SITE AND SETTLEMENT: LAND AND SETTLEMENT STRUCTURES IN RURAL NORTHUMBERLAND

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Abstract.

There is a growing awareness of concerns expressed by people who live in the countryside as arguments for and against new housing developments on farmland receive widespread and regular publicity. The debate follows several different perspectives from participant and non-participant parties with a focus of contention on erosion of traditional values. A persuasive argument in this debate is found in traditionalists' opposition to physical and social changes to existing hamlets, villages and small towns, on evidence of the effects of C20 housing accretions, and recognition of the threat to the nature of earlier settlements posed by urban standards of development.

This raises fundamental questions about interpretations of rurality in the context of settlement growth, and raises a challenge for developers to retain much admired rural characteristics in a climate of new housing need. The study addresses these issues by examining literature from a wide range of disciplines to develop a concept for meaningful analysis of settlements, in which site and social processes are manifest in building forms. It informs the debate by pinpointing formative elements in settlement development from investigation of linkages between building configurations and particular properties of location and place in a chronology of events and processes.

Hamlets, villages and small towns are in many senses beautiful places, combining variety and interaction of different qualities of forms and spaces in single buildings and groups of buildings. Part of this complexity is a combination of physical and socio-cultural elements which are reflected in particular uses and arrangements of buildings and spaces. The study proposes that settlements are social constructs in which landscape is a unique element and central to the formation of their distinctive configurations.

The study is composed of two parts of empirically based research of settlements in Northumberland. Quantitative and qualitative methodologies are used to explore the prevalence of relationships between building configurations and topographical and geological divisions, and to investigate the phenomena of social-cultural relationships with site. The analysis identifies key elements of landscape which are negotiated by groups of buildings to give distinctive qualities to configurations. The research helps understand site/settlement relationships, by acknowledging the processes and differences which occur over different locations and uses at different times. The research develops new methodologies in tracing site/settlement relationships, and promotes an analytic approach, as an instrument in development processes, to contextualise settlement formations by providing a rich insight into some of their essential characteristics. It concludes that site offers opportunities for and sets limits on development and provides a cohesion between physical and socio-cultural processes of development in a climate of continuous change.

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Aerial photograph of Rothbury and the Cocquet Valley.
SOURCE: J Martin, 1998.

CHAPTER 1.
Introduction. The Nature of the Study.

1.1 SETTLED LANDSCAPES.

Hamlets, villages and small towns are often regarded as beautiful places. They combine qualities of forms and spaces in single buildings and arrangements of groups of buildings. Sometimes features such as ponds, green spaces, streams, farmyards, are found to be part of the whole complex sense of beauty in rural areas. Or at the seaside a grouping of buildings around a small harbour creates a scene where a sense of beauty is enhanced by perhaps a beached boat, a fishing net under careful repair, lobster pots neatly stacked for use on another day, or an angler casting his line from a beach, pier or jetty[1].

Observations suggest what they have in common is a combination of physical and socio-cultural elements which are reflected in particular uses and arrangements of buildings and spaces to give each place a distinctive quality. In this respect it may be argued each small settlement is composed of many elements which combine to form a whole. This is the holistic hypothesis from which the study proceeds. It theorises that landscape is a unique element in the holistic complex and central to the formation of distinctive qualities of settlements. The study argues there is a transfer of qualities of site to configurations of groups of buildings which unifies location and buildings through limits imposed by particular landscape structures.

There is a physical relationship in which building lines are seen to follow topography and geology, and there is also a socio-cultural relationship between the setting and uses of buildings. A simple reasoning is found in the relationship between use and setting, for example, fishing settlements are situated at the coast, farming settlements are located near fertile land, and mining settlements are found in areas where coal can be found. But there is also a more complex consideration that different primary uses have particular ways of negotiating site structures.

[1] Similar observations were made by Murdoch and Marsden (1996: vi) during their visits to settlements in Aylesbury Vale, Buckinghamshire. According to Ballantyne (1992: 327) practices of looking at the English landscape draw heavily from theories advanced by Price during the C19.

The settlement studies show how provision of housing is crucial in determining the development of settlements. Case studies look at settlements from several physiographic regions and in all cases housing is the most numerous building type. However, identity is closely tied to ways in which primary industrial buildings respond to opportunities provided by location and limits imposed by particular properties of the place. Houses are often associated with these activities and in some cases it is possible to identify separate preferences for industrial and residential sites within the same location. Thus there are close links between these industries and houses for people who serve them. In other cases strong geometric frameworks and patterns are observed to dominate the settlement layouts. In medieval layouts they are recognised to respond to landscape characteristics in a range of different settings.

1.2 ACCRETIONS.

From observations made during visits to the countryside over several years these historic qualities appear to be threatened by an epidemic of developments which form different physical and socio-cultural relations with site.

One major element in these changes is the introduction of 'housing estates' which are built in response to an increasing demand for housing in rural areas from migrants from other settlements and towns and cities. The threat is defined by a division between the architecture of the earlier settlement and the architecture of the accretions which are attached to it. In the earlier settlement the configurations relate to site in ways already described. But in cases of accretions there appears to be no similar physical or social relationship with landscape. It can be argued these developments are simply part of a continuous process of change. But from the numbers and sizes of accretions observed, there is little doubt that these changes are at scale unseen in earlier settlements, and represent a significant threat to their distinctive character. Where they have almost totally enclosed earlier settlements there is a loss of identity as particular characteristics of the landscape succumb to urbanisation, and where new layouts, driven by C20 standards show little or no recognition of the site relationship found in earlier layouts. Earlier settlements sometimes become oases in larger urban sprawls and sometimes they disappear altogether or in part. An illustration of this can be seen from Figures 1.1 and 1.2, a C19 layout plan and C20 aerial photograph of Wooler.

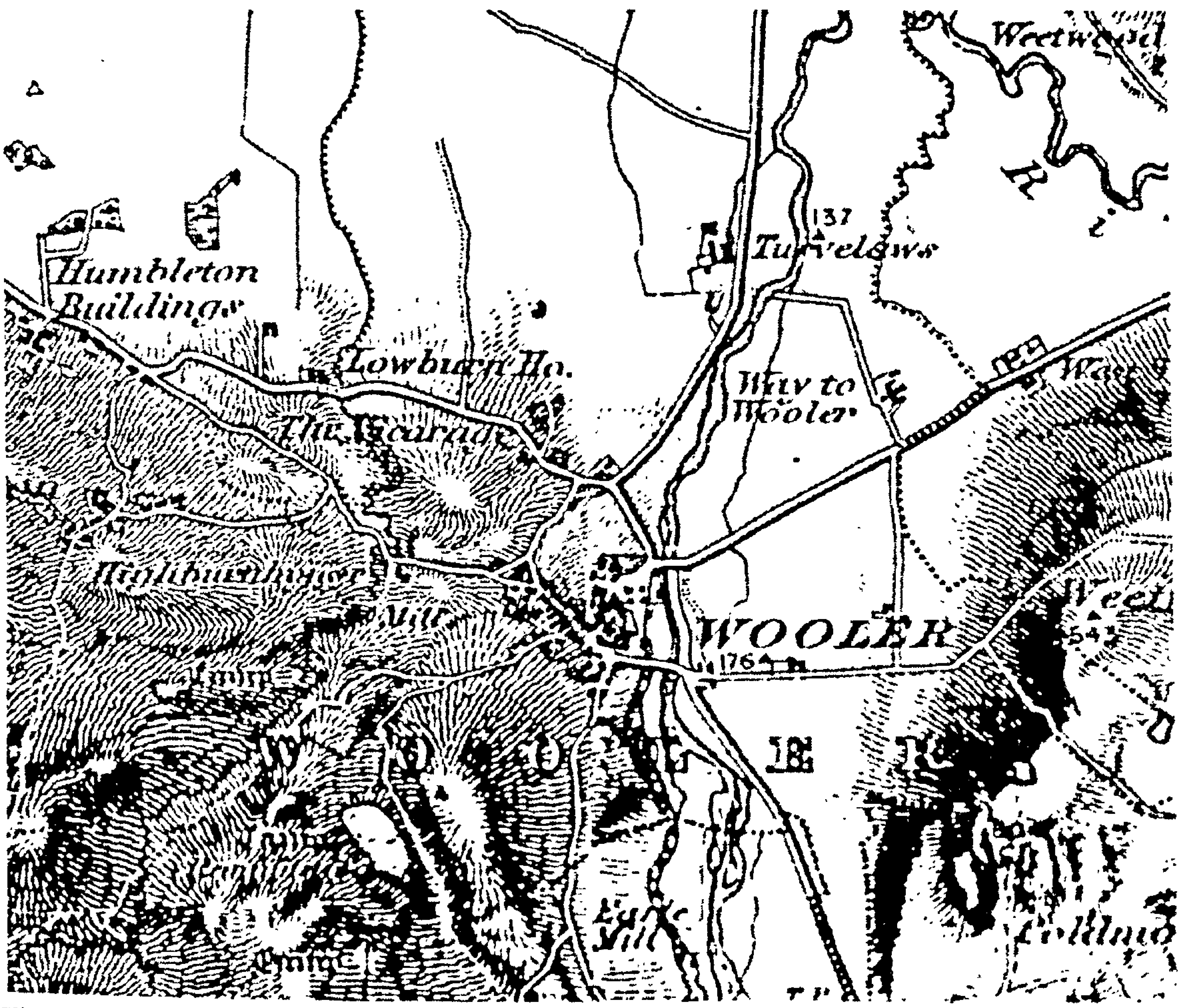

Fig. 1.1 **Wooler 1864. Plan.**
SOURCE: Reprint of first Ordnance Survey 1970

The earlier settlement shown on the C19 plan is characterised by a street which runs N-S following contours of a hill which rises to the SW, and an agglomeration on the plateau nearer the river in the E. Comparing this arrangement with the buildings illustrated on the photograph it can be seen considerable expansion has taken place over about 150 years and the early layout is now almost indistinguishable amongst new houses and roads.

Fig. 1.2 **Wooler 1997. Aerial photograph.**
SOURCE: Air Photos.

1.3 NORTHUMBERLAND AS AN AREA OF STUDY.

Northumberland is an appropriate area of study given its historical and geographical significance. 300 years of war with Scottish neighbours devastated the county. Only the most robust buildings survived, and most of the settlements seen today were rebuilt, sometimes on earlier sites, following the cessation of hostilities in the C18. This therefore represents an historic landmark from which to begin the study. It also coincides, give or take a few decades, with the production of detailed maps which document settlements during the period of rebuilding.

Northumberland is also a large county with a variety of landscapes north of the River Tyne. Its population has grown substantially during the C20 mainly in the conurbation of Tyneside, but also in rural and coastal areas where a more diffused increase is observed with some intense pockets of housing development attached to earlier settlements. As well as a long coastline which stretches nearly 100km from the Tyne to the Tweed it has a wide coastal plain which is separated from the western uplands by vales, scarps, and plateaux. The propositions can therefore be tested in different landscapes giving a more robust study than would be possible within a focus where such variety was not present.

1.4 FIGURE GROUND FORMS OF CONTEXT AND TEXTURE.

The approach for illustrating the discussion derives from the analytic systems of Schumacher (Nesbitt, 1996), Rapoport (1969) and Cullen (1961) who describe figure ground relationships and external influences acting upon formal building systems. Site and settlement relations are compared as figure ground forms of contexts and textures abstracted from zones and edges of landscape structures and groups of buildings. Data is drawn from OS maps and the Geological Survey grouped under headings topography and geology in the analysis and discussions. Thus the study is concerned with arrangements of landscape and buildings as they appear on plan and in tracing how forms and spaces adjust to location. Recognition and interpretation of figure ground forms is based on many years of experience as an architect surveying, designing and drawing plans.

The study is therefore concerned with plans of sites and settlements rather than materials and heights of buildings. Research investigates how arrangements of buildings respond to their setting to form special relations so that settlement individuality can be characterised as a product of location.

1.5 DEFINING SETTLEMENTS.

The theories are tested across all sizes of settlements excluding the North Tyneside conurbation to examine boundaries of size in reference to a traditional classificatory system. There is also an aspect of temporal significance. In chronologies of settlement development early patterns and frameworks which appear to support the hypothesis often form cores within larger urban areas. In many cases the historic patterns and frameworks limit following developments but observations also show that as buildings spread outwards from the core they become fragmented. Whereas the research adopts classificatory systems to examine the prevalence of site and settlements relationships in a population of settlements, further case studies investigate the complexities of specific places and expand classificatory definitions to embrace socio-cultural activities over many centuries.

1.6 THE STRUCTURE OF THE STUDY.

The structure of the study is in six successive parts: a review of related themes; construction of a theoretical approach; quantitative research; case study research; competing propositions; and conclusions and follows experimental research procedures[2]. A conceptual framework is drawn from related themes and combined with observations to identify a need for the study and to define the objectives of research. A theoretical approach is then constructed around the objectives and particular research methods selected. The main body of the text is devoted to quantitative and qualitative analysis. The first task of the analysis is to establish the mode of site and settlement relationships and its significance to the population as a whole (population here is intended to mean settlements within the area of study). On the basis that tests fall within accepted limits of significance in social science, various tables examine strengths, directions and natures of associations between variables for size, landscape features, and different physiographic regions. Case studies are used to investigate settlements for reasons how and why socio-cultural demands for location and properties of place help shape configurations of settlements in specific contexts

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[2] The research method follows the logic of social research often referred to as socio-logic. Rose and Sullivan describe this as follows. *"In social sciences there are many competing theories and a wide range of methods or techniques, but nevertheless it can be argued that there is a similar underlying logic to the process of social research regardless of the particular theory and method being used. In other words, there are general points we can make about theories, concepts and forms of explanation in social research. Thus, while there is not one methodology, it can be argued that there is one socio-logic. Socio-logic is the knitting together of theory, concept formation, the derivation of hypothesis, operationalisation, observation, data analysis, causal inference and back to theory again"* (Rose and Sullivan, 1996: 249, 250).

of agricultural, maritime and mining industries, thereby introducing use as part of the holistic hypothesis. Competing propositions to the theories are then examined for alternative reasons for particular shapes of groups of buildings in an attempt to give a robust account all likely possibilities. To give an account of the contingent natures of evolving settlement forms, chronologies of plans seek extant linkages to help construct a comprehensive illustration of the phenomena of physical and socio-cultural relationships between buildings and site in shapes of settlement plans over three centuries. In conclusion, inferences are drawn from both quantitative and qualitative analyses and compared with the propositions and hypothesis.

Because the discussions refer to many settlement plans the study is inevitably highly illustrated. Editorial problems of handling such a large volume of drawings arise in the statistical analysis where three drawings are prepared for each settlement. It was hoped to run these with commentaries as part of the main text and a draft was prepared in this way. But the system was abandoned because it produced a substantial gap in the interpretative text, and rather than give a continuous dialogue it caused an interruption between discussions about method and inferences. As a result the drawings for this part are listed as subsidiary items in Appendix F. However, case studies are treated in a different way. Discussions about plans from different dates in the period of study need to be continually cross referenced to plans and illustrations as arguments are developed. This is in contrast to the statistical study which draws discussions from tables and diagrams. Figures are therefore introduced at stages of the developing arguments as near to the relevant text as possible.

1.7 JUSTIFICATION AND CONTRIBUTION.

The study aims to add to our knowledge and understanding of processes in the preservation and enhancement of qualities of settlements in the countryside by demonstrating that landscape is a unique element and central to the formation of their distinctive configurations. In this it has four main objectives:

1. To understand the prevalence of site and settlement relations by comparing context and texture figure ground forms in different locations.
2. To understand the nature of site and settlement relations by investigating linkages between different uses and sites.
3. To develop analytic approaches to the study of site and settlements.

The utility of the research should not go unrecognised. It is seen as a valuable addition to present understanding of land and small settlement structures in practical and theoretical areas of discussion. It provides a formal basis from which processes of planning for change may proceed. The propositions are of specific structures from which to steer complexities of change along lines of uniqueness particular to individual settlements.

The approach also provides a practical method of looking at the landscape. An exploration of relationships between sites and settlements identifies key elements in settlement plans which give distinctive qualities to configurations and thereby leads to a better understanding of intelligible and characteristic settlement forms in issues of conservation and planning for future developments. This follows propositions advanced by Rapoport (1990) who criticises traditional histories of Architecture as conceptual and proposes that investigations should proceed on an evidential basis.

The study seeks to strengthen humanist and phenomenology theories by developing the idea of settlement individuality as a complex network of physical and socio-cultural elements.

Addressed to the broader concerns of the social scientist the study attempts to make a contribution to the knowledge of formal mechanisms, properties and processes of evolving small settlement plans in the hope that it may lead to a more ordered and harmonious settlement strategy for the general good.

> *There remains a common theme for a science of human society, and that while much progress has been made in developing its various facets and aspects, it is still important to try and tie parts together - not in search of a 'world*

formula' but to make sense of the social habitat in which we live, have lived and are likely to live. Dahrendorf in Harvey (1996: 11).

Sheep shearing at Ambleside.
SOURCE: Seymour, J. (1993: 71).

CHAPTER 2.
Conceptual framework of the study.

2.1 CONTENT.

This chapter explores a series of related themes about site and settlement relationships in general and specific contexts. Themes from a range of disciplines are discussed to develop a conceptual framework for the propositions advanced here. Literature provides most of the material for the discussion, but it also blended with observations of sites and settlements to provide a more robust account of the subject and to relate the literature to the aims and objectives of the study. The discussions identify the needs for this study and develop a strategy around which the analysis is constructed.

The most widely publicised concerns are for preservation and enhancement of qualities of settlements in rural areas. Discussions are dominated by problems of consumption, often defined as a dichotomy between new and long-time residents and the erosion of traditional values. The debate often tends to pass over important questions about the nature of settlement architecture for concerns of social exclusion, changes of land use, and loss of established practices. This chapter argues that these aspects fail to take account of fundamental architectural issues and how settlements can continue to expand and enhance their characteristic forms. Significant unanswered questions in the debate about the changing architecture of settlements are: Conservation of what, what is meant by characteristic settlement forms, and how can these effect new building developments? Observations suggest these are issues of complex physical and socio-cultural processes which need to be explored if the tensions of conservation and development are to be more fully understood.

This chapter discusses the on-going rural housing debate and identifies pressures for new housing as a threat to rural settlements. Central to propositions for the conservation and enhancement of characteristic forms is the identity of settlements and the role of site in shaping building configurations. Contextual theories emerged during the later part of the C20 as part of post-modern phenomenology of architecture, in which conceptions of place are a key element. A conceptual framework is developed from this phenomenological base by theorising the construction of settlement shapes as outcomes of relationships with landscape and soci-cultural practices.

2.2 PLANNING FOR HOUSING DEMAND IN RURAL AREAS.

Public concerns for rurality, conservation and erosion of traditional values under continued threat from new housing developments culminated in a Parliamentary White Paper *Rural England. A nation committed to a living countryside* (DoE and MAFF, 1995) which addresses a range of issues under four headings: government and people; working in the countryside; living in the countryside; and, a green and pleasant land. It describes a threat to the English rural scene from changes on four fronts: increasing mobility; leisure and recreation; decline of jobs in rural industries; and demands for jobs in new businesses which once would have been found only in towns. Indeed public concerns are shown to be well founded as the impact of changes is described in housing predictions of unprecedented scale.

> *The demand for large scale housing development, a result more of changes in our lifestyle than our growing population, is placing increasing pressures on our countryside. Over the last century our population has doubled but the number of houses has quadrupled, reflecting a substantial decline in average household size. People live longer and live in their own houses longer, they leave home for a place of their own earlier and, sadly, marriages break up far more often. We have not yet counted the social cost of these changes - particularly of the last, which lays expensive burdens upon society and upon the environment. Projections suggest that there may be 4.4 million extra households in England by 2016, compared with 1991 - that is almost one extra household for every four in 1991. This does not necessarily mean 4.4 million extra homes, but there is clearly a need for a substantial amount of land for new housing.* DoE and MAFF (1995: 131).

The projections have been widely debated and it is now generally acknowledged that the White Paper underestimates the true figure. Richard Best of the Joseph Rowntree Foundation[1] suggests two considerations have been omitted from the government computations. There is a deficiency due to demolition of existing housing stock, and

[1] *The Separating Society.* Public Lecture Series at University of Newcastle upon Tyne, 28 October 1997

a backlog of unhoused people. Taking these considerations into account he predicts 5 million homes are need by the year 2016, and from the record of houses built since 1991 the figure is very unlikely to be achieved. The debate also embraces differences between urban and greenfield sites. On the assumption the exodus to rural areas will not go on forever and by making urban sites more attractive to developers Best expects a good deal of the need to be met by sites within or associated with urban areas. This urban emphasis is also found in proposals to concentrate a large proportion of rural based households in areas with the largest population.

The White Paper describes the purpose of the planning system as a guide to the development and use of land in the public interest. Within this remit it

> *reconciles the needs of development and conservation, and secures economy, efficiency and amenity in the use of land. By integrating the twin objectives of development and environmental protection, the planning system contributes to sustainable development.* DoE and MAFF (1995: 35).

In practice policies have been to direct development to infill sites, but these are ineffective in cases of substantial new developments and there are numerous examples of accretions which show no awareness of distinctive characteristics of individual settlements. Recognising this deficiency the White Paper advocates a need to reconcile new development with conservation by proposing *"the principle that new development in the countryside should contribute to a sense of local identity"* (DoE and MAFF, 1995: 130) and goes on to recommend the preparation of village design statements throughout England, and the preparation of countryside design summaries (DoE and MAFF, 1995: 130). This study makes a direct contribution to the White Paper recommendations by developing a geometric system for analysing site and settlement relations.

By early 1998, nearly a year after the election of a new government, two new considerations entered the debate. Emphasis moved to rebuilding inner cities, and the official prediction of 4.4 million homes changed to 5.5 million. The new Secretary of State for the Environment announced in the press his intention to curb green belt building in an attempt to concentrate development on 'brown field sites' in big cities and conurbations. By September 1999 the intentions remained unfulfilled and *"John Prescott's blueprint for saving Britain's fields from being bricked over"* was criticised by Members of Parliament as *"vague, confused and unlikely to be achieved"* (Daily Mail, 2 September 1999: 6). MPs complained that *"the promised guidance on what Mr Prescott sees as good design has not yet been published"* (Daily Mail, 2 September 1999: 6). An account of the report which precedes these comments illustrates the grounds for this criticism.

The Report and Proceedings of the Environment, Transport and Regional Affairs Committee on Planning Policy Guidance, Session 1998 - 1999 states that although the 1947 planning system remained basically sound it has become stratified and inflexible and expresses doubts whether planners and other local authorities have the necessary skills and resources to implement a more creative approach to planning.

> *Major changes are needed...a significant shift in the culture of planners, volume housebuilders and others"* Environment, Transport and Regional Affairs Committee (1999: xxiii, xxiv)

The committee prescribes multidisciplinary approaches referred to as joined-up thinking and joined-up practice in planning procedures but fails to provide design guidance, other than to point to values promoted by the Countryside Agency and proposals in Design Bulletin 32 (1998). But the values of the Agency are generalisations which seek to:

> *conserve and enhance the countryside;*
> *promote social equity and economic opportunity for the people who live there;*
> *help everyone, wherever they live, to enjoy this national asset.*
> (The Countryside Agency, 1999),

and Design Bulletin 32 is mostly concerned with pedestrian and vehicular activities. Planning guidelines released by the Deputy Prime Minister early in 2000 are aimed at inner cities and towns and emphasise the use of terraces to ensure more dwellings are built on less land (Eastham, 2000: 2), (Hetherington, 2000: 4). There is no clear statement which directs planners how to achieve the quality and design, described as *"attractive places with real identity"* which the Environment, Transport and Regional Affairs Committee seeks.

However, the committee recognises *"design in context"* as development which is *"organically linked to its surroundings"* and in this it points to location as a formative element in new designs and touches upon a conceptual framework around which to construct this study (Environment, Transport and Regional Affairs Committee, 1999: 32).

The committee's reference to planning procedure is a criticism of post war planning policies which have dominated the rural development scene and are based on an orthodox systems approach to planning which has *"generated a series of standardised and generally accepted stages of the planning process, progressing from social goals, information retrieval and problem-analysis via various forms of plan-making to policy implementation and final reality"* (Cloke, 1983: 2). More recent planning policies have highlighted specific areas of guidance, influence and decision making which realigns the orthodox approach from emphasis on stages to emphasis on causal factors seen from outside the rural planning system looking in. Thus the system emphasises political process and participation as well as technical and professional science.

Whereas this wider approach draws a line under the earlier planning system, orthodoxy is still widely practised. This is particularly noticeable in modern accretions by speculative developers, where standard house types and layouts, more usually associated with estate housing in urban and sub-urban areas, are changing both the appearance and social structures of settlements. In a climate of increased housing demand in rural areas there is a clear need to investigate ways of identifying and preserving distinctive forms achieved by earlier settlement builders and to help understand their principles and implications in processes of change.

This section has described planning policy guidance *"which concentrates on the wider policy perspective at the expense of essential practicalities"* (Environment, Transport and Regional Affairs Committee, 1999: 32). Examination of planning policies at central and local government levels has pin-pointed a lack of *design guidance* as the weak linkage in approaches to reconcile the needs for development and conservation. The section has also described planning policies which realign orthodox sequential approaches and emphasise technical and professional science and causal factors in a *"strategic design context of new development"* (Environment, Transport and Regional Affairs Committee, 1999: 32). Thus this section has identified context as a key term in rural planning policy objectives and has pointed to a theoretical approach which is anchored in phenomenology. This study distinguishes the role of the countryside in rural settlement individuality, and theorises a phenomenology of architecture as a conceptual framework for constructing images of settlement characteristics as unique places. The study argues that understanding the significance and nature of site in the individuality of evolving settlement patterns is a key issue in conservation objectives and investigative approaches to this understanding provide a sound basis upon which to construct design guidance.

2.3 PHENOMENOLOGY OF ARCHITECTURE AS A CONCEPTUAL THEORY.

> *When man dwells he is simultaneously located in space and exposed to a certain environmental character. But he also has to identify himself with the environment, that is, he has to know how he is in a certain place.* Norberg-Schultz (1979: 19).

The principal proponent of a phenomenology of architecture is Christian Norberg-Schultz who draws attention to tectonic aspects of architecture to explain the environment. In addition to a focus on site, phenomenology in architecture is concerned with how things are made with emphasis on dwelling and historical connection. Norberg-Schultz argues that from the beginning man has recognised that nature consists of interrelated elements which express fundamental aspects of being. Landscape has structure and meaning which he classifies as modes of natural understanding found in *"the definition of the character of natural places, relating them to basic human traits"* (Norberg-Schultz, 1979: 28). Structure is described as variations in surface relief which give character and meaning to place. Phenomenology of architecture is a radical philosophy in its concern with landscape but particular qualities of place also includes a continuity with earlier works thus enabling valid generalisation to be made about environment. With roots firmly based in qualities and natures of place, phenomenology of architecture extends the arguments for a design guide from planning objectives and processes to a holistic interpretation of settlement architecture with inherent orders and meaning in relationships between buildings and location. This interpretation of settlement architecture has been largely overlooked in developments which have taken place since the middle of the C20. Indeed, an examination of architectural theory over the last thirty years shows a lack of dominance of any single viewpoint, often referred to as a pluralistic period. As a result architecture has become interdisciplinary depending on an array of critical paradigms. Long lasting questions include the origins and limits of architecture, issues of cultural expression and meaning, and relationships with architectural history. The site and settlement relationship theme of this research not only addresses the practicalities of design guidance but also defines settlement architecture in terms of humanistic and post-modern paradigms.

Inherent in issues of origin is the question of meaning of architecture and the definition of its limits. Colin St.John Wilson (1992: x, 50) argues that humanists claim function as the use of shelter is unique to architecture and therefore representative of its meaning, in contrast to neo-classicists' arguments that this is the essence of *building* as distinguished from *architecture* which also requires a symbolic function. Phenomenology of architecture[2] conceptualises these positions in the Gestalt theory of form-qualities, described as *"perceptual character of the whole ...of spatial or temporal nature"* (Thines, 1977: 67). Phenomenology of architecture is concerned with the concept of ontology, *"an analysis of the genesis of totality"* which *"leads logically to the study of the actual emergence of wholes"* (Thines, 1977: 73).

[2]Pure phenomenology was conceived as a radical philosophy mainly orientated towards psychology, and characterised by *"its opposition to imitation of exact science in the study of and its determination to place experimental research in the realm of a completely new conceptual framework* and addresses *meaningful relations of the subject to the world of his lived behaviour"* (Thines, 1977: 16; 20). Norberg-Schultz (1979: 7-10) takes this emphasis on the phenomenon of *"everyday lifeworld"* to develop a method for understanding relations of man to his environment which he describes as spirit of place or genius loci.

This underlies thinking towards site, place, landscape and making, thus bridging divisions between opposing interpretations of architecture and building. Place then is an expression of totality, *"a qualitative total phenomenon"* (Norberg-Schultz, 1979: 8).

The engagement of post-modern paradigms is a consequence of modern notions of place which are in contrast to the positivist aesthetic principles for beauty, order, unity and appropriateness, defined by medieval architects (Allsopp, 1959: 28-45). These elements became fragmented by modern theory which placed great faith in scientific and industrial revolutions contributing to well-being, and seen through mass production of affordable objects and housing. Post modernism asks if this faith was justified. The challenges to generally accepted views of the Modern Movement which arose during the 1950s were summarised by Alexander (1964).

> *My task has been to show that there is a deep and important underlying structural correspondence between the pattern of a problem and the process of designing a physical form which answers that problem...Before we can ourselves turn a problem into a form, we need to make explicit maps of the problem's structure, and therefore need first to invent a conceptual framework for such maps.* Alexander (1964: 132).

His call for a new physical order, organisation and form is reflected in the analysis of the genesis of totality later proposed by Thines and illustrates a fundamental shift in architectural theory upon which phenomenology of architecture is constructed. The shift is identified with linkages between process, pattern and context in which buildings are,

> *cognisant of their own purpose and materiality, of their history, of the physical context in which they are built, and of the social, cultural and political milieu that called them in to being.* Stern (1977: 67-68).

These linkages are defined by Norberg-Schultz in the meaningful correspondence between site and buildings.

> *If man made places are at all related to their environment, there ought to exist a meaningful correspondence between natural conditions and settlement morphology.* Norberg-Schultz (1979: 171).

Norberg-Schultz identifies phenomenology's potential in architecture as the ability to make the environment meaningful through the creation of specific places. He emphasises the importance of basic architectural elements wall, floor, ceiling, experienced as horizon, boundary and frame for nature. Vittorio Gregotti also argues the need for site to intensify, condense and make precise the structure and nature of man's understanding of it.

> *Nature...is not seen as an indifferent, inscrutable force or a divine cycle of creation, but rather as a collection of material things whose reasons and relations architecture has the task of revealing. We must therefore modify, redouble, measure, situate, and utilise the landscape in order to know and meet the environment as a geographical totality of concrete things which are inseparable from their historical organisation.*
> Gregotti (1985: 28).

Gregotti describes site as the *loadbearing material* for the architectural project enabling design to accommodate the spirit of the specific terrain which he refers to as modification.

> *It is modification which transforms place into architecture and establishes the original symbolic act of making contact with the earth, with the physical environment, with the idea of nature as a totality. Such a concept of the project sees architecture as a system of relations and distances, as the measurement of intervals rather than isolated objects. Thus the specificity of the solution is closely related to differences in situation, context, or environment. The organisation of space, therefore, starts from the idea of place: the project transforms place into settlement.* Gregotti (1985: 30).

This is further explained by Norberg-Schultz who sees everyday life consisting of concrete phenomena, which are interrelated in several ways. Some of the phenomena comprise others; for example, a forest is comprised of trees and a town is made up of houses. Landscape is regarded as one of these complex phenomena. Taken in the sense of man-made place, the phenomena of landscape form an environment for buildings. In fact, it is meaningless to imagine any happening without reference to a locality. Places are also manifestations of different actions in which different places are needed for different actions to be conducted in satisfactory ways and therefore give rise to demands for places with different properties, in accordance with different cultural traditions and different environmental conditions. Nature forms place as a comprehensive totality which, according to local circumstances, has a particular identity.

Man-made parts of the environment are represented by settlements of various sizes and types. Illustrating his arguments with plans and photographs of settlements (from African, European and American continents), Norberg-Schultz argues that if settlements are organically related to their environment, it implies that they serve as foci where environmental character is condensed and explained, through basic properties of man-made places, concentration and enclosure. Character is therefore determined by *how things are* and gives a basis for investigations of settlements as concrete phenomena related to place. Character denotes a general atmosphere and the concrete form of space defining elements. Landscapes also possess character. Character is therefore determined by the material and formal constitution of the place and an investigation must proceed from the question: how are the boundaries which define place? Clearly how a boundary defines space depends upon its formal articulation and how it is related to the ground and other buildings.

This is demonstrated in Prague where Norberg-Schultz describes the delimiting features of landscape which help shape the plan and explain the character of the city.

> *At Prague the rolling landscape of central Bohemia is condensed to form a particularly beautiful configuration. Along the large bend of the Vltava an extended hill rises which visualises the curve of the river. The hill and river are opposed but complementary forces, which make nature become alive with expressive power. Within the curve, opposite the hill, the land opens up in horizontal expanse before it starts to rise gently towards the south-east. At either end of the river-bend two marked isolated hills give definition to the area. The two halves of this extraordinary landscape were linked by a ford, a little to the north of the present Charles Bridge. On the left bank at the height of the ford, there is a valley which makes it possible to reach the castle hill and the land towards the west....Thus the city had found its form in accordance with the natural situation. First of all it consists of three parts: the dense settlement down on the plain, the dominant castle on the hill above,*

> *and the river as a separating and connecting element between them...During the course of history the basic juxtaposition has been interpreted and enriched by buildings of successive generations.*
>
> *The Old Town is situated on the flat promontory embraced by the river, and is gathered around the Old Town Square. The New Town fans out from the Old Town and rises slightly. It is located between the St. Vitus Hill in the north and the Vysehrad in the south, and is given internal structure by the three radial markets. Ideally the New Town is a segment of a ring, but the shape is stretched to reach the more distant Vysehrad. The Small Town is situated under the hill, within the concave valley, and is gathered along the Mostecka-Nerudova path. The Hradcany is above the other areas on the convex hill, and stretches along a ridge. Whereas the New Town is subordinate to the Old Town and does not possess an independent focus, the other three areas are centred on significant inner cores which have their spatial identity at the same time as they are identified in the townscape by vertical landmarks.* Norberg-Schultz (1979: 85, 94-97).

He argues the structure of Prague is not manifest in one particular environmental system, but is comprised of many parts in topological sense. He theorises the genius loci in terms of plan and styles which he describes as the *"Bohemian synthesis"* Norberg-Schultz (1979: 108). The basic spatial structure was suggested by natural place and fixed from the very beginning, and has survived to the present day. The city is *"first the true and meaningful focus of a delimited and characteristic region* where *we find the juxtaposition of an undulating plain, rocky hills and water. Thus, the site beautifully gathers and represents the surrounding country"* (Norberg-Schultz, 1997: 108, 99).

Norberg-Schultz theorises that settlements and landscape have a figure-ground relationship in which enclosure is tied to landscape.

> *The outside-inside relation which is a primary aspect of concrete space, implies that spaces posses a varying degree of extension and enclosure. Whereas landscapes are distinguished by a varied, but basically continuous extension, settlements are enclosed entities. Settlements and landscape therefore have a figure-ground relationship. In general any enclosure becomes manifest as a figure in relation to the extended ground of the landscape.* Norberg-Schultz (1979: 12)

These spatial properties and structural relationships are found in all settlements to some degree which he illustrates, but he ventures to suggest that these simple propositions are hardly understood and rarely practised in the present day.

> *Today, however, these simple structural relationships are hardly understood and still less respected. As a general identity of our places depends on such structures, they form an important part of the phenomenology of architecture.* Norberg-Schultz (1979: 171).

Observations support this lack of understanding and respect particularly in post war settlement developments. The study has already discussed the effects of the pluralistic period of architecture over the last thirty years and it is perhaps expected that the radical theory of phenomenology is eschewed in favour of issues of social and economic performance. But there is another issue which has contributed to the absence of Norberg-Schultz's simple structures in post war rural settlement developments. The theoretical arguments of phenomenology of architecture draw from a sample base of a few selected settlements from a global arena and this exclusivity makes the theories vulnerable to accusations of partiality. We should remember, however, Norberg-Schultz intended his work to be a first step towards a phenomenology of architecture and in need of further elaboration (Norberg-Schultz, 1979: 5). The accusations of partiality are therefore a restatement of the shortcomings which Norberg-Schultz recognised in his our work. By addressing this issue the study seeks to strengthen phenomenology theories. Gestalt theory calls for a collective interpretation of phenomenology as *"an analysis of the genesis of totality"* (Thines, 1977: 73), in which multiplicity describes the importance of *"collective association to characterise the phenomena"* and argues for discrimination between the *"abstract forms of a given multiplicity with regard to another multiplicity"* thus *"the vague character of multiplicity disappears and is replaced by the concept of number proper"* (Thines, 1977: 73, 74). This quantitative approach is clearly prescribed to strengthen the phenomenology position of collective association but is not taken up by Norberg-Schultz.

The study therefore extends the qualitative work of Norberg-Schultz by quantitative and qualitative analysis of structural relationships. It proceeds from a reflexive position and sets out to show that structural relationships are widespread in historical rural settlements plans particularly where landscapes are clearly defined in linear expressions such as the coast and riverain locations and where building forms and positions are derived from site related functions. The study theorises that individuality is not only a result of structural relationships with site but also incorporates use to give meaning to configurations in terms of enclosure. This reflects the humanist position in which use is seen as a fundamental element in the material and formal constitution of place, and which makes possible the engagement of various operations.

> *Architecture only comes into its own by answering to a call from outside its own discipline to serve a set of needs in society. By this I mean two things. First, to set up a spatial order that makes possible the fulfilment of manifold operations in an effective way. This is the basis of common use. Second, to bring to life an order of representation that embodies those occasions so that they can be recognised in an intelligible way.* St. John Wilson (1992: 62).

Phenomenological and humanist theories conceptualise place in terms of content and meaning in which physical and socio-cultural processes are part of the complex construction of settlement individuality. Content and meaning are expressed as theme and variation to describe individuality.

> *"Theme" represents a general complex of meanings, and the "variation" its circumstantial realisation. In general terms "theme and variation" allows for the expression of individuality within a system of manifest common meanings.* Norberg-Schultz (1979: 180)

This reflects St. John Wilson's interpretation of use where several different uses around a common theme are found the same complex.

> *the themes of purposefulness and use are the generating principles in the nature of architecture,...few buildings have so singular purpose that their reality is to be encompassed by one single sign system only; more meanings than one are to be conveyed at the level of operational use alone.* St. John Wilson (1992: xiv and 38).

Changing use reminds us place is not a fixed thing and whereas physical (natural) elements of site may stay comparatively static, the historical context of use signifies an ever changing process of adaptation to both site and buildings.

> *...in reality, use is neither static or passive. Use marks the beginning and end of each act of transformation, forming part of the cycle of actions by which the built environment lives.* Habraken (1998: 8).

A example of this is found at Urbino where Giancarlo de Carlo demonstrates an engagement with historical context and topography over many decades. His concerns with scale and context while preserving *"urban memory"*, are developed through an involvement of users at planning stages of his designs. Participation is seen as a means of combining theory and practice with roots in reality defined as use and location. He theorises that *"an architectural hypothesis must be corroborated and modified through contact with reality, the contingencies of programme and site"* (Zucchi, 1992: ix, xi). For De Carlo reality has a multifaceted and changing nature which *"bears close and continual scrutiny, and contains the seeds of a correspondingly diverse and vigorous architecture"* (Zucchi, 1992: 6). De Carlo identifies himself as a humanist, and this is taken to mean symbolising the Renaissance in the sense that has already been described by St. John Wilson, that it never lost sight of *"what, for him as for Wright, must always be architecture's ultimate reference point: the people who inhabit and use it"* (Zucchi, 1992: 8). The cultural highpoint of the Renaissance was man's relationship with his surroundings and De Carlo' writings and works endorse this philosophy.

> *The work of architecture makes no sense when disassociated from its use. Taken in isolation, it has no possibility of representing itself, nor of establishing purposeful relations with nature or history because its meaning is entirely contingent upon its active presence, upon the system of relations it establishes with its users. Following the patterns of these relations, it continues to modify the user and to be itself modified by the user, thereby integrating itself with nature and producing history, becoming itself through its use, a part of nature and history.* Zucchi (1992: 8).

A search for coherence is characteristic of De Carlo's work, which should be understood in relation to purpose and intention of the work, combining use of the terrain with architectural form. The dominant historical plan form is a major feature of De Carlo's reconciliation between conservation and rehabitation. He does not interpret renewal of historic centres as mere improvements and modernisation of buildings, but as a radical restructuring of the city in patterns and forms capable of guaranteeing continuity between existing and new physical frameworks. Kite describes this as a deep reading of the genius-loci which is echoed in the plan of the nearby Collegi dei Cappuccini, illustrated on Fig. 2.1,

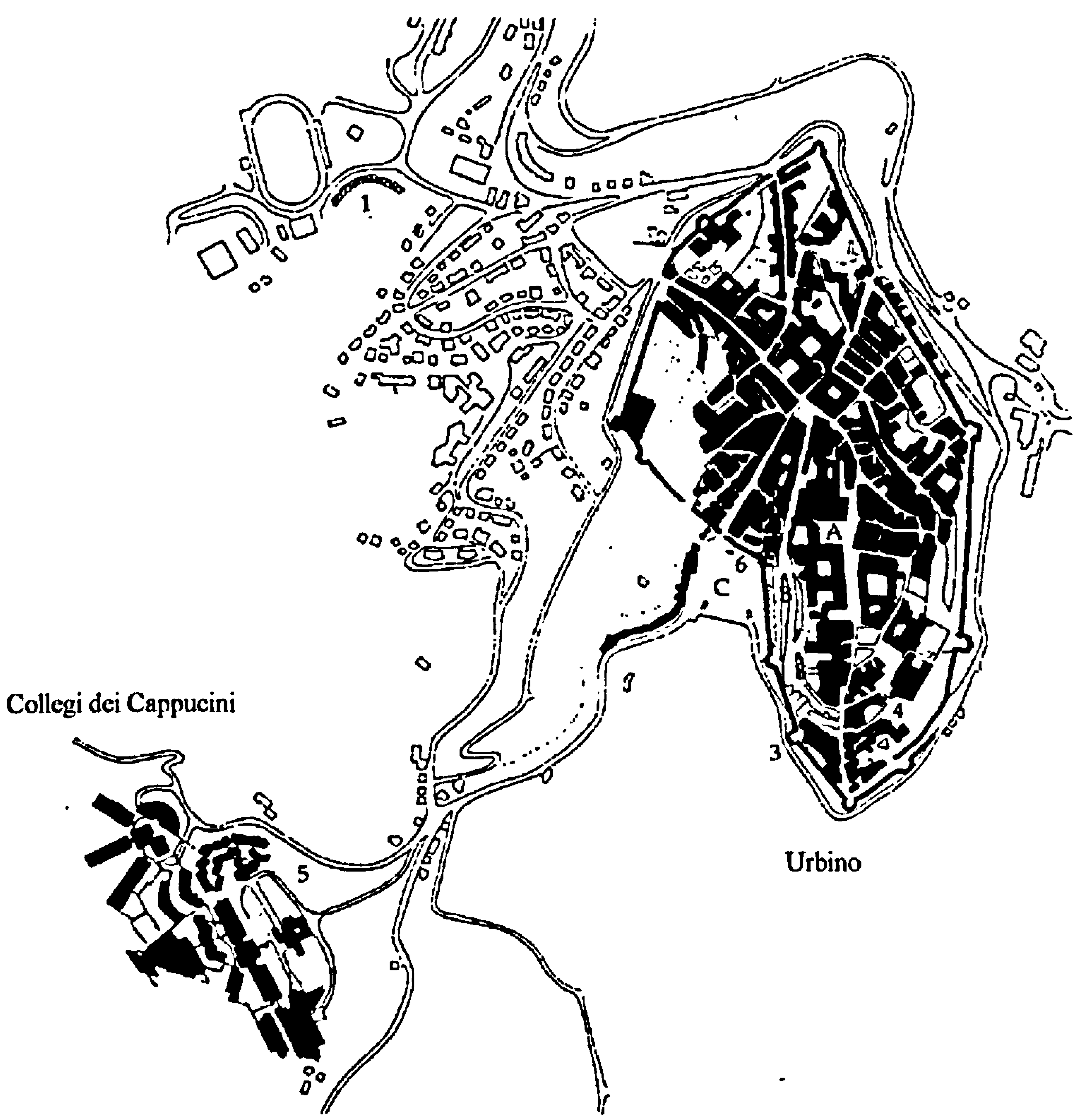

Fig 2.1 Collegi dei Cappuccini and Urbino c. 1987.
SOURCE: Zucchi (1992: 44)

where *"the responses to strata and topography are resonant with the impressions of the older Urbino"* and show *"an interplay of the man-made and the natural - a constructed landscape and a 'natural' urbanism"* (Kite, 2000: 4).

This relationship is discussed in terms of relative positions of corresponding patterns of the town and countryside.

> *The pattern of the town and the pattern of the countryside are homologous. If you analyse a section of the cultivated countryside...you realise that nature here is man made. If you analyse a section of the urban fabric...you see that the man-made is natural. But what is really remarkable is that the man-made quality of nature and the natural quality of the man-made both obey the same aesthetic laws.* (Kite, 2000: 4).

This concept of homology applied to architecture provides a continuity in evolving settlement plans by relating changes to similar origins, thereby drawing together the past, present and future in an interpretation of settlement architecture which works to reinforce qualities of natural site.

Genius loci was originally a Roman idea (although the concept of genius was understood by Ancient Greeks who dedicated sites to gods, and the Egyptians who modelled their layouts of buildings on the Nile landscape). In ancient Roman beliefs every being, in the senses of god, person and place, had a genius or guardian spirit which gave life and determined character or essence. Thus ancient man placed great importance on recognising the genius of the locality (loci) in which he lived. Indeed his survival depended on good relations with place in physical and psychic senses. The Roman idea of genius loci was reinterpreted in the C18 English landscape (Ballantyne, 1992: 324), but retained the fundamental concept of character or essence which Norberg-Schultz (1979), Alexander (1964), Stern (1977), Gregotti (1985), St.John Wilson (1992), Habraken (1998), Zucchi (1992), Kite (2000) describe as a continuing dependency between man and his environment.

A phenomenology of architecture defines the challenge in processes of continuous change to preserve the *genius loci* in ever new historical contexts thereby seeking a continuity with past, present and future. The next section discusses the impacts of historicism in terms of context, process and meaning.

2.4 THE DURABILTITY OF BUILDINGS AND A HISTORICAL CONDITION.

The durability of buildings confronts theorists with an historical condition: *"the simultaneous experience of works dating from vastly different time periods"* (Nesbitt, 1996: 20). The historical relationship between architecture and nature as developed through the construction of site can be considered in several ways.

> *The central question being addressed is clearly the relation among the past, present, and future - in this case the possible lessons of history for environmental design theory and how these lessons might be learned. Four broad positions are possible on this...Such material can be ignored; it can be rejected as irrelevant; it can be copied directly; or one can learn from it by deriving lessons through the application of various models, concepts, and principles to the material in question.* Rapoport (1990 : ix).

The modern idea of style is influenced by the periodisation of history and has been partly responsible for the modernist necessity for a break with the past (Nesbitt, 1996, 20). But architecture has often been isolated from the broader system of settings or cultural landscapes in which it is embedded and linked. Historical concern with buildings by a few known designers for which written records exist has limited its application. *"It is little wonder that such history has not been able to generalise"* (Rapoport, 1990: 25).

Central to discussions of meaning is the definition of the essence of architecture about which there is little consensus. Three elements : type; function; and tectonics, are frequently regarded as fundamental to architecture and can be correlated to the Vitruvian trilogy: delight, commodity and firmness. In the Modern Movement *"The priority placed on function as content would suggest that it is considered to be the essence of modern architecture"* (Nesbitt, 1996: 45). But Eisenman (1984: 154) argues that function has been present in architecture since the Renaissance and is really no more than a late phase of humanism. He goes on to propose form and function opposition is not necessarily inherent in architectural history and in this he recognises crucial differences between modernism and humanism. St. John Wilson shares this view when he describes a resolution of the three competing elements, under the agency of propriety arising from nature.

> *The key to every one of the architectures of the past that inspire us lies in the varied balance of forces achieved in bringing the three competing elements into resolution; and the agent of that resolution is a missing fourth element. Until that emerges, there can be no architecture - merely technology, sociology, or formalism. Vitruvius himself gave it a name when he spoke of propriety - 'decor' or decorum. This, he stated arises from authority, convention, custom, or nature, and decides all issues of appropriateness and convention.* St. John Wilson (1992: 193).

The connection with nature reminds us of the coherence of De Carlo's work at Urbino and that one of the significant events in recent architectural history is the notion that modern architecture is not singular but is composed of many tendencies and looks for continuities with earlier works. Rapoport (1990) argues for a linear approach in tracing relations of the past, present and future in which the first form of study is necessary for the second, because the past must be reconstructed as validly as possible before it can be used for purposes of a generalising discipline. The search is for relevant connections and linkages, not sequences.

> *In any historical study, one can distinguish between first, the establishing of a chronology, narrative description, or reconstruction of a particular place, person or group, period, event, artefact or work, or group of artefacts or works; and second, the study of the past in a generalised way, in order to trace patterns, achieve understanding, derive and test hypotheses, and eventually develop explanatory theory.* Rapoport (1990: 66).

Past environments comprise a vast body of evidence of what humans have built and are defined in such a way that a study must consider more than buildings. It is clear that no one discipline can deal with the full range of data. The study, therefore, takes an interdisciplinary approach in which buildings are seen to be part of a system of settings, and cultural landscapes within which people live and behave. This holistic perspective of the study is a generalised philosophy of context, *"the principle that a comprehensive account of any phenomena must be given in terms of the structure inherent in that phenomenon and the context in which the phenomenon belongs as a part"* (Sandywell, 1996: 163). Rapoport is critical of this interpretation *"since we* *cannot meaningfully envision a totality we necessarily abstract and isolate"* (Rapoport, 1990: 19). But Sandywell makes the point that context is the key term in this holistic perspective, emphasising the principle of seeing phenomena and significance from the perspective of the system as a whole. The mapping of the system or process draws in further contexts and therefore it becomes necessary to clearly define the field of study...*"it follows there will be an indefinite number of relevant contexts depending upon constraints both of the form investigated and of the interests of investigation"* (Sandywell, 1996: 163). The interaction between context and process is defined as the *"dynamic emergence of complexity through temporal sequences or phases of a system's evolution"* (Sandywell, 1996: 164). Contextual interpretations of place which emerge from this argument reflect the phenomenological position which emphasises *"the specificity of spatial experience and in some cases the genius loci, or unique spirit of the place"* (Nesbitt, 1996: 49). Spatial experience is therefore a result of verification of particular qualities of site through significant elements of architecture, the constituent elements of place, boundary and threshold. *"They form part of a figure which discloses the spatiality in question"* (Nesbitt, 1996: 49). Thus place-making is about the origins of architecture, the laying of stones that turn place into architecture.

The emphasis on generalisation and theory development proposed by Rapoport theorises these arguments by bracketing them with context, where all buildings and their relationship with site over time provide a rich source of meaning. This position is shared in a phenomenological interest in architecture's ability to condense the meaning of the environment and illuminate what is external to architecture.

Thus the answer to the post modern challenge *"what use can one make of past experiences with design and buildings"* (Nesbitt, 1996: 20), is found in Rapoport's proposition for a new theory of design.

> *to develop more rigorous ways of deriving lessons from historical precedents for the purpose of generalising more validly about human and humane environments, thus leading to a new theory of design.* Rapoport (1990 : ix).

But historical perspectives of exploitation or harmony with nature have also resulted in various perceptions of landscape, hence definitions of boundaries between rural and urban settlements have become unclear. To understand what these perceptions represent of the *"human place in nature"* (Nesbitt, 1996: 20) it is necessary to understand the contrasting approaches to the definition problem.

2.5 DEFINITIONS OF SETTLEMENTS.

Parallel with the shifts in architectural theory during the later part of the C20 was an expansion of professional interest in settlement planning and in particular a growing awareness of the challenge of rural settlement planning. The rapid expansion of this interest, and its engagement with a growing number of disciplines, is described as a transformation of rural planning. *"Rural planning has been gradually transformed from a young art in the 1940s and 1950s into a developing political, social and economic science in the 1980s"* (Cloke, 1983: 1). This indicates the growing complexity of a multidisciplinary architecture of rural settlements. Within this multidisciplinary interest, opposing attitudes argue over definitions of settlements. One view is that unambiguous definitions of rural areas are denied on ground of complexity. The alternative view is that *"rural definition is a necessary step in the understanding of the various differences and similarities between urban and rural areas"* (Cloke, 1983: 9). Definitions of size use simple numerical values drawn from population or housing statistics, but say little about the nature of settlements, and there are instances where numerically small settlements have urban characteristics such as density, markets, administrative functions. Thus social definitions can establish rural character by the way in which *"a settlement engenders a style of life"* (Cloke, 1983: 19).

Underlying differences between urban and rural are the concepts of social heterogeneity and homogeneity in which *"Size contributes to the loss of personal contact and the substitution of communication by means other than face to face contact"* (Jones, 1969: 8). Comparing small settlements with towns and cities they are relatively small and compact where anonymity is not as prevalent and face to face contact is a regular occurrence. These social considerations embrace the environments of small settlements in which population density may still throw together diversity, but does not lead to anonymity where numbers remain small and the identity of the individual is preserved. Thus size is important in defining settlements and begins to define their nature as social constructs where friendship, kinship, and family ties are built into the evolving forms. Sociological approaches combined with buildings and spaces define settlements in terms of communities as well as tectonics. They are social units of space. When Wright talks about the entire performance of a building he is blending the materials and nature of purpose of a building into architecture (Wilson, 1992: 58). This is true also, when applied to settlements. Materials are immediately evident to the eye and the nature of purpose is apparent in types of buildings which combine to form the settlement. Where earlier industries have given way to or are accompanied by other industries, changes do not always represent diversity in the sense of conflict but rather an extension of the settlement because size retains a sense of identity of place and population.

The most conspicuous contributions of geographers is the study of settlements in the adaptation of classificatory systems to landscape. Muir (1980) gives an insight into some of the types most used. Roberts (1987) expands these from regular and irregular plans into about a dozen or more types illustrated in Figure 2.2. The diversity of these plans indicates the problem with classificatory systems. They are not truly representative of the whole range of settlement configurations and therefore must be regarded with caution when defining characteristics of particular settlements. Roberts begins his system with two primitive root plans, rows and agglomerations. These pure classifications build around three fundamental criteria, basic shape, the degree of regularity, and the presence or absence of an integral or internal green. Thus two basic shapes represent the logical point of origin of the plans shown in the following Figure 2.2. In this way Roberts sees his classificatory system as a simple tool in the understanding of the complexity of settlement definition.

> *The purpose of this classification should be kept firmly in mind: it is not an end in itself, it is a tool, designed to reduce to order a mass of unwieldy*

> *information so that it may be more easily comprehended and more easily manipulated. If indeed settlement is the geographical record of its own evolution then classification is a key to this record.* Roberts (1987: 24, 25).

Roberts acknowledges the significance of site in shaping settlements, which he explores in terms of intrinsic or extrinsic qualities. In his extrinsic study he makes the critical observation that settlements grew initially at least, where key resources were available to support a larger grouping. His intrinsic studies examine the shapes of land beneath settlements. Roberts also implicates historicism in his system by describing earlier settlement forms as sub-cultural elements which form morphological frames for future developments.

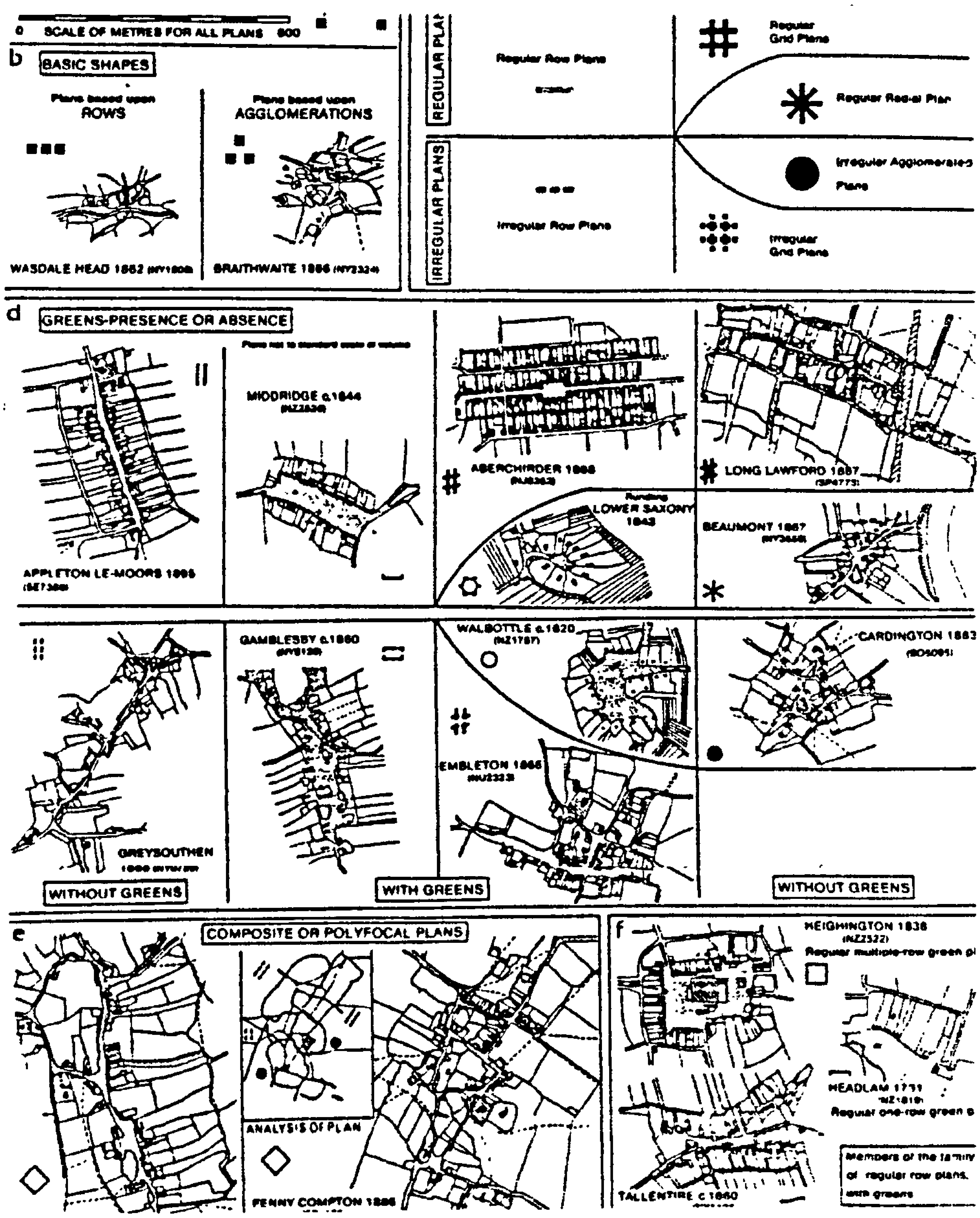

Fig. 2.2 **Settlement classificatory system.**
SOURCE: Roberts (1987: 25-26).

The accounts of multidisiplinary standpoints have led the study to two principles which underlie definitions of rural settlements in support of phenomenolgy and humanist theories:

1. Variations of site, size and socio-cultural function are taken as collective indicators of differences;
2. Historical frameworks underlie evolving forms.

However, observations suggest that as settlements evolved during the later part of the C20 new issues from changed relationships between configurations of buildings and site, size and socio-cultural function have raised questions about the accuracy of these indicators to represent distinctive identities. Housing estates more usually found in towns and cities are now commonplace on the fringes of rural settlements, thus sub-urban, urban and rural characters can be found in the same locations. Relations of pre and post war developments using site, size and socio-cultural indicators are shown in the following Table 2.1.

The responses show how the nature of settlements has changed and how definitions of pre war rural settlements have been eroded during the C20. The three responses in the pre war column express a *"totality"* (Thines, 1977: 73), a *"qualitative total phenomenon"* (Norberg-Schultz, !979: 8) in their unity around characteristics of site which is absent from responses in the post war columns. The responses reflect humanist and phenomenology theories of unity between physical elements of site and use which derive meaning from particular properties of place. Historical frameworks, therefore, are significant to site and socio-cultural function definitions in the continuation of traditions. Continuation also found in size definitions where evolving forms are contained by earlier frameworks from site and socio-cultural function. Thus positive response to the three definitions are woven together to provide an interpretation of rural settlements.

However, this interpretation is changed by negative responses shown in early post war and late C20 columns. Whereas infill housing, alterations and additions continue to follow historical frameworks, by far the largest developments are from estates of new houses located on the fringes of older settlements. Accretions have negative responses to all three definitions and display no awareness of historical frameworks.

	Pre war	**Early post war**	**Late C20**
Site	Figure-ground relationships. Awareness of historical frame works.	Accretions have no figure ground relationships. No awareness of historical frameworks. Small developments of infill nature follow historical frameworks.	Accretions have no figure ground relationships. No awareness of historical frameworks. Small developments of infill nature follow historical frameworks.
Size	Small increase. Awareness of historical frameworks.	Increases in settlement areas from housing accretions. No awareness of historical frameworks.	Increase in settlement area from housing accretions. No awareness of historical frameworks.
Socio-cultural function	Residential and industrial related. Awareness of historical frameworks	Residential. Limited relationship with pre war industrial functions. Decline of rural industries. Beginning of social dichotomy between old and new.	Residential. Unrelated to surviving industrial functions. Continued dichotomy between old and new.

Table. 2.1 Responses to settlement definitions using developments from pre and post war periods.

Thus the interwoven pattern of earlier settlement configurations is fragmented by these later additions and the humanist and phenomenology positions of unity from which rural settlements can be regarded as single pieces of architecture is eroded.

Three essential points identified from opposing arguments as general indicators of differences between urban and rural situations in town planning are:

1. *Rural settlements per se should be distinguished from the concept of open countryside, because the processes which shape and develop the built and unbuilt environments are nowadays often very different;*
2. *No population parameter can by itself represent the threshold between rural and other settlements;*
3. *Any broad definition of rural settlements should concern itself with the function and character of the settlement concerned.* Cloke (1983: 9).

But phenomenolgy positions argue the first point and third points are contradictory. Also, the population parameter between rural and urban is shown to be closely tied to size through the constraints of historical frameworks.

The ambiguity of the town planning premises indicates a need to rethink the contruction of settlement definitions. Negative and positive responses are manifest in man made forms and spaces in a *natural* setting, thus site is a relatively constant element over all periods and common to opposing definitions on degrees of complexity. Taken as a primary consideration in a phenomenology of settlement architecture it provides a contextual framework which underlies size and socio-cultural function, and thereby redefines boundaries between rural and urban in terms of figurative relationships with landscape.

The study hypothesises that rural settlements *per se* should not distinguished from the concept of open countryside but should be seen as part of it and figuratively related to it.

2.5.1 *Conservation of rurality.*

A fundamental key term and idea of spirit of place is 'rurality'. A dictionary definition of rural is: *"In, of, suggesting the country; pastoral or agricultural"* (The reader's Digest Dictionary, 1980), inferring relationships with the country and the life associated with it. It follows that settlements located in the countryside can be regarded as part of the definition of rurality. Rapoport (1969: 77-78) describes notions of rurality as group consciousness where enthusiastic responses are evoked by a harmony between landscape and buildings which is evident in traditional settlements.

Hence rurality is about identity and process, embedded in the gathering of natural and man made places.

There are therefore broad applications connected with all forms of rural development, restoration, modernisation, conversion, and additions, if we are intent on the preservation of rurality. The tensions which occur between existing settlement complexes and new housing accretions shows lack of consensus over notions of rurality in conservation objectives. Conservation can be broadly defined as

> a. *the restoration and refurbishment of existing structures;*
> b. *the development of an area through new building where an existing structure may form the key or impose the character of the whole; and,*
> c. *wholly new development within an area of character which is in turn enhanced by the new work.* Whittaker (Undated: 26).

Different conceptions of these objectives are found in practice. Three different approaches to place identity and conservation are identified[3] some of which have elements *"transparent in government and local authority policy, others less obvious and embedded in the values, attitudes and discourse of conservation professionals"* (Pendlebury, 1998: 4).

1. The approach of (SPAB) The Society for the Protection of Ancient Buildings Tradition which follows C19 writings by John Ruskin and William Morris. Integrity and honesty are essential to the retention of historic fabric and are usually applied to historic sites and monuments. The SPAB Tradition is clearly articulated and the best known conservation practice in public and private sectors.

2. The Urban Morphological Approach which is based upon the study of historical development of a settlement. It partly follows writings by Norberg-Schultz and theorises the development of townscape as a physical manifestation of the development of society imbued with cultural meaning. A detailed application of this approach demands careful understanding of the evolution of the settlement form. Recent interest in the approach by English Heritage differentiates between

a) the grain of the settlement expressed as: plots; patterns of lanes and alleys; and general historic topography; and

b) the townscape expressed as: shop fronts; and street furniture,

but interest by local planning authorities fails to recognise the significance of wholes and merely chooses singular elements of the settlement complex.[4]

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[3] The approaches are identified in a case study of Grainger Town by Pendlebury (1998) looking at issues of institutional capacity in regeneration process, and encompassing conceptions of place and identity as conservation objectives. The study conceptualises three models of conservation to help explain objectives which are sometimes complementary and sometimes in conflict.

[4] Pendlebury (1998) describes the protection of specific features of patterns of urban development now being incorporated in local planning policy, e.g. burgage plots.

3. The Visual Management Approach is orientated towards aesthetic and urban design considerations and has largely been responsible for 'facadism' and 'period' street furniture, reflecting English Heritage interest in townscape. It is a compromise position between conflicting objectives of conservation and renewal.

The three approaches describe separate interests of different parties in development and conservation processes and are in conflict over significance of historic fabric, town plans, and architectural form of new build. Pendlebury's interpretation of responses to these issues are shown in Table 2.2.

	1. SPAB Tradition	**2. Morphological Approach**	**3. Visual Management Approach**
Historic fabric	Retention of historic fabric	Important but not primary issue	Relatively unimportant
Town Plans	Neutral	Key factor	Only key features important
Architectural form of new build	Neutral	Need to respect morphology, scale mass etc., of historic area	Need to appear to respect scale, mass etc., in principal locations.

Table 2.2 Responses to historic fabric issues using three different sets of conservation objectives. Pendlebury (1998: 10)

Clearly, the second approach most closely reflects conservation of rurality by showing a need to respect morphology and historic fabric. Both responses 1 and 2 support phenomenological theories which argue that any true settlement is founded on *gathering* where man-made place visualises, complements and symbolises man's understanding of his environment.

> *Through building man made places are created which possess their individual genius loci. This genius is determined by what is visualised, complemented, symbolised or gathered.* Norberg-Schultz (1979: 58).

But this discussion has also shown that the three broad models of conservation are only partly representative of conservation of rurality as a group consciousness of responses to harmony between landscape and buildings, and identify a need for new conceptions of rurality in conservation approaches.

Clearly, harmony between landscape and buildings embraces old and new buildings and should therefore be emphasised as an objective of conservation of the settlement as a whole. Settlements are therefore theorised as whole pieces of architecture in the sense that they are organised structures where each element *"enters into a relationship of unique reciprocity with other elements"* (St.John Wilson, 1992: 41).

Implicit in this interpretation of settlement architecture is the formal connection with function. As a first principle it expresses some of the relationship between a settlement and its function researched by Best and Rogers (1973) and points to a proposition that settlements can regarded as whole pieces of architecture. In the evolving matrix of settlements a similarity is found with St.John Wilson's expression of architecture that relates to a proper sequence of operations, an order that grows from a demand of some functional purpose to be matched by its counterpart in building. This condition of dependence is true of all buildings from the monumental to the most humble, and where several buildings combine to serve a purpose it follows the condition is true of the group of buildings also. Further support for this proposition is found in a formalism of elements. Where several buildings combine to form larger groupings then according to the conditions of Aldrich (1963) and St.John Wilson (1992) they must demonstrate an order in their arrangement with each other. Using aerial readings of a region's physiognomy Brunhes (1997) examines milieu (the environment) and genre de vie (lifestyle) as limiting factors in shaping settlements. He argues the environment impressed its mark on those who inhabited it and on the things constructed from it, while human beings etched their presence on their buildings and works thereby reshaping the environment's physiognomy. He uses analogies between the layout of rooms of a house and parts of a settlement to demonstrate his argument that a unity of arrangement around a common use is apparent in each.

> *the relationship between the general physiognomy of the town and house; the house being an expression of this general physiognomy of the town, the house being a sort of tracing out of human inhabitation within certain general conditions of the geographic picture.* Brunhes (1997: 123).

The condition of dependence referred to by St.John Wilson (1992) is reflected in Brunhes' general conditions of the geographical picture. The relationship between the general characteristics of each is found in an analogy of purposes which are seen to pass from one to another. Taking the phenomenological position that these are closely tied to site, conservation of rurality is theorised as whole settlement in relation to its purpose and site.

2.6 CONTEXTUALISM.

The conceptual framework discussed in relation to a phenomenology of architecture has led the research towards contextual theory as a construct of urban form not style. This section builds on the writings and statements of Thomas Schumacher[5] who prescribes a figure ground analytical approach and the idea of differentiated building to reconcile modern urbanism with the traditional city. Figure ground plan diagrams illustrate the significance of form and spaces in creating the character of the city while differentiated building synthesises the *"deforming"* characteristics of site. Contextualism in the theories of Schumacher represents *"a middle ground position between an unrealistically frozen past with no future development permitted, and urban renewal with total loss of the urban fabric"* (Nesbitt, 1996: 295). Schumacher makes the observation that modern theories of urbanism and their application have tended to devalue the traditional city, with the result that urban configurations relate neither to the human being nor to the neighbourhood. These familiar criticisms reflect the conservation tensions discussed in the preceding sections where urban forms are found in rural locations. Hence the problems described by Schumacher are not limited to cities. This section discusses these principles in relation to rurality and develops a figure ground analytic system to explore *"systems of geometric organisation which can be abstracted from any given context (which contextualism seeks to divine as a design tool)"* (Nesbitt, 1996: 304). The construction of an analytic system is topical in current rural conservation issues, and follows the object of the study to strengthen an understanding of phenomenology as a way of looking at

[5] Schumacher was a student of Colin Rowe and his unpublished writings and statements referred to by Nesbitt (1996) reflect ideas of the Cornell University Design Studio with regard to building in the context of the city. The idea of collage was proposed by Rowe and Koetter as a method for uniting all parts of a pluralist situation after the ambivalence of utopian urban schemes.

rural settlement architecture, by showing how to document linkages between landscape and settlements.

Contextualism means fitting in with existing conditions, and has often been attached to stylistic situations to describe matching external materials such as bricks and tiles. This distortion ignores the wider applications of contextual theory as an analytical strategy, which are discussed here in relation to rurality. First, it is necessary to state some basic assumptions which form the ground rules of Schumacher's approach. He argues that the image of building as an object in itself is so much a part of the modern architect's vision that he is prone to see all ages of a building in these sculptural terms. The notion that some architectural forms can exist as fragments, collaged[6] into an environment, and that other forms can withstand elaborate deformations in the process of being adjusted to context have largely eluded the modern architect. It is precisely the ways in which idealised forms can be adjusted to a context or used as collage that contextualism seeks to explain, and it is the systems of geometric organisation which can be abstracted from any given context that contextualism seeks to divine as a design tool. Thus Schumacher's theory involves us with *"the urban structure of a given context"* (Nesbitt, 1996: 301).

Schumacher demonstrates the multiform nature of his figure ground theory of solids in voids and voids in solids in an analogy between the city and figure-ground plans of the Uffizi in Florence and Unité d'habitation in Marseilles.

> *The Unité is a rectangular prism, oblong and solid. The Uffizi is a rectangular prism, oblong and void. Both may be seen as "figures" surrounded by "ground", and each represents a way of looking at the city. An archetypal void seen as a figure in plan is a conceptual ambiguity since figures are generally thought of as solid. Yet when a void has the properties of a figure it is endowed with certain capabilities which "ground" voids lack.* Nesbitt (1996: 301).

[6] *"Rowe and Koetter distinguished bricolage (a term borrowed from Claude Lévi-Strauss) from collage, in which objects and episodes are obtrusively imported and, while they retain the overtones of their source and origin, they gain also a wholly new impact from their changed context. One can see the persuasive appeal of collage as a post-modern urban technique when it is defined as a way of giving integrity to a jumble of pluralist references which can allow Utopia to be dealt with as image, to be dealt with in fragments. The graphic techniques of reading developed by Rowe and the Cornell School offer a vocabulary (Built on solid/void relations) and syntax of continued validity for describing and understanding the city" Nesbitt* (1996: 54).

In other words to consider a space without the back up solid which provides its ground is to render an incomplete picture. Indeed, he theorises that figural space owes much of its vitality to the densely packed area around it recognised in the contrast between solid and void. In reversed black and white drawing the ambivalence of solid and void is obvious. Rasmussen (1964) explains this dual quality by illustrating perceptions of a black vase on a white ground.

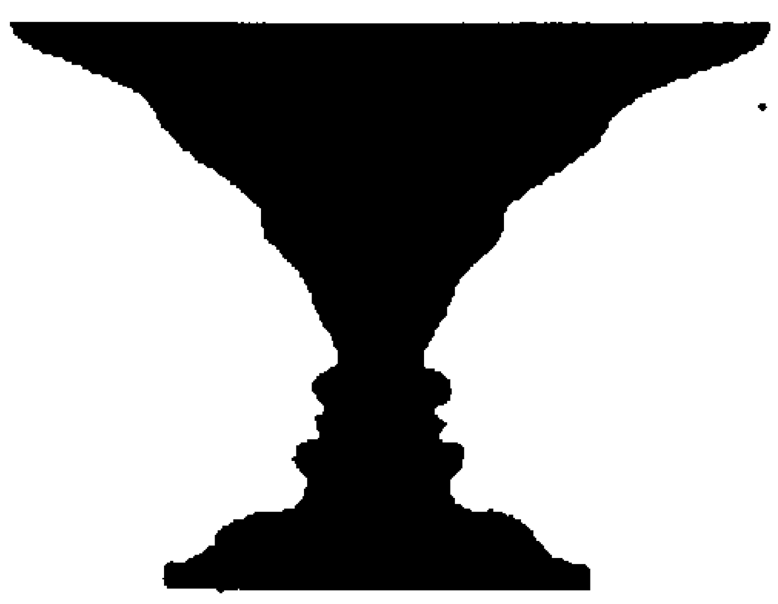


Fig. 2.3 Black vase on white ground.
SOURCE: Rasmussen (1964: 47)

Looking at the black object as figure the white has no apparent form, but if we consider the white as form instead of the vase we see two faces in profile. The purpose of this exercise is to determine that we cannot see both vase and profiles at the same time without a change in perception, yet the dependency between dual qualities of solid and void is indisputable.

Broadening this connection Schumacher theorises that abstracting zones and fields within particular city plans provides *"organising devices for further development"* (Nesbitt, 1996: 305), in which the presence of zones is generally related to certain periods of development. Two approaches are discussed to illustrate this point. The first uses grid plans which represent a careful use of order and brings the grids into spatial overlap to create a sense of place. Areas of collision are brought into sharp focus in need of resolution. The second approach which is developed from the first defines zones with hard edges in order to define context.

He demonstrates this in reversed black and white drawings with plans of Florence Cathedral and surrounding buildings to show the presence of zones generally related to different periods of development. The black figure of the Cathedral stands in a spacious white background in contrast to the surrounding tight-knit rectilinear black forms and white narrow streets representing a different period of development.

Figure 2.4 **Florence Cathedral Figure-Grounds**
SOURCE: Nesbitt (1996: 304)

Figure-ground abstractions show how *"important buildings and major spaces tend to section the city into a series of... fields"* (Nesbitt, 1996: 305). Hard edges define the different zones and clear differentiations can be seen between the central areas characterised by ornate building plans and open spaces and the surrounding simple rectilinear buildings and linear roads. In this way abstractions become tools for breaking different sets of buildings and spaces and to illustrate the interdependence of figure and ground. To consider one without the other is to render an incomplete picture. Schumacher likens these organisations to cubist painting, which he sees as an endless collage of overlapping forms which *"find their organisation via reference to larger elements often superimposed over them. In urban groupings a field of objects would be seen as a unit when they are defined by some dissimilar means of organisation"* (Nesbitt, 1996: 305).

Without some limiting organisational geometry the possibilities of combining various buildings becomes almost infinite, hence the use of the grid has become traditional. Schumacher is critical of this method since the grid has the effect of inhibiting sense of place because no place is different from another place. He compares this with the medieval town which he finds initially impossible to fathom but offers total orientation with familiarity. At Harlem where uneven terrain and diagonal axis provide the only resource for enlivening the grid he sees clues which point to an approach for redevelopment of the area.

Thus Schumacher creates a working formal shorthand which explains site pressures.

> *when presented with a design problem against which to measure the pre-deformed shapes given as the urban design exercise, the individual architect is in possession of an imput which shows him how to start making decisions.* Nesbitt (1996: 306).

Extending Schumacher's approach by taking an empirical rural environment, and assuming the recognition of both landscape and buildings as interdependent figure ground forms, the study theorises that structures of given contexts and textures are derived from configurations of landscape and buildings. Relating buildings to modulating characteristics of site we can arrive at a formally balanced contextual arrangement of buildings.

2.6.1 *Contextual figure ground forms in rural areas.*

Conceptions of solids in voids and voids in solids have been described to provide a general understanding of Schumacher's principles and to show how this contextual theory underpins rurality as context and texture in the figure ground theme. This has been described as zones and fields but the formal shorthand is limited by its focus on city texture and since landscape is not always readily translated into voids and solids a more vigorous graphic notation to measure pre-formed shapes of context and explain site pressures in rurality is required. Areas of collision and zones with hard edges foster images of linear defined spaces which are discussed by Rapoport (1969) and Cullen (1961) in terms of unity of plan, site and materials.

Rapoport differentiates between the charm and vitality of traditional forms and the drabness, dullness, and monotony of the new ones and theorises a harmony between buildings and site as an outcome of a strong geometry linked to landscape which is manifest in various ways.

> *The unity of plan, site and materials in traditional villages generates an enthusiastic response even in the most lay observers. Much of the response is evoked by harmony with the landscape, as well as a feeling of fitness to purpose, directness, and forcefulness. An intimate scale is created by a series of walls which not only enclose space, but also tie the houses together and link them to the landscape...The houses are related to the landscape through a strong geometry, some never using a straight line. The flowing lines of the buildings sit on the natural contours, showing a flair for visually combining and relating groups of buildings with such natural features as rock outcrops, trees, and land forms. The quality of these buildings is due as much to their being an expression of group consciousness as to the blending of building and land into a whole.* Rapoport (1969: 77-78).

Rapoport proposes a geometric notation system from flowing lines of buildings sitting on natural contours. The notation is linear and part of a selective process relating groups of buildings with landscape defined as contours, trees, land forms and rock outcrops. Rapoport refers to only few landscape features to illustrate his argument but clearly his animation connects geometric forms of landscape with figure-ground forms described by Schumacher and has further applications for articulating landscape as part of a figure-ground analytic system. Solid and void diagrams illustrate hard edges and define different zones in urban configurations, where there is a clear differentiation between buildings and spaces. Applied to landscape, hard edges are also found at divisions between land and sea, at riverbanks and at cliffs. But not all landscape is hard edged particularly where landscape is a continuous space. In these circumstances figure-ground diagrams are not able to represent zones without some addition to the geometric properties of the system. This study theorises that distortions of flat land by undulating hills are represented by a collage of contour templates which indicate magnitude of incline and orientates a hill in the surrounding landscape. A template is determined at any continuous level defining a line or edge in reference to the ground rising above and falling below it. In this way landscape is composed of connecting deformed lines or context-grid which follows Schumacher's enlivened grid at Harlem. The flowing lines of buildings which sit on contours exhibit abstract a geometric relationship with a template edge. Since this is also observed at the divisions between land and sea and riverbanks, rural context is shown to possess a variety of edges made up from different landscape characteristics. This is recognised by Cullen (1961) when he describes *"lines of force* (which) *have an obvious and immediate relationship with lines of demarcation in the geographical sense"* (Cullen, 1961: 111). His proposition implicates particular characteristics of context because the arrangement of the parts *"reflect certain lines of force which represent also the combination of circumstances that brought the town into being"* (Cullen, 1961: 111).

This connects context and texture through configurations which exhibit not only a relationship with the geometric properties of landscape but with specific functions and activities related to location. The next section discusses these abstractions in terms of textural figure-ground forms in given contexts.

2.6.2 *Textural figure-ground forms in rural areas.*

Texture is used by Schumacher to describe urban form as a collage of interwoven patterns of buildings. The communication of order and meaning is located in the paths and edges of specific textures. As part of these patterns theme and variation have already been discussed in terms of generating principles of architecture and how these are embedded in purposefulness, use and expressions of individuality. It has also been argued that the nature of architecture as a formal response to external needs is fundamental to the conceptual framework and ties buildings, site, and use together.

Thus textural figure-ground forms adjust to specific qualities of place in terms of different actions, purposefulness and use reflecting the phenomenological position of focusing, condensing and explaining environmental character. Differentiations between the contexts of coastal and inland locations recognise different environmental textures based on maritime and agricultural industries. Abstracting zones and fields to illustrate thematic deformations takes geographical and historical directions. Pre-textured environments are abstracted from historical contexts and build up a collage of fields and edges from early settlement formations to the present day.

This is illustrated in three studies by Robson (1986), Brown (1988), and Bettess (1997) who approach explorations of settlement configuration from different perspectives. Their themes are town and country planning, architecture and archaeology discussed from plans of settlements which illustrate interactions between the various settlement parts.

In his doctoral thesis Robson (1986) recognises uniqueness of place as a basis for planning policy. His proposition of uniqueness of place includes activities of its people and is based upon detailed knowledge of urban fabrics from town studies at Blyth and Hartlepool, where *"both ports...with similar areas of study and numerous features apparently, or at first sight, in common, were found to be fundamentally different in operation"* (Robson, 1986: 9). He found that not only were the towns unique, but parts of the same town and urban areas were discovered to operate in quite different ways. He theorises opportunity as a *"modus operandi"* for appraising attributes of a town.

His conclusions criticise planning policies for being submerged by corporate financial interest and unaware of local economies or uniqueness of place. In this he recognises a need for change and a design guide which takes uniqueness of place as its standpoint. An application for an analytic strategy in this instance arises from the shortcomings of Town and Country Planning procedures administered in the two different local authorities.

Brown (1988) explores mining settlements for similarities and differences in layouts and dwellings. Mining companies were seen as benefactors to a workforce which was drawn from ailing agricultural industries and in this respect there are similarities with Robson's observation of overriding financial interest in shaping settlements. But more importantly her study synthesises historical, technical, aesthetic and social fields of interest into an approach which reflects her wide knowledge of miners' cottages.

She concludes that it is the response to requirements of the local mining industry, explained as a product of local interest and materials, which gives cottages their identity.

> *Often large numbers of houses were built by a single colliery company giving the dwellings and the village a sense of consistency of design if the dwellings were of a high quality, alternatively a feeling of monotony if the design was inferior. Furthermore the 'waste' materials from the pit which were used to construct the dwellings, stone from the pit shaft and bricks from local clay, contributed to the homogeneity.* Brown (1988: IV, 61).

Brown also traces settlement forms to agricultural roots. Early settlements often followed a straggling pattern of small squares based on agricultural village plans around a central green. The settlement pattern developed through a series of stages to the more compact forms of the rows and grid iron of the later villages. Brown sees a correlation between the industrial processes of the mining industry and the configuration of the settlement pattern.

> *The development of the linear form facilitated ease of servicing to the cottages. The 'row' and the 'grid iron' pattern are seen as an extension of the industrial processes of the coal mining operation.* Brown (1988: IV, 65).

In a conveyor belt type operation of winning coal it is not difficult to see a correlation with the service advantages of linear forms of houses. This raises contextual and textural questions for investigation about linear configurations of settlements; if functional purpose overrides landscape characteristics in shaping settlement layouts.

Bettess (1997) takes a long historical perspective in her study of a single settlement. Her investigation is focused on the archaeological landscape and built up areas of Alnmouth. It uses multidisciplinary techniques to explore geographical, economic and social circumstances and their effects on the development of the settlement. Her aim is to make as complete a record as possible of the settlement over the whole duration of man's influence on the environment. By investigating linkages in the archaeological landscape and built up areas, she abstracts contexts and textures from early settlement formations to the present day. Bettess shows how circumstances from a broad base of social and economic events can be constrained by context where both buildings and site have a 'knock-on' effect for following textures.

Applications of the figure ground strategy can be found in these studies which theorise site as part of uniqueness of place. Whereas they do not demonstrate the Schumacher shorthand they do abstract differences in context and texture and from multidisciplinary standpoints illustrate how the analytic system can be applied as a general strategy to very different parti-themes.

Applications of the system can also be compared with terms of environment-behaviour relations (EBS) theorised by Rapoport (1990) as a new theory of design. He sees the environment as a genepool of historical data, and describes EBS as a scientific approach which addresses the question of relationships between the past, present and future.

> *(EBS) is a more or less "scientific" way of helping designers through programming, evaluation, or providing a data base. My own minority view is that EBS can go further than that: It can become the basis for the development of a new kind of theory of design - one based on a science rather than an art metaphor. The central question being addressed is clearly the relation among past present and future - in this case the possible lessons of history for environmental design theory and how these lessons might be learned. My suggestion is that some models, concepts, and principles* (lateral rather than linear approaches) *that have been developed in EBS will help provide valid lessons when based on the great body of environmental evidence that we possess.* Rapoport (1990: vii, viii).

Rapoport claims there is incontrovertible evidence for the highly culture-specific nature of settlement design in which patterns and regularities are likely to be highly significant. The purpose in studying historical data is to test concepts derived from current empirical research and to clarify them rather than illuminate the past. The object is to learn by analysis, to illustrate theories and concepts through case studies. Collages of fields of development from different periods proposed by Schumacher operationalise Rapoport's theory by setting explicit objectives and focusing the theory on context and texture.

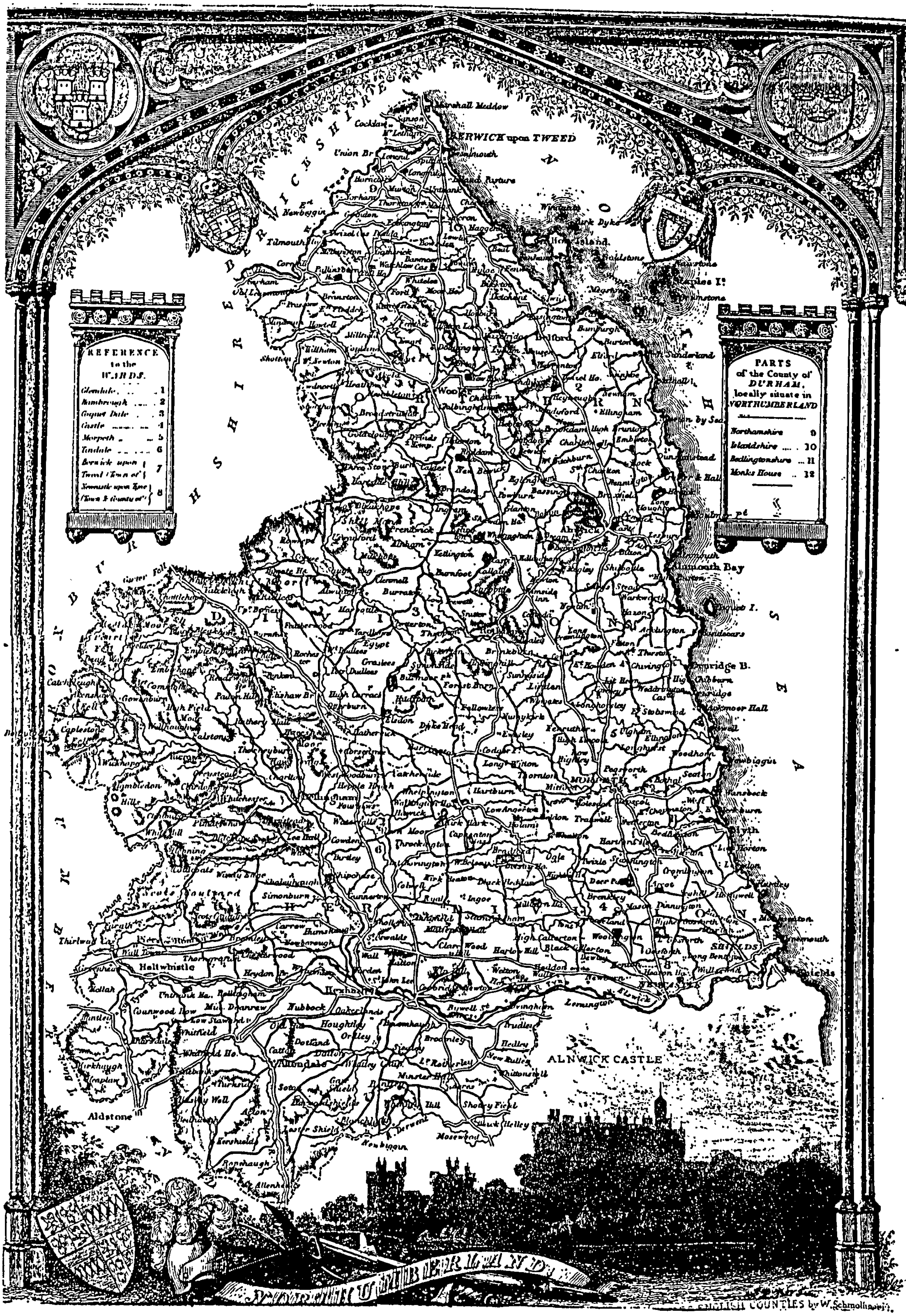
2.7 SUMMARY

The conceptual framework anchors the study in a phenomenology of architecture, and the tensions from conflicting conceptions of the conservation of rurality. The study has argued for clearer approaches to conservation objectives and interpretations of rurality.

The creation of specific places has been discussed from a phenomenology of architecture and humanist theories which has distinguished figure ground relationships and socio-cultural activities as key factors in the individuality of settlements. From this a coherent philosophy of architecture emerges, the conception of settlement architecture as a built order of unified configurations of buildings which possess figural character in relation to landscape and a strong sense of place as a meaningful social contruct - inherent local character. The chapter has theorised that the modern dilemma facing rural settlement development is a lack of understanding of these environmental characteristics, and that the creation of unique places and the conservation of distinctive rural settlement qualities in the face of tensions from new housing developments, is through a conception of the relationship between man and his environment. The study proposes that the context-grid analytic system can address these issues by providing flexible geometric strategies within which whole or parts of rural settlement can be analysed. It should be emphasised that the intention is to illustrate a flexible formal-shorthand which explains site pressures and central to the analytic system is uniqueness of place which brings with it special contextual and textural effects. The concept is contextual to specific places, but the study argues that phenomenological theory is strengthened by qualitative and quantitative studies of landscape and settlements in an articulated territorial focus.

This chapter has sought to provide a connection between the conceptual framework and contextual theories. It has also sought to show how applications of the analytic strategy assume abstractions and variations in context and texture of the elements, site, historicism, and configurations of buildings particularly in rural situations.

Research seeks to enrich understandings of landscape and settlement forms by exploring patterns and regularities in a diverse community of rural settlements. The next chapter describes the theoretical constructs of the research strategy, defines a contextual infrastructure from historic benchmarks and focuses the study geographically in a multiform and delimited landscape.



463. Moule's map, 1836

(Reduced from 7⅝" × 10⅝")

CHAPTER 3.
Research methods and the Northumberland context.

CONTENTS

3.1 INTRODUCTION.

This chapter connects the conceptual framework and contextual theory with the operationalisation of the research. It carefully defines the objectives of the research and develops theoretical models for testing by quantitative and qualitative methods and focuses the study historically and geographically.

Previous chapters have shown that the form of settlements is closely tied to site through landscape and use and has indicated how these are defined as context and texture figure-ground forms. Discussions have begun to expand urban contextual approaches into ideas of rurality. This chapter explains how context and texture can be illustrated from plans of rural settlements and how investigations test the hypothesis of individuality following socio-logic.

The chapter discusses the idea of experiment as a scientific method for inferring causal relationships and how this relates to social science analysis. Central to the methodology is a search for patterns and regularities which relate to the hypothesis of individuality. Statistical and case study research methods are explained as the foundation upon which to build data-analysis in preparation for detailed studies of settlements in following chapters.

3.2 EXPERIMENTAL PHENOMENOLOGY.

In phenomenology, perception is regarded as the primary source of knowledge in which subject and object are integrated, and therefore phenomenological research methods build around perceptual processes by focusing on the appearance and structure of things. The conceptual framework has already identified concerns with wholeness and contextualism has expanded this to the examination of contexts and textures from figure-ground plans. The research approach operationalises this strategy by following experimental phenomenology which is rooted in questions that give direction and focus to meaning, and in themes that sustain an enquiry. The approach attempts to control all factors which might affect what is being studied in order to specify the causal relationship involved. In these circumstances it is possible to define three conditions of determining cause and effect:

> *(i) that two variables co-vary such that when the experimenter manipulates one variable, the second variable varies without being similarly manipulated;*
> *(ii) temporal order - for something to cause something else to happen it must happen first;*
> *(iii) control for rival or alternative causal factors - we must be sure that other possible causes of the observed behaviour are controlled for.*
> Rose and Sullivan (1993:12,13).

Since the questions we ask derive from theory, it follows that what we measure in order to produce data, is also a theory guided process. Theory is a way of selective focusing that defines those elements which concern us, in other words data is constructed by being placed in a particular context which gives meaning.

3.2.1 *Objectives and composition of theoretical models.*

The previous section has described how investigations focus on a specific topic, construct a question to guide the study, and derive findings that will provide the basis for further research and reflection. Theoretical models are therefore a reflexive process of reduction from theories of Norberg-Schultz (1979), Zucchi (1992), Rapoport (1969, 1990), St.John Wilson (1992), Bruhnes (1997) and Nesbitt (1996) discussed in Chapter 2 and constructed around two objectives:

1. To strengthen phenomenology's representation of place by testing relationships between natural[1] place and man-made place in a random sample of settlements in rural areas;
2. To understand purposefulness and use in relation to properties of natural place.

The study theorises that structures of natural place are represented by topographical and geological variations. The research method therefore distinguishes geometric and structural information from the boundaries of different zones of relief, distribution,

[1] The term 'natural' place is developed from phenomenological interpretations of ground structures.

natures and strengths of different soils and bedrock for comparison with layout plans of groups of buildings.

Preliminary studies were carried out in two stages to test this topographical and geological model and to assess the difficulties of the research procedure. The first of these were carried out at rural settlements Stamfordham and Holy Island from site visits, with the help of OS Landranger Series Scale 1:50 000 and OS 1:10 000 and the Geological Survey Scale 1:50 000. Both settlements are constructed around a central green but one is coastal and the other is inland, providing opportunities to examine similar classified settlement structures[2] in different landscapes.

3.2.2 *Preliminary study of Stamfordham.*

Stamfordham is a settlement of about one hundred houses situated in the south of the county of Northumberland ten miles to the west of Newcastle with examples of pre and post war housing. Pevsner (1992: 576) describes houses dating from early C18 with some replacements of original buildings in the 1950s. The different shapes and relative positions of rows of buildings provide a sense of unity by their enclosure of a central green. The settlement is characterised by long rows of houses along the north and south sides, and substantial differences in their configurations. Illustrations show similarities between the structures of natural place and man made place.

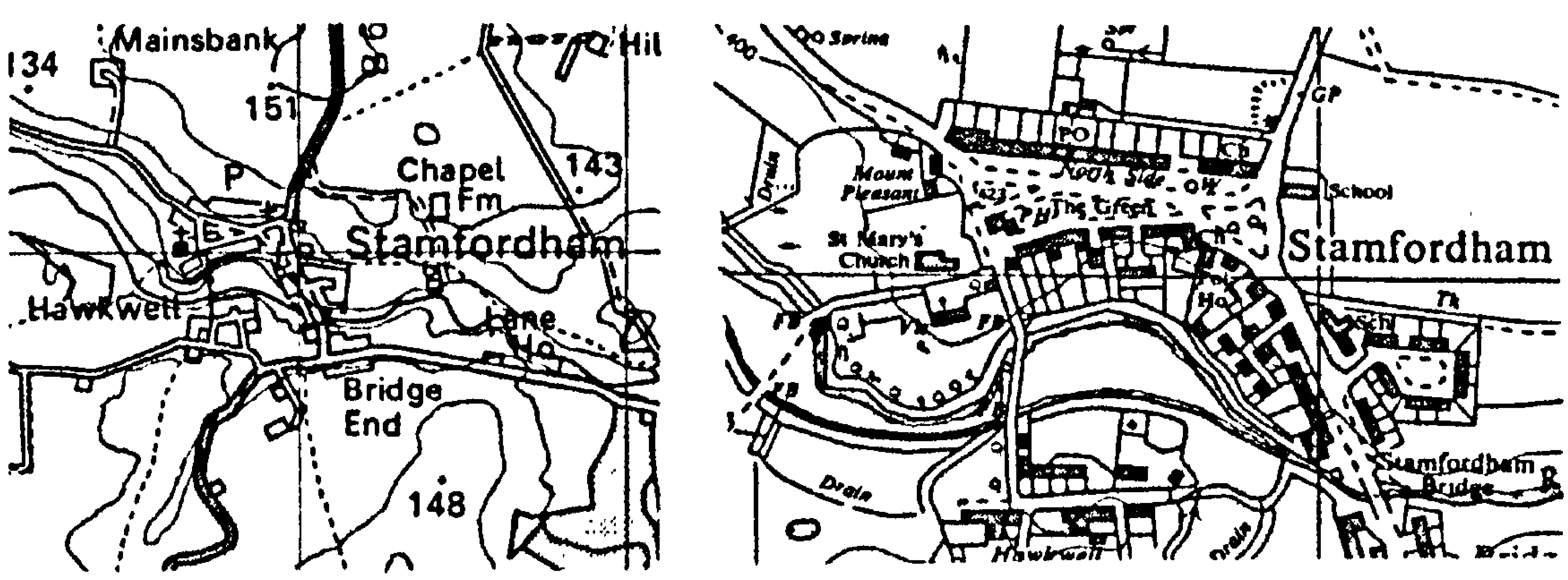


Fig. 3.1 Stamfordham c.1980
SOURCE: OS 1:50 000 ***SOURCE: OS 1:10 000***

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[2] Roberts (1987: 25 -26) recognises villages with a central focus (with or without greens) as a principal type in his classificatory system.

The topography is composed of two principle elements. The River Pont running in a W-E direction to the south of the village and an incline rising gradually to the north. **Fig 3.1** OS 1:50 000 shows the river curves sharply in the vicinity of the settlement with contours following this curve at the river bank and gradually straightening with increased elevation. OS 1: 10 000 shows buildings arranged in the same pattern as the contours with a curved row nearest to the river and a straight row where contours straighten to the north. The Geological Survey shows a similar pattern to the contours in the boundary between zones of boulder clay and alluvium.

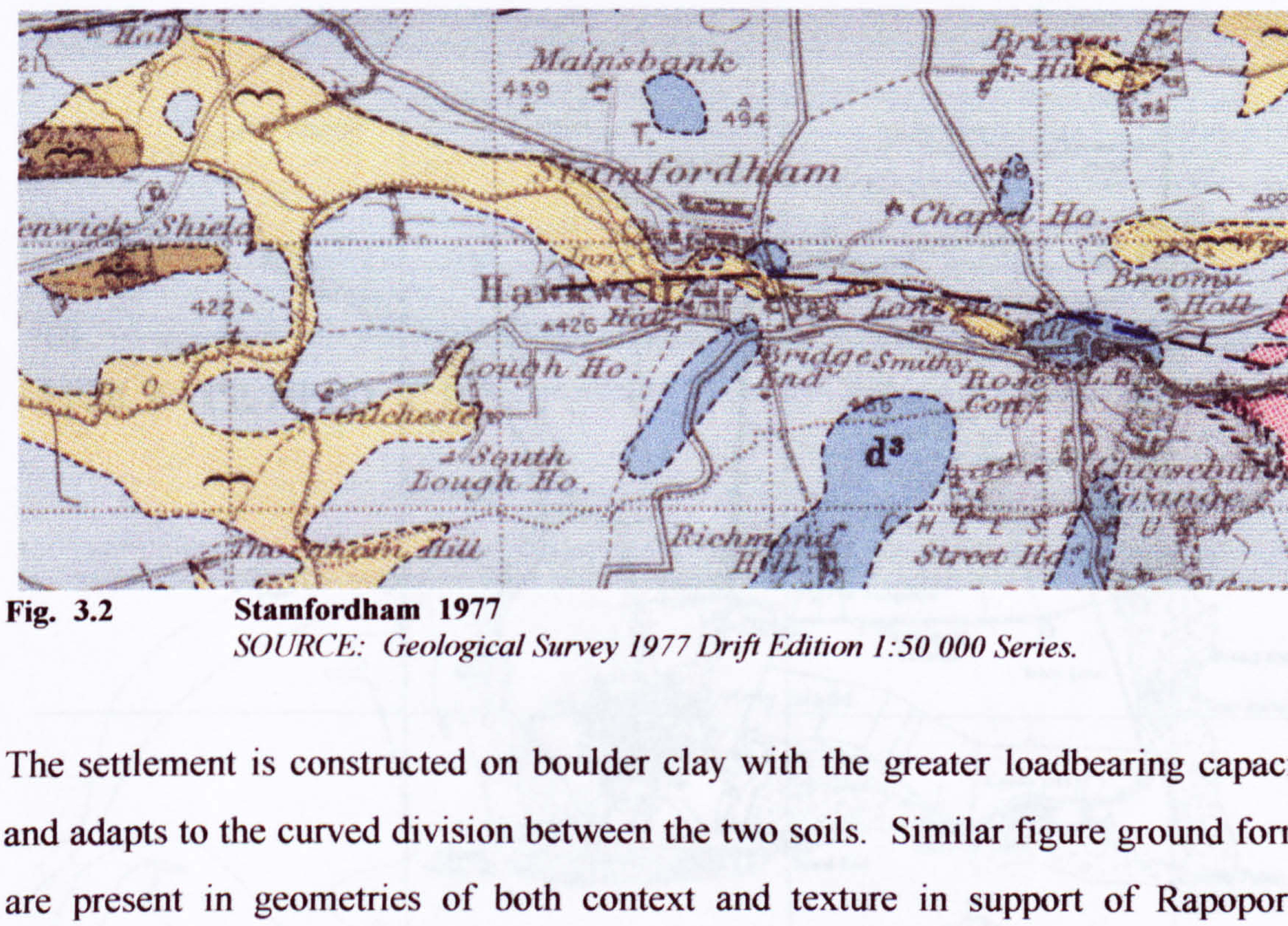

Fig. 3.2 **Stamfordham 1977**
SOURCE: Geological Survey 1977 Drift Edition 1:50 000 Series.

The settlement is constructed on boulder clay with the greater loadbearing capacity and adapts to the curved division between the two soils. Similar figure ground forms are present in geometries of both context and texture in support of Rapoport's description of buildings sitting on natural contours and the contextual discussions that building configurations abstract geometric relationships with contours as template edges and differentiate between qualities of soils. Replacement houses from the 1950s follow the original positions and lines of buildings providing a continuity between new developments and the old layout, so the relationship between context and texture is inherited at least from early C18.

3.2.3 ***Preliminary study of Holy Island.***

The exercise was repeated at Holy Island using aerial photographs and OS 1:10 000 and Geological Survey scale 1:50 000. Holy Island is a larger settlement than Stamfordham located at the south of the Island immediately to the north of the Priory ruins with a harbour for fishing boats to the east. The settlement has grown around a central market place and is a *"curious mixture of the pantiled vernacular and pebbledashed bungalow"* (Pevsner, 1992: 340). The topography is characterised by a steep cliff along the west coast, a hill to the south and a gradual descent to the harbour on the west.

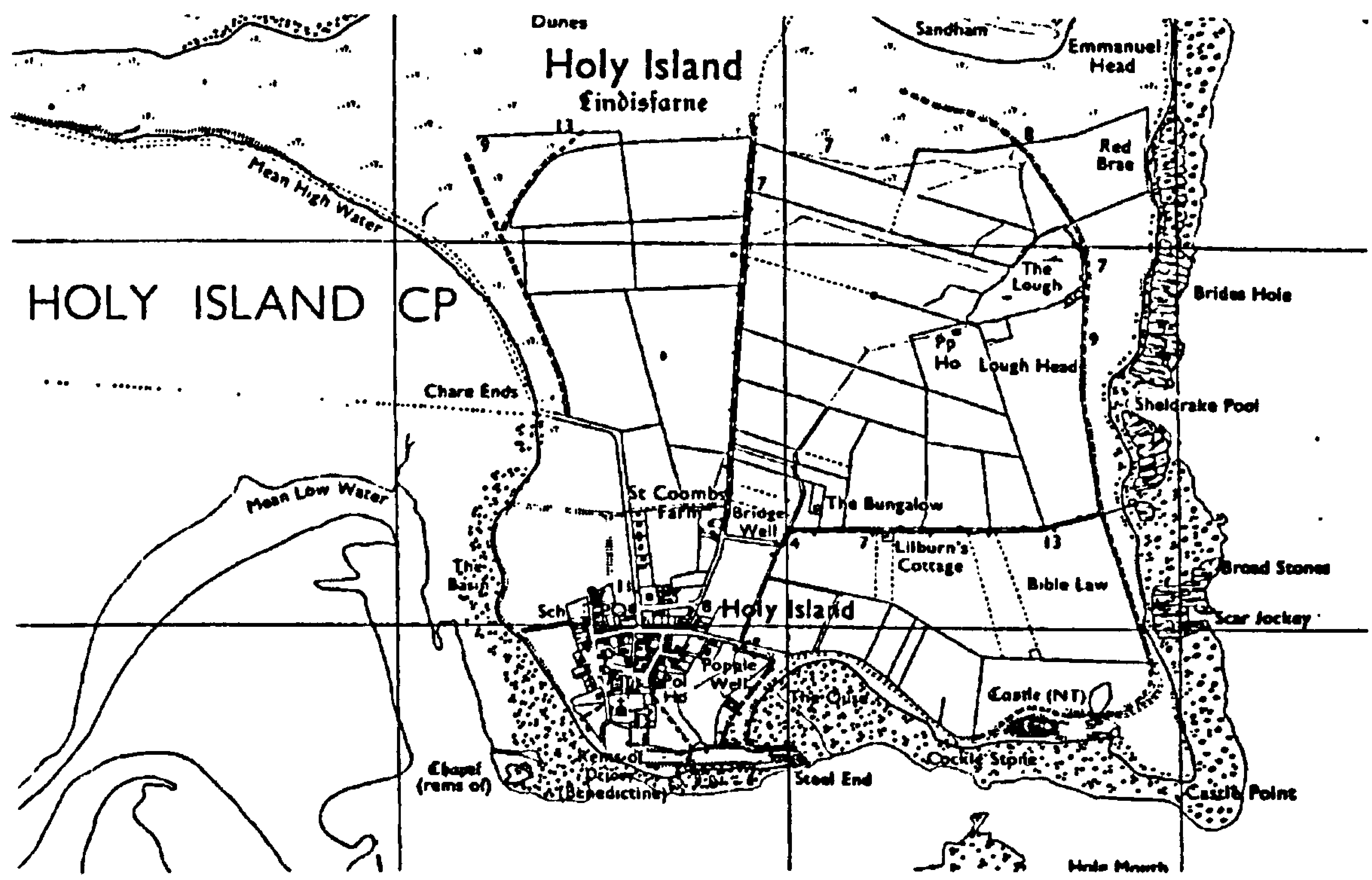

Fig. 3.3 **Holy Island 1995.**
SOURCE: OS Pathfinder Series, Scale 1:25 000.

Figs.3.3 and 3.4 shows the site of the settlement is almost flat. The buildings are arranged in a fan pattern with the narrow part at the Priory and widening towards the north. The overall configuration of the settlement is clearly perceived as a triangular zone of buildings with boundaries along three sides. Buildings along the west side of the settlement zone follow the hard edge formed by the cliff a short distance away and buildings along the east side of the settlement zone follow the line of the bay.

Comparing these zones and boundaries with the Geological Survey it can be seen the east boundary of the settlement zone corresponds to the division between good and poor loadbearing soils.

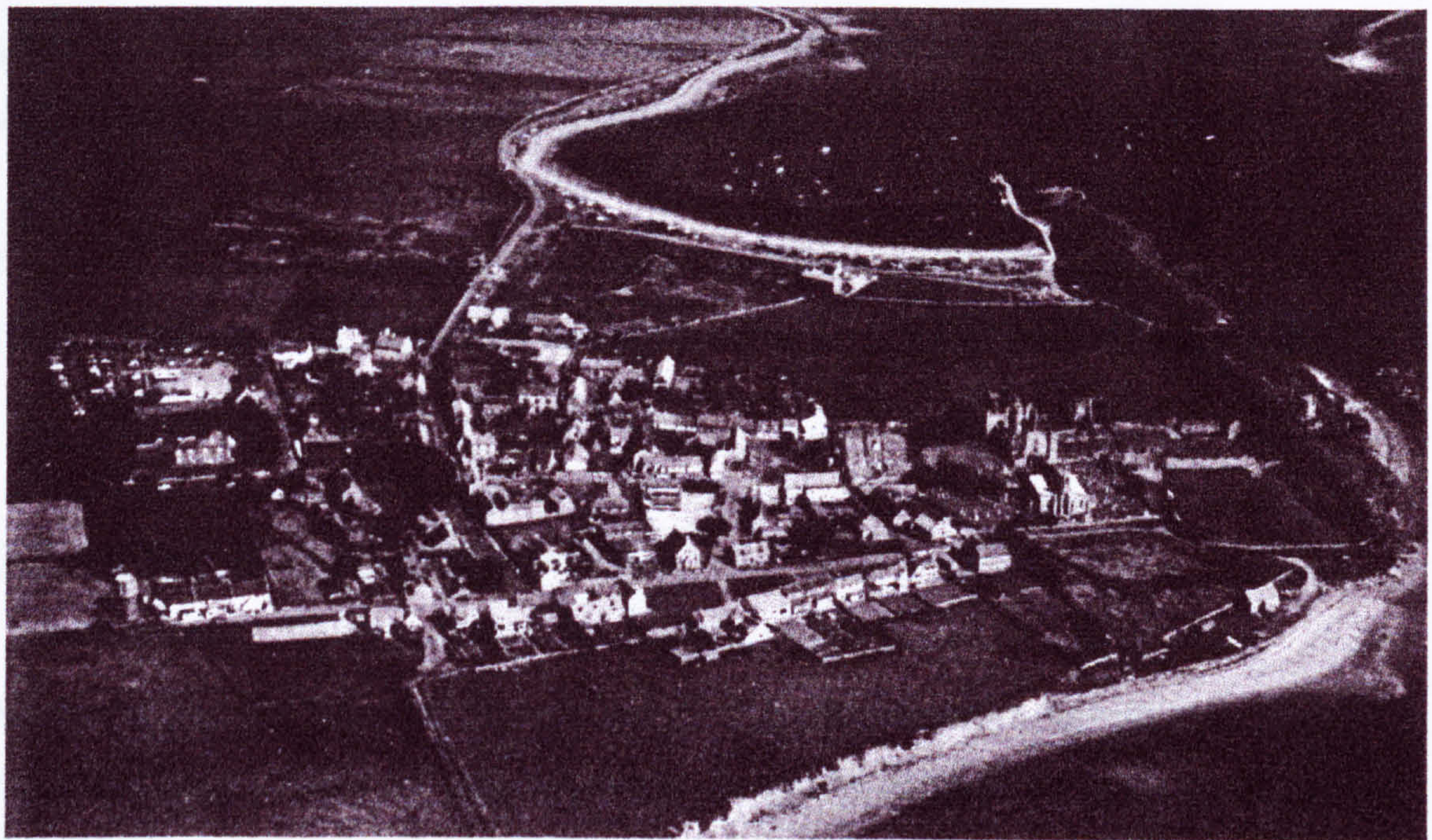

Fig. 3.4 **Holy Island c.1995**
SOURCE: Airfotos

Fig. 3.5 **Holy Island 1970**
SOURCE: Geological Survey 1970, Drift edition, Scale 1 inch Series

The settlement is constructed on a zone of boulder clay with the east rows of buildings following the boundary with the adjacent zone of raised beach. Similar figure ground forms of context and texture are found in topographical, geological and settlement boundaries in support of the theories that building configurations abstract geometric relationships with boundaries and hard edges of zones and that geology is significant in poor loadbearing ground conditions.

Medieval origins of man-made place are evident from the Priory, first built in the C11 (Pevsner, 1992: 335), and which defines the southern limit of the settlement zone.

3.2.4 *First theoretical models.*

Studies at Stamfordham and Holy Island identify differences in context and responses from buildings. These are summarised in the following table using six different sets of indicators.

	Stamfordham	**Holy Island**
Topography: River	Hard Edge where river forms boundary with the bank. Template of contours at riverbank. Followed by buildings to south.	Not applicable.
Cliff	Not applicable.	Hard Edge where sea forms boundary with the land. Followed by buildings to west.
Relief	Template of contour. Followed by buildings to north.	Templates of contours at hard edge with cliff and gradual fall to east. Followed by buildings to west and east.
Geology: Boulder Clay	Preferred soil. Zone visible on site. Followed by buildings to south.	Preferred soil. Zone not visible on site. Followed by buildings to east.
Raised Beach	Not applicable.	Avoided. Zone not visible on site. Followed by buildings to east.
Alluvium	Avoided. Zone visible on site. Followed by buildings to south.	Not applicable.

Table 3.1 Responses to natural place using six different sets of indicators

Different loadbearing characteristics of types of soils from the Geological Survey can be related to land with or without buildings.

Group	Class	Types of soils	Presumed bearing value kN/sq.m
III Cohesive soils	15 and 16	Boulder clay	150 - 600
ditto	18 and 19	Alluvium	<75
II Non-cohesive soils	14	Raised beach	<100

Table 3.2 Bearing capacities of three different types of soils.
SOURCE: British Standard Code of Practice CP 2004: 1972, table 1.

At both settlements there is a preference shown for land with greater loadbearing values corresponding to Group III on Table 3.2. But preliminary studies have also shown that buildings adapt to boundaries between different zones. At Stamfordham indicators river, relief, boulder clay and alluvium are shown to have responses in building configurations. At Holy Island, cliff, relief, boulder clay, and raised beach are shown to have responses in buildings configurations too. It is also shown that on the east side of this settlement the geological boundary between boulder clay and raised beach has a response from building configurations where the geological zone is not clearly defined by surface feature. It may be argued that generally topography follows the geology particularly since topographic base maps are used to locate the geology (Maltman, 1992: 1) and therefore a response to one is also a response to the other. But at Holy Island there is a case where the boundary between geological zones is significant in shaping settlement in the absence of topographic figure ground forms, thus identifying geology as a separate indicator. Natural place is therefore distinguished as topographical and geological figure ground forms and it follows that a self regulating theoretical model brackets these indicators in a cause and effect relationship:

Topography and geology are significant in shaping building configurations of rural settlements.

In both settlements more than one instance of corresponding relationships were found. At Stamfordham two relationships with topography and one with geology (one realtionship is measured as a boundary between two zones), and at Holy Island two with topography and two with geology are recorded. If same configurations of topography and geology are taken as one relationship then there are two in total at each settlement. This highlights problems of defining variables to represent topographic and geological indicators from such a small sample and therefore further preliminary studies test the model in larger numbers of settlements before constructing variables for statistical measurement.

Theories discussed in Chapter 2 have distinguished definite structures of place and time in context and texture relationships. To highlight the significance of temporal sequences in evolving textural structures indebted to prior systems a second theoretical model is constructed which pin-points these man-made structures and directs the research towards the second and third cause and effect conditions by mediating use and historical frameworks with changing settlement formations:

Location and historical frameworks provide opportunities for and place limitations on evolving settlements patterns.

The model reflects the phenomenological and humanist theories of socio-cultural use in the individuality of settlements and taken with the topographical and geological elements of the first model construct images of settlement architecture as a built order of buildings and strong sense of place.

The preliminary studies have relied upon plans of settlements drawn from maps, although additional data is accumulated from aerial photographs (where available), site visits and visual surveys. Some discussion is therefore required about the reliability and validity of these data sources and the quality of information available.

3.2.5 *Data sources.*

Both primary and secondary methods of collecting data are discussed for their validity and reliability. Validity is concerned with whether or not settlement plans provide the best source of data measurement in relation to the theoretical model, and reliability asks about the consistency and dependability of the measurements taken. There are questions regarding accuracy of what is recorded, gaps in the information recorded, and selective noting and recording. Whereas it is not suggested cartographers deliberately try to mislead, there is a view that the information they illustrate is selective because of the volume of information available. According to Roberts *"errors are simply one of the hazards of cartography"* (Roberts, 1987: 12) and argues this is because the large body of information stored on maps is vulnerable to errors of commission and omission. These problems identify the competence of the cartographer and the level of his technical skill especially prior to first Ordnance Surveys as particular concerns in the quality of measurement, and demonstrates the importance of visual surveys as a primary data collection method to assess the objectivity of the information given on maps.

Discussions with local residents have provided a good deal of rich data about physical and social changes, sometimes pointing to valuable pieces of evidence that would otherwise have been missed and strengthening the studies. Questionnaires and interviews were not used because of the contextual nature of the study and the evidence found on maps.

Surveying land and buildings is a well established service provided by architects. The author is well practised in techniques of measurement and drawing up buildings and sites and is able to approach the collection of primary data from a practical perspective and with first hand knowledge of visual surveys. The visual survey system is also employed by archaeologists which combines site walking with recent OS maps to distinguish modern features and residual components from earlier periods. Direction of slopes, spaces between buildings, omissions and additions, relative positions and shapes of groups of buildings, boundaries, purpose groups, access, distribution systems are compared with maps to build up a robust representation of the settlement configuration. It does not have the accuracy of measurements with tape, rod and dumpy level but it is beneficial in reducing survey time where many settlements are to be explored[3] and where relative configurations are more important than precise dimensions of walls and spaces.

One of the most significant observations made from the preliminary studies is that first hand knowledge accumulated during this process can not always be shown on plans, particularly working practices associated with use. At Stamfordham a description is required to understand that the central area was a collecting point for cattle at a ford over the River Pont, thus linking the settlement with agricultural use. This enrichment of secondary data from primary sources is important in the development of a theoretical model which seeks to understand use as a formative element of settlement configurations. Such a robust analysis of phenomenon which seeks temporal orders and explanations of alternative causal factors requires an analytic system based upon detailed investigations of single settlements, and is discussed in more detail in the following comparison of quantitative and qualitative methods.

Secondary data sources are generally divided into three types of maps: topographical; thematic; and cadastral, supported by archival illustrations[4]. Interpretation of physical features follows basic principles of map reading.

Topographic maps are illustrations which describe the surface features of an area, including land forms, and other aspects of human and natural origin and provide the core of secondary sources for exploration of settlement plans. During the C18 and C19 initiatives in the production of medium and large scale maps was taken by private surveyors in the absence of any general scheme of organising and financing of mapping on a national basis. Rapid changes in economy and society created a demand for cartographic documents showing change, often with legal implications. The demand was met by men who had been estate surveyors. Many maps of Northumberland were produced at small scales and three are particularly descriptive:

[3] Particularly in quantitative studies where a population is composed of many variables.
[4] Visits to archives at Alnwick Castle to inspect burgages, enclosure acts and awards provided valuable data, but copies were not allowed to be taken because of risks of damage. Notes were taken for later comparison with topographical, thematic and cadastral maps.

1769 Lieutenant Armstrong and Son, scale 10 miles to 3.312 ins.

1820 John Fryer & Sons, scale 8 miles to 7.8 ins.

1828 Greenwood, Scale 7 miles to 7 ins.

Whereas they do not provide detailed information of the type found on later OS maps, they illustrate general patterns of land use over large areas and are therefore valuable when read in conjunction with later OS maps, for noting chronologies of settlement changes. Comparisons with more accurate OS maps checks the data on earlier maps and gives a greater degree of reliability to the data collection procedure.

Thematic maps are represented by the Geological Survey which shows the distribution of different kinds of rock at the earth's surface. Thin coverings of soil are omitted but superficial deposits of geological interest such as dune-sand, till, and peat are normally shown. Maltman argues it is important to understand that the geological map is a highly interpretative document, and numerous interpretative steps are involved in its production.

> *Right from the moment the geological surveyor stands at an exposure of bedrock at the earth' surface, or examines a piece of drill core, subjective judgement is exercised. The surveyor has continually to decide to which formation, eventually to be a particular colour on the completed map, each rock exposure will be assigned...The completed map therefore reflects the surveying team's state of knowledge of the map area; even to some extent the state of geological science at the time.* Maltman (1995: 7).

One of the most important judgements a geologist has to make is the basis on which to divide the rocks of an area in to map units. Except in cases of perfectly exposed ground the geologist will have to infer the course of an outcrop. New technologies help in this respect. Drill core, seismic data, and remote sensing and computer methods in map manipulation and production are all modern tools to assist the accuracy of the information illustrated. Maps are continually being updated to incorporate these new technologies and there is therefore a continuous refining of information over time. Clearly the most reliable data is found on the most up to date maps. Site walking is used to interrogate the map data, and in all cases investigated it has been accurate.

The Geological Survey is described as "a powerful scientific device" which is both "scientifically sound and artistically attractive" (Maltman, 1992: 7), and **Figs. 3.2** and **3.5** have already illustrated some of these qualities at particular locations. **Fig. 3.6** shows a larger area to illustrate more fully the variety of design and dual qualities of data and array of colours which characterise geological maps. Symbols and colours which identify types of soils are shown in Appendix D.

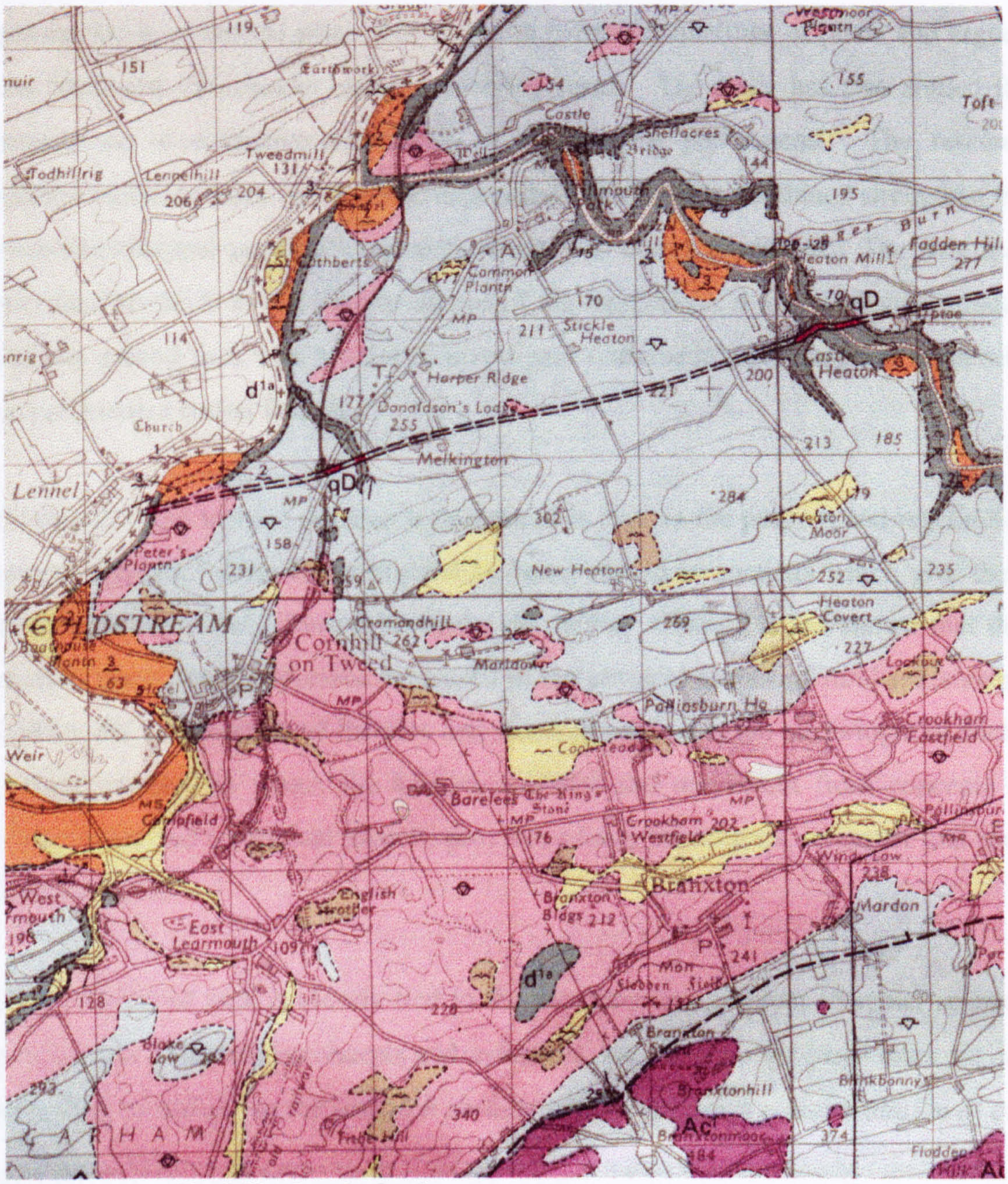

Fig. 3.6 **North Northumberland**
SOURCE: Geological Survey Drift Edition, 1979

Cadastral maps are tithe, burgage and enclosure maps showing ownership of land. When used in conjunction with later OS maps they help define particular locations of building lines and boundaries and add to the chronologies of settlement changes.

3.3 RESEARCH METHODS.

The previous sections have theorised topographical and geological indicators as figure ground forms of natural place, tied use with particular qualities of place and argued that historical frameworks underlie evolving forms. The study has also argued the importance of collective association to characterise phenomena. The research method therefore takes two analytic approaches which when combined strengthen the phenomenological position by meeting cause and effect conditions. The first uses statistical methods to test the prevalence of the topographical and geological model, and the second uses case studies to investigate settlement uses, temporal sequences and alternative causal factors.

Empirical social science research is concerned to explain the patterns and regularities society exhibits.[5] Data is constructed by being placed in contexts which give them meaning when viewed from a particular discipline. Chapter 2 has shown that this study is about social processes expressed in the physical shapes of rural settlements. Linking the construction of theories and research method is the socio-logic of social science research in which the knitting together and movement from concepts to observations and theoretical models, provides a basis for analysis, inference and back to theory again.

Interpretation of data is closely tied to the measurement problem in social science, which seeks to reconcile concepts and indicators, but *"how do we know when we are observing something in the research process which represents a manifestation of our*

[5] *"...the object of data analysis should be to aid us in arriving at a better understanding of the operation of social processes. We have questions which we wish to answer but those questions must derive from theory; and it follows that what we measure in order to produce data, and how we analyse those data, is also a theory guided process which leads in the end to new ways of thinking about the world, and to more theoretical puzzles"* (Rose and Sullivan, 1996: 4).

initial concepts and theories" (Rose and Sullivan, 1996: 12)? Chapter 2 has shown recognition of figure ground forms is crucial in interpretations of correlations between context and texture. Interpretations are therefore from personal observations which take an approach described by Eglin (1975) in his documentary method of interpretation:

> *The method consists of treating an actual appearance as the 'document of', as 'pointing to', as 'standing on behalf of' a presupposed underlying pattern. Not only in the underlying pattern derived from its individual documentary evidences, but the individual documentary evidences, in their turn are interpreted on the basis of 'what is known' about the underlying pattern.* Elgin (1975: 385).

He presupposes a background knowledge about the propositions based on personal experiences, and concludes that interpretation is a matter of understanding and judgement and is foundational for the practice of science, specifically sociology.

> *It is that...work of interpretation, whether found in the practice of scientists or of other societal members, that is the proper object of sociological inquiry and explanation.* Elgin (1975: 386).

The work in recognising figure ground forms from plans of settlements and maps of topography and geology and how this is woven into the construction of theoretical models is therefore essential in tracing correlations.

The analytic goal of the quantitative and qualitative research is to test findings against the predictions of theoretical models. If these tests are not passed then the models may need repair or restatement, or perhaps require a narrowing of the scope of their aims. In this respect they are constructed as self regulating models and are amended when necessary as the study proceeds.

3.3.1 *Quantitative approach.*

A variety of statistical techniques are used in empirical research in order to establish whether a relationship between sample variables may be inferred to apply to the population from which the sample was drawn. Significance tests form the central core of statistical inference, and are the technique of analysis by which statistical inferences concerning the relationship between two or more variables in a sample can be generalised to a population. Perhaps the two best known parametric tests are chi-square, which makes simple assumptions about underlying distributional form, and is suitable for simple nominal variables, and Spearman's rank correlation coefficient, which is widely used for variables consisting of ordinal or interval scales. To test the prevalence of the phenomenological theory of relationships between figure ground forms for context and texture, frequency distributions from nominal level measurements of site and settlement variables are analysed for significance using the chi-square test. The test gives numeric substance to contextual theories, and seek to demonstrate that relationships are widespread in settlements in rural areas.

Further analysis explores associations with different physiographies. This manipulation of site variables serves the second aim of the statistical study, to build images of settlement individuality by tying contexts and textures in different locations. Topographical and geological figure ground forms from different physiographies are compared with settlement plans, to tie texture to the phenomenon of particular properties of place. The study theorises that rural settlement individuality is an effect of a relationship with the unique structural arrangement of site in which higher frequencies of relationships are found where landscapes are most heavily sculptured. Opposing positions of heavily configured and almost featureless landscapes are therefore compared from relative strengths of associations with settlement plans to distinguish relationships in particular contexts.

To do this within statistical principles requires the construction of a probability mechanism which introduces an element of randomness into the sampling procedure. The aim is to draw samples of settlements which are a true representation of the population[6] with as much precision as possible. The study adopts a stratification

[6] *"One of the first steps in survey design is to define the population to be studied. Here the term "population" is used in the technical sense of the totality of the elements under study, where the elements are the units of analysis. The elements may be persons, but they could alternatively be households, farms, schools or any other unit"* (Kalton, 1987: 6). In this study elements are settlements.

sampling system to ensure representation of different physiographic groups in the proportions[7] they exist in the whole settlement population.

3.3.2 *Qualitative approach.*

The previous section has argued that a delimited landscape with many variations in physiography will focus the theoretical model in a range of different contexts which limit configurations of groups of buildings. The qualitative study theorises that different contexts must also offer opportunities for development and investigates how these are limited not only by zones and edges but also by historic frameworks.

Settlements from a variety of different uses are selected for investigation of patterns which connect building configurations with social processes. Chapters 2 and 3 have already discussed the significant temporal consideration in this approach since social processes and uses change considerably over time and configurations adapt to different conditions. As rural settlements evolve they create their own phenomenon of landscapes of buildings which constrain following developments. To examine these limits chronologies of development are constructed and effects sought in elements which persist from one period to another. There is a simple logic to this method of analysis from which it is possible to establish chains of events which combine to effect settlement configurations up to the present time. This is worthwhile discussing here because it has significance in establishing some causal links in the developing settlement matrix. It is an analytic structure which draws from the logic of succession, that *"some events must always be followed by other events on a contingency basis"* (Yin, 1994: 117). Yin explains that if the events have followed a predicted sequence of events then the study becomes the initial basis for causal inference. The replication logic of exploring different settlements is explained by Yin (1994).

> *The replication logic is analogous to that used in multiple experiments. Thus, if one has access only to three cases of a rare, clinical syndrome in*

[7]For details of the stratification system see Kalton (1987: 19).

> *psychology or medical science, the appropriate research design is one in which the same results are predicted for each of the three cases, thereby producing evidence that three cases did indeed involve the same syndrome. If similar results are obtained from all three cases, replication is said to have taken place...The logic underlying the use of multiple case studies is the same. Each case must be carefully selected so that it predicts similar results (a literal replication). This replication logic...must be distinguished from sampling logic commonly used in surveys.* Yin (1994: 45)

This approach is supported by Babbs[8] who also claims diagramming causal chains is fundamental to explanation, and comparison with other cases where replication is also evident further bolsters the inference.

An objective of the qualitative analysis is to build on and enrich the findings of the quantitative analysis through investigations of social and cultural considerations as essential elements in the shaping of settlements, particularly the relationships between use, location and place. These relationships are explored in the contexts of needs, opportunities and provision. Figure ground forms from shapes of groups of buildings, location and place are identified and compared to define opportunities for settlement development and limits which constrain the building configurations. Chronologies are illustrated by maps of settlements which highlight key changes in the evolving process. The ability to trace changes over time is a major strength of case studies which are not limited to cross-sectional or static measurements of a particular situation. Historical events and practices which run in tandem with map based chronologies are also examined for alternative causal factors in the shaping of settlements. The goal of this exploration is also to identify reasonable threats to the validity of repeated comparisons and to examine alternative theoretical propositions. The essential logic underlying this time-series design is the match of a trend between data points with different patterns postulated for different cases.

The qualitative approach has described how case studies investigate temporal order and alternative causal factors as an addition to the quantitative study to meet three conditions of cause and effect discussed at the beginning of this chapter and to lead to

[8] Notes from a lecture by Dr James Babbs in November 1996 as part of the Newcastle University Post-Graduate Training Programme in Social Sciences.

a rich explanation of the complex pattern of outcomes. The next section illustrates ways in which Schumacher's figure ground forms are used as an analytic tool to collect data in quantitative and qualitative research methods.

3.3.3 *Figure ground forms as linear figures.*

Schumacher's figure ground forms of context and texture have already been discussed in relation to theories of Rapoport (1969) and Cullen (1961) in Chapter 2 and the application of the formal shorthand to elements of natural and man-made landscapes. Figure ground forms have been theorised as edges between zones of topography and geology and this section connects these elements of landscape with buildings and spaces in an analytic strategy which builds images of rural settlements as corresponding formation of context and texture.

The possibilities of organising buildings within an unarticulated contextual system are infinite and Chapter 2 has argued that to limit the range of possibilities the grid system has often been traditional. Such a geometric system imposes its own rules on both context and texture and at first glance has little in common with contextual theory. However, following contextualism's search for a formal shorthand with which to explain site pressures the study theorises contours as a series of imaginary lines which have a geometry not dissimilar to an axis of a grid, but arranged to articulate a system of geometric organisation of landscape. An order is established by this approach similar in concept to the grid but without the rigidity of straight lines and freed up by pre-deformed shapes. The general conception of contours as horizontal lines which when placed in conjunction with others illustrate degrees of changes in relief is also an expression of the directions of change both vertically and horizontally which when read together give a general impression of the context. Linear figures from topography have already been discussed in Chapter 3 as lines from a collage of contoured levels which can be illustrated as a series of overlapping zones of pre-deformed shapes. In addition to topographic contours geological divisions also create imaginary lines on the landscape where different zones meet.

Therefore every site is a matrix of contours and geological divisions which distinguish the context of a particular place.

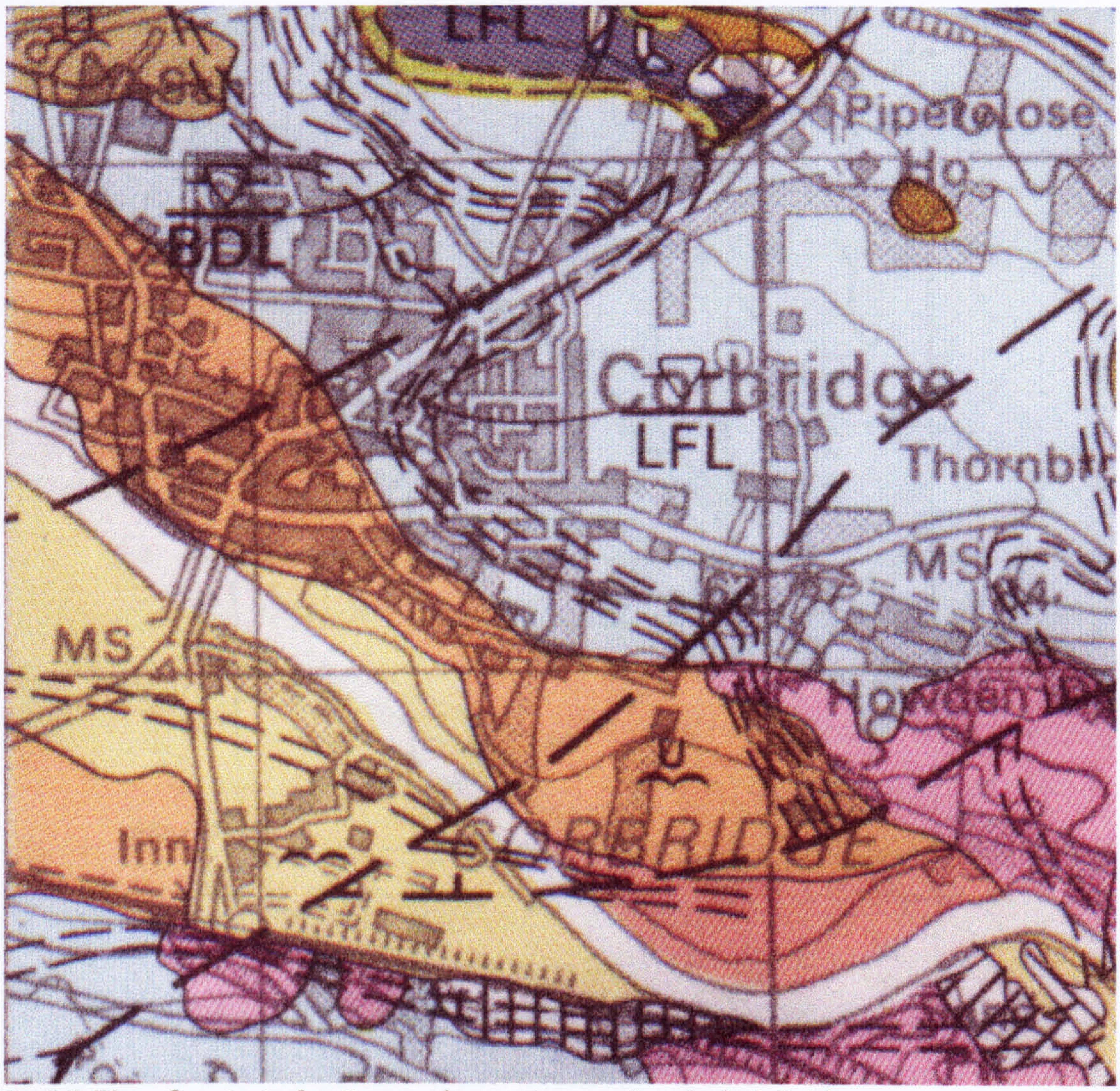

Fig. 3.7 Plan of contextual patterns using contours and geological divisions.
SOURCE: Geological Survey 1992 Sheet 20

Fig. 3.7 is an example of the Geological Survey showing contours and geological zones and divisions. Geological data is added to a topographic base map in order that the geology can be located, but when the object of selecting topographic and geological data is for comparison with formations of groups of buildings then the combined data illustration is confusing with contours sometimes obscured by geological information and vice versa. Given the topographical and geological variation in correspondence shown in the preliminary studies at Holy Island topographic maps and geological maps are illustrated separately as figure ground forms which follow the shapes of boundaries between different zones, boundaries and edges of contexts for comparison with the shapes of textures which are determined by edges of building lines.

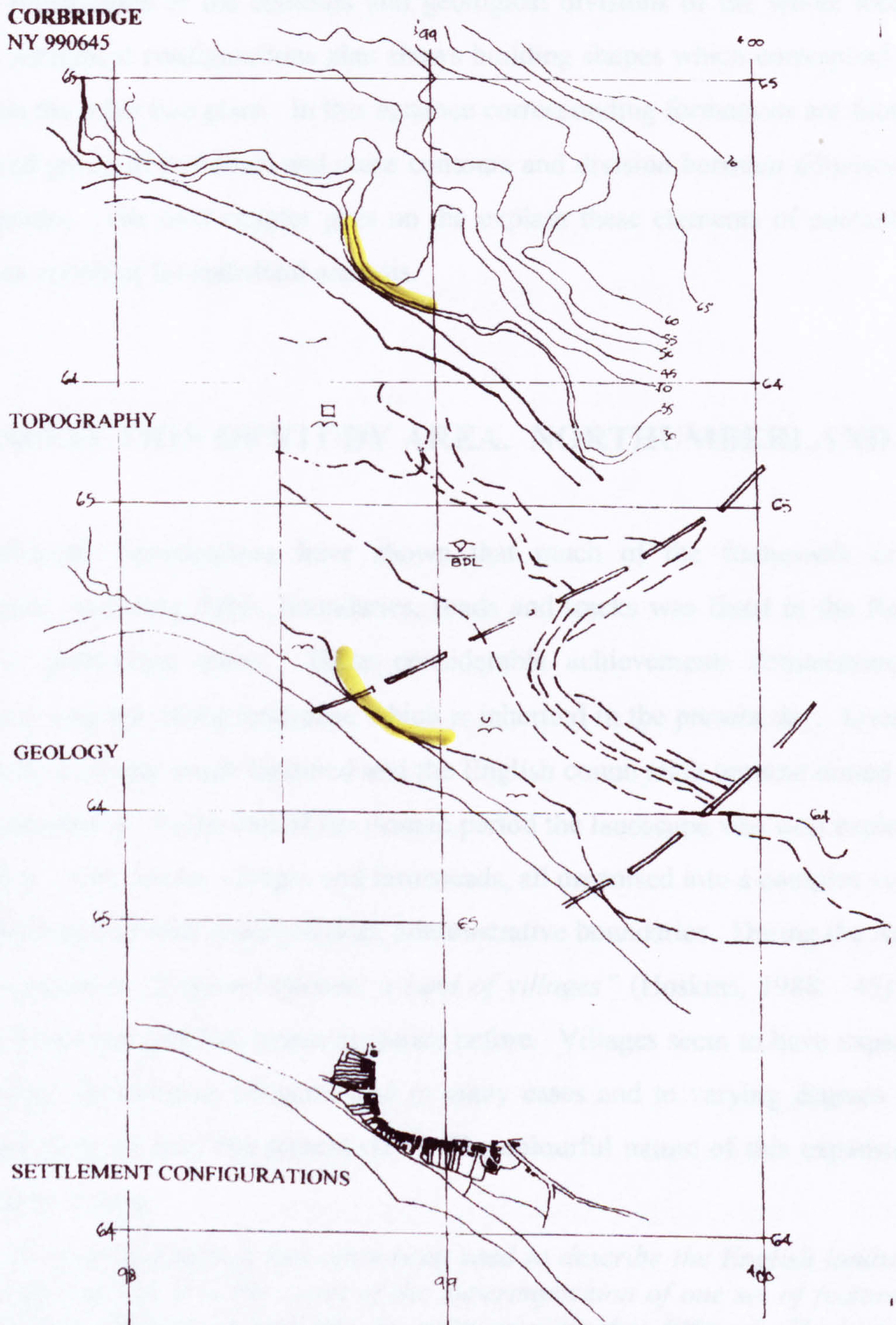

Fig. 3.8 Figure ground forms using plans of topography, geology and buildings.
SOURCES: OS scale 1:10 000 and Geological Survey 1992 Sheet 20.

Fig. 3.8 shows three plans of the same settlement location as an example of corresponding figure ground forms. Mercator grid lines are shown to help identify elements for comparison between plans. The topography and geology plans are general illustrations of the contours and geological divisions of the whole location and the settlement configurations plan shows building shapes which correspond with shapes on the other two plans. In this instance corresponding formations are found in the curved group of buildings and close contours and division between alluvium and river terraces. The next chapter goes on the explain these elements of context and texture as variables for statistical analysis.

3.4 SELECTION OF STUDY AREA. NORTHUMBERLAND.

Archaeological investigations have shown that much of the framework of the countryside, including fields, boundaries, roads and tracks was fixed in the Roman and even prehistoric times. These considerable achievements demonstrate the complexity and age of the landscape which is inherited in the present day. Living in settlements was very much favoured and the English countryside became dotted with settled complexes. At the end of the Roman period the landscape was well exploited, with fields, roads, towns, villages and farmsteads, all organised into a complex system of landholding and with fixed political, administrative boundaries. During the Anglo-Saxon occupation *"England became a land of villages"* (Hoskins, 1988: 45) in a series of processes that had begun centuries before. Villages seem to have expanded in size after the Norman conquest and in many cases and to varying degrees have continued to do so until the present day.[9] The colourful nature of this expansion is described by Taylor.

> *The word palimpsest has often been used to describe the English landscape, implying that it is the result of the superimposition of one set of features on another throughout time; but the reality is somewhat different. The history of settlement in England is not just the story of man's adaptation to dull geographical determinants, grinding social pressures, inevitable economic changes, or anything else that geographers, historians and archaeologists tell us. It is all of these things but it is much more. Most of all it is a wonderful, richly coloured, whirling kaleidoscope of movement and change. If we*

[9] Some villages disappeared during the black death and through emparking.

> *understand this then we may understand out past, present and future that much better.* Taylor (1984: 242).

Empirical research requires a focus by which to investigate this richness in a localised context. The county of Northumberland is an appropriate focus given that it is recognised as the most rural of English counties, is composed of a landscape with considerable variation in physiography and has a historical and geographical significance not shared to the same extent by other counties. It is characterised by uplands, plateaux, scarps, vales, coastal plain, and coast. Glacial tills of clay and sand overlay solid rocks and give potentially good farming country. There are 268 inland settlements excluding the North Tyne conurbation and 16 located along the coast, providing a population of 284 settlements within reach of the author's base of operations.

As well as the agrarian culture of inland areas based on arable, pastoral and mixed practices there is evidence of several maritime industries along the coast, and a substantial part of the northern coalfield occupies the SE corner of the county. There is therefore a variety of landscapes from which to draw samples to explore figurative relationships between site and settlement and a substantial base of industrial operations from which to investigate cause and effects of settlement changes.

The historical and geographical significance of the county is from its location in the NE corner of England on the border with Scotland which made it particularly vulnerable to attack during the 300 years wars which ended in the Act of Union in 1707. The desolation caused by the wars and the cessation of hostilities provide a temporal landmark from which to study the rebuilding of the county to the present day. This did not take place immediately upon the declaration of peace. Evidence from maps which show settlement layouts during the C18 and C19s suggest a gradual development towards a county-wide settlement framework with much of the building work taking place late in the C18 and C19. The available maps which illustrate this are of sufficient detail to allow chronologies of developments to be assembled in plans from the end of the C18 to the present day. This is an important consideration in the choice of setting. It is essential to any research project that data sources are available for collection of information. Northumberland settlements are substantially documented from the end of C18. This is particularly appropriate given the window of temporal study and is crucial for collection of research data in plans for investigation of effects of socio-cultural events over time.

Outside the conurbation of North Tyneside much of the rebuilding which took place during this time is still in evidence. Where substantial development and suburban spread has taken place in the C20, the earlier rebuilding from the C18 and C19s form central areas for shopping and business. There are 19 of these centres spread across the county in different physiographic locations. 265 other rural settlements which vary from small housing clusters to large accretions around earlier settlement cores, are also spread across different physiographic locations. There is therefore a diversity of settlement sizes and landscape from which to draw samples to examine physical and socio-cultural relations with site.

3.4.1 *Geology and topography.*

The focus of the geology is the Cheviot hills which began as volcanic outbursts preceding a series of further activities, deposits and erosions over a long period to the present day[10]. A generalised geology shown on **Fig. 3.9** illustrates the arrangements of zones, boundaries and types of bedrock which follow the North-South trend turning west at the Rivers Tyne and Coquet. It also defines the coast as a North-South boundary between bedrock and the North Sea at the east side. Political boundaries with Scotland, Cumbria and Durham overlap geological formations and delimit boundaries on the north, west and south sides.

Examined in terms of Schumacher's contextual theories the geology has clearly defined zones and boundaries between the different rock types configured to form a

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[10] This very concise description of the geological history is not intended to convey all the details of the long and complex process of change, but simply to acknowledge a few of the phenomena which have led to the geology of today since the concern of the study is for recent zones and boundaries which represent only a tiny part of the geological history

North-South trend and providing a skeleton for the Northumberland landscape. It is context specific with particular geometric properties characterised by the layout and elevation of zones, boundaries and hard edges.

The drift geology which overlays the bedrock is generally boulder clay or sand and gravel, except where outcrops of rocks appear at the surface or where sand or alluvium appear at the coast or rivers.

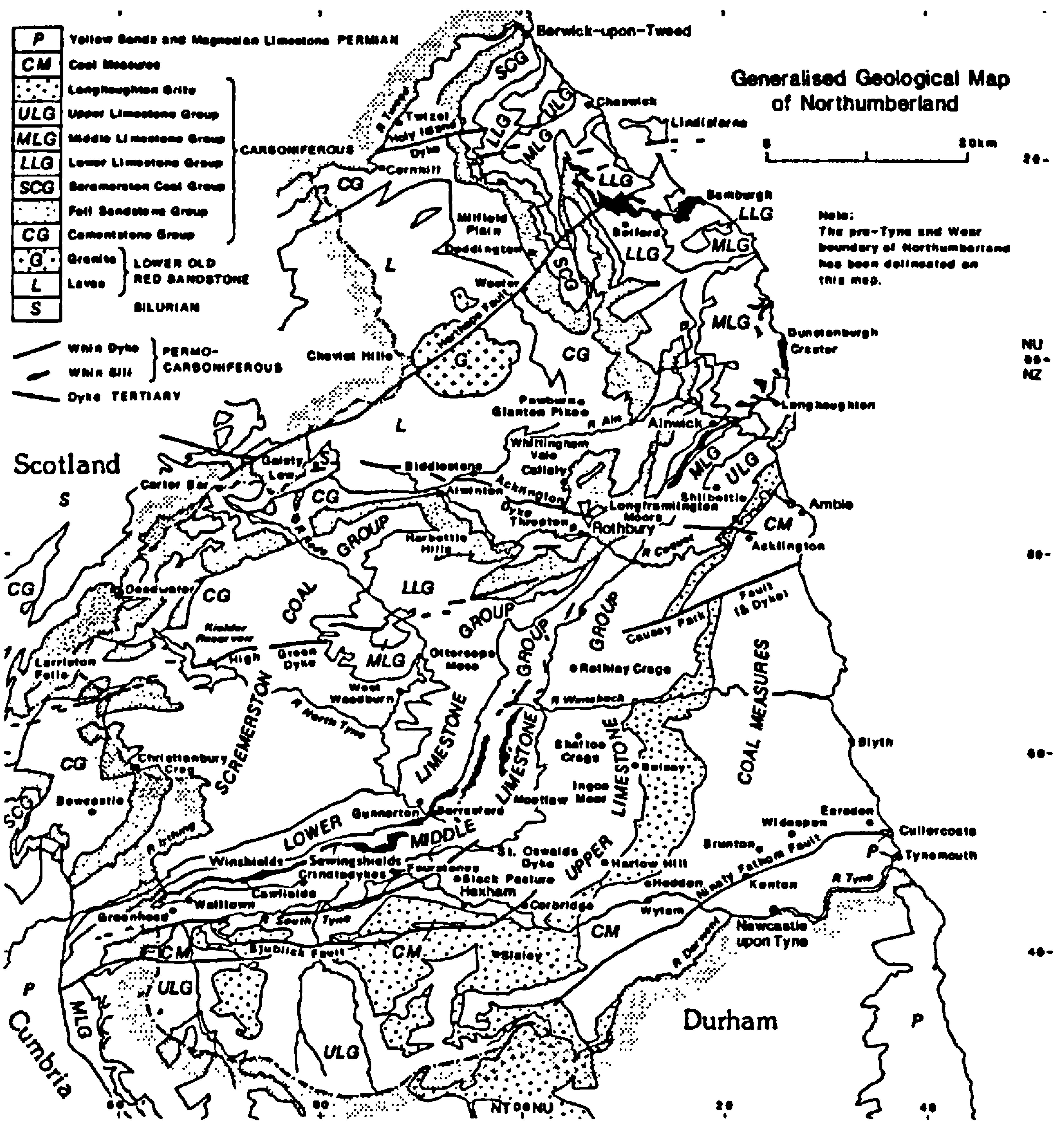


Fig 3.9 **Northumberland 1992. A map of the geology.**
SOURCE: Pevsner (1992: 26)

The topography of the county shown on **Fig. 3.10** reflects the nature of the underlying rock. Around the Cheviot are dales, moors and scarplands and the lowlands of the coast and Tyne Valley. The scenery abruptly changes to the broad, low-lying vales of the Coquet, Aln, Breamish and Till Rivers, and a landscape of farms, hedges and fields. In the south west of the county moors stretch to the horizon, broken only by outcrops of sandstone or Whin Sill that cuts through the landscape from the SW to the coast. The valleys of the North Tyne and Rede cut through the moorlands, but they are narrow and much more cut off from the rest of the county than the broad vales of the Coquet, Till and Aln.

The lowlands stretch in a crescent around the moors and hills, from the Tweed in the north down the coast to Tynemouth and west along the Tyne Valley. The south-east corner is the economic heartland forming an industrial triangle from Amble on the coast to Tynemouth and along the Tyne to the west of Newcastle. Rich soils along the Tyne and Till Valleys provide good arable farming land while the less fertile moorlands are mostly pastoral and there is a good deal of mixed farming. especially where zones meet.

The coast provides several anchorages and evidence of C19 shipping and commercial activities. But there has been a steady decline in trade and numbers of boats since the middle of the C20 and earlier ports are now almost exclusively used for mooring small leisure craft.

This area is also characterised by rich coal seams which led to the coalmining expansion of the C19 indicated in Fig. 3.11. Coal measures are largely focused in the south east corner of the county extending north along the coast to Amble and west along the Tyne Valley as far as Wylam. Mines are mostly concentrated near to the Rivers Wansbeck, Blyth, and Tyne where strong railway and maritime activities grew around shipping coal. Many improvements to harbours took place during the expansion of the coal mining industry with the construction of piers at major harbour mouths *"to meet the demands of the C19"* (Pevsner, 1992: 93).

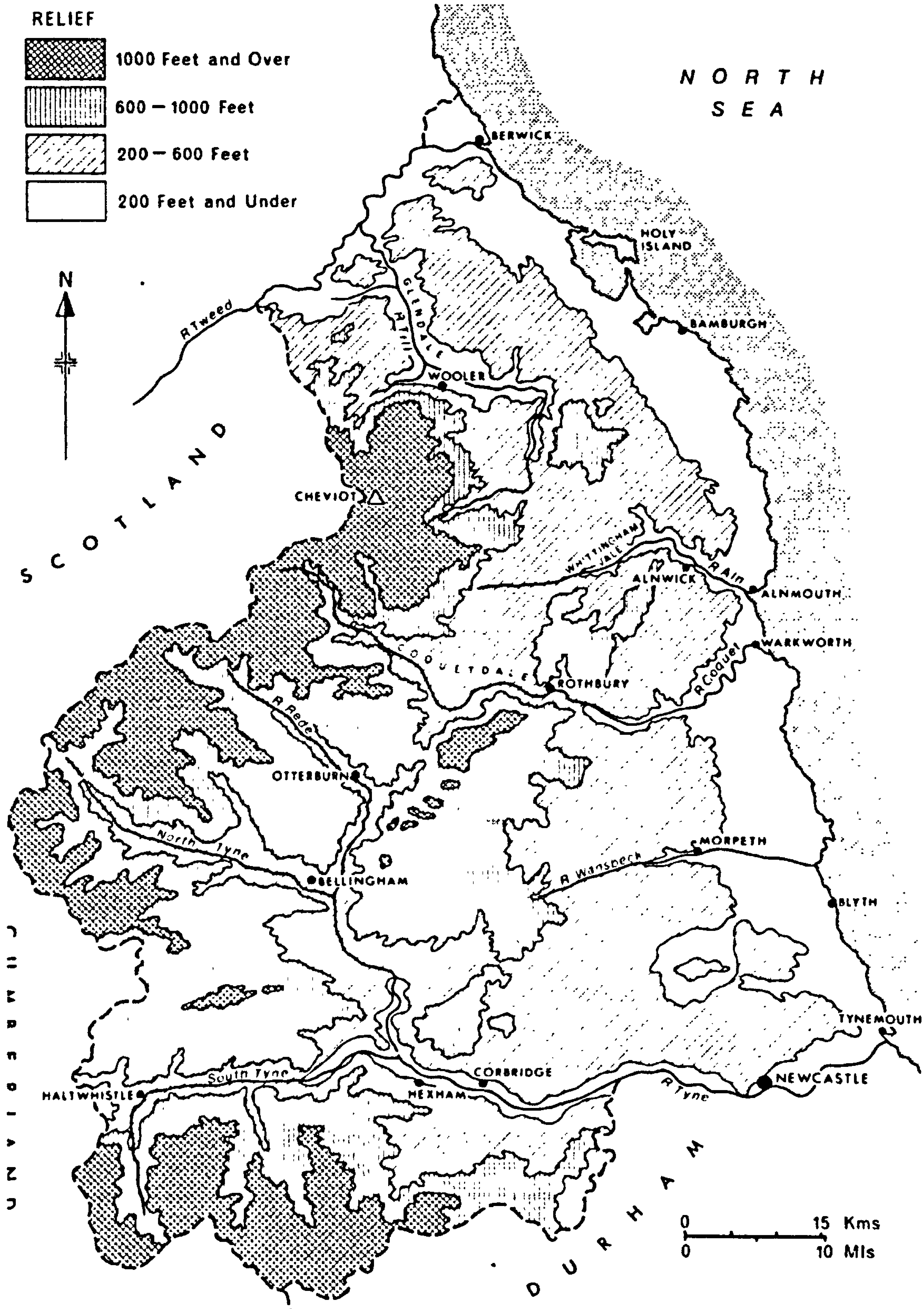


Fig. 3.10 Northumberland 1988. Map of the relief
SOURCE: Hepple (1988: 14)

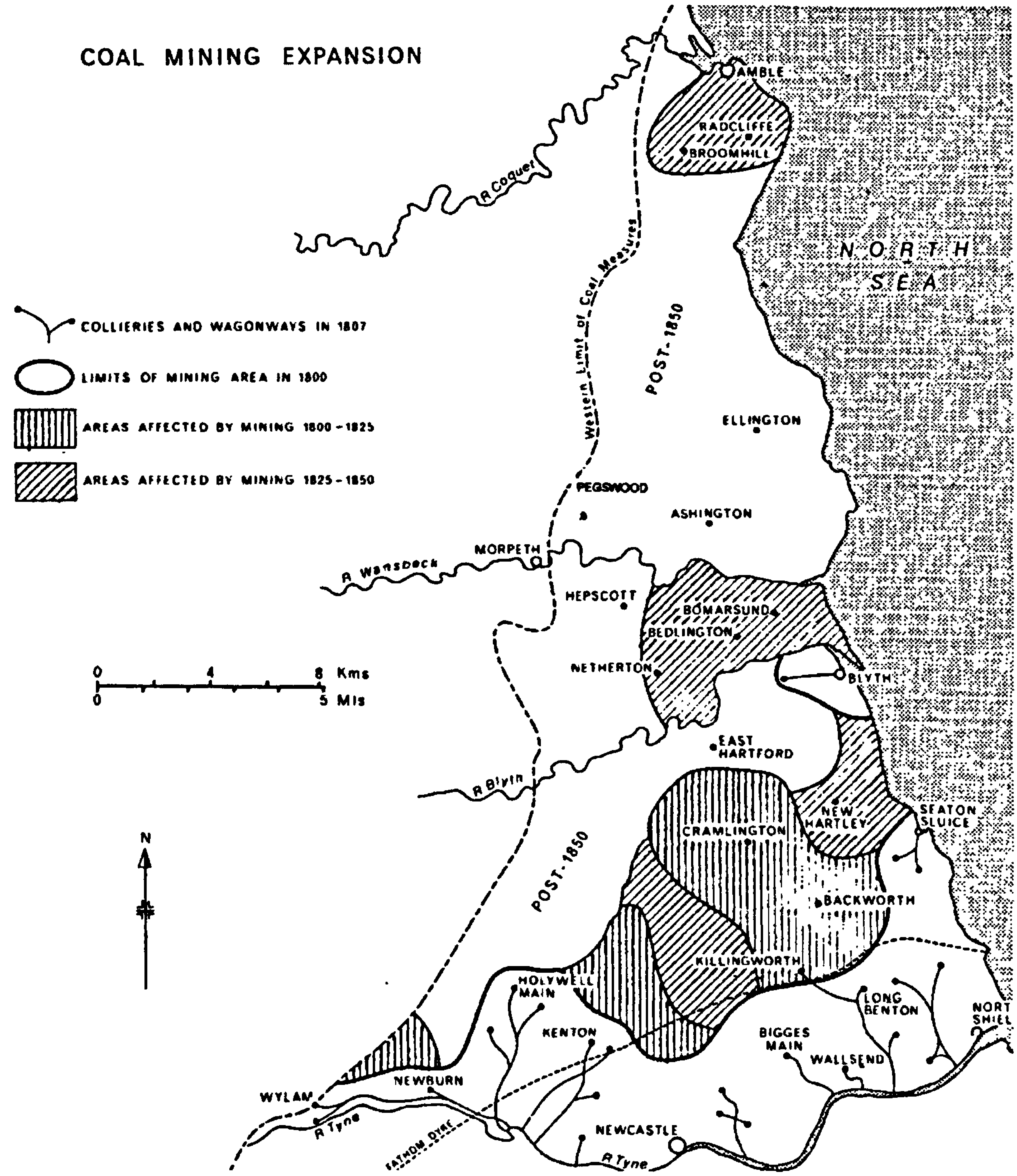


Fig. 3.11 South East Northumberland. C19 Coal mining expansion.
SOURCE: Hepple (1988: 105).

3.4.2 *Feudal systems.*

In medieval Northumberland a feudal system existed based on a relationship between superior and vassal. Land was held in feud in return for services which included military service and homage. Examples of the Norman system are still in evidence in the burgage configurations of many settlements and it is therefore proposed to begin the history at this point in time. After the Norman conquest an extensive number of grants of land were given to followers of the King who in turn granted parts of their estates to others. Many of the earliest surviving castles date from this period. Perhaps more significant was the system of burgages which can be seen in many of the settlement configurations. However, according to Hepple (1988) the vast bulk of the population was of pre-Norman origin, and the actual working of the land continued to be done by this native population. The basic feudal services in the Norman system were an obligation to work the lord's lands, or demesne, in return for the right to work land for yourself. Not all Northumberland was split into military baronies. Other land was held for official services in liberties or franchises, separate to the administration of the rest of the county. The coroner, the archbishop of York, the Durham bishopric and the Scottish King all held land in these ways. These separate jurisdictions created problems of administration, but nevertheless there was considerable agricultural expansion. The C12 and C13 were periods of growing population, improving climate with better growing conditions. Demand for farming land meant upland margins were expanded and the face of the cultivated landscape slowly increased. War with Scotland destroyed these gains.

3.4.3 ***Wars, poverty, and changes in agrarian organisation.***

The 300 years war between England and Scotland which ended in 1707 produced extreme poverty in Northumberland. Aeneas Sylvius Piccolomini travelled through the county in early C15 and recorded a bleak picture of what he observed.

> *The houses were of earth and wood, white bread was unknown, and at night all the men took shelter from the Scots in a local pele-tower, but left the women outside, saying that they would not be harmed. Northumberland was uninhabitable, horrible and uncultivated.* Hepple (1988: 46).

The earlier agrarian expansion of medieval Northumberland was accompanied by a parallel growth in commerce in the forms of regional exports and internal trade. Grain produce was bought and sold for local consumption and hides of cattle and sheep formed the main export business. Despite the disruption of this trade by wars, an infrastructure in the form of ports and markets persisted to the C18. The cessation of hostilities saw a number of improvements in the farming landscape, but these tended to effect only small parts of the county and by and large the landscape was one of open moor and heath with lowland settlements surrounded by unenclosed commons. It was not until the following century that the landscape showed significant changes by the revolution in agrarian organisation and agricultural techniques.

The agrarian revolution marks the beginning of physical changes to settlement configurations that were made possible by the favourable conditions for expansion. Whereas the 300 years of disruption was felt throughout England, the additional hardship of border hostilities was especially felt in Northumberland. The cessation of hostilities provides a window through which to see events immediately prior to and after that time. Since little remains in buildings from before that time, a robust study of the rebuilding of the county is only possible in the period after the beginning of the C18. It is only necessary to look farther back when particular events were inherited and appear to effect ways in which settlements developed. The historical picture of the following agrarian expansion is one of prosperity on an unrecognisable scale compared with the preceding 300 years. Technology and demand led to production on a massive scale with settlements growing from the ravages of war into thriving agricultural workshops within a century.

This picture changed during the middle of the C19 when cheap imports forced an agricultural depression, and mixed arable and pastoral farming emerged to compensate for loss of revenue from arable products. This mixed arable and pastoral farming has persisted to the present day.

3.4.4 *Coal mining, roads and railways.*

The end of hostilities also saw an increase in coal mining. Brown (1988: 41) shows that by mid C19 mines were widespread throughout the northern coalfield in the SE corner of the county. Agricultural settlements grew with accretions of miners' houses and pitheads.

Throughout this post-war period there were steady improvements in access by roads and railways. It effects were to allow movement of goods in and out of the region, so benefits were mixed. Local producers could not compete with cheaper imports to the region and many smaller agricultural industries, harbours and market towns contracted or died. Settlements developed new uses, particularly holiday resorts, but generally a rural decline spread throughout the county between the middle of the C19 and the early C20. The downward spiral of rural services and amenities is still continuing in many parts of the county despite an influx of commuters and a general trend of increasing population.

3.4.5 *Enclosure.*

Settlement patterns were modified by the introduction of enclosure acts and awards of the C18 and C19. Baker and Butlin (1973: 110) show that extensive open and common fields had largely disappeared by about 1750. According to Hammond (1913: 105) enclosure swept away the bureaucracy of the old village and created a new organisation of classes, although its effects on farming methods and on the village community were not always very great (Mingay, 1968: 18). The most significant effect of these was the disappearance of ancient greens as common land which was divided into paddocks or allocated to owners of adjacent properties, and the change to the general character of the countryside with the division of open land into fields.

3.4.6 *Maritime activity.*

There is a long history of fishing on the Northumberland coast. In C13 a fishing port was created at Tynemouth and along the coast there were numerous others at

Cullercoats, Newbiggin, Alnmouth, and Boulmer. Although most of the fish was for local consumption some was sent to London and eventually by C18 the rise of urban-industrial markets made fishing a focus for commercial investors. Fishing expanded along the coast notably from Lindisfarne, North Sunderland, Beadnell and North Shields, attracting boats from overseas. The coming of the railway and emphasis on larger fishing vessels meant fewer harbours were needed and smaller ones declined.

Commercial shipping activity followed agrarian expansion. The coastal carriage of grain and other agricultural produce was, after the coal trade, the most significant employer of shipping during the industrial revolution. In addition to the grain trade, *"Alnmouth and Berwick also sent a wide range of agricultural produce - butter, hams, eggs, wool-packs and leather - to more distant markets at home and abroad"* (Barrow, 1995: 8). Alnmouth, Seahouses and Berwick were tidal havens, perfectly adequate for small sloops and schooners engaged in the grain trade. By the beginning of the C20 the grain trade had declined and the outbreak of the First World War and the loss of German and Russian markets marked the end of an era. But evidence remains in the forms of piers and buildings which help differentiate between pre and post war developments and tie settlements to particular maritime uses.

3.4.7 *Northumberland National Park.*

The Northumberland National Park was designated in 1956. It extends north from the Roman Wall along the Tyne Valley and includes the North Tyne Valley and Redesdale, Simonside Hills and Cheviots, shown on the following map. Conservation of the landscape is the primary role of the National Park Authority, which is reflected in rural planning policies. Settlements within the Park area are mostly found along the east boundary and along the North Tyne and Rede Valleys.

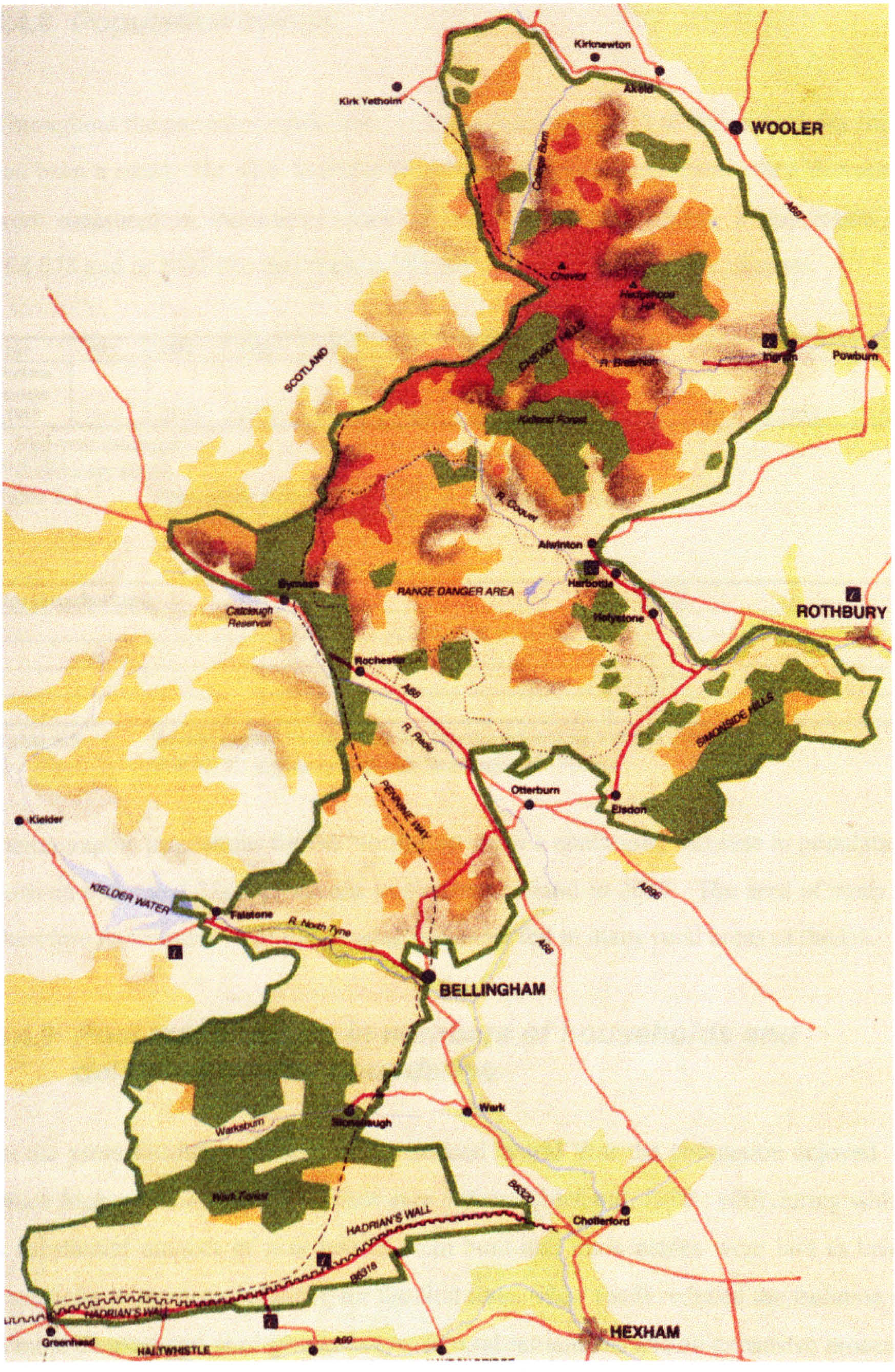


Fig 3.12 **Map of Northumberland National Park**
SOURCE: Hopkins (1987: 8).

3.4.8 *Population trends.*

Throughout the period of study from the beginning of the C18 to the present day there has been a steady but slow increase in population despite occasions when decreases were measured in intercensal years. Census from 1801 shows a population of 168,078 and in 1991 this had risen to 301,900 adjusted for boundary changes.

Year	1891	1901	1911	1921	1931	1939*	1951	1961	1971	1981**	1991
Persons present x 1000	193.6	219.3	251.7	274.0	264.5	262.7	272.6	274.3	279.6	299.9	301.9

* Mid-year estimates
**Preliminary count.

Table 3.4 **Population present 1891-1991 in Northumberland.**
SOURCE: Census (1991: 15, 11).

Northumberland	1998	326070
	2005	332276
	2010	336236
	2015	338221
	2019	338682

Table 3.5 **Demographic Projections for Northumberland 1998 to 2019.**
SOURCE: Office of National Statistics 1998 (ONS)

Demographic projections for the North East show a continuing increase in population with an estimated 338682 persons in Northumberland in 2019. The area of study is therefore representative of the housing pressures felt in many rural areas of the UK.

3.4.9 *Post war changes in numbers of households and delimited county boundaries.*

In the years following the end of the Second World War the population enjoyed *"a much higher standard of living than ever before"* (McCord, 1998: 400) during which a substantial number of new houses were built and main cables were laid to bring electricity to many rural homes for the first time. New roads reduced the isolation of remote districts and gave greater access to rural settlements and an expansive process in rural population and settlements took place. An indication of the increase in numbers of households between 1951 and 1991 can be seen in Table 3.6. The boundary changes of 1974 differentiate between the conurbation of Tyneside and six districts which are much less densely populated.

	1951	1971*	1981	1991
Numbers of households	235,403	273,460	107,779	121,691

*Numbers of households after 1974 show boundary changes which drew areas around Newcastle into Tyne and Wear County and are excluded from Northumberland.

Table 3.6. Increases in numbers of post war households.
SOURCE: Census 1951; 1971; 1981; 1991.

The six districts illustrated in the following Figure 3.13, have a combined population density of 0.6 person/hectare (compared with 2.4 for Great Britain) representing the most rural of English counties and delimit the rural area of study.

Figure 3.13 Delimited study area using political boundaries.
SOURCE: Census 1991.

3.5 SUMMARY.

This chapter has described an experimental research approach through self regulating models, examined the objectives of the study in three cause and effect conditions and developed theoretical models from preliminary studies. It has related statistical studies and case studies to the conceptual framework and focused the research geographically and historically in a delimited landscape. The next chapter takes a larger sample to test the quantitative research procedure as part of the experimental strategy, and goes on to explore the significance and associations of context and texture figure ground forms from random samples.

Alnwick and surrounding district in C19.

SOURCE: David and Charles facsimile. Scale 1 inch to a statute mile.

CHAPTER 4.
Statistical investigations.

4.1 INTRODUCTION.

Chapter 2 has argued for collective association to characterise the phenomenon of site and settlement relations as a totality (Thines, 1977: 73, 74). Statistical investigations are therefore a part of a dual analytical process which first seeks to elaborate and provide numeric substance to in depth case studies of single settlements, thereby characterising site and settlement relations generally within a regional focus. This chapter is therefore an introduction to in depth case studies.

The preliminary studies in Chapter 3 have pointed to differences in context and texture relations in which topography and geology are collectively or independently related to building configurations, and have also shown more than one instance of corresponding context and texture relations at the same settlement, raising new issues of ranking settlements by numbers of times corresponding relations are observed. Therefore this chapter begins by investigating these differences in a larger population of settlements to assess the practical difficulties of statistical measurement and to examine the case for precise amounts and degrees of difference within the aims of the study to provide a general characterisation of settlements within a regional focus.

The chapter goes on to develop the quantitative research method and tests the topographical and geological theoretical model by comparing context and texture figure ground forms over a random sample of settlements.

4.2 PRELIMINARY STUDIES OF SETTLEMENTS AT THE COAST.

Chapter 3 has argued that hard edges are particularly evident at divisions between land and sea and at boundaries of topographical and geological zones which define the physiography of the coast. Observations also suggest that settlements located at the coast are characterised by clearly defined edges of context and texture figure ground forms in support of the topographical and geological model. Investigative studies which firstly seek to clarify and define variables are helped by these strongly configured context and texture variable relationships and therefore the second set of preliminary studies focuses on settlements located at this land and sea division to assess how and what statistical data can be collected for analysis of settlements in other physiographies of the area of study.

The method of data collection uses topographical and geological maps and abstracts texture configurations where they can be compared with edges of context zones. APPENDIX 3 shows 16 settlements where this procedure is carried out and numbers of corresponding figure ground forms recorded. A summary of the findings is as follows.

	Topography	Geology	Total
Berwick on Tweed	2	3	3
Spittal	5	5	6
Holy Island	3	3	3
Seahouses	1	1	1
Beadnell	1	3	3
Newton by the Sea	1	3	3
Craster	2	2	2
Boulmer	1	1	1
Alnmouth	1	4	5
Amble	2	4	4
Low Hauxley	1	2	2
Cresswell	1	1	1
Newbiggin	3	5	5
Cambois	1	1	1
Blyth	1	1	1
Seaton Sluice	2	4	4

Table 4.1 **The Coast. Numbers of hits of context and texture figure ground forms using topography and geology as separate indicators for context.**

The figures reveal several practical difficulties with the research procedure. Firstly, the two variables topography and geology do not assign all cases. Table 4.1 shows differences in the total numbers of recorded corresponding forms and the sum of the first two columns. This indicates a combination of variables not clearly described by the variable definition and therefore a set of variables is constructed which describes the whole variance of measurement problem[1].

These are categorised as follows:

Both (Topography and Geology);

Topography Only;

Geology Only;

None at All.

In this way the presence or absence of different relationships between figure ground forms of context and texture can be summarised. The first three categories are mutually exclusive and exhaustive definitions of topographic and/or geological relationships and describe the theory in terms of independent variables for context. The final category None at All makes an operational definition which aims to move the investigative procedure back to theory and amendment of self regulating models following socio-logic.

A problem of reliability of data arises in the procedure of ranking settlements by numbers of corresponding forms. Comparing settlements assumes a correspondence has a common quantity in each case. But preliminary studies illustrated in Appendix C record instances where correspondences vary in both length and configuration. Indeed it may be argued that an imperative of the hypothesis of individuality is that every instance will be different. Extreme examples of difference are found at Cambois where a long straight row of dwellings is recorded as a corresponding form with topography and geology and at Boulmer where a relatively short straight row is also recorded, and at Beadnell a correspondence is recorded for a long row which has a double curved configuration. Introducing control variables to measure these precise amounts and degrees of difference duplicates a process which goes on to investigate particular building configurations through case studies and seeks at this stage only to assess the prevalence of the relationship theory by simple difference (YES or NO

[1] Statisticians describe a variable as *"a sort or allocation of cases into two or more mutually exclusive and exhaustive categories. In other words each case can be assigned to one category only, and all cases must be assigned."* This in turn must be related to the theoretical construct of the study *"in the form of one or more operational definition which gives meaning and content to a variable, i.e. which tells us what we must do in order to measure objects or people in terms of that variable. In this way we move from language of the theory to the language of research and eventually back to theory"* (Rose and Sullivan, 1996: 16).

responses to similarities between figure ground forms for context and texture). Nominal level statistical measurement therefore determines if corresponding context and texture figure ground forms are statistically significant within the study area.

The sample size is determined by the total number of settlements from which samples are drawn with as much precision as possible as a true representation of the whole population. To do this within a landscape of varied physiography and different density characteristics a probability mechanism is constructed around a stratified sampling system.

4.3 STRATIFICATION SAMPLING PROCEDURE.

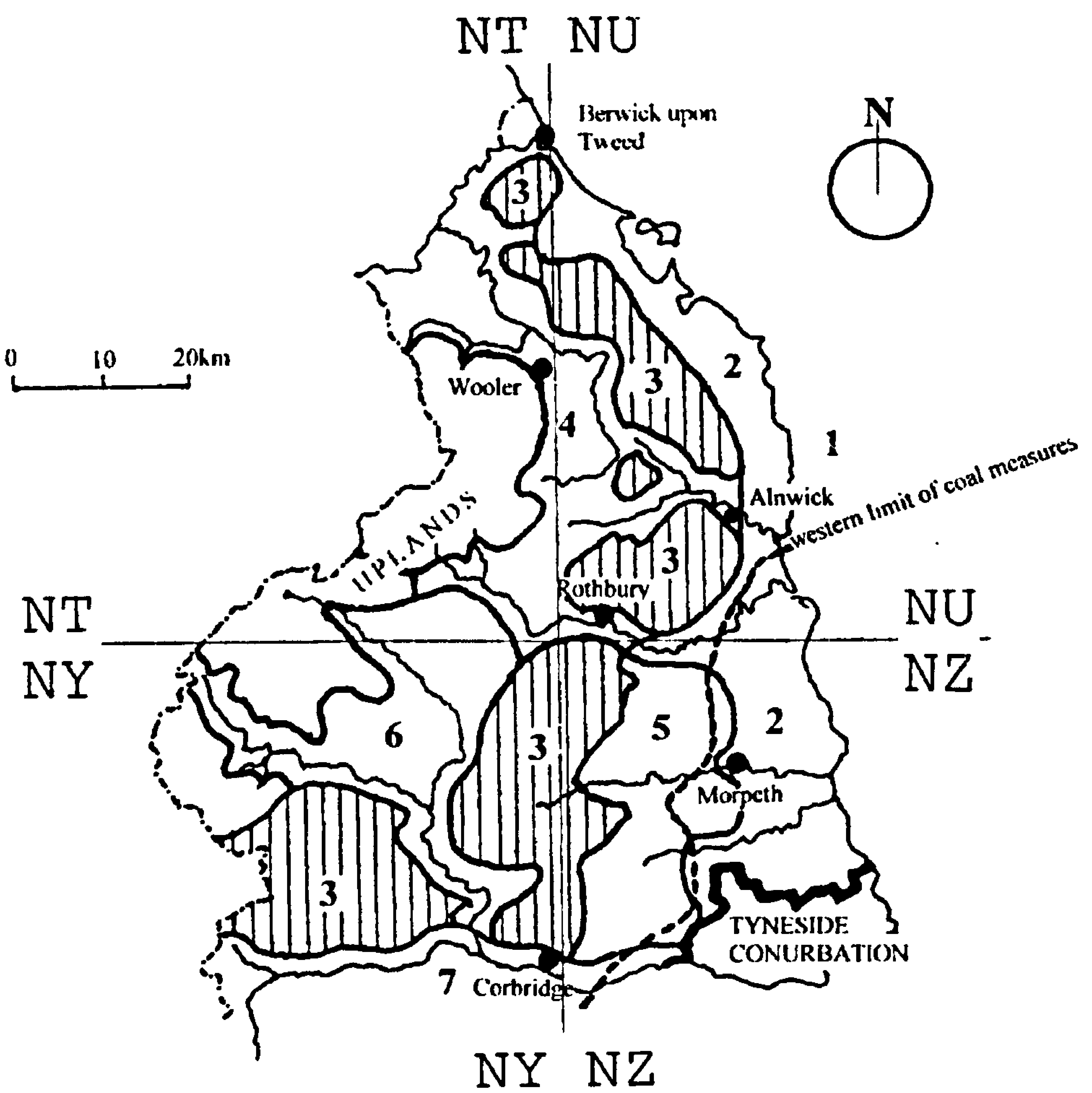
Given the aim of this statistical study to characterise site and settlement relations generally within a regional focus, the sampling procedure ties strengths of context and texture relationships with different landscapes through a stratified sampling procedure which identifies different characteristics of landscapes and delimits the county into seven regions of different physiographies (after Best and Rogers, 1973: 100) shown in the following table.

1	Coast
2	Coastal Plain
3	Scarps
4	Vales
5	Plateau
6	North Tyne and Redesdale
7	Tyne Valley north side

Table 4.2. Independent variable definitions using physiographic regions

An illustration of the boundaries and distribution of the different physiographic regions is shown in the following **Fig. 4.1.** The map shows rivers crossing the coastal plain, scarps, low plateau, vales, north Tyne and Redesdale, and Coal Measures which are mainly confined to the coastal plain but also penetrate into the low plateau. The topographical and geological features which cross physiographic boundaries are therefore characteristic to different physiographic regions and represent further classifications in the stratification sampling system.

PLAN OF PHYSIOGRAPHIC REGIONS.



STRATA
1. Coast 2. Coastal Plain 3. Scarp 4. Vales 5. Low plateau
6. North Tyne and Redesdale 7. Tyne Valley north side.

Fig. 4.1 Northumberland. Plan showing boundaries of different physiographic regions.
SOURCE: Baker and Butlin (1973: 100).

Ordnance Survey letters NT, NU, NZ, and NY identify where 10,000m square grids meet and are included to help identify locations of settlements which are defined by name and grid reference. Lines of demarcation between Coal Measures 82-3 and Millstone grit are taken from Geological Survey North Sheet 81. Major settlements are indicated to help in the general location of physiographic regions when compared with other maps.

Mutually exclusive independent variables using riverain and coal measures locations are categorised as follows.

x	settlement location not in following categories.
C	settlement location within area of coal measures.
R	riverain settlement.
CR	riverain settlement located within area of coal measures.

Table 4.3. Independent variable definitions using riverain and coal measures locations as indicators.

Similarly various sizes of settlements are observed in different physiographies and represent other classifications which help define the settlement population for this statistical study and later case study investigations of settlements as social constructs. The Scott Report (1942) sets limits for categories of sizes from numbers of buildings and people as definitions for practical purposes. The thresholds between different sizes[2] are as follows:

Less than 20 dwellings
20 - 300 dwellings
300 or more dwellings.

Table 4.4. Dependent variable definition using 3 indicators for size.
SOURCE: Sharpe(1946: 3).

The stratification sampling procedure is therefore constructed from independent and dependent variables of sites and settlements which connect the data to the two theoretical models by directing investigations to specific features of landscape and settlement sizes as given elements of context and texture in comparisons of figure ground forms. Appendix A lists and assigns numbers to the total settlement population of the area of study and categories them into physiographic regions and sub-populations by sizes and riverain and/or coal measures locations.

The total settlement population is summarised in the following **Table 4.5** which lists variables for different physiographic regions and sizes of settlements and records relative frequencies (f) of numbers of settlements in each category.

[2] These are sometimes used by academics and professionals to distinguish between hamlets, villages and small towns.

		Sub-populations		
		<20 dwellings	20-300 dwellings	>300 dwellings
Physiographic strata		(f)	(f)	(f)
1	Coast	2	9	5
2	Coastal Plain	41	28	7
3	Scarps	29	19	0
4	Vales	49	14	4
5	Plateau	21	11	1
6	N. Tyne and Redesdale	17	6	0
7	Tyne Valley north side	9	10	2
Totals		**168**	**97**	**19**
Proportionate Stratification		**17**	**10**	**2**

Table 4.5 **Summary of total population categories using different physiographies and sizes as variables**

The sub-population columns indicate the relative frequencies of settlements in each physiographic strata which is formulated as a proportionate stratification (17:10:2) in the final row. Most settlements are categorised in the first sub-population column with reductions shown in the second and third columns as the sizes of settlements increase. It can also be seen that there are large differences in the numbers of settlements in different physiographic regions to be reflected in the distribution of samples. Settlements are therefore stratified into further groupings of riverain and coal measures locations to provide a wider distribution of the total settlement population. Using a tombola method of random selection a sample list from which to draw comparisons of figure ground forms is constructed and summarised as assigned numbers in Appendix E Summary of Sample Selection and Sample Population List.

The locations and distribution of the sample settlements are illustrated in the following **Fig 4.2.**

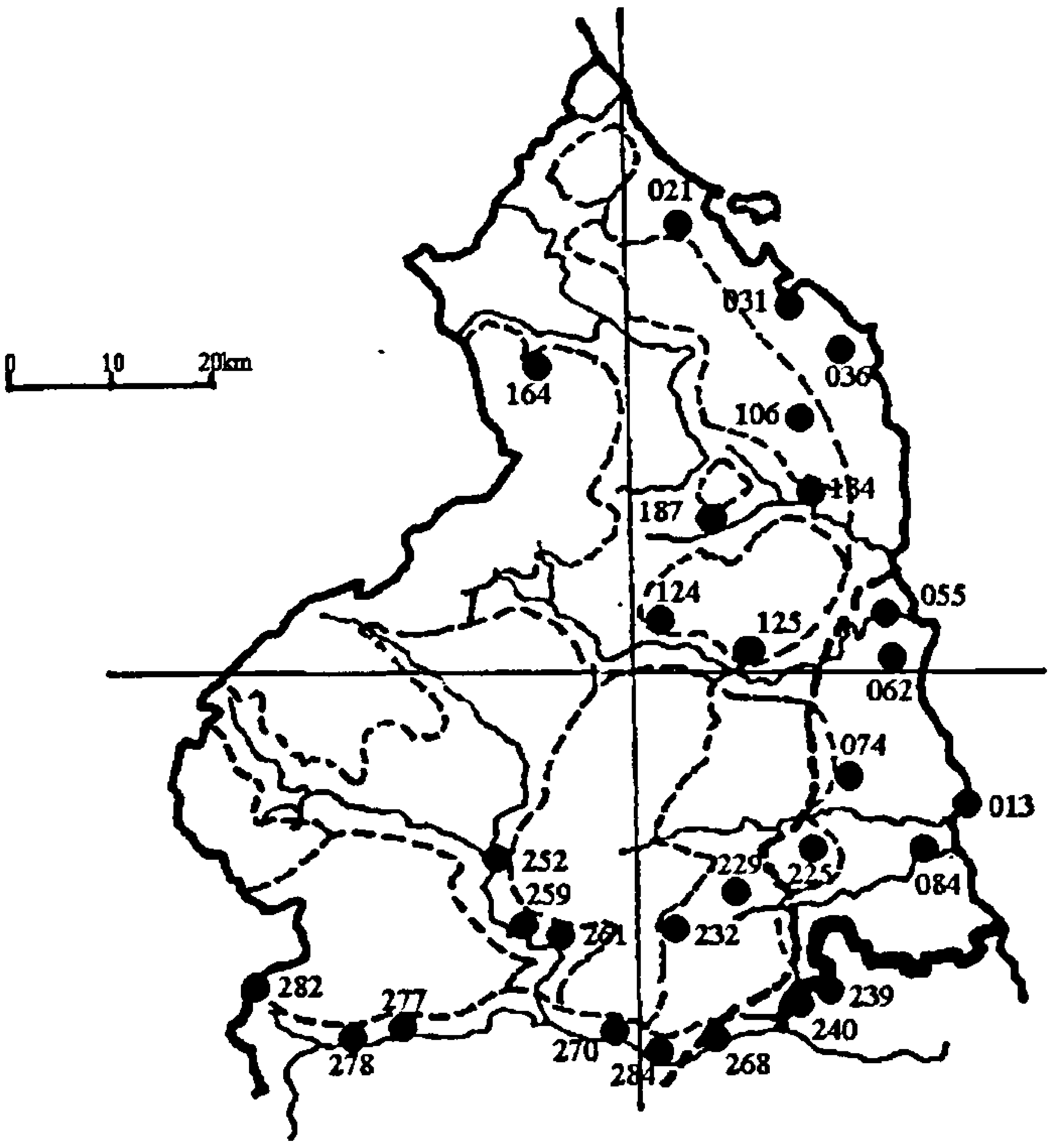


Fig. 4.2 **Plan of Northumberland showing locations of sample settlements.**

This section has shown how the topographical and geological model and research methods are developed in tandem as part of the logic of social science research and has therefore contextualised the analysis in terms of concepts and indicators. In the next section the prevalence of the theoretical model is tested to understand the significance and associations of site and settlement relationships thereby pin-pointing the strengths and weaknesses which underlie the theory.

4.4 FREQUENCY DISTRIBUTION AND SIGNIFICANCE TEST OF CONTEXT AND TEXTURE FIGURE GROUND FORMS.

Surveys of comparisons of context and texture figure forms are shown in Appendices C, F and G and the frequency distributions of results are summarised in the following Table 4.6.

			with missing data removed		cumulative	
	(f)	%	(f)	%	(f)	%
Both	22	75.9	22	(81.5)	22	(81.5)
Topography Only	5	17.2	5	(18.5)	27	(100.0)
Geology Only	0	0	0	(00.0)		
None at All	0	0	0	(00.0)		
Missing Data	2	6.9				
Totals	29	100.0	27	(100.0)	27	(100.0)

Table 4.6. **Frequency distributions using mutually exclusive variables for topography and geology.**

The first pair of numerical columns shows the frequency distribution of all the data including two instances where incomplete information was available. The second pair of numerical columns recalculates the distribution with these incomplete variables removed, and the third pair of columns shows the cumulative totals for the data in the previous two columns.

This chapter has already described the aim of the analysis to assess the prevalence of the relationship theory by simple difference where the higher the number of cases of comparisons of figure ground forms documented the more persuasive the evidence in support of the topographical and geological theoretical model. The mode (measure of central tendency) or value which most frequently occurs can be deduced from the following table of frequency scores taken from the (f) column with missing data removed columns in Table 4.6.

22	5	0	0

Table 4.7. **Scores of frequencies using four mutually exclusive variables.**

Clearly the modal category is represented by 22 scores signifying outcomes where both topography and geology are compared with texture figure ground forms and defined by 81.5% of cases in the data set.

The significance test[3] enumerated in Appendix H shows there is a statistically significant difference between observed and expected frequencies with $P<0.05$, inferring there is a less than 5% probability that the frequency distribution will be different from the sample population, or better than a 95% probability the frequency will be the same. Chapter 2 has theorised the dual qualities of structures of given contexts and textures as configurations of landscape and buildings in which a limiting organisational geometry is found in topography and geology. The significance test has provided compelling evidence in support of this theoretical argument by offering a substantial level of confidence that texture figure ground forms follow context figure ground forms across a variety of landscapes thereby linking textures to particular contexts.

To understand how this argument strengthens the phenomenological theory discussed in Chapters 2 we need to elaborate the context and texture relationships to understand their strength and natures. The next section investigates these issues from associations between categories of context and relative scores with texture in the data set.

4.5 ASSOCIATIONS OF TOPOGRAPHICAL AND GEOLOGICAL VARIABLES.

Phenomenological theory places emphasis on the uniqueness of site in context and texture relationships and it follows that particular locations may be related to textures in different ways. Topographic and geological variable definitions have already pointed to a complex geometry for context figure ground forms which requires further

[3] The significance test is the technique of analysis by which statistical inferences concerning the relationships between two or more variables in a sample can be generalised to a population.

investigation and explanation to understand how they configure textures in different physiographies. To do this the investigation focuses on two characteristics:

1. The strength or degree of association;
2. The nature of association;

drawing from percentaged data arranged in tables of crosstabulations.

Physiography and size differences are two of the major categories of the stratification sampling system and variations have already been observed in relative numbers (see Table 4.5). Strengths of association with mutually exclusive variables for topography and geology in different physiographies are summarised in the following Table 4.8.

	Strata							**Totals**
	5	**3**	**2**	**1**	**4**	**6**	**7**	
	Low Plateau N=(5) %	**Scarps** N=(3) %	**Coastal Plain** N=(7) %	**Coast** N=(2) %	**Vales** N=(3) %	**N Tyne and Red** N=(3) %	**Tyne Valley** N=(4) %	N=(27) %
Both	40.0	66.6	85.7	100.0	100.0	100.0	100.0	81.5
Top Only	60.0	33.4	14.3					18.5
Geol Only								00.0
None at All								00.0
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.8 **Proportions of mutually exclusive variables for settlements in physiographic regions.**

Proportions shows strongest associations in the first row of cells with variable Both (topography and geology) in four physiographic regions: Coast; Vales; North Tyne and Redesdale; and Tyne Valley north side, decreasing in the remaining three: Coastal Plain; Scarps; and, Low Plateau. Combined variables topography and geology have strongest associations with settlements in physiographies where divisions between land and water are a prominent landscape feature at the coast and rivers while weakest associations are found at the low plateau which is relatively featureless. The second row variable Topography Only shows strongest associations with settlements in Low Plateau physiography, decreasing over Scarps and Coastal Plain with no association in the remaining four regions. This variable row is also an expression of situations where comparisons with geology are not found and taken with the first row illustrates the increase in geological figure ground forms as physiography becomes more heavily sculptured. The final column shows associations with topography are recorded in all comparisons of context and texture figure ground forms.

The third and fourth rows Geology Only and None at All show no associations. Section 4.2 has already explained the operational definition of the None at All variable in socio-logic to move the investigative procedure back to theory. Clearly, where no outcomes are documented in the None at All category strong support is given to the topographical and geological model by default, since all scores are derived from topographic and/or geological variables.

Preliminary studies at Stamfordham and Holy Island showed a preference for building land with the greatest loadbearing capacity with edges between different soil zones reflected in the configurations of groups of buildings. Comparing loadbearing capacities of different soils in the sample settlement population shows this phenomenon is generally followed and a summary of responses is given in Table 4.9. The table in arranged with strongest loadbearing soils shown on the left column descending in value towards the right. The second two columns indicate that most settlements are constructed on gravel and sand or boulder clay but there is also a direction of association observed in 'B'lding land' cells which are to the left and on the higher value side of 'Avoided' cells indicating strongest associations with highest loadbearing capacities of soils of particular location in

52% of samples.

Other samples are fragmented between three situations:

22% have only one soil, particularly in the Low Plateau physiography;

12% are constructed on a combination of good loadbearing soils;

14% have part or all of the settlement buildings constructed on poor loadbearing soil particularly in the Tyne Valley.

These observations infer structures of different soils provide opportunities for development in an association with other soils in a given location. This relationship between site and settlement is characterised by informed choices of building sites thereby helping to pinpoint settlement locations in localised landscapes.

	Presumed bearing value kN/sq.m.						
	Bedrock **>4000**	**Gravel and sand** **600-200**	**Boulder clay** **600-150**	**Undifferentiated terraces** **600-75**	**Blown sand** **300-100**	**Raised beach** **<100**	**Alluvium** **<75**
Coast							
Alnmouth		B'lding land				Avoided	Avoided
Newbiggin			B'lding land		B'lding land		Avoided
Coastal Plain							
Beal	B'lding land		Avoided				
Longhirst		B'lding land	Avoided				
E Sleekburn			B'lding land				Avoided
Warren Mill	B'lding land						B'lding land
Broomhill			B'lding land				
Warkworth			B'lding land				B'lding land
N Sund'land			Avoided		B'lding land		
Scarps							
Snitter	B'lding land	Avoided					
Warenford		B'lding land					Avoided
Long fram			B'lding land				
Vales							
K Newton		B'lding land	B'lding land				Avoided
Denwick		B'lding land	Avoided				
Whittingh'm		B'lding land	B'lding land				
Low Plateau							
Ogle			B'lding land				
Black Call			B'lding land				
Fenwick			B'lding land				
Tranwell			B'lding land				
Woolsington			B'lding land				
N Tyne							
Chollerton		B'lding land	Avoided				
Redesm'th			B'lding land				Avoided
Barrasford		B'lding land	Avoided				Avoided
Tyne Valley							
Ovington		B'lding land	Avoided				
Bywell							B'lding land
Gilsland		B'lding land	B'lding land				B'lding land
Corbridge				B'lding land			Avoided

Table 4.9 **Responses to different soils using loadbearing characteristics as indicators.**
SOURCE: British Standard Code of Practice CP 2004: 1972, table 1.

A summary of responses to riverain and coal measures locations tests and develops the inference from Table 4.8 that strongest associations with combined topographical and geological variables are found at settlements where divisions between land and water are a prominent landscape feature.

	x % N=8	C % N=5	RC % N=4	R % N=10	Totals
Both	(7) 87.5	(3) 60.0	(2) 50	(10) 100.0	81.5
Top Only	(1).12.5	(2) 40.0	(2).50	(0) 00.0	18.5
Totals	100.0	100.0	100.0	100.0	100.0

Table 4.10 **Summary of responses to mutually exclusive variables in riverain (R) and coal measures (C) locations.**

The first cell in the fourth column R shows the strongest (100%) response to combined topographic and geological figure ground forms. The first cell in the first row also shows a strong association (87.5%) but is not representative of one particular landscape characteristic. Responses to combined variables in coal measures locations shown in second and third columns are relatively weak.

4.5 SUMMARY.

A summary of responses to topographic and geological figure ground forms using frequency distribution, associations and soil structure as indicators is shown in the following Table 4.11.

	Frequency Distribution Significance test shows P<0.06 or 94% probability the frequency distribution shown in Table 4.6 will be the same for the total settlement population. Strong support for generalisation of theoretical model.	**Associations**	**Soil Structure** 7 different types of soils were documented with loadbearing capacities from <75 to >4000kN/sq.m. Most settlements are constructed on boulder clay or sand and gravel.
Topography	Comparisons of context and texture figure ground forms found in 100% of samples. Compelling support for topographical indicator of the theoretical model.	Strongest association with all 7 physiographies and riverain and coal measures locations.	
Geology	Comparisons of context and texture figure ground forms found in 81.5% of samples. Strong support for the geological indicator of theoretical model	Strongest associations with 4 physiographies: Coast, Vales, N Tyne and Redesdale; and Tyne Valley, in particular with riverain and coastal sites.	Preference for strongest soils in 52% of the settlement samples. 22% have only one local soil. 12% are constructed on both boulder clay and sand and gravel. 14% are constructed on poor loadbearing soil.
None at all	No negative evidence	No negative evidence.	

Table 4.11 **Responses to topography and geology using three different indictors.**

The frequency distributions and significance test has provided persuasive arguments in support for the theoretical model

Topography and geology are significant in shaping building configurations of rural settlements.

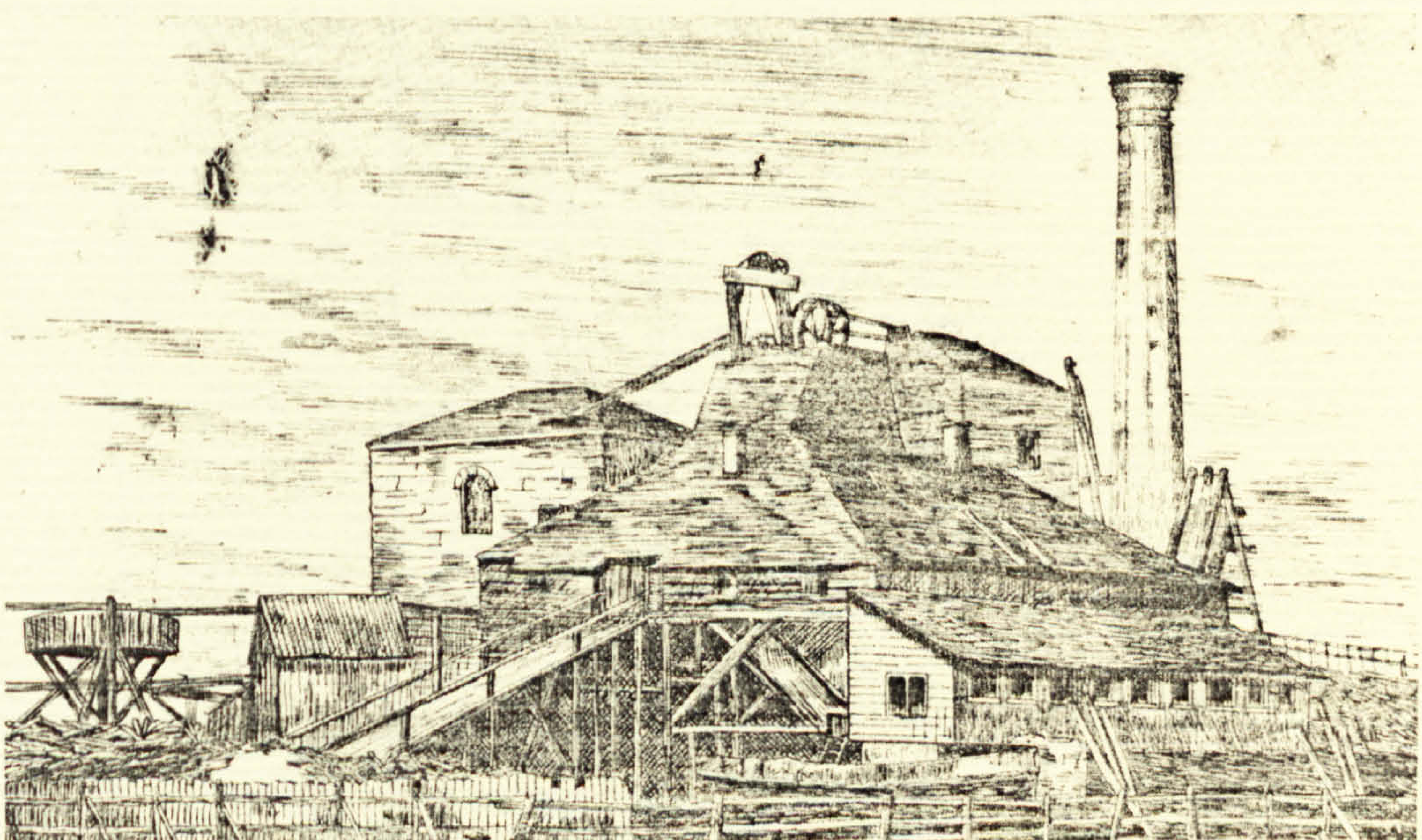
It has also provided evidence of variations in the relationships of topography and geology and textures. Inferences have been drawn that whereas comparisons with topography have a high degree of certainty in all settlements within the area of study, comparisons with geological figure ground forms have greatest strengths in areas of heavily configured landscape particularly where the divisions between land and water discussed by Cullen (1961: 111) are evident. The geological study has also shown that different loadbearing soils provide opportunities for building within best available loadbearing conditions thereby helping to locate settlement sites within a localised landscape.

These inferences generally characterise site and settlement relations in a regional focus and broaden the nature of the relationship theory by showing textures are tied to context as part of a complex understanding of the topographical and geological natures of site. The theoretical model needs no repair or restatement although the interactions of topographic and geological indicators of context and textures are more numerous than at first expected in the process of investigation.

The next two chapters take settlements from the sample population for in depth case studies and build on the finding of the statistical study by examining particular contexts and evolving textures in relation to social and cultural patterns over several centuries. Studies are guided by the second theoretical model, focusing on temporal sequences and exploring alternative social and cultural factors in context and texture comparisons.

Seahouses in C19.
SOURCE: Weightman, M.S. (1983: 17).

Cattle driven in for sale at Bamptom Cumberland in 1922.
SOURCE: Seymour (1993: 71).



Harton Colliery in 1888.

CHAPTER 5
Settlement Case Studies.

5.1 THE CASES STUDIES.

This chapter builds on the outcomes of the quantitative study described in Chapter 4 by investigating linkages between opportunities and provision. Case studies of different contexts and textures show how site offers opportunities for and places limitations on development thereby connecting landscape, building configurations and social processes.

The following four case studies investigate socio-cultural roles in settlement configurations in three primary industrial settings, maritime, agriculture, and mining, at Craster, Alnmouth, Kirk Newton, and Pegswood, located on Fig. 5.1.

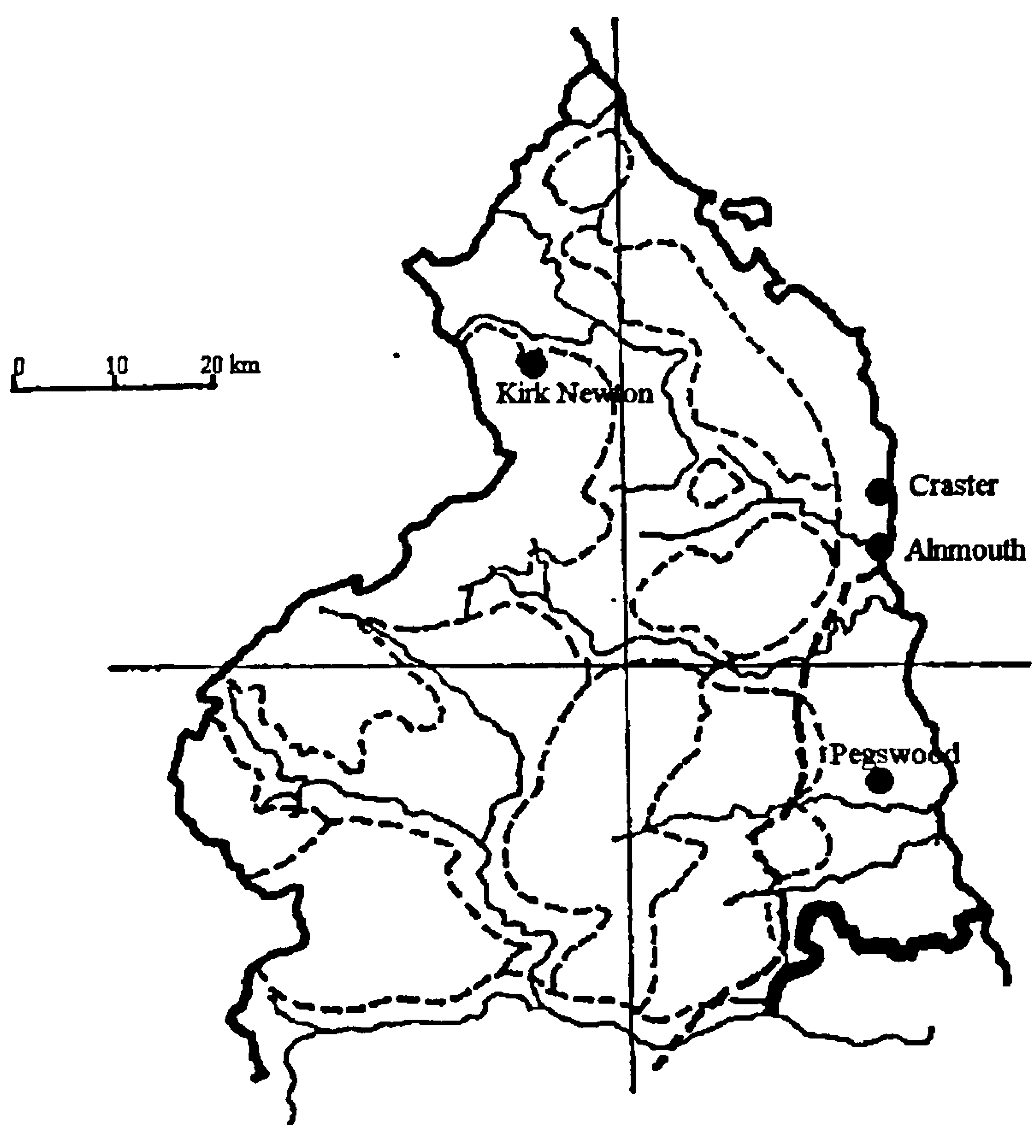


Fig. 5.1 Map of Northumberland showing locations of settlement case studies.

Each case study begins with a brief history which describes and characterises events leading up to and through the period of study to understand the natures of changes in evolving settlement patterns. The research investigates and compares data from different industrial activities using context and texture figure ground forms described in Chapter 2. The analysis is directed by the theoretical model,

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns.

and seeks causal chains in chronologies of changes to settlement configurations.

5.2 MARITIME SETTLEMENT CASE STUDY: CRASTER.

There is a long history of fishing on the Northumberland coast...Along the coast there were numerous fishing villages, such as Cullercoats, Newbiggin, Alnmouth and Boulmer. The fish caught were mainly for local consumption. though even in medieval times some fish were sent to London...Some local fishermen went further afield: in 1528 six 'craylers' from North Shields were sent to join the Iceland fleet. The fishing villages were also used for smuggling, especially in the C18. The rise of urban-industrial markets made fishing a focus for commercial investors, and in 1788 John Wood of Beadnell formed the Northumberland Branch of the British Fishery to fish from Beadnell and from Ullapool in Scotland, and built an improved harbour at Beadnell. After this both white fishing and herring expanded along the coast, based especially at Lindisfarne, North Sunderland, Beadnell and North Shields. The herring season in late summer attracted many foreign boats. In 1828 over 100 were using Beadnell, and Scottish girls came to help with the herring curing. At Lindisfarne in the 1860s the harbour might accommodate 100 French boats, and all the local boats catch was sold for the Stettin market in the Baltic. The coming of the railway made marketing easier, but, together with the increasing size of fishing boats, encouraged concentration on fewer harbours, notably North Shields and North Sunderland. The cobles gave way to larger, decked boats with 40 to 60 foot keels, the steam drifter for herring came in 1907. The numbers of boats fishing from the smaller harbours like Lindisfarne and Cullercoats declined, and the decline was especially notable at Alnmouth. The inshore herring fishery was over-exploited and the white fish over-trawled so that by 1914 the fishing fleets were looking further afield, and the coastal fisheries never regained their former importance.
Hepple (1988: 92, 93).

Pevsner also identifies a fishing port at Craster,

Craster was a fishing haven as early as 1626, but the harbour works dates from 1906-10, designed by F. Watt Sandeman of Newcastle; the contractors were McLaren & Proude, also of Newcastle. The harbour is a simple affair, comprising a amass concrete s pier and a n one of shuttered concrete with rubble fill. Three 27m silos supported on a concrete arch were added in 1914 to facilitate the shipment of whinstone chippings; these were demolished c.1936 and only the arch remains. Little fishing is done here now, but...kippers are still cured in a typical mid-C19 smoke house which has outer walls of whinstone, pantiled roofs, and a wooden bridge ventilator. Pevsner (1992: 248).

Much of the early settlement layout is still noticeable and there has been some expansion to the housing stock in more recent years.

The Ordnance Survey 1864 shows the framework of a settlement core which is traceable on other maps throughout the chronology. Precise locations of settlement configurations are intelligible on all maps except Early Hills Printings. This is more a generalisation of the settlement layout and topography using hatchures and giving a pictorial account of the setting not immediately evident in contoured maps. Nevertheless, differences are small and all maps concur over the general layout of 1864, inferring that by mid-C19 the framework of the settlement core was established and indicating a date, supported by records, from which to begin the analysis.

5.2.1 *Setting. 1864 - 1899.*

Histories describe Craster as a fishing village with a curing industry renowned for its smoked kippers. This broad description gives important clues about the nature of the settlement as a working unit. It indicates dual uses or functions based upon a maritime industry as fundamental elements in the individuality of the settlement matrix, distinguishing it from other maritime related settlements. These fishing activities have particular demands for setting which are more specific than for tertiary industries or housing, and therefore provide rich data for an investigation where causal relations between use and site are sought.

5.2.2 *Opportunities and limits for primary and secondary industries.*

A land base from which to conduct a maritime activity is by the nature of its function drawn to a coastal location. In the case of Craster the choice of location is driven by need for a safe haven to protect fishing boats in bad weather, and to facilitate landing craft and catches. Location in therefore dependent upon favourable properties of place to meet these practical requirements. The haven shown on maps up to 1899 in Fig. 5.2 is a narrow beach between quartz dolerite outcrops running inland into Craster Heugh and offered some natural protection from the sea by outcrops named Little Carr and Muckle Carr.

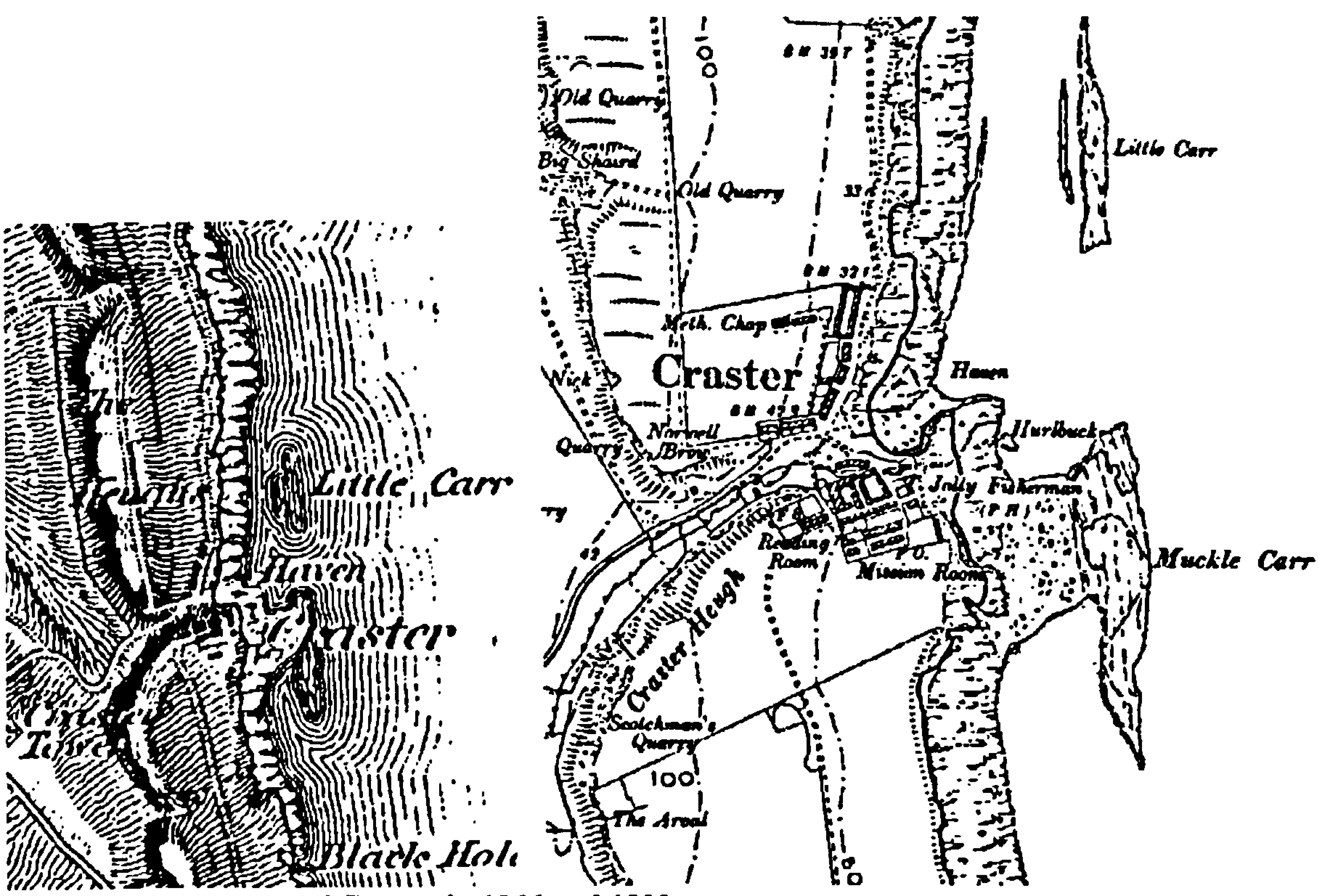


Fig. 5.2. **Maps of Craster in 1866 and 1899.**
SOURCES: David and Charles facsimile Scale : 1 inch to a statute mile; OS. Scale 1:10,560

Contours show the land rises in a shallow gradient from the beach along the heugh and this is still evident on the recent aerial photograph. This topography offers opportunities for beaching, storing, and launching boats. A gradual incline is favourable for heaving boats onto the beach for protection from heavy seas.[1] This process can be seen on **Fig. 5.3.**, which shows a boathouse located centrally in the heugh and small craft beached on the sandy haven. Further evidence of this landing and launching practice is found in the shape of the fishing boats. The coble is particularly designed with two side keels for launching from beaches and was commonly used for sea fishing during this period. The protected haven, beach, and heugh are favourable site characteristics under which maritime activity can operate. Opportunities for a maritime related settlement to evolve are created by site characteristics with an ability to accommodate the functions of the maritime industry.

Fig. 5.3. **Craster 1995. Aerial photograph.**
SOURCE: Airfotos.

The division between land and sea limits the settlement perimeter along one side. It is a steeply inclined barrier of dolerite quartz cliffs extending north and south from the haven limiting the flow of the sea.

Further limitations are imposed by steep inclines along the sides of the heugh. Here quartz dolerite cliffs turn inland from the coast and form a valley. No residential

[1] This habit is still followed today. During site visits cobles were observed to have been pulled up the beach beyond the high water line for storage and maintenance.

buildings appear to be constructed in the heugh, perhaps inferring that it may be liable to flooding or that it is land preserved for activities supporting the maritime industry. Clearly the haven and heugh are arterial in the working settlement, linking the maritime activities which extend inland from the haven and secondary uses which evolved on either side of it. It also causes a division of the settlement into two parts with building configurations limited and shaped by two lines which are formed by the tops of the escarpments and the flat plateaux which extend north and south.

Until recently fish smoking was an active secondary industry. The sheds for processing fish catches were in the same positions as those shown on early maps illustrated in rows and courtyards to the south of the heugh. It is a low-lying shelf of quartz dolerite giving nearest possible access to the working maritime area without encroaching upon it. The sheds introduce a secondary industry as a function of the primary fishing industry with demands for location and properties of place that arise from a functional relationship between them. That relationship is in the tasks performed after landing the catch and in processing it and is manifest in the access of the processing plant to the landed catch. There is a row of buildings which curves as it descends the escarpment and continues until it reaches the bottom. Located in this position it gives direct access to a processing shed and others behind from the working maritime area. The site feature which limits the configurations of other buildings along the south escarpment is bridged by this shed. It is the only building which comes close to the level of the heugh linking it with the level of the other sheds on the rock shelf behind.

Inferences interpreted from these site and settlement relationships are as follows. Firstly, the opportunity for maritime activity to be carried out in the area of the haven and the valley immediately inland are a result of the availability and ability of the site to accommodate the practical needs of the primary fishing industry. Secondly, limits set by the positions and shapes of quartz dolerite outcrops effect the location and configuration of industrial buildings.

The analysis suggests there are particular requirements for location from which to conduct maritime industry. It also suggests demands for particular plots within the site may be evident in attempts to relate the use of the secondary industrial buildings to maritime industry by locating them in the most favourable positions for tasks of unloading and storing catches for processing. Relationships are evident between the activities of the primary and secondary industrial working areas and buildings and their relative positions in the topography of the site. The relative positions of the quartz dolerite basin and the heugh offers unique site characteristics for locating buildings and external spaces within a dual working framework. These characteristic are not available elsewhere on the site.

5.2.3 *Opportunities and limits for tertiary industries and housing.*

To the east and south of the smoking sheds are other buildings with service industrial uses named on the Ordnance Survey 1899 as the Jolly Fisherman Public House, Post Office, Mission Room and Reading Room. The Jolly Fisherman is placed for ready access to both the sheds and the haven. The Post Office, Mission Room and Reading Room are positioned behind the sheds with configurations that follow the rectilinear pattern of the processing sheds. Their locations and configurations appear to be related only to the buildings which support the secondary processing industry. Although there are a few houses scattered around this part of the settlement, the south plateau is the industrial focus of the settlement and this function appears to have a knock-on effect on configurations of adjacent buildings.

The limits of the cliff are evident along the southern plateau. Buildings are placed in lines parallel to the division between the cliff and plateau and their positions are limited by the space between the cliff top and the smoking sheds to the west. The limits of the escarpment are also evident in the configurations of housing along the north side of the heugh and turning northwards where the escarpment meets the coast. Early maps show rows extending from the heugh up the coast closely following the line of the division between the plateau and the escarpment and cliff. They are located in close proximity to the heugh without encroaching upon it, at the same time following a ribbon configuration along the coast rather than copying the agglomeration pattern of the industrial focus to the south. The David and Charles facsimile, shown in **Fig 5.2** indicates a slightly different layout to the Ordnance Surveys of 1860 and 1899. The facsimile shows two buildings in front of the rows with a path between on what is now gardens of the dwellings opposite. These are not shown on the 1864 map but two small plots appear in these locations on the 1899 map.

There is an inconsistency here and it is not clear if it is a cartographic error or an attempt to indicate temporary buildings or huts. Nevertheless, it is interesting to note the buildings, however temporary, follow the same configurations as those on the other side of the path, by forming a building line parallel with the division made by the top of the cliff and plateau and reinforcing the importance of it as a limiting feature in the configuration of settlement buildings on the north side of the heugh. Their close proximity to the working area of the settlement infers a relationship of access. As dwellings for workers in the maritime industries they are favourably located for easy access to the working areas. But land to the south of the smoking sheds affords easy access too, and choice of plots on this basis alone is unconvincing. A persuasive theory arises from a hazard of the primary and secondary industries. Smells generated by the fish especially during the curing process are very pungent at times and may provide a clue why dwellings were situated away from the working area. Pungent smells are diluted by distance and by placing the dwellings on the opposite side of the heugh it helped reduce odours, at the same time giving ready access to the working area. Of course, when a southerly wind carried these smells distance would not be as effective. But at least some respite would be gained from what may have been a constant pollution problem in areas immediately adjacent to the smoking sheds. There is a similar precedent at Alnmouth where guano sheds were separated from the settlement because of the unpleasant smells they generated.

5.2.4 *Setting. 1899 - present day.*

This period saw major changes to the configuration of the settlement working area as a result of new working practices. The introduction of quarrying and expansion of the fishing trade prompted the constructions of a harbour early in the C20. At the middle of the century a relatively large housing estate (by standards of earlier numbers of dwellings) was constructed to the south of the harbour.

5.2.5 *Opportunities and limits for primary and secondary industries.*

The protection afforded by the haven was improved by the construction of piers to form a harbour. According to Pevsner (1992) the harbour works date from 1906-10. Changes to Craster haven were accompanied by changes to the size of boats and fishing practices. A glance at the low medium water marks on the 1899 and 1970 maps make it clear that this was not a deep mooring, consequently 40 -60 foot long boats with deep keels that moored inside the harbour would be high and dry during low tides.

However, even in these circumstances the harbour offered protection for boats that were too big to haul on shore and that were needed to sail greater distances than cobles to find depleting stocks of fish. Hepple gives an informative account of general changes in the maritime industry during the late C19 and early C20:

The cobles gave way to larger, decked boats with 40 -60 foot keels...and the steam drifter for herring came in 1907...by 1914 the fishing fleets were looking farther afield. Hepple (1988: 93).

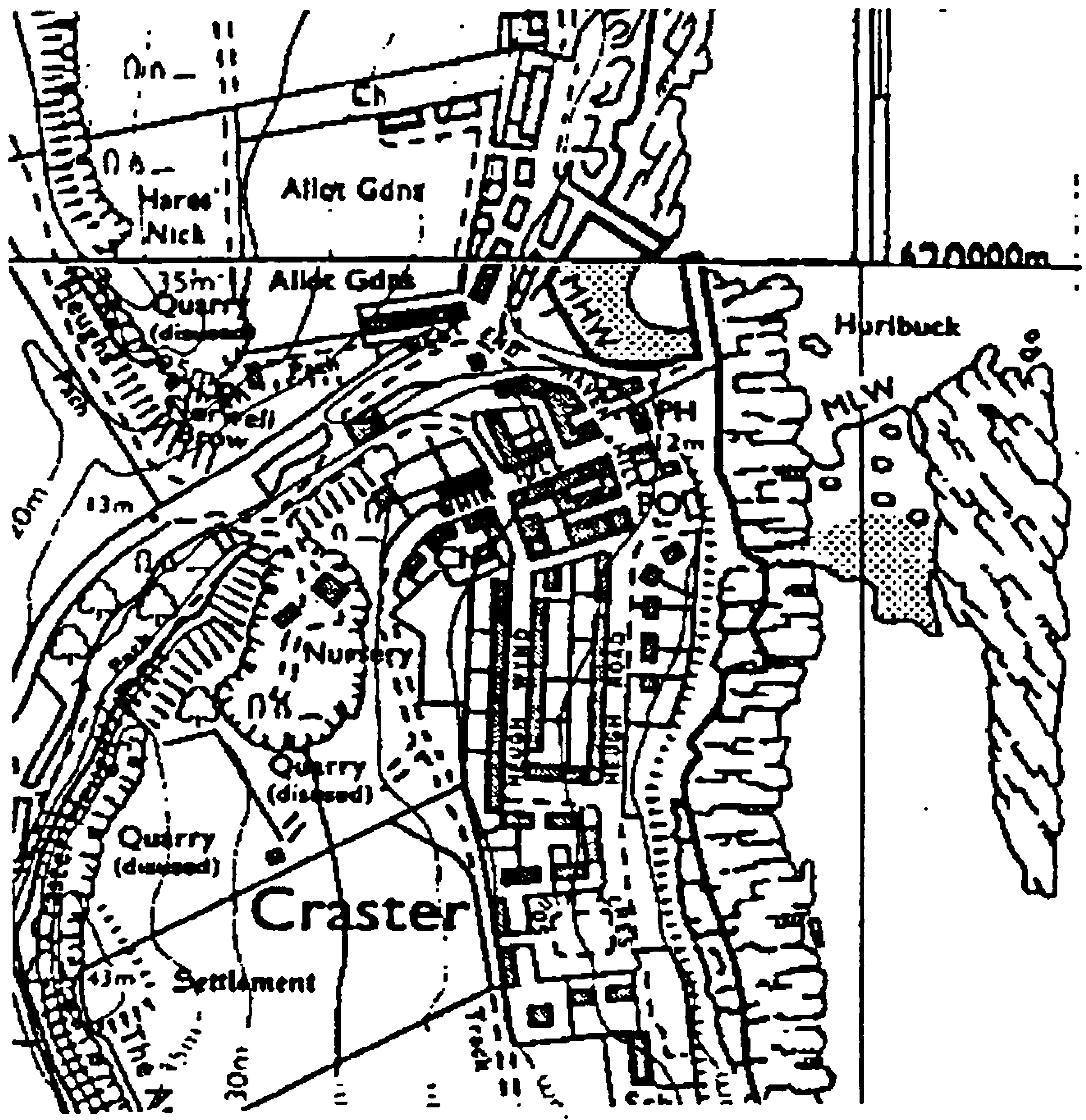


Fig. 5.4. **Craster. 1970**
SOURCE: OS. Scale 1:10,000

Quarrying whinstone was also an important primary industry in the late C19 and early C20. Evidence of a busy industry can be seen from the many disused quarries located to the north and south of the heugh and shown on Fig. 5.4 Remains of a hopper base can be seen at the end of the south pier on Fig. 5.3 where chips were loaded into coastal steamers. Thus the north pier, an extension of Whin Hill and within direct access to the quarries at the south side of the heugh, also served as platform for loading steamers as well as protecting the harbour. The business ceased to operate in 1930.

The changes to the haven were therefore dictated by changes to the working practices of the primary industries of the settlement. The impact on the settlement configuration is unmistakable. The haven, a focus of the primary industry activity takes on the identity of a man-made rather than natural feature and as a harbour becomes a strong element in configurations of the settlement matrix.

Despite the strong configurations of the harbour, building developments which occurred after its construction do not appear to respond to it. Instead, they follow the established patterns of building configurations evident on maps prior to the harbour's construction. Here the chronology becomes important in establishing causal links. Changes to industrial buildings configurations after the construction of the harbour still observe the geometry of the earlier sheds. Although some detail is lost in the different format of the 1970 map, examination of the more recent aerial photograph, Fig. 5.3 shows the layout of industrial buildings generally accords with the layout shown on the 1899 map. Changes tend to be small alterations rather than large additions and consequently the existing geometry of earlier configurations is retained.

5.2.6 *Opportunities and limits for tertiary industries and housing.*

Configurations of buildings for service industries do not appear to change between 1899 and 1970.

The largest change to the settlement over the whole chronology is in the housing development between 1899 and the present day. Opportunities for development extend across areas of two plateaux alongside existing housing on the north side of the heugh and to the south of the industrial buildings. Some industrial buildings have been converted to housing.

At the north of the heugh, development follows the pattern of the earlier housing configurations in parallel lines to the division formed by the tops of the escarpment and cliffs and plateau except for a terrace of dwellings and chapel at the most north part. Where an opportunity appears to exist for expansion on vacant land over all the north plateau there is an interesting characteristic in the way development avoids an enclosed area shown as allotment gardens on the 1970 map behind the linear configurations of buildings. Locals refers to this land, "for north side fishermen", which has been under their control since the fishermen's cottages were first constructed. A small number of new houses are shown on the aerial photograph

Fig. 5.3 in addition to those on the 1899 map, at each end of the curving configuration and along the heugh. Such a small demand for plots is accommodated as infills rather than backland development and may reflect the tenurial difficulties of building on land in the ownership of north side fishermen.

It is also interesting to note the ribbon form of this housing group is preserved where an early terrace has been demolished and replaced on the same site with another terrace of the same size.

To the south of the heugh is a substantial C20 housing development. This is limited by the cliffs of the coast and a path running N-S along the centre of the plateau. It is also limited by the southern perimeter of the industrial area. Buildings around the perimeter of the development follow the lines of these limits with a knock on effect on other dwellings. However, the nature of the configurations is different from earlier housing groups. Terraces and semi-detached houses are positioned on the site in parallel rows. This reflects the geometry seen in the industrial area but is looser than the compact industrial arrangement and uncharacteristic of housing configurations to the north of the heugh. The rigid pattern is an example of housing development practices which grow from regulatory standards.

The analysis traces several site settlement relationships during the period 1899 until the present day. At the north of the heugh there appears to be an attempt to confine the parallel relationships with coast and heugh, and building configurations, to periphery rows of dwellings. A substantial area of land behind this is almost entirely used as allotments and gardens. Elsewhere, two major developments took place. Firstly, the construction of a harbour and secondly, the construction of the housing estate on the south plateau. Two new concepts were introduced by these developments. Before, there was a traceable relationship between the activities of the settlement and the setting, seen in the industrial bases and housing need to service the industries all at a local level. As the settlement evolved this changed. Larger boats for fishing and transporting whinstone chips were required and demands for a harbour to accommodate these needs increased.

Changing demands are also noticeable in the housing developments that emerged during the C20 with the introduction of estate layouts. Population shifts and increased demands for housing led to the introduction of estate housing with layouts uncharacteristic of the earlier housing patterns of the settlement. They demonstrate a need for more dwellings than were previously required to service the local industries. The need was met by the introduction of a new repetitive configuration pattern which exhibits limits imposed by statutory controls. Later housing developments are also limited by their relationships with earlier buildings and the landscape characteristics of the south plateau.

5.2.7 *Discussion.*

An array of different events from the chronology combine to create a settlement framework which is unified by the central location of a harbour. Several distinctive events which shaped settlement configurations can be identified at different time periods that are substantially different from those of other time periods:

- Pre C19 settlement development for combined fishing and smoking industries;
- Early C20 harbour construction and quarrying industry;
- Later C20 housing expansion.

These different events are characterised by different classes of configurations. The first concentrated along the north cliffs and to the south of the haven is compact in rows and agglomerations. The second in the form of two piers is linear and spacious. The third, estate housing extending along the south plateau has a rigid structure of well spaced rows and regular distances between buildings.

There is little to relate the different classes other than the simple progression of events in which one follows the other. For example it cannot be said that the buildings prior to the construction of the harbour effected its configuration.

Similarly, it cannot be said that the harbour effected the configuration of the estate housing. Although it may be possible to infer the north limit of the estate housing is defined by the edge of the earlier industrial buildings, even here, a skew angle is noticeable and the parallel rows extend south in line with the coast rather than at any angle drawn from the earlier buildings. The settlement framework appears to be drawn from site characteristics where an order from topographic and geological divisions act as constraints and are causal in the configurations. Preliminary studies identified topographical and geological divisions which diffuse from the harbour along the coast and inland along the heugh. Their linear characteristics collect at the harbour making it a focus or core for the settlement geometry. The collection of buildings which form the present day settlement relate to the linear characteristics of these three diffused topographical and geological configurations giving the settlement a dependency on particular site features for its form. Although reasons for socio-cultural demands for properties of place can be proposed, causal events for evolving configurations are not totally explained through the chronology where classes of events differ so substantially over different periods. However, there are elements of a particular form in the integrity of the activities of a maritime industry and its coastal location. This infers a causal link between the nature of the industry and choice of site from which to conduct the activities associated with it. In the case of fishing, physical access to water is a prerequisite to conducting the activity, hence an integrity exists between the activity and coastal site.

It is argued that physical access to houses for people serving that industry brings them within the meaning of the second theoretical model, particularly when those houses are constructed adjacent to the area of industry and a physical relationship between them is observed. This wholeness is observed in the plans up to 1899 where all buildings are concentrated around the settlement core and houses for residents who work in the settlement industries are situated immediately adjacent to the core across the haven. A counter argument exists in the history of employment of these workers in nearby farming industries and in the quarries. Nevertheless, there is a fair assumption that houses are needed for those associated with the fishing industry whether or not there is parallel employment during lean times in the maritime industry. History also relates a decline of the maritime industry as the C20 progressed. This decline coincides with an increase in house building on the south plateau. There is clearly a change in the relationship between housing and the workforce for local industry. The numbers of dwellings constructed in the estate on the south plateau are too many to service the fishing industries and arguments advanced earlier about integrity cannot be applied. This is a significant change in the nature of the settlement matrix yet the wholeness is preserved and there is a sense of belonging between the old and new. A photograph taken from within the new housing estate at Heugh Wynd illustrates how physical and visual links between the old and new are preserved by retaining an open view of the old buildings and constructing them abutting to the old building line.

Fig 5.5. Craster. 1998. Photograph of Heugh Wynd looking south.
SOURCE: J.Martin, 1998.

A unity is created by retaining a reference to the earlier buildings within the estate housing framework. This principle is demonstrated again in the road to the east. The unity is created by the design of arrangements of dwellings along the east side of Heugh Road to preserve views of the coast from the road and houses and retain views of the old buildings to the south. Some building has taken place along the coast side of Heugh Road but these are spaciously placed thus keeping the open aspect to the sea.

Fig. 5.6. Craster. Photograph of Heugh Road looking south.
SOURCE: J.Martin, 1998.

Whereas the housing is not related to industrial activity the positions of the dwellings retain a relationship with a maritime site and settlement by simple recognition of its existing characteristics and incorporating them into the estate framework.

The prediction of the theoretical model:

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns.

is supported by the particular nature of the maritime industry at the coastal site, and activities associated with it.

5.3 MARITIME SETTLEMENT CASE STUDY: ALNMOUTH.

Of the four medieval ports mentioned by Hepple (1988: 92), Alnmouth retains parts of the infrastructure that grew around maritime activities, and is a rich primary source of data for chronologies and patterns. In other ports mentioned the settlements have either been absorbed into much larger towns or the infrastructures lost.

5.3.1 *Setting. 1864 - 1899.*

A history of the settlement from Almouth Village Guide prior to the first map is quoted to illustrate the functions of the overall settlement and buildings and changes that took place, as results of various demands for location.

The late C17 and C18 centuries were the hey-day of Alnmouth's prosperity. At one time there were 16 granaries in the town some of them three storeys for the storage of grain and a basement to house the caretaker. The harbour must have been very busy with topsail schooners and brigs plying backwards and forwards south to Newcastle and London and north to Berwick and Edinburgh, as well as across the North Sea to Scandinavia and Holland. As many as eighteen vessels were recorded to have been lying in port at one time...Fishing remained a vital part of the town's prosperity.

All the growing maritime activities required a number of facilities and an infrastructure started to take shape.

In 1753 a turnpike road was built all the way from Hexham to Alnmouth. This greatly improved the carriage of produce into the town...

The river used to pass to the south of Church Hill and then flow northwards to enter the sea to the east of Church Hill. On Christmas Day 1806 a great storm arose and the river broke through to form its current channel, thus cutting off Church Hill from the rest of the village...the breakthrough of the river was to prove a disaster for the town as a port. The new channel was not so deep as the original one and ships found it increasingly difficult to enter the harbour...Alnmouth was in economic decline. Coupled with this the age of steam had arrived, a railway was built mid C19 linking Edinburgh and London and proved a much swifter and simpler method of transporting goods.

Salvation came from the railway. Convenient and cheap transport provided by the North Eastern Railway made unspoilt seaside towns and villages such as Alnmouth attractive holiday resorts. A new building revolution took place, new houses were built at Riverside Road, Argyle Street, Marine Parade etc., suitable for holiday homes for wealthy merchants and business men, or as lodgings for the less well off. In 1864 a new road was built from the station into the village via a bridge named The Duchess Bridge.

A new church was built in 1876 and the temporary one became the village hall as it remains today. Many of the old granaries, which were of very sound construction were converted into dwellings. A fine example is Prospect Place. Another granary was made into a public school...until it was evacuated during World War 1. When a gas works was built a baths was constructed nearby where visitors could take warm seawater baths which was believed to have much therapeutic and medicinal powers in those Victorian times. Bettess (1997: 1-3).

This account is rich in information about the activities and events which helped to shape the settlement. By the middle of the C19 configurations of the settlement core were established from maritime industries within a framework of medieval burgage plots and the characteristic shape of the settlement traceable on other maps in the chronology up to the present day was in place.

In Norman times Alnmouth became a borough, and Bettess (1994) proposes the central street of the town constructed at that time established the course of Northumberland Street. Pevsner (1992) and Bettess (1994) recognise burgage strips on both sides of the street from the Wynd at the north of the settlement running down to the river on one side and to the common on the other. Burgages were common to many medieval settlements and were allocated by a baron to trusted and loyal followers who were free to develop their plots in whatever way they wished. This settlement was divided into burgage plots separated by a central spine. By building their homes where their burgage fronted onto the central spine the freemen created the street plan of the modern settlement. Boundaries of some of these burgages are still visible at Grosvenor Terrace, Crow's Nest Lane, River Bank Road, Prospect Place, Chapel Lane and Garden Terrace. This plot and spine framework creates a structural framework which continued to grow from industries of the following centuries. Buildings and infills generally followed the plots of the burgages.

By 1864 the primary industries of earlier years had ceased to operate, and tourism was the principal industry of the settlement.

5.3.2 *Opportunities and limits for maritime and tourism industries.*

Opportunities for maritime and tourism industries grow from settlement patterns inherited from previous eras. Examination of opportunities for maritime activities are discussed before tourism to obtain some understanding of the situation in which tourism grew. In her study of the history of the Alnmouth, Bettess concluded the settlement had been set up for particular trading purposes because of its esturine location. Generally, moving bulky goods by boats was preferred to transport by carts along poor roads. In the case of Alnmouth little equipment was needed beyond the provision of mooring posts, owing to the morphology of the river and shelter offered by the peninsula. This maritime activity was supported by a settlement which owes much of its shape to burgage rights awarded during Norman occupation. A burgage plan of 1614 by Bettess shows plots extending from the north to south over the entire length of the settlement. She describes a Norman borough,

...laid out along the top of the ridge from Church Hill almost as far as the northern boundary. It consisted of a two row plan lying north-south because of the geographical restrictions, rather than the favoured east west orientation.
Bettess (1994: 25).

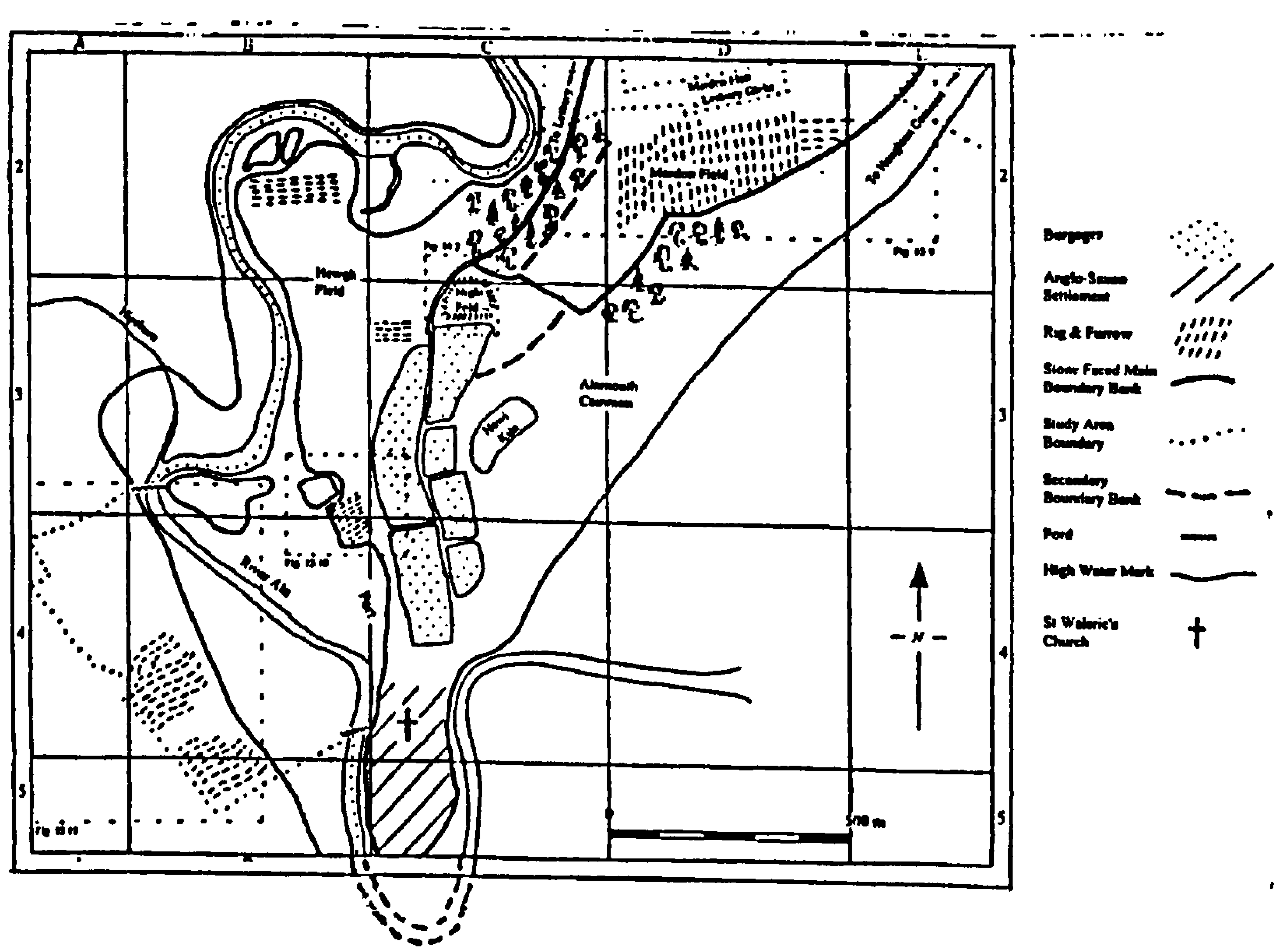
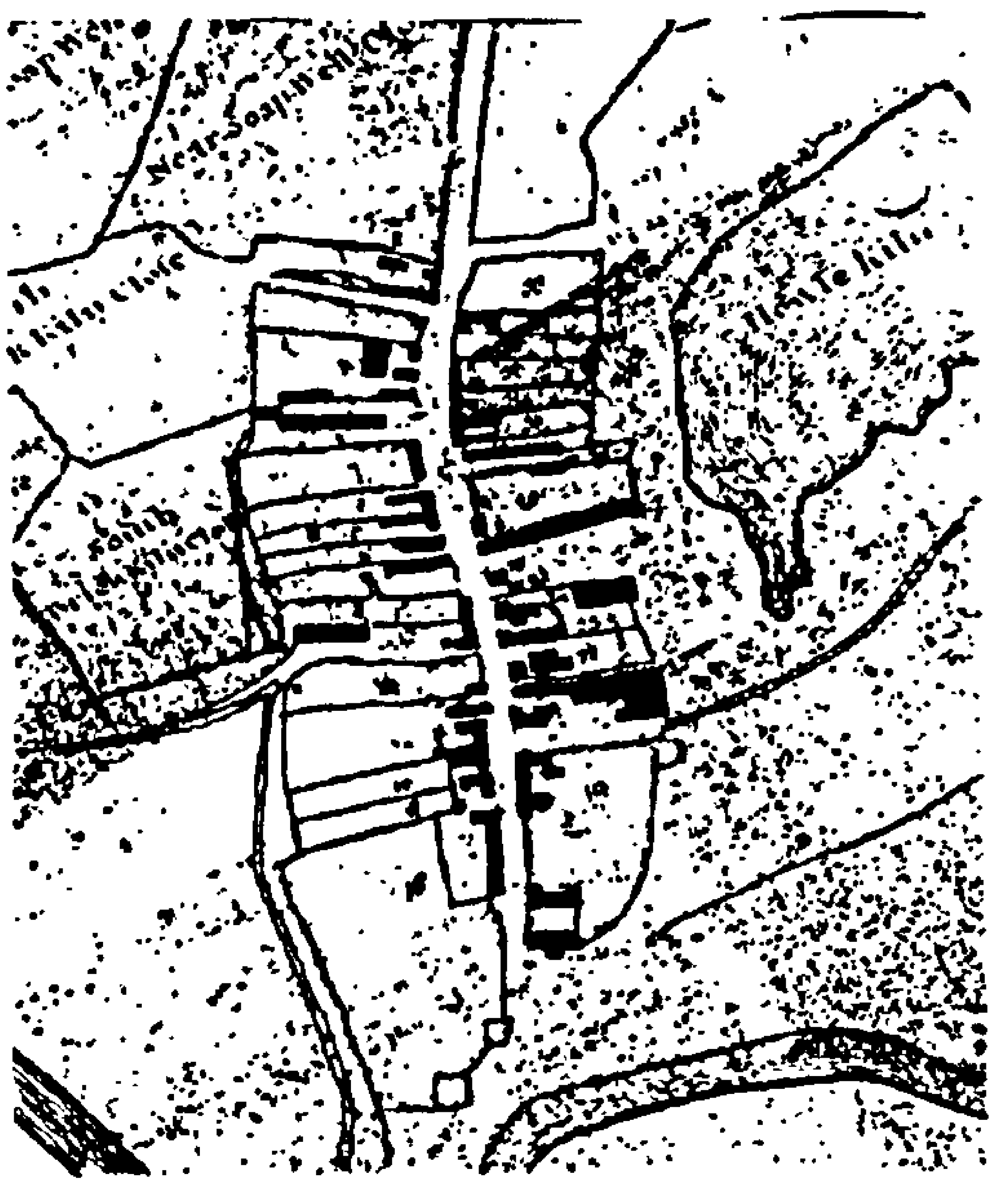


Fig. 5.7 **Alnmouth. Plan of the Norman Borough C13.**
SOURCE: Bettess (1994)



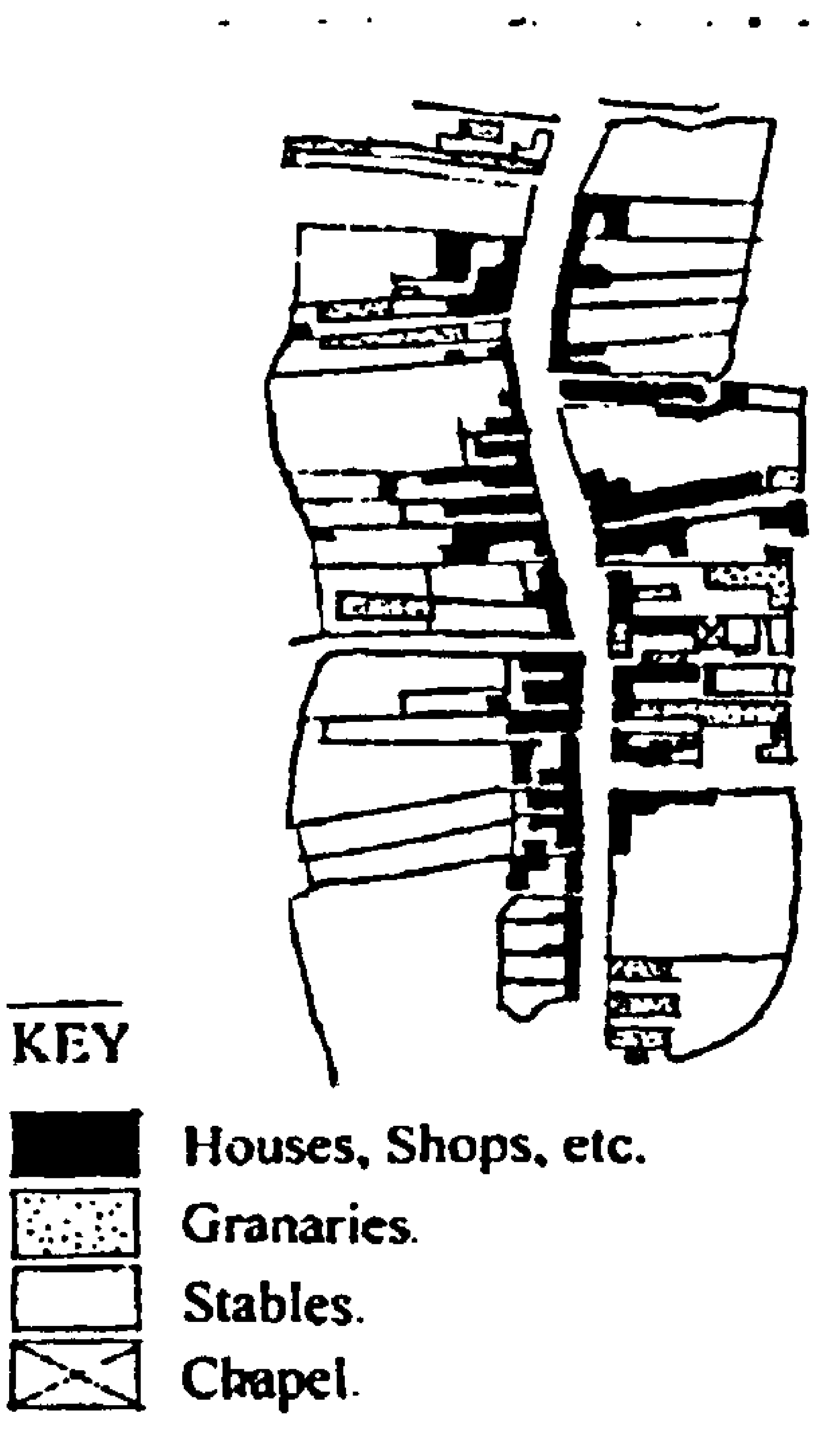


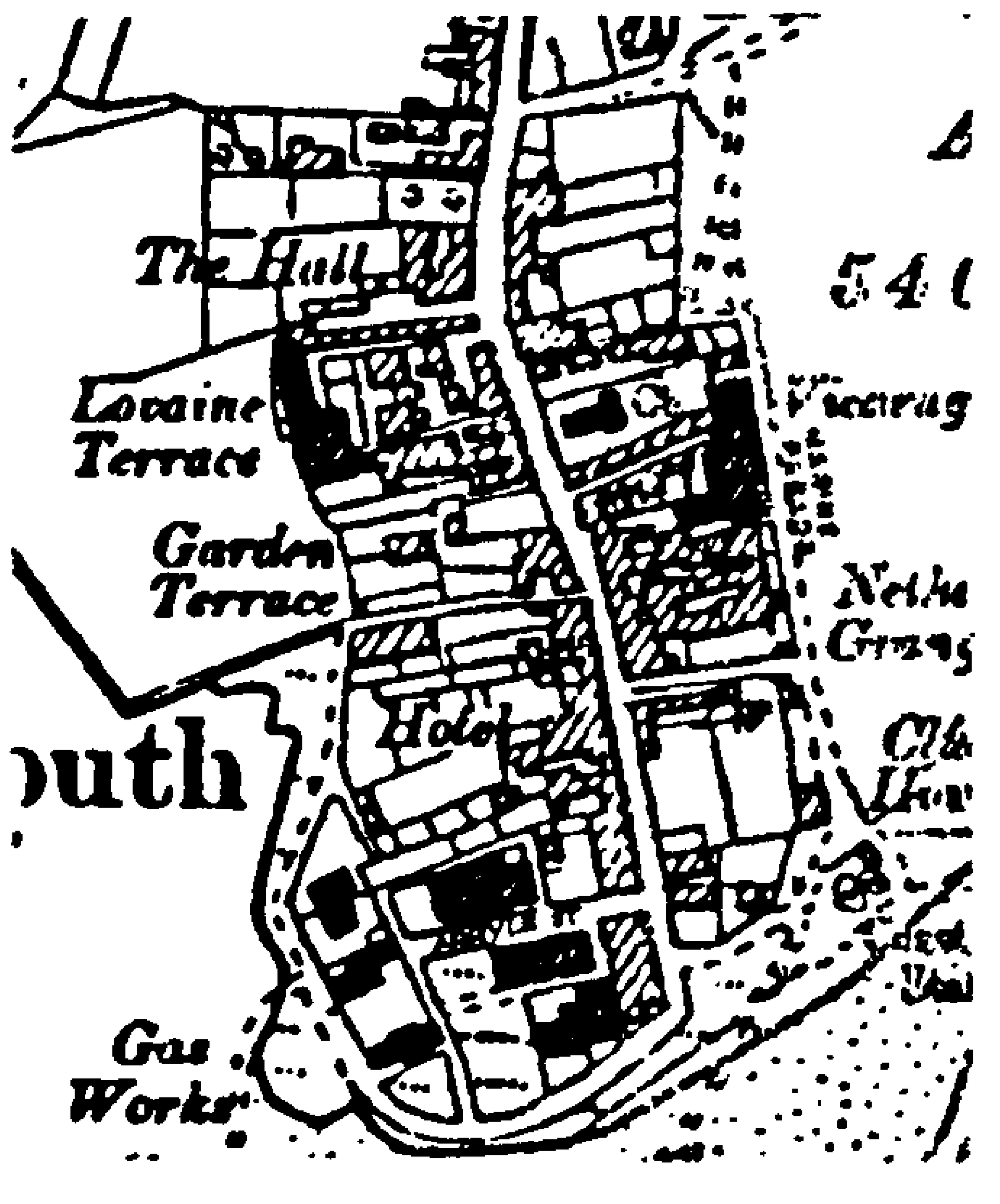
Fig. 5.8 Map of Alnmouth in 1791.
SOURCE: Wilkins

Fig. 5.9 Map of Alnmouth early C19
SOURCE: Betess (1994)

Burgages persisted throughout the wars with Scotland and are still evident on the Wilkin's Map of Alnmouth dated 1791. They dictated the settlement configurations before maritime industries of the C18 began operations. Buildings which followed to service the maritime activities were from existing stock and infills to the burgage framework. Granaries were long and thin following the burgage characteristic and located at right angles to the central spin. Generally the frontages to Northumberland Street were retained. The Tithe map by Bettess shows a layout the same as Wilkin's map and includes four functions of buildings which conform to the limits of the burgage framework: houses; granaries; stables; and chapel.

Alnmouth served two maritime industries. Firstly, bulky goods were imported and exported on schooners and brigs, and secondly, a busy fishing industry. From Bettess's research a harbour was identified to the east of the peninsula. There are deep water mooring posts for larger vessels in the estuary, and an old harbour wall is still visible at the west end of Garden Terrace. Natural characteristics appear to have influenced the choice of a favourable location for the maritime industry with only limited additions to the natural characteristics in the forms of mooring posts for deep keeled sailing vessels and a quay. Examining the relative positions of these features to the settlement configurations it seems reasonable to expect that storage for cargo would be located as near to the point of landing as possible. However, granaries were placed on both sides of Northumberland Street, inferring a different reason for relative positions to the quay. The location of three granaries at the south east corner of the peninsula shown on the Tithe maps may infer cargo was dispatched from the beach immediately to the south. Nevertheless, wherever granaries are located within the settlement matrix their configurations are related to the burgage framework of established ownership.

According to Pevsner (1992) a substantial fishing industry still flourished in the 1880s after the decline of the port, although little evidence of this exists in settlement configurations. Attempts to locate land based activities associated with the fishing industry are speculative. Examination of Fig. 5.7. shows the original route of the River Aln to the south of Church Hill with substantial areas of protected beach at the east of the peninsula above low tide where cobles could be moored. There is still evidence of a substantial protected area here after the river changed course and aerial photograph Fig. 5.14. shows this as a preferred area for boats with a scattering of them along the channel. However it presents difficulties for hauling boats ashore up the steep inclines of the sand gravel peninsula here and Bettess suggest the east shore was used for these purposes. There is no evidence on land which lends support to one particular theory and it may be the case that both were used dependent on weather conditions. Nevertheless, the significance of land at the south west tip of the peninsula remains unchanged. According to map evidence it remained an open space free of buildings for many decades until the end of the C19 and represented an opportunity for development outside the burgage constraints of long narrow plots. By 1899 Ordnance Survey shows Argyle Street has been constructed with rows of housing and plots forming a U pattern uncharacteristic the burgage constraints seen elsewhere.



Lovaine Terrace on the western periphery is another example of rows of dwellings built during the C19 which do not conform to the burgage constraints. To the east along Marine Terrace infill developments of houses tend to follow the burgage plot widths.

Fig. 5.10 Map of Alnmouth in 1899.
SOURCE: OS Scale 1:10 560

Guest houses and public houses within the earlier framework of configurations provided accommodation for tourists.

It is of interest that in a settlement that relied heavily upon the tourist trade there is no large hotel within the settlement matrix, but rather many smaller establishments offering limited accommodation. Again this may have been the result of burgage constraints on areas of land available. Old granaries which occupied several parcels of land were converted to different uses, but mostly for residential purposes. The most limiting element to settlement development was the geographic area and shape of the peninsula. This shortage of land led to infills, conversions and additions with the result that the matrix became denser over time. This is most noticeable by comparing the maps of 1866 and 1899. Despite the few years between editions there is a precise change in the density of configurations. Whereas the central spine and burgages defined the limits of the buildings in rows on either side of Northumberland Street during the maritime era, another limit became evident under pressure to expand. The shape of the periphery of the peninsula defined a limit which restricted and contained development within the characteristic peninsula configuration.

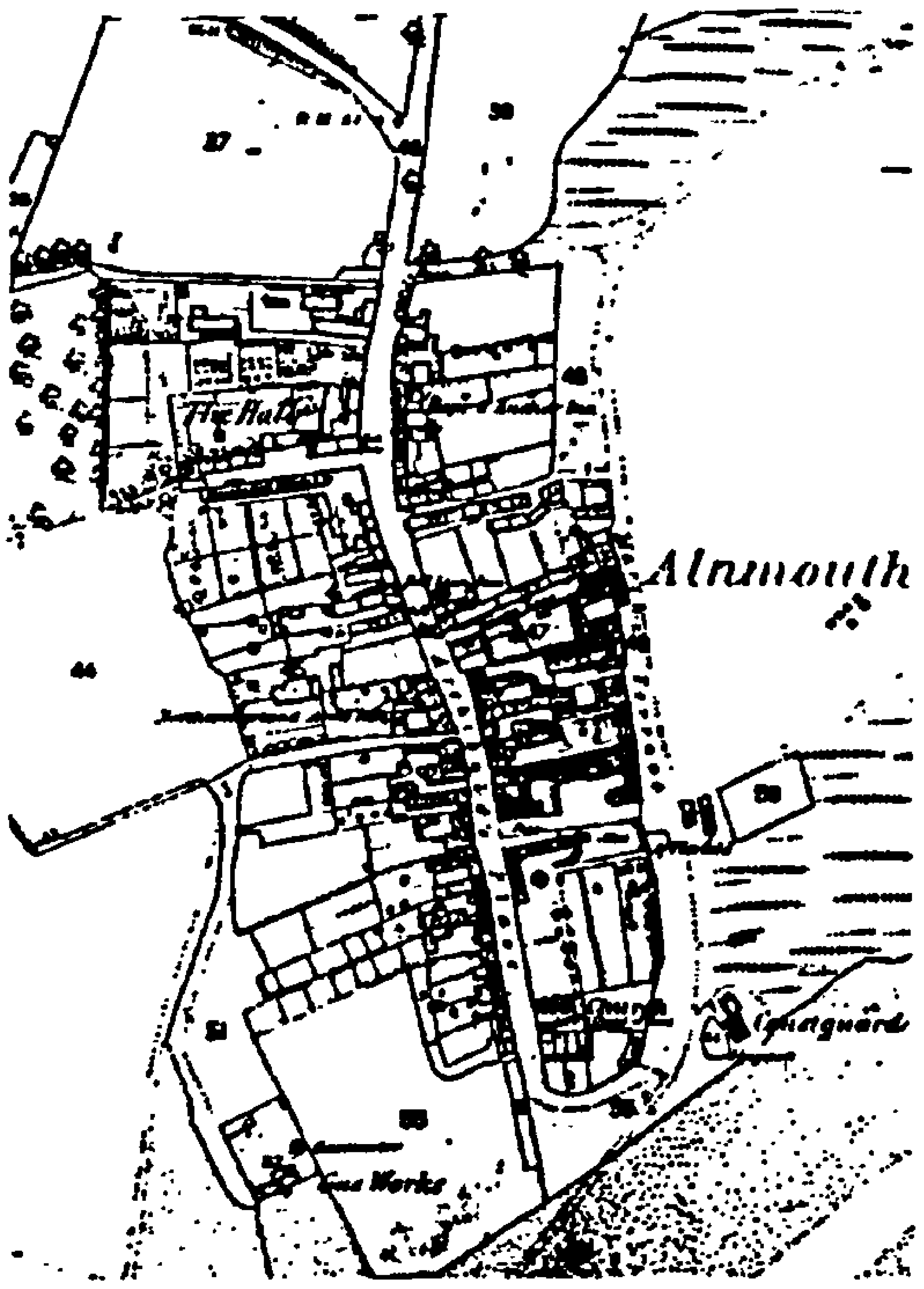


Fig. 5.11 Map of Alnmouth in 1866
SOURCE: OS Scale 1:10 560

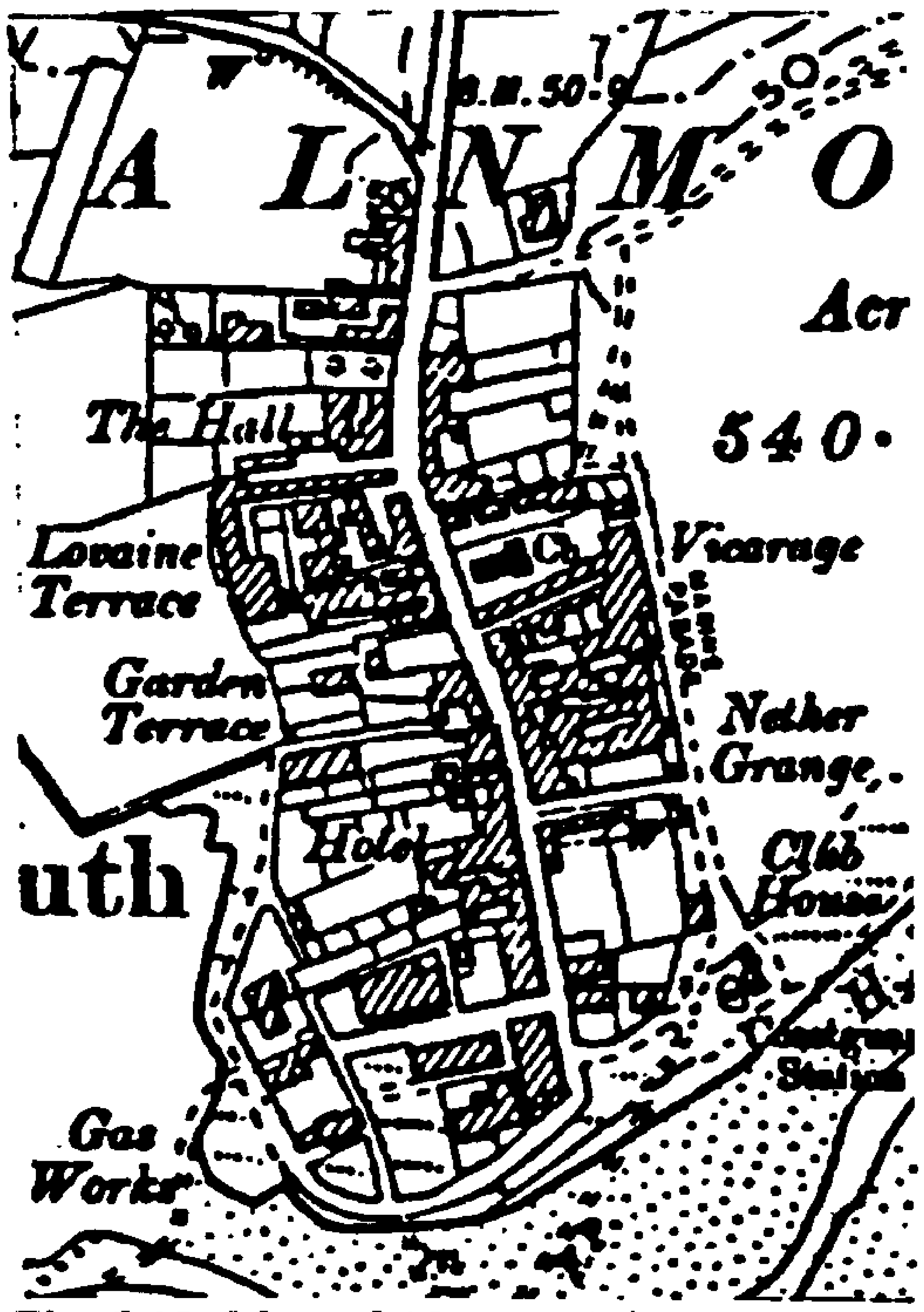


Fig. 5.12 Map of Alnmouth in 1899
SOURCE: OS Scale 1:10 560

Strong maritime industries operated under strict conditions of tenurial and legislative controls. Bettess (1994) records burgesses formed the earliest form of town council for the administration of laws. Clearly, these burgage holders would have held great sway over what took place within their settlement since land in their ownership occupied most of the settlement area. As well as burgages there were Stints which allowed only the burgesses to graze cattle on the inner and outer commons. Thus their control was not only over central buildings and plots but also over large areas of pasture adjacent to it.[2] Geographically the settlement site has a characteristic U configuration which is a peninsula formed from sand and gravel deposits. This configuration is seen on maps throughout the chronology and is most noticed as a limiting consideration once development potential related to the central spine of the settlement is exhausted. Therefore, in addition to legislative constraints there is also evidence for limits imposed by natural characteristics of the settlement site.

[2] Stints were given in addition to burgages. They allowed burgesses to graze their cattle on the common and gather fire wood to heat their homes. In those days there were two commons, the inner one still remains part of the settlement and the outer common, much larger in size, was located between Longhoughton and Alnmouth. The stint was therefore a tremendous boost to the wealth of the individual burgesses.

5.3.3 *1899 - present day. Opportunities and limits for maritime and tourism industries.*

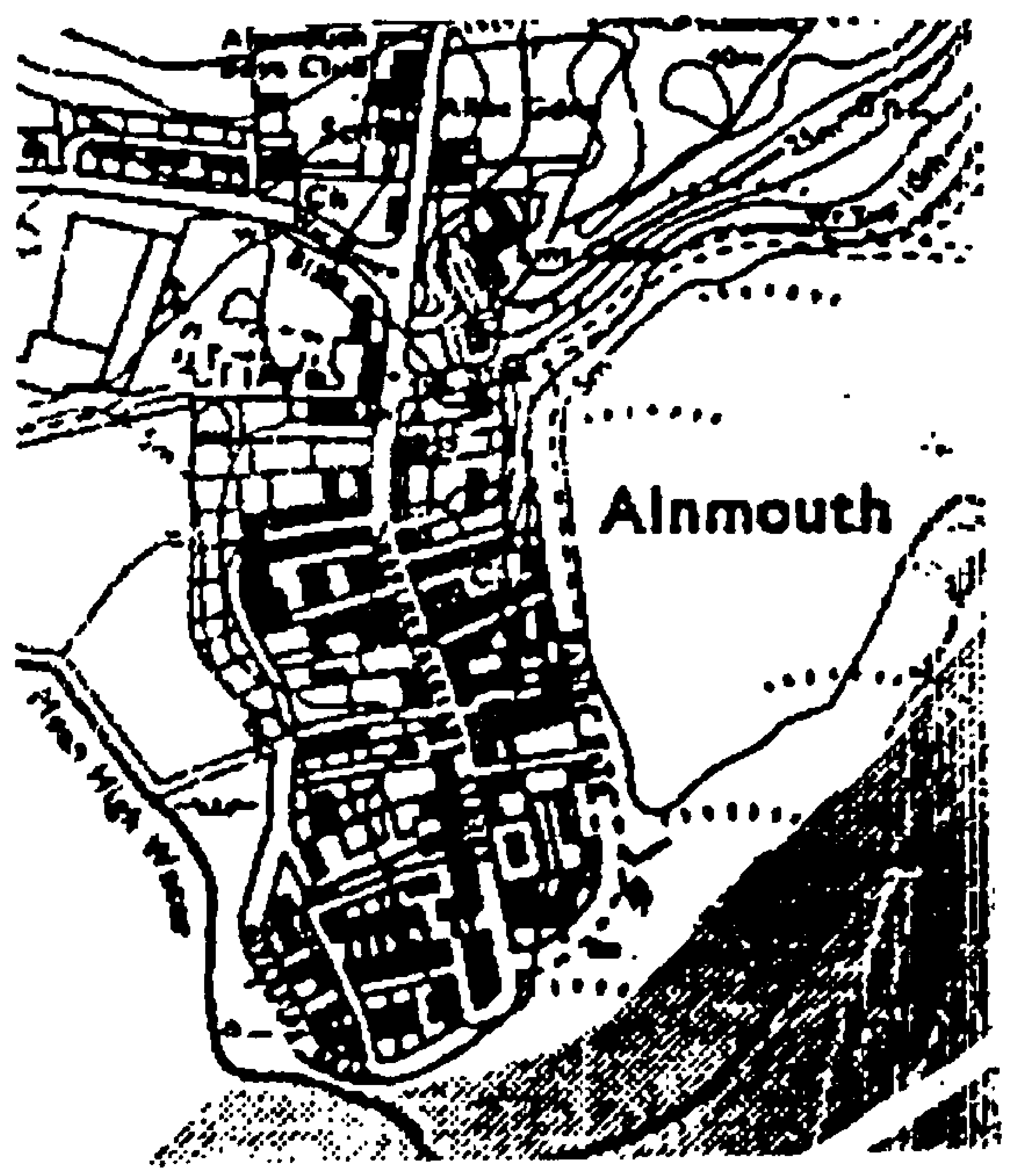


Fig. 5.13. Map of Alnmouth in 1970.
SOURCE: OS Scale 1:10 000

This period saw few changes to the settlement configuration prior to 1899. They were mainly infill developments of the few earlier plots that existed outside the burgage framework. OS 1970 shows developments in three main areas. On the east and west side of Northumberland Street north of The Wynd, at Lint Close and Alnmouth Boys Club, and on land at the south west corner of the peninsula, and Peases Garden to the north of Hindmarsh Hall.

None of the developments were related to maritime activity and not all were related to tourism. Housing played a major role, with many infill developments for residential purposes.

Numbers of bedspaces are limited by the numbers of rooms available, and expansion since 1899 seems to have reached saturation point within the peninsula form. Any further large scale expansion would need to be multi-storey or located outside the peninsula possibly to the north. There is evidence of a spread of housing at developments north of The Wynd and school.

Maritime activities are mostly leisure based with a variety of small craft evident in the estuary.

Demand for houses is limited to small pockets of development and has not changed the characteristics of the earlier settlement burgage plots with their frontages onto

Northumberland Street. Evidence of developments since 1899 suggest C20 suburban housing development practices are subdued by three particular constraints:

- burgages;
- lack of large sites within the peninsula;
- peninsula shape and size.

Building lines begun along Northumberland Street are maintained and follow Riverside Road and Marine Drive at the south of the settlement. Terraces behind these resemble the narrow strip developments of granaries within burgage plots. Peases Gardens seem oddly placed, set back from the road among other buildings which conform to the early burgage practice.

Settlement identity is preserved by a combination of physical site characteristics and socio-cultural controls in the form of burgages.

5.3.4 *Discussion.*

An array of socio-cultural events can be drawn from the chronology of development and from these causal linkages over time distinguished in the evolving settlement framework within natural constraints of the location and properties of place. The events which were instrumental in shaping the settlement framework were the location of the spinal access along the ridge of the peninsula and the division of sites on both sides of it. All following occurrences were dependent on these prior events. Convincing evidence of the contingency effect is found on the aerial photograph where burgage strips are clearly defined by linear building configurations within the peninsula geometry. It is acknowledge that early evidence of these configurations is drawn from the Norman period or before which had a significant effect on the progression of events which followed.

Fig. 5.14. Alnmouth 1995. Aerial photograph
SOURCE: Airfotos.

Before the beginning of the C19 the peninsula was much longer than it is today and included Church Hill to the south. The linear configuration of location would be very much more pronounced then and a central north south axis would be evident as it bent along the ridge of the peninsula ending in an elevated church at the top of the hill of the southern part. An indication of this can be obtained by comparing **Fig. 5.7.** *A Plan of Norman Borough* by Bettess and **Fig. 5.8.** Wilkin's' settlement map 1791, with contours on **Fig. 5.13** 1970 Ordnance Survey. The Bettess and Wilkin's plans show the long peninsula and an axis formed by the central spine road running N and S with a church at the south. Comparing this with the contours it can be seen there is a tendency to follow the high ground and so create the spinal route along a natural axis of the site.

The properties of place offered other practical characteristics for settlement planning within the Norman tenurial system. The spinal axis was not only a statement of the geometry of the peninsula but it separated the site into E and W parts where, according to Bettess (1994), the length of burgages correspond to a favoured size for awards of quarter of an acre burgages.

The chronology shows how these events have influenced the patterns of evolving configurations. The duality of physical characteristics of location and socio-cultural demands for properties of place gives order to the organisation of configurations by imposing a rigid structure on the settlement framework in support of the second theoretical model

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns.

This extends the relationship theory of site divisions and settlement configurations to include causal events for evolving settlement forms on a contingency basis. The significance of this is the prevailing dependency on some prior occurrence and its ability to limit development over several socio-cultural activities. It appears land ownership, in the form of burgages, is strongly placed by the geometry of their plots and body of burgesses they create, to steer development within the constraints of the settlement framework formed by the combined effect of many burgages. By retaining single ownerships the long narrow strip configuration of the burgage limits development by boundary, resulting in evolving linear forms which follow the burgage boundaries.

The prediction of the first theoretical model

Topography and geology are significant in shaping building configurations of rural settlements

is supported by the geometry of the peninsula and its constraining effect on the evolving settlement configurations.

5.4 AGRICULTURAL SETTLEMENT CASE STUDY: KIRK NEWTON.

The agricultural settlement case study is drawn from an area where improvements in agriculture at key points in history were especially noted. This is Glendale, a fertile agricultural region located in the north of the county not far from the Scottish border. Kirk Newton is a small settlement located at the foot of the Cheviot Hills overlooking the river valley to the north. Hepple describes it as desolated during the 300 years war except for part of the church. The settlement was almost entirely rebuilt after the end of hostilities, and its form has changed little from the layout shown on the map by Fryer 1820 to the present day. It offers an opportunity to investigate site and settlement relations in the context of agricultural use as it may have been implemented in the growing industrial climate of the C19 to the present day.

On farming Hepple says,

After the turmoil of the Civil War and Commonwealth, the later C17 saw a number of improvements in the farming landscape of Northumberland. In many villages on the coastal plain and in the Tyne valley, the open fields were enclosed by agreement and divided into individual consolidated farms...

These changes affected only a small part of the landscape. The lowland village fields were simply oases surrounded by much larger unenclosed commons, which completely dominated the upland moors. In the early C18 the Northumbrian landscape was largely one of open moor and heath, without hedges, trees and neat fields of today. In the following century this farming scene was transformed by the revolution in agrarian organisation and agricultural techniques. The growing demand from the new industrial regions (like Tyneside itself) led to rising food prices, and good farming profits, especially after 1750. The enclosure of open land allowed better husbandry, and the introduction of sown grasses, clovers and turnips encouraged new crop rotations, increasing yields, and provided winter feed for sheep and cattle.

The Stuart enclosures left few open fields to be enclosed by the formal machinery of Parliamentary Enclosure Acts that began to dominate after 1750, but vast moorland areas of Northumberland were enclosed in this way...

Although the county continued to have a strong pastoral emphasis, there were many more arable fields than today, even in quite upland areas. Not only was corn grown for home consumption, but an export bounty on corn (in force from 1689 to 1766) encouraged corn exporters, and a good deal of corn was shipped from Alnmouth, Beadnell and Berwick, to Scotland and to foreign ports...

Yields were improved not only by crop rotations, but also by treating the soil, adding marl to light soils and liming heavier soils...

One of the later regions to be improved was Glendale and Tweedside, which had been prosperous in the C13, but had suffered greatly in the Scottish wars...the loamy and

sandy soils had a lot of potential and the large areas available attracted enterprising farmers from Scotland and the south, who turned it into the best farming land in the county...
The change of Northumberland into an efficient farming region is illustrated by the new harvesting technology...in the late C18 a number of threshing-machines were invented. The thresher, situated in a wheelhouse, was driven either by horses, water, or windpower, or later by stationary steam-engines. Many old wheelhouses and chimneys survive on farms, often indicating the former extent of arable farming in areas now mainly pasture. Hepple (1988: 89-92.)

This identifies three key events in the general history of the county. Firstly, the end of the war with Scotland saw the gradual end of hostilities and produced conditions in which industries and the population could grow. Whereas this was true for all industries it is most noticeable in agriculture which was the most widespread. Secondly, acts of enclosure imposed a wide and ordered framework upon the landscape. According to Baker and Butlin (1973) by the turn of the C19 changes to the landscape were almost complete.

By 1800 enclosures, which had operated with notable intensity in the C17 and C18, had effected the almost total disappearance of the open and common fields, meadows and pastures, leaving only a few small remnants in the lowlands and various moorland and fell commons to be enclosed in the C19. Baker and Butlin (1973: 93).

And thirdly, an improvement in agricultural techniques and increased yields. There was also a considerable knock on effect with secondary industries benefiting from a booming farming industry.

The historical picture of the period of study is one of fervent activity in settlement building to meet the demands of a fast growing and improving agricultural industry. The population census of 1881 shows in 1801 the resident population was 168,078 and by 1901 it was 602,859, indicating the large population increases to be served by the farming industry. This is also the period best documented by maps. Before the middle of the C19 maps tend to be of a general nature without much detail of buildings and their particular locations. By the introduction of the early Ordnance Surveys settlement configurations were well established.

Maps by Armstrong (1769), Fryer (1820) and Greenwood (1828) shown in Figs. 5.15, 5.16 and 5.17 are pictorial accounts of settlement and landscape. Their use as single documents in determining settlement configurations is limited, but they do allow layouts to be defined when read in conjunction with later maps in the chronology. When read in this way they become valuable early records from which to trace evolving forms during formative years soon after the cessation of hostilities with Scotland.

5.4.1 *Setting. 1769 - 1897.*

Kirk Newton is located at the north of the county near the border with Scotland and as a result suffered very badly from raids by marauding Scots. Apart from transept and chancel walls of St.Gregory's church, no early buildings survive, although an early C18 tower is mentioned by Dixon (1981) and is shown as ruins on Armstrong's map of 1769. During the agrarian expansion of the late C18 and early C19 the potential of the loamy and sandy Glendale soils was recognised and enterprising farmers *"turned it into the best farming land in the county"* (1988, Hepple: 90).

The settlement grew in the agrarian expansion and continued to prosper until rural economies declined during the end of the C19. This period in the chronology represents two centuries of agricultural prosperity in which Kirk Newton appears to have been built afresh in the period of relative stability which followed the end of hostilities.

5.4.2 *Opportunities and limits for primary and secondary industries.*

We can identify two opportunities for primary and secondary industries to grow at Kirk Newton. Firstly, political and economic conditions created by peace with Scotland, and secondly, the fertile nature of land in the Glen valley. The primary industry of Kirk Newton draws from these opportunities through arable and pastoral farming methods creating conditions in which a settlement was able to evolve. Particular population numbers are given by Whelan (1855) for the period 1801 - 1851 in the parish of Kirk Newton. These are shown in a table format with percentage increases calculated from the previous year.

	1801	1811	1821	1831	1841	1851
Kirk Newton. Pop.	55	74	83	76	83	88
% increase		+34.5	+12.1	-8.4	+9.2	+6.02
County of Northumberland % increase		+0.85	+1.49	+1.09	+1.16	+1.35

Table 5.1 Kirk Newton and County of Northumberland. Population and percentage increases.
SOURCE: Whelan (1855)

Comparing these with percentages for the county census for the same period shows a substantially larger growth rate than for the county as a whole.

The significance of this is the strength of Glendale as an agricultural region indicated by the rate of population increase for years represented by Armstrong's, Fryer's, and Greenwood's maps, **Figs. 5.15, 5.16, 5.17** in the chronology. The census figures are provided because the growth of the settlements over this period is not clear on the small scale maps. The investigation takes place against a background of growing population which should be reflected in the demand for housing. Since map evidence is not of a detailed nature the census figures provide an alternative source of data about the settlement growth at that time. From the 1843 Tithe Map shown in **Fig. 5.18** it is evident the settlement framework and configurations of buildings were in the forms which have persisted to the present time.

The layout is common to Fryer's and Greenwood's maps, **Figs. 5.16** and **5.17**, indicating the settlement core was established sometime between the middle of the C18 and early in the C19. This can be positioned even more specifically by the account in the *Kirk Newton Terrier(1806),* shown in Appendix I, which describes details of the present layout and buildings.

The settlement core is an assembly of agricultural buildings and houses for farm workers. The statistical analysis identified particular geological characteristics which illustrate the division between two soils in the immediate area of the settlement. There is a fertile alluvium valley extending to the north which is used for crop growing. There are hills to the south with boulder clay depositions which are less preferred for crops than the sandy loamy valley and provide pasture for animals. Kirk Newton is located at the geological division between these soils where access to both is most easily obtained. The land begins to rise steeply to the south at this division. This is another indicator of choice of location. There appears to be a preference to locate the settlement on flat land rather than on a steeply inclined site. Little recognition is made of the flood characteristics of the River Glen. Levels shown on the contours of the statistical survey topographical map show a 60m contour extending from the settlement directly north to the river bank across the alluvium plain. The settlement is level with the river bank immediately to the north and therefore elevation does not appear to provide protection from flooding. Location appears to be based upon a simple choice of site near the church and at the change of geological soils.

After 1769 and before 1820 there is a significant change in the settlement configuration.. This is based on a rectilinear framework of paths around the Glebe and garden of the vicarage. The changes can be seen in the chronology of early maps.

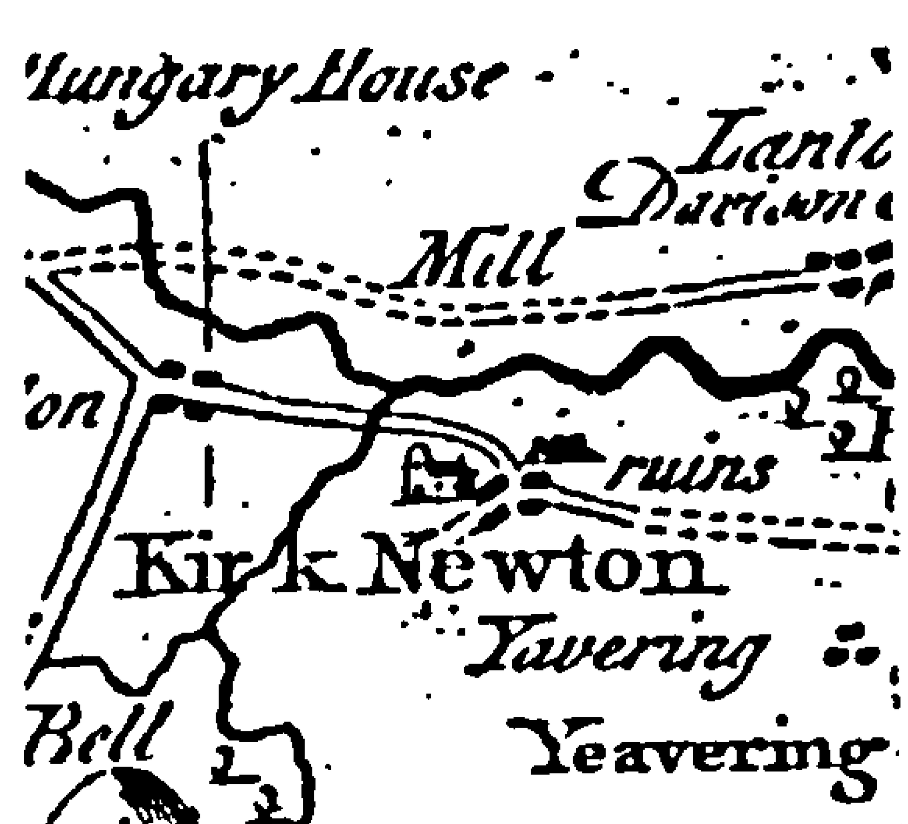


Fig. 5.15. Kirk Newton
1769
SOURCE: Armstrong.

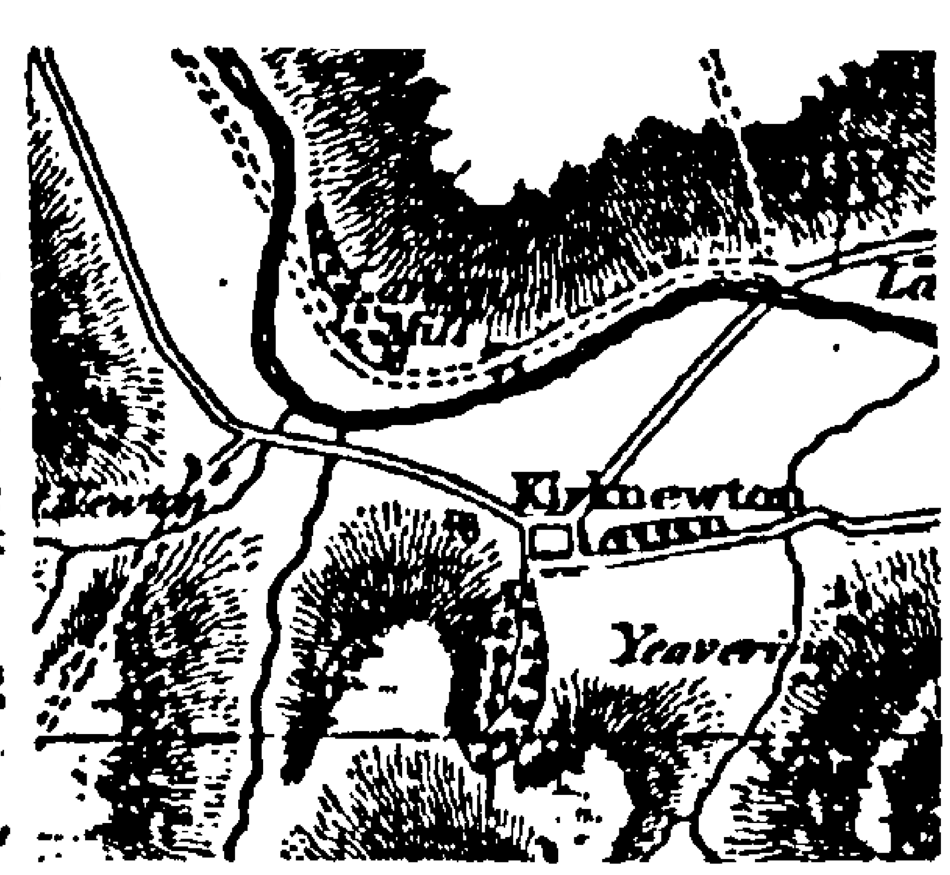


Fig. 5.16. Kirk Newton
1820
SOURCE: Fryer.

Fig. 5.17. Kirk Newton
1828
SOURCE: Greenwood

Accompanying this new framework is a new access to Lanton, a nearby settlement on the north side of the River Glen and a little to the east. With this Kirk Newton becomes a focal point at the meeting of accesses from the north, east and west with the rectangular glebe acting as a central feature surrounded by a path and linking the accesses from three directions. However, conversations with local residents indicate the path around the glebe was not to assist the general road pattern but rather a preference of the vicar who did not wish to journey to church along the established route through the farmyard which was located at the south of his vicarage. Given that the parish was responsible for road building this reason seems quite plausible. The fundamental configuration of the settlement framework therefore, evolved from a preference to isolate the access to the church from the adjacent farm buildings and activities.

The tithe map, Fig. 5.18, shows the settlement configuration in some detail when read in conjunction with the terrier. Also shown is the enclosure of surrounding fields.

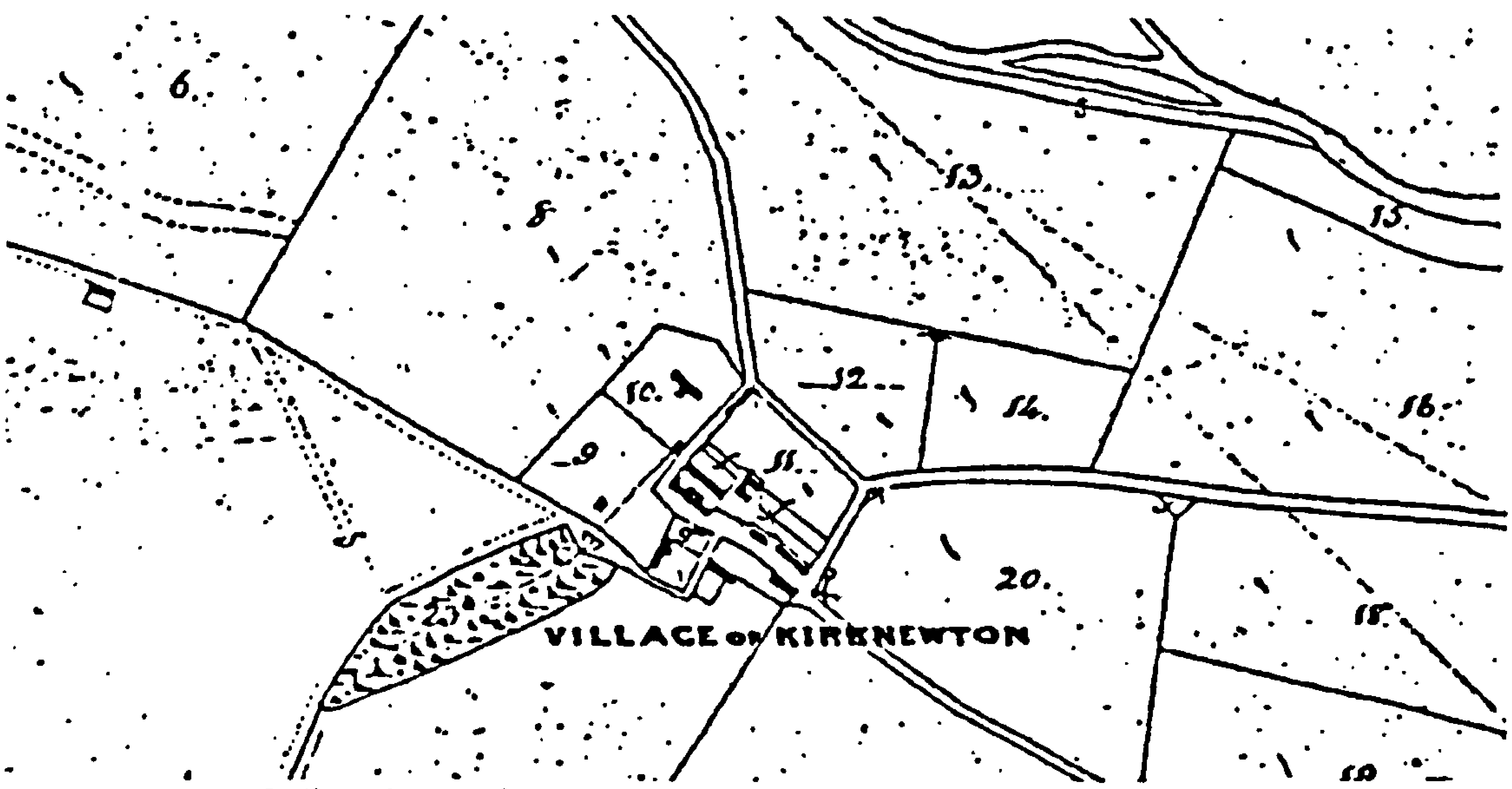


Fig. 5.18. Map of Kirk Newton in 1843.
SOURCE: Tithe map.

Farm buildings which comprise the settlement core are located at the SW corner of the rectilinear framework and extend E along the south side parallel to the contour which describe inclines of St.Gregory's Hill and West Hill to the S. To the south of the farm buildings there is a mill house which generates power for the milling process from a stream which runs from a man made reservoir between the two hills. The axis of the mill is at right angles to the farm buildings and follows the line of the stream. Here the positions of buildings are dictated by the location and direction of flow of the stream. Opportunity for this secondary industry results from the location of the reservoir and head of water produced by its height above the mill and passage for the stream along the natural line of the valley between the two hills.

Between 1843 and 1897 there were extensions and additions to the farm buildings at the SE corner of the settlement. They follow the geometry of the existing buildings in parallel building lines or turn at right angles to create yards in the spaces between them. According to the local farmer the single farm was split between two brothers into east and west farms towards the end of the C19.

The change between flat land and inclined land limits the settlement configuration along the south side. This is apparent in the case of farm buildings but not for the mill. The functions of the primary and secondary industries are suited to different topographic conditions. Farming appears to prefer locations on level ground, whereas the mill requires the flow of water for its grinding wheels and is more suited to an inclined site.

Practical issues of farming practices in cultivating land and grazing animals seems relevant to the choice of location and framework configuration. This practical approach is also seen in the location and configuration of the secondary industry building. Relationships are seen to exist between the natures of the industries and the topography of the settlement site.

5.4.3 *Opportunities and limits for housing.*

The expanding agricultural industry provided the opportunity for the development of dwellings within the configuration of farm buildings, where provision was made to accommodate workers associated with farming. It is clear this complex developed around a common agricultural use. In addition two large houses which are detached from the farm complex form parts of the settlement formation. Kirk Newton House surrounded by a large garden is located at the SW corner of the farm buildings. The vicarage surrounded by large gardens and a glebe is constructed to the N of the farm buildings. Social relationships between Kirk Newton House and the farm are unclear but the location on flat land follows the same choices shown in the selection of site for the farm. The Vicarage site occupies a prominent position and is the largest site of the whole settlement. It is detached from other buildings and immediately to the east of the church. The two houses and church occupy large tracts of land to the north and west of the farming complex thereby limiting further development of the settlement in this area.

A schoolhouse is located at the NW corner of the glebe following the lines of the western boundary. The general dates of its construction are the same as the farm buildings and mill. By 1898 there is a second row to the north of the schoolhouse following the same boundary. In late C19 a railway and station was constructed to the north of the settlement as part of the countywide expansion of the railway industry (Pevsner, 1992: 92).

The boundaries of the plots are mostly limited by their relative positions to other buildings and boundaries in a compact settlement layout. These create a characteristic framework of buildings which is not followed in the relative positions of Kirk Newton House and the church.

5.4.4 *Setting. 1897 - present day.*

This period in the chronology saw significant changes in the operation of the farming industry through improved distribution systems. Some development of close fields for new barns took place and houses began to be constructed in ribbon developments along roads to the north.

5.4.5 *Opportunities and limits for primary and secondary industries.*

Opportunities for the farming industry are seen in the transformation of earlier farming practices into agri-business with the construction of large barns to the south of the churchyard seen on **Fig. 5.19.**

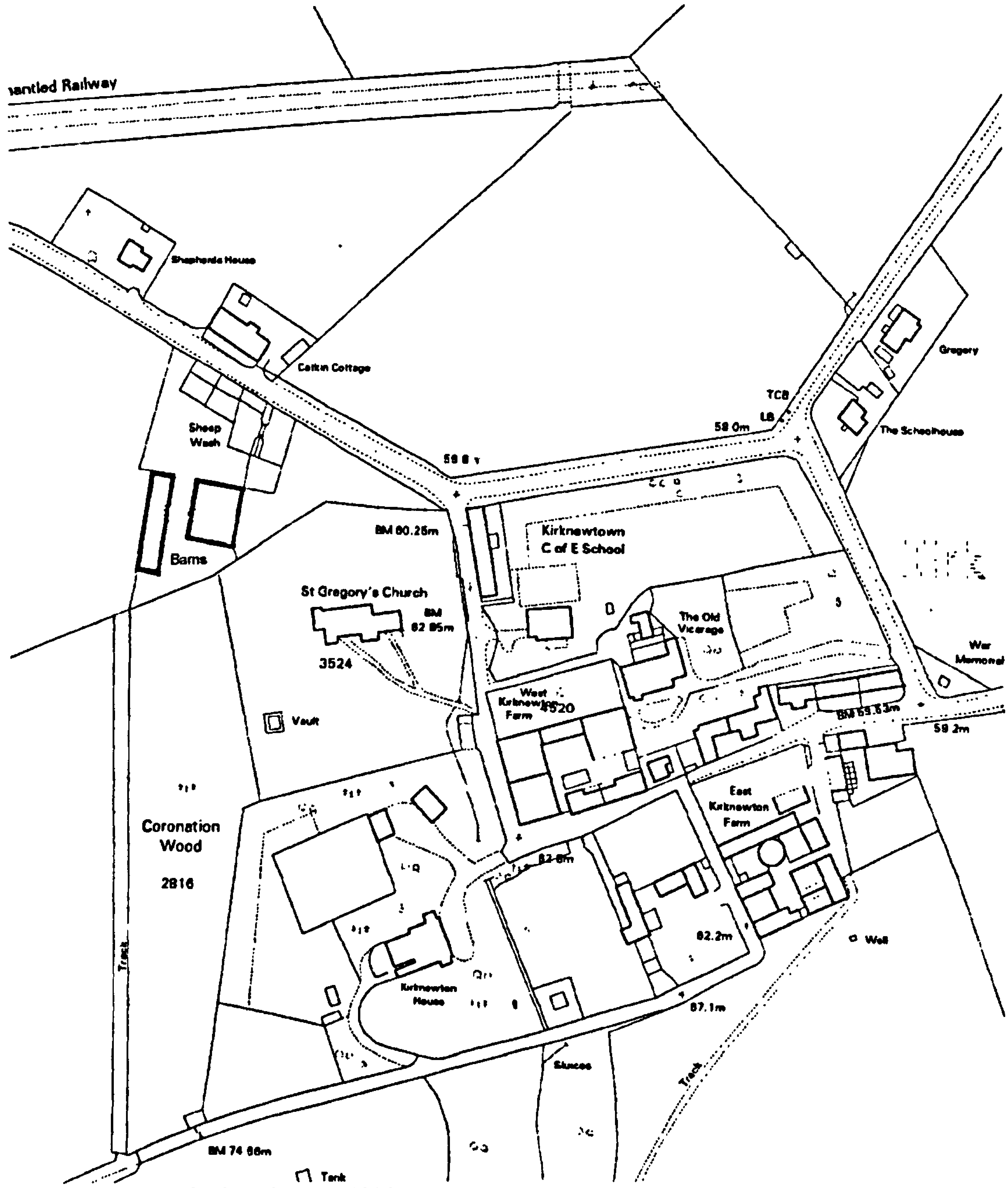


Fig. 5.19. Plan of Kirk Newton 1999.
SOURCE: Digimap.

Their large size precludes them from construction within the confines of the settlement core, but they follow the earlier compact characteristics by closely following the line of field walls on sides nearest the settlement. During this period the mill, situated to the south of the settlement core, ceased to operate and was converted to a house. Changes to the industrial bases have not led to significant changes in the configurations of buildings. Comparison of Ordnance Surveys 1897, 1923 and 1970, **Figs. 5.20, 5.21,** and **5.22** shows small differences to the configurations established by the end of the C19. Two extensions can be seen to the west farm on the later map, but these are largely 'roofing in' between buildings at opposite sides of the farmyard, and consequently their shapes are constrained by existing structures. A new barn is also seen at the north east corner of east farm, which follows the direction of the buildings immediately adjacent top it. Although the period is one of great changes to working practices, evidence in context of changes to the settlement configurations is limited to the new barns and infill around the farmyard. As farmers adopted an increased pastoral emphasis rearing livestock, there was a fall in the number of farm labourers as "*The countryside was emptying its surplus population into urban areas*" (McCord and Thompson, 1998: 292). Needs for rural housing reduced accordingly and it was not until late in the C19 and during C20 that demand increased and ribbon developments along roads to the north took place. The introduction of the railway line and station to the north of the settlement during C19 no doubt assisted in the expansion of the settlement plan in this direction. Since the removal of the line during the later part of the C20 this trend has continued with more houses constructed along roads to the north.

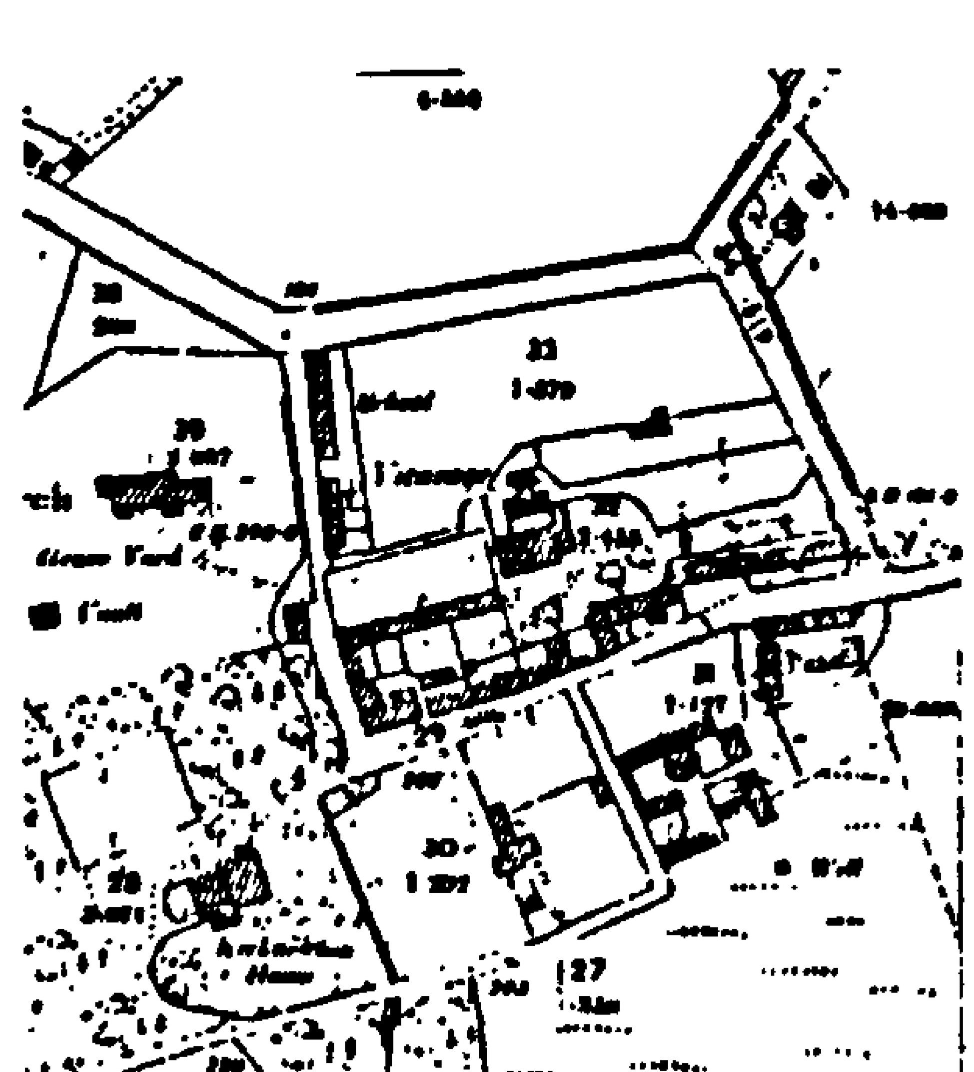


Fig. 5.20. Kirk Newton 1897
SOURCE: OS Scale 1:10560

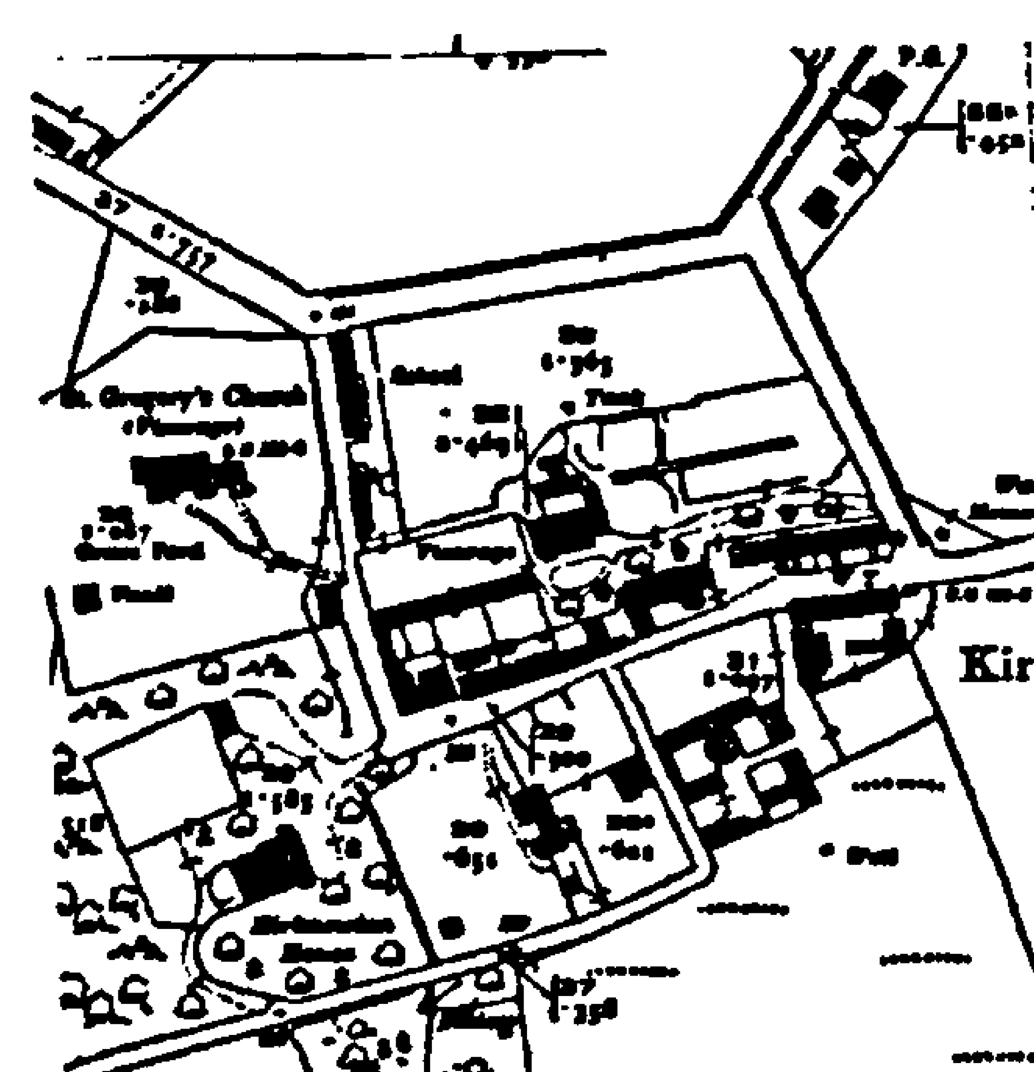


Fig. 5.21. Kirk Newton 1923
SOURCE: OS Scale 1:10560

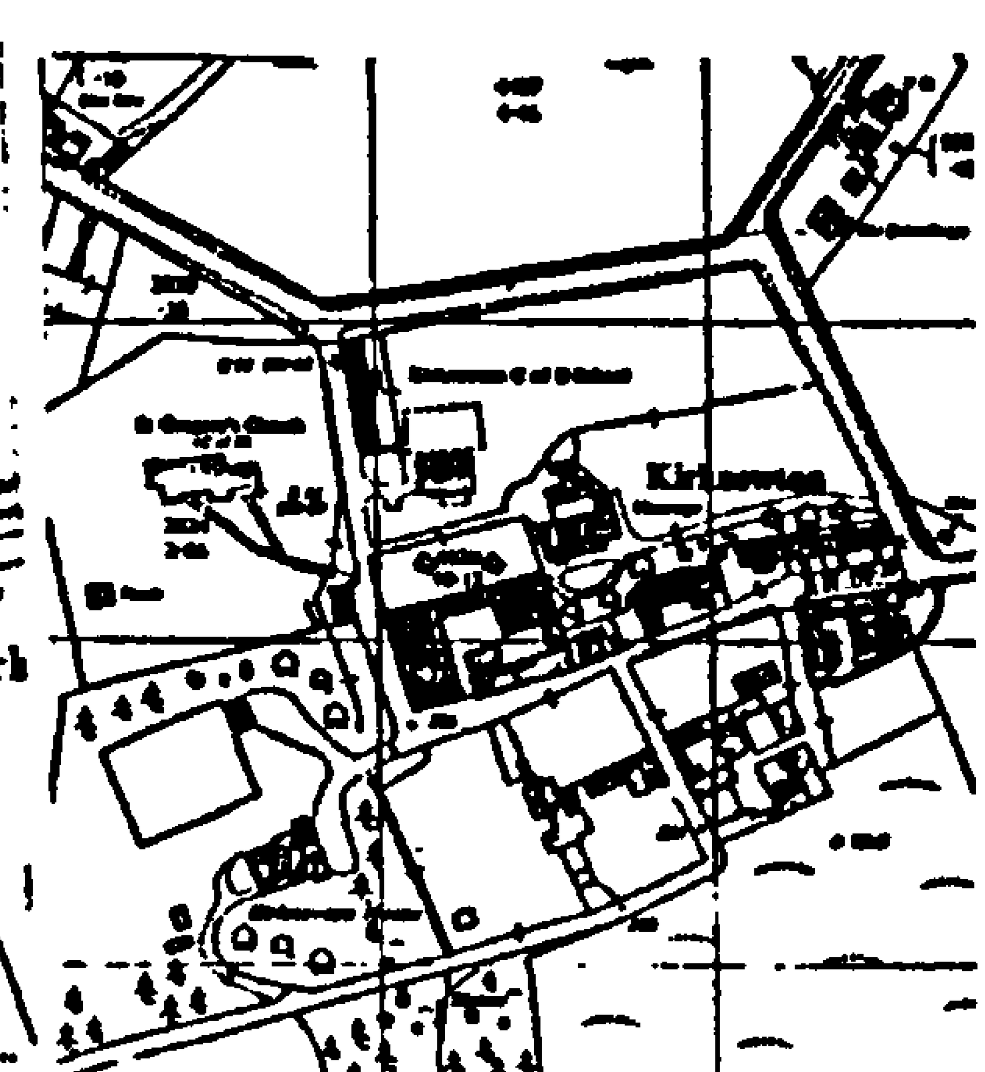


Fig. 5.22. Kirk Newton 1970
SOURCE: OS Scale 1:10 000

5.4.6 ***Opportunities and limits for housing.***

Many of the dwellings in terraces along the south part of the rectilinear framework are still used as residences, but they are mostly occupied by people who work outside the settlement and not in the farming industry.

Other dwellings were constructed between 1923 and 1970 along the north side of the road leading in a westerly direction. The earlier railway station is also converted into a dwelling. Dwellings were also constructed at the corner of the road leading from the NE corner of the rectilinear form in a NE direction.

Within the settlement core limits are imposed by the shapes of the building configurations and the land associated with each dwelling.

Outside the settlement core houses become fragmented along two roads without apparent constraints other than frontages to the highway. Within the settlement core houses show only minor alterations and the configurations of the C19 are adapted to present day needs. Where houses have been constructed outside the settlement core they are larger and detached from each other. The inference drawn from this is that without constraints of a rigid framework provided by the settlement core the houses cease to respond to the compact nature of the settlement. There is also no discernible linear landscape characteristic in the flat land between the settlement and the river to the north that developments may reflect and they simply follow the line created by the roads.

5.4.7 *Discussion.*

The event which was instrumental in shaping the settlement framework was the location of an E-W axis at the foot of hills to the south, created by the linear arrangement of buildings. The settlement framework of C18 and C19 has constrained most of the more recent developments within the settlement core. This is illustrated in the chronology of developments drawn from maps from the beginning of the C19 to the present day which show how the concentration of buildings along the E-W axis have influenced the patterns of evolving configurations. The E-W axis is a statement of the geometry and geology of the hillside and valley and separates the site into level and inclined plots of land which are reflected in the rigid geometry of the rows on the north side of the spine and the more open planned agglomerations to the south.

In addition, the properties of place offered practical characteristics for settlement planning within a mixed agricultural system where sheep and cattle rearing were established farming activity as well as crop production. The settlement is strategically placed at the foot of the hills for direct accesses to slopes to the south for animal grazing and to the more fertile flat land in the valley to the north for crop growing. Indeed this practice is still followed today. In this respect the settlement layout is related to the mixed farming management system, linking socio-cultural activities with opportunities and limits of location.

These discussions have shown how site and historical frameworks combine to give the settlement a particular identity in support of the theoretical models

Topography and geology are significant in shaping building configurations of settlements

and

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns.

C20 developments are also characterised by the ribbon development along roads to the north of the settlement where dwellings are spaced well apart with gardens fronting onto a highway. Whereas these show some of the characteristics of the housing accretions discussed in Chapter 2 and reflect a similar dichotomy between pre and post C20 developments they also highlight how recent developments take on different forms. Whereas estate housing is often constructed as a single short term contract here we find a piecemeal development process which also retains the dichotomies between pre and post C20 developments. New houses do not share the relationships with site and historical framework found in the settlement core and therefore do not retain the original settlement identity.

A church was located on the same site prior to the 300 years war with Scotland and part of it survived the devastation of border raids. The rebuilding of the settlement during the C18 and C19 took place on the east and south sides of the graveyard, following earlier traditions of building in close proximity to the church.

There are therefore a mixture of socio-cultural uses at Kirk Newton which have developed and changed over several centuries. The study has shown that the conceptual theories are supported by the layout of buildings at the core of the settlement and therefore differentiate between settlement structures which grew early in the C19 and in the late C19 and C20.

5.5 MINING SETTLEMENT CASE STUDY: PEGSWOOD.

The area of the Northumberland coalfield is shown on Fig. 3.11. It is found in the south east of the county enclosing the Tyneside conurbation on north and west sides. Mining settlements grew around major coalfields from the River Tyne corridor to the coastal settlement of Amble. Mining activity in this region was intense.

On mining Linsley says,

The C19 was to see great changes in the coal industry and the railways, ports, and harbours which principally served the coal trade. Firstly, to meet the growing demands of the industrial revolution. the coal industry further expanded its output and areas of activity. Many new mining villages were created...The scale of colliery house provision on the Great Northern Coalfield was unique. By 1913 the coal field employed nearly one quarter of all the colliery workmen in Great Britain but contained almost half of all colliery-owned houses. Linsley in Pevsner (1992: 90.)

McCord and Thompson (1998: 201) describe a 'knock-on' effect for agriculture with the availability of coal-fired lime kilns scattered throughout the region, assisting in agricultural improvement to meet the demand for food from an expanding mining population. Mining settlements were not isolated from earlier settlements within the area of the coalfields but grew alongside them and in many ways helped them prosper. Pegswood located a short distance to the north east of Morpeth was an agricultural settlement prior to the expansion of the coal mining industry and retained the agricultural use in tandem with mining. The settlement is a rich source of data for a mining case study which investigates how both agricultural and mining industries fit within a single settlement framework and how these have changed over several centuries.

5.5.1 *Setting.*

Pegswood is characterised by an early agricultural settlement and an accretion of miners' houses immediately to the west and south. The accretion of miners' houses and streets is substantially larger than the earlier settlement and is located between the earlier settlement and the mine shaft. In the later part on the C20 most of the mining accretion was demolished, therefore observations rely heavily on secondary sources. New housing accretions were subsequently built enclosing the early agricultural settlement on the south, east and west sides.

5.5.2 *Opportunities and limits for mining and late C20 housing accretions.*

From Figs. 5.23 and 5.24 it can be seen Pegswood was a farming settlement concentrated along a single street with Pegswood North Farm occupying a prominent position at the NW corner of the settlement. Buildings ran along two sides of a single street and began to spread at the east end where it forks in two directions.

Configurations of buildings follow the direction of the contour at 200ft. along a central ridge formed as the contour turns back on itself in a loop. The late C20 houses which replaced the rows of miners' houses follow the suburban trend discussed in Chapter 2 and have little relationship with landscape characteristics of site but are limited by the old agricultural settlement to the north, the railway line to the west and south and field boundaries to the south and east illustrated in Fig. 5.25.

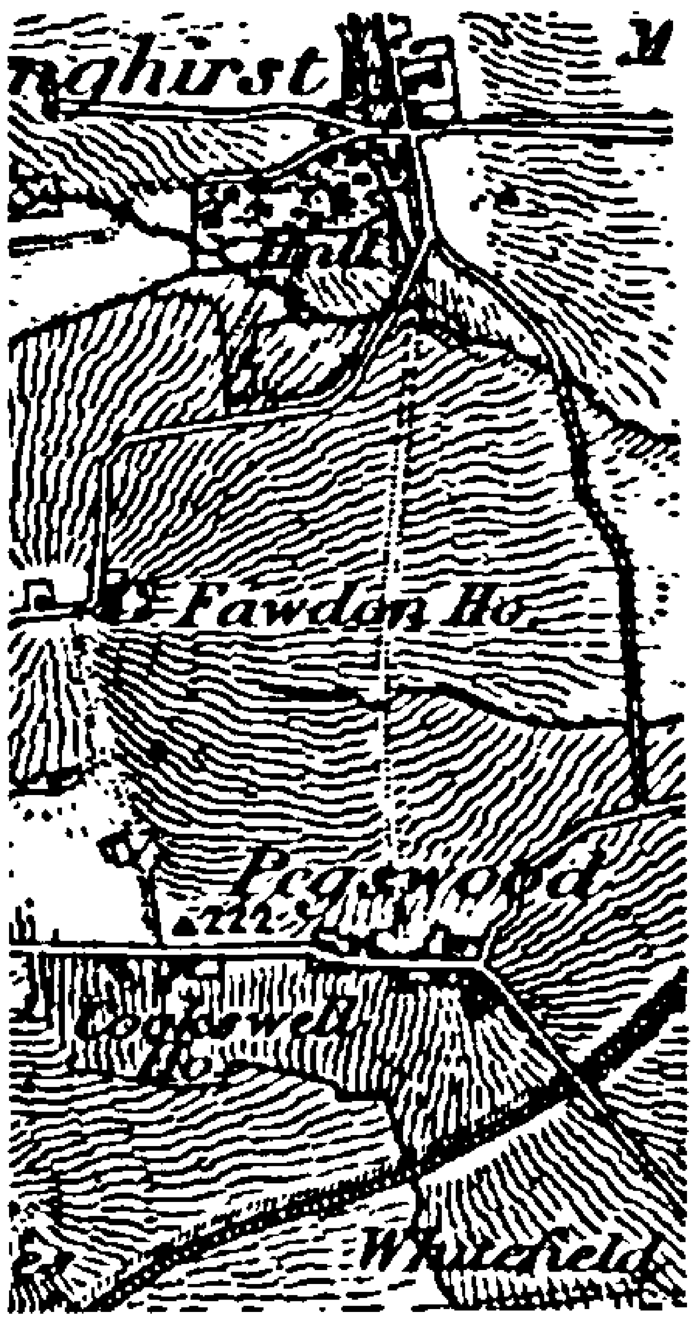


Fig. 5.23. Pegswood. 1866
SOURCE: David and Charles.

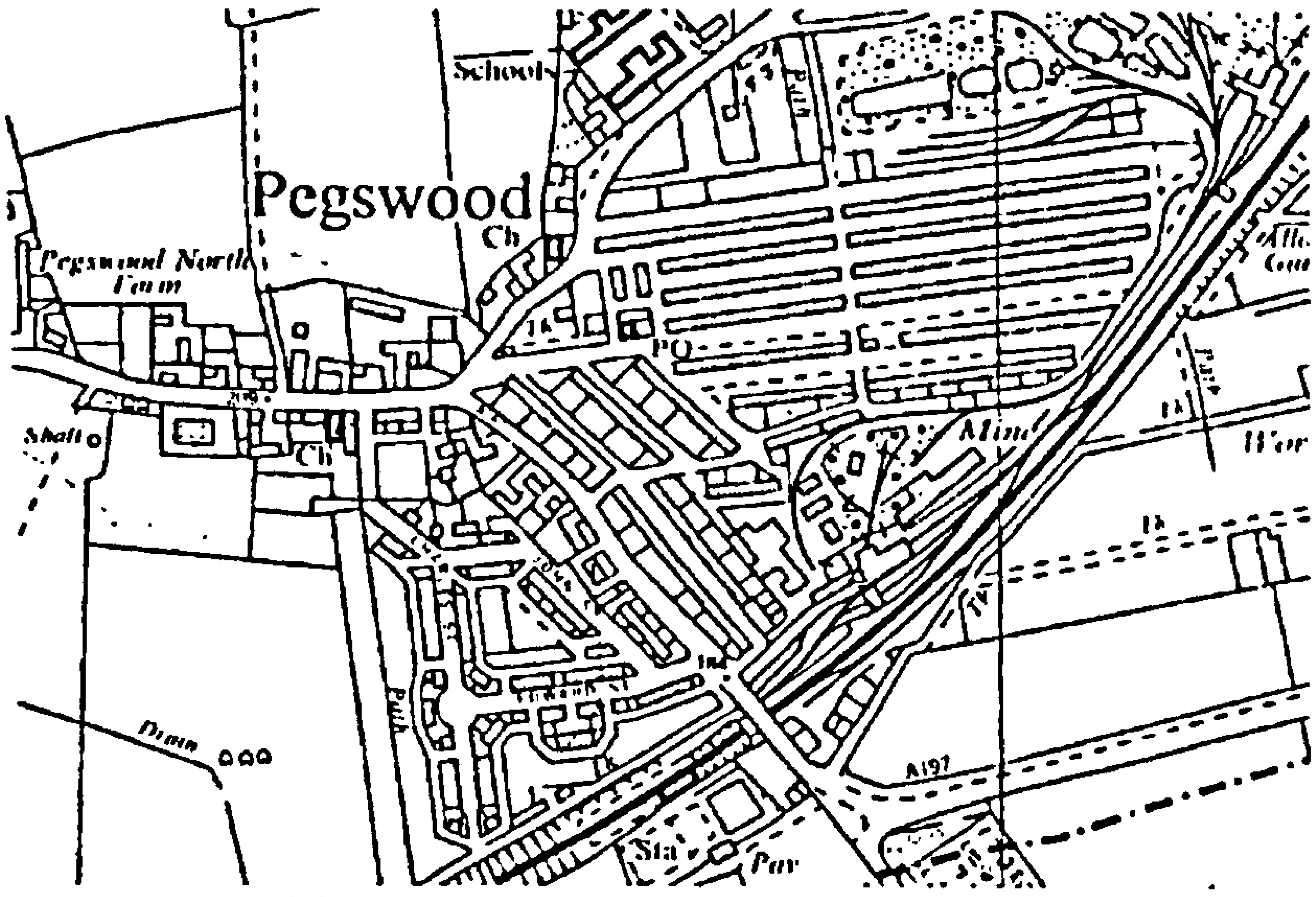


Fig. 5.24 Pegswood. 1969.
SOURCE: OS Scale 1: 10 560

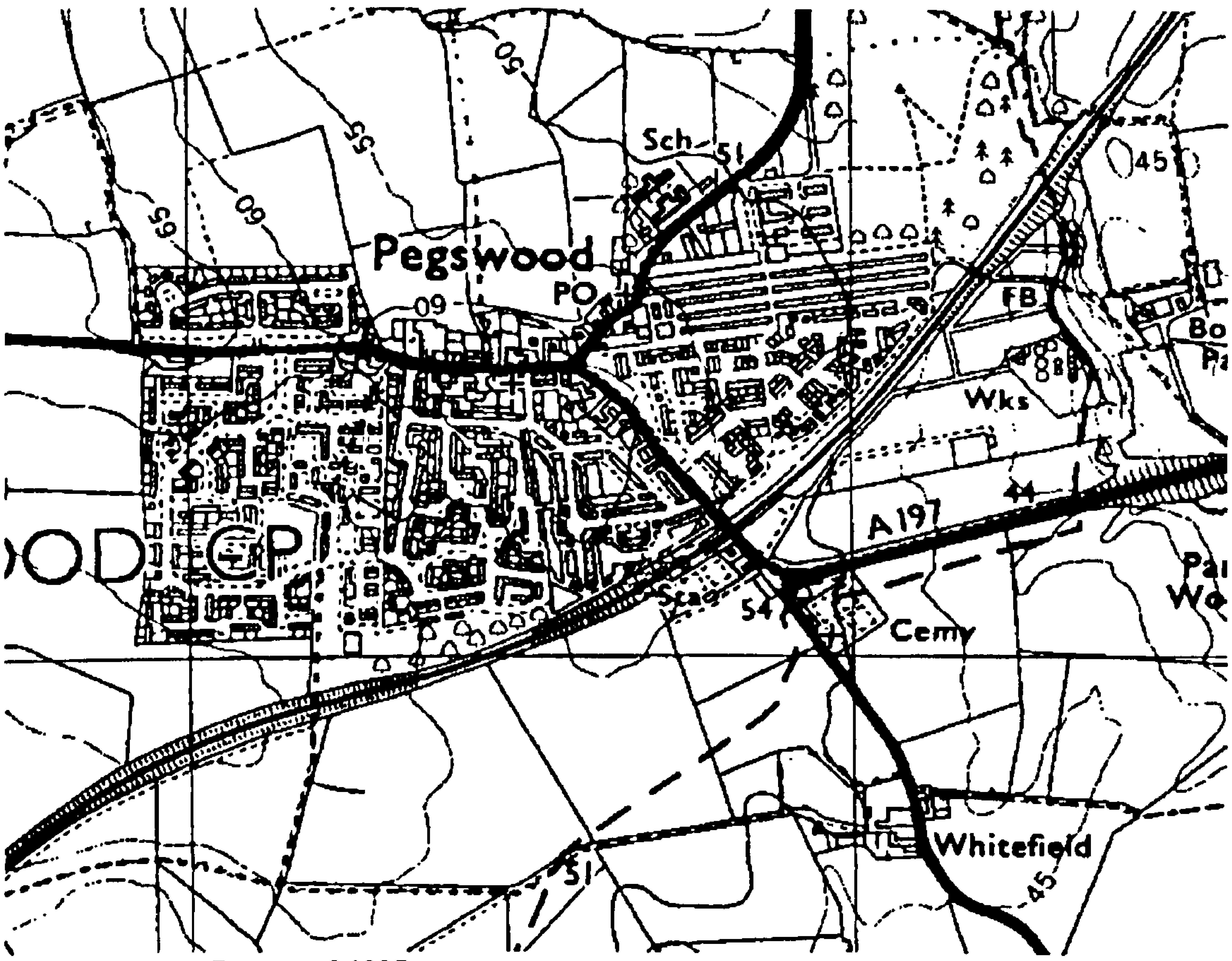


Fig. 5.25 **Pegswood 1995**
SOURCE: OS Pathfinder Series Scale 1: 25 000

The settlement is constructed on a coal measures outcrop shown on Fig. 5.26. which is the least fertile area in a general superficial deposition of boulder clay. Given the understanding of soil structures discussed in Chapter 4 it is possible that this understanding also extended to the nature of fertile soils particularly where agriculture had been a long term industry. A practical relationship is therefore inferred that the least fertile ground provides opportunities for development in association with other soils in a given location.

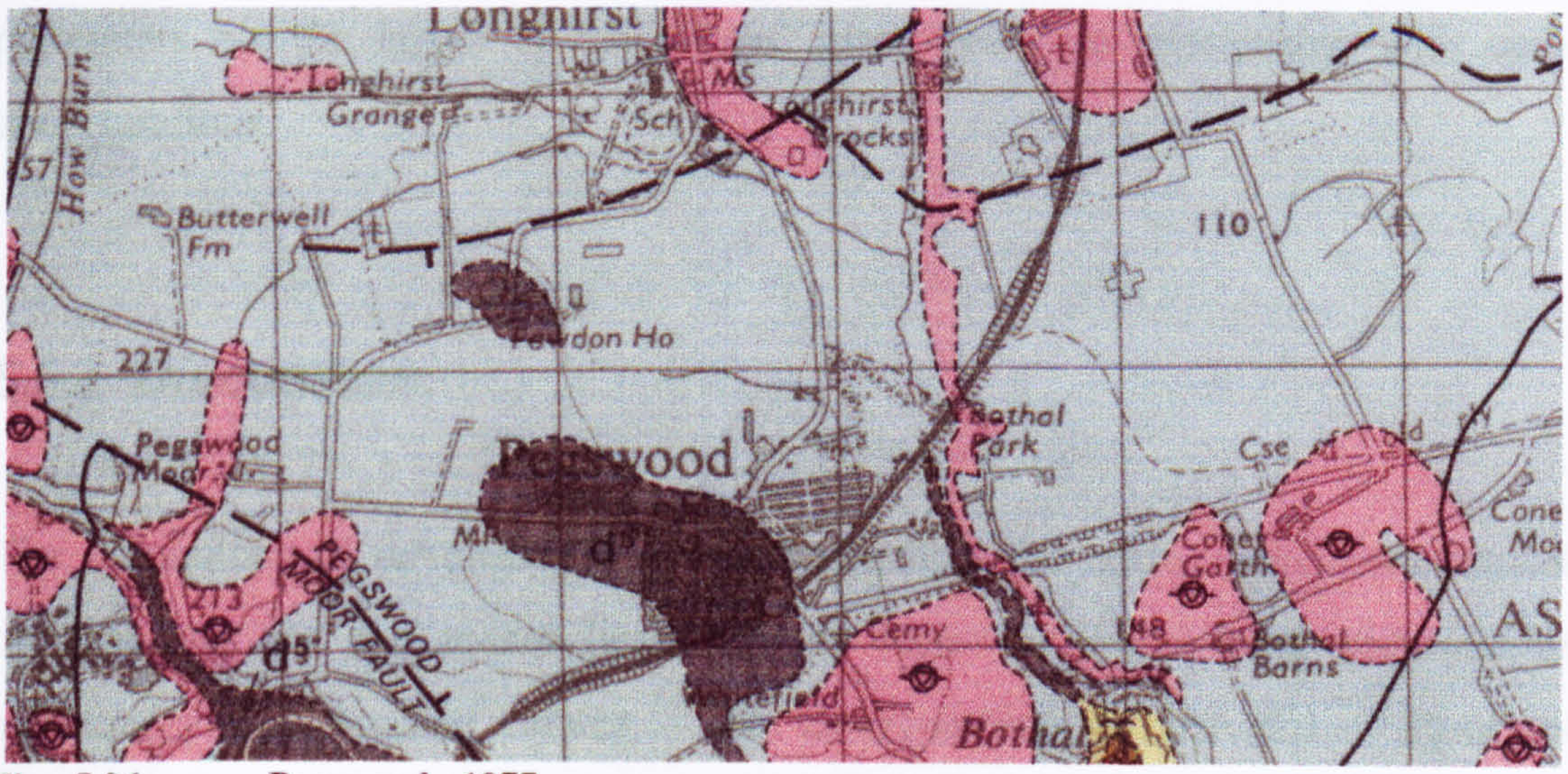


Fig. 5.26 **Pegswood. 1977.**
SOURCE: Geological Survey 9. Drift Edition. Scale 1:50,000.

The division between the limestone outcrop and boulder clay corresponds to the direction of the road and buildings which form the core of the old settlement. Both physical and social relationships are therefore found between the landscape and the configurations of buildings.

The earlier settlement, roads and railway line influence the direction of the grid iron pattern of the later mining accretion and constrain its boundaries. The railway at the SE of the settlement seen on the early map becomes significant in the later development and acts as a boundary to the pithead, works and grid iron housing pattern. Some rows follow the direction of the road to Bothal running in a south-east direction from the old settlement core. The main body of the grid iron housing is orientated so that a cross axis relates to both the early settlement core and the pithead.

The juxtaposition of the pithead and early settlement core creates limits to ways in which the grid iron pattern relates to site in circumstances where links are maintained with the older settlement core. The layout of the mining accretion provides ready access to the older part by an arrangement of roads which radiate from the settlement core but has no relationship with landscape features found in the earlier configurations.

The later C20 housing estates are limited by earlier settlement frameworks at their perimeters but the layout of the estates' plans bears no relationship with earlier configurations.

5.5.3 *Discussion.*

The chronology of development demonstrates how the earlier settlement provides opportunities for and places limits on the layout of the mining accretion and subsequent C20 housing estates. The configurations of the earlier framework together are seen to limit the growth of the accretions and also provide a focus for development around the old settlement core. The railway line is also shown to limit developments along the east and south sides of the settlement. Two inferences are drawn that the opportunities and limits created by the location and boundaries of the agricultural settlement and the position of the railway line were causal in:

- the configurations of the boundaries of the mining development and later C20 housing accretions;
- the characteristic radial layout of the mining accretion.

The distinctive linear geometry of the mining accretion developed from socio-cultural and socio-economic factors. Bye-laws addressed a range of constructional and planning matters in an attempt to improve the quality of construction and habitation of dwellings. From minimum spatial and construction requirement a series of standard designs emerged which were often repeated on the same sites. Brown (1988) concludes these were part of evolving patterns in mining settlements which developed into various geometric forms. These grew from agricultural origins on practical issues of construction, health, and economy, and culminated in the square, grid iron, and enlightened patterns. Her diagrammatic representation of the development pattern shown in Fig. 5.27 demonstrates the evolving process of the settlement forms to rigid configurations generally associated with mining settlements of the C19 and C20.

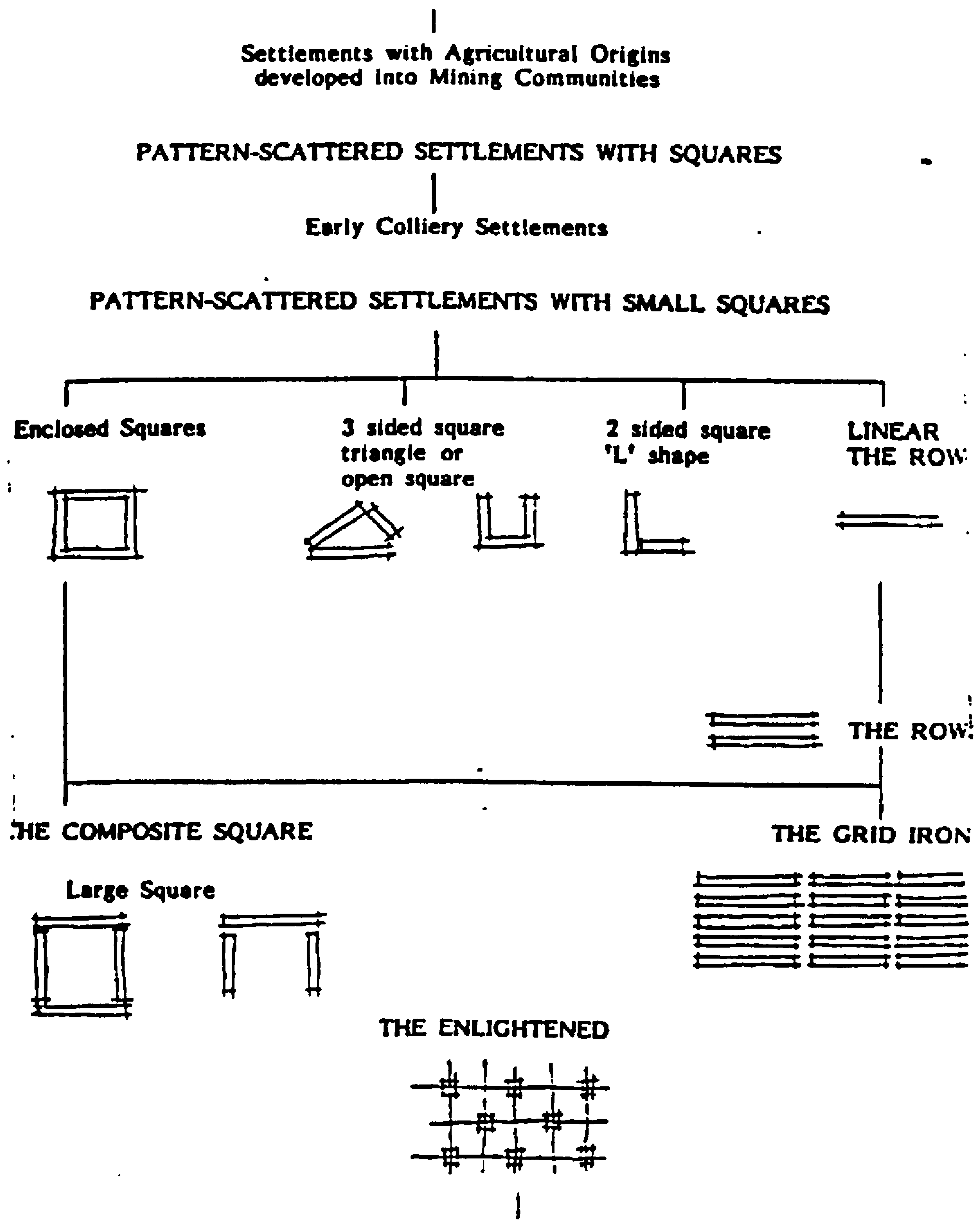


Fig. 5.27 **Diagrammatic representation of mining settlement patterns.**
SOURCE: Brown (1988: 6).

The sample settlement for this analysis shows a grid iron pattern which grew from the linear row, where the geometry is characterised by a repetition of parallel rows of dwellings.

However, the later C20 housing accretion layout shown on Fig 5.25 is from different origins.

This case study has shown the first theoretical model

Topography and geology are significant in shaping building configurations of settlements

is supported in the relationship between the linear configuration of the agricultural settlement buildings and the topographical contours and geological divisions between different soils.

The second theoretical model

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns.

is supported firstly, by the choice of fertile ground demonstrated in the position of the old settlement core and secondly, by the geometric pattern of the bye-law layout of the mining estate in response to the location of the pithead and old settlement core. The case study demonstrates how two different settlement configurations, the early agglomeration of buildings, and the later grid iron pattern of houses, combine to form a whole within the context of the holistic hypothesis through social and physical determinants.

Whereas the later C20 housing accretions are constructed around the old agricultural settlement there is no focus on the old core as was found in the grid iron system of the preceding mining settlement. However the contingency effect of the old agricultural settlement core is demonstrated in situations of complete demolition and redevelopment of large areas of housing within the settlement boundaries.

5.6 SUMMARY

Maritime, agricultural and mining case studies have supported the propositions that landscape and socio-cultural activities are tied to arrangements of settlement plans, and have also pointed to particular events in chronologies of changes which have shaped following developments. A summary of the findings is described in the following Table 5.2

	Craster	Alnmouth	Kirk Newton	Pegswood.
Context as topography and geology.	Settlement expansion limited by coast.	Settlement expansion limited by peninsula.	Settlement located at foot of hill and at division between two different subsoils.	Building lines follow contours and are located at a coal measures outcrop.
Maritime activities	Pre C20 fishing port. Piers built as part of settlement expansion for quarrying stone and for shipment of stone chippings.	Pre C20 port supporting import and export activities. Now mainly leisure purposes.		
Agricultural activities.			Continuous farming activities.	Continuous farming activities.
Mining activities.				Substantial coal mining industry between early and late C20.
Historical frameworks	Early buildings limit development at settlement core. C20 estate housing limited by settlement core on the N and by the coast on the E.	Ancient burgage strips limit subsequent development.	Row of early farm buildings limit development at foot of hill. Enclosure of fields during C19 and construction of C19 railway provide opportunities for and limit C20 housing to the N of the old settlement core.	C19 railway limit C20 settlement developments along SE boundary. Enclosure of fields during C19 define W boundaries of settlement expansion. Characteristic housing development patterns found in grid iron plans and C20 estate housing.

Table 5.2. Summary of findings of settlement case studies.

The case studies have shown that different figure ground forms of context provide zones and edges which are followed by settlement textures in all cases, and that operations of maritime, agriculture and mining industries are reflected in the arrangements and locations of buildings in the settlement plan. The investigations therefore define two aspects of site and settlement relations which combine to provide each place with its own identity. But the chronologies of settlement plans have also identified three different building practices, ancient burgages, C19 enclosure and C20 estate housing in settlement development. In particular the case studies have linked enclosure and C20 estate housing with the criticisms of rural development discussed in Chapter 2. The next chapter explores these issues of settlement development by focusing on the practices in other settlements within the study area. Case studies examine the natures of burgages, enclosures and accretions and broaden the investigation of their impacts on settlement plans to understand how they support or contradict the theory of site and settlement relationships in settlement individuality.

Corbridge and surrounding district in C18.
SOURCE: Fryer 1777.

CHAPTER 6.
Burgages, Enclosures and Accretions Case Studies.

6.1 INTRODUCTION.

Chapter 5 has identified three constraints in settlement configurations which have been called building practices. Burgages, enclosure and accretions have been identified as important elements in processes of change through case studies at Craster, Alnmouth, Kirk Newton and Pegswood. The studies have illustrated distinctive patterns in settlement plans at different times in the chronologies and pointed to processes in settlement configurations for further investigation in terms of the theoretical models.

This chapter builds on these findings through case studies of building practices at other settlements to understand how these processes change in different settings. Studies combine to form a chronology of practices from C12 to the present day which seeks to explore their natures and connections and to understand their impacts on settlement plans over several centuries.

At Alnmouth, burgages were seen to be constrained by the strong topography of the peninsula. Four other settlements where configurations of burgages can be investigated in a variety of landscape conditions are Warkworth, Rothbury, Alnwick, and Corbridge. At Kirk Newton enclosure of open fields was identified on the Tithe map of 1843 and this is investigated in more detail at Denwick, Rennington, Lesbury and Bilton and Corbridge. Bye laws which where shown to play significant roles in housing developments at Craster and Pegswood are examined as they have changed into the later part of the C20.

Chapter 3 has been critical of C20 accretions at rural settlements and has linked housing estates with pedestrian and vehicular activities and layout plans illustrated in Design Bulletin 32 (Baxter, 1998). This chapter examines the impact of Design Bulletin 32 on C20 housing accretions during the later part of the C20 in relation to old settlement cores at Morpeth and Corbridge and shows how context described in Chapter 2 connects different building practices under a common theme.

The locations of settlements for investigations are shown in **Fig. 6.1.**

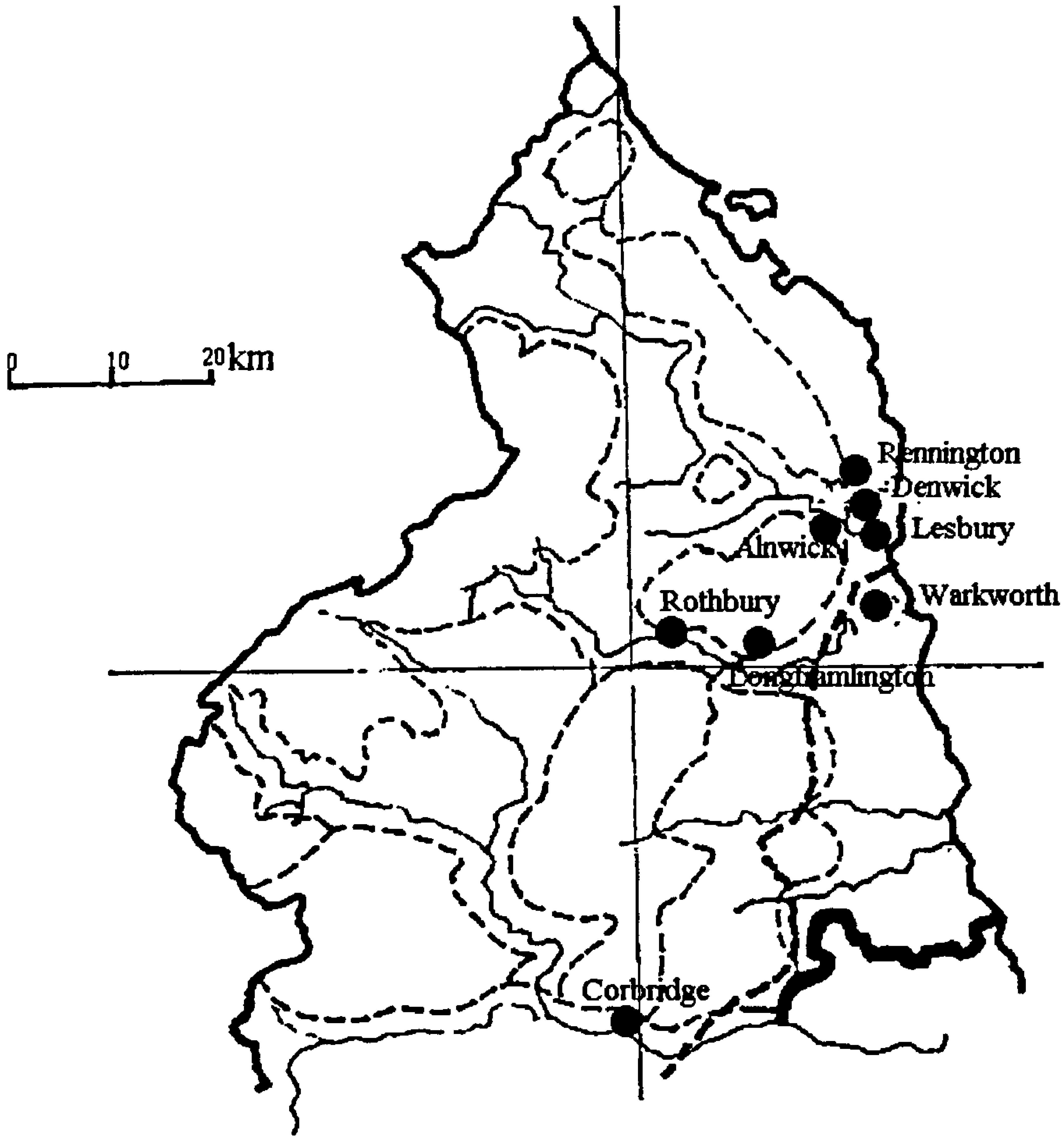


Fig 6.1 Map of Northumberland showing locations of settlements for case studies of building practices.

6.2 BURGAGES.

Warkworth has similarities with Alnmouth in that they are both located on a peninsula of land. However, different functional purposes are observed. Whereas Alnmouth was a port at the time of the Norman occupation and remained so during the rebuilding of the county, Warkworth was defensive with cottage industries, market and agriculture served by the nearby port of Amble. The investigation therefore discusses how the burgage strips constrain the evolving settlement form in different contexts and which elements in the settlement configurations dominate the development processes.

Recognising burgage strips on a plan appears to be an uncomplicated procedure given a historical knowledge of Norman settlement occupation. However, defining a burgage is not so straightforward. A general notion of the functional purpose of burgages was given in the earlier investigation at Alnmouth and is common to all plots. Boundaries were in part determined by the peninsula topography. But where such topographic limits do not exist some understanding of the variable dimensions of these structures is necessary to help understand the seemingly endless variety of sizes. Bettess (1997) suggests a generally accepted unit of measurement is the perch corresponding to 5.5 or 6 yards length. Multiples of these units were usually proportioned in strips running at right angles to the highway giving the settlement a characteristic burgage pattern. Opportunities and limits provided by the site are examined for effects on the lengths and widths of multiple strips placed side by side.

6.2.1 *Warkworth.*

The site of Warkworth offered opportunities for development as a military stronghold during the Anglo Saxon period.

> *Warkworth owes its existence to Britain's Anglo Saxon conquerors, who established the kingdom of Northumbria, and selected the Warkworth peninsula as its capital. They needed an easily defended site with good communications, from which they could administer the kingdom and defeat any subsequent native uprisings or foreign attacks. The peninsula's superb defensive qualities, proximity to the sea and to a safe harbour at the mouth of the River Coquet made it the ideal choice, so Saxon King Ceolwulph built a timber stronghold there in the C6.* Ward (1988: 9, 10.).

A nucleated village called Wercewode was constructed to the north and under the protection of the stronghold which enabled the villagers to produce surpluses of wool and to engage in rudimentary trade. Wool was exported from the nearby harbour and luxury goods imported. Thus Warkworth became a market and trade centre very early in its history. Its establishment as a religious centre was also at the hand of the King who became a monk at Lindisfarne in 737 and conferred Wercewode on the settlement which resulted in the first church being built on the site to the north of the peninsula in the area of the present church and shown on Fig. 6.4.

The Normans laid out the new planned borough of Warkworth on the ruins of the old Saxon settlement. A stone castle replaced the timber Saxon stronghold and burgages were constructed along a spine between the castle and the church. Examination of

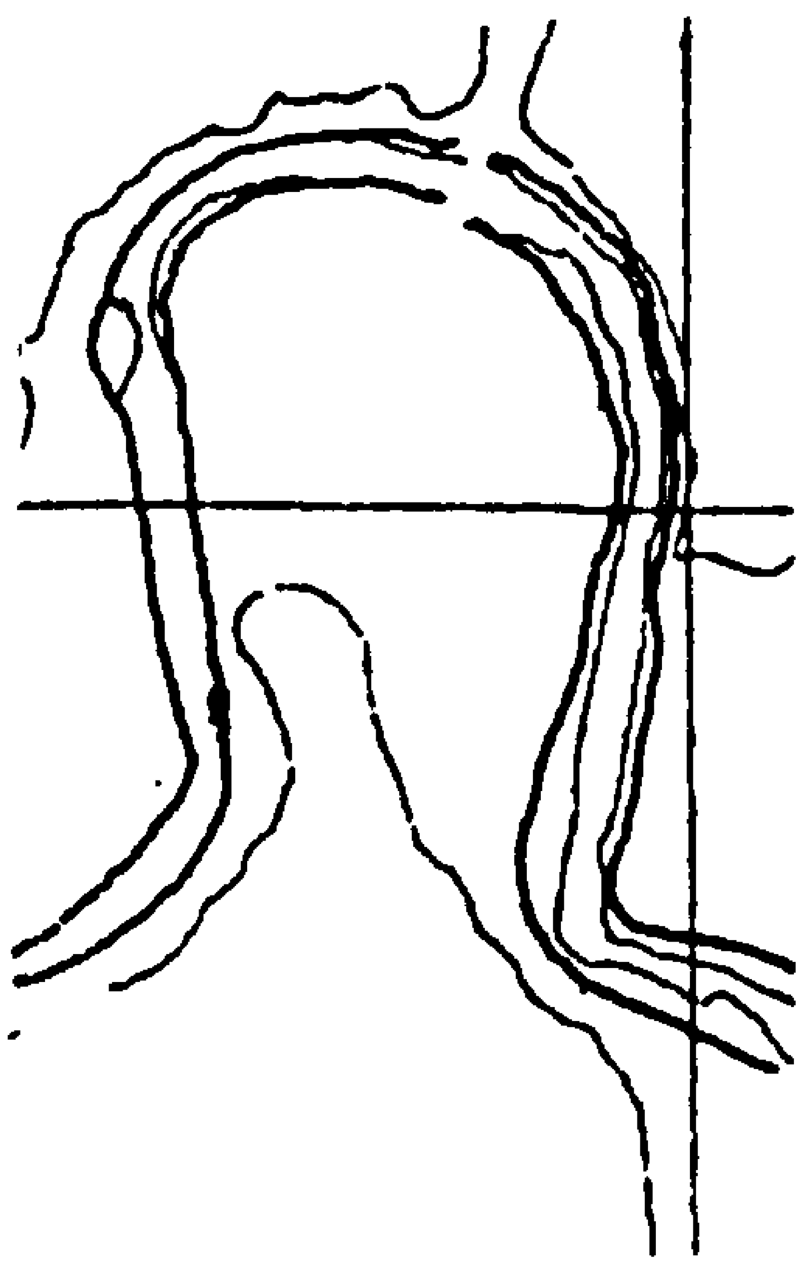


Fig.6.2 Warkworth 1970 Topography
SOURCE: OS 1:10 000

Fig. 6.3 Warkworth 1972 Geology
SOURCE: Geological Survey 6 Drift Ed. Scale 1:50 000

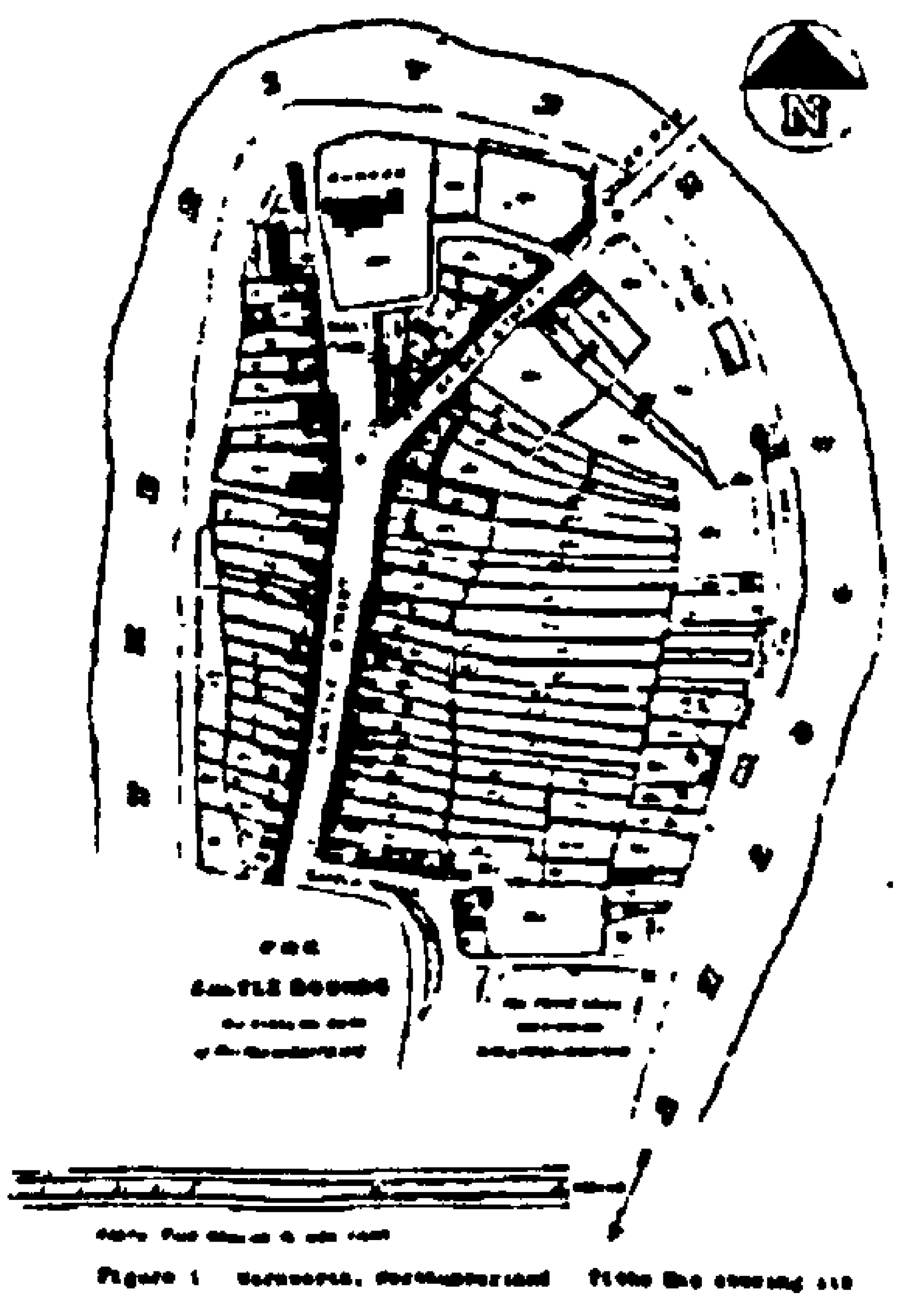


Fig. 6.4 Warkworth Norman Settlement
SOURCE: Tithe map in Ward (1988: fig 3)

the topography of the peninsula shows the site of the castle strategically located at the highest point at the neck of the peninsula loop. Constructing the castle in this position enclosed land to the north which was also protected by the river around the remaining three sides. Thus opportunity for development is given by the strategic benefits of site. Limits are also observed in the topography. The shape of the peninsula clearly constrains the area of the settlement and defines the boundaries on three sides. The effect is similar to that found at Alnmouth, but here a difference is found in the position of the spinal access in relation to the peninsula shape. Here it is not central and is situated towards the west of the peninsula as does the castle and church. Examination of the geological map shows another limit which appears to have been considered in the burgage layout. The spine Castle Street is located along the centre of a boulder clay deposition which is defined by the river bank on the north and west and alluvium on the east. There appears to be a conscious attempt to divide the more stable land evenly into burgages and avoid the alluvium which is liable flooding. The limit along the east side is defined by a path which runs northward from Castle Terrace to the junction of Bridge Street and The Butts. From the site numbering system strips of this alluvium land have clearly been assigned to properties along the east of Castle Street, and may have been useful for most of the time. However, the risk of flooding would always have been present and appears to have effected the offset characteristic of the settlement layout. The Y configuration of the road at the north gains level access to the tributary valley while forming a market area.

Fig. 6.4 shows a few c.C13 buildings located to the east of the central spine area. However with improved techniques of foundation design and construction during C20 limits imposed on earlier buildings by the nature of the soil have reduced with the result that several new buildings have been constructed on alluvium along both sides of The Butts at the east of the peninsula. But recent developments have been constrained by the earlier burgage framework in a similar way to developments at Alnmouth. The geometry of earlier framworks limits developments by their widths, so that new sites are formed from increments of one, two or more burgages. At the other side of The Butts the plots are longer, following the river and constrained by it at the back of the gardens.

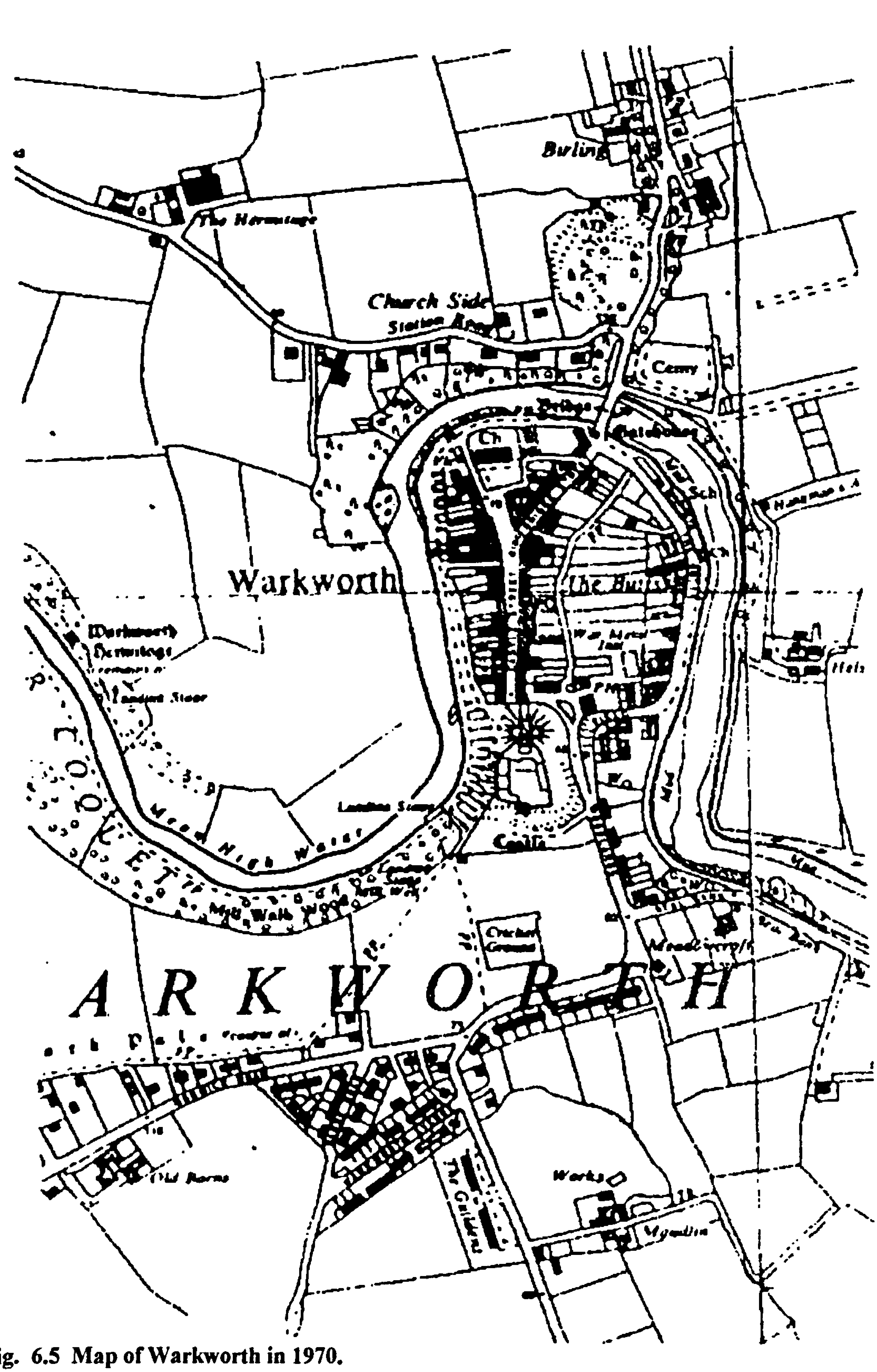


Fig. 6.5 Map of Warkworth in 1970.
SOURCE: OS 1970 1:10 000

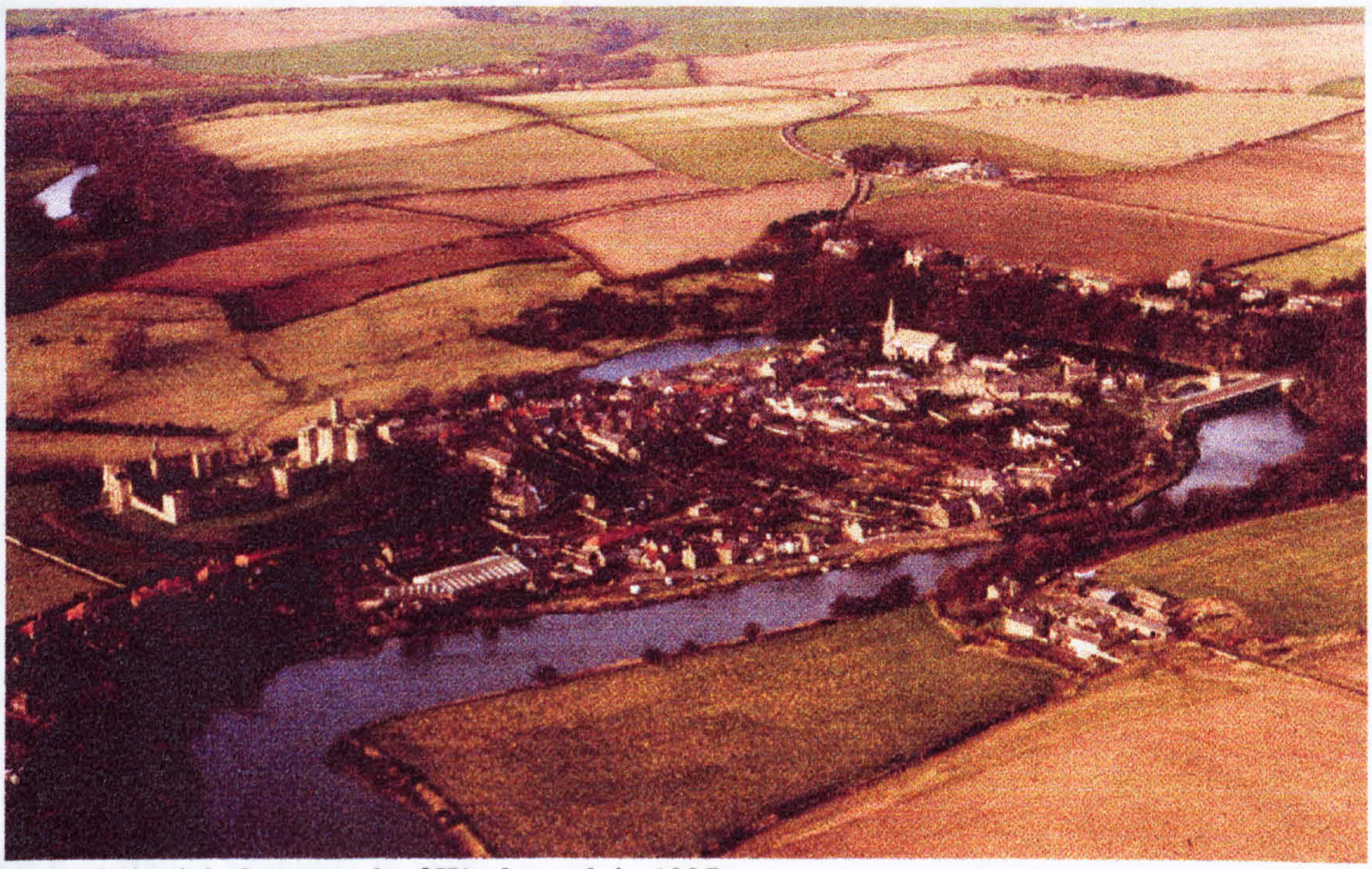


Fig. 6.6. Aerial photograph of Warkworth in 1995.
SOURCE: Airfotos.

6.2.2 *Rothbury.*

Rothbury is another riverain settlement with a medieval market function but here the settlement is inland and without any maritime relationship. It is located on the north side of the Coquet valley in a landscape characterised by scarps. The settlement framework of burgages encloses a large central market area which is constrained on the south by the river and on the north by a steeply rising hillside. A medieval bridge crosses the river at the eastern side of the settlement linking the settlement with the south bank on the old corn road from Alnwick to Corbridge.

A medieval settlement pattern based on burgages can be seen in the shapes of plots around Market Street and the centrally placed Church and rectangular enclosure which also houses the school and post office can be seen in Fig. 6.7. Examination of the topography shows these follow the directions of the River Coquet and contours on a substantial area of almost level land unusual amongst scarps. The rows to the south and east of Market Place are generally on the same level but as the north rows runs westward there is a shallow incline. Opportunities for construction of this burgage pattern are therefore presented by the breadth, length level of the shallow rising shelf between the river and scarps.

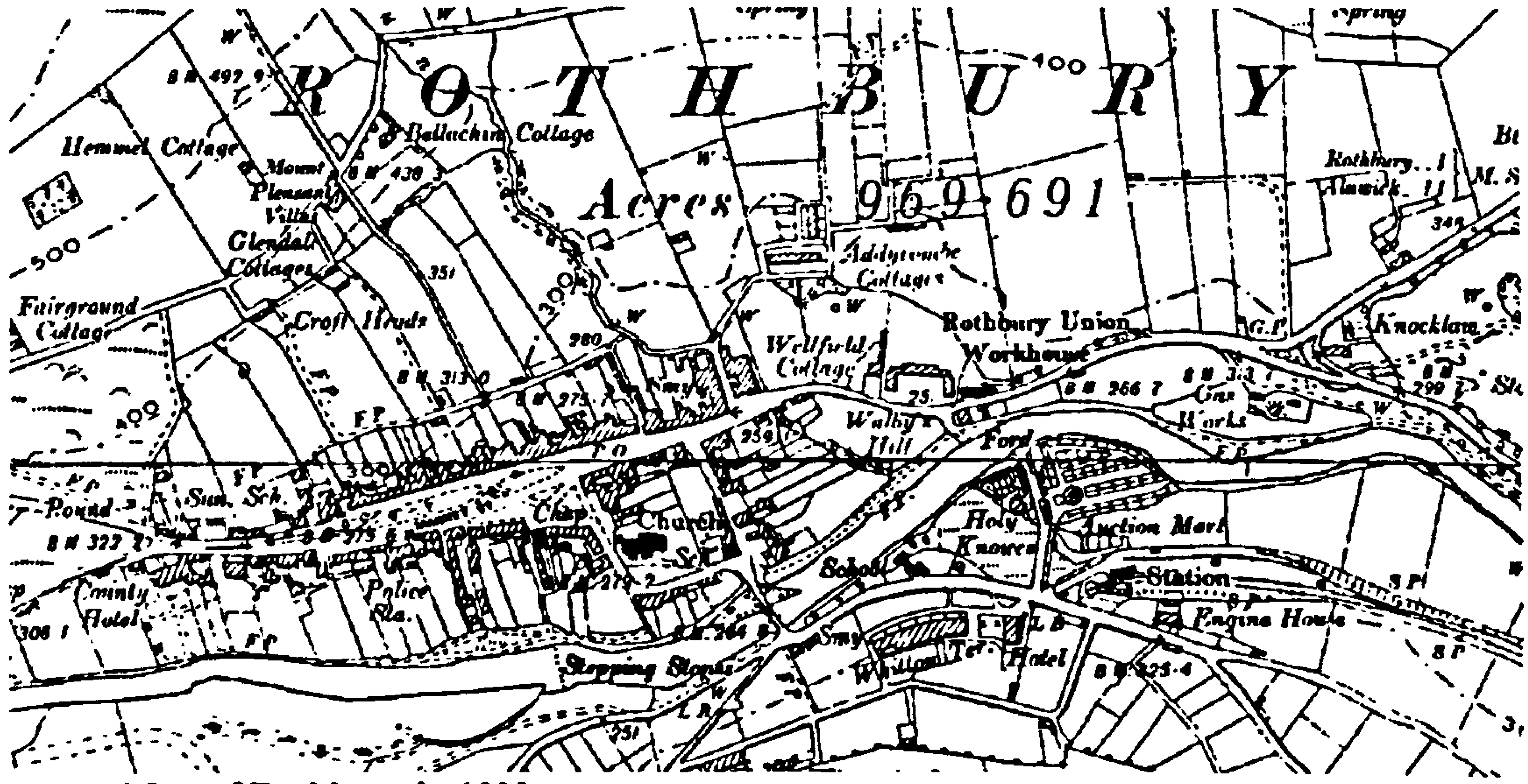


Fig.6.7 Map of Rothbury in 1899.
SOURCE: OS Scale 1:10 560

From earlier discussions about definitions of burgages, land behind the houses was seen to be an integral part of the letting. Planned on two sides of a central access area the width of site needed to accommodate a medieval settlement pattern is significant. Here it is 50 perches, at Alnmouth it is 40 and at Warkworth it is 30 (based on perches used by OS). These correspond to metric measurements of 274m, 213m, and 152m respectively. At Pegswood and Craster corresponding distances scaled between rear boundaries of facing rows is only 64m.

The geology illustrated on Fig. 6.8 shows much of the settlement is constructed on a sand and gravel deposition, except a centrally located rectangular form and buildings which are constructed on alluvium and river terraces. At first glance this appears to contradict the practice suggested at Warkworth, but on closer examination its can be seen that at Rothbury the relative levels between land and river are greater and the likelihood of flooding is therefore less. An inference drawn from this is that flooding rather than the nature of the soil was a consideration of location.

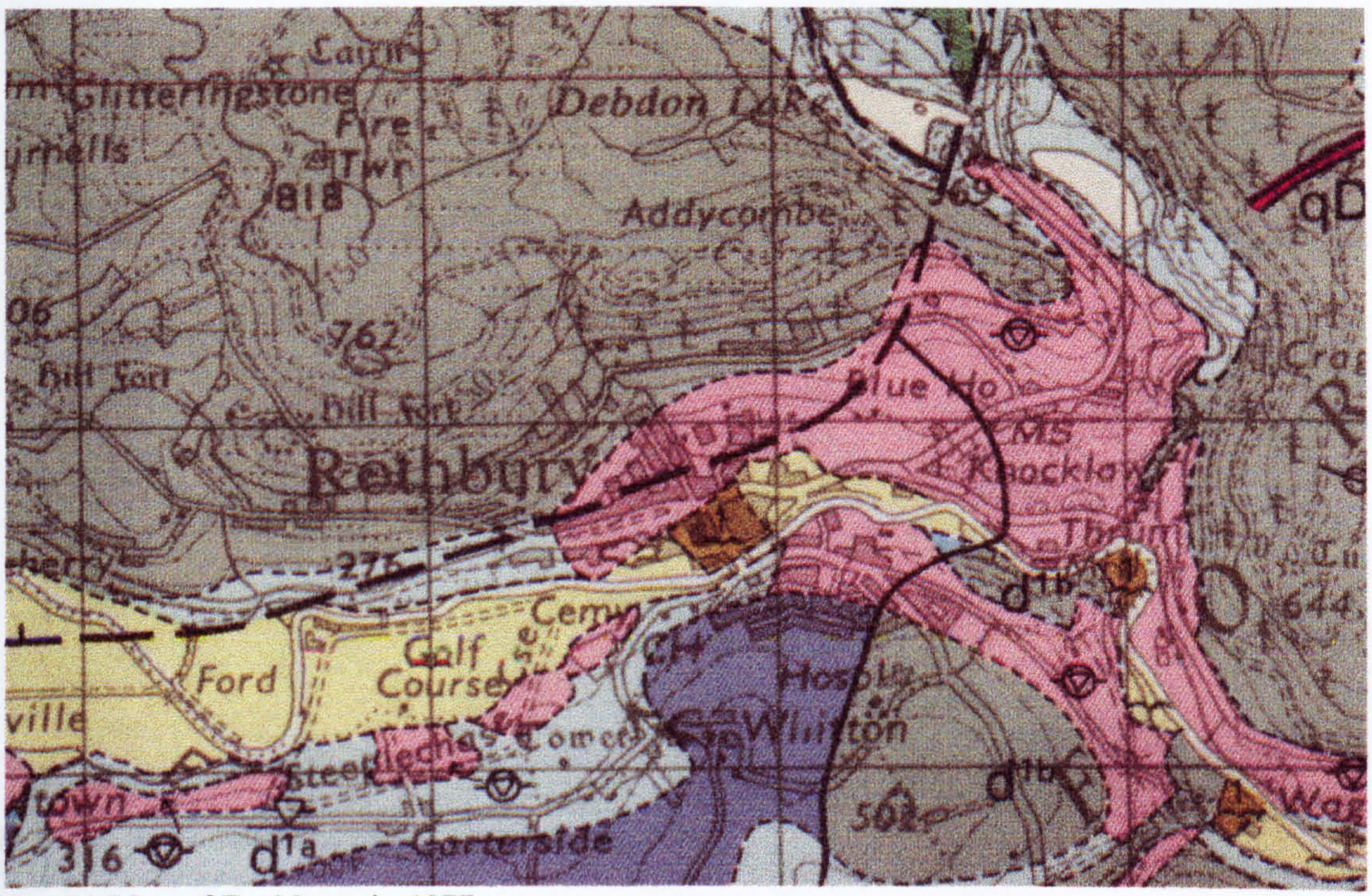


Fig. 6.8 Map of Rothbury in 1977.
SOURCE: Geological Survey 9 Drift Edition.
Scale 1:50 000

Fig. 6.7 also shows the limits impose on the burgages pattern by landscape features. There is a corresponding relationship between the linear figures of the south row of buildings and the river. Here the river bank defines the limits of the boundaries. At the north of the settlement there is a change in level which is more clearly seen on the aerial photograph.

Beyond the rear boundary of the north burgages the site rises more steeply. The line at which the change in level occurs defines the limit of the north boundary of the medieval settlement.

To the west the settlement configuration narrows and ends as the steeper hill nears the riverbank. To the east a similar effect is observed but is more acute.

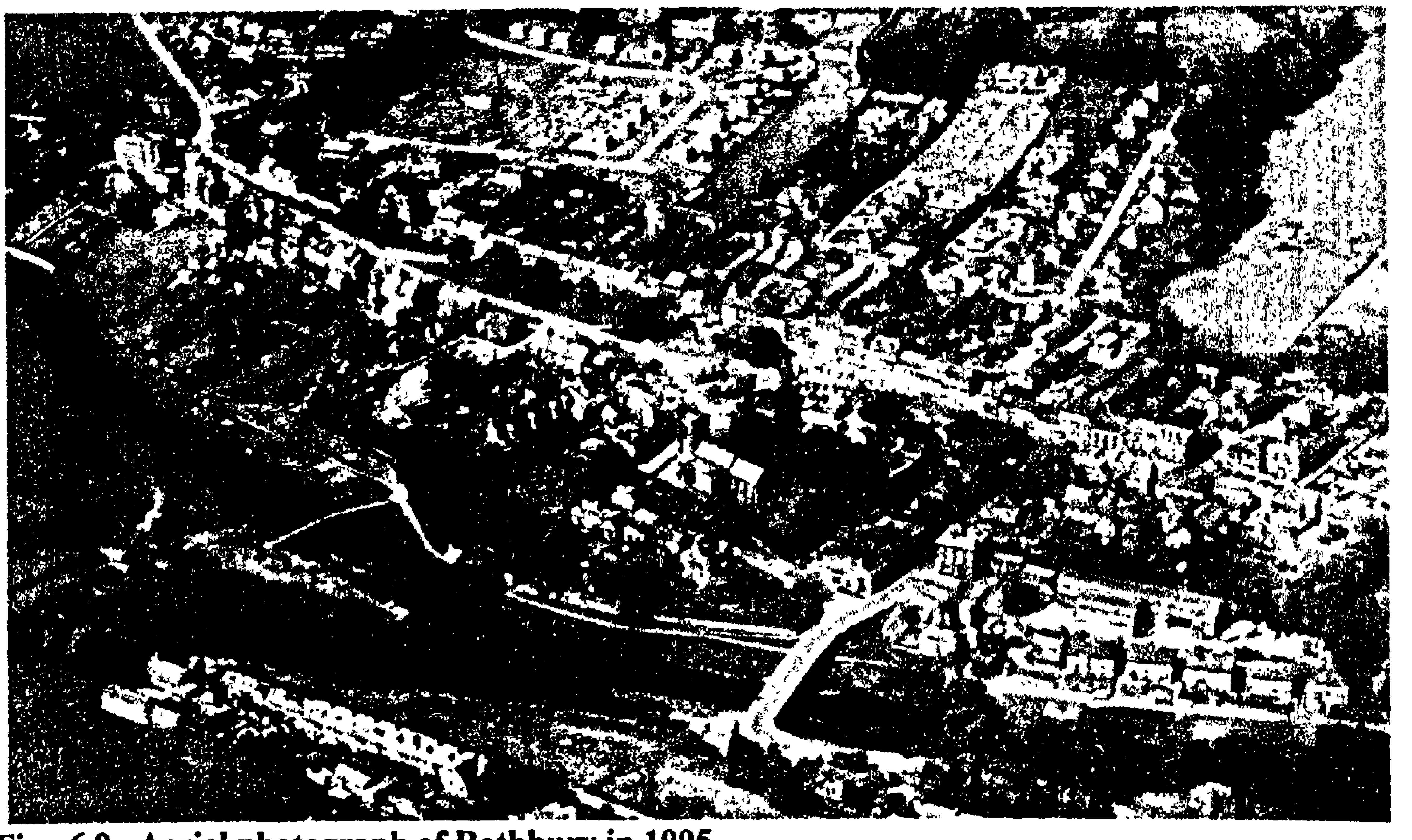


Fig. 6.9. Aerial photograph of Rothbury in 1995.
SOURCE: Airfotos

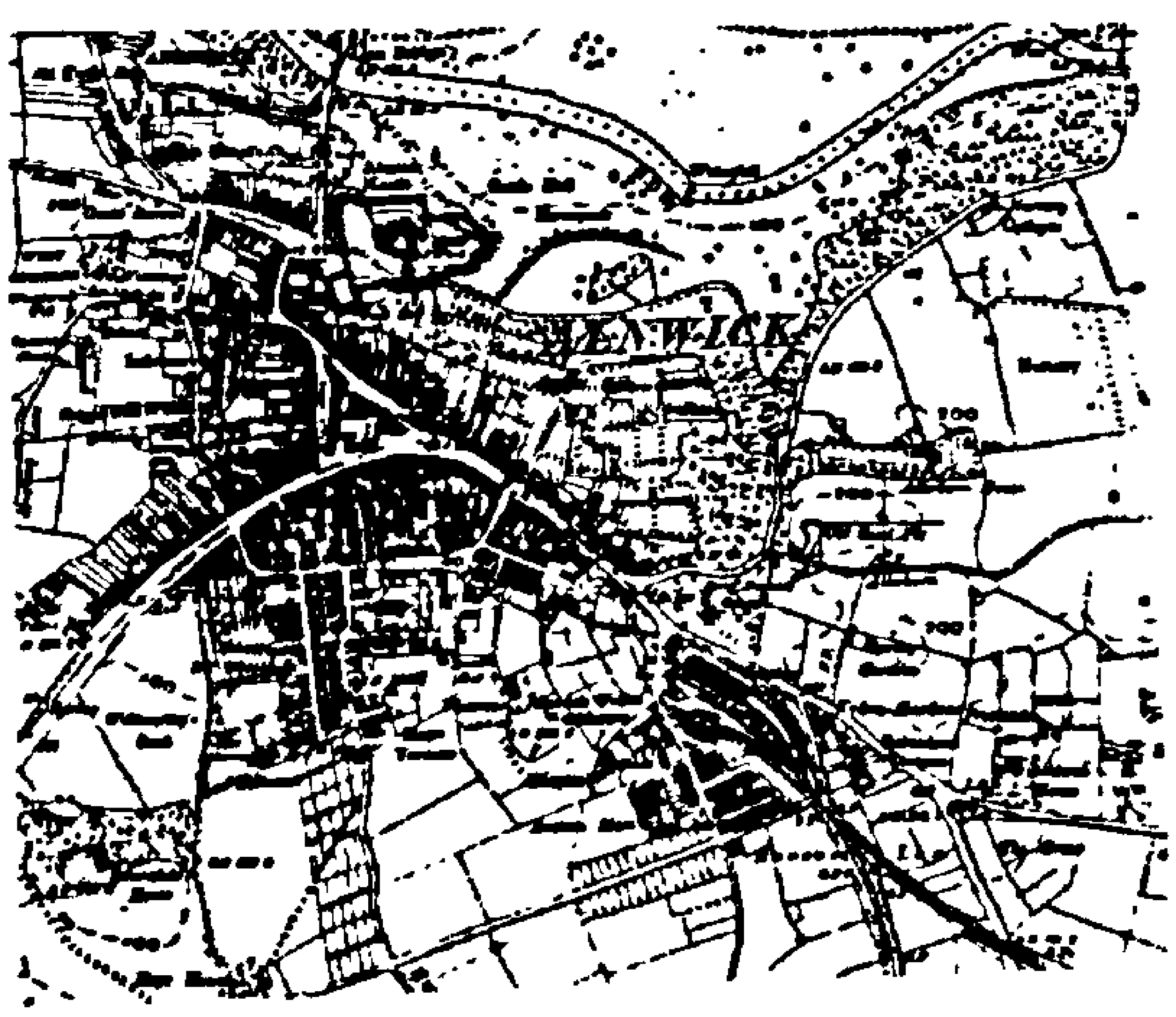
The location of the extremes of the north, south, east and west boundaries provide opportunities and limits for development in similar ways to the opportunities and limits of the locations at Alnmouth and Warkworth.

Fig. 6.9 shows C20 developments in two areas outside the settlement core. The first is along the river bank to the east of the bridge where a row of houses closely follows the line of the river bank and therefore falls within the same opportunities and limits observed in the medieval layout. However, the second is a series of accretions to the north of the north row of burgages and therefore falls outside the opportunities and limits of the medieval layout. The layouts of these accretions follow limits imposed by enclosure which is discussed later in this chapter.

6.2.3 *Alnwick.*

Alnwick is within the physiographic region described as vale near the coastal plain on the eastern edge of scarps. There does not appear to be any constraints imposed by the proximity of the settlement to the River Aln. The medieval settlement sprawls over gently rising ground on the south side of the Aln valley and castle. Burgage plots enclose a central market area.

Figs.6.10 and 6.11 shows burgages in three rows of different configurations enclosing a large triangular central area. For ease of discussion these are referred to as north, south and west rows. Examination of the topography shows the north and south rows



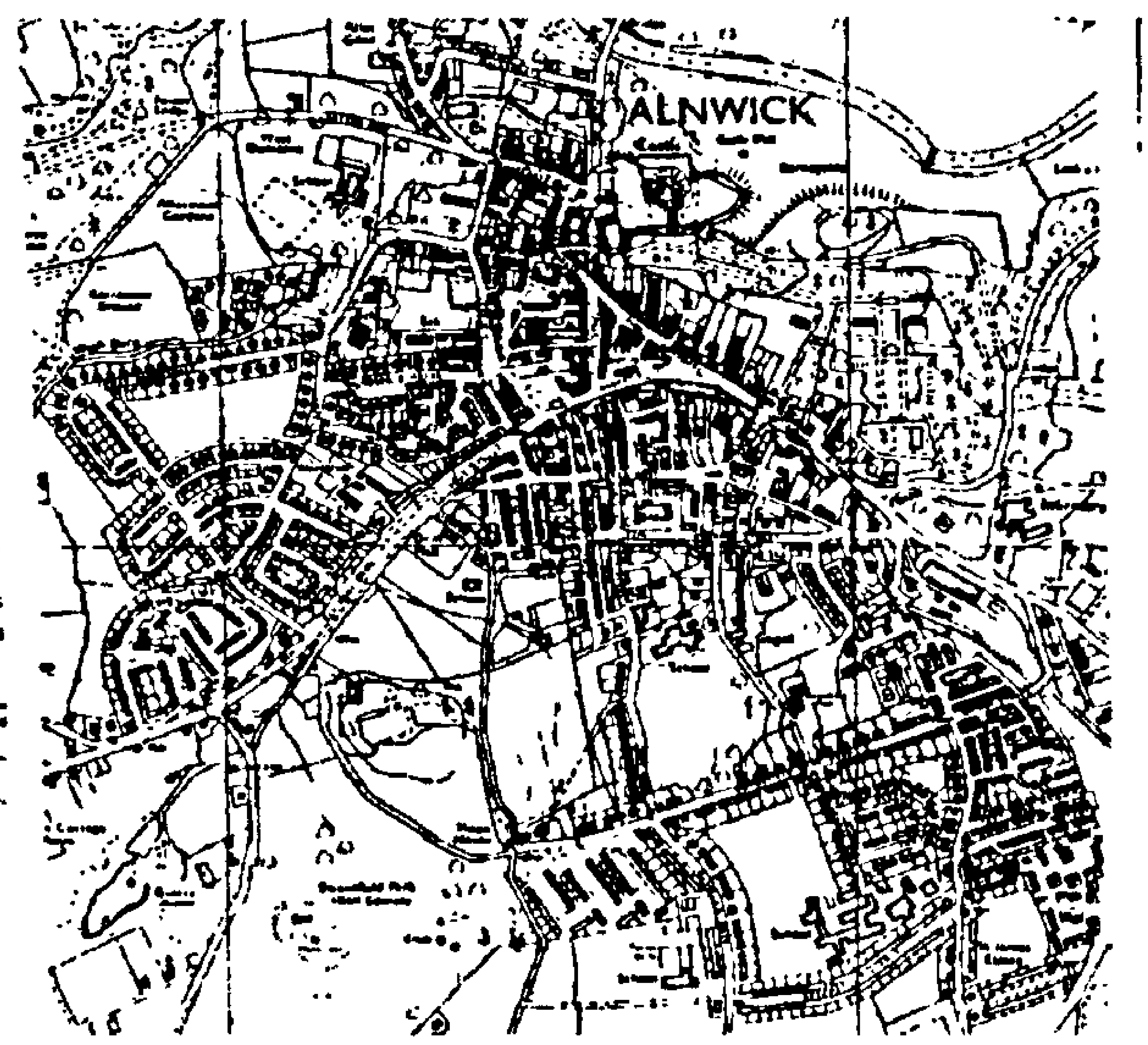


Fig.6.10. Map of Alnwick in 1899
SOURCE: OS Scale 1:10 560

Fig.6.11 Map of Alnwick in 1977.
SOURCE OS Scale 1:10 000

follow the direction of contours along Bondgate and Market Street. Bondgate is straight while Market Street curves into Clayport Street producing a central area which is enclosed on the west side by Fenkle Street. The central area is more or less level. The opportunity offered by the topography for development is the second instance where preference for particular site features are observed. A substantial shelf of level land is available in a landscape mostly dominated by scarps. In the surrounding districts the incline is more pronounced indicating a similar preference for level site as found in the previous case at Rothbury.

The geological survey shows the settlement constructed on a sand and gravel deposition which extends from the river to boulder clay scarps in the south. The divisions between different geological formations appears to be unrelated to any of the settlement configurations. But a preference is shown for land with best loadbearing qualities, following the discussions in Chapter 4.

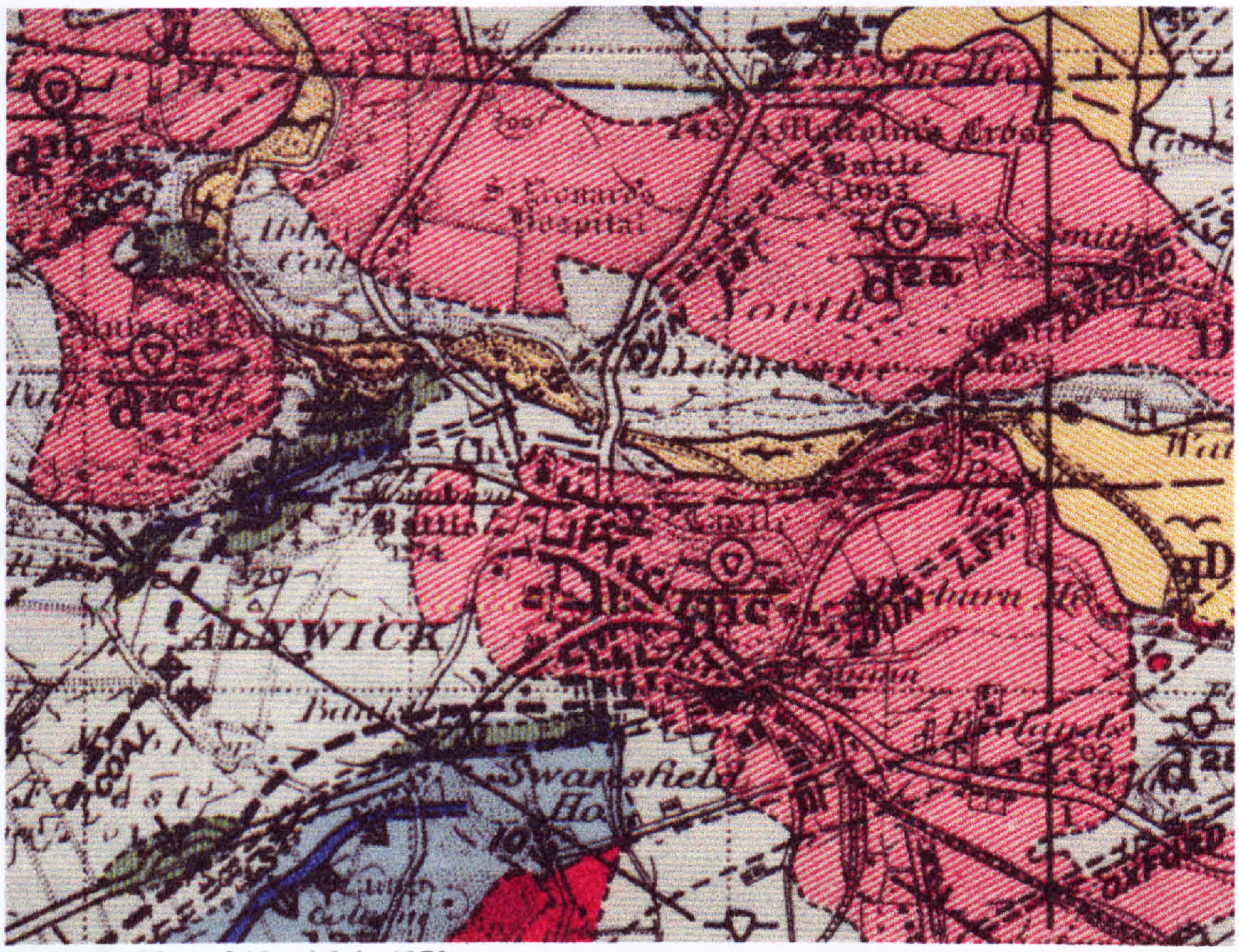


Fig. 6.12. Map of Alnwick in 1972.
SOURCE: Geological Survey 6 Drift Edition
Scale 1:50 000

The castle and grounds occupy land to the north, separating the settlement from the river and creating a limit for the north boundaries of the burgages. To the south and west the limits of the rear boundaries of the burgages, defined by Green Batt and Dispensary Street follow the lines of the contours. The incline increases behind Dispensary Hill but not immediately behind Green Batt and here there are more strips which have the same long narrow characteristics of burgages. In these instances the changes to steeper incline appears to define limits of burgages but the OS 1899 also shows strips with burgage characteristics lining the north side of Clayport Street where the incline is noticeably steeper than elsewhere. This appears to contradict earlier observations. However, Alnwick is much larger than the other settlements considered so far in this chapter and extra burgages may have been required to meet the demands of an increasing population at a later period in development of the medieval settlement. Some support for this proposition is given by the enclosure of the central area by town walls defined by Green Butt and Dispensary Lane. Clayport

Street is not enclosed which suggests it may have been constructed after the license to fortify was given in 1434. In these circumstances the early planning of the settlement core appears to follow similar opportunities and limits found at Rothbury.

C20 developments have spread in east, south and west directions from the settlement core following later land divisions created by enclosure acts and awards and railway embankments.

6.2.4 *Corbridge.*

Corbridge is similarly placed to Rothbury on the north bank of a river, but here there are no steeply rising hills to the north. Again burgages enclose a central market area and are evident in the layout of the present day.

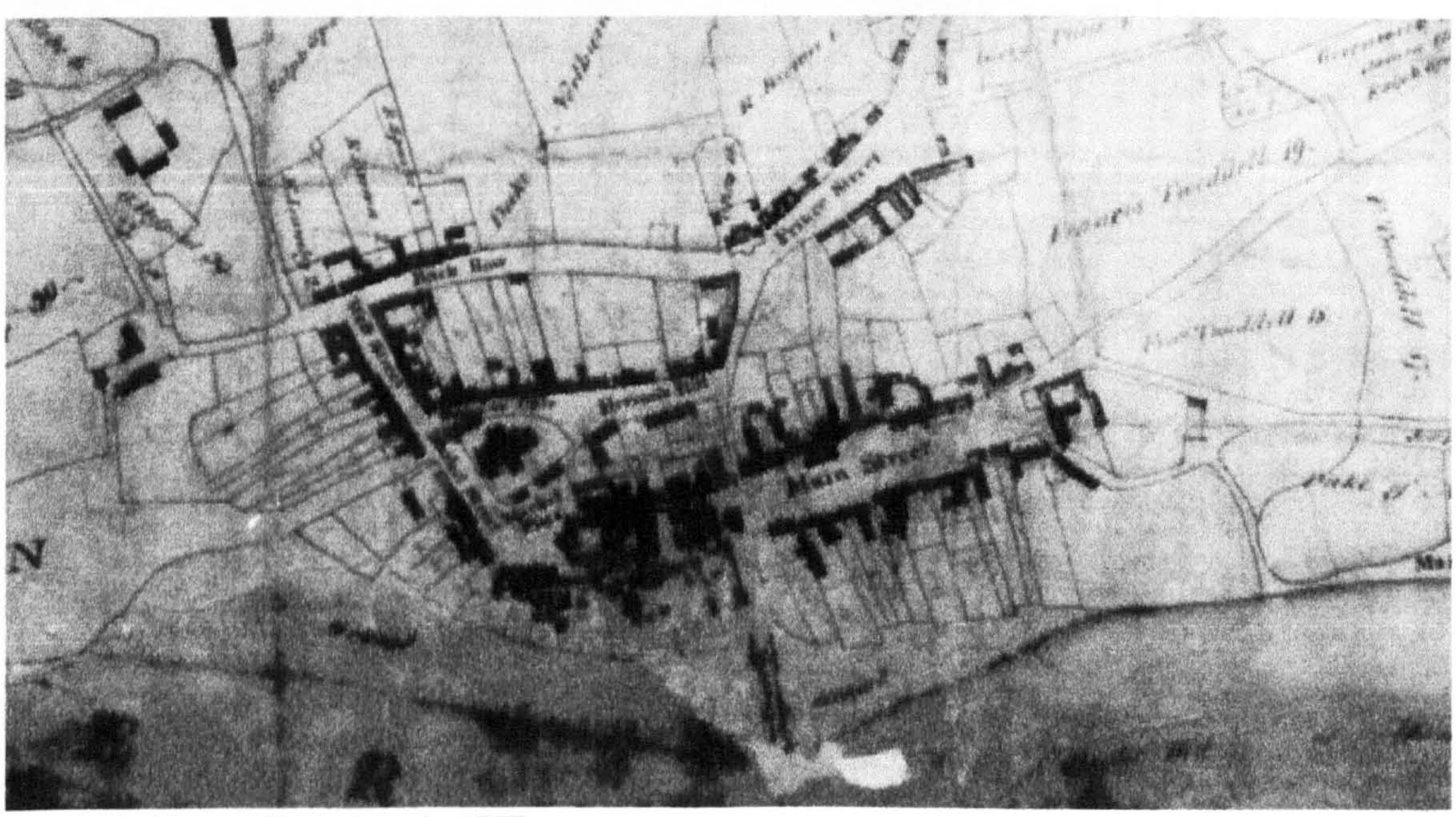


Fig. 6.13 Map of Corbridge in 1777.
SOURCE: Fryer 1777.

Examination of the plans of topography and geology prepared for the statistical analysis shows opportunities and limits similar to those found in the arrangement of landscape at Rothbury. A river runs in a west to east direction along the south of the settlement and there is a gently rising shelf raised above flood level on which the settlement is constructed. The shape of the shelf along the south side defines the limits of the south boundaries of the burgages and the more inclined land at the north of the site rises from the rear of the plots along Back Row. This is not steep by the standards of hills at Rothbury and Alnwick and on the basis of these rising sites there is no reason for the boundaries to be limited to the positions shown.

Examination of the geological survey shows the settlement is located on undifferentiated river deposits and follows the division these make with alluvium along the south side. As the settlement extends north the geology changes to boulder clay. This division is unrelated to any burgage configuration.

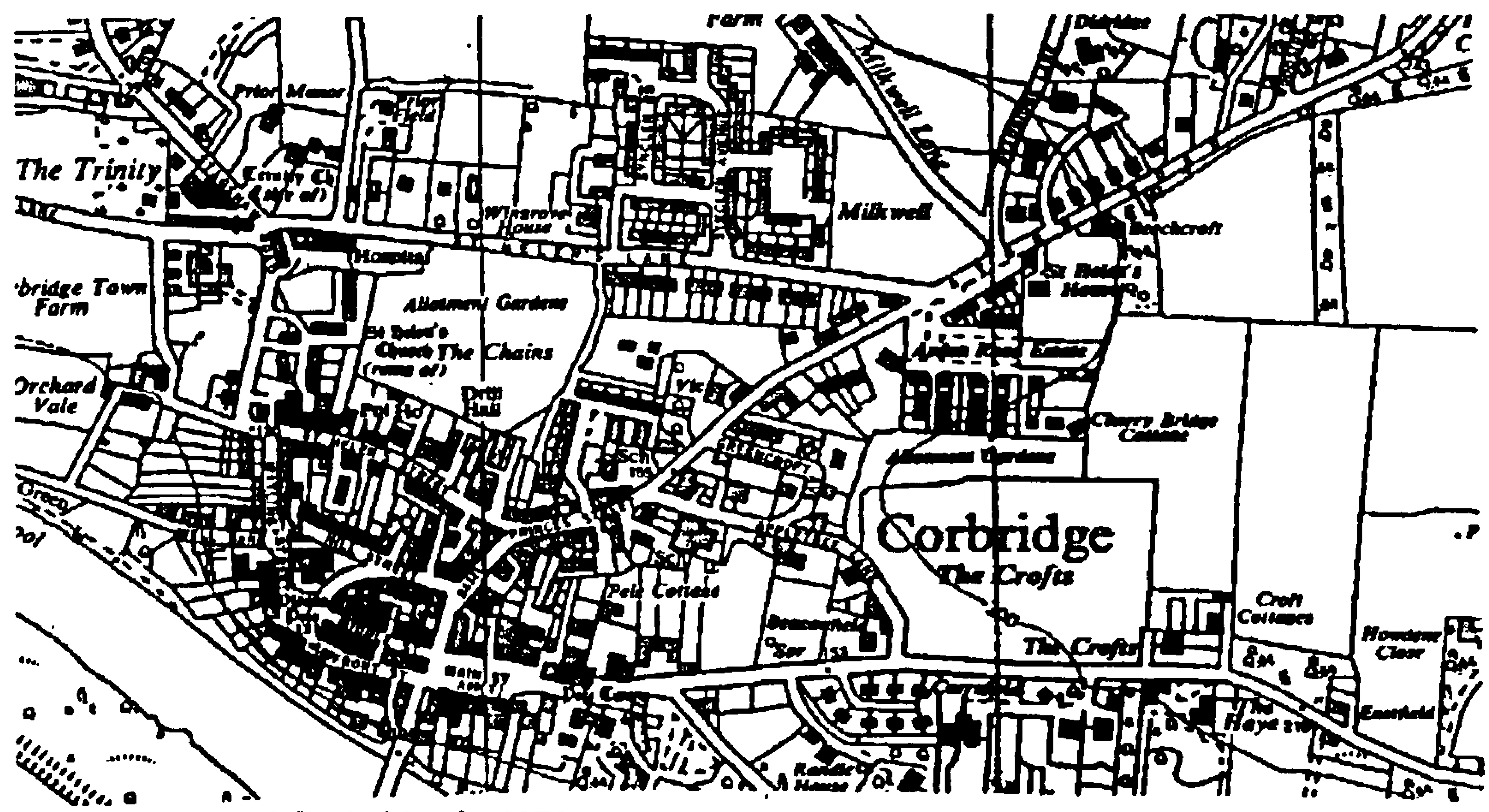


Fig. 6.14 Map of Corbridge in 1970.
SOURCE: OS Scale 1 ;10 000

Comparison with OS 1970 shows the burgages have constrained the development within the settlement core to infills within the burgage framework. Other C20 developments have spread north relating to field boundaries created from enclosure acts and awards and show no evidence of burgage constraints.

6.2.5 *Summary.*

The studies have shown that in all cases a common system of arrangement of burgage plots is adapted to location and properties of place. The simple arrangement of burgages in rows around a centrally placed common access area is recognisable in all cases. However, in each case the simple arrangement differs through a particular topographic or geological consideration and its effect on the orientation, length, breadth, configuration of rows and space between them. In cases where there are similar site elements, for example, peninsulas at Alnmouth and Warkworth, and river bank shelves at Rothbury and Corbridge, there are differences observed in settlement frameworks corresponding to particular linear figures of topography and geology which are unique to location. Distinctive settlement frameworks are constructed from the skilful manipulation of the formal system of burgage rows.

The predictions of the two theoretical models

Topography and geology are significant in shaping building configurations of settlements
and
Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns

are supported by the inferences drawn from these case studies.

The case studies have also shown a relationship of different nature. Locations of Warkworth, Rothbury and Alnwick on soils with greater loadbearing capacities support the inferences drawn in Chapter 4 that the relations between settlement and soil loadbearing capacity help pin point settlement locations in localised landscapes.

6.3 ENCLOSURE.

The second competing theory suggested by the layout at Kirk Newton is drawn from the fields systems and enclosure between 1740 and 1850. This was a system for enclosing common land to make it private property. It has already been recognised as a key event in the agricultural development of the county, and its importance is how it changed earlier settlement patterns and if its rectangular boundaries constrained subsequent settlement configurations. Baker and Butlin (1973) illustrate layouts of several settlements prior to enclosure showing common field systems and four are illustrated from different physiographic regions. Denwick is located within vales, Rennington within scarps, Lesbury and Bilton within coastal plain, and Corbridge within the Tyne valley.

Firstly, some understanding of the nature of enclosure is necessary to help place its effects within the contexts of the theoretical models. The enclosure of open and common land is a feature of agrarian changes which can be traced back to the early middle ages, but which noticeably took effect in Northumberland during the C18 and C19. The rural landscape derives much of its present appearance from enclosure of common land into private property seen in the divisions of fields by walls and fences. Not all precisely reflect the early acts and awards and some sub-divisions are evident, but the general patterns of walling and fencing established at that time have persisted to the present time. Enclosure was seen as a solution to problems of accommodating a growing population when there were few opportunities to make a living outside farming.

6.3.1 *Denwick.*

Denwick is located to the north of Alnwick on the south bank of Denwick Burn. Topographic and geological maps are illustrated in the statistical survey and show the settlement is situated on a shelf with hills rising to the north on the other side of the burn. The settlement follows the topography of the burn and a geological division between sand and gravel and boulder clay. In c.1624 Denwick was surrounded by a mixture of common arable land, meadow, stinted pasture and waste shown in Fig. 6.15. Direct access from the settlement core is shown to Denwick moor to the north of the settlement on higher ground and five infields - north, south, east and west fields, and stinted pasture. At the south of the settlement a boundary with the west and south fields is formed by the north bank of the River Aln.

The lines defining the outside of the fields can be related to the parish boundary when compared with **Fig. 6.16**. It is indicated by a dotted line along the north, east and south sides but has been lost perhaps due to the recent road building at the east side. Inside the parish boundary medieval divisions between commons can be related to landscape features and paths and are indicated by a broken line for reference. The enclosure of

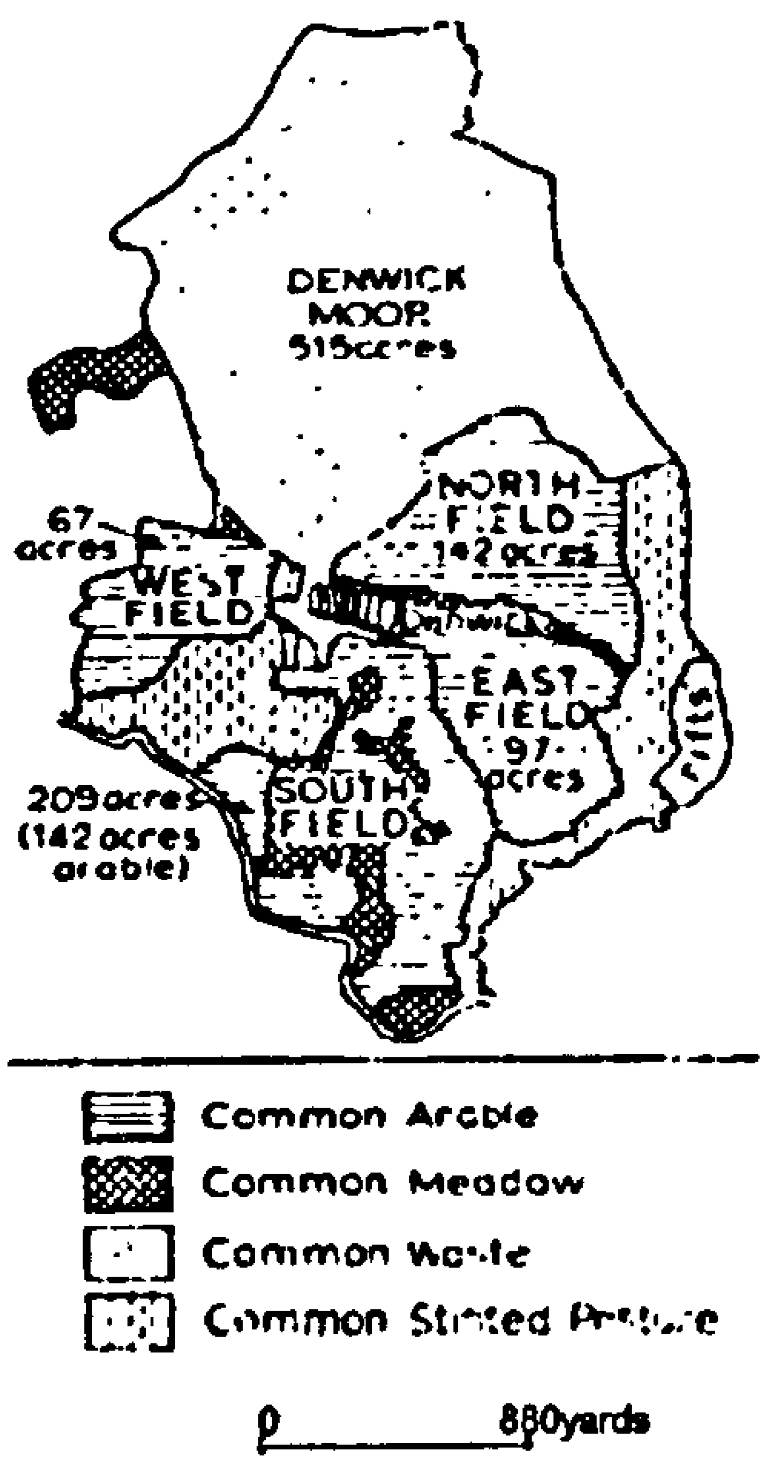


Fig. 6.15 Map of Denwick c.1642.
SOURCE: Alnwick ms. in Baker and Butlin(1973: 113)

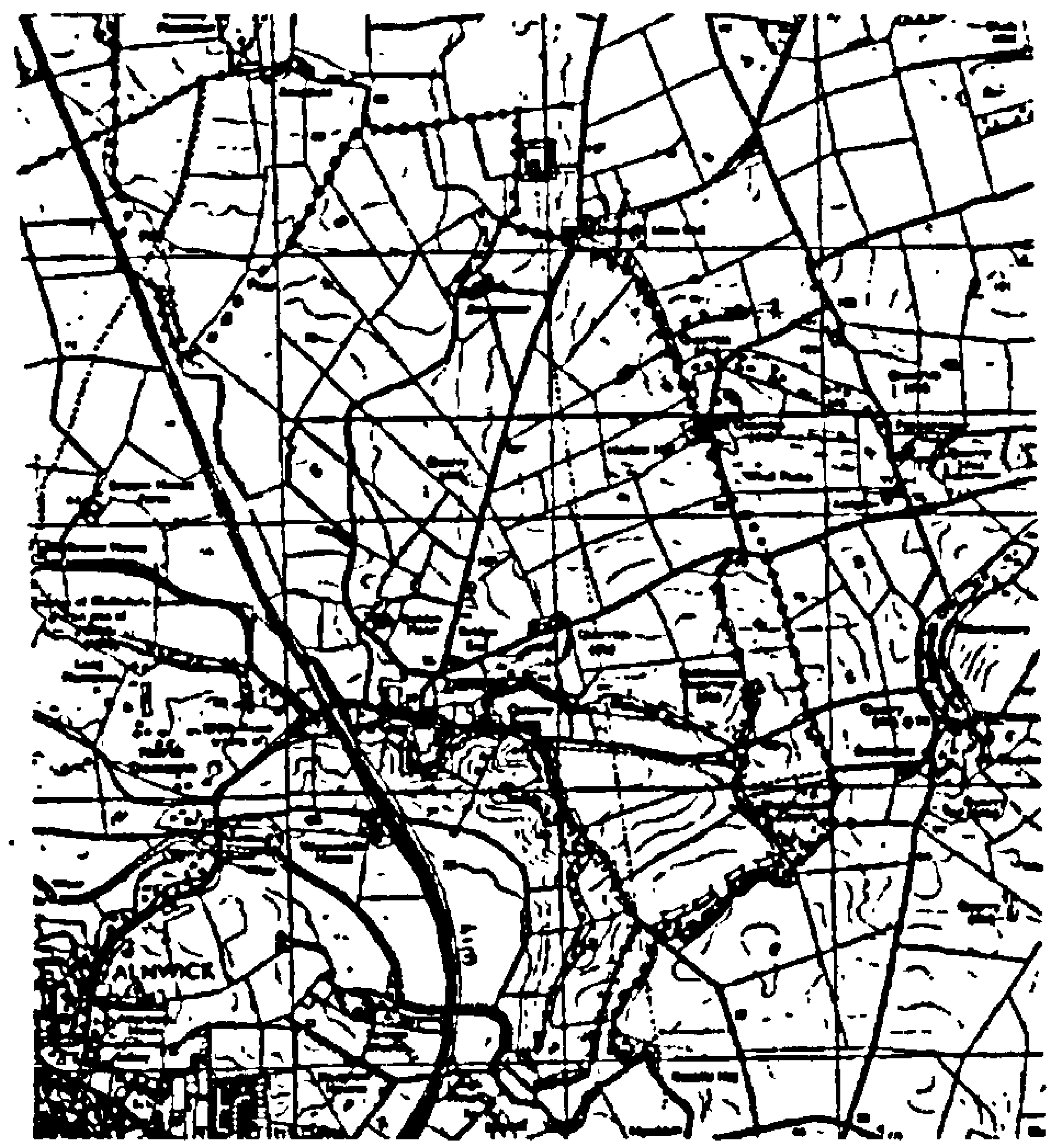


Fig. 6.16 Map of Denwick in 1981.
SOURCE: OS 1:25 000

the commons into smaller fields follow the same limits. There is little evidence of enclosure walls and fences crossing the boundaries of the earlier common field system and are mostly contained within them.

The settlement was rebuilt during the C19 following similar linear configurations of the earlier medieval pattern. There is no evidence of C20 housing accretions to this C19 layout. But where the recent major A1 road cuts across lines of walls and fences it creates a set of divisions which are clearly different to field systems and enclosure patterns to the east of the settlement where many of the old routes remain.

6.3.2 *Rennington.*

Rennington is located in scarps. Examination of the geological survey shows a uniform deposition of boulder clay over the whole settlement site without any divisions with other geological formations and therefore it is not intended to illustrate this or pursue it further as it clearly has no effect on configurations. However some interesting observations can be made about the topography, and medieval and recent settlement patterns. Comparison of plans from 1624 and 1981 shows similarities between settlement layouts with buildings running NW from the church and south from about the middle of that row. Similarities are also seen between the parish boundary and landscape features and the perimeter of the township shown on the C17 plan.

The plan of c.1642 shows Rennington surrounded by common arable fields, meadow, waste, stinted pasture and crofts. An orchard is located immediately to the east of the settlement where the common fields converge on the settlement. Some of the medieval field divisions within the parish boundary can be traced on the more recent OS map where roads follow routes between different common fields. These can be related to particular landscape features in some instances. South and west fields are divided by a small valley which then turns westward to form the southern boundary of the west field. This continues around the small hill until it meets the division with north field. The B 1340 road appears to follow the same configuration as the division between north field and croft the most northern common meadow. The new road south to Hocketwell appears to cut across the old south field and modern evidence of old divisions in this area is difficult to find.

The layout of the settlement rows follow the general pattern of the contours in two directions and has been followed, with some small deviation, in the modern settlement plan. Enclosures tend to follow the boundaries of earlier commons where they are still in evidence, but where roads have been constructed across the early fields, they appear to act as boundaries with little continuity of walls and fences on either side. The most noticeable enduring configuration is the kidney shaped orchard. There are no modern accretions constructed within or near to the settlement.

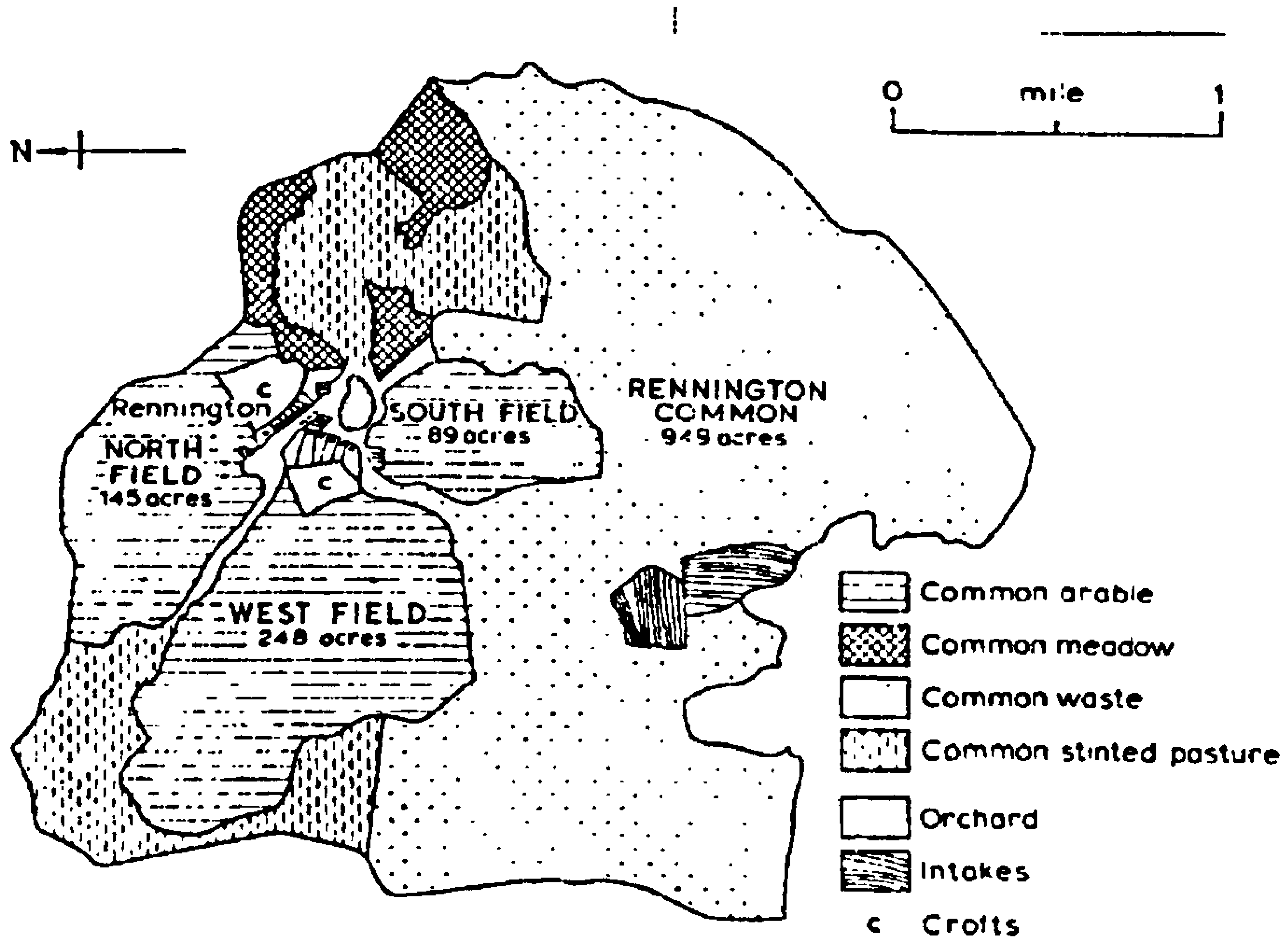


Fig. 6.17 Map of Rennington in c.1642.
SOURCE: Alnwick maps in Baker and Butlin (1973: 113)

Fig. 6.18 Map of Rennington in 1981.
SOURCE: OS 1:25 000

6.3.3 *Lesbury.*

Lesbury is located to the north-west of Alnmouth on the north bank of the river Aln in the coastal plain physiographic region. Examination of topography Fig. 6.22 and geological survey Fig. 6.21 shows the settlement is located on gently rising land following the direction of contours, and on boulder clay following a division with alluvium.

In c.1642 the settlement was enclosed on the north by Lesbury common, and west and east common arable fields shown on Fig. 6.19. There are similarities between present day parish boundaries shown and the perimeter of the medieval commons along the west and north sides. Similarities are also found between the internal divisions of the common fields and routes running north and east. A road north to Longhoughton is indicated by a thin broken line on Fig. 6.19 and is shown clearly on Fig. 6.20, 6.21, and 6.22. Enclosure within each common field and along the parish boundaries tends to follow the medieval divisions although some distortion can be seen where the railway runs through the west side.

The linear configurations of the medieval settlement are retained at the core of the present settlement pattern with some C20 accretions located at the east and west sides which relate to earlier field systems. To the east, dwellings are scattered around cross-roads which follow the pattern of the medieval division between the township and Lesbury east field. At the west side a ribbon development extends along the east side on the main road to Alnwick which follows the line of the east boundary of Lesbury West field as it extends north with the general direction of the River Aln.

In both instances of settlement expansion the divisions inherited from C17 field systems are shown to limit the boundaries of C20 housing accretions.

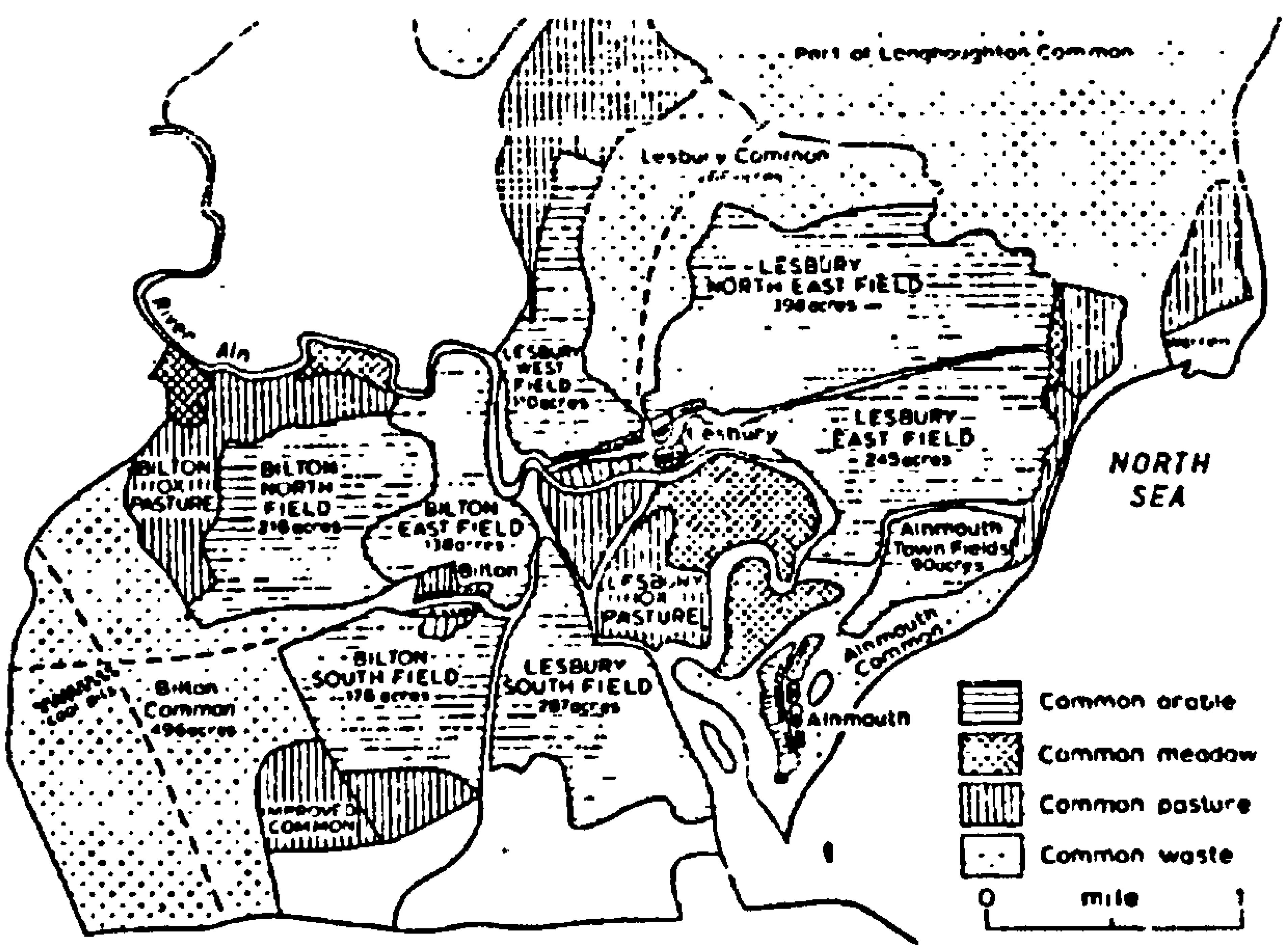


Fig. 6.19 Map of Lesbury in c.1642.
SOURCE: Alnwick maps in Baker and Butlin (1973:116)

Fig. 6.20 Map of Lesbury in 1981.
SOURCE: OS 1:25 000

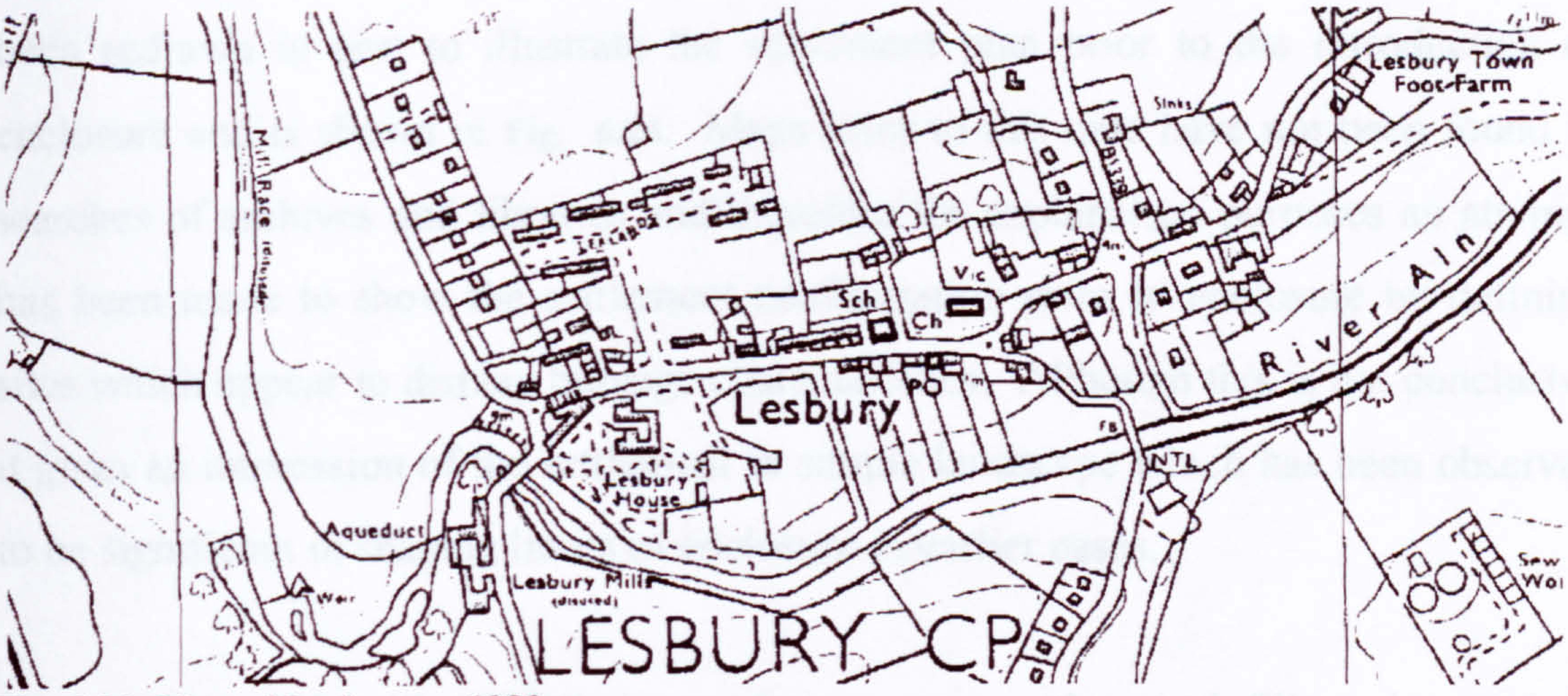


Fig. 6.21 Map of Lesbury c. 1980.
SOURCE: OS 1:10 000

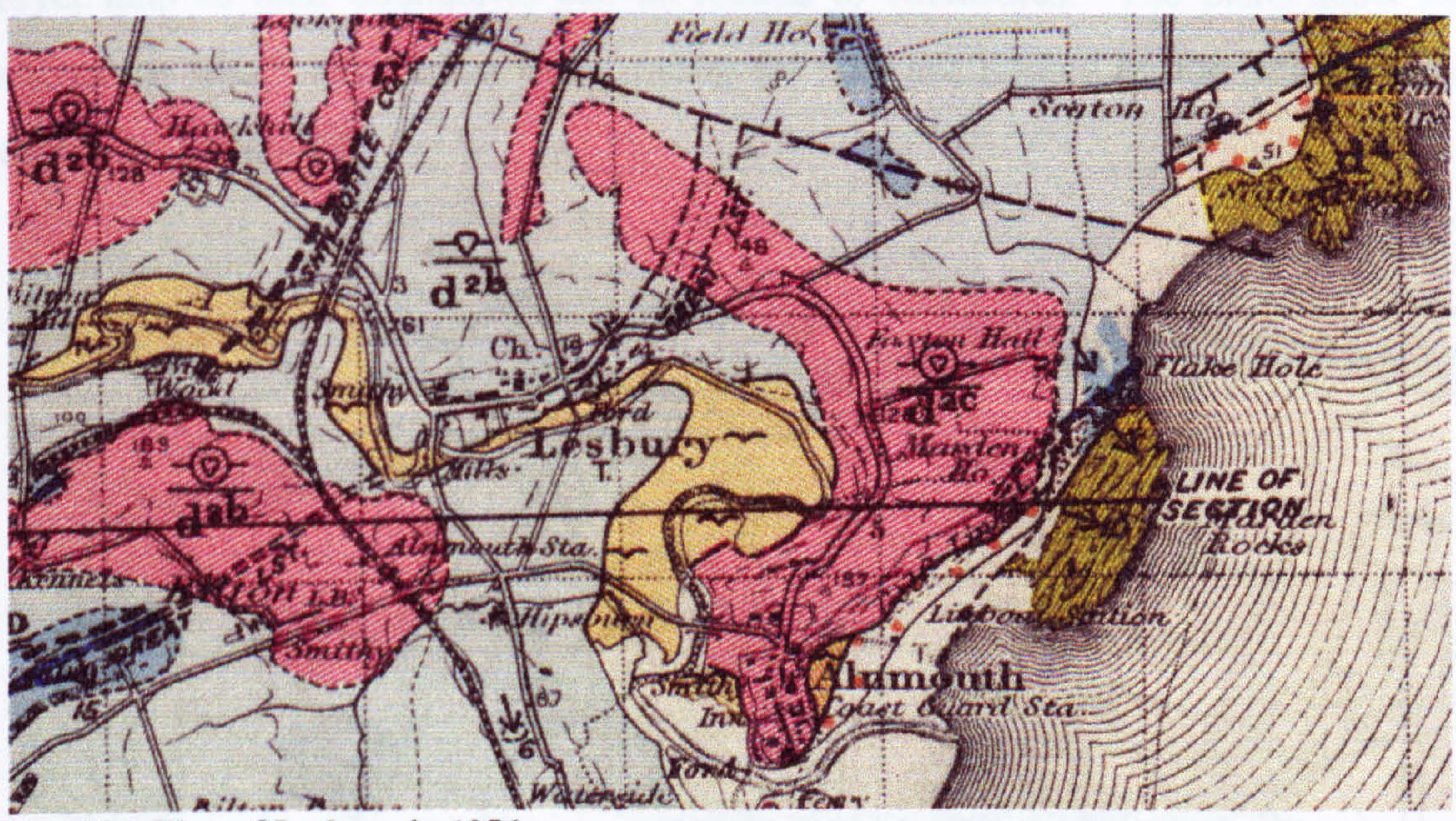


Fig. 6.22 Map of Lesbury in 1956.
SOURCE: Geological Survey 9 Drift Edition Scale 1:50 000

6.3.4 ***Corbridge.***

Corbridge is located in the Tyne Valley physiographic region. Topographic and geological maps are shown in the statistical survey, and have already been discussed in the burgage survey in the previous chapter.

Medieval field systems are discussed with reference to the Fryer map 1777, which has been redrawn in part to illustrate the settlement plan prior to the introduction of enclosure and is shown in Fig. 6.24. Maps prior to this date have not been found in searches of archives and libraries and therefore for explanation purposes an attempt has been made to show the settlement configuration prior to enclosure by defining sites which appear to display burgage characteristics. Although this is not conclusive it gives an impression of the settlement in simple landscape which has been observed to be significant in shaping limits of enclosure in earlier cases.

By comparing this with 1997 Ordnance Survey map, settlement infills and accretions over two centuries can be examined. Accretions sites are shown in outline on the Fryer map so their boundaries can be related to enclosures. The plans show that accretions which have taken place during the C20 are limited by the boundaries of enclosure of the C18.

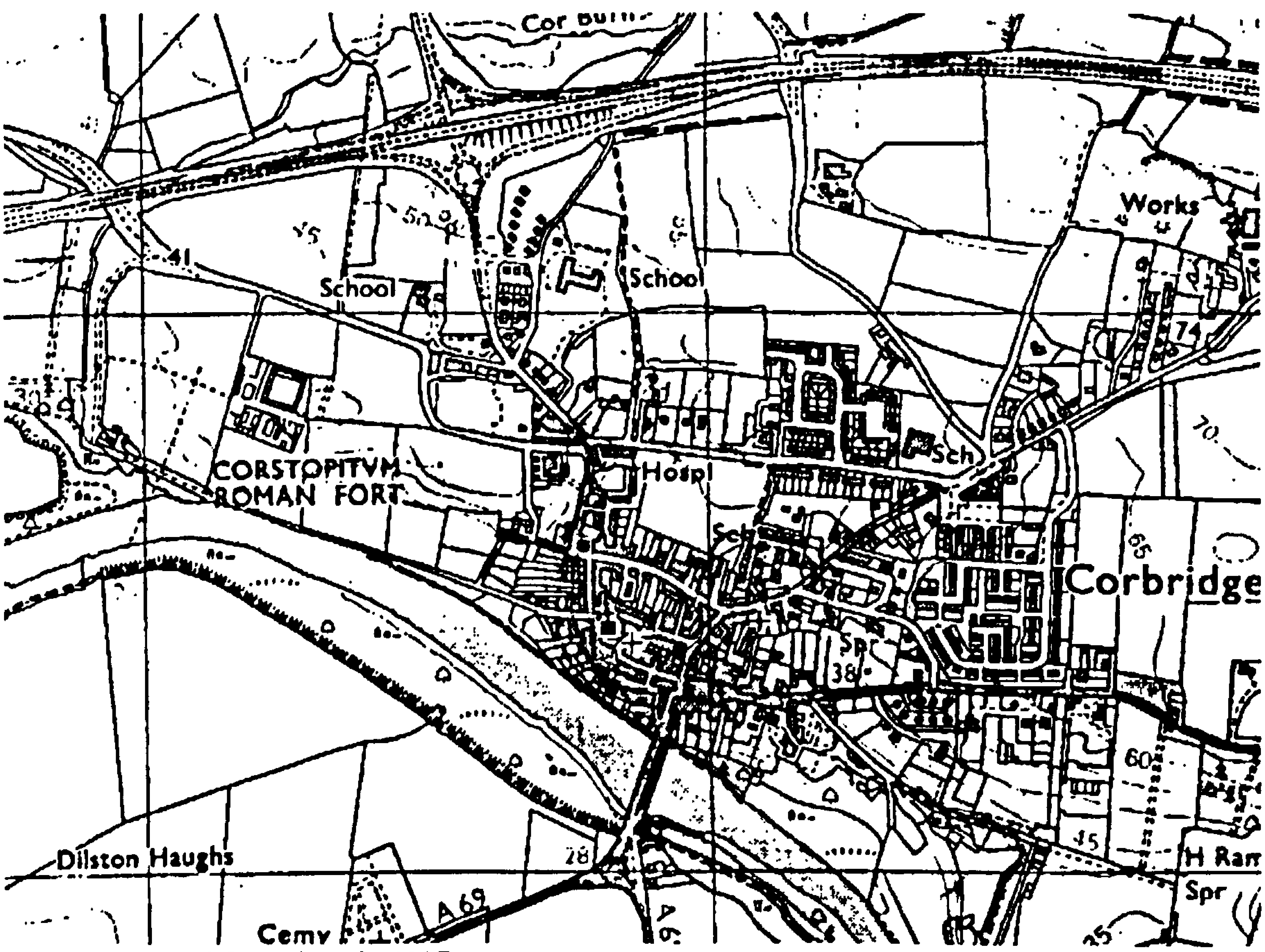


Fig. 6.23 Map of Corbridge in 1997.
SOURCE: OS Scale 1:25 000

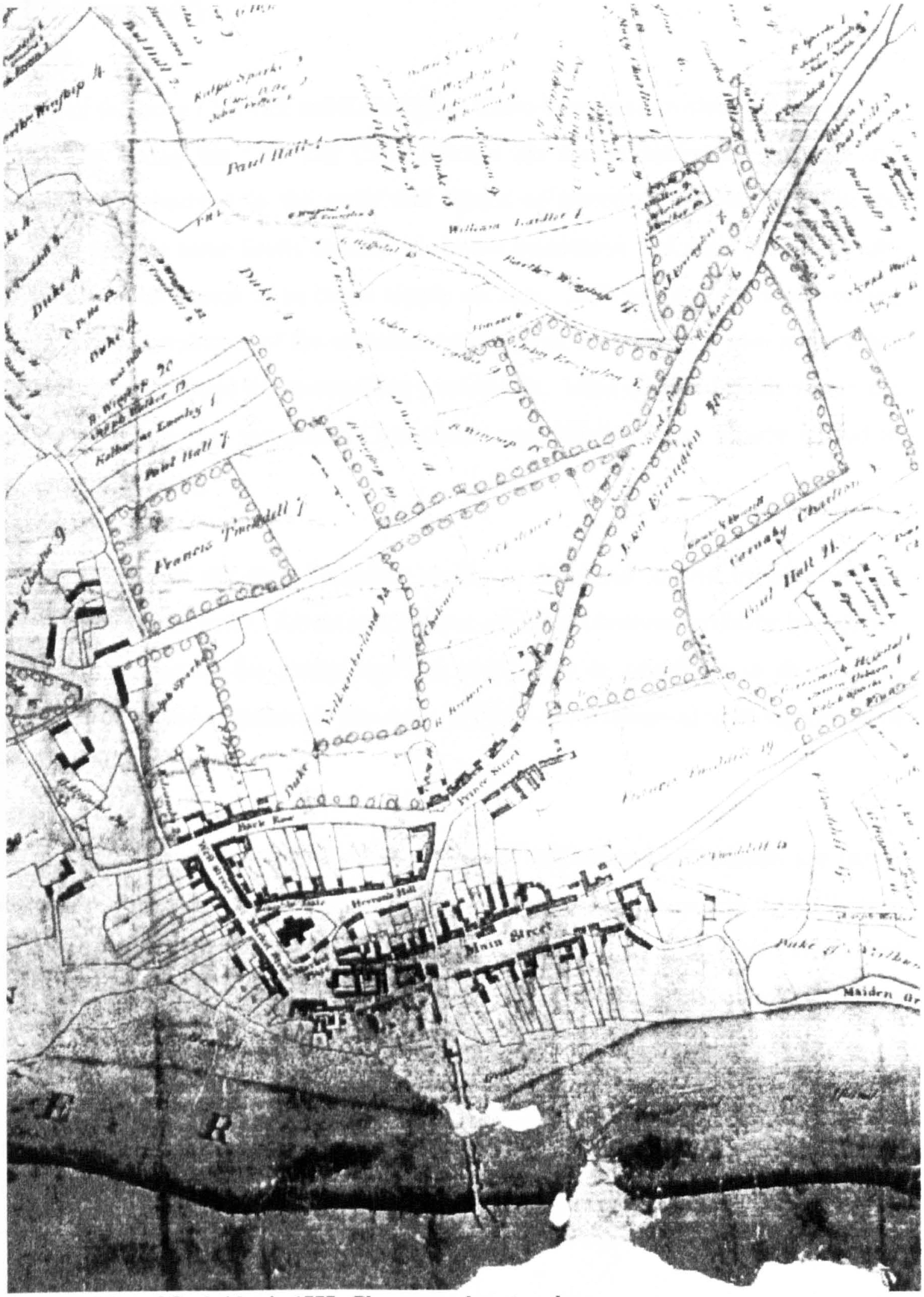


Fig. 6.24 Map of Corbridge in 1777. Plan pre and post-enclosure.
SOURCE: Fryer.

6.3.5 *Summary.*

In two of the cases Denwick and Rennington where there is no evidence of accretions, rebuilding during the C18 and C19s follows the earlier settlement patterns and enclosure is observed in the walls and fences of surrounding fields. Landscape features provide some limits to these enclosure boundaries but there are many sub-divisions which appear to be based simply on area. Both settlements have working farms at the peripheries of the settlement complexes, and there are also many other farms scattered around the surrounding countryside. Most enclosed fields within the parish boundaries are for pastoral and arable agriculture and are clearly related to demands of farming.

The prediction of the first theoretical model is supported in part by observations drawn from theses cases. Rivers and streams are often observed to define boundaries of fields, supporting the proposition that topography is significant in shaping the geometry of enclosure patterns. However, geology is not observed to be significant in these cases.

Divisions observed to shape the peripheries of land around settlements are parish boundaries. There are clear similarities between the shapes shown on the C17 maps and the C20 maps. Again topography plays a significant part where rivers and streams define particular limits but in many instances these appear to be arbitrary lines.

At Lesbury and Corbridge there are instances where enclosure is observed to provide limits for residential development which has taken place during the C20. Boundaries are clearly seen to reflect patterns of earlier enclosure walls and fences.

At Lesbury the accretions which spread to the north and east of the medieval settlement site are small and evidence of enclosure is mostly found in walls and fences of surrounding fields. Farms are scattered across the countryside and agriculture is the predominant activity. Unlike the two previous cases there is no evidence of a farm within the present settlement framework but productive fields extend to the boundaries of the built up settlement area.

The prediction of the first theoretical model is supported by observations of enclosure divisions which follow the topography of the river, but elsewhere they follow routes and the parish boundary with many sub-divisions within the boundaries of the pre-enclosure field systems.

The prediction of the second theoretical model is supported by the enclosure of land by walls and fences in geometric patterns and parish boundaries which shape the peripheries of the enclosed fields. Ancient parish boundaries are illustrated as geometric frameworks which limit shapes of the enclosure fields in all cases. Administrative boundaries are more usually seen to shape the peripheries of settlements where urbanisation has spread to the boundaries of a city or town area. However, in these cases the limits of the parish are observed to constrain a much more basic development pattern.

6.4 LAYOUT OBJECTIVES FOR DESIGN OF RESIDENTIAL ROADS.

The distinctive patterns suggested by housing layouts at Craster and Pegswood are based on bye-laws which followed the Public Health Act of 1846. It is not intended to describe these bye-laws nor the increasingly complex and lengthy legislation which followed since the details of precise standards have changed considerably over the years, and to give even an abridged version of them would be lengthy and not relevant to the study. Rather the study examines the implications of Design Bulletin 32 from the DoE and DT entitled *Residential Roads and footpaths layout considerations* and investigates settlement accretions at Lonframlington which followed its publication in 1979.

Design Bulletin 32 gives information and advice on the layout of roads and footpaths in new private and public sector housing schemes: It proposes a general approach to the development and application of local guidance; a summary of layout objectives which should be pursued in designs; suggests some partial solutions; and, provides geometric design data. The Bulletin followed many related bye-laws, governmental reports and papers and is still widely enforced as a design guide by local governments. Local development plans provide frameworks within which the design of residential roads and footpath networks are set. Highway and planning authorities are charged with ensuring the guidelines are followed when examining applications for statutory consents. Evidence of its widespread effects on housing estates can be observed in many residential developments.

6.4.1 *Vehicular movement patterns.*

Vehicular movement patterns provide the thrust of the design bulletin. Volume and type of traffic is considered against variables of household size and composition, socio-economic status, and levels of car ownership. It also recommends the spacing between buildings should be determined by *the width and alignment of roads and footpaths*, DoE and DT (1979: 9), in addition to well tried criteria of privacy, views, and light. Empirical evidence from which these recommendations are developed are sizes of approved housing schemes in 1974-75, when almost 90% of public sector schemes contained fewer than 100 dwellings and only 3% contained more than 250. The inference is therefore that no matter how small the housing scheme is it is governed by the recommendation of this bulletin.

An argument is introduced for the exclusion of none access traffic from housing sites on grounds of safety and nuisance which are not pursued here in detail, but the recommendations which follow are of particular interest to the holistic hypothesis and the second theoretical model. Five layout arrangements which exclude non-access traffic are offered as guides to designers. These are illustrated together with their supporting text in Fig. 6.25

Where none access traffic is excluded vehicle flows are normally very light except during peak flow conditions in mornings and early evenings. Further designs are illustrated to provide a safer environment by reducing vehicular flow and speed. These are illustrated together with the dialogue which accompanies them in **Fig. 6.26.**

Layout arrangements

4.05 The means of excluding non-access traffic will depend in part upon whether the site is located within a residential road network or between distributor roads. Such traffic may be excluded by providing:

(a) a completely closed residential road layout - so that short cuts are impossible (figures 4 and 5);

(b) a route which is no more convenient to use than a distributor road - so that there is no advantage for through traffic (Figure 6) or;

(c) a through route which is longer and more tortuous than the alternative along the distributor - thereby making the route inconvenient for use in anything other than an emergency (Figures 7 and 8)

4.06 The aim here as for other objectives, should be to make layout arrangements which are self-enforcing, rather than rely upon the use of signs,

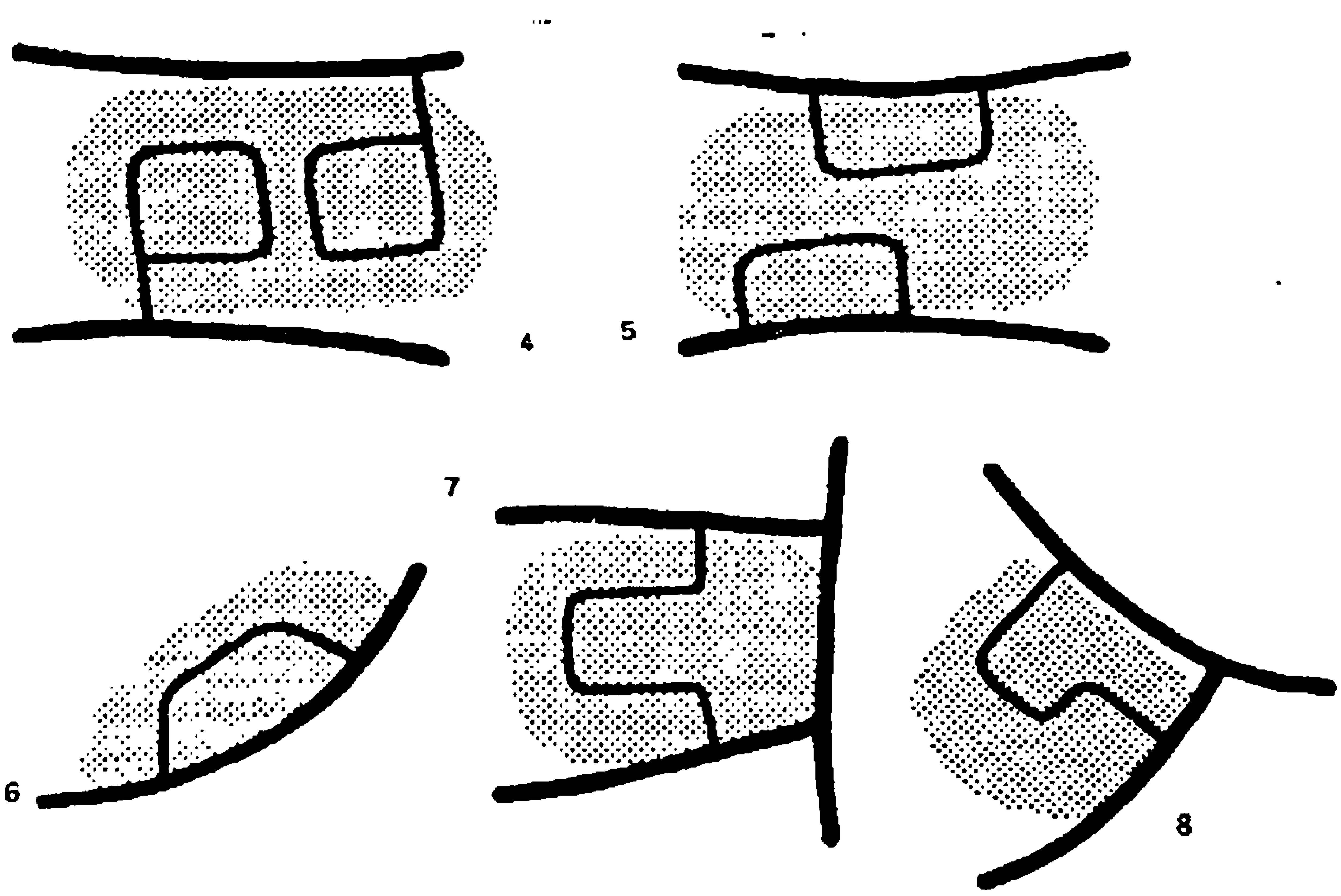


Fig. 6.25 Plans of layout arrangements for residential roads.
SOURCE: DoE and DT (1979: 11)

Vehicle flows in the vicinity of dwellings.

5.04 One of the options which may be available to ensure that vehicle flows in the immediate vicinity of the home are kept as low as possible is to provide a number of connections to the roads adjoining the site and to use cul-de-sacs or short loops leading off at several points (Figure 11). It may sometimes necessary, however, to connect culs-de-sac and short loops to collector roads leading off the site, thereby creating a hierarchy of residential roads in terms of traffic volume and possibly design speeds (Figure 12).

Vehicle speeds.

5.07 For the residential road network as a whole, the design option which is most likely to be effective in reducing speeds is the avoidance of long straight roads. This may be achieved by keeping culs-de-sac and loops short in length or by the introduction of 'T' junctions with short lengths of roads between (Figure 13). The introduction of tight bends and road narrowing may be used to reinforce such measures.

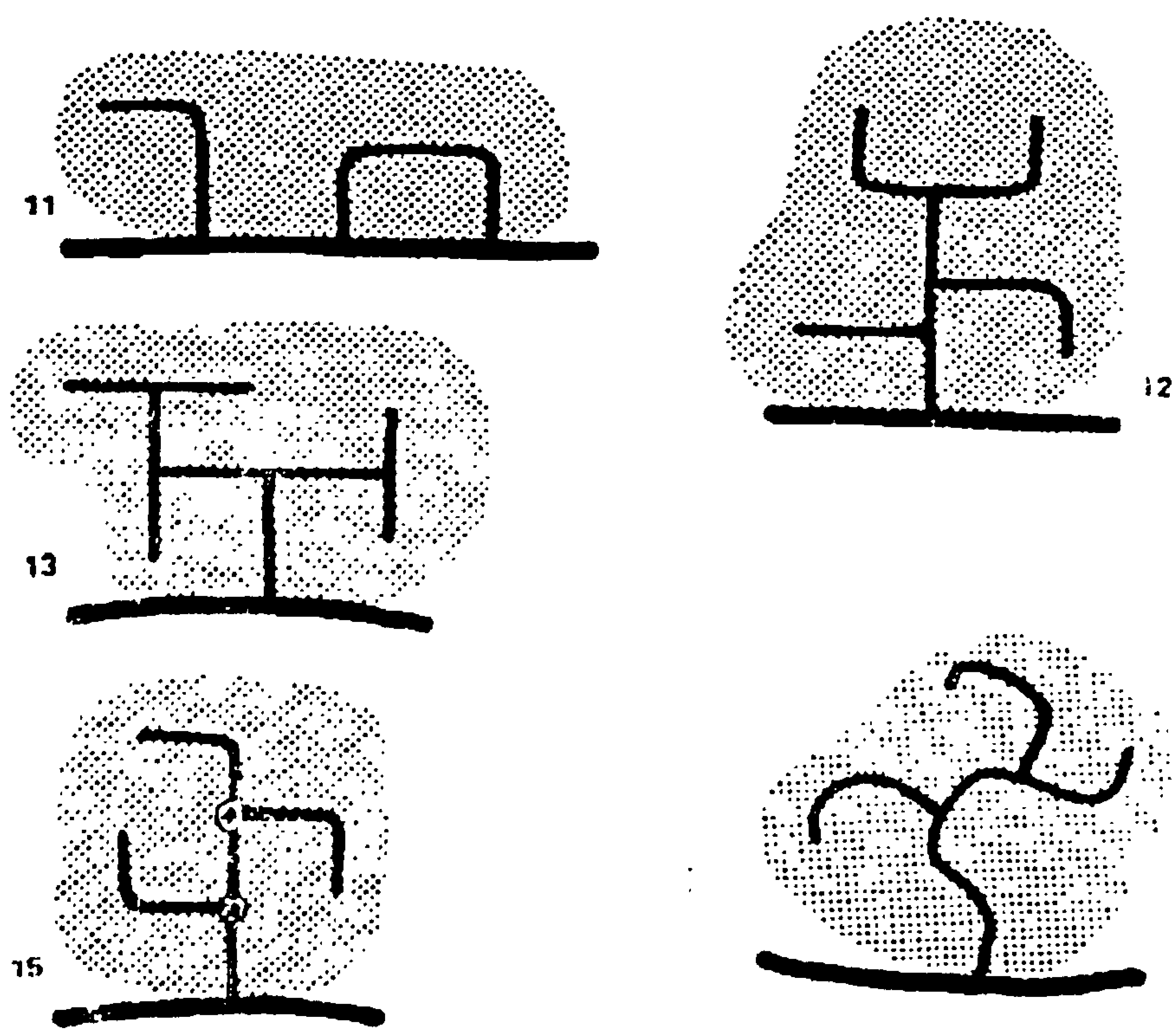


Fig. 6.26. Plans of layout arrangements for residential roads.
SOURCE: DoE and DT (1979: 14)

6.4.2 *Longframlington.*

Observations suggest in many cases these layouts act as models for road systems in housing accretions. Cases are examined where the recommendations of the Bulletin can be compared with earlier settlement route patterns to assess how they respond to settlement layout within the context of the holistic hypothesis. Significant differences are recognised in many of the distribution frameworks with accretions set aside from the general distribution system which forms part of the earlier settlement. At Longframlington there are two accretions where layouts similar to the models of the bulletin can be observed. These are at Knogley Way and Church Street, and opposite West Lane Cottages at Cairn Park Shown on **Fig. 6.27.**

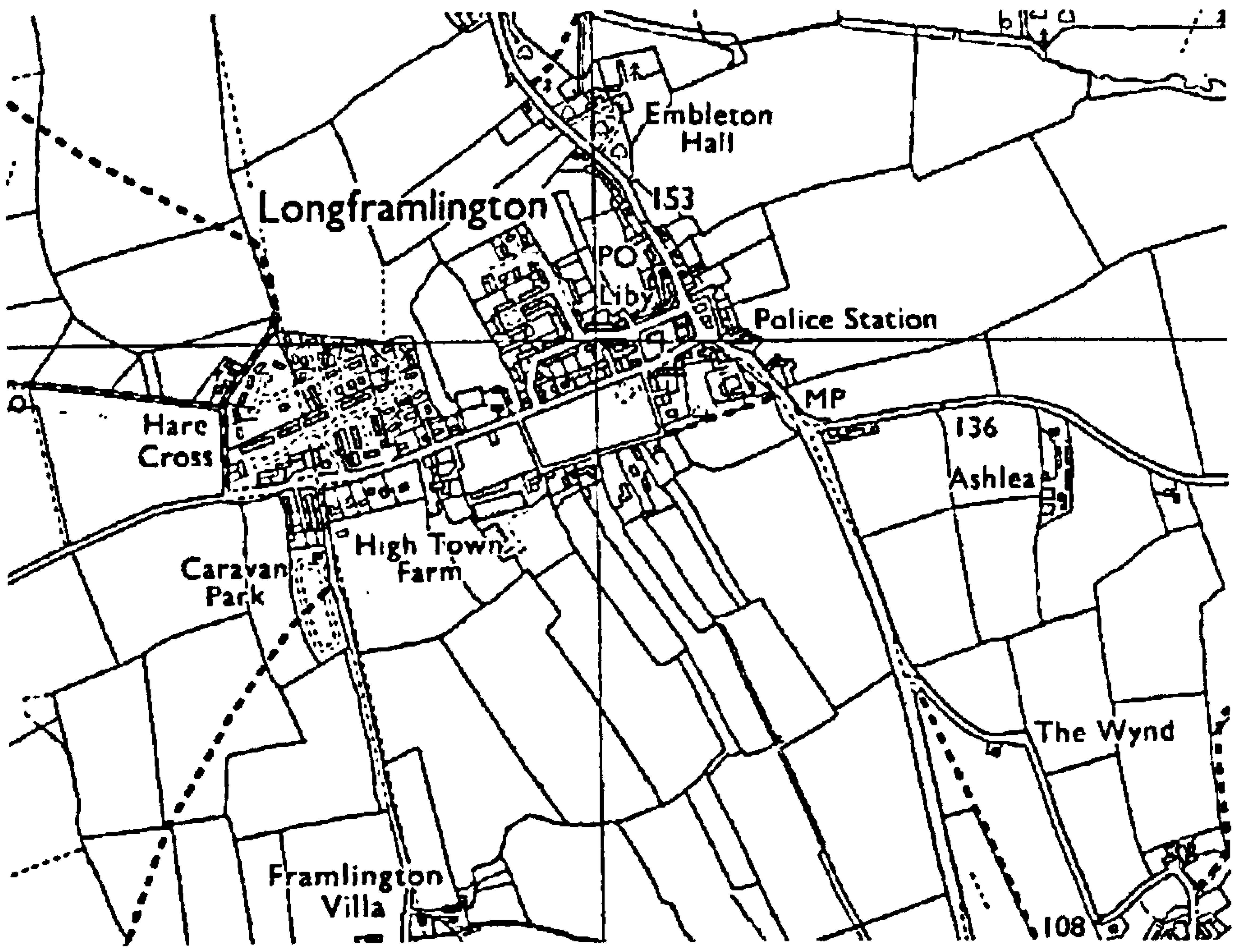


Fig. 6.27 Map of Longframlington in 1990.
SOURCE: OS Pathfinder 1: 25 000

Rothbury Road, running EW, and Front Street running NS, are primary, local and district distributor roads within the meanings of the classifications given in the Bulletin:

PRIMARY DISTRIBUTORS form the primary network for the town as a whole and longer distance traffic movements to, from and within the town are canalised on to such roads.
DISTRICT DISTRIBUTORS distribute traffic between the residential, industrial and principal business districts of the town and form the link between the primary network and the roads within residential areas.
LOCAL DISTRIBUTORS distribute traffic within districts. In residential areas, they form the link between district distributors and residential; roads and should not normally give direct access to dwellings.

RESIDENTIAL ACCESS ROADS link dwellings and their associated parking areas and common open spaces to distributors. Such roads are referred to in this bulletin as residential roads. DoE and DT (1979: 7)

The first observation drawn from this is that the classifications are not exclusive. Front Street is in fact part of the A 697, a well used route between Newcastle and Edinburgh. As well as houses it also has small shops, pub and church with frontages onto the carriageway and gives access to other residential areas. In these respects it meets the descriptions of all four distributors given in the classification. A similar situation exists at the Rothbury Road. This is a local route between two settlements, Longframlington and Rothbury, but also serves to provide direct access to houses and commercial garages and gives access to other residential areas and a farm. It therefore meets the descriptions of district and local distributors and residential access roads. There are clearly difficulties which arise through the interpretation of the Bulletin classificatory system in situations where old settlement frameworks exist. Indeed there appears to be a direct contrast between the spirits of the bulletin and the nature of the earlier layout. Whereas the bulletin proceeds from a theory of separation for safety purposes in an age of increasing vehicular activity a prevailing quality of the earlier settlement is cohesion. The meeting of two roads at the T junction between Rothbury Road and Front Street gives a focus to the settlement framework linking accesses to all residential, commercial, religious and industrial activities along their lengths. The nature of this layout with buildings fronting onto these route is in sharp contrast to the natures of the residential developments at Knogley Way and Cairn Park.

At the focus of the settlement is a loop road which links Front Street and Rothbury Road and accommodates a church, shop, library and some houses. Church Street is a continuation of the north side of this rectangular area and reflects the established circulation pattern by forming a second link between the two main roads. In this respect it also follows the geometry of Figure 8 and description C shown in **Fig. 6.27.**

But the intentions of the recommended model and the actual development are different. Rather than motivated by a desire to restrict traffic, Church Street really promotes links from Rothbury Road to the church and library. In contrast to this Knogley Way appears to exemplify the spirit of the bulletin by a layout of culs-de-sac which restricts access and isolates the accretion from any flow of through pedestrian and vehicular traffic. This is observed again at Cairn Park where a system of culs-de-sac which is very similar to Fig. 14 in the Bulletin isolates the accretion from the major flows of pedestrian and vehicular settlement traffic. In the context of the holistic hypothesis there is a dichotomy between the examples of the bulletin models and the layout patterns of previous configurations. The division is between geometries of configurations which reflect proposals to solve traffic problems of the C20 and the simple manipulation of landscape features observed in the layouts of earlier settlement. The locations and arrangements of multiple residences under bulletin models respond to different physical and social criteria than the settlement to which they are attached.

There are also significant differences observed in spaces between buildings recommended by the bulletin and those of earlier configurations. Part 6.03 of the bulletin begins by relating dimensions of carriageways, junctions, and turning spaces to the sizes and geometric characteristics of vehicles. This may be true for early settlements too, but at the time of rebuilding during C18 and C19s horse drawn carriages were probably the largest mode of transport. So whereas a common purpose is shared by C20 and earlier settlements in this respect differences exist in the dimensions of the vehicles from different eras. In particular refuse collection vehicles, removal lorries, and fire appliances require spaces in which to manoeuvre. Recommendations for carriageway widths for passing large vehicles is 5.5m, for a large vehicle and a car 4.8m, and for two cars 4.1m. Clearly the smallest of these is sufficient for a large vehicle but passing places are needed for oncoming traffic. The objective of the recommendations to make roads difficult to traverse is partially defeated by the requirements for generous turning circles and spaces for large vehicles particularly in roads of short length where they account for a substantial part of space given to carriageway. A result which emerged from this is a more spacious settlement pattern with distances between buildings increasing from 15m or thereabouts in earlier settlements to 24m or thereabouts in more recent accretions.

6.4.3 *Setting and site.*

Layout plans of accretions are clearly driven by rules relating to vehicular sizes and from observation there appears to be little recognition of landscape in the designs. However, the bulletin acknowledges the importance of overall appearance in relation to setting.

Overall appearance
1.12 Recent social surveys...have shown that the overall appearance of the scheme and how well it is looked after are among the most important determinants of residents' satisfaction. Residential roads and footpaths are an important part of the external environment which is seen both when entering the scheme and from each home.
1.13 Care is needed not only in the choice of surface materials and construction details but also, perhaps more importantly, in decisions which must be made about matters such as vertical and horizontal alignment in relation to the topography of the site and adjacent buildings.

Site characteristics.
3.22 The overall form of layout may be largely constrained by general considerations such as the numbers and types of dwellings to be provided, the shape and area of the site, and location of entry points...A further impact will often be made, especially on small sites, by factors such as the need to retain existing trees, hedgerows or buildings;...or the presence of slopes may affect requirements for pedestrian and cycle movement and the vertical alignment of roads and footpaths...Ground conditions be a major constraint on construction and specification. DoE and DT(1979: 3, 8, 9).

References to location and site features are mentioned as general considerations within the broader issues of traffic management in contrast to the prediction of the first theoretical model which proposes topography and geology as the overriding issues which shape roads and buildings. There is a stark contrast between the two standpoints which is observed in configurations of settlement prior to and after the introduction of the vehicular based recommendations. In the more spacious settlement patterns of C20 accretions evidence of relationships between topography and geology and configurations of buildings is more difficult to observe because building lines tend to follow boundaries and roads rather than landscape features. An interesting observation can also be made about geology. The notion that ground conditions can be a major constraint in construction and specification is a consideration which is already seen to be relevant to earlier configurations. But it is also the case with advances in the design of foundations that C20 buildings can be constructed on ground that may have judged unsuitable in earlier periods. This is particularly noticeable at Warkworth where recent dwellings have been constructed within areas at risk from flooding. Foundation designs can therefore release buildings from constraints of poor load bearing characteristics of soils and an inference drawn from this is in future geological divisions are likely to have decreasing importance in shaping configurations. Sites which were deemed unsuitable up to C19 are now available for development.

6.4.4 *Summary.*

The prediction of the second theoretical model seeks patterns in ways settlements are arranged, and where traffic management grows from dimensions of vehicles and spaces they need for manoeuvres then an order is clearly evident. But a unity between physical elements of site and settlement found in activities of earlier settlements is not found in C20 accretions examined at Longframlington. Whereas it is acknowledged a formalism is found in the traffic considerations it does not follow from a relationship with site, and in these circumstances an inference is drawn that bye-laws pose a threat to the individuality of the settlement. The significance of this threat is related to the increasing demand for C20 housing in rural areas described in Chapter 3 and is clearly considerable. Numeric limits proposed to increase safety are powerful design criteria particularly when they are enforced by planning authorities, and without greater emphasis on the roles of location and properties of place the growth of numbers of accretions which demonstrate these dominant vehicular criteria seems set to continue.

6.5 CUMULATIVE EFFECTS OF ACCRETIONS.

Studies have shown accretions are generally located on the fringes of earlier settlements with entry points from roads outside the settlement complex, although there are instances where entry points are placed within the heart of the settlement.

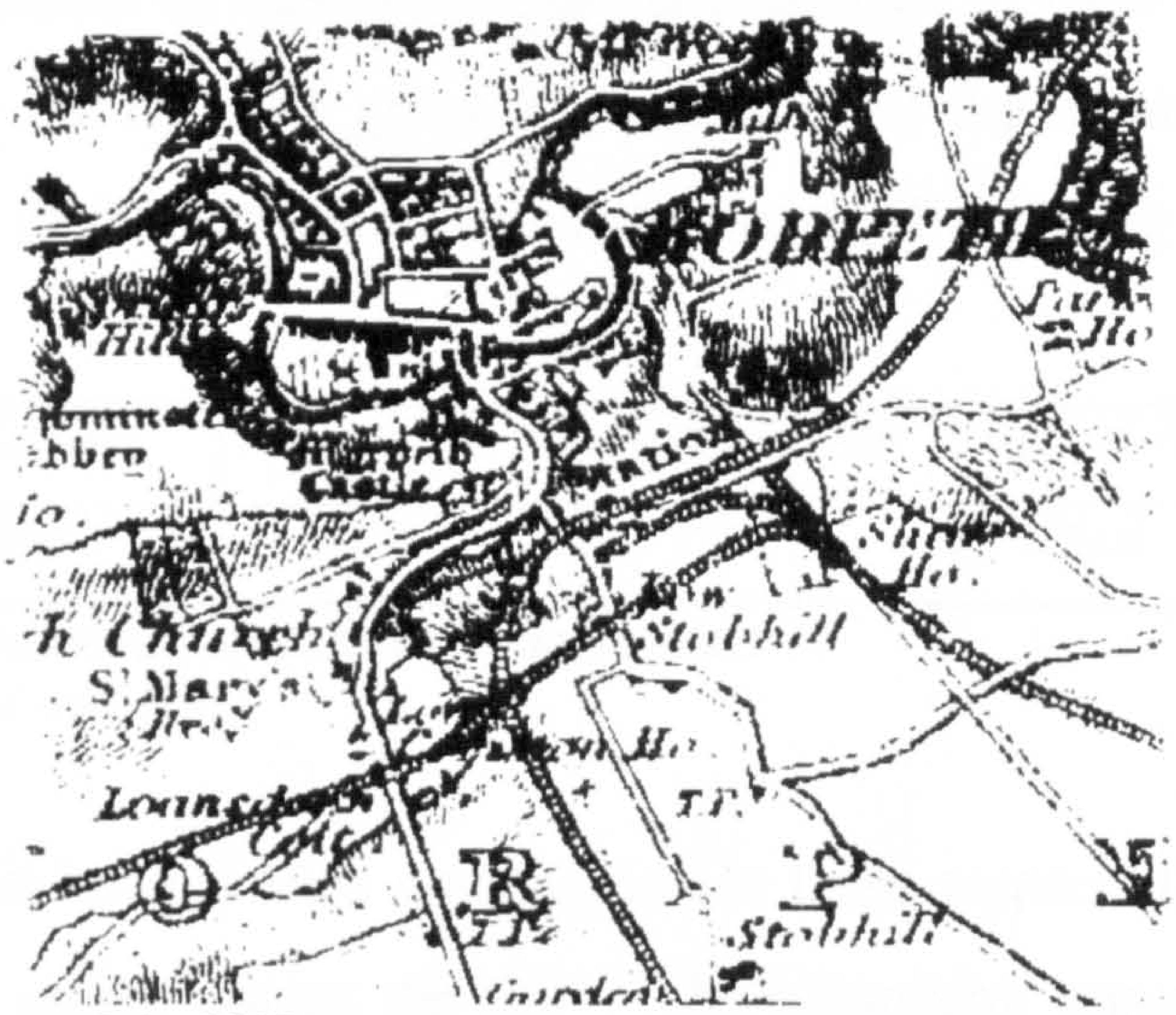


Fig. 6.28. Map of Morpeth in 1863
SOURCE: David and Charles Facsimile. Scale 1 ins. to 1 mile

Fig. 6.29. Map of Morpeth in 1995.
SOURCE: OS. Pathfinder Series. Scale 1:25 000

A comparison between settlements shown on the David and Charles facsimile and Ordnance Survey Pathfinder Series shows urbanisation usually occurs around earlier settlement cores. Morpeth is one example of this. The C19 settlement pattern changed little until the C20 when the population grew by 57.9% between 1921 and 1991. This growth is indicated on the extracts from census reports in Table 6.1. Also shown are a total number of households, and percentages with cars. Comparing these figures with the layout of 1995 gives an indication of the nature of the accretions which occupy most of the settlement area to the south of the River Wansbeck.

Pop. in 1921	Pop. in 1991	increase %	hseholds 1991	with car %
8928	14096	57.9	5724	70.4

Table 6.1 Morpeth. Selected population characteristics.
SOURCE: Census 1921 and 1991.

70.4% of households have at least one car, and in these respects they typify a market demand which has grown during the C20. The urbanising process shows two very different settlement patterns between configurations of the C19 and C20. Other cases studies have shown corresponding relationships between established settlement patterns and evolving settlement forms particularly in situations of strong topographic features. But at Morpeth it is difficult finding any corresponding relationship and Cullen's (1961) *amorphous character* readily springs to mind while site walking the housing developments.

Two characteristics from preceding investigations are immediately observed. Perhaps the most conspicuous are extended models of road patterns from Design Bulletin 32. Less conspicuous but still as significant is a long term effect of enclosure. That is the parcelling of land into plots which are readily identifiable for conveyancing. Prior to enclosure commons were often defined by landscape, but the introduction of fences and walls together with subsequent sub-divisions eroded this relationship, so when parcels of land are bought for development the boundaries which play a significant part in shaping the layout no longer relate to any recognisable landscape feature.

This process is also observed at Corbridge. Urbanisation is less advanced but the parcelling effect from enclosure can seen in isolated developments to the east of the settlement core illustrated in **Fig. 6.30.** If the same process continues and all the developments 'join up', then urbanisation similar to that at Morpeth will take place.

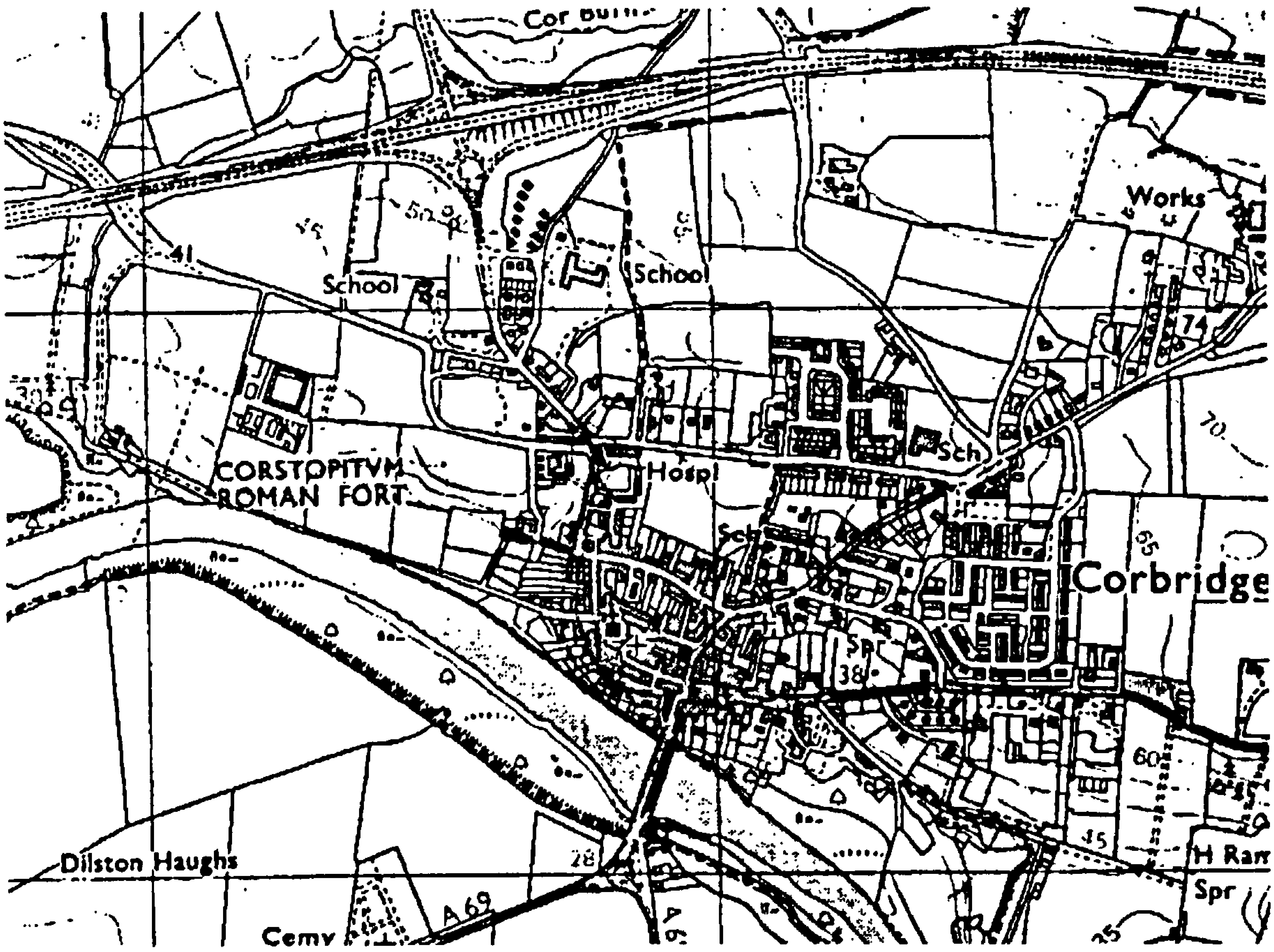


Fig. 6.30. Map of Corbridge in 1997.
SOURCE: OS 1:25 000

6.5.1 *Summary.*

The studies show where C20 housing begins to extend south from the River Wansbeck at Morpeth it is possible to find corresponding relationships between the shapes of the river bank and configurations of the boundaries of developments but elsewhere the boundaries follow the shapes of fields created during enclosure. At Corbridge enclosure of fields is also shown to provide limits for boundaries of C20 housing development as they spread north from the old settlement core. In these respects the theoretical models are supported by parts of the urbanisation. The effects of the river at Morpeth support the topographical and geological model and where C20 housing is situated adjacent to the cores the old frameworks place limitations on the boundaries of following developments in support of the second theortical model. However, C20 housing groups are characterised by the layouts of roads discussed in relation to Design Bulletin 32 in contrast to the relationship of context and texture as connected elements in settlement individuality described in Chapter 2.

Inferences drawn from this are that settlement cores rather than whole settlements appear to demonstrate the predictions of the theoretical models in investigations of settlements in the more than 300 dwellings group. At Morpeth and Corbridge the cores are the oldest parts of the settlements, inferring that correlations with sites are strongest in earlier settlement patterns thereby differentiating between pre and post second world war settlement developments.

6.6 IMPACTS OF BURGAGES, ENCLOSURE AND ACCRETIONS.

Investigations have shown how burgages , enclosure, and housing accretions impact on settlement development over several centuries and have illustrated the dichotomy which arises between early settlement cores and late C20 developments. They have shown how socio-cultural systems from different periods in the chronology reflect different value systems in site and settlement relationships, and how they create an ambivalence in the configurations of settlements before and after the middle of the C20. A summary of the outcomes of the case studies is shown in Table 6.2. Identities of the different systems are maintained, but these are of a general nature and when taken in the contexts of specific examples differences are observed which arise from the shaping effects of landscape and earlier configurations of buildings and boundaries. Therefore, site is shown to have importance in shaping settlements throughout the chronology and in different building practices.

The ambivalence is marked by agrarian changes, and non agrarian changes in which two distinct periods can be distinguished. Firstly, the agrarian organisation of medieval field systems which were an integral part of settlement structure, followed by a rationalisation of fields, working practices, and improvement of yields through enclosure. And secondly, the depletion of agricultural land for construction of large numbers of houses unrelated to agricultural activity. Late C20 developments have also been linked to increases in population and vehicular activities and characterised as surburban in contrast to rural natures of earlier settlement and countryside changes.

	Burgages. A medieval settlement system.	**Enclosures** C18 and C19 field system.	**Accretions** C20 settlement system.
Warkworth	A peninsula stronghold where medieval burgage plots form two sides of a spine and market area. The river forms the rear boundaries of burgage plots. Sand and gravel deposition preferred to alluvium.		
Rothbury	Located on a level shelf of land to the north of the River Coquet limited on the south by the river and on the north by hills. Burgage plots form a central market area which is also occupied by a church. The river and hills limit the burgage arrangement. Sand and gravel deposition preferred to fell sandstone to north and alluvium to south.		
Alnwick	A level site to the south of the River Aln. Burgage plots form a large central market area. Sand and gravel deposition preferred to boulder clay to the south.		
Corbridge	The settlement is located on a raised shelf of land which follows the curve of the River Tyne immediately to the south. Burgage plots are arranged around this curve and with straight rows to the north form a central market area which is also occupied by a church. River terraces preferred to alluvium.	Fields around the settlement core are defined by walls and fences of enclosure awards.	Housing accretions around the north, east and west side of the old settlement core are arranged in layouts which follow Design Bulletin 32 and are limited at their perimeters by the walls and fences of enclosure.
Denwick		Fields around the old settlement core are defined by walls and fences of enclosure awards. Enclosures follow ancient parish boundary.	
Rennington		Fields around the old settlement core are defined by walls and fences of enclosure awards. Enclosures follow boundaries of ancient commons.	
Lesbury		Fields around the old settlement core are enclosed by walls and fences. Enclosures follow boundaries of medieval commons.	
Lonframlington			Housing accretions follow road patterns of Design Bulletin 32. Boundaries of estates limited by enclosures from previous centuries.
Morpeth	Settlement located on shallow incline rising north from the River Wansbeck. Burgages form central market area. Shapes of groups of burgages follow bends in river. Settlement located on alluvium, river terraces and sand and gravel depositions.		Housing accretions follow road patterns of Design Bulletin 32. Boundaries of enclosed fields become obscured in suburban development except at perimeter. Settlement core surrounded by accterions.

Table 6.2 Summary of outcomes of burgages, enclosures and accretions case studies.

Nevertheless, the studies have also indicated that landscape, location and historical frameworks form different patterns which define settlement development at certain times and places. However, different characteristics are found in the Northumberland National Park where conservation strategies have protected settlements from the impacts of new housing accretions and settlement layouts have remained largely unchanged for several decades.

6.6.1 ***Northumberland National Park.***

The conservation of the built environment is accepted by every National Parks Authority as a major element in its conservation strategy which it achieves mostly through development control. MacEwen argues that although *"development control has been reasonably successful in conserving buildings and groups of buildings from earlier times and much of the familiar street scenes in centres of towns and villages* it has also been unable to avoid *the suburbanising effects of building 'off the peg' bungalows within the ruling standards of road widths, privacy distances, turning circles, hammerhead reversing areas, visibility splays, parking provision, lay-bys, lamp standards and access for dustmen, fire engines and all other technical requirements that make it impossible to retain the feeling of intimacy and cohesion that distinguishes earlier development"* (McEwen, 1982: 154). But the suburbanising effects of accretions which MacEwen describes are not found at settlements located within the Northumberland National Park. This is illustrated in two plans of Elsdon, **Figs. 6.31** and **6.32**, showing the settlement layout in a chronology from the mid to late C20. Apart from minor differences to buildings within the curtilages of established sites particularly at the SE corner of the settlement the layout is unchanged. At Alwinton the settlement plans, shown in **Figs. 6.33** and **6.34**, also illustrate the same earlier shapes without additions of suburban housing estates in the later plan.

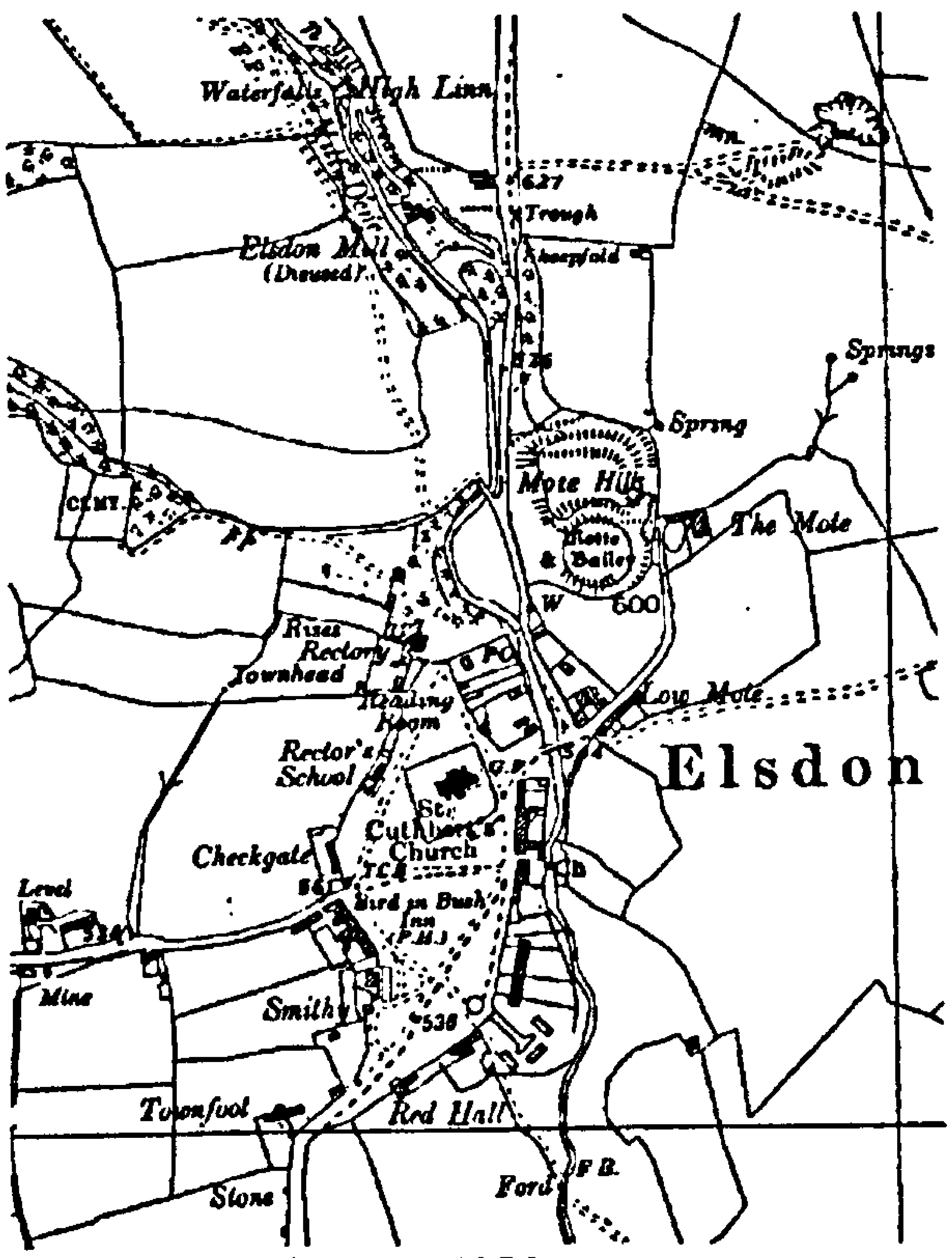


Fig 6.31 Map of Elsdon 1956
SOURCE: OS Scale 1:10560

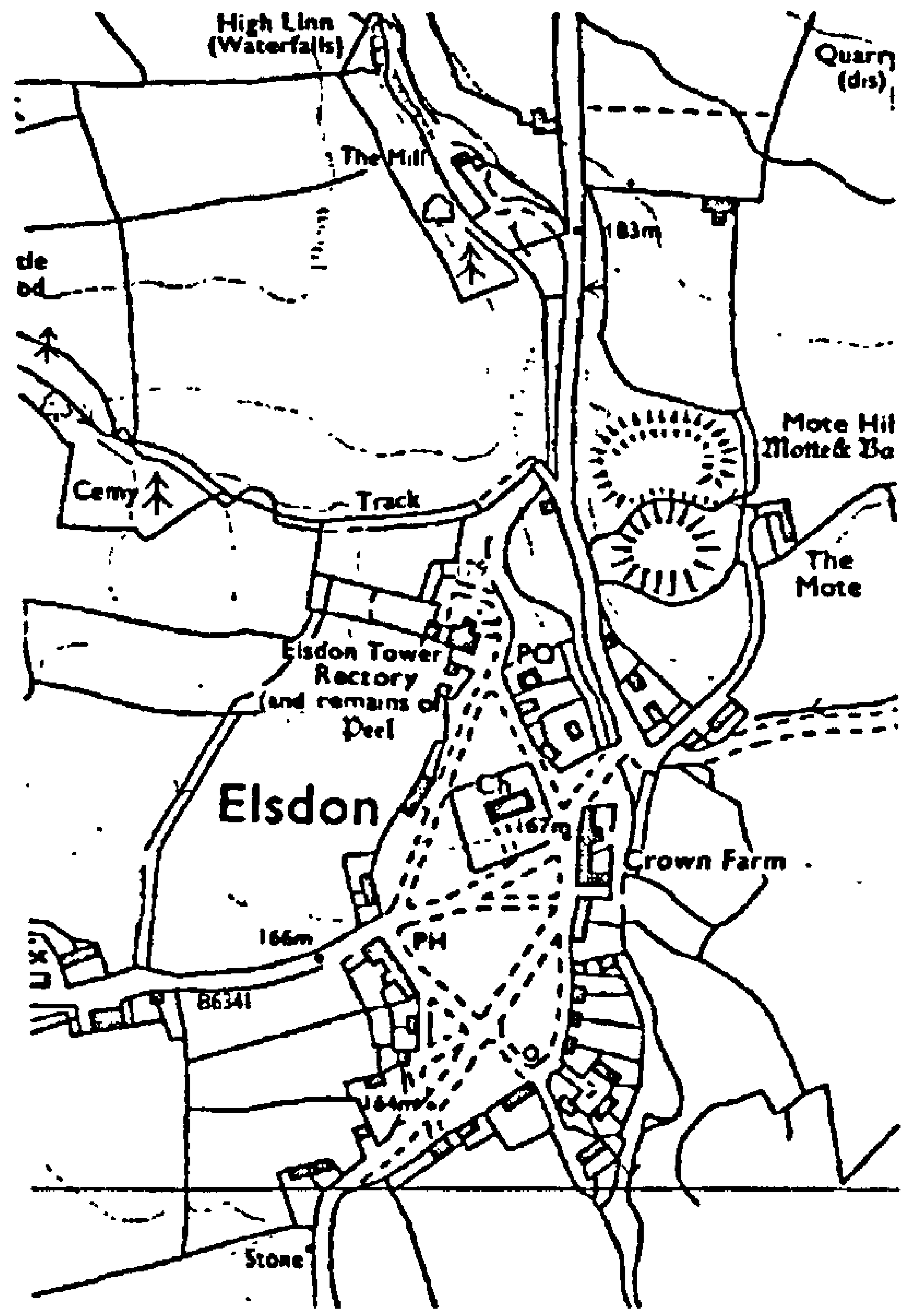


Fig 6.32 Map of Elsdon 1982
SOURCE: OS Scale 1:10 000

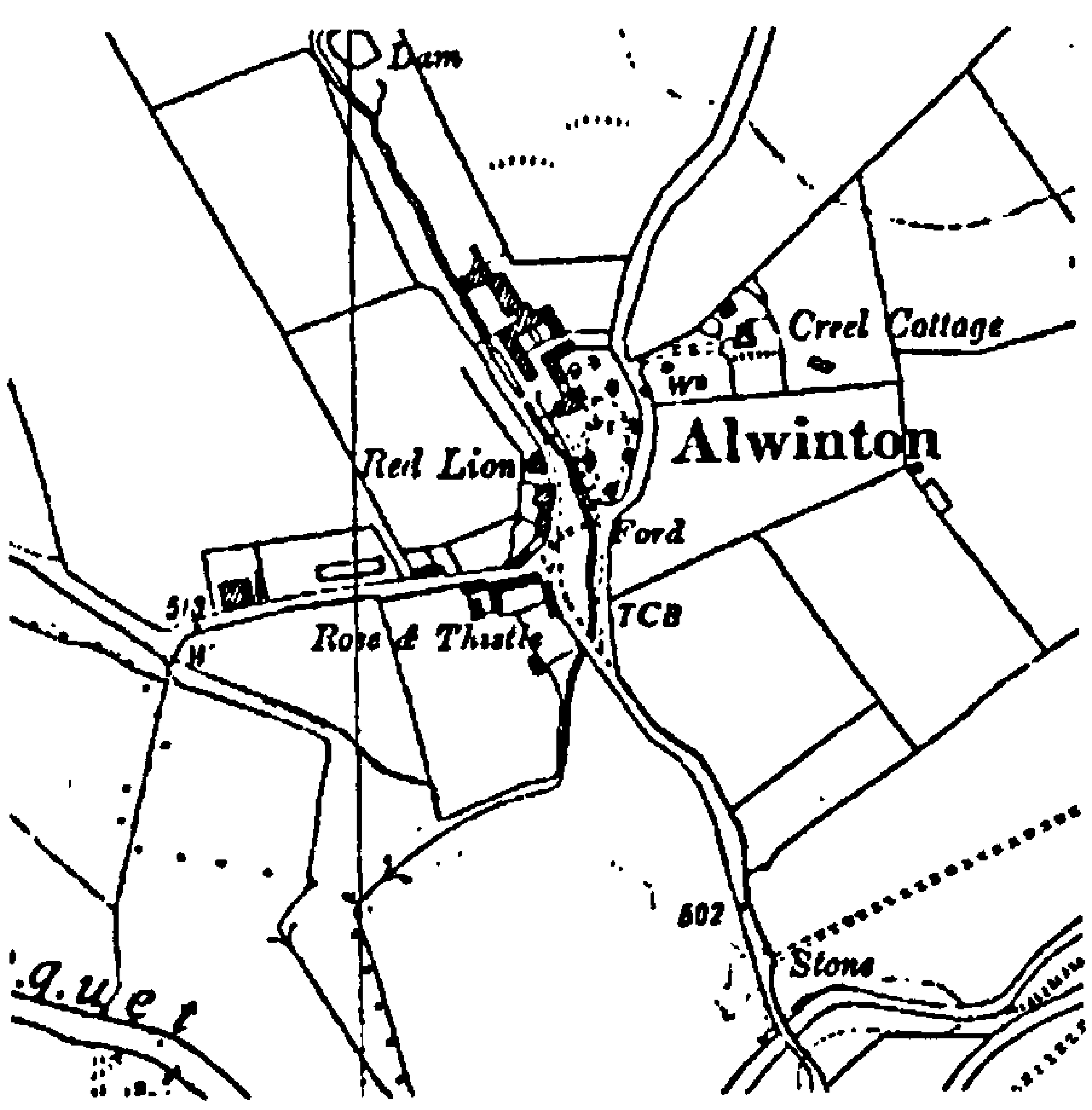


Fig 6.33 Map of Alwinton 1956
SOURCE: OS Scale 1:10560

Fig 6.34 Map of Alwinton 1982
SOURCE: OS Scale 1:10 000

Similar conditions are found at other settlements within the National Park area. Harbottle, Holystone and West Newton show little change to their overall configurations during the later part of the C20.

Comparing these plans with the case studies in Chapters 5 and 6 shows how conservation objectives are interpreted differently inside and outside the National Park boundaries and how National Park settlements are largely isolated from the impacts of housing accretions in the later part of C20. But this isolation approach to conservation is uncharacteristic of trends in other National Parks (MacEwen, 1982) and is criticised by The Countryside Agency which suggests *"people who want unchanging landscapes and chocolate box communities are being unrealistic"* and that future planning strategies should include *"more affordable housing in the countryside to help sustain the balanced communities that are so important in a vital and vibrant countryside"* (Wakeford, 2000: 8). There are therefore grounds which suggest that settlements in the Northumberland National Park may be subject to pressures for new housing in the future. The study has discussed how present conservation objectives and processes to have not secured *"high quality developments which do not swamp landscape and communities"* (Wakeford, 2000: 14) and has therefore shown how development processes also threaten the identities of settlements within the Northumberland National Park.

The concluding chapter combines all statistical and case studies to show how outcomes from the whole investigation impact upon theories of settlement individuality and argues that the study has distinguished systems of geometric organisation in site and settlement relations as a basis for design guidance in rural development generally.

Kirk Newton and surrounding district in C18
SOURCE: Armstrong, 1769.

CHAPTER 7
Site and settlement architecture: themes and meanings

7.1 INTRODUCTION.

This chapter brings together outcomes of the statistical analysis and case studies to develop the idea of rural settlement architecture. It argues that the theoretical concept is strengthened when topographical and geological comparisons with textures are tied to location and socio-cultural activities, thereby developing the idea of settlement individuality as a complex network of physical and socio-cultural elements.[1]

The investigative method of research has pin-pointed particular strengths in the relationship theory from which an analytic strategy for design statements is constructed. The chapter discusses how the research methods strengthen the notion of a formal shorthand described in the conceptual approach of the study, and examines its application as an analytic strategy and as a basis for design guides in rural settlement development.

7.2 STRENGTHENING THE THEORETICAL CONCEPT.

The study has argued for the creation of specific places from phenomenology and humanist theories, and has described settlement architecture as a built order of unified configurations of buildings which possess figural character in relation to landscape and a strong sense of place as a meaningful social construct - inherent local character. These have been explored through figure ground forms and socio-cultural activities in specific contexts which are found to offer opportunities for and set limits on development, giving cohesion to physical and social identities in complex and continuous processes of change. Two theoretical models:

Topography and geology are significant in shaping building configurations of rural settlements;

and

[1] During the PhD examination on 26 September 2000, the examiner John Warren added spring lines as a variable for site, which he has often observed in Yorkshire.

Location and historical frameworks provide opportunities for and place limitations on evolving settlement patterns

have directed statistical and case study research and have been found to be interwoven in settlement plans. The outcomes of investigations are pooled and summarised for comparison with phenomenological and humanist theories.

7.2.1 *Physical and socio-cultural content and meanings.*

The research has examined issues within defined contexts where form, use, location and place are seen as elements in the genesis of settlement architecture[2] and concludes that site offers opportunities for and sets limits on development, thereby giving cohesion to physical and social identities in complex and continuous processes of change.

A table of connecting outcomes of the research and humanist and phenomenology theories discussed in Chapter 2 is shown in the following Table 7.1. Indicators drawn from the theoretical models are shown in the first row and the investigative objectives of statistical and case studies in the first column together with humanist and phenomenology cells. The table shows inherent orders of topography and geology purposefully negotiated in comparisons with texture figure ground forms. It also shows location is tied to particular activities and loadbearing capacities of soils and the limiting effects of inherited historical frameworks on evolving plans.

The first four rows show comparisons of context and texture figure ground forms to be statistically significant and to have particular strengths which give substance to humanist St.John Wilson's (1992: x) claim of "*inherent order*" and "*proper*

[2] "*What is at stake is the obligation to seek in things and in situations an inherent but hidden order that needs to be identified, drawn out, helped to find and enjoy its own identity - a search that is very different from the urge to impose an order upon things from outside. And it is only in this sense and this proper sequence in the genesis of an order that questions of the balance between form and purpose can be addressed without triviality.*" St.John Wilson (1992: x).

sequence" normally applied to architecture as single buildings and to a phenomenology of architecture which focuses on the environment and how things are made.

Phenomenology	Nature seen as collection of material things whose reasons and relations architecture has the task of revealing. Modify, measure, situate and utilise the landscape in order to know and meet the environment as a geographical totality of concrete things.	The specificity of the (architectural) solution is closely related to differences in situation, context, or environment.	Focuses on how things are made with an emphasis on dwelling and historical connection.
Humanist theory	Fundamentally rooted in purposefulness. Combination of use of the terrain with architectural form.		Continuity between existing and new physical frameworks.

	Topography	**Geology**	**Location**	**Historicism**
Prevalence	100% in statistical comparisons of context and texture figure ground forms	81.5% in statistical comparisons of context and texture figure ground forms		In all case studies. Re-building after wars with Scotland.
Associations	Strong in all physiographies	Strongest in riverain and coastal sites	Specific activities tied to place.	
Structural Opportunities	Linear arrangements of textures after contours and divisions between land and water.	Preference for strongest loadbearing soils.	Where two or more soils types are found at one location.	Differentiations not followed in late C20 developments.
Structural Limitations	Figure ground forms of contours and divisions between water and land followed by configurations of buildings.	Edges of structural zones set limitations on spread of textures.	Edges of zones followed by peripheries of textures.	Edges of zones followed by peripheries of textures.
Socio-cultural Opportunities	Directed to location/use Seaside/rivers Fertile soil for arable and pastoral farming Coal measures.		Maritime, Farming, Coal mining	Textures/uses adapt to changes over time
Socio-cultural Limitations				Historical frameworks limit new development.
Summary	Inherent orders purposefully negotiated		Tied to activities	Outside order limited by context.
		Tied to soil structures in particular locations		

Table 7.1 **Responses to theoretical models and theoretical concepts using 4 different sets of indicators.**

Whereas St.John Wilson's humanist theories are directed at single buildings there is a parallel argument in support of the same claim for inherent order and sequence of operations in cases of settlements when examined in tandem with phenomenology theories. The study shows this is represented in comparisons of figure ground forms as an order between landscape and groups of buildings in which building lines not only follow contours and edges between land and water, but also follow boundaries of different geological zones. Comparisons of figure ground forms have also found 'knock on' situations where particular directions or orientations derived from landscape features are followed in parallel arrangements of groups of buildings. This was particularly noticeable in the north rows at Corbridge and Rothbury. There are also instances particularly in larger settlements, including Morpeth and Corbridge, where several zones and edges are found and where several comparisons of figure ground forms are observed. In addition to these edge and boundary comparisons from context grids, zones are also distinguished as soils with different loadbearing capacities with preferences for strongest soils. In these circumstances opportunities for development are found to be tied to strengths of soil structure which are then limited by edges between strong and weaker soil loadbearing zones. Thus, the specificity of solutions which are tied to differences in situation, context, or environment referred to in Chapter 2 (Gregotti, 1985: 30) are distinguished as physical figure ground forms of topography and geology. Gregotti's symbolic modification of buildings to accommodate different elements of the specific terrain thereby transforming place into architecture is shown to be tied to specific shapes of topography and geology. The research has investigated and distinguished topography and geology as central themes in the unity and individuality of settlement architecture through common geometries observed in the transfer of shapes from different landscapes to groups of buildings.

In addition, inherited settlement patterns and frameworks are shown to limit and shape subsequent developments. This is illustrated in larger settlements from the 20-300 and more than 300 dwellings categories which are constructed around central cores of historic origins with more modern developments spreading outwards. It is generally accepted that in suburbanised settlements, cores are usually the oldest parts which began as small groups of buildings and evolved into larger settlements[3]. This raises important considerations about the nature of the cores and the temporal frameworks which distinguish different settlement patterns. Central areas exhibit a variety of uses: residential, leisure, commercial and industrial. Sometimes shops have adapted original houses. Sometimes village halls are built on sites of earlier dwellings, or sometimes farm buildings and public houses are present. Whereas housing is shown to be crucial to the development of settlements it is clear that figure ground form comparisons are not exclusively found with dwellings and landscape but include other activities. Analysis of relationships in different physiographies has shown different natures of associations between location and settlements constructed around different uses, linking particular industrial activities with specific regions[4]. Settlements are therefore shown to be a complex of different sizes, natures and temporal sequences where textures of earlier settlement patterns combine with context to help shape particular identities.

However, the research has also shown that as settlements spread outwards from the core, comparisons between context and texture figure ground forms from topography and geology are replaced by different boundary conditions. Case studies have shown how land development practices have changed from the medieval period to the present day and how interpretations of a settlement architecture built up from humanist and phenomenological theories are tied to pre C20 settlement frameworks and how C20 legislation has steered developments away from themes of order and symbolic modification of buildings from specific terrains. Investigations have pursued chronologies of context and texture figure ground forms in three purpose groups: agriculture; maritime; and, mining to illustrate how interpretations of opportunities and limits set by location have changed over several centuries. Case studies have examined chronologies of linkages between textures in evolving settlement patterns, illustrating particular instances where a single settlement is the

[3] Hammond (1988: 245) makes the point that cores are surrounded by areas in which various residential land uses exist, collectively called suburbs. They are features which have largely grown up during the present century as a result of population growth. Suburbs expand outwards partly as a result of migration from more central areas.

[4] Case studies have discussed this in relation to agricultural, maritime and mining industries.

outcome of many complex processes over time. The coherence of these outcomes has been characterised in terms of opportunities and limits placed on settlement developments by location and place. As contexts and textures converge they begin to complement one another, and earlier building configurations become visible elements in an architectural landscape which then form relationships with subsequent developments. Provision of housing is found to be crucial in determining the development of settlements and studies have sought to show how these are woven into changing demands over nearly four centuries.

The fifth and sixth rows of Table 7.1 indicate how qualities of location are followed in differentiations between different purpose groups thereby linking socio-cultural activities to properties of place. Expressed as context and texture figure-ground forms the distinctive limits of landscape are most apparent where land and sea meet along the coast. At Alnmouth one continuous line between land and sea curves into one characteristic peninsula form which defines the settlement. At Craster the coastline is broken by a heugh and the line between land and sea divides and turns inland to form two sides of a small valley followed by dwelling on the north side and commercial buildings on the south. In the agricultural case study at Kirk Newton there is a comparison of context and texture figure ground form in contours and a single row of dwelling and farm buildings which gives the settlement its characteristic form. But investigations also show a perpendicular characteristic in a stream followed by the old mill-house and from which it derived its power. So studies show linkages between several socio-cultural activities, different textures which support those activities and variations in context in single places.

In addition, Alnmouth and Craster show rigid geometries in the arrangements of settlement plans. Further studies show burgage plots and 'estate housing' have their own systematic orders and in all cases of burgages this is shown to be modified by context. Characteristic forms are shown to issue from these inherited patterns of layouts but this is not the case in studies of C20 estate housing where systematic orders derive from criteria unrelated to location. Two examples of this are investigated. Firstly, the traditional grid iron layouts of mining villages and secondly recent accretions constructed on the peripheries of rural settlements. At Pegswood comparisons of context and texture are found in the early settlement plan and the rigid grid iron geometry appears to bear no relationship with landscape. Nevertheless, an intelligible and characteristic form emerges in the systematic order of the arrangement of dwellings. The architectural landscape created by the earlier agricultural settlement is shown to modify the periphery of the mining settlement on the west side, and there is some evidence to show that location orientates the grid to form access linkages with the old core. C20 accretions at Corbridge and Longframlington display systematic orders of different origin that are related to context in different ways. Housing developments are shown to respond to boundaries of field systems and patterns of ownership rather than earlier building patterns or landscape. These issues bring the study into topical debates about effects of housing on the rural environment and concerns over future developments based on similar development practices. It could be argued these experiences were expected and even sought out given the earlier discussions about needs for this study. But the different patterns of development highlight the need for an understanding of the complex relationships exhibited in these arrangements which somehow underlie the compositions of a general shift from the rural to the urban[5]. This approach to rural development is shown to be distinct from other influential forms inherited from previous eras. During the C19 there was a widely accepted view that rural and urban were discrete and these ideas were bound up in concerns for modernisation. However, in recent times the recognition of different development trajectories of distinct localities has brought into question many of the earlier beliefs. A new phenomenon has emerged in the form of differentiation between the old use-related configurations and the demands of a largely mobile population.

> *The phenomenon of differentiation in the rural world has been partially responsible for undermining the previously dominant rural sociological paradigms associated with structural-functionalism...This has given way to a diverse set of approaches, reflecting the diversity of rural life. The old*

[5] *"While it is evident that differentiation is being encouraged by new economic tendencies and cultural forms, it is equally true that these are situated in particular places at particular times and are subject to different degrees of resistance, modification, and transformation."* Murdoch and Marsden (1996: vii).

> *certainties based upon a clear distinction between the urban and rural no longer hold.* Murdoch and Marsden (1996: vii, viii).

During the C20 agriculture, the mainstay of the rural economy, underwent a technological revolution, substituting machinery and technology for labour and as a result traditional communities became increasingly hard to distinguish. Commuters replaced many of the earlier residents. The study has shown how textures reflect these changes and prescribed figurative elements of landscape as a focus for how the rural is made.

Images of rural settlement architecture which draw from humanist and phenomenology theories have been built up through corresponding structures of context and texture. A *"meaningful correspondence between natural conditions and settlement morphology"* (Norberg-Schultz, 1979: 171) has been illustrated in terms of site structures and content in the creation of specific places where environmental character is condensed and articulated.

This study has begun to build images of theme and variation, how particular places take on their socio-cultural and material shapes and how they give rise to distinctive forms of rurality. Over time developments are shown to build on each other to yield specific formations. The study has also shown a coherence which is presented as ideal types which characterise the range of considerations that might be expected within a holistic theory and which provide the basis for new development activities. Case studies have also shown how a range of settlement types and formations is present, dispelling any notions of a standard plan solution. Indeed effort has been spent to show how development processes lead to different outcomes at different places at different times.

The next section describes the utility of the research methods as an analytic strategy in topical issues of rural settlement development. It describes how the study has followed works of Schumacher (1996) and Rapoport (1990) in developing the research method as a design tool to mediate the past and present in new development activities.

7.3 THE UTILITY OF THE STUDY METHOD AS AN ANALYTIC STRATEGY

Outcomes have pointed to figurative elements of landscape which are shown to have linkages with configurations of groups of buildings and have conceptualised these as context and texture figure ground forms. The system follows the work of Thomas Schumacher described in Chapter 2 who outlines a method to explore systems of geometric organisation which can be extracted from any given context so that a designer possesses a design tool to help him make decisions. This is blended with the *"strong geometry"* of housing and landscape relations described by Rapoport (1969: 77-78) to arrive at a diagrammatic system to connect figure-ground forms of landscape and groups of buildings. The study has examined evidence from two investigative approaches which have been developed from the figure ground plan diagrams to illustrate the significance of form and spaces and deforming characteristics of location in creating rural settlement architecture. The two investigative threads are shown to steer a path through the maze of issues which contribute to the individuality of settlement plans. This steering process forms the principles of an analytic system in which opportunities and limits set by location are abstracted as sets of topographic, geological, and historic indicators to show the interdependence of figure ground forms. Place is illustrated as a context grid of predeformed shapes of contexts and textures, a graphic illustration of cultural capital for use in practices that mediate collective actions in new development activities. The process of simple deconstruction of the context grid into material and socio-cultural elements illuminates an analytic strategy for recognising, understanding and synthesising individuality of rural settlements in new development activities.

The study provides a sound theoretical basis from which to make judgements about rural development design. Humanist and phenomenology theories are shown to be strengthened by research which pinpoints specific elements of context and textures in conservation and development practices. The implications for new housing in rural areas are substantial. The analytical system addresses relations of past, present and future, by tracing linkages and patterns to develop understandings of continuities of contexts and textures in evolving settlement patterns and to illustrate properties of place as part of a settlement architecture. Designers are therefore provided with an analytic tool, a formal shorthand to help balance the old and new in creating a settlement architecture.

Seen from a vantage point of an early C21 frame of reference the line of succession from the Roman idea of genius loci symbolised in the dedication of sites to gods has clearly moved from ritual significance. The shift has been most noticeable in C20 housing developments where dependency between man and the environment has taken on new meanings which are in contrast to the Roman perception of the essence of place - the genius of locality. Phenomenology does not promote a resurrection of this Roman archetypal relationship but pursues an idea made possible through it, the analysis of its empirical effectiveness. It is not an atomist's view of beauty but an investigative procedure which focuses on environment and seeks to explain the appearance of things. The utility of this method should not go unrecognised. It is of practical use to planners, designers, developers, and conservationists, but much more than that, it points to new ways of thinking about how we perceive our environment, about our perceptions of themes, meaning and content and above all it points to a coherent paradigm of rural settlement architecture.

7.4 'USER' COMMUNITIES.

The study proceeds from widespread concerns about ways in which our rural environment is changing and has interpreted these in terms of theories and methods as an academic research study. Seen from the perspective of the outside world and 'user' communities it has attempted to relate outcomes to future development activities, in particular design processes. Analysis has attempted to tie the various parts of the research together and develop its various facets and aspects in a multidisciplinary conception of social science to make sense of the social habitat in which we live, have lived and are likely to continue to live. Consequently, the study serves dual purposes: firstly, it is academic research which seeks objective truths about how our environment is ordered; and secondly, it identifies practical applications of the research method in a 'user' community.

The two parts of the research approach, statistical analysis and case studies, are brought together to give an account of site and settlement as context and texture relationship processes within a regional focus and have thus provided a detailed account of how a localised study can illuminate the relationship theory. The study has pieced together a macro image of rural settlement architecture in Northumberland by investigating a distribution of settlements over a wide area, but no attempt has been made to generalise the outcomes to a larger population outside the area of study. However, given that the topographical and geological elements of landscape are shown to be common phenomena in site and rural settlement relations, and that evidence of evolving forms from earlier cores is accepted amongst contemporary scholars to be a general phenomenon, this study has bracketed two themes of rural settlement architecture which may be placed in a wider context of rural settlement development. The themes provide a schematic platform from which to steer complexities of change along lines of individuality and uniqueness, and expresssed as figure ground forms of context and texture, define an approach for exploration of site and rural settlement relations generally.

Glanton and Whittingham and surrounding area in C19.
SOURCE: David and Charles facsimile. Scale 1 inch to a statute mile.

APPENDICES.
Contents.

APPENDIX A.
Total Population List.

Each settlement of the total population is assigned a number associated with a particular physiographic region. This is in 7 strata illustrated in columns. Sub-populations are introduced in rows to group settlements by size.
Two further sub populations are added to these, signified by the letters R and C.

Sample frames of physiographic regions with sub-populations by numbers of dwellings, riverain and coal field locations.

LEGEND:
x = denotes category of settlement. Cx = Coal measures. RCx = Riverain and coal measures. Rx = Riverain.

	<20	20-300	300<
Strata 1 **COAST**			
001 Berwick upon Tweed			Rx
002 Spittal		Rx	
003 Holy Island		x	
004 Seahouses		x	
005 Beadnell		x	
006 Newton by the Sea	x		
007 Craster		x	
008 Boulmer		x	
009 Alnmouth		Rx	
010 Amble			RCx
011 Low Hauxley	Cx		
012 Cresswell		Cx	
013 Newbiggin			Cx
014 Cambois		RCx	
015 Blyth			RCx
016 Seaton Sluice			RCx
Strata 2 **COASTAL PLAIN**			
017 Cheswick	x		
018 Ancroft		x	
019 Goswick	x		
020 Haggerston	Rx		
021 Beal	x		
022 Berrington	Rx		
023 Fenwick	Rx		
024 Buckton	x		
025 Detchant	x		
026 Ross	x		
027 Belford			Rx
028 Easington	x		
029 Budle	x		
030 Bamburgh		x	
031 Waren Mill	Rx		
032 Spindlestone	x		
033 Burton	x		
034 Bradford	Rx		
035 Elford	x		
036 North Sunderland			x
037 Lucker	Rx		
038 Newham	x		
039 West Fleetham	Rx		
040 Swinhoe		x	
041 Chathill	x		
042 Preston	x		
043 High Newton by the Sea	x		
044 Brunton	Rx		

045 Christon Bank	x			
046 Embleton			x	
047 Dunston	x			
048 Howick	Rx			
049 Longhoughton			x	
050 Hawkhill	x			
051 Lesbury			Rx	
052 Bilton		x		
053 High Buston	x			
054 Birling			RCx	
055 Warkworth			RCx	
056 Gloster Hill	RCx			
057 Guyzance	x			
058 Acklington			Cx	
059 Togson			Cx	
060 Radcliffe	Cx			
061 High Hauxley	RCx			
062 Broomhill			Cx	
063 Felton			Rx	
064 East Thirston	x			
065 Red Row	Cx			
066 Chevington Drift	Cx			
067 Eshott			Cx	
068 West Chevington	Cx			
069 Widdrington			Cx	
070 Widdrington Station			Cx	
071 Ulgham			RCx	
072 Ellington			Cx	
073 Lynemouth			RCx	
074 Longhirst			RCx	
075 Woodhorn			RCx	
076 Ashington and Hirst				RCx
077 Pegswood			Cx	
078 Bothal	RCx			
079 Morpeth				RCx
080 Guide Post and Stakefrod				RCx
081 North Seaton			RCx	
082 Choppington			Cx	
083 Hepscott			RCx	
084 East Sleekburn	RCx			
085 Bebside	Cx			
086 Stannington			Cx	
087 Bedlington				RCx
088 Cramlington				Cx
089 New Hartley			Cx	
090 Hartley			Cx	
091 Seaton Delaval			Cx	
092 Seghill			Cx	

Strata 3
SCARPS

093 Highcliffe			x	
094 Scremerston			x	
095 Shoreswood	x			
096 Shoresdean	x			
097 West Allerdean	x			
098 Felkington	x			
099 Duddo			x	
100 Bowsden			x	
101 Lowick			x	
102 Ford			x	
103 Horton	x			
104 Warenton	x			
105 Bellshill	x			
106 Warenford	Rx			
107 Ellingham			Rx	
108 Hepburn	x			
109 North Charlton	x			
110 Old Bewick			x	
111 South Charlton	x			
112 Rock			Rx	

113 Eglingham		Rx	
114 Rennington		Rx	
115 Littlehoughton		x	
116 Beanley	x		
117 Titlington	x		
118 Abberwick	x		
119 Thrunton	x		
120 Edlingham	x		
121 Shilbottle		x	
122 Newton on the Moor		x	
123 Swarland		x	
124 Snitter	x		
125 Longframlington		x	
126 Lorbottle	x		
127 Elsdon		Rx	
128 Cambo	x		
129 Knowesgate	x		
130 Ridsdale	x		
131 Great Bavington	x		
132 Thockrington	x		
133 Little Swinburn	Rx		
134 Birtley	x		
135 Kirkheaton	x		
136 Ingoe		x	
137 Ryal	x		
138 Bingfield	x		
139 Whygate	x		
140 Stonehaugh		x	

Strara 4.
VALES

141 Tweedmouth and East Ord			Rx
142 Loanend	Rx		
143 Horncliffe		Rx	
144 Norham		x	
145 Castle Heaton	Rx		
146 Cornhill upon Tweed		Rx	
147 Etal	Rx		
148 Wark		Rx	
149 Carham	Rx		
150 Branxton		x	
151 Crookham	Rx		
152 Pressen	x		
153 Kimmerston	x		
154 Downham	x		
155 Milfield		x	
156 Fenton	Rx		
157 Doddington		Rx	
158 Pawston	x		
159 Kilham	Rx		
160 Lanton	x		
161 Coupland	Rx		
162 West Newton	x		
163 Hethpool	x		
164 Kirknewton	x		
165 Akeld	x		
166 Wooler			Rx
167 Chatton		x	
168 Chillingham	Rx		
169 Haughead	Rx		
170 Middleton	x		
171 Newtown	x		
172 East Lilburn	x		
173 Lilburn Tower	x		
174 Ilderton		Rx	
175 Wooperton	Rx		
176 Brandon	x		
177 Ingram	Rx		
178 Branton	Rx		
179 Powburn		Rx	
180 Glanton Pike	x		

181 Glanton		x	
182 Bolton	x		
183 Alnwick			Rx
184 Denwick	Rx		
185 Great Ryle	x		
186 Prendwick	x		
187 Whittingham		Rx	
188 Alnham	Rx		
189 Little Ryal	x		
190 Yetlington	x		
191 Callaly	x		
192 Netherton	Rx		
193 Biddestone	x		
194 Shillmoor	x		
195 Alwinton	Rx		
196 Burradon	x		
197 Linshiels	Rx		
198 Harbottle		Rx	
199 Sharpeton	x		
200 Thropton		x	
201 Rothbury			Rx
202 Whitton	x		
203 Hepple	x		
204 Great Tosson	x		
205 Newtown	x		
206 Holystone	Rx		
207 Warton	x		

Strata 5.
LOW PLATEAU

208 Forestburn Gate	Rx		
209 Wingates	x		
210 Causey Park Bridge	Rx		
211 Longhorsley		x	
212 Tritlington	RCx		
213 Netherwitton	Rx		
214 Stanton	x		
215 Hebron	Cx		
216 Longwitton	x		
217 Pigdon	x		
218 Scots Gap	x		
219 Hartburn	Rx		
220 Throphill	x		
221 Mitford		Rx	
222 Kirkwhelpington		Rx	
223 Middleton	Rx		
224 Meldon	x		
225 Tranwell		Cx	
226 Kirkharle	x		
227 Whalton		x	
228 Capheaton		x	
229 Ogle	x		
230 Belsay	x		
231 Milbourne	Rx		
232 Fenwick	Rx		
233 Great Whittington		x	
234 Matfen		Rx	
235 Stamfordham		Rx	
236 Dalton		Rx	
237 Harlow Hill	x		
238 Ponteland and Darras Hall			Rx
239 Woolsington		RCx	
240 Black Callerton	RCx		

Strata 6.
NORTH TYNE VALLEY AND REDESDALE

241 Byrness	Rx		
242 Redesdale camp	Rx		
243 Rochester	x		
244 Horsley	x		

245 Otterburn		x	
246 Falstone	Rx		
247 Kielder and Butterhaugh	Rx		
248 Greenhaugh	Rx		
249 West Woodburn	Rx		
250 Lanehead	x		
251 Bellingham		Rx	
252 Redesmouth	Rx		
253 Wark		Rx	
254 Great Swinburne	Rx		
255 Gunnerton	Rx		
256 Colwell	x		
257 Simonburn	Rx		
258 Nunwick	Rx		
259 Barrasford		x	
260 Humshaugh		x	
261 Chollerton	x		
262 Low Brunton	x		
263 Wall		x	

Strata 7.
TYNE VALLEY northside

264 Heddon on the Wall		Cx	
265 Wylam		RCx	
266 Horsley	Cx		
267 Ovingham		RCx	
268 Ovington	Cx		
269 Newton	x		
270 Corbridge			Rx
271 Sandhoe	x		
272 Acomb		Rx	
273 Fourstones		Rx	
274 Anick	x		
275 Newborough	x		
276 Haydon Bridge		Rx	
277 Bardon Mill		x	
278 Melkridge	x		
279 Henshaw	x		
280 Haltwhistle			Rx
281 Greenhead		Rx	
282 Gilsland		Rx	
283 Tow House and Redburn.		Rx	
284 Bywell	Rx		

APPENDIX B.
Preliminary Studies Population List.

Berwick
Spittal
Holy Island
Seahouses
Beadnell
Newton-by the Sea
Craster
Boulmer
Alnmouth
Amble
Low Hauxley
Cresswell
Newbiggin
Cambois
Blyth
Seaton Sluice

APPENDIX C.
Preliminary Studies Survey Sheets.

BERWICK UPON TWEED
NU 000530

TOPOGRAPHY.
The settlement is contained in a peninsula at the estuary of the river Tweed. This is elevated from HWMT level. The east coast is defined by a cliff, which merges with castle walls as it turns west at the mouth of the river. Spot levels show an incline from 15m to 20m N along the E cliff. The walled town inclines N from 17m near King's Mount to 39m at Gallows Knowe. The railway crosses the Tweed at the NW of the walled town dividing it from Highfields. Here levels steeply increase from 39m to 55m in the N and 62m in the W.

GEOLOGY.
The peninsula is surrounded by drift free solid rock. In the middle there is a large area of boulder clay extending N. Below HWMT level there are beach deposits.

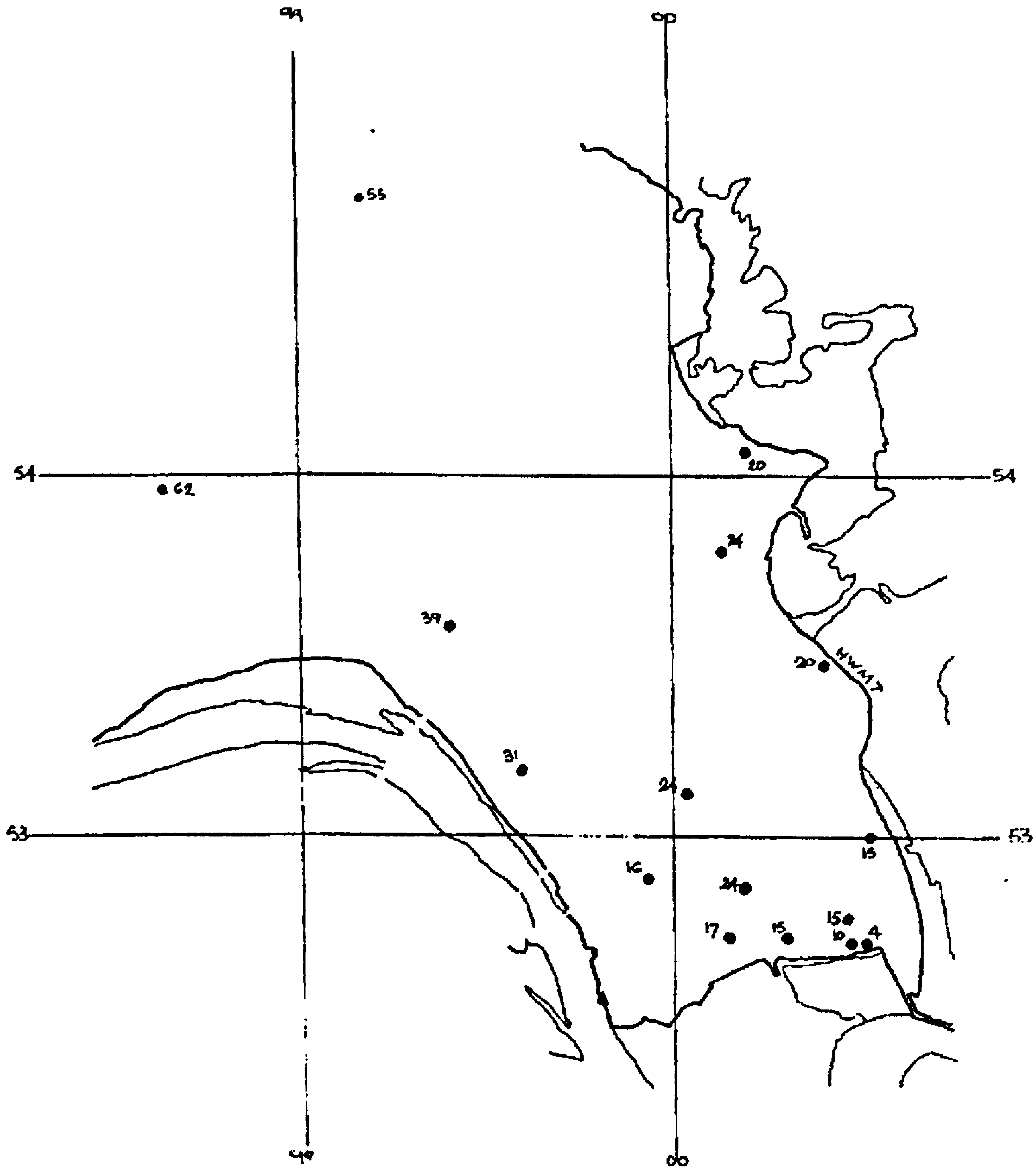
SETTLEMENT CONFIGURATIONS.

(1). Rows have a similar alignment to the estuary defined by the castle walls along the W and S sides of the settlement. Top., and Geol;

(2). Rows along Castle Tce., Castle Gate and Marygate have a similar alignment to the division between drift free solid rock and boulder clay. Geol;

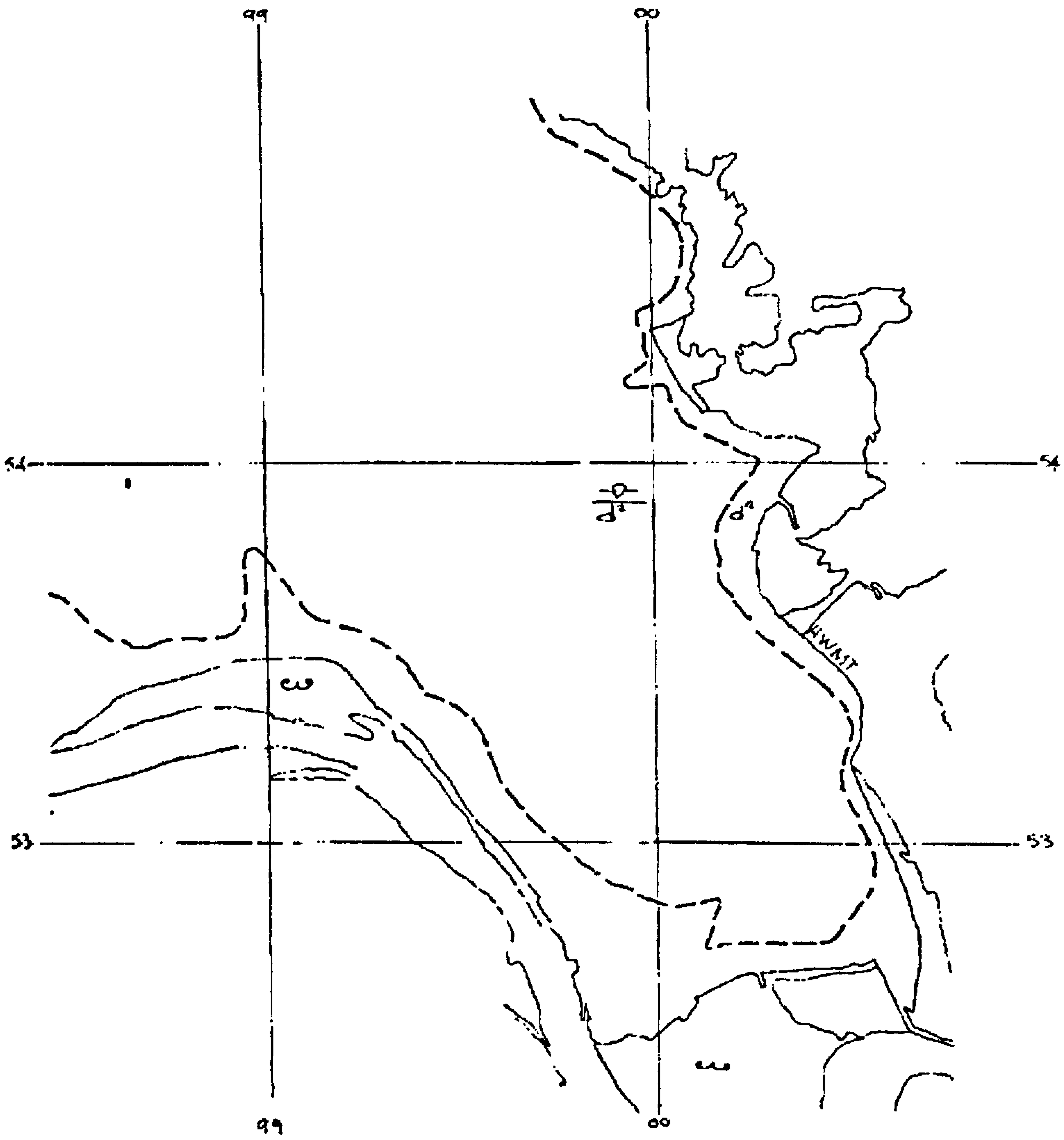
(3). Dispersed buildings at the S of Highfield have a similar alignment to the contour 45m and division between solid rock and boulder clay. Top., and Geol.

BERWICK UPON TWEED
NU 000530



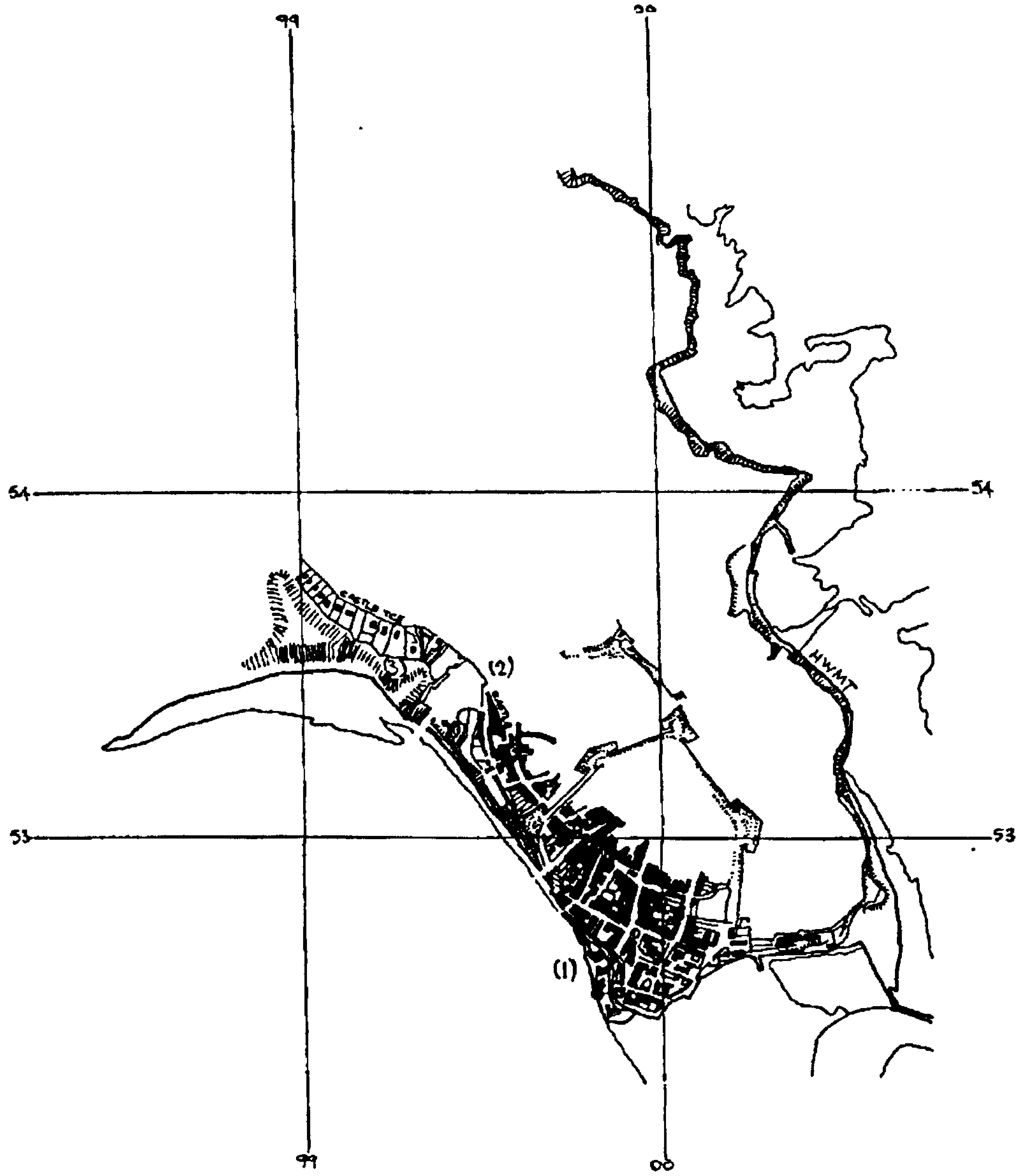
TOPOGRAPHY.

BERWICK UPON TWEED
NU 000530



GEOLOGY.

BERWICK UPON TWEED
NU 000530
HITS 3



SETTLEMENT CONFIGURATIONS.

SPITTAL
NU 006515

TOPOGRAPHY.
Spot levels show a gradual incline from the coast to a railway embankment running from the northwest to the southeast. Here there is a steep rise from 10m at the foot to 25m at the top. On the southwest of the railway line land continues to rise to 75m at the south corner of the settlement. Joining spot levels shows contours turning from a NW-SE to SW-NE direction.

GEOLOGY.
Divisions occur between five structures. Beach deposits lay outside HWMT. The coastline is predominantly drift free solid rock. The triangular shaped land to the NE of the railway line shows deposits of raised beach and blown sand. A band of boulder clay follows the railway line. Further to the west is more drift free solid rock signalling the beginning of scarplands.

SETTLEMENT CONFIGURATIONS.

(1). Agglomeration has a similar alignment with division between drift free solid rock and raised beach. Top., and Geol;

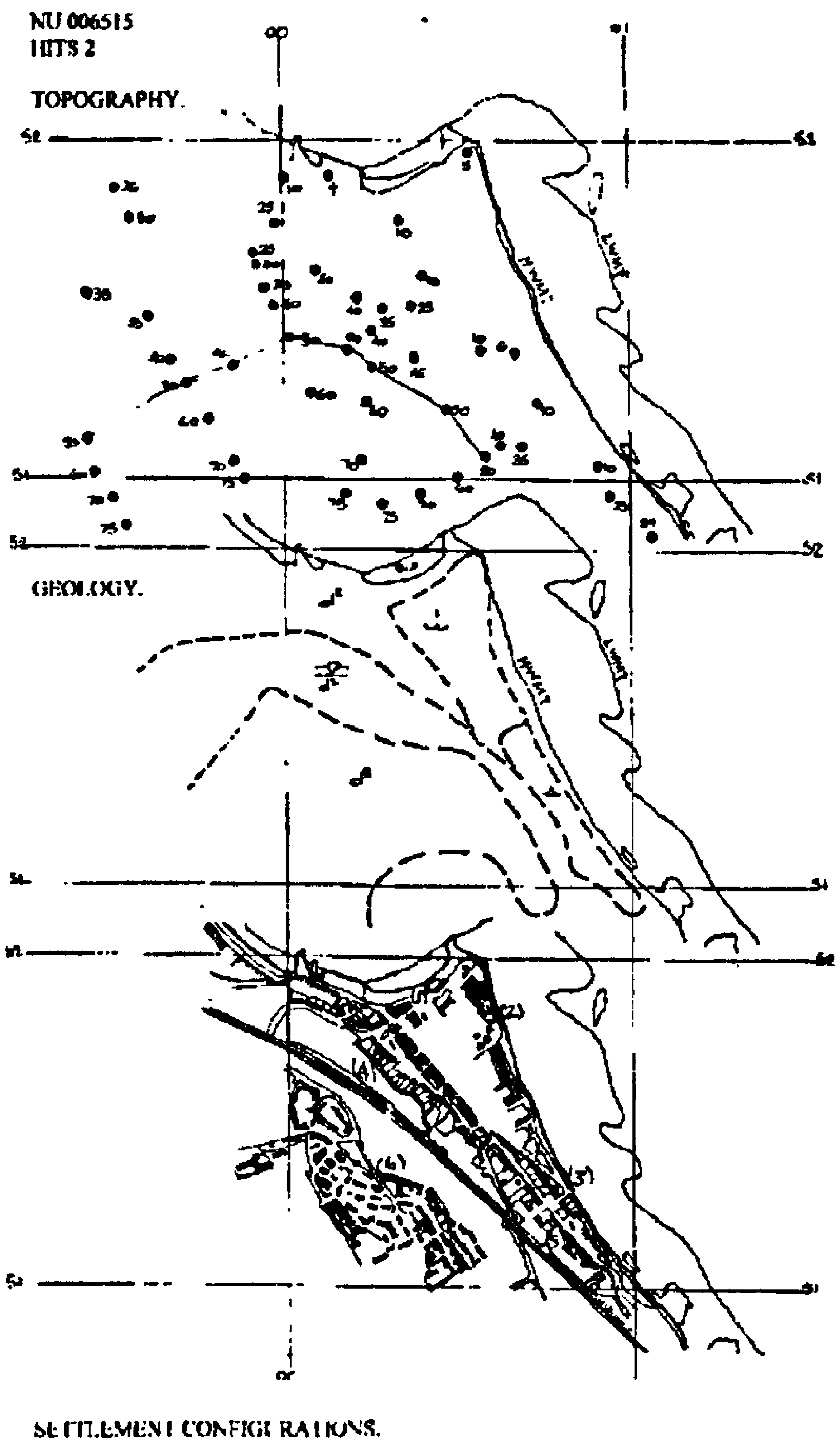
(2). Rows and agglomeration have similar alignment with raised beach and HWMT.Top., and Geol;

(3). Rows have similar alignments with blown sand and HWMT. Top and Geol;

(4). Rows have similar alignments with drift free solid rock and raised beach. This alignment is shared by the railway line. Top., and Geol;

(5). Rows have similar alignments with drift free solid rock and blown sand. This alignment is shared by the railway line. Geol;

(6). Rows have similar alignments with 50m contour. Top.


NU 006515
HITS 2
TOPOGRAPHY.
GEOLOGY.
SETTLEMENT CONFIGURATIONS.

HOLY ISLAND
NU 125420

TOPOGRAPHY.
Contours encircle a hill to the north of the settlement. They indicate a gradual incline from the south and east. It is steeper in the west. Levels at 5, 10, and 15m run from Heugh Hill in the south northwards. As they progress northwards the distance between them increases. Heugh Hill runs in an east west direction with steep sides on the north and south. It separates the settlement from the harbour. To the west of the settlement a cliff running north west from Heugh Hill marks the boundary with the sea. Remains of Lindisfarne Priory abut the settlement in the south.

GEOLOGY.
Divisions occur between four structures. To the east of the settlement is raised beach.
The settlement site is boulder clay. In the west is beach deposits. And at the south of the settlement is a band of quartz dolerite.

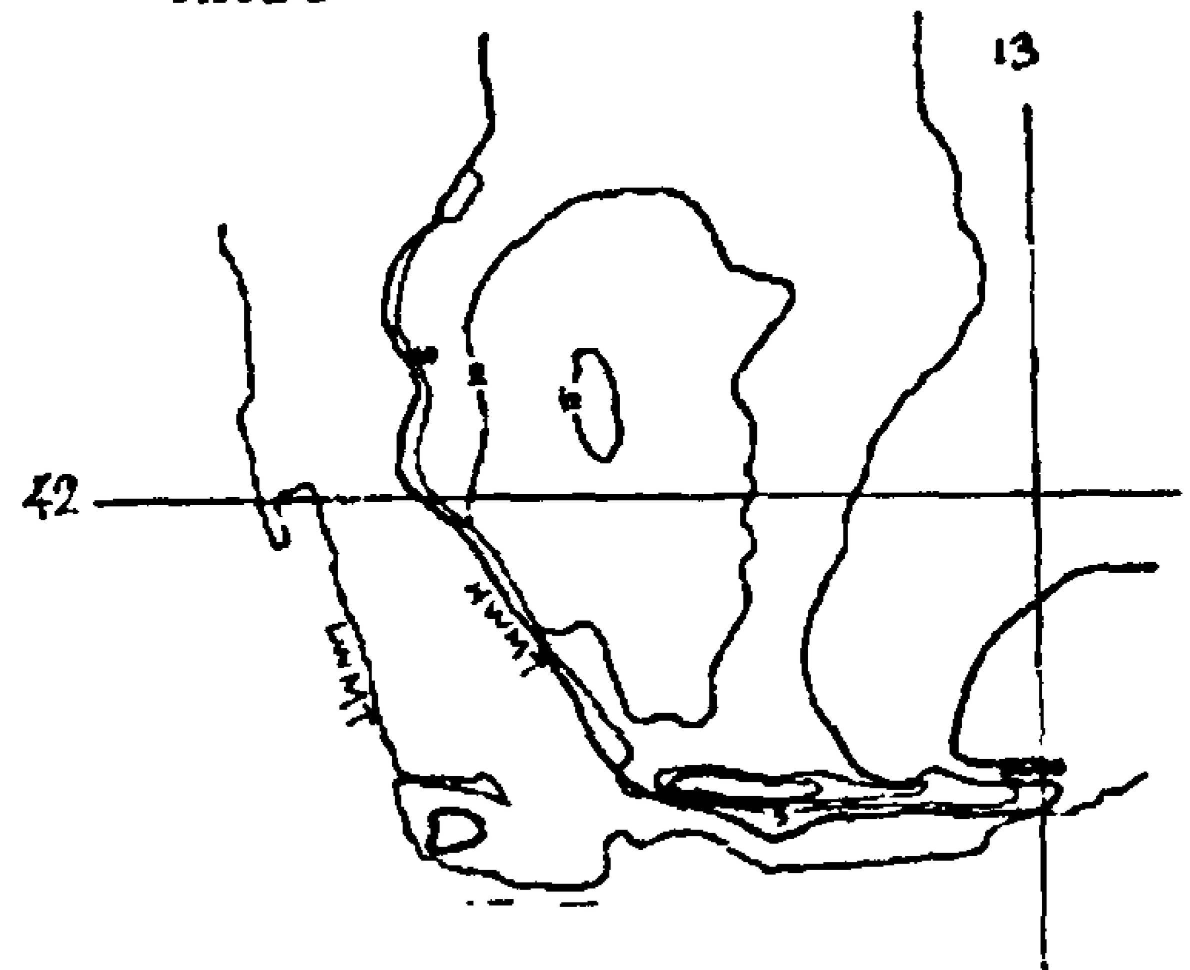
SETTLEMENT CONFIGURATIONS.

(1). The row of buildings to the east of the settlement have a similar alignment with the coast and the division between beach deposits and boulder clay. Top., and Geol;

(2). The agglomeration of buildings to the west of the settlement have a similar alignment to the direction of contour 5m and the division between raised beach and boulder clay. Top., and Geol;

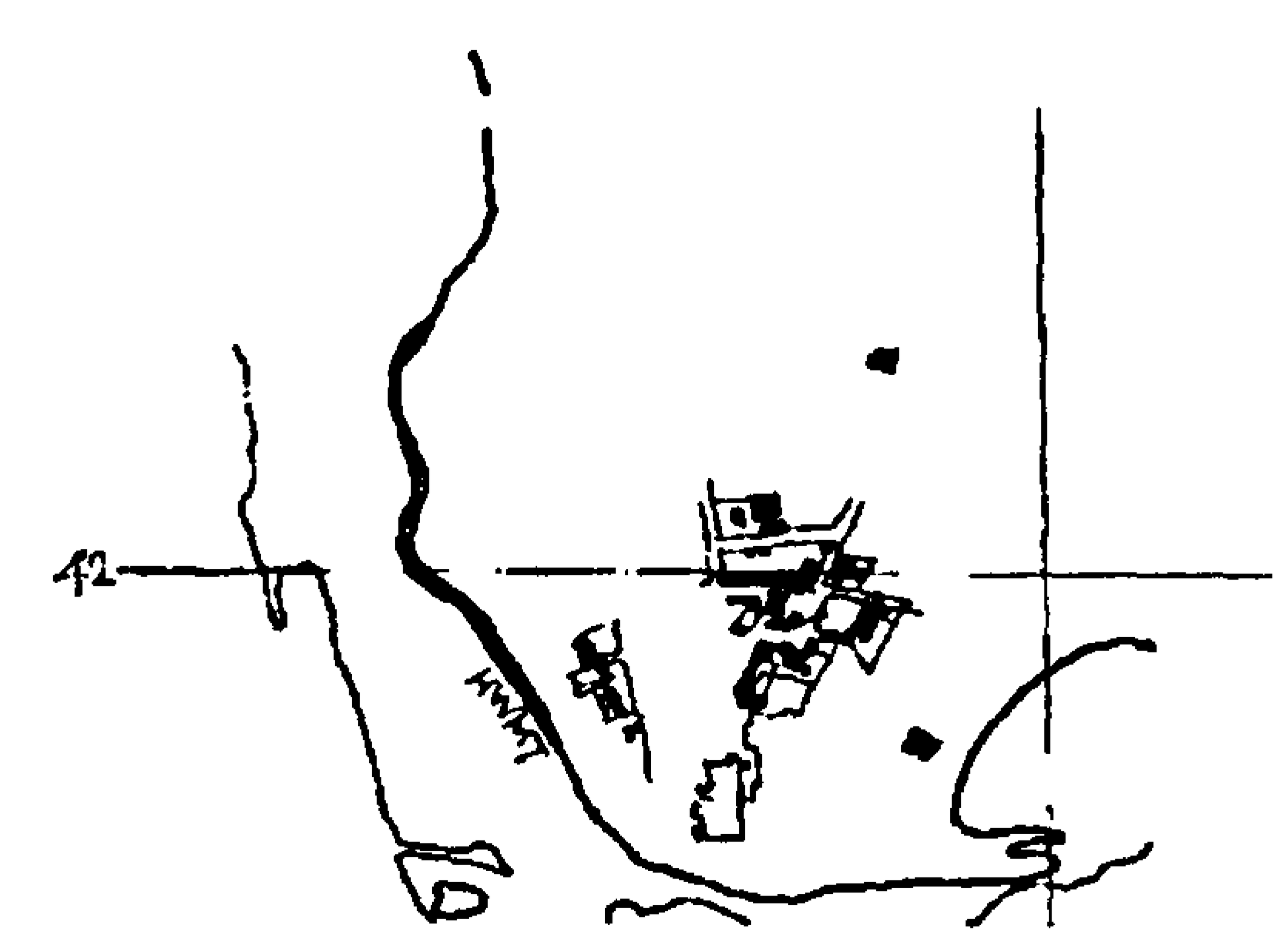
(3). The remains of Lindisfarne Priory have a similar alignment to the direction of the northern contours of Heugh Hill and the division between boulder clay and quartz dolerite. Top., and Geol.

HOLY ISLAND
NU 125420
HITS 3



TOPOGRAPHY.

GEOLOGY.



SETTLEMENT CONFIGURATIONS.

SEAHOUSES
NU 220320

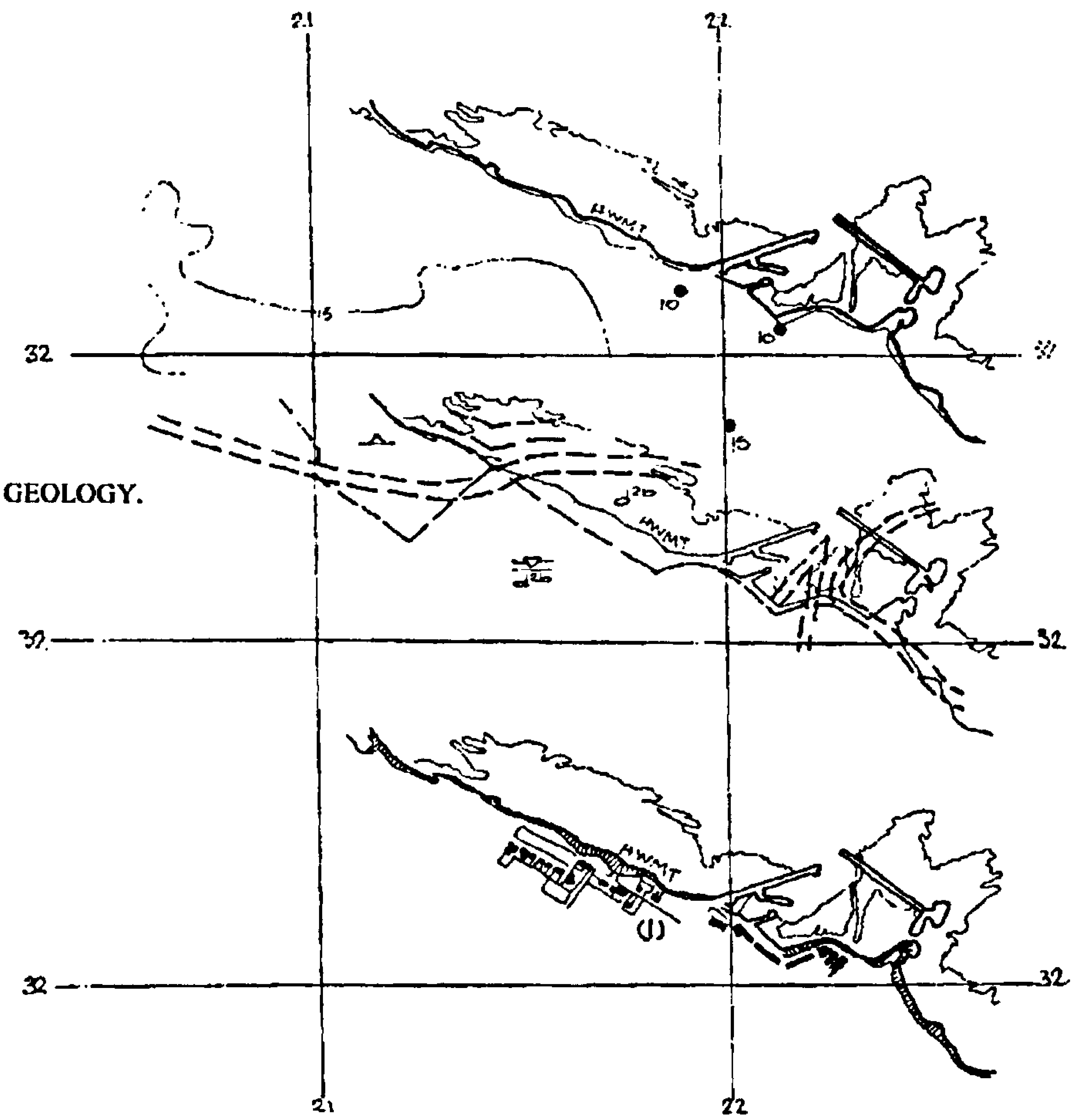
TOPOGRAPHY.
Spot levels indicate a flat coastline at 10m above HWMT. This runs in an E-W direction. A small manmade harbour is located at the east side of the settlement.

GEOLOGY.
There are three structures and several faults. The coastline is limestone. Aidan's Dunes form a coastal band of blown sand to the west. Boulder clay follows the coastline in the area of the settlement. Faults and coal out-crops are shown on the seaward side of the coast A fault extends a short distance inland from the harbour.

SETTLEMENT CONFIGURATIONS.
(1). Rows have a similar alignment to the division between boulder clay and limestone along the coastline. Top and Geol.

SEAHOUSES
NU 220320
HTS 1

TOPOGRAPHY.



GEOLOGY.

SETTLEMENT CONFIGURATIONS.

BEADNELL
NU 230294

TOPOGRAPHY
Contours indicate flat land at 5m above HWMT. The coast runs in an NW-SE direction. There is a small peninsula at the SE of the settlement.

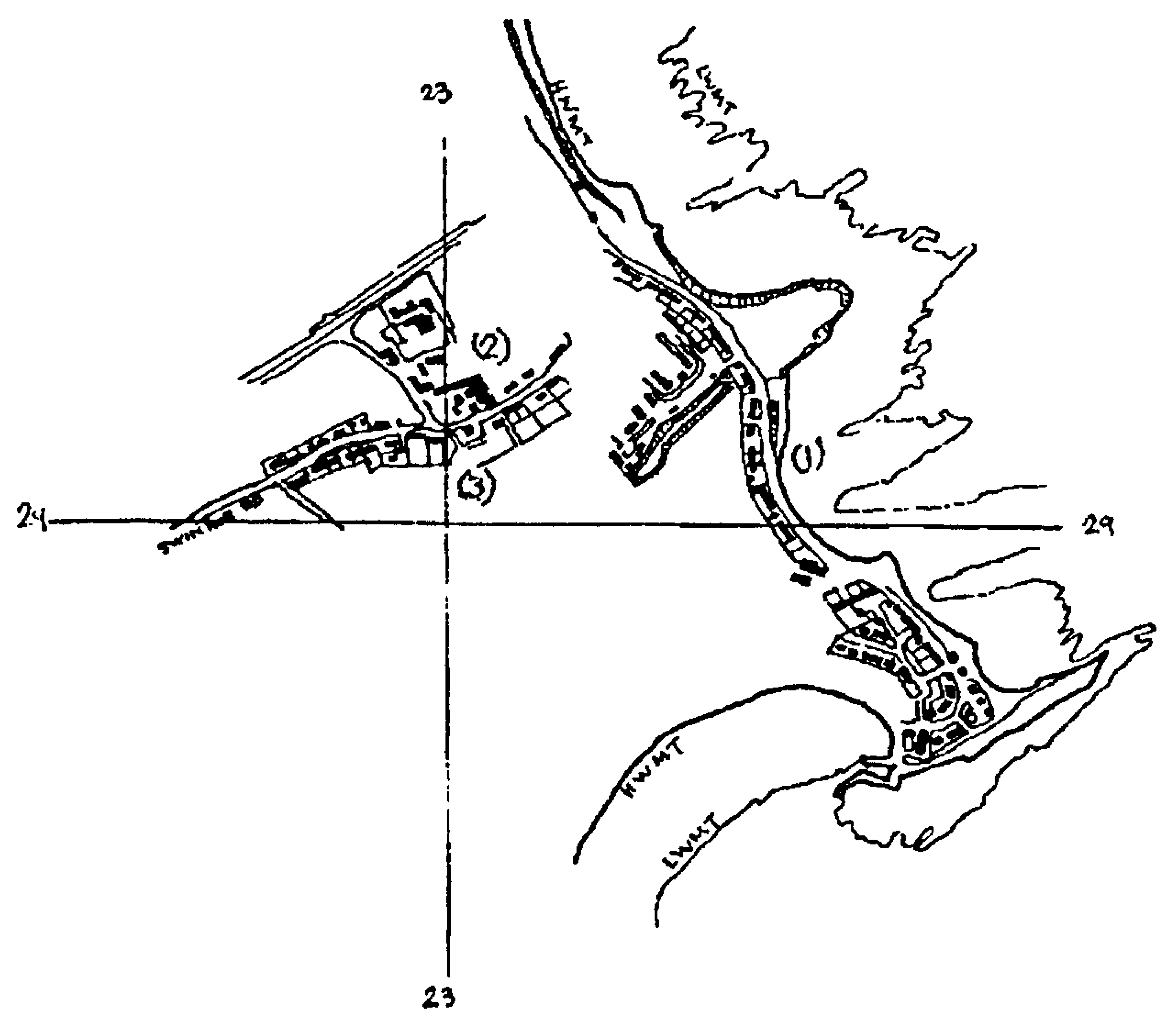
GEOLOGY.
There are four structures and several faults. The east coast and SE peninsula is limestone. Above HWMT in the SE a broad band of blown sand follows the coast extending NE over the peninsula. A narrow alluvium band is siuated to the NW of the blown sand with a branch projecting NW. The settlement site is boulder clay and limestone. A narrow band of blown sand follows the coast northward at the N of the settlement. Faults run in a SW-NE direction crossed by two running E-W.

SETTLEMENT CONFIGURATIONS.

(1). Rows have similar alignments with the coast and the limestone and blown sand structures which define it. Top and Geol;

(2). Rows and agglomerations have similar alignments with the divisions betweeen limestone and boulder clay. Geol;

(3). Rows have similar alignments with Beadnell coal crop. Geol.

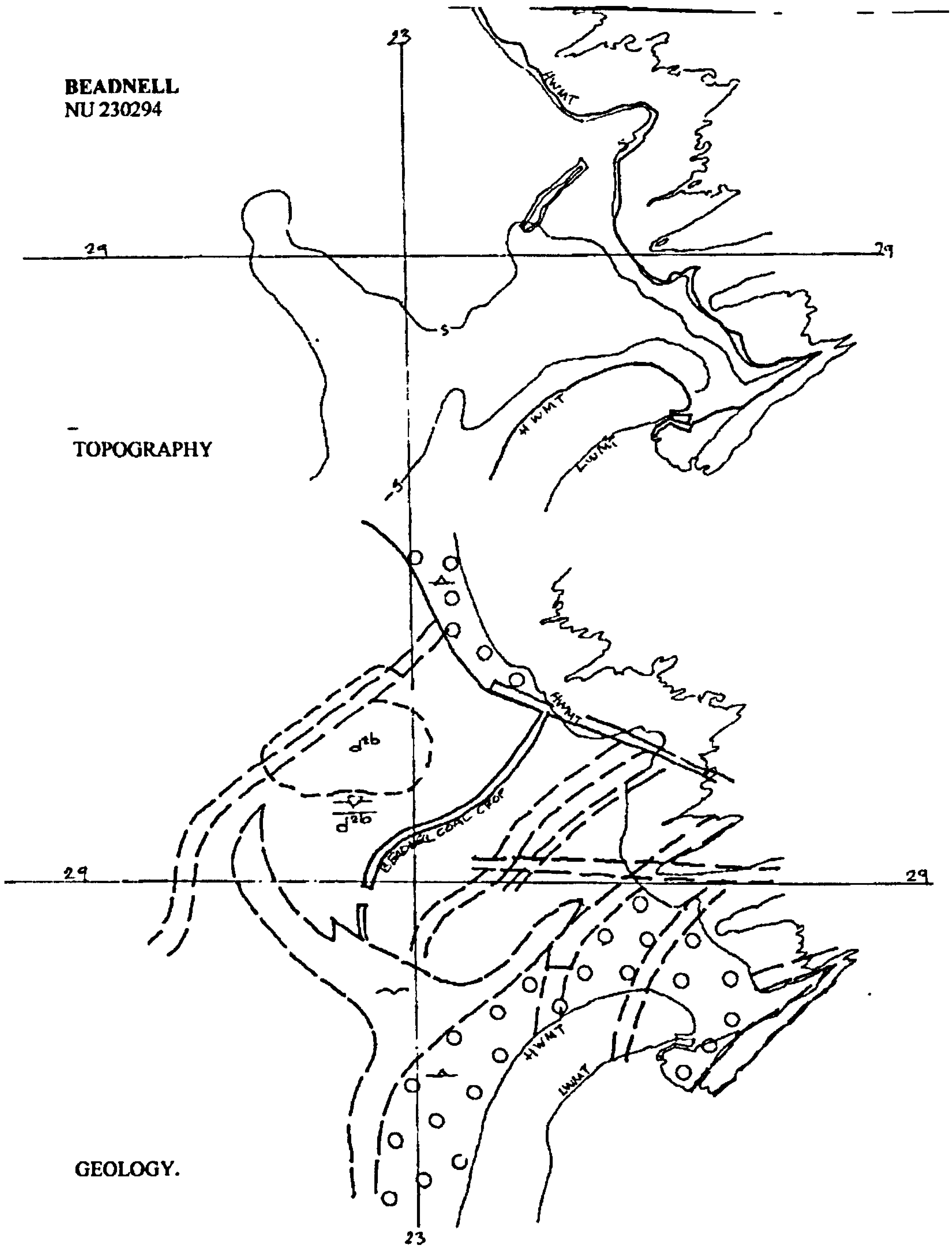


SETTLEMENT CONFIGURATIONS.

BEADNELL
NU 230294

TOPOGRAPHY

GEOLOGY.



LOW NEWTON by the SEA
NU 240244

TOPOGRAPHY.
Newton Haven is an angular bay. The coast runs from the NE-SW and turns in a SE direction. The settlement is located at the change of direction. Contours at 5m, 10m, 15m, and 20m are parallel with part of the coast running NE-SW. Here there is noticeable incline. The 5m contour turns with coast to a NW-SE direction.

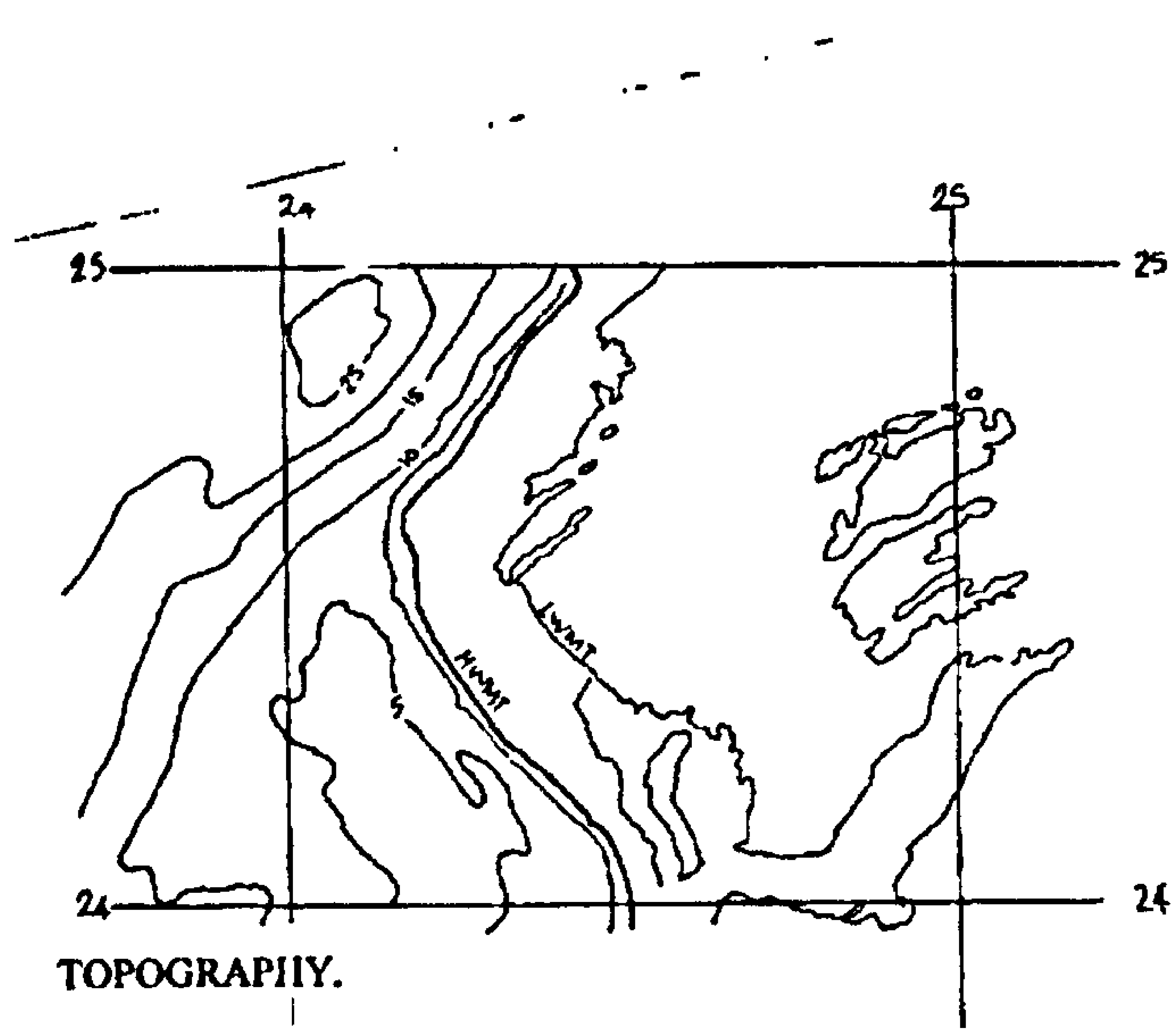
GEOLOGY.
There are five structures and three coal out-crops above HWMT. Blown sand and raised beach extend S from the settlement. Boulder clay extends W and limestone runs E. To the north in quartz dolerite. Coal outout-crops are uncertain.

SETTLEMENT CONFIGURATIONS.

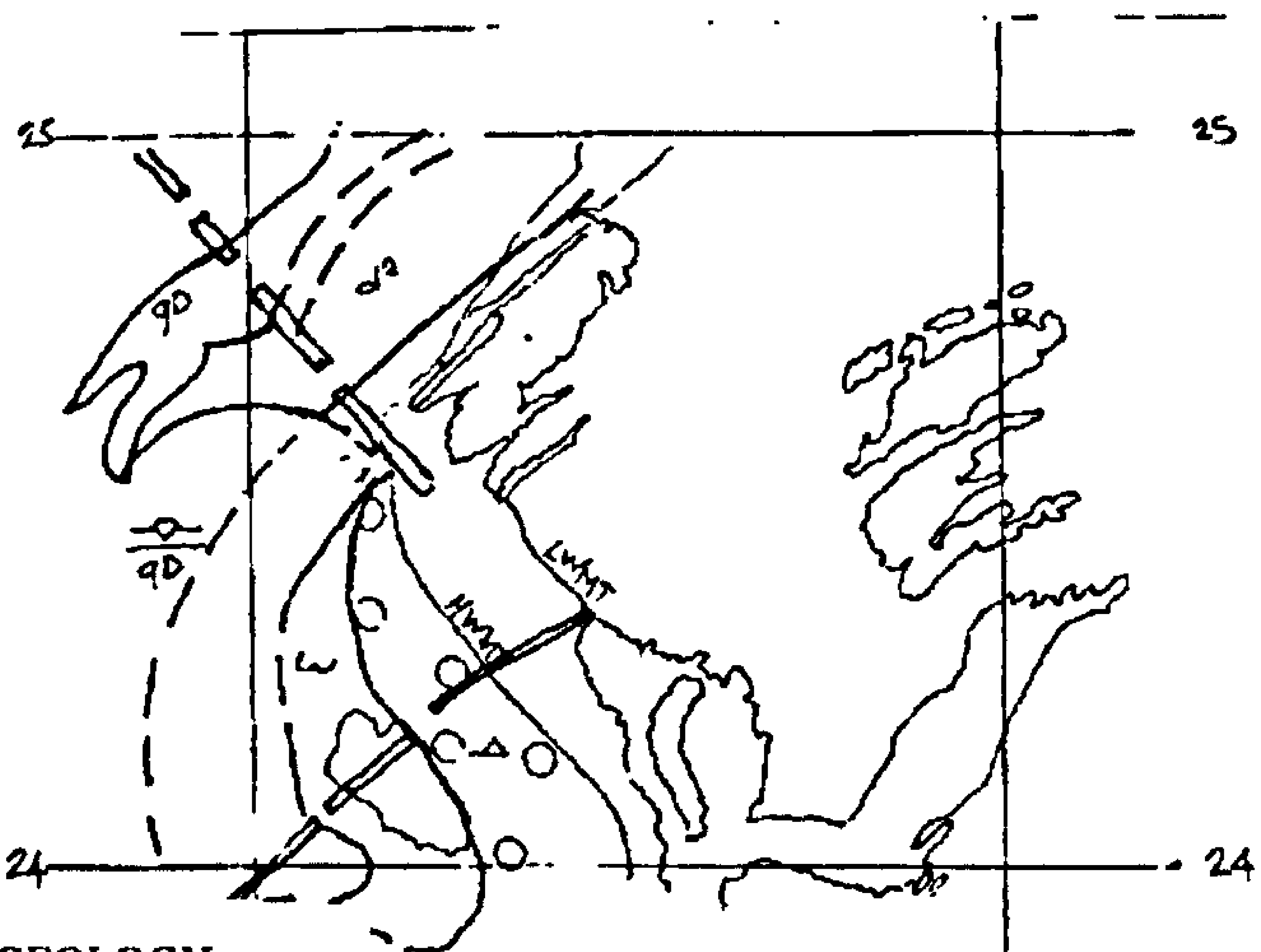
(1). There is a similar alignment in the NW-SE direction of the row and agglomeration and the coast running SE from the settlement defined by the blown sand division at HWMT and 5m contour. Top., and Geol;

(2). The limit of the settlement at the SE is defined by curved divisions between boulder clay with raised beach and blown sand. Geol;

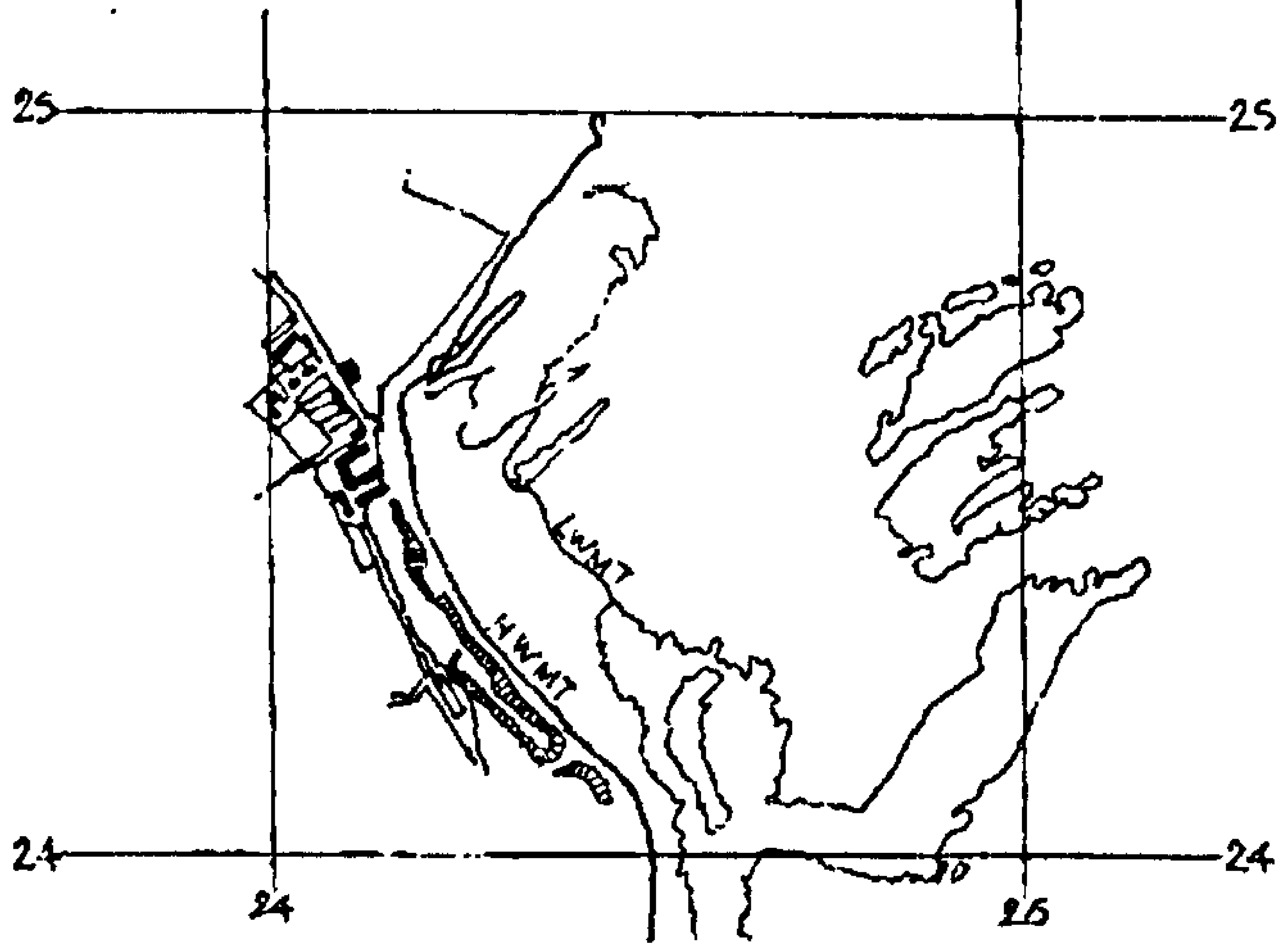
(3). There is a similar alignment between the row and agglomeration and the unnamed coal outcrop running at the NE of the settlement in a NW direction. Geol.



TOPOGRAPHY.



GEOLOGY.



SETTLEMENT CONFIGURATIONS.

CRASTER
NU 260200

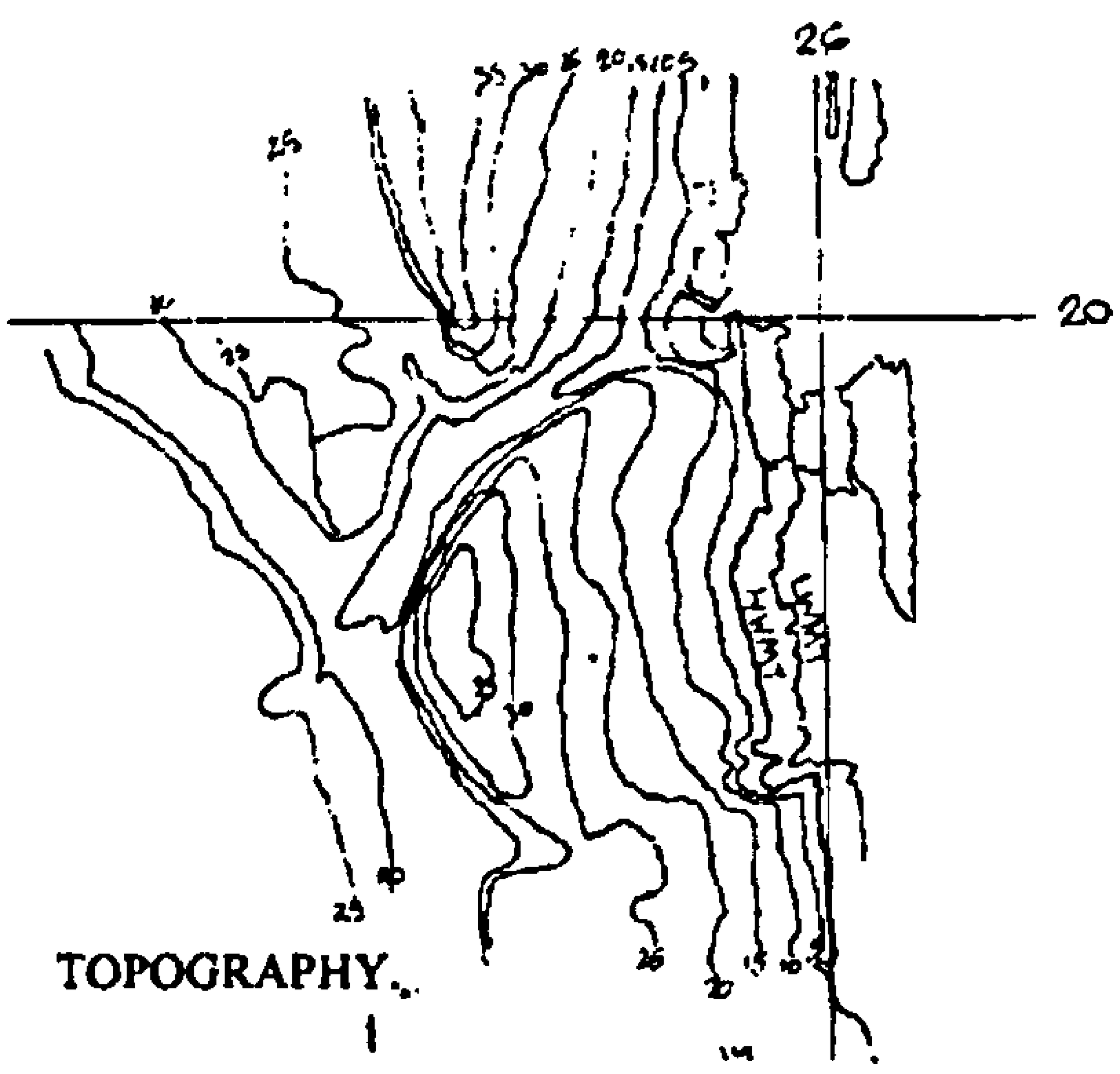
TOPOGRAPHY.
Contours indicate two steeply inclined hills separated by a valley. Levels rise from 5m along the coast to 35m near the summits. The shape of the 5, 10, and 15m contours follows the coast and valley. 20, 25, 30,and 35m contours turn in N and S directions to form the two hills. A man-made harbour is constructed where the the sea and valley meet.

GEOLOGY.
There are two structures and one coal out crop. Quartz dolerite inclines are topped withboulder clay. The coal out crop runs through the valley to the sea.

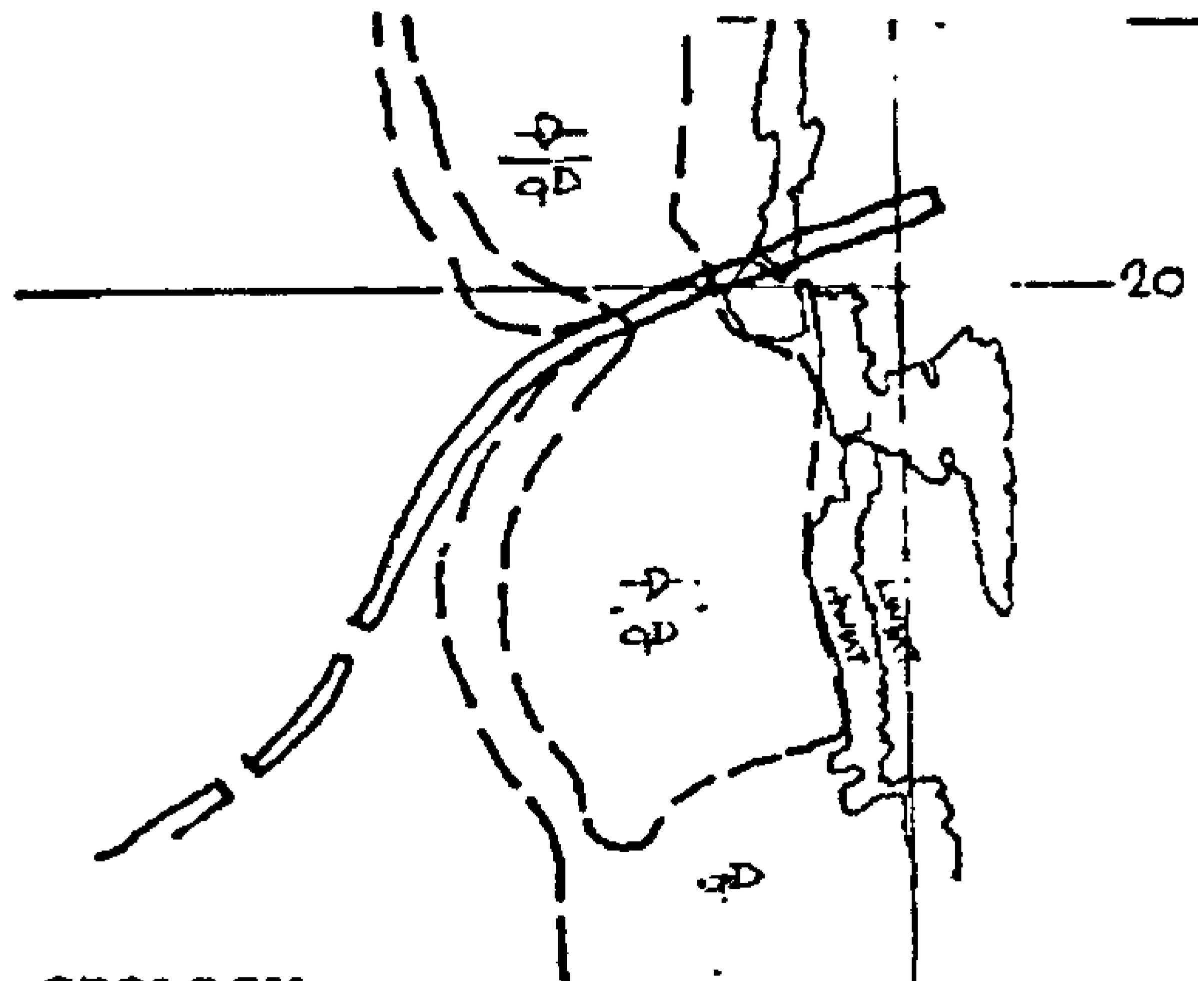
SETTLEMENT CONFIGURATIONS.

(1). Rows and agglomerations have similar alignments to the coast and contours and the division between boulder clay and quartz dolerite. Top., and Geol;

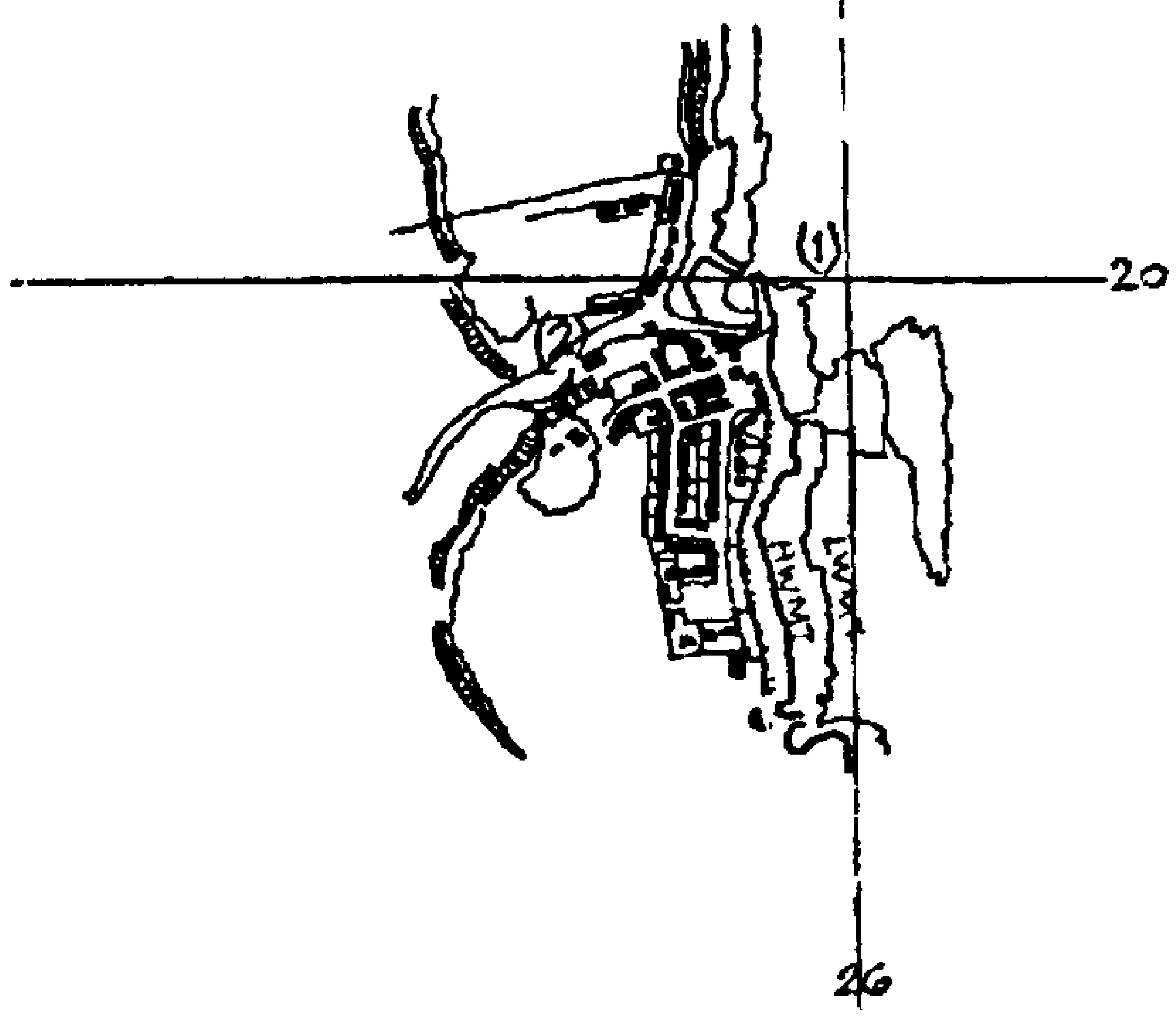
(2). Rows and agglomeration follow the valley contours and coal crop. Top., and Geol.



TOPOGRAPHY.



GEOLOGY.



SETTLEMENT CONFIGURATIONS.

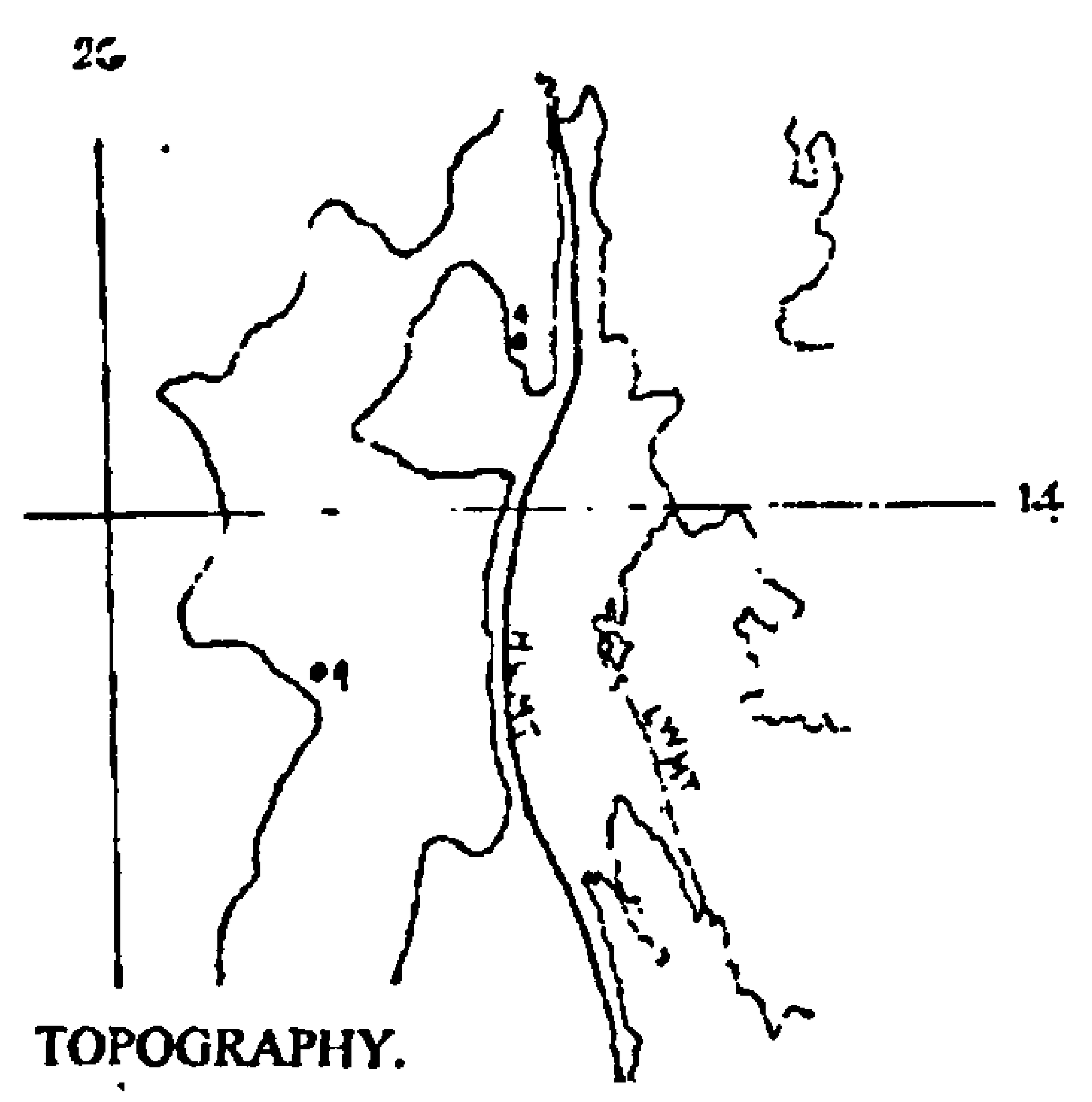
BOULMER
NU 266142

TOPOGRAPHY.
5m contour surrounds the settlement site immediately adjacent to the coast. Boulmer Hall is situated to the north and a row extends SW from the coast.

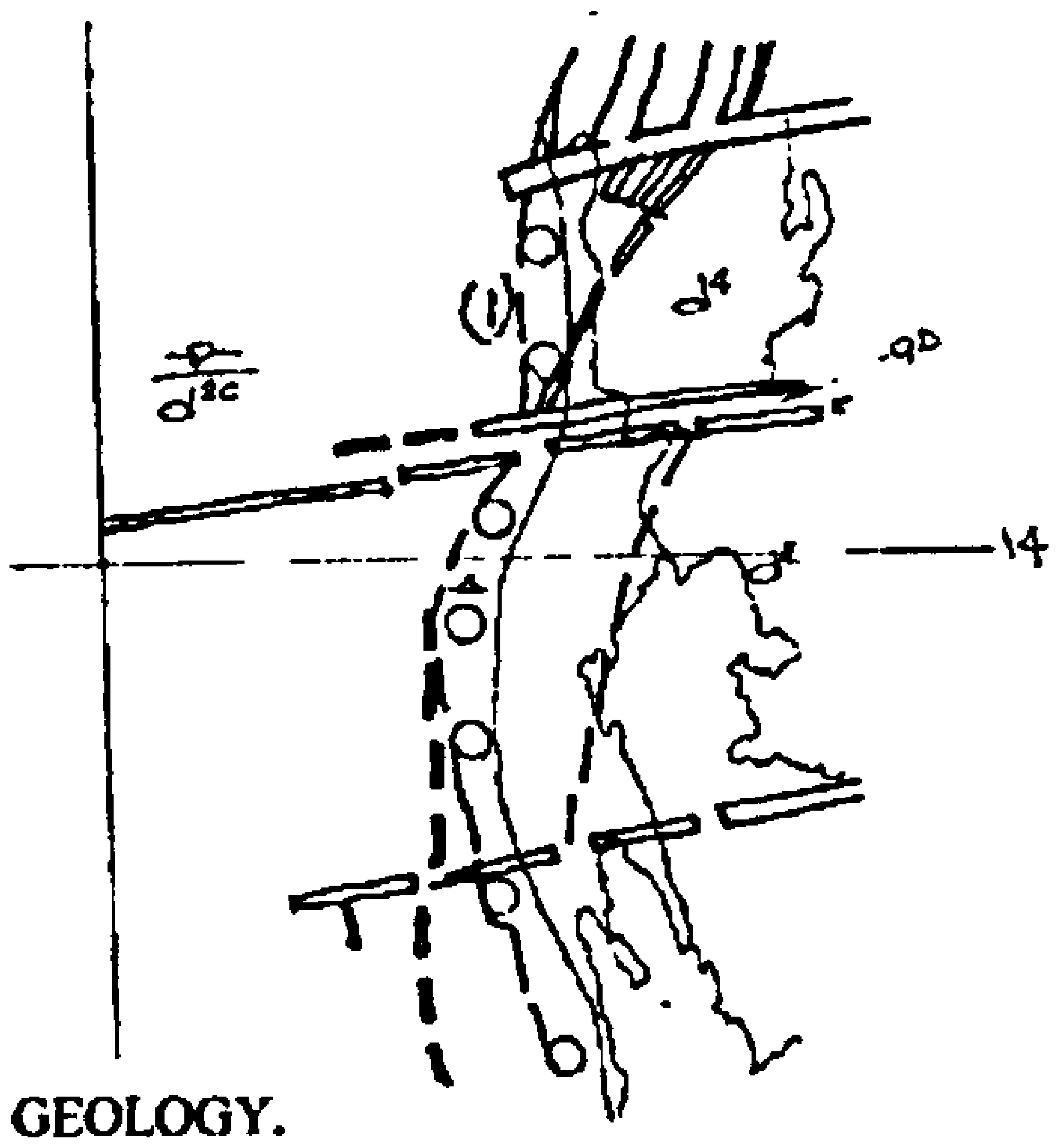
GEOLOGY.
There are two structures above HWMT and several faults. A band of blown sand runs in the direction of the coast. Boulder clay extends E from this band. A fault runs E-W to the north and a uncertain coal out crop runs E-W to the south.

SETTLEMENT CONFIGURATIONS.

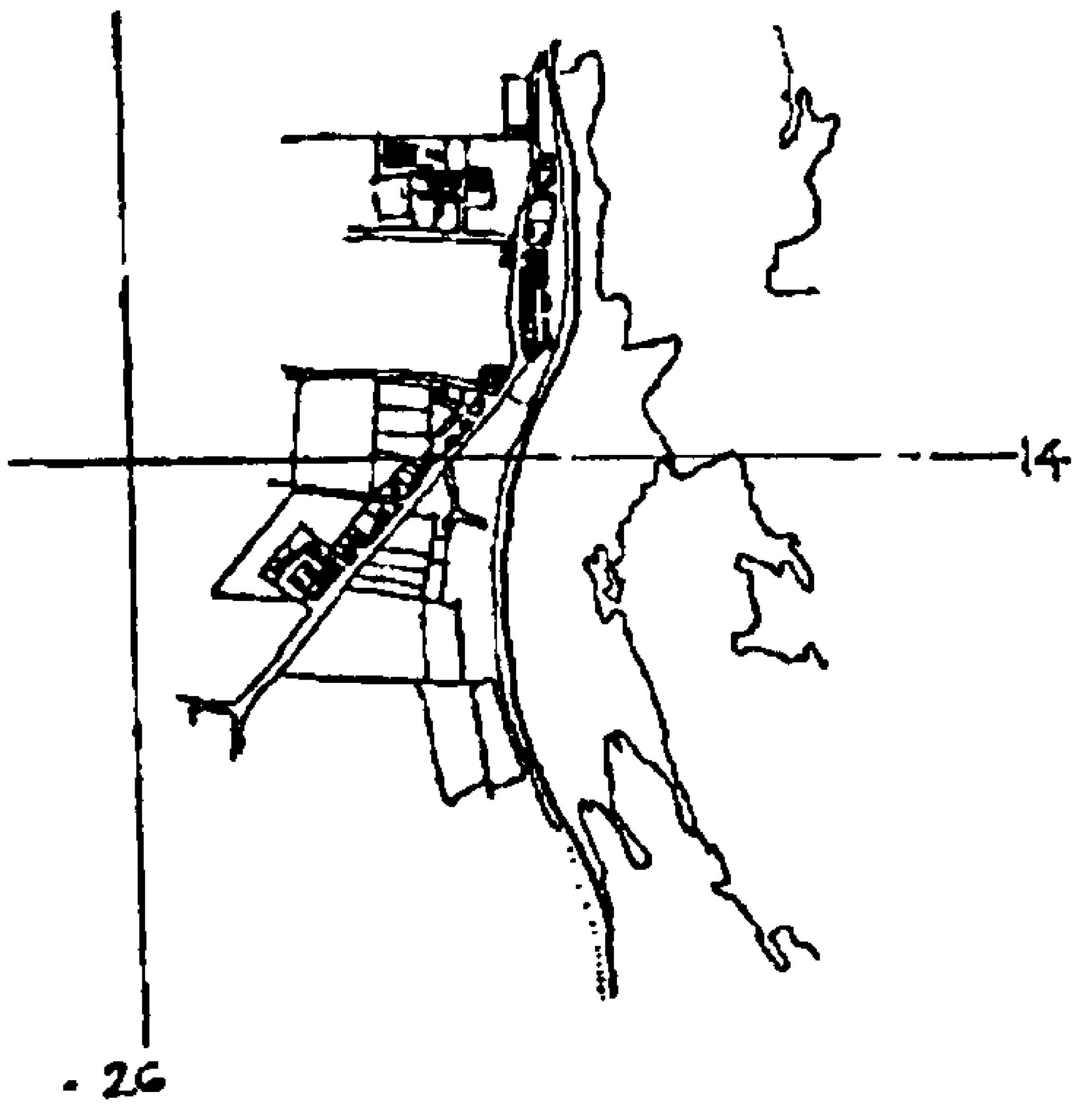
(1). There is a similarity between the row with the division between boulder clay and blown sand. Top., and Geol.



TOPOGRAPHY.



GEOLOGY.



SETTLEMENT CONFIGURATIONS.

ALNMOUTH
NU 246105

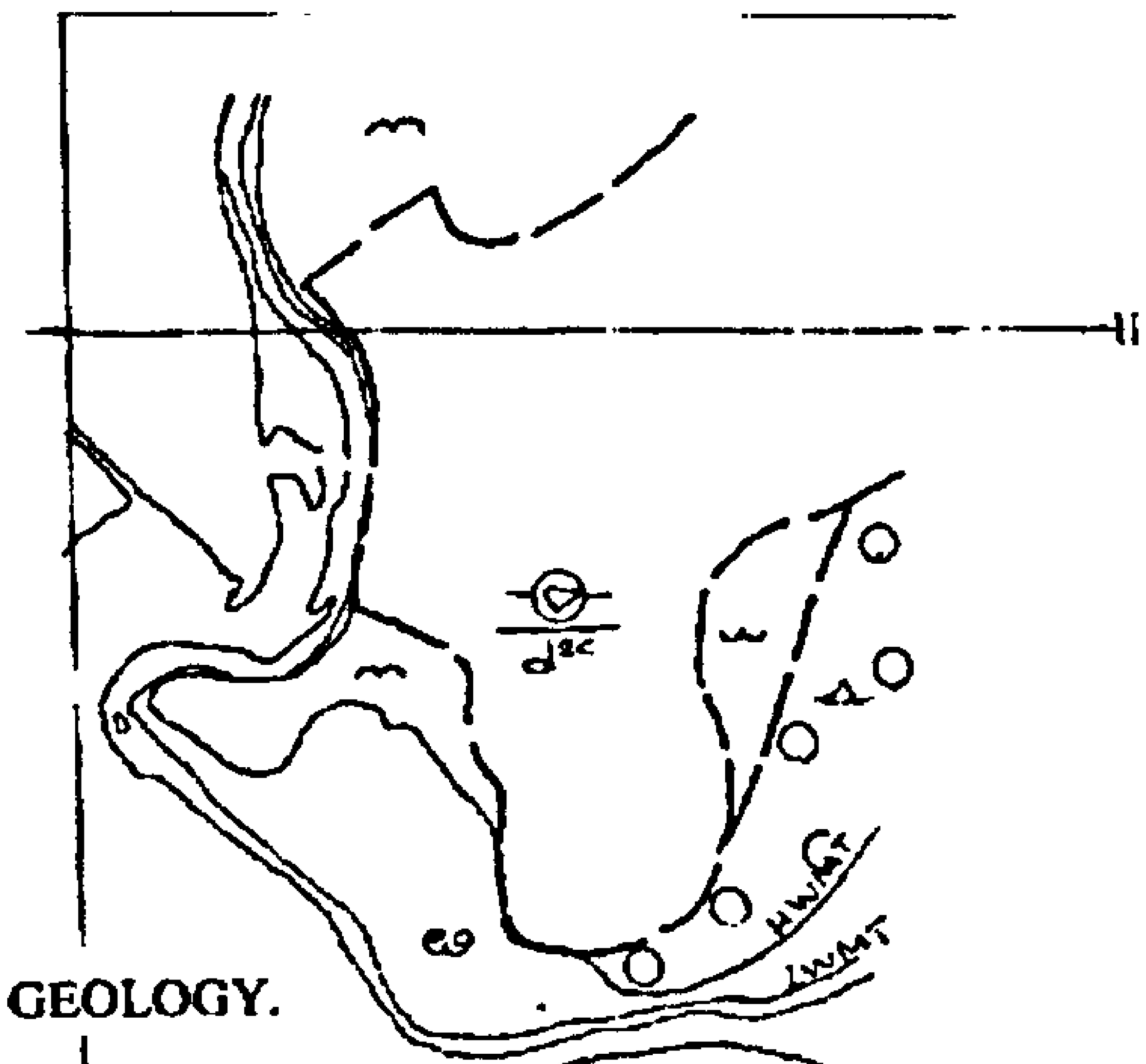
TOPOGRAPHY.
The settlement occupies a peninsula at the mouth of the river Aln. Contours follow the shape of the peninsula rising from 5 to 15m. They turn to a E-W direction in the north where they rise to 35m. There is a steep hill to the NE.

GEOLOGY.
There are five structures. The peninsula is gravel and sand, with alluvium and beach deposits to the E and raised beach to the W. Blown sand is to the W of the raised beach turning SW to meet the gravel and sand.

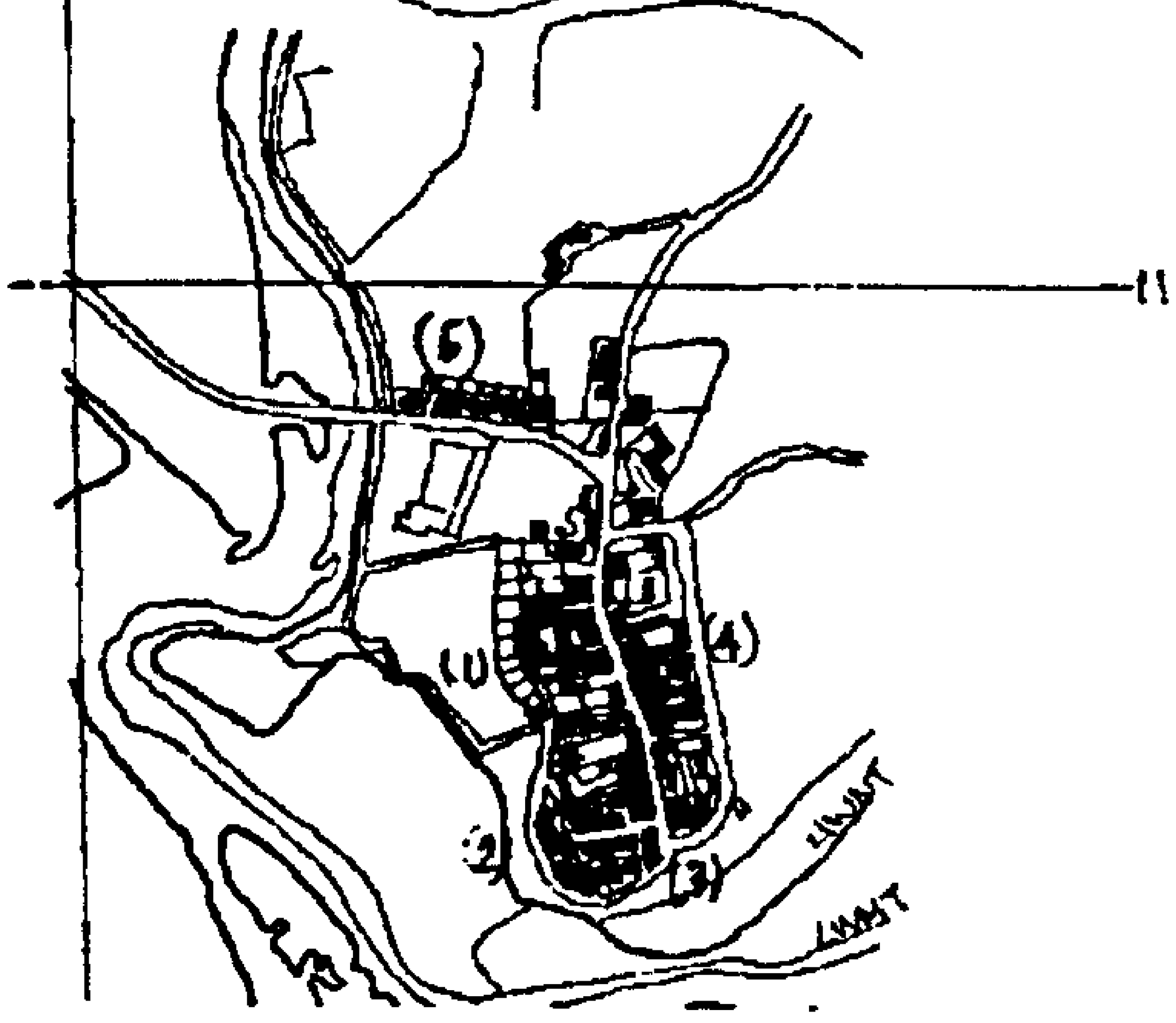
SETTLEMENT CONFIGURATION.

(1). The agglomeration outline follows the division between gravel and sand with: alluvium. Geol;
(2). Beach deposits. Geol;
(3). Blown sand. Geol
(4). Raised beach. Geol;
(5). A row follows the contour at 20m. Top.

TOPOGRAPHY.



GEOLOGY.



SETTLEMENT CONFIGURATION.

24

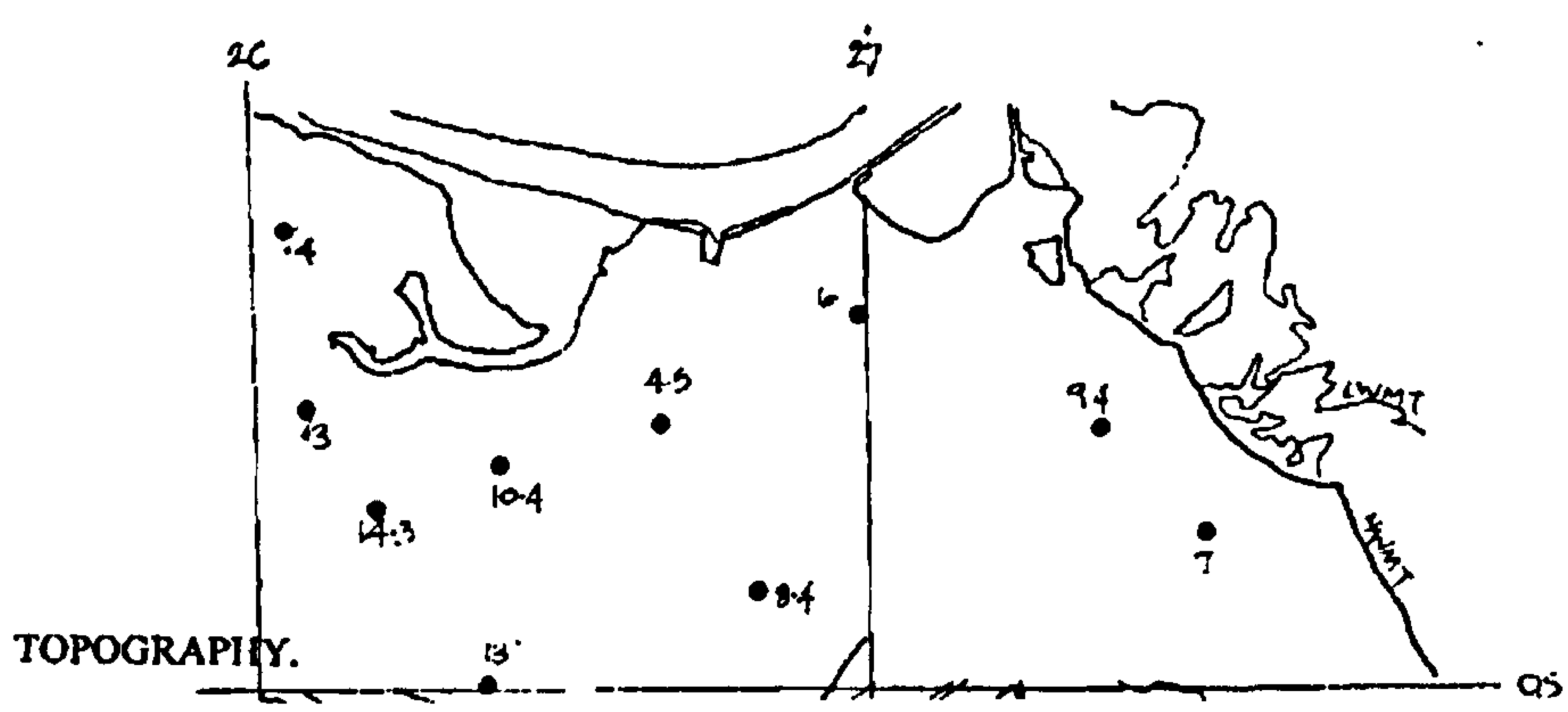
AMBLE
NU 270045

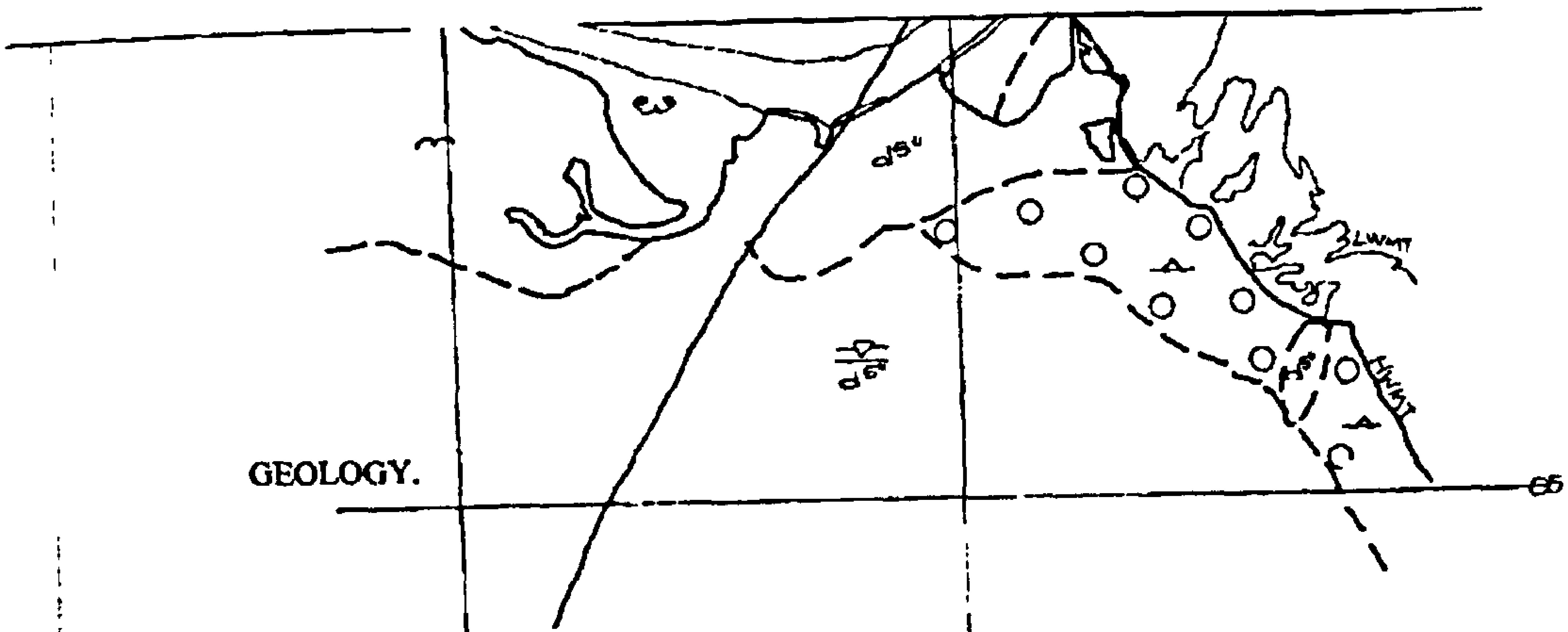
TOPOGRAPHY.
Amble occupies the south bank of Warkworth harbour. Spot levels indicate the settlement site rises from HWMT to 14.3m. There is a man-made harbour to the N. From this the settlement spreads S and W.

GEOLOGY.
There are five structures and one fault. Alluvium and beach deposits line the river bank to the W. This changes to limestone and boulder clay in the area of the settlement. A band of blown sand runs along the coast to the S.
A coal outcrop cuts across the site in a NE-SW direction.

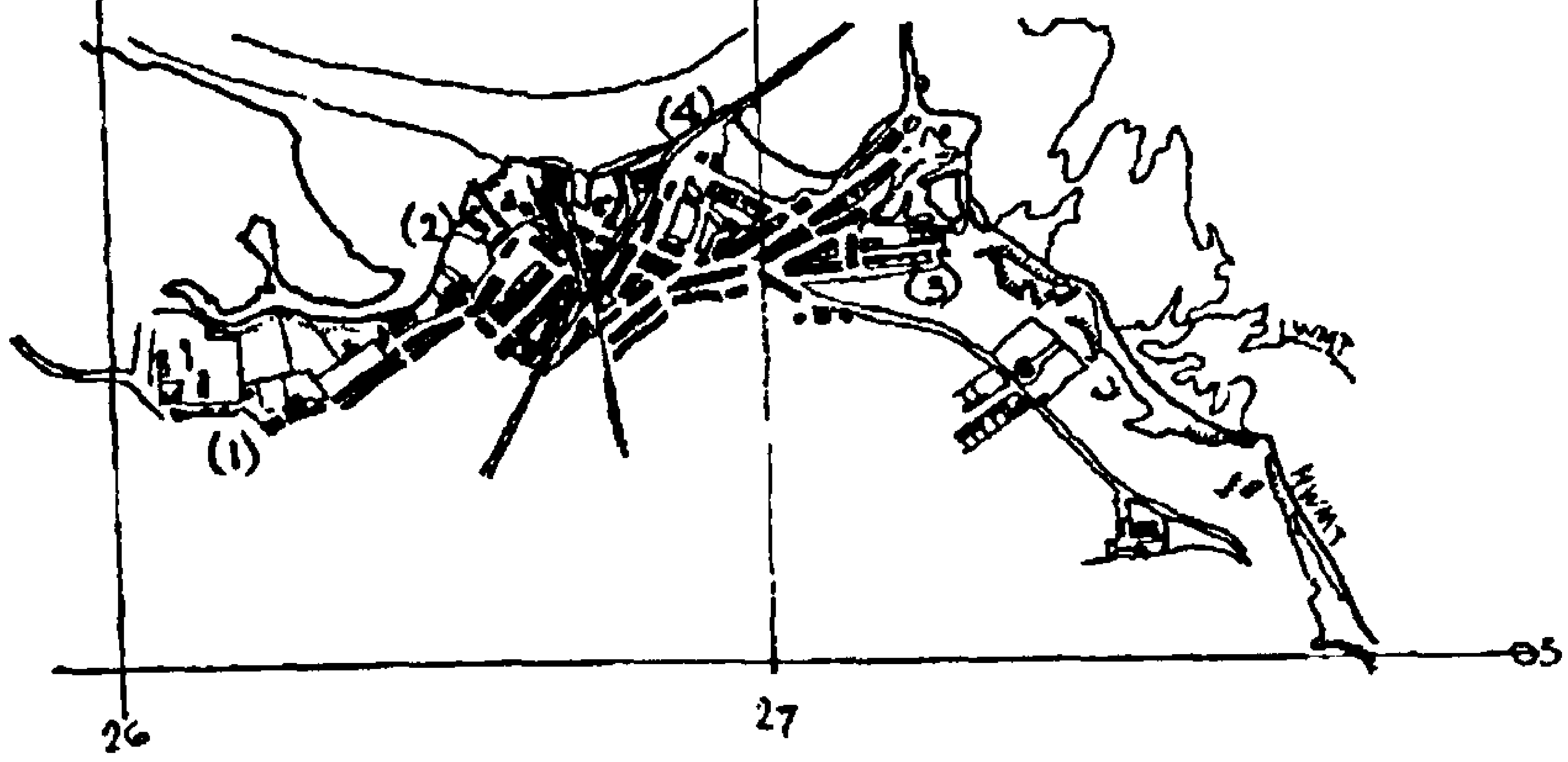
SETTLEMENT CONFIGURATIONS.

(1). There are similarities in rows and the division between boulder clay with alluvium. Geol;
(2). Beach deposits. Geol;
(3) There are similarities in rows and divisions between limestone and blown sand. Geol;
(4) There are similarities in rows and divisions between HWMT and limestone. Top., and Geol.





GEOLOGY.



SETTLEMENT CONFIGURATIONS.

LOW HAUXLEY
NU 286030

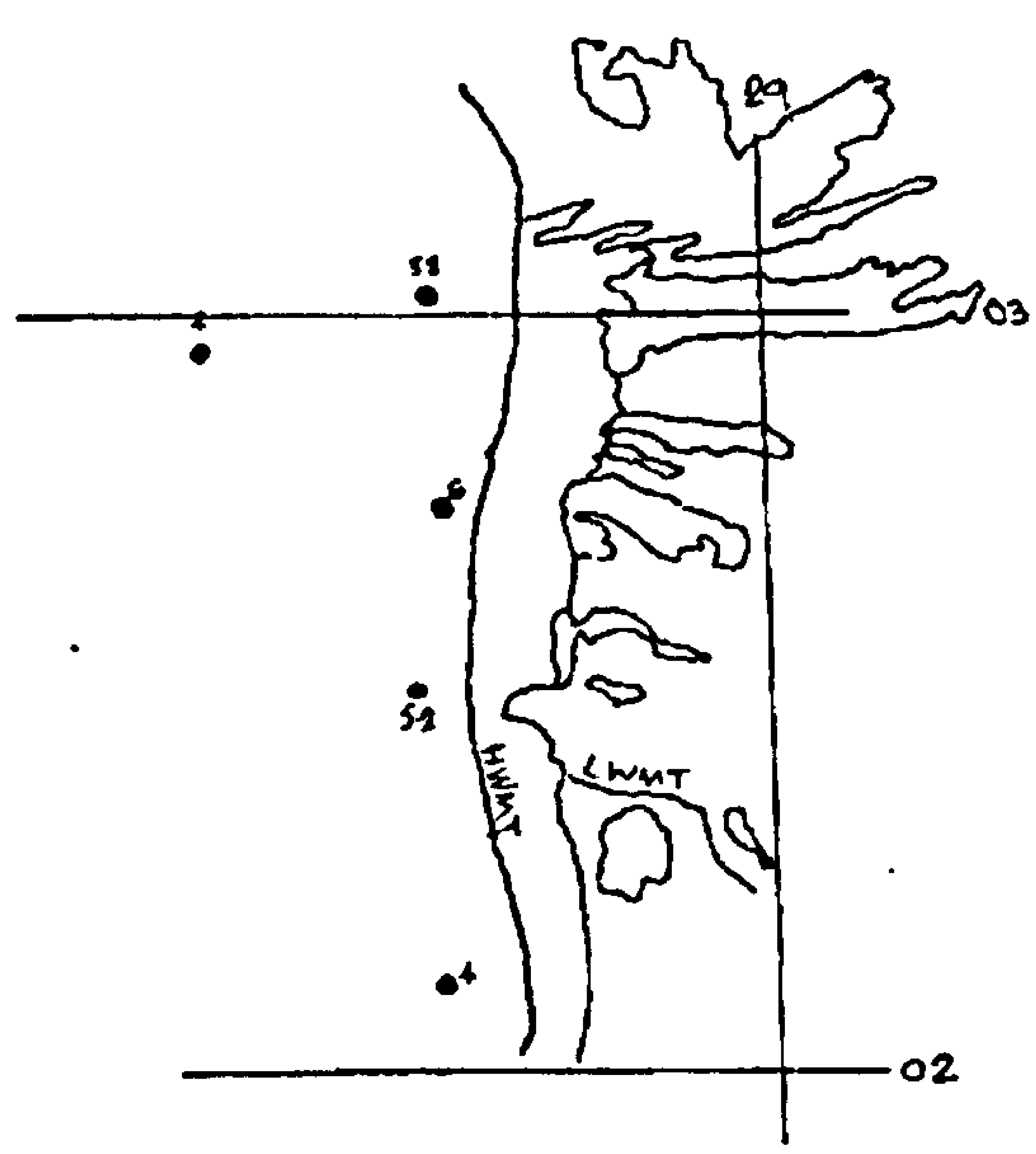
TOPOGRAPHY.
Spot levels show a small rise the settlement site at 6m.

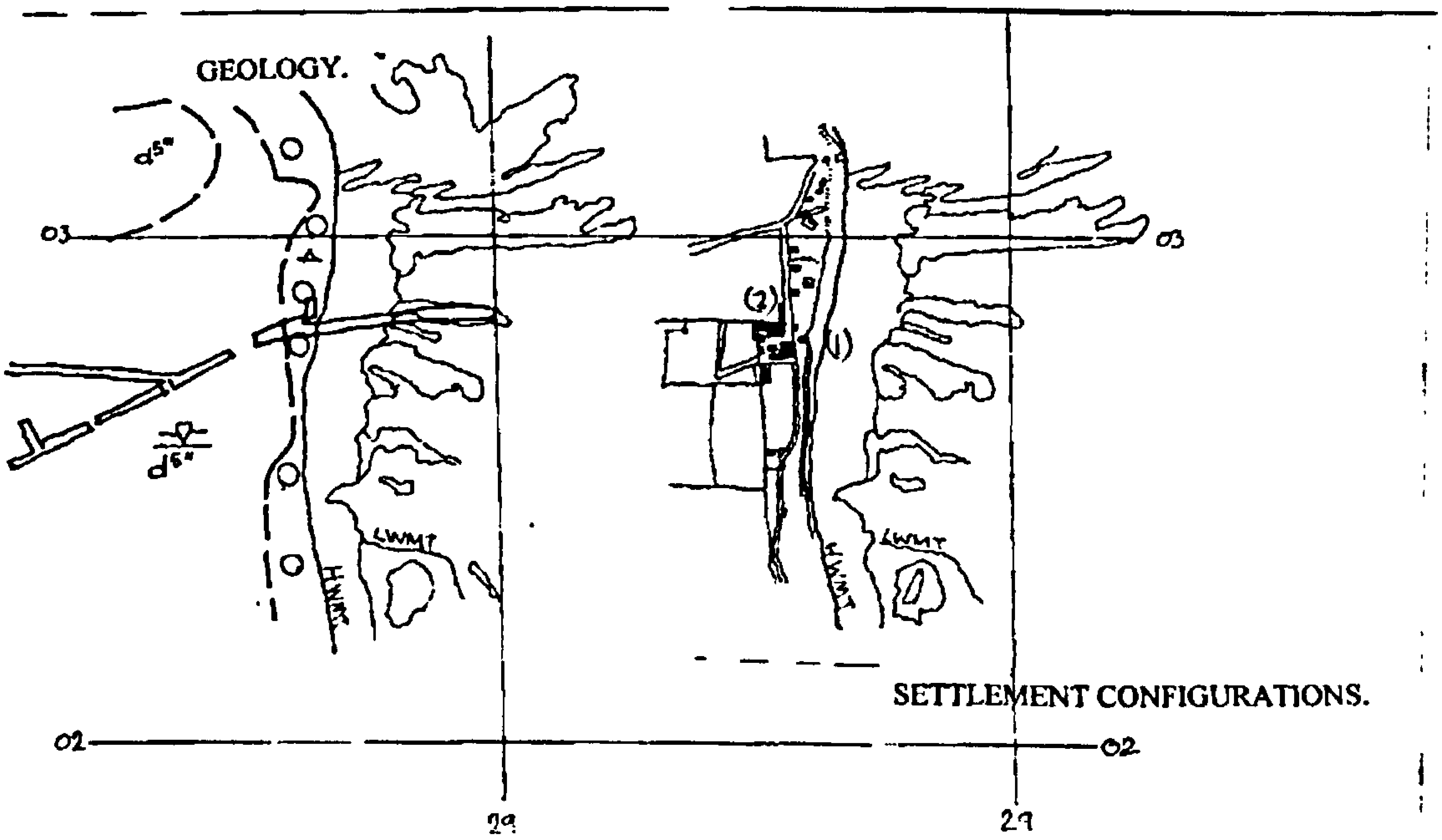
GEOLOGY.
There are two structures and one fault. A band of blown sand runs N-S in line with the coast. There is boulder clay to the W. A coal outcrop runs E-W to the N of the settlement site.

SETTLEMENT CONFIGURATIONS.

(1). There is a similarity in alignment between the agglomeration and the division between boulder clay with blown sand. Top., and Geol;

(2). There is a similarity in alignment between the agglomeration and the fault running E-W at the N of the site. Geol.




GEOLOGY.
03
03
LWMT
HWMT
LWMT
HWMT
(2)
(1)
SETTLEMENT CONFIGURATIONS.
02
02
29
29

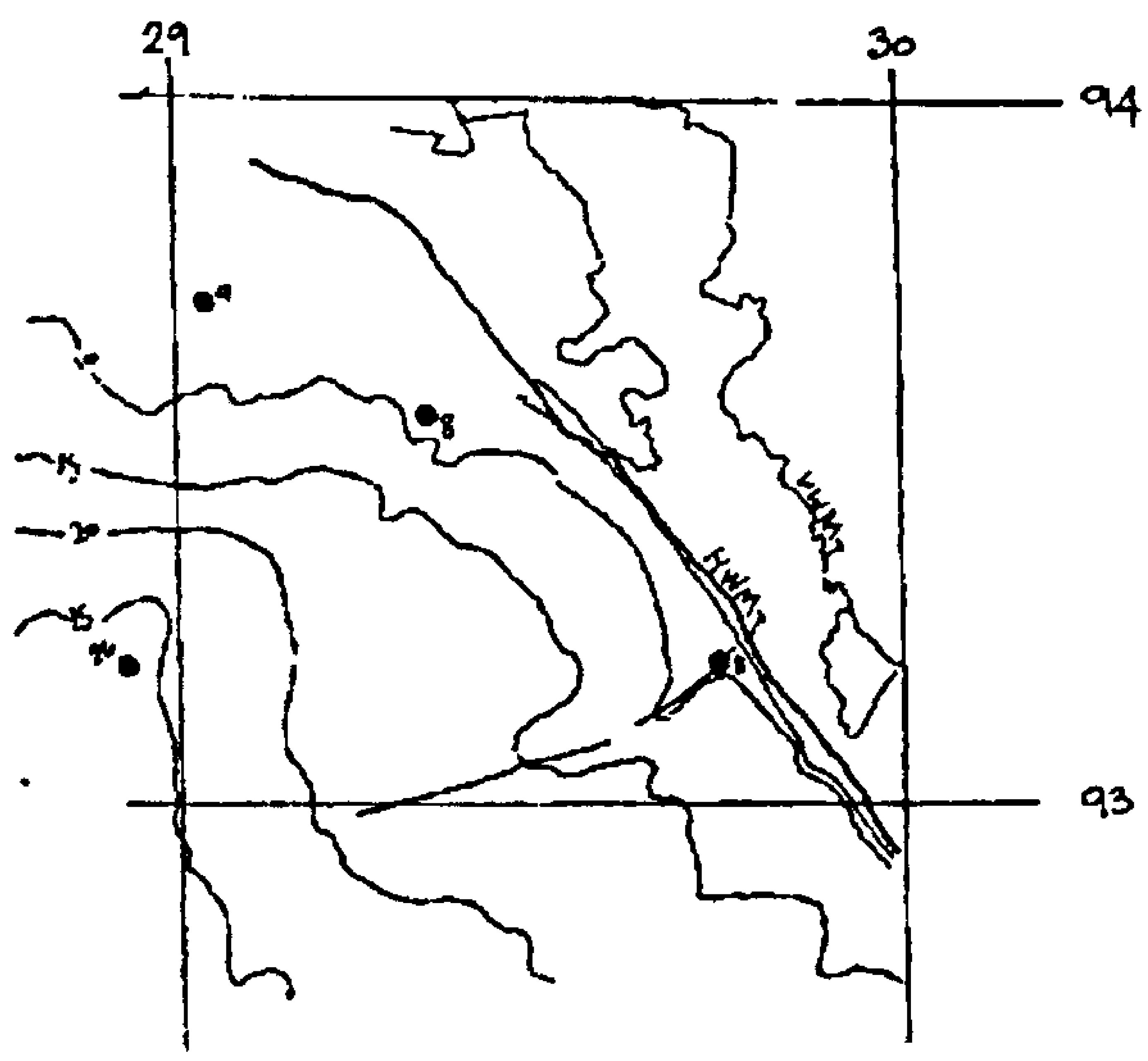
CRESSWELL
NU 293935

TOPOGRAPHY.
Contours and spot levels indicate a level coastal site at 8m rising to 26m at the S-W.

GEOLOGY.
There are two structures. A band of blown sand runs along the coast. Boulder clay extends from this inland.

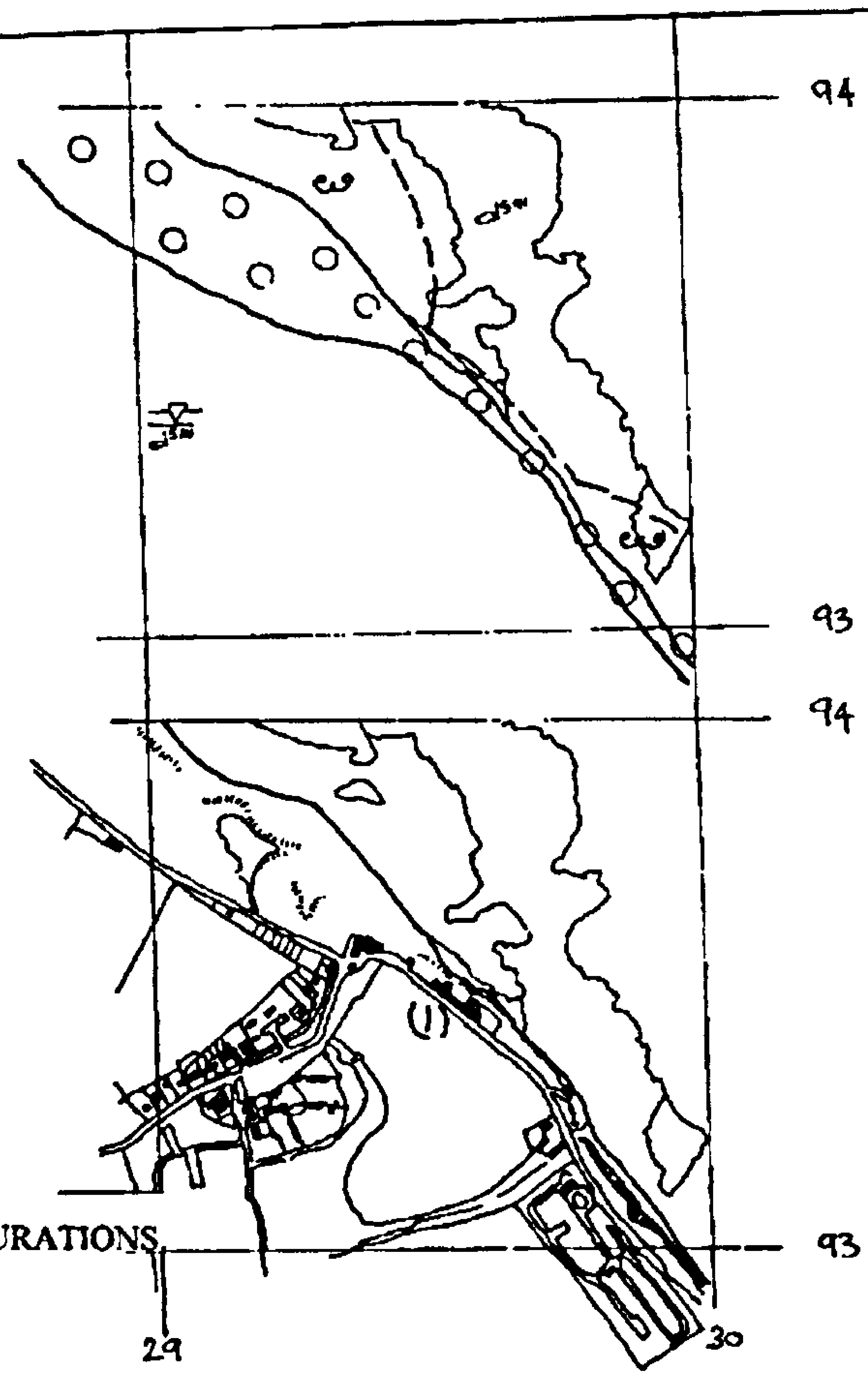
SETTLEMENT CONFIGURATIONS.

(1). There is a similar alignment in the row and division between blown sand with boulder clay. Top., and Geol.



TOPOGRAPHY.

GEOLOGY.



SETTLEMENT CONFIGURATIONS

NEWBIGGIN
NU 310875

TOPOGRAPHY.
Contours indicate levels rising from HWMT to 20m inland. There is a peninsula at the NE and a bay to the SW of this.

GEOLOGY.
There are five structures. Bands of blown sand and beach deposits follow the coast. Boulder clay is generally spred across the settlement site with limestone to the S and to the NW. A strip of alluvium etxends N from the bay.

SETTLEMENT CONFIGURATIONS.

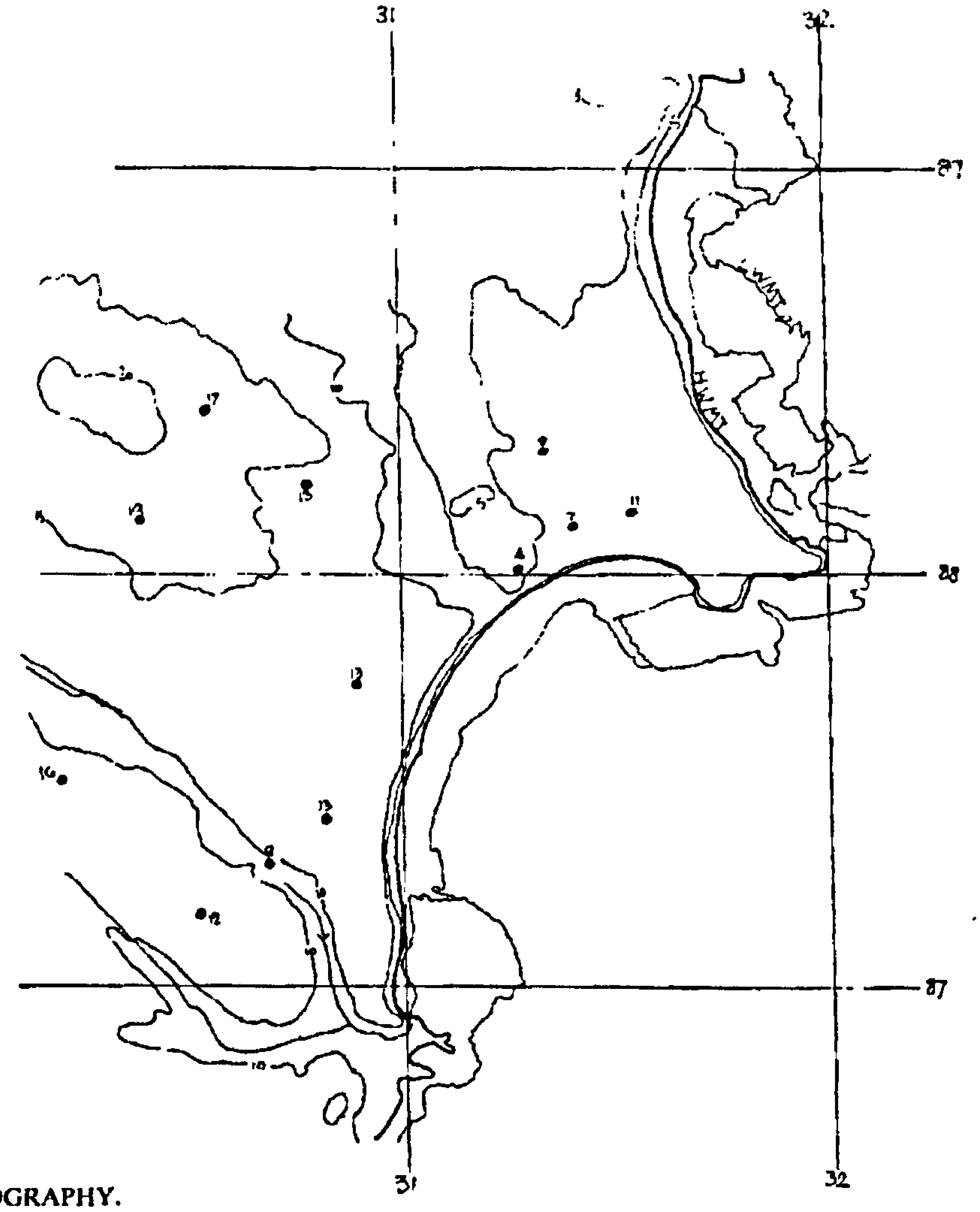
(1). There are similar alignments in the rows and division between blown sand with beach deposits. Top., and Geol;

(2) There is a similar alignment in the row and division between blown sand with boulder clay. Geol;

(3) and (4). There is are similar alignments in the rows and divisions between alluvium with boulder clay and contours. Top., and Geol;

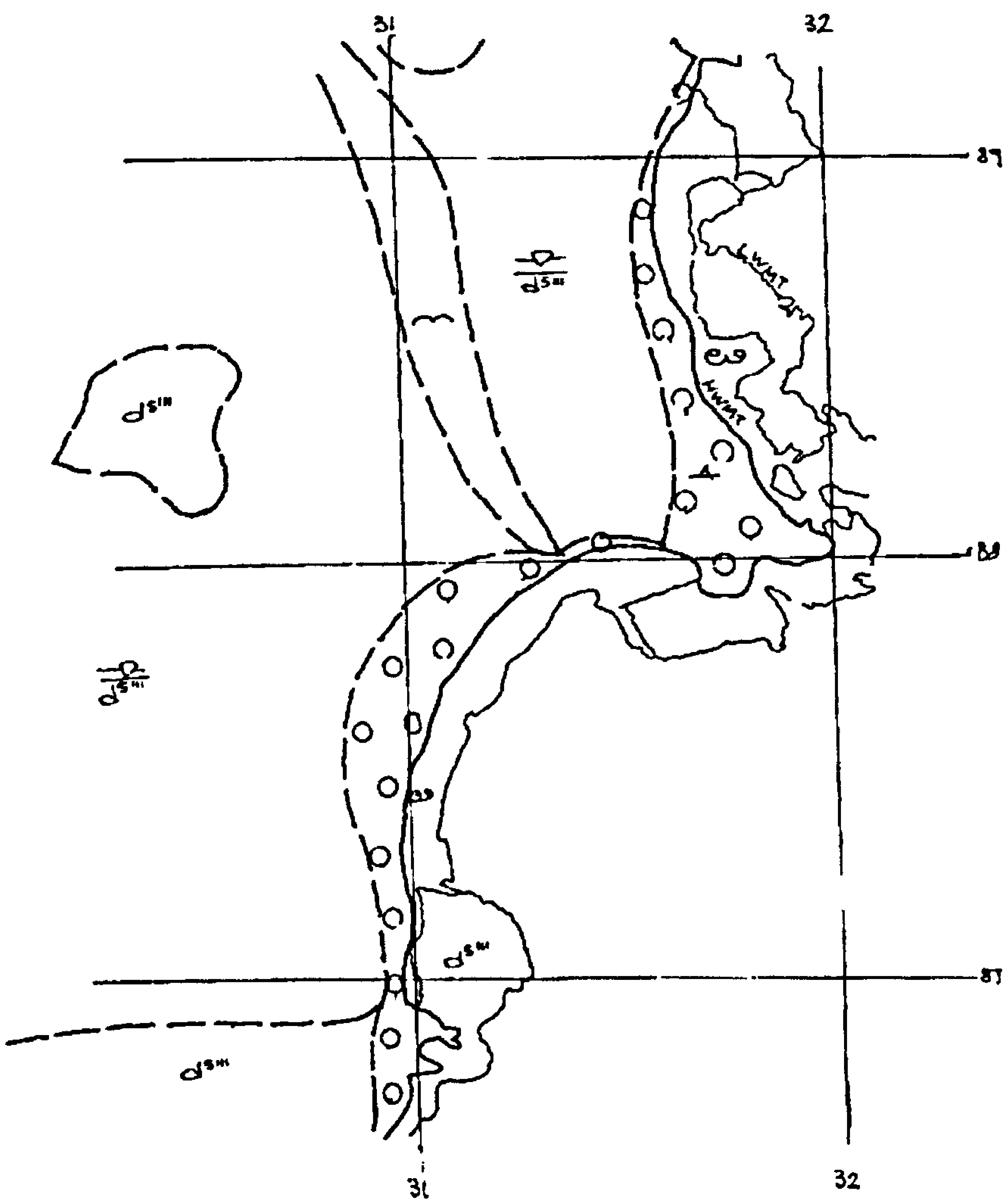
(5). There is a similar alignment in the row and division between blown sand with boulder clay. Geol.

NEWBIGGIN
NU 310875



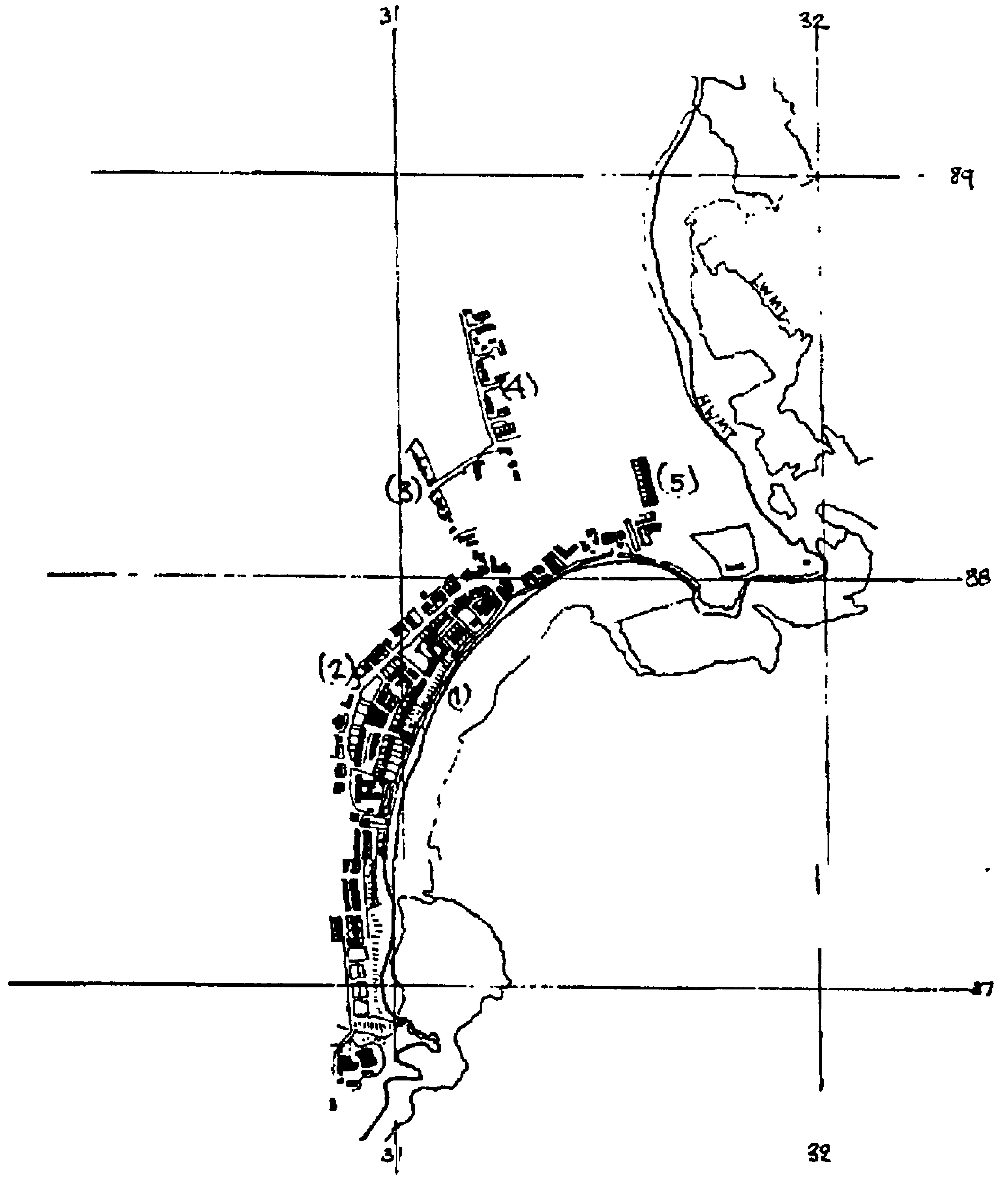
TOPOGRAPHY.

NEWBIGGIN
NU 310875



GEOLOGY.

NEWBIGGIN
NU 310875



SETTLEMENT CONFIGURATIONS.

CAMBOIS
NU 305840

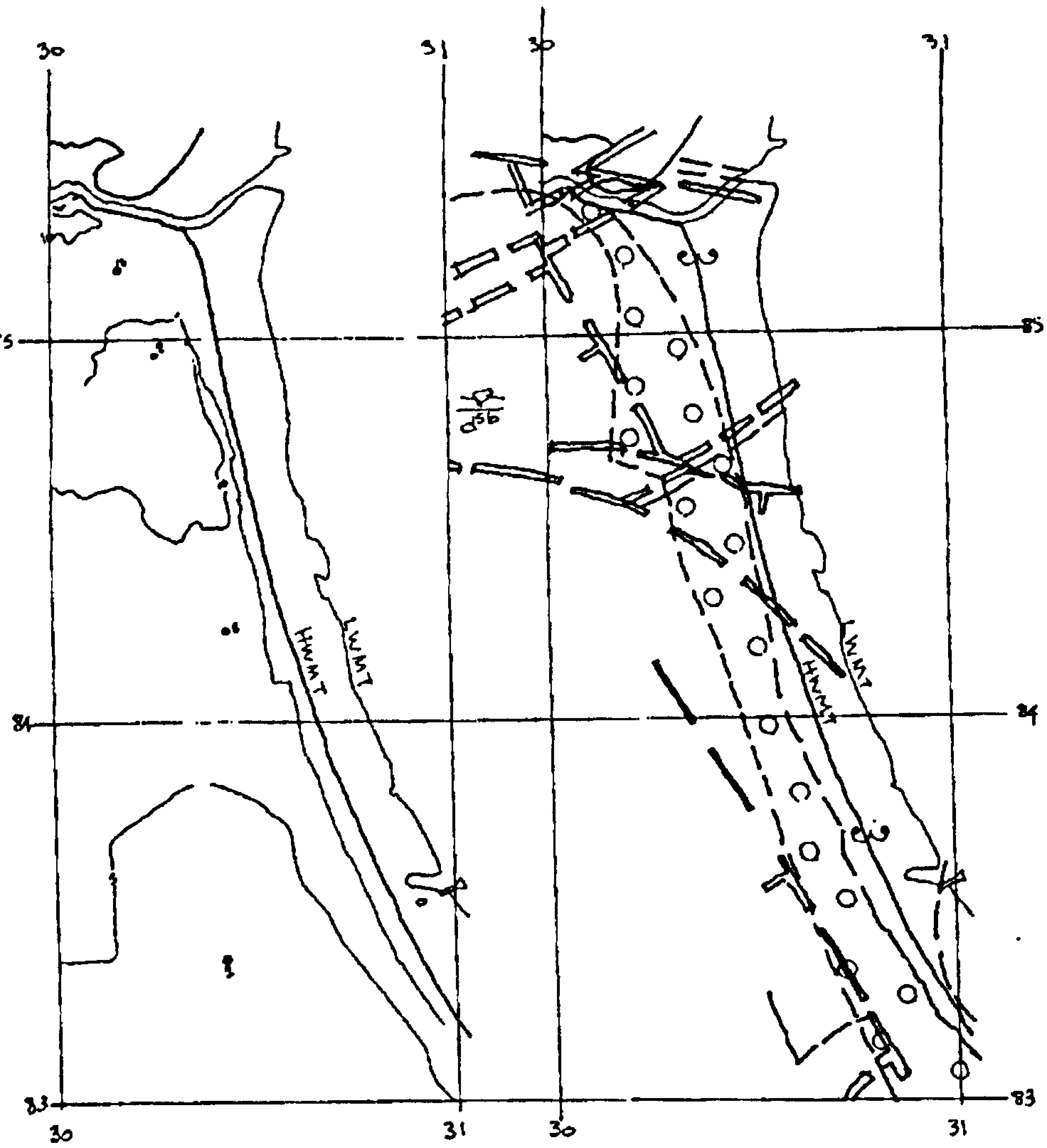
TOPOGRAPHY.
Contours and spot levels indicate the site rises gradually from HWMT to 13m.

GEOLOGY.
There are three structures and several faults. Bands of beach deposits and blown sand run along the coast. Boulder clay extends inland from these. Uncertain coal outcrops run N-S and E-W across the settlement site.

SETTLEMENT CONFIGURATIONS.

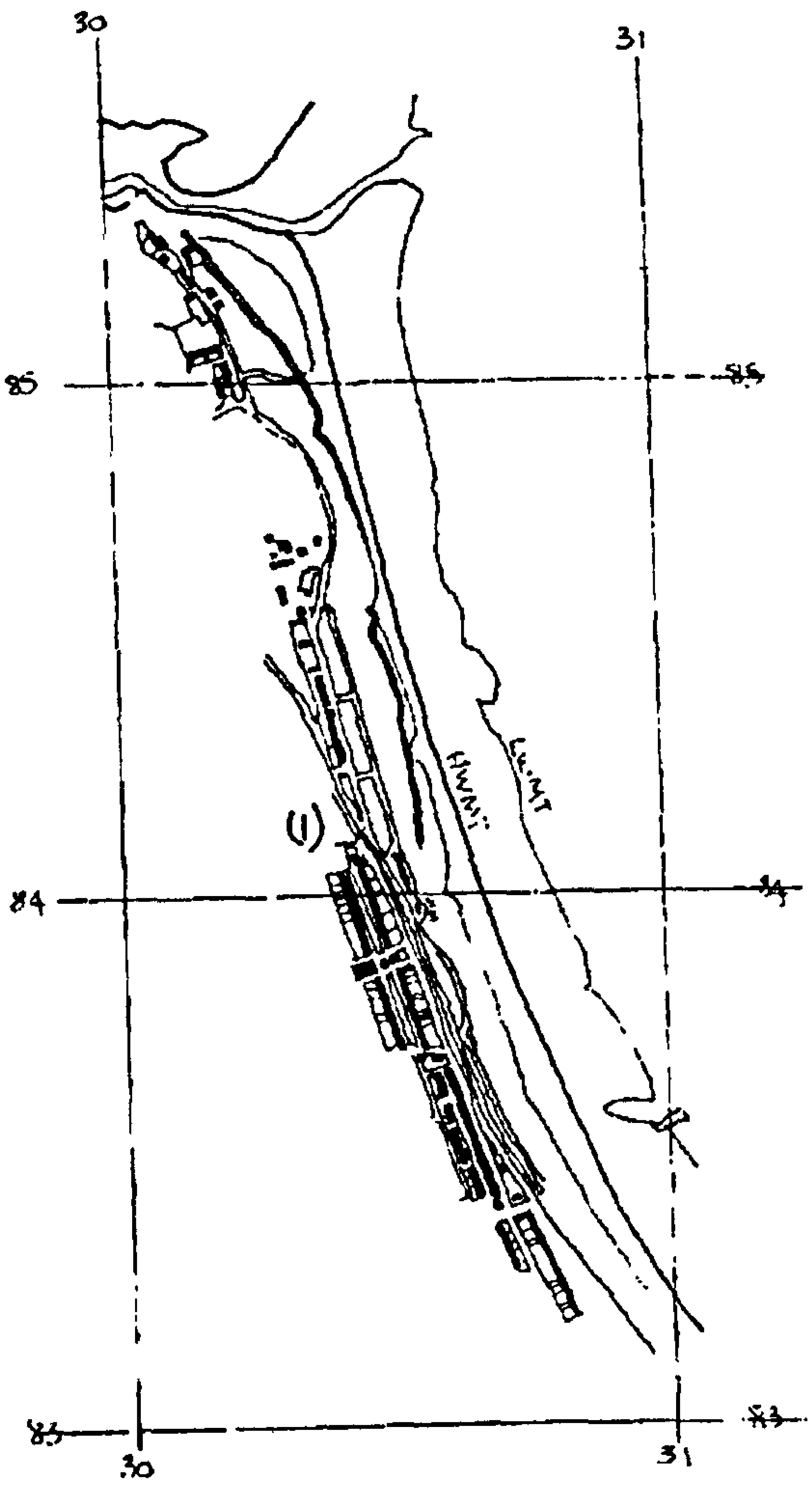
(1). There are similar alignments in rows and the division between boulder clay and blown sand and contours. Top., and Geol.

CAMBOIS
NU 305840



TOPOGRAPHY. GEOLOGY.

CAMBOIS
NU 305840



SETTLEMENT CONFIGURATIONS.

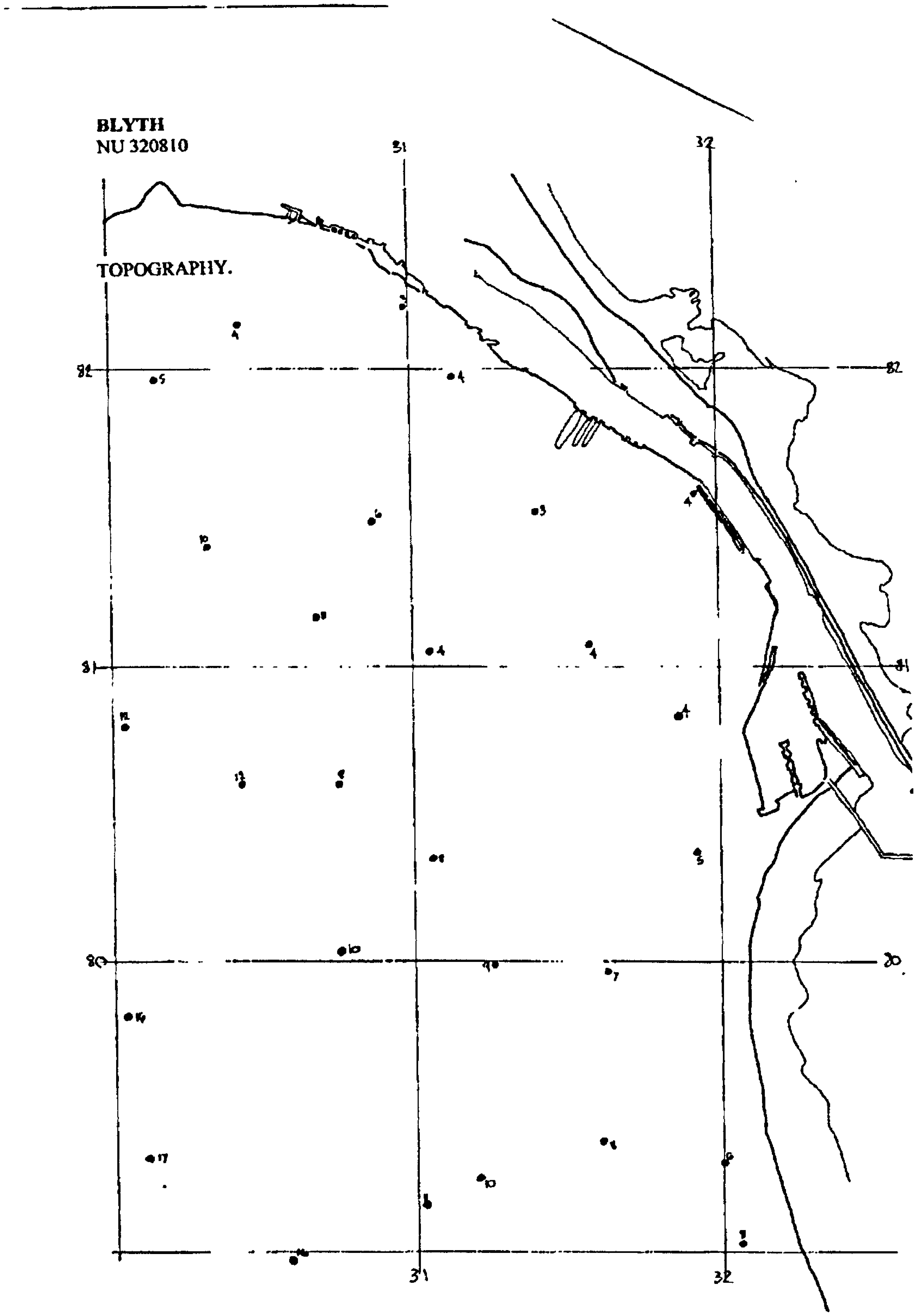
BLYTH
NU 320810

TOPOGRAPHY.
Spot levels indicate a rise from 3m to 16m across the settlement site. The site is at the mouth of the River Blyth.

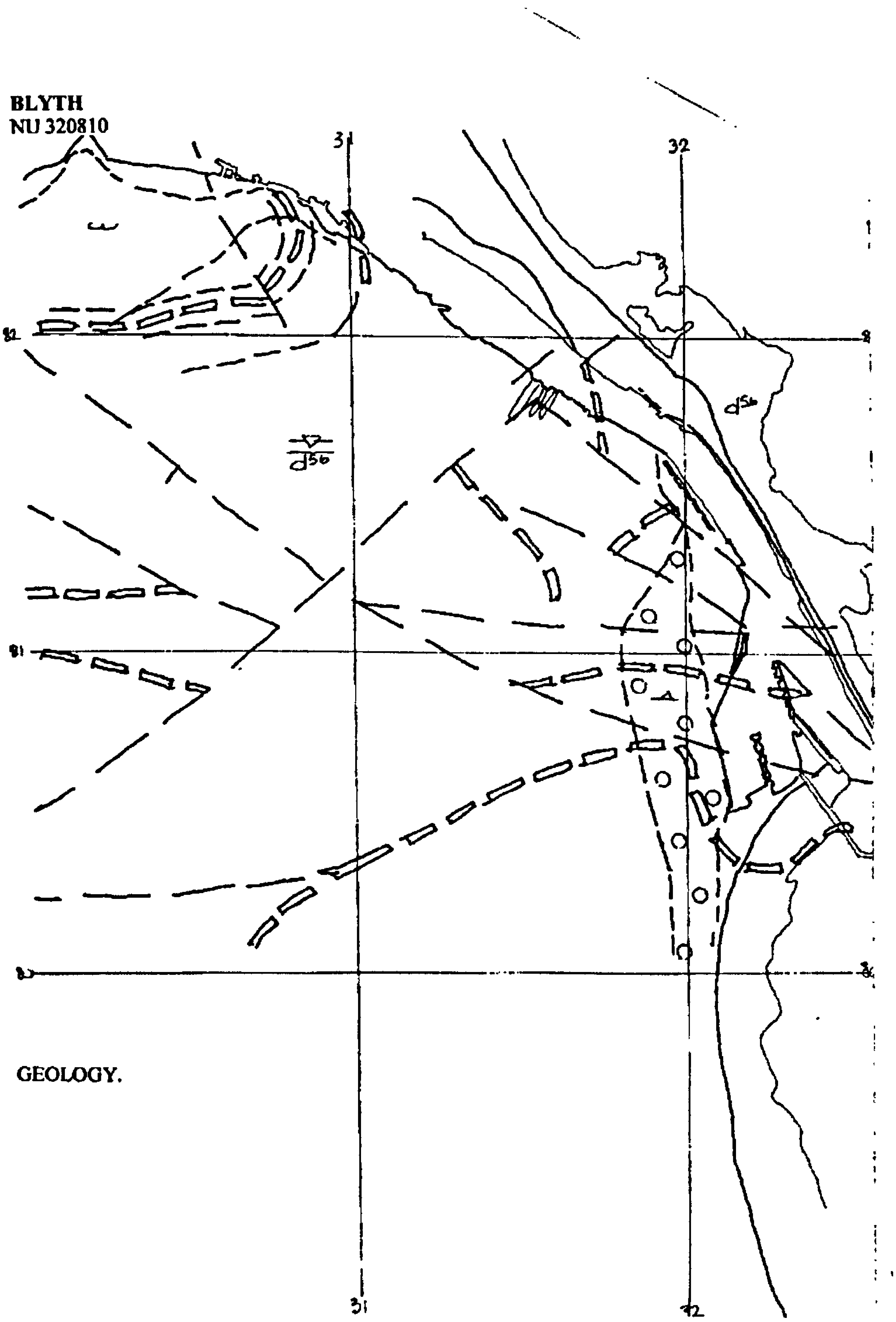
GEOLOGY.
There are three structures and several faults. Most of the site is covered in boulder clay. There are beach deposits to the NW and blown sand to the SE.
Coal outcrops cross the site in E-W directions.

SETTLEMENT CONFIGURATIONS.

(1). There are similar alignments in the rows and river frontage. Top., and Geol.

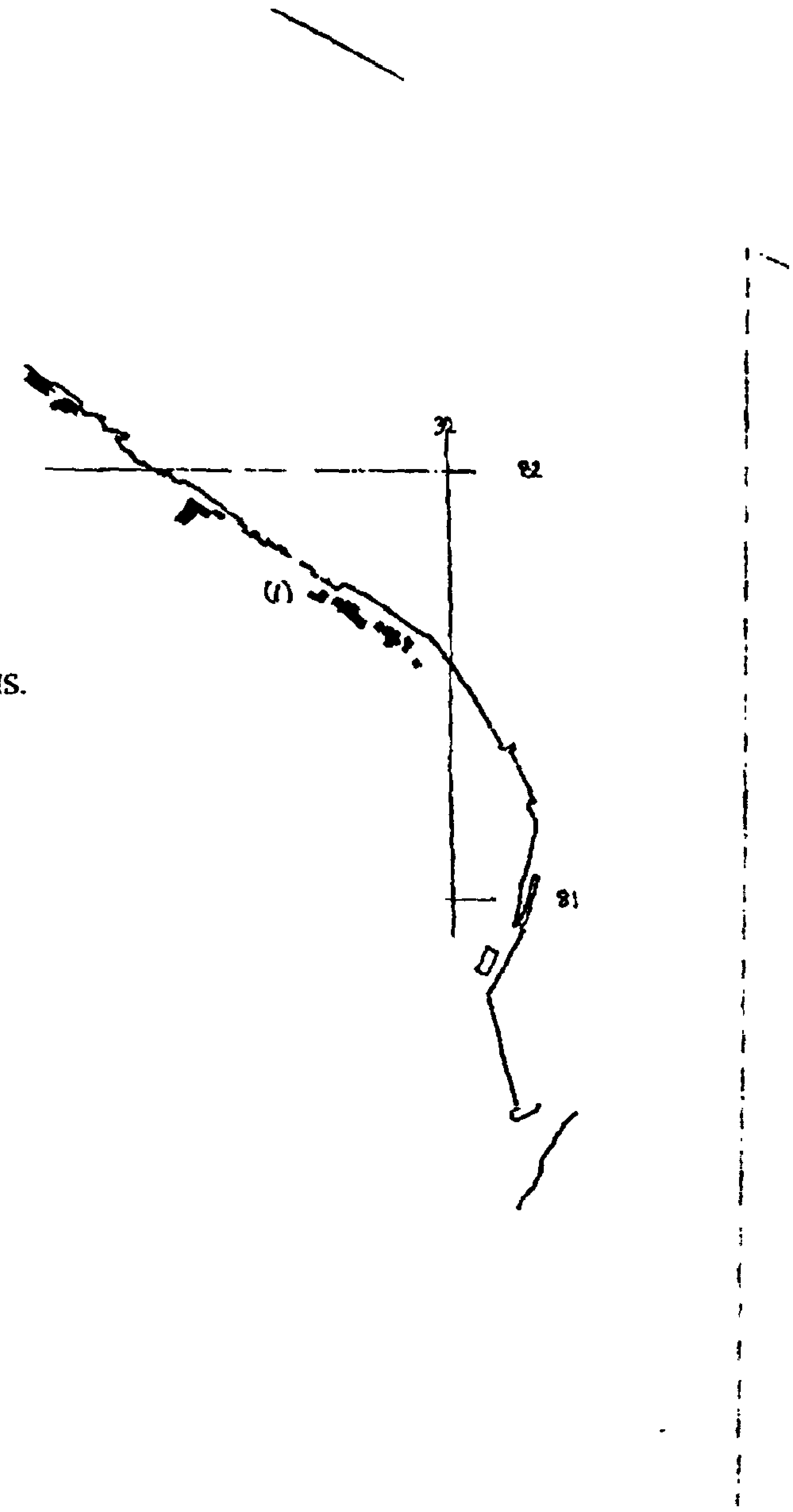

BLYTH
NU 320810
TOPOGRAPHY.
31
32
82
81
80

BLYTH
NU 320810



GEOLOGY.

BLYTH
NU 320810



SETTLEMENT CONFIGURATIONS.

SEATON SLUICE
NU 335765

TOPOGRAPHY.
Contours and spot levels indicate gradients from 5m to 30m. There is steep sided valley running N-S across the settlement site.

GEOLOGY.
There are four structures and several faults. A strip of blown sand follows the coast at the N of the site. Boulder clay covers the site generally. The valley has estuarine alluvium and limestone structures. Coal out-crops run E-W ans S-N across the site.

SETTLEMENT CONFIGURATIONS.

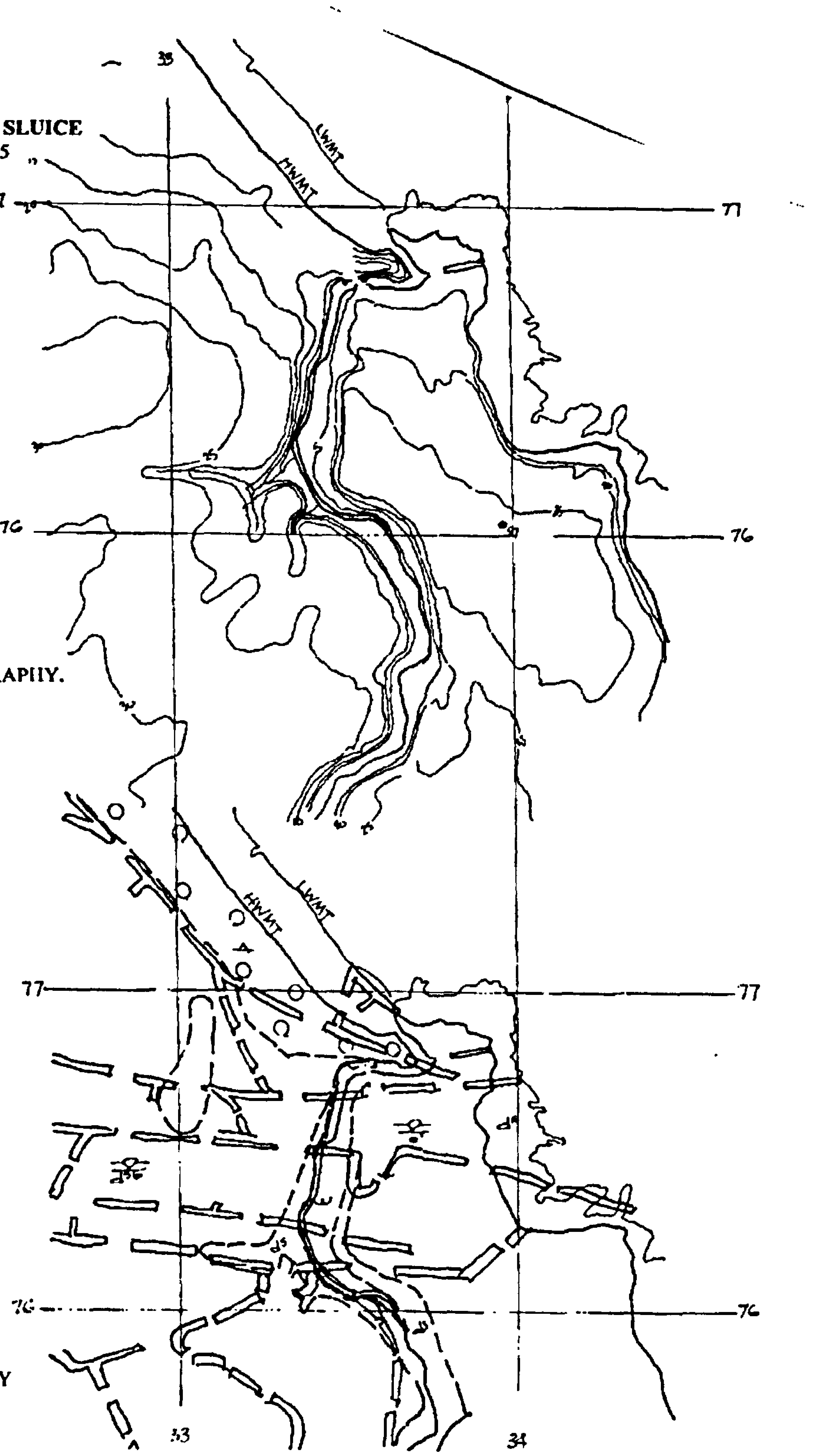
(1). Rows have a similar alignment to the division between boulder clay with blown sand. Geol;

(2). Rows have a similar alignment with a coal outcrop. Geol;

(3). Rows have a similar alignment with the coast. Top., and geol;

(4). Rows have a similar alignment to the division between limestone and boulder clay. Top., and Geol.

SEATON SLUICE
NU 335765

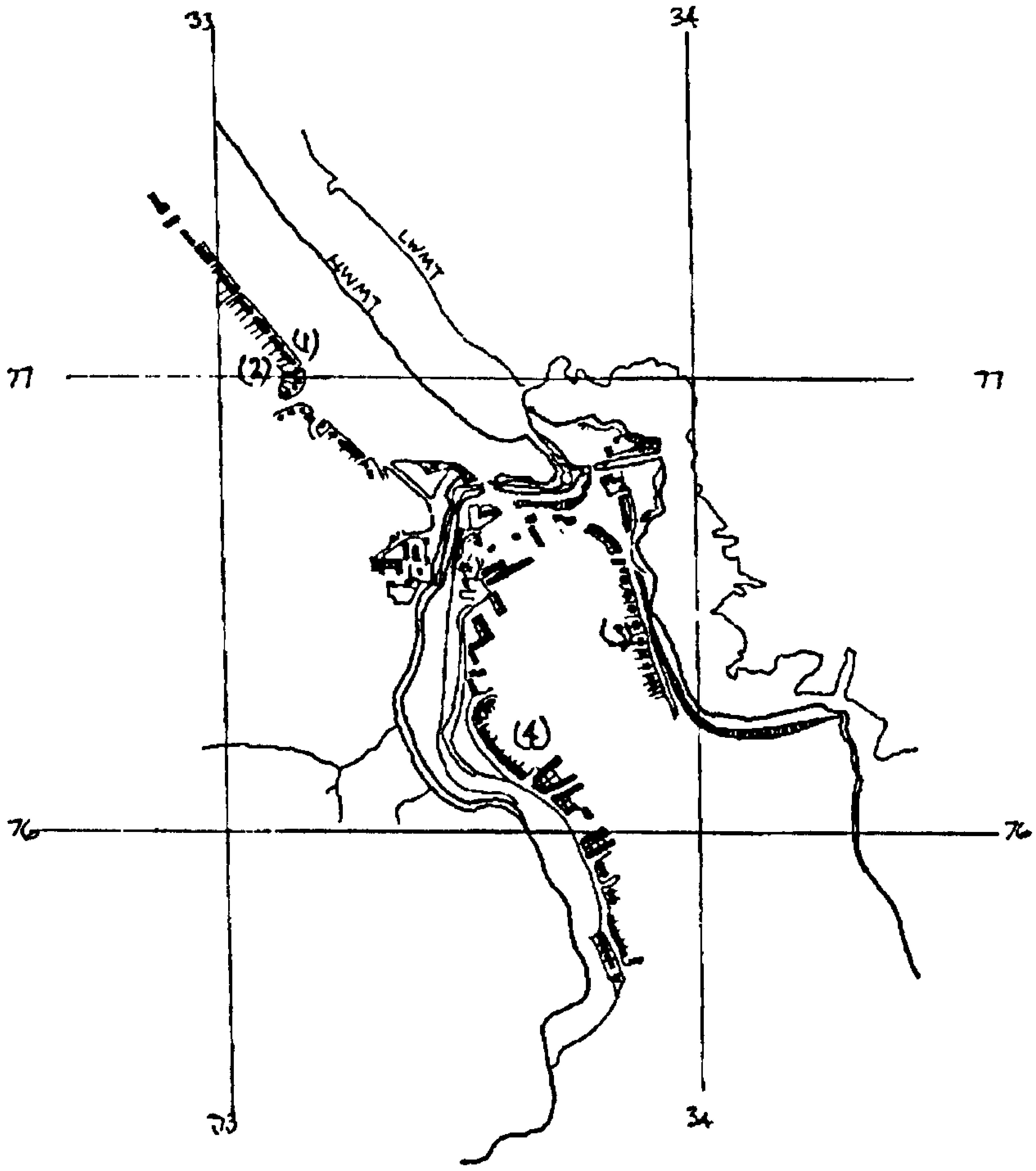


TOPOGRAPHY.

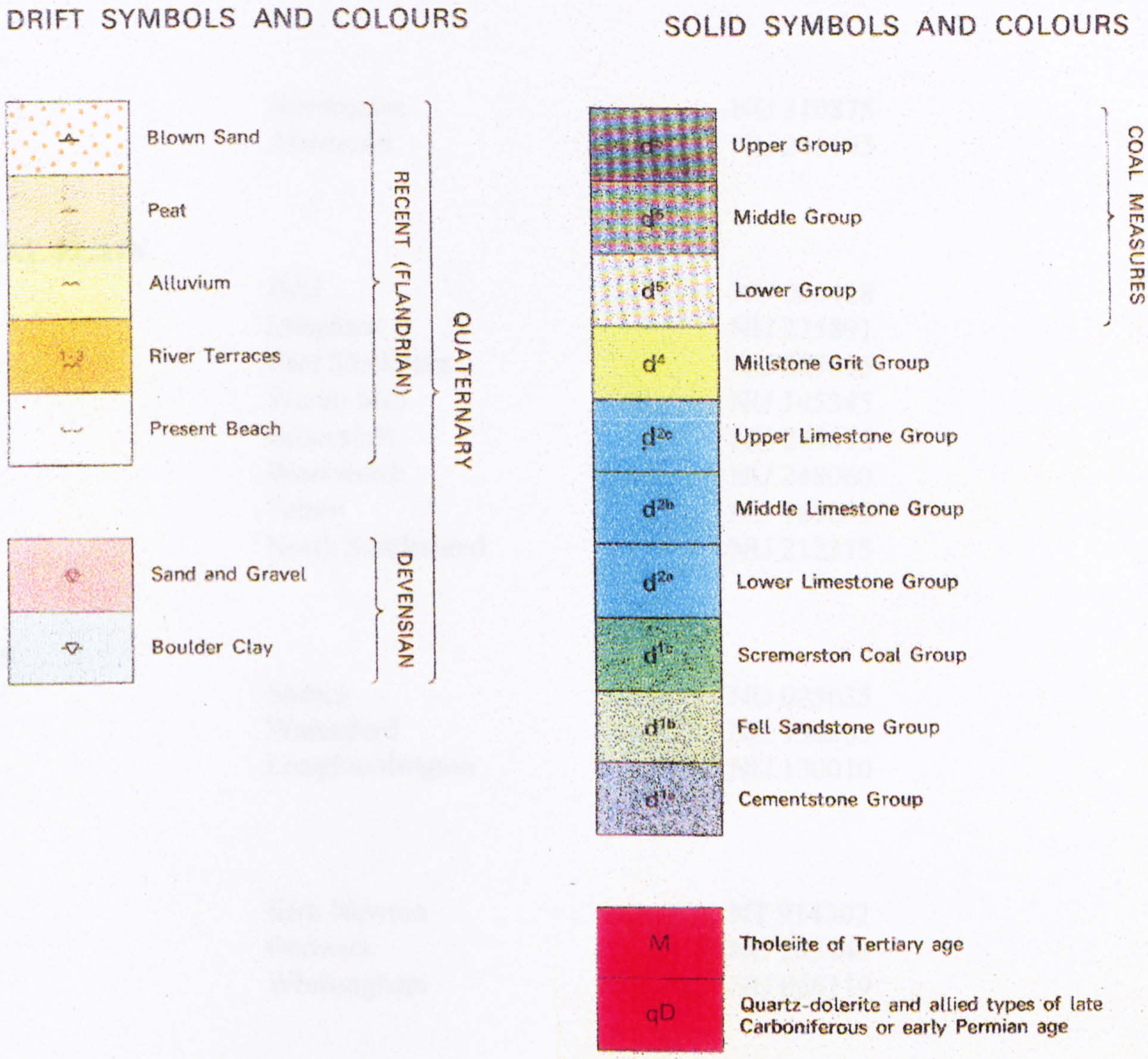
GEOLOGY

SEATON SLUICE
NU 335765

SETTLEMENT CONFIGURATIONS.



APPENDIX D.
Geological Survey Colours and Symbols.
SOURCE: Geological Survey 9 Drift Edition 1977. Scale 1:50 000.



APPENDIX E.
Sample Population List.

Assigned Number	Name	OS Ref
COAST		
013	Newbiggin	NU 310875
009	Alnmouth	NU 246105
COASTAL PLAIN		
021	Beal	NU 006428
074	Longhirst	NU 225891
084	East Sleekburn	NU 287835
031	Waren Mill	NU 145345
062	Broomhill	NU 245015
055	Warkworth	NU 248060
063	Felton	NU 185005
036	North Sunderland	NU 212315
SCARPS		
124	Snitter	NU 025035
106	Warenford	NU 136285
125	Longframlington	NU 130010
VALES		
164	Kirk Newton	NT 914302
184	Denwick	NU 205143
187	Whittingham	NU 066119
LOW PLATEAU		
229	Ogle	NZ 140790
215	Hebron	NZ 195898
240	Black Callerton	NZ 175699
232	Fenwick	NZ 057729
225	Tranwell	NZ 189836
239	Woolsington	NZ 197698

NORTH TYNE and REDESDALE

261	Chollerton	NY 932721
252	Redesmouth	NY 866822
259	Barrasford	NY 916735

TYNE VALLEY north side

278	Melkridge	NY 739640
268	Ovington	NZ 066638
284	Bywell	NZ 049615
277	Bardon Mill	NY 780646
282	Gilsland	NY 636664
270	Corbridge	NY 990645

Sub populations	<20				20-300				300<			
	x	C	RC	R	x	C	Rc	R	x	C	Rc	R
Strata 1		2				9				5		
Coast	1	1	0	0	5	1	1	2	0	1	3	1
		013						**009**				
Strata 2		41				28				7		
Coastal Plain	21	7	4	9	6	14	6	2	1	1	4	1
	021	**074**	**084**	**031**	**062**		**055**		**036**			
Strata 3		29				19				0		
Scarps	27	0	0	2	14	0	0	5	0	0	0	0
	124			**106**	**125**							
Strata 4		49				14				4		
Vales	30	0	0	19	6	0	0	8	0	0	0	4
	164			**184**				**187**				
Strata 5		21				11				1		
Low Plateau	11	1	2	7	4	1	1	5	0	0	0	1
	229		**240**	**232**		**225**	**239**					
Strata 6		17				6				0		
North Tyne valley & Redesdale	6	0	0	11	4	0	0	2	0	0	0	0
	261			**252**	**259**							
Strata 7		9				10				2		
Tyne valley north side	6	2	0	1	1	1	2	6	0	0	0	2
	278	**268**		**284**	**277**			**282**				**270**

Table E1 Summary of stratified sample selection from the total population list.

APPENDIX F.
Survey Data Sheets for the Sample Population of Settlements.
STRATA 2
COASTAL PLAIN

Settlement(y) number: 021 Name: BEAL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 066428	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: <20ᵗ	NO	NO	2 2

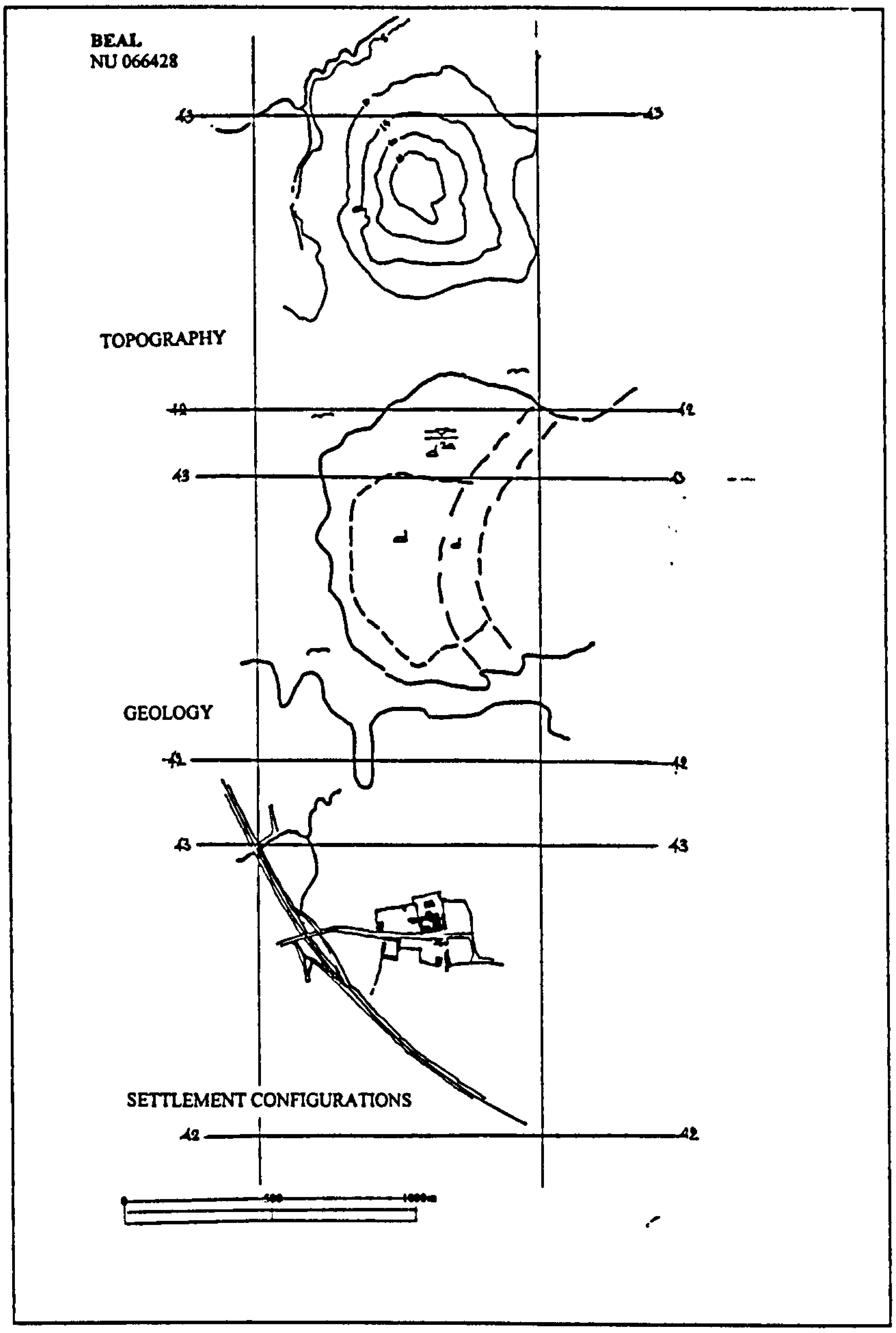
Map Refs:	1991	Ordnance Survey Landranger 75	Scale 1:50 000
	1981	Ordnance Survey	Scale 1:10 000
	1970	Geological Survey 4 Drift	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is at the top and immediately around a hill. This is shown by contours running in a circular pattern. The summit is occupied by a farm. Buildings radiate from this central form around the S slope.

GEOLOGY(x_2)

The settlement is constructed on a limestone outcrop surrounded by boulder clay superficial deposits. The division between the outcrop and boulder clay is oval in shape. Building configurations are arranged in a radial pattern from the centre of the oval outcrop.



Settlement(y) number: 074 Name: LONGHIRST	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 225891	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: <20Cx	NO	NO	2 2

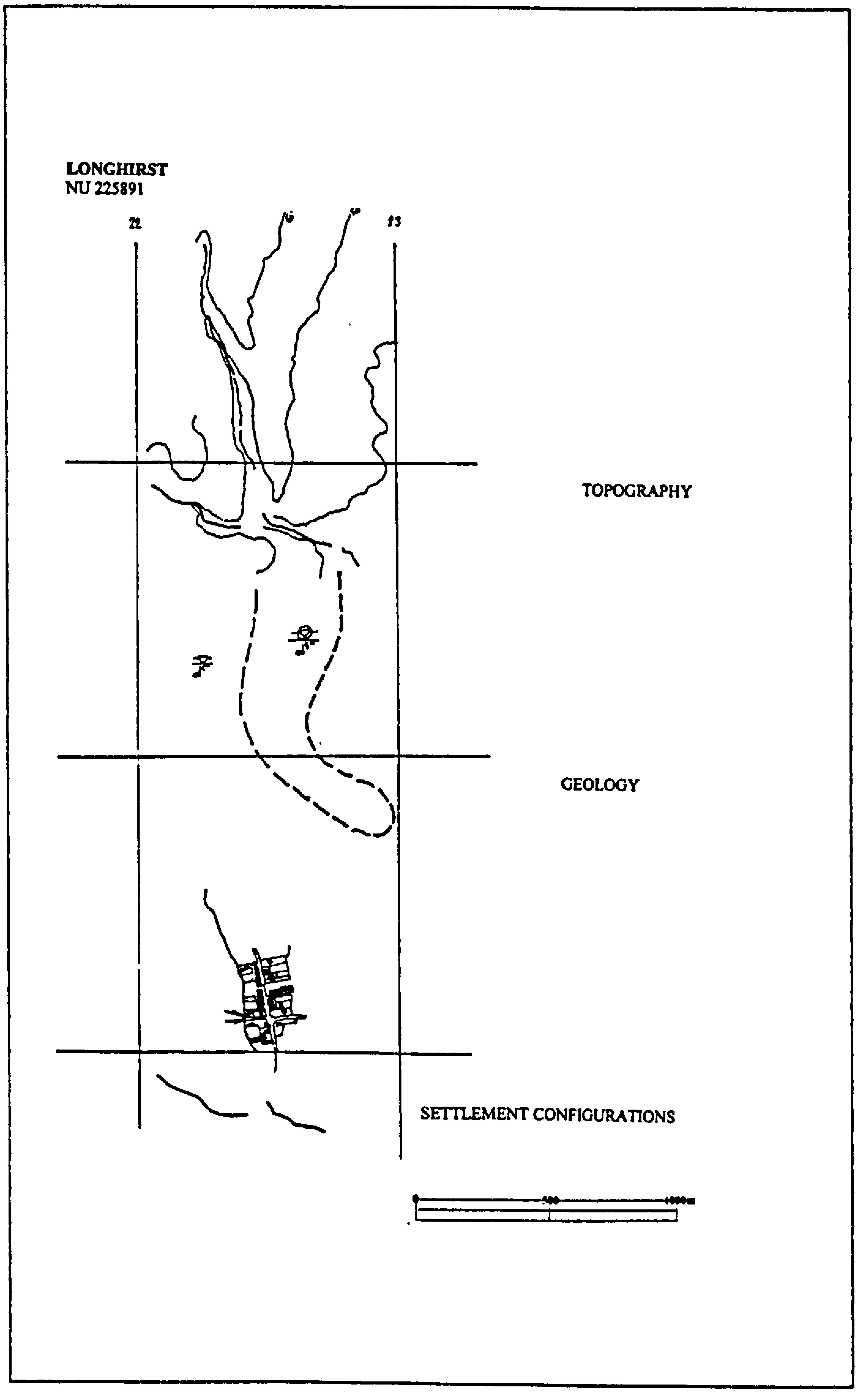
Map Refs:	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey Pathfinder 524	Scale 1:25 000
	1977	Geological Survey Drift 9	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is to the E of Longhirst Burn which runs in a N-S direction. Contours follow the direction of the Burn. Building configurations follow the direction of the contours in a N-S direction.

GEOLOGY(x_2)

The settlement is located on a sand and gravel superficial deposition on limestone bedrock. Boulder clay deposition is to the E, W and S. Building configurations follow the division between boulder clay and sand and gravel depositions.



Settlement(y) number: 084 Name: EAST SLEEKBURN	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 287835	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: <20RCx	NO	NO	2 2

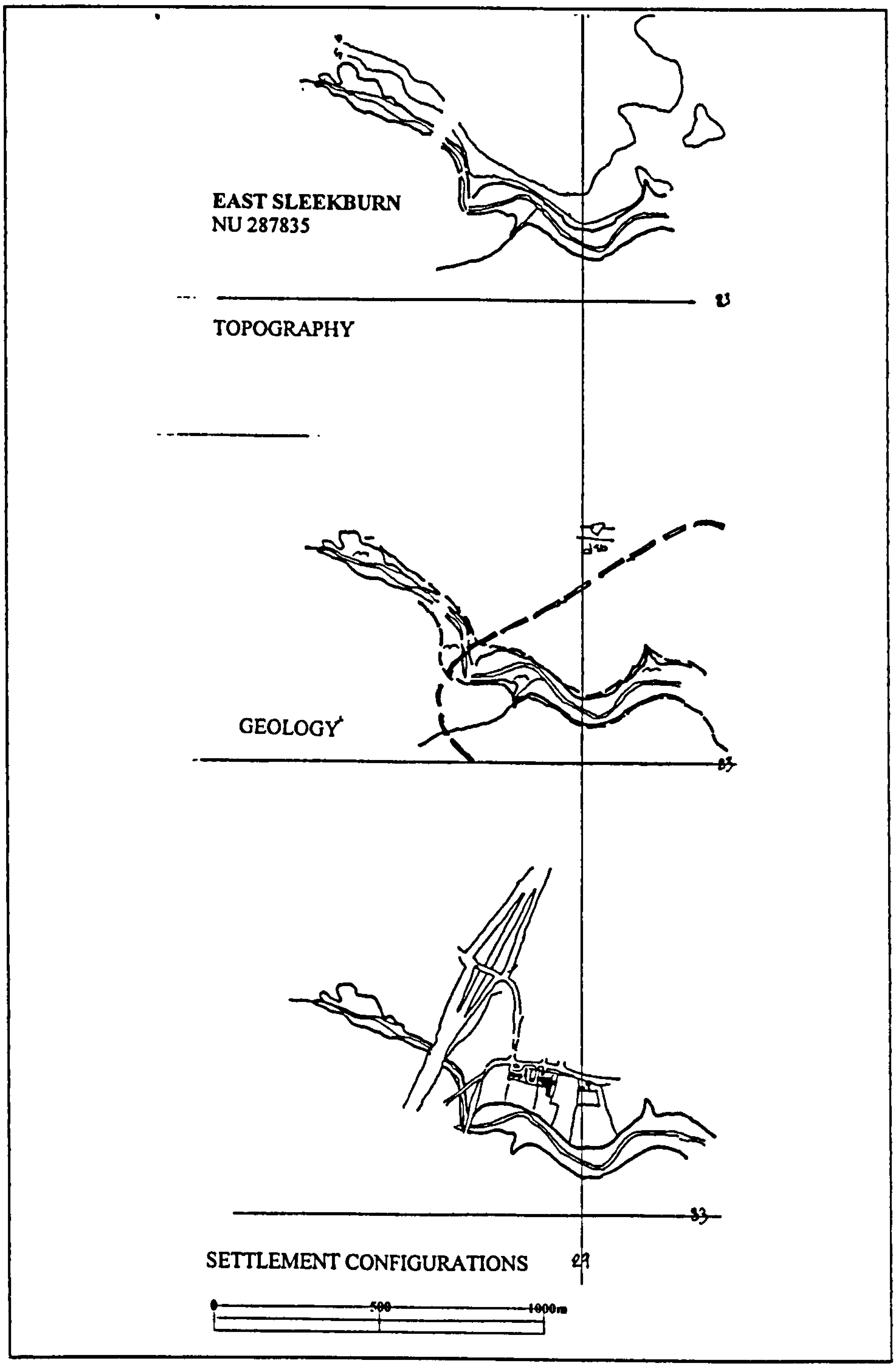
Map Refs:	1987	Ordnance Survey Landranger 81	Scale 1:50 000
	1977	Ordnance Survey	Scale 1:10 000
	1968	Geological Survey Drift 15	Scale 1:50 000

TOPOGRAPHY(x_1).

The location of the site is to the N of Sleek Burn running in an E-W direction. Contours follow the Burn with a short incline forming a bank. This flattens at the site. Building configurations follow the direction of the contours.

GEOLOGY(x_2)

The settlement is located on boulder clay. This forms a division with alluvium which follows the direction of the river. Building configurations follow the division between boulder clay and alluvium.



Settlement(y) number: 031 Name: WAREN MILL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 145345	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

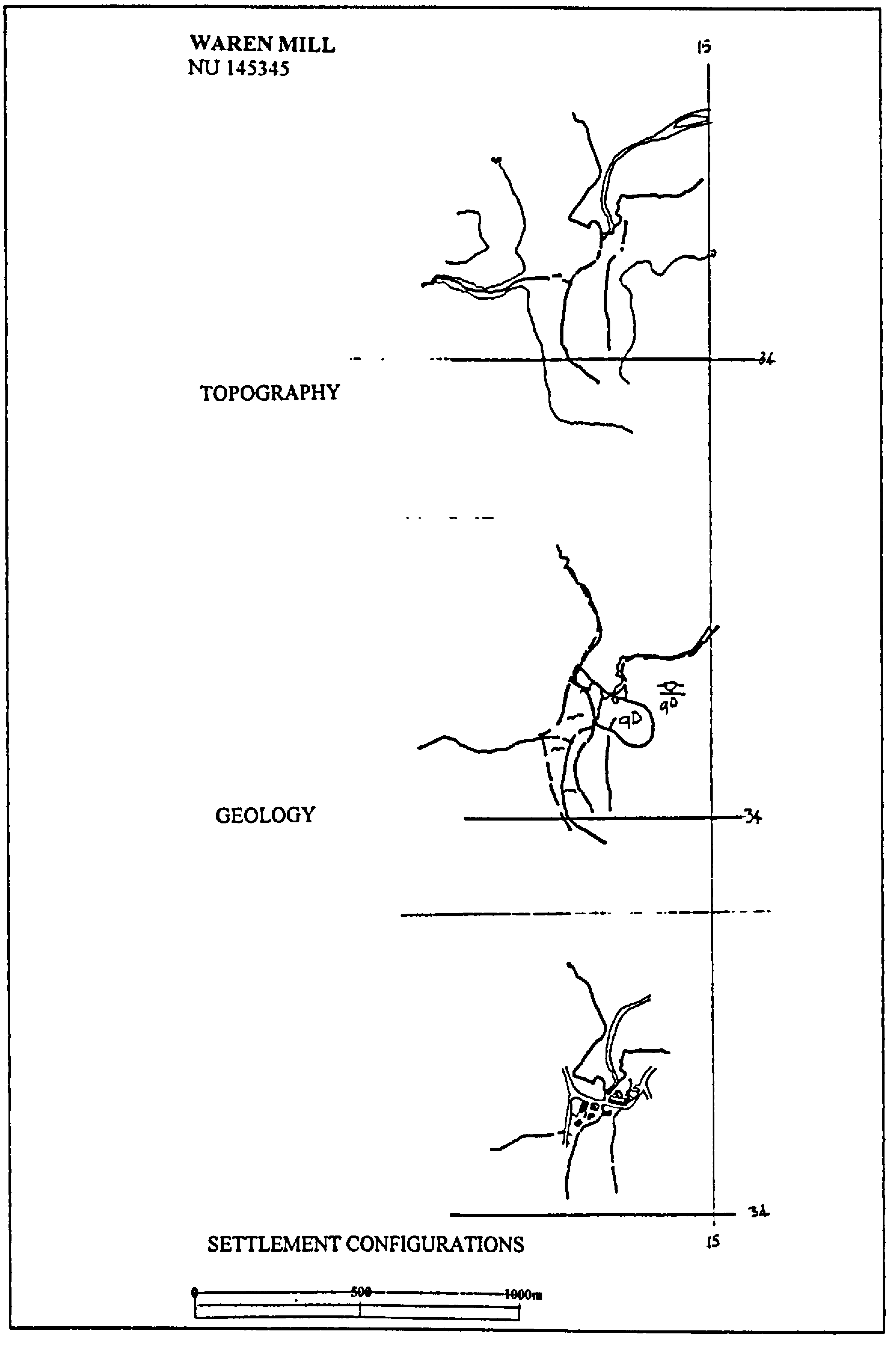
Map Refs:	1991	Ordnance Survey Landranger 75	Scale 1:50 000
	1970	Ordnance Survey	Scale 1:10 560
	1970	Geological Survey Drift 4	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is on the E and W banks of Waren Burn where it meets Chesterhill Slakes and Budle Bay. The Burn flows in a S-N direction. Contours follow the direction of the Burn. Building configurations follow the Burn along each bank.

GEOLOGY(x_2)

The settlement is located on alluvium and quartz dolerite. These form divisions with boulder clay superficial deposits on both sides of the Burn. Building configurations follow these divisions.



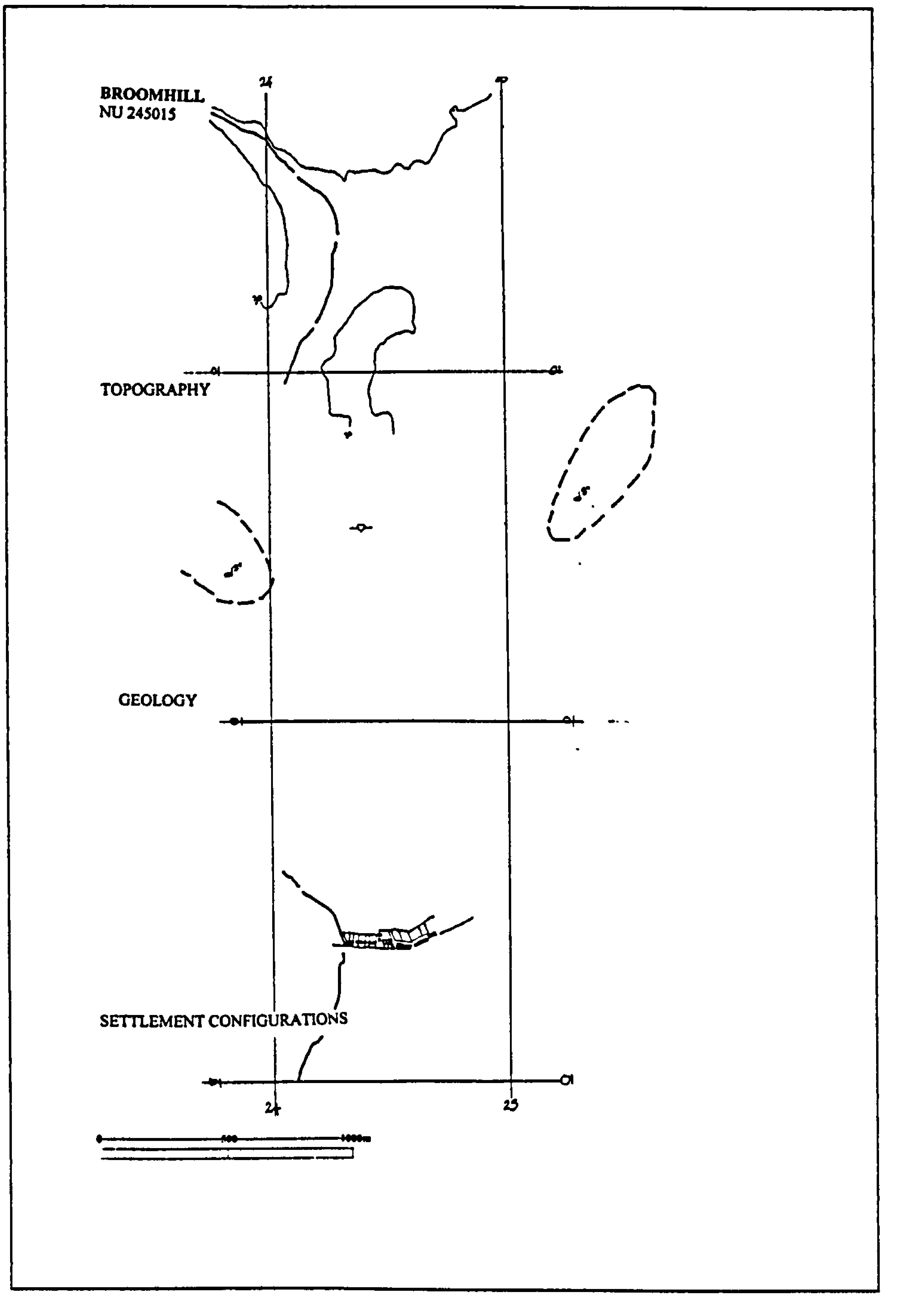
Settlement(y) number: 062 Name: BROOMHILL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 245015	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: 20-300Cx	NO	NO	2 2

Map Refs:	1987	Ordnance Survey Landranger 81	Scale 1:50 000
	1982	Ordnance Survey	Scale 1:10 560
	1977	Geological Survey Drift 9	Scale 1:50 000

TOPOGRAPHY(x_1). The location of the site is near the western limit of coal measures to the east of Woodside Burn. Contours follow the Burn in a NW-SE direction then change to an E-W and S-N direction. Building configurations follow the contour to the N of the site in an E-W direction.

GEOLOGY(x_2)

The settlement is located on boulder clay. There are no similarities between geological divisions and settlement configurations



Settlement(y) number: 055 Name: WARKWORTH	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 248060	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: 20-300RCx	NO	NO	2 2

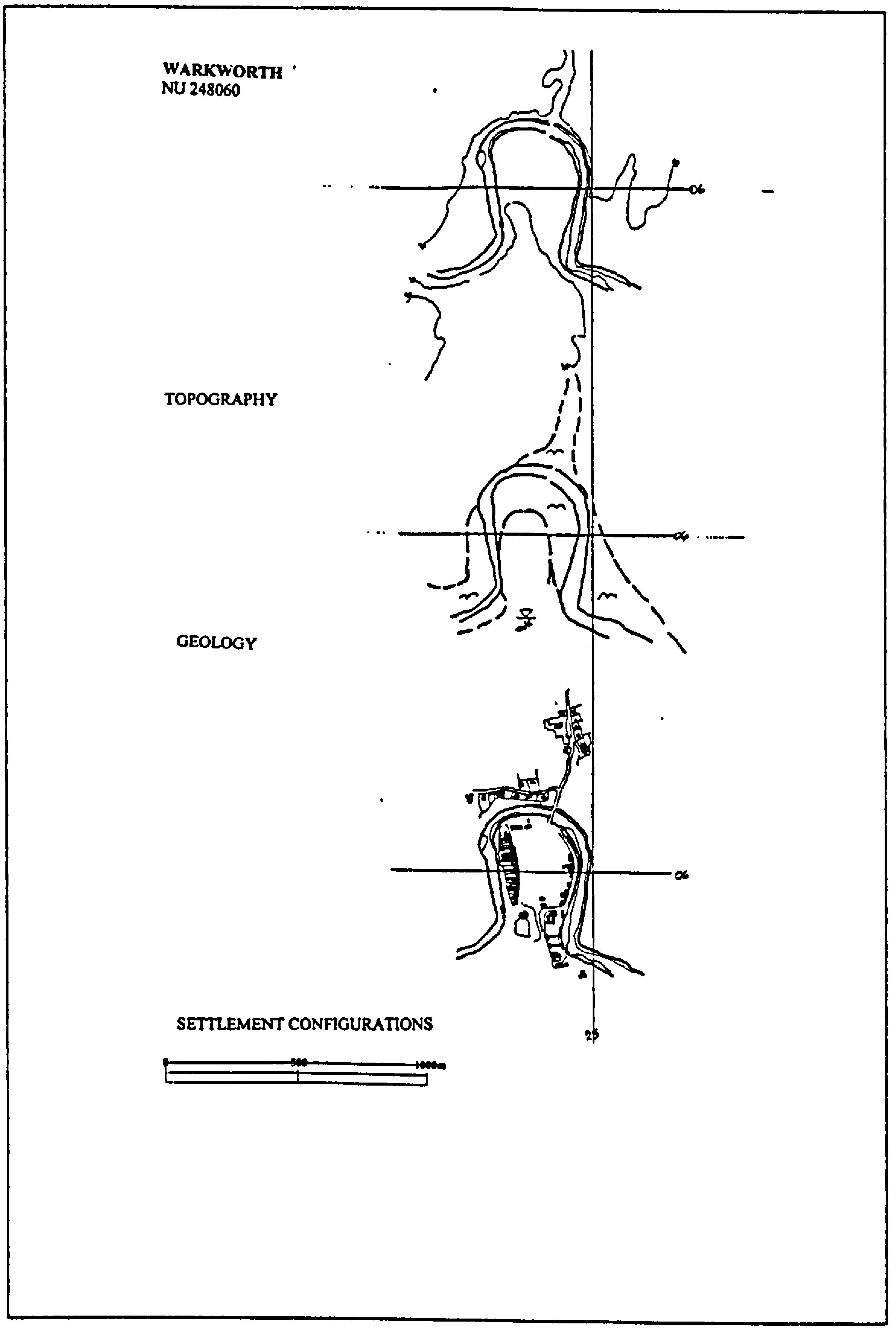
Map Refs:	1987	Ordnance Survey Lnandranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 560
	1972	Geological Survey Drift 6	Scale 1:50 000
	1977	Geological Survey Drift 9	Scale 1:50 000

TOPOGRAPHY(x_1).

The location of the site is on a peninsula of the River Coquet and along a Valley running N-S to the N of the peninsula. Warkworth Castle occupies an elevated hill to the S of the settlement Building configurations follow the curve of the peninsula and the N-S valley to the N.

GEOLOGY(x_2)

The settlement is located on boulder clay superficial deposits and alluvium. Building configurations follow the division between boulder clay and alluvium along the valley to the N of the settlement. They also follow the division to the SE of the peninsula and the curve of the River Coquet. Castle Street runs along the centre of the boulder clay deposition within the peninsula.



Settlement(y) number: 036 Name: NORTH SUNDERLAND	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 212315	YES	NO	1 2
Strata: 2	NO	YES	2 1
Sub-population: 300<x	NO	NO	2 2

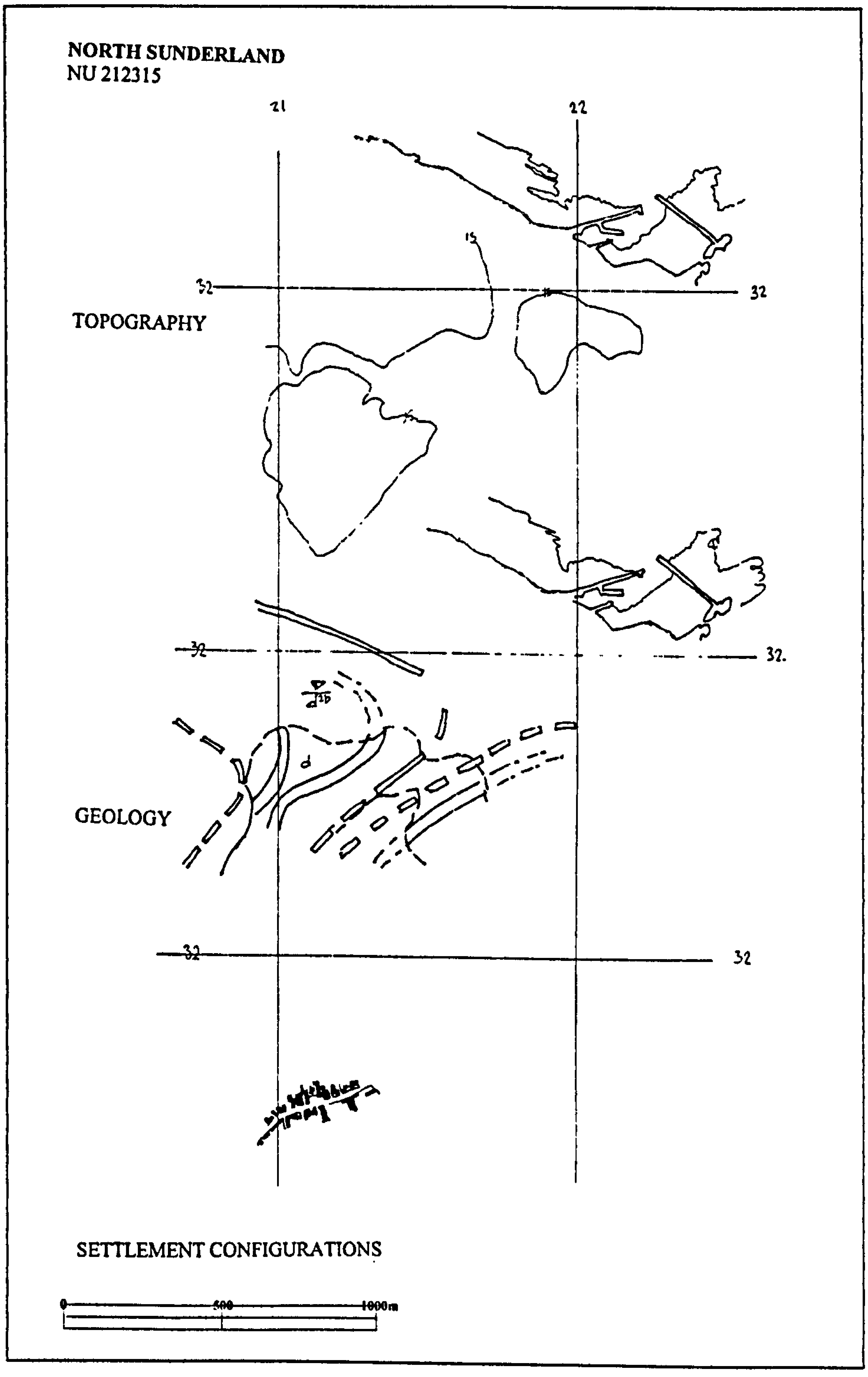
Map Refs:	1991	Ordnance Survey Landranger 75	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1970	Geological Survey Drift 4	Scale 1:50 000

TOPOGRAPHY(x_1).

The site is located to the W of and adjoining the coastal settlement of Seahouses. Contours form two hills. The settlement is in two parts. The W part follows the circular shape of the hill and is located almost evenly over it. The second part which runs towards the coast follows the direction of the contour immediately to the north.

GEOLOGY(x_2)

The settlement is located on a limestone outcrop. Boulder clay superficial deposit surrounds the outcrop. There are several faults running across the site in a SW-NE direction. Building configurations follow the direction of the limestone outcrop.



SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations <20				20-300				300<				outcome (v)
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
021	2	x												1 1
074	2		Cx											1 1
084	2			RCx										1 1
031	2				Rx									1 1
062	2						Cx							1 2
055	2							RCx						1 1
036	2									x				1 1

STRATA 3
SCARPS

Settlement(y) number: 124 Name: SNITTER	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 025035	YES	NO	1 2
Strata: 3	NO	YES	2 1
Sub-population: <20x	NO	NO	2 2

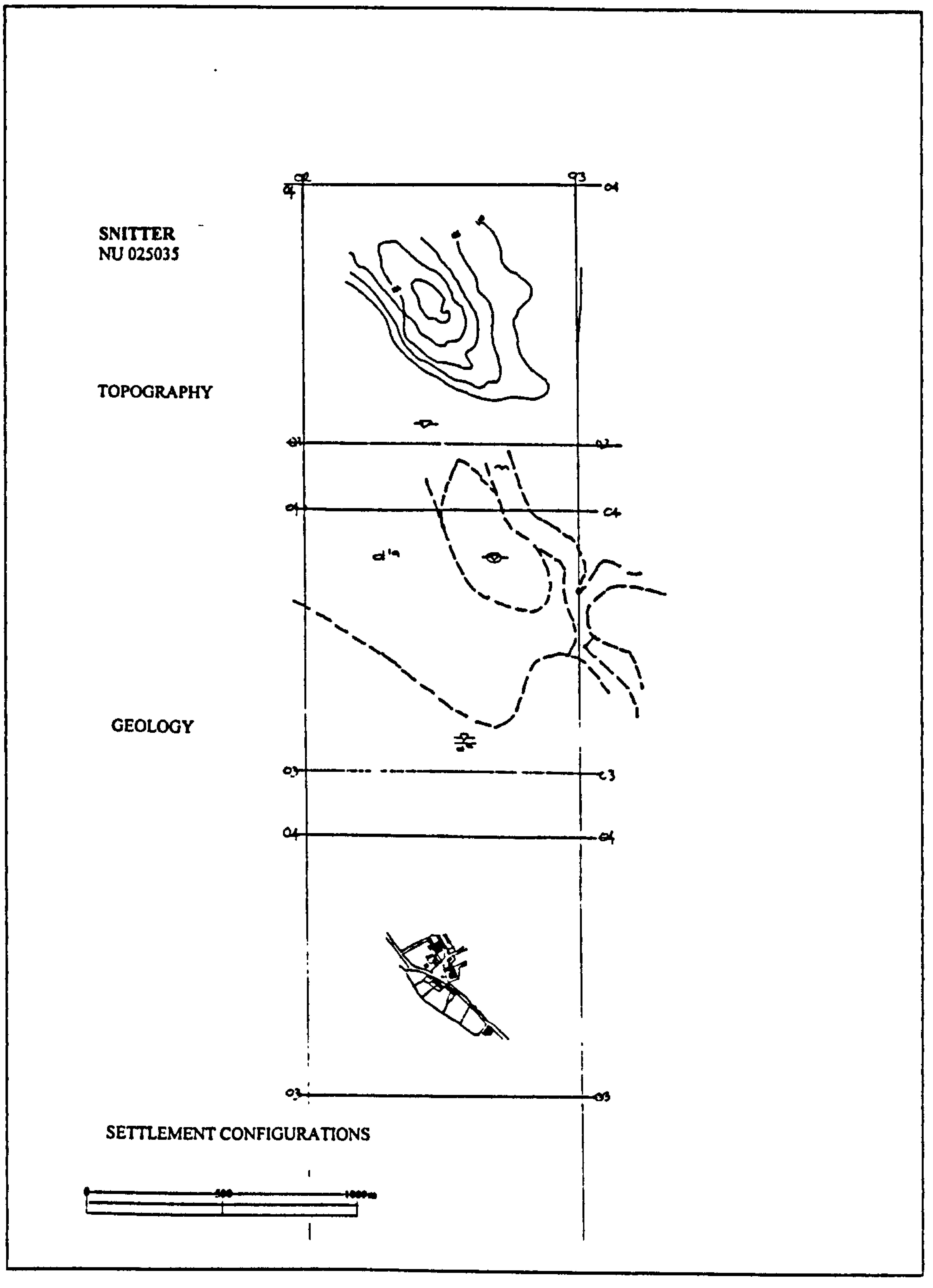
Map Refs:	1989	Ordnance Survey Pathfinder 500	Scale 1:25 000
	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1977	Geological Survey	Scale 1:50 000

TOPOGRAPHY(x_1)

The site is located on a summit of a hill at 130m. Contours show a steep rise to the NE and SW. It is shallower to the NW and SE. Building configurations follow the direction of the contours in a NW- SE direction.

GEOLOGY(x_2)

The settlement is located on an oval sand and gravel deposition on cementstone bedrock. Building configurations follow the division between sand and gravel, and cementstone.



Settlement(y) number: 106 Name: WARENFORD	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 136285	YES	NO	1 2
Strata: 3	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

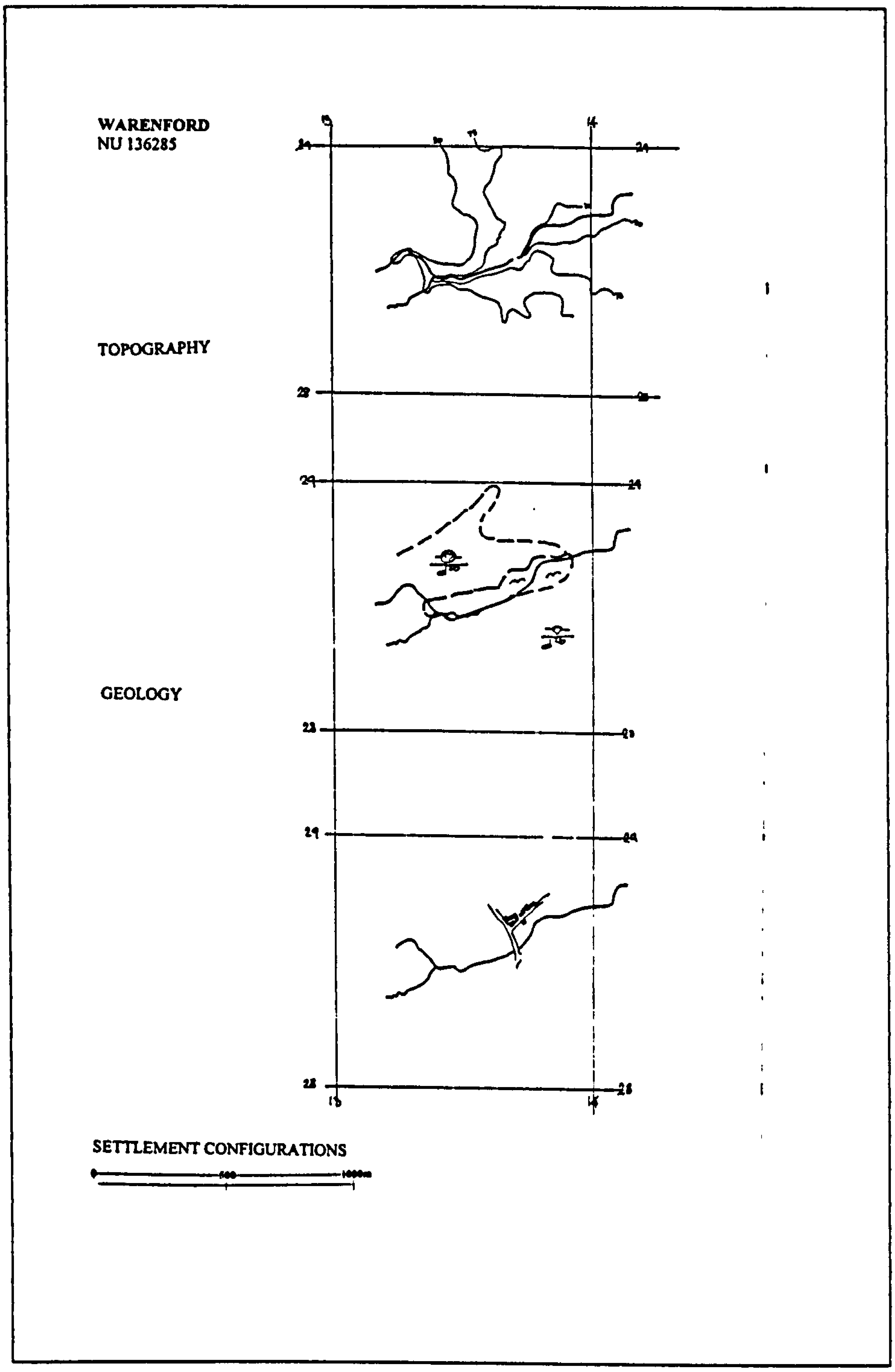
Map refs:	1991	Ordnance Survey Landranger 75	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1953	Geological Survey Drift	Scale 1:50 000

TOPOGRAPHY(x_1)

The site is located on the NW and SE banks of Waren Burn. Contours show the ground rising generally in a SW direction. Localised contours follow the banks of the Burn. Building configurations follow the contours along the NW bank of the burn.

GEOLOGY(x_2)

The settlement is located on sand and gravel on the N side of the burn, and boulder clay on the S side of the burn. Building configurations follow the division between sand and gravel and alluvium on the north side of the burn.



Settlement(y) number: 125 Name: LONGFRAMLINGTON	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 130010	YES	NO	1 2
Strata: 3	NO	YES	2 1
Sub-population: 20<300x	NO	NO	2 2

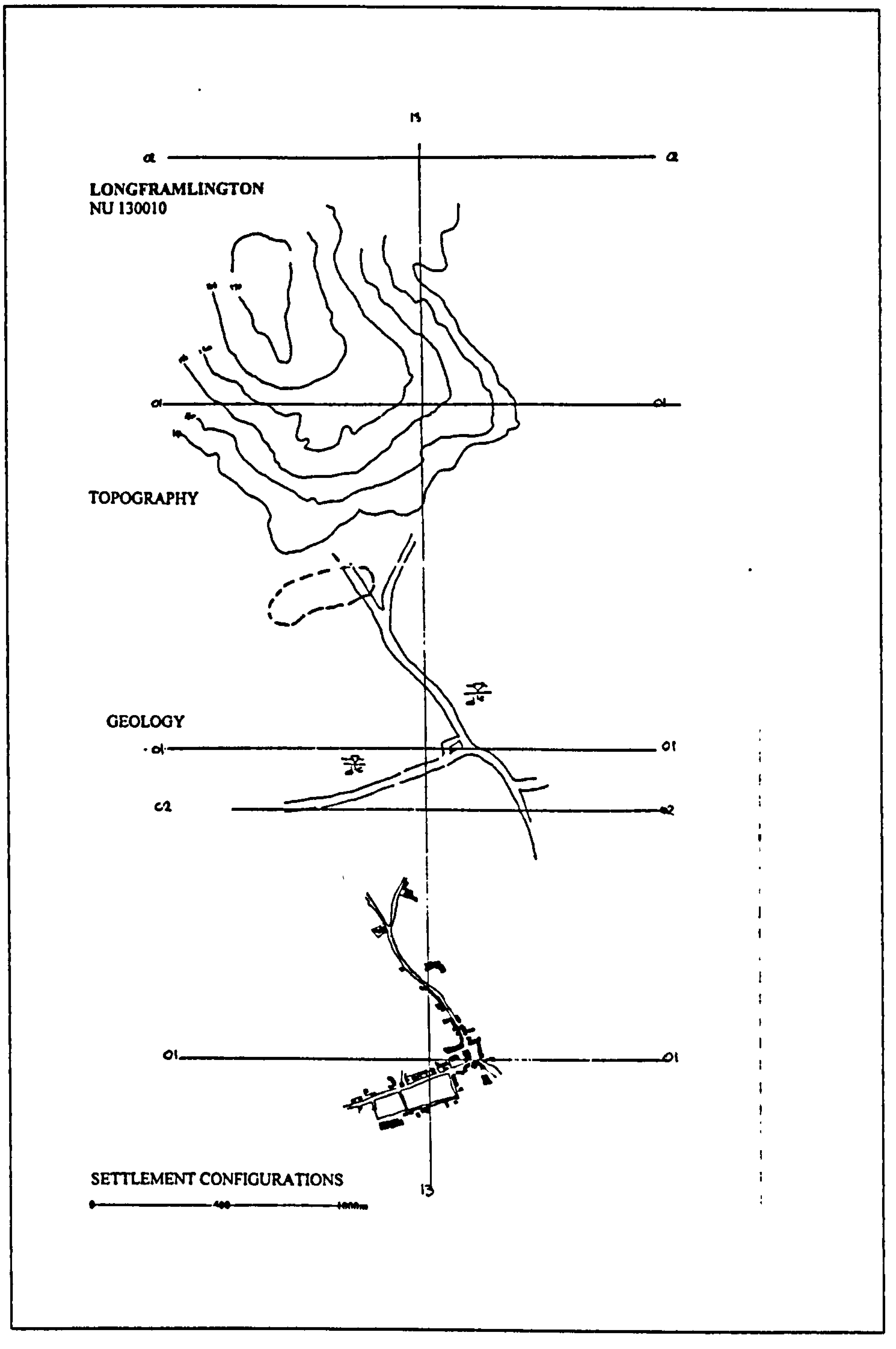
Map Refs:	1989	Ordnance Survey Pathfinder 500	Scale 1:25 000
	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1977	Geological Survey Drift 9	Scale 1:50 000

TOPOGRAPHY(x_1).

The site is located in the heart of the scarps at 150m to 155m. It occupies a relatively level site with hills rising to the NW and falling to the NE and SE. Contours are angular running in NW-SE and SW-NE directions. Building configurations follow the direction of the contours in this angular form.

GEOLOGY(x_2)

The settlement is located on boulder clay on cementstone bedrock. There are no divisions between different structures. Building configurations do not follow any geological division.



SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations <20				20-300				300<				outcome (v)
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
124	3	x												1 1
106	3				Rx									1 1
125	3					x								1 2

STRATA 4
VALES

Settlement(y) number: 164 Name: KIRK NEWTON	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NT 914302	YES	NO	1 2
Strata: 4	NO	YES	2 1
Sub-population: <20x	NO	NO	2 2

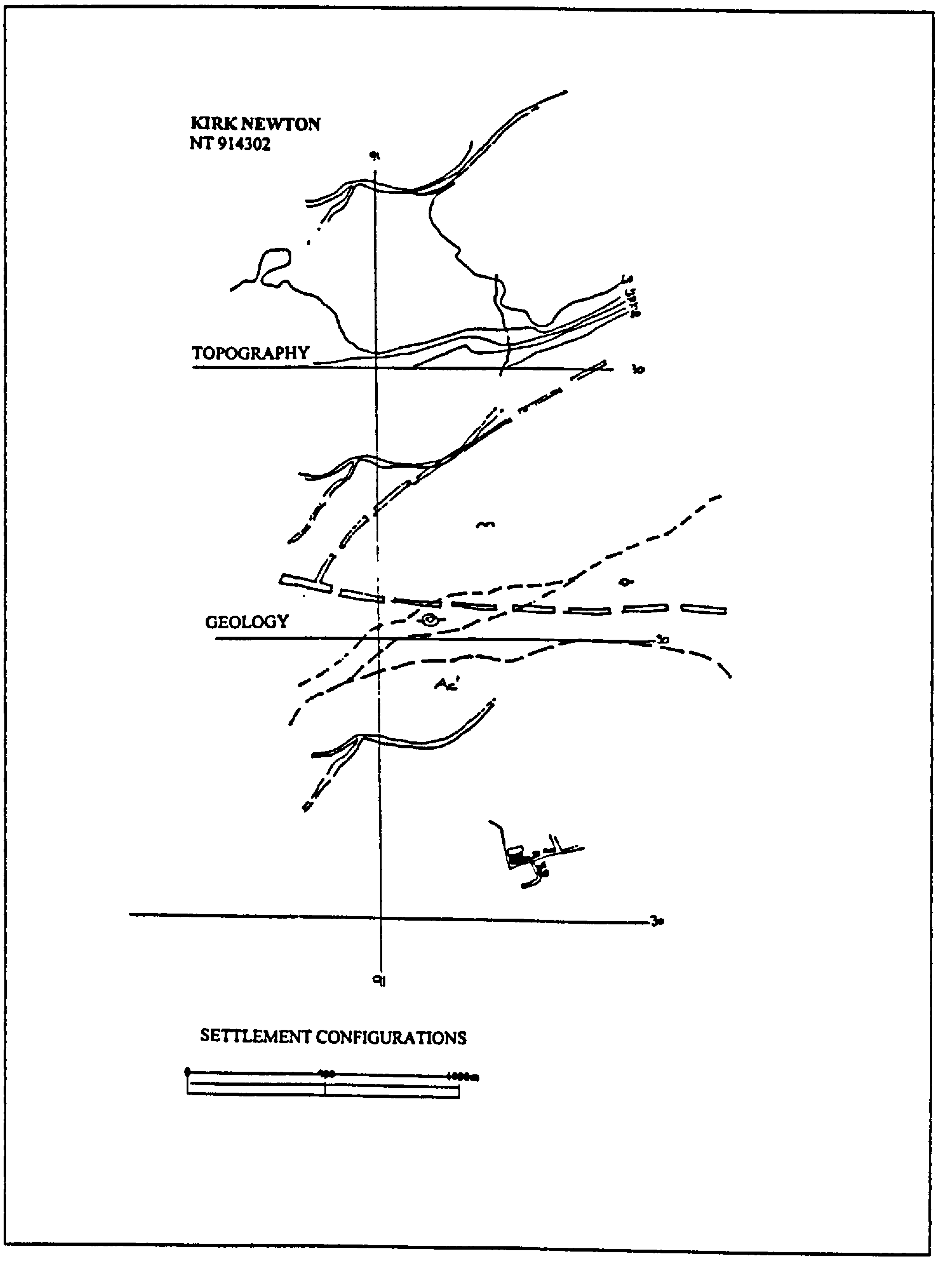
Map Refs	1985	Ordnance Survey Pathfinder 463	Scale 1:25 000
	1989	Ordnance Survey Landranger 74	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1979	Geological Survey Drift 3	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is in the Glen valley at the foot of St Gregory's Hill. The settlement occupies a flat site with contours showing a steep incline rising to the S from 60m. The contours run in a E-W direction. Building configurations follow the direction of the contours.

GEOLOGY(x_2)

The settlement is located on sand and gravel and boulder clay depositions. These form a division with alluvium to the N running in the same E-W direction as the contours. Building configurations follow the direction of the division between gravel and sand and boulder clay, and alluvium.



Settlement(y) number: 184 Name: DENWICK	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 205143	YES	NO	1 2
Strata: 4	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

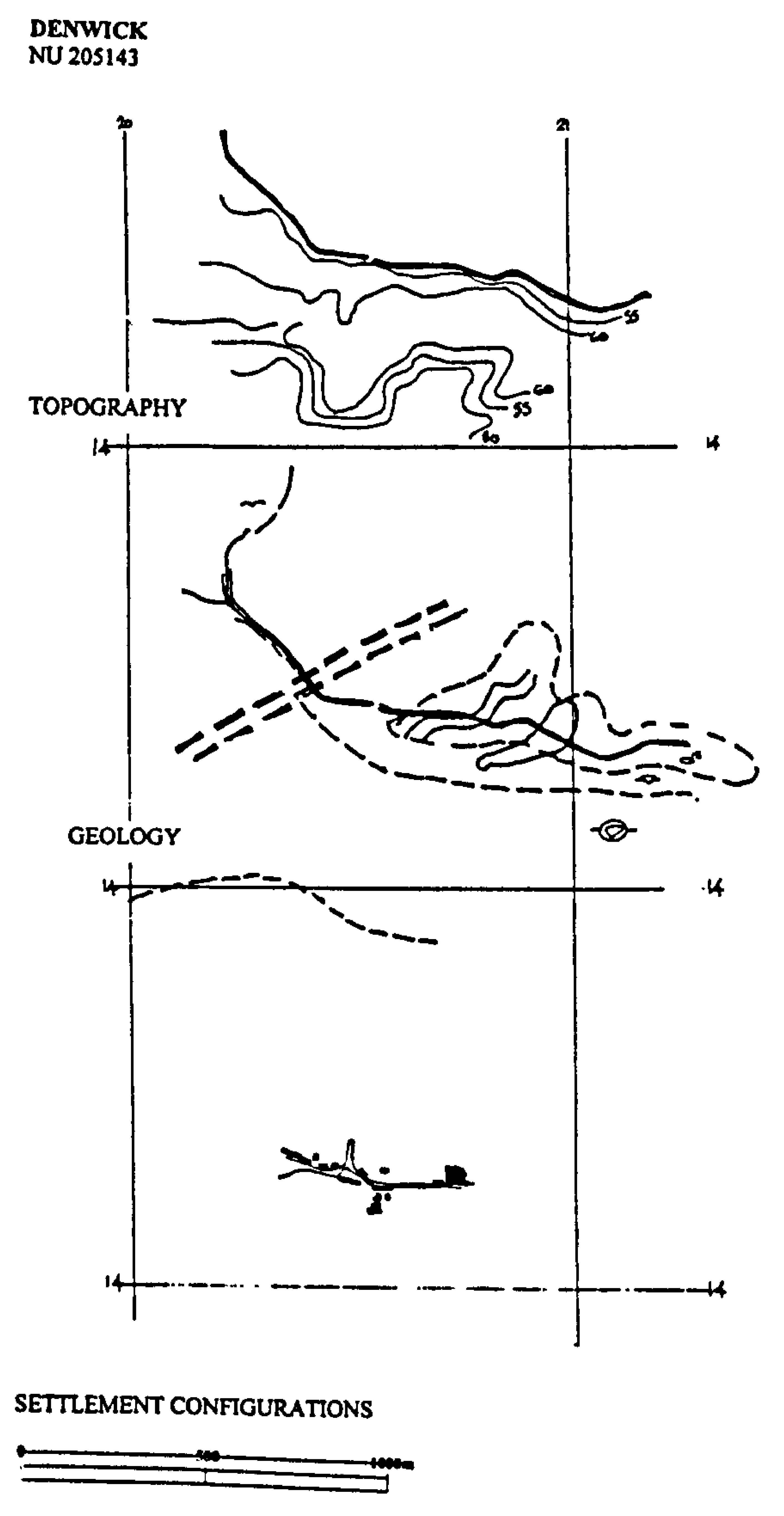
Map Refs	1981	Ordnance Survey Pathfinder 477	Scale 1:25 000
	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 560
	1966	Geological Survey Drift 6	Scale 1:50 000

TOPOGRAPHY(x_1)

The site is between scarps to the N and S in the valley of the River Aln. Denwick Burn runs immediately to the N. The settlement occupies a shelf at 60m. Contours follow Denwick Burn in an E-W direction. Building configurations follow the direction of the Burn and contours.

GEOLOGY(x_2)

The settlement is located on a sand and gravel deposition with boulder clay to the N and S. The division with boulder clay runs in an E-W direction with the contours. Building configurations follow the division between the sand and gravel deposition and boulder clay.



Settlement(y) number: 187 Name: WHITTINGHAM	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NU 066119	YES	NO	1 2
Strata: 4	NO	YES	2 1
Sub-population: 20<300Rx	NO	NO	2 2

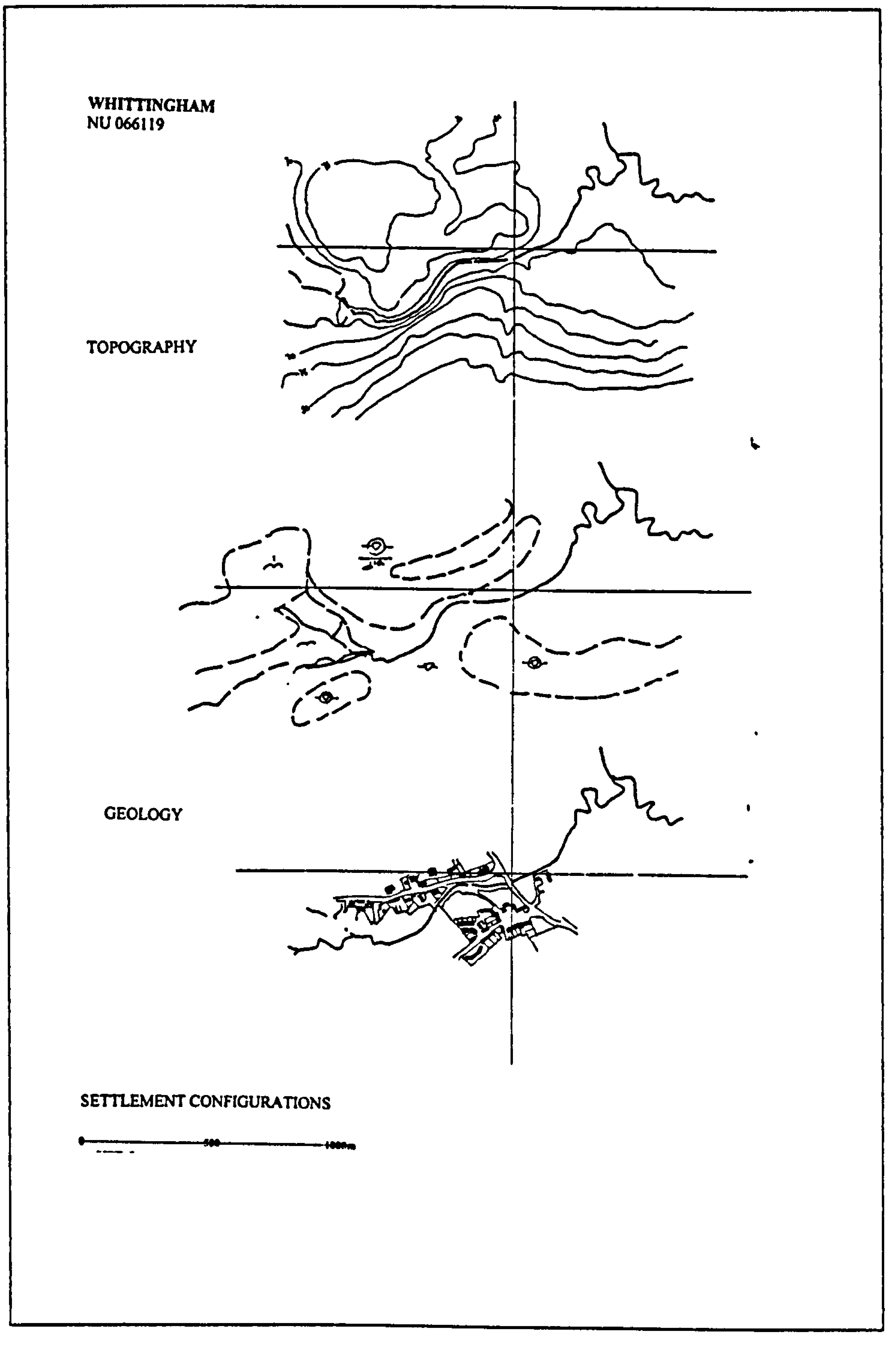
Map Refs:	1989	Ordnance Survey Pathfinder 488	Scale 1:25 000
	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1972	Geological Survey Drift 6	Scale 1:50 000

TOPOGRAPHY(x_1)

The site occupies the N and S banks of the River Aln in the Vale of Whittingham. Contours show the land rises from the river in both N and S directions. Building configurations follow the direction of the river and contours along the N bank.

GEOLOGY(x_2)

The settlement is located on sand and gravel and boulder clay depositions. Building configurations follow the divisions between these structures on the N and S sides of the river.



SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations <20				20-300				300<				outcome (v)
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
164	4	x												1 1
184	4				Rx									1 1
187	4								Rx					1 1

STRATA 5
LOW PLATEAU

Settlement(y) number: 229 Name: OGLE	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: Nz 140790	YES	NO	1 2
Strata: 5	NO	YES	2 1
Sub-population: <20x	NO	NO	2 2

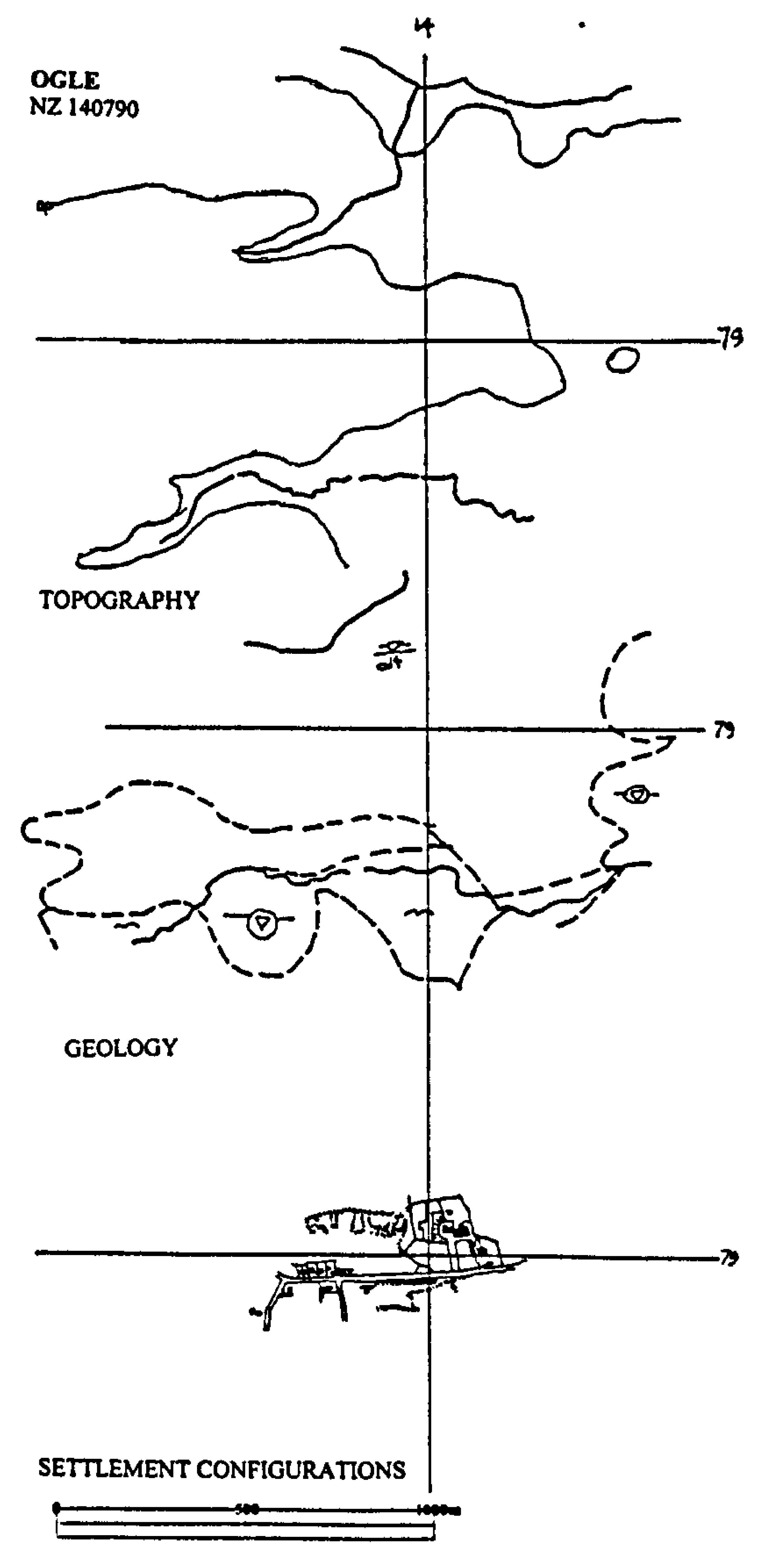
Map Refs:	1987	Ordnance Survey Landranger 88	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1977	Geological Survey 14 Drift	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is to the N of Ogle Burn running E-W. The settlement occupies a shallow site at about 90m. Contours run in an E-W direction returning on itself to the E of the settlement. Old village earthworks are located to the N of the settlement, and a castle was located to the E. Building configurations follow the direction of the contours.

GEOLOGY(x_2)

The settlement is located on boulder clay to the N of a sand and gravel deposition. The division between the boulder clay and sand and gravel runs in an E-W direction. Building configurations follow this division.



Settlement(y) number: 240 Name: BLACK CALLERTON	Topography(x_1)	Geology(x_2)	Possible outcomes (y)
	YES	YES	1 1
OS Ref.: NZ 175699	**YES**	**NO**	**1 2**
Strata: 5	NO	YES	2 1
Sub-population: <20RCx	NO	NO	2 2

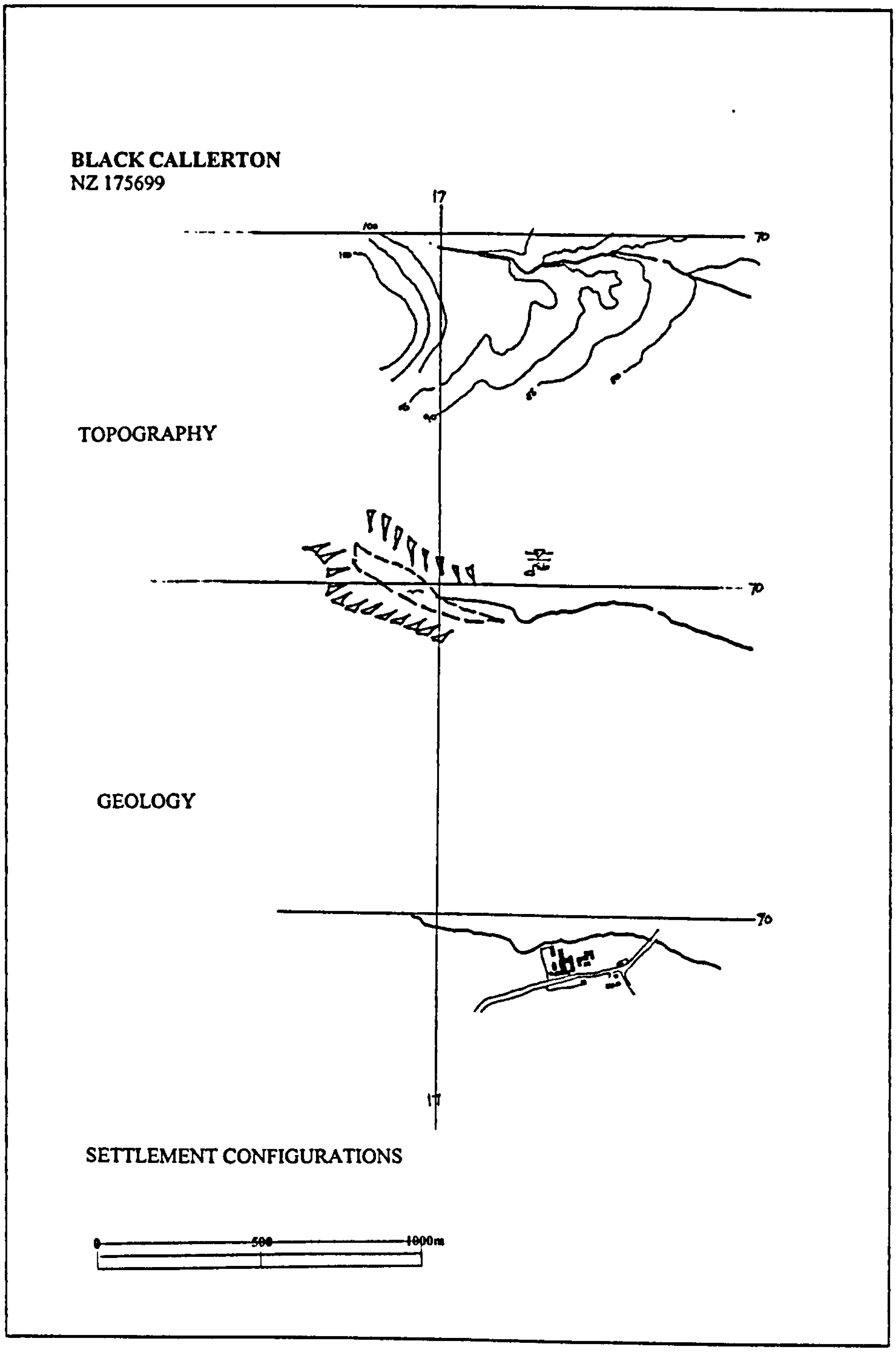
Map Refs: 1987 Ordndnce Survey Landranger 88 Scale 1:50 000
Ordnance Survey Scale 1:10 000
1977 Geological Survey Drift 14 Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the settlement is to the south of a stream running E-W. This interrupts a slope running in a NE-SW direction forming a shallow valley. Building configurations follow the direction of the stream.

GEOLOGY(x_2)

The settlement is located at the end of a glacial drainage channel on boulder clay. There are no similarities between geological divisions and building configurations.



Settlement(y) number: 232 Name: FENWICK	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NZ 057729	YES	NO	1 2
Strata: 5	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

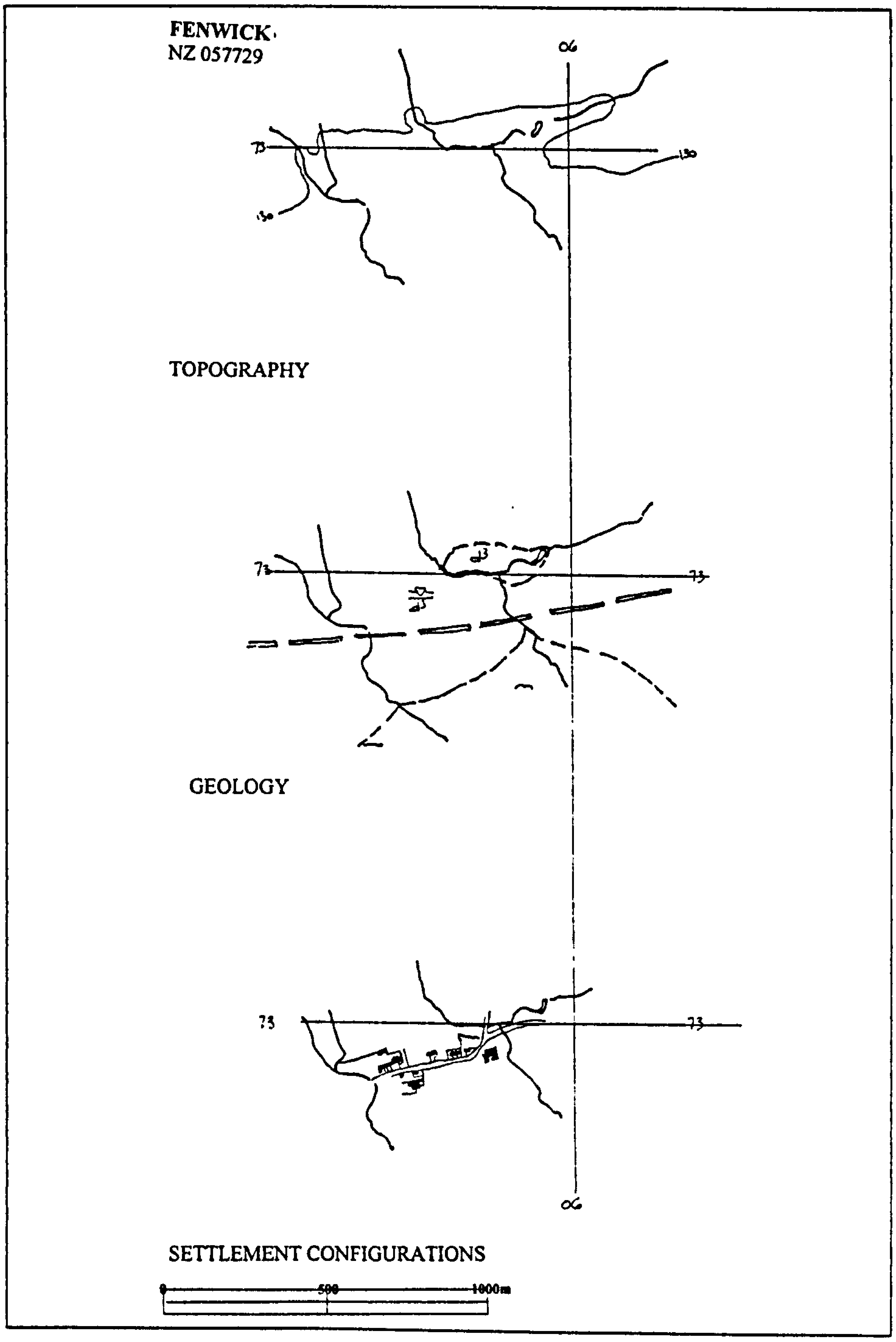
Map Refs:	1985	Ordnance Survey Landranger 87	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1977	Geological Survey Drift 14	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the settlement is on shallow rising land to the N between Fens Burn and Fenwick Burn. Contours run in an E-W direction. Building configurations follow the contours in an E-W direction.

GEOLOGY(x_2)

The settlement is located on boulder clay superficial deposit on limestone bedrock. A fault runs E-W across the site. Building configurations follow the direction of the fault.



Settlement(y) number: 225 Name: TRANWELL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NZ 189836	YES	NO	1 2
Strata: 5	NO	YES	2 1
Sub-population: 20-300Cx	NO	NO	2 2

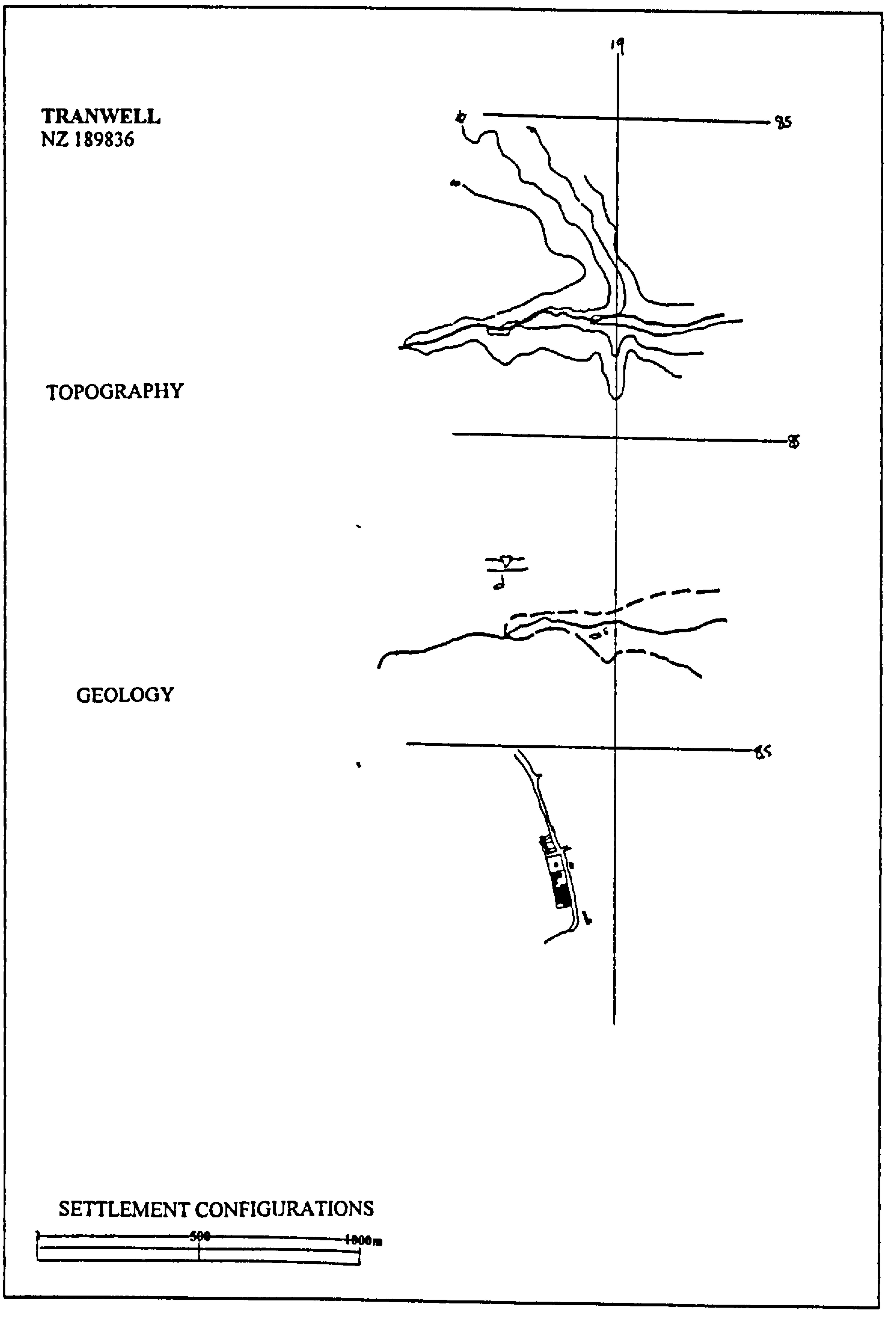
Map Refs:	1987	Ordnance Survey Landranger 81	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1977	Geological Survey Drift 14	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the settlement is to the north of Catch Burn which flows from Tranwell Reservoirs(disused). Catch Burn runs in an E-W direction. Contours run in a N-S direction and turn at the burn to form a valley. Building configurations follow the contours in a N-S direction.

GEOLOGY(x_2)

The settlement is located on boulder clay. There are no similarities between geological division s and building configurations.



Settlement(y) number: 239 Name: **WOOLSINGTON**	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NZ 197698	**YES**	**NO**	**1 2**
Strata: 5	NO	YES	2 1
Sub-population: 20-300RCx	NO	NO	2 2

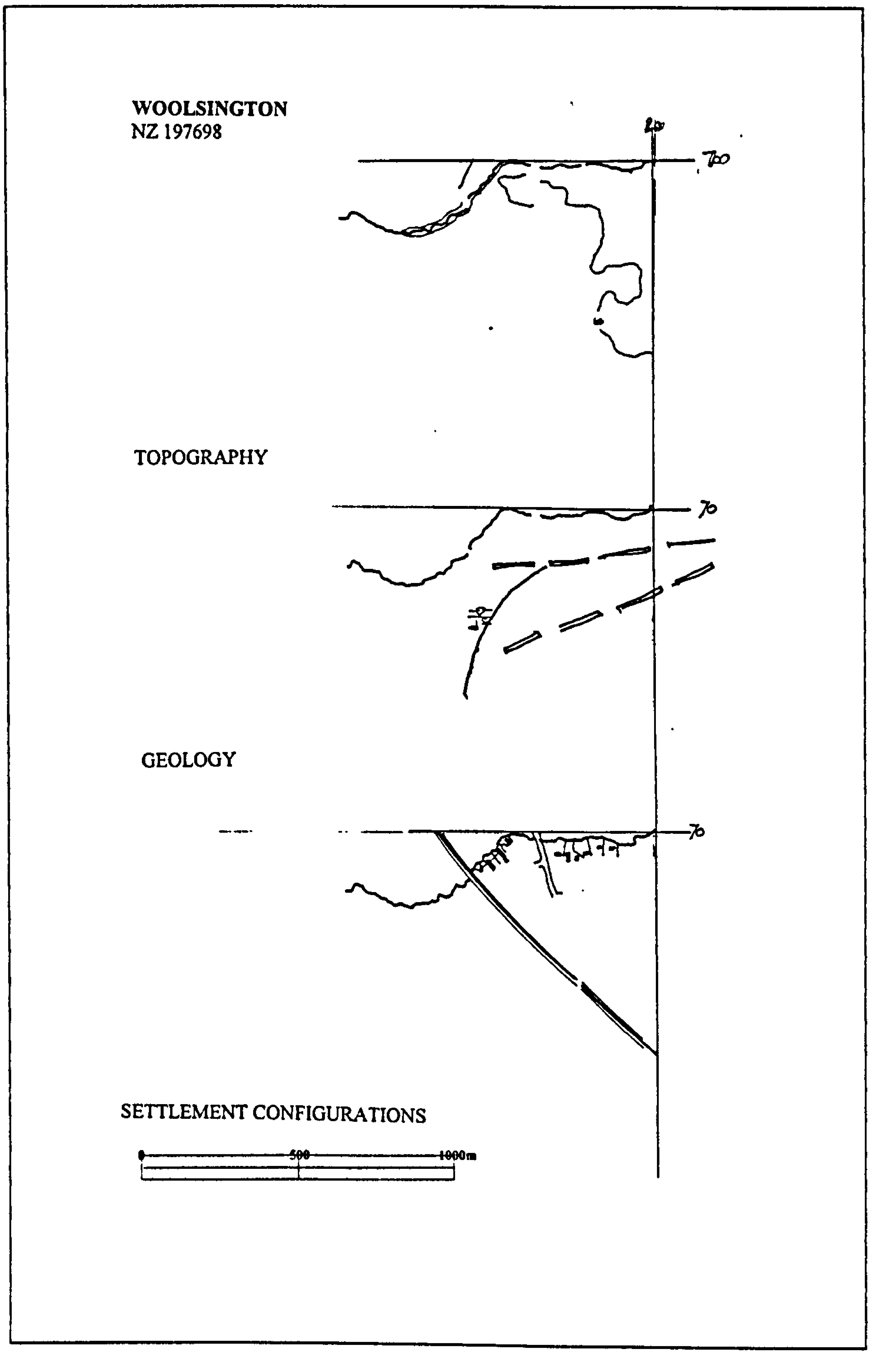
Map Refs: 1987 Ordnance Survey Landranger 88 Scale 1:50 000
Ordnance Survey Scale 1:10 000
1977 Geological Survey Drift 14 Scale 1:50 000

TOPOGRAPHY(x_1)

The settlement is located to the S of Ouse Burn. Contours follow the burn then turn SE across the site. The site is flat. Building configurations follow the Burn.

GEOLOGY(x_2)

The settlement is located on a boulder clay deposition. Several faults cross the site in an E-W direction. There are no similarities between geological divisions and building configurations.



SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations <20				20-300				300<				outcome (v)
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
229	5	x												1 1
240	5			RCx										1 2
232	5				Rx									1 1
225	5						Cx							1 2
239	5							RCx						1 2

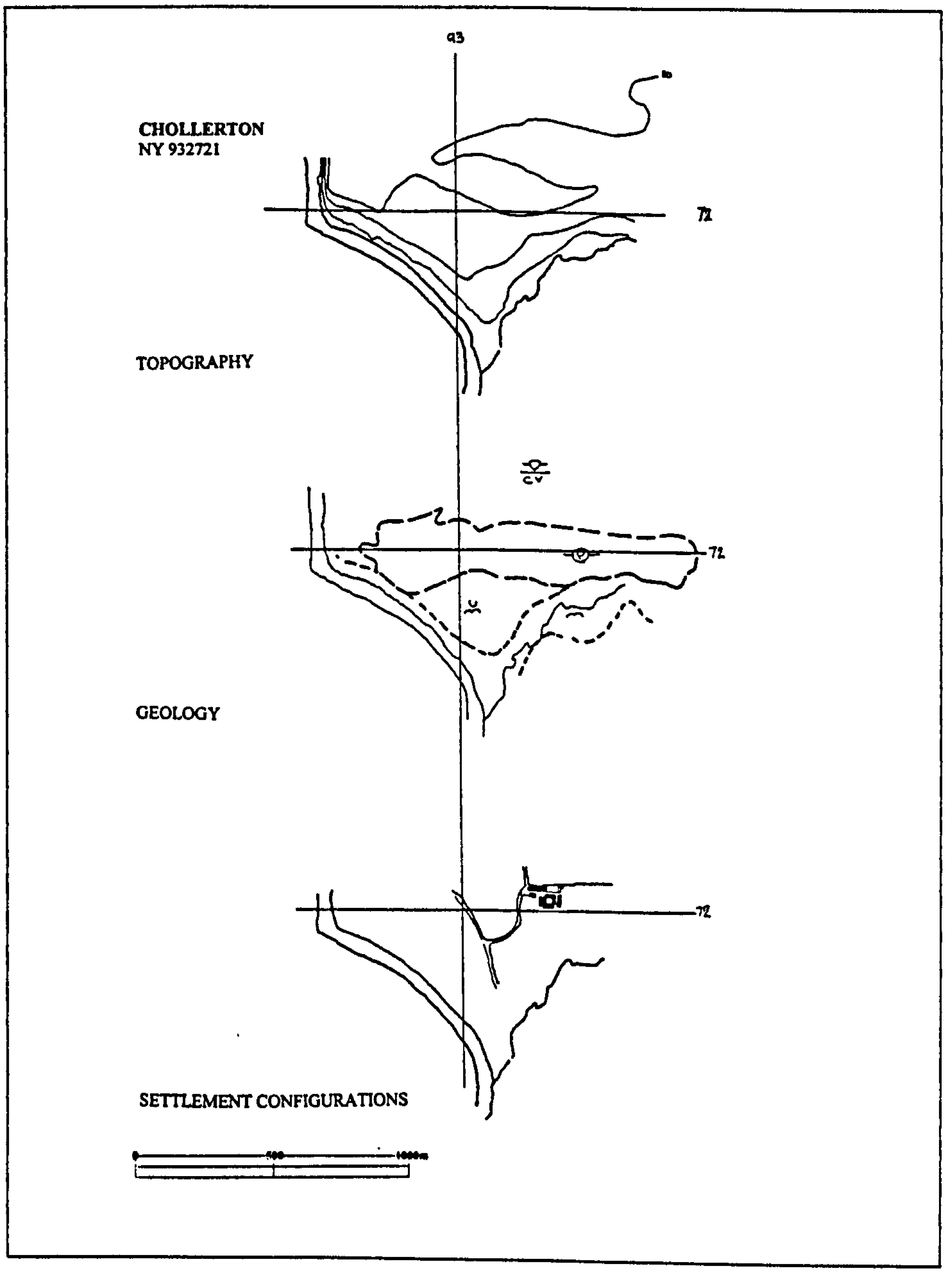
STRATA 6
NORTH TYNE VALLEY and REDESDALE.

Settlement(y) number: 261 Name: CHOLLERTON	Topography(x_1)	Geology(x_2)	Possible outcomes (y)
	YES	YES	1 1
OS Ref.: NY 932721	YES	NO	1 2
Strata: 6	NO	YES	2 1
Sub-population: <20x	NO	NO	2 2

Map Refs:	1997	Ordnance Survey Outdoor Leisure 43	Scale 1:25 000
	1985	Ordnance Survey Landranger 87	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1980	Geological Survey 13 Drift	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is in the narrow valley of the River North Tyne. The settlement occupies a shallow site between the River North Tyne and and Erring Burn. It is at the centre of an oval contour shape at 80m. There is a disused railway running NW-SE at the W of the settlement. Contours run in an E-W direction. Building configurations follow the direction of the contours.



GEOLOGY(x_2)

The settlement is located on a sand and gravel deposition. This forms a division with boulder clay to the N and river terraces and aluvium to the S. Building configurations follow the division between sand and gravel and boulder clay.

Settlement(y) number: 252 Name: **REDESMOUTH**	**Topography(x_1)**	**Geology(x_2)**	**Possible outcomes (v)**
	YES	YES	1 1
OS Ref.: NY 866822	YES	NO	1 2
Strata: 6	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

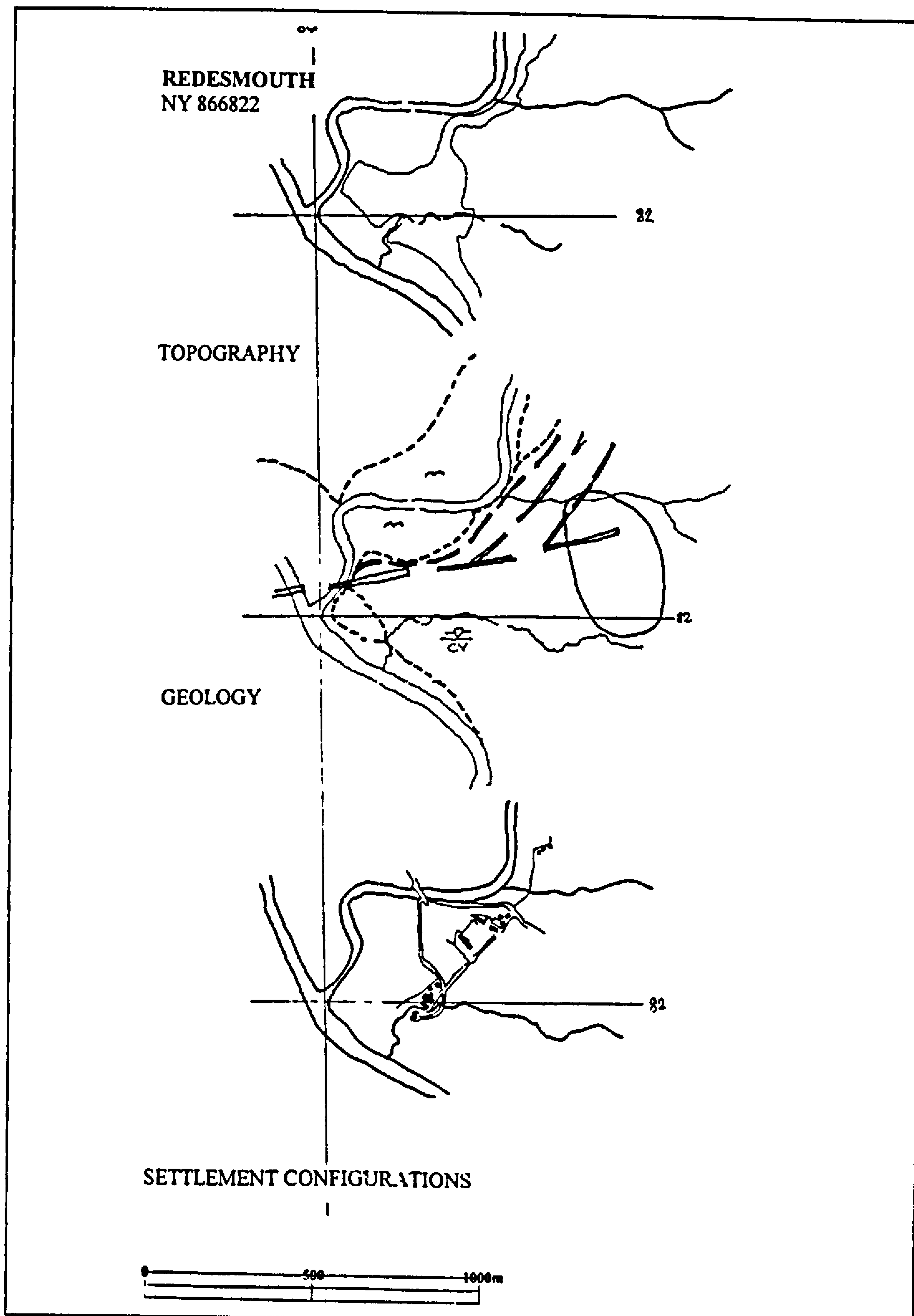
Map Refs:	1997	Ordnance Survey Outdoor Leisure 43	Scale 1:25 000
	1985	Ordnance Survey Landranger 87	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1980	Geological Survey Drift 13	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is at the meeting of the River Rede and the River North Tyne. It is also between streams on the N and S sides. It is also located at the fork of disused railway lines. Contour at 110m follows the angle formed by the meeting of the rivers. Contour at 120m forms a shelf then turns in N-S direction. Building configurations follow the 120m contour in the shape of the shelf.

GEOLOGY(x_2)

The settlement is located on a boulder clay deposition. Alluvium surrounds this in the area of the river on the NW and SW sides. Building configuration follow the division between boulder clay and alluvium on the NW side.



Settlement(y) number: 259 Name: BARRASFORD	Topography(x_1)	Geology(x_2)	Possible outcomes (y)
	YES	YES	1 1
OS Ref.: NY 916735	YES	NO	1 2
Strata: 6	NO	YES	2 1
Sub-population: 20-300x	NO	NO	2 2

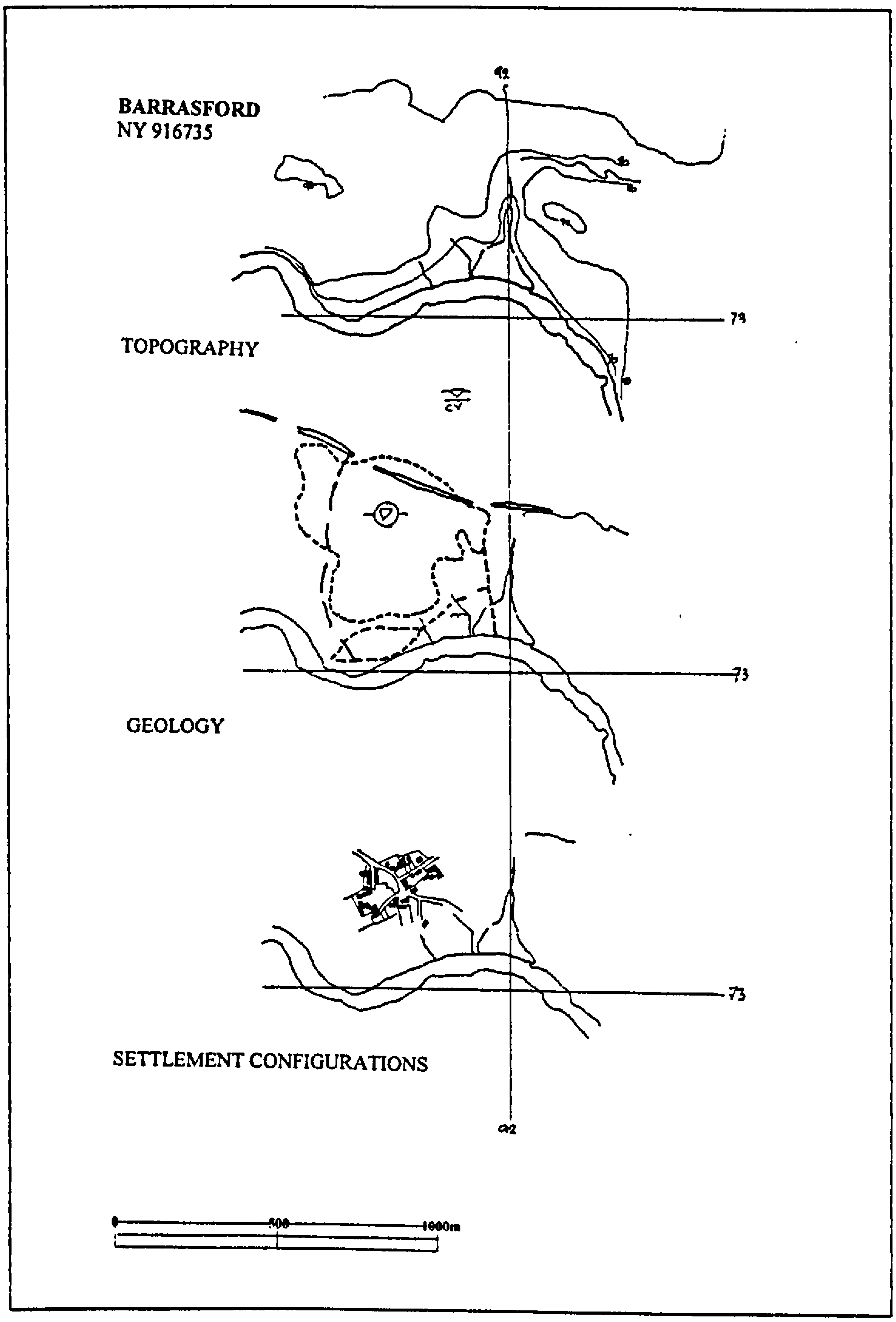
Map Refs:	1997	Ordnance Survey Outdoor Leisure 43	Scale 1:25 000
	1985	Ordnance Survey Landranger 87	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000
	1980	Geological Survey Drift 13	Scale 1:50 000

TOPOGRAPHY(x_1)

The location of the site is to the N of a right angle bend in the River North Tyne between contours 80m and 90m. Contours follow the direction of the river. There is a small oval knoll to the NW of the settlement which reflects the direction of the lower contours. Building configurations follow the direction of the contours.

GEOLOGY(x_2)

The settlement is located on a sand and gravel deposition with boulder clay to the N and alluvium and river terraces to the S. Building configuration follow the division between sand and gravel, and river terraces and alluvium.



SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations												outcome (v)
		<20				20-300				300<				
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
261	6	x												1 1
252	6				Rx									1 1
259	6					x								1 1

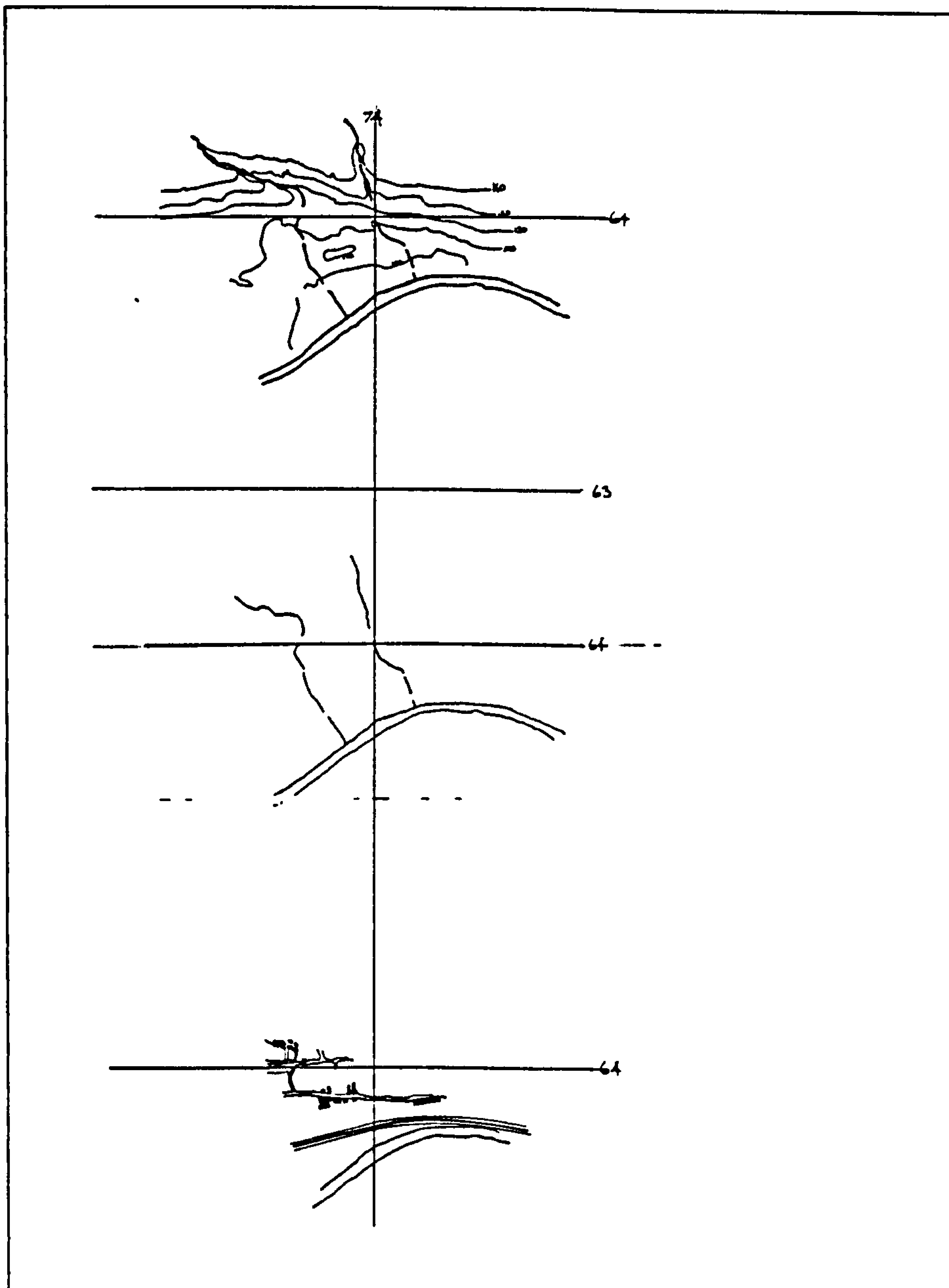
STRATA 7
TYNE VALLEY north side.

Settlement(y) number: 278 Name: MELKRIDGE	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NY 739640	YES	NO	1 9
Strata: 7	NO	YES	2 1
Sub-population: <20 x	NO	NO	2 2

Map refs:	1997	Ordnance Survey Outdoor Leisure 43.	Scale 1:25 000
	1985	Ordnance Survey Landranger 87	Scale 1:50 000
		Ordnance Survey	Scale 1:10 000

TOPOGRAPHY(x_1)

The site is located at the southern limit of scarps. Contours run in an E-W direction. They are interrupted by two burns flowing S(Melkridge Burn) and SE(High Town Burn) from hills to the north, forming narrow valleys with inclined sides. Building configurations follow High Town Burn running to the SE. They also follow a raised spur shown by the oval shaped 110m contour. This runs in an E-W direction parallel with the general direction of 100m to 140m contours. Above the settlement the hillside rises at a gradient of 1 in 7 or thereabouts.
A railway line runs along the Tyne valley between the settlement and the River Tyne.



GEOLOGY(x_2)

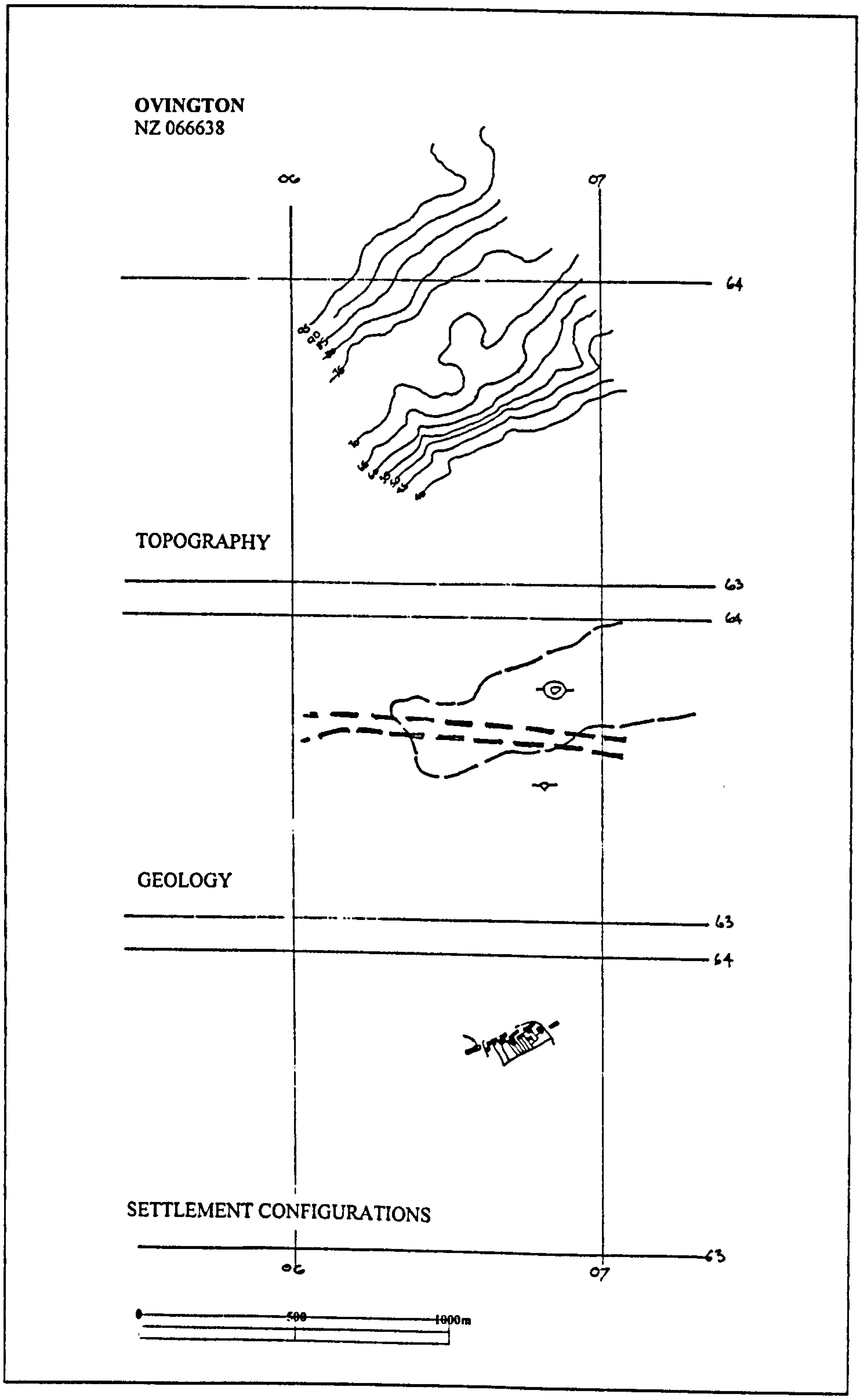
Missing data.

Settlement(y) number: 268 Name: OVINGTON	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NZ 066638	YES	NO	1 2
Strata: 7	NO	YES	2 1
Sub-population: <20Cx	NO	NO	2 2

Map refs: 1991 Ordnance Survey Pathfinder 548 Scale 1:25 000
1987 Ordnance Survey Landranger 88 Scale 1:50 000
1978 Ordnance Survey Scale 1:10 000
1992 Geological Survey 20 Drift Scale 1:50 000

TOPOGRAPHY(x_1)
The location of the site is at the southern limit of the low plateau. The settlement occupies a shallow shelf between contours 70m and 75m. Above and below these levels the hillside rises at a gradient of 1 in 10 or thereabouts.
Contours run in a SW-NE direction. Building configurations along the main street follow the direction of the contours. This is also reflected in the building lines as they spread north.

GEOLOGY(x_2)
The settlement is located on a sand and gravel deposit in a general boulder clay drift geology. The deposit is located at the shelf identified in the topography. The north and south sides of the deposit run in the SW-NE direction of the contours. Building configurations follow the direction of the division between the deposit and surrounding strata at the N and S sides.



Settlement(y) number: 284 Name: BYWELL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: NZ 049615	YES	NO	1 2
Strata: 7	NO	YES	2 1
Sub-population: <20Rx	NO	NO	2 2

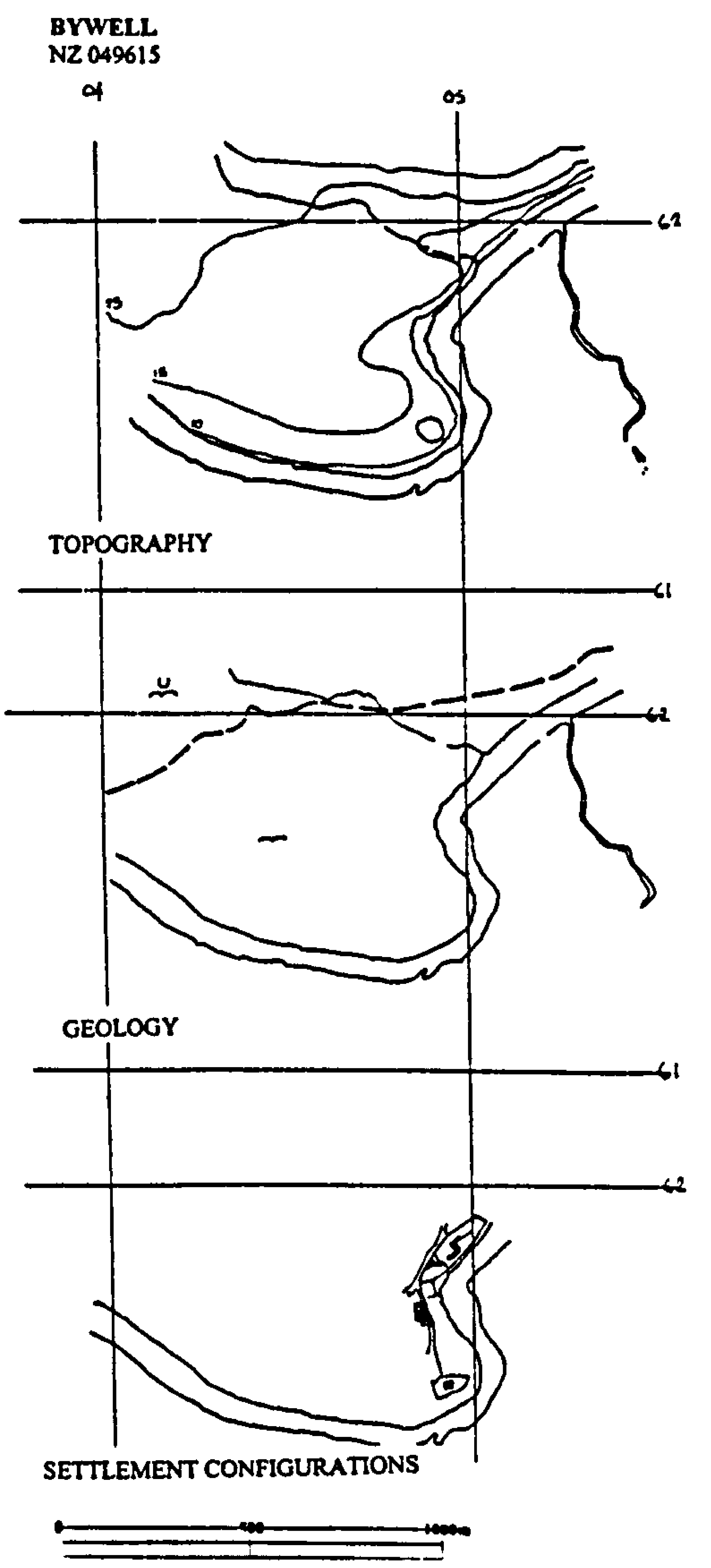
Map references: 1991 Ordnance Survey Pathfinder 548 Scale 1:25 000
1987 Ordnance Survey Landranger 88 Scale 1:50 000
1980 Ordnance Survey Scale 1:10 560
1992 Geological Survey 20 Drift Scale 1:50 000

TOPOGRAPHY(x_1)

The site is located at the southern limit of the low plateau at a sharp bend in the River Tyne. Contours follow the river bank. Clockey Burn runs from W-E at the north of the site. A spur at 15m is located at the origin of the radius of the river bend. The slope is generally gradual. There is a sharp incline where contours converge as the river runs NE. Building configurations follow the curve of the river and contours. A church is located on the spur.

GEOLOGY(x_2)

The settlement is located on an alluvium terrace. Building configurations follow the division between the alluvium deposit and the river.

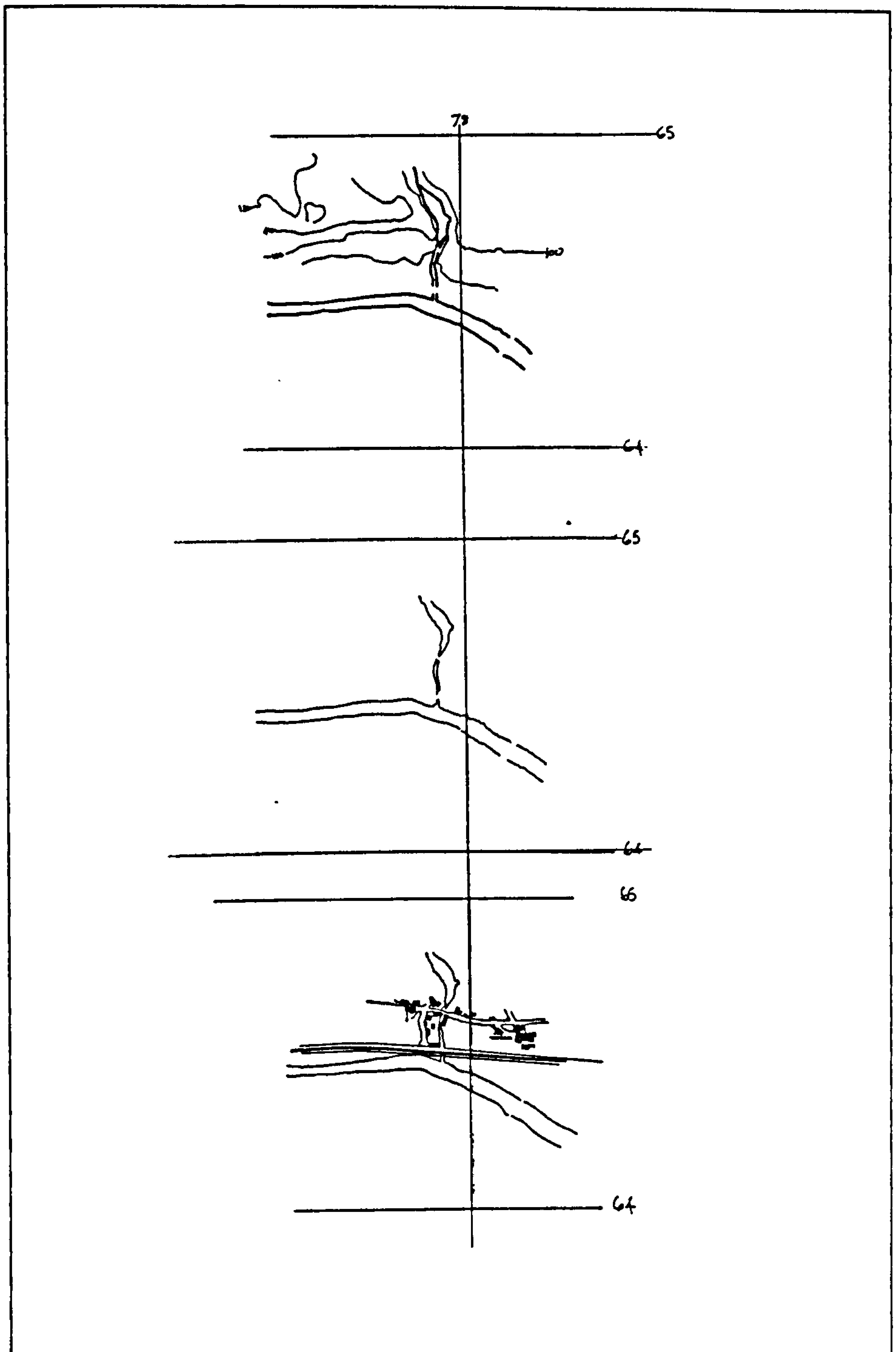


Settlement(y) number: 277 Name: BARDON MILL	Topography(x_1)	Geology(x_2)	Possible outcomes (v)
	YES	YES	1 1
OS Ref.: Ny 780646	YES	NO	1 2
Strata: 7	NO	YES	2 1
Sub-population: 20<300x	NO	NO	2 2

Map refs: 1997 Ordnance Survey Outdoor Leisure 43 Scale 1:25 000
1985 Ordnance Survey Landranger 87 Scale 1:50 000
Ordnance Survey Scale 1:10 000

TOPOGRAPHY(x_1).

The site is on the southern limit of scarps. Contours run E-W. They are interrupted by Mill Race and Chalnley Burn which run south to the River South Tyne forming narrow valleys with inclined sides. The general gradient of the site is 1 in 7 or thereabouts. There is a railway line running E-W between the settlement and the River South Tyne. Building configurations follow the direction of the contours running E-W. They also follow Mill Race along Station Road.



GEOLOGY(x_2)

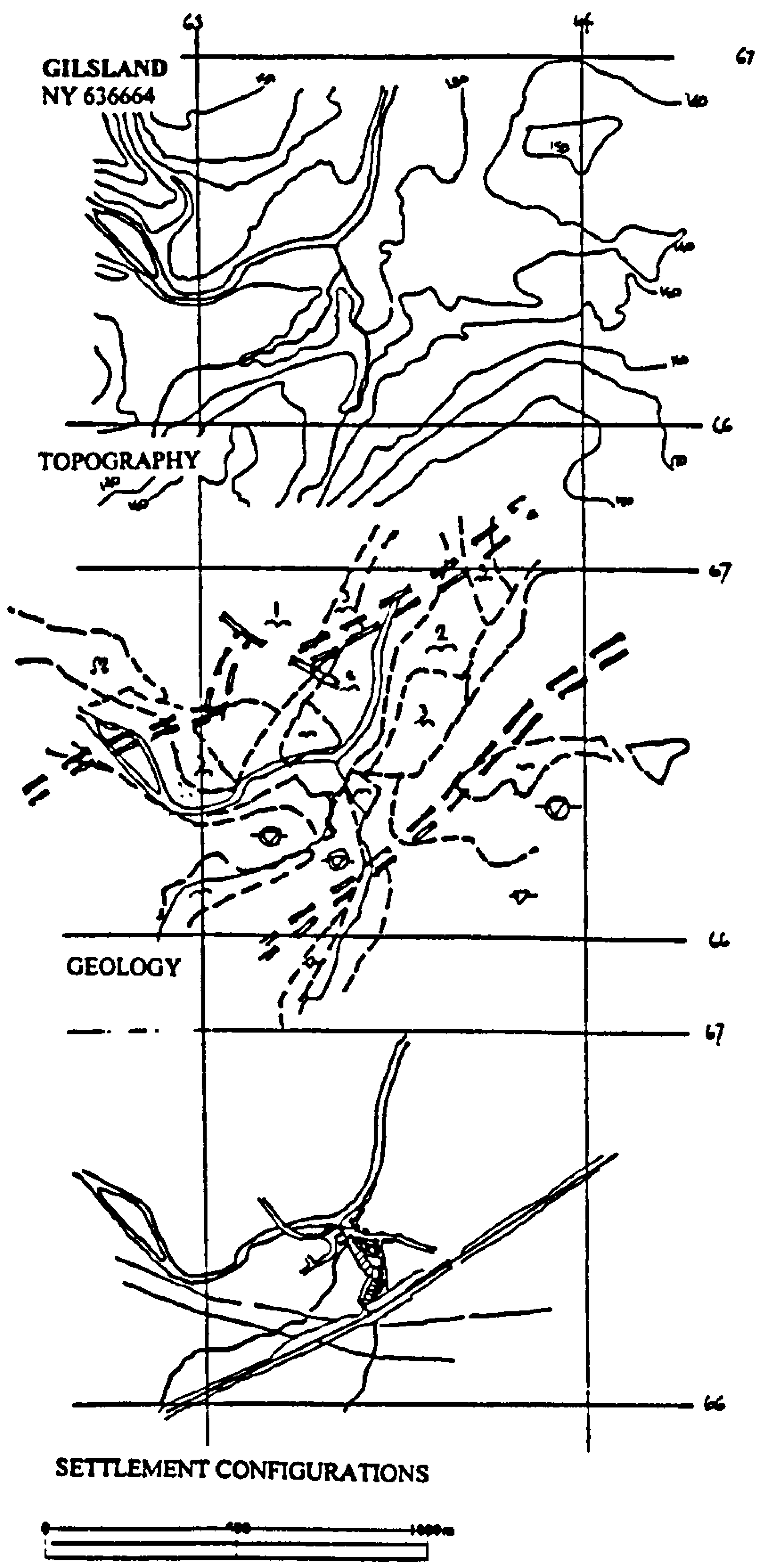
Missing data.

Settlement(y) number: 282 Name: GILSLAND	Topography(x_1)	Geology(x_2)	Possible outcomes (y)
	YES	YES	1 1
OS Ref.: NY 636664	YES	NO	1 2
Strata: 7	NO	YES	2 1
Sub-population: 20<300Rx	NO	NO	2 2

Map Refs:	1997	Ordnance Survey Outdoor Leisure 43	Scale 1:25 000
		Ordnance Survey	Scale 1:10 000
	1980	Geological Survey 18 Drift	Scale 1:50 000

TOPOGRAPHY(x_1)

Part of this settlement is in Northumberland and part is in Cumbria. For holistic purposes of this study the entire settlement is considered. The site is located at the meeting of the River Irthing and Poltross Burn. It is on the southern limit of scarps. A railway and Hadrian's Wall cross the site at the S. Directions of contours is varied, but generally follow the river and burn valleys. The valleys are steeply inclined. Hills rise from the valleys. Building configurations follow the river and burn directions at their meeting.



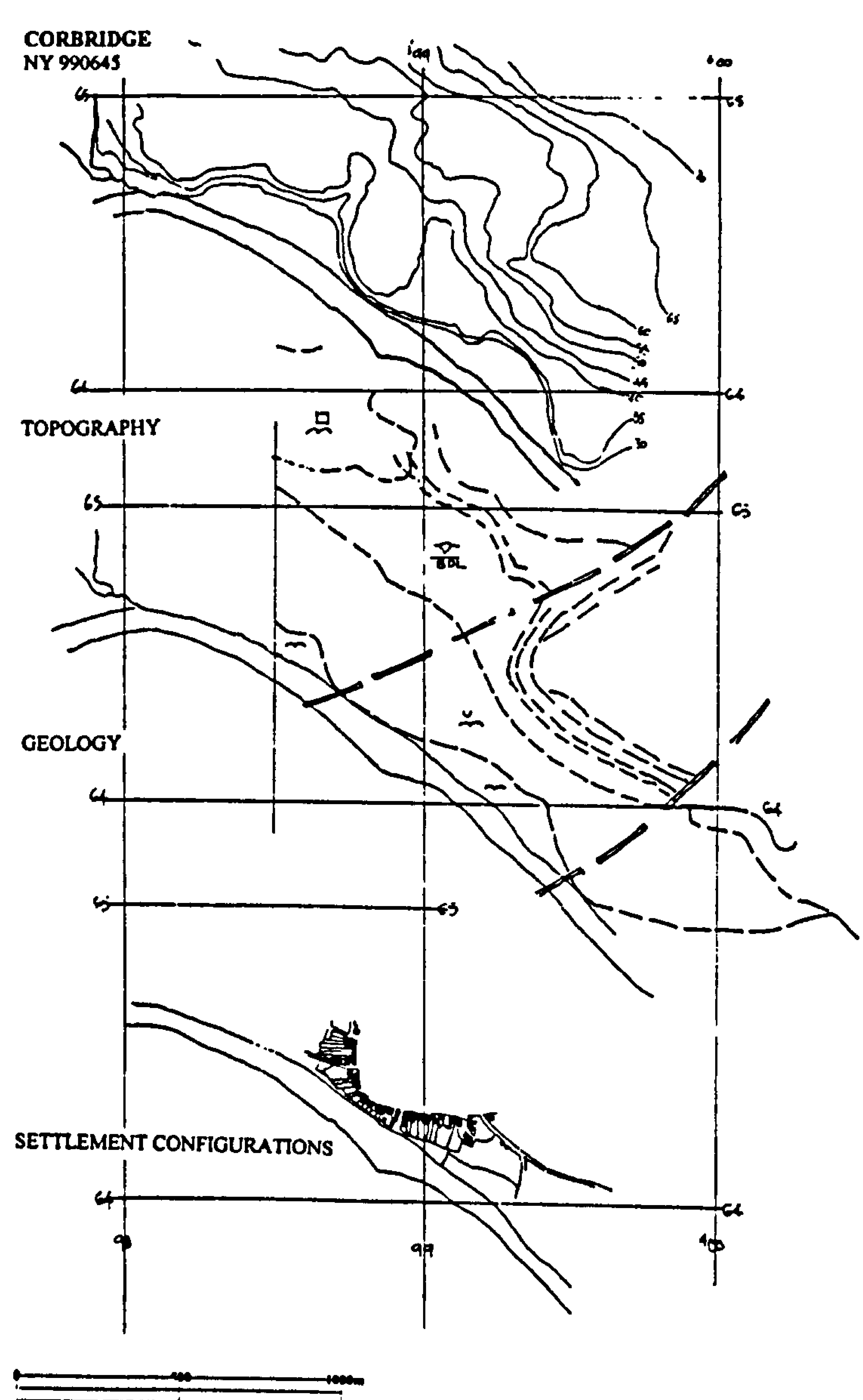
GEOLOGY(x_2)

The settlement is located on alluvium, terraces, boulder clay, and sand and gravel. Building configurations follow the division between boulder clay and terraces.

Settlement(y) number: 270 Name: CORBRIDGE	Topography(x_1)	Geology(x_2)	Possible outcomes (y)
	YES	YES	1 1
OS Ref.: NY 990645	YES	NO	1 2
Strata: 7	NO	YES	2 1
Sub-population: 300<Rx	NO	NO	2 2

Map Refs: 1997 Ordnance Survey Outdoor Leisure 43 Scale 1:25 000
1985 Ordnance Survey Landranger 87 Scale 1:50 000
Ordnance Survey Scale 1:10 000
1992 Geological Survey 20 Drift Scale 1:50 000

TOPOGRAPHY(x_1)
The location of the site is at the southern limit of scarps. The settlement extends N from the River Tyne. Contours between 30m and 40m curve along the river bank at a steep incline of 1 in 3. There is a gradual incline of 1 in 60 between contours 40m and 45m across the site then the incline becomes 1 in 8 between contours 55m and 70m. Contours run in a general NW-SE direction. Building configurations follow the curve of the contours along the river bank.



GEOLOGY(x_2)
The settlement is located on undifferentiated river terrace deposits and boulder clay on limestone bedrock. There are similarities between the configurations of contours identified in the topography, and drift geology. Building configurations follow the division between undifferentiated river terrace deposits and alluvium along the river bank.

SUMMARY OF OUTCOMES

(y) numbers	strata	sub-populations <20				20-300				300<				outcome (v)
		x	Cx	RCx	Rx	x	Cx	RCx	Rx	x	Cx	RCx	Rx	
278	7	x												19
268	7		Cx											11
284	7				Rx									11
277	7				Rx									19
282	7								Rx					11
270	7												Rx	11

APPENDIX G.
Results of Statistical Survey.

	<20				20 - 300				>300			
	x	Cx	RCx	Rx	c	Cx	RCx	Rx	x	Cx	RCx	Rx
Coast[1]		11						11				
Coastal Plain	11	11	11	11		12	11		11			
Scarps	11			11	12							
Vales	11			11				11				
Low Plateau	11		12	11		12	12					
N Tyne and Redesdale	11			11	11							
Tyne Valley north side	19	11		11	19			11				11

Table G1. **Data array of test results using physiographic regions and sub-populations of settlement sizes and riverain and coal measure locations.**

[1] Data is drawn from observations made during preliminary studies.

APPENDIX H. Significance Test.

χ^2 (Chi Square) is the test of statistical inference used to determine whether the difference between observed (O) and expected (E) frequencies is statistically significant and is seen as particularly appropriate to this analysis given that the data set is composed of categoric variables. The starting point is the null hypothesis which states there is no real difference between the sample mean and the total population mean. It is a working hypothesis which is tested statistically.

The procedure for testing asks what would the cell frequencies be if there was no relationship between Y the dependent variable (settlement) and X (site) the independent variable? A set of expected frequencies (E) is calculated under the null hypothesis of no relationship and compared with the observed frequencies (O). The question is then asked, is it likely that the sample has been taken from a population where the frequencies expected under the null hypothesis pertain, or is the difference between observed and expected frequencies so great that it can be concluded the sample was not taken from a population with those expected frequencies?

The sub-populations of settlement sizes progress from less than twenty dwellings to more than three hundred dwellings, but categorises these into three groups from the outset rather than recording data by particular size for individual settlements. The proportion of samples in each size category is the same as for the total population, 17:10:2. Samples are analysed as categoric variables at ordinal level measurement.

A table of (O) cells for Y variables are listed in columns under categories of numbers of dwellings for settlements <20, 20-300, >300. Rows are made up from the data sets Both, Topography only, Geology only, None at all.

For Y	For X Both f_o	Topography only f_o	Geology only f_o	None at all f_o	Total f_o
<20	15	1	0	0	16
20-300	5	4	0	0	9
>300	2	0	0	0	2
Total	22	5	0	0	27

Table H1. Observed frequencies (O).

For purposes of the significance test the last two rows, Geology Only and None at All, are deleted since they are of zero value. From the marginal frequencies in the table of observations a hypothetical model of no association is formed to determine the (E) values. This lists (E) values as letter cells.

For Y	For X		
	c_1	c_2	Marginal frequency
r_1	a	b	16
r_2	c	d	9
r_3	e	f	2
Marginal frequency	22	5	27

Table H2. Hypothetical table of no association.

Values for (E) are now calculated on the basis of no association between X and Y. In other words, what would the pattern of frequencies be for cells a, b, c, d, e, and f, if there is no association between X and Y. If there is no association in the table, then the ratio of r_1 cell frequencies should be the same throughout as it is in the overall distribution of Y itself. It is assumed the distribution of the dependent variable Y is the same for all categories of the independent variable X. The formula used for calculating expected frequencies E is

$$\frac{\text{row total} \times \text{column total}}{\text{overall total}}$$

which gives value for

$a = \frac{16x22}{27} = 13.03$ $b = \frac{16x5}{27} = 2.96$ $c = \frac{9x22}{27} = 7.33$

$d = \frac{9x5}{27} = 1.67$ $e = \frac{2x22}{27} = 1.63$ $f = \frac{2x5}{27} = .37$

To compare these (E) values with (O) values the difference O-E is calculated for each cell and shown in a table of frequencies.

For Y	For X	
	Both fo-fe	Topography only fo-fe
<20	1.97	-1.97
20-300	-2.33	2.33
>300	.37	-.37

Table H3. Frequency differences O-E.

The sum of all these values indicates the extent of the O-E differences over all the cells in the table.

		Both	Topography only
<20	O	15	1
	E	13.03	2.97
	O-E	1.97	-1.97
	$\frac{(O-E)^2}{E}$	.298	1.307
20-300	O	5	4
	E	7.33	1.76
	O-E	-2.33	2.33
	$\frac{(O-E)^2}{E}$	.741	3.251
>300	O	2	0
	E	1.63	.38
	O-E	.37	-.37
	$\frac{(O-E)^2}{E}$	.084	.37

$$\chi^2 = \Sigma . \frac{(O-E)^2}{E} = .298 + 1.307 + .741 + 3.251 + .084 + .37$$

$$= 6.051$$

To examine the statistical significance of 6.051 we need to find the corresponding critical value of the χ^2 distribution. Clearly, as the number of cells increases so the value of χ^2 is likely to increase . So, there is a need to make some allowance for the number of cells in finding the critical value of χ^2. Generally, the greater the number of cells, the more conservative the critical value of χ^2 must be to take account of this. Thus the χ^2 distribution varies accordingly to the degree of freedom (v). The degree of freedom for the χ^2 distribution is calculated as

$$(r-1)(c-1)$$

where r = number of rows and c = number of columns.

$$\begin{aligned} v &= (3-1)(2-1) \\ &= 2 \end{aligned}$$

From Table H4 critical values of χ^2 the level of significance, can be read.

v	$P=10\%$	$P=5\%$	$P=1\%$	$p=0.1\%$
1	2.71	3.84	6.63	10.83
2	4.61	5.99	9.21	13.81
3	6.25	7.81	11.34	16.27
4	7.78	9.49	13.28	18.47
5	9.24	11.07	15.09	20.52

Table H4. Critical values of χ^2
SOURCE: Rose and Sullivan (1996: 188).

The value of χ^2 is calculated as 6.051, which exceeds the critical value of χ^2 (5.99) for $v = 2$ at the 5% level of significance. There is therefore, a statistically significant difference between the observed and expected frequencies, with $P<0.05$, inferring there is less than 5% probability the frequency distribution of the topographic and geological variables will be different in the total population.

Associations between variables are discussed using the following model.

	Independent Variable				
	C				C
	O				O
	M	→	COMPARE	→	M
Dependent variable	P				P
	U	→	COMPARE	→	U
	T				T
	E				E
	↓				↓
	100%				
100%					
	(n)				(n)

Table H5. **Model for analysing percentage tables.**
(Rose and Sullivan, 1996:129)

It is usual to think of a relationship in terms of its co-variation. The extent to which a change in one variable is accompanied by a change in another variable. If, therefore, two variables change or vary together(either in the same or opposite directions, they co-vary and are associated (X→Y). An association exists if after computing percentages in the direction of the X variable (up and down) in a table, there is any difference in the percentage distribution of the dependent variable(Y) between categories of the independent variable(X). This percentageing is done in the direction of the independent variable(X) and comparing across.

APPENDIX I. Extract from the Kirk Newton Terrier in 1806.

SOURCE: Northumberland Records Office, Ref. KY 21.

The Vicarage House is built of rough unhewn stone, covered with a plaister of pebbles & lime, & is two stories in height. The roof is of thatch, & at present in bad condition. The mansion contains on the ground floor an entrance Lobby, two sitting rooms, a Kitchen, two Pantries, & a large Cellar. On the upper Floor are five Chambers, to one of which is annexed a light Closet or dressing Room. The different Apartments are floored with deal, ceiled, & are in sufficient repair. The Outhouses consist of. 1.st a Stable with four Stalls, together with a Loft for hay: its dimensions are 24 feet in length, & 15 ft. in breadth. 2.d a Coach House 15 feet by 8 ft. above which is a small Pigeon House. 3.d A Barn 15 ft. by 15 ft. - 4.th A Cow House 8 ft. by 15 ft. - There is also a range of small offices forming a right angle with the Stable, Coach House &c. the whole length of which is 42 feet, & the breadth 5 feet. The Outhouses are one uniform building, situated immediately behind the Vicarage House. The space between forms a back Yard or Court. The whole building is of stone with a roof of red tiles, & is in compleat repair, having been raised from the ground at the expence of the present Incumbent.

The House is situated on the south side of the Glebe, & is fenced out from the Village by a Wall in front. Part of the Glebe has been lately converted into a kind of shrubbery, through which there is an approach to the House. The rest of the Glebe consisting of about 1¾ Acres is now a Meadow

There is a Garden at the west end of the house, inclosed by a new stone wall, built likewise by the present Incumbent. The Garden is 52 yards long, & 19 yds. broad, & is bounded on the north side by a range of offices belonging to Mess.rs James's of Kirknewton: At the western extremity of the Garden is a door leading to the Church-yard.

There are two small Cottages standing at the south east corner of the Church Yard, built at the Parish expence, one for the Clerk's residence, another for a School-room. The Parish keeps these in repair, as well as the Church (the Chancel excepted) and the Church-yard fence, which is a stone one.

There is no furniture belonging to the Church, except a Cushion & cloth for the Pulpit, & a green Cloth for the Communion table: The Communion Plate consists of a silver Cup & salver: The former was given by Mr. Amor Oxley, & has the name of the Donor inscribed upon it: the latter bears no inscription, nor is the weight marked upon either of them. There is no Clock to the Church, & only one Bell.

The Clerk's Wages arise from Easter Offerings & fees upon Baptisms & Burials, & amount upon an Average to about 5 pounds p. Ann: — He is appointed by the Vicar.

— To the truth of the particulars contained in this Instrument we subscribe our Names this ninth day of July in the year of our Lord 1806.

John Boucher, Vicar of Kirknewton. John Davison

C. F. James.

Mark Preavely [illegible]

[illegible] [illegible] John [illegible]

KY 21

APPENDIX J.
Enclosure Awards in Northumberland.

Evidence of enclosure[1] for Northumberland comprises nine acts:

	Act	*Award*
Gunnerton	*1740*	*1741;*
West Matfen	*1757;*	
Norham	*1761*	*1762;*
Corbridge	*1776*	*1779;*
Elrington	*1784;*	
Thorneyburn, Greystead and Stannersburn	*1804*	*1816;*
Smiddywell in Simonburn	*1809*	*1818;*
Ovingham, Bywell St Peter and Bywell St Andrew	*1817*	*1817;*
Haltwhistle	*1844*	*1849.*

SOURCE: Baker and Butlin (1973: 103).

[1] McCord and Thompson (1998: 178) make the point that a good deal of enclosure took place by agreement between interested parties, and that cases of dispute or legal complexity were dealt with by a system of statutory enclosure.

Morpeth 1896.
SOURCE: OS 1:2500

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