CULTURAL DIFFERENCES IN SPATIAL PERCEPTION OF THE ENVIRONMENT AMONG CHILDREN 10-17 YEARS OLD IN THE WHITEHORSE AREA

by

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ABSTRACT

It is generally assumed that different cultures perceive the world in different ways. This assumption has remained untested in most cases.

This study examines two cultures--Indian and non-Indian in the urban environment of Whitehorse, Yukon Territory. The purpose is to find what differences, if any, occur in the groups' perceptions of the urban milieu and to isolate factors which do or do not influence these perceptions. Using cognitive mapping and photograph recognition techniques, the differences which were found were analysed, using chi-square and analyses of variance techniques. Although all 66 subjects of ages 10-17 had access to the same areas, places of importance for each group differed. Using the Appleyard classification, the Indian group produced predominately spatial maps, while the non-Indian maps were predominately sequential.

ACKNOWLEDGMENT

There are two people without whom this thesis, which has had its convoluted periods, would never have been finished. One is my husband, David, who during our strange and alcoholic courtship helped with setting up the research, and has since continually challenged and excited new ideas, as well as tolerated my outbursts. (He also drew the maps.) The other is my senior supervisor, Bob Horsfall, who with patience and enthusiasm most of the time, put up with mood changes and frustrations, and spent many hours helping and guiding me. Neither of them will ever know how much I love and appreciate them.

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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

Man has continuously and at an accelerated rate changed and modified his physical environment. Much of the change has taken place without any unifying concept of the total new environment which is being created or without thought of the effect of the change on the society which is exposed to it. Town planning has, until recently, been of the few, by the few, for the few, and there has been little awareness of the impact of its implementation on diverse groups in the community.[1] Of late, however, there has been increasing interest (in the fields of psychology, education, sociology and geography) in the role of the physical environment. The consideration of how and why man reacts to his environment has produced a spate of research into delinquency, effective teaching methods, perception and spatial reorganization: a great deal still remains to be learned about how individuals interact with their physical surroundings and how the organization of the space around them is perceived.

Much of the work that has been done in this area has involved adults who seem to be singularly homogeneous in age, background, occupation and income level. Since very few communities exhibit this high degree of homogeneity, it would appear desirable to ascertain how groups of differing backgrounds are affected by the space around them. Also, since in

the field of urban studies the main accent has been on adults in the community[2] (despite the fact that more than 50% of the population is under 21), consideration should be given to the needs of those in the younger age group.

With regard to this under 21 group, a meaningful environment based on understanding of what a child perceives as relevant and important in his surroundings should be considered as part of an effective educational experience. Such an experience should build on the relationship of the child to his surroundings and what he perceives, rather than on what the educator feels he should react to and perceive. That this is becoming the concern of educators is evidenced in statements such as that of Arthur Coombs in an education symposium-

> "If behavior is a function of personal meanings then perceptions must become the centre of the teacher-learning situation.... Perceptions must take their place as a vital part of the curriculum if knowing is to be effective in the lives of students."[3]

Thus, in order to be effective, structured educational experiences must be based on the perceived world of the child and the stimuli provided by it. Such an educational basis requires some knowledge of what places make an impression, how great a conception of space a child has, and to what extent these perceptions differ from group to group.

Problem and Literature

The purpose of the present study is to examine cultural differences in spatial perception of an urban environment among a group of subjects of age 10 - 17. In order to do this, factors such as age, sex, ethnicity, length of exposure to the locale and individual life style (measured by such indicies as residence, mobility, socio-economic factors and personal background) are correlated with areas of the city which appear important to the subject.

Since, as was stated above, most communities exhibit heterogeneity of age structure, cultural patterns, life styles and individual experiences, the qualitative and quantitative impact that the physical environment has would be expected to vary between groups. In a contemporary urban society in which most of the surroundings are man-made and which places emphasis on formal education, it is important to discover which facets of that environment stimulate and enhance the learning process[4] and to what degree the individual's characteristics and experiences shape and mould his image of the environment.[5] Stimulation of curiosity about the world is unlikely to occur in an individual whose exposure to unfamiliar elements of that world has resulted in enduring confusion.[6] Therefore, with regard to both education and planning, it appears mandatory to understand the impact of the environment and reasons for its impact on different groups of young people in a community.

There appears to be very little literature dealing with the geography of children. Some early references were made by Chombart de Lauwe[7], but the accent on the spatial range and local awareness of children - that is, their response to the environment, has been much more the province of the psychologist than of the geographer. In most cases research has dealt with the individual as an individual rather than as a member of a group.[8] Those who have made preliminary forays into studies of spatial perception of the physical environment have tended to work with college students but have suggested that the child's world is an important one. Lane,[9] in his book Political Ideology, uses the technique of verbal response to place names to ascertain which places have meaning for the subject and then examines the sources from which the awareness of place arose. The categories he uses are 1. personal involvement, 2. relative or friend involvement, 3. association with public figures, 4. association with public events and 5. associations stemming from generally newsworthy areas. For each of the 136 adults sampled, Lane postulates the range and focus of the sense of place. The response to verbal questioning is then compared to the focus of political interest of each subject. Lane suggests that in the contest for local and national attention four strands can be considered - these are 1. localism, 2. rootedness, 3. leverage and 4. community identity. He further suggests that both localism and

identification with the environment are a product of several generations, but since only one community was tested, this was not rigorously examined.[10] In enlarging on this theme, he states,

> "that it is the quality of experience, as well as its duration, which seems likely to affect the private geographical map, particularly the quality of childhood experiences." (Emphasis author's.)

Lane does not, however, examine these childhood experiences, nor does he state the actual technique used. He does indicate impressions from conversations - but verbal techniques can produce serious biases by voice inflexion or prompting on the part of the interviewer.[11] Nonetheless, Lane has pinpointed the importance of childhood perceptions in the relationship of adults to the environment and to their later involvement within a community.

One method of eliminating problems inherent in verbal techniques is suggested by Lynch in The Image of the City.[12] This is an expanded form of the ideas suggested by Trowbridge[13] in his original concept of a "mental map", reflecting the cognition of an area by an individual, using his private geographical orientation. Lynch has taken this basic concept and in his study of Boston asked subjects to draw a "mental map" of the environment as they perceive it, with the interviewer noting the order in which elements are produced, the

emphasis and the time involved in the map's construction. In his study Lynch uses three American cities, comparing the cognitive map with an accurate map to correlate the results. Later a very small sample of adults follows the map making task with description. In one case, Lynch also uses photographs which are classified and placed in such a way as to form a map of the city, and a field trip to record emotional responses to various areas. In this study there was a great deal of cross referencing so that checks could be made on original responses, but as Lynch himself points out there were certain limitations in the study.[14] One was the lack of heterogeneity among those sampled - all were drawn from a managerial or professional class, and only a small sample, n=16, completed all phases of the study. Some limitations which also seem apparent are that there was little attention paid to individual differences among the interviewees and also that repeated interviews about the same area over a period of time would likely change the subject's awareness of the area under study. In his suggestions for future research, Lynch maintains that studies should include references to images as they develop - that is, to include subjects who have been associated with the area for varying lengths of time, to consider how children develop an image of the world, how such images can be taught and communicated, and what forms are suitable for image development.[15] Some refinements of the mental map were later developed by Gould.[16]

The concept of image development and environmental stimuli has focussed attention in geography on the concept of the behavioral environment. This idea has been outlined by Kirk[17] who sees a filtering process imposed by the culture group and by individual characteristics on stimuli provided by the surroundings, to make each individual perception different from that of each other individual. Sonnenfeld[18] states this same idea:

> "Not until we are able to diagnose the variability in the human response to the environment according to its universal cultural and idiosyncratic elements are we likely to be able adequately to explain the quite specific response on the part of a specific group to a specific environment at the one extreme, and the apparent similarities of response of different groups to similar and different environments at the other extreme."

This same need is also brought forward in another context by Schroder, Driver and Streufert[19], as they state, "In many situations, particularly where complex decision making and intergroup and personal relations are involved, it would seem appropriate to weight the <u>way</u> a person thinks about a given problem more highly than <u>what</u> he thinks."

The idea of differing response, both on an individual level and between groups as manifested in varying imagery has also been expounded by Lowenthal.[20] In his article, Lowenthal points out cultural differences in world views and examines the

role of individual experiences, while maintaining that there is sufficient common perceptual basis to allow for communication. This cultural difference in perception is examined in a case study conducted by Sonnenfeld[21] in his work among Eskimos and non-Eskimos from a number of different areas. The technique used here involved a questionnaire covering age, ethnic origin, occupation, environmental and residential experiences, recollections of childhood environments and attitudes to the environment. This was used in conjunction with a Guttman scaled semantic differential test[22] and with choice between pairs of photographs varying in one of four basic dimensions - topography, water, vegetation and temperature. Some of the limitations inherent in this type of study are expressed by Collins and Seaton[23]: "Because the stimulus objects most of us are concerned with are so heavily imbued with aesthetic overtones, the "rubber band" phenomenon of psychophysical scaling becomes particularly troublesome", indicating that there is no way of knowing whether the scales used are the same for each subject. This point is particularly valid in cross cultural studies where there has been no attempt made to ascertain whether a group like the Eskimos have the same connotative meanings for words as their non-Eskimo counterparts. Another objection raised by Collins and Seaton[24] in this context is also valid with regard to Sonnenfeld's work - that is that "the crucial question occurs whether the same dimensions that describe real

structures also describes simulations of them." This applies in particular to a study such as Sonnenfeld's where the photographs are "second hand", having been taken from Strahler[25] and represented areas for some of which the Eskimo group had no prior knowledge. However, what does emerge from the study is that cultural and experiential factors play a large role in determining perception of and attitudes to the environment.

Much of this work has hinged on the different effects of the purely natural or of the man-made environment. As far as the urban environment is concerned, there has been increasing concern that this milieu should provide affective stimuli. Articles by Brower[26] and Fried and Gleicher[27] show concern for perception of an affective milieu and this is evidenced by the statement of Bacon,

> "Awareness of space goes far beyond cerebral activity. It engages the full range of senses and feelings, requiring involvement of the whole self to make a full response to it possible."[28]

That this concern for the urban environment is mainly adult oriented is stressed by Parr in his article The Child in the City.[29] He suggests that 60 years ago the mobility of the child was not very different from that of the adult, but that now the daily orbit of the child has been diminished in urban areas because of lack of planner awareness of the child's needs. He does not test this empirically but he does suggest it as a point to be considered in future research. Parr's assertion

needs empirical testing, particularly as he ignores the effect of media (especially television), which provides a symbolic image of the urban environment. It is likely that the general availability of television in North America has a profound effect on a child's perception of places, offering as it does, an already focussed view of the urban milieu.[30]

Some research using children as subjects has focussed on the technique of drawing. This work has been undertaken by psychologists and has been largely concerned with the child's actual development of the "sense of space" as exemplified in drawings - work by Piaget[31] and Dodwell[32] which has been largely concerned with the age at which the child develops "visual realism"[33] or the ability to portray on paper a coherent account of what he perceives. Others such as Vernon[34] and Estvan[35] have been concerned with how and why these drawings develop and how they portray perceptions. The use of human figure drawings to illustrate individual and group values has been current in the literature for the last 75 years - works by Goodenough,[36] Koppitz,[37] and Dennis[38] serve as examples of this type of approach. There was, however, until the late 1960's, very little use of mapping technique in this context, possibly because man-man and man-object relationships have been studied with children rather than man-land relationships. In the last two years the situation has altered somewhat and slowly this aspect of man-environment study is being recognised.

Representing this new approach is the recent work of David Stea[39]. In his paper, On the Measurement of Mental Maps: Model for studying Spatial and Geographical Orientation, he establishes ordering principles for mental maps. These are:

"1. Establishment of hierarchies--some places are more important than others, for whatever reason;
2. "Boundedness": the space conceived ends somewhere.

3. Objects and places are located within the space, and can be conceived as "points" clearly or fuzzily defined;
4. The points exist in relation to each other; that is, one can speak of
   a. distance between points
   b. bearing from one point to another
   c. routes from one point to another which include changes in direction taken in following the route
5. Connectedness;
   a. a route existing between two points connectedness
   b. any interference with the route, e.g.
      (1) lack of transportation facilities
      (2) changes in elevation in land routes constitutes a barrier."

He suggests that within this framework such maps are measurable in terms of time, distance and direction and uses this framework in a number of pilot studies. Stea's proposal provides coherent suggestions as to how a sense of personal space[40] is represented and what it represents. As Stea points out:

> "The assumption implicit in the model presented (here) is that people behave in accordance with spatial schemata - mental representations of "physical reality", and that knowledge and understanding of these representations should be of importance to geographers and planners.

> Clearly, these representations develop as the organism experiences and matures; we have as yet to determine just how."[41]

Other of Stea's works have included looking at methods of orientation[42] and transfer to a new situation of ideas derived from old experiences as well as examinations of concept of actual and perceived constraints.[43] This concept of constraints and visibility has also been examined by Appleyard, Lynch and Myer[44] and Carr and Schissler[45]. The present status of studies centering around the "image" is summarised by Stea and Downs[46] and by Downs[47], in which they outline themes which need examination in the area. In addition, the authors introduce the idea that there seem to be two research strategies which have developed to deal with these phenomena. One of these is a holistic approach, concerned with overall description, in which attempts are made to isolate interactions between segments of the spatial environment, types of people, and cognitive response typologies. The second type attempts to analyse the system interactions which have been isolated previously.[48] These system interactions are defined as the patterns of perception which emerge. The second type is, therefore, by necessity, more quantitative in approach than the first.

The present piece of research falls in the field of the first holistic type of study. Other studies of this sort have been Appleyard's Styles and Methods of Structuring a City, a study undertaken in Ciudad Guayana, Venezuela, to

see how people structured a city and whether different groups in the population would structure the same city in different ways.[49, 50] 75 subjects, selected to fill age, sex and education level quotas were asked to draw a sketch map including places they had mentioned verbally. They were then asked to describe a journey through the city, mentioning schools, police stations, hospitals, markets, shopping areas, churches, places where people meet, the Concejo Municipal, CVG offices, political party offices and anywhere else considered important. These maps were analysed by type of element, spatial (i.e. buildings or districts) or sequential (i.e. roads), which predominated and the level of accuracy of the map. Other factors such as age, sex, education level, tenure, travel mode and spatial familiarity were examined as covariables. From this study Appleyard concluded that there is a clear relationship between length of formal education and ability to produce a well organised cognitive map and that mapping may well be partly based on expectations rather than knowledge. Part of this second conclusion may have derived from the constraints placed on the respondents by the magnitude of the task. The distinct impression gained in reading this work is that the personal value system of the researcher is not far away.

Regarding young people, two works emerge. The first is Environmental Mapping in Young Children by Blaut, McCleary and Blaut,[51] which used 107 six year olds from Massachusetts and 20 from Puerto Rico. Some of each group were asked to

identify features on coloured oblique and vertical air photographs, while others were asked to identify features on a vertical photograph, prepare a tracing from the photograph, interpret the tracing after the photograph had been removed, and use the tracing as a map in the solution of a simulated navigation problem.[52] The authors concluded that these tasks could be performed by both groups at this age and thus that primitive map use and the interpretation of photographs appears to be a culturally independent, inherent ability.

In Black Youths View their Environment: Neighbourhood Map,[53] Ladd asked for verbal descriptions and maps marking their residence from each of 60 black adolescents of low income families in Boston. Analysis was based on descriptive categories which take into account form and content elements as criteria in the drawings. Four groups were postulated - those who produced pictorial drawings, those who produced schematic drawings, those whose drawings resembled a map, and those like maps but with landmarks. The maps were assessed in terms of age, grade level, sex, length of residence, number of streets included, landmarks, organization, accuracy and identification and position of subjects' residences. Age, sex and grade level were found to be irrelevant to cognitive ability. An apparent major determinant of the range and objects included in maps is the spatial range of activity of the subject. As Ladd points out:[54]

> "Not only do we need more information about the ways in which children and adolescents perceive, organize and represent urban areas, we should begin to examine the process of development of psychological and social associations with neighbourhoods and other places. Steinitz (1968) asserts that it is during the teenage years that the characteristics of meaningful places are learned by a native resident. The nature and stages of the "environmental learning" process and factors which influence the process should be studied."

This, then, is the current status of the research into perception of the urban environment. A large step forward has been made in the examination of "personal" geographies and by the attempts being made to isolate factors which influence these geographies. However, it is obvious that among the unanswered questions are those dealing with cross-cultural comparisons and the perceptions of urban environments by different cultural groups. Work highlighting the needs of the adolescent and the impact of the city on him is also sadly lacking. Little attention has been paid as yet to dynamic studies - changes in perception over time and the effect of rapid or slow change within an urban area on images of that milieu. These are just a few of the focal points with which perception studies must deal.

In terms of dealing with the information flow, new methodologies are needed. As the field broadens to include further studies, more accurate methods of analysis are required. Common to all workers in the field of environmental perception are pleas for much more research, and the continuous

raising of more and more questions as to how, why and what in the environment influences the cognition and behavior of individuals exposed to it. As Stea and Downs[55] describe the field of environmental behavior studies:

> "We discovered a barely pubescent adolescent constantly outgrowing its constraints and overreaching itself, sometimes rebellious, often obstreperous, talking in fits and starts, unsure about the legitimacy of its parentage, and, after a rosy-cheeked childhood, constantly crying for relevance."

FOOTNOTES

1. Views gathered from talking with town planners in Vancouver and Burnaby - even if research has been done, it rarely filters down to those who design cities.

2. See K. Lynch, The Image of the City, Cambridge (Mass.) Technology Press, 1960; D. Appleyard, "Styles and Methods of Structuring a City", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 100-118; Carr and D. Schissler, "The City as a Trip", Environment and Behavior, Vol. 1, No. 1, June 1969, p. 7-35 and others.

3. A. Coombs (Chairman), "Perceiving, Behaving, Becoming", Yearbook 1962, Association for Supervision and Curriculum Development, National Education Association, Washington, 1962, p. 68.

4. J. Huttenlocher, in J. Bruner, "Annual Reports", 1964.

5. See L. Macoby and J. Modiano in J. Bruner et al, Studies in Cognitive Growth, 1964; also J. Eliot, "Children's Spatial Visualization", NCSS Yearbook--Focus on Geography, Washington, 1970, p. 263-290.

6. See literature on autistic children, for example, B. Bettelheim, The Empty Fortress; Infantile Autism and the Birth of Self, New York Free Press, 1967; R. Hamblin et al, The Humanization Process, New York, Wiley Interscience, 1971; P. Weston (ed), Some Approaches to Teaching Autistic Children, Oxford: Pergamon Press, 1965.

7. C. de Lauwe, Famille et Habitations I Sciences Humains et Conceptions de L'Habitations, Paris CNRS, 1959, p. 70-101.

8. D. C. Dinkmeyer, Child Development--The Emerging Self, Englewood Cliffs, N. J.; Prentice-Hall, 1965.

9. R. Lane, Political Ideology--Why the American Common Man Believes As He Does, New York: Free Press, 1962, p. 301-309.

10. Ibid., p. 306.

11. Ibid., p. 106.

12. K. Lynch, The Image of the City, Cambridge (Mass.) Technology Press, 1960.

13. C. C. Trowbridge, "On Fundamental Methods of Orientation and Imaginary Maps", Science, Vol. 38, No. 990, Dec. 1913, p. 888-897.

14. K. Lynch, Op. cit., p. 156.

15. Ibid., p. 157.

16. P. R. Gould, "On Mental Maps", Michigan Inter-University Community of Mathematical Geographers, Discussion Paper No. 9, Dept. of Geography, University of Michigan, 1966.

17. W. Kirk, "Historical Geography and the Concept of the Behavioral Environment", Indian Geographical Journal, 1951, p. 159.

18. J. Sonnenfeld, Unpublished paper, Texas A & M University, 1968.

19. H. Schroder, M. Driver, & S. Streufert, Human Information Processing, Holt, Rinehart and Winston, 1967, p. 9.

20. D. Lowenthal, "Geography, Experience and Imagination", Environmental Perception and Behavior, Chicago U. Press, 1967.

21. J. Sonnenfeld, "Environmental Perception and Adaptation Level in the Arctic", Environmental Perception and Behavior, (ed) D. Lowenthal, Department of Geography, Research Paper No. 109, Chicago, 1967.

22. John Collins and Richard Seaton, Semantic Dimensions as Architectural Discriminators, Office of Academic Planning, UBC (Undated).

23. Osgood, C. E. et. al., The Measurement of Meaning, Urbana, University of Illinois Press, 1957.

24. J. Collins and R. Seaton, Op. cit., p. 8.

25. A Strahler, Physical Geography, New York, Wiley & Co., 1951.

26. Sidney Brower, "The Signs We Learn to Read", Landscape, Autumn, 1965, p. 9.

27. M. Fried and Peggy Gleicher, "Some Sources of Residential Satisfaction in an Urban Slum", Journal of the American Institute of Planners, Vol. 27-28, 1961-2, p. 311.

28. E. Bacon, Design of Cities, New York, Viking Press, 1967, p. 36.

29. A. E. Parr, "The Child in the City-Urbanity and the Urban Scene", Landscape, Vol. 16, No. 3, Spring 1967, Rydall Press, p. 4.

30. Such T. V. shows which focus on hospitals, police stations and certain other areas of cities as well as well known landmarks would be of the type referred to here.

31. J. Piaget and B. Inhelder, The Child's Conception of Space, New York: W. W. Norton, 1967.

32. D. Dodwell, "Children's Understanding of Spatial Concepts", Canadian Journal of Psychology, No. 17, 1963, p. 141.

33. Piaget and Inhelder, Op. cit., p. 24.

34. P. E. Vernon, Intelligence and Cultural Environment, London, Methuen, 1969.

35. F. J. Estvan, Social Studies in a Changing World, New York, Harcourt and Brace and World, 1968.

36. F. L. Goodenough and D. B. Harris, "Studies in the Psychology of Children's Drawings II: 1928-1949", Psychological Bulletin, No. 47: 1950, p. 369-433.

37. E. Koppitz, Psychological Evaluation of Children's Human Figure Drawings, New York, Grune and Stratton, 1968.

38. W. Dennis, Group Values Through Children's Drawings, New York, Wiley, 1966.

39. D. Stea, On the Measurement of Mental Maps, An Experimental Model for Studying Spatial and Geographical Orientation, Clark University, circa 1968, p. 1.

40. Sommer, Personal Space, Prentice Hall, 1969.

41. Stea, Op. cit., p. 24.

42. Stea, Some Notes on Orientation, Unpublished paper, Clark University, circa 1968.

43. D. Stea, Pedestrian Movement on the Westminster Mall: An Experimental Proposal, unpublished paper, Clark University, circa 1968.

44. D. Appleyard, K. Lynch and J. Myer, The View From the Road, Cambridge Mass., M.I.T. Press, 1964.

45. S. Carr and D. Schiessler, "The City as a Trip", Environment and Behavior, Vol. 1, No. 1, June 1969, p. 7-35.

46. D. Stea and R. Downs, "From the Outside Looking in at the Inside Looking Out", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 7-35.

47. R. Downs, "Terrae Incognitae Twenty Years After", Earth and Mineral Sciences, Vol. 40, No. 4, Pennsylvania State University, 1971, p. 30-31.

48. Stea and Downs, Op. cit., p. 7.

49. "Styles and Methods of Structuring a City", Environment and Behavior, Vol. 2, No. 1, p. 100-118.

50. "City Designers and the Pluralistic City" in Lloyd Rodwin and Associates, Planning Urban Growth and Regional Development, M.I.T. Press, 1969, p. 422-452.

51. J. M. Blaut, G. S. McCleary, Jr. and America S. Blaut, "Environmental Mapping in Young Children", Environment and Behavior, Vol. 2, No. 3, Dec. 1970, p. 335-347.

52. Ibid., p. 342.

53. Florence C. Ladd, "Black Youths View Their Environment; Neighbourhood Maps", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 74-99.

54. Ibid., p. 82.

55. Stea and Downs, Op. cit., p. 11.

CHAPTER II

THE STUDY - HYPOTHESES, SITE AND METHODS

The Study. The literature shows a need for environmental perception studies involving adolescents and dealing with different ethnic groups. The present work attempts to deal with both these facets as it examines differences in perception between Indian and non-Indian adolescents in Whitehorse, Yukon Territory. This chapter examines the choice of Whitehorse as a site and the methodology used.

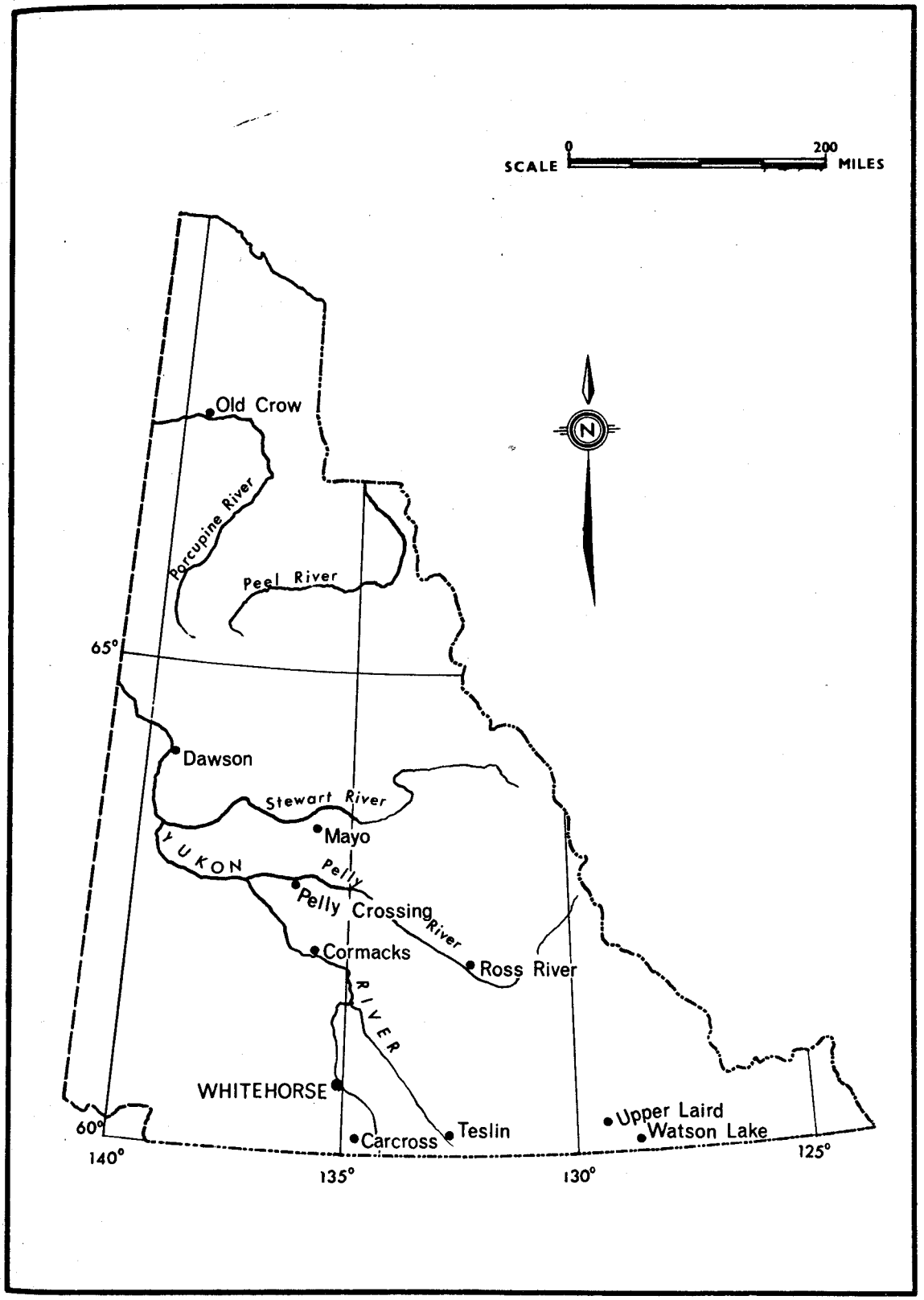
Hypotheses. Two hypotheses advanced in this study are:

(1) In an urban environment with cultural heterogeneity, there will be significant differences in the way each culture perceives its environment. These differences will manifest themselves quantitatively in the number of places and areas which have impact, and qualitatively in the style of map drawing.

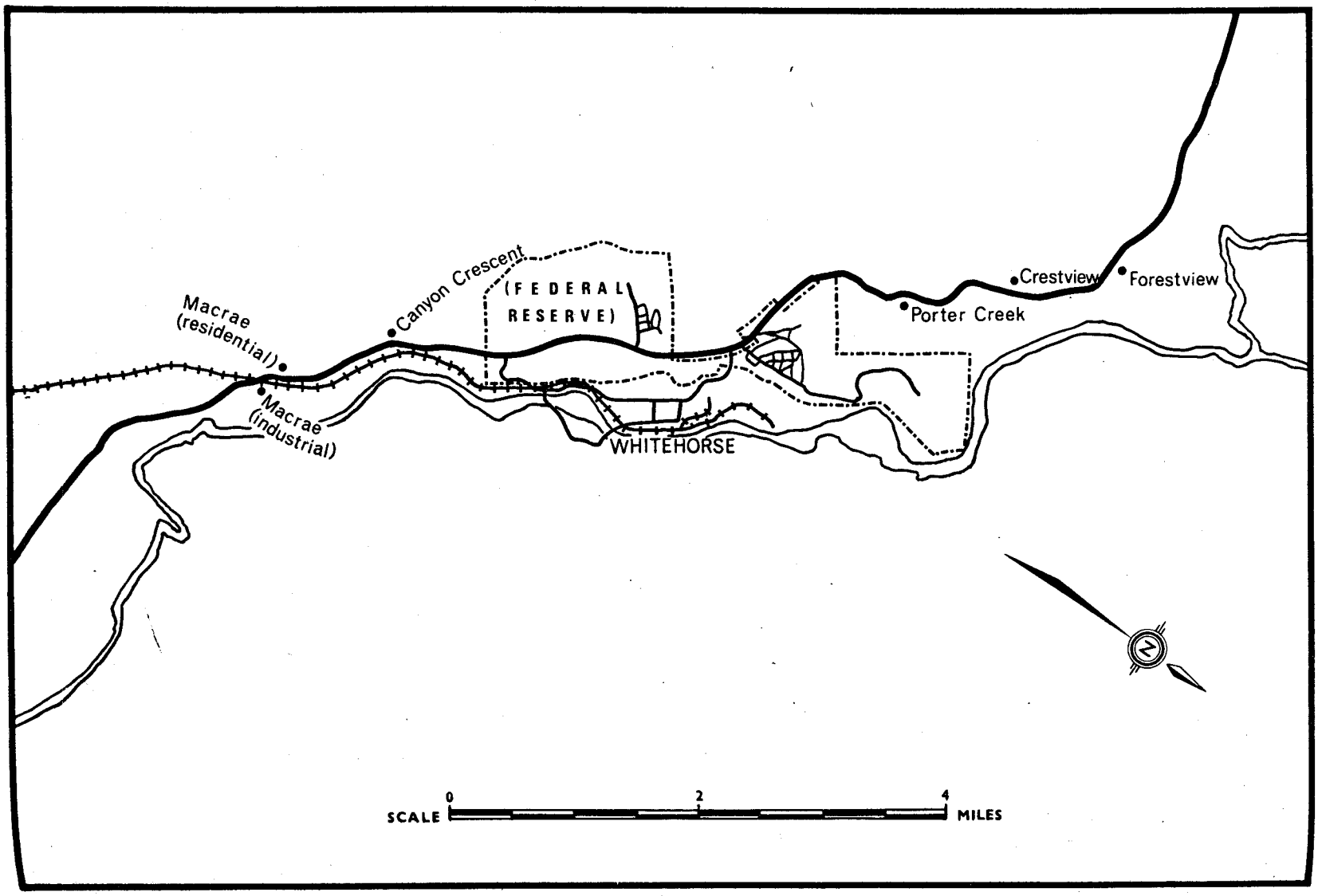
(2) The differences in perception will be linked to sites of importance to each culture, given that each has freedom of access to the areas under study (there is a stated policy of integration within the community).

The Site. Whitehorse is located on a terrace on the west bank of the Yukon River, although suburbs have spread to the east bank. (Maps 1, 2). The terrace on which downtown

MAP 1 WHITEHORSE, YUKON, — SITUATION MAP



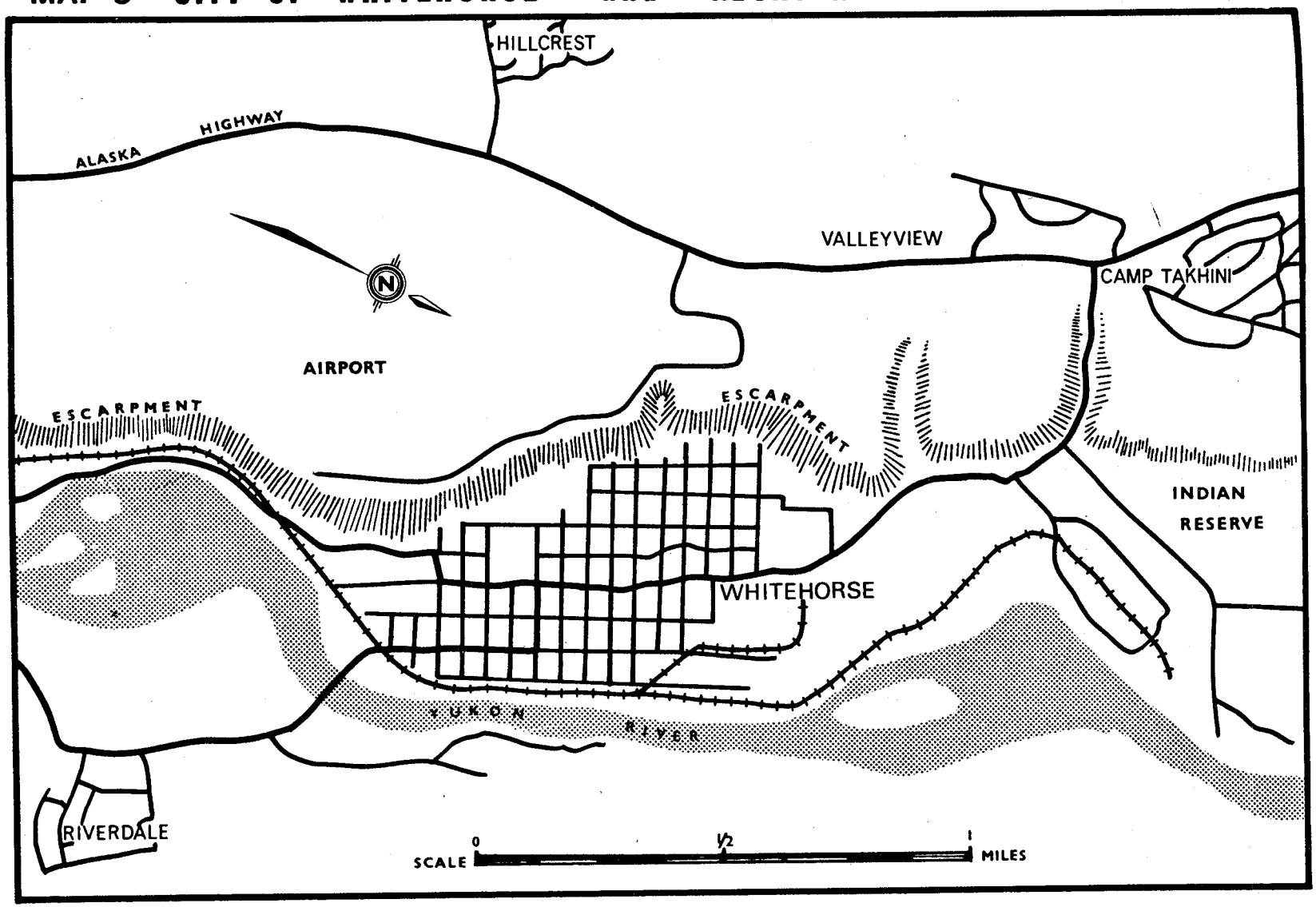
MAP 2 WHITEHORSE and ENVIRONS —— SITE MAP



Whitehorse is located ends at a small lake, formed by the expansion of the Yukon River as it emerges from Miles Canyon and the Whitehorse Rapids. The terrace extends west until it is suddenly halted by a scarp, which is about 290 feet high. (Map 3). The top of the scarp is flat benchland and it is here that the airport is located. The city has grown in an elongated manner along the river bank, to the north, has jumped the river to produce Riverdale and has spread on the benchland beyond the airport with the suburbs of Hillcrest, Crestview and Takhini. The main road, the Alaska Highway, travels in a north-south direction, paralleling the river, on the western side of the escarpment. The subsidiary road into Whitehorse starts at Two Mile Hill and cuts down the scarp. The city in the downtown areas is laid out in a grid pattern, except where physical constraints exist. Across the river in Riverdale--a newer and more prestigious suburb, there is a modified grid pattern with avenues, cul-de-sacs and crescents. The surrounding countryside is hilly with taiga vegetation. Precipitation is low, so that despite the extreme cold and darkness of the winters, mobility is maintained all year round with the exception of very few days. The city thus forms a fairly compact unit, with noticeable physical boundaries.[1]

Historically, the population of Whitehorse has risen and declined a number of times. From 1896 on, the city grew to about 20,000 in the wake of the Gold Rush and temporary buildings were the order of the day--none of these remain. After

MAP 3 CITY of WHITEHORSE and ADJACENT RESIDENTIAL AREAS



the gold declined, so did Whitehorse, until by 1914 there were only 350 people left.[2] During the second World War, the Alaska Highway and the airport were completed and 40,000 people moved into Whitehorse, constructing buildings such as the Old Log Church and housing for military personnel, much of which remained after the population declined in 1945. Growth occurred again and in 1950 Whitehorse became a city, and 5 years later the capital of the Yokon. In 1964 and 1969, the military withdrew, but there was a sufficiently large population for the buildings they had vacated to be taken over by citizens of the community. The population of Whitehorse when this study was conducted in 1969 was estimated to be about 10,000.[3]

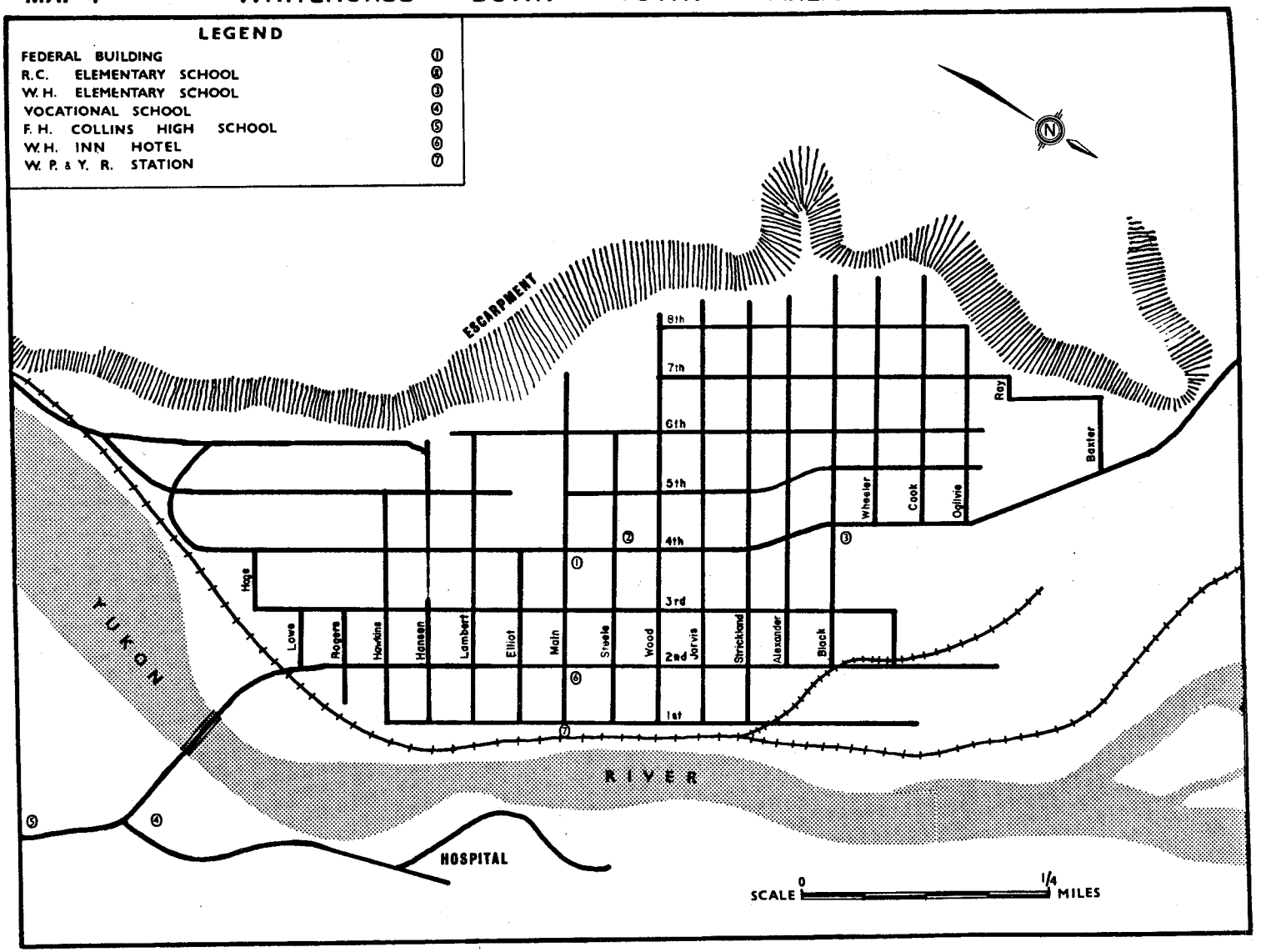
This population is stable at present--far more stable than is popularly believed. Certainly in the summer a transient population made up of tourists and those working in the mines appear, but there still remain a large number of people whose permanent homes are in Whitehorse and have been so for upwards of ten years. The City of Whitehorse includes Whitehorse, Hillcrest, Takhini, Valleyview, Riverdale and the Indian Reserve (see Map 3). The Indian Reserve is not an official reserve--there are none on the Yukon--but an area created by the Indian Affairs Department, which moved the Indian community out of Whitehorse proper in 1955.[4] Takhini has become a civil service neighbourhood, having been taken over from the army by the Territorial Government and is thus occupied by engineers, school teachers, social workers and firemen.

Hillcrest, army housing which was later sold to private buyers, contains people occupied in a wide variety of endeavours. The spectrum of socio-economic levels is much broader than it would be in a southern centre, because there was a desperate housing shortage when it was opened up. Land and houses were sold on a first-come, first-served basis and the quality of homes in the area varies greatly. Riverdale, the newest area of Whitehorse, is mainly occupied by professional or managerial groups, both private and governmental. This makes it the elite area of Whitehorse, but it does not contain all the civic and commercial leaders--some live in Hillcrest and some in downtown Whitehorse. There are also two permanent trailer courts, since peculiar housing regulations and land release policies prevent the building that is necessary. This has forced people to build a long way from Whitehorse and two satellite communities, which still use facilities of Whitehorse such as secondary schools, have developed. These two are Porter Creek, five miles north on the Alaska Highway and Crestview which is six miles further north.[5] Squatters were also found on Whiskey and Mocassin Flats, but by 1970, they had been removed and the land cleared of shacks. The squatters were generally Indians or newly arrived "whites", although some had been there for a considerable time.[6]

Like any city which is a centre of tertiary activity, distinct residential, commercial, industrial and recreation areas exist. The main townsite contains the business centre,

government offices, industry and the transportation functions of the Whitehorse area.[7] The main service centres are found along Main Street from First to Fourth Avenues and along Fourth Avenue, running north toward the city boundary. (Map 4) Here are several large department stores and in the downtown vicinity, four banks, and hotels which provide social centres in their bars and beer parlours, as well as accommodation and restaurant service. Service stations and automobile dealers are scattered throughout the area. The two major government buildings--the Federal Building and the Lyn Building, which houses the offices of the Territorial Government are situated in the downtown section, as is the new City Hall. There are 7 churches dispersed in several areas. Schools are found scattered throughout--6 are in the City of Whitehorse, one is in Porter Creek and there is a vocational school in Riverdale. These schools cover a range of classes--Porter Creek, Takhini, Selkirk in Riverdale, and Christ the King Elementary in the downtown area are elementary schools, offering Grades I-VI, Whitehorse Elementary in the downtown area has Grades I-VIII, while Christ the King High in Riverdale has Grades VI-X and the F. H. Collins Secondary School, also in Riverdale, has Grades VII-XII. The Vocational School caters to those over 15 years old. As might be surmised from the naming of the schools, this was originally a separate Roman Catholic school system, but at present all schools are under the auspices of the Yukon Department of Education and are therefore controlled by the Territorial Government. The Roman

MAP 4 WHITEHORSE DOWN — TOWN AREA



Catholic schools, although now no longer separate, still have religious instruction as part of their curriculum and prefer that staff and students be Roman Catholic. The only other public buildings are the library and Civic Centre which lie just outside the downtown area.

Social Characteristics. It has been estimated that the population of Whitehorse is increasing by 5.5% per annum, which is double the Canadian national average.[8] In a report published late in 1968 Carr and Associates predicted that the population will be 55,000 by 1981.[9] From an imbalance of 133 males to 100 females in 1951, the figure now stands at 105 males to 100 females, a reflection of the growing stability of the community. There is a highly social atmosphere in the town--there are about 40 clubs and organizations, an active night life which includes several good restaurants, dancing and floor shows in some of the bars. There is also a great deal of home entertaining and sporting activity. The community unity this engenders is partially a reflection of another factor:

> "A further factor strengthening community life is a mutual sense of isolation and detachment from the world outside. The expression "outside" is a concept common to most settlements in the North and occurs frequently in the social and editorial columns of the local papers.[10] This expression is never used in a nostalgic sense as it is in smaller northern communities--a memory of better times and better places--but an expression of the strong local loyalties of the community as a whole with common problems, who share the same rigorous climate and feel an isolation from the rest of the nation and its problems."[11]

This concept of "outside" certainly does exist, despite four jet flights a day to Vancouver, Edmonton and Fairbanks. There are, however, more people who have travelled extensively per capita in this area than would be found in southern centres. The C.B.C. and the television link to Whitehorse generate awareness of and interest in problems of the "outside", despite the main focus of interest in the community itself. The town has three newspapers.[12] The Whitehorse Star, produced bi-weekly, is the largest of the three and concentrates mainly on news in and around the Territory and news of the "outside" as it affects the Territory. It is widely read by all age groups and several of the subjects interviewed were employed in its delivery. It has the effect in the community of focussing interest, and is a strong force shaping the perceptions of the readers. The other two papers, the Yukon Daily News and the Midnight Sun, are not as widely read, particularly among the young people and therefore would not have the impact of the Whitehorse Star.[13]

The C.B.C. network maintains radio and TV studio facilities in Whitehorse. Much of its programming is geared to the north, including a program called Indian magazine, produced by Whitehorse Indians.[14] This influence has not been measured but it seems likely that it too would affect the perceptions within the community. Television first made its appearance in Whitehorse in packaged form in 1964,[15] and now there are three television stations. The first television sets appeared on the Indian Reserve late in 1968, about 4 years

later than in other areas of town. Since the programmes are packaged and non-local, any influence on perception of the local environs would probably be peripheral.

About 77% of Whitehorse residents are Canadian born. The other 23% includes immigrants from England, South Africa, the United States, Australia, and all parts of Europe, India, China and Japan. The Department of Citizenship and Immigration in 1961 listed 418 Indians in Whitehorse--about 20% of all Indians in the Territory. 1966 figures place this number at about 800[16], although private estimates suggest that about 20% of the population of Whitehorse is Indian or part Indian[17], representing four tribal groups--Kutchin, Nahanni, and Tagish, all inland tribes and the Tlingit, a coastal tribe who have migrated inland.[18]

There appear to be four distinct reasons for living in the community. Mostly people came north for one of the reasons stated below and having liked the freedom and informality in the way of life, have made Whitehorse their permanent home; (1) those who came because they were posted there for three years--a quick way in the Federal service to ensure promotion; (2) those who came looking for "adventure" in the sense of a different environment; (3) those who came simply to make money--usually attached to a mining concern and (4) those who came north to "escape" a broken marriage, a bad job or possible failure elsewhere. In many cases the permanent residents leave the north at some stage and attempt to live in another community

for one to five years and then return to Whitehorse. Of course, not all motivations are clear cut--in many cases there is a mixture of reasons for moving to Whitehorse. The tendency to leave and then return presented one of the problems in selecting the original data, since the actual length of residence was not always the same as it appeared to be from records of school enrolment.

Indian and non-Indian Use Patterns. Certain parts of the city are more frequented by non-Indians than Indians, while other areas attract more Indians. Most Indians and many of the non-Indians shop at the Taylor and Drury store, (the original Taylor had considerable empathy for the Indian plight). Hougen's is more generally patronised by non-Indians although unlike the Northern Commercial store, there is no active attempt to discourage the Indian group. More expensive stores such as Murdoch's Gift Store are almost exclusively patronised by non-Indians. The Whitehorse Inn and Edgewater beer parlours and the Whitehorse Inn cocktail lounge cater to both groups as well. The "Inn" drinking establishments are probably the noisiest in town. The non-Indian community also spend considerable time in the Whitehorse Inn cocktail lounge, particularly the younger element. By contrast the Taku and the Travelodge, which have quiet atmospheres, are patronised largely by non-Indians; intoxicated Indians are quietly and speedily removed. These are trends--one difficulty in making clear distinctions is that

most people rotate bars, depending on mood, entertainer and band, rather than adhering to one venue.

One distinguishable difference between Indian and non-Indian groups is in the mode of transport. Most non-Indian families have at least one car, while the majority of Indians who live on the reservation either walk or take a taxi. This is slowly changing--cars are starting to appear among the members of the younger Indian group. Communication between Indian and non-Indian is relatively free on an individual level. However, the Indian is subtly reminded of second-class citizenship, largely because of government intervention. The removal of the Indians from downtown to a reserve created by the Department of Indian Affairs is one clear example of separation, although school policy is for complete integration. Other instances include the Indian being ruled in court by the Indian Act and the existence of hostels reserved for Indian students only. The Department of Education resumes responsibility for housing non-Indians. The Indian hostels were at the time of this study run by the Department of Indian Affairs, which segregates students by religious denomination, in contrast to the non-denominational hostels run by the Department of Education.[19] Other factors have also accentuated differences between the groups. Most land in the downtown area is so expensive that very few Indians can afford to buy it, lacking auto mobility, and the outlying areas (which they may be able to afford) are precluded because of the distance from the city.

This sets up some interesting problems. In winter, for example, because the reserve is so far from town and because it lacks heating facilities, it is much pleasanter for many Indians to spend several months in the centrally heated, comfortable Correctional Institute at the edge of town. This means that in late September there is a rash of minor crime which will glean a four to six month sentence.[20] The above factors accumulate to ensure that, although the declared policy of all government bodies is one of integration, segregation and a setting apart of the Indian group occur. It might be expected that this would have considerable influence on the perceptions of the two groups.

The School System. As mentioned earlier, the entire school system is controlled by the Yukon Department of Education and includes a variety of schools. It is a policy of the department that the student attend the nearest possible school. This means that students frequently shift schools within the area as they and their families move. These changes have not been considered in the survey, but they may involve a student changing schools three or four times.[21] The students from outlying areas such as Porter Creek and Valleyview are bussed into the secondary schools and those who live further away are boarded in town in either hostels or private homes. The Indian students always stay in hostels if they are from out of town. One hostel is Roman Catholic, one is Anglican, and they are

situated side by side in Riverdale. Some of the Indian students from the local reserve also live in the hostels, particularly if there are problems at home, such as proven child beating. In the main, the Roman Catholic students attend one of the Christ the King schools, while the others attend secular schools up to Grade X.

The education system follows the British Columbia curriculum.[22] The system is well able to compete with those of southern cities and teachers and student in Whitehorse are being exposed to an educational experience similar to that in any urban centre.[23] F. H. Collins is a UNESCO school and the largest secondary school in the Yukon. It offers opportunities for travel for the students which far exceed those found outside the Yukon as was evident among the senior students interviewed. It is estimated that 5-10% of the students had represented the school outside the Yukon.

One trend noticeable throughout the Whitehorse system was that many of the students were in a lower grade than would be expected from their age level, in comparison with the pupils in a southern community in Canada. This was evident among both Indian and non-Indian students, although for different reasons. In the case of the Indians it was frequently because entry into school had been delayed for as long as possible. With the non-Indians, it was frequently the result of moving so many times. The mean leaving age at the end of Grade XII tended to 18-19 rather than 17-18 as in British Columbia.[24]

The appropriateness of transplanting curricula designed for use in southern British Columbia to the Yukon is still open to question, but so far there is no indication that active consideration is being given to this or that a separate educational philosophy is being evolved. Such a philosophy would appear to merit consideration.

Despite the fact that Indian and non-Indian students tended to be the same age in the same grade, the Indians followed the patterns predicted by their measured IQ's and consistently appeared at the lowest level in the grade, while non-Indians occupied the higher levels, although not always as predicted by their rated IQ's. As will become apparent later, this in no way represents the relative abilities of Indian and non-Indian students.

A variety of reasons favoured the choice of Whitehorse for this study. These include:

(1) this is an urban area which has undergone rapid rapid expansion,

(2) a high percentage of the population falls into the age group 10-17,

(3) the community is small enough that a pilot study done in a fixed four month period could be representative[25] of the population yet economically and socially more diverse than other Yukon communities,

(4) there is an apparent wide spectrum of cultural backgrounds, occupations, education and income levels

among the population,

(5) the area was already known to the researcher and information was available,

(6) the interviewer in her role as a substitute teacher was known to some respondents, which reduced tension in interviews.

Sample Community. From an examination of school records[26], it was clear that one of the myths of the northern community, that the majority of the population is transient, is untrue. On the contrary, a great number of the subjects had been born in Whitehorse and had spent most of their school life there. Of the remainder, it appeared that the greatest proportion on a provincial basis were from British Columbia, non-Indians born in the rest of Canada and non-Indians born outside Canada. Indian children, all of whom were born in the Yukon, formed the fifth group. As a second measure of exposure to Whitehorse, each of these groups was then subdivided into those who had spent all their school life in Whitehorse school system and those who had not. The preliminary selection was done from school records rather than from interview data and each school record card contained a list of all the schools the subject had attended.[27]

Since Piaget and Inhelder[28] suggest that the age of visual realism commences at eight, it was felt that if the sample commenced with a ten year lower limit, it could be

assumed that this cognitive ability had been developed.[29]

The age levels were then chosen to be 10-11, 12-13, 14-15 and 16-17 for each of the classes. This constituted a clustered, double stratified sample with birthplace as the cluster and age and total or non-total attendance in the Whitehorse school system as the stratifications. The school records of the 2,541 students in the Whitehorse area were examined and grouped according to the above criteria. Selection was then made (using random number tables), in proportion to the total numbers in the school population in each cluster.[30] The details of the sample and the population are found in Table 1. Over-selection was made in all categories to allow for non-response. It was estimated[31] that a sample size of 65.70 would be sufficient to establish a significance level of 0.01, and accurately represent the population. Over-selection was made in each cluster and stratum resulting in original selection of 106 subjects. When the final sample was fixed, so that the sample clusters were proportional to the total numbers in each cluster in the population, a final sample size of 66 was obtained.

Records for the 106 selected students were then rechecked and details such as father's occupation, school grade and home address were noted. Several of those selected were removed from the sample in consultation with the principal or staff, on the grounds of parental attitudes, difficulty[32] with the child (particularly among the younger age group) or because the student

TABLE 1

SAMPLE AND POPULATION CHARACTERISTICS

Cluster Group	Sample Size	School Population Size *	Per cent of total Population
Indian	14	539	21
Non-Indian born in B.C.	16	616	24
Non-Indian born in Canada	14	539	21
Non-Indian born outside Canada	12	462	18
Non-Indian born in Whitehorse	10	385	15
Total	66	2,541	

* Figures from Department of Education, Whitehorse and from examination of school records. (Sept. 1969).

was suspended and unavailable. It may well be that this procedure biased the sample. However of the original sample, this only applied to six of whom two were Indian and four non-Indian and these were compensated for by over-sampling.

Data Collection. All available parents (of children in the sample) were contacted and arrangements were made to obtain details of the student's background. In the interviews with the parents questioning was directed towards the parents' birthplace, length of residence in Canada (where applicable), places of residence, length of residence in Whitehorse, occupation, degree of involvement in community activities and clubs in Whitehorse and the amount of travelling that had been done which involved the subject. Many of these questions were also asked of the subject during the interview.

The interviews with the subjects were conducted in the schools rather than in the home. The benefits of this were manifold--the schools provided quiet offices which ensured privacy, there was no interruption or interference from outside agencies, the subject was free from parental "help", and since the interviewer had been substituting in the schools and had previously at least minimally contacted each subject, a relationship had already been formed which could continue within the confines of the school. This meant that the role of the interviewer was simply that of a teacher and this lessened the stress factor particularly for the young Indian subjects.

The interview was conducted in three stages. The questionnaire stage was interspersed among the other two (mapping and photograph location), so that questions pertaining to the maps or photographs were either concurrent with or followed the appropriate activity. The possibility of imposing a time limit on each interview was considered, but was discarded since it was felt that the imposition of such a restriction on the subject could produce biased results--that is, in the drawing of a map, if the subject stopped when time ran out, certain known points might be omitted. This decision proved wise, since among the younger subjects were those who drew on such a large scale that a considerable length of time was taken. Also, for some of the younger Indian children, instructions had the effect of increasing their reticence. Instead, the time involved in each stage of the interview was noted and calculated as a proportion of the total interview time.

Each interview was conducted separately and the subject provided with a large amount of blank foolscap paper. Although most of the subjects treated the edges of the papers as boundaries for their maps, this was not a specified condition since it was felt that what was being tested was cognitive ability, not ability to organise a map of the city of Whitehorse. In most cases the area to be mapped was taken to include Whitehorse and environs, but some subjects produced maps which encompassed a much larger area. The subjects were asked to label features which particularly attracted their notice.[33]

In each case a note was made of the point of origin of the map and the order in which the subjects drew various objects. Particular attention was paid to whether the overall grid pattern of Whitehorse had been noticed or whether orientation was in a trip sequence or by landmarks. Questions pertaining to this map then followed--the interviewee was asked the frequency of trips downtown, the places generally visted and mode of travel. Any particular place of interest was noted, such as a paper route or a job in any of the stores.

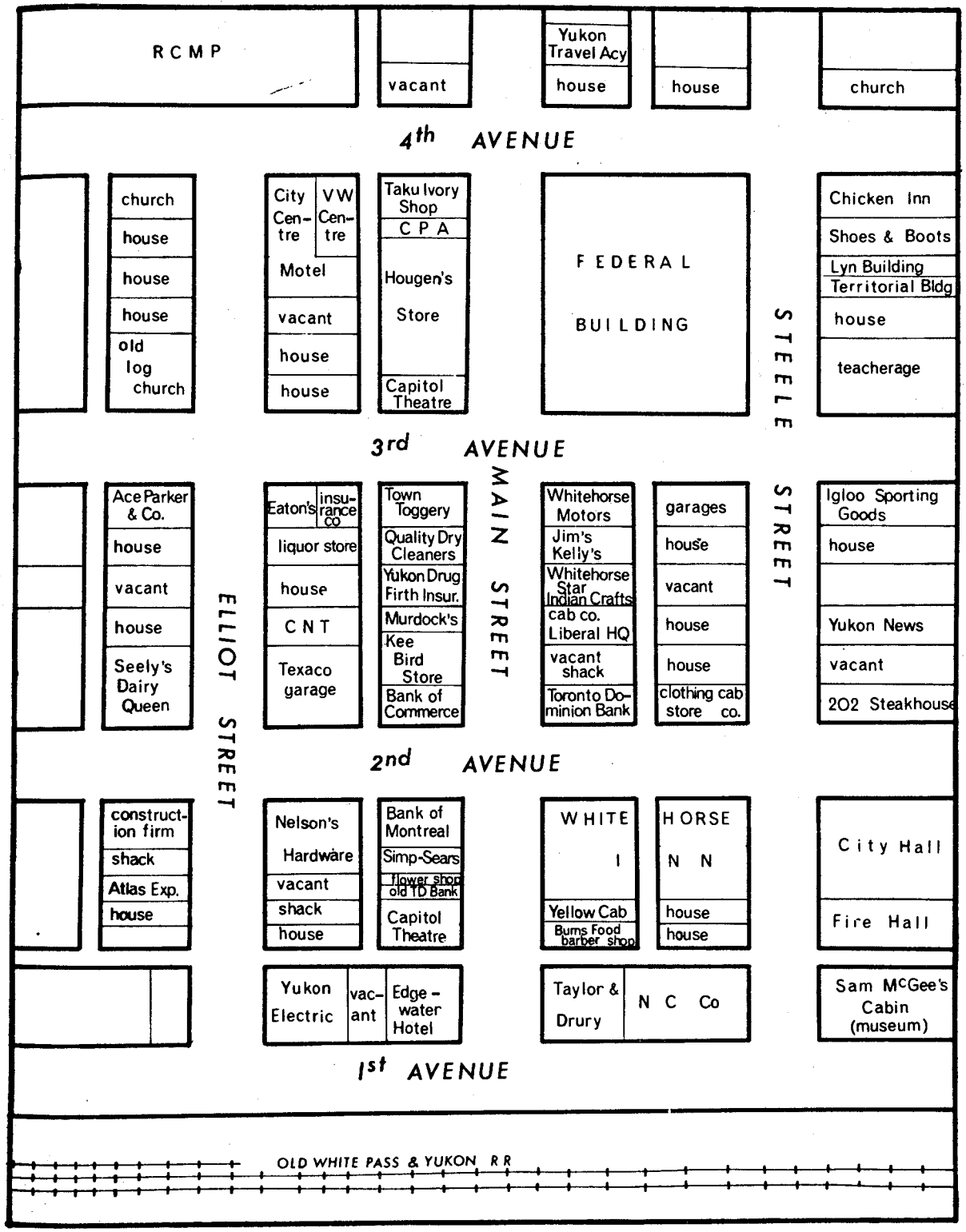
The final stage of the interview involved the use of photographs of the city to be located by the subject on a base map (see Appendix B). These photographs formed a mosaic map of a portion of downtown Whitehorse. As can be seen from the base map, which is a scale map of 8 full city blocks and 8 block frontages, there is sufficient room for the subject to record on the map the number of the appropriate photograph. A subject was free to organise the photographs as he chose. It was possible to organise them in the sequence in which they had been photographed, although they were presented to the subjects in random order. The streets were named on the map, as was the Yukon River, to make sure that orientation to the base map would be easy.[34] A complete photographic coverage of both sides of Fourth, Third, Second and First Avenues between Steele and Eliot Streets was obtained, as well as both sides of Steele, Main and Eliot Streets between First and Fourth Avenues. A note was made of what appeared in the photographed area, the

orientation of which, as can be seen from Map 4 is Main Street in an ENE direction. (see Map 5).[35]

It was originally intended to randomize the order of the photographs at the conclusion of each interview, but it proved to be a time consuming task and so before the start of each interview they were shuffled well. Careful observation of the way they turned out indicated that this was adequate as a way of mixing the photographs and that they were totally out of sequence. Some examples of the photographs appear in figures i-vi in Appendix A.[36]

It was explained to each child that all the photographs fitted on the areas covered by the base map and that they had been taken by the method outlined above. When he had been given the randomized photographs, the subject was asked to choose those he recognised and place the appropriate number on the base map to indicate <u>exactly</u> where he felt the object in the photograph was located. He was instructed to ignore those places which he did not recognise. Some subjects were determined to place each photograph and an element of sheer guesswork entered into the placing.[37] Most subjects arranged the photographs in a systematic order, having first discarded those which had no impact, but a few chose to place each photograph as it appeared in the pile. The time taken to complete the photo mosaic and the order in which they were placed on the base map was noted. In some cases it was possible to obtain from the subject the basis for his choice and the clues which

MAP 5 PLACES IDENTIFIED IN PHOTOGRAPHIC TEST



were used for orientation, but in others any questions of this type produced either a non-response or almost complete withdrawal of the subject.

This completed the interview. The average interview lasted 80 minutes with a range of 40 to 110 minutes. Factors which appeared to influence the time were attention span, the meticulousness with which the maps were executed, the determination to do everything, and the sociability of the subject. It did not appear to be influenced by age, ethnic origin, grade level or drawing ability.

Methods of Analysis. (Statistical). A variety of statistical methods were used, including Fisher's Exact Probability Test and Chi Square[38] and Two Way and One Way Analyses of Variance.[39] All calculations were done on an Olivetti 101 computer.

The other methods of analysis to which the data was subjected are outined in Chapter III.

FOOTNOTES

1. Institute of Local Government, D.N.A., The City of Whitehorse, Queens, 1960, p. 10.

2. C.M.H.C., Whitehorse, Government Printers, Ottawa, 1963, p. 5.

3. Private conversation with Bob and Rusty Earlem, owners and publishers of The Whitehorse Star, 1969.

4. Private conversation with Bob and Rusty Earlem, publishers of The Whitehorse Star.

5. C.M.H.C., Op. cit., p. 20.

6. J. Lotz, The Squatters of Whitehorse, Government Printers, Ottawa, 1964.

7. C.M.H.C., Op. cit., p. 10.

8. D.B.S., Op. Cit.

9. Carr and Associates, The Yukon Economy, Its Potential for Growth and Continuity, Vol. I, Ottawa, 1968, p. 242.

10. C.M.H.C. report - Whitehorse Star: Vol. 61, No. 44, Oct. 19, 1961, et seq.

11. Ibid., p. 27.

12. One newspaper, the Yukon News is now defunct. Three were operating in 1969.

13. Circulation figures from each paper.

14. The guiding light of this programme is Bob Charlie, an Indian who lives on the Reserve and has a great deal of respect from all the community. He discussed many problems with the writer, and was of considerable help.

15. The Whitehorse Star, Vol. 64, No. 32, Aug., 1964.

16. D.B.S., Census, 1966.

17. City manager's estimate, private conversation, 1968.

18. C.M.H.C., Op. cit., p. 27.

19. This situation existed when this study was done, and the build-up of pressure over this resulted in 1971 in the Department of Education taking over. Slowly, desegregation is taking place.

20. Bob and Rusty Earlem and the Superintendent of Correctional Institute, private conversations, 1969.

21. P. Rossi, Why Families Move, Illinois, Free Press, 1955.

22. There is a turnover of approximately 30% per year among teachers, although as everywhere in 1971, it is now much lower. In fact the rate is in line with many urban areas of Canada. There are plenty of applications--usually about 700 to fill 70 vacancies.

23. Warren Rongve, Senior Administrator in the Department of Education, private conversation, 1969.

24. Examination of school records in Whitehorse and at Centennial School, Vancouver and Chase School, Chase, B. C.

25. L. Kish, Survey Sampling, New York: John Wiley and Sons, 1967, p. 91, 106.

26. School records were opened to me by the courtesy and help of the Yukon Department of Education. I would particularly like to thank Warren Rongve, late of the Department for his help and assistance in making this material available.

27. Originally, in an attempt to break length of exposure to the environment down into finer classes, a classification system was set up based on those who had spent all their lives in the area, those who had spent all years but one, those who spent all years but two, etc. This proved to be very clumsy and it became obvious that in order to cover all contingencies many more interviews would need to be conducted than was possible. Thus, the simpler breakdown of those who had spent all their school lives in Whitehorse and those who had not, was used.

28. J. Piaget and B. Inhelder, The Child's Conception of Space, New York, W. W. Norton, 1955.

29. Subsequent to this decision, six eight and nine year olds were tested, some of whom could respond to the testing, others of whom had not yet developed the ability to portray information in the form of a map. With the eight and nine year olds, the IQ's from school records were compared with map drawing ability to see whether any correlation existed, but no pattern could be

found. Both the Indian children interviewed in this age range had been able to perform the task (IQ's 89 and 95 respectively). Among the non-Indians, one student with an IQ of 120 had been unable to produce a map, while another rated 98 seemed perfectly capable. Generally, the IQ's of the Indian group fell below 100, while those of the non-Indian group varied between 96 and 130, with a mean of about 110. There seemed to be no clear trend relating task performance and within group IQ's. IQ's within groups were randomized under the sampling technique.

30. M. G. Kendall and B. B. Smith, "Random Number Tables", Randomness and Random Sampling Numbers, J. R. statist. Soc., 101, 1938.

31. L. Kish, Op. cit., pp. 106-124.

32. Some of these were children with learning difficulties or those who were so shy with strangers that communication was impossible.

33. In most cases the concept of a map did not include natural features such as the mountains or escarpment although some did include the Yukon River.

34. Before selection of the area to be photographed, sixty students of varying ages were asked in class to make a list of 20 things which occurred to them when they thought of Whitehorse. Eliminating such answers as dogs, cats, cars and people it became obvious that the focus was around Main Street, from the Yukon River to Fourth Avenue. Since this was an area common to all, it was decided to use Main Street as the centre of the photograph series. The area finally chosen was that bounded by the Yukon River, Steele and Eliot Streets and Fourth Avenue (see Map 4). The area was then photographed by walking down the centre of the street and photographing what appeared on each side of the street, in an attempt to have the same scale for all the pictures.

35. The photographs were then laid out in a giant mosaic and examined. Several were removed so that there would be definite gaps in the mosaic, particularly where two buildings had the same function in the city, but were situated in different areas. This was done to see if there was any confusion between the actual recognition of the building and recognition of the function of the building. Those photographs which were totally non-descript were also removed--these were scenes which gave little or no indication of their location. The remaining 107 photographs were the numbered from 1 to 106 (including 55a) and numbers were chosen from a random number table to put them in non-sequence.

36. Some of them have faded as a polaroid camera was used. The reason for this was that if they did not turn out it would be immediately known. As it takes three weeks to have film developed in the Yukon, this is an advantage.

37. It was interesting to note that usually associated with this phenomenon was fear of being graded lower--a product of the education system?

38. See S. Siegel, Non-Parametric Statistics, New York: McGraw Hill, 1956 for "Fisher's Exact Probability Test", and "Chi Square", p. 26, 62.

39. See J. Cole and A. Cuchlaine King, Quantitative Geography, London, John Wiley and Sons, 1968 for "Two and One Way Analyses of Variance", p. 91, 106.

CHAPTER III

RESULTS

Classification of Data. The two stages of map construction and photograph recognition were firstly considered separately and then together to see what differences emerged. The maps were categorised according to Appleyard's spatial and sequential classification.[1] They were also arranged using Ladd's criteria.[2] In each case the 5 clusters were used as comparative groups. 25 places were isolated from the maps. These places had been found to recur most often; their incidence was checked against each group to see if any trends occurred.

The Indian and non-Indian groupings were evaluated with respect to age, sex, length of residence, socio-economic standing, place of residence and education level.

Certain characteristics of the maps such as style of drawing and accuracy were examined, as was the average time taken by each group to complete the task.

Data from the photograph location task were treated in a similar manner. The same influential characteristics were examined with respect to the accuracy with which the places were located on the base map. Again Indian, non-Indian comparisons were treated in detail. When the data from both the map drawing and the photograph recognition had been separately analysed, map versus drawing comparisons were made. The large

body of subjective information which had been collected via interview or from analysis of the maps was then examined and the data grouped so that trends stemming from style of drawing, background and life experience could be distinguished.

Results. In the analyses of the material gathered, two basic distinctions can be made. Some characteristics, such as the effect of age, sex, place of residence, length of residence, inclusion or exclusion of places, time needed for each task to be completed, and the type of map could be tested something you can measure quantitatively, whereas other characters such as quality of map, impressions from conversation with both subject and parents were often so diffuse that only subjective analysis could be used. In this case, some of these maps have been included to show specific examples of conclusions reached.

As has been stated previously, a clustered double stratified sampling technique was used with Indian and non-Indian born in Whitehorse, non-Indian born in British Columbia, non-Indian born in the rest of Canada and non-Indian born outside Canada, used as the clusters, and age and educational experience totally in, or not toally in Whitehorse, as the stratifications. Most of this information was collected from school records which in some cased proved to be incorrect. These cases were reclassified into the correct cells. In one case in particular this inaccuracy proved a boon as an Indian subject had been adopted by a non-Indian family and lived her

whole life in a conventional upper middle class family in Riverdale. The fact that her perceptions differed from those of other Indian subjects suggests that the differences in perception are cultural and not genetic.

The same procedures were used with the maps and photographs in terms of which places were included and which excluded. On the maps, 25 places from a variety of locations in the city were chosen. These are listed in Table 2. These 25 were chosen from an examination of all maps and were the places which more frequently occurred. The inclusions were tested with respect to age, sex and culture (Indian versus non-Indian, with finer analysis of significant differences where it seemed necessary.) The places included in the maps were then compared for time taken to execute the drawing task, spatial cognition, i.e. whether the subject maps predominantly road sequences or spatial relationships with landmarks, residence and length of exposure of the subject to the site.

The same procedure was followed for the 66 places in the photographs,[3] and comparisons were drawn between the results of thw two tasks. A study of the occurrence of three dimensional drawing techniques in the maps was also made. Throghout the study the significance level was set at $p=0.01$.[4] Neither age nor sex seemed to make significant difference in per capita rates of correct inclusions in the maps or photographs.[5] (see Tables 3, 4). This indicates that recognition (photographs)

TABLE 2

LANDMARKS USED IN COMPARISON OF MAPS

No	Landmark	Site
1	Taku Hotel	Downtown
2	Whitehorse Inn	Downtown
3	Edgewater Hotel	Downtown
4	Tourist Services	North of town
5	Hougen's Store	Downtown
6	Taylor and Drury	Downtown
7	Northern Commercial Co.	Downtown
8	White Pass Railway Station	Downtown
9	R. C. M. P.	Downtown
10	Lyn Building	Downtown
11	Federal Building	Downtown
12	Bank of Commerce	Downtown
13	Bank of Montreal	Downtown
14	Vocational School	Riverdale
15	F. H. Collins Sec. School	Riverdale
16	Whitehorse Elementary	In town, north
17	Christ the King Sec. School	Riverdale
18	Hospital	East bank of river
19	Medical Dental Centre	Downtown
20	Any Church(es) (7 in number)	Downtown
21	Yukon Theatre	Downtown
22	Capital Theatre	Downtown
23	Fire Department	Downtown
24	Museum	Downtown
25	Any River boat(s) (4 in number)	South and east of town

TABLE 3

* MAP VERSUS PHOTOGRAPH INCLUSIONS COMPARED WITH RESPECT TO AGE OF SUBJECT

Age	Map Inclusion	Photograph Inclusions
10-11 (N=15)	97	93
12-13 (N=18)	144	129
14-15 (N=18)	141	124
16-17 (N=14)	140	146

df=3

χ^2=1.236

* (These are tests of interaction)

TABLE 4

* MAP VERSUS PHOTOGRAPH INCLUSIONS COMPARED WITH RESPECT TO SEX OF SUBJECT

Sex	Map Inclusion	Photograph Inclusion
Male (N=29)	246	242
Female (N=37)	276	250

df=1

χ^2=0.350

* (These are tests of interaction)

and recall (maps) are not differentially a function of either the age or the sex of the subject, despite the apparent improvement in both tasks with increasing age. The only age at which there was a slight increase in the number of places included was in the above 12 group. This is not surprising as the map technique is testing recall as well as spatial cognition. Recall seemed to reach a plateau at age 12 to 13. There was no effective difference in the inclusion frequency of the two sexes. Using Indian, non-Indian subgroups in testing number of place inclusions in maps and photographs, age and sex were again found to be non-significant. (See Tables 5, 6). Thus age and sex do not account for the subsequently discussed differences between Indian and non-Indian groups.

Using the residential areas outlined in Table 7, a one way analysis of variance[6] produced a significant Indian, non-Indian term ($p < 0.01$)[7] for the photographs but was non-significant for the maps.[8] (See Tables 8, 9). As will be seen later, this reflects cultural rather than socio-economic differences, particularly as place of residence was not a significant factor among the non-Indian subjects. A one way analysis of variance applied to the Indian group, using the reserve and hostels in Riverdale as places of residence, also showed that place of residence is, by and large, a non-controlling factor, among the Indian group. However the fact that the Indian group located more photographs indicates that the controlling factor is the cultural difference and not the place of residence.

TABLE 5

* MAP AND PHOTOGRAPH INCLUSION FOR 12-13 AGE GROUP.

	Photographs	Maps
Indian (N=14)	130	126
Non-Indian (N=52)	362	396

$\chi^2 = 0.57$

* (This is a test of interaction)

TABLE 6a

* MAP AND PHOTOGRAPH INCLUSIONS OF FEMALE SUBJECTS.

	Photographs	Maps
Indian (N=8)	107	129
Non-Indian (N=29)	385	393

$\chi^2 = 0.68$

TABLE 6b

* MAP AND PHOTOGRAPH INCLUSIONS OF MALE SUBJECTS.

	Photographs	Maps
Indian (N=6)	98	112
Non-Indian (N=23)	302	316

$\chi^2 = 0.64$

* (These are tests of interaction)

TABLE 7

MAP AND PHOTOGRAPH INCLUSIONS FOR INDIAN/NON-INDIAN RESIDENCE AREAS.

No	Area	Indians (n=14)	# Map Inclus.	# Photo Inclus.	Non-Indians (n=51)	# Map Inclus.	# Photo Inclus.
1	Reserve	7	76	310	-	-	-
2	Riverdale	6	63	210	21	219	481
3	Downtown	-	-	-	14	131	313
4	Takhini	-	-	-	8	104	257
5	Hillcrest	-	-	-	4	39	82
6	Alaska H'way	-	-	-	2	24	90
7	Valleyview	-	-	-	2	23	48
8	Porter Creek	1	15	60	-	-	-

TABLE 8

ANALYSIS OF NUMBER OF PHOTOGRAPH INCLUSIONS WITH RESPECT TO RESIDENCE (from data in Table 7)

ANALYSIS OF VARIANCE SUMMARY

Source	df	Sum of Squares	Mean Square
Total	65	18380.216	
Between Residence Areas	7	6095.684	870.812
Within Residence Areas	58	12284.53	215.518

$F_{7,58}=4.040$

TABLE 9

ANALYSIS OF NUMBER OF MAP INCLUSIONS WITH RESPECT TO RESIDENCE (from data in Table 7)

ANALYSIS OF VARIANCE SUMMARY

Source	df	Sum of Squares	Mean Square
Total	65	1296.319	
Between Residence Areas	7	131.555	18.793
Within Residence Area	58	1164.764	20.082

$F_{7,58}=0.935$

As has been pointed out in Chapter II, there was some difficulty in establishing a basis for accuracy in the maps. It was decided to use the criteria outlined by Ladd[9] in her analysis of maps produced by black youths in Boston. She chose four categories - Group 1 drawings are pictorial, Group 11 Schematic, Group 111 resemble maps, that is, are a portrayal of the layout of streets and Group 1V resemble maps with other identifiable landmarks which would make the area recognisable, and therefore would be the best for orientation to the area and the most accurate representation of the area. Three judges[10] were asked to assess the maps with respect to these criteria and it was found that there was complete agreement in 51 of the 66 maps. Disagreement centred mainly in the shades between categories 111 and 1V. The majority decision was accepted for the remaining 15. There was no clear cultural difference in the ability to produce undistorted maps, with both Indian and non-Indian maps classified into each group. This means that the measure of accuracy does not discriminate between Indians and non-Indians in this study.

Some of the other features mentioned by Ladd[11] were also considered. The area the maps represented ranged from about half a city block on Main Street (see Fig. i) to maps including an area ranging from Two Mile Hill to Riverdale (see Fig. ii). Other examples of subjects' maps appear in Appendix C. One of the reasons for those in Whitehorse may be that although various neighbourhoods exist, e. g. Riverdale, Takhini, etc.,

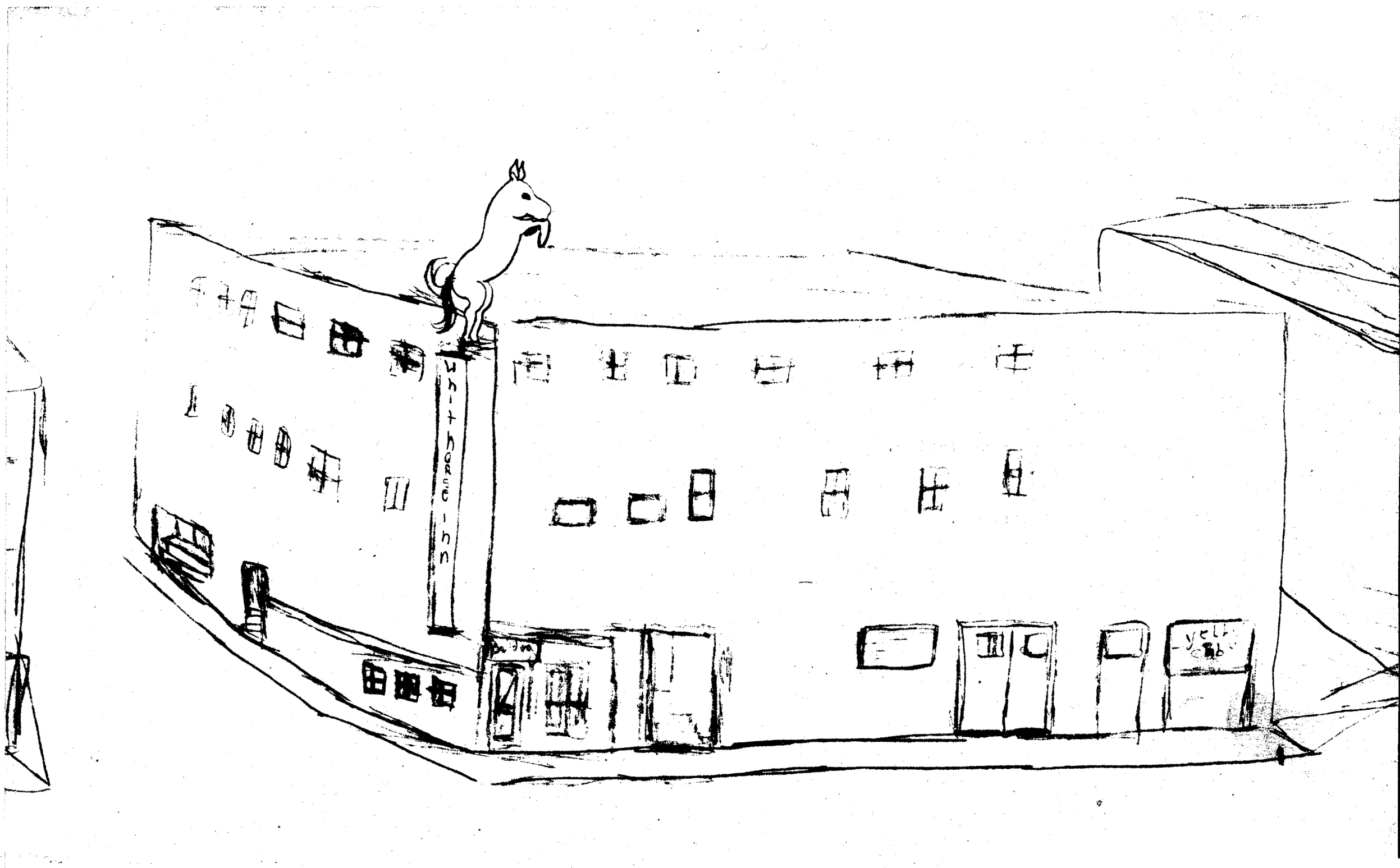
64.

Fig. (i)

Map of Whitehorse by Indian,

Age 10

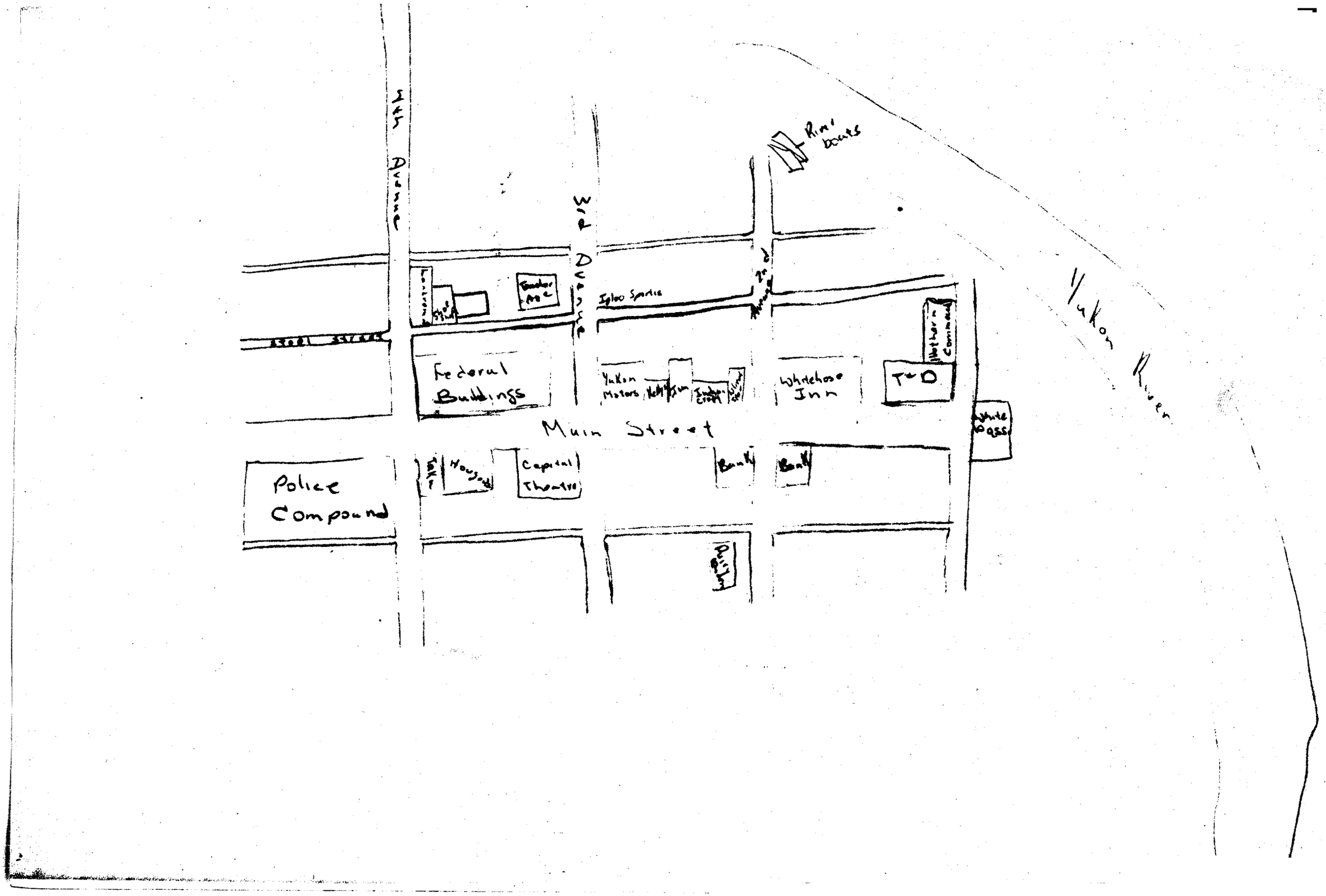
Spatial Scattered.


The White Horse Inn

65.

Fig. (ii)

Map of Whitehorse by non-Indian, born outside Canada, Age 12 Sequential Netted.


1st Avenue
2nd Avenue
3rd Avenue
Rim' Doors
Yukon River
Igloo Sparkle
Federal Buildings
Yukon Motors
Whitehorse Inn
T-D
Main Street
Police Compound
Capital Theatre
Bank
Bank

there is considerable mobility for all groups as the city is quite small in area and focusses on one downtown service centre. The only areas which received no mention in the maps were Takhini, Hillcrest, Crestview and Porter Creek which might almost be dormitory suburbs, requiring bus transport. That these omissions occurred in the maps of those who live in these areas suggests that they are not viewed as part of Whitehorse proper, but rather as outlying areas.

As has been indicated previously, consideration was given to the number of landmarks included. The twenty-five landmarks appear in Table 1. A two way analysis of variance[12] was performed for number of persons including each landmark and it was found that the landmarks' term was significant ($p<0.001$) while Indian/non-Indian differences were not (see Table 10). On examination of each of the 25 landmarks, certain were found to have much greater significance for the Indian group than for the non-Indian, while others had the opposite appeal. These significant or non-significant places appear to be a function of the subcultural use of the areas. While a few places showed marked differences, there were not enough of these to generate a significant interaction term. The places shown in Table 11 which were mentioned 40% more frequently among the Indian group were #1. the Whitehorse Inn, which is the predominant drinking place of the Indians and a place outside which many of the younger Indians spend considerable time, waiting for one or both parents, #2. the Lyn building,

TABLE 10

NUMBER OF PERSONS INCLUDING LANDMARKS IN MAPS FOR INDIAN, NON-INDIAN SUBJECTS (from data in Appendix E)

ANALYSIS OF VARIANCE SUMMARY

Source	df	Sum of Squares	Mean Square	F	p
Total	1649	403.0			
Between SS	65	50.8	0.78	3.54	<0.001
Within SS	1584	35.2	0.22		
Indian vs non-Indian	1	0.6	0.6	<1	n.s.
Within Indian vs non-Indian	64	351.6	5.49		
Landmarks	24	74.6	3.11	18.29	<.001
Landmark x Indian vs non-Indian	24	3.28	0.13	<1	n.s.
Landmark x within Indian vs non-Indian	1536	274.32	0.17		

TABLE 11

AREAS OR LANDMARKS PREDOMINANTLY RECALLED BY INDIAN/NON-INDIAN SUBJECTS.

Group	Landmark	% of Group Recalling
Indian	Whitehorse Inn	35.7
	Lyn Building	35.7
	Whitehorse Elementary School	35.7
	Christ the King Secondary School	35.7
	Churches (any of 7)	28.5
	Fire Department	28.5
	Edgewater Hotel	21.4
Non-Indian	River Boats	27.0
	White Pass Railway Station	31.8
	Northern Commercial Co.	23.0
	Medical-Dental Building	23.0

which houses the Welfare department and the Department of Education, #3. the Whitehorse Elementary School, a major landmark fairly close to the Reserve which is often the first school attended by the group, #4. Christ the King Secondary School, which is situated across the road from the hostels which house about 50% of the Indians in the sample, #5. the churches, not surprising as there has been considerable missionary energy expended among the Indians, both in the community and through church domination of part of the school system and #6. the Fire Department (the incidence of fires on the reserve is higher than ahywhere else in town). The only other place which was recalled significantly (2% more frequently among Indians) was the Edgewater Hotel, an establishment with the other downtown beer parlour. This building also houses the city's finest restaurant, which may account for the lower differential between Indians and non-Indians.

On the other hand, the following places held greater interest for the non-Indian subjects: 1. the river boats, considered to be a tourist attraction, 2. the White Pass Railway Station, 3. Northern Commercial Co., which unlike other stores made a policy of discouraging Indians, and 4. the Medical Dental Building, which is the office of all doctors and dentists in the area, therefore attended with regularity by the non-Indian group and not the Indian. In these four cases, the non-Indians would have greater association with the places mentioned. The other places were more or less culturally

neutral with the Federal Building being the most common element in all maps.

Possibly the most outstanding characteristic which appeared from the analysis of the maps was the dominant spatial construction which the Indian subjects portrayed. The type of scale outlined by Appleyard[13] in his study conducted among adults in Ciudad Guyana was used to examine this phenomena. Appleyard devised a scale using the type of element predominantly produced in each map and categorised his maps into two major classes - those which were sequentially dominant (roads being the major orientation mechanism) and those which were spatially dominant (individual buildings, landmarks or districts are the major organising mechanism). Within these major groupings, four subtypes were postulated. For the sequential group, these were fragmented (short, disjointed sequences), chain (trunk, and branches) branch and loop (a basic linear system with other outcroppings) and network (showing parts of the overall road pattern). For the spatial group, the subgroups were scatter and cluster (in which individual buildings appeared without connection) mosaic (the enclosure of districts by boundaries), link (in which road connections were present or there were links between buildings) and finally patterned (in which a total road and spatial system existed). Like the network maps, the patterned maps were the most complete, and demonstrated a subject's ability to handle maps.

In the study which was conducted in Whitehorse, two of the eight subtypes did not appear at all. This conclusion was arrived at from analysis of the maps by three judges.[14] This exclusion may well be the result of the difference in layout between the two cities. Ciudad Guyana may be described as a partial cobweb bounded by the V-shape of the river banks[15]. Whitehorse, on the other hand, is flat and the road pattern is a grid with road angles at 90°. It is likely that the lack of any pattern but straight lines caused the elimination of two of the categories isolated in the maps of Ciudad Guyana. The chain in the sequential group and the mosaic in the spatial were the absent subtypes. The maps were classified according to the remaining six categories (see Table 12).

With one exception, all the India maps fell into the spatial category, while the non-Indians were distributed between spatial and sequential. The probability of this occurring by chance is very low according to Fisher's Exact Probability Test.[16] ... (see Table 14). The Indian subgroup apparently perceives its surroundings with far greater spatial awareness than does the non-Indian group. This result was highlighted by the fact that the one Indian case which appeared among those who drew in a sequential fashion was that of the Indian girl who had been adopted by a non-Indian family and had lived as an upper middle class non-Indian.

Environmental awareness among the Indians also manifested itself in a way that had not been expected. When the maps

TABLE 12

MAP TYPES

APPLEYARD CLASSIFICATION - MAJOR CLASSES

Type	Indian	Non-Indian	Total
Sequential	1	29	30
Spatial	13	22	35

TABLE 13

APPLEYARD CLASSIFICATION - MINOR SUBTYPES

Types	Indian	Non-Indian Born in B.C.	Non-Indian born in Canada	Non-Indian born outside Canada	Non-Indian born in Whitehorse
Sequential					
a. Fragmented	-	2	7	3	3
b. Branch and Loop	1	2	2	1	2
c. ~~Nettled~~ Network	-	1	-	2	3
Spatial					
a. ~~Scattered~~	4	3	3	2	3
b. Linked	4	1	1	1	1
c. Patterned	5	2	3	2	1

TABLE 14

MAP TYPE, USING APPLEYARD CLASSIFICATION, FOR INDIAN, NON-INDIAN GROUPS
FISHER'S EXACT PROBABILITY TEST (from data in Table 12)

Map Type	Indian Maps	Non-Indian Maps	Total Maps
Spatial	13	29	42
Sequential	1	22	23
Total	14	51*	65

p=0.0041 (two tailed test)

* one non-Indian was unable to draw a map (tenure in Whitehorse was less than two months).

were examined it became obvious that a number of them (both spatial and sequential) featured three-dimensional drawing. Closer inspection revealed that this characteristic predominated among the Indian group, but disappeared in the above age 14 age group. A chi-square test was run on the incidence of three dimensional maps in the Indian/non-Indian subgroups (see Table 15). The result was statistically significant ($p<0.001$), indicating that a sense of space which may well disappear when enough time spent in an institutionalised education system and with the adoption of non-Indian concepts of mapping. One of the most remarkable examples of the three-dimensional mapping is seen in Fig. i. The map is totally pictorial, but with highly developed three dimensional skill. The incidence of three dimensional drawing in the Indian group strengthens the conclusion that the Indians are more spatially oriented than the non-Indians, as they orient three-dimensionally, and are aware of interrelationships on landmarks.

This conclusion is again reinforced when the results of the identification and location of the photographs are considered. Although there were 106 photographs, only 66 places were represented (shown in Table 16), as some of the larger buildings required more than one photograph. The location of the places is shown on Map 5. A two way analysis of variance on the number of correct recognitions[17] indicates that place is non-significant but that Indian/non-Indian differences are quite significant ($p<0.001$), with the

TABLE 15

* OCCURRENCE OF THREE DIMENSIONAL DRAWING IN MAPS WITH RESPECT TO INDIAN, NON-INDIAN SUBJECTS

	Indian	Non-Indian	Total
Three dimensional	8	2	10
Not Three dimensional	6	50	56
Total	14	52	66

$\chi^2 = 18.32$

* (This is a test of interaction)

TABLE 16

PLACES SHOWN ON PHOTOGRAPHS

1. White Pass & Yukon R. Station
2. Old Yukon Electric
3. White Pass Installation
4. End Eliot St.
5. Edgewater Hotel
6. Capital Hotel
7. Bank of Montreal
8. Alley beside Edgewater
9. Nelson's Plumbing
10. Shack beside Nelson's
11. New Yukon Electric
12. Vacant lot on Eliot St.
13. Atlas Building
14. Small shack on Eliot
15. Corner Eliot & 2nd Sts.
16. Taylor & Drury Department Store
17. Northern Commercial Co.
18. Cab Co. (Yellow Cab)
19. Whitehorse Inn
20. Museum
21. Sam McGee's Cottage
22. City Hall
23. Cab Co.
24. Toronto-Dominion Bank
25. Shack on Main St.
26. Cab Co. (Black top) & Election Headquarter
27. Yukon Craft & Whitehorse Star Building
28. Kelly's Motors
29. Whitehorse Motors
30. Federal Building
31. House corner Eliot & 3rd
32. Yukon Travel Agency
33. Garage
34. Igloo Sporting Goods
35. Teacherage
36. Lyn building
37. Vacant lot on 4th
38. Corner 4th & Main
39. R. C. M. P. barracks
40. Taku Hotel
41. Alley between V. W. & Taku
42. V. W. Garage
43. Centre Motel
44. Capital Theatre
45. Alley near Capital Theatre
46. Town Toggery
47. Qualita Dry Cleaners
48. Yukon Drugs
49. Murdoch's Store
50. Kee Bird Stores
51. C. B. C.
52. Texaco Garage
53. Canadian National
54. Liquor Store
55. Eaton's Store
56. Insurance Co.
57. Dair Queen
58. Seely's Store
59. Skyscraper
60. House on Eliot
61. Next house
62. Ace Parker Co.
63. Old Log Church
64. House
65. Next House
66. Church (New)

******

Indian subjects placing more of the photographs correctly than the non-Indian subjects (see Table 17). Since this technique tests recognition and awareness of spatial relationships between places, it indicates again the possibility of higher spatial awareness of the Indian youth.

To isolate factors which may contribute to this difference, a one-way analysis was performed on Indian data[18] using place of residence as a variable, but limiting the areas of residence to the reserve and hostels in Riverdale; the areas in which the Indians lived. The results shown in Table 18 indicate that the subjects from the reserve fared better in place recognition and location than those in Riverdale. It was thought that this might in part be attributable to the fact that those living on the reserve were indigenous to Whitehorse, whereas those in the hostels had not spent as long in the Whitehorse area. To test this possibility, both for the maps and the photographs, chi-square tests were run using total and less than total time spent in Whitehorse. Results indicated that (Tables 19, 20) those subjects whose entire experience was in the Whitehorse area located more of the places in both the maps and the photographs. This is not so surprising in the photograph location, since its key is recognition of places, but its appearance in the maps is in opposition to the findings of both Appleyard[19] and Ladd[20], who suggest that less complicated maps are usually produced by those who have been longest in an area. It may be that the lack

TABLE 17

NUMBER OF PLACES CORRECTLY INCLUDED IN PHOTOGRAPH LOCATION TEST (from Data in Appendix E)

ANALYSIS OF VARIANCE SUMMARY

Source	df	Sum of Squares	Mean Square	F	p
Total	4351	70519.14			
Between SS	65	253.15	3.89	0.23	
Within SS	4290	70265.99	16.37		
Indian vs non-Indian	1	57.87	57.87	18.97	<0.001
Within Indian vs non-Indian	64	195.28	3.05		
Place	65	140.82	2.17		
Place x Indian vs non-Indian	65	51.02	0.78	2.9	N.S.
Place x Within Indian vs non-Indian	4160	70174.15	16.87	0.006	N.S.

TABLE 18

PHOTOGRAPH INCLUSIONS FOR INDIAN SUBJECTS - EFFECT OF RESIDENCE FOR RESERVE VERSUS RIVERDALE RESIDENTS (from data in Table 7)

ANALYSIS OF VARIANCE SUMMARY

Source	df	Sum of Squares	Mean Square
Total	13	4001.43	
Between Residence Area	1	1070.09	1070.09
Within Residence Area	12	2931.34	244.27

$F_{1,12}=4.38$

TABLE 19

MAP PLACE INCLUSIONS VERSUS RESIDENCE LENGTH FOR INDIAN/NON-INDIAN GROUPS

Ethnicity	Residence Length	n	No of Inclusions
Indian	Total	6	80
	Non total	8	90
Non-Indian	Total	32	320
	Non total	20	212

TABLE 20

PHOTOGRAPH PLACE INCLUSIONS VERSUS RESIDENCE LENGTH FOR INDIAN/NON-INDIAN GROUPS

Ethnicity	Residence Length	n	No of Inclusions
Indian	Total	6	347
	Non total	8	296
Non-Indian	Total	32	792
	Non total	20	417

of time or boundary constraints in the map production task produced the results in this study.

The time taken by each subject to perform each segment of the tasks was also analysed, (Table 21). With one exception (the Indian girl reared in the non-Indian setting) the Indian subjects took longer to draw the maps than the non-Indians, but were quicker in placing the photographs. Again this implies that the recognition ability of the Indian is much higher than that of the non-Indian and that both groups' ability to recall is almost the same, with the non-Indian group having a slight, non-significant edge.

Certain other features emerged from an examination of the raw data but these could not be analysed statistically. Notable for most subjects were two major landmarks - the Whitehorse Inn and the Federal Building. The reasons for this are probably twofold--the Federal Building is also part of the post office and the courthouse, while the Whitehorse Inn, as well as being a social centre, contains the bowling alley, a restaurant and a taxi company. Thus, both buildings are multifunctional. The second reason is visual--both buildings occupy a city block and are relatively striking.

Other frequently recognized places were banks, the Taku hotel, which is on the busiest corner in the downtown area, and the Taylor and Drury Department Store (frequented by both cultural groups and on a corner). The White Pass and Yukon Railway Station (which burnt down in 1970), was also a feature

TABLE 21

*1 AVERAGE TIME IN MINUTES TAKEN FOR MAP DRAWING AND PHOTOGRAPH RECOGNITION TASKS FOR INDIAN AND NON-INDIAN SUBJECTS

Group	Map	Photograph
Indian *2	41.5	25.5
Non-Indian	21.5	40.5

$\chi^2 = 1.56$

*1 This is a test of interaction.

*2 The single Indian subject, reared in a non-Indian family spent 25 minutes in map production, and 35 minutes in photograph location.

recognised by both groups and recalled predominantly by the non-Indian group. This is probably visual--it occupied a block on the western end of Main Street, adjacent to the river and separated from other buildings. Only the Indian group made any mention of taxi companies on their maps. This is functional; for many this is the prime mode of travel, apart from walking, while non-Indians, when not walking, use private automobile.

One surprising feature of the maps was that only eight of the 66 subjects drew in any natural features such as the river, the clay bank or the escarpment. This suggests that the urban area is seen as being removed from its physical setting or that an urban map implies a built environment. It may be that this is a perception peculiar to the youth group who were born into Whitehorse as an urban environment, rather than watching it evolve or seeing it as an escape from more highly urbanised areas. 25, or about one-third of the subjects seemed aware of the grid layout and drew their maps with the grid pattern in mind. Rather than thinking out each step as they drew, these subjects drew a basic grid first and then placed landmarks and names on the grid. The Indian subjects predominated in this characteristic--64% of the Indians produced maps like this. This lends substance to the conclusion that there is a difference in perception between Indian and non-Indian youth. Although there is little difference in each group's ability to remember salient features, what differences there are manifest themselves quantitatively in the number of places recognized and

qualitatively in the cognitive style displayed. This adds up to the Indian being more spatially aware and having greater recognition of elements in his environment, despite the fact that in the majority of cases, his mobility is far less than that of his non-Indian counterpart.

FOOTNOTES

1. D. Appleyard, "Styles and Methods of Structuring a City", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 100-118.

2. Florence Ladd, "Black Youths View Their Environment", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 74-99.

3. Although 107 photographs were taken, only 66 places were represented, as some of the larger buildings required more than one photograph to cover them. Throughout the analysis, the 66 places were used as a measuring criteria, not the number of actual photographs.

4. An elevated level of significance was demanded because use analyses of variance with this 1-0 type of data does not meet the formal requirements of the techniques. However, as has been demonstrated by Norton, cited in E. Lindquist, Design & Analysis of Experiments in Psychology & Education, Houghton, Mifflin & Co., Boston, 1953, p. 85 et seq., a high significance level such as this effectively eliminates Type I errors inherent in the use of ANOVA with this sort of data.

5. In all tables, number of map and photograph inclusions are cumulative.

6. Dinary data - assumptions of normality and heterogeneity not met: significance level set high (0.001 rather 0.01) to avoid Type I errors, see Lindquist, Op. cit., p. 85.

7. Olivetti Underwood Programme 101, Statistical Analysis, 1968, p. 208.

8. Ibid.

9. Forence Ladd., Op. cit., p. 94.

10. The three judges were non-teaching friends.

11. Florence Ladd, Op. cit., p. 99.

12. Olivetti Underwood, Op. cit., p. 208 and see footnote 6.

13. D. Appleyard, Op. cit., p. 100-118.

14. Again three judges were used; this time one was a teacher. Where no agreement (2 out of 3) could be reached, the author made the final decision from notes of the process of map construction. This meant that the sequential maps were constructed with pathways first and landmarks added while spatial maps drew

landmarks predominately.

15. D. Appleyard, "City Designers and the Pluralistic City", Rodwin & Associates (ed), Planning Urban Growth and Regional Development, M.I.T. Press, 1969, p. 422-452.

16. S. Siegel, Non-Parametric Statistics, New York: McGraw-Hill, 1956, p. 96.

17. Olivetti, Op. cit., p. 208.

18. Ibid.

19. D. Appleyard, "Styles and Methods of Structuring a City", Op. cit., p. 98.

20. Florence Ladd, Op. cit., p. 98.

CHAPTER IV

CONCLUSIONS AND SUGGESTIONS FOR THE FUTURE

It had been expected that there would be some quantitative and qualitative differences in recalled perception of urban milieux between the Indian and non-Indian subjects. Some of these differences were expected to stem from the "types" of maps drawn, particularly among the younger Indian group, who would have been relatively unlikely to be exposed to formal maps. Place of residence and length of exposure to the local environment were also expected to be significant factors creating differences. Certain places which are obvious landmarks in the city were likely to appear common to all, but those places which had special use would dominate in each group's maps and recognition of the photographs. Overall, because of different patterns of mobility, peer group interaction and family education, it was expected that the subcultural groups would view the urban milieu of Whitehorse in dissimilar ways.

Summary Conclusion

This study advanced two hypotheses:

(1) In an urban environment in which there is cultural heterogeneity, there will be important and reliable differences in the way each culture perceives its environment. These differences will manifest themselves both quantitatively in the number of places which have impact and areas which are seen as

important, and qualitatively in the style of map drawing.

(2) The differences in perception will be linked to sites of importance to each culture, although all have freedom of access to the areas under study, and there is a stated policy of integration within the community.

The results tend to confirm both these hypotheses, with the following characteristics emerging as important:

(1) Age and sex were found to have little bearing on perceptions in this age group (10-17 years).

(2) Indian vs. non-Indian differences were substantial, compared to within-culture differences.

(3) In the map drawing task the non-Indian accomplished the task much faster than the Indian.

(4) Most of the three dimensional maps were produced by younger Indian children.

(5) In analysing styles of maps, the Indian Maps were predominantly spatial, while the non-Indian were predominantly sequential, as these terms are defined in Chapter III.

(6) From the maps, certain landmarks had particular memorability for the Indian group, while others were memorable to the non-Indian group. Certain areas were memorable to both.

(7) Those who had lived longest in the area had best recall and recognition of the area and its landmarks.

(8) The Indian group placed the photographs more quickly and more accurately than the non-Indian, indicating greater recognition of the environment.

In toto, these results lead to the conclusion that there are strong and distinct cultural differences in perception between the Indian and non-Indian subjects interviewed. These differences manifest themselves as much greater spatial awareness exhibited by the Indian group than that shown by the non-Indian group.[1]

Limitations in Classification. The predominant limitation in the classification of data arose from the use of an open ended enquiry technique. This could be seen in the confusion over what constituted a map and from diverse responses to the informal questioning. Further complications derived from the lack of complete information about some of the subjects, in particular the Indians where conversation with the parents was impossible. This rendered some of the hoped-for avenues of exploration in qualitative analysis invalid.

Limitations of the Sample. This study is viewed as a pilot study of one methodology for examining the impact of spatial organization on a group of young people. Whitehorse exemplifies communities which (1) occupy an urban setting, (2) are undergoing rapid change, and (3) have a wide range of diversity in age structure, occupation, cultures, income level and state in individual life cycle. However, before generalisations on communities of this type can be made, comparative studies are needed. Unfortunately, time constraints prevented any follow up work. In some cases (particularly in the Indian

group) there was difficulty in obtaining background information from parents who were not in Whitehorse; information provided by the subjects was relied upon. Certain factors had to be assumed to be universal or sufficiently randomised not to bias or cloud the results--these were IQ level, the ability to sketch, and exposure to maps of Whitehorse. Certain other important factors were ignored or assumed to be random--such attributes as attitudes, values of the students, the length of time spent in school, the effect of change of schools, relationships with family and peer groups and the age at which the subject began formal education.

Discussion of Results

Certain features of Whitehorse were found to dominate in both the maps and the photograph location. These are places which serve as landmarks because of visibility, size, centrality, and function. Some places combine all four characteristics and these are most commonly drawn or correctly placed. The Federal Building and the Whitehorse Inn are large, easily and centrally placed buildings which are considered important in the community, and are frequented by all. Other places have one or two of the characteristics--the banks, for example, have visibility and function but their use by this age group is minimal. The study shows that despite supposed integration in the community, patterns of function and use differ for each culture and some places have more impact for one group than for another. There are some

peculiar and unexpected omissions--the definite non-importance of schools in the maps suggests that they are not considered part of Whitehorse, although they are part of the subject's immediate environment.

Many of the more interesting buildings are being removed or suffer from lack of visibility (examples of these are a three story log skyscraper, the old museum, etc.). Their replacements are frequently faceless, architecturally bland buildings which are not visually notable. An example of the importance of this type of stimulation comes from an Old Log Church which has a great deal of charm, but is not the church that the majority of church-going subjects attend, nor is it in a prominent locality. Nevertheless, it is sufficiently stimulating visually to be included in many of the maps and to be recognised and located from its photograph by a large number of the subjects. In fact, its frequency of production in the maps is much higher than any of the other churches.

The tendency to obscure or bypass landmarks for the sake of expediency--one of the access roads has been rerouted, resulting in the bypassing of river boats, the Log Church and several old homes--results in lack of interest in the urban milieu. Studies are needed to determine the effect of rerouting and whether awareness of an area is strengthened or diminished by the route chosen.[2] Certainly, the most commonly identified landmarks are found in areas which are frequently used and in which visibility is not blocked. The creation of a visually

stimulating environment, particularly for child and young people, is imperative, especially in an area such as Whitehorse, which is undergoing rapid growth and change and which has not, as yet, reached a stable sterility. From the study, it is obvious that a considerable portion of the 10-17 year old population respond to the environment in terms of its buildings and their impact; room for development of this inherent characteristic should be made by exciting and interesting use of urban space.

Possibly the most disturbing feature arising from this type of study is, however, the complete lack of awareness and use by professional educators of the nature of perceptions of the students with whom they are dealing. The absence of any attempt to build on the already formed perceptual structure of the subjects and the continual predication of learning on assumptions that all individuals view the world as an adult non-Indian would, is disturbing.

The three dimensional characteristic in Indian maps and its subsequent disappearance at a later age suggest that acculturations has set in and that the Indian child is acclimated to an alien learning experience. This hypothesis needs further examination.

As has been demonstrated here, the concept of recall on which the current education philosophy is built[3] disadvantages the Indian student and neglects recognition, in which he excels. From school performance, it appears that the Indian student has difficulty accepting the material which is accepted and learned

by the non-Indian. Certainly some concepts are common to both cultures, but there needs to be sufficient flexibility to ensure that each group has the opportunity to recognise and develop its full potential with the aid of, rather than in spite of, the education system. The problem that the Indian student has in assimilating the social norms of non-Indian society by which he finds himself dominated are serious enough without the added burden of being expected to perceive the world through non-Indian eyes and to be adjudged a failure if he does not succeed.[4] In many cases it must be difficult for an Indian student to grasp the concepts which are presented to him. For example, automobility separates the concepts of distance for Indian and non-Indian. As the Indian ascends through the system, these misunderstandings become more severe and almost impossible to cope with. That most of the Indian subjects suffer from this type of problem is evidenced by the fact that they were ranked in the lowest stream and were simply marking time until the school leaving age of 15. These same subjects appeared in the interview and in the tests to be alert and fully capable and in no way "less intelligent" than their non-Indian counterparts. Blaut[5], states that informal mapping behavior operates in children regardless of culture and points the way to different learning in the social studies. Blaut suggests that this activity is one of the earliest uses of model-thinking; this suggestion should be rigorously examined so that already developed abilities of the student are integrated into and built upon within the formal education

structure.

Thus it is evident that more youth-oriented research is needed in both urban and educational planning. This does raise questions of technique. The use of highly structured tasks is often questionable with adult groups, particularly if the researcher is of a different culture from one or all the subjects. Under the same circumstances, with younger groups, the problem becomes more critical and may result in withdrawal, confusion and non-useful responses as the subject feels threatened. For these reasons an open-ended technique was used, with as little instruction as possible. It may well be that the lack of instruction resulted in confusion for some subjects, although this was not discernable. Whenever questions came from the subject they were answered, making every effort to avoid bias.

The type of task undertaken and the compromise solutions developed accentuated the need for far more refinement of "mental mapping" and photograph recognition and location techniques. The mental map is a useful device and one which young people enjoy producing. However, as yet there is no clear indication of what the subject views as a "map". There are no clear ways of assessing accuracy and its relationship to orientation ability and needs of the subject. The problem of measurement of cognitive maps is at present under study,[6] using campus settings and college students and it is hoped that these will provide some useful techniques. However, it must be borne

in mind that a select group such as the college student population may well produce a particular type of cognitive map, which is of limited applicability and pertinence in a different age, educational or cultural setting. Lynch's[7] use of nodes and edges is applicable in middle class adult contexts, but may not apply in other cultures. The type of map with which Lynch dealt may never appear among early age groups or non-European cultures, even; thus the techniques may be culture specific. Blaut's[8] conclusions and those of this study indicate that the cognitive map is viable regardless of culture, but the degree to which it can be used in cross-cultural comparisons needs examination. Thus the factors which influence the type of cognitive map produced must be isolated to see where valid comparisons may be made, and where the environment may be changed to maximise the potential of all cultures exposed to it. Indications from map production studies done to date are that age and sex do not significantly affect cognitive mapping. The effect of mobility in life, socio-economic status, perceived role in the community, individual and group social dynamics, goals, and values on cognition remain to be studied. Truly rational and humanistic planning must await some knowledge of these effects.

The mapping technique obviously has much to offer as a tool. So too do photograph placement techniques and use of semantic differential in environmental perception and appraisal[9] but again their use must be carefully evaluated. Some of the

questions to be answered are: How can these tests be structured to obtain most information from the subjects? Which tests are applicable to cross-cultural studies? Sonnenfeld[10] has used a semantic differential with Eskimo and White children, while MacArthur[11] in a later work indicates that the comprehension of even very simple words is much more different among Eskimo, Indian and White children than had previously been thought. Certainly the use of more complex semantic differential techniques, such as those used by Collins[12] would be precluded in cross-cultural studies, unless it could be clearly established that each word had the same connotative meaning for each subject.

Other questions arise: With the use of photographs, is colour a significant factor? Do colour and culture interact? Would the use of moving film or video give different results than static photographs? As Downs[13] has pointed out: "Image is a complex construct and there are significant interrelations between spatial cognition, urban form and human behavior of which we are almost completely ignorant." Overall much more research is needed to determine how cognition, form and behavior interrelate and under what conditions inherent human potential can be maximised in an urban milieu.

Other researchers, such as Lynch[14] and Ladd[15] have also pointed out the need for studies along the line outlined by Downs. Some more specific areas and factors which can be identified as a result of the present study are: To what extent

has cross-cultural contact influenced the perceptions of both groups, especially those of the less dominant group? Would a group in which contact had existed for four or five generations perceive differently from one in which contact had only been for one or two generations? What is the effect of the organised church, particularly in a northern community where it has been a dominant education force? To what extent does the degree of acculturation of a group change the quality of perception of their surroundings? Most importantly, how can information about differing perceptions help overcome some of the problems associated with cultural interfaces, or acculturation? To what extent is real integration possible in communities which have heterogeneous cultural tapestries; can this be achieved by imposition or through understanding differing cognitions, is it possible to recognise and build on strengths of each subculture?[16] There are of course other facets which emerge and need consideration but it is in the field of cognition and cross-cultural studies that research is most imperative.

This study has been an attempt to approach these topics in the context provided by Whitehorse. Despite the questions which such research raises, the differences noted are sufficient to indicate that assumptions of universal cognitive structure regardless of culture are fallacious. Since there are almost no culturally homogeneous urban areas in North America, this type of research is mandatory if improved design of the environment for human use is a social goal. The work that Lynch,

Appleyard and Ladd have done, fortunately on extremely different groups, has produced divergent enough results to attest to this conclusion.[17]

In a world which is rapidly becoming aware of the importance of creating an environment of quality, the role of environmental behaviour studies cannot be ignored. The how and why of cognition and the understanding of positive ways in which innate perceptions[18] can be reinforced by planning and education to create milieux of value are prime considerations in the betterment of the human condition in the global village. The field of social sciences offers no greater challenge for the '70's.

FOOTNOTES

1. This suggests that the ability to recognise elements in their environment is more highly developed among those who have fared poorly in the formal education structure. This conclusion calls into question that reached by Appleyard, who feels that spatial ability is a function of formal education. The Indian group in this study, in fact, rated consistently lower than the non-Indians in IQ and grading. Indian students were in lower streams and were frequently on the vocational programme as they are considered "uneducable" in the academic learning environment.

Similarly, in using the chi-square test on sex as a discriminating factor, the security conscious female of Appleyard's study, who is home oriented, did not emerge. She must be a product of later social stimuli as she could not be isolated from the overall sample.

2. Lynch's work indicates that routes, edges and nodes are of prime importance, particularly in the View From the Road.

3. See all B. C. Curricula in use in the Yukon--each is prefaced by a blurb on desired goals, which are white, middle class.

4. Of course, not all ethnic characteristics are required to be considered in providing a positive educational environment, but the emphasis which is put on school results creates this failure syndrome. (Private conversation with teachers and counsellors, 1969.)

5. J. M. Blaut, S. S. McCleary, and America S. Blaut, "Environmental Mapping in Young Children", Environment and Behavior, Vol. 2, No. 3, Dec. 1970.

6. Research being done at Clark University and Johns Hopkins, courtesy of Dr. R. Horsfall, SFU, 1970.

7. K. Lynch, The Image of the City, Cambridge, Mass. MIT Press, 1960.

8. J. M. Blaut et al., Op. cit.

9. C. E. Osgood, G. Suci and P. Tannenbaum, "The Logic of Semantic Differentiation" in Sol Saporta (ed) Psycholinguistics, Holt, Rinehart and Winston, 1960, p. 283.

10. J. Sonnenfeld, "Environmental Perception and Adaptation Level in the Arctic", Environmental Perception and Behavior, David Lowenthal (ed), Department of Geography, Research Paper 109, Chicago, 1967.

11. R. MacArthur, Cross Cultural Differences in Semantics, unpublished paper given at A.A.A.S. in Whitehorse, Sept. 1968.

12. J. Collins, Perceptual Dimensions of Architectural Space Validated Against Architectural Criteria, Ph.D. dissertation, University of Utah, 1969.

13. R. Downs, "The Cognitive Structure of an Urban Shopping Centre", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 39.

14. K. Lynch, Op. cit.

15. Florence C. Ladd, "Black Youths View Their Environment", Environment and Behavior, Vol. 2, No. 1, June 1970, p. 74-99.

16. Margaret Mead's works are concerned with this type of problem.

17. R. Brown and E. Lennenberg, "A Study in Language and Cognition" in Sol Saporta (ed), Psycholinguistics, Holt, Rinehart and Winston, 1961, p. 480.

18. "Innate perceptions" here refers to perceptions deriving from all non-formal education or assimilation of culture rather than to inborn characteristics.

ADDITIONAL REFERENCES

A. BOOKS

Appleyard, Donald, Lynch, Kevin, and Myer, J., The View from the Road, Cambridge, Mass., M.I.T. Press, 1964.

Bacon, Edmund, Desions of Cities, New York, Viking Press, 1967.

Barker, R. G. (ed), The Stream of Behavior, N. Y. Appleton - Century - Crofts, 1963.

Bruner, Jerome S., et al., Studies in Cognitive Growth, N. Y. John Wiley, 1966.

Carr and Associates, The Yukon Economy - It's Potential for Growth and Continuity, Vol. 1, Ottawa, 1968.

C.M.H.C., Whitehorse, Government Printers, Feb. 1963.

Cole, John and King, Cuchlaine, Quantitative Geography, John Wiley and Sons, 1968.

Collins, John, Perceptual Dimensions of Architectural Space Validated against Behavioral Criteria, Ph.D. dissertation, University of Utah, 1969.

Coombs, Arthur (chairman) Perceiving, Behaving, Becoming, Yearbook, 1962, Association for Supervision and Curriculum Development, National Education Association, Washington, D.C., 1962.

Cox, Kevin and Golledge, R., (eds) Behavioral Problems in Geography: A Symposium, Northwestern University, Studies in Geograph, 17, 1969.

Dominion Bureau of Statistics, Census 1961, 1966, Ottawa.

Dominion Bureau of Statistics, Census of Indians in Canada, Ottawa, 1959.

Dennis, Wayne, Group Values through Children's Drawings, New York, Wiley, 1966.

Dinkmeyer, Don C., Child Development - The Emerging Self, Englewood Cliffs, N. J., Prentice Hall, 1965.

Edwards, Allen L., Statistical Analysis, Rinehart and Co., N. Y. 1959.

Estvan, Frank J., Social Studies in a Changing World, N. Y., Harcourt, Brace and World, 1968.

Gould, Peter R., On Mental Maps, Michigan Inter-University Community of Mathematical Geographers, Discussion Papers No. 9.

Hall, Edward T., The Silent Language, Garden City, N. Y., Doubleday and Co., 1959.

Institute of Local Government and Department of Northern Affairs, The City of Whitehorse, Queen's Printers, Ottawa, 1960.

Koppitz, E., Psychological Evaluation of Children's Human Figure Drawings, N. Y., Grune and Stratton, 1968.

Lane, Robert, Political Ideology - Why the American Common Man Believes What He Does, N. Y., Free Press of Glencoe, 1962.

Lauwe, Chombart de., Famille et habitations I- Sciences humains et conceptions de l'habitation, Paris, CNRS, 1959.

Levine, Stuart and O'Lurie, Nancy, The American Indian Today, Pelican, 1970.

Linquist, E. F., Design and Analysis of Experiments in Psychology and Education, Houghton, Mifflin Co., Boston, 1953.

Lotz, Jim, The Squatters of Whitehorse, Government Printers, Ottawa, 1964.

Lowenthal, David, Geography, Experience and Imagination, Environmental Perception and Behavior, Chicago University Press, 1967.

Lynch, Kevin, The Image of the City, Cambridge, Mass. M.I.T. Press, 1960.

Lunzer, E. A. and Morris, J. F. (ed), Development in Human Learning, American Elsevier Publishing Co. Inc., N. Y., 1968.

McCarthy, Philip J., Sampling-Elementary Principles, Bulletin No. 15, Cornell University, Ithaca N. Y. 1951.

Olivetti Underwood Programme 101, Statistical Analysis, 1968.

Osgood, C. E. et al, The Measurement of Meaning, Urbana, U. of Illinois Press, 1957.

Piaget, Jean., The Child's Construction of Reality, Routledge and Kegan Paul, London, 1955.

Piaget, Jean and Inhelder, Barbel, The Child's Conception of Space, New York, W. W. Norton, 1967.

Rodwin, Lloyd and Associates, Planning Urban Growth and Regional Development- The Experience of the Guyana Program of Venezuela, M.I.T. Press, 1969.

Saporta, Sol (ed) Psycholinguistics, Holt, Rinehart and Winston, N. Y., 1961.

Schroeder, Harold, Driver, Michael and Streufert, Siegfried, Human Information Processing, Holt, Rinehart and Winston, N. Y., 1967.

Siegel, Sidney, Non-parametric Statistics for the Behavioral Sciences, McGraw-Hill Co., N. Y., 1956.

Sommer, Robert, Personal Space-The Behavioral Basis of Design, Englewood Cliffs, N. J., Prentice Hall Inc., 1969.

Strahler, Arthur, Physical Geography, New York, Wiley and Co., 1951.

Vernon, Philip E., Intelligence and Cultural Environment, London, Methuen, 1969.

B. Essays and Articles in Collections

Appleyard, Donald, "Why Buildings are Known: A predictive Tool for Architects and Planners," Environment and Behavior, Vol. 1, No. 2, Dec. 1969, p. 131.

Appleyard, Donald, "Styles and Methods of Structuring a City," Environment and Behavior, Vol. 2, No. 1, p. 100-118.

Appleyard, Donald, "City Designers and the Pluralistic City," Planning Urban Growth and Regional Development, M.I.T. Press, 1969, p. 422-452.

Brower, Sidney, "The Signs We Learn to Read," Landscape, Autumn, 1965, p. 9.

Blaut, James M. McCleary, Jr., George S., and Blaut, America S., "Environmental Mapping in Young Children," Environment and Behavior, Vol. 2, No. 3, Dec. 1970, p. 335-347.

Brown, Roger and Lennenberg, Eric, "A Study in Language and Cognition", Psycholinguistics, Holt, Rinehart and Winston, 1961, p. 480-492.

Carr, Stephen and Schissler, Dale, "The City as a Trip," Environment and Behavior, Vol. 1, No. 1, June 1969, p. 7-36.

Collins, John and Seaton, Richard, Semantic Dimensions as Architectural Discriminators, Office of Academic Planning, U.B.C., 1960's.

de Jong, D., "Images of Urban Areas," Journal of American Institute of Planners, 28, Nov. p. 266-276.

Dodwell, D., "Children's Understanding of Spatial Concepts," Canadian Journal of Psychology, No. 17, 1963, p. 141-147.

Downs, Roger, "The Cognitive Structure of an Urban Shopping Centre," Environment and Behavior, Vol. 2, No. 1, June 1970, p. 39-48.

Firey, Walter, Irving, "Sentiment and Symbolism as Ecological Variables," American Sociological Review, Vol. 10, p. 140-148.

Fried, Marc and Gleicher, Peggy, "Some Sources of Residential Satisfaction in an Urban Slum" Journal of American Institute of Planners, Vol. 27-28, 1961-2, p. 311.

Goodenough, F. L., and Harris, D. B. "Studies in the Psychology of Children's Drawings II, 1928-1949," Psychological Bulletin, No. 17, 1950, p. 369-433.

Gutman, Robert, "Site Planning and Social Behavior," Journal of Social Issues, Vol. XXII, No. 4, Oct. 1966, p. 103-115.

Kates, R., and Wohlwill, J., "Man's Response to the Physical Environment," Journal of Social Issues, XXII, No. 4, Special Issue, 1966.

Kendall, M. G. and Smith, B. B. "Randomness and Random Sampling Nos" Journal Review of Statistical Society, 101, 1938.

Kirk, William, "Historical Geography and the Concept of the Behavioral Environment," Indian Geographical Journal, 1951, p. 159.

Ladd, Florence C., "Black Youths View Their Environment: Neighbourhood Maps," Environment and Behavior, Vol. 2, No. 1, June, 1970, p. 74-99.

Lowenthal, David, "Geography, Experience and Imagination: Towards a Geographical Epistemology," Annals of the Association of American Geographers, Vol. 51, No. 3, 1961, p. 241-260.

Lynch, Kevin and Rivkin, Malcolm, "A Walk Around the Block," Landscape, Vol. 8, No. 3 Spring 1959, p. 24-34.

MacBride, M., "Whitehorse," The Northwest Digest, Sept.-Oct., 1956.

Osgood, C. E., Suci, G., and Tannenbaum, P., "The Logic of Semantic Differentiation," Psycholinguistics, Holt, Rinehart and Winston, 1961, p. 283.

Parr, A. E., "The Child in the City-Urbanity and the Urban Scene," Landscape, Vol. 16, No. 8, Spring 1967, p. 4.

Rushdoony, H. A.,"A Child's Ability to read maps: Summary of the Research," Journal of Geography, 67, 1968, p. 213-222.

Sonnenfeld, Joseph, "Environmental Perception and Adaptation Level in the Arctic," Environmental Perception and Behavior, Research Paper No. 109, Chicago, 1967.

Sonnenfeld, Joseph, "Geography, Perception and the Behavioral Environment," The Use of Space by Animals and Man, A.A.A.S. Symposium, 1968.

Sonnenfeld, Joseph, "Equivalence and Distortion of the Perceptual Environment," Environment and Behavior, Vol. 1, No. 1, June 1969, p. 83-100.

Stea, David and Downs, Roger, "Cognitive Representations of man's Spatial Environment," Environment and Behavior, Vol. 2, No. 1, June 1970.

Stea, David and Downs, Roger, "From the Outside Looking In at the Inside Looking Out," Environment and Behavior, Vol. 2, No. 1, June 1970, p. 100-118.

Trowbridge, C. C., "On Fundamental Methods of Orientation and Imaginary Maps," Science 38: 1913, p. 888-897.

Vernon, M. D., "Perception and Perceptual Learning," Development in Human Learning, America Elsevier Publishing Co. Inc., N. Y., p. 1.

C. Unpublished Papers

MacArthur, Russell S., "Educational Potential of Northern Canadian Native Pupils," presented at A.A.A.S. conference, Whitehorse, 1968.

Sonnenfeld, Joseph, Unpublished Paper, Texas A. & M. University, 1968.

Stea, David, "Some Notes on Orientation," Clark University, circa, 1968.

Stea, David, "On the Measurement of Mental Maps: An Experimental Model for Studying Spatial and Geographical Orientation," Clark University, circa 1968.

Stea, David, "Pedestrian Movement on the Westminster Mall - An Experimental Proposal," Clark University, circa 1968.

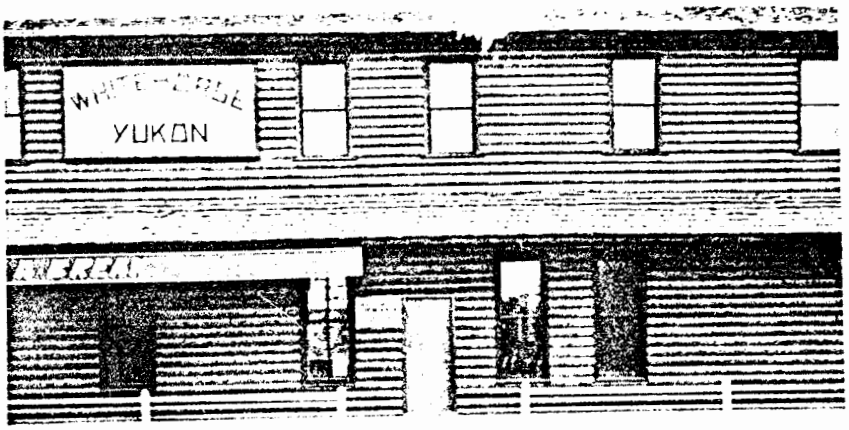
APPENDIX A

Examples of Photographs Used in Photograph Recognition.

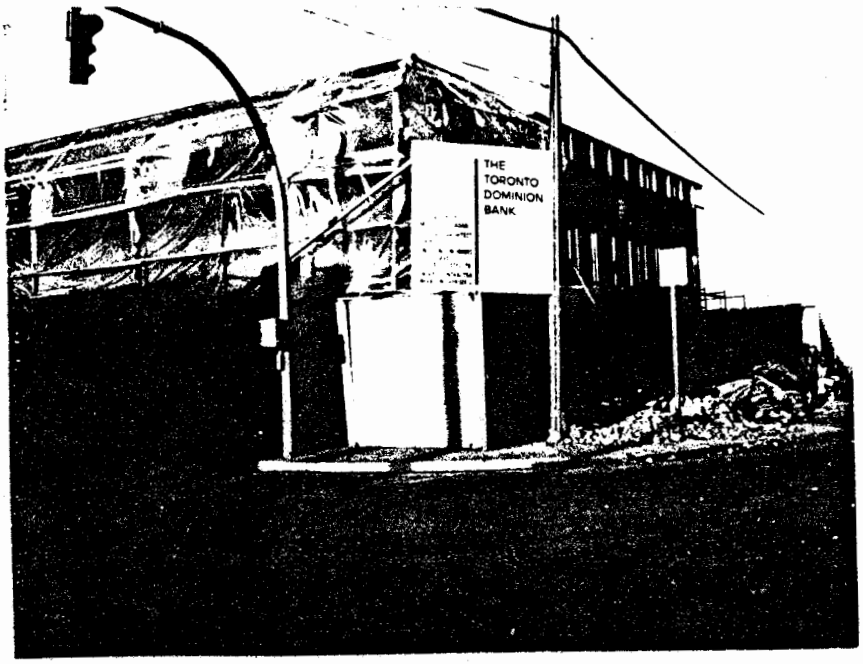
Test, Keyed to List in Text, Table 15, p. 76-77.

No. 19, Fig. (i) Whitehorse Inn.

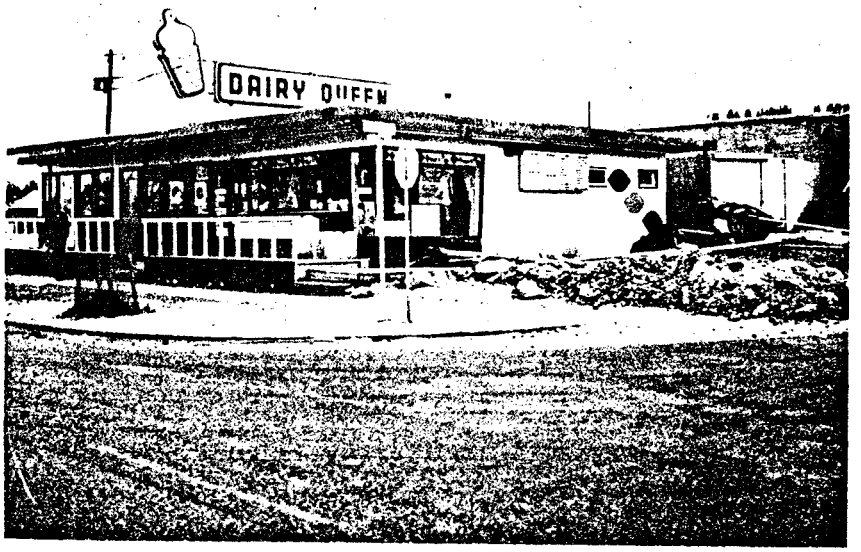
No. 11, Fig. (ii) New Yukon Electric Building.



No. 1, Fig. (iii) White Pass and Yukon Railway Station.

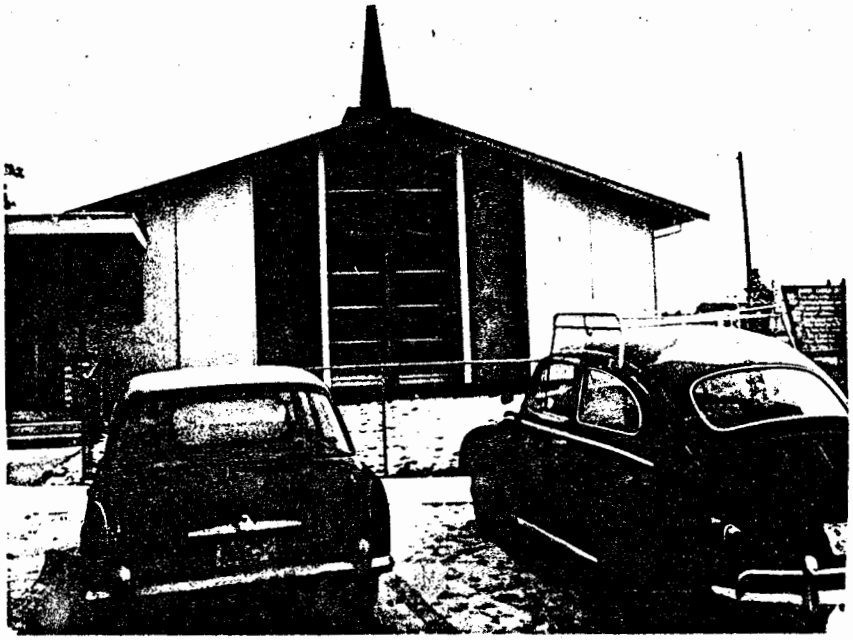


No. 29, Fig. (iv) New Toronto-Dominion Bank.

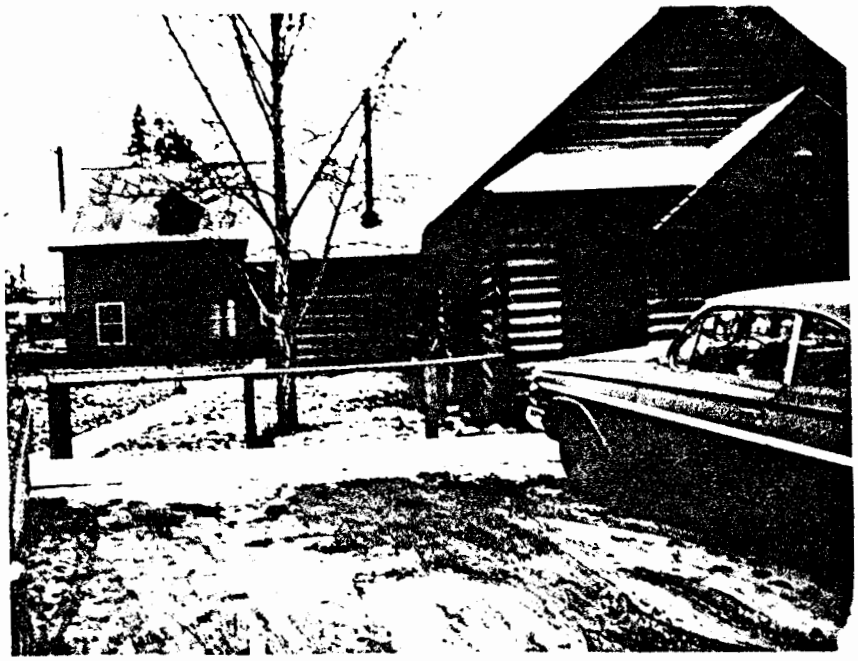


No. 57, Fig. (v) Dairy Queen.

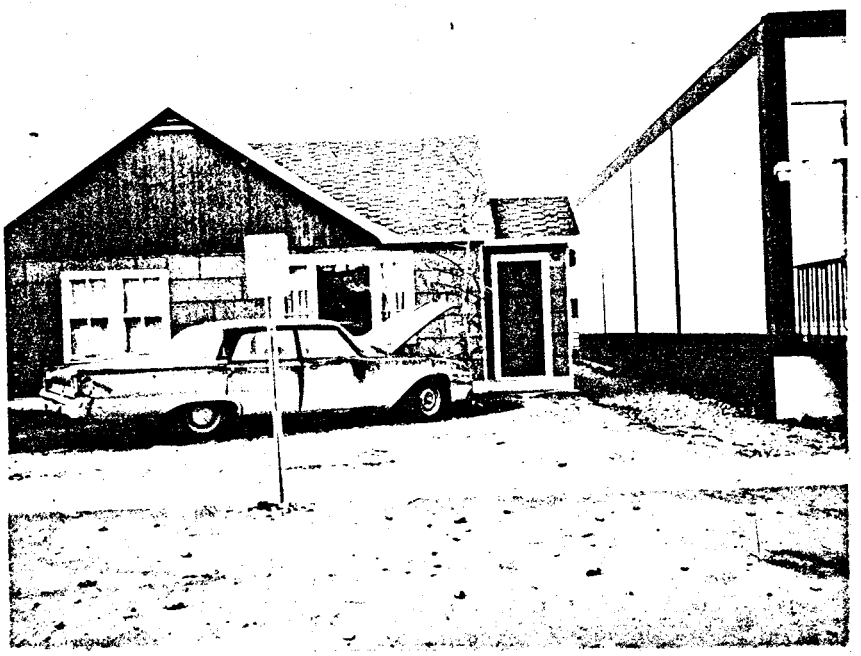
No. 12, Fig. (vi) Vacant lot Eliot St.



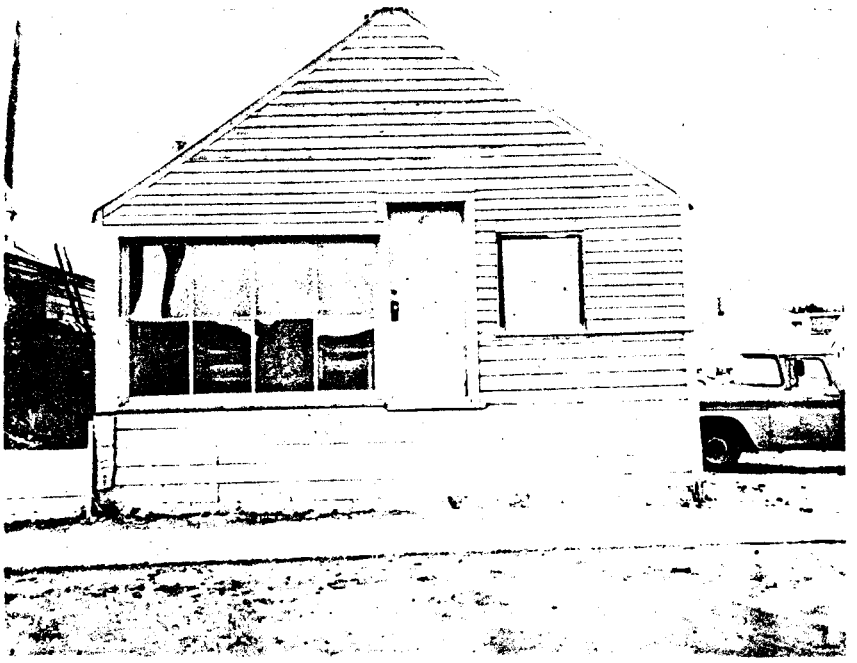
No. 66, Fig. (vii) Church.



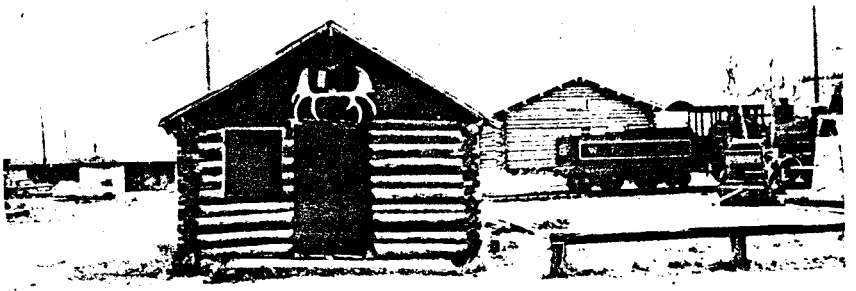
No. 64, Fig. (viii) House on Eliot St.



No. 60
Fig. (ix) House beside Canadian National Telecommunications.



No. 26.
Fig. (v) Taxi Stand and Election Headquarters.

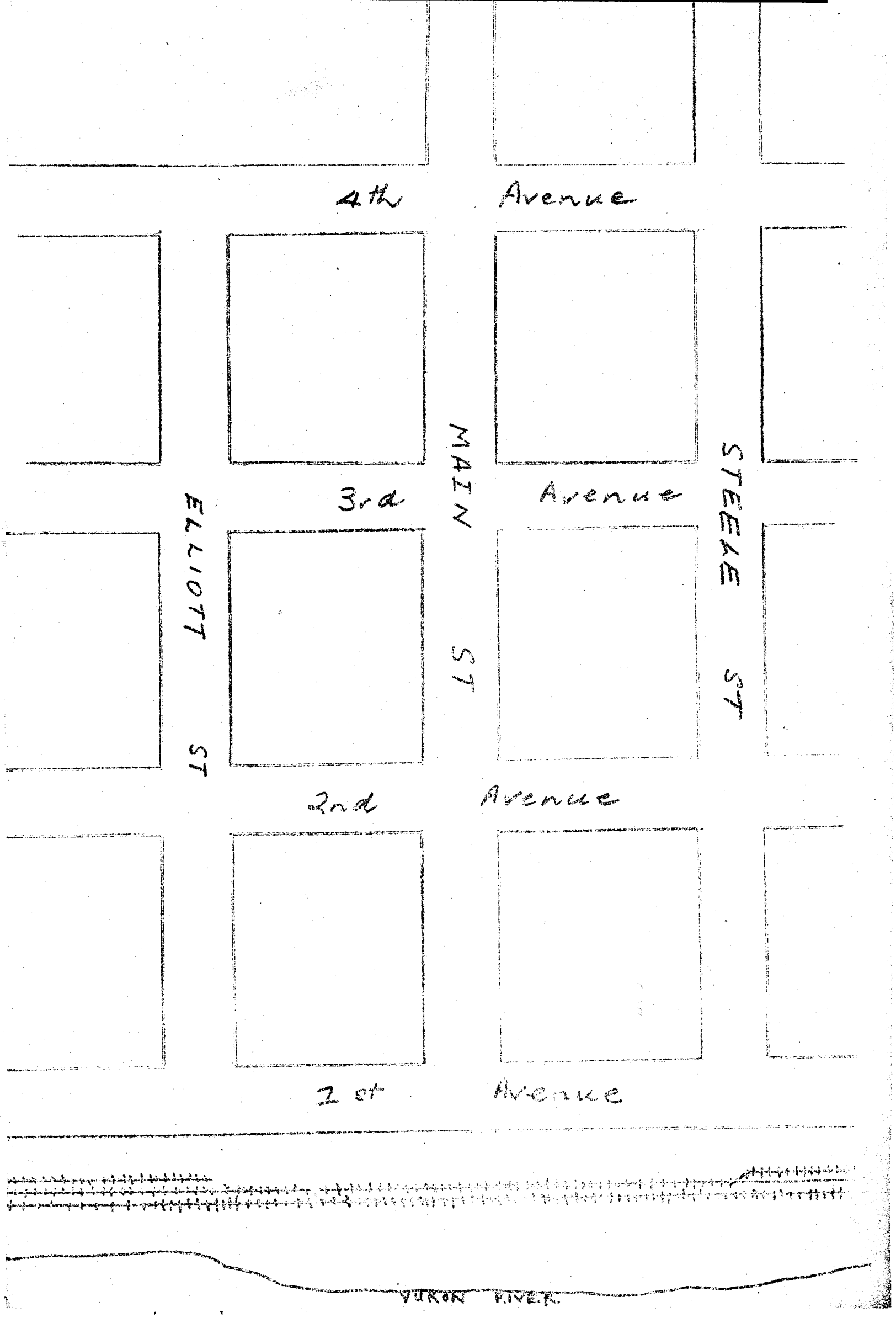


No. 21 Fig. (xi) Sam McGee's Cabin.

No. 34,
Fig. (xii) Igloo Sporting Goods Store

APPENDIX B

Base Map for Photograph Location.


4th Avenue
3rd Avenue
2nd Avenue
1 st Avenue
MAIN ST
STEELE ST
ELLIOTT ST
YUKON RIVER

APPENDIX C

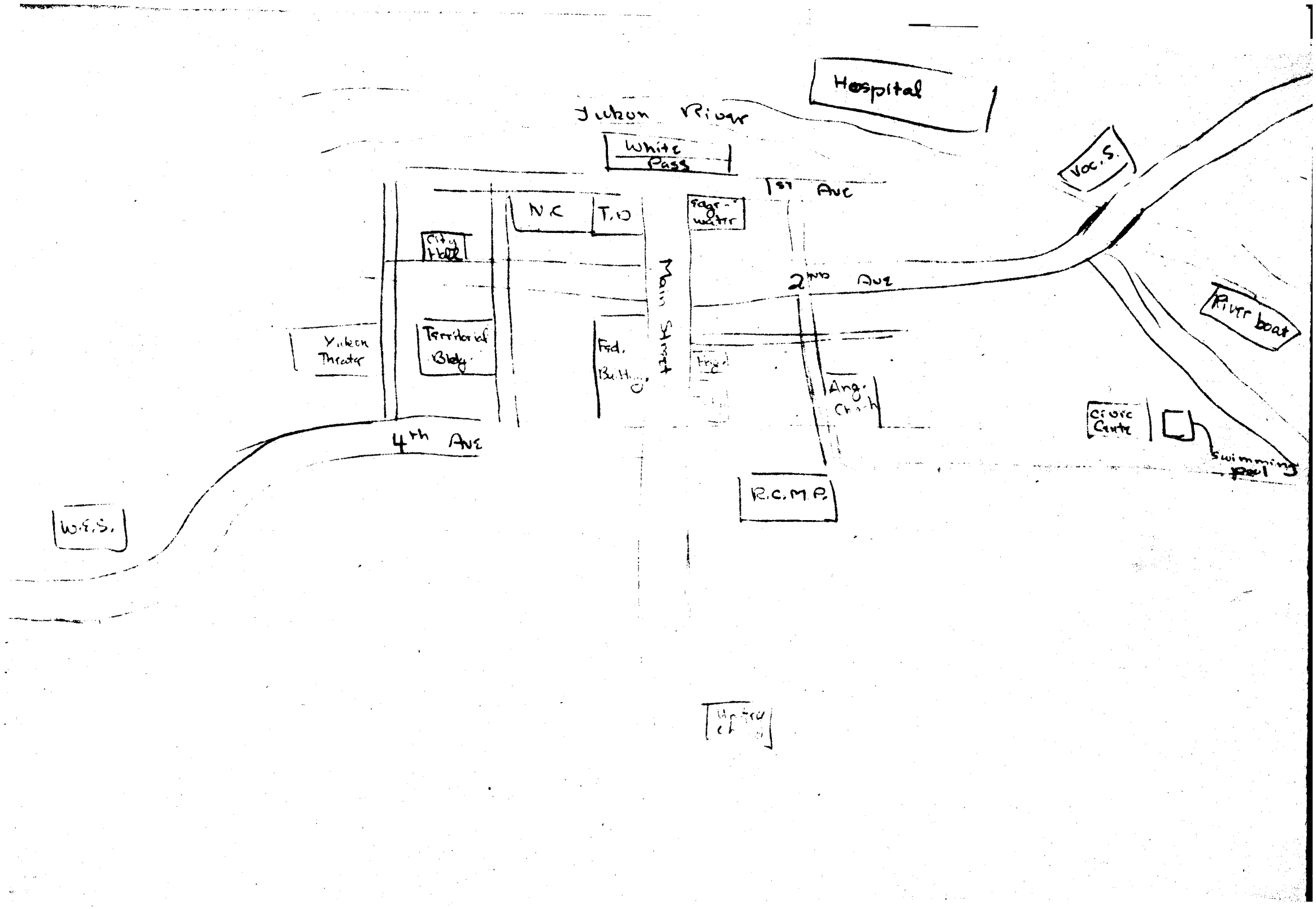
Examples of Maps Drawn by Subjects -

Classified by Appleyard's Criteria.

119.

Map I

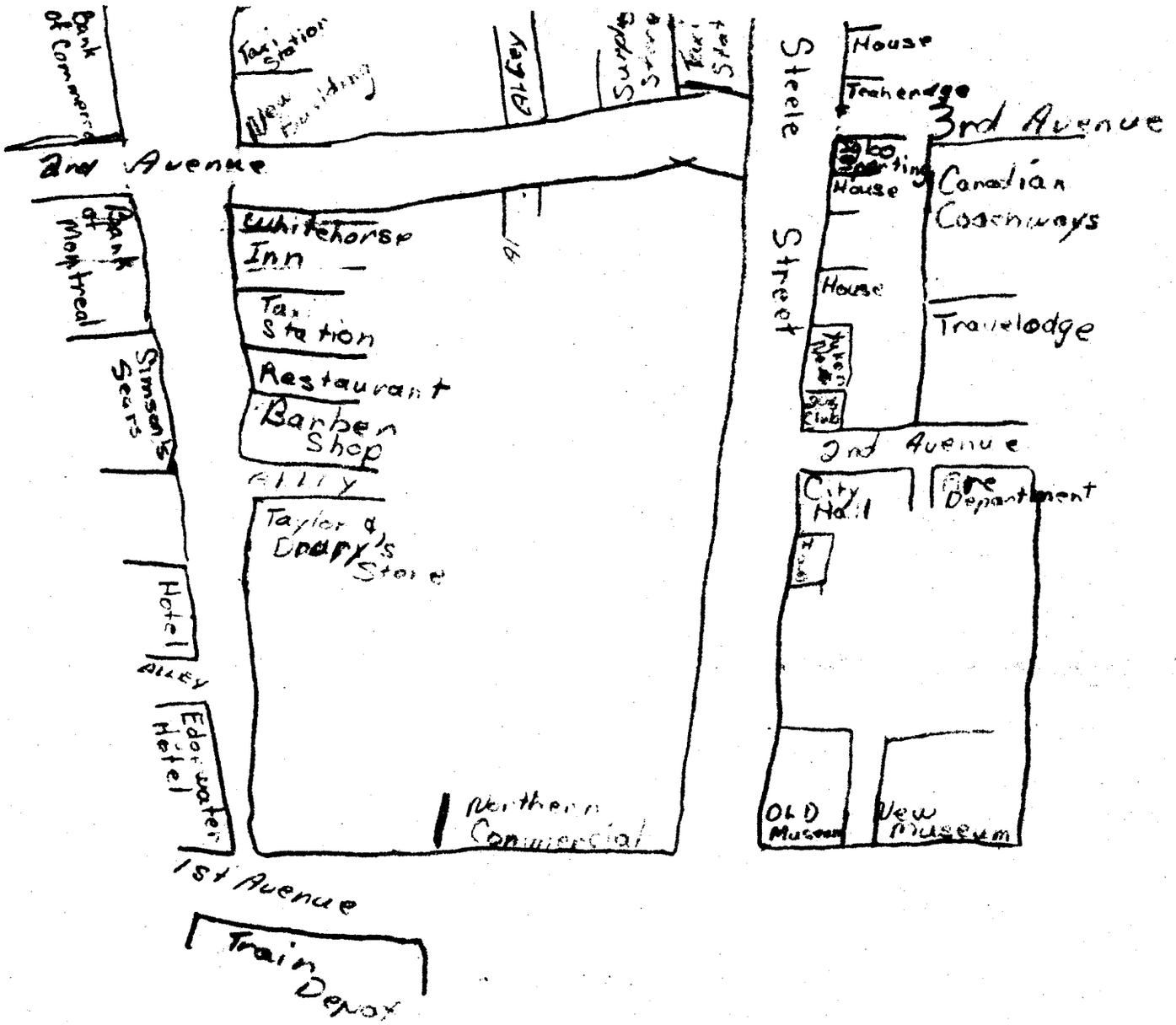
.inked Map - Indian subject, age 16


Hospital
Yukon River
White Pass
1st Ave
N.C
T.D
Fagr-whitr
City Hall
Main St
2nd Ave
Voc. S.
Yukon Theater
Territorial Bldg.
Fed. Bldg.
Ang. Ch.
Rivtr boat
Civic Centre
swimming pool
4th Ave
W.F.S.
R.C.M.P

120.

Map II

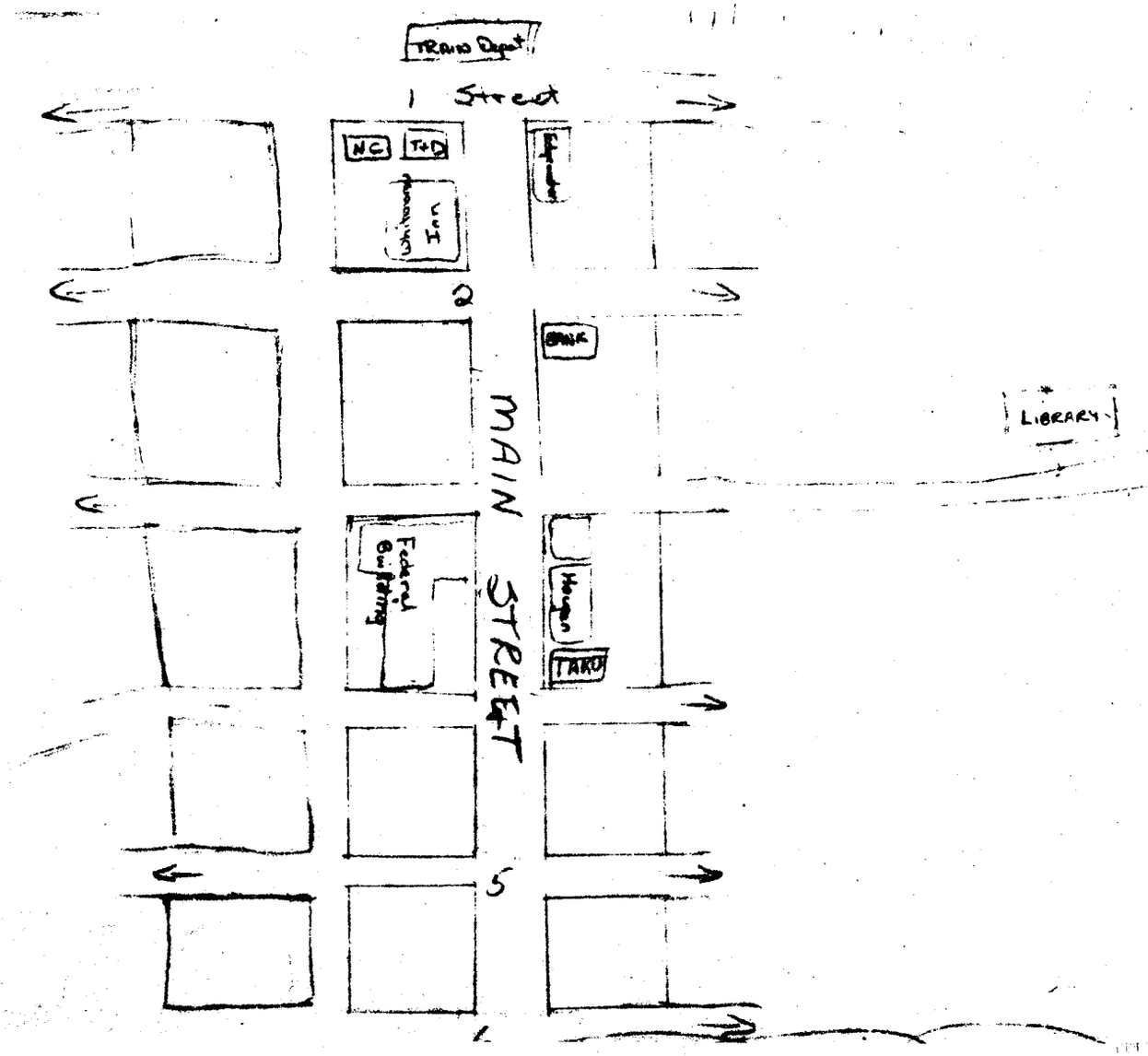
Spatial Linked Map - non-Indian, Age 11

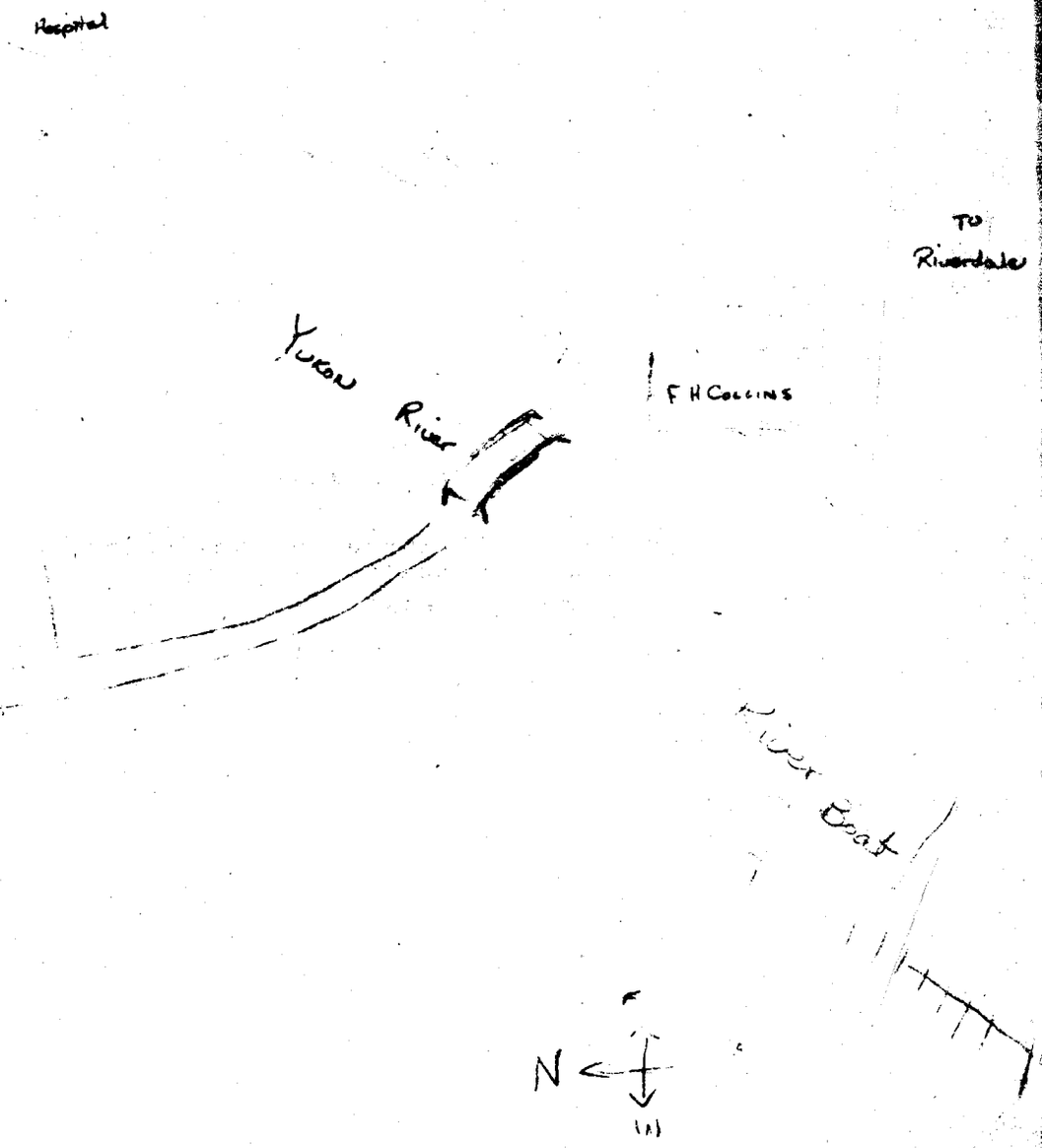

Bank of Commerce
Taxi Station
Taylor
Supplies Store
Taxi Stat
Steele Street
House
Tenhenge
3rd Avenue
Canadian Coachways
Travelodge
2nd Avenue
City Hall
Fire Department
OLD Museum
New Museum
2nd Avenue
Bank of Montreal
Simpsons Sears
Whitehorse Inn
Taxi Station
Restaurant
Barber Shop
ALLEY
Taylor & Drury's Store
Hotel
ALLEY
Edgewater Hotel
Northern Commercial
1st Avenue
Train Depot

121.

Map III

Spatial Patterned Map - Indian, age 17

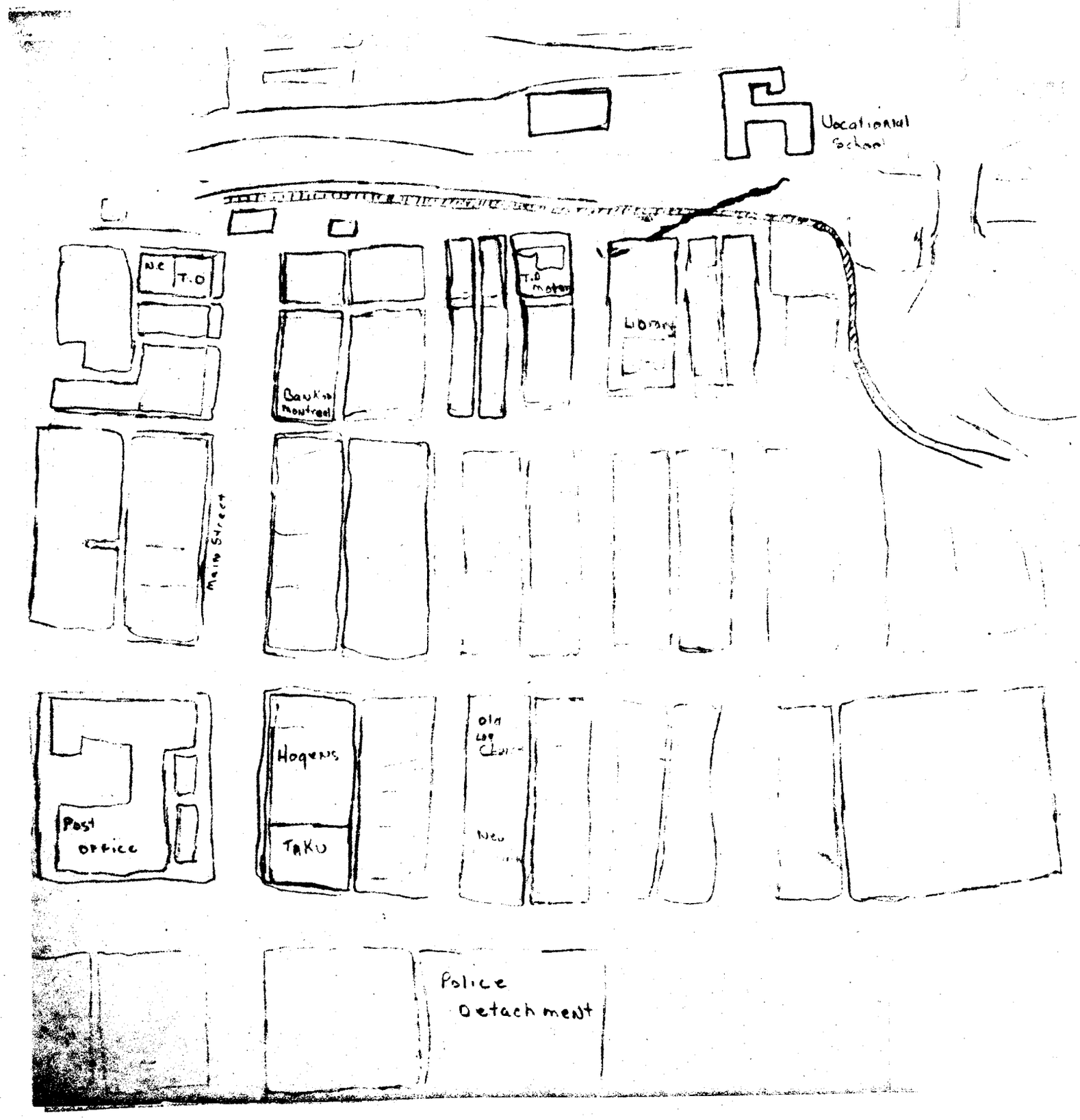

TRANS Dept
1 Street
N.C.
T+D
Whitehorse Inn
Fire Hall
2
3
4
5
6
MAIN STREET
BANK
Federal Building
Hougen
TAKO

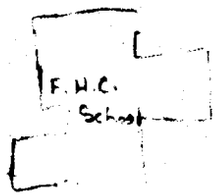

Hospital
TO Riverdale
YUKON River
F H COLLINS
LIBRARY
River Boat
N

122.

Map IV

Patterned Map - Indian, age 14

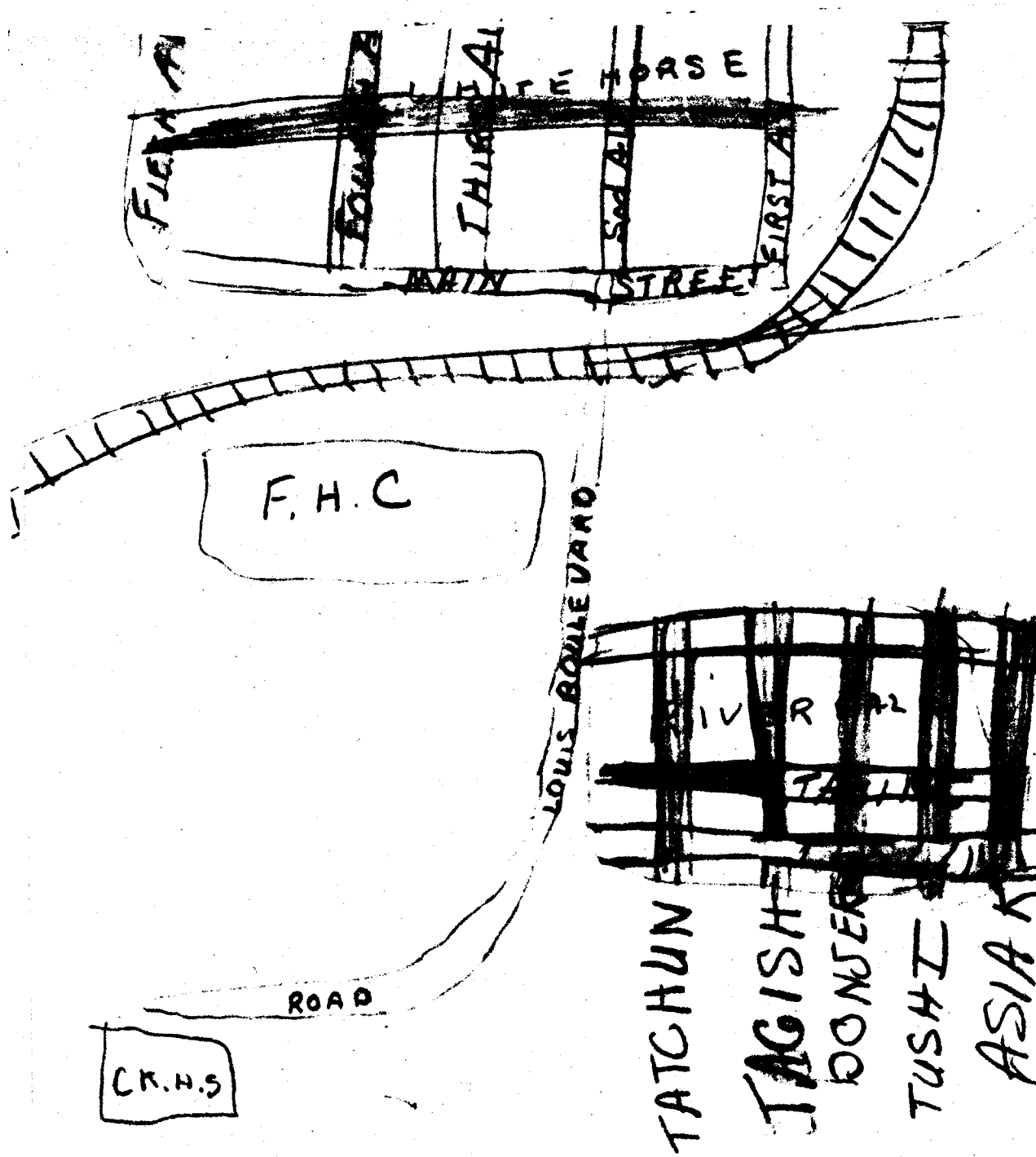

Vocational School
N.C
T.O
T.O motors
Library
Bank of Montreal
Main Street
Hoqens
TAKU
Old Log Church
New
Post office
Police Detachment


F.H.C. School

123.

Map V

Branch & Loop Map - non-Indian subject, age 14

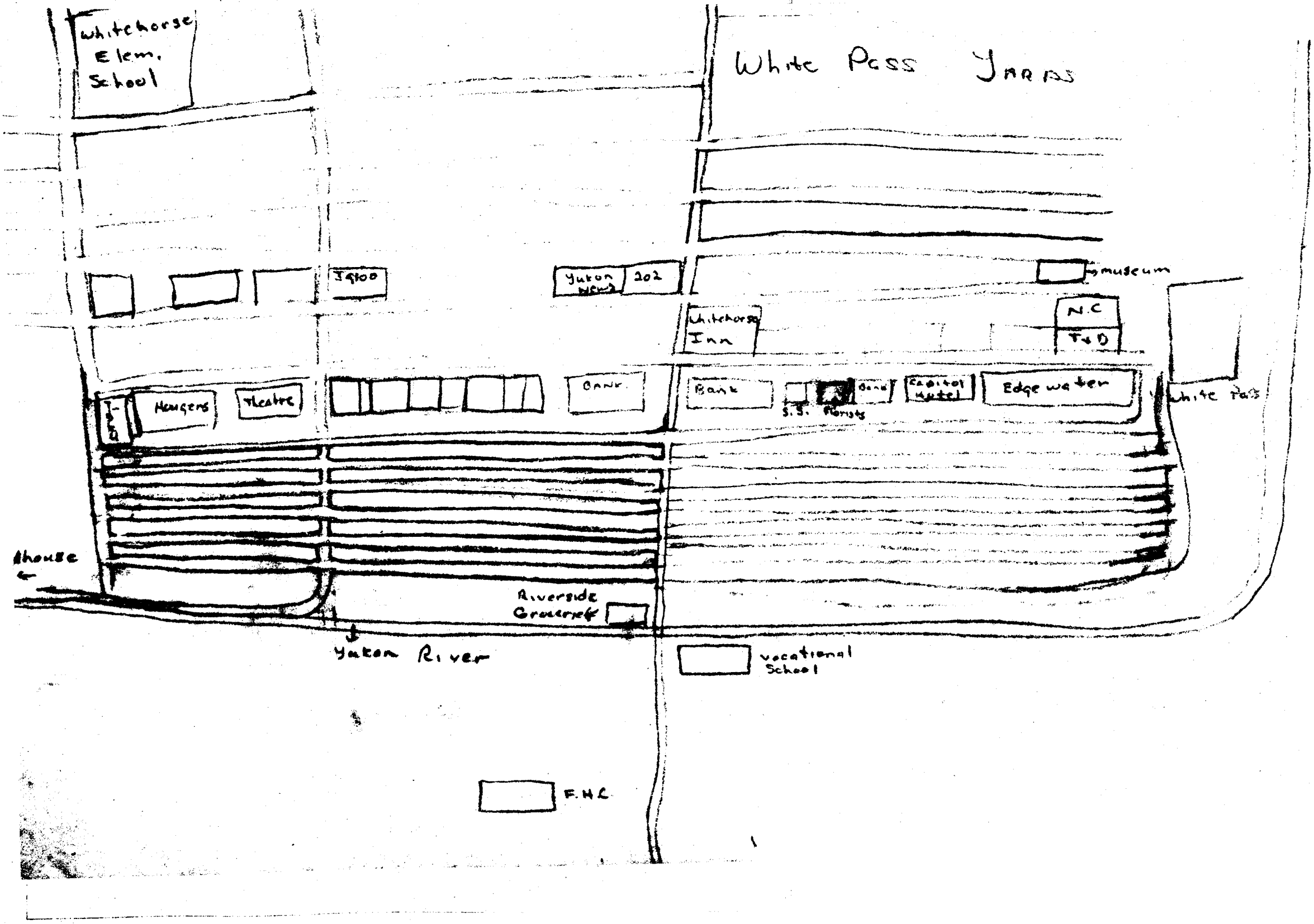

WHITE HORSE
MAIN STREET
F.H.C
ROAD
C.R.H.S
TATCHUN
TAGISH
TUSHI
ASIA K

ALSEK

124.

Map VI

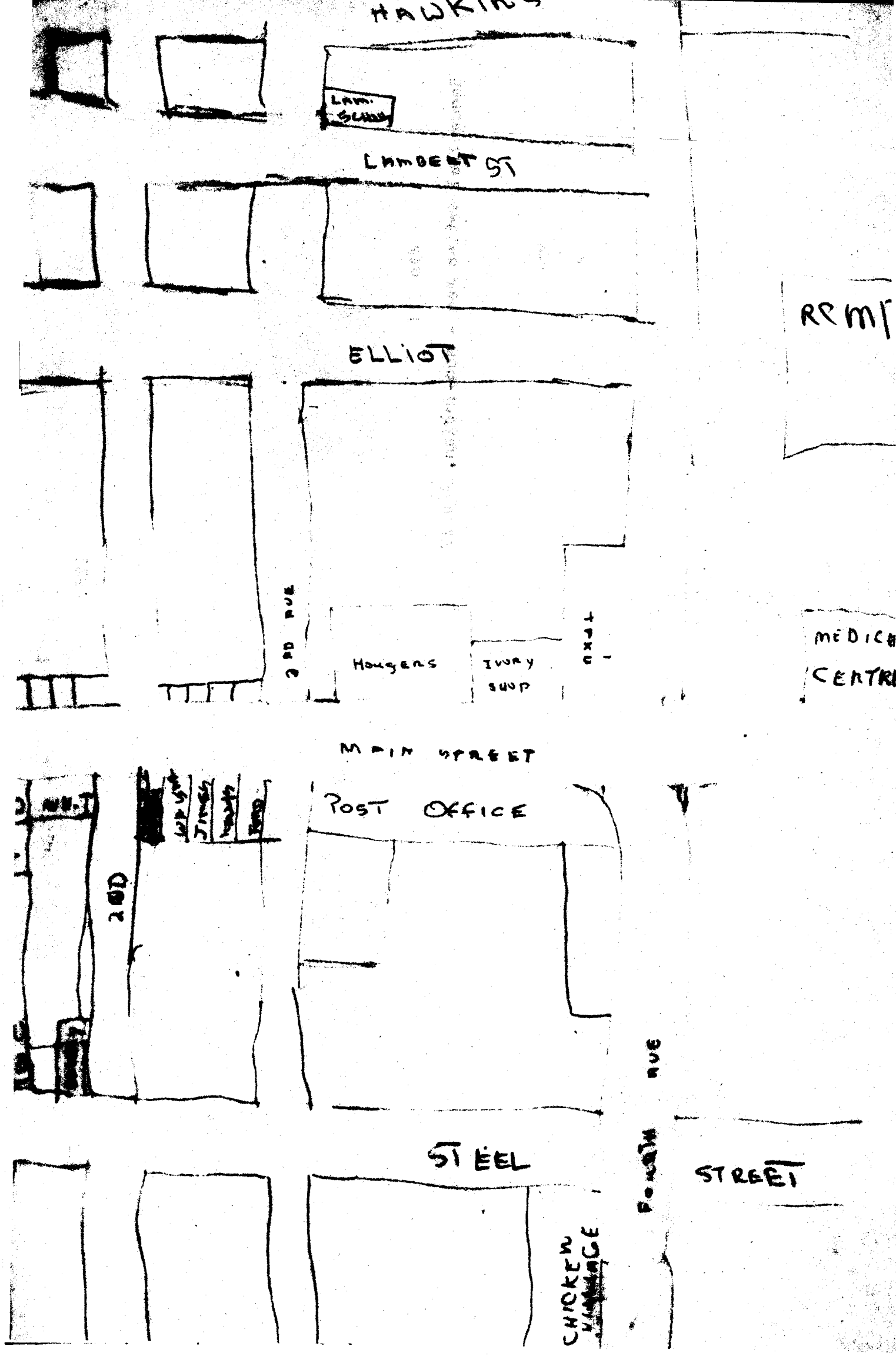
Sequential Netted Map - non-Indian, age 16


Whitehorse Elem. School
White Pass Inn
Yukon News
202
museum
N.C
T&D
Whitehorse Inn
Bank
Bank
S.S. Florists
Capitol Hotel
Edgewater
White Pass
Hougens
Theatre
Bank
Riverside Groceteff
Yukon River
vocational School
F.H.L

125.

Map VII

Sequential Netted Map - non-Indian, Age 12


HAWKINS
Lambert St
ELLIOT
2ND AVE
Hougens
Ivory
Shop
MEDICAL
CENTRE
MAIN STREET
POST OFFICE
2ND
STEEL
STREET

APPENDIX D

Sample Questionnaires

Used in Subject and Parent Interviews

Child Questionnaire (General Area of Questioning)

1) How do you feel about Whitehorse?
(Any subjects who react violently against Whitehorse will be eliminated at this stage)

2) Draw a map of the City of Whitehorse, putting in all the things that you consider important.

3) What is the most exciting place to you in Whitehorse? Why? How often do you go there?

4) What do you usually do after school? Where do the friends you visit most often live?

5) Draw a map of the region (already shown to interviewee) putting in all the things you consider important.

6) What is the most memorable trip you have taken in this area? Why? How often do you go there?

7) Is there any place which particularly interests you in this area? Why?

8) Draw a rough map of Canada (again shown) putting all the things you consider important.

9) Where have you been in this area? Where beyond this area - map approx position. If extensive travelling outside, what impressed you most and why?

10) Where would you like to go? Why?

Rearrange these photos so that they form a pictorial map of Whitehorse.

Adult Questionnaire

1) How do you feel about Whitehorse?

2) How long have you lived in Whitehorse? Here?

3) Where were you before this? Was your child with you?

4) Where were you born? Where did you spend your childhood?

5) What place has the greatest impact upon you?

Personal Details

Occupation

Education

Degree of involvement in community affairs (i) formal (ii) informal

What parts of the area are most important to you? Why?

APPENDIX E

BASIC DATA

Ethnicity	n	Total Number of Map Inclusions	Total Number of Photograph Inclusions
Indian	14	135	480
Non-Indian born in B. C.	16	138	240
Non-Indian Born in Rest of Canada	14	107	208
Non-Indian born outside Canada	12	94	184
Non-Indian born in Whitehorse	10	66	159
Total	66	540	1271