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## INTRODUCTION

The developing historic research design prepared for use on Delaware DOT cultural resource projects presents a model for regional settlement patterning and individual settlement development over time. The foundation of this developmental settlement pattern model is location theory used by social and economic geographers (see Hudson 1969; Lemon 1972; Morrill 1974). The model employs the transportation system as a general framework within the region since transportation has been considered a primary factor in historic site location due to the need for access to markets (see Lemon 1972:119; Morrill 1974:136; Swedlund 1975:28). Not only is this a viable research approach, but since the location of historic sites along transportation routes is a primary pragmatic concern of DelDOT, such a model facilitates the consolidation of our public and professional archaeological responsibilities.

The research design is tailored to be sufficiently general so that data previously obtained, and that yet to be acquired, in the Delmarva Peninsula can be utilized, but yet not so general that more specific research designs cannot be developed from it.

## LOCATION THEORY

Basing his work in part on ecological studies, Hudson (1969) developed an explanatory model of rural settlement. This model assumes that the area under study is topographically uniform and homogeneous in terms of available resources, and that any differences in farm sizes are due to variables whose net effect is random. In addition, the model includes a temporal dimension, allowing for process oriented studies. Hudson (1969:366-371) defined three stages of development:

1. Colonization - A given population moves into a frontier area.

Settlements are few and dispersed, and population density is low.

2. Spread - As population density increases, the total frontier area becomes occupied. The spatial process is diffusion, manifested in "offspring" settlements clustered near the original colonizing settlements. If population growth is the result of natural increase, settlement locations tend to be clustered. If, however, population growth is due primarily to immigration, "it seems likely that new settlements could be somewhat repelled by the earlier settlements, under conditions of contiguous landholdings of approximately equal size typical of most homesteading" (Hudson 1969:370), then settlement spacing would tend toward regularity.
3. Competition - As population density increases, competition for resources (such as agricultural land and marketing areas) leads to regularity in settlement patterning, especially regarding settlements larger than individual farm holdings. However, a large variability in farm sizes can result in a clustered pattern, and moderate size variability tends toward random spacing, while small variability in farm sizes produces a regular settlement pattern.

Hudson (1969) tested his locational model in rural Iowa, hypothesizing that the general long term trend would be toward regular settlement patterning. His results indicate that through a 90 year-period, farm settlements exhibited an initial clustered patterning, then randomness, and finally regularity (Hudson 1969:380), thus supporting his location model.

Since the majority of the Delmarva Peninsula is coastal plain with fairly uniform topography and homogeneous distribution of resources, Hudson's location

model is particularly relevant. Northern Delaware and northeastern Maryland, however, contain fall line and piedmont topographic variability which may preclude utilizing Hudson's model with validity in this area. A study conducted in northwestern Massachusetts (Swedlund 1975) has particular relevance to this problem. Swedlund (1975) applied Hudson's location model to the settlement pattern in three Massachusetts Counties. Despite topographic variability, Swedlund's (1975:31) results support Hudson's (1969:386) findings regarding the tendency toward regular settlement spacing through time. Thus, the location model should have utility in the piedmont areas of Delaware and northwestern Maryland.

Swedlund (1975), however, did note some variations from Hudson's (1969) location model. Since there are several factors that affect settlement patterning thru time other than population density, these should be taken into consideration when applying the model and analyzing results. The following are several important factors that affect settlement pattern:

1. Economics
2. Transportation system
3. Geography
4. Population size and density
5. Technological innovations
6. Governmental action
7. Social concerns

All these factors function inter-relatedly, but any factor may exert greater or lesser influence at any one time or place. In general, however, it appears that economic and transportation factors are the most influential, with the others acting as secondary pressures. A discussion of each factor will illustrate how settlement pattern is affected.

1. Economics - Of primary importance in the western market economy is the ability of a producer to distribute his commodities to consumers as efficiently as possible to permit profit (realization). Commodity distribution normally occurs in a market, whether it be a store or weekly (fair). For each commodity, there is a spatial area within which it is profitably marketable, however, this commodity range is not the same for all commodities. The size of a commodity range depends upon (a) demand for the item (usually expressed in terms of population size); (b) purchasing power (roughly equivalent to social status); (c) transportation efficiency (ease of movement); and (d) competition from other markets (Beavon 1977:19). In addition, perceived value of the item and perceived distance to obtain it are important factors. As the distance from this market increases, consumer access is more difficult in terms of time, effort, and cost. (Beavon 1977:138; Morrill 1974:210). Consequently, smaller markets will become established in outlying areas to serve these consumers (Beavon 1977:138). This is the basic reasoning behind central place theory, which describes settlement location in terms of retail marketing areas (see Beavon 1977; Crumley 1979). Central place theory includes a hierarchy of equidistant market centers based upon the largest range of any of the commodities which it marketed. (Beavon 1977:22-23).
2. Transportation System - Transportation has been termed the major factor in settlement development (Morrill 1974:136). Not only is transportation of primary economic importance in moving produce and consumers to markets, but transportation also provides avenues for social interaction. The transportation system includes the means of transport (i.e., foot, horseback, wagon, railroad, shipping) and the

transportation network, the physical routes upon which movement occurs. Changes in any part of the transportation system are factors in changes in the settlement pattern and in internal settlement pattern (Morrill 1974:127, 136). Many transportation routes are built in response to existing demand (often, but not always, economic), although the location of many routes may determine the location of future settlements (Morrill 1974:140). In terms of the volume of transportation and the efficiency (time vs. cost) of a route, major routes connect larger settlements, while lesser routes serve smaller places (Morrill 1974:132).

3. Geography - Geographic features provide avenues for and barriers to movement. For example, a river may on the one hand provide easy access for transportation, but on the other hand serve to divide an area through which it flows. Some geographic features, such as marshes and steep slopes are not conducive to settlement, while others, such as fertile coastal plains encourage settlement. One aspect of geography is not apparent by viewing a landscape or examining a topographic map - perceived travel distance to achieve a goal. Environmental resources available for exploitation, either for subsistence or production purposes also influence settlement pattern. Areas of prime agricultural land were the first to be settled in southeastern Pennsylvania (Lemon 1972:104), and deposits of raw materials for manufacturing (such as a rich coal seam) will encourage settlements (Blouet 1972:7). In addition, non-economic geographic features such as socially perceived landscape aesthetics may also affect choice of settlement location (Henry 1980:7), although such socio-geographic factors may be more relevant at the individual site level.

4. Population Size and Density - Effects of changes in population size and density have been discussed in terms of Hudson's (1969) location model.
5. Technological Innovations - Technological innovations in transport and/or manufacturing that permit commodities to be made for less cost and transported to market more efficiently will affect settlement pattern. For example, the introduction of the steam engine allowed for more efficient industrial production which lowered consumer costs, while the introduction of railway lines into less inhabited areas previously served only by wagon roads, permitted more efficient ease of movement for population expansion and social interaction.
6. Governmental Action - Intentional regional planning by governments can have a profound effect on settlement pattern (if such is the case, Hudson's model is superficial (Hudson 1969:381). Hudson (1969:380-381) found however, that despite a planned grid system of roads in Iowa, the changing settlement pattern supporting his model was apparent. Additionally, Lemon (1972:88-104) noted that although Penn had required a rectangular configuration of townships, roads, and villages in southeastern Pennsylvania, the homesteaders and surveyors disregarded Penn's plans. The resultant settlement pattern through time supports Hudson's (1969) model.
7. Social Concerns - Social variables such as religion, kinship ties, social status, and perhaps ethnicity also affect settlement pattern. For example, Lemon (1972:43) found that "the distributional patterns of nationalities and religious denominations (in southeastern Pennsylvania) seem to indicate that settlers were strongly attracted by their own cultural groups." However, these variables may be more apparent in internal settlement patterning (e.g., upper class neighborhoods or ethnic ghettos) than at the regional level.

## SETTLEMENT DEVELOPMENT

Within the framework of the overarching location model, a settlement development model has been developed using transportation networks as the means by which the Delmarva region is linked into a systemic whole.

As discussed earlier, transportation is a major factor in settlement development (Morrill 1974:136), not only on a regional scale, but also at the settlement level. The processes of transportation route development and settlement location and development are so interwoven that it is particularly difficult at this time to isolate them. The following transportation route ranking has been devised in an attempt to isolate transportation route factors. This typology is based primarily on distance, amount of connectivity, and means of transport, and is a revised version of that developed for use in Alexandria, Virginia (Klein and Henry 1980).

### TRANSPORTATION ROUTE RANKING SCHEME

#### A. Water Routes

1. Trans-Oceanic (e.g., - Philadelphia - London)
2. Coastal (e.g., Philadelphia - New York)
3. River (e.g., Philadelphia - Wilmington)
4. Canal (e.g., Chesapeake - Delaware Canal) (Phila. - Baltimore)

#### B. Surface Routes

1. Inter-regional roads (e.g., I-95) - those routes that extend beyond a region's boundaries, the region in this case being the Delmarva Peninsula south of Pennsylvania.

2. Intro-regional connectors (e.g., Del. 896) - major routes within a region that intersect at least once with an inter-regional road.
3. Local access feeders (e.g., farm roads) - small routes within a region that may or may not connect to intra-regional roads, but which provide access to the hinterlands of the region. Residential streets in housing developments or urban areas may be considered Local Access Feeders.

#### C. Railway Routes

1. Inter-regional lines (e.g. Philadelphia-Baltimore) - extend beyond the region's boundaries, and may have few stations in proportion to route distance; may have several tracks on one bed.
2. Intra-regional connectors (e.g., Wilmington-Dover) - may have high station-to-distance ratio, with one track.
3. Local spurs - extend short distance from intra-regional connector or inter-regional line, with one station at its terminus and one track.
4. City trolley - provides passenger transport within an urban area, and has been shown to have been an influential factor in internal settlement development (Hoffecker 1974:37-39). It is expected that only the largest settlements will have trolleys.

The following presents a tentative hierarchical typology of settlements within a region. Although most hierarchical settlement typologies have been based primarily on economic factors (central place hierarchies are most noted (see Beavon 1977), such schemes do not take into account other conditions that influence settlement development. For example, economics alone cannot explain the existence of Washington, D.C., Atlantic City, N.J., or Vatican City in Rome.

Therefore, several other factors, such as relative size, settlement functions and structural density, have been utilized as well to distinguish one settlement type from another. Other researchers (see discussion in Beavon 1977:43-49) have devised settlement hierarchies based on population size and number of businesses. Although these two variables would provide useful economic information, they would have to be utilized in conjunction with other social factors. In addition, it was felt that the collection of such data for each settlement under study would be prohibitively time consuming, if not impossible. There are no strict boundaries between types - settlements are actually arranged along a continuum but the typology is simply a heuristic device to facilitate analysis. Moreover, this typology may be considered a series of hypotheses on internal settlement patterning, since it is based only loosely on other research (e.g., Lewis 1976; Cressey 1980; Blouet 1972; Beavon 1977; Lemon 1974; Wise; 1980). The typology has been developed to be applied at any time period, although there are certain characteristics specific to particular developmental phases, which are discussed.

### SETTLEMENT TYPOLOGY

1. Homestead - The homestead is the basic settlement unit and consists of the land, house, and outbuildings occupied by a small number of people, usually (though not always) a family. A homestead can be a 500 acre farm or a property lot in a large city.
2. Hamlet - A Hamlet is a small cluster of homesteads. Internal settlement pattern is irregular, showing no evidence of planning. Initial function of the Hamlet may be kin-related (the homesteads of one family clustered together) or associated with the presence of a church. There may be a few part-time specialists, such as a blacksmith, providing goods and

services to a limited area.

3. Village - The village is larger, in terms of area and population, than the Hamlet. Internal settlement pattern may be irregular, especially if the village grew from a Hamlet, or it may be planned. The village may function in local commerce as a small scale trading center, and may contain, for example, a store, an inn, and/or a blacksmith. The village may also have a post office, a church and a school, providing a few minor governmental functions and several important social functions. There may be little spatial segregation in terms of social status or land use.
4. Town - The town is larger than the village. The homestead density to Town area ratio is still fairly low, but higher than that of the village. Internal settlement pattern is usually planned, (i.e. regular placement of streets, often in a grid pattern), but may exhibit areas of irregularity if the town has grown from an unplanned village. The town is a major economic and social focus of the sub-region within which it is located. The town is usually a minor, though important, participant in inter-regional trade functioning often as a transshipment point. Due to this economic function, the town offers a greater range of goods to consumers in the sub-region and more employment opportunities. Small scale manufacturing and greater specialization in production are evident. The town also serves important social functions by providing church activities and "town hall" recreations such as travelling entertainment and school activities. The town may also serve as the focal point for the political and/or judicial administration of the sub-region.

The town exhibits changes in its internal settlement pattern over time, primarily as a result of population growth, although other factors are influential. The temporal trend is toward internal spatial consolidation, some spatial segregation, and growth in spatial size.

One type of town has special chronological importance - the "Frontier Town" of the 17th and early 18th centuries. Lewis (1976) has presented a model of the developing frontier in which the Frontier Town is the focal point for all economic, political, social, and religious activities of the frontier and serves as the only link between the frontier and the homeland. In these functions, the Frontier Town may better be termed a City (see discussion below), but because this type of Town exhibits a low ratio of structures to area, it is called a Town. In addition, the Frontier Town does not appear except in a frontier situation (the initial Colonization stage of Hudson's (1969) model). It has, therefore, been considered a special type of Town pertinent only to a specific stage of settlement and time period (usually 17th to early 18th century on the east coast). Internal settlement pattern is characterized by dispersed homesteads, concentrated along the major transportation route(s), and little spatial segregation in terms of land use or social status. The Frontier Town is primarily a marketing center, transporting raw materials and semi-processed goods to the homeland and receiving processed goods in return. Depending upon the degree to which other factors influence the Frontier Town's development, its inter-regional functions and regional importance either may decrease, leading to equilibrium or decline, or these may increase, resulting in a City settlement type.

5. City - The City is larger than a Town, and has a high ratio of homesteads to area. There is usually only one within a region. Internal settlement pattern is planned, and spatial expansions resulting from growth are usually planned. The City fulfills major inter-regional economic functions, and may perform important inter-regional political, judicial, and social functions. The City is the major focal point within the region for economic, political, judicial, and social activities. Large scale manufacturing is present. In addition, residents of the City are dependent upon the hinterland for subsistence items. Cities develop from Town settlements given the presence of favorable factors influencing settlement development such as population growth, position in relation to other towns and cities, and/or access to raw materials.

In terms of chronological development, two special types of City can be identified within the general framework of the City characteristics just discussed. The first is the Mercantile City typical from the mid 18th to the early 19th century, the second is the Industrial City, characteristic from ca. 1830-1900.

- (a) Mercantile City - The focus of a Mercantile City is on merchandising, shipping, and bulk processing. The Mercantile City has often grown from a Frontier Town, and internal settlement pattern exhibits continued consolidation. Settlement density increases as competition for prime locations along major transportation route(s) increase. Spatial segregation in terms of social status and land use begins to occur and becomes

increasingly apparent through time. Multi-use structures (e.g, commercial first floor, residential second floor), high status residences, and small scale refined crafts tend to be located along the major transportation route(s); while low status housing, bulk product handling, light manufacturing and heavy crafts tend to be located on the outskirts (see Sjoberg 1960:323-324). Workers, however, live near their jobs.

- (b) Industrial City - The development of an Industrial City from a Mercantile City is dependent upon innovations in technology and transport that occurred ca. 1800 (e.g., steam power, railroad). A city may be termed Industrial, even if it has no industry or railroad, due to the fact that it is the recipient of industrial consequences in another city. Industrialization, through more efficient production and transport, made a wider range of goods, services, and employment available to those residing in the City and its surrounding region. Spatial segregation in terms of land use and social status continues and becomes quite apparent in the few decades before 1900. High status residences tend to be located on the outskirts of the City, while low status residences, bulk product handling, light manufacturing tend to be located in the City core near the railroad and heavy industry. Financial, mercantile, and small scale craft operations tend to be located in the City core, but these workers live elsewhere. Residential neighborhoods are loosely related to social status and occupation. In addition, there is increasing social stratification and differentiation in consumer behavior.

As discussed earlier, the developmental processes of settlements and transportation networks are intertwined to such an extent that it is difficult to isolate factors influencing one but not the other. But since it has been stated that major transportation routes connect larger places, while lesser routes serve smaller places (Morrill 1974:132), the following chart presents hypothesized relationships between settlement types and transportation routes.

Settlement Type	Water				Surface			Railroad			
	Trans-Ocean	Coastal	River	Canal	Inter-Region	Intra-Region	Local Access	Intra-Region	Spurs	Trolley	
Homestead	.	.	+	.	+	+	*	.	.	-	-
Hamlet	.	.	+	.	?	+	*	.	.	?	-
Village	.	?	+	+	?	*	+	.	+	+	-
Town	?	+	+	+	+	*	+	+	*	+	-
Frontier Town	*	+	+	+	*	+	+	-	-	-	-
City (M & I)	*	+	*	+	*	+	+	*	+	+	+

- .
  - \*
  - +
  - ?
  -
- (Intersections of one type with another and crossroads increase probability.)

### FACTORS AFFECTING SETTLEMENT DEVELOPMENT

The several factors previously mentioned as important in influencing settlement pattern are also influential in settlement development.

1. Economics - Of primary concern for settlement development is the

influence of economic competition and the ability of a settlement to maintain its place within the competitive economic system. If there are too many economic losses to competitors elsewhere, a settlement will lose resident workers and businesses, and will eventually decline in importance. If, however, the settlement is able to continue to succeed over its competitors, it will grow and may assume the economic position of one of its competitors.

2. Transportation System - In general, the higher the Transportation Route rank (1 being high) between two settlements, the larger the amount of interaction (socio-economic) between them (Morrill 1974:132). Thus if a settlement is situated on a minor ranked route, it will not be able to increase in importance (economic, social, political) unless or until the route is modified. The route, in this case, retards settlement development, even if other factors are very favorable, since the means of interaction (the route) is insufficient to manage the amount of interaction (be it individuals wishing to visit, or produce needing to get to market). Settlement development would not long be hindered, however, since various economic, political, and social pressures would influence route rank modification. Changes in transportation route location are extremely important in settlement development. For example, when the railroad was built south through the Delmarva Peninsula, it bypassed the thriving riverport of Odessa, going instead through Middletown. As a result of losing this more efficient means of inter-settlement interaction, Odessa's development declined, while Middletown benefited from the increased inter-settlement interaction and its development increased.
3. Geography - Probably the most important geographical factor is the

presence or absence of energy and raw material and resources for economic production. The presence of such resources would encourage settlement; while the absence of such resources would not necessarily discourage settlement, such settlement would tend to be smaller and less important economically. Localized geographical features, such as marshes, steep slopes and river banks, will tend to influence the direction of settlement growth.

4. Population Size - Population size is a crucial factor influencing settlement development. If a settlement is able to absorb increasing population economically and socially, in terms of jobs and housing, the settlement will grow spatially and will increase in settlement density. As a consequence, internal settlement patterning changes through time. Should a settlement not be able to absorb its increasing population, migration will occur to other settlements which can absorb it. This tends to result in an increase in interaction between these two settlements due to kinship maintaining social and business relationships.
5. Technological Innovations - Technological innovations specifically in terms of transportation are very influential in settlement development. Technological innovations that increase the efficiency of interaction within and between settlements (e.g., transportation innovations) will tend to result in changes in settlement development. The introduction of the railroad into Wilmington, for example, rejuvenated the City, which had been suffering severe economic decline (Hoffecker 1974:17), while the city trolley network constructed in the 1860s permitted city growth to expand by affording workers the means to travel to their jobs.
6. Social Concerns - Social concerns are also influential in settlement development, although perhaps in minor ways. As an example, the

desire in the late 19th century for recreational beach resorts either revitalized small beach hamlets or villages, or new resort settlements were founded. Internal settlement pattern is affected by such social factors as ethnicity and social status, manifested in neighborhoods and ghettos.

## **APPLICATION OF LOCATION AND SETTLEMENT DEVELOPMENT MODELS**

### **A. Data Required**

The data required to utilize the location model and to test the settlement development mode fall into two categories: (1) documentary, and (2) archaeological. The two data sets must be used in conjunction to provide one data base. The first provides data on spatial distribution of settlements through the examination of such historic records as maps, tax rolls, and census lists. The second provides more detailed information on internal settlement-patterning, land use, and material correlates of human behavior.

### **B. DeIDOT Projects**

Six DeIDOT archaeological projects provide the majority of data for applying the models. These are:

1. Wilmington Boulevard (Cunningham et. al. 1984)
2. Rt. 4 Schoolhouse (Catts et. al. 1983)
3. Wilson-Slack Agricultural Complex (Coleman et. al. 1984)
4. Ferguson House (Coleman et. al. 1983)
5. Temple Cabin
6. Ogle House

It is tentatively hypothesized that these six sites can be classified as, and can

provide data on, all of the settlement types discussed earlier. Proposed settlement type assignments are as follows:

1. Wilmington Blvd. (three phases)  
Frontier Town, 1630-1730  
Mercantile City, 1730-1835  
Industrial City, 1835-1900
2. Rt. 4 Schoolhouse  
This site does not appear to fit any of the settlement types and may need to be considered a specific type of site, i.e., rural education, which may exhibit its own particular locational patterns.
3. Wilson-Slack House  
Hamlet, 1840-ca. 1900  
(blacksmithy, wheelwright, railroad station, pre-1850 schoolhouse)
4. Ferguson House  
Homestead, ca. 1800-present  
(agricultural, poultry)
5. Temple Cabin (Ogle's "Red House")  
Homestead in a Village (Ogletown)
6. Ogle House  
Homestead in a Village (Ogletown)

In addition, historical information on Newark and other settlements such as Christiana, Stanton, Ogletown, New Castle, and Glasgow will be utilized to elucidate more completely the development of settlements and settlement patterning through time.

#### C. Artifact Distributions

A basic archaeological assumption that governs the majority of

archaeological research and analysis is that since human behavior is not random, the archaeological record will exhibit non-random patterns reflecting that behavior. Thus patterns at one type of site may or may not differ from those at another site, and research models provide explanatory means of comparison.

The following factors affect the distribution (or diffusion) of artifacts on a regional level (Hodder 1977:278-291), and are very similar to those discussed as affecting settlement patterning:

1. Friction effect of distance (as distance increases, the frequency of occurrence decreases)
2. Geography (avenues for or barriers to movement)
3. Social and economic (i.e., perceived and actual) value
4. Locations and sizes of competing markets
5. Settlement pattern (in terms of opportunities for interaction via transport network)
6. Degree of receptivity to a new item or idea (Dunnell 1970:316)
7. Time

Therefore, distributions of various classes of artifacts marketed during different time periods can be used to test changes in interaction between settlements in terms of trade patterns and to compare the development of different settlement types. Various researchers have found that quality and quantity of specific artifact types vary according to social status (e.g., Otto 1975; Cressey 1980). Artifact distribution patterns can thus be used to compare status differences within and between settlement types.

Two statistical measures can be used to test interaction between settlements for both the location model and the settlement development model. The first of these is the nearest neighbor statistic, which determines the degree a settlement pattern deviates from random (see Earle 1976). Although this is a descriptive statistic only, it has a high degree of objectivity. Swedlund (1975) used nearest neighbor analysis productively in testing Hudson's (1969) location model. The second statistic that could be employed is the gravity model, which states that "the amount of interaction between two communities is directly proportional to their populations and inversely proportional to the distance between them" (Plog 1976:256). Plog (1976) used this model successfully in his Mesoamerica study, but notes that since its explanatory value is very low, other models should be employed as well (Plog 1976:257). There are difficulties with both of these analytical procedures (Earle 1976; Plog 1976; Crumley 1979), but they have been shown to have utility if the proper precautions are taken.

## CONCLUSION

A developing historic research design has been prepared for the Delaware DOT cultural resource projects which can be applied to the Delmarva Peninsula region as a whole. The research design is sufficiently general that data previously obtained, plus that to be acquired in the future, under varying research orientations can be utilized. In addition, the research design framework permits generalized predictions to be made about site location relative to DelDOT's prime function - transportation. Little research has been undertaken in historical archaeology on historic settlement patterning and settlement development through time. It is hoped that the application of this research design in Delaware will contribute significantly to historical archaeological knowledge.

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# LOWER DELMARVA REGIONAL CENTER FOR ARCHAEOLOGY

SALISBURY STATE COLLEGE  
SALISBURY, MARYLAND 21801

RECEIVED

July 30, 1981

AUG 8 1981

Dear Sue,

OFFICE OF PLANNING  
DEPT. OF TRANSPORTATION

I liked the Historic Research Design alot, and I am at somewhat of a loss to make any general suggestions for improving it. I will offer up a few particularistic observations based on my experiences down here, however. I hope they will be of some use. First, it is apparent on Marylands lower shore that bridging points on rivers skew road systems very markedly and concomitantly affect settlement patterns. Bridges seemingly are much more efficient movers of peoples and goods than river ferries. Most early towns down here developed not at the mouths of rivers but at the lowest points on rivers that could be easily bridged. With the exception of Cambridge the towns that grew were towns on bridges, not towns on ferries. Second the limited availability of water power down here had a very great effect on settlement, not so much initially but from 1750 on. Areas with low water power potential consistently loose population to areas with high water power potential. Third, as far as long distant water transportation is concerned, speed and regularity of service were very important to the kinds of goods transported. The beginnings of steam navigation on the Cheasapeake Bay changed marketing patterns for the lower shore by making Baltimore accessable faster and on a more regular basis. The shift from grain to fruit, vegetables and seafood that occured on Marylands Lower Eastern shore between 1800 and 1870 was apparently triggered initially by improved water contacts with Baltimore. This shift was intensified by the coming of the Railroad later on. Fourth, as far as earliest settlement is concerned, the most important factor seems to have been accessability to water, but the next most important factor was the drainage characteristics of the soil. Areas with good access to navigable waterways are settled first if they are well drained, but if land is poorly drained then despite water access settlement is delayed by about a generation. A similar delay in settlement is seen with

interior areas that have good drainage but no water access. Apparently the difficulty of moving goods on land just about balanced the difficulties created by the farming of poorly drained land. As the road system developed of course, interior lands of high agricultural potential increased in desirability relative to accessible but poorly drained lands. Congratulations on the research design.

Yours,

Tom Davidson

Edward F. Heite  
P.O. Box 53  
Camden - Wyoming, Del. 19934  
302-697-1789

office information management consultant  
SOPA certified professional archaeologist

September 21, 1981

Mr. Kevin Cunningham  
Archaeologist  
Division of Highways  
P. O. Box 779  
Dover, Delaware 19901

Dear Kevin:

I'd like to go over the research design document in some detail. However, in a letter there is space only for a few high spots. It seems to me that the work of several others in this area should be considered. Dan, Cara, Lou, and I have been refining these very concepts for about ten years now. Cara, for one, drafted a design for the use of the state. I can see in this document some misconceptions that will trap a newcomer who has not worked extensively with the subject.

In particular, see my two publications on the subject, which were published as volumes 1 and 2 of the state preservation plan several years ago.

I urge you to consider convening a symposium on the subject, before you go any farther. If this document is published in its present form, you are likely to precipitate polarization and controversy that is unnecessary at this stage.

First, I question the statement that the area under study is topographically uniform and homogenous. The author later identifies some rather large exceptions. Certainly it is impossible to say that the original settlers were culturally homogenous, or that the population ever became a single social or cultural entity. Any research design specifically for Delaware must take into account our rich ethnic and physical diversity.

Three competent researchers have studied the first-generation rural settlements in great detail. Working in all three counties, they found that the early land grants were defined by natural features and not by any pre-arranged patterns. These physical features that defined

the earliest boundaries survive as boundaries today.

In fact, below the canal, there are at least four different historic environments, that produced radically different settlement and subsistence patterns from first colonization to the present.

Hudson's three stages might apply to Pencader, Christiana, Brandywine, White Clay, and Mill Creek hundreds, where the land was in fact parcelled out in Penn's grid scheme after 1682. In fact, Lemon's observations hold true in these parts of Delaware. However, the vast majority of our land area was laid out in a wholly different type of pattern. Settlements were few and concentrated; landholdings were small and close together. The first areas of settlement were densely populated, planned communities. Later the population dispersed, to coalesce later.

Moreover, I believe that it is difficult to blandly equate the federal Land Office system to Penn's. The Pennsylvania land office never was able to impose the grid on Delaware in any case. In Iowa, the grid was a prearranged system, which dictated the very concept of land itself, as sections and quarter sections. In the east, land was conceived in terms of plantations, fields, or inheritances of undefined shape and acreage. The whole concept is different.

Our population did not spread out evenly, partly because of large speculative holdings, partly because of topography, and partly because of the transportation network. Until the generation of the American Revolution, everything west of the uppermost mills was "forest" or inferior land.

During the nineteenth century, railroad routes marked a massive shift in population. Up and down the Delaware Rail Road, the average size of landholdings changed radically, from large speculative tracts, to smallholdings, back to large farms, and then back to smallholdings. The duPont road in the twentieth century, and the decline of the peach industry, marked another radical population and homestead-size shift.

However, in the more recent case, the forces at work were wholly different.

The paper does not address the very important fact that Delaware had two periods of frontier town-building, in the seventeenth and nineteenth centuries. In both cases, new

towns were erected quickly, according to a predetermined and culturally predictable plan, without a developed hinterland network. Both the coastal frontier towns and the railroad towns inherited the Ulster model verbatim, as did the courthouse towns of Arkansas and other well-publicized examples. This is not to say that all Delaware townsites were born in this manner. Certainly there is a second, accretional, form of townsite in Delaware, that emerged in the presence of mills, landing roads, and north-south roads, in a combination that could be quantified.

Variability of farm size in Delaware is a function of soil, drainage, transportation, varying ownership types, and market. Because certain resources are concentrated in specific areas of the state, we have a very high degree of geographical determinism.

I question the statement that six identified DelDOT projects can adequately test all the settlement types listed in the paper. In the first place, they are upstate, where the historical environment is utterly different from downstate. Furthermore, the sites in question reflect only about a third of our settlement history.

For your consideration, I submit a list of "factors affecting settlement development" in Delaware. These may fit into the rather broad categories outlined by Henry, but some are so significant that they probably should be considered as major factors independently:

#### Soil Drainage

Since the seventeenth century, drainage has dictated settlement, both constricting and expanding the spread of population. This aspect of geography is nowhere mentioned in the document, probably because it was not a factor in Southeastern Pennsylvania or Iowa, whence came the data for the model. The paper does, however, identify marshes as impediments to settlement, which is precisely the opposite of the Delaware experience.

#### Power

Water power is such a dominant theme in Delaware history, from the earliest times through the nineteenth century, that it cannot be lumped under geography or wherever it is. Nearly every community in the state before 1855, except New Castle, Dover, and Wilmington, derived much of its vigor from water power resources.

## Portage

I find the definition of transportation route types too generalized and too vague. Delmarva's role as a portage on the north-south corridor made nearly all of our transpeninsular routes part of the inter-regional system. This would place most of our roads in the highest class of the conventional hierarchy, which is misleading in the extreme. New Castle is the only early portage town that could be called a center for inter-regional communication. In view of the overwhelming importance of portage throughout Delaware, I believe that you need to re-think the whole matter of surface transportation categories. Even the Delaware Rail Road was conceived as a portage, part of a combined water-land inter-regional network.

Around the middle of the nineteenth century, Delaware's major transportation arteries ceased to be portages and became parts of single-mode transportation networks. The slow conversion to single-mode transportation was not complete until very recently.

All in all, the paper is a competent general essay on research design, but it is not a specific Delaware document, reflecting applicable specific local understanding. To compound matters, there are some zingers among the examples. For example, "It is expected that only the largest settlements will have trolleys." Dover, Odessa, Port Penn hardly were "largest settlements". Such a sweeping generalization reflects poor understanding both of electric-railway history and the history of Delaware. The statement itself has little bearing on the document, but its absurdity will reflect poorly upon the author's, and your agency's, credibility.

As it stands, the document will be received as a rehash of broadly-accepted statements, without the specificity and insight of a research design statement.

For your sake, I urge you to keep this document out of circulation until there has been time to hone it considerably. I'm ready to help, and the others in the field certainly are.

Lou has reviewed the document with me, but probably will have some more specific input through her channels.

In the meantime, I urge you to get a copy of the state plan for historic preservation, volume 1, in which I outlined

many of these issues in more specific detail. The thematic statements appear in volume 2. Although I have developed my ideas further since that time, the document was accepted by some pretty insightful people as a basis for research design.

Sincerely,

A handwritten signature in black ink, appearing to be the initials 'NA' or similar, written in a cursive style.

UNIVERSITY OF DELAWARE  
NEWARK, DELAWARE  
19711

RECEIVED  
OCT 14 1981

OFFICE OF PLANNING  
DEPT. OF TRANSPORTATION

COLLEGE OF ARTS & SCIENCE  
DEPARTMENT OF ANTHROPOLOGY

October 11, 1981

Dear Kevin:

Thank you for the opportunity to comment upon Susan Henry's proposed "Delaware Historic Research Design". Because I am not trained as a historic archaeologist I have not commented upon these aspects of the proposed research design. However, because the fundamental applications of many of the locational models have a common basis in prehistoric and historic archaeology I have included some comments on these aspects of the research design. Also, over the years I have been involved in the study of historic settlement patterns in southeastern Pennsylvania and I am familiar with Lemon's work that is cited in many places in this research design. Where appropriate I have included comments on this topic. Finally, you asked me specifically about possible statistical tests of the generalizations offered in the research design and the methods proposed at the end of the design. I have also provided these comments.

My specific comments on the proposed research design are as follows:

- page 1, line 9 - Lemon also stresses the role of available natural resources such as soils, mineral resources, etc. These factors are not addressed in this model.
- page 1, line 20 - I doubt that topographic uniformity or homogeneity of resources applies to the Delaware Coastal Plain or Piedmont physiographic zones. Especially given the varied estuarine settings.
- page 3, line 2 - see comments for page 1, line 20.
- page 4, line 7 - Russ Handsman has shown that our ideas about how present market economies work are not always accurate assessments of how past market economies have worked. (For copies of Russ's work write to him at the American Indian Archaeological Institute, Washington, CT).
- page 5, last line - I think that this is a misreading of Lemon's work. The earliest settlements of Lancaster and Chester Counties was associated with mineral resources, namely the Welsh mining communities.
- page 6, line 23 - I don not think that it is at all definite that the southeastern Pennsylvania data fits Hudson's model. For example, Jennings' studies of Logan's policies in the Indian trade have shown that these policies greatly affected settlement patterns in large portions of Lancaster County.
- page 7, line 6 - It is not at all clear that variables of ethnic/religious affiliation are more readily apparent in internal settlement patterning. In the previous sentence Lemon's data is cited; however, Lemon's study clearly showed that regional settlement pattern differences in Lancaster County correlated with religious groups such as Quakers, Anabaptists, and ethnic groups such as the Welsh. The cited literature is inappropriate for the general statements presented!

page 20, line 23 - There are major problems with the nearest neighbor statistic as documented in a series of articles in recent issues of American Antiquity. The problems with applying it to this research designs are data controls, time controls, intervening variables, and transformations of distance measures.

page 21, line 4 - It is not at all clear from Steve Plog's study that the gravity model works. Jochim's work also shows problems (IMPORTANT PROBLEMS) with this approach.

page 21, line 16 - It seems as if many years' work on historic settlement pattern studies in Delaware have been ignored.

In addition to these specific comments I would like to make a few general observations. First, the major weakness of this research design is that it is too superficial and general. It ignores almost all of the previous historical archaeological research in Delaware. (There are only two citations of Delaware studies in the references cited section!). All of Delaware south of Route 95 seems to have been ignored. Even more seriously, there seems to be a complete disregard of the cultural variability and cultural context of the locational data. This is especially true in the use of Lemon's data.

With regard to the locational analyses, there is a certain "fuzziness" in the presentation of the concepts that indicates a "fuzziness" on the part of the understanding of the author. The quantitative methods appear to be a "grab-bag" of approaches obtained from a simple perusal of Flannery's Early Mesoamerican Village.

I hate to be completely negative, but I find it difficult to say much good about this research design. It looks like an "F&S" job, fast and sloppy. I do not think that it will even serve the needs of your short-term research projects for the Route 4 project. I think a more complete review of existing data and analyses in Delaware is needed and coordination with Dan Griffith's office is essential. Dan and I have worked out a format for the prehistoric resources that is applicable in its general outline to many of your problems. Also, it is necessary to comply with the Federal RP3 guidelines and this research design does not even come close. I am sure Dan can help you out with this.

If I can provide any further assistance, please let me know.

Sincerely,

  
Jay F. Custer, Ph.D.  
Assistant Professor of Anthropology



RECEIVED  
OCT 16 1981

Maryland Historical Trust

OFFICE OF PLANNING  
DEPT. OF TRANSPORTATION

October 14, 1981

Ms. Susan L. Henry  
Project Archeologist  
Division of Highways  
Box 778  
Dover, Delaware 19901

Dear Sue:

I have reviewed your historic research design for Del/DOT and found it a very useful document. My knowledge about central place theory and location theory is secondary and has been expanded by your well written paper. The comments which follow were typed as I read the paper and responded to the points raised. They represent my initial, uncensored reactions. I hope this frank response will be of greater value than a more contrived response.

I. Introduction: This is a fine introductory statement about the model, but a paragraph concerning the need for such an approach from both a significance and predictive model standpoint might be useful. I agree that both intra and inter-site settlement pattern concerns should be addressed, and I agree that the road transportation routes lend themselves to this task, but with diminishing applicability through time.

II. Location Theory: Hudson's three stages of rural settlement apparently hold all factors static, except the nature of the population increase. As you point out on page 3, this static model must be modified by evaluating conditioning factors which better reflect a real world situation. I feel that the spread stage, as outlined in your paper, does not apply to 17th century Chesapeake society, although it would be of value for New England studies. A number of studies have been conducted in Maryland which deal with these factors in greater detail and which might provide useful elaboration for the three stages discussed (historical geographers and historians).

Do you really think that the coastal plain is uniform, particularly with the tidal areas and interior upland swamps providing such contrasting desirability factors to settlement? The Piedmont in Maryland did not result in regular spacing, for much of the barren areas were avoided during initial settlement, with the new settlers repeating the coastal plain example of preference for the fertile river valleys. Yet through time, spacing did become regular, but this reflected the crops under cultivation, the tenant system, and other factors. Your seven factors would make interesting themes for expansion as part of a state plan.

Ms. Susan L. Henry  
October 14, 1981  
Page 2

1. Economic: Your central place theory is an important model for the late 18th century to the present, but it does not apply very well to the 17th and early 18th century situation, as town development in the Chesapeake was virtually non-existent. This rather significant period, therefore, needs to be discussed by reference to more appropriate models. Moreover, the most important factor in affecting early site settlement, dispersal, etc., was the agricultural produce grown and the system of land tenure, which should be given equal importance in economic consideration.

2. Geography: In this section, you seem to be supporting my earlier doubts about the uniform nature of the landscape in Delaware which seems to be the prime assumption for your location theory. Given this, why even use location theory other than to say that it does not apply (unless it does for certain periods in history).

3. Population size and density: I have expressed my problems with Hudson's assumption about this subject. I suggest that this section could be expanded to say how this may not be applicable for certain periods while appropriate for others.

III. Settlement Development: I like your typology for transportation routes, but the brief introduction of the typology leaves the reader wondering how the categories will be of use in location on central place models.

The settlement typology is also a good ideal which researchers interested in prehistoric archeology should strive to do (instead of the big-little division now used). Your definition of hamlet and village are fine for the modern period, but are they equally applicable for earlier periods? Perhaps discussion like you give for the definition of town should also be applied to 17th and 18th century difference in hamlet and villages. Where does non-residential site consideration enter into your settlement pattern types for such things as the various mills which were prevalent in the 18th and 19th century in the rural landscape?

The section of factors affecting settlement development provides a framework for addressing many of the questions raised above, and as such is a useful and vital section to the discussion. Your artifact distribution factors are also well considered, although here you may wish to mention gravity models and how they should apply in a market system (I see you do mention this).

Conclusions: As always, this section could probably need expansion. How will these models be applied for the Del/DOT project to be studied? Like most models, your paper provides a fine framework

Ms. Susan L. Henry  
October 14, 1981  
Page 3

for you, but will it be of any meaning to highway planners? I think that the work could also be improved by using historical research to provide examples of the model applicability to Delaware. I refer you to the University of Maryland, Department of Geography papers No. 4 on a historical demographic analysis of Maryland's growth for many useful references for your study.

In summary, this is a well written document for the archeological community and provides a useful framework for understanding the range of settlement types expected and the modifying factors which enable the general model to be refined to better reflect historical fact. More detailed historic document research of the modifying factors should result in a better assessment of the settlement pattern of the area.

I hope these thoughts are useful. I look forward to discussing these points with you in greater detail. Keep up the great work!

Yours,



Wayne E. Clark  
State Administrator  
of Archeology

WEC/mf

cc: Mr. Daniel Griffith



STATE OF DELAWARE  
DEPARTMENT OF STATE

DIVISION OF HISTORICAL AND CULTURAL AFFAIRS

OLD STATE HOUSE • THE GREEN • DOVER • 19901

(302) 736-5685

BUREAU OF MEMORANDUM TO:  
HISTORIC PRESERVATION

Kevin Cunningham  
Department of Transportation

FROM: Alice H. Guerrant  
Historic Archaeologist

DATE: March 29, 1984

SUBJECT: Research Design for Highways

I have read through Sue's research design again very carefully, and despite some criticisms about its applicability which I know it received, I feel it is a very good starting point for organizing the approach to DELDOT's far-flung projects. The discussion of the applicability of Hudson's model should be expanded, to demonstrate that the differences between the Plains environment and the Mid-Atlantic Coast environment are realized and taken into consideration (as is in fact done in the Geography Section). In addition, the expected effects of this model need to be discussed in the application section. As it is, no explanation is offered to show how Hudson's developmental model relates to the hierarchical definitions of settlement types and transportation routes. Where, in other words, do the properties listed here fit in Hudson's scheme, and what data is needed to test this?

My main comment about this paper is that it does not go far enough; it is only the first step. For this research design to be truly useful to Highways, the historic context of the region has to be explicated as well, and the important research issues for each period and for the major resource types have to be presented in light of this research design. The model needs to be placed in a real-world situation in order to generate specific, testable hypotheses in relation to specific resources. Without an historic context, it is impossible to judge whether the information contained within a site is important to the research design. The Rt. 13 study has shown that a general historic context for a large area can be generated without doing intensive documentary research.

I also have a few minor comments. In the route ranking scheme, there is no place given for local river traffic, up and down along Indian River, for example; river in this scheme seems to refer exclusively to the Delaware.

Wilmington was never a Frontier Town, in Kenneth Lewis' definition of the term. Christinaham was, but cannot be considered relevant to Wilmington's settlement and development.

The question of where to put isolated schools in the definition of settlement types could probably be resolved by adding Rural Community, defined as a dispersed settlement of isolated homesteads and specialized support facilities, such as schools, mills, churches, blacksmith shops and so on, connected by local transportation networks within a small geographic area and possessing ethnic and socio-economic characteristics in common.

I hope this has been of some help. Let me know if you have any questions on these comments.

RECEIVED  
MAY 12 1984