of 80,000 - 100,000 barrels per day throughput. This is equal to 4 - 5 million tons crude oil, per annum, although initial throughput is likely to be about 60,000 barrels per day.

The units within the refinery are likely to consist of a hydro-skimmer, desulphurisation and sulphur recovery plants, an aromatics plant and an asphalt and coking plant. Approximately 1 million tons of oil products could be made available for sale directly from the refinery per annum and these would include petrol, diesel fuel and heavy oil in quantities sufficient to supply the North of Scotland. At present about 200,000 tons per annum of petroleum products are brought into Inverness by sea alone. Arrangements have tentatively been made to supply oil products to distribution companies and networks in Scotland and England.

Since the original report was drawn up, the large natural gas finds in the North Sea and the prospects of finding gas in the Moray Firth make a difference to the design of the refinery in favour of a more economical arrangement and reduced import of crude oil, i.e. a better balance can be made of the components of the crude oil if some natural gas is available to go with it and it is now proposed that natural gas be used wherever possible in the Complex. Optimisation of the use of natural gas still has to be worked out.

2. Power Plant

The Chemical Complex envisages the use of about 200 megawatts of electrical power and a new type of power plant unit has been devised which is based on gas turbine and waste heat boiler systems which can be built in economic modular units of 100 megawatts or less. The power plant will be inegrated into a steam ring main for the Complex. It would also provide hot water for central heating purposes and for any horticultural purposes that may be envisaged.

Further comments concerning the provision of power as a general service appear below.

It seems likely that developments to recover sulphur from the flue gases of power stations will become a practicability in the very near future and provision for doing this at Invergordon will be considered.

3. Fertiliser Plant

It is envisaged that a complete range of fertiliser plants will be installed based on a 1,000 ton per day ammonia plant and a phosphoric acid production facility which, with production of potassium nitrate/phosphate, will allow a complete range of very high nutrient value fertilisers to be produced for sophisticated markets such as Western Europe, including the United Kingdom.

In addition, substantial quantities of straight nitrogenous fertiliser will be available largely for export. Total fertiliser tonnage will be about 850,000 tons per annum.

A very high degree of flexibility is built into the fertiliser section to allow a wide variety of products and product mixes to be obtained and also to allow the intermediate products, for instance, nitric acid to become available for other processes elsewhere. A by-product of the fertiliser plant will be 350,000 tons per annum of cement.

4. Polymers

The growing demand for plastics in the world encourages the production of monomers and polymers at Invergordon and it is currently

envisaged that a large ethylene cracker with a capacity of about 350,000 tons per year will be the centre of operations. This will provide not only ethylene for making PVC and polyethylene but also would make available propylene and C4 fractions for more sophisticated plastics in due time.

5. Polymer Production

It is proposed to produce about 100,000 tons per annum of PVC by both suspension and emulsion polymerisation techniques which will give a wide range of products. The chlorine will come as a by-product from the manufacture of potassium nitrate or potassium phosphate in the fertiliser section. It is also expected that production of low density polyethylene will follow after the PVC at a level of 100,000 tons per annum and various co-polymers and propylene, ethylene, vinyl chloride, acrylonitrile and styrene will also be made.

It is also likely that nylon type polymers will be added in the phase after that.

The production of plasticisers and other derivatives such as polyols is likely to be undertaken by another company but they would take feedstocks such as ethylene and aromatics from the Invergordon Chemical Complex.

6. Petroleum Coke

Since large quantities of petroleum coke will be required for electric

furnaces and electrolytic cell operation and since there is a large export potential for petroleum coke it is expected that a coker of 250,000 tons per annum will be incorporated in the refinery section.

PROCESS INTEGRATION

There are several key steps in the Chemical Complex which allow the by-product of one process to be the feedstock for another and from these critical combinations of plant, considerable economies have been effected and are as below:

1. Hydrochloric Acid, Potassium Nitrate/Phosphate Plant

Chlorine is a material in short supply in Europe owing to the fact that the usual by-product caustic soda is a drug on the market and thus an increasing burden of the cost of electrolysis (the process by which it is usually made) has to be carried by the chlorine.

The process envisaged for the Complex takes the chlorine out of the crude potash, which is imported, by reacting it either with nitric acid or phosphoric acid thus liberating hydrochloric acid a suitable feedstock for making PVC and/or other chlorine requiring materials and at the same time upgrading the potash into a chloride-free potash fertiliser, thus disposing of the problem of caustic soda.

2. Sulphur Re-Cycle Loop

There is currently a shortage of sulphur in the world and though this

is likely to be a short-term problem over the next five years, the price is likely to remain high and it appears to be economic to recover the sulphur from the calcium sulphate by-product from the phosphoric acid production facility. This is done by roasting the calcium sulphate in a kiln with shale, thus regenerating sulphuric acid and yielding cement as the by-product. The sulphuric acid is required in the phosphoric acid plant.

The recovery of sulphur from the refinery section is an entirely separate operation.

Consideration has also been given to the production of large amounts of elemental sulphur, in addition to that recovered from the crude oil, based on indigenous calcium sulphate which would make a material contribution to the Balance of Payments. This is a second stage project and full details are not yet available.

3. Refinery Integration

Integration of refinery operations is standard procedure, but in the case of the Invergordon Complex it is further proposed to integrate the hydrocarbon feedstocks and by-products from the chemical processing with the refinery operation. Thus for instance, ample hydrogen will be available to make economic processes such as catalytic reforming which, under normal circumstances, might not be economic on this scale if hydrogen had to be manufactured specially for it.

It is expected that great savings will result from the integration of natural gas with crude oil refining and enable a number of other

products, for instance, methanol and formaldehyde to be produced at a second stage, extremely competively.

Intimately connected with the refinery integration is utilisation and production of steam and it seems likely that great benefits can be obtained by using steam from the power plant in the refinery rather than generating steam separately. It must be pointed out, however, that this latter integration, whilst economic, based on crude oil may no longer be so if natural gas were available at significantly less cost per therm.

APPENDIX 4.

ELECTRICITY

Sample Power Cost, Assumptions and Calculations

1. Capital Costs

Gas turbine electric power units cost from £17 - £25/kwh installed. The budget estimates used in the calculations were obtained from Brown-Boveri for heavy industrial models and Rolls-Royce for aircraft types.

2. Thermal Efficiency

(a) Industrial gas turbines run at about 22-23% efficiency } open cycle
Aircraft Turbines run at about 24-26% efficiency }

(b) Addition of waste heat boilers to the industrial gas turbines will raise the efficiency to about 34-37% and raise the cost to about £30/kw. Modification of aircraft gas turbines to steam injection could raise the efficiency to 35-41% without materially altering the capital cost: Indeed Westinghouse in the USA claim that steam injection actually lowers the cost/kw.

Further waste heat recovery on this latter system, which does not involve any cooling water losses seems possible, bringing thermal efficiencies to well over 40%.

3. Operating Costs

Fuel is costed without tax as no energy is to be sold outside the complex.

Bunker fuel costs 2 pence/therm)
Crude oil costs from 2 - 3.5 pence/therm) delivered
Natural gas estimated 1.5 - 3.5 pence/therm)

It is reasonable to consider that suitable fuel for any type of installation could be made available between at 2 - 3 pence/therm assuming access to the refinery.

Maintenance is taken at 2% of capital cost p.a. Labour on a gas turbine installation would not exceed three to four men per shift for a 500 MW capacity.

4. Accounting

40% capital equipment grant is taken into account as Invergordon is a development area.

Government loans at about 5½% interest are available through the HIDB.

5. Reliability and Standby

Gas turbine units have run for at least 12 years without trouble (insufficient time has elapsed for great experience to have been obtained). Availabilities of 99.2% have been achieved over long periods and modern units are expected to be available 99.6% of the time, taking into account routine maintenance. Since a modular system is contemplated, standby is minimised and, by using the standby to supply interruptible loads, power supply can be "firm" to essential loads.

Note: No credits have been taken for sale of steam waste heat or sulphur.

6. Calculations

Low Cost

Capital cost £22/kw
40% grant £8.8/kw
Net Capital cost £13.2/kw

Fuel cost 2d/therm, 37% efficiency	= 0.185 d/kwh
Depreciation 30 yrs, 96% load factor (8400 hrs)	= 0.013 d/kwh
Interest 5½%	= 0.010 d/kwh
Maintenance 2% of £22/kw	= 0.013 d/kwh
Labour 4 x 3 men at £1,500 p.a. 500 MW	= 0.001 d/kwh
Overheads 100% of labour	= 0.001 d/kwh
Total:	0.223 d/kwh

High Cost

Capital cost £30/kw

40% grant £12/kw

Net Capital cost £18/kw

Fuel cost 3d/therm, 35% efficiency	= 0.296 d/kwh
Depreciation 30 years, 96% load factor	= 0.017 d/kwh
Interest 5½%	= 0.014 d/kwh
Maintenance 2% of £30/kw	= 0.017 d/kwh
Labour 4 x 4 men £1,500 p.a. 500 MW	= 0.0015 d/kwh
Overheads 100% of labour	= 0.0015 d/kwh
Total:	0.347 d/kwh