METHODS FOR EVALUATING DRIVER-ROAD INTERACTIONS

A Pilot Study

by

MAYER DAVID SPIVACK

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF
CITY PLANNING
at the
MASSACHUSETTS INSTITUTE OF
TECHNOLOGY
June 1964

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ABSTRACT

This paper demonstrates and describes for a road milieu experimental field methods for observing, recording, and interpreting, events in human verbal and non-verbal behavior with respect to their time and place of occurrence. The information so derived may be used to describe the physical environment in behavioral terms. Such description would provide a basis for design quality evaluation.

Thesis Supervisor: Kevin Lynch
Title: Professor of City Planning

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The author wishes to express his gratitude to Professor Kevin Lynch for his advice and assistance as thesis supervisor, and to David Myers for his assistance in the early formulation of this work. Also to Mrs. Anne Smith for her intelligent and cooperative typing.

This thesis is dedicated to my wife, Kathleen Spivack.

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I. INTRODUCTION

A. GENERAL FOCUS

This thesis presents a method, developed by the author, for observing and analyzing the behavior of automobile drivers, and relating the observed behavior, in sequence, to the external physical environment with respect to its time and place of occurrence. The analytical techniques which will be demonstrated attempt to show how hypotheses may be drawn about cause and effect interrelationships between objects or conditions in the environment and the observed behavior.

B. PURPOSE

The techniques of observation and analysis can provide pre-design information about the behavioral conventions of the client and therefore some measure of prediction and control over the success of the product in behavioral terms. The designer may later employ the same techniques to gather a feedback of data on the success of his product in the case of a completed and inhabited design.

C. RATIONALE

The City, its buildings, exterior spaces, places and roads, are the physical context in which the lives and actions of countless individuals are set.

There are bound to be mutual interactions - and adaptations over time - between the actions, or behavior of populations and their physical environment.

The interactions may be evidenced by changes discernible in either (or both) the behavior-patterns of the user-population or the form and life-expectancy of the objects in the environment.

In the case of a poor fit between the behavioral needs of a population and its physical environs the weakest of the two will yield. I.e., either behavior patterns will adapt to more conveniently fit the inflexible physical provisions, or the behavior patterns being more rigid will wear away at the objects in the environment. Neither alternative is desirable.

Therefore, information on behavior-design interrelationships would be of great use in evaluating design quality.

D. THEORETICAL MODEL OF ATTENTION DYNAMICS

The driver can cope with a limited number of simultaneous tasks. All behavior, including communicating, places demands on the driver for his energy and attention. Examination of the variables in the driver's communicating and driving behavior will, by its content and intensity and/or by the absence or presence of such behavior, reveal the attentional and emotional demands of the task of driving and of the road milieu.

Quote from driver after interview:

> Sometimes the traffic was so heavy, you had to break off what you were saying in the middle to concentrate on driving. It was difficult to even finish a thought.

E. THEORETICAL MODEL OF EMOTIONAL DYNAMICS

The driver maintains emotional equilibrium by a kind of homeostatic process employing repression as a leveler of small but irritating transient negative responses to the road, to traffic, and to the road environment.

Quote from driver after interview:

> "You know, you don't have feelings, you just drive." (Long laughter followed immediately by -) "You know, it was unattractive, very unattractive."

F. APOLOGIA

Common complaints and criticism of existing cities and plans suggests that they are variously mechanistic, cold, inhospitable, auto-oriented,* impersonal, anti-pedestrian, and machine-scaled places, where roads and parking lots predominate; that the individual is swamped and alienated from himself and others by the mass and anomie of the modern city.

Providing that these criticisms are to some extent true for the more recent of our urban places,, it must be pointed out in defense of the planner that he has little reliable design information to guide him in any areas save those which border upon technology. From the fairly sophisticated technologies surrounding building, transportation, and communications, the planner has inherited design standards in the form of manuals, handbooks, and construction codes well supplied with data on the quantitative spatial requirements of automobiles, highways, buildings, power lines, etc. From the loquacious humanists and social scientists, however, he has received nothing but criticism and opinion.

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* The author is aware of the auto-oriented and rather mechanistic approach of this thesis, and wishes to state that the milieu of automobile and road was chosen only because the driving situation offers more easily measured behavioral output variables than encountered in most other everyday situations. Future work based upon this study will attempt to analyze the more subtle behavior encountered in other environments, much of which would needlessly over-complicate the study at this early stage.

The effect of this skewed supply of design information has been to force the planner to operate out of intuition, the traditional domain of the artist, when dealing with the "unknowns" and "unpredictibles" of human spatial and physical needs, and to be on somewhat more firm ground when designing for automobiles, highways, and buildings. His intuitions offer no sound or acceptable refutation of the engineer's firmly based arguments.

To a limited extent there are available design standards published by agencies closer in outlook to the humanists such as exist in the interest of preserving green space, or increasing the supply of urban recreation land. However these standards, though quantitative, are based upon more or less arbitrary estimates of what gross space requirements for various human functions might be desirable. The origin of this kind of standard is nearly always obscure, and ultimately must rest upon the questionable premises of precedent.

What the planner must have if he is to increase the effectiveness of his solutions and produce more viable city environments, is access to reliable techniques for gathering information about human behavior and its interactions with the physical environment which he, the planner, is manipulating.

CHAPTER I. FEEDBACK AND METHODOLOGY

A. THE PROBLEM OF FEEDBACK

The city planner, less fortunate than other kinds of designers, operates for the most part in an information vacuum. That is, the tool designer can, within a matter of days or weeks, handle and test his designed product. Through handling and use he may evaluate the success of his design and design intentions. Enlightened, he may then reformulate his original design concept, and modify or redesign the tool, or approve of the final product and go on to more sophisticated developments based upon his experiences with the total design cycle. The urban designer or city planner most often (except in the case of site planners and recent urban renewal projects) does not ever experience the results of his design efforts. Several conditions operate against him: first, probably a relatively few plans or designs of any one urban planner are ever effectuated. Second, in the case of a plan that is realized, there is usually a rather prolonged time-lag (in the order of years). Third, there is little agreement among practitioners about the proper conceptual basis for evaluating the success of a planner's work other than on conventional aesthetic and perhaps economic grounds.

The usual volume of argument accompanyint aesthetic, economic or social evaluations will lead most observers to at least concede that there are nearly as many points of view and opinions in these matters as there are people. Briefly, such methods as are currently available to the city planner are

likely to be highly biased in favor of the personal aesthetic, economic, or social formulations of the critic and often tell us more about the idiosyncratic nature of the critic himself than they can tell us about the design.

This foregoing situation accounts for quite a good deal of whatever fuzzy-mindedness has been associated with aesthetic judgments about planning and related fields. Planning decisions will inevitably suffer from a large measure of arbitrariness and guesswork unsupported by empiric experiences until such time as there are available reliable techniques for evaluating the success, past or future, of a design or decision. What the planner lacks and needs, and what makes the job of the tool designer so much easier, is some kind of feedback of information about the finished product in the context of its use. It may be argued that other ways do exist and are in use, but to the knowledge of this observer no formal method has yet been proposed which attempts to provide feedback and evaluate or predict design success from a behavioral standpoint. Yet ultimately a design must succeed or fail in behavioral terms. Quite simply, a project or building will either match the established patterns of ecological and social behavior or it will to some degree strain them. A design which, in ignorance, severely strains the established behavior patterns will fail. The symptoms of failure are familiar: disrepair, declining value, vandalism - social

disorders of various sorts in excess of the norms. Cities are full of failing attempts to house populations in inappropriate settings, and of transportation systems which ignore behavior patterns to a dangerous degree.

This is not to suggest that the success of a design will rest upon behavioral criteria alone. Certainly there are many other possible sources of difficulty which are already familiar to the designer and need not be discussed here.

However, given a situation where all other criteria for good design are met, if the designer still has not incorporated into his product the results of some intuitive understanding of how people will use his product, i.e. how they will fit their life spaces to the material spaces he has designed, his work (not to mention the consumers of his work) will probably "wear out" long before it should through a kind of behavioral "friction."

A very simple and familiar example of this "behavioral wear" or "friction" might be seen any time in most of the early post-war federally sponsored housing projects. Often in housing of this sort, all the surfaces on and around the buildings as high as a child's reach and as extensive, have been fairly badly mutilated. This "defacing" of property (an irony, for most of those much criticized structures are faceless to begin with) is perhaps a minor failure, not enough to cause the downfall of the whole design. But it is symptomatic of

failure in a design which did not adequately provide for the life-space requirements of young children, whose overpowering need is to manipulate, to control, to experiment with and master the physical environment. All this in a physical environment of non-manipulable cement brick, asphalt, cement, privet and chain link fencing. In this case, with no special provisions for the needs of young children, the grounds and houses themselves become challenging objects for manipulation. The walls become chalkboards, the privet must bear the burdens of a tree, soon showing only root stumps and a few leafless twigs, even cement bricks have been pulled loose from their moorings and used by the children for other purposes. When, as it eventually must, the asphalt paving cracks, it is patiently pulled up by many small hands in order to get down to softer more manipulable materials.

This kind of wearing out or failure could be prevented by pre-design research into the way the children spend their time, how they play, what they play with, etc. (even easier in this case would have been a consultation with specialists in child development). Basically this type of information is always derived from observations of behavior whether made along the way in the course of other pursuits by a child development worker, or deliberately sought by the designer and his staff, or a research group. The example of a housing situation was chosen to illustrate the general way in which behavioral information can be used to the aid of the designer,

and indeed to point out that the results of behavioral investigation are more generally applicable to design problems than is suggested by the title and focus of this thesis.

A too familiar symptom of behavioral wear is often seen by the side of the road, as in Fig. / , where signposts, fencing or other road furniture are bent, broken or torn out by automobile accidents. Frequently, these problems result from poor programming of direction signs and information disclosure along the road, a situation which a modification of the techniques recommended here could improve.

It is urged that the designer consider the proposals in this paper, and any other method which will bring reliable behavioral insights into the design cycle, both before and after the construction of a job, and that these efforts of observation and interpretation be as objective and non-intuitive as possible.

In the case where the designer elects to change the behavior patterns of his future design consumers, it is even more imperative that he operate out of a knowledge of the existing patterns. For without this understanding there can be no measure of change or the costs of change.

B. NOTES ON OTHER METHODS OF METHODOLOGICAL INTEREST

A search of the literature in driver behavior and related studies made in 1955 by the Harvard School of Public Health and published in a volume entitled Human Variables

Fig 1, Behavioral Wear

in Motor Vehicle Accidents, A Review of the Literature,[1] reveals that the majority if not all of the work published prior to that date under titles relating to driver behavior was concerned exclusively with traffic control and/or accident prevention. None of the 1031 cited studies anticipates the methods developed in this paper. Certainly the citations represent valuable publications in the fields of accident prevention and traffic control. Note, however, that the objective of this thesis, as expressed earlier, is not to present data and conclusions on the subject of driver behavior (or accident prevention) but to develop in a pilot study a method of observing human behavior in its ordinary context. The emphasis then in this thesis is on methodology applicable in a variety of milieux to problems of behavioral observation. Of more particular relevance to the study of behavior as presented here are a few studies, some in the social sciences, some in city planning, some, included for methodological interest, from the fields of animal behavior and even ethology. It is also in these fields that working methods have evolved which most closely resemble those in this thesis.

1. The "Clinical" Methods:

Clinical psychologists employ a number of analytical techniques which have at one time or another been applied to the task of assessing alertness, mood quality, emotional

condition, etc., they include questionnaires, special interviewing techniques and psycho-physiological measurement.

Notable among the later psycho-physiological methods are the measurements of breathing rate, blood pressure, heart rate, eye-blink rate, galvanometric skin response, and electroencephalogram. Many, if not all of the above have been suggested as a means of evaluating the relationship between the environmental stimulus and the individual's response. However, for purposes of field investigation, most of these techniques are much too cumbersome. Most seriously alter the normal environmental conditions in which the individual customarily operates by attaching the subject to pieces of sensitive and perhaps uncomfortable laboratory recording equipment. Constrained subjects are rather atypical and behave in an atypical fashion.

Ideally the experimental situation should affect the environment as little as possible and should not, by discomfort or inconvenience, remind the subject that he is being watched.

In the laboratory, in the hands of a specialist in psycho-physiological testing, these techniques may yet become a valuable asset to controlled laboratory investigation of individual-environment interactions. At this point, however, the considerable difficulties encountered during administration of the tests, and the fact that so little is known about psycho-physiological response mechanisms and their stimuli

should act as a caution against their exclusive use in research of this type.

2. Questionnaire Methods

Methods aimed at the verbal responses of the subject at the conscious level, such as questionnaires, sentence-completion tests and certain kinds of controlled interviews are subject to question on several counts. Much of the information sought is out of awareness for the subject. Questionnaires certainly address the conscious mind more readily than they tap the unconscious. The subject simply does not know what are his responses to the myriads of external stimuli which he sees, and which he automatically screens out of conscious awareness as a sleeper does the accustomed noises and creaks of his night-time house. The information sought is by most direct-question methods inaccessible to the investigators.

3. Other Interview Methods

Kevin Lynch[2] has successfully employed a variant of the direct question approach in a study of individual orientation in the urban environment. His subjects, when asked to draw a map from memory of a trip recently taken, or of an imagined trip across familiar territory, respond in their drawing and in the monologue which accompanies it, with

graphic material revealing the strength of their "image" of the area, and its connection in their minds to the rest of the environment. Omissions and false or mistaken articulation of parts reveals what the subject could not possibly tell the investigator in a simple verbal reply /for he cannot describe that which he does not know/ namely that whole sections of a city are either misplaced, misshapen or missing in his memory and image of the area. It is also with this technique, a fairly simple matter to change the scale and level of detail in recall by simply requesting smaller or larger areas to be drawn and discussed.

4. Environmental Simulators

Another device, in use by students of traffic control, perception studies and driver training experiments, is the environmental simulator. In its driving simulation form the simulator consists of a wide-screen moving picture projection apparatus linked to a stationary, but powered, automobile whose manipulable controls actually move both the car (laterally only) and the screened image of a road and traffic. Operation of accelerator and brake, linked by servomechanisms to the projector, increase or decrease the speed of the projected image, duplicating with great realism for the "driver" the experience of driving an automobile in full control down a highway. The advantages of such an apparatus are many. Experiments involving extreme

fatigue, confusion or great (simulated) danger may be performed and driver responses and behavior observed with complete safety for both driver and observer.

Also, the projected image seen and responded to by many subjects is an unvarying standardized environment with no unpredictable "environmental noise" to mask or to skew the information sought by the experimenter.

Variations of the driving simulation techniques are desirable for other studies also. At the World's Fair in New York in 1964, visitors may enjoy the experience of 360° projection on a hemispherical screen surrounding the viewing audience. The author has not yet seen this display, but until recently 360° projection techniques, useful for experimental purposes in total visual environment simulation, have been unconvincing, and plagued by problems of optical distortions, graininess of image, synchronization difficulties and low light intensities.

Even when operating satisfactorily, desirable an experimental tool as the environmental simulator is, it is in proportion, an extremely expensive one to obtain, placing it out of range for small-budget studies.

CHAPTER II

TECHNIQUES OF DATA COLLECTING AND RECORDING

A. Abstract of Data Collecting Techniques

The investigator guides drivers over a route of highly varied character which passed through the downtown area and included several major intersections, many minor ones, and a great many turnings. The drivers were informed only that they would be directed en route and that they must at no time drive on the expressway. They were asked to talk as openly and constantly as possible about the feelings and attitudes they experienced on the trip, and were encouraged to make any other comments they wished. The drivers' subjective monologue, together with occasional encouragements by the investigator were tape recorded. At the same time,* the drivers were being continuously photographed by a movie camera which provided a record of behavioral signs which would be guided or at least clues to their level of attention to the task of driving. The moving picture of driver behavior included in the image a continuous record of behavior-event location while en route.

Both records, tape and film were later transcribed onto one form and very closely (within a few yards), placed as to their position of occurrence on a map. The mapped records may be then compared and/or tabulated and otherwise analyzed to extract the maximum meaningful data.

* Movies were made of later runs only.

1. Some New Techniques for Observing Behavior

There are now emerging from the behavioral sciences and particularly from anthropology and linguistics new techniques for observing and recording human behavior at a level of detail and subtlety never before possible. Faced with the tremendous task of comprehending a strange culture on its own terms in the field, the anthropologist has found it expedient to become aware of and sensitive to minute changes in the meanings of familiar acts, word meanings, gesture patterns, and facial expression.

The experienced field worker, like the experienced psychiatrist, learns to read several levels of communication at once, and to make his interpretation on the basis of the sum and/or the conflicts. Recently (within the past ten years) there have been evolving two unique methods of observation and recording which are of significance to the data gathering needs of the behavior-minded designer-planner.

The first, named kinesics by Dr. Roy Birdwhistell, is "the study of the visually sensible aspects of non-verbal interpersonal communication."[3] Dr. Birdwhistell has defined the study of kinesics in terms which reflect considerable conceptual similarity to linguistics which is more or less its "parent" discipline.

The second, less a method than a conceptual framework, is called Proxemics. Proxemics is "the study of man's spatial relations."[4] This approach has, to an extent, developed out

of studies in territorial behavior in animals, and deals specifically with behavioral movements in space with regard to other individuals and to the structure and form of the environment. The concepts of Proxemics, while not particularly helpful in the analysis of driver behavior, will prove useful in studies of wider significance dealing with the observation of human behavior for the purposes of providing design information for three dimension spaces.

The borderlines between the two frames of reference are fused at many points. Both of the above are concerned with non verbal communication or "silent language." They both open up the possibility of directly observing and recording human behavior in a controlled and repeatable fashion.

Not as recent, but still in considerable controversy despite its widespread practice as a branch of medicine, are the conceptual and working frameworks of psychoanalysis and psychiatry. The section on data analysis makes use of many techniques and rationale borrowed from these areas.

It is now feasible with the aid of insights and working methods of kinesics and proxemics to directly observe the behavioral responses of large numbers of subjects who are living normally in the environment under study. With the aid of Birdwhistell's kinesics it is probable that, when studying decision making, we may watch the decision being made, i.e. read the language of facial and body gesture rather than waiting

for the decision to be made and record where the person went, or what he did. Kinesics, then, allows a finer grain of measurement in time than hitherto available.

It must be understood that valid observations of behavior may be made only on the outputs, i.e. actions, of the subject. Both verbal and kinesic behavior are outputs (actions) rich with measurable variables and valid behavioral observables.

2. Some Kinesic Theory

What commends the study of these particular aspects of human behavior to our attention as relevant to the understanding of interrelationships between the individual and the physical environment is that both verbal and non-verbal communications and behavior patterns have their origins in culture. Both are socially learned. Neither could have come to exist independent of culture and social interaction. Therefore, the very evolution of communicating behavior and all other socially learned, culturally specific behavior[5] patterns must be due to their ability to be communicated from one person, on one generation, to another. Each is a kind of language. Implicit within these languages, and corollary to their existence and function, is their basis in a collective consensus relating signs, symbols and their respective meanings together in a regular and predictible fashion. These languages are understood and used by everyone, even the investigator, within a given cultural context.

Therefore the investigator has ready access to an established and very regular source of data which is being produced every waking moment by every individual. Furthermore, these channels of communication are the ones which customarily carry information - data, if you will - about the feelings and emotions of the observed. The problems still remain to design experiments and seek out situations in everyday life that induce people to communicate their feelings about the environment, or to interact in a crucial, definite, and regular way with the environment. This accomplished, the task is to systematize, interpret, and prove these interrelationships.

The observation techniques and experimental procedures that follow will depend to an extent upon the employment of kinesics in their analysis. However, as this paper is primarily concerned with methods of particular relevance to the urban planner I shall go on to the specifics of technique referring the reader to the original texts on kinesics[6] for a more thorough knowledge of that subject.

3. Sequence of Operations

Data is collected, recorded and analyzed in the following sequence:

Recording the Interview

Production of a, Moving picture

b. tape recording

c, observer's notes (if possible)

d, elapsed time record

The Analysis of Interview data (a,b,c,d)

Written content analysis of

movie and sound track

with time and location notes,

Derivation of Relative Levels of attention and emotional sequences of run from the above analysis, translation into symbology of this information with time and location notes. Placement of above symbols on a map of the route.

Comparison of R.L.A. figures and emotional sequences from many drivers. On a master map sheet the results of many interviews are collected and compared. General conclusions about driver-road interaction sequences and their cause and effect relationships may be made from this master sheet. The "behavioral fit" on design quality may be evaluated from this map.

B. SAMPLE SIZE

This pilot study was performed on information gathered from fourteen drivers not all of which were analyzed the same way nor in the same detail. The results of a few interviews were discarded as failures in technique, and were therefore not analyzed. Each interview was instrumental in the development of the method.

With the development of more sophisticated analytical tools yielding highly detailed, fully reproducible data and interpretations on each driver, it may become feasible to work with small sample sizes. However it seems likely that for some time to come larger sample-sizes than fourteen will be desirable in order to be able to split the sample into various control and experimental groups, and to be able to use more than one potentially biasing and idiosynchratic investigator. Larger samples are also desirable in order to compare the reactions of different groups of drivers, i.e. commuters, one time users, etc., to the same road route.

In any case, the larger sample sizes will require a variety of well developed and easily employed observational techniques which can be quickly and economically employed.

C. THE INTERVIEW

1. The Experimental Situation

The observer (variously termed - the investigator, the observer-interviewer) is seated in the front (right hand) passenger seat of an automobile which is to be driven by the subject (variously termed - the subject, driver, interviewee). The driver is at the wheel. A tape recorder is secured behind the front seat, out of sight and operates continuously during the run. A dynamic microphone is placed as unobtrusively as possible at close range to the driver's head. A movie camera operates continuously, photographing with an extreme wide angle lens, the movements, gestures, and facial expressions of the driver.

The camera may be mounted, by means of a clamp, or other convenient attachment, to the car, or hand held by the investigator. In every case the automobile used must be the property of the driver or a vehicle he uses often enough or to be fully familiar with the control patterns and with the visual field peculiarities of that particular car. Otherwise, the normal patterns of driving behavior will be disrupted by an unfamiliarity with the vehicle and resulting compensatory behavior.

The observer endeavored to keep his own remarks to a necessary minimum, and to restrict himself to neutral topics in a non-directive interview in order not to influence the

progress of the run or the driver's experience and behavior. Occasional comments by the observer were necessary to provide the driver with routing instructions or to encourage the driver's conversation (which was being tape recorded).

The driver is informed:

a) first, he will learn the purpose of the interview at its end. All his specific questions about purpose are responded to with neutral replies.

b) that he is not to drive on the expressway during the trip.

c) that he will receive routing instructions from the investigator while en route in time for him to maneuver.

d) that the trip will take about 10 minutes.

e) that he should "talk as freely and continuously as possible during the run, about feelings, emotions or whatever thoughts or ideas arise during the trip even if they seem unrelated or insignificant to the road or driving." In effect, the driver was asked to free associate to the road.

2. Special Circumstances of the Interview Situation

The interview technique as conducted and reported here introduces several undesirable factors to the environment of the driver and to the circumstances of his driving.

The driver will react to some extent to the burdens placed upon him by the interview. He is being watched, photographed by a movie camera, and his voice tape recorded. A certain amount of self-consciousness and camera-shy behavior is almost inevitable. It is often necessary to distract the driver from his curiosity or concern about the equipment and its operation by engaging him in conversation by way of neutral opening remarks.

The driver does not know the destination and the route in his own terms but is constrained, by lack of information, to follow routing instructions given en route by the observer. Thus, his decision making may be altered in time and character. However, the point at which the driver requests routing information may be used as the approximate point from which the driver first perceives the intersection or decision situation (a finer grain of location placement may be derived from kinesic analysis).

The driver's lack of a route image also contributes to the over-occurrence of disorientation and confusion during the trip.

Camera shyness, curiosity, and self-consciousness are not necessarily totally negative factors in the interview situation. According to the model of attention dynamics presented on page 3, the driver will allow himself the luxury of these distractions only when his driving task is lease demanding. Distractions and over-concern about the recording processes may then be treated as is any other communicating or distracting interaction and interpreted similarly.

CHAPTER III

TECHNIQUES OF ANALYSIS

1. The Filmed and Recorded Data - its Content and Analysis

The two major data sources, film and magnetic tape, are synchronized as closely as possible (lip-synchronization of speech being most desirable) and analyzed as indicated in the sections on verbal and non-verbal content analysis.

Many hours are required to do a truly detailed analysis of either the visual or the sound track and both tasks are facilitated by the use of an instantly reversible projector and tape recorder, or if sound-on-film techniques are employed, a reversible stop-frame sound projection. Stop frame (or single frame) projector capability is essential for fixing loci of behavioral events along the route.

A. CONTENT OF THE FILMED IMAGE

The moving picture record made of the driver's responses and actions during the trip contains the following information:

a. Elapsed time. A stopwatch is attached to an extension of the camera clamp close to camera and in a part of the image field not useful for other purposes (lower corners). The watch is triggered at the beginning of the trip. The elapsed time of the run and the time-duration of particular events may be read directly from the projected image.

b. Non-verbal communications. Gestures, facial expressions, whole body movements, postural changes, mechanical outputs (shifting, braking, etc.)

c. Sequential locations. A continuous record of locations at which behavioral events occur can be read clearly due to the extreme depth of field in wide angle lenses used (5.7 mm. focal length on 16 mm. camera).

d. Extraneous events. Special circumstances of traffic appear in the film and may be used to explain enigmas in the sound track or in behavior.

B. CONTENT OF THE TAPE RECORDED SOUNDS

The sound track made to accompany the film includes identifiable sounds of the following events:

a. Verbal communications. The driver's monologue and conversation with the observer as well as non word utterances (exclamations, etc.) comprise the major content.

b. Mechanical noise associated with driver outputs such as shifting, acceleration, slowing, turning, signaling, (clicks or ticks) are surprisingly well recorded from the normal noises of most cars. These sounds are very valuable in analysis of the context.

c. Extraneous noises - sounds originating outside the car such as traffic sounds, horns, squealing brakes, trucks, trolleys, etc., valuable for recalling the context and explaining enigmas in the analytical sequence.

1. Recording Equipment

Any high quality portable tape recorder fitted with a sensitive dynamic microphone may be used. Equipment in this study consisted of a Butoba M.T.7 tape recorder fitted with a Tandberg TM-2 dynamic microphone. The tape recordings were made at 3 3/4 inches per second.

2. Motion Picture Equipment

It will be desirable in future work to use an 8 mm. movie camera fitted with provisions for magnetic sound on film recording. The 8 mm. format is desirable because of its low film costs. Also work of this type does not require long projection distances or large projected images. The 8 mm. Fairchild sound on film camera is recommended, its prime disadvantage being its short film run when compared with a normal 16 mm. camera. The equipment used in this study however was all in the 16 mm. format.

A French Eclair 16 mm. reflex camera fitted with a kinoptic 5.6 mm. wide angle lens was used with its variable shutter set at a speed of 1/250 of a second to yield blur free stop motion projection of detail such as hand position of the stop watch. The film was Eastman plus X reversal in 400 foot rolls to accommodate the full length of the trip.

C. TECHNIQUES OF DIRECT OBSERVATION DURING THE INTERVIEW

1. Note Taking of Non-verbal Behavior

In this study all subjects, except those of whom filmed records were made, were directly observed during the interview. All subjects were tape recorded. Most emphasis is placed upon the later, filmed interviews and the techniques developed during those later trials, than on direct observation because of the superiority of the film methods. Direct observation, although inaccurate and imprecise is still certainly useful in some contexts, and is of immeasurable value in acquainting oneself with techniques of observing.

Many familiarization runs with non-subject drivers were made, learning by slow steps to generally comprehend the obscure dumb-show of the driver. Non-verbal communication by humans is certainly not less difficult to understand than the counterpart formal patterns of gestures and postures with which the lower animals continue to baffle ethologists. Fortunately when dealing with humans we have two advantages; one that we may ask the communicant questions and thereby learn to connect general, and his specific emotive patterns with his postures, gestures, and facial movements. The second, that subjectively, many intuitive responses and evaluations of non-verbal communication between humans are everyday occurrences, their greatest pitfall lying not in misinterpretation but in being overlooked.

It is surprisingly difficult to teach oneself to remain an observer only, and to learn not to enter into conversations or otherwise involve oneself with, and influence, the behavior and thoughts of the subject. Our own accustomed patterns of social behavior - our nearly automatic responses to the movements and vocalizations of others - must be overcome. In the jargon of clinical psychology, one must learn to conduct a non-directive interview. To this end it is strongly recommended that the investigator schedule his "runs" and his film analysis sessions for a time of day in which he is in the habit of being most energetic. Mid-afternoon lethargy or end-of-the-day fatigue are strong detriments to intense, continued, attention to the minute details of what may often be the most mundane and uninteresting behavior. It is all too easy for the investigator to lapse or escape into a more normal (and deceptively more interesting) state of mind in which the behavior to be recorded is out of awareness for both subject and observer. The result of such a run is, of course, no data. After many familiarization runs of this sort one is convinced of the value, and economy, of making movie film records of each run. The method of direct observation is most useful when time is short and when acquainting oneself with the techniques of observation.

D. THE TRANSCRIPTION FROM TAPE AND FILM

The records on magnetic tape and movie film must be transcribed to a graphic and written language in order to compare the results of runs with different drivers and to analyze the results.

The techniques of kinesic and verbal content analysis, described generally in an earlier section and in great detail later, are applied to the film and taped records of the trip as soon as possible after making the run in order to gain what benefit of information is available in the fresh recall of events from the observer's memory of the run. The results should if possible be checked, and hopefully duplicated, by another analyst. Alternately, separate workers can administer the interview and do analysis of the records, checking later with the interviewer on questionable points. It is essential that the observer does not skip the recording steps, as no single observation made during the run can reveal the level of detail needed for depth analysis of this kind. Essential in analyzing the film record is the use of the tape recorder as a dictating machine. The observer need not take his eyes off the screen to write or drop his pen to reverse or stop the projection.

The taped description of filmed driver behavior events may then be played back and written down. The transcription to paper is best, at this point, keyed to a map associated

with an analyzed version of the sound track, and with the faithfully transcribed sound track itself if possible.

Later, additional information, the result of analysis of this primary transcribed data, can be added to the same map in the form of profiles or ratings of the driver's Relative Level of Attention (R.L.A.) and emotional quality symbols. This composite set of data on one driver may then be transferred to a sheet containing the results, in numbers and symbols, of many driver interviews, which is the final form of the data.

E. INTERPRETATION OF TAPE CONTENTS

a. Driver outputs (mechanical
b. Single and non word utterances
c. Conversation
d. Silences

a. Driver outputs - horn sounds, acceleration (motor) noises, braking sounds (a sliding tone made up of many unidentifiable noises - a kind of "zzzshshsh" with a steadily descending frequency, somewhat like a slowing trolley car) and other noises generated by and within the car that cannot be classed as utterances. These are useful in that they are an unimpeachable if incomplete record of the job done by the driver, against which his verbalizations may be more meaningfully understood.

b. Verbalizations - Non-word and single word sounds, such as grunts, grumbles, mutterings, groans, exclamations (hey!), yawns, coughs, expressive sighs, and laughter, can usually be understood by the "tone of voice" as expressive of a mood or state of mind, i.e. boredom, anger, interest, invitation, frustration, etc. These cryptic utterances of the driver often mark the beginning of a change of mood or state of mind. Verbalizations of this sort are on the borderline of awareness, the driver may not remember having made them. It would be hopeless to try to get an accurate sound-picture of such "communications" without tape recordings, for frequently they are almost out of awareness for the observer also, for the "ear" filters them out as unimportant before we have a chance to be conscious of their existence.

These short, often unintelligible bursts of sound occur frequently as expressions of the subjects' need to wait a moment before continuing conversation or making a decision. In the tape records (as may be observed in the transcription) the non-word, or single word, sounds, seem to be related to periods of relatively high driving activity and thus to the higher relative levels of attention. In addition these utterances often occur during periods of relatively low conversation or monologue, which also can mean preoccupation with the task of driving.

In summary, the variables that can be obtained from a study of non-word and single word utterances are:

1. "Tone of voice" indicates mood tone, feelings about past or future remark.
2. Amplitude level of voice, on a continuum from a whisper to a shout, indicating importance, surprise, specific emotions (shouted oooh!! might be fear).
3. Frequency of occurrence (not pitch) is related to level of preoccupation with task of driving - deciding - thinking - etc., depending upon the context. The driver tends to alternate conflicting tasks such as hard acceleration and conversation.
4. The reason for employment of single word utterances is often indicated by their denotative meaning. Frequently, in a series of string of single and non-word utterances, a single denotative word will clarify and make explicit the meaning of all the rest. The other, non-word utterances functioning as modifiers via tone, rhythm, amplitude, etc., as in the following example: uhm / a / woul / hey / Left? /

c. Conversation - (or monologue) has an obvious meaning as communication. The subject will often simply tell the observer what he is feeling or how bored or excited he feels. Often, if prompted to talk continuously, or to free associate, the driver will bring up matters of little direct value to the investigator. To uncover the most information in these situations it is necessary then to learn to read

between the lines, and to interpret the flow of interest, the imagery, the slanting of language, the emotional loading and emotional coloration, and the sequence of associations between topics and ideas. This is a ticklish job and one that requires some experience and study on the part of the investigator. Familiarity with the methods and concepts employed in psychoanalysis and psychiatry is a necessity, for it is within these disciplines that the techniques of content analysis have been developed most fully.

It is outside the scope of this (or any single) paper to provide for the uninitiated an adequate discussion of the highly sophisticated techniques commonly used in clinical and research settings. The summary following the transcription (pp. 96) may be consulted as an example of such interpretation.

References to these subjects have a history of rousing controversy about their validity as research techniques. This controversy about their validity as research techniques. This controversy and its two sides are, again, outside the scope of this paper, and belong to the painful history of the social sciences in general, and not to this <u>particular</u> application.

d. <u>Silences</u>. Lack of any verbal output or response on the part of the driver may indicate, depending upon the context, that the driver is (a) too busy driving to bother speaking, or is (b) otherwise preoccupied with his thoughts, and states

that he has nothing to say. Any and all of the alternative reasons for his silence are meaningful to this study. However, without supporting data taken in some other area (kinesics, content analysis of previous or following comments, or from the noises of particularly intense outputs of the driver such as rapid deceleration), none of the above mentioned alternative conditions alone is sufficient for the formation of a valid interpretation.

i. Examples. If it can be shown by cross-referencing with other outputs in the recorded data that the driver's task is, for the moment, extremely demanding, we may be safe in assuming a cause and effect relationship between the driver's silence and his preoccupation with driving. If, in the absence of supporting cross-referenced data he falls into the second category and is thoughtfully preoccupied, he cannot be attending too strenuously to driving and is "lost in thought." A driver in that "nothing to say" category may be microphone shy or he may be (more likely) daydreaming; unconscious of his daydream, he will not be able to verbalize its substance. Such drivers are at a low ebb of active attention to the reality "out there," and frequently will sit through green lights at a dead stop. The reasons for escape into fantasy or silence may be traced in the conversation surrounding the silence or to the environmental situation. (This aspect of the work is extremely difficult to pin down and deserves further study.) Needless to say, there are many

instances where noises or silences, scratches and frowns, are inexplicable. All the data researchable by these methods depends upon interpretation. If interpretations vary in accuracy and interpreter's bias results, the salvation of such methods will rest in multiplying the number of interpreters and subjects and hoping that inconsistencies and biases will be wiped out by the more general sample obtained.

F. SPECIAL NOTE ON MECHANICAL OUTPUTS

The techniques of recording mechanical outputs of the driver used in this study are primitive, approximate and incomplete. There are many methods of recording and analyzing mechanical (control) outputs of drivers that are in fairly common use. All employ fairly expensive, sophisticated, electro-mechanical equipment. With more time and money, it would be a simple matter to add these existing observation routines to study methods such as are proposed here. As it is, they are out of range of the resources and time limits imposed upon this thesis.

Therefore, approximate data on the mechanical (control) outputs of the driver has been derived for presentation here by examining the films and the tapes for sounds of acceleration, braking, gear changing, speed level, horn operation, directional signaling (the alternator may often be quite clearly heard), and whatever other secondary clues to behavior may be found. These are noted at the time of verbal

analysis of the tape and film and written into the transcription at the margin. Further notes may be taken, if possible, live, by the investigator during the interview.

G. DESCRIPTION OF THE ROUTE

(Pull out Map, p.42 for reference before reading this section.)

Starting on Albany Street at Boston City Hospital (A on map fig. 1), the road is straight for about 3850 feet where it bends slightly to the right and plunges abruptly under the Southeast Expressway which passes overhead on columns (B). Immediately, it bends sharply to the left and runs for nearly 3400 feet between and parallel to the expressway which is above on the left, and the old Fort Point Channel below on the right (C). Then, following a series of twists and turns for 3925 or so feet, the route curves across the wet edge of Boston at the harbor (D), passing in turn Chinatown (E), the leather and garment district (F), South Station (G) and diverges from its bumpy course along Atlantic Avenue at Rowes Wharf (H). Here the route enters the strange dark world under the expressway (I) where it tunnels along for another 2075 feet emerging suddenly into the glare and chaos of the Sumner Tunnel intersection, entrance and exit.(J)

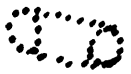
Braving this, the course is then across the edge of the North End (K) under the expressway (L) but only briefly, and out to the right down North Washington Street to the intersection with Atlantic Avenue at the beginning of the bridge (M) leading to City Square, Charlestown (N).

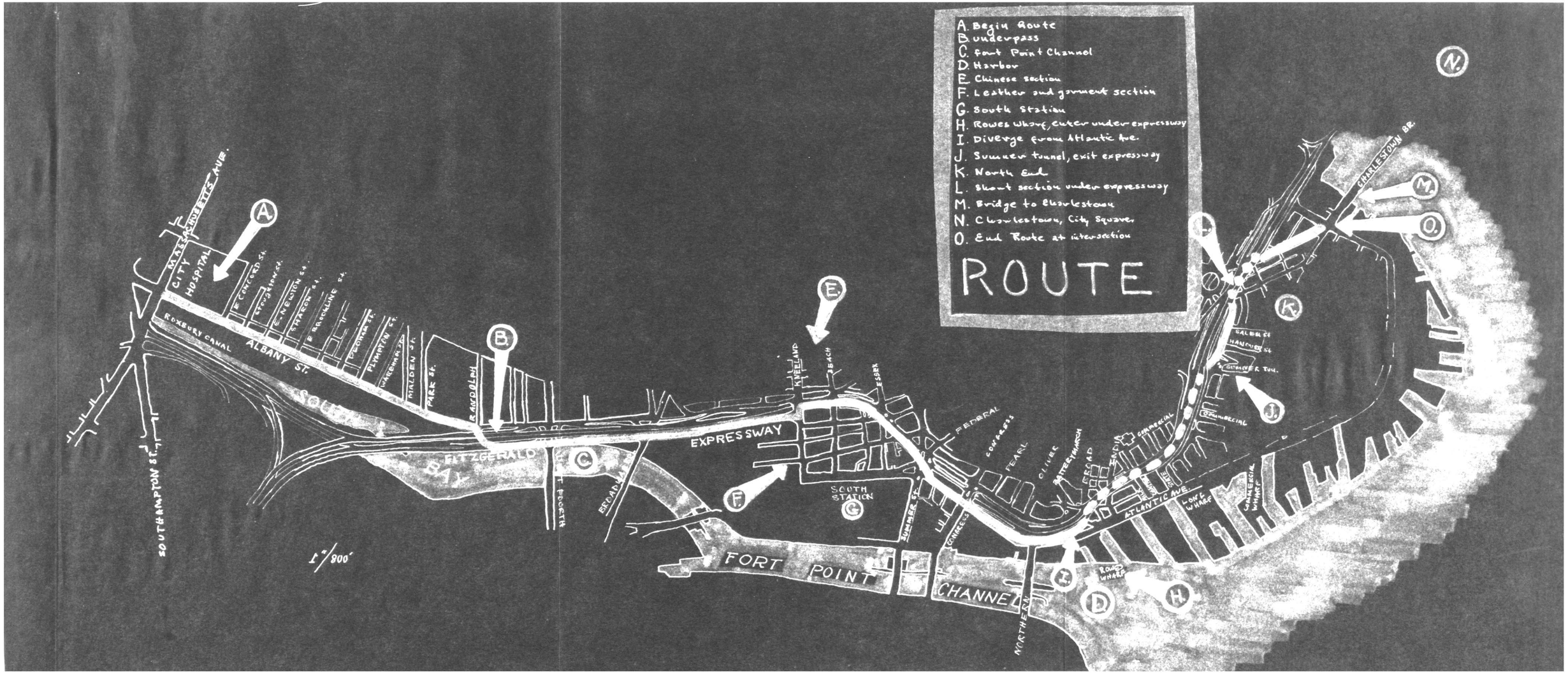
This last segment terminating the trip at the Atlantic Avenue intersection (O) is about 2200 feet in length. The whole route is approximately 15450 feet or two and 3/4 miles and 930 feet long. Trip time on the average is under nine minutes but varies considerably with weather and traffic conditions.

1. The Channel Notation

Obviously, useful as it is in the above context, general description such as the preceding one is not sufficient as a standardized inventory of the separate environmental features which together are experienced as a road. In order to examine the interactions of the driver with the road milieu he travels within, it is necessary that the details of that road be noted as a kind of inventory in sequence. A simple notation (hereafter called "the channel notation") system was devised to describe the characteristics of the route (See notation key P 41.).

H. KEY TO CHANNEL NOTATION

Symbol	Meaning
	two way, no divider
	two way divided
	one way
	no or obscure channelization
	the route itself is denoted by a darkened line
	direction of intersecting traffic stream
	tunnel or overhead structure
	the route under an overhead structure
	direction of travel en route


A. Begin Route
B. Underpass
C. Fort Point Channel
D. Harbor
E. Chinese section
F. Leather and garment section
G. South Station
H. Rowes Wharf, enter under expressway
I. Diverge from Atlantic Ave.
J. Summer tunnel, exit expressway
K. North End
L. Short section under expressway
M. Bridge to Charlestown
N. Charlestown, City Square
O. End Route at intersection
ROUTE
MASS. AVE.
ROBERTS
CITY HOSPITAL
E. CONCORD ST.
E. NEWTON ST.
E. BROOKLINE ST.
ROXBURY CANAL
ALBANY ST.
SOUTHAMPTON ST.
1" = 800'
FITZGERALD EXPRESSWAY
BAY
T. FOOT
BROADWAY
PARK ST.
RANDOLPH
KNEELAND
BEACH
ESSEX
SOUTH STATION
SUMMER ST.
CONGRESS
FEDERAL
FEARL
OLIVER
MITCHELL
FRANKLIN
SAVOY
COMMERCIAL
ATLANTIC AVE.
FORT POINT CHANNEL
NORTHERN AVE.
ROWES WHARF
COMMERCIAL WHARF
CHARLESTOWN BR.
SALEM
HANOVER ST.
CITY SQUARE
TUN.

I. PHOTOGRAPHIC DESCRIPTION

On the following pages are a sequence of photographs taken at or before every intersection encountered by the driver. The map located at the end of the photographs, page 62, is keyed to the photographs by the numbers and should be pulled out for reference before continuing. In addition the 1" = 100' reference maps beginning on page 113 may be consulted for a richer picture of the environment at the various points along the route.

1

2

3

Fig 3

4

5

6

7

8

9

10

11

12


EXPRESSWAY
NORTH

13


PEDESTRIANS
BICYCLES
AND
HORSES
PROHIBITED

14

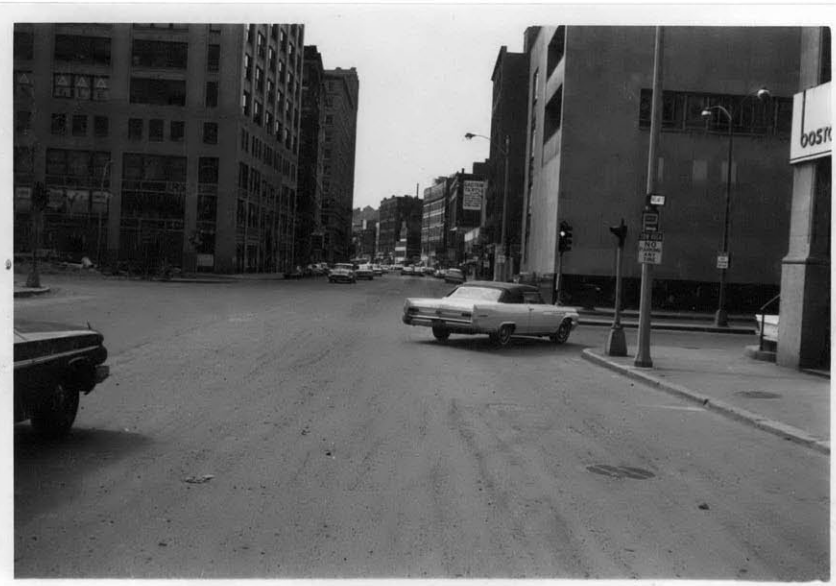

MERGING
TRAFFIC

15

16

17

18



19

20

21


C·I·BRINK
Gulf
EXPRESSWAY NORTH

22


C·I·BRINK
Gulf
NO-INOX
GASOLINE
NO LEFT TURN

23


Gulf
NO-NOX
GASOLINE
PREMIUM QUALITY YOU CAN DEPEND ON
DO NOT ENTER
KEEP RIGHT

24


A&P
NEW ENGLAND OFFICE
EXPRESSWAY NORTH

25


BACK BAY - CALLAHAN TUNNEL
CHARLESTOWN - NO. STATION

26


PROVINCETOWN
BLISS
BLISS
MARINE
WAREHOUSE
ANNEX

27

28

29

30

31

32

33

34

35

36


RENT A CAR FOR ONLY--
BUDGET
5
5
CALL HA 6-5093
DO NOT ENTER
DO NOT ENTER
DO NOT ENTER

37

38


the Florida fan!
GIUFFRE'S FISH MARKET

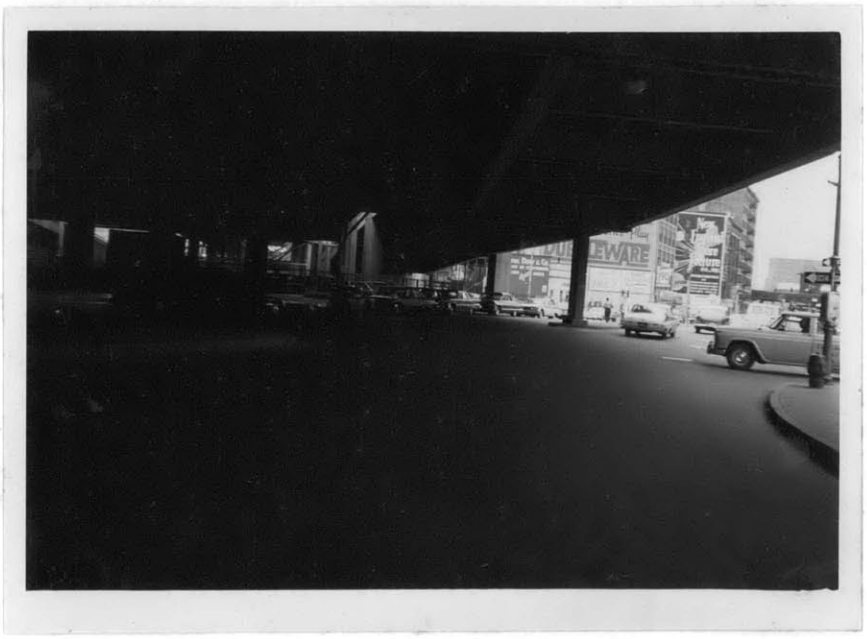
39


BOSTON
DOWNTOWN
EXPRESSWAY
SOUTH
HAYMARKET
SQUARE
M.A. FRUIT
VEGETABLES

40

41

42

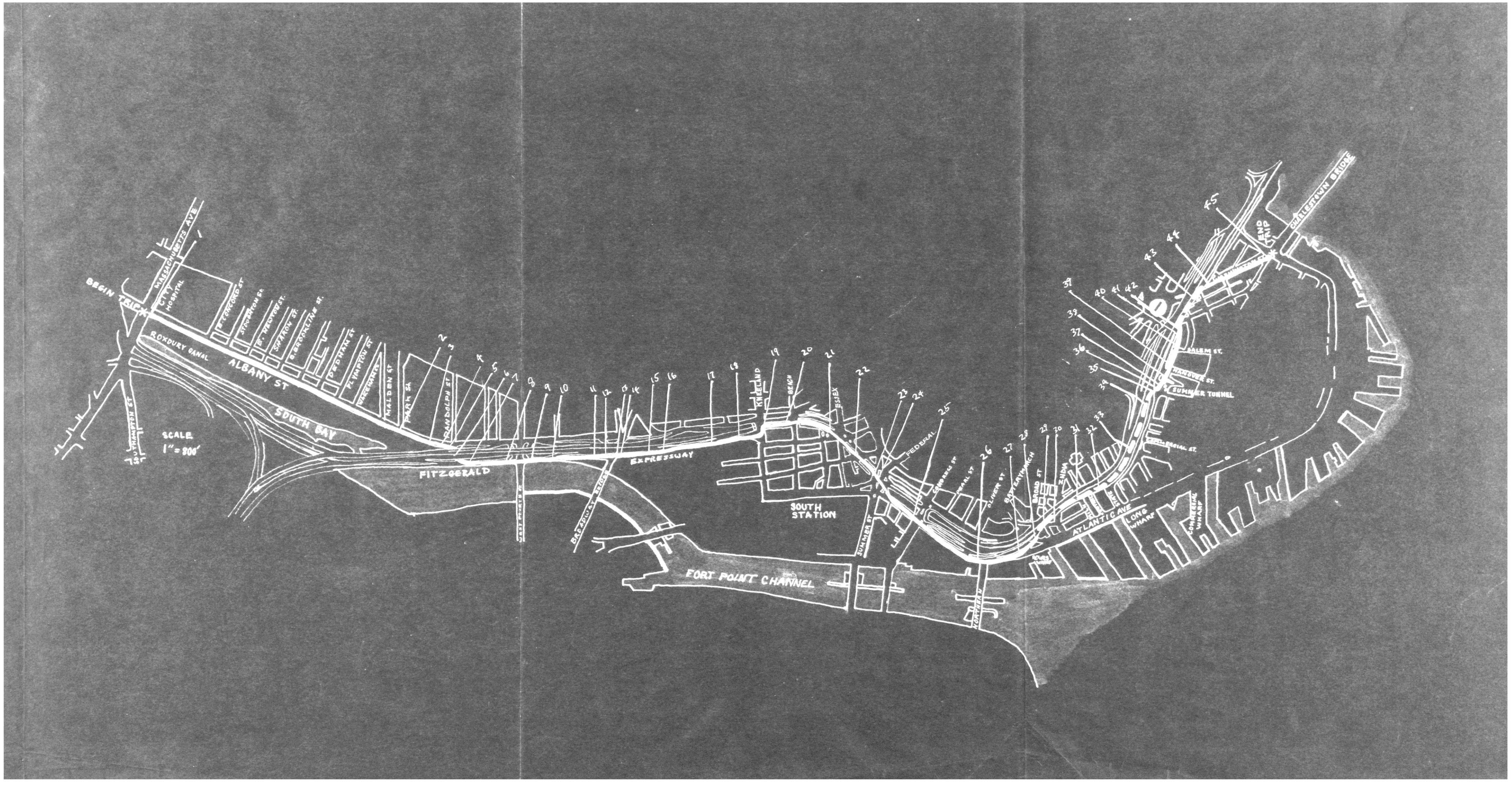


43


Play
SAMS
New England Store Fixture Co., Inc.
J. SKLAR & CO. INC.
FACTORY OUTLET
KEEP RIGHT

44

45


BEGIN TRIP
WASHINGTON STREET AVE
CITY HOSPITAL
E. NEWTON ST.
E. BROOKLINE ST.
E. CANTON ST.
E. CONCORD ST.
E. DEDHAM ST.
E. HAMPDEN ST.
E. NEWTON ST.
E. BROOKLINE ST.
MALDEN ST.
PARK SQ.
WASHINGTON ST.
ROXBURY CANAL
ALBANY ST
SOUTH BAY
SCALE
1" = 800'
FITZGERALD EXPRESSWAY
KNEELAND
BEACH
ESSEX
FEDERAL
SUMMER ST.
SOUTH STATION
FORT POINT CHANNEL
BOSTON WHARF
CHAUNCY ST.
AVON PL.
OLIVER ST.
BATTERYMARCH
BROAD ST.
UNION
ATLANTIC AVE
LONG WHARF
COMMERCIAL WHARF
CHARLESTOWN BRIDGE
END TRIP
SALEM ST.
HANOVER ST.
SUMMER TUNNEL
NORTH RADIAL ST.

J. THE RELATIVE LEVEL OF ATTENTION (R.L.A.)

The relative level of attention is a rating of the driver's degree of involvement or engagement with his task of driving. The data for its derivation are in two forms - 1) written comments of the investigator observing live or filmed kinesic outputs, and 2) the voice variables in the magnetic tape recording. Neither, taken alone, is adequate for the formation of an R.L.A. sequence.

Data obtained from magnetic tapes tend to give a broader, less sensitive indication of attention changes, with fewer peaks and smaller excursions. Filmed data, because of its continuous character (as opposed to the intermittent bursts of speech on tapes) yields extremely fine, frame by frame, resolution of behavior. Changes from one level of attention to another, higher or lower, may be placed exactly in time and space, the background image clearly fixing the location of occurrence.

R.L.A. profiles produced from filmed data show many more changes and greater excursions than profiles made from taped sounds. Filmed data also may be a more accurate source, although in this pilot study the accuracy and replicability of the newly developed methods have not yet been tested.

K. R.L.A. DERIVED FROM TAPE RECORDINGS

In the transcription starting on page 86, there is a continuous sequence of the driver's Relative Level of Attention (R.L.A.) mainly derived from the verbal responses of that driver as recorded. It is impossible to adequately indicate in transcription, the nuances in vocal expression, tone of voice, rises and falling off of frequency, amplitude changes and other communication variables that modify word and idea and which communicate interest, excitement, mood, etc., in everyday conversation. However, each of us hearing the voice of another (within the same culture) instantly and clearly recognizes the subtle intent of every small vocal modulation. Direct access to the tape recordings and films is therefore necessary for making up a rating of the R.L.A. Its appearance on the transcription is a record, a transcription itself, taken from the tape recording. However, a study of the relationships of R.L.A. ratings and the transcription material which it describes will explain more fully its relationship to the verbal outputs.

L. DISCUSSION OF THE VERBAL DERIVATION OF THE R.L.A.

Special Note: R.L.A. stages (0-6) progress from a score of 0 (distracted) to (excited) 6. There is a peculiar circularity in the effects of the two expremes of attention (0 - 6), which is not present in conditions 2-5. That is, given a man who is reacting somewhat aggressively and angrily to another driver's actions we may be justified in assigning him a dual score of 0-6 to indicate that his anger his risen to a point where it vies with his driving attention (and skill) for his energy and time. He may in fact be distracted (0), and rendered inefficient by his highly aroused state (6).

1. Verbal Criteria for R.L.A. Derivation

The criteria that follow are general and approximate, much further work must be done to resolve the categories into mutually exclusive groups of conditions.

0 distracted, off, inattention	Signs of sleepiness or distraction, i.e. long quiets punctuated by drawled, incomprehensible slurred mutterings, broken phrases poorly articulated, yawns, sighs, deep measured slow breathing.
	Distraction from other causes, attention directed to other subjects and clearly distracted from road, i.e. discussion of the merits of a pretty girl with clear reference to the fact that the

driver is looking at her.

1- peripheral automatic — Considerable verbal attention to extraneous details, yawning, bored tone of voice, cursing other drivers.

2- preoccupied automatic — Fluent conversation, rapid speech, cursing other drivers, reading signs, billboards aloud, singing and tapping time, [illegible]

3- normal confident — Normal rate and tone of conversation for that driver when driving most competently and easily, punctuated by temporary changes to other states (2-4) depending upon demands of traffic and the road. This class if the null point of the six categories or ratings.

4- occupied active — Conversation is now broken by the need to devote energy to driving. Expressiveness of voice varies toward a monotone. Variations in volume and rapidity of speech (clipped - drawled) unrelated to content or meaning reveal split interest with driving task. Example: while passing - "soooo / - wait / um / look when I / what did you say? / the extension or drawling of words may actually express the maneuver of passing or its timing.

The driver's verbal responses in conversation may also appear somewhat delayed.

5- The driver involved heavily in his task may be reluctant to talk at all, or at least display greater than normal delay in responding to questions, etc. when he does talk it may be in non-words such as "uh huh" or "umm," meaning "wait a minute before you ask me, will you?" He is withdrawn into the task of driving. These periods may be indicated only by a period of verbal silence through which other mechanical outputs may be heard to predominate.

involved

intent

6- The voice may express anger, or other somewhat dramatic emotion - fear, surprise, etc., by its content, tone, volume and pitch. There may be non-words, i.e. gasps, exclamations, and curses. In some cases an ambiguous, long, determined silence may be the only evidence of arousal.

excited

aroused

The R.L.A., then, is derived from the verbal portion of the sound recording by variations in emotional loading, speech frequency, intensity, volume, pitch and tone of the voice.

M. DERIVATION OF R.L.A. FROM FILMED KINESIC CLUES AND SIGNS

The interpretation of filmed and written notes, on kinesic (non-verbal) behavior, taken during the time of the driving interview is perhaps more important in the derivation of the R.L.A. than interpretations from the taped verbal responses.

The movie film permits of repeated observations each focusing upon a particular aspect of body movement, gesture, facial expression, posture, etc. Such exhaustive analysis of the filmed data enables the investigator to accumulate redundant information. By checking one observation, say, on the hands, against another of the facial expression, through the same span of filmed time, the general fidelity of interpretation is increased.

A second driver-behavior interview with a different driver-subject is analyzed on page 108 from a movie taken during the run. The analysis accompanies a transcription from the film of all the relevant kinesic movements. It is combined on the same form with the corresponding R.L.A. ratings, location, the interpretation, and an explanation of the context.

N. CRITERIA FOR THE KINESIC DERIVATION OF THE R.L.A.

The kinesic, or non-verbal, outputs contributing to the derivation of the R.L.A. are scored according to their position on a behavioral continuum varying from sleepiness to physical agitation. This set of criteria, like the criteria for R.L.A. rating from a sound track, are approximate and need further work and experience with the technique of observing.

0- distracted off, inattention

Posture - sagging towards complete relaxation or in continued attention (address) to some distracting influence.

muscles - loose or responding to wrong (other) stimuli.

movements - slow, lethargic, erratic or to some other task

coordination - poor or to some other task

facial expression - none or drowsy, or indicating misdirected attention.

head - nodding or hanging, addressing wrong way.

hands - removed from or loosely connected with wheel, gesturing.

1- peripheral automatic

Posture - more or less erect, awake, but resting
muscles - cycling rapidly from no activity to corrective movements
movements - corrective, sudden, or otherwise directed, erratic
coordination - cyclically normal with cycle from on to off.
facial expression - any
head - oscillating side to side, little time forward on road or addressed to observer. Peripheral vision employed to drive.
hands - normal or doing some extraneous task, gesturing.

2- preoccupied automatic

Posture - normal, erect, yet relaxed not tense
muscles - normally toned
movements - corrective, smooth but often late, tuning radio, etc.
co-ordination - "reflex driving," good coordination
facial expression - any or preoccupied
head - swinging, oscillating side to side but with equal or near equal time addressed to road.
hands - busy with other task in addition to driving (opening pack of cigarettes)

3- normal confident

Posture - normal erect, not tense, not relaxed.
muscles - normal tension, tone.
movements - normal driving movements, smooth

coordination - good

facial expression - normal and at null

head - addressed front majority of time

hands - working on wheel, minimum of external involvements

This is considered the null point of the six ratings.

4- occupied active

Posture - erect, cautious, forward leaning, prepared, tensed.

muscles - tensed, ready

movements - animated, smooth, deliberate

coordination - high, good

facial expression - determined, concentrating, attentive,

head - addressed to road, forward

hands - poised, ready, tensed, high on wheel

5- involved intent

Posture - working, erect, ready, tensed, leaning forward

muscles - tensed, responsive

movements - deliberate, smooth, perhaps rapid, animated

coordination - excellent, rapid

facial expression - exaggerated, rapid changes concentration, variety of display, animated

head - addressed forward, erect

hands - tensed, poised, or gesturing to drivers working at wheel.

6- Posture - tense, stiff or rigid, or changing

excited muscles - active, tensed

aroused movements - rapid, exaggerated, or deliberate and forceful

coordination - quite good or extremely poor (in certain emotions), emergency reaction times

facial expression - determined, cold, blank or grotesque

head - any position

hands - any position - very busily involved with driving or protecting body, gesturing at drivers, moving very rapidly, or holding tightly to wheel.

The R.L.A. is derived from kinesic behavior by examination, measurement, and interpretation of the kinesic display in terms of its rapidity, tension, position, changes, intensity (of expressiveness) postural position, direction of address and coordination.

Probable
R.L.A.
Ratings
↓

0

1

Fig. 5 The photographs on these sheets are intended to illustrate the kinds of behavior observed. They are inadequate in and of themselves to provide a basis for RLA Ratings.

R.L.A.

2-3

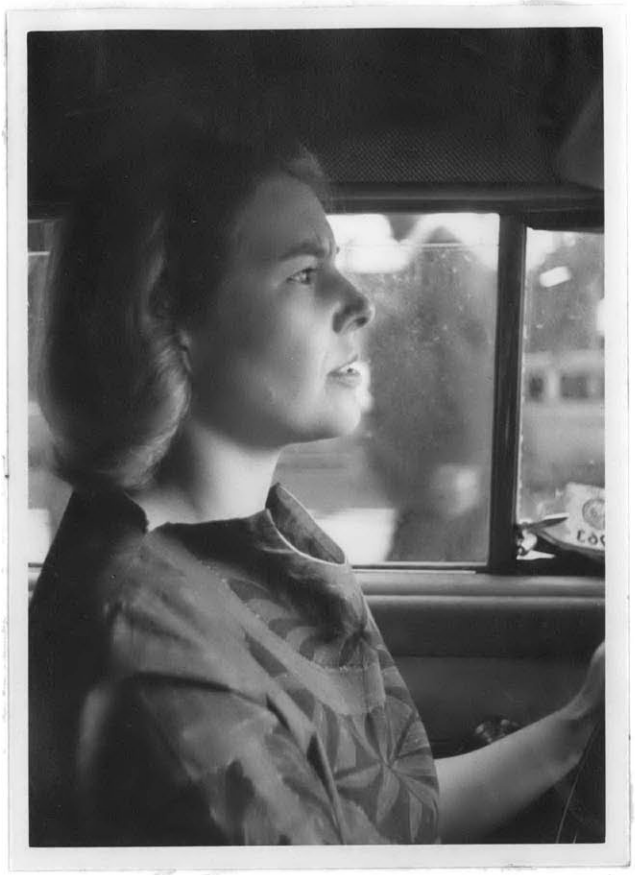
3

3

R.L.A.

3-4

4-5



R.L.A.

5

5-6

O. INTEGRATED RATING SCALE AND SYSTEM FOR DERIVATION OF THE RELATIVE LEVEL OF ATTENTION

Score	attention condition	kinesic outputs	verbal outputs	mechanical outputs
0	distracted off inattention	asleep or attending elsewhere, body sag, muscles at rest, no control outputs or feedback movements, face expressionless or elsewhere involved. Communicating with passenger exclusive of road.	talking excitedly to passenger or quiet (asleep) perhaps very soft drawling voice, broken phrases, incoherent, sighs, yawns, deep slow breathing, cursing at other drivers.	no control contact, hands feet, no movements if contact, out of control, wrong control, accident, missed turns, lights, near accident (other cars horns, brakes, on tape).
1	peripheral automatic	swinging vision, head oscillating, extended side viewing, peripheral eye contact on road, body relaxed and nearly resting, or communicating intensely with passenger to exclusion of road.	talking freely and fluently. Talking of roadside events, yawning, boredom sounds, tuning radio	correction movements of control only, no anticipation of coming events, jerky driving, over-correcting, sudden turns, too rapid maneuvering, compensating for late perception.
2	preoccupied automatic	alternating attention to road and other interest equal time on each, body semi-erect in seat, reflex driving, attention split, tuning radio.	fluent conversation, talk about roadside events, cursing at other drivers	nearly normal, no distinct outputs, controlling other things, radio, books, packages, etc.
3	normal confident	normal erect posture yet relaxed, not tensed, eyes on road most of time (normal for that driver) all postural positions at null.	normal rate of conversation for that driver on trip, and elsewhere with variations due to rises and falls of road action, Voice volume normal, expressive	normal control of car
4	occupied active	posture of caution, care, preparedness, erect leaning slightly forward, hands assume new, higher position on wheel, feet poised or working, full attention to road, face motions	broken sequence of conversation, monotone of expression variations in volume unrelated to meaning of words, extended or drawn out words, or clipped speech somewhat delayed verbal responses in conversation.	economy of gesture in control motions, hard accelerating, braking, turning, passing.
5	involved intent	working posture, in constant motion, erected, tensed, leaning forward, feet working, face motions are exaggerated and fairly rapid, hands poised or gesturing to drivers.	reluctant to communicate, withdrawn into task of driving, preoccupied sounding umm's, uh-huhs, extremes of 4, lapse of conversation, quiet	efficiency of control, economy of gestures, accelerating, braking, turning, passing.
6	excited aroused	Violent movement, very high rate of body movement and tension, rigidity of posture, perhaps distracted by excitement (score of 0-6) grotesque facial expressions, accident reaction or near accident.	violent language, loud voice, emotionality of tone quite high, high rate of speech, gasps, exclamations, curses or silent and determined, a long silence	poorly coordinated control and gesture, over-correction, dangerously poor performance, violent maneuvering, or extremely efficient operation in emergency.

P. THE RLA PROFILES EXPANDED FORM

The chart on the following page collates the R.L.A. profiles for all the drivers that were analyzed. The profiles are constructed on seven points, left to right 0-6. The route map, reading from bottom to top, indicates the location of changes in the profiles. The profile marked by the arrow and number (1) is derived from the verbal analysis demonstrated in this thesis. The profile marked with the arrow and number (2) is derived from the moving picture record of non-verbal behavior also analyzed in this thesis. Note the increase of detail in profile number (2) made from non-verbal responses compared to that made from tape recordings (as were the other nine profiles). Below normal scores (below (3)) are indicated with a solid tone. Elevated scores are indicated by a hatched area.

R.L.A. RUNS (EXPANDED FORM)

Q. EMOTIONAL RESPONSES OF DRIVERS

1. Derivation of Emotion Response

The data on emotional responses of the driver are derived from many cross checked auditions of the tapes and films to gain what insight into the emotional condition of the driver as might be communicated by his speech and actions. The driver's total verbal output is (rather informally) examined in the light of the following variables: Amplitude, pitch, frequency of verbalization, tone of voice, and the emotional content and emotional loading of words, expressions, ideas on as many levels as can be identified. The interpreted result of such examination appears with the transcription of a tape recording beginning on page 86 in symbolic form as explained in the Key to Emotional Response Symbols which precedes it on page 84 .

The driver's kinesic behavior, somewhat more enigmatic in terms of revealing emotional condition than for the R.L.A., is examined for simple common clues and signs of emotional condition such as the following unsystematized but perhaps deceptively familiar examples - "worried" frowning, happy or glum, depressed, facial expressions, movements of surprise and fear, quizzical or curious facial expressions, etc. In simple terms, the observer asks himself: How would I feel if

I wore that expression, or stood, or sat, or moved, that way? Birdwhistell finds, despite the irregular and subjective research technique, that most informants or observers of a particular kinesic behavior pattern or facial expression from within the same culture will describe similar initiation and cutoff points in a continuum of kinesic movements - " ... certain kines (the least isolated particle of movement) seem to have traceable <u>differential meaning</u>. Differential meaning occurs when informants repetitively report that the variation in placement, intensity, or position of a kine 'changes the meaning' of a set or continuum." [7]

Since none of the above listed variables of behavior has a particular reputation for reliability, the author does not wish to defend the accuracy of results gained by the methods described above, but, in view of the fact that better means are unavailable, and that we must anyway operate overmuch out of intuition, or at best make great use of unsystematized information in evaluating another's emotional state, it seems worthwhile to attempt an improvement in the foundations of our intuitions.

As indicators of the imponderable complexity of human emotionality, all of the cited criteria or variables are relied upon every day by every person who communicates with another. They obviously have some value as indicators and communicators, even indices of emotional quality and/or quantity. How much reliability is indeed a moot point at this time. However,

in the future, tests of this could fairly easily be designed to give a quantified estimate of reliability. At the moment, we have nothing better, we must use what we have and learn its capabilities as we gain experience with the technique and its limitations.

CHAPTER IV

THE TRANSCRIPTIONS AND THEIR ANALYSIS

(Pull out map p. 104)

A. Transcription of a Typical Tape Recording

The following is a complete transcription of a driver interview. A listing of the elapsed time appears in the left hand column. The elapsed time is printed every five seconds. (The closer grouping of numbers vertically indicates slower rates of speech. Fast speech displays long vertical spacing of intervals.)

At the end of the transcribed material will be found an analysis of the transcription, in detail. The analysis and transcription are keyed together by the elapsed time figures which appear in both. Both in turn are keyed to a map by the same elapsed time figures. The map on page **104** should be pulled out before covering that material.

1. Circumstances of the Interview

This interview was made in the afternoon on a Saturday in spring. The weather was damp and chilly but not raining. The automobile used was the driver's own Sunbeam sports car with two seats, with the top closed.

The driver in this case is a psychiatrist. Later, after reading of the transcript and its analysis, she was able to confirm (subjectively) the interpretations made by the author.

B. KEY TO TRANSCRIPTION NOTATION

/...../	word or phrase spoken without pause by the driver.
/(.....)/	word or phrase spoken by the interviewer
/-laughs-/	sound of laughter
/<u>....</u>/	word or phrase with strong tonal or volume emphasis
/-----/	non word or single word utterances
/xxxxx/	acceleration
/ooooo/	deceleration

C. KEY TO EMOTIONAL RESPONSE SYMBOLS

Symbol	Condition of emotion
	Anxiety, insecurity, fear, worry, apprehensive
	Anger
	Irritation
	Content, relaxed, secure, safe
	Seeking, confused
	Pleased, happy, cheerful
	Depressed, sad
	Lonely
	Excited
	Frustrated
	Disoriented
	Relieved
	Careful
	Blunder
	Repression
	Null, normal, no emotion
	Positive
	Negative

D. KEY TO R.L.A. RATINGS

0	Distracted, off, inattention
1	Peripheral automatic
2	Preoccupied automatic
3	Normal, confident, null
4	Occupied, active
5	Involved, intent
6	Excited, aroused

E. TRANSCRIPTION

0 You know / I want to med school here / (yeh?) /
5 xxxxxxxxx

10 ? / and part of their services were in
ooooooooo

city / and part in Mass Memorial / (so you use this
15 xxxxxxxxxxxxxxx

20 road a lot?) / so I know the area / kind of / this /
xxxxxxxxxx xxxxxxx xxx ---

since they put the expressway in
25 xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

this road is / less used than it used to be /
30 xxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxx

(yeh? was it busy?) / It used to be more busy /

35 really / and / this was part of my district
------ ---

when I was on / fourth year medical /

40 and that / the project / the cathedral
----

project was a / most of it but I
--

had some down these streets down here /
45

I had that because it was closest to

the umm / medical school and I didn't
50 ----

have any um- /

(how do you feel about this?) / what about it? /
55 ooooooooooooo

(about traffic about this about traffic about

cars about the road?) / I'm not paying

60 too much attention / I'm noticing

65

them obviously / but um / you know it's /
ooooooooooooooooo __ __ ooooooooooooo

y do y just don't / sort of ignore it
70 -- -- --

75 as much as y'can / It's pretty / y'know /
-----

80 unattractive / (mostly out of awareness?) /

85 It's there but y I just don't a / y'know /
--- --- ------

90

sort of a / well y'notice my mind
---

went to what / in a sense was a /

95 a pleasant association to the area
-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

rather than to/ (ya) I mean
xxxxxxxxxxxxx

and it wasn't all pleasant because
xxxxxxxxxxxxxxxxxxxxxxx

100

certainly / going to people/'s houses
xxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxx

that lived there / was not always /
ooooooooooooooooooooooooooooo

where are we going? / (now one thing
oooooooooooooooooooooooooooooooooo

that you're to do / is avoid using the
oooooooooooooooo

superhighway / we're going to be driving

(outside)
on service roads) / fine / (Horn) / go left? /

(no you want to go straight) / oh / (and you
---- xxxxxxxxx

don't want to go on the highway) /
xxxxx oooooooo xxxxxxxx

straight and not on the highway? /
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

(yes / straight and not on the highway /
xxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx

(you can you know / you missed it) / oh /
xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxx ---

over there alright / (ya) / sorry / (that's
xxxxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxx

all right /_um / let's get off then / (just get
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxx

off as soon as possible / that's fine /

it's all right / okay -laughs- / get off

at Kneeland St. / en - I couldn't have
----

pulled out then anyway / or at least /

(well it's all right you'd have ended up here
oooooooooooooooooooooooooooooooooooooooo

anyway) / yeh but / I mean / a lot a traffic is /
oooooo ------ ------ ooooooooooooooooo

(y'wanta take a right here) / yeh / what's he
oooooooooooooooooooooooooooooooooooooooo

doing? / Come on, buster you going right /
oooooo xxxxxxxxxx oooooo xxxxxxxxxxxx

(huh?) / you going right / you going left / or
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxx

which are ya going to do? / now / (you want
xxxxxxxxxxxxxxxxxxxxxxxx ---- oooooooo

to take a left again / have you ever
oooooooooooooooooooooooooooooooo

tried to take any other turns in this

intersection?) / I've never come here /
xxxxxxx

this way / (do you know the road here /
xxxxxxx xxxxxxxxxxxxxxxxxxxxxxx

have you been here before?) / I've been
xxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxx

in Park Square / (yuh take a right) /
xxxxxxxxxxxxxx ssssxxxxxxxxxxxx

this South Station? / I get mixed / (yes) /
xxxxxxxxxxxxxxxxxx oooooooooo

up down here / (almost South Station) / I get /
ooooooooooooooooo xxxxxxxxxxxxxxxxx ------

we're going straight / (right / correct / -laugh- /
xxxxxxxxxxxxxx

-laughs- go ahead and back up, huh? /
xxxxxxxxxxxxxxxx oooooooooooo

uh right - laugh- I mean correct -laugh-) laugh /
ooooooooooooooooooooooooooooooo shift
irrelevant joke omitted at pause for light
(thoughts on people walking)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

where are we going now? / (want to take a

right) /2 right? / (but not a sharp one) /
xxxxxx ooooooooooooooooooooooo

oh okay / (you want to go down by that
------- ooooooooooooooooooooooooooo

row / down by that row of brick buildings) /
ooooooooooooooooooooooooooooooooooooooo

uh huh / make the light I guess / where are we? /
------ xxxxxxxxxxoooooooooo

(oh) / this is Atlantic Ave. / Ah / that's what
--- -----

I thought but I wasn't sure / you know /

i-i- all that roadway / we're going straight
---- ------

down? / straight or left? / um you want
, ---

to go to the right / and straight) /

ya boy the / all the landmarks are
--- --- ---
xxxxxxxxxxxxxxxxxxx

different because of the / highway
ooooooooooo

it's hard to know where you are /
ooooooooooooooooooooo

xxxxxxxxxxxx

straight huh? / (yuh) / I'm supposed
xxxxxxxxxxxxxxxx

to be free associating and I /

(huh? / well it's difficult) / yeh / (even for

a psychiatrist) / both laugh / maybe but

particularly in a car / laughing / (yuh) /

(okay now you want to cut around

to the right / y / to the left) / left / (I'm
----

sorry) / now are we going ? / where

are we going? /(straight ahead) / okay /

(hey it looks like we may get a break

in the weather) / hmmm / (there's a front
------

out there) / ya know / actually / y'know /
xxxxxxxxxxxxxxxxxxx xxxxxxxx

riding around like this and sort of
xxxxxxxxxxxxxxxxxxx xxxxxxxxxxx

looking at what you're looking at /
xxxxxoooooooooooooxxxxxxxxxxxxxxxx

it's a whole lot a / more / - unattractive
xxxxxxxxxxxxxxx ---

then you think / (yuh / uh! /
xxxxxxxxxxxxxx ooooooooooo

how do you feel about this?) /
385 xxxxxxxxxxxxxxxxxxxxxxxxxxxx

w - there's no sun! / It's very nice in the

390
winter time I guess / there's no snow here /

but a/uu / it has a / closed in feeling / straight? /
395 xxxxxxxxxxxxxxxxxxxxxxx

(yup) / yo / you know the intersection of

400
Dover and um / Washington? /
xxxxxxxxxxxxxxxxxxxxxooooooooooxxxxxxxxx
405 outside
That is the deadliest / Horn / intersection /
xxxxxxxx oooooooooooooooo

where's that?) / Dover and Washington /

410 (I'm not sure where Dover is) /
xxxxxxoooooooooooxxxxxxxxxoooooooooo

I'll show it to you on the way / back /
xxxxxxxxxxxxxoooooooooxxxxxxxxxxxxxxxxoooooo
415
it is / i-i- / the elvated's cross / and
----- xxxxxxxxxxxxxxxxxoooooooo

420 it's / it's / you know / is in the
---- xxxxxxxxxxxxxxxxxxxxxxxxxxx

middle of the South End it's in
xxxxxx

425 the middle of the slums/ and a /
xxxxxxxxxxx ---

the over / pass / just really / we're not
---- ------

430 going on the expressway I take it /

(that's right) / soo / you must want to
-----

go to the North End / or something
xxxxxxxxxxxxxx

close to it / (that's correct / ya) /
xxxxxxxxxxx

you want to go right or you want to

go straight? / (straight) / okay / . . . /
xxxxxxx oooooooooooooooo xxxxxxxx oooooooo

i-i-i- n the market / u / (you want to
----- oooooooooooo --- xxxxxxxxx ooooooooo

go to the right) / okay / straight / (and then
xxxxxxxxxx

straight) / okay / got all chopped up /
xxxxxxxxxxx

with this thing / (huh?) / the market

got all chopped up with this thing /
xxxxxxxxxxxxxxxxx

(yuh) / It's / like / what / they were / afraid
xxxxxxx

would happen in Newton with the road
xxxxxxxxxxxxxx ooooooooo

and it probably will / like there'll be a / a / I /
xxxxxxxxxxxxxx xxxxxxxxxxxxx -- --- ---

split the city / split / it split / the
xxxxxxxxxxxxxxx ----- xxxxxxxx ooooooooo

North End area / (yah, it's going to cut

things up / there's no doubt about that) /

the road / (d'you know where you are?) / yah /
xxxxxxxxxxxxoooooooooooooo

tss - approximately / (okay / then the thing to do
oooooooooooooooooooooooooooooooooooooooo

is to take a left) / ya / we're in
oooooooooooooooooooooooooo

Charles / town / (and the trip is over) / gee /

End of interview
(this marks the end of it) / right here? /

(yeh / we're all done) / okay /

you want to see Washington and Dover? /

(y-y-mean is it on our way?) / We can do

it fairly easy I think / I mean it's /

(how did you feel about the trip you

took?) / In a way a / yu /

(how would you characterize it?) / I'm not

sure / I mean a lot of it I was

familiar with / but / ya know / like

it was a / like skirting the expressway /

(ya) / (but how did you feel about it?) /

what d'you mean / how do I

feel about it? / it's / part of driving

through Boston / -laughs- / (what's that like? /

Laughs- you know / you don't have feelings

y'just drive / -long laugh- / you know / it was

unattractive / very unattractive /

and you're just getting from

one place to another / just as

fast as you can /

F. CONTENT ANALYSIS OF TAPE RECORDING

Key to elapsed time of interview

0 Normal driving routine begins - with the positive associations to prior experiences in the district of the road.

24 Attention swings to the road itself, and the traffic, described as "more busy" in the past, at the first encounters with present traffic. (slight repression of annoyance at traffic).

53 (How do you feel about this?) / (about traffic ... cars ... the road?) She becomes aware that she has been unaware of the environment and " ... not paying too much attention /"

60 She admits to noticing these things (she must, to be able to maneuver) but avoids the emotional responses -

75 "it's pretty / y'know / unattractive /" (which is very nearly whispered, itself a kind of fight against recognition of the word content). She admits self analytically, to the above sequence of emotional dynamics - "my mind

92 went to what / in a sense was a / pleasant association to the area rather than to /" - here she again avoids

98 mention of the exact nature of the implied unpleasantness,

and instead recalls ("it wasn't all pleasant") past unpleasantness in the "pleasant area" - a watered down version of present reactions.

105 Driver is at a decision point, a fork in the road, sees two alternatives, and questions investigator for routing instructions. The car is in the left hand lane and stopped at a red light. There is a truck to the right, also stopped. The observer responds with:
120 "Go straight ... and you don't want ... the highway," reinforcing the earlier - "avoid using the superhighway." The driver perceives the alternative road choices as a dilemma having an insoluble ambiguity, both look to be superhighway entrance ramps. She is in the left lane, the natural route taken by most drivers in the large number observed by this investigator. The maneuver to the right lane to take the right fork is awkward enough to cause her to force herself to quickly comprehend the meaning of the route instruction. She cannot.
124 In mild panic she literally shouts - "Straight and not on the highway?!!" Meaning, clearly, by the tone of her exclamation - Why that's not possible! There is not enough time for her to ponder this and take the right ramp, the truck has begun to move and she, also moves off, taking the wrong ramp and blundering.

Her difficulty in discriminating the character of the

two ramps is not unique. Others, 5 out of 10 in recorded trials, have made the same mistake. A few minutes of stationary road-watching will collect other identical examples. She feels badly for making an error and probably missing part of the run (along the other ramp).
145 She rationalizes with some degree of truth, "I couldn't have pulled out then anyway" (the driver later admitted to feeling "miffed" because she had not even seen the alternate until too late)

At the intersection of Kneeland street with the service
165 road she is frustrated by an indecisive driver ahead and mildly, but irritably, bawls him out (to herself) - "Come on, buster, you going right ... " Passing or avoiding him she is relieved, she loudly pronounces
177 "Now!",marking the beginning of a new series of turns in a decidedly more urban section, the leather district.
205 She confesses to being "mixed up / down here," and asks if this is South Station. It is not. She has seen the curved parking garage in her peripheral vision while rounding a broad curve and confused the two.

295 Later in a very bumpy stretch along Atlantic Avenue all her speech is discontinuous and incomplete in her effort to control and guide her hard sprung,
295 quick-steering sports car - "you know / i-i all that

roadway /" and - "ya / boy / the - " / (bumps?)
The bumps are plainly audible on the tape. She
begins to reveal a theme.of dislike for the superhighway.
305 "/ all the landmarks are so different because of the /
highway it's hard to know where you are / ", which she
continues much later (see 455).

On Atlantic Avenue she self-consciously reminds herself
326 that she should "be free associating." There follows
330 a joke pointing up the (implied) superiority of the
psychoanalyst's couch, more commonly employed for the
purpose than a car, revealing some inconvenience at
having to think and talk and drive at the same time.

335 The car has been stationary at a stoplight waiting to
turn off Atlantic Avenue into the dark tunnel-like space
under the southeast expressway. The driver has had 23
seconds to contemplate this prospect of enveloping dark-
ness. The expressway has, just earlier, begun to be
revealed in a negative role (see 305). She reveals
her musings generated in the 23 seconds of silence (364)
364 just as she moves off - "y'know / actually / y'know /
riding around like this and sort of looking at what you're
looking at / it's a whole lot a / more / - unattractive
than you think /." This statement begins a long and
nearly unbroken series of associations and comments
all of which share a somewhat negative cast, as will
follow.

The investigator asks - "How do you feel about this?" a few yards into the "tunnel." She replied - "w /
387 there's no sun!" (in a tone of voice which could have as easily supported the meaning for the question "Why ask? It's obvious" (in the negative). The environment lacks (to her) an essential desirable feature - the sun. She both rationalizes her negativeness and partly tries
389 to suppress it with: "It's very nice in the winter time I guess / there's no snow here / " (the run was made on a warm snowless day in April). Dissatisfied with her inability to do away with her growing dislike for
394 the place she opines - "It has a closed-in feeling." Two seconds later, her feelings really get the upper
396 hand, she asks - "Yo / you know the intersection of Dover and um / Washington?"/ and then - "That is the deadliest / (Horn blows outside somewhere interrupting her) / intersection". Her choice of a highly colored word "deadly" indicates that her thought associations have taken a trend towards the somber, emphatically so, for she pronounces the underlined words much more loudly than is usual in her speech. (She laughed upon hearing her exclamation during playback of the recording.) This associative connection with deadly places suggests that she is unconsciously responding to an element of anxiety which she may feel in places that give her a "closed in feeling" (394), or that she is anxious for other reasons.

Her train of thought continues, the next 13 seconds,
416 contain references to "elevated's" (416) (MTA overhead), "slums" (424) and "the overpass" (428) (an association with the expressway over her own head) - all three references are to subjects, objects if you will, that are commonly disliked (perhaps excepting the overpass which is negative on other grounds).

She is successfully through the Sumner Tunnel intersection and the North End, having no difficulty there, but having been very busy (from visual observation) when
452 she stutters "i-i-i-n the market / n / .... / got all chopped up / with this thing / " ("huh?" - the observer) / "the market got all chopped up with this thing / ".

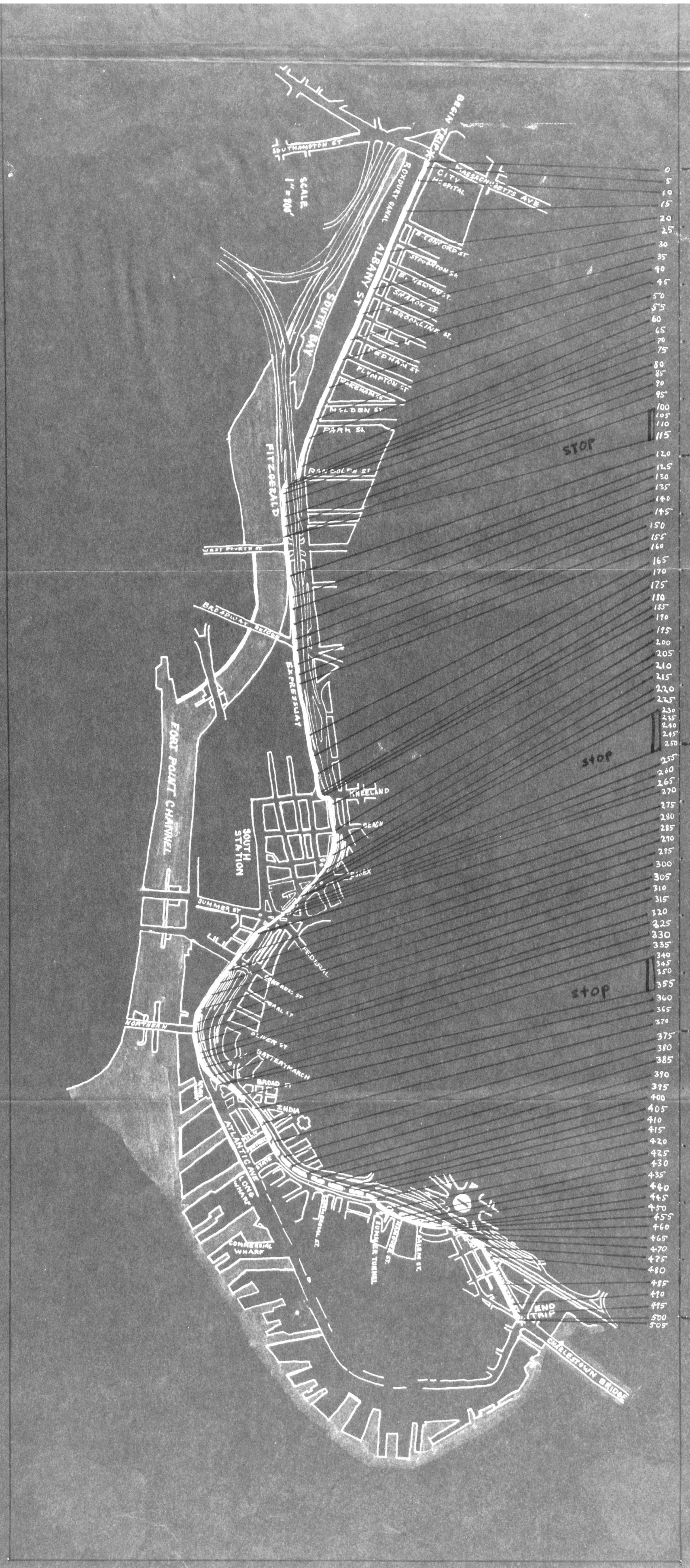
It is interesting but perhaps not related, that once before during the trip, on Atlantic Avenue, when she encountered a stretch of strong bumpiness, she also stuttered the same way while maneuvering around and through the potholes and railroad tracks (294) " / you know / i-i all that roadway / " This time also (452) she stutters and breaks her rhythm of conversation while encountering strong bumps, the rattles from which are loud in the recording. In both cases it is probably safe to assume that the bumps were inconvenient and a somewhat frustrating experience.

480 The driver later (480) shows concern that the expressways will and have " /split the city / split / it split / the north end area /", another chopping, cutting reference with negative implications.

Shortly thereafter, the run finished, she shows her continued willingness to show the intersection of
512 "Washington and Dover" (512 and 407), the "deadly" place; she is caught up in this interest perhaps as a result of the omnipotence of associative environmental stimuli - i.e. "If you can't fight 'em, join 'em."

520 When asked for her "feelings" about the trip (520), and her characterization of it, she replied defensively (as she did the first time she was asked for her "feelings"
539 (54) " / what about it? /"), " / what do you mean / how do I feel about it? / it's part of driving through Boston /". This sidestepping of the question was accompanied by an ironic sounding chuckle, which spread into loud ironic sounding laughter as she immediately continued - laughing - "/ you know / you don't have feelings y'just drive / (long laugh) / you know / it was unattractive / very unattractive / and you're just getting from one place to another / just as fast as you can./ "

Her summary, above, again attempts to deny her feelings, and emotions (even psychiatrists seem to do this). Unequal to the task, however, she pronounced the trip " / unattractive / very unattractive /", in an urgent and sincere tone of voice.


BEGIN TRIP
SOUTHAMPTON ST
SCALE 1" = 800'
CITY HOSPITAL
MASSACHUSETTS AVE
ROXBURY CANAL
ALBANY ST
SOUTH BAY
E. CONCORD ST
STOUGHTON ST
E. NEWTON ST
SHARON ST
E. BROOKLINE ST
DEDHAM ST
PLYMPTON ST
WAREHAM ST
MALDEN ST
PARK St
RANDOLPH ST
FITZGERALD
EXPRESSWAY
WEST FOURTH ST
BROADWAY BRIDGE
FORT POINT CHANNEL
SOUTH STATION
KNEELAND
BEACH
ESSEX
SUMMER ST
FEDERAL
NORTHERN
CONGRESS ST
PEARL ST
OLIVER ST
BATTERYMARCH
BROAD ST
INDIA
ATLANTIC AVE
STATE
LONG WHARF
COMMERCIAL WHARF
SUMNER TUNNEL
END TRIP
CHARLESTOWN BRIDGE
STOP
STOP
STOP
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505

G. EMOTION SEQUENCES AND DISCOMFORT INDEX DATA

The chart on the following page collates emotion sequences from all analyzed trips with the point of origin along the route. The chart should be read from bottom to top. Changes in channelization are indicated in column A. Each run is enclosed between solid vertical lines E, F, G, H, I, J, K. L. M. N. Column P indicates the number of similar responses for points along the route. Column O shows total similar responses for each zone. Zones are marked off by horizontal lines; there are 18 zones. For an explanation of the Discomfort Index, see page /33.

Mount on 8.5x11 blank sheet

EMOTION AND DISCOMFORT DATA

ROUTE MAP

Causeway St. — Commercial — Endicott — Hanover — N. Ramp — Sumner & Callahan Tunnels — Commercial — Clinton — S. Market — Commerce — State — Central — Milk — India — Broad — Northern — N. Ramp — Atlantic — X Ramp — Congress — Federal — Essex — Lincoln — Beech — Kneeland — X. Ramp — Broadway — X. Ramp — W. 4th St. — Bridge — Randolph — Park — Malden — Wareham — Plympton — Dedham — E. Canton — E. Brookline — Sharon — E. Newton — Stoughton — E. Concord — Mass. Ave — Albany

	Channelization	ZONE Division	Division NAME and CONTEXT	Tom	Bill	Sid	Jean	Sue	Don	Dave	Ed	Dan	Jo	Division Totals	Calculations for points plotted	Discomfort Index Figures: NORMAL	DISCOMFORT	ERROR	NORMAL=0 DISCOMFORT INDEX	Errors (D)
			Emotion Sequences																	
		18	North Washington St.	? * X	⊙	(	*		?	X	(		A	3 X 2 ?		5 6 10 10	5 4	0 0 0		
		17	Under Expressway and under N.T.A.	?	X	X ?		X ?	■	■	■	G	X	+? +X 3 ⊠	3X 3■ 2?	5 4	5 3	3		
		16	Hanover St NO. End and approach to Expressway structure (#3)		(	(						* *	X (	2 C 2 *	2 (	8 8	2 2			
		15	Sumner Tunnel and approach		*	?	?	*	X	■	X	*	?	9 * 4 ? 2 ■	3 * 3 ? 2 X	0	1	/		
		14	Approach to Sumner Tunnel	△ *	*	*	? *	X	■		*	*		7 * 1 ■	6 *	8 2	2 7	/		
		13	Under expressway	?	⌒	(	(■ *	*	■	X	*		(* (4 * 3 (2 ⊥ (⊤ (		2 ■ 3 * 2 ■	8 7 4 9 9 9 9 7	2 / 6 / / / / 3	2		
		12	Expressway (#2) Superstructure and approach	X	(	(	?	(	(	(	(X	*	? 0 ?	8 (3 ? 2 X	8 (2 ?	1 8 8	9 2 2			
		11	Atlantic Ave.		X (						X	* (	D * X	3 X 2 *		10 10 7 9 8 9	0 3 / 2 1			
		10	CONGRESS St, approach to Cong. St	?		X			X		X		?	3 X	2 ? 3 X	5	5			
	?	9	SOUTH STATION, SO. STA. Approach	X	? ?		? *		X X	? * X X	X	*	? ?	6 ? 5 X 2 *	4 ? 2 ? 1 X 2 ?	2 4	8 6			
		8		X												10 10 7 9 9 10	0 0 3 1 1 0			
		7	Kneeland St, approach to Kneeland St, Begin 2 way divided curve, expressway North ramp #2	? *	? (	?	?	X		? X		? * * ?	⊙	7 ? 2 X 2 * 2 (	5 ?	4 7 10 8 9 10 10 9	6 3 0 2 1 0 0 1			
		6	Broadway and approach	*		(			X	X	?			2 X	2 X	10 10 5	0 0 5			
		5	x'way ramp #1 Ramp approach, W. 4th St and approach				△	*			■ *		■	5 ? 4 X 2 ⊠ 3 *	2 ■ 2 *	10 8 7 10	0 3 0	2		
		4	W. 4th St. and approach	■ ? (	? X		? X	X		?	X	*	?D	4 X 5 ?	5 ? 4 X	7 1	2 9	1		
		3	after Bridge	X ⊙		(					*	(*		2 * 2 (		8 9	2 1			
		2	Bridge approach, Bridge (x'way #)	?				⊙	*	* △	(		(	2 * 2 ∩	2 *	6 8	4 2			
		1	Albany St, Bridge approach, Bridge	X	⌒		?	⊙			*	*	⊙	60 5 * 5 ∩ 3 ? 2 △ 2 X	2 *	10 10 8 10 10 8 10 10 9 10 10 10 10	0 0 2 1 1 2 2 1 1 0 1 0 0			
		0	City Hospital	⊙	⊡	⌒	X	⊙		⊙	△	*	⊙		4 ⊙	5	5			
				A	B C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T

H. THE TRANSCRIPTION AND ANALYSIS OF THE FILMED IMAGE

The foregoing analysis of the tape recording and this analysis of non-verbal filmed behavior should be regarded, for purposes of illustration, as if they had been made at the same time, using the same driver as a subject. Unfortunately, due to scheduling difficulties it was not possible to take both sets of data at the same time.

The transcription that follows is a set of observer's notes made by the author during repeated screenings of the projected image. The observing technique as described earlier makes use of the tape recorder as a dictating machine. This data has been transcribed from dictated observer's comments.

The notes (center column) are together with information on the point of occurrence (extreme left column), with the rating of Relative Level of Attention (R.L.A. left column). The R.L.A. figures were derived from information on the same sheet. A running explanation of the context of behavior follows the action in the right column.

Before reading this section, pull out the map on page 112. The transcription and the map are keyed together by elapsed time figures which appear both in the map and in the text of the transcription.

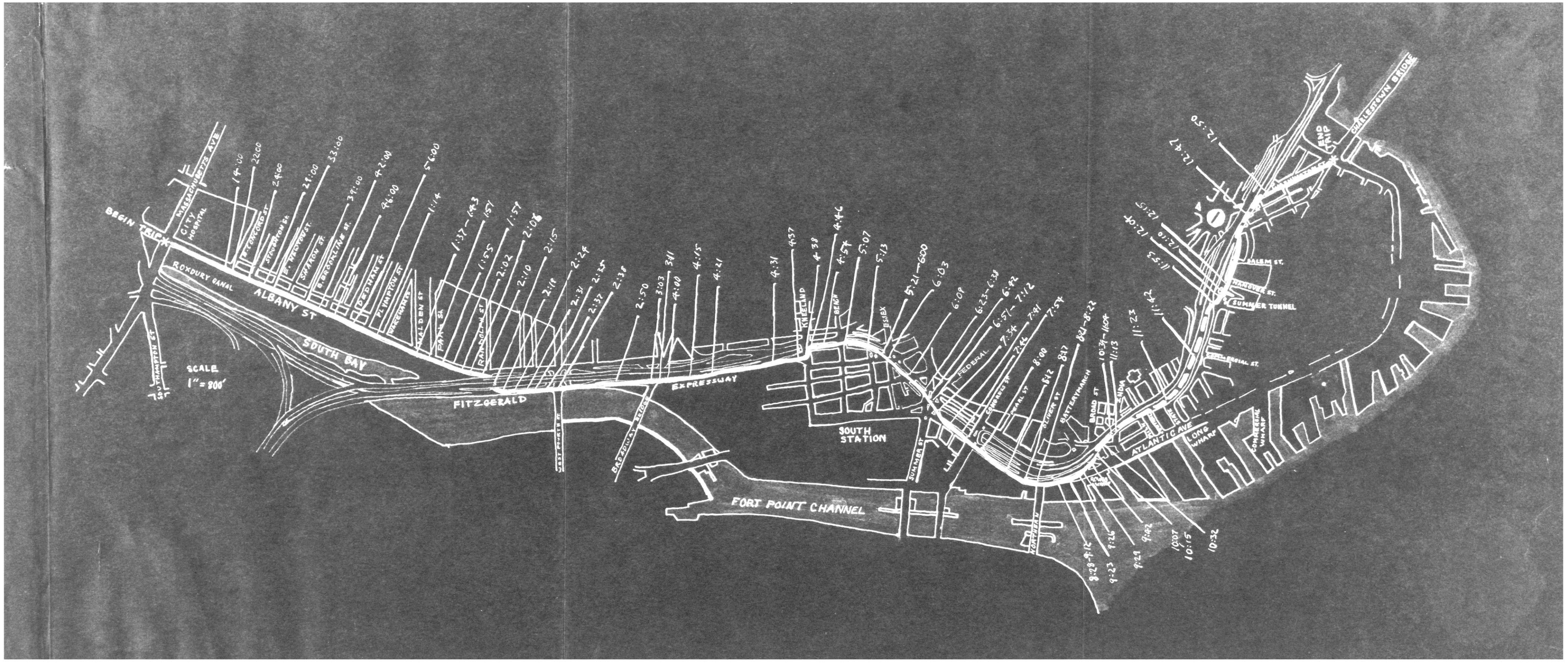
I. ANALYSIS AND TRANSCRIPTION OF NON VERBAL DATA FROM FILMED IMAGE

Location	R.L.A.	Non-verbal Behavior	Elapsed Time	Context
Begin Albany Street		Leans forward, eyes ahead. Head rt., eyes straight, mirror.	14:00	High attention Comments to
East Concord St.	3	Head left, eyes left gesture (quickly) rt. hand, eyes straight	22:00 24:00	observer checks side street talking
Stoughton St.		Looks left eyes, head, eyes head stright		attending "
after Stoughton		Reaches for directional signal, foot off accel.	29:00	sees traffic entering on
E. Newton	3	Looks left, resumes old position.	33:00	left. slows
E. Brookline	5	Gesture rt. hand. Bump geature, broadly, expressively, eyes ahead	39:00 42:00	attending and talking about bumps in road.
		Drapes one wrist on wheel spoke, then the other, smiles, laughs	46:00	driving relaxed competent "
	3			"
Hiller Hollis Bldg.		Drops both wrists	56:00	talking, competen
		Head rt, eyes st.		"
		Points rt. hand, eyes straight	1:14	" "
		Points again		"
	3			
		Moves hands		"
		head right, eyes st.		"
		Lefts wrists,		"
		smiles, laughs	1:37	"
Malden St.	3	STOPS / Starts	1:43	Traffic at inter-
	3	holds spokes		section
	4	sets mouth, takes deep breath, mouth	1:51	relaxed a mild kind of gasp
Park St.		open, foot poised in air over brake, puts foot		Sees quick stop
	3	back, bites lower lip,		situation devel-
	3	face at null, stern smile		oping ahead, anticipating preparedness behavior

Location	R.L.A.	Non-verbal Behavior	Elapsed Time	Context
Beginning of Bus storage yard		Rt. hand up on wheel	1:59	first perceives
		1:00 begins to feel for direct signal w/ left,	2:02	turn in road ahead expects
		shows down, finds signal turns to right without	2:06	to signal, realizes that
turns under expressway		using signal	2:10	there is no need as there is only
		Turns left under ex'way	2:15	one path.
out from under	3	Looks rt.	2:19	"S" curve
		eyes, head straight		acute angle
		compress lips	2:24	intersecting
		Looks around rt.	2:31	road on right "composes face"
on Fort Point Service road		Tense grip on wheel relax grip	2:35	checks traffic to cut right
				Slowing down
before W.Fourth St.	4	Takes deep breath	2:37	faster
		Open mouth, raises foot from accelerator		first perceives intersection anticipates
at W.Fourth St. intersect.		Points both hands on wheel	2:39	a quick stop asking direction
	4-3	One hand up, one at 11:00		about fork in road
		feeling signal	2:50	anticipates
Before Broadway bridge		looking around front car		intersection at Broadway bridge
at intersection stopped	4-3	head right, eyes ahead		
		eyes head left stop	3:03	increasing attention
		" " right		
		" " left		
		Scratches nose		very attentive
		leans right		some mind
starts		both hands clutching wheel		anxiety at intersection
at some intersection (violated invisible sign)	5	Stopped by cop	3:11	Excited
	3	Going up ramp, hands on spokes, shakes head negatively.		(ramp does not lead to expressway)
	3	Right hand up, up, purses lips up purses lips strongly, eyes head straight		says: have been stopped before accelerates high attention "

Location	R.L.A.	Non-verbal Behavior	Elapsed Time	Context
	3	Head slightly elevated & back, smiles		Attention
				"
		Looks left	4:21	"
	3	Purses lips, concerned tips head back (mirror)	4:31	Slowing down for left turn
		checks left right	4:37	"
corner	4-3	left, takes left	4:38	"
Kneeland		takes right and		"
leaving Kneeland		simultaneously looks		distracted by
(new street	2	left	4:46	construct. for
no name)	3	eyes head straight		1 second
		gestures with rt.hand		asks directions
Beach St.		keeping it on wheel	4:54	attending normally
		looks slightly right		"
	3	eyes, head, straight		"
		points to right, smiles	5:07	"
Essex St.		purses lips, stopping		Distracted by
		point at helicopter		curved garage
		Straight arms wheel		stops gestures
		Stops, looks left	5:21	distracted, but
Stopped				at stop, waiting
		Starts, purses lips	6:00	anticipates quick
	3	and takes left foot		stop ahead
		to brake pedal	6:03	
		Looks right	6:09	
South St.		Stops, looks left	6:23	
		Feels directional signal		does not yet know
still stopped		Looks left, right slowly		path and she
	3	starts, asks way, points		should ask, it's
		takes too sharp right	6:42	late
				looks confused
		stop, does not respond	6:51	"
Summer St.		to directions, makes		"
at So.Station	4-	error		"
		Labors over wheel at		"
		stop, turning right, left.		"
	4	Starts, hand signals left		Understanding of
		Cuts across traffic	7:12	directions
	4	Purses lips, moves quickly and hard		" tense situation
		purses lips cuts across		going across
	3	Raises right hand, tense thumb, moves hand,		traffic "
		gestures, nods, moves	7:46	relaxing
stopped	3	body forward, back, stops	7:54	composes body
before Congress St.				

Location	R.L.A.	Non-verbal Behavior	Elapsed Time	Context
		Starts, points gestures w/right hand (on wheel)	8:00	dislikes bumps
Stop & go traffic on Atlantic Ave.		continuously waves back and forth		2nd R.R.tracks in road (says so)
	3-	Head up, right	8:12	very difficult
		eyes head right, twice	8:17	driving (says
Northern Ave.		Stop. Start fast, stop	8:28	it's awful)
		Looks left,	9:23	"
	3	" right, right	9:29	"
	3	slows, lips set jaw forward		on bumps
Before going under expwy.		purses lips. Stops moves body	10:07	"
		starts	10:15	unsure of
	3	mouth open		directions
		concerned hesitant		"
		looks left	10:32	"
		pursed lips, stop	10:39	"
	4-	A fight breaks out in front between others		
under expressway				
	4-	Blows horn, cuts	10:48	working hard
		around	11:04	"
drives fast	3	looks at fighter (in	11:13	"
no stops		car)		
	3	Hands high		relaxes
		Head right, eyes st.		speech emphasis
		shuts off signal		talking freely
		points with right hand	11:23	"
	3	Looks left, right,		"
		smiles, turns all	11:42	talks to rear
	3-	the way around		(observer)
	2	looks behind		makes joke
out from under expressway	3	Cuts out of "tunnel" straight arms wheel,	11:53	
at beginning of Sumner tunnel intersection		stops, starts		
		Looks concerned, frowns	12:04	perceives com-
	3	Looks right, left.		plicated inter-
		Around rt, left, rt.		section
	4-	Points ahead	12:10	works very hard
		Bites lip, looks right	12:15	at crossing
		at cars coming out of		"
	4	Sumner Tunnel		"
At Hanover St.	3	Hands high, head up, eyes		Relaxes some-
		head, straight		what, attending
		Makes turn under highway		heavily
	3	driving slowly, carefully		driving through
		smiles, makes	12:47	pedestrians
At beginning of Washington St.	3	second turn	12:50	(visible) relaxed


BEGIN TRUCK
MASSACHUSETTS AVE
CITY HOSPITAL
ALBANY ST
ROXBURY CANAL
SOUTH BAY
SCALE 1" = 800'
FITZGERALD EXPRESSWAY
SOUTH STATION
FORT POINT CHANNEL
SUMMER TUNNEL
ATLANTIC AVE
LONG WHARF
CHARLESTOWN BRIDGE

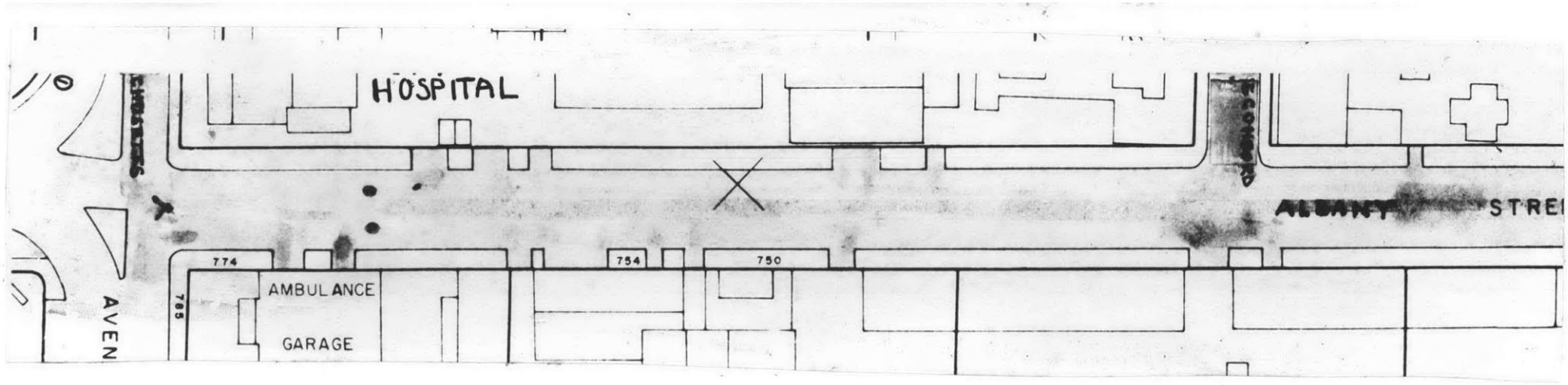
1" = 100' REFERENCE MAPS

The maps on the following 16 pages are included to give a more detailed reference source to the environment of the road. The maps should be read in sequence and from top to bottom.

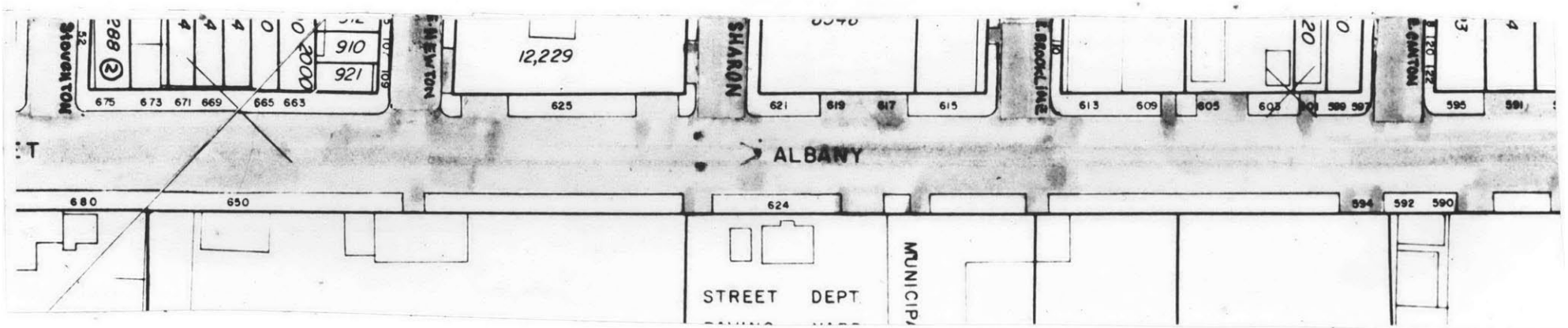
K. KEY TO CHANNEL NOTATION

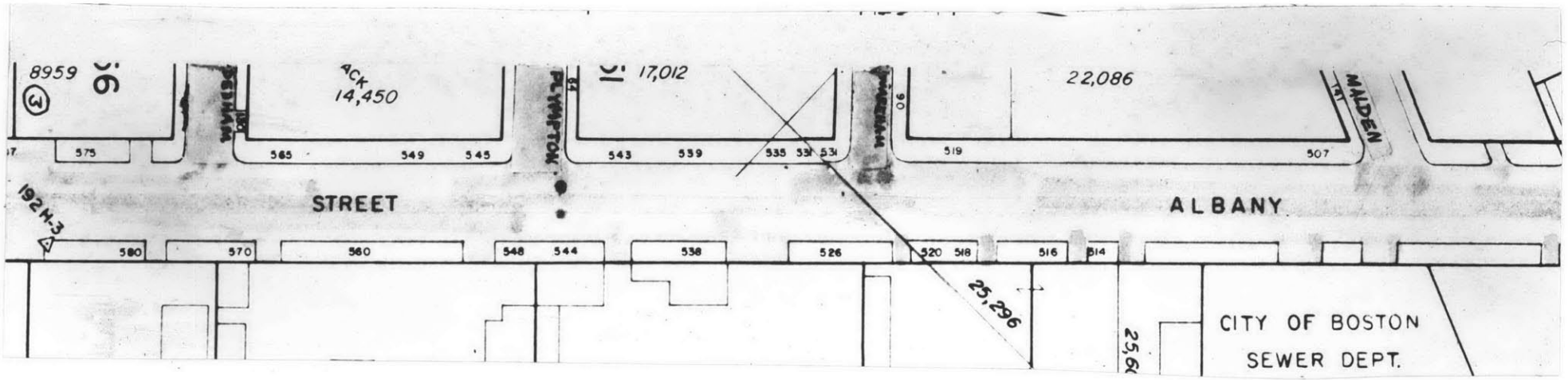
Symbol.	Meaning
	two way, no divider
	two way divided
	one way
	no or obscure channelization
	the route itself is denoted by a darkened line
	direction of intersecting traffic stream
	tunnel or overhead structure
	the route under an overhead structure
	direction of travel en route

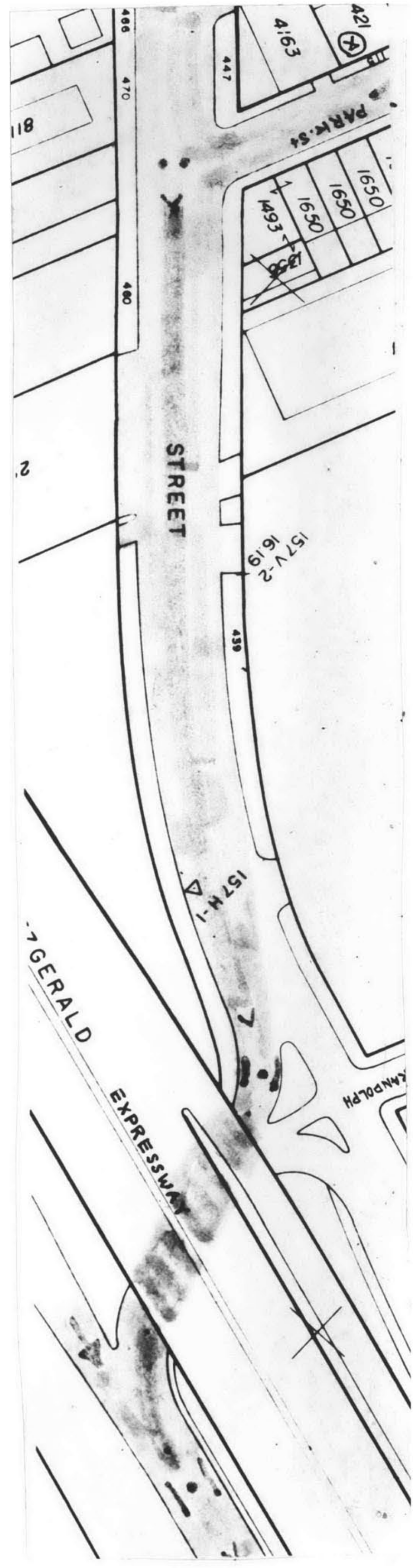
115

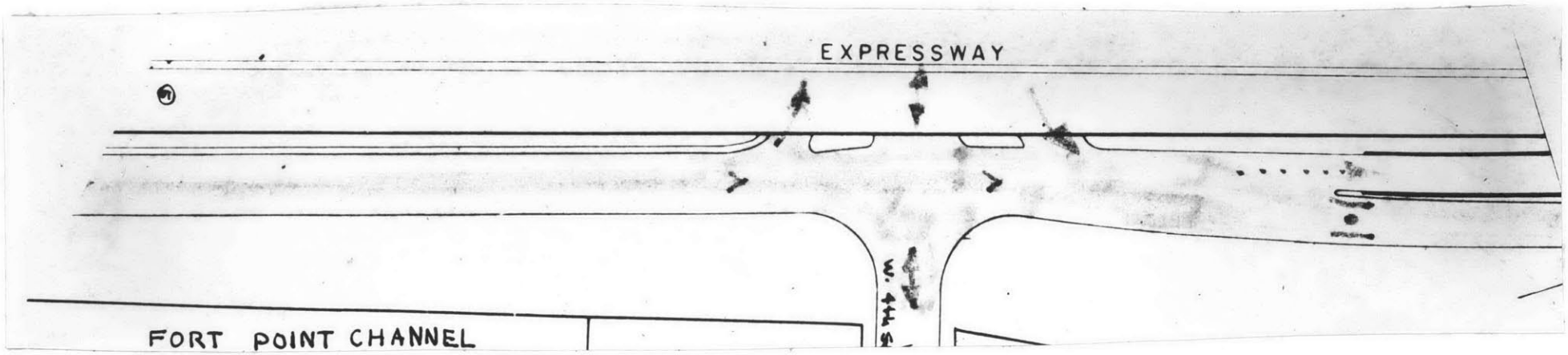


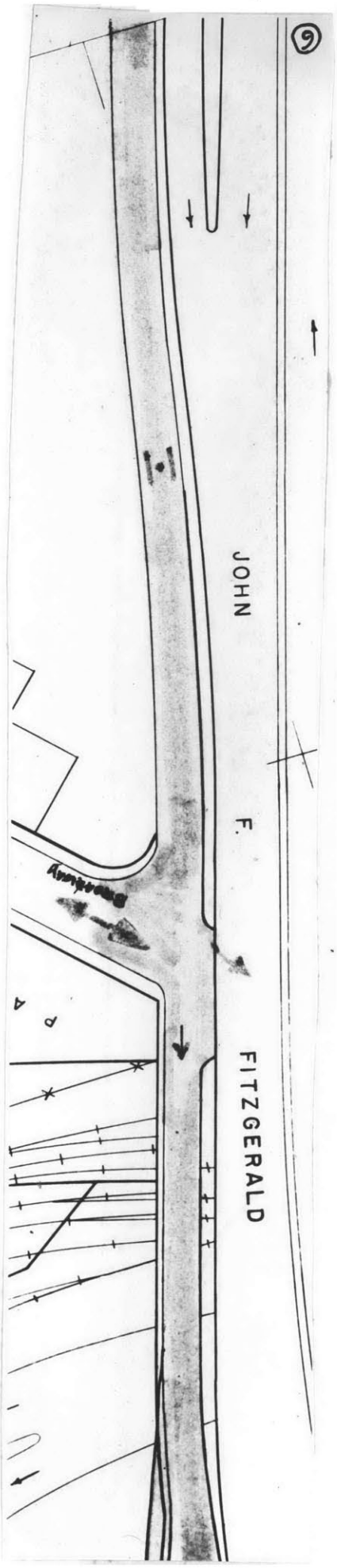
Begin

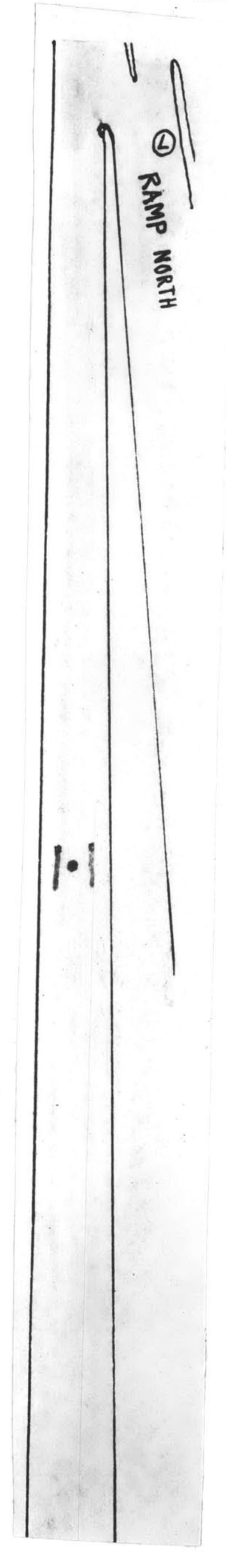

910
921
12,229
SHARON
675 673 671 669 665 663
625
621 619 617 615
613 609 605
595
591
ALBANY
680
650
624
592 590
STREET DEPT

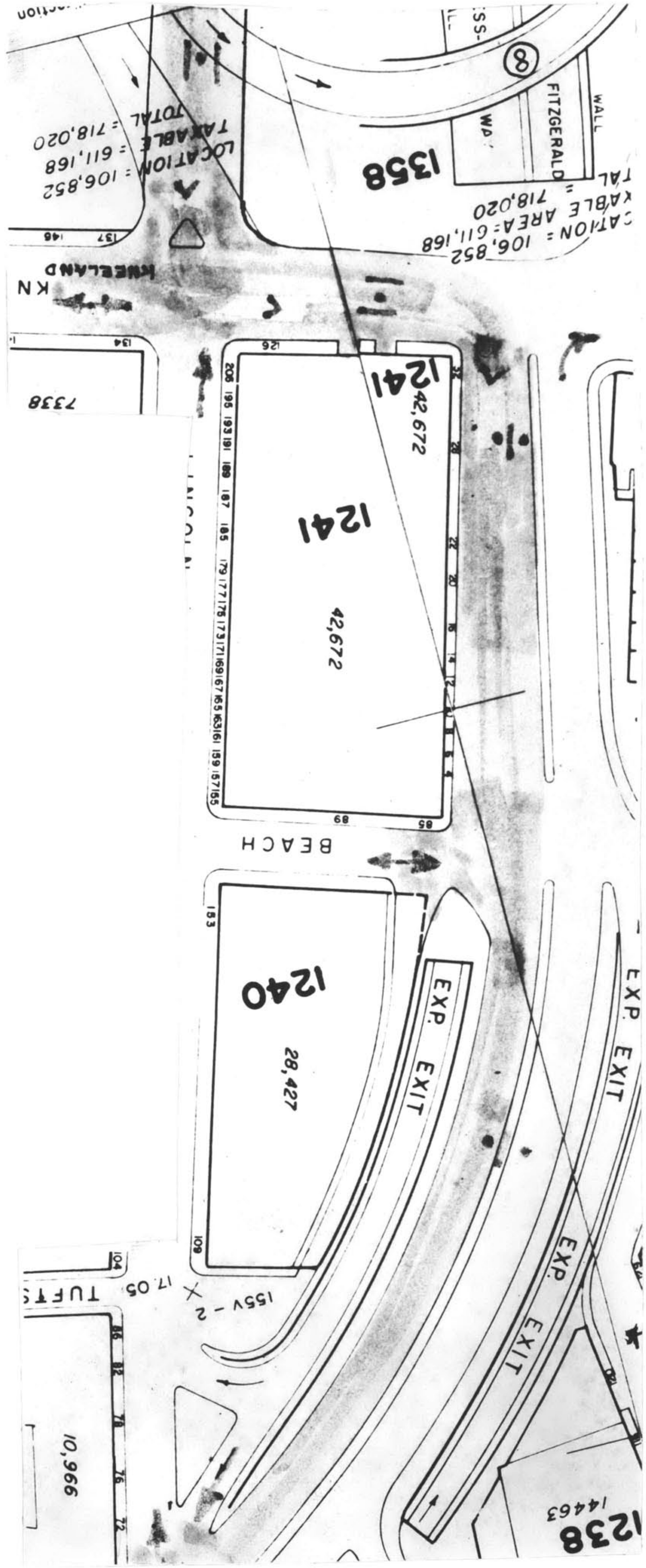

8959
3
96
ACK
14,450
17,012
22,086
MALDEN
575
565
549
545
543
539
535
531
519
507
STREET
ALBANY
192M-3
580
570
560
548
544
538
526
520
518
516
514
25,296
CITY OF BOSTON
SEWER DEPT.

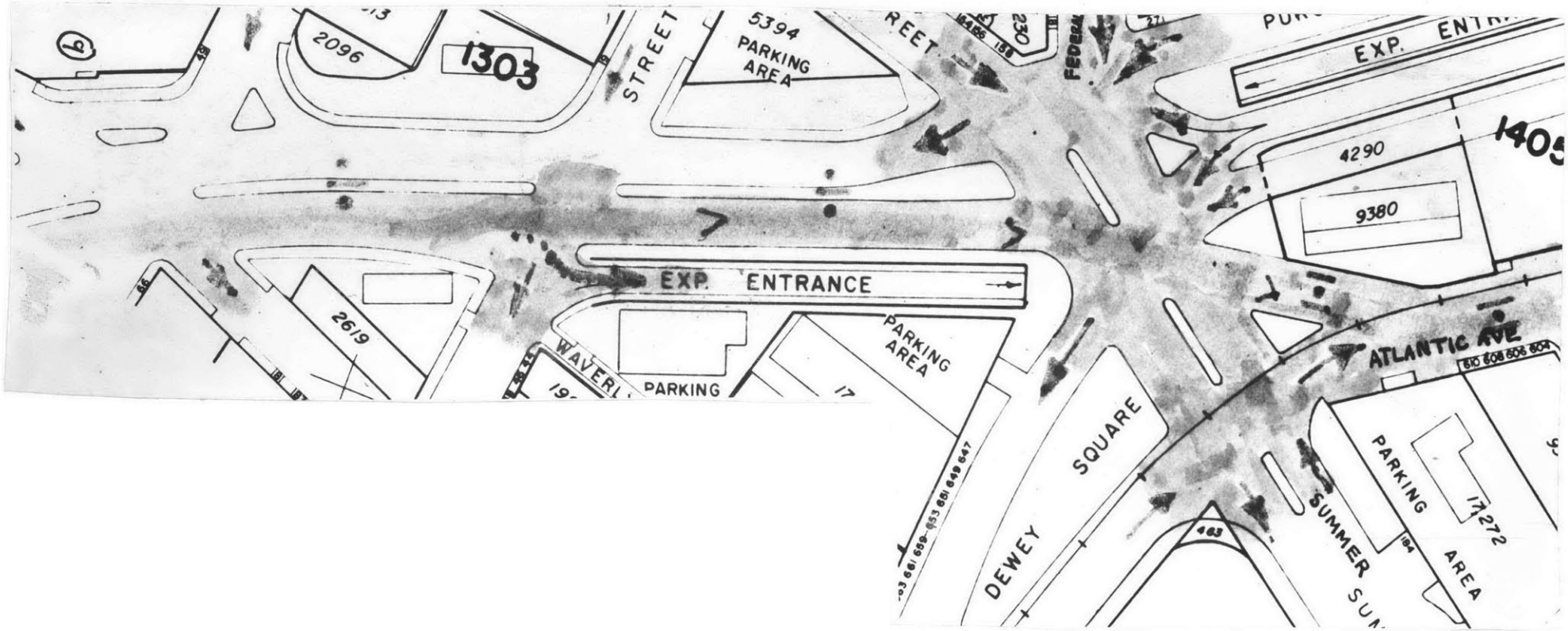

STREET
PARK St
157 V-2
16.19
157 H-1
GERALD
EXPRESSWAY
RANDOLPH

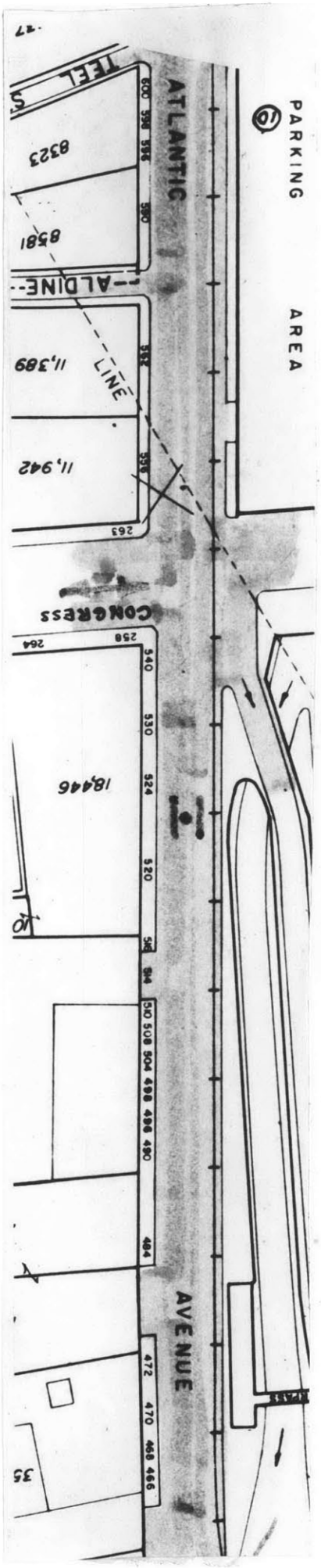

EXPRESSWAY
W. 4th St
FORT POINT CHANNEL


9
JOHN
F.
FITZGERALD


RAMP NORTH


LOCATION = 106,852
TAXABLE = 611,168
TOTAL = 718,020
1358
FITZGERALD
WALL
KNEELAND
1241
42,672
BEACH
1240
28,427
EXP. EXIT
TUFTS
155V - 2
17.05
10,966
7338
1238
14463


2096
1303
STREET
5394
PARKING
AREA
EXP. ENTRANCE
4290
9380
2619
PARKING
AREA
ATLANTIC AVE
DEWEY
SQUARE
PARKING
AREA
17272
SUMMER


ATLANTIC
AVENUE
PARKING
AREA
CONGRESS
ALDINE
LINE
TEEL
8323
8581
11,389
11,942
18,446
263
258
264
540
530
524
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514
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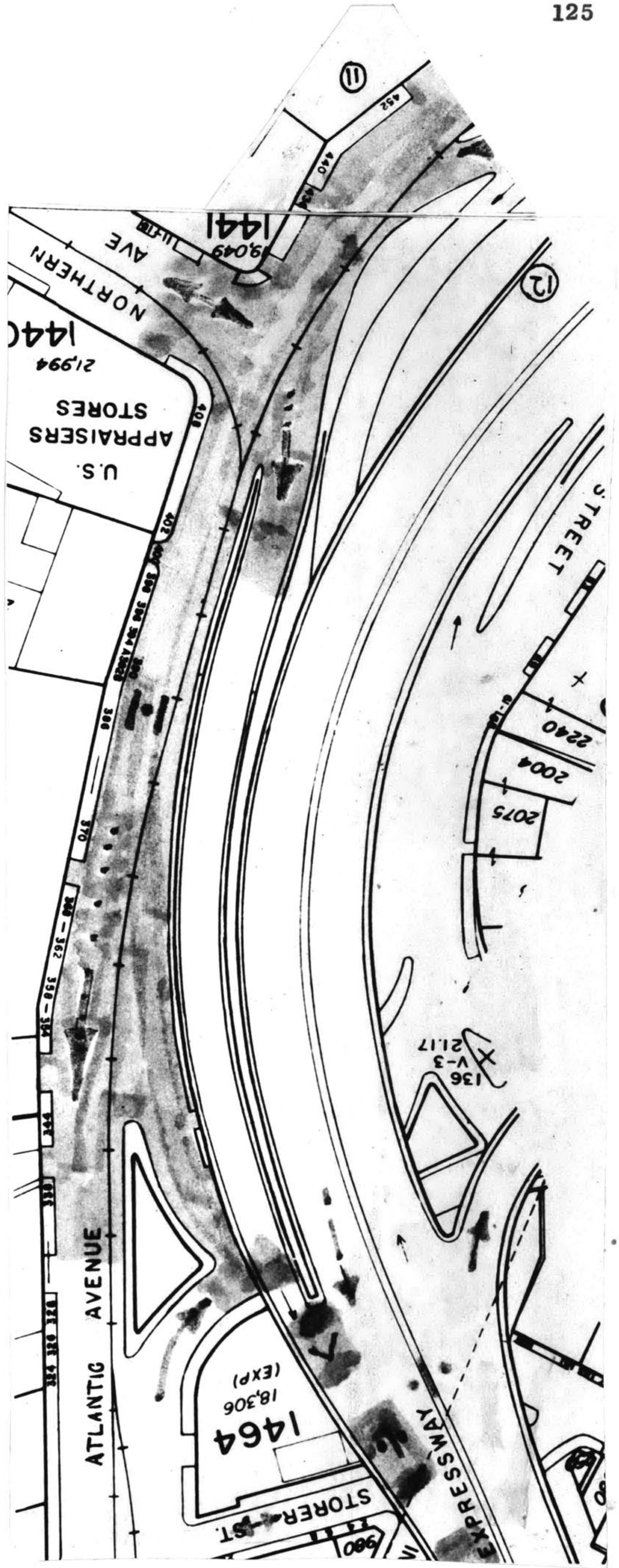
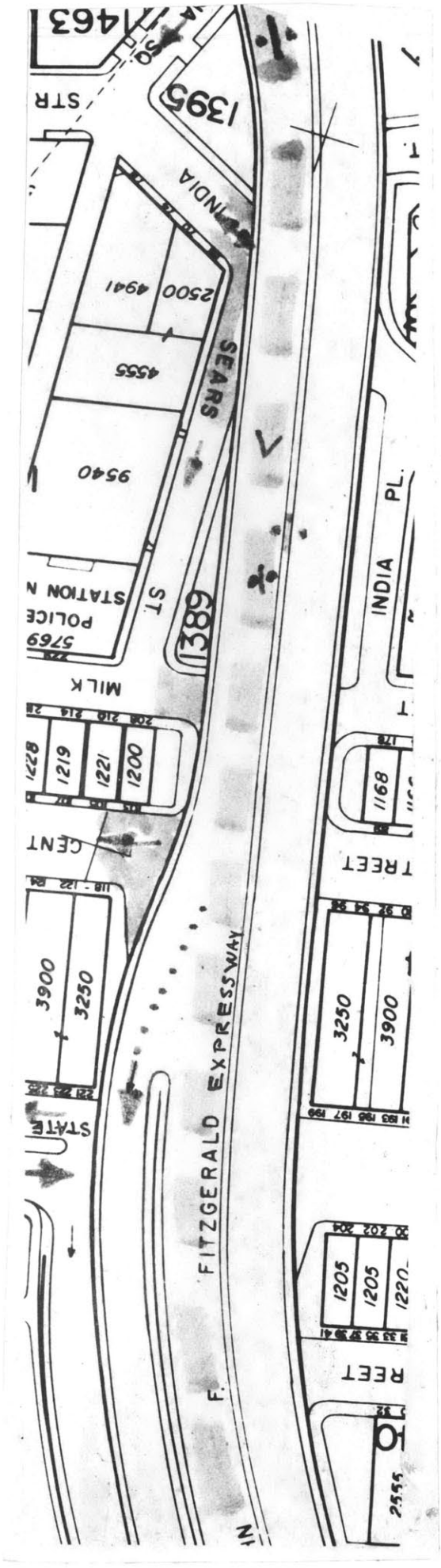
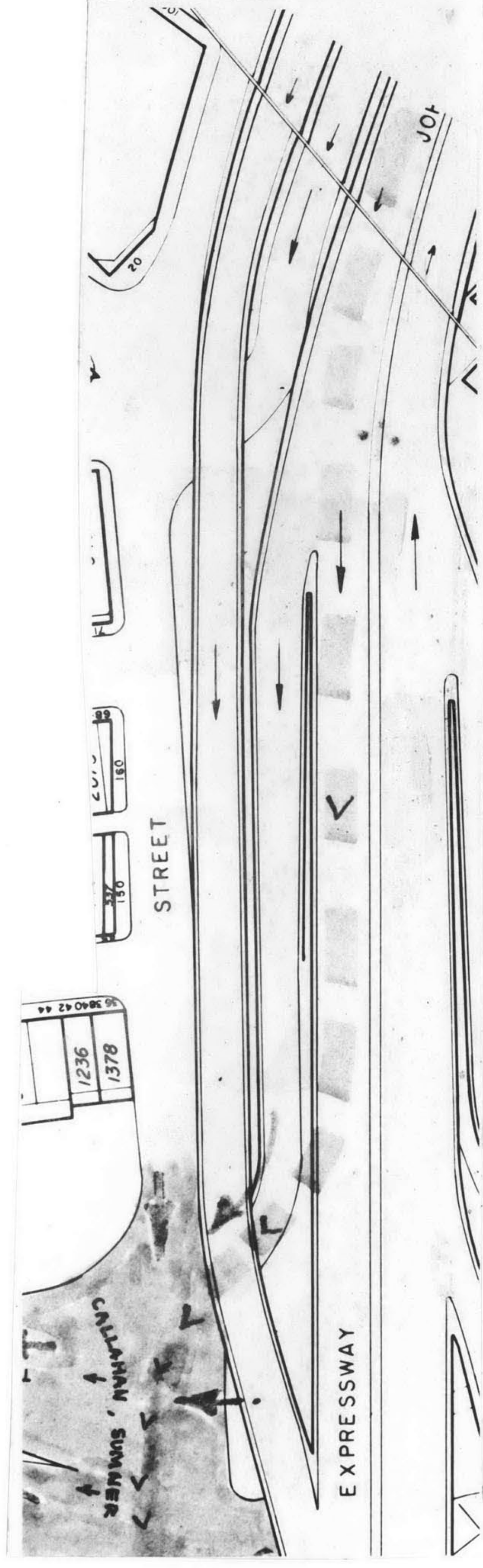
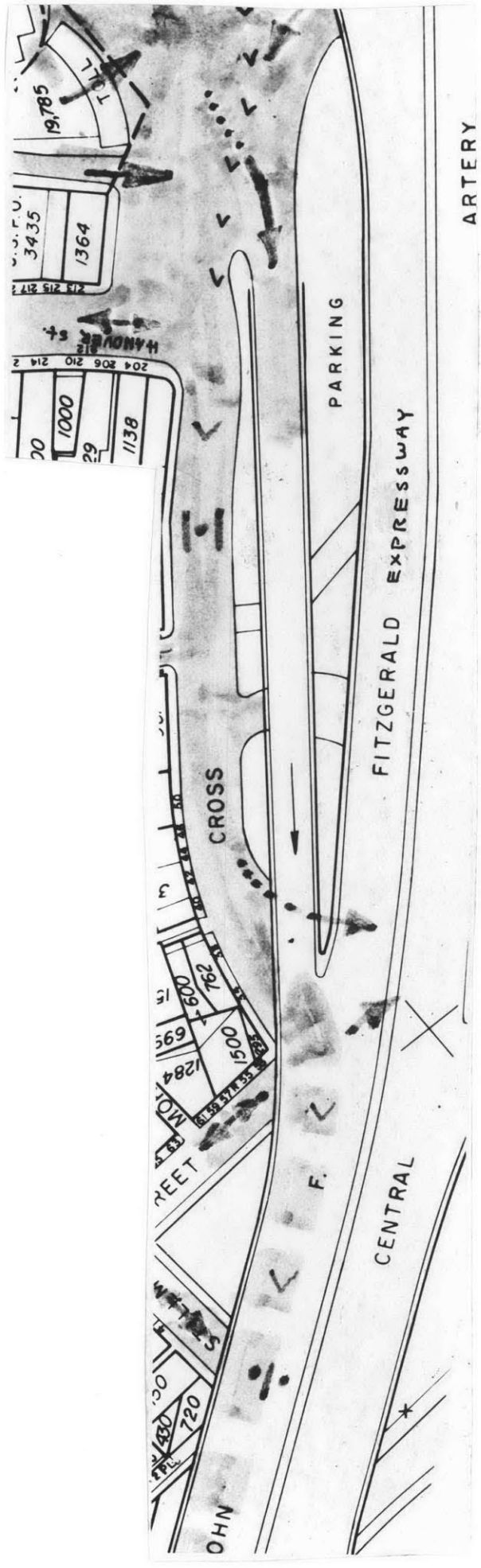
508
504
498
496
490
484
472
470
468
466
35

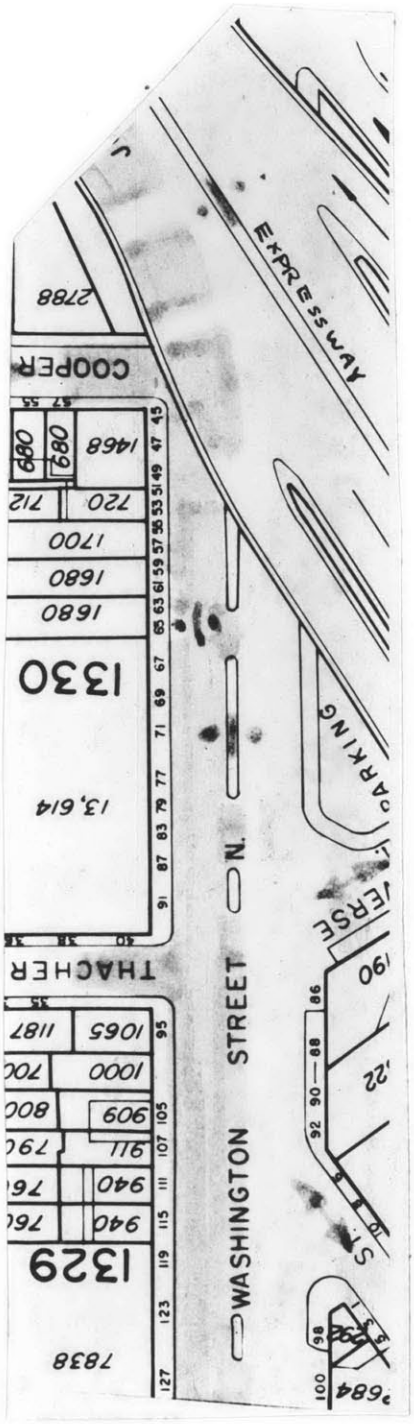


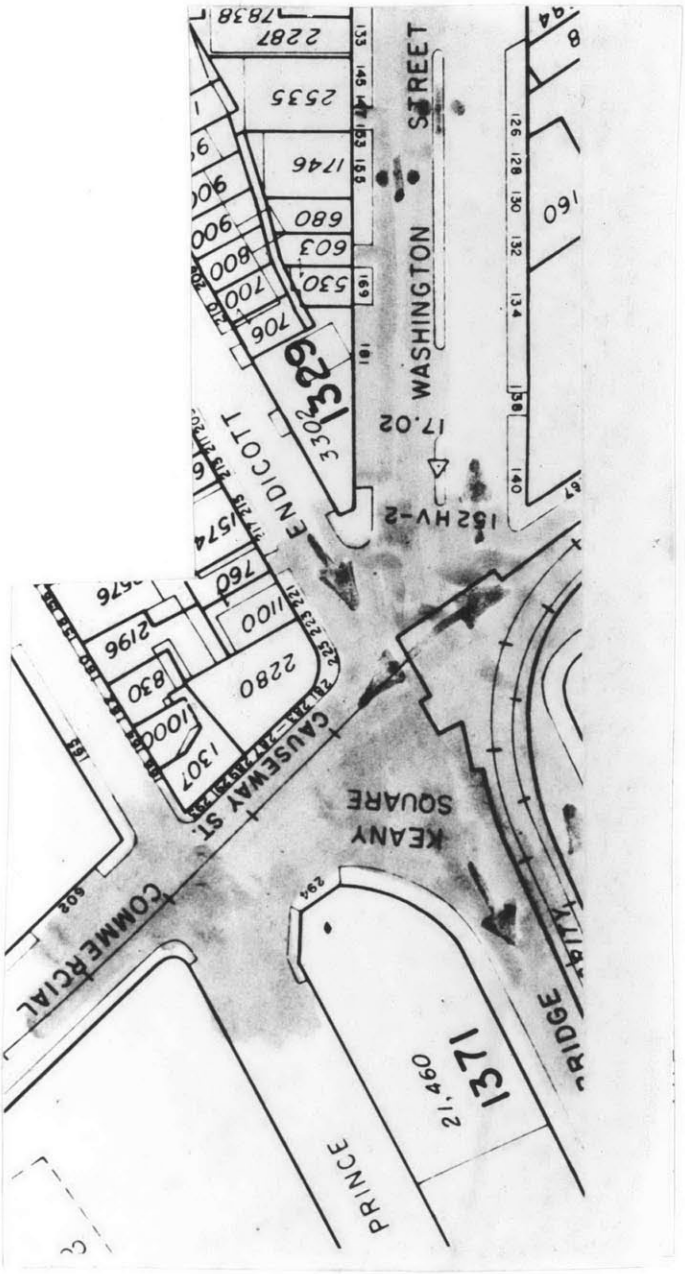
NORTHERN AVE
1440
21,994
U.S. APPRAISERS STORES
1441
19,049
STREET
2240
2004
2075
136
V-3
21.17
ATLANTIC AVENUE
1464
18,306
(EXP)
STORER ST.
EXPRESSWAY
408
402
386
370
358-364
344
338


463
139
STR
INDIA
2500
4941
4555
SEARS
9540
STATION N
POLICE
5769
ST.
389
MILK
INDIA PL.
1228
1219
1221
1200
1168
CENT
TREET
3900
3250
3250
3900
STATE
FITZGERALD EXPRESSWAY
1205
1205
REET
2555


STREET
EXPRESSWAY
CALLAHAN , SUMNER
1236
1378
20
160
130


FITZGERALD EXPRESSWAY
PARKING
ARTERY
CROSS
CENTRAL
19,785
3435
1364
1000
1138
762
600
1500
720


EXPRESSWAY
WASHINGTON STREET N.
PARKING
COOPER
THACHER
2788
1330
13,614
1329
7838
1468
720
1700
1680
1680
1065
1000
909
940
940
9684


WASHINGTON STREET
ENDICOTT
CAUSEWAY ST.
KEANY SQUARE
COMMERCIAL
PRINCE
1529
1571
152 HV-2
17.02
21,460
160
2535
1746
680
603
530
706
760
1100
2280
830
2196
1307
1000
2287
7838

CHAPTER V

THE DATA

Route map and zone division graphics for following charts and data

Accompanying and giving spatial meaning to all the charts and data is a standard route map at 1" = 800' scale. The curve of the map is straightened for convenience at two points, (dotted lines and directional arrows) one just before Congress Street and another after Northern Avenue. The map as well as all charts should be read from bottom to top.

All charts and maps are divided into eighteen sections or horizontal zones by horizontal lines having their origin in columns B and C. Where both columns (B or C) are toned, the zone defined by the tone in column (B) will be larger than, and inclusive of the zone defined by column (C). Column (C) zones are small approach zones within a larger road sequence, totals for which are given separately and together with the larger column (B) zone on page in the zone division totals /Column (C)/

Significance of Zones

Column (D), zone division name and context, locates and in part describes the activity or task to be performed or attended to by a driver on the road.

In a sense, each zone encloses a length of road which has a kind of inbuilt "behavioral program." It is the context of this program which is described in Column D.

Emotion and Discomfort Data

Before proceeding pull out map and data page 183.

Emotion Sequences

Columns E through N inclusive present the total sequential listing of all recorded emotional responses for all subjects tested /key to emotion symbols page (84)7.

Zone Division Totals

In Column O are a tabulation of emotional response types that occurred in groups of two or larger. With the exception of errors (which are not emotions) single occurrences of a particular emotional reaction were regarded as spurious and were therefore ignored in this tabulation.

Collations for Points

Column P lists precise points along the route where multiple entries of the same emotional reactions were recorded. The figure to the left of the symbol represents the number of times for that point the indicated (by symbol) emotional response was recorded.

Channelization

Column A records the onset of new types of road channelization as they occur to the driver. See key to Channel notation, page 114.

Discomfort Index

Columns Q. R. S. and T present the raw data (Q. R, S) and the summary profile (T) for the Discomfort Index. This profile is based upon the assumed dichotomy of emotional responses into two major categories - those which allow the individual to remain comparatively calm and untroubled, and those emotions which are relatively uncomfortable.

Into the first harmonious category fall the emotional states of pleasure (u), relief (o), states of contentment-security (o). These emotions are given the normative score (0) (zero).

The second category of uncomfortable psychic states includes the emotions of anxiety (*), irritation (x), anger (⏢), loneliness (⊡), depression (⌒), frustration (⋊), confusion (?), repression (⊥), disorientation (D), boredom (⊖), and negativeness or rejection (⊖). Each of the above assumed unpleasant responses is given a score of 1 (one). Within these categories unlike emotional responses may be treated together as long as they fall under the same general class.

Discomfort Index Profile

Thus the discomfort index profile is made up of the added scores of 1, each representing an individual's uncomfortable response to the road environment or to the trip. Note that high scores, such as 9 recorded at the Sumner Tunnel intersection, do not represent high intensities of discomfort. Instead they should be read as collations of like uncomfortable responses from the ten tested drivers.* A copy of the Discomfort index profile is also included with the R.L.A. Profiles on the comparison sheet, page 182 .

The raw figures upon which the discomfort profile is based are recorded in columns Q, R, S. Included in this set of figures are the occurrences of errors. Errors in driving-accidents, wrong turns, missed lights, signs ignored, etc., are not properly classed with either the Emotion-l responses or with the relative levels of attention. However, it is felt that some analytical value may be discovered from comparison of error points and volumes with these responses and so error listings are included with both the Emotional and R.L.A. profiles and figures.

Discomfort Index Runs and Total Profile

Page 185 is a pull out chart of the Discomfort Index Runs and total profile. Each of the ten runs is given with a score

*Explanatory note: There were ten drivers tested for emotional response and eleven drivers tested for R.L.A. responses. The difference in sample size is of no importance to this study.

of one (indicated by block of color placed against the base line (O)). Where an emotional response of the uncomfortable category was recorded.

R.L.A. Runs Expanded Form

Page 184 is a pull out chart of the individual R.L.A. profiles for each of the eleven runs. The profiles are constructed around the normative base line of 3. Scores below three are indicated by a solid tone and their numerical score. Scores above three are indicated by a notched area and the numerical score. Errors are indicated by numerical scores of 0.6.

The Averaged R.L.A. Profile Expanded States

Before proceeding pull out map and data page 182 .

The expanded state R.L.A. Profile is based upon the assumption that levels of attention or arousal do not cut off immediately after inception, but instead, linger on until superceded by another changed state of arousal.

Neither of the assumptions behind the two averaged profiles should be taken as representative of the actual dynamics and duration of arousal states as experienced by drivers. Both are exaggerations of opposite ends of the time-duration scale for the purposes of extracting particular kinds of information from the data.

Probably the various arousal states (or R.L.A. levels) show neither sharp attenuation after inception nor do they linger on and on until a new arousal situation supervenes. More likely, shortly after inception of a particular level of vigilance there is a gradual diminishing of intensity which may show differing degradation rates for higher and lower levels of attention.

To the extent that the compressed profile shows distorted R.L.A. levels toward the normative, the expanded profile is distorted away from it toward the high and low extremes 0 and 6. This is due to overlapping between the averaged individual profiles at the points where each may show an extension of unrealistically long duration of any single R.L.A. level. This distorting factor should be particularly true for the more uneventful stretches of road where new R.L.A. states do not often interrupt each other. Long distances of high or low levels of attention such as appear (on the expanded profile) along Albany Street are somewhat questionable.

Interpretation of the Expanded Profile

As may be seen, the profile conveniently falls into three sections (A.B.C.) the first (A) from City Hospital to Broadway begins at (2) the lowest (averaged) level to appear on the profile and rises intermittently to a single peak high of (4).

In this first section over half of the length recorded is shown at a level lower than the normative (3). Nowhere else on the profile save for an inexplicable transient (2-)

is the R.L.A. so low.

Section (B) begins at Broadway. Here for the first time the driver can see the downtown area massed large directly ahead. Perhaps significantly at this point also the R.L.A. rises to 3- which is sustained with only upward variations for roughly one third of the total length of the trip and the whole of section (B).

Section (C) begins as the road enters the space under the Southeast Expressway. The relatively high R.L.A. drops to 3 and stays at (3) for over a third of the length of section (C), a sure sign that the individual profiles show a spattering of recorded (2's) which they do. Abruptly as the road leaves the confines of the overhead structure for the chaos of the Sumner Tunnel intersection the R.L.A. rises for the longest and highest peak on the profile (4-).

Once in the North End, the levels diminish to 3, rising suddenly again before a second short run under the expressway, where the level drops once more for an instant to (2-) rising again to (3) at which the trip finishes.

The Averaged R.L.A. Profile Compressed State.

Before proceeding pull out map and data page 182

This profile is based upon the assumption that states of attention or arousal have a short duration. Therefore only points where new values were recorded on the individual profiles

have been included. It is a profile of value change points.

This compressed profile is not a true picture or true average of the alignments among the eleven drivers' R.L.A. profiles, rather, it is a profile which describes the arousal characteristics of the route, for points of arousal inception only. Therefore, due to the elimination of recorded levels of extended arousal hanging over after the point of inception, the relative peak to trough heights are of less consequence and may be more or less disregarded except for major excursions.

R.L.A. values will be distorted uniformly toward the normative point (3) resulting from the assumption that at points where no value changes were recorded, the value (hanging over from a previous change) would revert to 3 (norm). The profile should be read as a linear record of nearly equivalent arousal points, other or further interpretations tending to mislead.

Interpretation of Compressed R.L.A. Profile

Twenty points show up as significantly above the baseline R.L.A. of 3 and none fall below it. Where no numerical value is listed the norm (3) may be assumed.

Listed from the beginning of the trip they are:

		R.L.A.
1.	Before Wareham St.	3-
2.	Before Park St.	3-
3.	Immediately after the bridge under the expressway at the end of Albany St.	3-
4.	Before West 4th St.	3-
5.	Before expressway North ramp	3-
6.	At expressway North ramp	4
7.	At Broadway at the expressway North ramp	3-
8.	Before Kneeland St.	3-
9.	Before Kneeland St.	3-
10.	At Kneeland St.	3-
11.	At Beach St.	3-
12.	At Lincoln St.	3-
13.	At Essex St.	3-
14.	South Station approach	4
15.	South Station intersection	3-
16.	At State St.	3-
17.	Before Sumner Tunnel	4
18.	At Sumner Tunnel intersection	4
19.	" " " "	4
20.	Before going under expressway after Hanover St. North End	5

CHAPTER VI

DRIVER ROAD INTERACTIONS

It is too early to attempt a formal evaluation of design quality based upon the findings of these experimental methods, nor are the presentation of such findings part of the intention of this thesis.

The discussion which follows is tentative and informal. It is intended to illustrate the probable ways in which the behavioral information, once recorded, might be employed as design feedback to the improvement of an already existing situation.

In an attempt to arrive at a new set of working hypotheses the limited data that has been presented will be explored for possible evidence of driver-road interactions. The model and operational definition of Driver Road Interactions is based upon the two person dialogue, with the stimuli from the road and the road environment in the role of one "person," the driver being the second person.

In the course of a typical trip, driver and road carry on a continuous "conversation," each dependent upon the outcome of the other's "answer" to put "questions" to formulate the next "question."

The driver in unfamiliar territory rounding a blind curve urgently asks of the road (with his eyes) where next? What next? or where is the road? Should the road be straight, wide and unobstructed, easily seen and understood, the driver will have his "answer" and is free to act or direct his path accordingly. As he drives further on the strength of his "answer" information, the road will disclose new perspectives or hide them, respectively "asking" the driver to choose his path and to act, or if the road is hidden, provoking the driver to seek a path or to "question" the road.

If, as in the case of the previous illustration there is an easy exchange or access to information, the driver will at all times be prepared to cope with his pathfinding, lane choice, and intersection alternative decisions, further, his car will be in control and not overdriven, i.e. his speed will be appropriate to the approaching environment, and his movements prepared for in advance.

If in the opposite case a driver rounding a blind curve, as in the first example, should ask of the road, what next? where?, and receive as an "answer" the bafflement of an imposing expressway, toll booth or 2 three-way forks in the road he may react with anxiety or confusion. The road has answered a question with a question at a time when an answer

was needed quickly. The dialogue has been disrupted. Unfortunately it is the driver whose failure is most easily observed at this point. But it is the road design and its sequence of information disclosure which has really failed.

A Discussion of the Route in Behavioral Terms

The following discussion of the data will make most use of the chart, Comparison Sheet, which appears on page 182. This chart should now be pulled out for reference during the reading. The analysis of the data and the route will proceed zone by zone for all eighteen zones except where two zones are best treated as a unit. Each zone will be described in three parts:

First, a general physical description including the program of the zone to be followed by the driver;

Second, a recapitulation of the driver responses to the part of the route delimited by the zone;

Third, an attempt to trace the observed driver behavior presented in the profiles to its sources in the environment of the road and in the road itself. In this third part, objects and conditions which appear to affect the behavior of a significant portion of drivers will be tentatively identified and hypotheses drawn about Driver Road Interactions.

At the end of this section on page 166, will appear a short critique of the route in behavioral terms, identifying points at which the behavioral fit is poor and the road malfunctions.

Zone 1

From City Hospital to after Park Street, Albany Street throughout its length, may be regarded as one unified space. It is a long straight road with good perspective view, a series of 11 streets evenly punctuate the left side. There are no streets at all on the right side, little traffic flow is encountered from the side streets until one reaches Wareham Street, thereafter traffic increases to a maximum flow leaving Park Street.

Zone 1 Responses

For this beginning zone, the Relative Level of Attention Expanded Average (R.L.A.X.) is at the very outset the Lowest score (2) to be recorded anywhere on the trip. The Relative Level of Attention Compressed Average (R.L.A.C.) is at (2.8) below normal, indicating that there is either a distracting stimulus at the beginning of the trip, or that beginning the trip in an experimental situation is somewhat distracting in and of itself.

The Discomfort Index Total registers a fiarly high (5)

indicating that nearly half the drivers were uncomfortable at the outset.

It seems reasonable to assume some discomfort due to the unusual circumstances of the interview-driving situation, also it is to be expected that emotional states evaluated at the beginning of the trip probably exhibit some hold-over from earlier states not associated with the trip environment.

The R.L.A.X. shows a steady rise in the first half of zone 1, reaching the norm 3 exactly in the middle. The R.L.A.C. rises immediately after the initial Low of (2.8) to the norm (3) and continues to the same midpoint in zone 1 where it shows a very small rise to 3.1. It is also at this point that the D.I.T. shows the first of 3 peaks of (2). This score of (2) is not high and the position of the three peaks indicates that they result from disturbances at the intersections of Dedham Street, and again at Wareham Street which are too slight to register their effects on the R.L.A. profiles. Only on the third peak of (2), at Malden and Park does there also appear on the R.L.A.X. a slight rise to (3.4). Just after Park Street, however, the R.L.A. C. rises to (3.5), a fairly high score for this profile /the highest recorded is (4.5)7 showing a sharp stimulus after the side streets have all been bypassed which may anticipate rises in the D.I.T. and in the R.L.A.X. in Zone 2, and may reflect traffic slowing for coming turn.

Zone 1 Interactions

Pre-trip experiences have influenced the outset of zone 1. These influences are soon overcome by the need to cope with the immediate situation. Thus a gradual rise in R.L.A. to the norm. At the far end of the street, increasing traffic flows exiting from side streets cause rises in discomfort levels which are echoed in the R.L.A.X. profile only very late in the zone. The peaks in all three profiles are characteristically low and of short duration with no carry-over even in the R.L.A.X. Emotional sequences of individual runs show a nearly even scatter of reaction types with any (2) point collations for anxiety before Dedham Street.

Zone 1 characteristically is nearly homogeneous and uneventful giving rise only to quickly suppressed mild emotional stirrings due to traffic conditions and a slowly rising demand upon the driver's attention.

Zone 2 and Zone 1

The program or task to be met in Zone 2 is as follows: In a short time and space (400 feet) approach an end to the straight road of Zone 1 through a gradual left curve which culminates abruptly at a two way fork (the left side of which must not be entered) a sharp turn to the right and a plunge under a bridge carrying the Southeast expressway overhead. Under the bridge the road follows a rapid "S" curve in the relative dark. Also, the fork marks the beginning of one way channelization and the entrance to southeast expressway service roads.

Zone 2 and 1 Responses

The R.L.A.X. shows the first sustained rise of the route beginning just prior to zone 2 and continuing at (3.3) until just beyond its far border. The R.L.A.C. rises to a low (3.2) shortly before entering under the bridge and coinciding with the island dividing the fork in the road where the sharp right turn must be made. The Discomfort Index totals rise to (2) at the same point, and then rise again to (4) which is maintained into Zone 3. The zone division totals of emotional responses show two anxious and two depressed drivers. The same two anxious drivers show up on the point collations.

Zone 2 and 1 Interactions

Anticipation of a coming transition from a predictable roadway through a somewhat ambiguous fork in the road, to a roadway which lies hidden beyond the bridge (through which there is no clear view) produced a long sustained mild rise in attention (R.L.A.X.). The lack of a well defined route direction and the coincidence of the need for rapid decision making increases both the urgency and the rate of the driver road dialogue. Two drivers react with signs of anxiety probably resulting from inadequate information and the realization that they may have made a wrong turn. Two others are seen as depressed (which may easily be the result of suppressed anxiety or some other reaction such as confusion).

These "unanswered questions" follow them through the zone 2 maneuvers, with Discomfort levels rising from (2) to (4).

Zone 3

Called "after bridge" in the column zone division name and context, Zone 3 is an extremely short recovery and re-orientation zone. The driver emerges from the darkness under the bridge in Zone 2 and, while quickly coping with intermittent traffic impinging upon him from over his right shoulder (rear right), he first glimpses his direction on the new, formerly (Zone 1) hidden, roadway. He sees ahead an undulating, straight roadway interrupted by cross streets at regular intervals. His channel, one way is sharply defined by the expressway overhead to the left and the Fort Point chennel below to his right.

Zone 3 Responses

The R.L.A.X. of (3.3) which was maintained through zone 2 drops to normal just as the R.L.A.C. rises to (3.3). The Discomfort Index drops to (1). The 3rd zone sees two pleasure responses and two anxious drivers.

Zone 3 Interactions

The opposed movements of the two R.L.A. profiles suggest that there is a measure of release from the specific tension of elevated levels of attention due to the intersection and turn complex just traversed, a hypothesis which is strengthened by the two "pleasure" observations which turn up in the Zone Division totals.

The short peak seen in the compressed R.L.A. average is almost surely due to the need to evaluate and cope with the traffic which is entering from the driver's right rear. In general, short, abrupt rises in either R.L.A. or discomfort Index profile are probably not potent enough to transfer their effects from the emotions to the Levels of attention or vice versa. This exigency is soon over. The Discomfort Index profile shows a reduction from (4) to (1) in Zone 3.

Zone 4 and Zone 5

West Fourth Street and its approach in the 4th zone is a short entirely visible piece of road leading to the traffic signal controlled intersection at West Fourth Street. Shortly before the intersection there is the opportunity to turn left and return under the expressway to its other side. Beyond, Zone 5 is also visible in its entirety.

Zones 4 and 5 Responses

The Zone division totals (groups of two or more similar emotional responses) for Zone 4 show one error, four irritated and five confused drivers. (The same score is seen on the point collations.) The Discomfort Index rises from an initial (2) to (9) and drops quickly back to (2) in the short space of this zone. The R.L.A.C. shows a rise to (3.4) toward the end of Zone 4. The R.L.A.X. starts at a Low (2.7) and rises, coincidentally with the other R.L.A., to (3.2).

Zones 4 and 5 Interactions

The reorientation process which began in Zone 3 is most active in Zone 4 where the driver has an opportunity to consider his whereabouts. Five drivers are visibly confused. For them the dialogue with the road has again broken down. They have "asked" - where am I, where am I going? The reply is mixed. Ultimate destination is answered quite clearly, however the anonymous roadside's uninterrupted highway superstructure on the left, and undifferentiated swamp and mud on the right for great distances, provide no clue as to the driver's present location. Also, at this point the driver sees ahead into Zone 5 where the only "answer" to his "where am I going?" is found in a fork in the road, one side leading up a ramp to the southeast expressway and the other, also resembling a ramp, unmarked. The dialogue has completely failed. The driver must guess his route and location.

There is enough going on in the driver's mind to cause him to miss details of his immediate environment while looking for larger, perhaps more distant clues. One driver in this situation drove through the red light at West 4th Street. It is within the limits of Zone 4 that a decision must be made about the maneuver to be effected in Zone 5, for the driver must jockey for his proper lane to enter one or the other sides of the zone 5 fork, deciding on the basis of inadequate information and the cutting from lane to lane cause four drivers some irritation.

Zones 5 and 4

Much in the program of zone 5 has been discussed in zone 4. Briefly, it is the approach and entrance to a fork in the road between a ramp up to the superhighway on the left and an unmarked ramplike space on the lower right.

Zones 5 and 4 Responses

As drivers get closer to the fork attention levels rise steadily, from (2.8) to (3.5) and to a high of (4) on the R.L.A.X. Levels on the R.L.A.C. follow closely with none quite so high or quite as low ranging from (3) to (3.3) to (3.8). There is a short peak of (3) on the Discomfort Index in the middle of Zone 5.

Five drivers are still confused as in Zone 4. Four are still irritated. Two drivers show signs of anxiety and three make errors in driving.

Zones 5 and 4 Interactions

As drivers approach the fork more closely, levels of attention to the decision at the fork rise in two steps. Proximity to the decision point does not dispel the ambiguity of the information provided by the road. Three drivers show signs of anxiety as the need to know and to act becomes more immediate. Presumably those who are confused (5) are also somewhat anxious. The special products of Zone 5 over its minor Zone 4 (see Zone Divisions on chart) are anxiety and errors.

Resulting probably from the broken dialogue and from guesswork driving, three drivers take the ramp up to the expressway against instructions. The expressway and its ramp are attractive solutions to the "questions" posed by the driver at this point. They both offer to give him a better view of his surroundings and immediate location from above, and to reestablish the discontinued dialogue.

Zone 6

In Zone 6 the driver approaches the right angle intersection with Broadway and crosses it. There is no traffic light, only a stop sign, and a sign reading expressway north which seems to indicate that the road ahead will shortly become the expressway which it does not necessarily do.

Zone 6 Responses

While R.L.A. levels drop on both profiles from the Zone 5 levels of (4) (R.L.A.X.) and (3.8) (R.L.A.C.) to (3.3) and (2.9) respectively in Zone 6, the Discomfort Index rises to (5). Thereafter the (2.9) R.L.A.C. rises to a Low (3.2).

Zone 6 Interactions

The roadway leading away from the Broadway intersection is visible only right at the intersection. Earlier, vision is blocked by a small hill or undulation in the road. When finally seen, there appears to be no alternative to ascending a ramp to the superhighway - a more delimited dilemma than the similar

ramp in the previous zone. Drivers have just been through an annoying situation of a similar sort. They are primed to avoid the expressway ramps. There seems to be little choice, there is no chaos or confusion of roads, only one road with an equivocal sign. In the dialogue the road has "answered" "yes and no."

Drivers plunge ahead fatalistically, there is nothing to examine for clues thus no rise in the R.L.A. The whole event is over so rapidly - as drivers clear the top of the ramp - that they have no time to react. All the profiles are low at this point.

Zone 7

The seventh is a large zone with several events in the program. The road surface is vertically undulating. At the halfway point in Zone 7 there is a merge with ramps leaving the expressway (to the left) and entering onto the expressway. Further along, the intersection with Kneeland Street and a forced left turn followed quickly by a right turn. The whole zone provides the driver with a dramatic view down into the financial district of Boston which he will soon pass through.

Zone 7 Responses

The earliest part of Zone 7 incorporates the ramp-like road which began in Zone 6. Any discomfort engendered by a lack of information in earlier zones is dispelled by the total nature

of information given to the driver as he tops the rise in the hill and sees his direction and his whereabouts quite plainly. In the beginning of Zone 7 a low (1) discomfort index profile is not surprising. However, a short-lived rise of (3.3) is seen in the R.L.A.C., a hangover of the earlier Zone 6 need for information. This (3.3) rise is extinguished at the top of the hill. The R.L.A.X. begins at (3.1) and then reads successively - (3.4)(3.2)(3.3)(3.7) and (3.4). The late rise in R.L.A.X. is mirrored by rises in both the R.L.A.C. (3.5)(3.3) and in the Discomfort Index (1) (2) (3) (6). Seven drivers are confused, two are irritated, two anxious and two depressed in the course of this zone.

Zone 7 Interactions

General reduction of earlier "hangover" readings on all three profiles coincides with the receipt of an "answer" to long held "questions" about immediate location. The merging of roadway with off and on ramps to the expressway causes a gradual rise in all profiles (at this point no less than 12 parallel lanes of 2 direction traffic are visible simultaneously separated by thin iron fencing.)

The choice of path between the on ramp to the expressway and the alternate (proper) choice, an unmarked service road, causes some discomfort especially as the non-expressway route appears to dead-end in a large building. No errors are experienced however and all drivers remain on the route as instructed.

The intersection with Kneeland Street causes (5) drivers to appear confused and/or disoriented. The Section totals for Zone 7 are (7) confused, (2) irritated, (2) anxious, and (2) depressed. All but four of these responses occur quite close to the Kneeland St. Intersection which accounts for the high Discomfort Index at that point. Drivers find that although the street entrances are at odd alignments to each other and seem to be chaotic, the single direction (permitted) flow is of sufficient volume to make any maneuver other than flowing with the tide impossible. It is not attempted and the R.L.A.'s return slowly to near normal (3.2) (both) while coping with the tighter maneuvers of traffic conditions.

Zone 8

The task in Zone 8 is simply to round a gentle right hand curve and cross several intersecting streets. Zone 8 begins two way divided channelization. None of the intersections are at all difficult and the road direction is well defined.

Zone 8 Responses

All three profiles show similar minor variations which reflect stop and go traffic conditions through this section. R.L.A.X. shows a sequence - (3.4) (3.3) (3.4) (3.5). The R.L.A.C. shows - (3.2) (3.3) (3.2) (3.3) (3.2) (3.3). The Discomfort Index jumps (0) (1) (3) (0). Two drivers are confident and two seem confused or lost. One driver makes an error.

Zone 8 Interactions

Minor variations in observed results reflect traffic conditions and an easily negotiated series of cross streets. Two drivers appear lost or disoriented perhaps as a result of the restricted forward view due to the curving road, and to the somewhat disorienting series of right angle turns made previously in Zone 7. One of these "lost" drivers drove through a red light.

Zone 9

Zone 9 includes only the intersection at South Station. At South Station eleven roads exhaust into about two acres of pavement with pedestrian islands erected here and there throughout in such a manner as to guide the traffic through in orderly fashion. There are, in addition, several sets of traffic lights. For a more adequate description of the space see the map on page .23. Channelization is questionable and confusing.

Zone 9 Responses

All three profiles show strong rises, the R.L.A.X. - (3.5) (3.8) (4), - the R.L.A.C. - (3.3) (3.7) (3.3) - the Discomfort Index (6) (8). Zone division totals show that the intersection adversely affected many - frustrating two, irritating five and confusing six.

Zone 9 Interactions

Although the intersection is both confoundingly large and complex, it is, in behavioral terms, a simple large crisis that must be met. Levels of attention rise in order to cope with traffic and path finding, the Discomfort Index shows that nearly all the drivers are unquiet, confusion and anxiety being the common response. There is nothing to be found in the data for Zone 9 that common sense would not have predicted.

Zone 10

Perhaps Zone 10, after seeing the data, should not have been included as a separate zone at all but added to the previous Zone 9. Zone 10 is the approach to, and negotiation of Congress Street.

Zone 10 Responses

Actually part of the declining levels on all profiles from Zone 9 high points, Zone 10 is swamped in the "hangover" from the South Station intersection. The R.L.A.X. drops from (4) to (3.8), the R.L.A.C. drops from (3.7) to (3.3), the Discomfort Index drops from (8) to (5). If, as is probably the case, the second figure for each profile describes Zone 10, then the demands made by this intersection are discernible within the larger declining curve from Zone 9.

Zone 10 Interactions

Were Zone 10 not preceded by as massive a stimulus as the South Station intersection, it might appear that the profile levels would rise rather than decline. The figures of (3.8) R.L.A.X., (3.3) R.L.A.C., and (5) Discomfort Index may be attributable to the approach and negotiation of Congress Street but the zones are too short, and the profiles too insensitive a tool to pry them apart.

Zone 11

Zone 11 is for most of its length a simple bending stretch of Atlantic Avenue. There is an expressway on-ramp immediately at the beginning after Congress Street, and another just after Northern Avenue. The surface of the roadway is paved with cobbles in places and cracked concrete in others. Railroad tracks run the length of the center of the road.

Zone 11 Responses

The R.L.A.X. begins at (3.8) then fluctuates - (3.5) (3.6) (3.5).

The R.L.A.C. begins at (3), then fluctuates (3.1)(3)(3.1).

The Discomfort Index shows a fluctuating rise - (1)(2)(1) (3)(0).

The Zone Division totals reveal three irritated and two frustrated drivers.

Zone 11 Interactions

With the exception of the two expressway ramps which are well enough marked, and off axis to not tempt their accidental use, there are no events on the road to cause profile changes. The fluctuating R.L.A. profiles may be interpreted as a response to the often heavy auto and truck traffic on this stretch, and to the primary source of discomfort encountered in Zone 11 - The Railroad Tracks. Often drivers find driving parallel to these inset tracks a difficult and nerve-wracking job. Thus the slightly elevated Discomfort Index (3) and the three irritated and two frustrated drivers in the zone division totals.

Zone 12

The program for this zone is uncomplicated. The road diverges from Atlantic Avenue while rounding a gentle curve to the left. There is a short approach to the relatively dark space under the expressway which encloses the roadway nearly totally for over half of the rest of the trip. While still in Zone 12 the road enters this space.

Zone 12 Responses

The R.L.A.X. slowly falls - (3.6) (3.5) and (3.3).

The R.L.A.C. keeps a constant (3).

The Discomfort Index shows a score of 2 for a while and jumps to (9).

Eight people, as shown in the Zone Division totals, experience depression, three are confused or lost, two are irritated.

Zone 12 Interactions

No difficulties are encountered with driving by any of the subjects. Attention levels hold near normal or slightly elevated which may be typical of dense traffic or city driving. A sharp rise to (9) is seen in the Discomfort Index at the point where the road enters the darkened space under the expressway. Eight of these drivers experience depression at the same point as shown in the point collations. It would appear that this enclosed space is depressing to drivers.

Zone 13

Zone 13 is entirely enclosed within and under the structure supporting the expressway which runs overhead. Over a dozen small streets penetrate into and some cross the route. Most are controlled by traffic lights and stop signs. No part of the city except the darkened sides of near buildings is visible.

Zone 13 Responses

The R.L.A.X. is inscrutible - (3.1) (2.9) (3.5) (3.2), so is the R.L.A.C. - (3) (3.1) (3) (3) (3) (3.5) (3) (3.1). Both are predominantly Low. The Discomfort Index drops from (9) at the entrance to the enclosure to (3), then to (1) for a long distance whereupon (6) (1) and (2). The section totals show (4) anxious, (3) depressed, (2) repressing some other feeling and 2 drivers making driving errors.

Zone 13 Interactions

All profiles tend to remain Low and near normal. Each has a definite rise two thirds of the way through Zone 13. This rise on the R.L.A. profiles is due to the manner of scoring errors (0-6). The 0-6 score is counted as a (6) in order that it will show up on the profiles as an event of some significance. Yhe (6) recorded on the Discomfort Index reflects one driver repressing (1) depression (1), (by forced cheerfulness or some other ruse) one confused driver, one irritated driver, and three anxious drivers, all at the same point. Immediately after this two drivers make errors. One drives through a red light, another found cause to make a sharp right hand turn and head as quickly as he could for an on-ramp to the expressway. (When asked why, he said: "I guess I just wanted to get out of here.")

Without knowing with any precision just what is happening, it seems probable that the space under the expressway affects drivers in a peculiar fashion, reducing their effect, or expression of feelings and communications, and somehow building anxiety and discomfort and reducing driving efficiency (2 errors).

Zones 14 and 15

Both Zones 14 and 15 will be treated togather; zone 15 is larger and includes the minor approach Zone 14. In 14, the roadway,still enclosed under the expressway structure, approaches the end of the tunnel like space through a sharp right turn.

In Zone 15 drivers must turn left and cross the several determined streams of traffic which are entering and leaving the Callahan and Sumner Tunnels. Zone 15 ends shortly after Hanover Street, and after an expressway ramp opposite, on Cross Street.

Zones 14 and 15 Responses

The R.L.A.X. in Zone 14 rises from (3.2) to (4), rising again in Zone 15 to (4.4) and (4.9) which is the highest score reached on that profile on the route.

The R.L.A.C. in Zone 14 rises from an initial (3) to (4) and in Zone 15 drops slightly to (3.7) and again to (3.6).

The Discomfort Index rises in 14 from (2) to (7) and falls back to (2) when in Zone 15 it rises again to (9).

The Zone Division totals show (9) anxious and (4) confused drivers, and two who make driving errors.

Zones 14 and 15 Interactions

Both Zones 14 and 15 together function the same way that did Zone 9 at the South Station intersection. The pattern of profile changes is quite similar although 14 and 15 are of a higher magnitude than 9. This comparison suggests that the (2) recorded on the Discomfort Index between (7) and (9) in Zones 14 and 15 is spurious and more related to the method of recording reactions for the totals than to the improbable lowering of high Discomfort figures at this point.

The pattern of this intersection is one of a gradual buildup of the intensity of attention as shown in the R.L.A. expanded average, and of a steady rate of nearly uniform intensity in the R.L.A. compressed average. This is a convenient example of the cumulative and reinforcing or "hangover" effect in the R.L.A.X. as mentioned in the explanation of that profile on page 135.

This most massive of intersections is so unbalanced (a thin stream of traffic bucks a tremendously thick one) and the provisions for crossing the tunnel traffic are so poor (policemen who are preoccupied with keeping the tunnel users unsnarled and do not seem to notice the users of this route) that many drivers doubted the advisability, if not the legality, of the crossing. It is no surprise therefore that (9) drivers became anxious, (4) confused, and that when faced with an "escape route" after the crossing - the expressway ramp opposite Hanover Street, one driver took it, registering as an error. Earlier, in Zone 14 at the very beginning of the intersection one driver stopped his car and waited for over a full minute ignoring several opportunities to cross. When asked why, he revealed that he was expecting a light to change or someone to tell him to go. There were no lights, and the police had not stopped him. He seemed to be wishing the whole intersection away.

Zone 16 and Zone 17

Zone 16 is along Cross Street which cuts across the edge of the North End of Boston. The way is likely to be cluttered with combined auto, foot, and market cart traffic. Passage

is usually quite halting and slow. At the end of this section, in Zone 17, the road re-enters for a second time (not counting the bridge on Albany Street) the darkness of the space under the expressway. Zone 17 consists of that darkened and surrounded roadway.

Zones 16 and 17 Responses

Zone 16 sees rapid drops in all profiles. The R.L.A.X. drops (4.9) (4.2) (3.1). The R.L.A.C. drops (2.6) (3.1) (3). The Discomfort Index drops from (9) to (2).

In Zone 17 all profiles rise again. The R.L.A.X. rises to (4.6) and then falls off to (3.3). The R.L.A.C. rises to (4.5) and drops to (3). The Discomfort Index rises from (3) to (5).

Zones 16 and 17 Interactions

In Zone 16 the extremely slow pace of driving, often less than 5 m.p.h., allows levels of attention to drop to quite low limits, for even casual observation of the somewhat chaotic scene allows ample time, at this speed, to drive and act appropriately. There is time to look around and, as this is a kind of oasis where for the first time on the route people and activity are seen, drivers relax. Two seem to be pleased in the zone division totals, and only one driver who is observed showing signs of anxiety twice in Zone 16 seems unusually anxious.

In Zone 17, however, just before the entrance under the expressway structure, three drivers make driving errors by taking a sharp turn to the left. The proper road to which they were directed en route, was not perceived as an alternative due to the great change in light levels between the two spaces, also due to the layout of the surrounding parking lots and structural members, and to the parks cars in the road; the correct route resembled a driveway or a parking lot entrance rather than a public road. The (3) errors and their (0-6) scores account for the higher R.L.A. profiles in Zone 17. The Discomfort Index rise from (3) to (5) is perhaps associated with the utter "placelessness" or disorienting quality of the space under the highway as it curves around to the right. Four drivers appear irritated and four confused or lost.

Zone 18

Zone 18 ends the route. It is a straight stretch of road out from under the expressway. The channelization is again clearly two way divided. The program is unchallenging - drive straight ahead.

Zone 18 Responses

Both R.L.A. (C. or X.) profiles show the same drops to below the normal level (2.8), after which they continue at or near the normal point until the end of the route.

The Discomfort Index shows a two step rise at the very end of the zone and the route of (4) and (5).

Zone 18 Interactions

Entering Zone 18 (North Washington Street) drivers see ahead of them an unobstructed well defined roadway. Perhaps with some relaxation to normal levels of attention in this unchallenging situation, some "hunting" or variability of attention intensities is experienced before true normal levels are found. Probably, as was suggested earlier in the descriptive material on each of the profiles, minor (.1) (.2) or even (.3) variations are not significant and normal levels are achieved immediately.

The risein the Discomfort Index at the finish point results from anticipatory interaction with an intersection which is not included in the route. Three drivers are seen as irritated and two others show that they are lost or confused. Most when asked their immediate location did not know.

CHAPTER VII

CRITIQUE OF THE ROUTE IN BEHAVIORAL TERMS

An Evaluation of the Behavioral Fit

Zone 1 — Zone 1 is homogeneous with adequate dialogue to sustain normal driving conditions.

Zone 2 — The long anticipation of a break in dialogue at the bridge "from a predictible roadway, through a somewhat ambiguous fork in the road, to a roadway which lies hidden beyond the bridge (through which there is no clear view)" - produces a long sustained rise in attention (R.L.A.X.). The Route direction is ill defined and ill marked in terms of immediate and long term direction goals.

Zone 3 — After the bridge unexpected traffic enters or "merges" from the right near causing a sudden if low intensity burst of attention.

Zone 4 and 5 — Drivers are markedly disturbed by feelings of irritation and disorientation or being lost. The dialogue has disintegrated. The driver needs to know where he is going in order to act on the decision (a fork in

the road) which clearly looms ahead in the next zone. Drivers proceed on guesswork. This situation causes "lost-seeking" behavior, or searching about for identifiable objects and/or landmarks. Drivers so in need of general orientation sometimes are too preoccupied to pay attention to the immediate surroundings and may make dangerous errors. This information, if given, must be provided early enough for lane changing to negotiate the coming fork in the road.

Zones 5 and 4 — The fork in the road is ambiguous and inadequately marked. Special information about the function and destination of the right hand or service road are needed. Drivers whose real need is to stay on the service road are seduced to, and trapped on, the expressway, by the ramp which is the clearer of the two alternatives. Even though it be the wrong route, it successfully reestablishes the dialogue.

Zone 6 — The roadway leading away from the Broadway intersection is improperly and inadequately marked. It appears to be, and is, designated as a ramp leading to the Southeast Expressway. However, the second alternative leading to Kneeland Street (an important downtown destination) and part of this route, is not indicated.

Zone 7 Drivers are disturbed by the traffic and chaos of the Kneeland Street intersection which badly needs regulation. All drivers successfully negotiated it but not without misgivings. Not all alternative choices are clearly visible.

Zone 8 The series of turns prior to this zone, and the broad curve which characterizes it, tend to mildly disorient drivers. In one case "lost-seeking" behavior resulted in an illegally passed red light.

Zone 9 The South Station intersection is large and complex. It has no special observable ills that would not be lessened if it were a small simple intersection. It is, for all its size and complexity, a surprisingly easy crisis to negotiate. The elevated R.L.A. and Discomfort Index profiles describe a large crisis in simple terms.

Zone 10 There are no observable adverse reactions to Zone 10.

Zone 11 Drivers are annoyed and frustrated by the railroad tracks in the pavement of the road. Rises in the Discomfort Index totals are not accompanied by attention level changes.

Zone 12 As drivers enter the darkened space under the expressway many are strongly depressed. The effect is transformed at night, when in contrast to its daytime

darkness, the expressway supporting structure and ceiling serves as a bright reflecting surface for the many lights mounted on the underside. It would be revealing to paint the undersides of the structure white and retest with another series of drivers in the daytime.

Zone 13 Further manifestations of the "disturbing effects" of the under expressway space are found in Zone 13 where two drivers make errors, one missing or misperceiving a red light, and another who attempted to "escape" the space. Most drivers exhibit some suppression of affect.

There is also in Zone 13 a long sequence of normal (3) R.L.A.C. scores. This may indicate one of two possibilities; one, that under tense "depressing" conditions normal driving is more easily accomplished, or at least is as easily accomplished, as it is under other kinds of conditions. Or what appears perhaps more probable - that the methods of observing and recording are not acute enough in discriminating the sub-normal from the normal levels of attention. This might indicate that some of the many normal (3)'s were more properly sub-normal. As it is, in three of the individual profiles (R.L.A. Runs Expanded Form) strong and continued sub-normal scores are reported.

This would not conflict with what appears to be reduced driving efficiency giving rise to two errors unexplainable in terms of a broken driver-road dialogue.

Zone 14 and 15

The intersection at the Callahan and Sumner Tunnels is the worst spot on the route. All three profiles indicate massive reactions, and one error is recorded by a driver who would not cross. See page 162.

From the point of view of the driver on this route he must cross the heavy tunnel traffic at his peril. No provisions exist to regulate the flow of traffic in any of the various routes it may follow through the vast space of pavement. In addition, flows of traffic are uneven and unbalanced, the number of cars entering and leaving the tunnel far exceeding that from any other source. It is conceivable that an unfamiliar driver might get sucked into the tunnel entrance by the overwhelming mass of traffic crossing his path.

Zones 16 and 17

Zone 16 functions well. Zone 17, however, includes a single point of sufficient ambiguity as to cause three identical errors to be made by different drivers. At the point where the road (Cross Street) enters the dark space under the expressway for the last time its whole character undergoes a subtle change. Where formerly the roadway was exposed to sunlight and human activity, it becomes dark and empty of people. It

resembles, after its change, a part of the municipal parking spaces which surround it. As a consequence drivers erroneously assume that the proper continuation of the road that they have been on is one that bends around to the left and eventually goes in the reverse direction. The dialogue is misleading.

To make matters worse, once properly on the correct route and under the expressway, the road curves almost imperceptibly, eventually disorienting many drivers.

Zone 18 Zone 18 functions well.

In the previous critique of the Route an effort was made only to identify trouble spots on the route as revealed in the data and not to suggest remedies. That should remain the task of the highway designer whose knowledge of possible solutions, it is hoped, would be greater than that of a critic.

CHAPTER VIII

TENTATIVE FINDINGS FROM THE DATA

This chapter will cover a wide range of tentative findings whose origins are referred to in the data. Some will be useful as new working hypotheses for future studies, others will be merely conjecture. Each has its place and value in a field where questions are rare and answers rarer.

Findings from the Relative Level of Attention Profiles

Study of the R.L.A. profiles will reveal that certain events and conditions in the program of the road tend to produce profile silhouettes or curves of a characteristic nature. Most often these observations may best be made from the averaged R.L.A. data on the Comparison Sheet, p. 182.

1. Driving in town and traffic* produced a long sustained mild elevation in the R.L.A.X. of between (3.2) and (3.6). This indicates that the baseline norm (3) may vary with changing levels of environmental noise or with increasing and decreasing levels of stimulus. Drivers may be more alert when driving in town than elsewhere.

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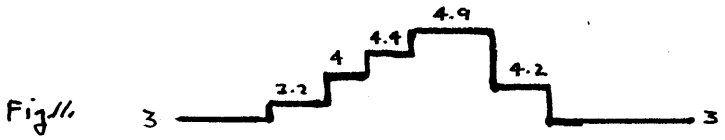
* See section 'B' R.L.A.X.

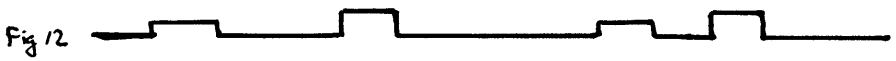
2. Driving through intersections reveals a characteristic curve having a long stepped rise for the intersection approach, a peak at the center of the intersection and a sharp fall off of attention intensities after the peak has been passed as in figure (11) (From R.L.A.X., Zones 14, 15, 16)



Intersections without the slow upward slope are suspect if the peak is of a high value for such intersections probably are not announced far enough in advance and are come upon by surprise.

3. Driving in Traffic or on long streets with occasional side street traffic such as on Albany Street (see all three profiles and figure (12)7 produce similar profile patterns of normal levels punctuated by brief coping and recovery elevations. Each small peak marks an ephemeral event in traffic or an interruption from a side street. The presence of such short peaks scattered along an otherwise normal baseline suggests an attitude of alertness or readiness.

Fig. (12) Traffic and/or side street pattern.



4. "Hunting." There may be a tendency for relatively high R.L.A. levels to be followed by subnormal scores, exhibiting a moment of uncautious relief after elevated attention intensities. The profile may then stabilize at normal almost immediately. See: R.L.A. Runs Expanded Form columns headed Bill, Jean, M.D.,

5. Errors appear after low (2.7) (2.8) or medium (3.4) R.L.A. Scores, and more frequently after low scores on the R.L.A. Runs Expanded Form (individual profiles). In the column in R.L.A. Runs . . . marked Don is the single exception in eleven cases where this is not so.

6. Parallelism of Profiles. The Discomfort Index Total and both of the R.L.A. averaged profiles vary closely together with perhaps the Discomfort Index displaying a slight time lag behind the R.L.A. profiles. Perhaps arousal reactions occur before emotional responses.

7. Optimum Stimulus Level. Between R.L.A. (3) and (3.5) appears to be associated with the lowest frequency of elevated Discomfort Index scores. These levels are also maintained the longest once established on all profiles.

8. High Levels of Attention are upsetting. High scores on either averaged R.L.A. profiles coincide with or slightly lead high scores on the Discomfort Index Profile.

9. Settings of Highest R.L.A. Scores.

ERRORS must be disregarded as associative or causative factors in high R.L.A. scores due to the manner of scoring (0-6) the (6) counted as the R.L.A. score for an error. Otherwise errors would be the most frequent associate of elevated attention levels.

INTERSECTIONS of any but the lowest magnitude. See elevated R.L.A. Levels.

FORKS IN THE ROAD usually accompanied by insufficient decision making information. Often, forks include as one alternative an expressway or ramp.

BROKEN DIALOGUE. Whenever "questions" are left "unanswered" and lost-seeking behavior occurs, high attention intensities occur. However, the attention may be focused on objects or distances irrelevant to the task of vehicle guidance or attending to the road.

10. Anticipation shows as sustained Rise in R.L.A.

In nearly every case intersections are preceded by a sustained rise in the R.L.A.X. The rises of longest duration accompany intersections, can be seen over the longest distances.

11. Long straight roads reduce Attention.

Zone 1, Zone 13 and Zone 18, the longest, straightest roadways on the route, show the greatest frequency of sub-normal attention intensities. See R.L.A. Runs (Expanded Form).

12. The Discomfort Index as a more global type of evaluation is a more accurate level of evaluation of mood or emotional state in this first data than are the observations of individual responses. Individual responses are harder to discriminate from each other and so benefit from a more inclusive category.

The Emotion Data or individual run observations may be more responsive generally than is the R.L.A. to small stimuli.

Transient peaks in either the R.L.A. or in the Discomfort Index are probably not potent enough to transfer their effects from one "system" to the other. More sustained rises probably do.

13. Surface Conditions and irregularities may show up in emotional reactions of irritation or frustration, and on the Discomfort Index without any effect upon the levels of attention as in Zone 11 along the railroad tracks.

14. The presence of traffic is beneficial. Traffic raises R.L.A. levels from sub-normal to normal or slightly above normal, (as in Zone 1 on Albany Street where the steady rise in R.L.A. levels is coincident with the increase of traffic). There is also some indication that steady, moving traffic may reduce elevated R.L.A. scores to normal or near normal levels (as on Atlantic Ave. in Zone 11 and in Zone 16 in the North End).

This is suggestive of a homeostatic process whereby traffic (or any other unpredictable and relatively constant stimuli) may induce levels of arousal which are close to optimum by continued demand, reducing chances of peaks in Relative Levels of attention, i.e. low levels are elevated to normal by the continued mild stimulus and high levels are dealt with by advance planning.

15. Enclosed roadways cause trouble. The dark space under the Southeast Expressway made many drivers uncomfortable and was the scene of two errors. Interestingly, observations showed that most drivers exhibited some suppression of affect, and lessened communication. The errors suggest lowered driving efficiency.

16. Pedestrian crowded streets and dense traffic may not be particularly difficult for the motorist provided that, as on Cross Street in the North End, the traffic moves slowly. Ample time is thus available to perceive details and to maneuver safely. In Zone 16 on Cross Street R.L.A. scores were falling to normal despite the chaos. The discomfort Index was at a low (2).

17. Drivers may "shut off" or "wish away" massive challenges or potentially dangerous or confusing situations, by waiting overlong at entrances to the larger intersections (from the observer's notes).

The Dialogue

18. Broken dialogue. In cases where the dialogue has broken down the driver's primary need is for information. "Questions" that remain "unanswered" will be repeated endlessly until answered or swamped by some more powerful event.

19. Anxiety may follow in the wake of "unanswered questions" to the accompaniment of confusion. Drivers in this situation exhibit "lost-seeking behavior" and actively search the environment for orientation clues which will re-establish the dialogue.

20. Landmarks should be especially visible from points of confusion and anxiety.

21. "Lost-seeking Behavior" may endanger the driver whose perceptions are often set for special clues ignoring more immediate details.

22. Breaks in dialogue. The onset of unanswered questions or breaks in dialogue may precede large Discomfort Index scores.

23. "Answers" may be found at fall-off points in both R.L.A. profiles and in the Discomfort Index.

24. Where confusion reigns between alternative road choices, drivers under stress will often simply choose the clearest one or the largest one even if it is most likely to be the wrong one.

25. Driving errors are often caused during an anxious attempt to re-establish dialogue with the road and end confusion or disorientation.

Interrelationships between R.L.A. and Emotional States

See Chart, fig. (14), page 180.

26. Anxiety, Irritation, Confusion and Anger are associated with the highest as well as the lowest (with the addition of depression) R.L.A. scores.

27. Confusion was the most frequently recorded emotional state, with irritation second, and anxiety third.

28. Normal (3) scores were reported in the R.L.A. more often (90) than all other scores combined (73).

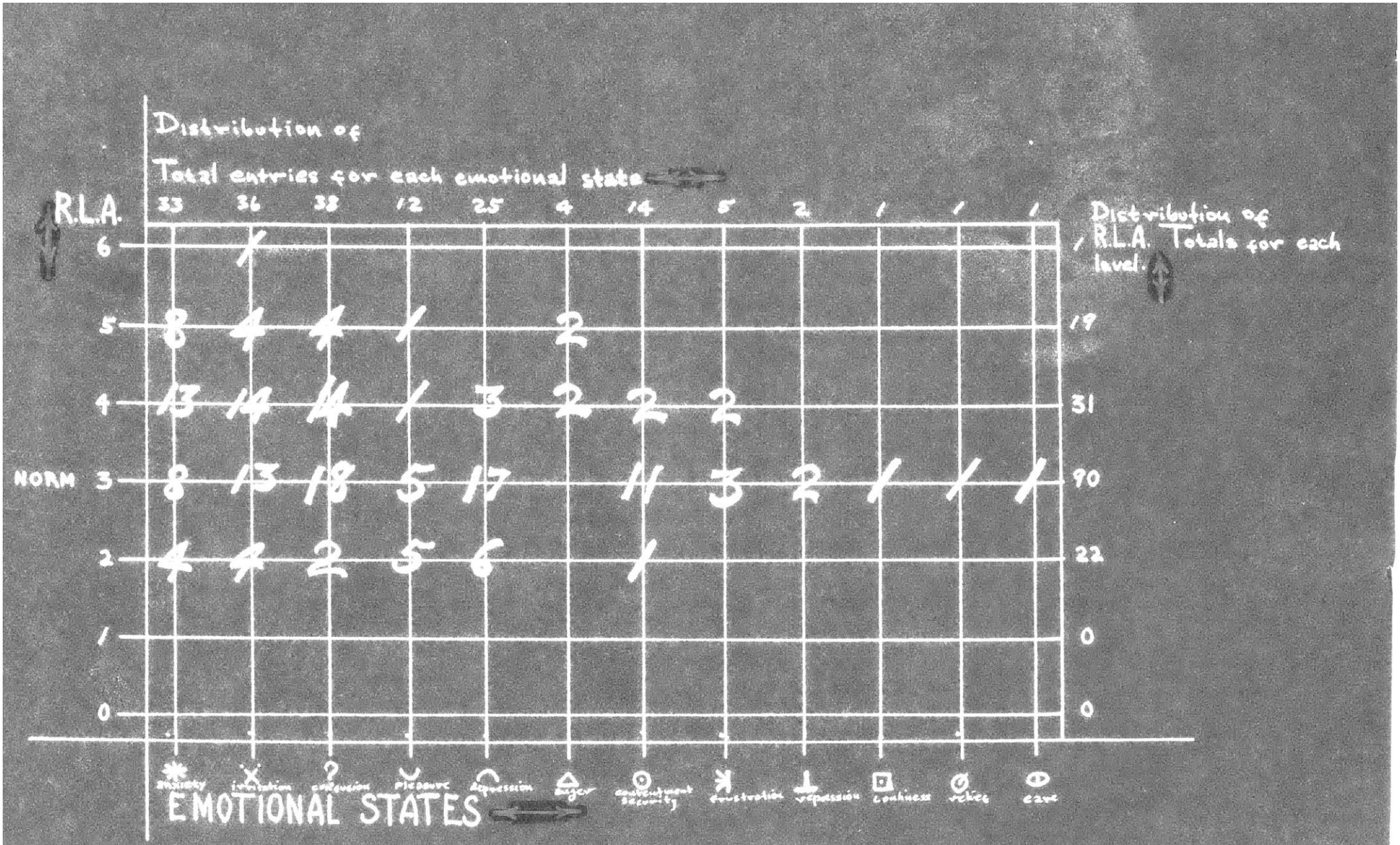
29. Depression is more often associated with subnormal or normal R.L.A. Scores than with elevated scores.

30. Depression may be a result of the repression of other emotions such as anxiety, confusion, irritation, or anger.

31. Errors are associated with the following R.L.A. scores which were either recorded previous to or coincidentally with the error.

# of errors	R.L.A. score
7	3
2	5
2	2
1	4
Total 12 errors	

Fig. (13)



Interrelation between R.L.A. and Emotional States as obtained from data.

32. Errors are associated with the following emotional states which were either recorded previous to or coincidentally with the error.

# of errors	Emotional state
4	irritation
2	anxiety and confusion together
2	anxiety
2	confusion
1	depression
1	no emotion recorded

Total 12 errors

Fig. (15)

mount on 8½"×11" blank sheet

COMPARISON SHEET

Read bottom to top.

Channelization	Zone Division	Zone Division Name and Content		RLA Expanded Average	RLA Compressed Average	Discomfort Index Total
				3	3	0
Kneeland/St. Commercial		North Washington		3.0 2.9 3.0 2.9 3.3	2.9 2.9 2.9 2.8 3.	5 4 0
Kneeland/St. Ambient		Under Expressway & under MTA.	3	4.6	4.5	5 3
Salem		Haynes St. NB End and approach to Expressway structure (#2)		4.1 4.2	3. 3.1	2
Haynes / X. Ramp		Summer Tunnel and approach	1	4. 4.4	3.6 3.7	9
		Approach to Summer Tunnel	1	4	4	2 7
Commercial, Clinton, So. Market, Commerce, State, Central, Milk, India, Broad		Under Expressway	2	3.2 3.5 2.9 3.1	3.1 3. 3. 3. 3. 3. 3.5 3. 3. 3. 3. 3. 3. 3. 3.1 3.	2 1 6 1 3 1
		Expressway superstructure (#2) and approach		3.3 3.5 3.6	3. 3. 3.	2
X. Ramp, Northern					3.1	0
X. Ramp, Atlantic		Atlantic Ave		3.5 3.6 3.5 3.8	3. 3. 3.1 3.1 2.	3 1 2 1 6
Congress		Congress St. and approach to Cong. St.		4	3.3	5
Federal	?	South Station, So. Sta. Approach.		3.8 2.8	3.7 3.3	8 6
Essex, Lincoln, Beech		2 way divided curve (No Name)		3.4 3.2 3.3 3.4	3.2 3.3 3.2 3.3 3.2	0 3 0 6
Kneeland		Kneeland St. approach, Begin 2 Way divided curve, Expressway North ramp (#2)	7	3.7 3.3 3.2 3.4 3.1	3.3 3.5 3. 3. 3.1 3. 3.3	3 0 2 1 0 1
Broadway, X. Ramp		Broadway and approach	6	3.3	3.2 2.9	0 5
		X Way ramp (#1) Ramp approach, W. 4th St and approach	5	2 4 3.4 2.8	3.8 3.3 3.	0 3
W. 4th. St.		W. 4th. St and approach	4	3.2 2.7	3.4	2 1 2
Bridge		After Bridge	3		3.3	2 1
Randolph	1 0 1	Bridge approach expressway structure (#1)	2	3.3	3. 3.2	4 2
		Albany St Bridge approach, Bridge		3.4 3.3 2.9 2.7 2.5 2	3.5 3.1 3. 3.4 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 2.8	0 2 0 2 0 2 0 1 0 5
Albany: Park, Malden, Wareham, Plympton, Dedham St., Braintree, E. Brookline, Sharon, E. Newton, Stoughton, E. Concord						
Mass. Ave.		City Hospital				

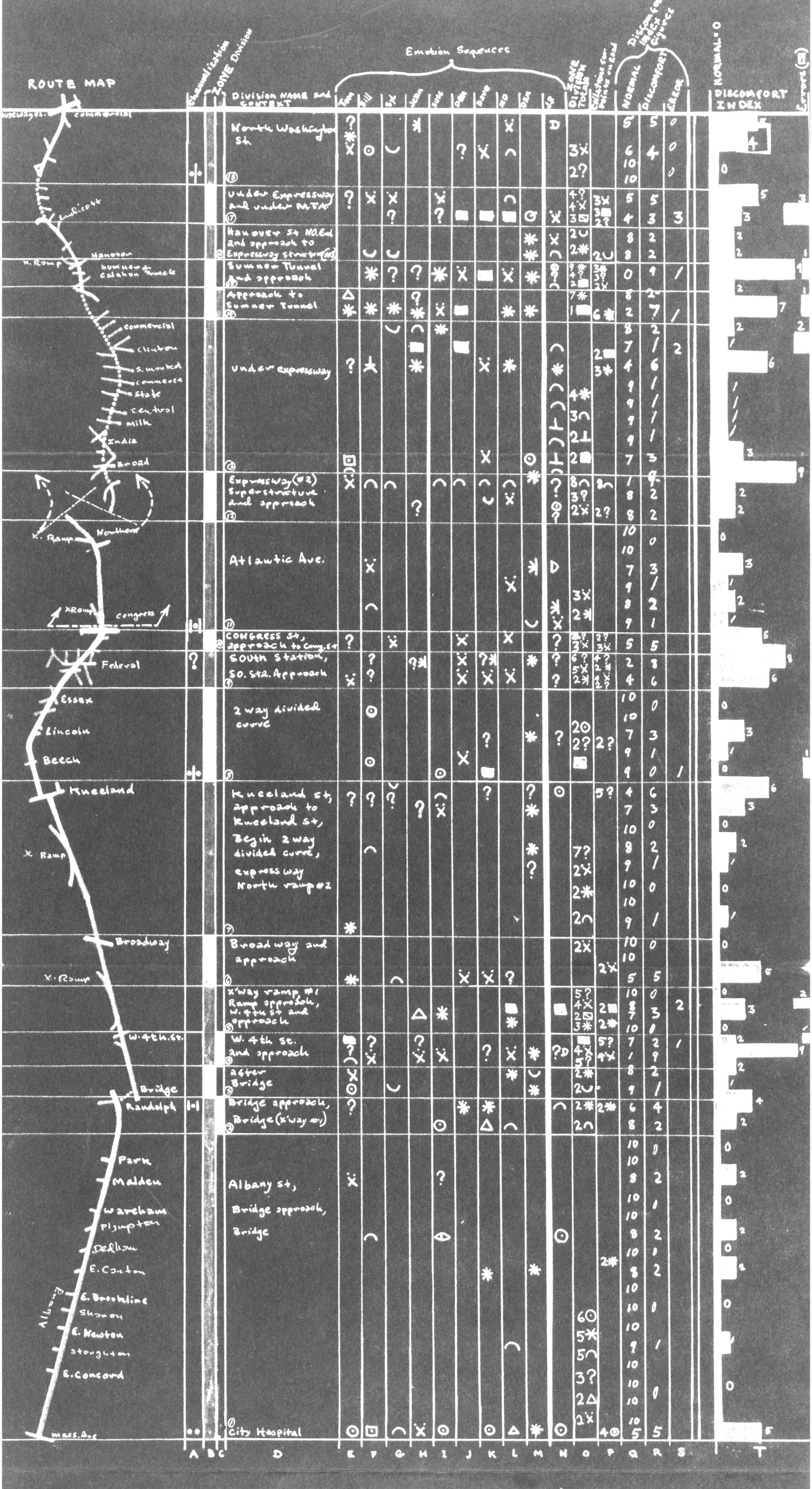
A B C D

ERRORS 0

RLA EXPANDED AVERAGE 3

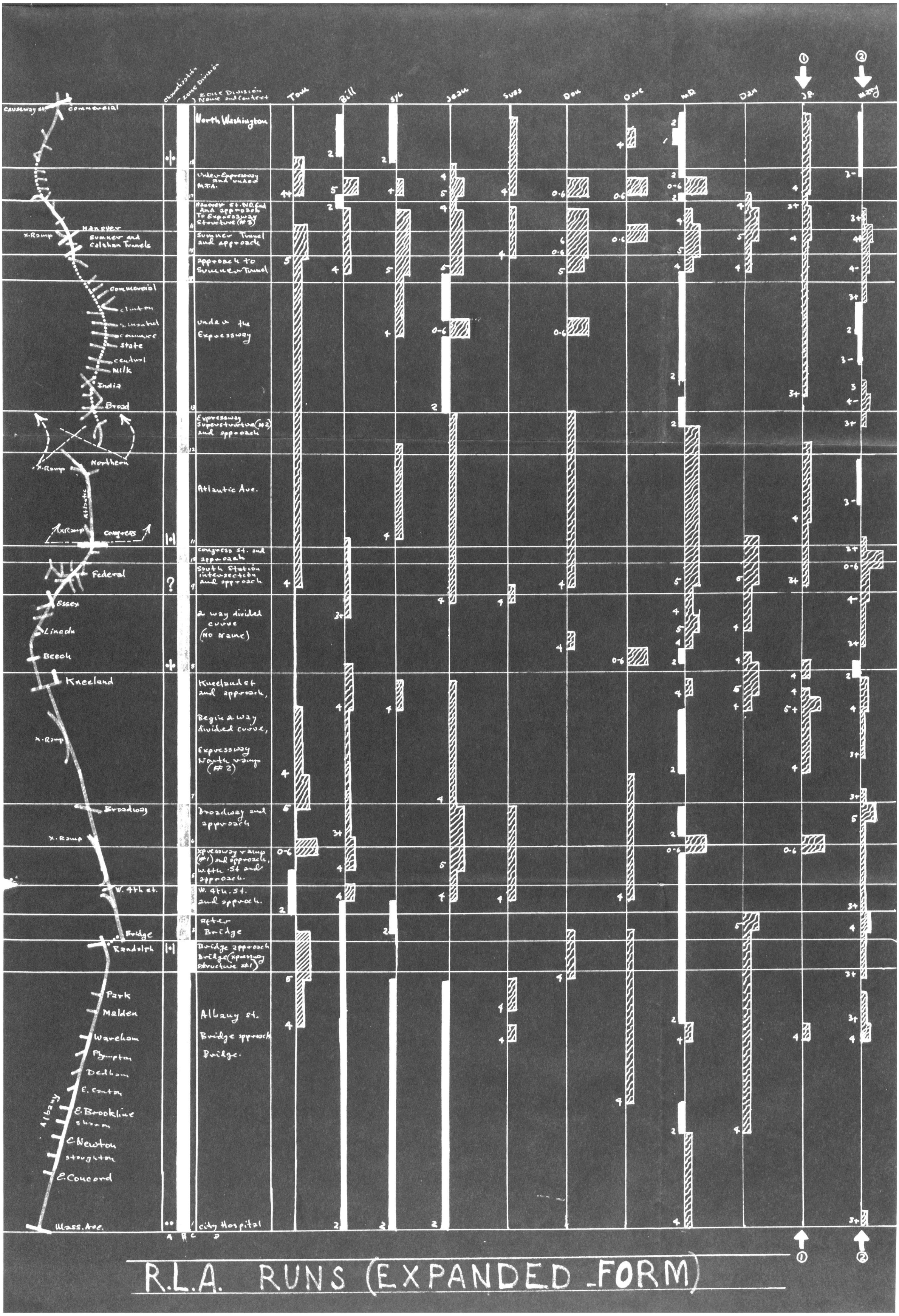
RLA COMPRESS AVERAGE 3

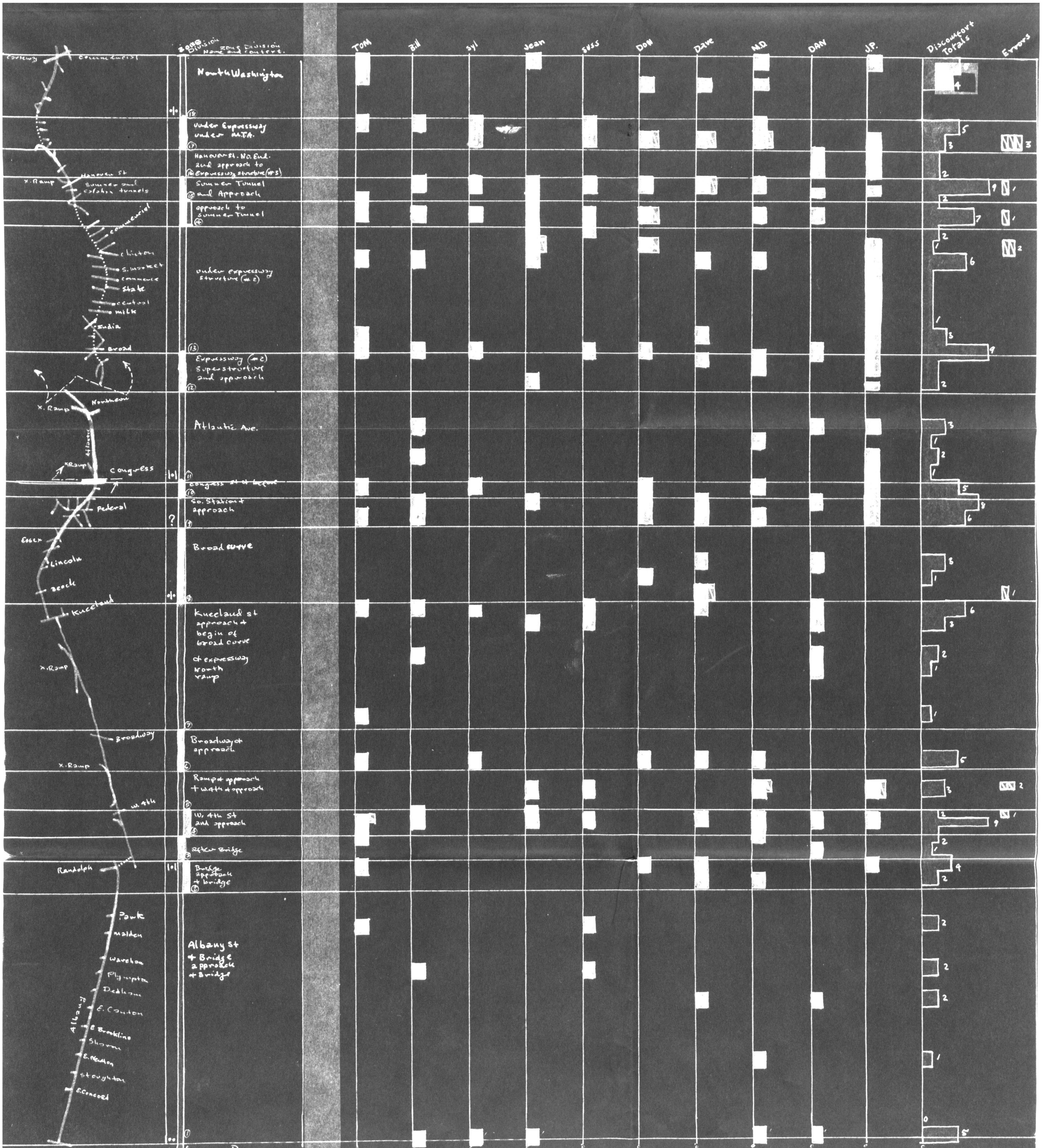
DISCOMFORT INDEX TOTAL 0



EMOTION AND DISCOMFORT DATA

R.L.A. RUNS (EXPANDED FORM)





DISCOMFORT INDEX RUNS AND TOTAL PROFILE

APPENDIX

A. Notes on Evaluation of Methods:

The methods of observation and recording employed during the development of this thesis were far from standardized. There was considerable difference, due to experiment and improvement, between the early and the later methods. Only the later methods are demonstrated in detail, as they embody the better aspects of those that were performed before. The analytical procedures also varied due to development during the research. However, due to the fact that the methods differed mainly in their qualitative respects and remained similar in the basic approach, it may be assumed that there is a basis for comparison of data among the interviews.

The emotion sequences, there is reason to suspect, suffer more than the R.L.A. from the inferiority of the earlier techniques which followed the same plan as the later ones, but had not the benefit of the analysis - in-depth employed later as in the transcript.

The experience gained in preparing the two highly detailed transcripts has persuaded this investigator

that it is certainly possible to see human behavior in great detail, and at considerable depth. Sufficient detail and depth, it would seem, to allow for valid research on human behavior patterns based upon these methods.

With modification in observing techniques the basic methods of verbal and non verbal behavior analysis should be applicable in any observable situation. Since the behavior will bear the same assumed relationship to the "inner life" of the individuals.

The R.L.A. may not be as useful in other environmental situations where the path and sequence of events may be less controlled. More elaborate mapping procedures and ways of comparing differing paths through an environment will have to be developed for other types of milieux.

The visual observation and recording may be performed at a distance with the aid of telephoto lenses on the movie camera. The author has done some experimenting in this direction with automobile drivers as subjects. and finds that the long distance approach tends to be more gross than close-range observation. Records of verbal behavior at a distance are less easily obtained without the informed cooperation of the observed. Miniaturized f.m. transmitters would be employed to this end. However, the object of observation at a distance would very likely be to disturb the interactions as little as possible and to introduce no self-consciousness into the behavior and awareness of the observed.

Films records proved to contain the most useful data for the derivation of R.L.A. profiles. Emotional sequences, on the other hand, could best be derived from a study of the tape-recorded verbal behavior, with strong support from kinesic analysis of the films.

Filmed records are absolutely necessary for both the reliability of any such study and for the necessary level of detail in recording and observation. No method of observation unaided by filmed records is sufficiently acute.

A total of fourteen driver observation runs were made on the route in addition to preliminary runs made earlier on other routes. Not all of the fourteen have been reported, however, as it was more profitable to spend the time developing the method in greater depth than in the accumulation of data.

In this first study of methodology it was necessary to explore the content of the films and tapes in great detail and to make interpretations in great depth.

In future studies, employing more subjects, such analysis will become far too time-consuming and difficult to handle. More global types of analysis and interpretations are desirable if, in the light of future experience, they are feasible.

B. Future Work:

The tasks imposed upon further work by the results and experience of this first investigation are the following:

1. To establish the level of replicability in observing and analyzing the material.
   More than one investigator should be employed to test the replicability of the methods; in addition, various procedures involving subjective evaluation of the interpretations by the observed should be tried to aid in evaluating the fidelity of interpretation.
2. Critical tests must be performed to test the theoretical models and tentative hypotheses in quantitative terms.

FOOTNOTES

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

3. Birdwhistell, Ray L. "Kinesics and Communication," in Explorations, studies in culture and communication publication 3. Toronto, Canada: University of Toronto, August, 1954.

4. Hall, Dr.Edward T. "Proxemics, the Study of Man's Spatial Relations," Reprinted from Man's Image in Medicine and Anthropology (?).

5. Quoted by Birdwhistell, in "Paralanguage: 25 Years after Sapir," from The Selected Writings of Edward Sapir. Ed. David G. Mandelbaum. Berkeley & Los Angeles: Univ. of California Press, 1949., p. 556.
   "In spite of . . . difficulties of conscious analysis, we respond to gestures with an extreme alertness and, one might almost say, in accordance with an elaborate code that is written nowhere, known by none, and understood by all."

6. Birdwhistell, Ray L.,"Kinesics in the Context of Motor Habits,"a paper presented before the American Anthropological Association, Dec. 28, 1957; also, Birdwhistell, "Paralanguage: 25 Years after Sapir," Unpublished paper; Birdwhistell, "Kinesics and Communication"; Birdwhistell, "Introduction to Kinesics" (an annotation system for analysis of body motion and gesture), Louisville, Ky.: University of Louisville, Dept. of Psychology, 1962.

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