C R O W L A N D T O W N S H I P

A Study of Land Utilization

By

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of the Requirements for the Degree
Bachelor of Arts

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L. G. Reeds

McMaster University
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A C K N O W L E D G E M E N T S

The author wishes to thank the many people without whose help this study would not have been possible. Some are remembered for constructive criticism and helpful ideas as in the case of Mr. Reeds and Mr. Wood. Others, too numerous to mention, must be thanked for their patience, consideration and unfailing interest, notably G. Ballentine Carruth. But particular appreciation must be extended to all those thoughtful enough to devote time to interviews and questionnaires. It is from all these people that this work has evolved consequently it is dedicated to them.

C O N T E N T S

LIST OF ILLUSTRATIONS

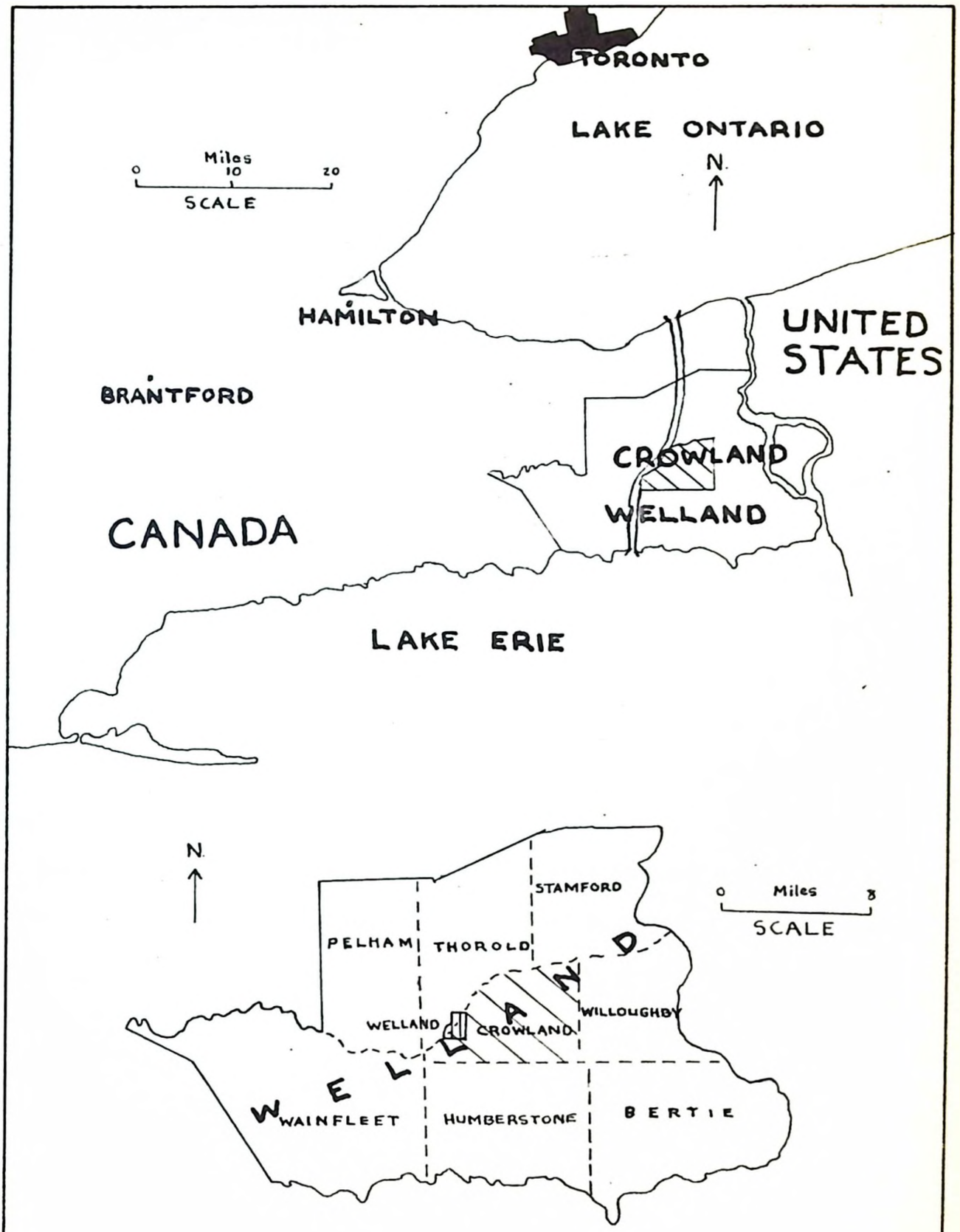
LIST OF PHOTOGRAPHS

Introduction

This is a study of land use in Crowland Township.

The text is divided into seven chapters. In the first chapter, the location, size and shape of the township are discussed. The second chapter analyses and describes the physical environment of the area. The third chapter is a historical analysis of the evolution of land use in the township. Man's adjustment to the environment has changed with the introduction of technological social, economic and cultural improvements in Crowland. The fourth, fifth and sixth chapters consider the present land use of the area in relation to the physical and historical background. The final chapter summarizes and concludes the study.

The material presented in the text has been derived from a variety of sources. Any literature available, pertaining to the study area has been reviewed. Field work was conducted in both rural and urban areas.



LOCATION of THESIS AREA

DGR.

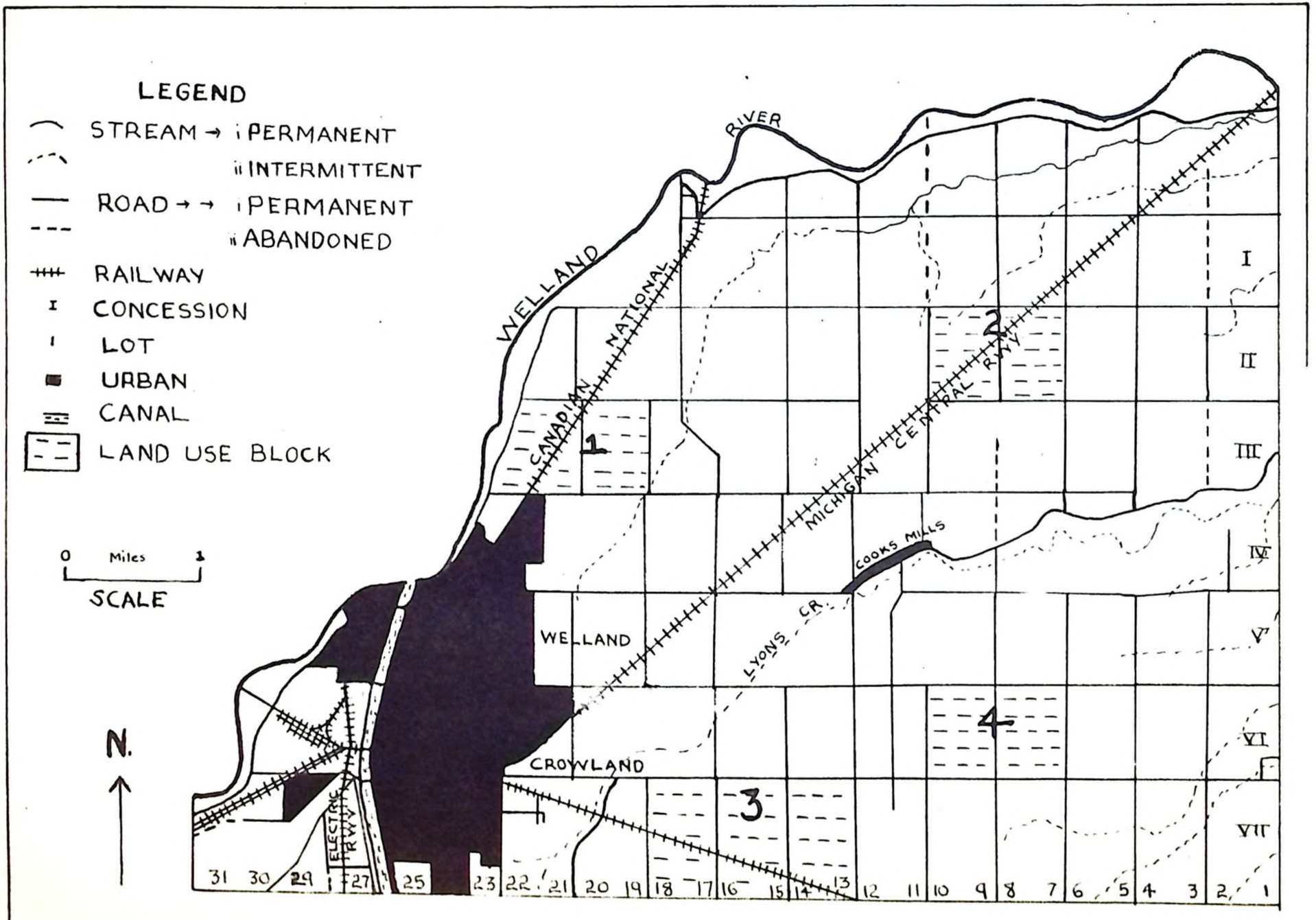
Chapter I Location, Size and Shape

Crowland Township is located centrally in Welland County. It is bounded on the north by Thorold and Stamford, on the west by Pelham and Wainfleet, on the south by Humberstone and on the east by Willoughby township. The city of Welland is located for the most part within Crowland Township. The city straddles the Welland River, a natural and political boundary of Crowland.

Crowland occupies a total of 19,793 acres. The city of Welland has an area of 2.19 square miles; a small part of which is located outside Crowland in Thorold Township.

The shape of Crowland is similar to the quadrant of a circle. If this analogy is completed, Welland would be described as lying on the circumference of the quadrant, the Welland River.

The study area is located within 15 miles of Niagara Falls, 25 miles of Buffalo, 45 miles of Hamilton and 80 miles of Toronto.



INDEX MAP CROWLAND

Figure 2

The Physical Environment

ter II Geology

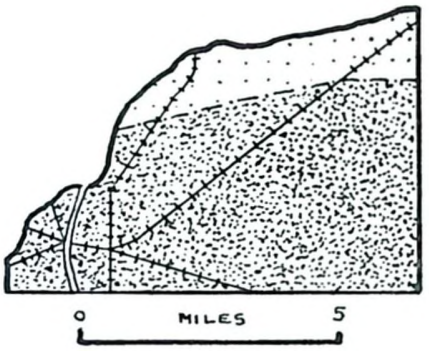
The Niagara Peninsula is underlain by sedimentary strata of the Palæozoic era. Crowland township itself overlies rock formations of the Silurian period. All these sediments rest on an uneven surface of Precambrian, igneous and metamorphic rocks which outcrop approximately 120 miles to the north as the Canadian Shield.

The oldest Silurian rocks consist of sandstone and shales; the middle Silurian is characterized mostly be dolomites: while the youngest rocks of Silurian age are represented by shales and interbedded Platy dolomites. At no point do any of these formations outcrop in Crowland Township; nor have the strata underlying the township undergone any strong deformation. They dip southwards at the average rate of 30 feet per mile.(1) Drillings have been taken at numerous sites throughout the township. Not one drilling gives the depth to bedrock at less than 60 feet.

Certain strata underlying the bedrock are important in natural gas production. The two main types of reservoir rocks in the Niagara Peninsula are the limestone of the Clinton and the sandstones of the Thorold, Grimsby and Whirlpool numbers of the Medina formation. (figure 4). The Whirlpool sandstone is the main producing horizon in Crowland. Smaller quantities of gas are also obtained from the Clinton. The Clinton is the highest producer in the Niagara Peninsula. A few wells are found towards the northern boundary of Crowland but production has mainly been concentrated in the southern sections of the township.

(1) Caley J.F. The Paleogoic Geology of the Toronto-Hamilton Area.

GEOLOGY
CROWLAND TOWNSHIP



SCALE

LEGEND

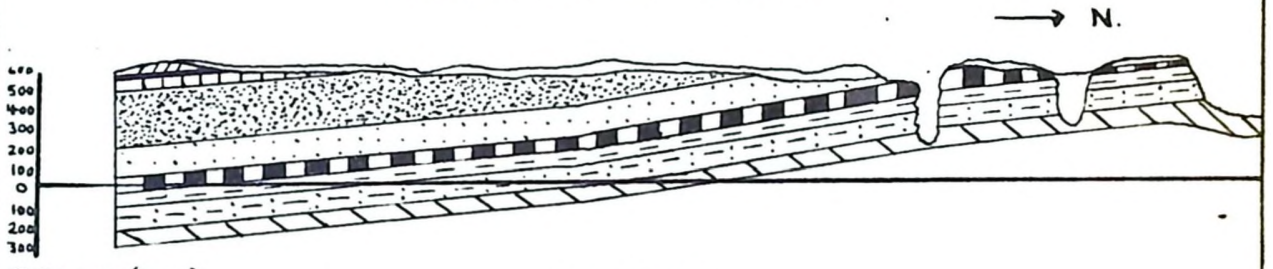
CANAL

RAILWAY

GUELPH DOLOMITE

CAMILLUS SHALE

VERTICAL VIEW



SCALE (feet)

LEGEND

			SURFACE DEPOSITS
DEVONIAN	ONONDAGA		ONONDAGA LIMESTONE
	ORISKANY		ORISKANY SANDSTONE
SILURIAN	CAYUGAN	(SALINA)	AKRON DOLOMITE
			CAMILLUS SHALE
	GUELPH		GUELPH DOLOMITE
	NIAGARA		LOCKPORT DOLOMITE
			CLINTON DOLOMITE
	MEDINA-CATARACT		THOROLD SANDSTONE
ORDOVICIAN	QUEENSTON		QUEENSTON SHALE

CROSS - SECTION
(After CALEY)

Figure 3

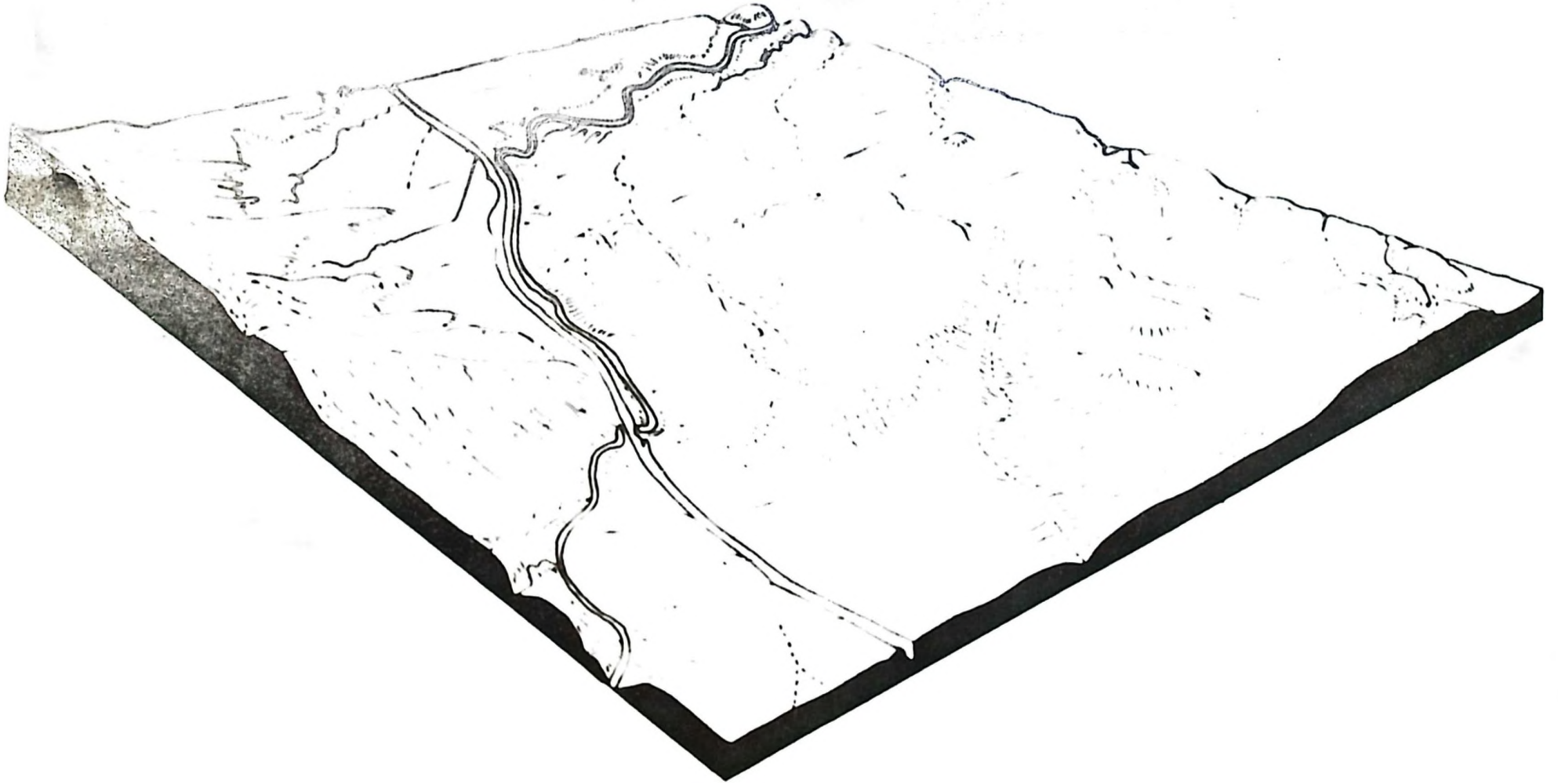
Deposits of glacial and glacial-lacustrine material cover the bedrock everywhere. Thus, even though the level surface relief in Crowland reflects the nature of the underlying rock formations; the influence of glacial materials has also been important in determining relief in the township. The lowest elevations, 575 A.T., are found, naturally enough, close to Welland River and Lyon's Creek. The difference between these elevations and those of the rolling hills in the south of Crowland is only 50 feet.

Glacial History

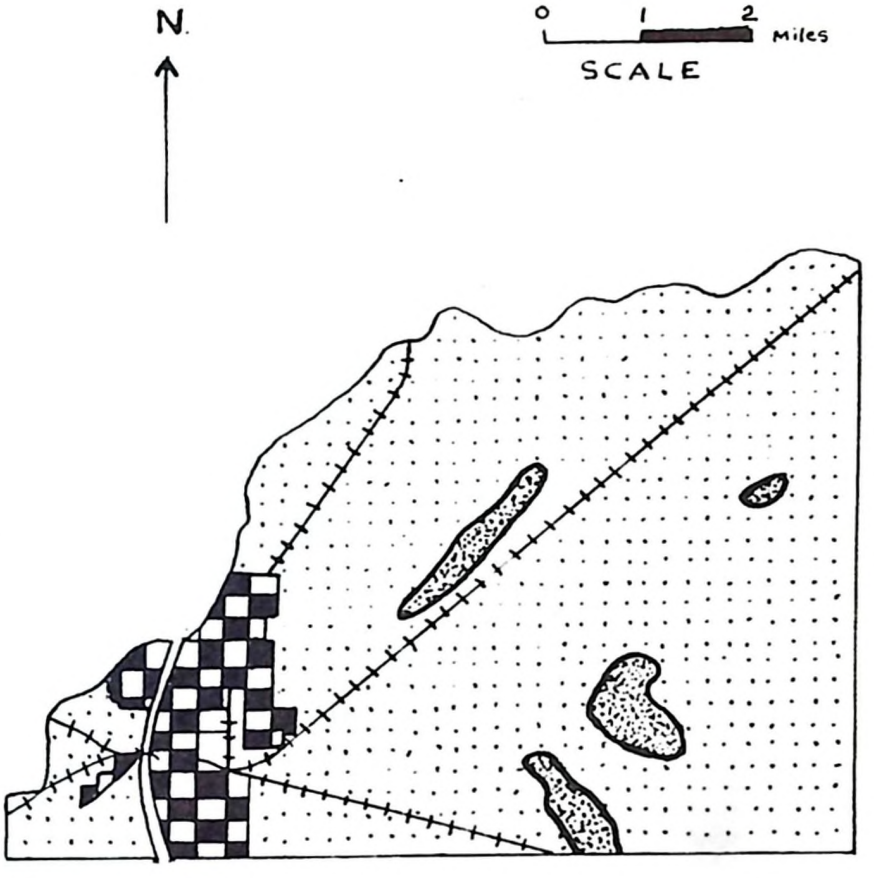
Man's activity in Crowland has been and still is strongly affected by the relief, soils, and vegetation developed upon these glacial materials. Their origin is therefore of interest. The Wisconsin glaciation was most important. It changed the older physical landscape completely, creating new drainage patterns and altering the topography by burying everything beneath huge quantities of glacial debris. These changes were effected by a huge lobe of ice which occupied the lowland basin now known as Lake Ontario. It is known as the Lake Ontario Lobe. The ice sheet moved through the preglacial re-entrants of the Niagria escarpment tearing and scraping away the Palæozoic shales and limestones as it went. Materials of all sizes were laid down to the south of the escarpment brow. Till, high in clay content, eventually covered the old surface of Crowland township.

With time the Pleistocene climate became warmer. The ice melted and the glacier waned; but it did so in a series of advances and retreats. The melt water from the receding glaciers created large lakes. The largest and most important of these was Lake Warren; it covered the Niagria Peninsula. According to Putnam and Chapman, the lake reached a height of 875 feet A.T.[1] Streams flowed into Warren carrying great

(1) Putnam D.F. : Physiography of Southern Ontario, Toronto 1951.



BLOCK DIAGRAM
CROWLAND TOWNSHIP



PHYSIOGRAPHIC DIVISIONS of CROWLAND TOWNSHIP

(After Putnam and Chapman)

J.G.N.

Figure 5

volumes of material from the retreating ice sheet. The older till deposits were reworked and modified by the slowly moving lake waters. A flat-lying clay plain resulted. Putnam has named this the Haldimand Clay Plain. Crowland is located in a west-central position in this lacustrine plain.

Gradually these lake waters receded southwards and eastwards into the basin of what is now Lake Erie. Lake Warren slowed and stopped periodically during this retreat. During these periods when the lake level was relatively stable, sand bars were created either through wave or steam action. Remnants of shorelines and sand bars are scattered over the whole Niagria region. Four very distinct sand bars have collected on higher ground in Crowland. Putnam and Chapman have mapped these, (figure 5) but not other smaller features associated with them because of the large scale that would be required.

Present Landscape

Crowland is flat and poorly drained. The topography of the township reflects the level surface of the underlying bedrock. But the effects of the glacial lakes have been important in the creation of the present surface features. Throughout the township the topography is characteristic of a lake bottom. The relief is worthy of further attention since it is of paramount importance in controlling drainage and land use. Soils in Crowland are differentiated almost solely on the basis of drainage differences.

Only the undulating sand bars break the monotony of the clay palin. The level nature of the terrain and the heavy texture of the acid clays result in incomplete drainage over the whole of the township. This flat relief and poor drainage imposes severe limitations upon agriculture. General farming, generally of a poor quality, is typical in Crowland.

The Welland River and Lyon's Creek drain the township. Only in the vicinity of these streams and of the sand bars does the drainage improve.

A cross-section of a sand bar taken at an abandoned gravel pit on the southernmost bar in the township.

A section of the clay plain characteristic of the greater part of Crowland.

Slopes ~~approximately~~ exceeding 3 percent are rare anywhere upon the clay plain. Thirty percent slopes are not uncommon towards the northeast corner of Crowland in the valley of Lyon's Creek. Better soil development is associated with increasing slope and improved drainage. Agriculture improves with these conditions. Land use changes for similar reasons upon the sand bars. The slopes here are not so steep as in the stream valleys nor are they as level as upon the interior clay plain. The gentle slopes of these sand bars formerly supported vineyards.

Climate

The climate of Crowland is determined chiefly by two factors; the moderating influence of the nearby lakes, and its position in the cyclonic belt.

The Great Lakes moderate both winter and summer temperatures. Lake Erie is particularly important because of its position south and west of Crowland. In summer the cool moist winds coming from Lake Erie lower temperatures in the township. In winter these winds have a moderating effect. The frequent passage of cyclones and anticyclones particularly in summer causes rather extensive weather changes every 2 to 5 days.

Climate is quite uniform throughout Crowland. There are no significant variations in relief in the township. Differences in elevation seldom exceed 25 feet. So microclimatical differences are practically non-existent and do not affect land use in the township.

Putnam places Crowland Township in the Lake Counties Climatic Region. (1) His conclusions are borne out by figures obtained from the weather station at Welland Airport.

Table I will provide the reader with almost any data required. Putnam's data on the Lake Erie Counties and Niagria Fruit Belt region are

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(1) Putnam D.F. and Chapman L.J.: Climate of Southern Ontario. Scientific Agriculture 1938.

CLIMATIC DATA
(degree F)

	Welland				ST. Catharines			
	- 30 year average -							
Month	Mean Temp	Total Prec. Inch.	Temp 1953	Prec. 1953	Mean Temp	Total Prec	Temp. 1953	Prec. 1953
Jan.	25	2.90	31	2.6	26	2.08	31	2.0
Feb.	25	2.72	30	1.2	26	1.95	31	1.1
Mar	33	2.93	36	3.3	33	2.12	37	4.1
Apr	44	2.92	44	1.7	44	2.30	45	2.3
May	55	2.88	56	6.1	56	2.51	57	4.7
June	66	2.63	67	1.6	66	2.44	68	2.7
July	71	2.98	71	2.1	71	2.37	72	2.0
Aug.	70	2.33	70	3.8	70	2.27	72	4.4
Sept.	63	3.28	62	4.0	63	2.81	64	4.5
Oct.	51	2.70	54	0.5	52	2.14	55	0.6
Nov.	40	2.99	44	2.6	40	2.36	45	2.2
Dec.	29	2.76	34	2.5	30	2.04	35	1.5
Year	47.7	34.02	49.9	32.0	48.1	27.39	51.0	32.0

Figure 6A

included. These may be compared with each other and with Welland and St. Catherines. Welland is typical of Crowland Township, both lying within the Lake Erie Counties Region. St. Catherines is included since it is located not far from Welland and within the Niagara Fruit Belt.

The mean monthly and yearly temperatures and the total monthly and yearly precipitation (30 year averages) are included for both Welland and St. Catherines. The same data is supplied for both centres for 1953. Many interesting and significant correlations are possible.

The mean annual temperature for Crowland and Welland is 47.7°F. This is slightly higher than the mean annual temperature for both the Lake Erie Counties and the Niagara Fruit Belt. A glance at table also shows us that the seasonal temperatures for Welland are higher than those for the same 2 regions. Welland's winter temperatures are highest comparatively, being 3.3°F higher than its regional mean of 23°F.

The moderating effects of the Great Lakes are reflected in the maximum and minimum temperatures experienced. Putnam gives 34°F as the extreme low temperature for the Lake Erie Counties Region. No exact data for Welland is available in this connection but older residents cannot recall temperatures anywhere near this figure. A comparison of the mean winter temperatures for the city of Welland and the Lake Erie Counties Region also indicates that the city's extreme low would be appreciably higher than that of the region. It is doubtful if temperatures have exceeded -20°F in the township of Crowland. Farther to the north where the influence of Lake Erie and Lake Ontario is not so strong, temperature extremes drop below -34°F. This results in a lower regional average and a definite misconception for Crowland Township.

In considering the length of growing season and the frost-free period, we must rely on data supplied by Dr. Putnam. No exact information is available for Crowland.

CLIMATIC DATA

(degrees F)

	Niagara Fruit Belt	Lake Erie Counties	Welland
Mean Annual Temperature	47	46	44.7
Mean Winter Temperature	25	23	26.3
Mean Spring Temperature	43	43	44
Mean Summer Temperature	68	67	69
Mean Fall Temperature	51	49	51.3
Extreme Low Temperature	-16	-34	
Extreme High Temperature	104	106	
Daily Temperature Range (average)	17	18	
Date of Last Spring Frost (average)	May 8	May 10	
Date of First Fall Frost	Oct 13	Oct 10	
Number of Frost Free Days (average)	158	153	
Beginning of Growing Season (average)	April 11	April 14	
End of Growing Season	Nov 9	Nov 3	
Average Length of Growing Season	212	203	
Average Annual Precipitation	30.9"	33.8"	34.02"
Average Annual Snowfall	38"	61"	45"
Average Rainfall (Apr. 1-Sept. 30)	15.7"	17.1"	17.02"
Average Summer Rainfall (J.J.A.)	8.0	8.8	7.94
Frequency of Droughts	30	20	
Percent of Sunshine in Growing Season	55%	54%	
Altitude	250'-400'	600'-800'	599'

The growing season lasts from April 16 to November 2, a period of 203 days. In the lake plain below the escarpment and closer to Lake Ontario, the growing season has an average length of 12 days beginning April 10 and continuing until November 9. Above the escarpment farther from both Lake Erie and Lake Ontario the first fall frost will likely occur on or about October 1 and the last spring frost about May 15, a frost-free period of 144 days. Again there is a contrast with conditions below the escarpment on the lake plain. The last spring frost usually occurs here a week earlier and the final fall frost a week later, giving a total of 158 days free of frost. But it is well to remember in studying Putnam's figures for the region that we have indicated Welland's temperature is higher in nearly every respect. It is reasonable to assume that the frost-free period in Crowland will be somewhat longer than the 158 days average for the Lake Erie Counties Region.

The average annual precipitation is 33.8 inches for the Lake Erie Region; at Welland it is 34.02 inches. This contrasts with the precipitation below the escarpment at St. Catherines where the "rain shadow" effect results in an average precipitation of 27.39 inches per year. Just over 50% of the precipitation in Crowland is concentrated in the growing season.

Rainy days in Crowland exceed 100 annually. This is not surprising considering Crowland's position in the cyclonic belt. Most of the bright sunny weather occurs in the growing season. Of the possible total, this season receives about 54% of the bright days.

Climate is favourable to agriculture in Crowland. The township has a better climate than the Fruit Belt area in all but one major respect: - low temperature extremes. The danger of a low temperature in winter in Crowland is a disadvantage for fruit culture. Fruit has been grown to some extent in Crowland but is rapidly disappearing. Climate is the

major cause but other factors such as soil, level topography, soil texture and drainage are often unfavourable. In contrast the climate factor has stimulated the development of specialized fruit farming in the area below the escarpment. Crowland's climate is favourable to general farming.

Vegetation

In southwestern Ontario the climate is comparatively warm and moist; the land is generally undulating to rolling. Conditions are favourable to hardwood growth.

According to Halliday(1) Crowland Township falls within the Niagara Section of the Deciduous Forest Region.

Broad-leaved trees are characteristic of the natural vegetation of the township. They include beech, sugar maple, basswood, red, white and bur and swamp oak. The maple-beech association is dominant. The large number of oaks reflects the poor drainage of the area. A number of species are found in this hardwood zone which are unique in Canada i.e. the tulip, sassafras, butternut hickory and black walnut.

Coniferous species are poorly developed; they are thinly scattered throughout the township. Hemlock, white pine and red juniper are found. Historians and local authorities indicate pine and hemlock were numerous upon the lighter soils of the sand bars. Very few remain today.

The forst was not of great commercial importance because of the dominance of hardwood growth. Maple, elm, oak, birch and basswood were some of the commercially important hardwoods cut in the township. They were used largely in Southern Ontario. Firewood, railroad ties, veneers amd furniture, all absorbed part of the production.

Of the original vegetation less than 8% remains. (Dept. of Lands and Forests). This is largely confined to woodlots. A large section

(1) Halliday W.E.D., A FOREST CLASSIFICATION FOR CANADA Ottawa 1937

of bush is notable in the southeastern corner of the township. Oak still lines the laneways in the south. Willows are especially common in poorly drained areas where most of the remaining trees are located. Large sections of infertile or ill-drained land are now idle and would be better returned to forest cover.

Soils

The soils of Crowland Township have been developed beneath predominantly broad-leaved vegetation in a cool humid climate. They are part of the grey-brown pozolic group, of zonal soils. These soils can be further classified on the basis of parent material, relief and drainage. (1)

A Soils developed from lacustro-morainic materials.

The parent materials of these soils is a heavy ground moraine which has been altered by wave action and lacustrine deposition. The depth of sediment is not usually greater than three feet.

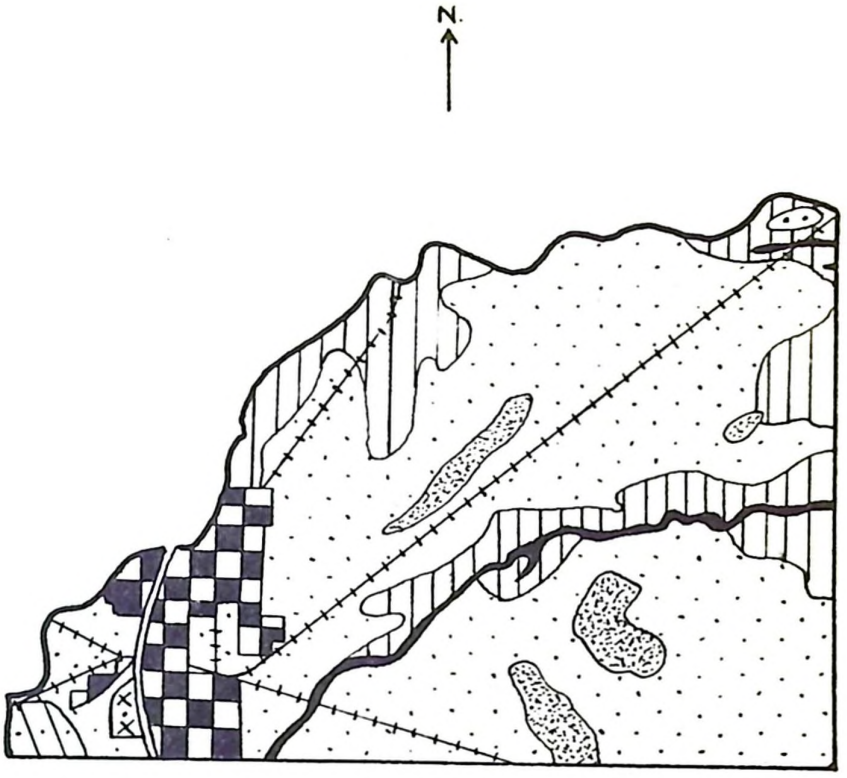
Caistor Clay Loam

These soils have developed from heavy tills particularly high in shale content and fairly high in limestone. Clay content is so high that perculation has been hindered resulting in poor profile development.

This soil type is of little importance since it occupies a limited area in the southwest corner of the township, in a growing urban section. The natural vegetation is a hardwood association of elm, oak, ash, hickory, beech and maple. Relief is level to undulating. Natural drainage is only fair. The soils are acidic in reaction.

Caistor Clay Loam is a fairly productive soil for agricultural purposes. But at present these soils are little used for agriculture in Crowland. Formerly general farming was typical with an emphasis on stock-raising. The soils are low in organic matter, phosphorous and calcium. Potash is present only in moderate quantities.

(1) Much of the material used here has been drawn from or inspired by Soils Dept. O.A.C.



Miles
0 1 2 3 4
SCALE

LEGEND

- URBAN
- RAILWAY
- WELLAND CANAL
- CAISTOR CLAY LOAM
- WELLAND CLAY
- NIAGARA CLAY
- ONTARIO LOAM
- BOTTOM LAND

(after Soils Dept. O.A.C.)

SOILS of CROWLAND TOWNSHIP

Figure 7

Welland Clay

This soil develops on parent materials very similar to those underlying Caistor Clay Loam. The natural vegetation is typically elm, ash, oak, hickory, beech and maple. The topography is smooth to undulating. The soils are acid in reaction and low in phosphate and organic matter.

They are fair to poor for agricultural purposes. Poor general farming is typical with an emphasis on the grazing of livestock. A few cash crops are grown, wheat being the most important.

The major problem here is drainage. Tile is little used and if it were the heavy texture of the parent material might well render it ineffective. Ditching is common but is not too successful because of lack of slope. Lime, phosphate and organic matter should be applied to maintain fertility levels.

These soils cover the greater part of Crowland township. The problems within this soil type are typical of agriculture within the township and accounted for its poor quality. Idle land and pasture are characteristic.

Profile

Ao :- litter, decomposing leaves, twigs and organic matter.

A1 :- One inch of brown to black, fibrous organic matter, amorphous.

A2 :- one to two inches thick, light brown-grey in colour, high in clay , massive, compact.

B :- four to six inches of yellow-brown compact clay, slightly mottled.

C :- brown to iron grey in colour, saturated in many cases, dense and compact, fine textured, mottled.

This is not a typical Welland clay profile in the strictest sense of the word. Poor drainage has hindered development in this soil type. Often profiles are shallow and resemble muck soils. The profile illustrated was taken at a site with somewhat better drainage than that usually associated with Welland Clays. Profile development is typically poor in Welland clay;

variability in profile is also characteristic in this soil type.

Niagara Clay

This soil type also develops on lacustro-morainic parent materials. The natural vegetation is similar to that upon the Welland clays but fewer of the species peculiar to poorly drained areas occur i.e. various species of oak, willow, etc.

The relief is undulating to rolling. The soil type is generally located on slopes close to streams in the township. Drainage is fair to good. The soils are acid in reaction and low in organic matter and phosphate.

These soils are suitable to general farming and are intensively used in Crowland because of the poor quality of the Welland clays. Fruit and cash crops are more evident. But fruit culture is declining because of competition from better quality crops originating in the fruit belt below the escarpment. Cash crops are not too common; those associated with dairying are dominant. Wheat, hay, oats, corn and barley are the main crops. The growth of truck crops increases towards Welland.

The drainage problem is negligible. The application of fertilizers high in organic matter, lime and phospherous will maintain fertility at a high level. These soils along with the Ontario Loams are exceptional in Crowland Township. They do not exhibit the poor drainage typical of the greater part of the township and are favourable to better general farming.

Profile

Ao :- litter, one-half inch.

A1 :- five inches, brown-black, friable, high in clay.

A2 :- five inches, light-brown, leached, compact, clay.

B :- six to eight inches, red-brown clay, compact, massive.

C :- red-brown, semi-stratified clay, compact, brick-like, little

mottling, a few pebbles about ten inches below B horizon.

Good drainage has resulted in the development of good, deep profiles in the Niagara clays. This is a typical profile.

B Soils formed from shallow sands over clay.

These soils are the result of wave action in the post-glacial lakes which left sandbars three to eight feet deep over heavy glacial till. Their texture is coarse relative to the clay soils of the township.

Ontario Loam

The natural vegetation includes oak, elm, ash, hickory, hard maple and beech. A few pines and hemlock are also scattered over these sandbars.

The topography is gently rolling. Drainage is fair to good. The soils are acid in reaction and low in phosphate and potash. Organic matter is also inadequate.

This soil type is well suited to the growth of a wide range of high value cash crops. Fruit was more common in the past than it is at present. But the sands are not really deep enough to provide for great differences in farm practice. Internal drainage is hindered somewhat by the level relief atop the sandbars and particularly by the proximity of the underlying clays to the surface. Land use is now similar to that of the surrounding clay soils. Grapes are still grown upon the gently sloping flanks of the bars. But dairying is becoming more important as that type of farming is more profitable. Both milk and vegetables are produced to supply local demand particularly in Welland. General farming is typical at present; the emphasis is toward milk production.

Erosion is slight. The chief fertility needs are phosphate, lime, potash and organic matter.

Profile

Ao :- one inch of litter.

Al :- four inches of black-grey, friable sand, with the odd stone occuring.

A2 :- eight or nine inches of leached, light red-brown sand, stony, pebbly.

B :- four inches, dark brown, finer sand, mixed, high percentage of pebbles and gravel.

C :- dark brown heterogeneous mass of sand and gravel.

O Bottomland

Bottomland is an azonal soil. It is located along streams subject to flooding during part or all of the year. Both fine and coarse materials compose the soil. Profile development is poor. The physical and chemical properties of Bottomland are variable.

This soil type is located along Lyon's Creek and the Welland River in Crowland Township. The areas not used for permanent pasture are left as waste land.

These five soil types exist in Crowland. Of these Welland clay covers the greater part of the township. This soil type is adaptable because of poor drainage, only to poor general farming.

ter III The Evolution of Land Use in Crowland Township

The physical foundation underlying man's activity in Crowland has been considered. Land use has changed as different opportunities were discovered in the environment. A historical analysis of these changes and the physical, economic and cultural factors causing them is essential to a full understanding of present land use in the township. Several distinct changes have occurred since the land was first used as a hunting ground by the Neutral Indians. Minor adjustments and variations have occurred within these distinct periods. The broad periods will be stressed; the minor variations considered and commented upon.

Initially the trend of settlement was to occupy the most fertile and most accessible areas. Agricultural land use was primitive and experimental in these years. Man was forced to adjust to his new environment in a very complete way. As advances were made in agricultural methods and techniques, settlement spread inland, but with great difficulty and at high cost.

Crowland's first settlers came into the Niagara Peninsula along the Hudson-Mohawk corridor. They travelled down the Niagara and Welland Rivers, and settled on more accessible sites along these streams. Lyon's Creek provided the routeway for initial penetration into the interior of Crowland.

Transportation was the major problem to these early settlers. The township was covered with thick forest. This provided an important source of early income to the settlers but greatly handicapped agricultural expansion within the township. Settlement was slow and gradual. The first road was not built until 1801. The first administrative meeting was

held in 1803. At this time the population was reported as 210. This was an era of great hardship. Transport was primitive. Grain was moved to early milling centres in the Short Hills by foot or horse, or by water to mills at Niagara-on-the-lake.

Primitive subsistence farming was characteristic of this period. Farming was concentrated in isolated clearings. Log cabins and the absence of schools, churches and roads were common. Wheat and oats were the first crops; cattle were few. Lumbering and hunting supplemented the settlers' livelihood in the winter months. Much time was spent clearing the land; hard work was the order of the day. Social life was connected with the need for work and involved barn-raising, corn-husking contests etc. The lack of roads limited social intercourse. A barter economy existed and land speculation was common. A typical block of land sold for 18 pence an acre.

In this pioneer era, industry was located in an irregular localized pattern conforming to local physical controls. These pioneer industries were portage conscious; tending to locate at breaks in communications between river and road but where stream flow provided ample water power. Between 1806 and 1807 the Cook brothers built Crowland's first industries. These were saw and grist mills located along Lyon's Creek. The site was not too favourable but provided the stimulus needed to develop the township's first village, Cook's Mills. The mills competed disadvantageously with others located at better power sites in the Short Hills and along the Niagara River.

The War of 1812 had profound effects on the growth of Crowland Township. Disturbances caused by the war blighted the township's development before it was barely started. It took some years to rebuild.

An excellent description of Crowland was published in 1817. It took the form of a report to Robert Gourlay, Governor of Upper Canada at that

time. The level topography clay soils and rolling sand bars of the south are considered. The report indicates the township was still very largely forest-covered. A description of the natural vegetation included white oak, swamp oak, red oak, various species of maple, beech, bass, linden, hickory, elm etc. In some places large growths of white pine occurred. Lyon's Creek is described as a sluggish, brackish stream, rising in the swamps and marshes of the south. This indicates drainage was much poorer than at present. A report on land values was also included in this account. A 100 acre farm close to Cook's Mills sold for 312 pounds; only forty acres were cleared and the buildings were poor.

After 1815 a second period of immigration began. The Napoleonic wars were over. Disbanded soldiers and their families dissatisfied with employment conditions in Great Britain emigrated to Canada. The population increased tremendously. The Gore District increased 1900 % in the thirty-three years up to 1850. (1) This growth was evident in Crowland. A population of 210 in 1803 had grown to 600 by 1817, a 300% increase in fourteen years. Wheat continued to be the main crop in Upper Canada in these years, both for physical and economic reasons. But Crowland was hampered by its inland location and poor transportation facilities. Climate and soils were favourable to wheat growth but the heavy clay soils and poor drainage resulted in smaller yields per acre in Crowland. For these reasons subsistence farming lingered in the township for some time after the "wheat mining" era had begun in more favoured regions.

The limitations imposed upon development in the Niagara Peninsula by poor transport finally brought results. Schemes were introduced to open up the interior by the construction of an artificial waterway joining Lake Erie and Lake Ontario. Merritt induced settlers to aid him in

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(1) Census of Canada 1951.

building a canal between Twelve Mile Creek and the Welland River. This was designed to stabilize the water level of Twelve Mile Creek since mill operations were affected by lower water levels in summer drought periods. The first survey for the canal was made in 1818. It led to the realization of the older scheme to join Lakes Erie and Ontario. Construction began in 1824 and was completed in 1833. Goods were carried along this first wooden canal to Welland River (Chippewa Creek). Pt. Robinson was located at this junction point. The materials were either transhipped to other carriers here or went straight down the Chippewa into the Niagara River and on to Lake Erie.

A feeder canal was built from Dunnville to Port Robinson. This canal was designed to raise water levels in the canal proper. An aqueduct was constructed to convey this supplementary water supply over the eastern section of the Chippewa Creek and on to the junction point at Port Robinson. The labour camp housing Irish workmen engaged in the construction of this project was located on the present site of Welland. The settlement was appropriately called Aqueduct. The presence of large numbers of labourers stimulated the development of stock-raising in Crowland to satisfy their demand for beef.

Neither Crowland nor Aqueduct derived much benefit from this first early canal. Port Robinson occupied the strategic position and grew rapidly. Prior to 1824 this settlement consisted of but one residence. By 1835 it was a thriving commercial centre. Yet the early canal was not a financial or economic success. In 1842 the Canadian government took over complete control. Extensive improvements followed. The old canal was deepened and widened. Stone replaced wood as building material. An extension was built from Port Robinson to Lake Erie. Port Colbourne developed at the Lake Erie outlet. The effects were almost immediate. In 1851 Aqueduct, now known as Merritsville, had only two flour mills; both

driven by water power derived from the aqueduct. These two industries returned only £1550 in 1851 and employed less than 10 people. One saw mill was also located at Welland producing goods valued at £400. Two years later, in 1853 a carding mill had located in Welland, using 10,000 pounds of wool a year. A tannery was also present. All these industries are closely connected to the produce of the region. Wheat was the main cash crop and many flour mills were necessary. The hardwoods cut in Crowland were processed in local mills. The stock-raising industry, as stimulated by the Irish labourers, resulted in a surplus of hides and the rise of a tannery industry. A brewery, a rope yard. a lath factory, two planning mills, one pail factory , and a pottery were also located in Merritsville in 1853. The industrial function of the city was well established. The second canal provided the stimulus for the tremendous rise in manufacturing in Merritsville.

Physical factors still limited the growth of agriculture in 1851. Wheat was the major crop but only 1818 acres were grown.(1) The decade of the forties had seen more immigration into Ontario. This was the result of economic and social failure in Great Britain. Immigration was encouraged by the introduction of a free land grant policy by the British Government. The Gore area alone increased more than 571% in 10 years.(2) Crowland's rural population increased only 150% during the period from 1820-1850. Immigrants preferred settlement on more fertile areas. Only about 40% of the land in Crowland was cleared by 1846. Agriculture was still largely of a self sufficient nature. Farming was backward, it was of a poor general farming type. The emphasis was towards the breeding and fattening of beef and pigs. Sheep were rather plentiful. According to the 1851 Census, 2539 sheep were grazing in the township/ Nine hundred

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(1) Census 1911
(2) Abid.

and nineteen pigs were also being fattened by Crowland farmers. The rural population of Crowland township was 1478 in 1851. Merritsville had grown until her inhabitants totalled 1110. The total population in the study area was 2,888, an increase of 382% over 1817. There was a close balance between rural and urban population; rural comprising 52% and urban 48% of the whole. But this comparison is not actually a valid one. Part of Merritsville was located in Thorold Township. As a result the urban population in Crowland was less than 1410. But it is almost certain that the ratio of rural to urban population in the township was no more than 6:4.

The second phase of our historical study begins here. Crowland has proved itself physically unsuitable to the production of good crops. The trend was the production of livestock, particularly sheep and pigs in 1851. The construction of the first canal resulted in the establishment and growth of an urban centre, Merritsville. Cheap transportation and power associated with the canal and so with Merritsville attracted industry. But these were limited in size and production, still depending largely on local supplies. Disadvantages of environment in regard to crops, and technical improvement favouring industrial and urban growth, have resulted in a balance of rural and urban population in 1851. The regionwds at the point of transition. Two factors completed the change to an urban population and an industrial economy; the canal with its ever increasing economic effects and the political division of Lincoln County into two counties. Merritsville was renamed Welland the capital city of the new Welland County.

Industry in the pioneer stage was in the form of power-driven mills. Physical controls were significant. Climate and topography were the controlling factors. Frequent summer droughts with resulting low stream volume and gentle gradients were handicaps over large sections of

the Niagara Peninsula. Crowland suffered particularly from the lack of slope. As a result mills in the Niagara region located at scattered often inaccessible points in ravines and at water-falls. Intermittant power and inaccessibility hindered industrial development.

The first canal was built to rectify the problem of reliability of flow. The old mills gradually declined, particularly with the improvement and extension of the canal in the 1840's. New industries located along the canal near sources of cheap power and transport. A linear alignment of industry evolved, conforming with the Welland canal and replacing the old localized pattern.(1) A national system of communications now passed through Crowland Township. Welland occupied a position within the linear pattern of towns parallel to the canal. The canal supplied power to Welland industry and the town was situated at the crossroads of inter-regional routes. The town's industry was no longer dependant on a limited local market nor upon a limited supply of local raw materials. It had an excellent opportunity to develop on an inter-regional scale. The coming of the railways in the decade between 1850 and 1860 further emphasized the broad basis upon which Welland industry could grow.

The flour and saw mills were still the chief industries in Welland in the early 1850's. These industries remained important until the opening of the Canadian West, the end of the Reciprocity treaty in 1866, and the termination of the Civil War in the United States in 1865. At this time huge volumes of grain began flowing eastward from the Canadian prairies and United States midwest in particular. Local grain producers could not compete with low-priced, high quality western wheat. A decline in wheat farming began in southern Ontario. The trend to a more diversified crop programme started.

Port Colborne occupied a strategic position in regard to western

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(1) J.W. Watson. The Changing Historical Pattern of the Niagara Peninsula, Ontario Historical Society Papers and Records Vol.37 Toronto, 1945.

grain especially when ship sizes on the Great Lakes increased. Boats had to be completely unloaded or lightened before passing up the canal. Port Colborne became a transhipment point for this grain because of her position at the Erie terminus of Welland Canal. A rail line was built to transfer goods to St. Catherines; from this town, wheat was reloaded and shipped east. Grain elevators and flour mills multiplied in Port Colborne.

Thorold began to dominate the lumber industry. This town was located well in relation to the lumbering regions of Ontario and lower Quebec. Raw materials could be brought together to take advantage of the immense water resources of the old Welland Canal and the ample water power available at the brow of the Niagara escarpment. Shipment was cheap via water routes to nearby United States markets.

The wool industry began to concentrate in Welland, particularly as railways increased. Cheaper wool, of better quality and greater quantity began to flow into Welland from the United States via the new rail lines. By 1880 three rail lines centred on Welland, now a railway node. The canal served as a link between the old power sources along the canal and the new sources of wool in the United States and Canadian west. As the textile industry became more diversified, spreading into cotton and silks, the railways became more important since they brought the raw cotton and silk from the United States. The Michigan Central Railway became especially important in this trade. The rail lines funnelled through Welland and branched out to serve the expanding Canadian market. Local production of wool soon declined in Niagara Peninsula. Welland grew with the canal, the railways and the depletion of local resources. The railways in particular gave access to cheaper sources of raw material. Other wool centres along the canal were dependent on local supplies and did not have the inter-regional connections necessary to compete with Welland. Both these centres and the local areas producing wool declined. Welland's extra-

regional contacts have been fundamental to the city's industrial development.

The iron and steel industry began to develop during the 1880's. The early iron and steel industries in the Niagara Peninsula were located along the Niagara River, close to supplies of United States iron ore. Charcoal produced from local forests served as fuel and power was provided by the Niagara River. But with the opening of the improved canal in the 1840's, American ships engaged in the coal and iron ore trade moved through the canal with increasing frequency and in growing numbers. But again ship sizes increased. The canal was outdated both for handling of grain and the coal and iron ore trade. Plans were begun in 1871 to construct a wider deeper stone canal. This was completed in 1887. A proportionate increase in canal traffic occurred.

Large quantities of American coal, and iron ore from Pennsylvania began to come to canal towns, particularly Welland and St. Catherines. These two towns were already well advanced in relation to industry in the rest of the centres in the linear canal pattern. Similar raw materials also began togo to Hamilton. So iron and steel industries began to spring up where coal and iron trade was centralized. Imports also began by rail. Welland's position as a rail hub placed her in a favourable position here. Water power was present in ample amounts.

A significant change in power production occurred about 1890. Hydro-electric power production began at Niagara Falls in particular. Hamilton's better position, in relation to water routes, its good natural harbour, distribution facilities and wide trade area resulted in the development of a basic steel industry. Welland gradually began to specialize in electro-metallurgical processes because of its superior position in relation to power sources at Niagara Falls and Queenston.

Agriculture also underwent a radical change during this period.

Wheat production began to climb rapidly. A simultaneous occurrence of several economic and social conditions provided huge markets for Canadian wheat. The improved canal provided cheap transport for wheat; it was also a cause of improved drainage upon the clay flats of Crowland. The Crimean War 1854-1856 and the Reciprocity Treaty 1856-1866 created new markets and stimulated wheat production. In 1851 only 1818 bushels of wheat were produced in Crowland. By 1881 a fantastic increase had occurred; 47007 bushels of wheat were grown in the township. The Civil War in the United States also provided a large market for Canadian agricultural produce up to 1866. Wheat shipments to United States markets increased.

The growth in wheat production in Crowland is reflected in the increase in occupied land from 16,602 acres in 1851 to 18,537 in 1871. Pasture land fell from 4,638 acres in 1851, to 2,647 in 1871. More land was being cultivated for wheat production.

But the factors which favoured growth were temporary. Most of the stimulus underlying "wheat mining" had disappeared by 1866. The Crimean War ended in 1856. The Reciprocity Treaty was cancelled in 1866. The Civil War came to an end in the same year. The Reciprocity cancellation gave Canadian industry a chance to develop without competition from United States produce. But the agricultural side of the economy suffered. Canadian wheat could only be sold in the United States after tariff payments. More important, peace in the United States meant the opening of the Mid-West. Construction of railways into the Canadian and American west brought competition from huge volumes of high quality western grain. The canal itself proved to be a significant factor in declining production in Southern Ontario. Western wheat flowed through the canal, overseas to world markets. "Wheat mining" had also reduced the fertility of the soil. A decline was inevitable for physical reasons. The same land was used year after year without improvement. It is fortunate that the wheat era did end in Ontario. Otherwise

today great tracts might lie infertile. Soil exhaustion reached a high point about 1870.

Whaat was the most important cash crop in Crowland at this time. But beef production was still significant, and sheep grazing while dropping in importance, still occupied a prominent place in the land use of the township.

At first the farmers in Crowland began to improve their land in an attempt to compete with western wheat. In 1851 improved land totalled 5,476 acres, by 1871 the figure was 9,649 acres, an increase of 80% in twenty years. A wider range of crops was introduced in many areas. This was not too evident in Crowland, although grapes and poultry began to become more important. Crop rotation was emphasized; gradually less emphasis was placed on wheat. More attention was given to livestock production and especially to dairying. These types of farming are those most suited to the physical conditions in the township. A more scientific approach to agriculture began in much of Ontario. This was true of Crowland but only to a degree. Many people left Crowland and emigrated to rich western wheat areas. Some went into surrounding urban centres. Others left for the United States. The higher wheat production for 1881 was actually a projection of the wheat era. The collapse had begun about 1870. But wheat production had acquired momentum. Farmers had come to expect high returns from the sale of this crop. For some time they attempted to recover their lost income through improved land use and greater production. It was a simple case of economics. The farmers in Crowland tried to sell more wheat at lower prices in order to achieve the old returns. But the wheat decline was inevitable. The trend was to specialization within the broad general farming pattern. Urban population was now appreciably greater than rural. The population figures reflect the secondary role of agriculture in Crowland. Physical factors limit agriculture to a poor general

farming type. But urban growth has improved agricultural conditions in the township. Dairying has become more and more important as population increased in Crowland. By 1890 the emphasis on dairying within the general farming pattern was evident. Milch cows had increased by about twelve per cent since 1851. No figures are available for fluid milk production. But there was a significant increase in butter production, 20,140 pounds or sixty-six per cent in ten years.

1851 - 36,217 pounds
1891 - 56,357 pounds

Growth of wheat production in the west was not entirely unfavourable to Ontario agriculture. The decline in wheat production was directly related to western development. But the rising production of the west also had an indirect and favourable effect on agriculture in Ontario. As the west grew it provided markets for Ontario's manufactured goods. This stimulated industrial and urban growth. There was a greater demand for food crops and dairy produce. Milk was needed the year round. Silos and other outbuildings associated with winter dairying had to be built. The farm landscape changed. The introduction of bulk feeds designed to provide more manure accompanied the growing use of pasture and hay crops in a rotation system designed to restore and maintain soil fertility. Wheat declined; sheep and hogs became less important.

	Sheep	Pigs
1891	832	683
1851	2539	919

A new specialty, fowl, increased rapidly. There were 5,303 chickens in the township in 1891. Yet there is no evidence of any significant number prior to 1880.

A significant change occurred in farm numbers and size.

There were 115 farms in Crowland in 1851, 130 in 1891. There were fifty-five per cent more farms under 100 acres in 1891. There were still seventy-nine farms between fifty and one hundred acres but a false impression is given here. In 1851 most of the farms were close to 100 acres. In 1891 the largest percentage were close to fifty acres in size.

Population reached an all-time low of 1107 in Crowland in 1891. Welland was still growing; the population was 2,035. The land under crops was increasing. Wheat was still the main cash crop, but had declined almost fifty per cent in output in ten years.

The decline in farm population is shown in decreased yields. The only increase is seen in hay, which amounted to 3,824 tons in 1891 and 2,830 tons in 1880. This increase reflects the trend to livestock production and the increased use of the crop as a winter feed in dairying. From this point on Crowland township increases little in rural population. General farming is typical with a gradual trend to dairying and poultry farming. In the year 1900 we see both agriculture and industry beginning to specialize in Crowland in accordance with physical and economic controls. Industry and urban land use are most important. Farming is poor; despite the emphasis on dairy produce because of competition from milk-producing areas in surrounding townships.

The trend towards specialization actually began about 1890 in both agriculture and industry. But the depression of the 1890's and early 1900's with subsequent migration to the west hindered the culmination of this process. The rural and urban population within the study area fell alarmingly up to 1901. The rural population in Crowland reached an all-time low during this period. Only 1010 people remained on farms in the township. The population of Welland fell to 1863 by 1901. This is the only interruption in the city's steady growth. Both the agricultural and urban declines were of a temporary nature. In 1911, renewal of favourable

AGRICULTURE

Total Area of Township: 19793 acres

Date	Occupied	Improved	Crops	Pasture	Woodlot	Orchard
1851	16,602	8,343	5,476	4,638	8,259	
1871	18,537	12,712	9,649	2,647		
1881	18,158	14,102	11,222	2,318		
1891	17,655	14,008	11,931	1,491	3,647	
1911	18,579	15,857	10,264	1,386	2,344	
1921	14,806	12,409	7,778	2,898	1,891	125
1931	15,684	12,981	8,861	2,506	2,211	
1941			7,408	2,856	1,583	54
1951	12,456	9,462	5,583	2,227	1,496	

LIVESTOCK

	Milch Cows	Beef	Sheep	Pigs	Chicken	Barrels (Beef)	Barrels (Pork)
1851	591		2,539	919		164	422
						No. of Cattle Killed	
1890	682		832	683	5,303	223	812
1941	713	10	23	605	15,834		
1951	600	65	0	585	11,663		

Figure 8

economic conditions, particularly revival of industrial markets, was shown in a rural population of 1667 and an urban population of 5318. The industrial growth is most significant since it affected development in the agricultural and urban spheres. The tension created by international crises and the development of domestic markets was important.

The changing nature of agriculture is illustrated by census figures for 1911. Wheat was still a major crop with a production of 23,753 bushels. But the most striking growth was that associated with Welland; it was urban not rural. The boom in manufacturing during the war attracted new population to the Welland area. Many of the newcomers built homes outside Welland proper but close to the city. Expansion was very rapid. Annexation did not take place in these years. The result was the development of urban Crowland; urban growth closely associated with Welland but not incorporated in the town. This urban population of Crowland consists largely of foreign elements of independent spirit. Resistance to annexation is typical of them.. Expansion of Welland within Crowland has always been difficult for this reason. The city has often found it easier to grow northwestwards into Thorold Township. So growth in Crowland and Welland though classified separately was not in actually disassociated. The increase in both entities is merely urban development associated with Welland's industrial growth. Farm population in Crowland has remained relatively unchanged since 1901. The 1951 census gave a farm population of 1008 in Crowland; in 1901 it was 1010. A glance at figure 9 will illustrate the association between population increase in Welland and Crowland.

Many physical disadvantages have greatly limited agricultural activity in the township. Specialization did occur within the general farming structure. But agriculture was constantly in an unfavourable position when competing with more physically favoured regions to the nqth.

POPULATION

Year	Crowland	Welland
1851	1,478	
1871	1,317	1,110
1881	1,318	1,870
1891	1,107	2,035
1901	1,010	1,863
1911	1,667	5,318
1921	3,825	8,654
1931	4,999	10,709
1941	6,638	12,500
1951	12,086	15,382
1954	13,540	16,435

Figure 9

The agricultural situation remained relatively the same through 1931-1941. In the 1930's there was a slight increase in agricultural activity because of the industrial slump. Crop land increased twelve per cent and occupied land seven per cent. Acreages of occupied land, improved land, and crop land all fell during the war years when industry boomed in Welland. Of 7,408 acres under crops in 1941, 4516 acres were hay. Oats occupied 1,242 acres. These two crops occupied seventy-eight per cent of the total land cropped in Crowland: a striking illustration of the emphasis on feed production. By 1941 agricultural conditions resembled those before the depression. The amount of crop land fell below the 1921 total. The crop land total of 7,408 acres was the lowest since 1851.

The decline continued. In 1851 improved land totalled 9,462 acres of which ~~only~~ 5,583 or fifty-five per cent was crop land. Occupied farm land comprised only sixty-three per cent of the total township area. The declining importance of agriculture in Crowland is obvious. Despite the unfavourable physical environment, favourable economic and social conditions initiated a trend to the production of milk and poultry products.

Any agricultural success in Crowland is related to the development of specialized products for a local market. In contrast the growth of industry is connected with specialized production for an international market. The canal initiated industrial development and the growth of Welland. The location of the city close to cheap hydro-electric power produced along the Niagara River and the development of Welland as a railway junction stimulated the growth of industries specializing in the processing and refining of bulk produce. The railways have been responsible to a great extent for the decline of canal centres such as Port Robinson. But their concentration on Welland assisted remarkably in the development of its industry. The canal and the railway gave Welland

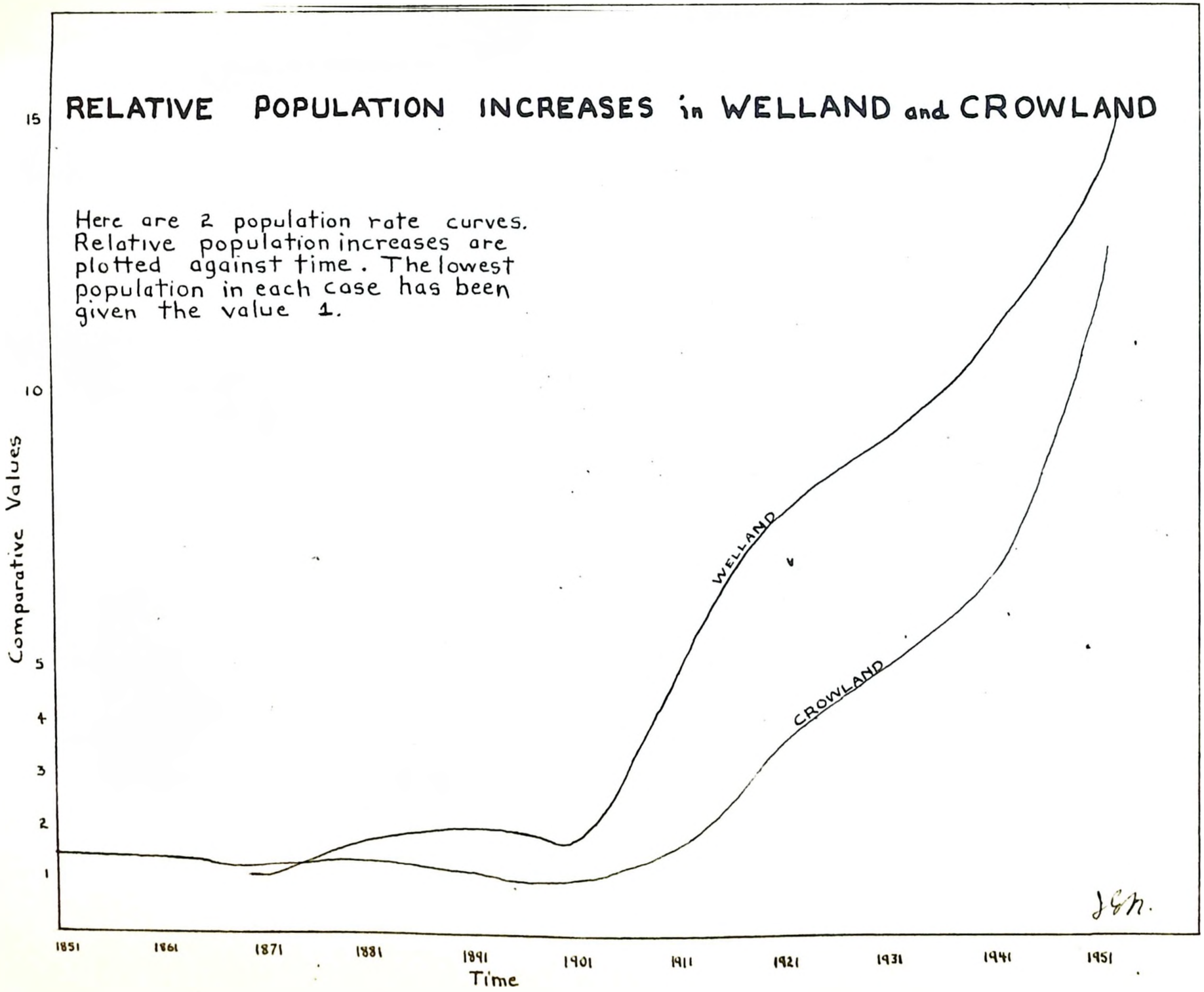

RELATIVE POPULATION INCREASES in WELLAND and CROWLAND
Here are 2 population rate curves. Relative population increases are plotted against time. The lowest population in each case has been given the value 1.
Comparative Values
15
10
5
4
3
2
1
WELLAND
CROWLAND
1851
1861
1871
1881
1891
1901
1911
1921
1931
1941
1951
Time

Figure 10

extra-regional contacts. Appalachian coal could be transported easily and quickly to the Welland area. Hamilton, particularly favoured for the production of basic iron and steel, developed nearby.

With the introduction of the railway, industry began to concentrate at rail nodes, but specialized in different functions at different nodes. The electro-metallurgical and high grade steel industries settled in Welland where the international coal routes by rail and the international iron routes by water meet at a point only twelve miles from the Niagara powerhouses.

The two world wars provided the stimulus for the tremendous development that has occurred in the last forty years. In 1911 Welland had a population of 5318. There were twenty industrial establishments in the city employing 684 workers. The total value of production was $1,375,374; compare this to a value of $152,078 in 1901. The influence of events leading to World War I cannot be over emphasized as regards this increase of eighty per cent in thirty years. From this point industry continued to develop along specialized lines, as laid down with the advent of the railways.

By 1951 there were fifty-seven plants in Welland employing 8,798 people. Production was valued at $142,357,821 an almost unbelievable increase of 100% in value of goods produced since 1911. Textiles are an important product. But the emphasis is on the production of finer steel products, tools and machinery, particularly electrical machinery.

As industry developed the relationships between Welland and the Niagara region became stronger. The close connection between Crowland and Welland has perhaps been overemphasized. However the Welland labour force has been quoted at 8,798. Yet Welland itself has a population of 15,382. It is not possible that Welland have over fifty per cent of its total population employed in industry. The great majority of the labour supply must come from outside the city. This is a patent indication of the interdependence

WELLAND MANUFACTURES

	Population	Establishments	Capital	Employees	Wages Salaries	Cost of Materials	Cost of Fuel, Elec.	Value of Products
1891	2035	36	175,290	215	44,023	131,385		233,738
1901	1863	8	100,363	128	57,257	65,222		152,087
1911	5318	20	1,877,576	684	286,752	761,137		1,375,374
1951	15382	57		8878	29,600,073	66,963,015	5,708,473	142,357,821

WELLAND COUNTY MANUFACTURES

1951		280		25,040	80,390,291	300,498,547	19,123,707	509,583,309

Figure 11

of Welland and Crowland, here particularly manifested in the field of industry.

Having considered the physical environment and analysed settlement and the historical evolution of land use in relation to these physical as well as to economic and social controls; we can now study and understand the landscape of Crowland as it is today.

Land Use

Rural Land Use

Agriculture

Agriculture is of minor importance in Crowland Township. The climate is favourable but the level topography and heavy texture of the fine-textured soils present critical drainage problems.

During the years of agricultural settlement in the township there have been changes in the crops grown and in kind and numbers of livestock kept. Physical factors are naturally the major determinant of agricultural productivity in any area. But economic, social and cultural factors have all been most important in the creation of the present agricultural pattern in Crowland Township. Improvement in transportation facilities accompanied by increasing competition of other agricultural areas and the development of industry and urban centres nearby has greatly influenced the type of farming.

Crowland is an area of general farming, generally of a poor quality. The township consists of 19793 acres; only 12456 acres are occupied. Of this 78 percent or 9674 acres are improved. Only 57 per cent or 5583 acres of occupied land is under crops. Almost 3000 acres are unimproved and 2227 acres are in pasture.

In Crowland the uniformity of physical controls is reflected in the similarity in agricultural production over the whole of the township. Yet some differences exist; these are related to improved drainage and the effect of economic controls. Four blocks of land have been selected in areas as different as possible both physically and economically. Yet

throughout all these blocks the dominance of general farming and the uniformity of crops grown is the most striking feature.

Unfavourable physical factors do not result in differences in crops grown as would be the case in other agricultural areas. Where agriculture is carried on in Crowland, land use is generally uniform; the unfavourable factors result in a high percentage of idle land, pasture, part-time farming and abandonment. A land use map and pie graph have been prepared for each block considered. These are designed to illustrate the written material and emphasize the relationships and conclusions derived.

Block I is situated north of Welland (figure 2). The block is divided into two sections by the railway. Physical controls and land use differ in each of these sections.

To the west of the tracks the land is undulating to rolling since the section forms part of the slope leading to the Welland River. This rolling relief results in fair to good drainage and good soil development. Niagara Clays have evolved under these conditions. These soils are suitable to good general farming. Surface drainage is no problem since slopes often exceed 8 per cent.

Some erosion has occurred but no gullying is evident. Farm practices are generally prohibitive to severe erosion; little soil being bare in spring or fall when rainfall is heaviest. Internal drainage is often imperfect particularly in the periods of heavy rainfall but does not hinder the farmer to any great extent. Nevertheless most of the wheat grown is of the winter variety indicating spring drainage conditions do not always permit early cultivation in spring.

Land use is intensive in this western section. Only a small portion of idle land exists; the rest is crop land. Good yields of hay, winter wheat, spring wheat and row crops are not uncommon. The dominance of hay reflects the dairy emphasis within the general farming structure.

Farm buildings are well maintained and of good quality and farmers in this section are prosperous.

To the east of the rail line conditions are reversed. The land is flat. Shallow depressions often exist in the centre of fields. The soils are poorly developed Welland clays. The depth of organic matter composing the upper horizons and the mottled nature of the subsoil resemble conditions found in half-bag soils. The land is almost completely idle. Woodlot is also common. Fences indicate agriculture was attempted at some time in the past, some hay, winter grain and row crops are grown. The small orchard has now been abandoned; only a few apples are used for home consumption. This is typical of the failure of fruit farming throughout the township. A small area is devoted to crops along the eastern boundary. A field of winter wheat was observed; the tilled areas appear to be intended for row crops. But farming here is only part-time. The wheat grown serves only to supplement the income derived from industrial employment. The land is not productive enough to support full-time farming. This phenomenon is again characteristic of agriculture in Crowland. Many farmers unable to compete with cheaper better quality produce from outside areas now work in industries in Welland where wages are high and hours relatively short. Yet they are unwilling to abandon their farms completely. Rather they are attempting to improve their whole economic situation by farming in the evenings and on weekends.

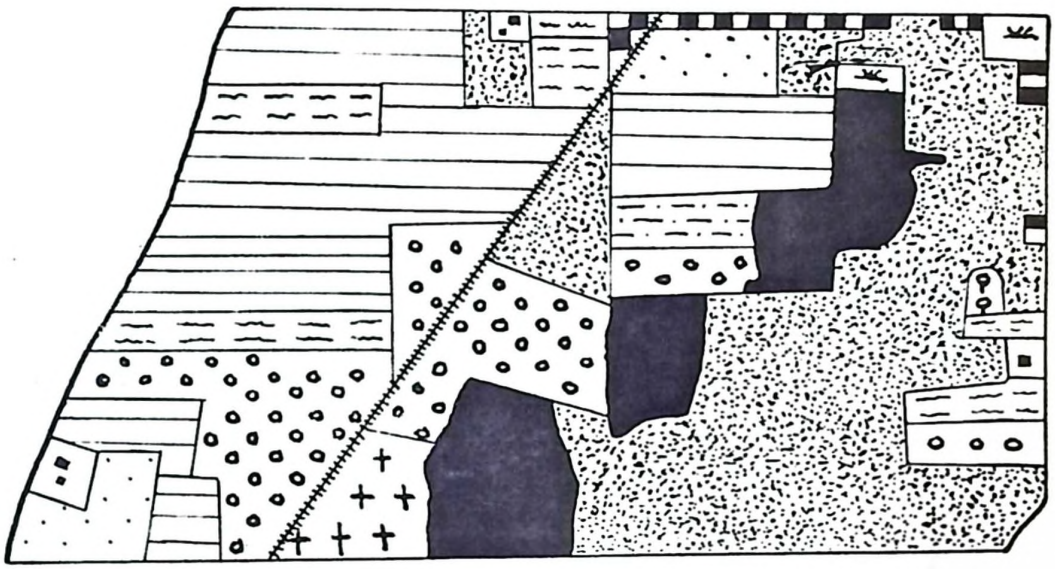
Industrial and urban encroachment have also occurred in this section. Atlas Steel Company is expanding along the railway. Urban development is at present concentrated along the northern boundary of the eastern block. But poor drainage is also detrimental to industrial and urban land use. Tile drains would have to be introduced if the land were to be of any real value. Only a few ditches exist at present.

Physical factors enable the farmers on the western portion of this

block to produce good crops. Consequently land values are high and industrial encroachment negligible. The physical disadvantages in the eastern section result in a high percentage of idle land. The land in this area is of speculative value in relation to industrial and urban growth but drainage will have to improve with development along these lines.

The accompanying pie graph illustrates the land use for the block as a whole. But in studying this diagram the percentages should be related to the section in which each particular land use is concentrated. For example 31 per cent of the land in the complete block is idle but the overwhelming proportion of this is found in the physically unfavourable eastern section.

BLOCK 1



1 inch : 618 feet
SCALE

ROW CROPS		WOODLOT	
TILLED		IDLE	
GRAIN WINTER		FARM BUILDING	
SPRING		URBAN	
HAY		ROAD	
PASTURE		INDUSTRIAL	

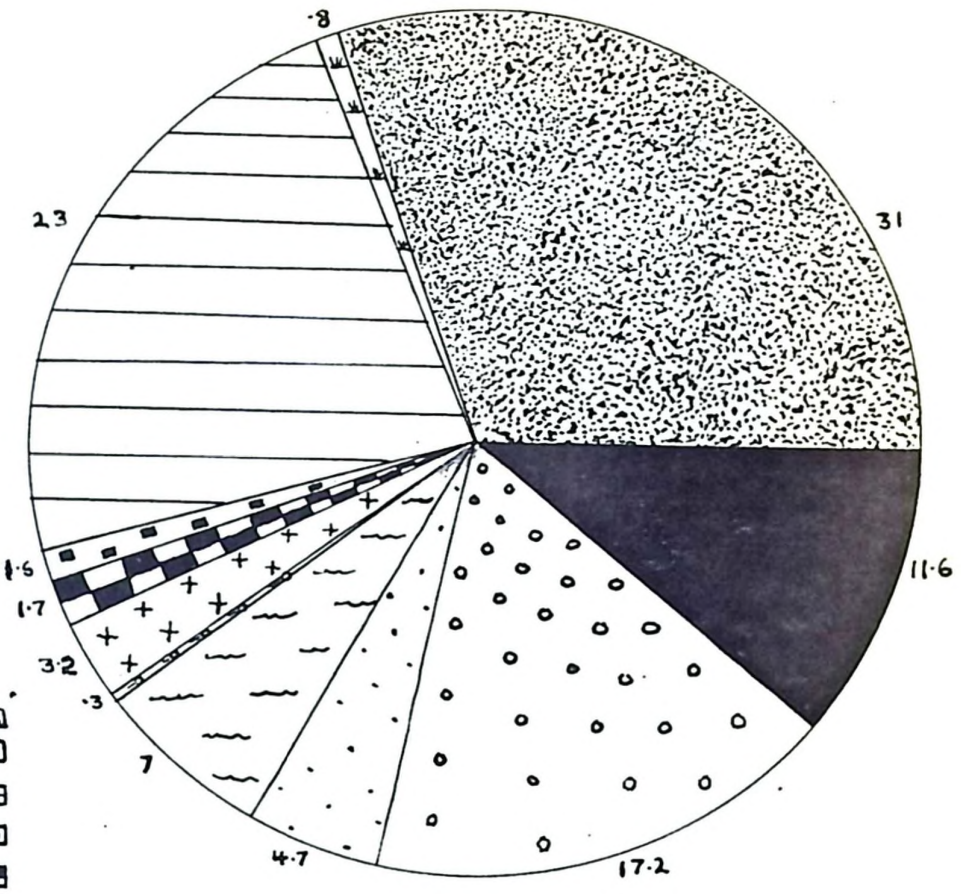
LAND USE IN CROWLAND

JSN.

Figure 12

LAND USE

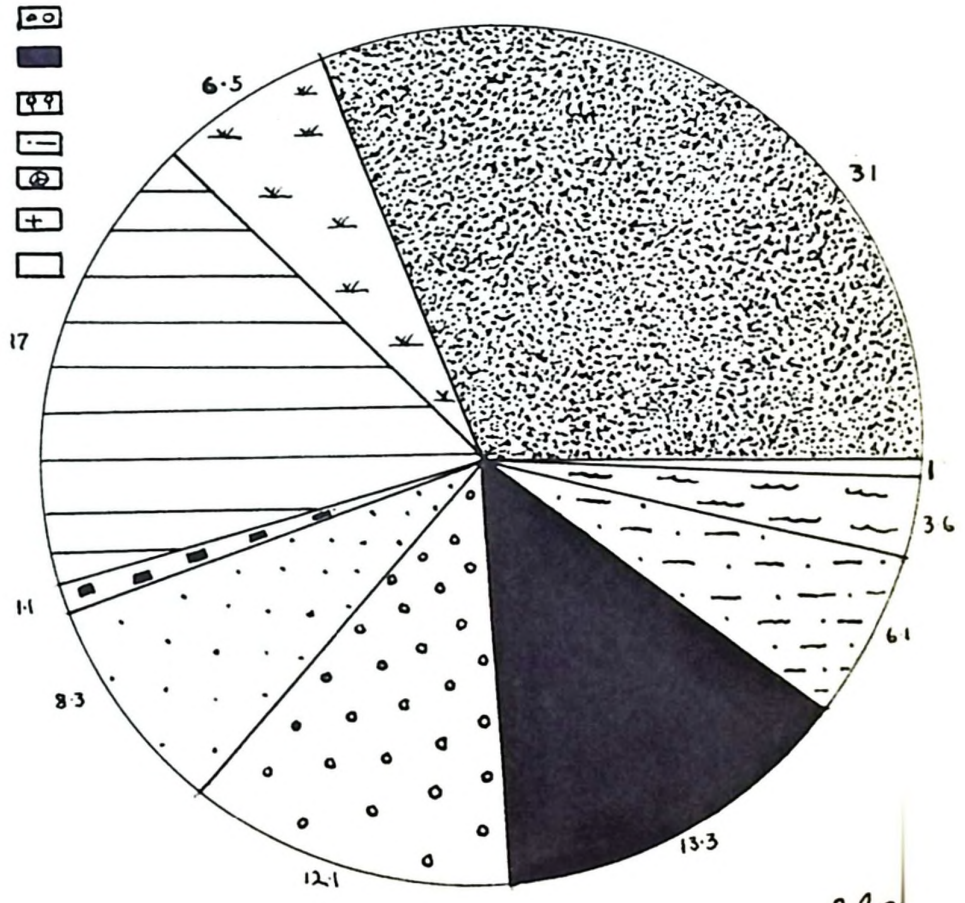
BLOCK 1



LEGEND

- IDLE
- PASTURE
- HAY
- FARM BUILDING
- URBAN
- TILL
- SPRING WHEAT
- WINTER WHEAT
- WOODLAND
- ORCHARD
- ROW
- GRAVEL PIT
- INDUSTRY
- OTHER

BLOCK 2

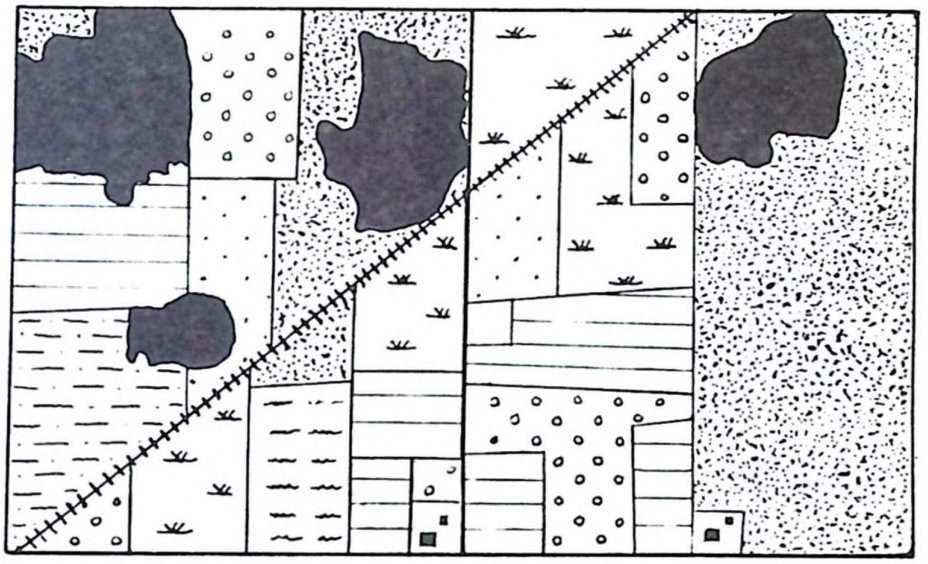


JM.

Figure 13

BLOCK 2

N



1 inch : 618 feet
SCALE

ROW CROPS		WOODLOT	
TILLED		IDLE	
GRAIN WINTER		FARM BUILDING	
SPRING		URBAN	
HAY		ROAD	
PASTURE		RAILWAY	

LAND USE IN CROWLAND

D.G.N.

Figure 1.2

Block II is situated in the north-central section of Crowland Township. (figure 2)

The land is quite flat. But it does not have the depressional qualities noted in the first block studied. Both surface and internal drainage are poor. Conditions here are typical of those favouring the development of the Welland Clay soil type.

Attempts at artificial drainage are limited to ditching. The great extent of flat land and the lack of slope limit drainage possibilities. In addition the heavy nature of the Welland Clay's would likely render them impervious to the flow of gravitational water. As a result tile underdrainage might not improve soil development; if it did so it would not in all probability be an economical improvement. A well-drained soil is more important for the growing of grains than for the production of feed crops. With grain earliness of seeding is important. Seeding is delayed for weeks in Crowland because of poorly drained soils. Winter grains are emphasized in Crowland at present. Recalling the physical limitations outlined above; it is doubtful whether underdrainage would improve conditions to the point where farmers in Crowland could compete with those in more physically favoured areas. The production of hay and other crops associated with the dairy emphasis is possible without underdrainage.

Idle land constitutes 31 percent of the total area of Block II. Woodlot comprises 13.3%. Pasture occupied 6.5 percent. Only 47.1% is devoted to crops; of this total hay occupies 17 percent. Row crops, consisting almost totally of corn total 6.1 percent. This crop is used predominantly as ensilage. Wheat is an important cash crop. Despite its limited feed-value, even this crop is used for grazing. The dairy emphasis is indisputable. Quite large herds of dairy cattle were observed during the survey of this block. No pure-bred cattle were discovered. Hens and pigs were also numerous but no sheep graze in this area. Minute market gardens were seen but produce was used only on the farm. Farm

Level poorly drained clay soil characteristic of most of Crowland. Note the attempts at ditching.

Looking down into Lyon's Creek: - the slopes here are among the steepest in Crowland. But drainage limits use to pasture.

buildings were old and rather poorly maintained.

On the eastern boundary in particular, idle land is dominant. Small , run-down houses are characteristic of this section as are the television sets and a late model car. The poor condition of farmland and farm-buildings contrast with other evidence of prosperity. These facts indicate abandonment of farming. The people are employed in the city and no longer have any interest in agriculture. Some part-time farming is carried on but land is also rented to those more interested in farming as a source of income.

Crop land here is concentrated on one farm in the centre of the block. This farm alone appears solely dependent on agriculture for his livelihood. This is typical of farming on the Welland clay soils and so of the greater part of the township. The increasing proportion of idle land on these soils is directly related to the decreasing amount of crop land in the township. In 1941, 7408 acres were cropped in Crowland; this contrasts with the 1951 total of 5582, a decline of almost 25 percent in 10 years.

This block is an excellent illustration of an important agricultural trend in Crowland. More and more people are turning to the city for employment; fewer are relying on agriculture as a basic source of income. But these individuals are using more land, the greater proportion of which they devote to feed crops and pasture land. Milk production is increasing to satisfy increasing demand from urban centres.

The third block is situated in the wouthwest positon of Crowland, close to expanding urban development. (figure 2) This block shows the transition from farming to idle land and abandonment, on poorer soils, as one moves closer to the city of Welland.

Block I indicated that favourable physical factors resulted in intensive use of land for cropping purposes. High incomes associated with good agriculture meant these regions could resist urban and industrial

infringement. But unfavourable physical factors also limited agriculture development. High percentages of idle land and part-time farming were typical under these conditions. This third block further emphasizes these relationships.

Level relief is characteristic. This section has been strongly influenced by glacial lakes. It lies well within the region formerly covered both by Lake Lundy and Lake Warren. Drainage is poor. Lack of slope and heavy texture of the clay soils again preclude the economical installation of artificial drains.

Nearly one-half the land lies idle; 8.6 percent is in woodlot. Only 19.1 percent of the total area of this block is crop land. There is little emphasis on any aspect of farming. Winter wheat comprises 10% of the total area but yields are not high nor are they good quality.

Agricultural decline in the area has been concentrated in the last 20 years. The aerial photos used in the survey indicate the great majority of land was under crops in 1928. The growth of Welland and the influence of World War II has drawn farmers from agricultural pursuits into Welland's industry. The rail line passing through the block will almost certainly attract industry in the future. Land is left idle in speculation of this as well as of urban growth. A glance at the pie graph will show the high incidence of farm abandonment in the western and eastern portions of the block in particular.

The houses are occupied however; the inhabitants working in Welland.

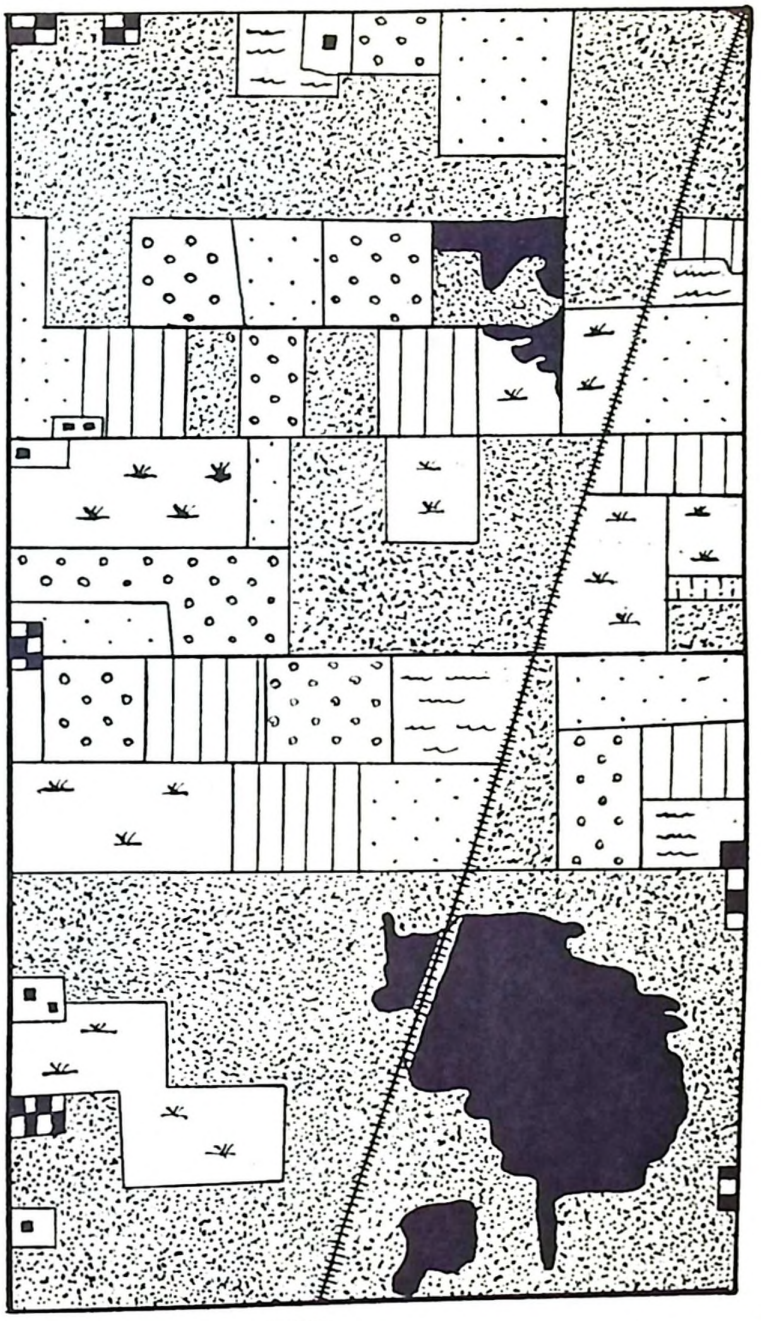
Evidence of part-time farming is found on the western boundary, nearest Welland. Small proportions of tilled and wheat land have been delimited here, in the midst of a large idle tract. A few chickens and some poor grade cattle were noticed on this farm.

Here again we notice the development of one good farm in the centre of the block. Graded cattle were pastured on the greater proportion of

this farm; the milk produced being sold in Welland.

Homes are third or fourth class within this block. The beginnings of installation of water services was noted :- a positive indication of advancing urban growth. Urban land totals only .55 percent of the total land used, but sections to the west of this block show appreciably greater proportions of urban development. Urban land use is concentrated along the main roads running in an east to west direction. The terrible condition of roads perpendicular to and linking the latter routes is a major deterrent to urban growth. Drainage conditions will have to be improved and roads repaired if urban land use is to penetrate the interior of the block. Any industrial development will require betterment of these conditions, particularly in transportation.

BLOCK 3



N. ←

1 inch : 618 feet
SCALE

ROW CROPS
TILLED
GRAIN WINTER
SPRING
HAY
PASTURE

WOODLOT
IDLE
FARM BUILDING
URBAN
ROAD
RAILWAY

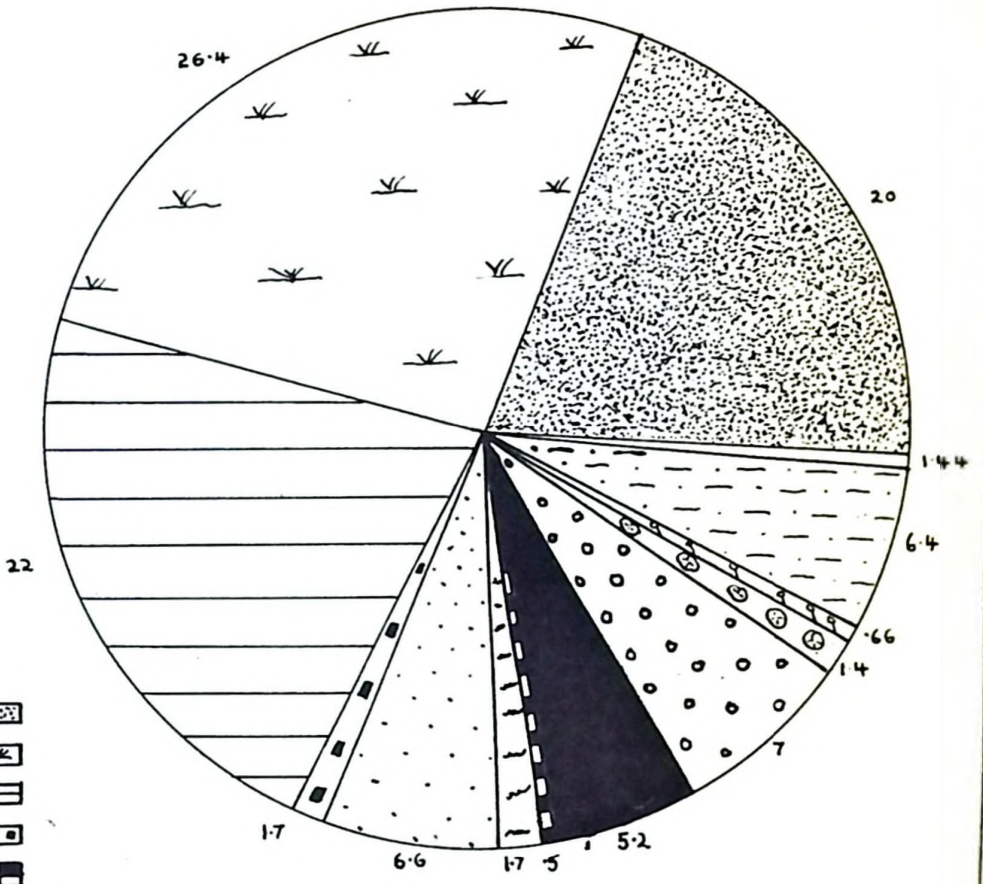
LAND USE IN CROWLAND

H. N.

Figure 15

LAND USE

BLOCK 4



LEGEND

- IDLE
- PASTURE
- HAY
- FARM BUILDINGS
- URBAN
- TILL
- SPRING WHEAT
- WINTER WHEAT
- WOODLAND
- ORCHARD
- ROW
- GRAVEL PIT
- OTHER

BLOCK 3

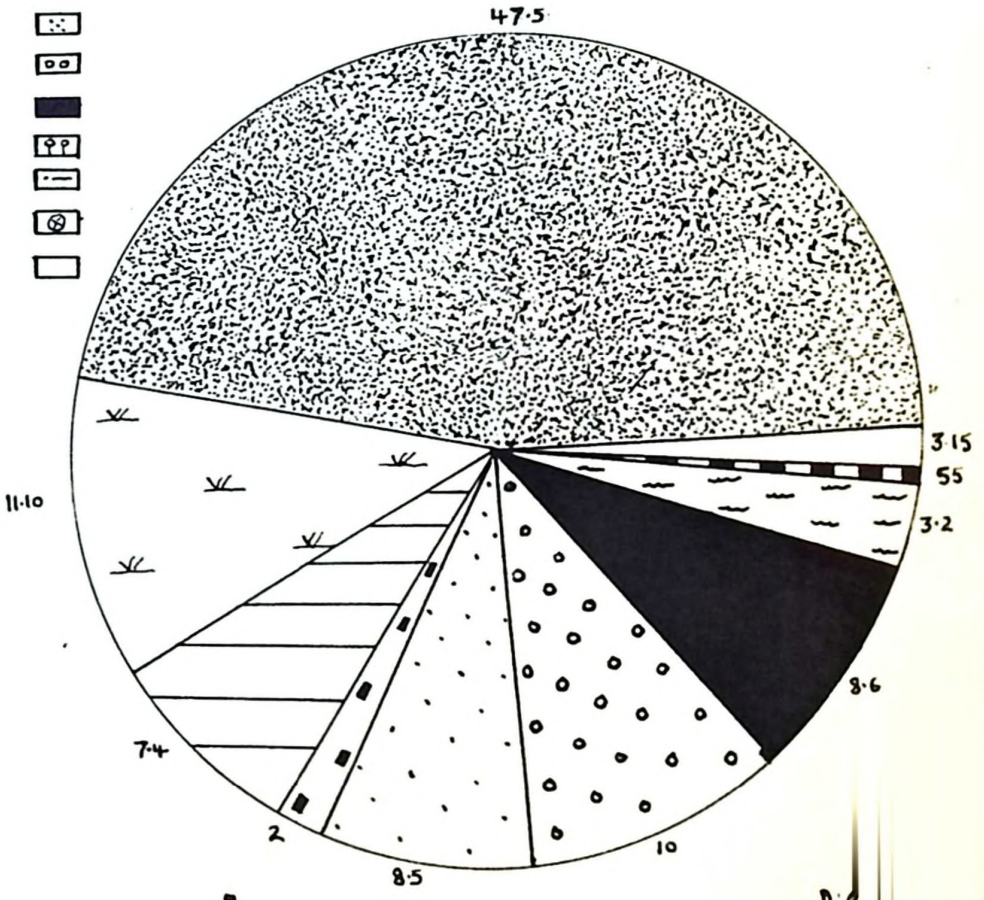
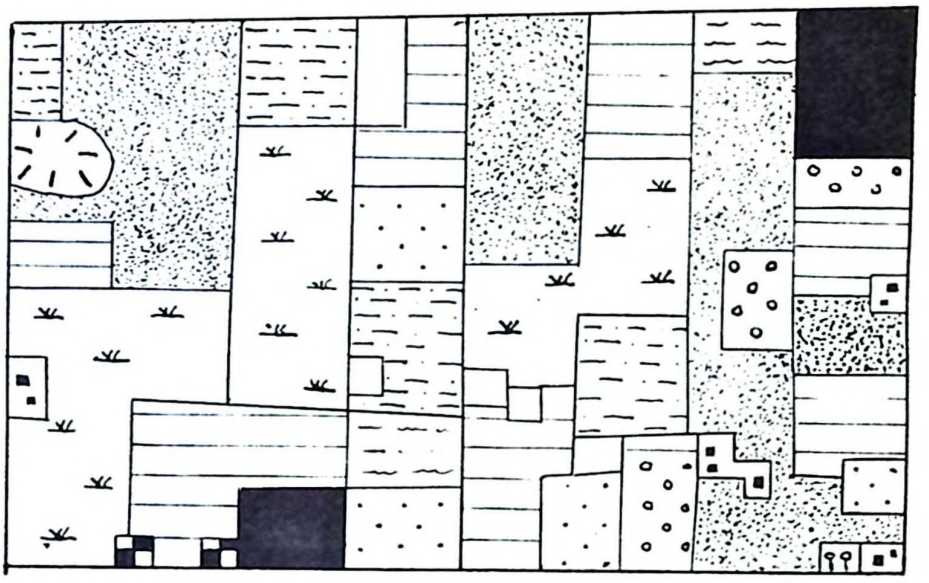


Figure 16

BLOCK 4

N



1 inch : 618 feet
SCALE

ROW CROPS		WOODLOT	
TILLED		IDLE	
GRAIN WINTER		FARM BUILDING	
SPRING		URBAN	
HAY		ROAD	
PASTURE		GRAVEL PIT	

LAND USE IN CROWLAND

J.R.N.

Figure 17

. APR . 55

looking up the gentle slope of a sand bar. The flat poorly drained clays in the foreground give way to good crop land and pasture.

. APR . 55

An excellent dairy farm on the same sand bar.

The fourth and final block is located on the sandbar in the southern portion of the township (figure 2). The block will show differences and similarities in land use between the sandy deposits of the sandbars and the Welland and Niagria clays. The block is largely composed of sandy materials but parts of the clay plain surrounding the sandbar are included.

Gradual slopes lead from the flat clay plain to the upper surface of the sandbar. Elevations only increase 25 feet or so between these two physiographic divisions. On the clay flats the slope is generally between 0-3 percent while the slopes along the flanks of the sandbar approach 8 percent.

The upper surface of the bar is hummocky but relief has been modified and rounded by lake action. Drainage is fair to good. Surface drainage is excellent but the sandbars are only about 8 feet above the clay deposits at their deepest point. Internal drainage becomes less effective as the sand deposits decrease in thickness towards the margins of the bar. Nevertheless the drainage on the sandbars in Crowland, particularly in that under observation, are superior to any in the township. The soils formed are known as Ontario Loam. They are rather coarse in texture, particularly in the vicinity of the gravel pit where gravel forms the greatest percentage of the parent material.

General farming is characteristic. Idle land comprises 20 percent of the total area but is concentrated on the clay flats about the sandbar. Woodlot includes 5.2 percent; the largest portion is again found in the northeast corner of the block on Welland clay. Hay, winter and spring wheat, row crops and orchards are all grown on the sandbar itself. About 48 percent of the land is devoted to pasture and the cultivation of hay. More purebred Holstein cattle were noticed on this sandbar than in any other section of the township.

CENSUS DATA - AGRICULTURE (1951)

Area of Occupied	Welland County	Crowland
Farmland (Acres)	155,444	12,456
Improved Land (Total)	121,310	9,462
1. Under Crops	78,950	5,583
2. Summer Fallow	8,040	521
3. Pasture	25,217	2,227
4. Other	9,103	1,131
Unimproved Land (Total)	34,134	2,994
1. Woodland	15,250	1,496
2. Other	18,884	1,498
Farm Population	11,118	1,008
Farm Operators	2,035	145

FARM VALUES AND SIZE OF FARM

	Welland County	Crowland	Pelham
Total Value ($)	30,912,206	1,663,835	6,876,870
Land and Buildings	20,940,814	1,064,584	4,996,575
Implements and Machinery	5,415,621	335,679	1,174,208
Livestock	4,555,771	263,572	706,087
All Occupied Farms	2,035	145	466
Under 3 (acres)	16	0	4
3-9 "	200	2	76
10-69 "	869	56	266
70-129 "	628	62	89

Figure 18A

Proximity to the city and the suitability of the sandy soils has resulted in some attempts at market gardening. Beans have been the most successful crop in this respect. Orchards are concentrated along the flanks of the sandbar since air drainage causes lower temperatures at the base of the slope. Grapes are dominant although apples and pears are also grown. The pear and apple orchards are little used at present; production is falling. These crops are generally used on the farm. Fruit farming was never too common in Crowland since physical factors were not suitable enough to permit competition with crops grown on the well serated slopes of the large sandy areas particularly located in Pelham Township.

The influence of better slopes, coarser soils and better drainage has not resulted in any real differences in crops grown between the sandbars and the clay flats. In the past differences were more common but general farming is the rule today. Economic factors such as the growth of Welland have favoured the development of a dairy industry. The real difference between the sandbars and the clay plains is in intensity of land use. Comparatively little land is idle on the sandbar. Just as land use was more intensive with improving physical conditions on the Niagria clays, so too more land is used on the sandbars. But essentially the same crops are produced throughout the township. It is the quality of general farming crops and the amount of land cultivated that varies with changing physical conditions.

Summary

Agriculture is of comparatively little importance in the total economy of Crowland Township. Only one percent of the total labour force in the Welland-Crowland area is employed in agriculture. Farm population comprises less than four percent of the total population within the same area. Poor drainage associated with level relief and heavy clay soils is the major physical deterrent. The growth of Welland and its industries

LIVESTOCK ON FARMS AND AREA OF FIELD CROPS (1951)

	Welland	Crowland	Pelham
Horses	2240	168	335
Cattle Total	13909	862	1925
Cows and Heifers (1 yr. or over)			
For Milk	9619	593	1412
For Beef	848	23	65
Other	3442	246	448
Sheep	1549	0	93
Swine	8574	585	1809
Hens and Chicken			
Hens & Pullets	70232	3376	11663
Other	171549	7525	38775

FIELD CROPS AREA (1951)

	Welland	Crowland	Pelham
Total	71,757	5,545	9,674
Wheat	15,667	1,193	2,032
Barley	394	10	25
Oats	15,346	1,210	2,055
Rye	198	10	89
Mixed Grains	4,081	241	412
Cultivated Hay (alpalpa, Clover)	32,107	2,659	4,343
Other Fodder			
Crops	3,617	214	549
Potatoes	302	7	146
Other Fields	29	1	8

Figure 130.

has drawn population from the farms of Crowland and resulted in a high percentage of idle land and part-time farming. The economic factor has also determined the dairy emphasis typical of the general farm structure of the township. The trend to dairying, large farms, a high percentage of pasture and hay production will continue but agriculture will still occupy a minor position in the total economy of Crowland Township.

Minerals : Natural Gas

Drilling for natural gas began in Welland County in 1889. Production started in Crowland not long afterwards. Development has largely occurred in the southern part of the township. Small concentrations of wells exist on lots one to six, concessions IV to VII. (Index Map) Only a few wells are situated near the northern boundary.

Whirlpool sandstone is the main producing horizon in Crowland. Smaller quantities of gas are obtained from Clinton limestone, the main reservoir in the Niagara Peninsula. Generally wells produce from both these horizons. In some sections of the township, Grimsby sandstone is also a source of gas.

Natural gas production is of relatively little importance in the total economy of the township. The Welland Field produced 696,528 M cubic feet of gas in 1952. Crowland's contribution was not significant in composing this total. Only Stamford and Thorold Townships underproduced Crowland in 1952 and Stamford produced no gas at all. The accompanying table provides essential statistics for Crowland. An idea of the value of production can be gained if one remembers $1.00 per cubic foot is the approximate price.

Crowland Wells (Dec.31, 1952)

(1)

Producing	Idle	Abandoned	Open Flow (M cubic feet)
52	-	2	35

There are eight companies producing natural gas in Crowland. The

(1) Geologic Report : Natural Gas Production in Ontario 1952 - R.B. Harkness

Crowland Gas Syndicate is most important since it is the only concern licensed both to produce and distribute gas.

U.S. Imports have had important effects on the natural gas industry. Fewer Wells are now producing and they are doing so on a seasonal basis. Production will likely continue at a moderate rate for some time whereas without imports natural gas reserves in the Niagara Peninsula would not be long in becoming depleted.

Urban Land Use

A Study of Greater Welland

Location The City of Welland is located centrally along the western boundary of Crowland Township. A relatively large section of the city is situated on the west bank of the canal, between it and the Welland River, in Thorold Township.

Physical Site The physical site of any city is very important. Welland lies on the flat clay plain which was laid down while the area was inundated beneath a series of glacial lakes. But the original site did not possess characteristics favourable for urban growth. It was the construction of the Welland Canal providing cheap water power and transportation that attracted industry and associated residential and commercial development. The historical background has been considered. It must be understood since it is the key to an understanding of Welland as it exists today.

Introduction The industrial function is most important in Welland and the greater part of the urban study is devoted to it. Past and present locative factors are all important. Main industrial trends are of interest as well as the nature of present production.

The commercial and residential functions of the city must also be considered. But they are of minor interest and have drawn only general treatment. Welland is of the lower order of commercial centres. Its retail trade area does not dominate even the county in which the city is located. Residential development in much of Welland is not of a particularly high quality. That part of Welland west of the canal in the Thorold area is the best residential section. The reasons for this and other

differences in residence are of some interest.

The human and social geography has been considered but as quickly as possible. Police and fire, sewage and water, cultural, administrative and other services have not been discussed independently. Their relationships to Greater Welland and its region are more important.

The primary purpose of the study is to emphasize industrial development as much as possible. A general impression of other aspects of Welland is intended but only insofar as they are needed to give completeness to the study. Welland is an important city and will become more important with time. This development will be related to advances in its industry. The overall attention, the city itself deserves must be sacrificed because of this is primarily a township study and must perforce be somewhat general in nature.

"Greater Welland" : - a definition.

Satellitic urban growth has occurred within Crowland Township close to Welland. This urban tract has a population of approximately 13,000 at present. It is a separate political entity and is actually part of Crowland Township. This urban phenomenon has been termed "Urban Crowland". Politically this area is not part of Welland ; geographically it must be considered as such. In the geographical sense Welland City and Urban Crowland are one urban tract. The political differences do not make for a divided study. They are only important as factors affecting "Greater Welland", an organic unit.

A Historical Analysis of the City's Growth and Situation

Greater Welland has developed in association with the canal. Flour grist and saw mills were established near the aqueduct channelling the Welland River beneath the canal. Plentiful water power and cheap transportation were the major determinants. Initial development took place on the west bank of the canal, at the site of a labour camp housing workers

involved in the construction of the aqueduct. The grazing of sheep and beef cattle in the Short Hills and in Crowland Township led to the establishment of textiles and a tannery. The settlement became capital of the newly created Welland County in 1853. The administrative buildings were constructed on the east bank of the canal in Crowland Township. This attracted settlement and industry. Welland now straddled the canal, occupying sections on both sides of it. A new canal was started in 1871 and finished in 1885. In the same period railways were constructed and began to centre on the town. Industrial development was intensified and expanded. The railways and canals provided extra-regional connections. Local supplies of raw-materials became less important as better quality produce from United States sources became plentiful. Industries and settlement now tended to locate on the east bank of the canal closer to the source of supply. The greater expanse of flat land on this side of the canal was also important in changing the direction of growth. With the development of hydro-electric power along the Niagara River the trend to location on the east bank in Crowland Township was finalized. The railways had provided Welland with advantages such that it became a leading textile centre. Relatively large amounts of power were also needed in this type of industry. Reliability of flow was also important. Since the power sources were closest to the east bank, industry tended to locate there, where power interruption was less likely to occur and transmission cost low. But these companies also remained along the canal and close to railways. These transportation factors had originally favoured Welland as a textile centre and led to the decline of competitors along the canal. The three-fold concentration of railways, canal, and hydro-electric power also provided the ideal location for iron and steel industries. These appeared in the late years of the nineteenth century. The proximity of the Niagara power sources was the most important factor in determining

the concentration of electro-metallurgical industries at Welland. The site of Welland has changed little since 1900. Only in recent years have other factors come into play, and affected the direction of growth.

World War I and II and the construction of the last canal between 1913 and 1932 did not result in a relocation of industry. The growth and development of Welland was greatly accelerated by these factors but continued in the same location up to the present. But it was during World War I that the great industrial expansion initiated the growth of Urban Crowland. The concept of "Greater Welland" really originates here. Annexation of the new industrial sites and associated urban tracts did not occur in World War I. Other considerations seemed more important at that time. The situation has now developed to the point where Crowland strongly resists annexation. Two political entities now exist. This dualism has extended beyond the administrative field. For example some services are now separate in both Urban Crowland and Welland. The efficient operation of the whole urban tract has been affected.

The results have been most significant to Welland. The city's growth has been restricted. Any growth to the west and south is part of Urban Crowland, not Welland. It is here that the industries tend to locate since taxes are lower, but the same advantages and services are available. Residential development for plant workers will also likely locate near the industries. The northern extension of Welland is also limited. The Welland River lies in its path. But the problem is not severe. Plenty of land is still available for some years to come in this direction. In the north Atlas Steel Company is located in relation to the railway. Development will continue along this track. But it will tend to remain on the eastern side of the railway, principally because good agricultural land lies to the west. The Niagara clay soils provide good incomes for farmers in many cases and they will tend to resist annexation. They are justified

in doing so since relatively little good agricultural land exists in Crowland. Drainage is a problem on the level, heavy-textured Welland clays east of the railway. Conditions will need to be improved if industrial and associated residential growth are to occur.

The best possibilities for expansion for the city of Welland are to the west of the canal. But the area is zoned for residence use only. The result has been the growth of a first class residential section beyond the older areas. So the city of Welland is again expanding on a site west of the canal. But industrial expansion is not involved.

In the area west of the canal but south of the Welland River we have another problem. This section is part of Crowland Township. It is limited in extent and rather poorly drained particularly in the southern portions towards the Humberstone peat bog. Housing developments are not important here. It is not an ideal location since access to the rest of the city can only be gained via bridges across the Welland River and the canal.

The picture is now clear . Industry and less valuable working-class houses locate in Urban Crowland. Higher class housing is concentrated in that part of Welland west of the canal. The older sections of Welland located on the east side of the canal, roughly south of Atlas Steel, west of Crowland Avenue and north of Lincoln St. seem to be dominated more and more by commercial areas. The commercial core of Greater Welland is located in this section. The natural zones within the whole urban agglomeration are crystallizing. This process could be confirmed if an overall zoning plan were put into effect. Both Welland and Crowland have produced duplicate plans. These do not agree in all respects. Crowland's plan was first introduced in the fall of 1954. It is possible that agreement may be reached and a common plan adopted.

The Present Land Use Pattern

There are two approaches to this study. Residential, Commercial and industrial distributions could be considered separately as they occur within the urban centre. But for purposes of continuity and because of the general nature of the treatment I will discuss various blocks within Greater Welland, pointing out the major functions as they occur within these divisions. Each block will be selected as far as possible because of the dominant nature of one function.

Residences have been classified on the basis of personal observation. This is a subjective classification. Another observer might disagree with the final placement of fringe or transitional areas but it is likely the overall picture would be much the same. The residential classification is on a zonal basis; it is not a house to house study. Streets have been marked on the accompanying fold map (back cover) and will be used to identify blocks or zones.

Classification

Superior houses are those judged to exceed $15,000 in value. They are generally large and are built of brick or stone. Frame ranch-style houses of superior quality are included. This type of residence is in excellent condition and is situated on a large well-kept lot. Old mansions and modern houses are included here. The general setting is important. Streets in superior zones are in good repair; the area is well serviced.

First-class homes are those within the $10,000 to $15,000 range. They generally lack the palatial nature of the superior class but are of good size and well maintained. The building material is usually brick. Most frame ranch houses are included in this category. Large old houses have also been placed in this class if they are in good repair. Those included are usually built of stone and formerly housed the upper class in Welland. At present many are used as apartments.

. APR . 55

This superior home is typical of those west of the canal in Welland and contrasts with the modern third-class homes characteristic of Crowland.

. APR . 55

Second-class houses are valued at between $6,000 and $10,000. The houses are often large and the majority are constructed of brick or stucco. They are usually not so modern nor so well-kept as first-class homes. Some second-class homes in Welland are modern but are not so large or substantial as their older counterparts described above. They will fall into the third-class category in time. A second-class area may be classified as such because of its proximity to an industrial or commercial zone. These detract from its value because of noise, traffic, smoke etc.

Third-class homes are between $3,000 and $6,000 in value and are usually small. Larger homes in a state of ill-repair are included. Again, small third-class homes may be in good repair, but their general setting may detract from their value. Generally these homes are constructed of frame or stucco. In nearly every case they are located close to industrial or commercial areas, if not on the outer fringes of urban land.

There is only one fourth-class area in Welland. The stucco houses are old, run-down and crowded together on very small lots. Roads are poor. Industries are close by. Dead end streets are found.

The Norway-Merrit Street Block is located on the west side of the canal, north of the Welland River. It extends from Niagara Street westwards to the city limits and from the Welland River north to Thorold Road. The eastern boundary of the block, Niagara Street, consists of old brick homes on fair-sized lots. Some are in need of repair. To the west is a new housing area. Here are many high value homes; they are placed in the first-class or superior category. The complete block is essentially a first-class residential area. Older estates are distributed among ranch-style residences. Old small second and third class houses are concentrated near the Welland River, where Welland first originated as Aqueduct. A modern school and an excellent park are located in this zone. Roads are generally good except where development has been very recent. There is

Older homes formerly first class but now of the second grade; these are definitely superior to the old run-down fourth class houses located close to the Atlas Steel Co.

ample room for further growth. No industrial or commercial development has occurred nor is it likely too, since the block is zoned as a first-class residential area.

The Rose-McCormick Street block is located on the west side of the canal but east of Niagara Street. This is a second-class residential area. The houses are about 15 or 20 years old. Some are still in excellent condition and are classified as first-class residences. Other houses are smaller and/or in need of repair. Certain houses particularly in the northern section of the block are typical of those locating on the outskirts of a town because of low taxes. To the south near the river in the old flour and grist mill area, some of the oldest houses in Welland are located. Several date back to the nineteenth century. To the east, idle land is characteristic. Settlement has not yet extended to the river. A few small industries are located in the southern part of this block. A local commercial area exists in the north. The area has been zoned as second-class residential.

A commercial zone is situated in this section at the bottom of Niagara Street. This western extension of the commercial core of Welland serves the western side of the canal. This is typical of Welland. The river and particularly the canal divide the town. Traffic on the Welland Canal often limits movement from one side to the other. The result has been the development of an important commercial area here. A duplication of fire services exists for similar reasons. So both political and physical boundaries create duplicity of services.

The Niagara-West Main Street commercial zone is of the first rank. Clothing and food shops, a Loblaw's Groceteria, a Brewer's Retail and a jewellery and other specialty shops are all found here. The area has been zoned for commercial use.

The Wade-Maple Street block is located south of the Welland River and

west of the canal. This is primarily a second-class residential area. The houses were built prior to the war. They are of frame or brick construction. About half the houses are in good repair, those towards the canal and the Welland River decline in value. The proximity of industry reduces house values in the whole area. The section has a diversity of functions. It is a recreational area; the Agricultural Park is particularly important in this respect. The block supplies valuable services; Welland's hospital is situated here. Industry is attracted by the railways and the canal. A number of firms producing wood products are located east of the Wade Street area in a belt along the electric railway. Heavier industry is found closer to the canal. The function of this block is not so clearly defined as those previously considered. The area is heterogeneous in nature; residential, recreational, commercial, and industrial functions are all present. The block is older than many of the other sections of the city. It was settled at an early date. Functional zones do not develop so clearly in a young growing town.

The Prince Charles Highway, a 4 lane route into Welland, passes through the Wade-Maple Block. Since its route has not yet been mapped only an approximation has been included in the functional map. The road has already had a significant effect in reducing congestion at the Main Street Bridge leading into the heart of Welland.

The third block is located south of that just considered. It is an industrial zone. A cluster of small industries are situated along Water Street, the northern boundary of this section. They are chiefly concerned with metal fabrication. The Imperial Oil plant is of more importance. Cheap transportation associated with the Welland Canal has determined its location. Crude oils are shipped to the site via the canal, processed and distributed by rail to the Canadian market. The Greater Welland Planning Board has zoned the area for heavy industry.

Looking north on King Street towards the Main Street Bridge, the main entrance to the city of Welland. The city hall can be seen on the right.

This view was taken from the same position as the above photo but looking south. The commercial function becomes less important as King Street trends towards Crowland.

Yet the township has zoned the western portion of the block, closer to the river, as a residential area.

The Station Street block is part of Urban Crowland. It is located south of the Imperial Oil area. The section is a second-class residential zone. The houses are stuccoed and box-like in form. Construction has been recent. The residences are well maintained. Development is spreading southwards. The region is zoned for second-class housing.

The Ross Street Block is located east of the Welland and North of the commercial core of Welland. This is a mixed residential area. First, second and third-class houses occur.

The first class homes are located alongside the river. They are impressive estates situated on large lots usually bounded by high hedges. This section has been zoned as first-class residential. Second and third-class houses are located to the east. These structures are similar in construction and appearance but differ in condition. Third-class houses increase towards the Stokes Rubber and the Atlas Steel Companies. These obnoxious industries lower land values. The area has been zoned as a second-class residential area.

The Commercial core occupies a central position in Welland. It is situated close to the junction of the Welland River and the canal, and is the focal point for most roads leading into the city. Businesses are concentrated in an L-shaped pattern along East Main and King Streets. Administrative facilities are found in this zone. It is the centre of city and county government. Fire and police services, the jail, the courthouse, the post office and the Welland Market are all located in this section. All types of businesses, restaurants, clothing stores, banks and financial institutions are distributed within the L. The public library is located on King Street. Speciality stores are found on both avenues.

A view of the Welland Market

A section of the commercial core located close to the market.

The services involved cover a trade area containing 51,000 people. (1) A park is located along the bank of the canal close to the Main Street Bridge. Another recreational zone is located towards the southern fringe of the commercial core. It includes the Welland Arena, and the Welland Curling Club. Residences within this area are generally third-class, consisting of older houses, often with a store on the ground floor. Businesses are concentrated at the ground level; apartments are found overhead. Industries are concentrated between King Street and the canal. United Steel Company is perhaps the most important of these.

The State-Victoria Street block is located inside the arms of the L-shaped commercial core. It is bounded on the east by the Canadian Pacific Railway and on the south by Lincoln Street. This is a second-class housing area. Large old homes in the northern section of this block were ranked as first-class. Welland'swealthier citizens lived in these houses in the past. But industry and commerce developed close by. Most of these houses are now divided into apartments, for working class families. Six and seven room houses are characteristic of the central section. These well-maintained brick structures are approximately 20 years old. Conditions deteriorate towards the Cotton Mills and the commercial core. Some third-class houses are located in these sections. The whole block has been zoned as a second-class residential area.

The Plymouth Cordage block is located east of King, south of Lincoln and west of Plymouth Streets. It is north of the Plymouth Cordage Plant. The homes were built by the company about the turn of the century to house its workers. The buildings are frame and are the largest residences in Welland. Clapboard covers the roof and most of the exterior of each structure. They are in various stages of upkeep. Division into 6 or 7

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(1) Business Year Book 1953

apartments is not uncommon. The condition of the individual building depends on the attitude of the inhabitants. Immigrants and persons of continental European origin form the major proportion of the population. Often these people, because of their background, allow conditions to deteriorate. The block has been zoned as second-class residential.

An industrial area is located south of these homes. It is part of urban Crowland. The Plymouth Cordage Company, Page Hersey Tubes and the Electro-Metallurgical Company dominate the block. The last two in particular are obnoxious industries. Waste accruing from their production has been spread over large sections along the southern boundary of Crowland. Smoke and unpleasant odors are common. The third-class housing section in the Seventh Street area reflects the industrial mature of the block. This is the poorest housing area in Greater Welland. Dust and dirt cover the poorly-kept buildings. Homes are stucco in construction and crowded together on unbelievably small lots. Often several families live in one small house. A commercial zone has developed along lower King Street to supply these inhabitants as well as the industrial workers. Except for existing housing developments most of the area has been zoned for industry both by Crowland and Welland. But opinion differs as to the type of industry that should locate in certain areas.

The Avon-Orchard Avenue block is located east of Page Hersey Tubes Limited. Two types of residence exist here. Older bungalow-type structure generally of frame or stucco were the first houses built. New developments in the eastern section of the Orchard Avenue area resemble the box-like houses of the Station Street block. Most of these have been built since the war. The older bungalows are often well-maintained. The people are foreign in origin and take pride in their own home. They tend to cultivate their lots or to plant attractive plants and flowers about the house. The roads are poor. The obnoxious conditions created by the

nearby plants depress land values. Both Welland and Crowland indicate this is a second-class housing zone. Small commercial centres have developed here to satisfy local demand. The grocery and drug store are characteristic.

The Wartime Housing block is located east of Plymouth Road, South of Lincoln Street, and north of the Canadian Pacific Railway. The homes vary in condition and are similar to developments in the east end of Hamilton. The homes are frame; they have no foundations and are quite unattractive. A number of parks are located in the area. But they are not well-maintained. Weeds are common. A large waste area is situated in the central section of the block. It is indicated as a park on the Welland Planning Board's official map.

The area developed rapidly in the war; it was laid out in a well planned grid pattern. Streets were constructed in the Louis Ave area but housing development has not occurred.

The people are heterogeneous in origin. The roads are in fair condition but sidewalks are often non-existent. The block has been zoned as a second-class residential area.

The Hagar Street Block is located east of the Cotton Mill section on the urban fringe. It is a second-class residential area. The box-like homes are similar to those in the Station Street block. Further settlement is occuring eastwards. Drainage is poor in sections and roads are a problem.

Another third-class residential area is located west of the Hagar block, north of the cotton mills and east of the Canadian National Railway. These small prewar homes are frame and stucco in construction. They are in fair to poor condition. Proximity to industry and commercial activity is a disadvantage in this respect. The area is classified as a second-class residential zone. The third-class homes east of Atlas Steel Company are similar to those in the last area. The dust and smoke

associated with the company make for poor living conditions. The roads are poor. Recreational activites are limited; no parks exist. The area is partly in Welland and partly in Crowland. Welland zones the northern portion of the block for industry while Crowland indicates it is to be a residential area. There is a need for agreement here since it is already a problem area.

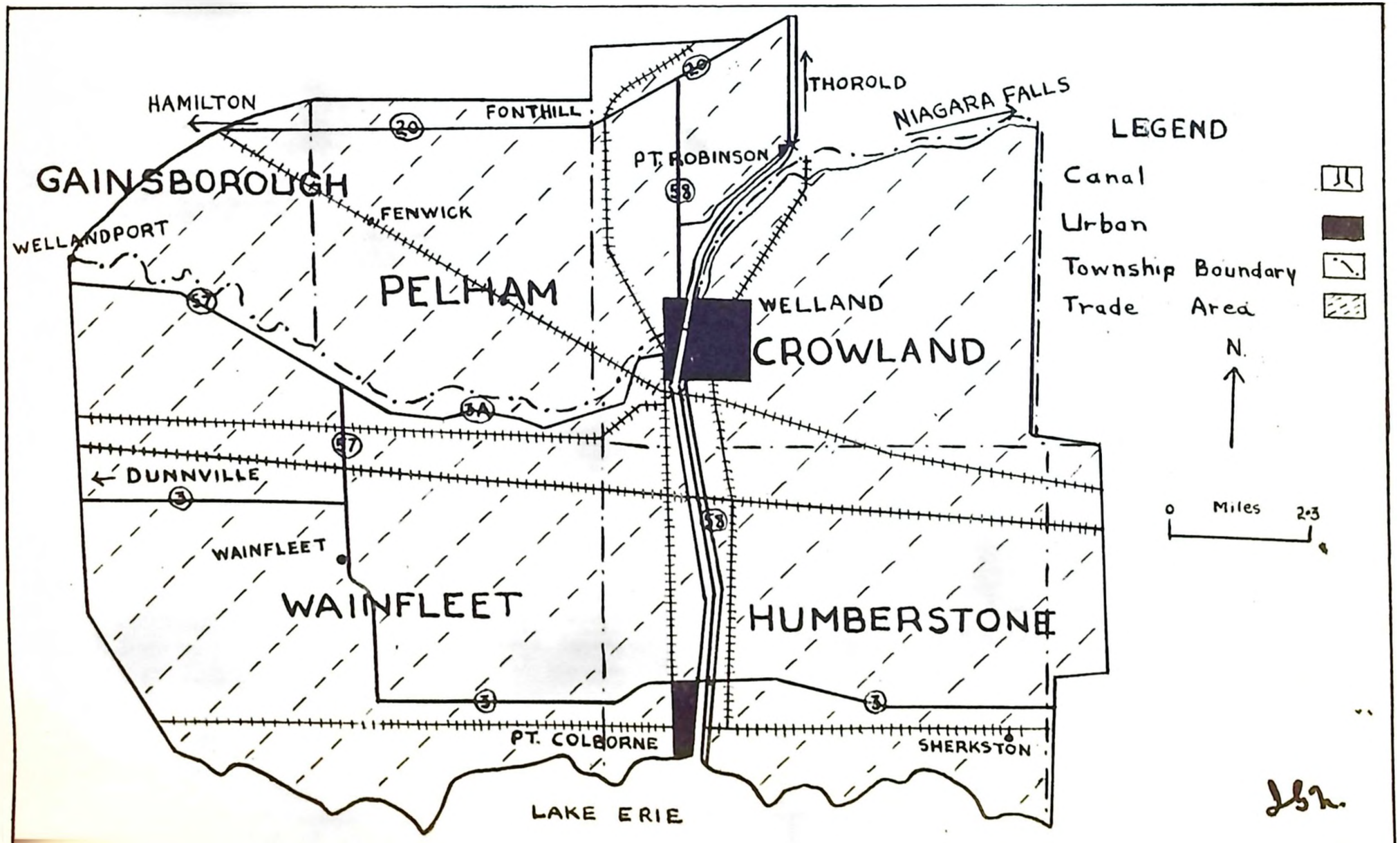
In summation, housing in Welland City is generally first or second-class. The houses in Crowland are smaller. Their frame and stucco construction contrasts with the greater amount of brick used in Welland proper. Third class houses are characteristic of Urban Crowland and are dominant in the Greater Welland area.

The commercial function is concentrated in the city of Welland. Local commercial zones serve small areas in both Welland and urban Crowland but commercial activity is concentrated in the King-Main area.

The industrial function is located primarily in Urban Crowland. Industrial sites are limited in the city of Welland at present but important industries are located there. United Steel Company and the Cotton Mills are good examples. But Atlas Steel, Page Hersey Tubes and Electro-Metals are the major industries of Greater Welland. These are located principally in Crowland. Their future growth will occur in the township. Industrial development will tend to concentrate more and more in Crowland because of its many industrial sites and lower taxes.

The Main Functions of Welland.

Welland has two main functions, commercial and industrial. The residential function is also important but has already received adequate treatment as far as the scope of this study is concerned. Certain other functions and services have for similar reasons been delegated to the Appendix (A). These include administration, police and fire protection, traffic, water, sewage, health etc; they deserve comment but are of minor significance in relation to industry and commerce. As has been stated previously the purpose of this study is not to provide a detailed picture of Welland but rather to stress those functions most significant in their relationship with the region.



WELLAND'S RETAIL TRADE AREA

Figure 19.

Commerce and Finance.

Commerce and finance are second only to industry in importance in Greater Welland. But commercial and financial services are perhaps more important than the industrial function to the city's immediate hinterland. Commercial activities are concentrated in the region while industrial produce is often diffused in a national, even an internationl, market.

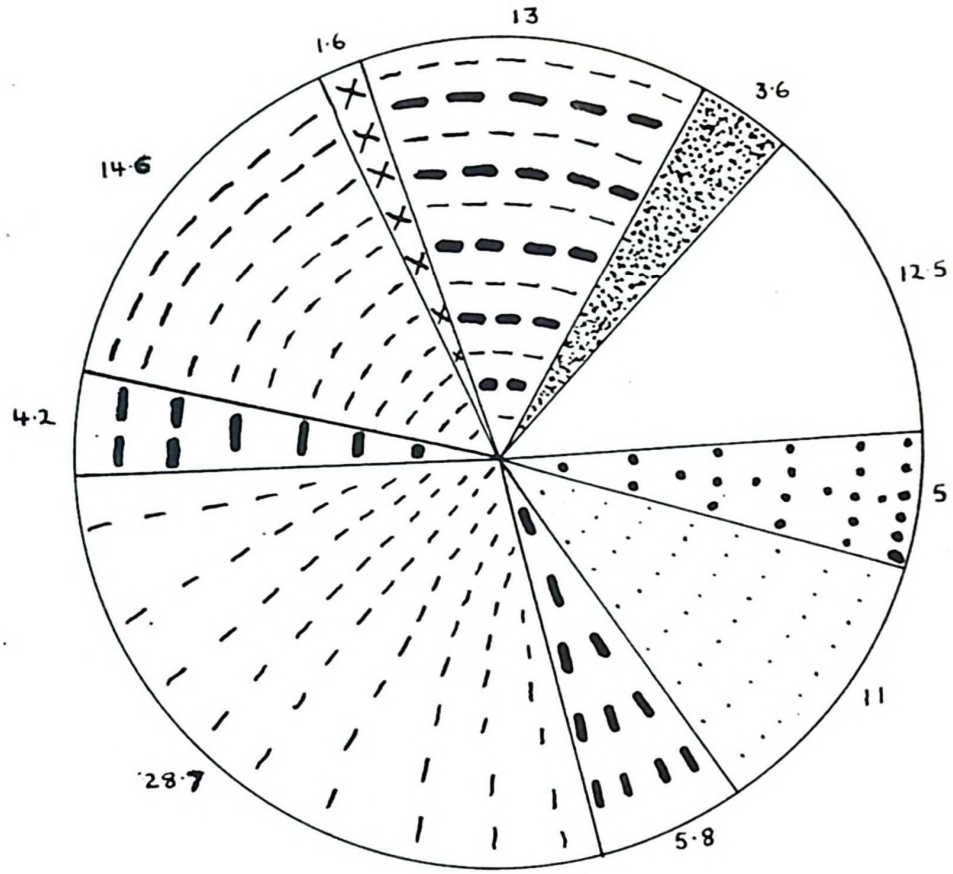
Retail services are most influential. The Retail Trade area has been illustrated on an accompanying map.

The Welland Evening Tribune is Welland's only newspaper. Its circulation has been the main criterion used in delimiting Welland's retail trade area. This source has been supplemented by interviews with responsible persons in commercial establishments in Welland.

The Evening Tribune has a daily circulation of 13,825. No other newspapers are published in Welland County. This is characteristic; Welland offers many services not obtainable at any other point in the county. The area covered by Tribune distribution includes Welland, Port Colborne and Dunnville. Offices are located in all three cities. Advertisements in the Tribune are an important determinant of business activity in Welland.

In 1954 retail sales from 238 stores in Welland brought $24,692,000 into the city. Wholesale trade is less important relative to retail services. The only figures available for wholesale trade are found in the 1941 Census. Welland sold $5,584,500 worth of wholesale produce in that year. It is certain this figure has undergone a substantial increase for retail sales in 1953 exceeded the 1941 total by 300 percent.

The accompanying pie graph entitled Retail Establishments, shows the type of produce sold in Welland. An idea of their relative importance within the city's retail trade is also given. The establishments considered in preparing this diagram were not situated wholly in Welland. Thorold's retail establishments were also included since data supplied by the Welland



LEGEND

		NUMBER
GENERAL MERCHANDISE	▭	18
APPAREL	▭	37
HOUSEHOLD	▭	21
FOOD	▭	102
BUILDING MATERIAL	▭	15
RESTAURANTS	▭	52
MOTOR VEHICLES	▭	6
GARAGES	▭	47
DRUGS	▭	13
OTHER	▭	45
TOTAL		356

RETAIL ESTABLISHMENTS

(COURTESY WELLAND CHAMBER of COMMERCE)

June 20

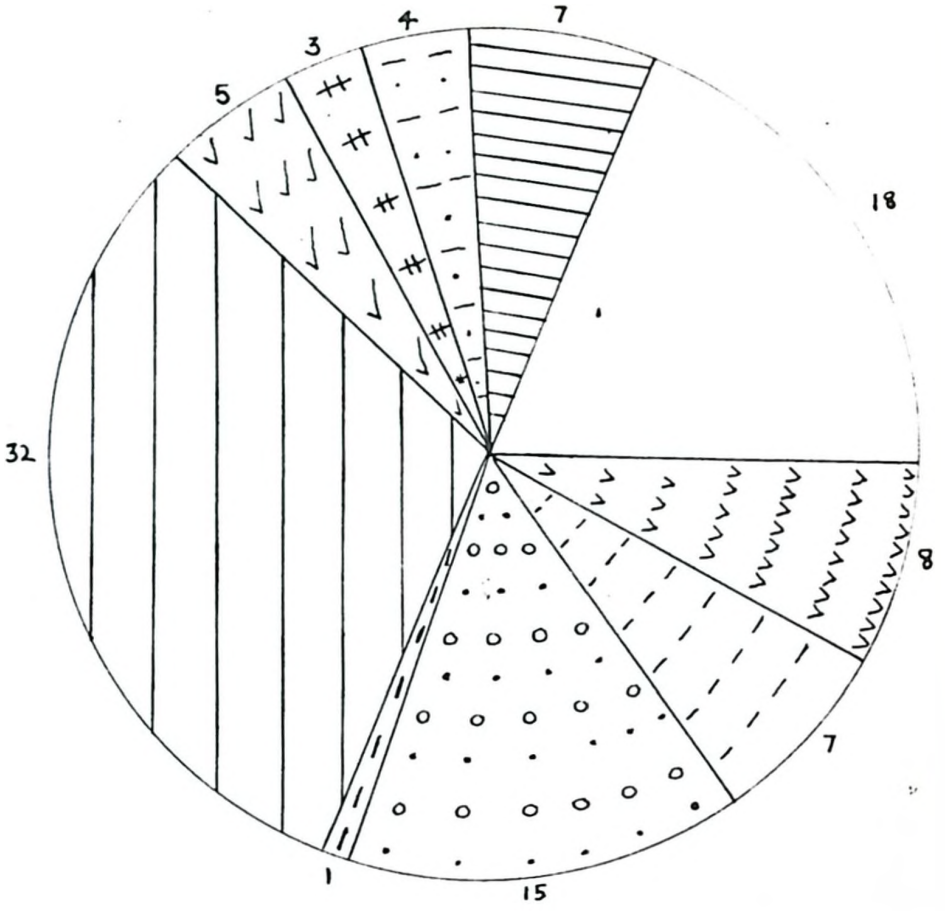
Chamber of Commerce included that city's figures. Thorold and Welland are similar in many respects. At any rate impression not exactness is the purpose here.

Food outlets are twice as numerous as any other type of establishment. Twenty-eight percent of the city's retail income is derived from this source. Customers come into the city from the greater part of Welland County. The Welland Market is perhaps the most interesting food outlet. It differs from the majority of food establishments in that it is solely concerned with the sale of local produce. The market is held three times weekly. Fruit, truck crops, fowl and meat produce are sold.
The pie graph entitled Welland-Crowland-Thorold Labour Pool shows that owners and managers, professional, clerical, commercial and service occupations compose 41 percent of the complete labour pool. Each of these groups is related directly to trade in Welland.

Greater Welland has eight banks. The largest proportion of their business originates in the urban area but a high percentage of deposits are held by local agriculturalists. Loans and mortgages are tendered by these banks to farm operators throughout Welland County. Five loan companies are also engaged in similar activity. These institutions are not as popular as the banks but the L.B. Duff Loan Company is well known and heavily patronized. The financial and commercial connection between Welland and its region is one of the strongest ties.

Industry

It is estimated 8,798 male and female workers are employed in the industries of the Greater Welland. But the urban centre has a total population that just exceed 24,000; it is inconceivable that more than 33% of this population should be employed in industry. Therefore must of this labour force is drawn from the surrounding area. Centres such as Cook's Mills, Fenwick and Fonthill are essentially dormatory towns. Their



LEGEND

OWNERS, MANAGERS	VV
PROFESSIONAL	--
CLERICAL	99
AGRICULTURAL	I
MANUFACTURING	III
CONSTRUCTION	☑
TRANSPORTATION	⊞
COMMERCIAL	▪▫▪
SERVICE	☰
OTHER	▭

WELLAND-CROWLAND-THOROLD LABOUR POOL
(COURTESY WELLAND CHAMBER of COMMERCE)

Figure 82.

working population migrates daily to Welland. Crowland has a total population of 12,086. Of this total 8067 are classified as urban; 1008 live on the farm. The other 3,011 inhabitants live in urban areas. They are not included in the population figures for Greater Welland yet undoubtedly a large percentage of workers in this group are employed in industries in this urban area. The effects are similar in other townships in the area. Industrial influence is significant in that it employs many people from the surrounding hinterland. It is doubly important in that it also supplies a host of manufactured goods to the same area, through retail and wholesale outlets in Greater Welland. In this respect some commercial outlets are merely projections connected with and emphazing the industrial base underlying the economy of Welland and its region.

In addition specialized manufactured goods exert a world-wide influence. Alloys and stainless steel products produced in Welland are sold on an international scale. Atlas Steel exports fifteen percent of its annual production overseas; forty-five percent of the total is sold outside Ontario. Excellent transportation facilities are the major determinant of Greater Welland's local and particularly its national and international spheres of influence.

Transport and Trade.

Welland has road connections with Hamilton, Niagara Falls, Dunnville, Port Colborne and Buffalo. These highways are in good condition. Cheap and rapid transportation is provided. Over 60% of Canadian and United States Markets are located within trucking distance of Welland.(1)

The local county and township roads are another matter. Under dry conditions these roads are fairly good; under moist conditions they are often impassable. The clay areas are particularly bad in this respect; this

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(1) Business Year Book 1953.

includes much of the region about Welland. The application of greater amounts of gravel and other surface materials is desirable. This would almost certainly result in an extension of Welland's local trade area (retail) particularly in fringe areas. But the growth would not be great. The retail trade areas of the Niagara Peninsula are either mature or approaching that state. In the north and northeast Welland's trade area is limited by Saint Catherines and Niagara Falls. In the west Hamilton and Dunnville compete with Welland. In contrast competition is limited in the south. Welland's trade extends to Port Colborne on Lake Erie. This town is primarily industrial. One concern, the International Nickel Company is responsible for the city's existence. Port Colborne is not so diversified commercially as Welland and consequently is within that city's retail trade area.

In contrast to its local transportational facilities, Welland's extra-regional contacts are excellent. The Welland Canal provides access to both east and west. As a port, Welland handled 321,499 tons of coastal and foreign shipping in 1948.

	In Coasting Service		In Foreign Service		Total	
Vessels Arrived, 1948	Number	Registered Net Tons	Number	Registered Net Tons	Number	Registered Net Tons
	79	96,950	37	62,337	116	159,237
Vessels Departed 1948	53	62,160	64	100,052	117	162,212

The government docks handling shipments are located along the banks of the canal. This is far from an ideal situation. With the coming of the Seaway, greater volumes of traffic will be passing through the canal. A larger volume of goods will also be handled by the Port of Welland. The location of Welland's dock facilities and the small space available for shipping purposes will limit the city's expansion as a port.

Railways are Welland's most important connections with other regions.

North of Welland the canal passes beneath the Port Robinson Bridge and enters Crowland Township.

The cheap water transport provided by the canal has attracted many industries. Deposits of raw materials and associated industries are common along the banks.

They bring raw materials to Welland industry and branch out to Canadian and U.S. markets. The functional map of Welland illustrates the pattern of these railways within the urban area. The location of industrial zones close to the tracks indicate their importance as locative factors.

Welland also has a municipal airport within two miles of the city which has customs clearance facilities. The field is not a large one. There is one large hanger, a control tower and an asphalt runway. A number of local industries make use of the field to move rush-freight shipments. Executives in Welland industry also use this rapid means of transportation.

Welland possesses a variety of transportation possibilities. Of these the canal and the railways have been most important; both provide the city with inter-regional connections. As a result they are fundamental to industrial development and so to the total economy of Welland. Transportation has been the most important factor in creating Welland as it exists today.

The Present Industrial Situation in Greater Welland.

Greater Welland has fifty-nine industries at present. The location of the more important concerns is indicated on the functional map.

Materials for this study were obtained in a variety of ways. An examination of any literature available was undertaken. Interviews were conducted in Welland. An industrial survey was carried out through the mails. A number of identical forms were sent to twelve industries in Welland. These firms were chosen both for their basic importance to Welland and because of differences in types of products. A copy of the questionnaire is included in Apprendix (C). Only five companies out of twelve asked to reply did so. Interest was centred on reasons for location, disadvantages of present site, sources of raw materials, products and their markets and means of transportation.

The importance of industry within the total economy of Welland has been emphasized. The dominance of industry as a basic source of income for Welland can best be illustrated by comparing total retail sales, the second greatest source of income for the city, to the income derived from industry. In 1950 close to $100,000,000 was derived from industrial production, while only about $25,000,000 was earned in retail sales. Over 8790 people were employed in Welland's 57 industries in the same year. A total of $23,657,248 was paid in salaries and wages.

The area within twenty-five miles of Welland is Ontario's most industrialized region, having 229 industries. The main products are steels, piping, ferro-alloys abrasives and textiles. Over 36,000 people are employed. The gross income in 1951 was $533,160,000. Payrolls amounted to 149.3 million dollars in the same year. Welland employed twenty-three percent of the region's industrial workers. The urban area's gross income was about 20 percent of the regional total.

Atlas Steel Company is the most important industrial concern in the

Welland area. It is the most influential in Canadian and European markets. Approximately 1500 people are employed, more than any other plant in Welland. In addition the plant facilities cover an area larger than that of any other plant. The company has branches and warehouses in Montreal, Toronto, Hamilton, Windsor, Vancouver and Winnipeg. A variety of alloys and specialized high value steels are produced. Most industrial companies in Ontario use Atlas tool steels. The company is the largest producer of stainless steel in the British Empire and the only major manufacturer of that product in Canada.

Scrap steel and alloys are the principal raw materials. Hamilton is the source of scrap, Electro-Metals located in Crowland, of alloys. The interdependence of companies in Welland is notable. The transportation of these raw materials is largely by road although any coal used is brought from the United States by rail.

Of the company's total production, 85 percent is sold in Canada. Ontario buys 55percent, Quebec and the Maritimes 20 percent and the Prairies and British Columbia 5 percent respectively. The remaining 15 percent is exported. The major buyers are located in England, Belgium Italy and Switzerland, In transportation of finished products, rail and water transport are more important than they were in the handling of raw materials. Over 50 percent of the total production is moved via the canal or the railways.

Atlas originally located in Welland in 1928. In 1929 56 people were employed; about 1,500 are employed at present. The total value of production in 1950 was $12,300,000 about 12 percent of the total value of Welland's industrial output. Wages are high; the average being $1.94 an hour over a 40 hour week. These high wages present problems to other industries in the area, particularly in textiles.

Atlas will continue to expand. The coming of the Saint Lawrence

Seaway will provide cheaper transportation and a wider overseas market. The seaway will favour the sale of specialized products produced by companies such as Atlas. Competition will certainly increase for Canadian markets from overseas areas. It is in the production of specialized goods that Canadian companies such as Atlas will be able to take advantage of the seaway and not be ruined by it. The company producing a wide range of general produce will be handicapped by more intensive competition from foreign countries specializing in one phase of production and capable therefore of turning out cheaper, higher quality goods.

Page Hershey Tubes is the second ranking industrial firm in Welland. The company produces steel pipe and tubing of all kinds and sizes. The plant is similar to Atlas since it is also the largest producer of its kind in the Empire.

The company employs 1250 people. Unfortunately this concern chose to ignore the questionnaire sent to them. As a result no information is available concerning the source of their raw materials. It is likely that a connection exists between firms such as the Steel Company of Canada at Hamilton, Atlas Steels and Page Hershey.

The company's markets are world-wide. A glance at the functional map will show its location is ideal for shipment in almost any direction. Page Hershey has access to docks located along the Welland Canal. Railways are also used intensively. More track lies within the company's property than exists in that of any other firm in Welland. Rail lines lead to all Canadian and U.S. centres.

The Seaway will have the same affects on Page Hershey as it has on Atlas. Production will be stimulated by cheaper transportation and the wider range of markets thus available.

Electrometallurgical Company is a division of Union Canbick of Canada Limited. The firm commenced operations in 1907. Its buildings

occupy an area of 774,877 square feet in Crowland Township. Just over 800 people are employed. Most of the labour supply is derived from Urban Crowland. The company produces alloys of all kinds. Ferro alloys, and carbon and graphite electrodes are particularly important.

This company also failed to return a completed questionnaire. As a result, little information is available concerning the nature of raw materials used or their source. The company has excellent transportation facilities at its disposal. Its location in relation to the railways and upon the canal provides a wide range of markets and sources of raw materials. This company has connections with other firms in Welland. Atlas Steel reported that alloys were supplied to them by Electrometals.

This industry is particularly obnoxious. Dust and dirt are typical of the surrounding area. Large volumes of waste material cover one concession and part of another east of the plant. Physical factors are unfavourable to agriculture in this area. But the company's presence has also been a contributing factor in regard to the high percentage of idle land. (Block III Agricultural Land Use).

Woods Manufacturing Company. The Welland plant is actually known as the Empire Division of the Woods Manufacturing Company. The area covered by the present buildings is 308,500 square feet. Over 780 workers are employed. This plant can be located on the functional map. It is one of several textile industries situated centrally in Greater Welland. The block in which they are located has been labelled "the Cotton Mills".

Woods Manufacturing differs from the companies previously considered in two major respects: it is a textile industry; both male and female workers are employed in the plant. The industries discussed previously were heavy steel industries; their labour force was almost entirely male.

Products manufactured by this company include industrial sheeting, denims, ducks, towelling, twine and carpet yarns. These are all cotton

goods.

Raw cotton is the company's principal raw material. Over 30,000 bales weighing 500 pounds each are used annually. This cotton is brought principally by rail but also by water from the U.S.A., Mexico and South America.

All production is sold in Canadian markets. Ontario consumes about 50 percent, Quebec 15 percent, the Prairies 30 percent and the Maritimes and British Columbia 2.5 percent respectively. Produce is shipped to markets mainly by road. Water and rail provide connections with the Maritimes and western areas respectively.

This company located in Welland in 1913. At the time of original location, Welland seemed favourable because of good rail connections with U.S. sources of raw materials; its good position in relation to the Canadian market and the large supply of secondary labour available. By 1913 Welland was a heavy industrial area. Wives of men employed in the iron and steel industry were employed in Woods and other textile industries. Distance from raw materials was a handicap in these early years, but the position was the best obtainable in Canada.

Since the time of original location, heavy industry has forced wages up. The high cost of labour and its scarcity in boom periods are the company's main problems today. These factors are unfavourable particularly in relation to the situation in Quebec, the company's main source of competition.

The value of production in 1950 was about $8,000,000, about 8 percent of Welland's industrial income.

General Tire and Rubber Company of Canada Limited - Welland.

The Welland plant is the Stokes' Division of the General Tire and Rubber Company of Canada Limited. At present the plants buildings occupy 212,000 square feet. About 640 people are employed. The firm commenced

operations in Welland in 1920. Today it produces a veritable myriad of rubber goods. Most of the produce is not too bulky. It consists of rubber accessories such as ash trays, billiard cushions, bowling balls, rubber bumpers, pipe-fittings, garbets etc. The plant's position on the railway is ideal for marketing purposes since goods of this size are perfectly adapted to shipment by rail, at low cost. Raw materials are obtained from U.S. sources, usually by rail.

This plant is one of the top five industries in Greater Welland. It is located within the city limits. Despite its importance, it is unique since the industrial emphasis in Welland is to specialized steel and textile products. The plant thus has additional value. It is not subjected to periods of boom and depression characteristic of the former types of industry. But there is a problem in securing raw materials at times. The plant does not consume great volumes of rubber though; remember it produces a number of small items. As a result it can usually operate despite poor supply conditions.

The five industries just discussed are the basic industries. Just over 8000 people are employed in the industries of this urban area. Of this total, 64% or 5040 workers are employed in the five basic industries. They dominate the industrial function of Welland. It is impossible to determine the gross income of all five companies. Atlas produces twelve percent of the city's gross industrial income and Woods eight percent of this total. It seems likely that the returns garnered by these five industries would approximate 50 percent of the total value of industrial production in Greater Welland. It is because of these industries that Greater Welland exists today. Commerce and other services are all related to and affected by them. Any instability in these five companies affects the total economy of Welland, and it has been noted that they are unstable. This explains the "boom and bust" nature of the Welland economy in the past

and the related recurring periods of unemployment.

Diversification in industry is needed to stabilize Welland's economy. Competition from cheap labour areas in Quebec is affecting the textile industries in the area. Iron and Steel production is quite high at present and the three plants specializing in various phases of that industry are doing fairly well. Because of their specialization they are in a better position economically than industries producing a wide range of products.

A significant amount of their production is already sold overseas. The seaway will likely stimulate these industries initially by providing cheaper and more efficient transport to foreign markets. But it is necessary that these concerns keep abreast of developments in their fields. If competitors develop any technological practices that greatly reduce costs Welland's iron and steel industry and the Greater Welland area's economic structure will be severely affected. It would be an advantage if a greater variety of industries could be attracted to Greater Welland.

The remaining fifty-four industries are either of medium or minor importance; it is obviously impossible to discuss all of them.

The medium industries usually have 100-300 workers. A variety of products are produced. Electrical appliances, heavy specialized steel and engineering goods, foundry and forge products, cotton and nylon textiles and alloy and stainless steel products are all included. The separate companies within the medium classification are discussed systematically with respect to site, area, type of produce etc. in the Appendix (D).

These industries differ from the basic ones in their range of market. Usually the goods are sold only in Canada, often primarily in Ontario. But some concerns such as United Steel Corporation are transitional.

Most of their products are sold in Canada, but some enter foreign markets. The trend to specialized steel goods is characteristic among the

medium as well as the basic industries. These find a wider market in Canada some of the electrical appliances or textiles. It is seldom that cottons, yarns etc. from Welland find a good market in eastern Ontario or Quebec, because of the volumes of low-cost materials produced by Quebec industries. Yet the low-cost transportation facilities available to Welland industries often permits them to compete in seemingly unfavourable areas.

National Textiles Co. has an unexpectedly wide trade area. It sells over 50 percent of its production in Ontario, 40 percent in the Maritimes and 10 percent in Quebec. The high percentage sold in the Maritimes is directly related to the cheap water transport available to Welland industries. The economies of the long haul make it possible for manufactured goods produced in Welland to compete with Quebec produce in the Maritimes. Again the trade area of a concern may be extensive if the plant is a division of a large corporation. National Textiles is associated with seven other plants, all controlled through head offices at Toronto. The same company carries on a retail and wholesale business throughout Canada. Obviously sales are easier than in the case of an independent concern located only in Welland.

Good rail and other transportation facilities favour cheap shipment of raw materials. But markets for medium industry are usually within trucking range of Welland. As a result most of the finished goods produced by medium industries move to market by road.

The medium class industries are secondary in importance to basic industries in the total economy of Greater Welland. Nevertheless their contribution is significant. They employ about 2,000 people or 25 percent of those employed in industry in the Greater Welland area. The greater part of Welland's gross industrial income is derived through products produced by basic and medium industries. But a third class of industry exists; it is of minor importance.

Minor industries produce goods needed in a local market; goods that are essentially services for the population of Greater Welland and its region. They are closely related to the two major classes of industry. They often process materials originally produced by them. These industries do not bring a significant income into the Greater Welland area. The basic and medium industries bring income into Greater Welland from outside its region. It is this income that the minor industries often tap by the sale of their produce. The minor industries are consequently parasitic in nature.

Often these minor industries are closely connected to agriculture in the region. Dairy and bread companies fall into this category. They process agricultural produce for sale in the city. It follows that agriculture in Crowland is parasitic in nature. The emphasis in agriculture is to produce milk, poultry, and meat products for sale in Welland and other surrounding urban areas. This doesnot bring income into the Greater Welland region. The two major classes of industry do this. In return the industries and their employees are serviced by minor industries and agriculture for a share in this income.

There are three classes of industry in Welland. The basic industr. produce goods for the national and international markets. The medium industries are smaller in area occupied, and have fewer employees. They tend to produce goods for a smaller market usually provincial or national in scale. The basic and medium industries bring income into the Greater Welland area from other regions. They employ 65-75 percent of the industrial labour force and provide the greatest proportion of the income of the Greater Welland area. Minor industries and agriculture service the people employed in these major industries. In return for this they receive a share in this income; they are essentially parasitic in nature. Without the basic and medium industries Welland's economy would collapse.

The future seems optimistic. The seaway will stimulate further production by providing cheaper transport and a wider range of markets for the specialized iron and steel products of Welland. The commercial and agricultural phases of Welland's economy will also be stimulated because of their relationships to the major industries.

Summary and Conclusion

Crowland is located centrally in Welland County within the Niagara Peninsula. The Welland Canal passes through the southwestern corner of Crowland. The city of Welland is located at the point where the Welland River passes beneath the canal.

Crowland Township is underlain by Paleozoic sediments of Silurian age. The area has been glaciated. Ground Moraine high in clay content was deposited in what is now Crowland Township. These materials were modified by action of post-glacial lakes. A veneer of lacustrine sediments was also deposited. The flat nature of the underlying bedrock and the influence of the glacial lakes is reflected in the flat relief of the township.

The climate is cool and humid. The average annual temperature is 47.7°F. The extremes of temperature are not great. The winter extreme has not been lower than -20°F. The average length of growing season is 203 days. The average annual rainfall is 34.02 inches and is well distributed on a seasonal basis. Climate is favourable to agriculture.

Hardwood vegetation predominates. Coniferous species are poorly developed, In the past the hardwoods were cut for furniture and other uses. Only 7 percent of the township remains in woodlot.

The cool humid climate and hardwood vegetation has resulted in the development of grey-brown podzolic-soils. Poor drainage associated with heavy clay parent materials and level relief has resulted in the formation of five soil types. The Welland clays are the most extensive in the township. They are suitable only to poor general farming.

These physical determinants have so affected agriculture that it occupies a minor role in the economy of Crowland Township. Farm population comprises only four percent of the total population and only one percent of the area's labour force. The growth of Welland and its industries has drawn population from the farms and resulted in a high incidence of idle land and part-time farming. The economic factor has also determined the dairy emphasis typical of the general farming structure of Crowland. The trend to dairying, larger farms, and a high percentage of pasture and hay production will continue. But agriculture will still occupy a minor role in the total economy of Crowland Township.

Natural gas production is of little importance in Crowland. Whirlpool sandstone is the main producing horizon of the township. Clinton limestone and Grimsby sandstone also serve as sources of natural gas. The Welland field produced 686,528 M. cubic feet of natural gas in 1952. To this total, Crowland contributed only 35. M. cubic feet.

Welland lies on the flat clay plain laid down by the glacial lakes. The city began with the construction of the aqueduct associated with the Welland Canal. The cheap water power and transportation associated with the canal attracted industries and related commercial and residential development. Flour and grist mills, tanneries and textiles related to local sources of raw materials were typical in 1850. The railway era began in the 1850-1860 period. The rail lines began to concentrate on Welland and its industries particularly textiles, were stimulated. The iron and steel industry was attracted to Welland by this improvement. In the 1890's hydro-electric installations began along the Niagara River. Electro-metallurgical and high grade steel industries now began to concentrate in Welland where the international coal routes by rail and the international iron routes by water met at a point only 12 miles from the Niagara powerhouses. The city of Welland expanded rapidly in accordance

with all these changes. The stimulus provided by the construction of the fourth canal and the two World Wars completed the development of present-day Welland. Heavy industrial expansion occurred and urban growth was rapid. Greater Welland was created during this period when urban areas in Crowland developed but remained unincorporated. As a result Crowland Township contains the greater part of an urban tract consisting of the city of Welland and Urban Crowland. Welland proper has been unable to expand because of resistance to annexation by Crowland. Industrial and urban growth associated with Greater Welland is concentrated in Crowland. This trend will continue because of more available land and lower taxes in the township. Commercial function is most important in determining the region dependent on Welland. Over 50,000 people are indluded in that part of Welland County lying in the urban centre's retail trade area.

The industrial function is fundamental to the total economy of Welland and so Crowland Township. Industries in Welland provide manufactured goods to the region as well as to national markets. But five basic industries in the area produce on an international scale. Their success is directly related to the excellent transportation facilities available. The greater part of the labour force of Greater Welland is employed in these industries. They supply most of the regional income. Agriculture and commerce are essentially parasitic since they tap the income supplied by the basic industries.

Growth and development in Crowland has always been associated with manufacturing in the past. Industrial development has in turn been stimulated particularly by improvements in transportation. The first industries in Crowland were located close to power and transport along Lyon's Creek. With the construction of the canal Welland was founded and a linear pattern of industry evolved parallel to the canal. Later the introduction of

railways caused further industrial growth and a nodal concentration of specialized industries. Today another major transportation improvement the St. Lawrence Seaway is under construction. It is inevitable that a new phase in industrial and urban growth occur in Crowland township.

E N D

Appendix A

Administration

The city of Welland is governed by a mayor and eight aldermen. A reeve and deputy reeve govern Crowland; their offices are located on King St. just east of the Plymouth Cordage Co. In addition Welland is the capital of Welland County. Administrative and judicial offices are located in the city. In its capacity as county seat Welland has some influence over a population of 123,233 people (1951).

Police Protection.

A central police station is located in the city of Welland. A staff of 22 is retained. Two radio-equipped cars are used. Service is confined within the city limit. Urban Crowland employs a staff of eight, with one radio car. Rural areas are policed by the Ontario Provincial Police.

Fire Protection.

There are 5 fire stations in the Greater Welland area with a permanent staff of 26 paid firemen. Thirty-five volunteers are on 24 hour call. Fire services are available on both sides of the canal. Interruption by canal traffic could be disastrous. Most fire-fighting equipment is concentrated in the city of Welland and is available to Crowland Township. But in rural areas in particular, volunteer firemen are more important.

Traffic.

The traffic problem was acute in Welland until 1947. Canal traffic continually interrupted the movement of vehicles. Normally, a city has

2 rush hour situations. Welland had a series of them; each occurring when a boat passed down the canal. Huge traffic jams were created on several streets leading to the bridges crossing the canal. In 1947 a one-way system was introduced. As a result, only one line of traffic now leads to the bridges in each direction. Congestion is reduced to a minimum. There is one disadvantage. Anyone who is unfamiliar with the system can easily become confused by the more than usual number of traffic lights and one-way streets. As a result of these traffic improvements connections between Welland and the surrounding area have been improved. Sales in the city have been stimulated since congestion no longer makes people reluctant to enter Welland.

Water

A pumping and filtration plant located in Welland supplies water to Urban Crowland, and Thorold as well as the city itself. Over 9,000,000 gallons of water can be pumped and purified daily. At present an average of 5,000,000 gallons are used per day. Several local industries have their own pumping plants. Private wells are still typical in rural areas.

The water used in urban areas is obtained from the Welland Canal. Port Colborne's sewage is dumped into Lake Erie but some distance from the entrance to the canal. As a result pollution of drinking water is not a problem.

Sewage

The Welland plant supplies both the city and Urban Crowland. Rural sewage is disposed of by more primitive means. Raw sewage is dumped untreated into the Welland River east of the aqueduct. The river is fairly turbulent after its passage beneath the canal and carries waste downstream for some distance before it begins to collect openly along the stream banks. This system is poor in its effects on areas east of the city.

Appendix A.

The situation is more serious at Thorold. Sewage is dumped into the old canal. Waste products from pulp and paper plants aggravate the situation here. The solution lies in the construction of a sewage disposal plant. A project has been proposed. The plant is to be built between Thorold and Greater Welland. It will be available for use by both centres.

Cultural Services

The Welland Library has a total of 20,000 books; over 85,000 loans are made annually. Most people in Welland County use the library.

There are 34 churches in the Greater Welland area. All popular denominations are represented. As a religious centre Welland exerts a powerful influence over the surrounding district. But this effect is not so intensive as other services offered by the city. The country Church is still very popular in outlying areas.

Health Services

Health services are much greater in extent than the size of the centre would indicate. A well known medical specialist will attract patients from all over the world. Cost is not a determining factor where health is concerned. Again the existence of such specialists makes it difficult to delimit medical spheres of influence.

A full-time pathologist and pharmacist are employed in Welland's hospital. The presence of these specialists has widened Welland's medical sphere of influence. But many specialists and a greater wealth of medical services are located at larger hospitals in Hamilton and Saint Catherines. Welland's medical services are concentrated therefore in Welland County. Welland has an excellent general hospital with 200 beds. Special ailments are treated at other centres.

Appendix A

Recreation

Welland is an important recreational centre. Amusements available are many and varied. There are 3 good-sized theatres, 3 bowling alleys, outdoor swimming pools, Y.M.C.A. and Y.W.C.A. facilities as well as a host of hotels and clubs. The city has a municipal arena seating 2424 people. Hockey teams connected with the Ontario Minor Hockey Association draw spectators from all over the county. Welland Baseball Park has a similar effect in the summer. The curling rink is of special interest. Once a year, a Canada-wide "Bonspiel" is held which attracts national participation. Welland's recreational facilities are used intensively by the inhabitants of Welland County. But city dwellers also take advantage of opportunities to enjoy rural amusements. The Fonthill Golf and Country Club attracts many members from Greater Welland.

Agriculture.

The Welland Fair is held every September in the Agricultural Park in Welland. Local farmers are given an opportunity to display their produce. Improvements in agricultural techniques are also shown to visiting rural folk. Welland is the outlet for much of Welland County's agricultural production. The Welland Market is particularly important in this respect. The Agricultural Representative for Welland County also has an office in Welland. His role is significant in cementing the bonds between the city and the region.

Appendix B

Transportation

Railways

(1) The Canadian National Railway provides freight and passenger service to Toronto and Buffalo, New York.

(2) The Canadian National Railway (Niagara, St. Catherines and Toronto Electric Line) runs from St. Catherines through Welland to Port Colborne. Passenger and freight service is provided.

(3) The New York Central Railway. The main line of the New York Central Railway runs through Welland, providing connections with New York, Buffalo, Windsor, Detroit and Chicago. Both passenger and freight service is provided.

(4) The Toronto, Hamilton and Buffalo Railway. This line connects the New York Central Railway at Welland with the Canadian Pacific at Hamilton and provides freight and passenger service between Buffalo, Welland, Hamilton, Toronto and points beyond.

(5) The Wabash Railway runs between Windsor and Buffalo; this line is used mainly for freight purposes.

(6) The Chesapeake and Ohio Railway operates between Sarnia and Niagara Falls. Freight service is most important.

Highways.

The Queen's Highway 3A has 24.8 miles of paved surface, joining Wel to Niagara Falls.

The Queen's Highway 3 is 260 miles in length, running between Welland and Windsor. Both highway 3A and 3 connect at Welland.

The Queen's Highway 20 joins 3A five miles from Welland. This route

passes through Niagara Falls, Hamilton and Toronto.

The Queen's Highway 58 runs through Welland from Saint Catherines to Port Colborne. It joins the Queen Elizabeth Highway at Saint Catherines and the Trans-Canada Highway at Toronto.

Appendix C.

Industrial Survey, Welland, Ontario

Name of Company

Questionnaire:

1. In what year did the company locate in Welland?

2. To what extent did the Welland area offer advantages to your industry at the time of original location in Welland?
   Such as:
   a. Transportation
   b. Raw Materials
   c. Proximity to Market
   d. Power (Price? Reliability?)
   e. Labour Supply
   f. Water Supply

3. What were the disadvantages at time of location (again the above factor would be considered)?

4. What are the present advantages or disadvantages for the company offered by the Welland Area if conditions have changed significantly since first locating in Welland?
   In:
   a. Transportation
   b. Raw Material
   c. Proximity to Market
   d. Power (Price? Reliability?)
   e. Labour Supply
   f. Water Supply

5. What connections exist with other industries in the Welland Area with regard to your use of their products or raw material or vice versa?

6. (a) What are the principal raw materials used by your company?
   (b) What quantities (general) are used annually?
   (c) Where are your principal sources of raw material?
   (d) Is transportation by road, rail or water?

7. (a) What % of the output of the company is exported from Canada?
   (b) Which countries are the major buyers?
   (c) What % of the output is sold in (1) Ontario
   (2) Quebec
   (3) Maritimes
   (4) Prairies
   (5) British Colombia

8. What % of finished products is shipped by road, rail or water?

Appendix C

9. Of what corporation if any is your Welland Plant a branch?

10. (a) What is the present labour force? Men?
Women?

(b) What was the labour force in 1950?
1945?
1940?
1935?
1929?
1920?
1913?
1900?

11. What was the value of your production in 1950?
1945?
1940?
1935?
1929?
1920?
1913?
1900?

12. How and where do you dispose of your sewage?

13. Do you have a union in your plant?

14. What is the average salary per worker?

Appendix D

The Reliance Engineering and Electric Company of Canada Limited

This firm commenced operations in Welland in 1934. At present the area occupied by its buildings is 72,000 square feet. The company employs 266 workers. A.C. and D.C. generators, regulators and other electrical apparatus is produced.

Canada Foundries and Forgings Limited

The firm began operating in Welland in 1916. The area of its present buildings is 180,000 square feet. About 230 people are employed. All types of foundry and forge products are manufactured including alloy and stainless steels, carbon die forgings, grinder and propellor shafts, axles, rings, etc.

The United Steel Corporation Limited

This firm commenced operating under the name of United Steel Corporation in 1934 but the original business dates back to 1860. It is one of the oldest concerns in Welland and was one of the very first steel industries to locate in the Niagara Peninsula. The area of present buildings is 140,000 square feet. About 220 people are employed. Products manufactured include mine hoists, hydraulic presses, contractors equipment and marine and dock equipment.

Switson Industries Limited

This firm began operations in Welland in 1941. At present the buildings occupy 50,000 square feet. Employees number 175. The products manufactured include vacuum cleaners and floor polishers.

Appendix D

The Timms Construction and Engineering Limited.

This firm was founded in Welland in 1921. The area of present buildings is 70,000 square feet. There are between 100-400 employees. A staff of 30 is premanently maintained at head offices in Welland. The other employees work in the field. Their number varies with contracts secured. The company is involved in engineering, designing and building construction.

The Standard Steel Construction Company

This firm originally commenced operations in 1908. About 200 people are employed. Beams, frames and other construction materials are produced.

Plymouth Cordage Company

This is one of the oldest textile firms in Welland. The company provided homes for its employees in the past. About 135 people are employed. Rope, twine and nylon cord are all produced.

Dominion Fabrics Limited

This firm commenced operations in 1926. It is a branch of Dominion Fabrics Limited, Dunnville, Ontario. The Welland plant employs 115 people. The mill and warehouses cover an area of 59,014 square feet. All types of cotton yarns are produced.

Welland Iron and Brass Company Limited

This firm began operating in 1918. About 100 people are employed. Copper and iron castings are the main products.

Welland Electric Steel Foundry Limited

This firm commenced operations in 1924 in Welland. At present the buildings cover an area of 34,000 square feet. There are 98 employees. Products manufactured include stainless steel castings, valves etc. stainless steel fabricating equipment and manganese steel alloys.

Appendix E

Industrial Listing
(Adapted from material supplied by the Welland Chamber of Commerce)

Atherton Woodworking Company Sash, Frames, Store and Office Fixtures.	15 Alexander Street
Atlas Steels Limited Tool Steels, Special Steels, Stainless Steel, Sheet and Strip	Main Street East
Canada Foundry and Forgings Ltd. Drop Forgings.	Empire Street
Canadian Landis Machine Co. Threading Machinery	526 Ontario Road, Crowland.
Christie Brown and Co.Ltd. Bakery Products	236 Burgar Street
Day Co. of Canada Metal Fabrication	Seventh Street
Dominion Oxygen Co. Ltd. Compressed Gases	Dain Avenue
Dominion Yarns Ltd. Cotton Yarns	142 Empire Street
Electro-Metallurgical Co. of Canada Ltd. Alloys of all kinds	Crowland
El Mech Tools Ltd. Machinists Tool and Die	569 Southworth St. Crowland
General Die and Machine Co. Hardware Forgings	Major Street
International Cooperage of Canada Ltd. Barrels	Crowland
Martin Dairy Ltd Dairy Products	160 Burgar St.
National Products Co. Washing Compounds	10 Park Street

Appendix E

National Textiles Ltd. Work Clothing	31 Alexander St.
Niagara Die and Tool Co.Ltd. Tool and Die	Canal Bank, Crowland
Niagara Lumber and Planing Mill Ltd. Millwork Products (sash, doors etc)	219 Burgar St.
North Side Dairy Ltd. Dairy Products	18 Elm St., West
Page Hershey Tubes Ltd. Steel Pipe and Tubing	Dain Ave. Crowland
Plymouth Cordage Ltd. Binder twine and rope	229 Plymouth Rd.
Quality Pattern Co. Wood Patterns	160 Burgar St.
Stokes Division General Tire and Rubber Co. of Canada, Rubber Products	John St.
Switson Industries Ltd. Vacuum Cleaners etc.	201 Major St.
Scott Building Products Concrete and Celocrete Blocks	65 Empire Street
Sunnyside Dairy Dairy Products	27 Seventh St.
R. Timms Construction Co.Ltd. General Construction	221 Burgar St.
Thermoid Ltd.	41 Victoria St.
United Steel Corporation Ltd. Power Transmission Equipment.	317 King St.
Vaughan Seed Co.Ltd. Seeds and Bulbs	111 Victoria St.
Valencourt Boiler Works Heating Equipment	Aqueduct Street
Volta Manufacturing Co.Ltd. All Types of Furnaces etc.	Alexander St.
Welland Electric Steel Foundry Ltd. Stainless Steel, Alloys etc.	125 Victoria St.

Appendix E

Welland Iron and Brass Ltd. Metal Castings.	102 Niagara St.
Woods Manufacturing Co.Ltd. Canvas Goods	Empire St.
Welland-Pt.Colborne Evening Tribune Daily Newspaper	78 King St.
Welland Dairy Ltd. Dairy Products	70 Patterson Ave.
Welland New Method Laundry Ltd. Laundry of All Kinds	249 Burgar St.
Reliance Engineering and Electric (Canada) Ltd. Commonwealth Division Motors and Transformers	130 Denistoun St.
Peninsula Die and Tool	Southworth Ave. Crowland.

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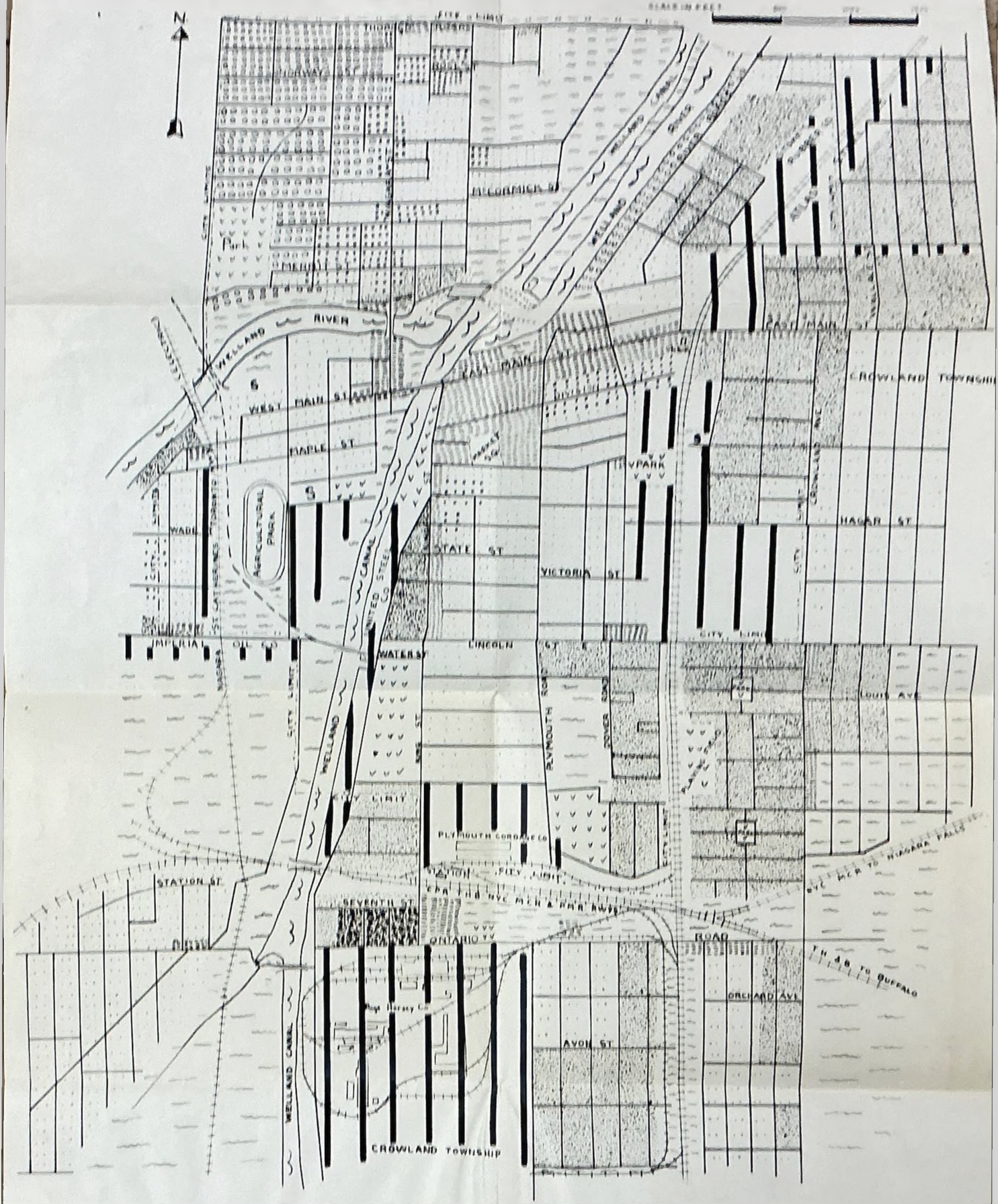

FUNCTIONAL MAP of WELLAND

LEGEND

RESIDENTIAL		COMMERCE		RAILWAY	
Superior		INDUSTRY		ROAD	
First		RECREATION		CITY LIMITS	
Second		IDLE		AQUEDUCT	
Third		CANAL		AQUEDUCT'S COURSE	
Fourth		BRIDGE			

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