

NCHRP
SUMMARY
OF
PROGRESS

December 31, 1997

**Transportation Research Board
National Research Council**

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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NATIONAL

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RESEARCH

PROGRAM

SUMMARY OF PROGRESS

December 31, 1997

NOTICE TO READERS

On December 31, 1988, a *special edition* of the *Summary of Progress* was published compiling information on all projects initiated under the NCHRP from its inception in 1962 through 1988. Subsequent editions through 1995 updated the *Summary of Progress* series, including *only* those projects that were active, or for which some type of activity remained, after January 1, 1989. Beginning in 1996, information about project status was posted on the NCHRP World Wide Web site

www2.nas.edu/trbcrp

Detailed project write-ups will now be available only on the NCHRP web site.

To obtain a copy of the *Summary of Progress Through 1988—Special Edition*, refer to the final page of this document for ordering information.

Transportation Research Board
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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. More predominantly, however, the need for more efficient, economical, and safer highway transportation and the importance of meshing with other modes and other societal concerns leads to national problems of increasing complexity. A coordinated program of high-quality cooperative research provides a highly effective approach to such problems.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. AASHTO's program is supported on a continuing basis by funds from participating member states of the Association and receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer AASHTO's research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to its parent organization, the National Academy of Sciences, a private, nonprofit institution, is an insurance of objectivity; and it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

Research programs are developed annually by AASHTO on the basis of research needs identified by chief administrators of the highway and transportation departments, by committees of AASHTO, and by the Federal Highway Administrator. The programs are then referred for administration through the Transportation Research Board, and research projects addressing the specific needs are defined by the Board on the basis of the AASHTO problem statements. The projects are advertised widely for proposals, and qualified agencies are selected on the basis of research plans offering the greatest probabilities of success. The research is carried out under contract, and administration and surveillance are responsibilities of a Board-appointed staff.

The needs for highway research are many, and the National Cooperative Highway Research Program is an efficient mechanism for providing timely solutions to problems of mutual concern to many responsible groups. The Program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

COOPERATIVE RESEARCH PROGRAMS STAFF

Robert J. Reilly, *Director, Cooperative Research Programs*

National Cooperative Highway Research Program

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J.F. Caraway
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M.R. Evans
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D.V. Jenkins
H.H. Jenkins
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V.H. Waight
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J.R. Young

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J.A. Racin
D.G. Stuart
L.F. Sutherland
M.H. Thomas
R. Tiedemann
J. Zamurs

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D.W. Lucas
W. Lum
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S.H. Sale
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R.K. Tinney
S.L. Tucker
J.P. Underwood
D.G. Ward
M.L. Yancey

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MAILING ADDRESS

TRANSPORTATION RESEARCH BOARD
2101 Constitution Avenue NW
Washington, D.C. 20418

OFFICE ADDRESS

2001 Wisconsin Avenue NW
Washington, D.C. 20007
Phone: 202-334-3224

INTERNET ADDRESS

www2.nas.edu/trbcrp

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

SUMMARY OF PROGRESS

DECEMBER 31, 1997

INTRODUCTION

The National Cooperative Highway Research Program (NCHRP) was established in 1962 to provide a continuing program of highway research. It is sponsored by member departments of the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration (FHWA), U.S. Department of Transportation, and is carried out under a three-way agreement among these agencies and the National Academy of Sciences. AASHTO annually proposes specific research problems for inclusion in the NCHRP fiscal year activities. At least two-thirds of the member departments must approve the research problems and agree to their financial support before they can be brought into the Program. Following balloting by the member departments, the approved problems are referred to the Academy, where they are reviewed to determine their acceptability to the Academy for administration by the Transportation Research Board. Each State annually contracts with the Academy to commit a portion of its Federal-aid state planning and research (SPR) funds. These funds presently make available a cooperative pool of about \$17.0 million for NCHRP each year.

Each research project in the program is assigned to a panel made up of persons knowledgeable in the particular problem area. The panel analyzes the problem, outlines the particular project and its objectives, and then prepares a research project statement by which proposals are solicited from qualified research agencies. The panels review the proposals, recommend contract awards, and provide counsel to the NCHRP staff responsible for surveillance of work under the research contracts. Finally, they review final reports for acceptability and for accomplishment of the approved research plan. There are presently almost 1,000 members on these panels coming from 50 States, the District of Columbia, Puerto Rico, Canada, and Australia.

A professional staff is assigned to NCHRP by the Board. Projects engineers with training and experience in the many research areas encompassed by the Program are responsible for administrative and technical surveillance of the contracts. If necessary, frequent meetings involving the staff, panel, and agency personnel are held to review project progress and provide guidance for ongoing work.

Figure 1. NCHRP CLASSIFICATION SYSTEM

PROBLEM AREAS	
<p>RESEARCH FIELD A ADMINISTRATION</p> <p>2 Economics 11 Law 19 Finance</p>	<p>RESEARCH FIELD B TRANSPORTATION PLANNING</p> <p>8 Forecasting 25 Impact Analysis (SEEE*)</p> <p>* Social, Environmental, Economic, Energy</p>
<p>RESEARCH FIELD C DESIGN</p> <p>1 Pavements 12 Bridges 15 General Design 16 Roadside Development 22 Vehicle Barrier Systems</p>	<p>RESEARCH FIELD D MATERIALS AND CONSTRUCTION</p> <p>4 General Materials 9 Bituminous Materials 10 Specs, Procedures, and Practices 18 Concrete Materials</p>
<p>RESEARCH FIELD E SOILS AND GEOLOGY</p> <p>21 Testing and Instrumentation 23 Properties 24 Mechanics and Foundations</p>	<p>RESEARCH FIELD F MAINTENANCE</p> <p>6 Snow and Ice Control 13 Equipment 14 Maintenance of Way and Structures</p>
<p>RESEARCH FIELD G TRAFFIC</p> <p>3 Operations and Control 5 Illumination and Visibility 7 Traffic Planning 17 Safety</p>	<p>SPECIAL PROJECTS</p> <p>20 Encompasses all projects not readily identified with other problem areas</p>

Most research findings are published in the NCHRP *Report* series, the NCHRP *Synthesis* series, or as a *Research Results Digest*. Each state highway administrator receives a copy immediately on publication, and as many as 6,000 copies are issued through the Transportation Research Board's Publications Office.

Twice each year, detailed progress reports are submitted by the NCHRP to the sponsors to provide them with current information on the specifics of technical progress of the projects, as well as the specifics of administrative matters relating to Program operation. These reports are supplemented by publication of an annual summary of progress that is made available at the end of each year to both the sponsors and the public at large.

HOW NCHRP PROGRAMS ARE FORMULATED

NCHRP programs are initiated on an annual basis, and there are many steps between initiation and the time that the final reports are published. Each fiscal year's program must start with the *identification of critical problems* by: state highway and transportation departments, AASHTO Committees, and the Federal Highway Administration.

The many problems (usually for more than 150) received from these sources each year are first screened to determine

- If the proposed problem represents an immediate research need and is of interest to many states.
- If it can be handled effectively under a cooperative program.
- If similar efforts are already under way, or if satisfactory answers are already available. In these respects, a search is made of the relevant literature stored in the Board's automated Transportation Research Information Services (TRIS).
- The probability of success.

The technical merits of the problems that survive this initial screening (usually about 50 percent) are then evaluated in depth by the AASHTO Standing Committee on Research. Final priorities are determined each year at a meeting to formulate research programs for the NCHRP.

After the program is approved, by AASHTO, it is referred to TRB for execution.

PROGRAMS RECEIVED TO DATE

Through most of NCHRP's history, each year's program generally has consisted of from 10 to, most recently, 25 new problems, each with funding usually ranging between \$200,000 and \$400,000 and a like number of continuations of projects funded in earlier years. Measured against the large number of research needs, as evidenced by the list that has ranged as high as 253 problems submitted for evaluation in a single year, the funds made available to the NCHRP each year have been far too limited. For about 15 years, annual funding for the NCHRP remained nearly constant at just below \$5 million, while, during this period, the purchasing power of the research dollar was severely reduced by inflation. This decline was reversed with enactment of the Surface Transportation Assistance Act of 1982, which resulted in an approximately 50 percent funding increase

for NCHRP. The Federal-aid highway legislation enacted in 1987 had the effect of reducing NCHRP funding by 18 percent to a level of about \$6.8 million. In February 1988, AASHTO approved a new formula for NCHRP contributions (5.5 percent of Federal-Aid Highway Planning and Research apportionments) to restore NCHRP funding to approximately \$8.3 million starting in fiscal year 1989. The Intermodal Surface Transportation Efficiency Act of 1991 resulted in a funding level of approximately \$17.0 million for NCHRP starting in fiscal year 1992.

In 1997, AASHTO referred the FY '98 program of research problems to the TRB for execution. From all programs through FY '97, 669 research contracts have resulted (Table S-2), totaling some \$157 million, and the FY '98 program will increase that number by another 25 contracts, for some \$9 million. The subject matter of the projects ranges across the full spectrum of concern within the highway industry and evidences the sponsor's immediate interest in acquiring answers at an early date to the many acute problems facing administrators and engineers. The FY '99 program will be formulated in March 1998 by the Standing Committee on Research. Proposals will be solicited starting in 1998. AASHTO's initial steps toward development of the FY 2000 research program will be taken early in 1998.

FINANCING THE PROGRAM

Each year, each State contracts with the National Academy of Sciences to support the Program. The agreement commits the State to 5.5 percent of its 2 percent Federal-aid state planning and research (SPR) funds. From these contributions a cooperative pool of about \$17.0 million is presently made available each year for NCHRP's administrative and contract research operations. Funds are scheduled to become available such that research can begin near the first of each year; for example, projects in the FY '98 program are scheduled to begin in January 1998.

HOW THE NCHRP IS ORGANIZED TO ADMINISTER RESEARCH PROGRAMS

All problems are assigned to specific problem areas within each of the eight broad research fields shown in Figure 1 and are given related NCHRP project numbers.

Each project is assigned to a panel consisting of outstanding individuals very knowledgeable in the project area who are looked to for technical guidance and counsel throughout the research and reporting phases. A broad search is made for these individuals, and the Board usually receives about four to five times as many nominees as can be used in the available panel positions. The panels are in existence for the life of their projects. Members do not act as consultants or advisors to project investigators; they may not submit proposals for research. All members serve without compensation, and their total yearly contribution to the Program adds up to thousands of staff-days. The panel members are drawn from all walks of professional life, and, as shown in Table S-1, heavy dependence is placed on the states for providing members. The perspective of state people in defining the research needed to solve operational problems is most important if projects that are both practical and feasible within the limits of available funds are to be structured.

The duties and responsibilities of project panels include the following:

- Defining the scope of problems assigned by AASHTO and drafting project statements requesting proposals for studies.
- Evaluating proposals and making recommendations regarding selection of research agencies.
- Monitoring research progress.
- Providing guidance regarding technical aspects of the research.
- Reviewing and evaluating project reports as to the accomplishment of objectives and suitability for publication.
- Making recommendations as to whether or not studies should be continued.

HOW THE PROJECTS ARE PLACED UNDER CONTRACT

It is important to note that **the NCHRP is not in the business of awarding grants for basic research**. Rather, the Program calls for contract research with specific objectives that, if achieved, will result in solutions that are practical and readily usable. As the NCHRP gets each year's program under way, the project panels meet to write research project statements based on the research problems referred by AASHTO.

These statements are then issued electronically on the Internet's World Wide Web. Anyone interested in receiving research Project Statements must periodically browse the NCHRP World Wide Web site or register electronically on the same web site (www2.nas.edu/trberp). Those who have registered electronically receive an e-mail notification of every Project Statement posting. Because NCHRP operates on a fixed-schedule, proposals must be submitted according to fixed deadlines.

Contracts have been let to agencies headquartered in more than 25 States, the District of Columbia, Canada, and England. The types of agencies selected to conduct NCHRP research are listed in Table S-2. The opportunity to propose is open to anyone possessing extensive, demonstrated capability and experience in the problem area. Because the projects call for practical remedies to pressing operational problems, it is expected that only the highest level of agency capability will be applied in meeting the commitments of the proposal—capability cannot be developed at project expense. Consonant with the goal of providing practical, readily usable solutions to pressing problems, time and experience have led to the development of fairly stringent specifications for proposals and agency attributes that are acceptable to the mission-oriented nature of the NCHRP. Proposals must comply with the format in the current brochure, *Information and Instructions for Preparing Proposals*.

The staff and panel members evaluate all proposals in a uniform manner, with primary consideration given to

- The understanding of the problem and the merit of the research plan and approach.
- The experiment design and the promise of fulfilling the objectives of the project statement.
- The qualifications of the principal investigator and other members of the research team.
- The adequacy of the facilities.

TABLE S-1
Distribution of Project Panel and Committee Membership with Respect to Affiliation

AFFILIATION	NO. OF PANEL MEMBERS
1 State agencies	519
2 Federal agencies*	95
3 Special transportation and other governmental agencies	24
4 Educational institutions	152
5 Industry, consultants, and trade associations	168
All	958

* Does not include FHWA liaison representatives

TABLE S-2
Agency Distribution of FY '63 Through FY '97 Projects

TYPE OF AGENCY	CONTRACTS	
	NO.*	%
Educational institution	241	36
Research institutes	95	14
Industry, consultants, and trade associations	304	45
Professional societies and service organizations	22	3
State highway and transportation departments	4	<1
Special transportation and other governmental agencies	3	<1
All	669	100

* Totals do not include the individual topics and tasks for Projects 20-5, 20-6, and 20-7.

The proposed budget is not one of the primary factors because the funds available for research are announced in the Project Statement. The budget does not enter the evaluation process leading to agency selection, except when specific items are reviewed to better determine staff allocations and distribution of resources. When the proposed cost exceeds the funds stated to be available, the proposal is rejected on receipt.

A panel meeting is held to select an agency for each project, and a review is made of all known aspects of performance of the proposers on other research projects under NCHRP or elsewhere. The successful proposals are retained by the panel members for use in monitoring the research. Proposals are considered to be privileged, and the information in them is not released outside the TRB unless explicit approval is obtained from the agency. Policy also holds that panel deliberations and meeting notes are privileged.

Following the selection meetings, a list of recommended research agencies is transmitted to AASHTO and the Federal Highway Administration for their review and approval. Contracts between the Academy and the research agencies are executed, and research is begun. **Again, it should be emphasized that the NCHRP is a program of contract research—it does not operate on a grant basis.** Further, proposals can be received only in response to advertised Project Statements, as the funds available each year to the Program are earmarked in their entirety for research problems specified by the sponsor—AASHTO.

From the standpoint of AASHTO's interests, needs, and capital investments, it is important to understand that a contract is not signed with the selected agency until the staff and project panel are satisfied that the proposed scope of work provides the best probability for success in meeting AASHTO's needs. In the period between agency selection and contract execution, a concerted effort is made to resolve questions and clarify matters of technical substance emanating from the selection process. This action usually results in an addendum to the research plan in the agency's approved proposal; therefore, both the proposal and the addendum are incorporated in the contract as the binding scope of work. Furthermore, soon after contract execution, the agency is required to submit a Working Plan that is intended to be an amplified version of the research plan. It is against this document that progress of the project is monitored by the staff and project panel.

The policy of the NCHRP is to provide a debriefing to unsuccessful proposers to indicate the technical areas in which their proposals were judged weak and deficient and how the weaknesses or deficiencies were factors in their not having been selected.

The NCHRP projects included in the 36 fiscal year programs conducted to date are listed in Table 1.

The Academy's research contract is one of the following:

- Cost-Reimbursement
- Cost-Reimbursement Plus Fixed Fee
- Fixed Price

The Academy decides, in agreement with the agency, which type of contract will be used in each case.

KEEPING TRACK OF RESEARCH IN PROGRESS

Once research starts, administrative and technical surveillance of its progress is performed by NCHRP staff, presently standing at 20 (full-time equivalents)—11 professional, 9 support. In-depth surveillance by contract managers with wide-ranging expertise contributes much to the probability of project success and can be one of the most significant of the several elements influencing how well objectives are met. It is recognized, however, that a delicate balance must be maintained in the practical exercise of surveillance. It must be penetrating enough to be effective, yet it must not be so complex or burdensome as to distract the researchers from their primary efforts or add unreasonably to the agency's cost of doing business.

In addition to reviewing monthly progress schedules and quarterly progress reports, the projects engineers maintain frequent telephone contacts and regularly visit the research agencies throughout the contract periods. They talk with each principal investigator about the project's status to learn if the research is being pursued in line with the approved research plan, and they provide guidance in all technical and administrative matters. They provide liaison in whatever manner is required to keep their project panels abreast of progress and to acquire panel guidance and counsel in technical matters, particularly as regards the relationships between research objectives and the needs of the practicing engineer. Because the agency's proposal is incorporated in its entirety in the contract, the agency's approved budget is among the items subject to the terms of the agreement. The principal investigator has flexibility in managing the budget up to the point of not materially departing from the approved research plan or exceeding the contract's maximum allowable cost. Major changes to account for promising new leads or unproductive lines of study must be approved in advance by the staff and project panel and are authorized through a contract amendment. Agency invoices are checked monthly by staff for deviations from the approved budget. Based on all surveillance activities, staff prepares its own progress reports, which are sent to the sponsors to provide a current awareness of ongoing work. Finally, the staff and panels evaluate the completed research to determine the degree of technical compliance with the contract so that recommendations for contract close-out can be made.

A point heavily stressed with the research agencies at the time of the first surveillance visit is that they must orient their thinking toward presentation of their research results in a form that is directly usable by practicing engineers. Further, to enable an easy determination of the usefulness of the results to practice, each final report includes a "Summary of Findings" and a chapter on "Interpretation, Appraisal, and Application of Results." The detailed research techniques and analyses of interest primarily to researchers are offered in appendixes. Such specification of the style and organization of reports guides the researcher in presenting results so that maximum use by the sponsors may be obtained.

NCHRP publications consist of the following:

- Project reports in the regular *NCHRP Report* series.

- Reports in the *NCHRP Synthesis of Highway Practice* series.
- Annual *Summary of Progress* through December 31.
- *NCHRP Research Results Digests*.
- *NCHRP Legal Research Digests*.
- NCHRP IDEA Annual Progress Report.
- Semiannual progress reports.
- Unedited agency reports on the World Wide Web.

The semiannual progress reports are issued only to the various program participants. The other publications are distributed more widely through the NCHRP and through the Board's selective distribution process; the print order for reports in the formal NCHRP series ranges from 3,500 to 7,000 copies. In addition to AASHTO and the Chief Administrative Officers, copies automatically go to the following:

- Individual TRB members who have selected publications in the particular subject area of the report.
- About 100 libraries.
- Transportation Research Board representatives in the state highway and transportation departments.
- Educational institutions.
- Liaison representatives.
- Appropriate panels and committees.

News releases announcing the publication of NCHRP reports are sent to appropriate trade publications and other news media. For each report, the NCHRP staff writes a foreword that identifies the fields of specialty of those individuals having most interest in the results. It also suggests how the results fit into present knowledge and practice. Furthermore, the Board's Technical Activities Staff follows the progress of the work and is therefore able to discuss the potential application of research results during their periodic visits to State highway and transportation departments. All published reports are offered for sale through the Board's Publications Office and are also entered in the National Technical Information Service (NTIS). All unpublished reports are placed on microfiche for ready availability to interested parties.

SYSTEMATIC PLANNING FOR GETTING RESEARCH RESULTS FROM NCHRP PROJECTS INTO PRACTICE

Promoting Useful Results

Previous reference has been made to the fact that many activities take place between initiation of research programs and execution of research contracts. Many additional ones take place before formal publication of the final reports is realized. At milestones in the process network reflecting all activities, NCHRP concentrates on the opportunities to increase the probability that useful results will find their way into practice more quickly. Beyond the sponsor's initial contribution of setting the goals for a program of applied research dedicated to solving pressing operational problems, the NCHRP tries to further increase the probability by

- Establishing the agency and personnel qualifications that are mandatory if the goals are to be achieved. Emphasis is placed on the importance of a record of successful past performance in endeavors similar to those to be undertaken. Further, it is also stipulated that proposals are not acceptable if they do not contain specific statements as to how the anticipated results can be used to improve practice.
- Making use of panel members, who not only are experts in the particular problem area but who also have a complete understanding of the needs of the practitioners, to define the research problem and its objectives in the form of a precise project statement on which fully responsive research proposals can be based. Experts drawn from the highway and transportation departments play a major role in this task.
- Exercising extreme care in the process of selecting research agencies to ensure not only that the proposed research plan is the best possible in addressing the specifics of the objectives but that it also culminates in the best promise for providing the practitioner with a product that is both usable and readily implementable.
- Establishing—on the basis of staff and project panel review of and suggested modifications to the research plan—a clear meeting of the minds as to what specifically is expected from the project and the researchers in order to meet the needs of the practitioner.
- Acquiring an amplified research plan that is intended to detail comprehensively the approved research plan and to include a specific schedule of events for the major tasks. This document is used by the staff in the day-to-day surveillance of the project's progress and by the project panel as required.
- Carrying out project surveillance sufficient to keeping the research in line with the approved research plan, constantly keeping the researchers aware of the needs of the practitioner, and ensuring that all project developments through final reporting center around these needs.
- Requiring research reports in a format that is designed specifically to first meet the needs of the busy administrator and the practitioner. Different treatment is given to the material that would be of interest to other researchers.

NCHRP Reporting of Research Results

In an applied research program such as the NCHRP, the sponsor rightfully expects not only results that are accurate but also findings that can be readily put into practice. This means that the final research reports must be presented in language understandable to both administrators and engineers and in such format as to permit easy assimilation. Research reports are sometimes so clouded by obscure language and format that the reader must spend precious time and effort in translating them into concise and readily usable working documents. Research agencies for the NCHRP are required to report their results in a form that succinctly summarizes the findings for the busy administrator

and likewise informs the practitioner of the application of the findings. The detailed research techniques and analyses in which a researcher would be interested are presented in appendixes and do not have to be labored through to extract the findings. The Program specifies style and organization of all reports to guide the researchers in their writing so that maximum use by the sponsors may be obtained.

IMPLEMENTING RESEARCH RESULTS

Over the years there have been opportunities for the Program staff and various AASHTO committees to work together to structure the research findings into the best possible form for immediate use by the practitioner. Such joint efforts are highly desirable and represent the ultimate in the steps that the Program can take to weight the odds in favor of implementation of the findings.

AASHTO has provided the NCHRP with frequent opportunities for staff and project researchers to go before the various committees of the Association to present their findings and recommendations directly to the user community.

EXAMPLES OF UTILIZATION OF NCHRP RESEARCH RESULTS

Beyond the uses of NCHRP research results cited in Table 2, there undoubtedly are many other uses that are unknown to the Program. NCHRP reports have been abstracted by numerous foreign countries, including Russia, with subsequent utilization being reported here. In the interest of all potential users, the Program will be grateful for any information on actual application of results and associated cost savings. This will be reported in the hope that widespread interest will develop in the States and that, consequently, research results will find their way more quickly into policies, practices, procedures, specifications, and standards of the highway and transportation departments.

SUMMARY

The NCHRP is a unique contract research effort designed to respond quickly and efficiently to the needs of State highway and transportation departments through the solution of the pressing transportation problems. Although the Transportation Research Board administers the Program, the research content is solely the prerogative of AASHTO and its member departments. The Program is one of applied (rather than basic) research, and every possible effort is made to help administrators and engineers put the findings to early use. Program policy ensures maximum exposure of the research while in progress in the hope that research results will, in fact, more quickly find their way into practice in the form of policies, procedures, specifications, and standards of State highway and transportation departments.

STATUS OF NCHRP PROJECTS

The following table summarizes the status of all projects in the NCHRP. Detailed status reports on those projects for which there is any type of contractual activity can be found on the NCHRP World Wide Web site at

www2.nas.edu/trbcrp

TABLE 1

SUMMARY OF STATUS THROUGH DECEMBER 31, 1997, FOR FY '63 THROUGH FY '98 PROJECTS

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
No.	Title					
AREA ONE : DESIGN--PAVEMENTS						
01-01(01)	Development of Procedures for Comparing the AASHO Road Test Findings with Performance of (1) Existing Pavements and (2) Newly Constructed Experimental Pavements	HRB	42,800 *	3/1/63	2/29/64	Completed---Published as NCHRP Reports 2, 2A
01-01(02)	Guidelines for Extending the Findings of the AASHO Road Test---Implementation Phase	HRB	11,356 *	8/31/65		Contract terminated---No report
01-02	Comparison of Different Methods for Evaluating Pavement Conditions	Purdue U	29,957 *	2/15/63	2/28/65	Completed---Phase I report publ. as NCHRP Report 7; final report not publ.; for avail.. see Summary of Progress Through 1988
01-03(01)	Factors Influencing Pavement Performance---Regional	Purdue U	45,982 *	2/15/63	9/30/67	Completed---Published as NCHRP Report 132
01-03(02)	Factors Influencing Pavement Performance---Local	Northwestern U	19,850 *	9/1/63	9/30/64	Completed---Published as NCHRP Report 22
01-03(03)	Factors Influencing Pavement Performance	U of California	19,800 *	4/1/64	10/31/65	Completed---Published as NCHRP Report 35
01-04(01)	Extension of Road Test Performance Concepts	Georgia Tech	10,000 *	10/1/63	9/30/64	Completed---Published as NCHRP Report 10
01-04(01)A	Extension of Road Test Performance Concepts	Duke U	19,924 *	2/1/65	9/30/66	Completed---Published as NCHRP Report 97
01-04(02)	Extension of Road Test Performance Concepts	Purdue U	12,243 *	2/1/64	1/31/66	Completed---Published as NCHRP Report 30
01-05	Detecting Variations in Load-Carrying Capacity of Flexible Pavements	Cornell Aero Lab	49,011 *	1/15/64	7/15/65	Completed---Published as NCHRP Report 21
01-05(02)	Detecting Seasonal Changes in Load-Carrying Capabilities of Flexible Pavements	Texas A&M	49,428 *	9/1/66	6/30/68	Completed---Published as NCHRP Report 76
01-06	Standard Measurements for Satellite Program---Measurement Team	Texas A&M	61,353 *	3/31/64	1/31/67	Completed---Published as NCHRP Report 59
01-07	Development of Interim Skid-Resistance Requirements for Highway Pavement Surfaces	Penn State U	24,815 *	6/15/65	12/15/66	Completed---Published as NCHRP Report 37
01-08	Factors Involved in the Design of Asphalt Pavement Surfaces	Materials R&D	23,255 *	1/1/65	2/28/66	Completed---Published as NCHRP Report 39
01-09	Evaluation of Studded Tires	Cornell Aero Lab	24,998 *	10/1/66	6/30/67	Completed---Published as NCHRP Report 61
01-10	Translating AASHO Road Test Findings---Basic Properties of Pavement Components	Materials R&D	203,094 *	9/12/66	12/31/70	Completed---Published as NCHRP Reports 139, 140
01-10A	Systems Approach to Pavement Design---Implementation Phase	Texas A&M	100,000 *	3/1/72	12/31/73	Completed---Published as NCHRP Report 160

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
01-10B	Development of Pavement Structural Subsystems	Woodward-Clyde	447,941 *	2/1/74	7/31/86	Completed---Published as NCHRP Report 291
01-11	Evaluation of AASHTO Interim Guides for Design of Pavement Structures	Materials R&D	83,925 *	10/23/67	4/30/71	Completed---Published as NCHRP Report 128; Guidelines published by AASHTO
01-12	Determination of Pavement Friction Coefficients Required for Driving Tasks	Franklin Inst	309,244 *	8/25/69	6/8/73	Completed---Published as NCHRP Report 154
01-12(02)	Locked-Wheel Pavement Skid Tester Correlation and Calibration Techniques	Penn State U	319,000 *	9/16/70	5/15/73	Completed---Published as NCHRP Report 151
01-12(03)	Requirements for Wear-Resistant and Skid-Resistant Highway Pavement Surfaces	Materials R&D	261,955 *	11/1/71	9/30/75	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
01-12A	Wet-Weather Skidding Accident Reduction at Intersections	Ohio DOT	199,955 *	7/1/75	7/1/78	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
01-13	Effects of Studded Tires on Highway Safety	Calspan Corp	208,898 *	4/19/71	8/20/74	Completed---Published as NCHRP Report 183
01-13(02)	Effects of Studded Tires on Highway Safety---Non-Winter Driving Conditions	U of Michigan	39,450 *	2/15/72	5/31/73	Completed---Published as NCHRP Report 176
01-14	Influence of Combined Highway Grade and Horizontal Alignment on Skidding	U of Michigan	69,968 *	10/15/72	1/14/74	Completed---Published as NCHRP Report 184
01-15	Design of Continuously Reinforced Concrete Pavements for Highways	U of Texas	151,870 *	8/1/72	8/31/75	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
01-16	Evaluation of Winter-Driving Traction Aids	Penn State U	304,400 *	6/3/74	10/31/81	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
01-17	Guidelines for Recycling Pavement Materials	Texas A&M	199,470 *	11/1/76	9/30/79	Completed---Published as NCHRP Report 224
01-18	Calibration and Correlation of Response-Type Road Roughness Measuring Systems	U of Michigan	250,000 *	10/1/77	9/30/80	Completed---Published as NCHRP Report 228
01-19	Development of a System for Nationwide Evaluation of PCC Pavements	U of Illinois	225,000 *	1/23/78	3/15/85	Completed---Published as NCHRP Report 277
01-20	Influence of Asphalt Temperature Susceptibility on Pavement Construction and Performance	Texas A&M	200,000 *	5/1/79	7/16/84	Completed---Published as NCHRP Reports 268 and 269
01-21	Repair of Joint-Related Distress in Portland Cement Concrete Pavements	U of Illinois	300,000 *	5/15/80	6/28/85	Completed---Published as NCHRP Report 281
01-22	Shoulder Geometrics and Use Guidelines	Hugh Downs/RK&K	100,000 *	9/8/81	4/7/83	Completed---Published as NCHRP Report 254
01-23	Pavement Roughness and Rideability	KETRON, Inc.	249,990 *	1/4/82	11/30/84	Completed---Published as NCHRP Report 275
01-23(02)	Pavement Roughness and Rideability---Field Evaluation	JMJ Research	199,983 *	1/6/86	12/31/87	Completed---Published as NCHRP Report 308

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
01-24	Revision of AASHTO Interim Guide for Design of Pavement Structures	McCullough/Finn				Conducted under Project 20-07, Task 24
01-25	Effects of Heavy Vehicle Characteristics on Pavement Response and Performance	TRB	100,000 *	6/12/86	11/30/87	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
01-25(01)	Effects of Heavy Vehicle Characteristics on Pavement Response and Performance—Phase II	U of Michigan	400,000 *	9/1/88	12/31/91	Completed—Published as NCHRP Report 353
01-26	Calibrated Mechanistic Structural Analysis Procedures for Pavements	U of Illinois	499,942	2/6/87	12/31/92	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
01-27	Video Image Processing for Evaluating Pavement Surface Distress	Triple Vision	350,000 *	3/1/89	8/31/91	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
01-28	Laboratory Determination of Resilient Modulus for Flexible Pavement Design	Georgia Tech Research	443,433	4/15/90	2/28/97	Completed—Publication decision pending
01-28A	Harmonized Test Methods for Laboratory Determination of Resilient Modulus for Flexible Pavement Design	U of Maryland	101,325			Contract pending
01-29	Improved Surface Drainage of Pavements	Penn State U	400,000	1/4/93	4/30/97	Receipt of agency report pending
01-30	Support Under Portland Cement Concrete Pavements	U of Illinois	150,000	1/1/93	9/30/94	Completed—Published as NCHRP Report 372
01-31	Smoothness Specifications for Pavements	ERES Consult	399,980	2/1/94	12/31/96	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
01-32	Systems for Design of Highway Pavements	ERES Consult	500,000	2/1/94	5/30/97	Completed—Publication decision pending
01-33	Methodology to Improve Pavement-Investment Decisions	Washington State U	499,800	7/1/95	6/30/98	Research in Progress
01-34	Performance of Subsurface Pavement Drainage	ERES Consult	499,985	5/15/95	3/15/98	Research in Progress
01-35	Guidelines for Developing Pavement Performance Trends	---				Project cancelled
01-35A	Guide for Pavement Management	---	200,000			Contract pending
01-36	Determination of Pavement Damage from Super-Single & Singled-Out Dual Truck Tires	U Nevada - Reno	400,000	11/1/96	7/31/99	Research in progress
01-37	Development of the 2002 Guide for the Design of New and Rehabilitated Pavement Structures	Nichols Consult Eng	325,489	12/20/96	7/31/97	Contract terminated
01-37A	Development of the 2002 Guide for the Design of New and Rehabilitated Pavement Structures—Phase II					Contract pending

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
AREA TWO : ADMINISTRATION--ECONOMICS						
02-01	Criteria for Highway Benefit Analysis	U of Washington	101,948 *	6/1/63	11/30/67	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
02-02	Guidelines for the Determination of Community Consequences	U of Washington	48,873 *	7/1/63	8/31/64	Completed—Published as NCHRP Report 18
02-03	Analysis of Motor Vehicle Accident Data as Related to Highway Classes and Design Elements	Cornell Aero Lab	155,972 *	6/1/63	8/31/66	Completed—Published as NCHRP Report 47
02-04	The Value of Highway Travel Time, Comfort, Convenience, and Uniform Driving Speed	Texas A&M	77,100 *	6/1/63	8/31/66	Completed—Published as NCHRP Report 33
02-05	Running Cost of Motor Vehicles as Affected by Highway Design and Traffic	Catholic U	101,263 *	6/1/63	12/31/66	Completed—Published as NCHRP Report 13; Phase II report included in NCHRP Report 111
02-05A	Running Cost of Motor Vehicles as Affected by Highway Design and Traffic	Paul J. Claffey	65,665 *	7/1/67	8/10/70	Completed—Report included in NCHRP Report 111
02-06	Warranted Levels of Improvement for Local Rural Roads	Stanford U	40,000 *	6/1/63	9/30/66	Completed—Published as NCHRP Report 63
02-07	Road User Costs in Urban Areas	Catholic U	99,376 *	2/1/64	5/31/66	Completed—Report included in NCHRP Report 111
02-08	Estimation and Evaluation of Diverted and Generated (Induced) Traffic	Northwestern U	40,000 *	5/1/64	8/31/66	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
02-09	Effect of Highway Landscape Development on Nearby Property	Franklin Inst	149,103 *	11/8/65	1/31/68	Completed—Published as NCHRP Report 75
02-10	Future Needs for Oversize-Overweight Permit Operation on State Highways	Jorgensen & Assoc	99,655 *	11/1/66	4/30/68	Completed—Published as NCHRP Report 80
02-11	Summary and Evaluation of Economic Consequences of Highway Improvements	HRB	110,000 *	1/1/67	7/31/70	Completed—Published as NCHRP Report 122
02-12	Highway User Economic Analysis	Stanford Research Inst	100,069 *	4/1/74	5/31/77	Completed—Report published by AASHTO
02-13	Multilane Design Alternatives for Improving Suburban Highways	Midwest Research Inst	100,000 *	7/18/83	3/31/85	Completed—Published as NCHRP Report 282
02-14	Public/Private Partnerships for Financing Highway Improvements	Kimley-Horn & Assoc	175,000 *	1/1/86	1/31/90	Completed—Phase I report publ. as NCHRP Report 307; Phase II report published as NCHRP Research Results Digest 179
02-15	Identifying, Measuring, and Evaluating the Benefits of Safety Roadside Rest Areas	KLD Assoc	236,560 *	1/13/86	4/30/89	Completed—Published as NCHRP Report 324
02-16	Relationships Between Vehicle Configurations and Highway Design	TRB	912,000 *	3/2/87	6/30/90	Completed—Published as TRB Special Report 227

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
02-17(01)	Methodologies for Evaluating the Effects of Transportation Policies on the Economy	Hickling Corp	99,145 *	9/1/89	1/31/91	Completed---Published as NCHRP Report 342
02-17(02)	Workshop on Research Needs in Transportation and Economic Development	Greenhome & O'Mara	52,000 *	9/1/89	7/31/90	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
02-17(03)	Macroeconomic Analysis of the Linkages Between Transportation Investments and Economic Performance	Johns Hopkins	250,000	11/1/91	5/31/97	Completed---Published as NCHRP Report 389
02-17(03)A	Update and Enhancement of Dataset for Macroeconomic Analysis of Transportation Investments and Economic Performance	Johns Hopkins	49,990	11/1/95	12/31/97	Completed---Report in review process
02-17(04)	Measuring the Relationship Between Freight Transportation Services and Industry Productivity	Hickling Corp	250,000	10/14/91	6/30/94	Completed---Summary to be published as a NCHRP Research Results Digest
02-17(05)	Impact of Urban Congestion on Business	Cambridge Systematics	170,000	9/15/91	3/15/93	Completed---Summary published as NCHRP Research Results Digest 202
02-17(06)	Tourism Travel Contributions to Economic Development	Greenhome & O'Mara	299,448	2/1/93	2/28/97	Completed---Publication decision pending
02-18	Research Strategies for Improving Highway User Cost-Estimating Methodologies	Hickling Corp	200,000	1/2/91	6/30/93	Completed---Summary to be published as a NCHRP Research Results Digest
02-18(02)	Valuation of Travel-Time Savings and Predictability in Congested Conditions for Highway User-Cost Estimation	Hickling Lewis Brod	149,809	2/20/95	7/31/97	Completed---Publication decision pending
02-18(03)	Development of an Innovative Highway User-Cost Estimation Procedure	Hickling Lewis Brod	100,000	11/15/94	3/30/97	Completed---Publication decision pending
02-18(04)	Development and Demonstration of StratBENCOST Procedure	Hickling Lewis Brod	150,000	12/1/97	5/31/99	Research in progress
02-19	Research on the Relationship Between Economic Development and Transportation Development	Apogee Research	100,000	4/14/95	4/15/97	Completed---Publication decision pending
02-20	Economic Trends and Multimodal Transportation Requirements	Louis Berger Intl	249,999	2/15/95	3/31/98	Research in progress
02-21	Economic Implications of Congestion	Cambridge Systematics	299,995	4/1/97	7/31/99	Research in progress
02-22	Needs in Communicating the Economic Impacts of Transportation Development	Apogee Research	200,000	2/3/97	6/2/98	Research in progress

AREA THREE : TRAFFIC--OPERATIONS AND CONTROL

03-01	Development of Criteria for Evaluating Traffic Operations	Cornell Aero Lab	158,878 *	2/15/63	2/28/66	Completed---Report not publ.; for avail. see Summary of Progress Through 1988
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TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
03-02	Surveillance Methods and Ways and Means of Communicating with Drivers	Cornell Aero Lab	246,756 *	2/15/63	4/30/66	Completed---Published as NCHRP Reports 9, 28, 29
03-03	Sensing and Communication Between Vehicles	Ohio State U	163,190 *	2/15/63	11/30/65	Completed---Published as NCHRP Report 51
03-04	Means of Locating Disabled or Stopped Vehicles and Methods of Communication with a Central Location	Airborne Instruments	127,991 *	3/1/63	12/15/66	Completed---Published as NCHRP Report 6; Phase II published as NCHRP Report 40
03-05	Improved Criteria for Designing and Timing Traffic Signal Systems	Planning Research	264,902 *	3/1/63	12/31/69	Completed---Published as NCHRP Reports 3, 32; Phase II published as NCHRP Report 73; Phase III published as NCHRP Report 124
03-06	Effect of Regulatory Devices on Intersection Capacity and Operation	De Leuw, Cather	153,175 *	4/1/63	8/15/66	Completed---Published as NCHRP Reports 11, 41
03-07	Establishment of Standards for Highway Noise Levels	Boit, Beranek	572,263 *	2/1/64	11/30/74	Completed---Published as NCHRP Report 78; Phase II publ. as NCHRP Rpt. 117; Phase III publ. as NCHRP Rpt. 144; Phase IV publ. as NCHRP Rpts. 173, 174
03-08	Factors Influencing Safety at Highway-Rail Grade Crossings	Voorhees & Assoc	91,421 *	12/1/63	1/6/67	Completed---Total project published as NCHRP Report 50
03-09	Analysis and Projection of Research on Traffic Surveillance, Communication, and Control	Jorgensen & Assoc	23,760 *	10/15/66	1/14/68	Completed---Published as NCHRP Report 84
03-10	Application of Vehicle Operating Characteristics to Geometric Design and Traffic Operations	Cornell Aero Lab	41,520 *	1/1/66	3/10/67	Completed---Published as NCHRP Report 68
03-11	Optimizing Street Operations Through Traffic Regulations and Control	Peat, Marwick, et al	258,331 *	9/1/66	9/30/68	Completed---Published as NCHRP Report 110
03-12	Development of Information Requirements and Transmission Techniques for Highway Users	Airborne Instruments	398,976 *	10/1/66	12/11/72	Completed---Phase I and II reports included in NCHRP Report 123; Phase III not publ.; for avail. see Summary of Progress Through 1988
03-13	Guidelines for Medial and Marginal Access Control of Major Roadways	Texas A&M	149,293 *	9/1/67	11/30/69	Completed---Published as NCHRP Report 93
03-14	Optimizing Flow on Existing Street Networks	Edwards & Kelcey	990,000 *	10/1/67	1/10/70	Completed---Published as NCHRP Report 113
03-15	Weaving Area Operations Study	Poly Inst of NY	300,000 *	10/1/69	12/31/73	Completed---Published as NCHRP Report 159
03-16	Freeway Lane Drops	System Dev Corp	176,604 *	11/1/69	10/31/73	Completed---Report not publ.; for avail., see Summary of Progress Through 1988; last phase publ. as NCHRP Report 175
03-17	Improving Traffic Operations and Safety at Exit Gore Areas	Penn State U	79,983 *	1/1/71	11/30/72	Completed---Published as NCHRP Report 145

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
03-18(01)	Improved Control Logic for Use with Computer-Controlled Traffic	Stanford Research Inst	381,660 *	7/15/71	6/30/77	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-18(02)	Traffic Control in Oversaturated Street Networks	Poly Inst of NY	200,000 *	9/1/71	6/30/75	Completed—Published as NCHRP Report 194
03-18(03)	Cost-Effectiveness Methodology for Evaluation of Signalized Street Network Surveillance and Control Systems	JHK & Assoc	123,267 *	5/1/75	4/15/77	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-18(04)	Methodology for Performance Evaluation of Signalized Network Control Strategies	Computran	148,705 *	7/21/77	11/20/80	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-19	Grade Effects on Traffic Flow Stability and Capacity	Midwest Research Inst	220,443 *	9/1/71	8/31/74	Completed—Published as NCHRP Report 185
03-20	Traffic Signal Warrants	KLD Assoc	201,935 *	9/1/72	12/31/76	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-20A	Peak-Hour Traffic Signal Warrants	JHK & Assoc	150,000 *	6/23/80	7/31/82	Completed—Published as NCHRP Report 249
03-21	Motorist Response to Highway Guide Signing	BioTechnology	272,071 *	4/1/74	1/31/76	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-21(02)	Effectiveness of Changeable-Message Displays in Advance of High-Speed Freeway Lane Closures	BioTechnology	170,993 *	12/1/79	8/31/81	Completed—Published as NCHRP Report 235
03-22	Guidelines for Design and Operation of Ramp Control Systems	Stanford Research Inst	199,030 *	4/15/74	12/31/75	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-22A	Guidelines for Design and Operation of Ramp Control Systems	Texas A&M	249,538 *	2/1/77	3/31/81	Completed—Published as NCHRP Report 232
03-23	Guidelines for Uniformity in Traffic Control Signal Design Configurations	KLD Assoc	308,779 *	4/8/74	7/28/77	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-24	Determine the Luminous Requirements for Retroreflective Highway Signing	U of Michigan	100,000 *	9/1/74	4/30/77	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-25	Cost and Safety Effectiveness of Highway Design Elements	Jorgensen & Assoc	260,576 *	7/15/75	4/16/78	Completed—Published as NCHRP Report 197
03-26	Investigation of Selected Noise Barrier Acoustical Parameters	Penn State U	224,494 *	12/1/76	2/28/80	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-27	Guidelines for Selecting Traffic Signal Control at Individual Intersections	Voorhees & Assoc	150,000 *	11/15/76	7/31/79	Completed—Published as NCHRP Report 233
03-28	Development of an Improved Highway Capacity Manual	JHK & Assoc	161,000 *	12/15/77	8/15/79	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-28(02)	Urban Signalized Intersection Capacity	JHK & Assoc	331,000 *	10/1/79	8/31/82	Completed—Results included in Highway Capacity Manual (TRB Special Report 209)

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
03-28A	Two-Lane, Two-Way Rural Highway Capacity	Texas A&M	157,492 *	5/1/80	2/28/83	Completed—Results included in Highway Capacity Manual (TRB Special Report 209)
03-28B	New Highway Capacity Manual	Poly Inst of NY	283,440 *	7/1/82	3/31/85	Completed—Published as Highway Capacity Manual (TRB Special Report 209)
03-28C	Effects of Quality of Traffic Signal Progression on Delay	Texas A&M	164,546 *	8/1/86	7/31/88	Completed—Published as NCHRP Report 339
03-29	Traffic Signal Display Complexity	Systems Tech	196,284 *	7/1/83	3/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
03-30	Intersection Channelization	Jack Leisch Assoc	130,000 *	7/1/83	5/15/85	Completed—Published as NCHRP Report 279
03-31	Guidelines for Evaluating Alternatives for Replacing a Grade-Separated Rail/Highway Crossing	Ernst & Whinney	200,000 *	9/4/84	2/28/87	Completed—Published as NCHRP Report 288
03-32	Temporary Pavement Markings for Work Zones	Texas A&M	164,990 *	5/1/85	2/28/87	Completed—Summary published in Transportation Research Record 1160
03-33	Capacity and Level-of-Service Procedures for Multilane Rural and Suburban Highways	JHK & Assoc	475,132 *	6/1/85	4/30/90	Completed—Results included in Highway Capacity Manual (TRB Special Report 209)
03-34	The Feasibility of a National Heavy-Vehicle Monitoring System	Arthur D. Little	499,791 *	11/1/85	9/30/88	Completed—Published as NCHRP Report 303
03-35	Speed-Change Lanes	JHK & Assoc	250,000 *	6/1/86	5/31/89	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-36	Development of a Low-Cost Bridge Weigh-In-Motion System	Bridge Weighing Systems	400,000 *	2/16/87	2/28/90	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-37	Capacity and Level of Service at Ramp-Freeway Junctions	Polytechnic U	400,000	7/1/90	12/31/93	Completed—Results included in Highway Capacity Manual (TRB Special Report 209)
03-37(02)	Capacity and Level of Service at Ramp-Freeway Junctions (Phase II)	Polytechnic U	150,000	9/1/94	4/30/96	Completed—Published as NCHRP Report 385
03-38(01)	Assessment of Advanced Technologies for Relieving Urban Traffic Congestion	Castle Rock Consult	202,666 *	7/1/87	6/30/91	Completed—Published as NCHRP Report 340
03-38(01)A	A Study to Assess Advanced Vehicle and Highway Technologies	TRB	345,000	7/1/89	3/31/91	Completed—Published as TRB Special Report 232
03-38(02)	Travel Characteristics of Large-Scale Suburban Activity Centers	JHK & Assoc	300,000 *	6/1/87	2/28/89	Completed—Published as NCHRP Report 323
03-38(03)	Traffic Adaptive Control (Phase 1)—Critical Intersection Control Strategies; (Phase 2)—OPAC Control Strategies	Farradyne Systems	374,829	9/1/87	3/31/93	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-38(04)	Traffic Signal Control for Saturated Conditions	KLD & Assoc	270,000 *	10/1/87	6/4/92	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-38(05)	Effective Utilization of Street Width	Midwest Research Inst	159,941 *	4/1/88	6/30/90	Completed—Published as NCHRP Report 330

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
03-38(06)	Cost Sharing for Transportation Improvements Near Major Suburban Employment Centers	Indiana U Fdn	125,000	5/15/88	2/28/91	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
03-38(07)	Access Management Policies and Guidelines for Activity Centers	Metro Transportation Group	224,759	5/15/89	9/30/93	Completed---Published as NCHRP Report 348
03-39	Evaluation and Calibration Procedures for Weigh-In-Motion Systems	Texas A&M	398,500	3/1/88	12/31/93	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
03-39(02)	On-Site Evaluation and Calibration Procedures for Weigh-In-Motion Systems	Washington State U	247,846	3/10/94	12/9/95	Completed---Report not publ.; agency report avail. for loan; summarized in NCHRP Research Results Digest 214
03-40	Single Point Urban Interchange Design and Operations Analysis	Texas A&M	241,037 *	5/1/89	11/30/91	Completed---Report published as NCHRP Report 345
03-41	Procedure for Determining Work Zone Speed Limits	Graham-Migletz	200,000	11/15/89	5/31/93	Completed---Summarized in NCHRP Research Results Digest 192
03-41(02)	Effectiveness and Implementability of Procedures for Determining Work Zone Speed Limits	Graham-Migletz	200,000	1/1/94	3/31/97	Completed---Publication decision pending
03-42	Determination of Stopping Sight Distances	Texas A&M	500,000	5/1/91	11/1/94	Completed---To be publ. as NCHRP Report 400
03-43	Use of Shoulders and Narrow Lanes to Increase Freeway Capacity	JHK & Assoc	300,000	1/15/91	4/15/94	Completed---Published as NCHRP Report 369
03-44	Improved Traffic Control Device Design and Placement to Aid the Older Driver	Michigan State U	350,000	2/15/92	12/31/96	Completed---Publication decision pending
03-45	Speed-Flow Relationships for Basic Freeway Segments	JHK & Assoc	350,000	11/1/92	6/30/95	Completed---Results to be included in 1998 Highway Capacity Manual
03-46	Capacity and Level of Service at Unsignalized Intersections	U of Idaho	412,436	1/1/93	12/31/95	Completed---Results to be included in 1998 Highway Capacity Manual; see project write-up on NCHRP WWW homepage
03-47	Capacity Analysis of Interchange Ramp Terminals	Texas A&M	400,000	1/1/94	4/30/97	Completed---Results to be included in 2000 Highway Capacity Manual; see project write-up on NCHRP WWW homepage
03-48	Capacity Analysis for Actuated Intersections	U of Florida	250,000	12/15/93	9/30/96	Completed---Results to be included in 1998 Highway Capacity Manual; see project write-up on NCHRP WWW homepage
03-49	Capacity and Operational Effects of Midblock Left-Turn Lanes	U of Nebraska - Lincoln	300,000	1/1/94	11/30/96	Completed---Published as NCHRP Report 395
03-50	Driver Information Overload	Westat	299,833	1/3/94	6/30/98	Research in progress
03-51	Communications Mediums for Signal, IVHS, and Freeway Surveillance Systems	Kimley-Horn & Assoc	380,000	12/15/93	4/30/96	Completed---Report not publ.; see project write-up on NCHRP WWW homepage

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
03-52	Impacts of Access-Management Techniques	Urbitran Assoc	399,982	2/27/95	3/31/98	Research in progress
03-53	Development of a HOV Systems Manual	Texas A&M	250,000	2/20/95	2/28/98	Research in progress
03-54	Uniform Traffic Signal Displays for Protected/Permissive Left-Turn Control	Kittelson & Assoc	100,000	1/9/95	12/31/96	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-54(02)	Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control	Kittelson & Assoc	400,000	12/1/97	11/30/99	Research in progress
03-55	A Highway Capacity Manual for the Year 2000	Catalina Engineering	300,000	1/1/95	10/31/96	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-55(02)	Techniques to Estimate Speeds and Service Volumes for Planning Applications	Dowling Assoc	200,000	7/1/95	9/30/96	Completed—Published as NCHRP Report 387
03-55(02)A	Planning Applications for the Year 2000 Highway Capacity Manual	Dowling Assoc	200,000	7/18/97	6/17/99	Research in progress
03-55(03)	Capacity and Quality of Service for Two-Lane Highways	Midwest Research Inst	600,000	9/15/95	7/31/98	Research in progress
03-55(04)	Performance Measures and Levels of Service in the Year 2000 Highway Capacity Manual	JHK & Assoc/Transcore	159,250	1/8/96	10/31/97	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
03-55(05)	Capacity and Quality of Service of Weaving Areas	Viggen Corp	299,829	12/1/96	1/31/99	Research in progress
03-55(06)	Production of the Year 2000 Highway Capacity Manual	Catalina Engineering	900,000	10/15/96	1/4/00	Research in progress
03-56	Systemwide Impact of Safety and Traffic Operation Design Decisions for Resurfacing, Restoration, or Rehabilitation (RRR) Projects	Midwest Research Inst	300,000	5/15/96	5/14/99	Research in progress

AREA FOUR : MATERIALS AND CONSTRUCTION--GENERAL MATERIALS

04-01	Development of Appropriate Methods for Evaluating the Effectiveness of Stabilizing Agents	U of Illinois	114,991 *	6/1/63	10/31/66	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
04-02	A Study of Degrading Aggregates in Bases and Subbases with Production of Excessive Amounts of and/or Harmful Types of Fines	Purdue U	63,990 *	2/15/63	11/30/66	Completed—Published as NCHRP Report 98
04-03(01)	Development of Methods to Identify Aggregate Particles Which Undergo Destructive Volume Changes When Frozen in Concrete	VPI	43,337 *	3/1/63	3/31/67	Completed—Published as NCHRP Report 12; Phase II publ. as NCHRP Report 65
04-03(02)	Development of Methods to Identify Aggregate Particles Which Undergo Destructive Volume Changes When Frozen in Concrete	Penn State U	106,213 *	3/25/63	8/3/67	Completed—Published as HRB Special Report 80 and NCHRP Report 15; Phase II publ. as NCHRP Report 66

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
04-04	Synthetic Aggregates for Highway Uses	Battelle Memorial Inst	14,790 *	3/1/63	4/15/64	Completed---Published as NCHRP Report 8
04-05	A Study of the Mechanism Whereby the Strength of Bases and Subbases Is Affected by Frost and Moisture	Michigan Tech U	64,105 *	2/15/63	8/31/65	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
04-06	Protective Coatings for Highway Structural Steel	Steel Structures Painting Council	25,000 *	3/1/65	11/30/66	Completed---Published as NCHRP Reports 74, 74A, 74B
04-07	Fatigue Strength of High-Yield Reinforcing Bars	PCA	150,000 *	10/1/67	8/31/73	Completed---Report included in NCHRP Report 164
04-08	Research Needs Relating to Performance of Aggregates in Highway Construction	VPI	55,254 *	1/1/68	4/30/69	Completed---Published as NCHRP Report 100
04-08(02)	Density Standards for Field Compaction of Granular Bases and Subbases	Clemson U	95,248 *	4/1/71	6/30/73	Completed---Published as NCHRP Report 172
04-08(03)	Predicting Moisture-Induced Damage to Asphaltic Concrete	U of Idaho	261,037 *	9/1/71	1/31/82	Completed---Published as NCHRP Report 192; Phase II publ. as NCHRP Report 246
04-08(04)	Predicting Moisture-Induced Damage to Asphaltic Concrete---10-year Field Evaluation	U of Idaho	24,402 *	6/1/85	1/31/87	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
04-09	Evaluation of Preformed Elastomeric Pavement Joint Sealing Systems and Practices	Utah DOT	93,494 *	10/1/68	6/30/71	Completed---Report included in Phase II report
04-09(01)	Preformed Elastomeric Pavement Joint Sealing Systems---Field Evaluation Phase	Utah DOT	144,837 *	10/1/72	12/31/79	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
04-10	Promising Replacements for Conventional Aggregates for Highway Use	U of Illinois	50,000 *	10/15/69	3/31/71	Completed---Published as NCHRP Report 135
04-10A	Waste Materials as Potential Replacements for Highway Aggregates	Valley Forge Lab	53,663 *	9/1/72	11/30/73	Completed---Published as NCHRP Report 166
04-11	Buried Plastic Pipe for Drainage of Transportation Facilities	Simpson, Gumpertz, & Heger	200,000 *	9/16/74	1/26/79	Completed---Published as NCHRP Report 225
04-12	Upgrading of Poor or Marginal Aggregates for PCC and Bituminous Pavements	Penn State U	149,941 *	12/1/76	5/31/79	Completed---Published as NCHRP Report 207
04-13	Temporary Pavement Marking Systems	Sw Research Inst	49,500 *	11/1/76	2/28/78	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
04-13A	Temporary Pavement Marking Paint Systems	Georgia Tech	69,971 *	4/1/78	9/30/79	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
04-14	Coating Systems for Painting Old and New Structural Steel	Georgia Tech	199,302 *	1/1/78	12/31/81	Completed---Report not publ.; for avail., see Summary of Progress Through 1988

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
04-15	Corrosion Protection of Prestressing Systems in Concrete Bridges	Wiss, Janney, Elstner & Assoc	249,973 *	7/1/82	11/30/85	Completed---Published as NCHRP Report 313
04-16	Cost and Service Life of Pavement Markings	Penn State U	340,327 *	10/1/84	8/30/90	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
04-17	Environmental Monitoring and Evaluation of Calcium Magnesium Acetate (CMA)	U of Washington	199,943 *	1/7/85	10/31/87	Completed---Published as NCHRP Report 305
04-18	Design and Evaluation of Large Stone Mixtures	Texas A&M	299,440	6/1/92	7/31/96	Completed---Published as NCHRP Report 386
04-19	Aggregate Tests Related to Asphalt Concrete Performance in Pavements	Auburn U	499,194	2/1/94	5/31/97	Completed---To be published as NCHRP Report 405
04-20	Aggregate Tests Related to Performance of Portland Cement Concrete	Texas A&M	132,890	3/15/95	12/31/96	Contract terminated
04-20A	Aggregate Tests Related to Performance of Portland Cement Concrete: State-of-the-Art Report and Plan for Research	Richard C. Meininger	30,000	5/27/97	1/31/98	Research in progress
04-21	Appropriate Use of Waste and Recycled Materials in the Transportation Industry	Chesner Engineering	499,974	6/1/95	5/31/98	Research in progress
04-22	Pavement-Marking Materials: Health, Environmental, and Performance Assessment	Research Triangle Inst	199,996	2/1/95	1/30/97	Completed---Published as NCHRP Report 392
04-23	Performance-Related Tests of Aggregates for Use in Unbound Pavement Layers	Applied Research Assoc	499,938	5/1/96	4/30/99	Research in progress
04-24	HDPE Pipe Material Specifications and Design Requirements	Geosynthetic Research Inst of Drexel U	130,000	1/1/97	3/31/98	Research in progress
04-25	Implementation Plan for Automating Highway-Materials Testing	Braun Intertec Corp	154,960	2/10/97	5/9/98	Research in progress
04-26	Thermoplastic Drainage Pipe, Design and Testing	----	500,000			Contract pending

AREA FIVE: TRAFFIC--ILLUMINATION AND VISIBILITY

05-02(01)	Effects of Illumination on Operating Characteristics of Freeways---Traffic Flow, Driver Behavior, and Accidents	Yale U	145,849 *	2/15/63	7/31/67	Completed---Report included in NCHRP Report 60
05-02(02)	Effects of Illumination on Operating Characteristics of Freeways---Driver Response, Visibility, and Visual Discomfort	Ohio State U	81,187 *	2/15/63	8/31/65	Completed---Report included in NCHRP Report 60
05-02(03)	Effects of Illumination on Operating Characteristics of Freeways---Driver Discomfort	Inst for Research	37,460 *	2/20/63	2/28/66	Completed---Report included in NCHRP Report 60
05-03	Visual Information Needed by the Driver at Night	Ohio State U	100,940 *	9/1/64	3/31/67	Completed---Published as NCHRP Report 99

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
05-04	Economic Study of Roadway Lighting	Franklin Inst	19,412 *	7/20/64	8/31/65	Completed---Published as NCHRP Report 20
05-05	Nighttime Use of Highway Pavement Delineation Materials	Sw Research Inst	150,000 *	3/1/65	9/15/69	Completed---Published as NCHRP Report 45; Phase II published as NCHRP Report 85
05-05A	Development of Optimum Specifications for Glass Beads in Pavement Markings	Penn State U	99,350 *	5/1/71	6/30/73	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
05-05B	Pavement Marking Systems for Improved Wet-Night Visibility Where Snowplowing Is Prevalent	Texas A&M	200,000 *	9/1/71	12/31/74	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
05-06	Highway Fog	Cornell Aero Lab	99,955 *	10/2/67	4/30/69	Completed---Published as NCHRP Report 95
05-06A	Highway Fog	Sperry Rand	93,540 *	9/1/70	5/31/73	Completed---Published as NCHRP Report 171
05-07	Roadway Delineation Systems	Penn State U	469,526 *	10/1/68	6/30/71	Completed---Published as NCHRP Report 130
05-08	Warrants for Highway Lighting	Texas A&M	198,875 *	3/16/70	2/15/73	Completed---Published as NCHRP Report 152
05-09	Partial Lighting of Interchanges	KETRON, Inc.	199,999 *	12/1/80	1/31/83	Completed---Published as NCHRP Report 256
05-10	A Mobile System for Measuring Retroreflectance of Traffic Signs	EKTRON Appl Image	480,795 *	9/7/87	12/31/90	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
05-11	Implementation Strategies for Sign Retroreflectivity Standards	Bellomo-McGee	203,544 *	2/15/89	8/31/91	Completed---Published as NCHRP Report 346
05-12	Requirements for Application of Light Emitting Diodes (LEDs) to Traffic Control Signals	Lighting Sciences	249,973	2/15/92	8/15/94	Completed---Agency report avail. for loan; summarized in NCHRP Research Results Digest 205
05-13	Illumination Guidelines for Nighttime Highway Work	U of Florida Research Fdn	173,979	2/1/93	6/30/95	Completed---Agency report avail. for loan; summarized in NCHRP Research Reports Digest 216
05-13(02)	Illumination Guidelines for Nighttime Highway Work	U of Florida Research Fdn	199,243	2/1/96	5/31/98	Research in progress
05-14	Advance Warning Arrow Panel Visibility	Last Resource	275,000	3/1/93	12/31/96	Completed---Publication decision pending
05-15	Visibility Performance Requirements for Vehicular Traffic Signals	Westat, Inc.	350,000	3/18/96	8/17/98	Research in progress

AREA SIX : MAINTENANCE--SNOW AND ICE CONTROL

06-01	Development of Economical and Effective Chemical Deicing Agents to Minimize Injury to Highway Structures and Vehicles	IIT Research Inst	40,000 *	2/15/63	9/30/64	Completed---Published as NCHRP Report 19
06-02	Nonchemical Methods for Preventing or Removing Snow and Ice Accumulations on Highway Structures	Jorgensen & Assoc	25,000 *	2/15/63	2/29/64	Completed---Published as NCHRP Report 4

TABLE 1 (Continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
No.	Title					
06-03	Development and Evaluation of Protective Coatings to Prevent Deterioration of Concrete Structures by Deicing Agents	Battelle Memorial Inst	58,557 *	3/1/63	2/28/65	Completed---Published as NCHRP Report 16
06-04	Evaluation and Development of Methods for Reducing Corrosion of Reinforcing Steel	Battelle Memorial Inst	39,330 *	3/1/63	4/30/65	Completed---Published as NCHRP Report 23
06-05	Study of Physical Factors Influencing Resistance of Concrete to Deicing Agents	U of Illinois	72,500 *	3/1/63	8/31/65	Completed---Published as NCHRP Report 27
06-06	To Evaluate Existing Methods and/or Develop Improved Methods for the Measurement of Certain Properties of Concrete	Ohio State U	69,393 *	3/1/63	2/28/66	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
06-07	Estimation of Disintegration in Concrete Structures	Geotechnics	8,547 *	3/1/63	8/31/64	Contract terminated---No report; research resumed under Project 06-07A
06-07A	Estimation of Disintegration in Concrete Structures	IIT Research Inst	44,614 *	2/1/65	7/31/66	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
06-08	Evaluation of Methods of Replacement of Deteriorated Concrete in Structures	Tallamy Assoc	25,000 *	2/15/63	2/29/64	Completed---Published as NCHRP Report 1
06-09	Potential Accelerating Effects of Chemical Deicing Damage by Traffic and Other Environmental-Induced Stresses in Concrete Bridge Decks	U of Illinois	200,000 *	1/1/65	6/15/68	Completed---Published as NCHRP Report 101
06-10	Develop Improved Snow Removal and Ice Control Techniques at Interchanges	Tallamy Assoc	95,000 *	9/1/67	9/30/70	Completed---Published as NCHRP Report 127
06-11	Economic Evaluation of the Effects of Ice and Frost on Bridge Decks	Midwest Research Inst	100,000 *	9/1/70	9/11/74	Completed---Published as NCHRP Report 182
06-12	Improved Visibility for Snow Plowing Operations	Rensselaer Polytechnic Inst	299,581	11/1/95	10/31/98	Research in progress
06-13	Guidelines for Snow and Ice Control Materials and Methods	---	600,000			Contract pending

AREA SEVEN : TRAFFIC--TRAFFIC PLANNING

07-01	The Influence of Land Use on Urban Travel Patterns	Louis E. Keefer	129,568 *	2/1/64	9/30/67	Completed---Published as NCHRP Report 24, 62
07-02	Traffic Attraction of Rural Outdoor Recreational Areas	IIT Research Inst	49,496 *	2/1/64	5/31/66	Completed---Total project published as NCHRP Report 44
07-03	Weighing Vehicles in Motion	Franklin Inst	73,391 *	2/1/64	8/31/67	Completed---Published as NCHRP Report 71
07-04	Factors and Trends in Trip Lengths	Voorhees & Assoc	150,980 *	2/1/64	1/10/69	Completed---Published as NCHRP Report 48; Phase II published as NCHRP Report 89

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
07-05	Predicted Traffic Usage of a Major Highway Facility Versus Actual Usage	Yale U	99,675 *	2/1/64	11/30/66	Completed---Published as NCHRP Report 58
07-06	Multiple Use of Lands Within Highway Rights-of-Way	Barton-Aschman	24,220 *	2/1/66	2/28/67	Completed---Published as NCHRP Report 53
07-07	Motorists' Needs and Services on Interstate Highways	Airborne Instruments	99,267 *	1/1/66	12/31/67	Completed---Published as NCHRP Report 64
07-08	User Cost and Related Consequences of Alternative Levels of Highway Service	Stanford Research Inst	99,070 *	9/1/70	4/15/72	Completed---Published as NCHRP Report 133
07-09	Development of Models for Predicting Weekend Recreational Traffic	Midwest Research Inst	74,983 *	9/1/72	5/15/74	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
07-10	Peak-Period Traffic Congestion	Remak/Rosenbloom	49,624 *	4/1/74	3/31/75	Completed---Published as NCHRP Report 169
07-10(02)	The Institutional Aspects of Implementing Congestion-Reducing Techniques	Remak/Rosenbloom	74,703 *	4/1/75	11/30/78	Completed---Published as NCHRP Report 205
07-11	Low-Cost TSM Projects---Simplified Procedures for Evaluation and Setting Priorities	Multiplications, Inc.	199,988 *	4/6/81	11/30/83	Completed---Published as NCHRP Report 263
07-11A	Low-Cost TSM Projects---Simplified Procedures for Evaluation, Phase II	Texas A&M	150,000 *	3/4/85	8/3/86	Completed---Published as NCHRP Report 283
07-12	Microcomputer Evaluation of Highway User Benefits	Texas A&M	200,000	2/1/89	9/30/95	Completed---Report released with software through McTrans Center at U of Florida
07-12(02)	Metrication and Enhancement of MicroBENCOST Software Package	Texas A&M	170,000	12/15/95	6/30/97	Research in progress; time extension pending
07-13	Quantifying Congestion	Texas A&M	375,000	3/1/92	2/28/97	Completed---Published as NCHRP Report 398

AREA EIGHT : TRANSPORTATION PLANNING--FORECASTING

08-01	Social and Economic Factors Affecting Travel	Vogt, Ivers	94,558 *	2/1/64	9/23/66	Completed---Published as NCHRP Report 70
08-02	Factors Influencing Modal Trip Assignment	IIT Research Inst	298,033 *	2/1/64	8/31/66	Completed---Published as NCHRP Report 57
08-03	Individual Preferences for Various Means of Transportation	U of Penn	63,282 *	2/1/64	3/31/65	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-04	Criteria for Evaluating Alternative Transportation Plans	Northwestern U	89,900 *	2/1/65	8/1/67	Completed---Report included in NCHRP Report 96
08-04A	Criteria for Evaluating Alternative Transportation Plans	U of Illinois	5,000 *	10/14/68	1/10/69	Completed---Published as NCHRP Report 96
08-05	Transportation Aspects of Land-Use Controls	Victor Gruen	125,538 *	4/1/65	1/15/70	Completed---Published as NCHRP Report 31; Phase II published as NCHRP Report 121

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
08-06	Individual Preferences for Alternative Dwelling Types and Environments	U of North Carolina	99,897 *	2/14/66	3/13/68	Completed---Published as NCHRP Report 81
08-07	Evaluation of Data Requirements and Collection Techniques for Transportation Planning	Creighton-Hamburg	190,000 *	9/13/68	8/28/70	Completed---Published as NCHRP Report 120
08-07A	Data Requirements and Transportation Planning Procedures in Small Urban Areas	U of Tennessee	98,005 *	6/1/73	6/14/75	Completed---Published as NCHRP Report 167
08-08(01)	The Impact of Highways upon Environmental Values (Study Design)	M I T	29,654 *	9/16/68	3/14/69	Completed---Study design, not published
08-08(02)	The Impact of Highways upon Environmental Values (Study Design)	Daniel, Mann, et al	28,950 *	9/9/68	3/7/69	Completed---Study design, not published
08-08(03)	The Impact of Highways upon Environmental Values	M I T	470,000 *	9/15/69	7/31/74	Completed---Published as NCHRP Report 156
08-09	Comparative Economic Analysis of Alternative Multimodal Passenger Transportation Systems	Creighton-Hamburg	100,000 *	9/1/71	1/31/73	Completed---Published as NCHRP Report 146
08-10	Planning and Design Guidelines for Efficient Bus Utilization of Highway Facilities	Wilbur Smith Assoc	149,907 *	9/1/71	7/31/73	Completed---Published as NCHRP Reports 143 and 155
08-11	Social, Economic, Environmental Consequences of Not Constructing a Transportation Facility	DACP, Inc.	364,363 *	9/16/74	11/30/79	Completed---Phase I report not publ.; for avail., see Summary of Progress Through 1988; Phase II report published as NCHRP Reports 216 and 217
08-12	Travel Estimation Procedures for Quick Response to Urban Policy Issues	Metro Wash COG	39,895 *	9/3/74	12/31/75	Completed---Results published in 08-12A report
08-12A	Travel Estimation Procedures for Quick Response to Urban Policy Issues	COMSIS Corp	239,331 *	11/1/75	10/31/78	Completed---Published as NCHRP Reports 186 and 187
08-13	Disaggregate Travel Demand Models	Charles River Assoc	100,000 *	9/15/74	1/31/76	Completed---Phase I report not publ.; for avail., see Summary of Progress Through 1988
08-13(02)	Disaggregate Travel Demand Models	Charles River Assoc	200,000 *	5/1/76	12/31/80	Completed---Published as NCHRP Report 253
08-14	New Approaches to Understanding Travel Behavior	Boston College	144,135 *	1/1/75	4/30/77	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-14A	New Approaches to Understanding Travel Behavior: Phase II	Charles River Assoc	221,250 *	1/1/78	6/30/82	Completed---Published as NCHRP Report 250
08-15	State and Regional Transportation Impact Identification and Measurement	Bigelow-Crain	80,000 *	9/1/74	5/31/76	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-15A	Economic Impacts of State Transportation Policies and Programs	Reg Sci Research Inst	117,852 *	10/1/77	3/31/80	Completed---Report not publ.; for avail., see Summary of Progress Through 1988

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
08-16	Guidelines for Public Transportation Levels of Service and Evaluation	U of Tennessee	489,952 *	1/1/76	12/31/80	Completed---Published as NCHRP Reports 208, 209, 210, 211, 212
08-17	Freight Data Requirements for Statewide Transportation Systems Planning	R. Creighton Assoc	231,147 *	7/15/75	2/15/77	Completed---Published as NCHRP Reports 177 and 178
08-18	Techniques for Evaluating Options in Statewide Transportation Planning/Programming	Planning Envr Intl/AMV	300,393 *	9/1/75	6/30/78	Completed---Published as NCHRP Reports 179 and 199
08-19	The Relationship of Changes in Urban Highway Supply to Vehicle-Miles of Travel	Cambridge Systematics	199,954 *	12/1/76	11/30/78	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-20	Improved Methods for Vehicle Counting and Determining Vehicle-Miles of Travel	Hamburg & Assoc	200,000 *	1/2/78	7/31/80	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-21	Guidelines for Use of Vanpools and Carpools as a Transportation System Management Technique	Geo Washington U	265,486 *	3/1/79	6/30/81	Completed---Guidelines published as NCHRP Report 241; research report not publ.; for avail., see Summary of Progress Through 1988
08-22	Transportation Financing Within the Context of Energy Constraints	System Design Concepts	100,000 *	3/26/79	2/27/81	Completed---Published as NCHRP Report 231
08-23	Fuel Supply Limitations and Passenger Travel	Charles River Assoc	110,000 *	4/2/79	9/1/80	Completed---Published as NCHRP Report 229
08-24	Forecasting the Basic Inputs to Transportation Planning	Hamburg & Assoc	81,000 *	1/21/80	4/30/82	Completed---Published as NCHRP Report 266
08-24A	Forecasting the Basic Inputs to Transportation Planning at the Zonal Level	COMSIS Corp	192,444 *	4/1/87	2/28/90	Completed---Published as NCHRP Report 328
08-25	Intercity Bus Transportation Planning	Peat, Marwick, et al	200,000 *	4/1/80	1/31/82	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
08-26	Development of Highway Traffic Data for Project Planning and Design in Urbanized Areas	JHK & Assoc	100,000 *	5/15/81	12/31/82	Completed---Published as NCHRP Report 255
08-27	Cost-Effectiveness of Transportation Services for Handicapped Persons	U of Tennessee	199,543 *	9/1/81	4/30/83	Completed---Published as NCHRP Reports 261 and 262
08-28	Strategic Planning and Management for Transportation Agencies	Ernst & Young	180,020 *	6/1/87	6/25/90	Completed---Published as NCHRP Report 331
08-29	Travel Estimation Techniques for Urban Planning	Barton-Aschman Assoc	300,000	2/15/91	4/29/94	Completed---Report to be published as NCHRP Report 365 after completion of 08-29(02)
08-29(02)	Travel Estimation Techniques for Urban Planning	Barton-Aschman Assoc	47,398	7/1/95	1/12/96	Completed---To be published as NCHRP Report 365
08-30	Characteristics and Changes in Freight Transportation Demand	Cambridge Systematics	550,000	12/15/92	2/29/96	Completed---Published as NCHRP Report 388
08-31	Long-Term Availability of Multimodal Corridor Capacity	The Urban Inst	285,000	1/4/93	1/1/96	Completed---Continued as Project 08-31A

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
08-31A	Long-Term Availability of Multimodal Corridor Capacity	Cambridge Systematics	65,920	7/1/95	3/31/96	Completed---To be published as NCHRP Report 399
08-32	Workshop on Multimodal Transportation Planning Research Needs	TRB	70,000	3/15/93	3/14/94	Completed---Report not published; for avail., see Summary of Progress Through 1988
08-32(01)	Innovative Practices for Multimodal Transportation Planning for Freight and Passengers	Transmanagement, Inc.	140,658	12/1/94	6/30/96	Completed---Publication decision pending
08-32(02)	Multimodal Transportation: Development of a Performance-Based Planning Process	Cambridge Systematics	250,000	1/1/95	7/31/96	Completed---Phase I to be summarized as a NCHRP Research Results Digest
08-32(02)A	Multimodal Transportation: Development of a Performance-Based Planning Process	Cambridge Systematics	299,990	4/1/97	9/30/98	Research in progress
08-32(03)	Integration of Land-Use Planning with Multimodal Transportation Planning	Parsons, Brinckerhoff, Quade, & Douglas	400,000	10/1/95	8/31/98	Research in progress
08-32(04)	Developing and Maintaining Partnerships for Multimodal Transportation Planning	Kimley-Horn & Assoc	199,950	3/1/95	6/30/97	Completed---Publication decision pending
08-32(05)	Multimodal Transportation Planning Data	Jack Faucett Assoc	350,000	2/1/95	12/31/96	Completed---Published as NCHRP Report 401
08-33	Quantifying Air-Quality and Other Benefits and Costs of Transportation Control Measures	Cambridge Systematics	1,014,964	7/1/95	10/31/98	Research in progress; interim material published in NCHRP Research Results Digest 217
08-34	Major Investment Studies: Development of a Practitioner's Guidebook for Effective Study Design, Management, and Implementation	JHK & Assoc/Transcore	200,000	3/1/97	8/31/98	Research in progress
08-35	Incorporating ITS into the Transportation Planning Process	---	300,000			Contract pending

AREA NINE : MATERIALS AND CONSTRUCTION--BITUMINOUS MATERIALS

09-01	Asphalt Durability and Its Relation to Pavement Performance	American Oil	100,000 *	2/1/64	4/30/67	Completed---Total project published as NCHRP Report 67
09-02	Asphalt Durability and Its Relation to Pavement Performance---Adhesion	Montana College	101,903 *	1/1/65	10/31/67	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
09-03	Evaluation of Pavement Joint and Crack Sealing Materials and Practices	Rensselaer Polytechnic Inst	24,996 *	6/1/65	6/30/66	Completed---Published as NCHRP Report 38
09-04	Minimizing Premature Cracking of Asphaltic Concrete Pavements	Materials R&D	99,560 *	11/1/71	6/30/73	Completed---Published as NCHRP Report 195
09-04A	Bayesian Analysis Methodology for Verifying Recommendations to Minimize Asphalt Pavement Distress	Woodward-Clyde	204,194 *	9/15/75	11/1/78	Completed---Published as NCHRP Report 213

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
09-05	Design of Emulsified Asphalt Paving Mixtures	Asphalt Inst	150,172 *	4/1/80	6/30/84	Completed—Published as NCHRP Report 259
09-06(01)	Asphalt Aggregate Mixture Analysis System (AAMAS)	Brent Rauhut Eng	660,017 *	1/5/87	6/4/90	Completed—Published as NCHRP Report 338
09-06A	Development of Asphalt Aggregate Mixture Analysis System: Phase I	ARE, Inc.	25,000 *	6/2/86	10/2/86	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
09-06B	Development of Asphalt Aggregate Mixture Analysis System: Phase I	Brent Rauhut Eng	25,000 *	6/2/86	10/2/86	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
09-06C	Development of Asphalt Aggregate Mixture Analysis System: Phase I	U of Maryland	24,879 *	6/2/86	10/2/86	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
09-07	Field Procedures and Equipment to Implement SHRP Asphalt Specifications	Brent Rauhut Eng	1,080,784	4/1/93	7/15/97	Completed—Publication decision pending
09-08	Designing Stone Matrix Asphalt Mixtures	Auburn U	995,720	4/1/94	6/30/98	Research in progress
09-09	Refinement of SUPERPAVE Gyrotory Compaction Procedure	Natl Center for Asphalt Tech	499,850	6/1/96	7/31/98	Research in progress
09-10	SUPERPAVE Protocols for Modified Asphalt Binders	Asphalt Inst	499,643	4/15/96	10/14/98	Research in progress
09-11	Segregation in Hot-Mix Asphalt Pavements	Natl Center for Asphalt Tech	300,000	6/15/97	6/14/99	Research in progress
09-12	Incorporation of Reclaimed Asphalt Pavement in the Superpave System	Purdue U	399,921	4/1/97	3/31/99	Research in progress
09-13	Evaluation of Moisture Sensitivity Tests	----	150,000			Contract pending
09-14	Investigation of the Restricted Zone in the Superpave Aggregate Gradation Specification	----	400,000			Contract pending
09-15	Quality Characteristics of Hot-Mix Asphalt Pavements for Use in Performance-Related Specifications	----	450,000			Contract pending

AREA TEN : MATERIALS AND CONSTRUCTION--SPECIFICATIONS, PROCEDURES, AND PRACTICES

10-01	Development of Guidelines for Practical and Realistic Construction Specifications	Miller-Warden	25,000 *	11/15/63	11/14/64	Completed---Published as NCHRP Report 17
10-02	Evaluation of Construction Control Procedures	Miller-Warden	59,750 *	11/4/63	2/1/66	Completed---Published as NCHRP Report 34
10-02A	Evaluation of Construction Control Procedures	Materials R&D	70,945 *	7/15/66	11/14/67	Completed—Published as NCHRP Report 69
10-03	Effects of Different Methods of Stockpiling and Handling Aggregates	Miller-Warden	55,000 *	10/22/63	10/16/65	Completed—Published as NCHRP Report 5; Phase II published as NCHRP Report 46
10-04	Rapid Test Methods for Field Control of Construction	Clemson U	99,320 *	2/1/64	2/28/67	Completed---Published as NCHRP Report 103

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
10-05	Density and Moisture Content Measurements by Nuclear Methods	Research Triangle Inst	88,636 *	1/15/64	10/7/66	Completed—Published as NCHRP Report 14; Phase II published as NCHRP Report 43
10-05A	Optimization of Nuclear Density and Moisture Content Measurement Methods	North Carolina State U	51,214 *	2/1/68	1/31/70	Completed—Published as NCHRP Report 125
10-06	Measurement of Pavement Thicknesses by Rapid and Nondestructive Methods	IIT Research Inst	108,821 *	2/1/64	10/31/66	Completed—Published as NCHRP Report 52
10-07	Potential Uses of Sonic and Ultrasonic Devices in Highway Construction	Ohio State U	24,310 *	2/1/64	3/31/65	Completed—Published as NCHRP Report 25
10-08	Evaluating Procedures for Determining Concrete Pavement Thickness and Reinforcement Position	Pennsylvania DOT	151,982 *	3/2/70	7/31/73	Completed—Published as NCHRP Report 168
10-09	Criteria for Need of Seal Coats for Bituminous Pavements	U of Minnesota	50,000 *	11/1/69	2/28/74	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
10-10	Acceptance Criteria for Electroslag Weldments in Bridges	US Steel	300,000 *	5/1/74	9/30/78	Completed—Published as NCHRP Report 201
10-11	Development of a Performance Specification for Bridge Deck Joint-Sealing Systems	Howard, Needles, et al	29,996 *	12/1/76	4/30/78	Completed—Published as NCHRP Report 204
10-12	Acceptance of Aggregates Used in Bituminous Paving Mixtures	Texas A&M	174,411 *	9/1/77	6/30/81	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
10-13	Ultrasonic Measurement of Weld Flaw Size	The Welding Inst	376,000 *	7/1/79	8/31/85	Completed—Published as NCHRP Report 242; Phase II report not publ.; for avail., see Summary of Progress
10-14	Locating Voids Beneath Pavement Using Pulsed Electromagnetic Wave Techniques	Georgia Tech	99,850 *	4/2/79	5/1/81	Completed—Published as NCHRP Report 237
10-15	Structural Strength Evaluation of Existing Reinforced Concrete Bridges	Eng Computer Corp	225,000 *	4/1/80	4/30/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988; Phase II publ. as NCHRP Report 292
10-16	Assessment of Deficiencies and Preservation of Bridge Substructures Below the Waterline	Byrd, Tallamy, et al	150,000 *	2/16/81	12/1/82	Completed—Published as NCHRP Report 251
10-17	Use of Antistripping Additives in Asphaltic Concrete Mixtures	David G. Tunnicliff	676,335 *	3/1/81	11/30/94	Completed—Phase I report publ. as NCHRP Report 274; Phase II report published as NCHRP Report 373
10-18	Specifying and Obtaining Entrained Air in Concrete	Constr Tech Lab/PCA	73,585 *	5/4/81	6/1/83	Completed—Published as NCHRP Report 258
10-19	Adding Dust Collector Fines to Asphalt Paving Mixtures	Penn State U	49,926 *	3/1/81	11/30/82	Completed—Published as NCHRP Report 252

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
10-20	Elastomeric Bearings Design, Construction, and Materials	U of Washington	374,715 *	2/1/81	5/31/89	Completed---Published as NCHRP Report 248; Phase II publ. as NCHRP Report 298; Phase III publ. as NCHRP Report 325
10-20A	High-Load, Multi-Rotational Bridge Bearings: Design, Materials, and Construction	U of Washington	265,398	6/1/86	12/31/93	Completed---Publication decision pending
10-21	Performance of Bridge Deck Concrete Subjected to Traffic-Induced Vibrations During Placement	TRB	25,000 *	2/1/80	9/30/81	Completed---Published as NCHRP Synthesis 86
10-22	The Performance of Weathering Steel in Bridges	Sheladia Assoc	195,550 *	4/1/82	8/31/87	Completed---Phase I publ. as NCHRP Report 272; Phase II publ. as NCHRP Report 314
10-23	Removal of Lead-Based Bridge Paints	Midwest Research Inst	81,118 *	7/1/82	6/30/83	Completed---Published as NCHRP Report 265
10-24	Rapid Replacement of PCC Pavement Segments	ARE, Inc.	240,000 *	3/15/82	3/14/88	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
10-25	Measurement of Cement and Water Content of Fresh Concrete	USACE Wtlys Exp Sta	148,303 *	10/13/83	9/5/86	Completed---Published as NCHRP Report 284
10-25A	Instantaneous Determination of Water-Cement Ratio in Fresh Concrete	Wiss, Janney, Elstner	272,431 *	6/1/85	2/15/90	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
10-26	Data Bases for Performance-Related Specifications for Highway Construction	ARE, Inc.	60,000 *	6/15/83	9/14/84	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
10-26A	Performance-Related Specifications for Hot-Mix Asphaltic Concrete	Penn State U	250,000 *	1/6/86	9/30/89	Completed---Published as NCHRP Report 332
10-27	Determination of Asphaltic Concrete Pavement Structural Properties by Nondestructive Testing	Texas A&M	449,519 *	9/17/84	8/31/89	Completed---Published as NCHRP Report 327
10-28	A Method to Determine Deteriorated Areas in Portland Cement Concrete Pavements	Gulf Applied Research	199,784 *	11/1/85	12/31/87	Completed---Published as NCHRP Report 304
10-29	Anchorage Zone Reinforcement for Post-Tensioned Concrete Girders	U of Texas	489,223 *	10/1/86	9/30/92	Completed---Published as NCHRP Report 356
10-30(01)	Nondestructive Methods for Field Inspection of Embedded or Encased High Strength Steel Rods and Cables	U of Manchester	25,000 *	1/6/86	9/29/86	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
10-30(02)	Nondestructive Methods for Field Inspection of Embedded or Encased High Strength Steel Rods and Cables	Sw Research Inst	25,000 *	1/20/86	10/3/86	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
10-30(03)	Nondestructive Methods for Field Inspection of Embedded or Encased High Strength Steel Rods and Cables	U of Manchester	400,000 *	7/1/87	4/30/91	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
10-31	Acceptance Criteria for Steel Bridge Welds	Materials Research Lab	348,350 *	1/1/86	12/31/89	Completed---Published as NCHRP Report 335

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
10-32	Durability of In-Place Concrete Containing High-Range Water-Reducing Admixtures	Constr Tech Lab/PCA	99,811	1/6/86	7/5/87	Completed—Published as NCHRP Report 296
10-32A	Durability Testing of High-Strength Concrete Containing High-Range Water-Reducing Admixtures	Utah State U	249,238	9/1/87	4/30/93	Completed—Summary published as NCHRP Research Results Digest 208
10-33	Potential Benefits of Geosynthetics in Flexible Pavement Systems	Georgia Tech Research	100,000 *	1/6/86	12/15/88	Completed—Published as NCHRP Report 315
10-34	Transient Protection, Grounding, and Shielding of Electronic Traffic Control Equipment	Georgia Tech Research	339,988	3/1/86	9/30/95	Completed—Phase I report publ. as NCHRP Report 317; Phase II agency report avail. for loan
10-35	Fatigue Behavior of Welded and Mechanical Splices in Reinforcing Steel	Wiss, Janney, Elstner Assoc	300,000 *	11/1/87	4/30/91	Completed—Published as NCHRP Research Results Digest 197
10-36	Evaluation of Weldments Incorporating Backing Materials	Arctec Canada Ltd/Fleet Tech Ltd	349,475	6/13/88	9/30/93	Completed—Publication decision pending
10-37	Performance of Epoxy-Coated Reinforcing Steel in Highway Bridges	Kenneth Clear	350,000	5/1/91	7/31/94	Completed—Published as NCHRP Report 370
10-37A	Performance of Epoxy-Coated Reinforcing Steel—Laboratory Testing	Florida Atlantic U	66,121	8/1/94	7/31/98	Research in progress; time extension pending
10-37B	A Protocol for the Evaluation of Existing Bridges Containing Epoxy-Coated Reinforcing Steel	Richard Weyers Consult	10,000	9/1/94	12/31/95	Completed—Report not published; summarized in NCHRP Research Results Digest 215
10-37C	Repair and Rehabilitation of Bridge Components Containing Epoxy-Coated Reinforcement	Concorr, Inc.	324,963	1/1/96	12/31/98	Research in progress
10-38	Fatigue-Resistant Design of Cantilevered Signal, Sign, and Light Supports	Lehigh U	300,000	9/1/92	5/30/96	Completed—Publication decision pending
10-38(02)	Fatigue-Resistant Design of Cantilevered Signal, Sign, and Light Supports	—				Contract pending
10-39	Construction Testing and Inspection Levels	Bergstralh-Shaw-Newman	140,000	9/1/92	6/1/94	Completed—Report available only to sponsors
10-39A	Testing and Inspection Levels for Hot-Mix Asphaltic Concrete Overlays	U of Wisconsin	260,000	2/1/96	1/31/98	Research in progress
10-40	Plasma Arc Cutting of Bridge Steels	Edison Welding Inst	268,688	1/18/93	7/31/95	Completed—Published as NCHRP Report 384
10-41	Evaluation of Unbonded Portland Cement Concrete Overlays	ERES Consult	200,000	2/1/94	8/29/97	Research in progress
10-42	Constructibility Review Process for Transportation Facilities	Texas A&M	300,000	2/15/94	8/14/96	Completed—Published as NCHRP Reports 390 and 391
10-43	Movable Bridge Inspection, Evaluation, and Maintenance	A.G. Lichtenstein & Assoc	284,000	2/1/94	6/30/97	Completed—AASHTO adoption of manual pending

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
10-44	Nondestructive Testing to Determine Insitu Material Properties of Pavement Layers	Brent Rauhut Eng	160,000	4/3/95	6/30/97	Contract terminated
10-45	Procedures for Evaluating Corrosion-Inhibiting Admixtures for Structural Concrete	CC Technologies Labs	274,848	12/1/95	5/31/98	Research in progress
10-46	Guidelines for Longitudinal Pavement Profile Measurement	U of Michigan	300,000	7/1/96	6/30/98	Research in progress
10-47	Guidelines for Longitudinal Pavement Profile Measurement	U of Michigan	300,000	7/1/96	6/30/98	Research in progress
10-48	Assessing Pavement Layer Condition Using Radar - Bar	North Carolina State	62,000	2/1/96	7/31/98	Research in progress
10-49	Improved Contracting Methods for Highway Construction Projects	Texas A&M	250,000	1/1/97	12/31/98	Research in progress
10-50	Strategies for Rehabilitating High Pavements Subjected to High Traffic Volumes	North Carolina State	20,700	2/2/97	5/21/98	Research in progress
10-51	Performance-Related Specifications for Elastomeric Bridge Bearings	U of Texas - Austin	324,918	7/1/97	6/30/99	Research in progress
10-52	Performance Tests for Vehicle Bridge Deck Gaps	North Carolina State	17,999	1/1/97	12/31/98	Contract terminated
10-53	Condition Evaluation of Prestressing Steel Strands in Concrete Bridges	Constr Tech Lab	387,035	4/1/97	9/30/99	Research in progress
10-54	Quality Based Performance Rating of Contractors, Cracks, Precipitation and Bridge Repairs	Team State	187,000	3/1/97	10/31/98	Research in progress
AREA ELEVEN : ADMINISTRATION--LAW						
11-01	Rules of Compensability and Valuation in Highway Land Acquisition	U of Wisconsin	84,840 *	1/1/65	4/30/67	Completed---Published as NCHRP Report 104
11-01(01)	Eliminating Enhancement or Diminution Effects on Right-of-Way Valuation	Real Estate Research	5,000	9/2/68	2/28/69	Completed---Published as NCHRP Report 114
11-01(02)	Recognition of Benefits to Remainder Property in Highway Valuation	Montano & Assoc	5,000 *	10/1/68	3/31/69	Completed---Published as NCHRP Report 88
11-01(03)	Taxation Aspects of Right-of-Way Acquisition	U of Tulsa	2,250	9/16/68	4/30/69	Project terminated---No final report
11-01(04)	Compensation in the Nature of Additives to Market Value	U of Oklahoma	2,500 *	12/1/68	5/31/69	Completed---Report not publ.; for avail., see Summary of Progress Through 1988

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
11-01(05)	Rules of Discovery and Disclosure in Highway Condemnation Proceedings	Long, Mikkelborg	2,500 *	9/15/68	4/14/69	Completed---Published as NCHRP Report 87
11-01(06)	Valuation and Condemnation Problems of Selected Special Purpose Properties	Edward E. Level	7,500 *	9/2/68	11/28/69	Completed---Published as NCHRP Report 92
11-01(07)	Valuation and Compensability of Noise, Pollution, and Other Environmental Factors	U of Oklahoma	2,500 *	10/1/68	3/31/69	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
11-01(08)	Remainder Damages Caused by Drainage, Runoff, Blasting, and Slides	Harrison Lewis	7,500 *	10/15/68	1/15/70	Completed---Published as NCHRP Report 134
11-01(09)	Valuation and Condemnation Problems Involving Trade Fixtures	Edward L. Snitzer	5,000 *	3/15/69	12/1/69	Completed---Published as NCHRP Report 94
11-01(10)	Compensability and Valuation Aspects of Residential Displacement in Highway Programs	Ross, Hardies, et al	5,000 *	3/15/69	9/15/69	Completed---Published as NCHRP Report 107
11-01(11)	Valuation Elements of Joint Development Projects, Including Air Rights	Real Estate Research	5,000 *	2/24/69	8/25/69	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
11-02	Theory and Practice in Inverse Condemnation	Reg & Urban Planning	15,000 *	2/1/65	6/30/66	Completed---Published as NCHRP Report 72
11-03	Valuation and Legal Implications of Scenic, Conservation, and Roadside Easements	Sutte, Jr. & Assoc	25,000 *	11/1/66	12/15/67	Completed---Published as NCHRP Report 56
11-03(01)	Public Control of Roadside Advertising Signs for Highway Beautification	Sutte, Jr. & Assoc	20,000 *	10/1/68	12/31/69	Completed---Published as NCHRP Report 119
11-03(02)	Public Control of Junkyards for Highway Beautification	Real Estate Research	13,300 *	9/2/68	2/28/70	Completed---Published as NCHRP Report 112
11-04	Elimination of Wide Divergence in Right-of-Way Valuation	Am Inst RI Est' App	24,959 *	7/1/69	2/28/71	Completed---Published as NCHRP Report 126
11-05	Valuation of Air Space	Daniel, Mann, et al	49,800 *	10/1/70	5/31/72	Completed---Published as NCHRP Report 142
11-06	Valuation and Compensability of Noise Pollution	Jack Faucett Assoc	94,744 *	4/1/74	7/31/75	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
11-07	National Data-Management System for Highway Tort Claims	Penn State U	274,999	5/1/97	8/31/99	Research in progress

AREA TWELVE : DESIGN--BRIDGES

12-01	Deformation of Steel Beams Related to Permitted Highway Bridge Overloads	U of Missouri	50,000 *	2/1/65	6/30/67	Completed---Report included in Project 12-06 report
12-02	Distribution of Wheel Loads on Highway Bridges	Iowa State U	79,512 *	6/1/66	12/31/68	Completed---Published as NCHRP Report 83
12-03	Development of Waterproof Roadway Joints for Bridges	Sw Research Inst	149,895 *	12/15/65	3/14/69	Completed---Report available only to sponsors

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
12-04	Thermal Characteristics of Highway Bridges	Sw Research Inst	102,400 *	12/15/65	3/31/68	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
12-05	Protection of Steel in Prestressed Concrete Bridges	U of Denver	173,255 *	9/15/66	11/15/68	Completed---Published as NCHRP Report 90
12-06	Prediction of Permanent Camber of Bridges	U of Missouri	82,253 *	2/1/67	4/30/72	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
12-07	Effects of Weldments on Fatigue Strength of Steel Beams	Lehigh U	399,023 *	10/1/66	12/31/72	Completed---Published as NCHRP Report 102; Phase II published as NCHRP Report 147
12-08	Bridge Rail Service Requirements as a Basis for Design Criteria	Texas A&M	98,546 *	3/1/68	6/30/71	Completed---Published as NCHRP Report 86; Phase II published as NCHRP Report 149
12-09	Elastomeric Bearing Research	Battelle Memorial Inst	84,800 *	9/1/67	1/31/70	Completed---Published as NCHRP Report 109
12-10	Analysis and Design of Bridge Bents	PCA	297,900 *	1/1/70	12/31/73	Completed---Published as NCHRP Report 163
12-11	Waterproof Membranes for Protection of Concrete Bridge Decks	Materials R&D	303,004 *	8/1/70	9/30/78	Completed---Published as NCHRP Report 165; Phase II report not publ.; for avail., see Summary of Progress Through 1988
12-12	Welded Steel Bridge Members Under Variable-Cycle Fatigue Loadings	US Steel	310,000 *	10/1/70	10/31/75	Completed---Published as NCHRP Report 188
12-13	Cathodic Protection for Reinforced Concrete Bridge Decks	USS Eng & Consult	174,601 *	10/1/72	7/31/74	Completed---Published as NCHRP Report 180
12-13A	Field Evaluation of Galvanic Cathodic Protection for Reinforced Concrete Bridge Decks	PCA	74,405 *	8/1/75	5/15/81	Completed---Published as NCHRP Report 234
12-14	Subcritical Crack Growth in Steel Bridge Members	US Steel	99,923 *	10/1/72	6/30/74	Completed---Published as NCHRP Report 181
12-15	Detection and Repair of Fatigue Cracking in Highway Bridges	Lehigh U	100,000 *	10/1/72	4/30/75	Completed---Published as NCHRP Report 206
12-15(02)	Retrofitting Procedures for Fatigue-Damaged Full-Scale Welded Bridge Beams	Lehigh U	150,000 *	6/1/76	11/30/78	Completed---Published as NCHRP Report 206
12-15(03)	Fatigue Behavior of Full-Scale Welded Bridge Attachments	Lehigh U	125,000 *	2/1/78	7/31/80	Completed---Published as NCHRP Report 227
12-15(04)	Steel Bridge Members Under Variable-Amplitude, Long-Life Fatigue Loading	Lehigh U	150,000 *	4/1/80	9/30/83	Completed---Published as NCHRP Report 267
12-15(05)	Fatigue Behavior of Variable-Loaded Bridge Details Near the Fatigue Limit	Lehigh U	399,999 *	9/1/83	12/31/90	Completed---Interim report publ. as NCHRP Report 286; final report publ. as NCHRP Report 354
12-16	Influence of Bridge Deck Repairs on Corrosion of Reinforcing Steel	Battelle Columbus	214,912 *	9/1/74	11/30/77	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
12-17	Evaluation of Repair Techniques for Damaged Steel Bridge Members	Battelle Columbus	49,974 *	11/15/76	4/30/78	Completed---Report not publ.; for avail., see Summary of Progress Through 1988

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
12-17A	Guidelines for Evaluation and Repair of Damaged Steel Bridge Members	Shanafelt/Horn	99,950 *	10/1/81	5/31/84	Completed—Published as NCHRP Report 271
12-18	Development of an Integrated Bridge Design System	Multiplications, Inc.	224,985 *	9/6/77	12/31/82	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
12-18A	Assessment of an Integrated Bridge Design System	Eng Computer Corp	15,000 *	2/1/84	1/3/86	Completed—Report available only to sponsors
12-19	Cathodic Protection of Concrete Bridge Structures	Corrosion Eng & Res	250,000 *	1/1/78	12/31/80	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
12-19A	Concrete Sealers for Protection of Bridge Structures	Wiss, Janney, Elstner	99,190 *	8/1/79	12/1/81	Completed—Published as NCHRP Report 244
12-19B	Cathodic Protection of Concrete Bridge Structures	Wiss, Janney, Elstner	138,900 *	11/1/82	4/30/85	Completed—Published as NCHRP Report 278
12-20	Bridges on Secondary Highways and Local Roads: Rehabilitation and Replacement	U of Virginia	169,878 *	3/1/78	11/30/81	Completed—Published as NCHRP Report 222; Phase II publ. as NCHRP Report 243
12-21	Evaluation of Damage and Methods of Repair for Prestressed Concrete Bridge Members	G. O. Shanafelt	188,454 *	4/15/79	7/8/85	Completed—Published as NCHRP Report 226; Phase II publ. as NCHRP Report 280
12-22	Thermal Effects in Concrete Bridge Superstructures	Eng Computer Corp	100,000 *	10/1/81	1/31/84	Completed—Published as NCHRP Report 276
12-23	Recommended Revisions to the AASHTO Manual for Maintenance Inspection of Bridges	Lichtenstein & Assoc	233,800 *	1/3/89	8/3/92	Completed—Final report distributed to sponsor
12-24	Design of Multi-Beam Precast Bridge Superstructures	U of Washington	149,879 *	8/1/83	5/31/86	Completed—Published as NCHRP Report 287
12-25	Fatigue and Fracture Evaluation for Rating Riveted Steel Bridges	Lehigh U	199,957 *	9/1/84	9/30/87	Completed—Published as NCHRP Report 302
12-26	Distribution of Wheel Loads on Highway Bridges	Imbsen & Assoc	300,000 *	4/15/85	12/15/87	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
12-26(02)	Distribution of Wheel Loads on Highway Bridges	Imbsen & Assoc	600,000 *	4/15/85	12/31/93	Completed—Phase I & II publ. as NCHRP Research Results Digest 187; Phase III publication decision pending
12-27	Welded Repair of Cracks in Steel Bridge Members	The Welding Inst	374,575 *	10/15/84	2/28/89	Completed—Published as NCHRP Report 321
12-28(01)	Load Capacity Evaluation of Existing Bridges	Case Western Reserve U	302,000 *	9/1/85	8/31/89	Completed—Published as NCHRP Report 301
12-28(02)	Bridge Management Systems	ARE, Inc.	495,000 *	6/24/85	4/30/90	Completed—Published as NCHRP Report 300; Phase II has no final report
12-28(02)A	Bridge Management Systems Software	Natl Eng Tech Corp	585,000	1/10/92	12/31/94	Completed—No report
12-28(02)B	Bridge Management Systems Software	Natl Eng Tech Corp	140,000	8/14/95	12/31/96	Completed—No report; software and documentation available
12-28(03)	Fatigue Evaluation Procedures for Steel Bridges	Case Western Reserve U	200,000 *	7/1/85	9/30/87	Completed—Published as NCHRP Report 299

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
12-28(04)	Methods of Strengthening Existing Highway Bridges	Iowa State U	164,985 *	7/1/85	7/31/87	Completed—Published as NCHRP Report 293
12-28(05)	Standard Methodology for Conducting Condition Surveys of Concrete Bridge Components	New Mexico State U	98,338 *	8/1/85	8/31/87	Completed—Published as NCHRP Report 312
12-28(06)	Distortion-Induced Fatigue Cracking in Steel Bridges	Lehigh U	250,000 *	10/1/85	11/30/89	Completed—Published as NCHRP Report 336
12-28(07)	Guidelines for Evaluating Corrosion Effects in Existing Steel Bridges	Modjeski and Masters	298,644 *	5/5/86	11/30/89	Completed—Published as NCHRP Report 333
12-28(08)	Improving Bridge Load Capacity Estimates by Correlation with Test Data	U of Tennessee	191,024 *	2/1/86	2/19/88	Completed—Published as NCHRP Report 306
12-28(09)	Methods of Flaw Detection in Concrete Bridge Components	—				Combined with Project 10-30(03)
12-28(10)	Guidelines for Determining Redundancy in Steel Bridges	Lehigh U	299,995 *	3/1/86	5/31/89	Completed—Published as NCHRP Report 319
12-28(11)	Development of Site-Specific Load Models for Bridge Rating	Imbsen & Assoc	200,000 *	2/9/87	3/30/90	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
12-28(12)	Inelastic Rating Procedures for Steel Beam and Girder Bridges	U of Minnesota	241,031 *	9/1/87	5/30/90	Completed—Published as NCHRP Report 352
12-28(13)	Nondestructive Load Testing for Bridge Evaluation and Rating	Raths, Raths, & Johnson	150,000 *	10/4/87	9/30/89	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
12-28(13)A	Bridge Rating Through Nondestructive Load Testing	A.G. Lichtenstein & Assoc	227,200 *	12/17/90	2/28/94	Completed—Publication decision pending
12-29	Design of Simple-Span Precast Prestressed Bridge Girders Made Continuous	Constr Tech Lab/PCA	241,993 *	8/26/85	5/31/88	Completed—Published as NCHRP Report 322
12-30	Fatigue of Cables in Cable-Stayed Bridges	Acer Freeman Fox Ltd	124,975	1/13/86	2/12/89	Completed—Report not publ.; see project write-up on NCHRP WWW homepage
12-31	Notch Toughness Variability in Bridge Steel Plates	U of Texas	385,000 *	9/1/87	9/1/92	Completed—Published as NCHRP Report 355
12-32	Evaluation of Bridge Deck Protective Strategies	U of Washington	92,515 *	4/1/86	5/15/87	Completed—Published as NCHRP Report 297
12-33	Development of a Comprehensive Bridge Specification and Commentary	Modjeski & Masters	1,404,167	7/1/88	12/31/95	Completed—Specifications publ. by AASHTO; publication decision on other reports pending
12-33A	Development of a Comprehensive Bridge Specification and Commentary—Timber Structures and Code Calibration	Sensei Engineers	60,000	9/19/88	12/31/91	Completed—No report
12-33B	Development of a Comprehensive Bridge Specification and Commentary—Concrete Structures	Imbsen & Assoc	125,500 *	9/19/88	3/31/92	Completed—No report
12-33C	Development of a Comprehensive Bridge Specification and Commentary—Soil-Structure Interaction Systems	D'Appolonia	83,832 *	7/24/89	3/31/92	Completed—No report
12-34	Update of AASHTO Standard Specifications for Highway Bridges: Division II—Construction	Imbsen & Assoc	200,000 *	10/19/87	10/18/89	Completed—Report not publ.; see project write-up on NCHRP WWW homepage

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
12-35	Recommended Specifications for the Design of Foundations, Retaining Walls, and Substructures	D'Appolonia	99,588 *	1/4/88	7/3/89	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
12-36	Redundancy in Highway Bridge Superstructures	City College of NY	200,000	1/89	11/16/93	Completed---See Project 12-36(02)
12-36(02)	Redundancy in Highway Bridge Superstructures: Phase II	City College of NY	250,000	9/1/94	5/31/97	Completed---Published as NCHRP Report 406
12-37	Transverse Cracking in Normal Concrete Bridge Decks	West Virginia Eismann Assoc	450,000	1/2/92	3/31/95	Completed---Published as NCHRP Report 380
12-38	Improved Design Specifications for Horizontally Curved Steel Girder Highway Bridges	Auburn U	300,000	1/1/93	12/31/97	Research in progress
12-39	Design Specifications for Dabie Forces on Highway Bridges	UM of Louisville	474,000	3/1/93	4/15/98	Receipt of agency report pending
12-40	Fatigue Criteria for Modular Bridge Expansion Joints	Lehigh U	335,000	1/18/94	4/30/97	Completed---Published as NCHRP Report 402
12-41	Rapid Replacement of Bridge Decks	U of Nebraska-Lincoln	99,921	1/1/94	8/31/97	Completed---To be published as NCHRP Report 407
12-42	LRFD Bridge Design Specifications Support	Modjeski & Masters	363,150	2/1/95	1/31/98	Research in progress
12-43	Life Cycle Cost Analysis for Bridges	Mail Engineering Corp	350,000	2/15/96	8/27/98	Research in progress
12-44	Recommended Specifications for the Design of Movable Highway Bridges	Modjeski & Masters	299,817	7/26/96	10/25/98	Research in progress
12-45	Recommended Specifications for Large-Span Culverts	Simpson Gumpertz & Hays	475,000	4/26/96	1/25/99	Research in progress
12-46	Manual for Condition Evaluation and Load Rating of Highway Bridges Using Load and Resistance Factor Philosophy	A.G. Lichtenstein & Assoc	300,000	3/1/97	8/31/99	Research in progress
12-47	Redundancy in Highway Bridge Substructures	---	250,000	---	---	Contract pending
12-48	Design of Highway Bridges for Extreme Events	----	400,000	---	---	Contract pending
12-49	Comprehensive Specification for the Seismic Design of Bridges	---	600,000	---	---	Contract pending
12-50	Bridge Software Validation Guidelines and Examples	----	250,000	---	---	Contract pending
12-51	Effect of Truck Weight on Bridge Network Costs	---	400,000	---	---	Contract pending

AREA THIRTEEN : MAINTENANCE--EQUIPMENT

13-01	Equipment Rental Rates	Ernst & Ernst	22,800 *	2/1/65	1/31/66	Completed---Published as NCHRP Report 26
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TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
AREA FOURTEEN : MAINTENANCE--MAINTENANCE OF WAY AND STRUCTURES						
14-01	Upgrading of Unit Maintenance Cost Index and Development of Interstate Maintenance Requirements	Tallamy Assoc	205,128 *	3/1/65	3/31/67	Completed---Published as NCHRP Report 42
14-02	Techniques for Reducing Roadway Occupancy During Routine Maintenance Activities	Byrd, Tallamy, et al	200,000 *	10/1/70	3/31/73	Completed---Published as NCHRP Report 161
14-03	Improved Pavement-Shoulder Joint Design	Georgia Tech	100,838 *	9/11/72	3/15/76	Completed---Published as NCHRP Report 202
14-04	Reconditioning Heavy-Duty Freeways in Urban Areas	Texas A&M	99,665 *	4/15/74	3/24/76	Completed---Published as NCHRP Report 196
14-05	Maintenance Levels-of-Service Guidelines	Woodward-Clyde	204,200 *	1/1/78	4/30/80	Completed---Published as NCHRP Report 223
14-05(02)	Maintenance Levels-of-Service Guidelines	Woodward-Clyde	107,950 *	9/15/81	8/31/84	Completed---Published as NCHRP Report 273
14-06	Evaluating Deferred Maintenance Strategies	ARE, Inc.	325,000 *	6/1/82	12/31/85	Completed---Published as NCHRP Report 285
14-07	Interactive Microcomputer Network for Innovative Maintenance Operations	Woodward-Clyde	82,819 *	9/1/87	6/30/91	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
14-08	Chip Seal Coats for High-Traffic-Volume Asphalt Concrete Pavements	Intermountain Research Fdn	80,078	7/6/87	10/5/90	Contract terminated---Summary to be included in 14-08A report
14-08A	Chip Seal Coats for High-Traffic-Volume Asphalt Concrete Pavements	Asphalt Inst	159,922	1/1/91	12/31/92	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
14-09	Workshop on Research Needs in the Management of Highway Maintenance	TRB	42,000 *	6/12/88	6/15/88	Completed---Problem statements developed
14-09(01)	Effective Maintenance Budget Strategies	The Urban Inst	300,000	11/15/89	4/30/94	Completed---Published as NCHRP Report 366
14-09(02)	Incorporation of Maintenance Considerations in Highway Design	Daniel, Mann, Johnson, et al	168,122 *	1/15/90	2/27/92	Completed---Published as NCHRP Report 349
14-09(03)	Maintenance Contracting	Bergstralh-Shaw-Newman	150,000 *	3/12/90	9/11/91	Completed---Published as NCHRP Report 344
14-09(04)	Role of Highway Maintenance in Integrated Management Systems	Cambridge Systematics	225,000	4/15/91	7/15/93	Completed---Published as NCHRP Report 363
14-09(05)	Impacts of Environmental, Health, and Safety Regulations on Highway Maintenance	Auburn U	150,000	5/1/91	5/31/93	Completed---Publication decision pending
14-09(06)	Professional Development of Maintenance Engineers and Managers	U of Maryland	174,998	2/1/91	1/31/93	Completed---Published as NCHRP Report 360
14-10	Improvements in Data Acquisition Technology for Maintenance Management Systems	The Urban Inst	300,000 *	5/29/89	3/31/93	Completed---Published as NCHRP Report 334; Phase II publ. as NCHRP Report 361

Project							
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **	
14-11	Effective Motivation of Highway Maintenance Personnel	Penn State U	200,000	6/1/89	11/30/92	Completed---Report, training manual, and instructor's guide avail. for loan	
14-12	Highway Maintenance Quality Assurance	ERES Consult	325,241	3/1/95	6/30/98	Research in progress	
AREA FIFTEEN : DESIGN--GENERAL DESIGN							
15-01	Guardrail Design	Cornell Aero Lab	19,723 *	12/15/65	6/14/66	Completed---Published as NCHRP Report 36	
15-01(02)	Guardrail Performance and Design	Sw Research Inst	380,000 *	7/1/67	12/31/71	Completed---Published as NCHRP Reports 54, 115; Phase II published as NCHRP Reports 118, 129	
15-02	Design to Control Erosion in Roadside Drainage Channels	U of Minnesota	97,300 *	7/1/66	6/30/74	Completed---Phase I report publ. as NCHRP Report 108; Phase II report not publ.; for avail., see Summary of Progress Through 1988	
15-03	Rational Structural Analysis and Design of Pipe Culverts	Northwestern U	49,937 *	10/1/67	12/31/68	Completed---Published as NCHRP Report 110	
15-04	Estimating Runoff Rates from Small Rural Watersheds	Travelers Research Ctr	299,902 *	9/1/67	3/16/70	Completed---Published as NCHRP Report 136	
15-05	Dynamic Characteristics of Heavy Highway Vehicles	Gen Motors Corp	135,000 *	8/15/67	1/10/69	Completed---Published as NCHRP Report 105	
15-06	Development of Criteria for Safer Luminaire Supports	Texas A&M	147,254 *	9/1/67	8/31/68	Completed---Published as NCHRP Report 77	
15-07	Flow Modifications by Storage Loss Through Flood Plain Encroachment	Dames & Moore	99,730 *	5/1/80	1/31/82	Completed---Report not publ.; for avail., see Summary of Progress Through 1988	
15-08	Parameters Affecting Stopping Sight Distance and Vehicle Acceleration/Deceleration Characteristics	U of Michigan	274,482 *	5/1/82	5/31/84	Completed---Published as NCHRP Report 270	
15-09	Encasement of Pipelines Through Highway Roadbeds	Byrd, Tallamy, et al	30,000 *	10/1/86	6/30/88	Completed---Published as NCHRP Report 309	
15-10	Development of a Design/Graphics Interface System	C. W. Beilfuss & Assoc	500,000 *	8/1/85	11/30/88	Completed---Published as NCHRP Report 326	
15-11	Computer-Aided Analysis of Highway Encroachments on Mobile Boundary Streams	Simons & Assoc	246,945 *	7/1/87	3/31/90	Report distributed to sponsors; research continued as Project 15-11A	
15-11A	BRI-STARS Maintenance Support and Enhancement	Hydrau Tech	99,827	6/1/91	11/30/93	Completed---Published as NCHRP Research Results Digest 201	
15-12	Roadway Widths for Low Traffic Volume Roads	CH2M Hill	250,000	5/1/89	10/31/95	Completed---Published as NCHRP Report 362	
15-13	Long-Term Performance of Geosynthetics in Drainage Applications	Geosynthetic Research Inst of Drexel U	455,240	4/1/90	3/31/93	Completed---Published as NCHRP Report 367	
15-14(01)	Intersection Sight Distance	Midwest Research Inst	350,000	6/1/92	8/31/96	Completed---Published as NCHRP Report 383	

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
15-14(02)	Median Intersection Design	Midwest Research Inst	350,000	6/1/92	5/15/95	Completed---Published as NCHRP Report 375
15-15	Collection and Presentation of Roadway Inventory Data	MCNC	400,000	2/15/96	2/14/98	Research in progress
15-16	Superelevation Distribution Methods and Transition Designs	U of Nebraska	45,549	2/1/97	1/31/99	Transferred---Continued as Project 15-16A
15-16A	Superelevation Distribution Methods and Transition Designs	Texas A&M	154,451	8/1/97	1/31/99	Research in progress
15-17	Geometric Design Consistency on Higher-Speed, Non-Urban, Two-Lane Roads	---	300,000			Contract pending
15-18	Design Speed and Operating Speed	---	500,000			Contract pending
AREA SIXTEEN : DESIGN--ROADSIDE DEVELOPMENT						
16-01	Effects of Deicing Compounds on Vegetation and Water Supplies	VPI	217,300 *	3/1/66	4/30/72	Completed---Published as NCHRP Reports 91 and 170
16-02	Evaluation of Research on Roadside Development	Western States	100,000 *	10/1/67	3/31/69	Completed---Published as NCHRP Report 137
16-03	Erosion Control During Highway Construction	Utah State U	250,000 *	11/1/73	11/30/79	Completed---Published as NCHRP Reports 220, 221
AREA SEVENTEEN : TRAFFIC--SAFETY						
17-01	Development of Improved Methods for Reduction of Traffic Accidents	Cornell Aero Lab	247,847 *	2/1/66	5/31/68	Completed---Published as NCHRP Report 79
17-02	Methods for Evaluating Highway Safety Improvements	ORI	29,973 *	1/10/72	6/20/72	Contract terminated---No report; research resumed under Project 17-02A
17-02A	Methods for Evaluating Highway Safety Improvements	Jorgensen & Assoc	98,403 *	2/1/73	7/31/74	Completed---Published as NCHRP Report 162
17-03	Application of Traffic Conflicts Analysis at Intersections	Midwest Research Inst	190,000 *	12/15/77	10/31/79	Completed---Published as NCHRP Report 219
17-04	Evaluation of Traffic Controls for Street and Highway Work Zones	BioTechnology	200,000 *	1/2/78	6/30/79	Completed---Report included in NCHRP Report 236
17-04(02)	Evaluation of Traffic Cones and Tubes for Street and Highway Work Zones	BioTechnology	125,000 *	4/23/80	9/30/81	Completed---Published as NCHRP Report 236
17-05	Effectiveness of Clear Recovery Zones	Midwest Research Inst	200,000 *	4/1/80	4/30/82	Completed---Published as NCHRP Report 247
17-06	Service Vehicle Lighting and Traffic Control Systems for Short-Term and Moving Work Zones---Phase I	BioTechnology	85,069 *	11/1/82	7/24/84	Completed---Research continued as Project 17-06A

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
17-06A	Service Vehicle Lighting and Traffic Control Systems for Short-Term and Moving Work Zones---Phase II	Transportation Research Corp	252,277 *	1/2/90	2/28/90	Completed---Published as NCHRP Report 337
17-07	Guidelines for Converting STOP to YIELD Control at Intersections	Bellomo-McGee	200,000 *	12/16/88	5/15/89	Completed---Published as NCHRP Report 320
17-08	Traffic Barrier and Control Treatments for Restricted Work Zones	Texas A&M	500,000	6/1/88	6/30/93	Completed---Published as NCHRP Report 358
17-09	Effect of Highway Standards on Safety	Bellomo-McGee	200,000	2/15/92	12/31/94	Completed---Published as NCHRP Report 374
17-09(02)	Impacts of Resurfacing Projects With and Without Additional Safety Improvements	Bellomo-McGee	300,000	10/1/95	6/30/98	Research in progress
17-10	Structural Supports for Highway Signs, Luminaires, and Traffic Signals	U of Alabama at Birmingham	299,970	2/1/94	12/1/97	Completed---Publication decision pending
17-10(02)	Structural Supports for Highway Signs, Luminaires, and Traffic Signals	---	370,000			Contract pending
17-11	Recovery Area Distance Relationships for Highway Roadsides	Texas A&M	500,000	3/1/95	2/27/98	Research in progress
17-12	Improved Safety Information to Support Highway Design	Northwestern U	199,982	1/30/95	12/31/97	Completed---Report in review process
17-13	Strategic Plan for Improving Roadside Safety	TRB	200,000	5/1/95	3/30/98	Research in progress
17-14	Improved Guidelines for Median Safety	Bellomo-McGee	300,000	3/1/97	8/31/99	Research in progress
17-15	Accident Mitigation on Congested Rural and Exurban Two- and Three-Lane Highways	Texas A&M	250,000	4/1/97	2/28/99	Research in progress
17-16	Accident Warrant for Traffic Signals	Bellomo-McGee	300,000	3/1/97	3/31/99	Research in progress
17-17	Development of Guidelines for Nighttime Road Work to Improve Safety and Operations	Last Resource	250,000	1/15/97	1/14/99	Research in progress

AREA EIGHTEEN : MATERIALS AND CONSTRUCTION--CONCRETE MATERIALS

18-01	Revibration of Retarded Concrete for Continuous Bridge Decks	U of Illinois	103,895 *	9/1/67	12/1/69	Completed---Published as NCHRP Report 106
18-02	Use of Polymers in Highway Concrete	Lehigh U	300,000 *	10/1/72	9/30/75	Completed---Published as NCHRP Report 190
18-02(02)	Polymer Concrete in Highway Bridge Decks	Lehigh U	30,000 *	1/1/78	3/15/79	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
18-02(03)	Long-Term Rehabilitation of Salt-Contaminated Bridge Decks	Lehigh U	199,900 *	5/1/80	4/29/83	Completed---Published as NCHRP Report 257
18-03	Silica Fume Concrete for Bridge Decks	Constr Tech Lab	323,935	3/1/95	9/30/97	Completed---Publication decision pending

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
18-04	Durability of "Early-Opening-to-Traffic" Portland Cement Concrete for Pavement Rehabilitation	----				Contract not awarded
18-04A	Durability of "Early-Opening-to-Traffic" Portland Cement Concrete for Pavement Rehabilitation: Background and Plan for Evaluation	---	42,968			Contract pending
18-05	Relationship of Portland Cement Characteristics to Concrete Durability	Penn State U	400,000	4/7/97	10/6/99	Research in progress
18-06	Service Life of Corrosion-Damaged Reinforced Concrete Bridge Superstructure Elements	---	400,000			Contract pending

AREA NINETEEN : ADMINISTRATION--FINANCE

19-01	Budgeting for State Highway Departments	Ernst & Ernst	45,000 *	9/5/67	9/4/68	Completed---Report not publ.; summarized in NCHRP Research Results Digest 20
19-02(01)	Develop Performance Budgeting System to Serve Highway Maintenance Management	Booz-Allen & Hamilton	6,000 *	9/2/68	10/31/68	Completed---Working plan; not published
19-02(02)	Develop Performance Budgeting System to Serve Highway Maintenance Management	Ernst & Ernst	6,000 *	9/2/68	10/31/68	Completed---Working plan; not published
19-02(03)	Develop Performance Budgeting System to Serve Highway Maintenance Management	Jorgensen & Assoc	6,000 *	9/2/68	10/31/68	Completed---Research continued as Project 19-02(04)
19-02(04)	Develop Performance Budgeting System to Serve Highway Maintenance Management	Jorgensen & Assoc	220,000 *	2/1/69	11/30/71	Completed---Published as NCHRP Report 131
19-03	Economic Effects of Changes in Legal Vehicle Weights and Dimensions on Highways	Wilbur Smith Assoc	96,728 *	9/15/70	6/14/72	Completed---Published as NCHRP Report 141

AREA TWENTY : SPECIAL PROJECTS

20-01	Highway Research Information Service	HRB	455,000 *	3/16/64	10/31/67	Completed---Informal publication only; service is operational
20-02	Research Needs in Highway Transportation	Tallamy/Smith	98,760 *	4/1/66	12/31/67	Completed---Published as NCHRP Report 55
20-03	Optimizing Freeway Corridor Operation Through Traffic Surveillance, Communication, and Control	Texas A&M	594,556 a	12/15/66	1/31/69	Completed---Results summarized in Project 20-03C report
20-03A	Optimizing Freeway Corridor Operation Through Traffic Surveillance, Communication, and Control	U of Michigan	525,631 b	11/20/68	5/31/71	Completed---Results summarized in Project 20-03C report

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
20-03B	Optimizing Freeway Corridor Operation Through Traffic Surveillance, Communication, and Control—Summary Reporting	Patrick J. Athol	31,116 *	7/1/72	9/27/74	Project terminated uncompleted; no reports prepared
20-03C	Summary of the Lodge Freeway Research	Asriel Taragin	10,183 *	11/15/75	7/15/76	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-03D	Summary of All Freeway Surveillance, Communication and Control Experience	Voorhees & Assoc	40,000 *	5/15/77	12/31/78	Completed—Special publ.; for avail., see Summary of Progress Through 1988
20-04	Public Preference for Future Individual Transportation	Chilton Research	195,260 *	5/2/67	1/21/69	Completed—Published as NCHRP Reports 49, 82
20-04A	Public Preference for Future Individual Transportation	National Analysts	83,911 *	5/2/67	1/2/68	Completed—Published as NCHRP Reports 49, 82
20-05	Synthesis of Information Related to Highway Problems	TRB	850,000 c	12/15/67		Research in progress: Refer to Table 4 for topic reports published as NCHRP Syntheses
20-06	Legal Problems Arising out of Highway Programs	TRB	100,000 c	11/1/68		Research in progress: Refer to Tables 5 and 6 for publications
20-07	Research for AASHTO Standing Committee on Highways	Varies		c 12/2/68		Research in progress: Refer to write-ups on NCHRP WWW homepage
20-08	Interactive Graphic Systems for Highway Design	Control Data	49,672 *	9/1/70	7/31/71	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-09	Socioeconomic Consequences of Right-of-Way Acquisition Induced Resident Dislocation	RMC Research Corp	202,579 *	8/1/72	12/17/76	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-10	The Benefits of Separating Pedestrians and Vehicles	Stanford Research Inst	100,000 *	8/26/74	4/30/76	Completed—Published as NCHRP Report 189
20-10(02)	The Benefits of Separating Pedestrians and Vehicles	SRI Intl	100,000 *	9/1/78	7/31/81	Completed—Published as NCHRP Report 240
20-11	Toward Environmental Benefit/Cost Analysis—Measurement Methodology	Poly Inst of NY	100,000 *	9/1/72	5/31/74	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-11A	Toward Environmental Benefit/Cost Analysis—Measurement Methodology	Cornell U	27,212 *	9/1/75	11/30/76	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-11B	Toward Environmental Benefit/Cost Analysis: Energy-Flow Analysis (Manual)	Cornell U	140,450 *	1/24/77	5/4/79	Completed—Report not publ.; for avail., see Summary of Progress Through 1988; sum. in NCHRP Research Results Digest 114
20-11C	Toward Environmental Benefit/Cost Methodology: Energy-Flow Analysis (Study Design)	The Cannon Group	14,786 *	4/1/77	3/31/78	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-12	Effects of Air Pollution Regulations on Highway Construction and Maintenance	Howard, Needles, et al	80,446 *	4/1/74	7/31/75	Completed—Published as NCHRP Report 191
20-13	Beneficial Environmental Effects Associated with Freeway Construction	Penn State U	49,965 *	9/3/74	8/2/75	Completed—Published as NCHRP Report 193

TABLE 1 (Continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
No.	Title					
20-14	Monitoring Carbon Monoxide Concentrations in Urban Areas	Tech Service Corp	99,973 *	10/1/76	3/31/78	Completed—Published as NCHRP Report 200
20-14A	Statistical Analysis of Ozone Data for Transportation/Air Quality Planning	SRI Intl	193,907 *	9/15/79	12/18/81	Completed—Published as NCHRP Report 238
20-15	Ecological Effects of Highway Fills on Wetlands	U of Massachusetts	152,085 *	12/1/76	12/31/79	Completed—Published as NCHRP Reports 218A and 218B
20-16	State Laws and Regulations on Truck Size, Weight, and Speed	R. J. Hansen Assoc	281,975 *	10/11/76	9/1/78	Completed—Published as NCHRP Report 198
20-17	Statewide Freight Demand Forecasting Procedures	Cambridge Systematics	73,151 *	4/1/79	7/31/80	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-17A	Application of Statewide Freight Demand Forecasting Techniques	R. Creighton Assoc	193,500 *	6/1/81	1/31/84	Completed—Published as NCHRP Report 260
20-18	Evaluation of Highway Air Pollution Dispersion Models	SRI Intl	207,509 *	3/15/79	2/28/82	Completed—Published as NCHRP Report 245
20-19	Pedestrian Convenience and Safety on Suburban and Rural Highways	JHK & Assoc	160,000 *	5/1/85	12/31/86	Completed—Published as NCHRP Reports 294A and 294B
20-19(02)	Pedestrian Safety and Convenience on Suburban and Rural Highways—Implementation Phase	JHK & Assoc	146,218 *	9/1/87	12/31/89	Completed—Results incorporated into National Highway Institute courses
20-20	SHRP Pre-Implementation Research	AASHTO	500,000 *	10/1/84	9/30/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(02)	SHRP Overview and Integration Planning	U of Maryland	90,000 *	3/15/85	5/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(03)	SHRP Detailed Planning for Research on Asphalt Properties	ARE, Inc.	115,000 *	3/15/85	1/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(05)	SHRP Detailed Planning for Research on Maintenance Effectiveness	Texas R&D Fdn	90,000 *	3/15/85	1/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(06)	SHRP Detailed Planning for Research on Bridge Component Protection	David G. Manning	80,000 *	3/15/85	1/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(07)	SHRP Detailed Planning for Research on Cement and Concrete	Constr Tech Lab/PCA	75,000 *	3/15/85	1/31/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-20(08)	SHRP Detailed Planning for Research on Snow and Ice Removal	USA CRREL	73,781 *	4/12/85	2/26/86	Completed—Report not publ.; for avail., see Summary of Progress Through 1988
20-21	Development of an Automated Field Survey Data Collection System	ARE, Inc./Cooper Tech	200,000 *	2/3/86	5/5/87	Completed—Published as NCHRP Report 295
20-22	Factors to be Considered by Highway Agencies in the Identification and Remediation of Hazardous Waste Sites	HMM Assoc	148,015 *	11/1/86	7/1/88	Completed—Published as NCHRP Report 310

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
20-23	Kinematic Differential GPS Satellite Surveying	GPS Services/NGS	298,793	9/15/88	9/14/90	Completed---Report distributed to sponsors; sum. in NCHRP Research Results Digests 185 & 199
20-24	Research Program Design--Administration of Highway and Transportation Agencies	Apogee Research	125,000 *	5/11/87	9/30/88	Completed---Report distributed to sponsors; sum. in NCHRP Research Results Digests 170 & 183
20-24(01)	Using Market Research to Improve the Management of Transportation Systems	Apogee Research	199,923 *	10/1/88	9/30/89	Completed---Published as NCHRP Report 329
20-24(02)	Executive Management Information Systems for State Departments of Transportation	Andersen Consult	100,000 *	5/1/89	10/4/89	Completed---Report distributed to sponsors; sum. in NCHRP Research Results Digest 173
20-24(03)	Expanding the Civil Engineering Pool	Penn State U	300,000	7/1/90	6/30/94	Completed---Phases I and II published as NCHRP Report 347; Phase III published as NCHRP Report 347-Part II
20-24(03)A	Civil Engineering Careers in Transportation--Outreach Program	AASHTO	100,000	5/1/92	8/31/93	Completed---Summary published in NCHRP Research Results Digest 196, revised
20-24(04)	Senior Executive Service, Participant's Manual	Braun, Johns & Golden	25,000 *	1/1/88	9/30/91	Report sent to AASHTO for publication
20-24(05)	Public Outreach in Transportation Management	Frank Wilson & Assoc	99,974 *	8/1/91	1/31/93	Completed---Published as NCHRP Report 364
20-24(06)A	Performance Measures for State Highway and Transportation Agencies	Highway Users Fdn	84,891 *	8/1/91	6/2/93	Completed---Published as NCHRP Report 357
20-24(06)B	Business Systems Plan for Highway Engineering Information	Prodata, Inc.	149,977	8/26/91	10/31/92	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
20-24(06)C	Information Systems for Transportation Agencies	Stone & Webster Transportation Services	185,660	2/15/95	3/31/98	Research in progress
20-24(07)	Alternative Approaches to the Taxation of Heavy Vehicles	Cambridge Systematics	300,000	3/1/92	10/15/94	Completed---Published as NCHRP Report 377
20-24(07)A	Alternative Approaches to the Taxation of Heavy Vehicles	Cambridge Systematics	200,000	2/1/96	12/31/97	Research in progress
20-24(08)	Project 20-24 Series--Revisited	Apogee Research	20,000	4/22/92	12/31/94	Completed---Agency report available for loan
20-24(09)	State Departments of Transportation--Strategies for Change	Natl Academy of Public Administration	279,855	6/15/93	12/14/94	Completed---Published as NCHRP Report 371
20-24(10)	Customer-Based Quality in Transportation	Howard/Stein-Hudson Assoc	100,000	2/1/94	3/31/95	Completed---Published as NCHRP Report 376
20-25	Training Needs for Highway Construction Personnel	U of Maryland	73,728 *	6/15/89	12/31/90	Completed---Report not publ.; agency report avail. for loan; summarized in NCHRP Research Results Digest 206

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
20-25(02)	Training for Highway Construction Personnel	SNI Intl Resources	224,790	11/1/91	6/30/96	Completed---Agency report avail. for loan; summarized in NCHRP Research Results Digest 206
20-25(03)	Development of Training Material for Highway Construction Personnel	SNI Intl Resources	296,001	4/17/95	8/7/97	Completed---Agency report avail. for loan; to be summarized in a NCHRP Research Results Digest
20-26	Bond and Insurance Coverages for Highway Construction Contractors	Texas A&M	99,999 *	6/1/89	9/30/90	Completed---Published as NCHRP Report 341
20-27	Adaptation of Geographic Information Systems for Transportation	U of Wisconsin	220,000	3/1/90	6/30/93	Completed---Published as NCHRP Report 359 and NCHRP Research Results Digest 180 and 191
20-27(02)	Development of System and Application Architectures for Geographic Information Systems in Transport	U of Wisconsin - Madison	200,000	4/1/94	8/31/97	Completed---Part I report published as NCHRP Research Results Digest 218; Part II report published as NCHRP Research Results Digest 221
20-27(03)	Guidelines for the Implementation of Multimodal Transportation Location Referencing Systems		150,000			Contract pending
20-28	Hazardous Wastes in Highway Rights-of-Way	TRB	300,000	4/16/90	2/1/92	Completed---Published as NCHRP Report 351
20-29	Development of a Multimodal Framework for Freight Transportation Investment: Consideration of Rail and Highway Trade-Offs	Texas A&M	150,000	5/15/92	8/31/94	Completed---Report not publ. pending completion of continuation project; see project write-up on NCHRP WWW homepage
20-29(02)	Development of a Computer Model for Multimodal, Multicriteria Transportation Investment Analysis	Texas A&M	200,000	12/15/95	3/31/98	Research in progress
20-30	NCHRP--IDEA Program	TRB	1,000,000 c	7/8/92		Research in progress
20-31	Public Policy for Surface Freight Transportation	TRB	200,000	12/1/92	9/4/96	Completed---Published as TRB Special Report 246
20-32	Development of a Comprehensive Thesaurus for Transportation Research	CDB Enterprises	225,000	12/1/93	8/31/96	Completed---Report not publ.; see project write-up on NCHRP WWW homepage
20-32(02)	Refinement of the Transportation Research Thesaurus and Implementation of Updated TRIS Keyword Index	CDB Enterprises	199,965	12/1/97	11/30/99	Research in progress
20-33	Facilitating the Implementation of Research Findings	Rand	499,955	1/22/93	1/15/96	Completed---Summarized in NCHRP Report 382
20-33(02)	The Role of Procurement and Contracting Approaches in Facilitating the Implementation of Research Findings	Trauner Consulting	299,993	2/15/97	8/14/98	Research in progress
20-34	Developing Measures of Effectiveness for Truck Weight Enforcement Activities	Transportation Research Corp	499,625	12/20/93	3/18/98	Research in progress
20-35	Plan for SHRP Follow-Up Studies	TRB/NCHRP	100,000	6/1/93	9/30/95	Completed---Project report avail. for loan

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
20-36	Highway Research and Technology--International Information Sharing	TRB/NCHRP	575,000 c	1/26/93		Research in progress
20-37	Strategic Direction for the NCHRP and Other AASHTO Research Activities	Apogee Research	243,642	3/1/94	3/31/95	Completed--Report not publ.; see project write-up on NCHRP WWW homepage
20-38	Development of a Manual for State Transportation Research	Reilly, Horowitz, Harder	118,000	9/1/94	6/30/97	Completed--Agency report avail. for loan
20-39	Improved User Access to TRIS Through the AASHTO VAN	Texas Transportation Inst	35,944	11/1/94	7/31/95	Completed--Phase II pending system implementation
20-40	Conversion of AASHTO Publications to Metric Units	Texas A&M	1,175,439	11/10/94	12/31/97	Research in progress
20-41	Approaches for Increasing Private-Sector Involvement in Highway Innovation Process	TRB	62,500	11/1/94	6/30/96	Completed--Published as TRB Special Report 249
20-42	Sustainable Transportation	TRB	150,000	5/1/94	7/31/97	Completed--To be published as TRB Special Report 251
20-43	Application of CD-ROM Technology for AASHTO Technical Documents	Applied Research Assoc	319,936	1/8/96	3/31/98	Research in progress
20-44	Accelerating the Application of NCHRP Research Results	TRB	100,000 c	8/1/95		Support for various implementation activities
20-44C	Policy Implications of the Economic Value of Transportation	Apogee Research	25,427	8/1/96	12/31/96	Completed--Report sent to AASHTO
20-45	Scientific Approaches for Transportation Research	----	200,000			Contract pending
20-46	Systems Approach to Evaluating Innovations for Integration into Highway Practice	---	125,000			Contract pending
20-47	Quality and Accuracy of Positional Data in Transportation	----	300,000			Contract pending

AREA TWENTY-ONE : SOILS AND GEOLOGY--TESTING AND INSTRUMENTATION

21-01	Instrumentation for Measurement of Moisture	Research Triangle Inst	35,027 *	8/25/69	2/24/71	Completed--Published as NCHRP Report 138
21-02	Instrumentation for Moisture Measurement--Bases, Subgrades, and Earth Materials (Sensor Development)	Sw Research Inst	64,976 *	2/1/72	1/31/74	Completed--Report not publ.; included in Project 21-02(03) report
21-02(02)	Instrumentation for Moisture Measurement--Bases, Subgrades, and Earth Materials (Sensor Development)	SUNY Buffalo	29,953 *	4/1/72	9/30/73	Completed--Report not publ.; included in Project 21-02(03) report
21-02(03)	Instrumentation for Moisture Measurement--Bases, Subgrades, and Earth Materials (Sensor Evaluation)	Sw Research Inst	154,452 *	9/3/74	12/31/79	Completed--Report not publ.; see project write-up on NCHRP WWW homepage

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
21-03	Instrumentation for Measuring Scour at Bridge Piers and Abutments	Ayres Assoc	915,918	12/4/89	3/31/97	Completed---Phase I report summary in NCHRP Research Results Digest 189; no Phase II report; Phase III publ. as NCHRP Reports 396, 397A, and 397B
21-04	Sealing Geotechnical Exploratory Holes to Protect the Subsurface Environment	Strata Eng Corp	344,510	3/1/91	11/30/95	Completed---Published as NCHRP Report 378
21-05	Determination of Unknown Subsurface Bridge Foundations	Olson Eng	350,000	4/27/92	8/28/95	Completed---Report not publ.; agency report avail. for loan; summarized in NCHRP Research Results Digest 213
21-05(02)	Unknown Subsurface Bridge Foundation Testing	Olson Eng	380,000	2/15/96	2/14/98	Research in progress
AREA TWENTY-TWO : DESIGN--VEHICLE BARRIER SYSTEMS						
22-01	Concepts for Improved Traffic Barrier Systems	Walter W. White	25,000 *	10/1/70	12/31/71	Completed---Report not publ.; for avail., see Summary of Progress Through 1988
22-01A	Testing and Evaluation of Bridge Rail Concepts	Texas A&M	40,000 *	3/1/74	5/30/75	Completed---Report not publ.; for avail., see Summary of Progress Through 1988; summarized in NCHRP Research Results Digest 81
22-02	Traffic Barrier Performance and Design	Sw Research Inst	205,000 *	1/1/72	3/31/75	Completed---Phase I & II (Task 1) reports not publ.; summarized in NCHRP RRD 84, 102; Task 2 report publ. as NCHRP Report 153
22-02(02)	Multiple Service Level Highway Bridge Railings--Performance and Design Criteria	Sw Research Inst	195,000 *	8/1/76	4/30/79	Completed---Agency reports on Phase I and Phase II avail. for loan
22-02(03)	Multiple Service Level Highway Bridge Railings--Selection Procedures	Sw Research Inst	200,000 *	1/1/79	5/31/81	Completed---Published as NCHRP Report 239
22-02(04)	Procedures for Testing Highway Appurtenances	Sw Research Inst	30,000 *	5/1/79	2/28/81	Completed---Published as NCHRP Report 230
22-03	Field Evaluation of Vehicle Barrier Systems	Calspan Corp	25,000 *	1/1/74	2/15/75	Completed---Report not publ.; summarized in NCHRP Research Results Digest 76
22-03A	Field Evaluation of Vehicle Barrier Systems	Arthur L. Elliott	10,000 *	7/1/74	12/31/74	Completed---Report not publ.; summarized in NCHRP Research Results Digest 76
22-04	Performance of Longitudinal Traffic Barriers	Sw Research Inst	503,954 *	7/1/83	7/15/87	Completed---Published as NCHRP Report 289
22-05	Develop Performance Standards & Hardware for Low Service Level Guardrail Systems	Sw Research Inst	200,000	5/1/85	3/15/92	Completed---Research continued as Project 22-05A

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
22-05A	Warrants for the Installation of Low Service Level Guardrail Systems	Wilbur Smith Assoc	100,000 *	5/1/90	1/31/92	Completed---Agency report and User's Guide avail. for loan; summarized in NCHRP Research Results Digest 194
22-06	Roadside Safety Design for Small Vehicles	Texas A&M	350,000 *	6/1/85	11/30/88	Completed---Published as NCHRP Report 318
22-07	Update of "Recommended Procedures for Safety Performance Evaluation of Highway Appurtenances"	Texas A&M	200,000 *	6/1/89	8/31/92	Completed---Published as NCHRP Report 350
22-08	Evaluation of Performance Level Selection Criteria for Bridge Railings	Texas A&M	200,000	4/15/89	12/31/95	Completed---Summary to be published as a NCHRP Research Results Digest
22-09	Improved Procedures for Cost-Effectiveness Analysis of Roadside Safety Features	Texas A&M	250,000	6/1/94	4/30/98	Research in progress
22-10	Updated Materials for a Traffic Barrier/Small Sign Support Hardware Guide	Momentum Eng	350,000	1/2/91	12/31/96	Completed---Two guides publ. by AASHTO; final report avail. for loan
22-11	Evaluation of Roadside Features to Accommodate Vans, Mini-Vans, Pickup Trucks, & 4-Wheel Drive Vehicles	Texas A&M	400,000	6/1/94	8/1/98	Research in progress
22-12	Guidelines for the Selection, Installation, and Maintenance of Highway Safety Features	Texas A&M	500,000	6/1/95	12/31/98	Research in progress
22-13	Performance of Roadside Barriers	U of Iowa	500,000	4/1/96	9/30/98	Research in progress
22-14	Improvements of Procedures for the Safety Performance Evaluation of Roadside Features	Texas A&M	200,000	3/1/97	6/30/99	Research in progress
22-15	Improving the Compatibility of Vehicles and Roadside Safety Hardware	----	300,000			Contract pending

AREA TWENTY-THREE : SOILS AND GEOLOGY--PROPERTIES

23-00 No Projects

AREA TWENTY-FOUR : SOILS AND GEOLOGY--MECHANICS AND FOUNDATIONS

24-01	Manual on Subsurface Investigations	Haley & Aldrich	75,000 *	4/2/79	12/31/80	Completed---Report published by AASHTO
24-02	Reinforcement of Earth Slopes and Embankments	Dames & Moore	150,000 *	8/22/83	5/21/87	Completed---Published as NCHRP Report 290
24-03	Laboratory Evaluation of Piles Installed with Vibratory Drivers	U of Houston	200,000 *	1/6/86	8/31/88	Completed---Published as NCHRP Report 316
24-04	Load Factor Design Criteria for Highway Structure Foundations	VPI	459,152 *	9/1/87	2/28/91	Completed---Published as NCHRP Report 343

TABLE 1 (Continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
24-05	Downdrag on Bitumen-Coated Piles	Texas A&M	385,000	6/15/88	8/31/94	Completed—Agency reports available for loan
24-06	Expert System for Stream Stability and Scour Evaluation	U of Washington	500,000	3/15/93	3/31/98	Phase II research in progress
24-07	Countermeasures to Protect Bridge Piers from Scour	U of Minnesota	400,000	5/1/95	3/31/98	Research in progress
24-08	Scour at Bridge Foundations: Research Needs	U of Louisville	166,575	2/1/95	1/31/97	Completed—Agency report available for loan
24-09	Static and Dynamic Lateral Loading of Pile Groups	Auburn U	499,962	6/15/97	12/14/99	Research in progress
24-10	Thermally Sprayed Metallic Coatings to Protect Steel Pilings	—	300,000			Contract pending
24-11	Guidelines for Geofoam Applications in Embankment and Slope Stabilization Projects	—	200,000			Contract pending
24-12	Controlled Low-Strength Material for Backfill, Utility Bedding, and Void Fill	—	300,000			Contract pending
24-13	Evaluation of Metal Tensioned Systems in Geotechnical Applications	—	500,000			Contract pending
24-14	Scour at Contracted Bridge Sites	—	500,000			Contract pending
24-15	Bridge Scour in Cohesive Materials	—	350,000			Contract pending
24-16	Methodology for Predicting Channel Migration	—	300,000			Contract pending

AREA TWENTY-FIVE : TRANSPORTATION PLANNING--IMPACT ANALYSIS

25-01	Effects of Highway Runoff on Wetlands	Rexnord, Inc.	162,189 *	2/16/81	3/16/84	Completed---Published as NCHRP Report 264
25-02	Predicting Stop-and-Go Traffic Noise Levels	Vanderbilt U	63,145 *	1/18/88	5/31/89	Completed---Published as NCHRP Report 311
25-03	Guidelines for the Development of Wetland Replacement Areas	URS Consult	311,102	4/1/89	9/30/97	Completed---Guide manual published as NCHRP Report 379
25-04	Determining Economic Impacts on Adjacent Businesses Due to Restricting Left Turns	Cambridge Systematics	300,000	6/15/92	3/31/95	Completed—Agency report avail. for loan; summary to be publ. as a NCHRP Research Results Digest
25-05	Remote Sensing and Other Technologies for the Identification and Classification of Wetlands	Normandeau Assoc	299,770	6/1/92	2/29/96	Completed---Publication decision pending
25-06	Intersection Air Quality Modeling	Systems Applications	2,500,000	1/1/93	6/30/98	Research In progress
25-07	Improving Transportation Data for Mobile Source Emissions Estimates	U of Tennessee	200,000	12/1/93	10/31/95	Completed---To be published as NCHRP Report 394

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status **
25-08	Impact of Highway Capacity Improvements on Air Quality and Energy Consumption	TRB	100,000	3/1/93	7/30/95	Completed---Published as TRB Special Report 245
25-09	Environmental Impact of Construction and Repair Materials on Surface and Ground Waters	Oregon State U	842,123	3/1/94	3/31/98	Research in progress
25-10	Estimating the Indirect Effects of Proposed Transportation Projects	Louis Berger Intl	287,666	12/1/93	5/31/96	Completed---To be published as NCHRP Report 403
25-11	Development of a Modal-Emissions Model	U of California at Riverside	1,992,604	6/15/95	6/14/98	Research in progress
25-12	Wet Detention Pond Design for Highway Runoff Pollution Control	Washington State U	400,000	4/16/96	4/15/99	Research in progress
25-13	Assessments of Impacts of Bridge Deck Runoff Contaminants on Receiving Waters	CH2M Hill	249,961	3/15/97	6/14/99	Research in progress
25-14	Heavy Duty Vehicle Emissions	---	500,000			Contract pending
25-15	Short-Term Monitoring for Compliance with Air Quality Standards	---	200,000			Contract pending

* Final contract cost

** Information on all projects initiated under the NCHRP from its inception in 1962 through 1988 is included in the Special Edition of Summary of Progress through 1988. Subsequent to 1988, information about project status is available on the NCHRP World Wide Web site at <http://www2.nas.edu/trbcrp>.

^a NCHRP funds obligated under the \$314,340 four-way agreement among the National Academy of Sciences, Michigan Department of State Highways, Wayne County, and the City of Detroit.

^b NCHRP funds obligated under the \$70,000 five-way agreement among the National Academy of Sciences, Michigan Department of State Highways, Wayne County, the City of Detroit, and the University of Michigan.

^c Continuing activity. Amount shown is for latest fiscal year in which funding was provided.

TABLE 2
EXAMPLES OF UTILIZATION OF NCHRP RESULTS*

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
1-1	Reports 2, 2A	Illinois Div. Hwys., Bur. of Res. and Devel.	In studies of existing pavements and the rehabilitated AASHTO Road Test project at Ottawa, Ill. Particular use made of recommendations for experimental designs, measurement programs, and data processing analysis.
1-2	Report 7	Conn. DOT N. Y. DOT Tallamy, Byrd,—	To design experimental pavement projects. To develop a flexible pavement performance equation; in use June 1968. In study of highway maintenance quality levels for Ohio Dept. of Hwys.
1-3(2)	Report 22	Conn. DOT	In evaluating flexible experimental pavements.
1-3(3)	Report 35	Conn. DOT	In evaluating flexible experimental pavements.
1-4	Report 10	Conn. DOT	In analyses of data from experimental pavements.
1-4(2)	Report 30	Conn. DOT	In evaluating flexible experimental pavements.
1-5	Report 21	Conn. DOT	In evaluating flexible experimental pavements.
1-5(2)	Report 76	N. Dak. SHD	Major equipment purchase based on successful use of similar equipment in conduct of project.
1-7	Report 37	Conn. DOT Nat'l. Hwy. Safety Bur. 92nd Cong., 1 Sess.	In evaluating flexible experimental pavements. In preparation of a <i>Highway Safety Program Manual</i> for issuance to the States. House of Representatives subcommittee hearings on highway safety and skidding.
1-8	Agency final report	Conn. DOT Consult. for USN and USAF	As justification to establish skid test program in Connecticut. Development of new approach to pavement design for heavy aircraft loadings; used for redesign of Salt Lake City runway to accommodate B747 aircraft and in design of runway, taxiways, and aprons at Air Force Plant No. 42 near Palmdale, Calif., where design load is 500 tons (gross) from B2707 (SST) configuration.
1-9	Report 61	Calif. Div. Hwys.	In evaluation of proposed State legislation regarding use of studded tires.
1-10	Agency final report	Conn. DOT Consult. for USN and USAF	In providing documentation for studded tire legislation. See Project 1-8.
1-11	Agency report	U.S. Forest Serv.	In preparation of an Engineering Technical Report evaluating several commonly accepted pavement design methods, as to their applicability for design of pavement systems for Forest Service roads.
1-12	—	AASHTO 92nd Cong., 1st Sess.	Partly published as <i>Interim Guide for Design of Pavement Structures, 1972</i> . House of Representatives subcommittee hearings on highway safety and skidding.
1-12(2)	Report 154	Conn. DOT	As background information on skid-testing program.
1-12(3)	—	92nd Cong., 1 Sess.	See Project 1-12.
1-12(3)	Report 151	Conn. DOT N. Y. DOT	As background information on skid-testing program. Leans heavily on the suggestions presented when purchasing or altering skid trailers and when modifying operational procedures.
1-14	Agency final report	ASTM 92nd Cong., 1 Sess.	As basis for updating ASTM Method E274. See Project 1-12.
1-14	Agency final report	Va. DOT	Safety Committee reviewed agency recommendations for improvements at high accident site, with resulting request for FHWA approval as an Interstate Safety Project.
1-17	Report 224	Washington DOT Japan Road	In the design of pavement rehabilitation programs. Translated in Japanese.

*Project titles, as well as project status, are given in Table 1. Publication titles are given in Tables 3, 4, 5, and 6.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
1-18	Report 228	Contractors Association	Basis for designing an international calibration exercise for road meters.
1-19	Agency interim report	World Bank FHWA	As input to FHWA-AASHTO Long-Term Pavement Monitoring Program documents.
1-21	Agency draft guide, "Specs. for Joint Repair"	Illinois DOT FHWA	As reference for identifying concrete pavement distress. As input to internal publication titled, "Construction Handbook on PCC Pavement Rehabilitation."
1-25(1)	Report 353	Penn. DOT Firestone Industrial Products Co.	As a guide for developing policies and repair techniques. Material used in brochure for distribution at International Truck Show (Apr '96) and Mid-America Truck Show (Mar '96).
2-5	Reports 13, 111	One State (unkn.)	To replace outdated material in AASHTO book, <i>Urban Freeway Design</i> .
2-5A	Report 111	AASHTO	In draft of proposed AASHTO publication, <i>A Policy on Arterial Highways in Urban Areas</i> .
2-6	Report 63	W. W. Rankin, I. T. E. E. L. Grant, W. G. Ireson	In preparing textbook on traffic engineering. In textbook, <i>Principles of Engineering Economy</i> .
2-11	Report 122	World Bank	For teaching purposes by the Economic Development Institute of the International Bank for Reconstruction and Development.
2-12	Agency rep. and Rep. 111	Federal Supply Serv., Gen. Serv. Adm.	Vehicle operating cost data applied in review of Govt. employee automobile costs.
	Agency report	J. Leisch & Assoc. AASHTO	As an aid in conducting a planning-design course for the South Carolina SHD in coordination with the Governor's Safety Program. Published by AASHTO as <i>A Manual on User Benefit Analysis of Highway and Bus Transit Improvements</i> .
2-15	Report 324	Colorado SHD Ministry of Transportation and Highways, British Columbia, Canada	As a partial basis for development of the State's "Benefit/Cost Analysis Manual." Analysis of rest area locations on a 148-km section of the Trans-Canada Highway
2-18(3)	Agency report	Md. DOT	The StratBENCOST software is being tested as a tool for establishing project priorities for statewide planning and programming.
3-2	Reports 9, 29	Illinois Div. of Hwys., Bur. of Traffic	In a FAI 80 Motorist Communication project. Also, more emphasis being placed on influence of pedestrians on signal timing, because signals in small cities are almost always in the CBD where there are many pedestrians.
3-4	Reports 6, 40	Calif. Div. of Hwys.	Source of background information for highway and law enforcement officials facing problem decisions on location of disabled or stopped vehicles.
3-5	Reports 3, 32, 73, 124	D.C. Dept. of Hwys. and Traffic	Incremental travel cost technique applied to a comprehensive determination of existing effectiveness of operation in D.C. traffic signal system. Annual incremental travel costs in D.C. system were estimated and used in benefit/cost analysis of traffic signal system improvement alternatives.
		Minn. DOH	Steps taken toward implementation of the delay difference offset technique in an existing signal network.
		Calif. Div. of	Source of information to supplement and improve the effectiveness with which the

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
3-7	Agency final report	Hwys. Goodell, Grivas and Assoc.	Division can carry out its program of reducing delay to the motorist. Also of value in designing innovative signals; in fact, the Division engaged the principal investigator on a consulting basis to help simulate different levels of traffic for a project under design in Riverside County. Obtained contract to use model described in report on a network in Detroit.
	Reports 78, 117 and "Illustrative Recording of Traffic Noise"	Hwy. Depts., FHWA offices, universities, consulting firms, County Bd. of Educ.	Demand for the tape has been large, and loan copies have been circulated widely.
	Georgia SHD	Although the principal use of the tape has been educational in nature, one County Board of Education was so impressed with the noise differential between open and closed window situations that consideration was given to installation of air conditioning and storm windows for school buildings adjacent to freeways.	
	Minnesota Legislature	Noise design guide used in design of urban freeway system. For demonstration purposes in hearings by House "Transportation" Committee, and Senate "Highways" and "Natural Resources and Environment" Committees. Both Senate committees took favorable action on a Truck Noise Control bill patterned after the California law.	
	Virginia DOH	To evaluate noise for several proposed highways and to make subsequent explanations to the public on the impact of the noise on the community. One instance involved I-195, a six-lane depressed highway in a residential area of Richmond. Using the computer program from <i>Report 78</i> , peak-hour traffic was used to project the noise levels; comparisons were made with actual readings taken in the area. Another case involved projecting noise levels on I-66 in the vicinity of Washington, D.C., to determine if they would be within an acceptable limit. Revisions were made in the cross sections where estimates exceed the acceptable limit. The Department estimates that almost \$18,000 was saved by doing the evaluation work in-house, rather than contracting it. Annual savings of \$50,000 to \$75,000 have been forecast in the instance of standard evaluations of major projects.	
	Arizona cons. firm	In design and location of a 4.5-mi segment of I-10 (Papago Freeway) traversing a high-density area of downtown Phoenix. Recommendations made are expected to substantially reduce noise levels in areas adjacent to the Freeway.	
	Natl. Assn. of Home-builders	In development of a <i>Builders' Acoustical Manual</i> that includes guidelines for prediction of site noise due to traffic.	
	Missouri SH Comm. FHWA	Highway traffic noise simulation program used to establish noise projections on new project designs. In developing highway noise level standards PPM 90-2, "Interim Noise Standards and Procedures for Implementing Section 109(I) 23 U.S.C."	
	Louisiana DOH AASHTO	As primary texts in a "noise school" for parish (county) engineers. As source documents for new (1974) publication, "Guide on Evaluation and Attenuation of Traffic Noise."	
	Report 117	Howard, Needles, et al. Express Hwy. Res. Fdn. (Japan) Colorado DOH	Model for predicting highway traffic noise validated under contract to a state highway department. Abridgment (8 pp.) published in April 1972 issue of <i>Expressways and Automobiles</i> (in Japanese). Projected noise study based on a U.S. DOT program developed directly from this report, considered to represent the best study procedure from available empirical

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
			and theoretical research on highway noise.
	Agency final rep. draft	Minn. DOH Envir. Protection Agency	Predictions for use in design of I-35W noise barrier in S. Minneapolis. In evaluating alternatives for truck noise emission regulations.
	Agency final rep.	Nat. Bur. Stand. Md.-Natl. Cap. Park and Plan. Comm.	Published a form of the Noise Prediction Nomogram adapted to an "L-equivalent" measure. Found to be useful and quite accurate as a tool in preparation of land-use plans.
3-8	Rep. 78, 117, 144 Report 50	Conn. DOT Orange Co. (Calif.) Traf. Eng. Council Illinois Div. of Hwys., Bur. of Design	As a basis for noise analyses. Extensive use as best available source of information for preparation of warrants for installation of protective devices at rail-grade crossings. In a continuing program toward grade crossing safety, with particular use seen for portion dealing with crossings where flashing light signals—with or without gates—are not warranted.
3-9	Report 84	Conn. DOT Calif. Div. of Hwys.	Source reference for Railroad-Highway Safety Grade Crossing Program. Recommendations used on Freeway Surveillance and Control Project (Los Angeles), involving expenditure of about \$8 million in 3 years.
3-12	Report 123	Transp. Syst. Center	Information on fixed highway signing principles particularly helpful in providing control signals to pilots at Kennedy International Airport (New York).
	Agency report	Street Name Signing Comm., ITE	As background information in review of street name signing applications to meet motorists' needs.
3-12(2)	Agency final report	AAA Found, for Traffic Safety	As the primary reference for preparation of the pamphlet, "Improving Road Guide Signs . . . What Can <u>You</u> Do About It?"
3-13	Report 93	City of Waco, Tex.	Plans to incorporate in subdivision and zoning regulations many of the controls recommended as a means of protecting facility capacity and safety.
3-14	Film, "Relief for Tired Streets"	N.Y. DOT	To encourage municipalities in State to apply traffic engineering solutions to their congestion problems.
3-15	Agency report	Consultant	Using nomographs and incorporating the research findings into some current projects.
3-16	Agency report	FHWA	As support material in resolving an operations problem.
3-18(1)	Agency interim report	City of Lincoln, Nebr.	In design of digital computer-controlled traffic control system to supervise 250 to 300 signalized intersections.
	Agency report	New Zealand Ministry of Works N.Y. DOT	To reduce hardware costs by applying greater software capabilities to computer-controlled traffic signal operations. As background and design evaluation for a centralized computer traffic surveillance and control system in the Northern Long Island Corridor.
3-18(2)	Agency report	Dade Cty., Fla.	As basis for operational changes at selected locations.
3-18(3)	Agency interim report	FHWA	A summary report presenting results of a survey of traffic signal system design and operation practices was used in development of a FHWA training program for traffic engineering personnel.
	Agency report	Texas SDH and Pub. Transp.	Report selected as a textbook for a course for city and state traffic engineers in traffic signal system design.
3-19	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-20	Agency report	FHWA	To develop interest in warrant improvement within Signals Subcommittee of

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
3-21	Agency report	N.J. Tpk. Auth.	National Advisory Committee on Uniform Traffic Devices. In conjunction with research project studying visual effects of variable-message signs.
3-22A	Report 232	Texas SDHPT	Text material for the "Freeway Management Operations Workshop." Participants included SDHPT district personnel, state and city traffic engineers, and state and city police.
3-23	Agency report	AMV Australia FHWA	In developing a manual for design of signalized intersections for Road Safety and Traffic Authority, Victoria, Australia. To amend Sections 4B-8, 4B-10, 4B-11, and 4B-12 of the <i>Manual on Uniform Traffic Control Devices</i> .
3-25	Agency final report	Consultant	To determine the safety impacts of lower design standards related to construction and maintenance activities in the context of energy conservation.
3-26	Agency interim report	City of Edmonton, Alberta, Can.	In designing noise-barrier walls.
	Agency final report	County of Sacramento PIng. & Commun. Dev. Dept.	As a supplement to the FHWA Highway Noise Prediction Model used to conduct environmental analyses of proposed highway projects.
3-27	Report 233	Fuel Efficient Traffic Signal Mgmt. Program	In their Bulletin, readers were referred to various Report figures that would aid in determining timing parameters for traffic-actuated controllers.
3-28	Unpublished by NCHRP. TRB Circular 212	Polytechnic Inst. of N.Y.	Highway capacity workshop materials.
3-28A	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-28B	TRB Special Rpt 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-28C	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-28(2)	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-31	Report 288	FHWA/NHI	Material incorporated into National Highway Institute training course.
3-33	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-36	—	Private sector	Basic designs for bridge weighing system was translated into a commercial system now being marketed by Toledo Scale.
3-37	TRB Special Report 209	States, FHWA, Universities	As primary resource document for highway capacity analysis and as basic document for training programs and computer software.
3-38(7)	Report 348	New Jersey DOT	Used in developing access management regulations, providing expert testimony, and preparing legal guidance.
3-41(2)	Res. Results Dig. 192	Nat'l. Comm. on Uniform Traff. C'trl. Devices	The committee is reviewing the procedures for setting work zone speed limits for possible inclusion in the <i>Manual on Uniform Traffic Control Devices</i> .
4-3	Reports 12, 15, 65, 66	ASTM	Basis for development of C671, "Tentative Method of Test for Critical Dilation of Concrete Specimens Subject to Freezing," and C682, "Resistance of Aggregates to

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
4-6	Reports 74, 74A, 74B	Conn. DOT	Freezing." As backup in developing paint systems for highway bridges.
4-7	Report 164	AASHTO	Recommendations for consideration of fatigue of reinforcement in concrete highway bridges incorporated in 1975 as provisions in AASHTO "Standard Specifications for Highway Bridges."
4-8(3)	Agency final report Report 246	Ariz. DOT AASHTO	To revise Department's asphalt paving mix design criteria Test procedure adopted by AASHTO Subcommittee on Materials and published in AASHTO <i>Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part II</i> , 1986, as T283-85, "Resistance of Compacted Bituminous Mixtures to Moisture-Induced Damage."
4-11	Agency interim report	FAA.	Tentative guidelines for selection and installation of plastic pipe were used to reduce time and funds required for a research project on plastic pipe for airport drainage.
		State Hwy. and Transp. Materials Engrs.	On basis of advisory panel member comments that information in report would be useful to practicing engineers, report was distributed to members of AASHTO Operating Sub-Committee on Materials.
		U.S. Forest Serv.	Distributed to each regional office on basis of headquarters office determination that it will prove of use to engineers involved in design of road and sanitary sewer projects.
		Albuquerque, N.M.	In deciding on use of certain materials for city sewers.
	Report 225	Illinois DOT Soil Conservation Service, USDA	In preparing specifications and purchase of plastic pipe. As a guide in developing a technical release on plastic piping materials for use by field personnel in planning and design of plastic pipe systems.
5-4	Report 20	AASHTO AASHTO Stdg. Comm. on Engrg. and Opers.	In developing materials' specifications. Input (with Report 77, Proj. 15-6) to the March 1969 publication, <i>Informational Guide to Roadway Lighting</i> .
5-5A, B	Agency report	DeLeuw Cather	Findings incorporated in research study.
5-7	Report 130	Ohio DOH	Reference source of current and complete information on individual delineation techniques.
		Org. for Econ. Coop. and Devel. Res. Group C-8 FHWA	In preparing report on Visual Effectiveness and Durability of Road Markings, Reflectors, and Delineators.
5-9	Report 256	AASHTO	In a report of two FHWA Delineation Conferences, summarized in four parts for group presentations, NCHRP Project 5-7 is described as the most comprehensive delineation research in recent years and its report as giving the best available description of the guidance function of delineation.
5-10	Agency report and prototype system	Mich. DOT	Referenced in "An Informational Guide for Roadway Lighting." Prototype design updated to create the Mobile Evaluation of Traffic Signs van that measures the retroreflectivity of 300 to 400 signs per day.
6-1	Report 19	California Div. of Hwys.	Source material and bibliography simplified literature search and saved much valuable time. Results incorporated in planning and design of new projects.
6-2	Report 4	Conn. DOT Calif. Div. of Hwys.	In developing deicing chemical policy. See Project 6-1.
6-3	Report 16	Conn. DOT Calif. Div. of	In developing snow and ice policies. See Project 6-1.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
6-4	Report 23	Hwys. Natl. Flaxseed Processors Assn. Conn. DOT Iowa SH Conn.	Advertising (<i>Civil Eng.</i> , Feb. 1966) highlighting research results in stating "... considering both the economy and performance, the best results by far were obtained by vegetable oil, and particularly linseed oil solutions." In developing treatments to prevent deterioration of PCC bridge decks. Constructed bridge with galvanized reinforcing bars in one-half of deck. This follows recommendations to the effect that more field evaluation is required of zinc, nickel, and asphalt-epoxy coatings.
6-5	Report 27	Calif. Div. of Hwys.	See Project 6-1.
6-8	Report 1	Calif. Div. of Hwys.	See Project 6-1.
6-10	Agency reports	U.S. Park Serv. Calif. Div. of Hwys.	Techniques used by consulting engineering firm for deck repair of Memorial Bridge, Washington, D.C., depended heavily on reported results. In preparation of plans for two sections of US 50 from Riverton to the Nevada State line. Design consideration given to those factors considered vital to increased safety and reduced maintenance at interchanges under the adverse conditions of snow and ice.
	Report 127 Report 127 and 35-mm slides	Conn. DOT N.Y. DOT	As source reference for snow and ice policy. Region 5 duplicated a loan set of 35-mm slides illustrating Appendix J for showing at Region meetings. They have proven helpful for both design and maintenance activities.
7-4	Report 89	Illinois DOT, Bur. Planning	Findings have been found useful, and practice has been modified to conform with them.
7-7	Report 64	Ohio DOH	Implemented several recommendations pertaining to rest areas with maps and other information of interest to motorists, signing conformity, service patrols, patrol aircraft, and medicopter service.
7-8	Report 133	Conn. DOT Dept. of Eng., Univ. of Wisconsin	As a basis for noise analyses. As a reference text for an extension course entitled "Data Collection and Evaluation Techniques for Transportation Systems Management."
7-10	Agency interim report	Oregon County Transit Dist.	In preparation of an energy contingency plan.
	Agency report	U.S.EPA	To brief members of Senate Public Works Committee on the state of the art of transportation controls.
	Report 169	N.Y. State DOT	As examples of how to develop possible air quality packages for seminars to state and metropolitan planning organization transportation planners.
7-10(2)	Agency final report	Hawaii DOT N.Y. State DOT	As a basic guide for the State's TSM plan. Same as Project 7-10
7-11	Report 263	FHWA	Material for transportation planning methods course.
7-12	—	Transport Canada	Adopted MicroBENCOST as the platform for the analysis of project feasibility.
7-13	Report 398	FHWA/Teach America Corporation New York DOT Washington State DOT	Included in CD-ROM Used in updating the DOT's "Mobility Goal" and congestion management system. Used in quantifying congestion in the Puget Sound region.
8-3	Agency report	Arizona HD	Source material for decisions based on consumer sensitivity to the various factors considered in trip making.
8-4	Report 96	Dept. of Eng., Univ. of Wisconsin	As a text in short course on Urban Transportation Planning.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
8-5	Report 121	Dept. of Eng., Univ. of Wisconsin	As a text in Traffic Engineering Seminar.
8-5A	Report 121	G. E. Pidcock Co.	To forecast volume of traffic generated by proposed subdivisions and developments.
8-8(3)	Agency interim report	Iowa SH Comm.	In development of an action plan in conformance with FHWA PPM 90-4.
	Agency report	Del. DOH & T	In development of an action plan in conformance with FHWA PPM 90-4.
	Report 156	N.Y. DOT, Transp. Planning Div.	In preparation of a synthesis report giving background to regional personnel responsible for citizen participation. Also useful in development of N.Y. State Action Plan.
		FHWA	Assisted in development of PPM 90-4.
		Mich. DOT	Assisted in preparation of the state's Action Plan.
		Nat'l. Inst. for Road Res., S. Africa	In developing similar procedures in South Africa.
8-10	Report 155	Conn. DOT	In preparing environmental impact statements.
		Harvard Professor	In preparing a textbook.
8-11	Agency report	Illinois DOT	Portions incorporated into a manual on assessment of ecological impacts from highways for distribution to district engineers and others doing work for the department.
8-12	Agency report	FHWA	By regional transportation planners to provide technical support to the states.
		Princeton Univ.	In graduate courses.
8-12A	Agency final report and User's Guide	NYS DOT	User's Guide distributed to all regional planning offices to provide a quick-response capability for estimating travel demand.
		Consultant to Nat'l. Inst. for Transport and Road Res., S. Africa	To develop guidelines for undertaking urban transportation studies.
	Reports 186 and 187	Harvard Univ.	As course material.
		Univ. of Wisconsin Extension	As course material in conjunction with the NCHRP training material.
		FHWA, Urban Planning Div.	Practical applications by state and local agencies were documented in a report entitled "Application of Quick Response Travel Estimation Procedures." Site impact, corridor, and system analyses were included.
	Report 187, Training Materials, and microcomputer applications	FHWA, National Hwy. Inst., State/Local Agencies, & Numerous Universities	As the basic training aid for short courses. More than 1,000 state and local officials have participated in 35 courses sponsored by FHWA's Urban Planning Div. in cooperation with MHI. Six additional courses are planned for next year.
8-16	Agency final report Appendix, "Transportation Services for the Transportation Disadvantaged"	Am. Public Transit Assoc.	Testimony on proposed DOT regulations to implement Sec. 504 of the Older Americans Rehabilitation Act.
		U.S. Cong.	Evaluation of DOT regulations to implement Sec. 504 of the Older Americans Rehabilitation Act.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
8-16	Report 208	Division of Mass Transp., Caltrans	For determining alternatives for service implementation.
	Report 209	Division of Mass Transp., Caltrans	In development of transportation services for the transportation disadvantaged.
	Report 210	Division of Mass Transp., Caltrans	As a resource document for over-all planning activities.
	Report 211	Division of Mass Transp., Caltrans	To restructure and reorient marketing efforts.
8-20	Preliminary Draft Rpt.	Nat'l Inst. for Transport & Road Res., S. Africa	To design traffic counting program for four provinces of South Africa.
8-23	Agency report	North Central Texas Council of Govts.	In quarterly report on DOE contract, the projected automotive operating costs of gasoline and non-gasoline engines.
8-25	Agency report	Montana Dept. of Commerce	To redesign approach of an analysis of intercity buses.
8-26	Report 255	FHWA	As a primary reference for training course material (National Highway Institute).
8-27	Report 262	N. Y. MTA	To develop handicapped ridership for rail system.
9-3	Report 38	Ford Motor Co.	Saved countless hours of search and survey by state-of-the-art section on highways joint and crack sealing materials and methods. Useful in further understanding various design, construction, and maintenance problems, in analyzing specific failures, and in adapting future developments in highways to their industrial and other roadway problems.
10-1	Report 17	N. Dak. State Univ.	Basic text for a course in statistical quality control taught to both undergraduates and a sizable number of engineers, the majority of the latter being highway department employees.
		Illinois Div. H, Bur. Materials	In conjunction with FHWA sigma bank, and data developed by our field testing, to develop special provisions covering statistical acceptance of bituminous concrete pavement.
10-2	Report 34	Conn. DOT. Illinois Div. H, Bur. Materials	As reference by Specifications Division. In conjunction with supplementary materials, as a basis for recommending and/or limiting stockpiling methods to be included in the policy being developed for aggregate inspection and acceptance.
10-2A	Report 69	Conn. DOT	In developing statistical specifications.
10-5	Reports 14, 13	Conn. DOT	In establishing nuclear density and moisture tests in soils.
10-6	Report 52	Illinois Div. H, Bur. R&D	Considering a trial of recommendation for use of nuclear pellet technique for measuring pavement thickness.
10-8	Agency final report	Penn. DOT	The Ohio State ultrasonic gauge, several eddy current proximity gauges, and additional pachometers used with the new statistically based acceptance specifications to reduce over-all construction costs.
10-9	Res. Results Digest 48	U. Minn. and Minn. DOH	In seminars conducted throughout Minnesota to train city and county personnel in use of the pavement surface condition rating system.
10-10	Report 201	FHWA	As a basis to prohibit use of electroslag welding in main structural tension members on federal-aid projects and to institute a program of rigorous inspection in existing structures welded by the electroslag process.
10-17	Report 274	ASTM	Adopted test method as ASTM Standard D 4867, Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
10-18	Report 258	Concrete Construction Magazine	A condensed version of this report appeared in the August 1984 issue. The magazine is distributed nationally to engineers and contractors by a number of State ready-mixed-concrete associations.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
10-20	Report 248	AASHTO	Unconfined elastomeric bearing specifications adopted in toto in the "1985 Interim AASHTO Standard Specifications for Highway Bridges."
10-21	Synthesis 86	Del. River Joint Toll Bridge Comm.	Information of direct relevance in decision regarding replacement of bridge deck on a major bridge.
10-29	Report 356	AASHTO	Recommendations adopted and incorporated into AASHTO <i>Standard Specifications for Bridges</i> .
10-43	Agency final report	AASHTO	The manual for movable bridge inspection evaluation and maintenance developed under this project was adopted by AASHTO in 1997.
11-1(6)	Report 92	N. Mex. SH Comm.	In settling negotiations for purchase of an airport.
11-3	Report 56	Indiana SH Comm. Ill. Div. H. Bur. Rt.-of-Way	Rated as "excellent" by Land Acquisition Division, which requested extra copies for use in development of new work in area of responsibility. Most of the principles set forth have been in practice. Land Economic Study unit conducted a study according to the report recommendation for one method of analysis of the value of scenic easements.
12-2	Report 83	Calif. Div. of Hwys.	Own research project on "Analysis, Design and Behavior of Highway Bridges" used both basic knowledge and example of a well-devised rational approach to further simplify the proposed formulas and criteria recommended as revisions to the AASHTO Specifications, and to consolidate and authenticate the proposed criteria by further model and prototype verification of analytically obtained values.
12-5	Report 90	Calif. Div. of Hwys.	Confirmed the Division's present practices, gave reassurance that its long-term investment in prestressed concrete structures is sound, and answered the question as to practicability of protective coatings.
12-7	Report 102	Naval Ship Res. and Devel. Lab. Illinois DOT, Bur. Design Conn. DOT	Limited portions used in a technical report entitled "Some Observations on the Fatigue Behavior of Specimens and Structures." Findings have been found useful, and practice has been modified to conform with them. To change bridge design parameters in order to reduce fatigue cracking.
	Report 147	AASHTO Conn. DOT. Am. Rwy. Eng. Assn.	Fatigue specification recommendations adopted in total in "1974 Interim AASHTO Standard Specifications for Highway Bridges." To accomplish bridge design modifications intended to reduce fatigue cracking. To develop modifications to fatigue provisions in AREA Specifications (1975).
12-8	Report 86	Canadian Stds. Assn. Conn. DOT	Committee on Design of Highway Bridges used results in updating standards for bridge railing loads. To provide backup information for current bridge-rail design.
12-11	Report 165	Minn. DOT	In selecting waterproof membrane systems for field evaluation.
12-15(3)	Report 227	Wisc. DOT Iowa DOT Ill. DOT Kans. DOT Pa. DOT Conn. DOT	To retrofit fatigue-susceptible structural details in welded steel highway bridges.
12-19A	Report 244	Kans. DOT Commercial product manufacturers Industrywide	As reference for guidance in selecting concrete sealers. As a standard for establishing their own specifications on specific products. Results of study have caused many states and industry to be more concerned with technical support on claims made for the performance of concrete sealers. Test procedures in report have become an unofficial standard.
12-22	Report 276	AASHTO	Subcommittee on Bridges and Structures adopted recommendations for thermal gradient design as a Guide Specification to the 1988 Interim AASHTO "Standard Specifications for Highway Bridges."

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
12-23	—	AASHTO	The manual developed under this project was adopted by AASHTO and published in 1994 as the AASHTO <i>Condition Evaluation Manual for Bridges</i> .
12-24	Report 287	AASHTO	Subcommittee on Bridges and Structures adopted recommended changes to the load distribution requirements for multibeam bridge superstructures in the <i>Standard Specifications for Highway Bridges</i> in 1988.
12-27	Report 321	Alfred Benesch & Co.	The guidelines outlined in the report were used to ensure sound weld quality when repairing fatigue cracks in the girder webs of four welded-plate-girder railroad bridges.
12-28(1)	Report 301	AASHTO	The second phase from Project 12-28(1) developed a comprehensive bridge load capacity specification based on the results of Projects 10-15(1) and 12-28(1). The Subcommittee on Bridges and Structures adopted the load capacity evaluation guidelines as a Guide Specification in 1988.
12-28(2)	Agency final report	Maine DOT	BRIDGIT bridge management software in use.
12-28(3)	Report 299	AASHTO	The fatigue design guidelines were adopted by the Subcommittee on Bridges and Structures as a Guide Specification in 1988. The fatigue evaluation guidelines were adopted as a Guide Specification in 1989.
12-32	Report 297	AASHTO	The corrosion protection requirements for reinforcing steel in the <i>Standard Specifications for Highway Bridges</i> were revised by the Subcommittee on Bridges and Structures in 1988 as a result of the recommendations included in the report.
12-33	Res. Results Digest 198	AASHTO	The specifications developed under this project were adopted by AASHTO and published in 1994 as the AASHTO <i>LRFD Bridge Design Specifications</i> , a comprehensive specification which can be used as an alternate to the AASHTO <i>Standard Specifications for Bridges</i> .
12-34	—	AASHTO	Subcommittee on Bridges and Structures adopted complete revision and replacement for Division II—Construction of the <i>Standard Specifications for Highway Bridges</i> in 1990.
12-35	—	AASHTO	Subcommittee on Bridges and Structures adopted complete revision and replacement for Sections 4, 5, and 7 (Foundations, Substructures, and Retaining Walls) of the <i>Standard Specifications for Highway Bridges</i> in 1990.
13-1	Report 26	Del. SHD	In a study of highway maintenance management, Advanced Management Planning, Inc., recommended use as a guide in establishing equipment rental rates.
14-1	Report 42	Minn. DOH	Of considerable assistance to the investigators in the Maintenance Program Budget Pilot Study, which includes a determination of the sets of road characteristics to which quality and quantity standards codes should be assigned.
		Wash.State SH Comm.	In development of a unit maintenance expenditure index for the State.
		Ohio Dept. of Hwys.	In a study to develop a forecast of maintenance needs for the 1970 to 80 decade and compare it with the trends in highway maintenance needs for the U.S. as a whole and for the Northeast region in particular.
		Conn. DOT	In establishing Maintenance Management System.
14-5	Report 223	Penn. DOT	To determine tradeoffs between various maintenance activities for resource allocation. Allowing gross to grow 6 in. higher before cutting saves \$600,000 a year that may be used to reduce edge-drop-off.
15-1	Report 36	Commercial firm	In formulating a design for a new fiberglass guardrail system.
15-1(2)	Report 54	Federal and State agencies	In planning, design, construction, maintenance, replacement of guardrails and median barriers.
		American Iron and Steel Inst.	Recommendations on standardization of guardrail hardware by the Highway Task Force of the Institute's Sheet Committee to include use of the flat washer illustrated on page 29 of <i>Report 54</i> .
		Illinois Div. of Hwys.	Included in highway design policies and standards by Bur. of Design. New Bur. of Maintenance standards for guardrail and median barriers adapted from report. Bur. of Traffic comments highlight <i>Design Manual</i> or <i>Highway Standards</i> areas that could be improved by the findings; the warranting of trial installations of various types of median barriers, for reasons of both safety and economy; and the value of certain information as a tool to determine whether to remove or upgrade existing

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
			installations.
	Report 115	Nevada DOH Illinois DOT, Bur. Design	In evaluating acceptability of the Department's design criteria and standards. Findings have been found useful, and practice has been modified to conform with them.
	Report 118	Conn. DOT N.Y. DOT	As a basis of guardrail systems currently used in Connecticut. As a vital supplement to a recently prepared design manual covering policies, procedures, and standards. Design guide refers to report for further information.
15-2	Report 108	Conn. DOT	On trial basis, used the design technique developed for channels lined with riprap. Major relocation of a stream and tributaries having a design flood discharge of 3,900 cfs from a drainage area of 7.3 sq mi was involved. Saving from use of riprap instead of paving was estimated to be more than \$90,000. Evaluation of the effectiveness of the treatment is continuing, especially observation of behavior during and after any significant storms.
		Wisconsin DOT	Channel design procedure applied to ditches along the Lake Wissota--Cadott Road in Chippewa County, previously subject to erosion, but none has occurred since use of riprap according to the procedure.
		Kans.SH Comm.	As basis for publication, "Design of Stable Roadside Channels"
		Minnesota DOH	To design riprap for a stream relocation at Moose Lake. Riprap erosion protection functioned as planned during rainstorms providing discharges approximating the design value of 275 cfs.
		Colo. OH Soil Conserv. Serv., U.S. Dept. of Agr.	Method to size riprap protection included in Ch. 8 of Design Manual. Recommendations used in preparation of <i>SCS Tech. Release No. 59</i> , "Hydraulic Design of Riprap Gradient Control Structures."
	Report 108 and agency draft	Hydr. Br., Bridge Div., FHWA	As source documents for "Stable Channel Designs"; design procedures for riprap linings developed principally from Report 108.
	Report 108 and agency report	Consultant, Madrid, Spain	Riprap design procedure applied to channels along motorways in Spain.
15-4	Report 136	Indiana SH Comm.	Used National Small Streams Data Inventory compiled during project as an additional check on flood flow estimates.
15-6	Report 77	AASHTO Stdg. Comm. on Hwys. California Div. of Hwys.	Input (with Report 20, Proj. 5-4) to March 1969 publication, <i>Informational Guide to Roadway Lighting</i> . Instrumental in setting the standards for California and aiding in developing the most satisfactory breakaway base. The California research, without that done under NCHRP, reportedly would have cost well over \$100,000 to develop or affirm preliminary designs of this type.
15-7	Agency final report and User's Manual	Conn. DOT Wyo. Hwy. Dept.	As a basis for breakaway luminaires for highway lighting. As reference for guidance in determining flow modifications caused by storage losses on encroached flood plains.
15-12	Report 362	AASHTO	The report recommendations have been used to prepare updates for the AASHTO Green Book.
16-1	Report 91	California Div. of Hwys. U.S. Government	Appendix D ("Effects of Salts on Plant Biota") is the most complete dissertation on soil salinity and salt-tolerant plants in the Division's reference files. As a primary reference in formulating the National Environmental Policy Act of 1969 and Executive Order 11514 on "Protection and Enhancement of Environmental Quality."
16-3	Agency report Report 221	Conn. DOT Iowa DOT Hittman Assoc. Inc.	In preparation of environmental impact statements. In a training program on erosion control for state personnel. Information and illustrations used in a field manual for the Office of Surface Mining, U.S. Dept. of Interior.
	Reports 220 and 221	Utah DOT	To develop a manual.
		Park City,	Developers are required by city ordinance to comply with provisions set forth in

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
17-1	Report 79	Utah Robley Winfrey Calspan	the reports. In development of college textbook, <i>Economic Analysis for Highways</i> .
		Min. of Transp., Brazil	As starting point for a Tri-Level Accident Research Program for NHTSA and the Motor Vehicle Mfrs. Assn. Translated into Portuguese.
17-2A	Agency report	S. Dak. DOT., Div. of Hwys.	To assist in evaluating safety improvements accomplished under an ongoing safety program.
	Report 162	Northwestern Univ. Off. of Hwy Safety, FHWA	As a reference and teaching aid in a graduate course in highway safety programming. By staff serving as instructors for a series of regional seminars on evaluation of safety improvements.
17-3	Report 219	FHWA Off. of Traff. Op. The Israel Nat'l Council for Prevention of Accidents	As source document for FHWA's Positive Guidance series on planning and collection of field data. The final report and a training film prepared to this research were used in a pilot project to study conflicting traffic movements at intersections.
17-4	Report 236	FHWA, Nat'l Comm. on Uniform Traffic Control Devices	As a basis for changes in a Uniform Manual of Traffic Control Devices, Part VI, Traffic Control for Street and Highway Construction and Maintenance Operations
18-2(3)	Report 257	Penn. DOT	To develop a field trial for the deep polymer impregnation of a bridge deck with the "deep grooving technique."
19-2(4)	Report 131	Off. of R&D, FHWA	As a primary reference in training courses on managing highway maintenance.
19-3	Report 141	Nat'l. Inst. for Road Res., S. Africa	As source document in investigating certain aspects of vehicle sizes and weights on South African highways.
20-1	(HRIS)	Many diverse agencies	The Highway Research Information Service is known to be used widely by a number of organizations in addition to state highway departments. Recognition has been given to the periodic issues of <i>Highway Research in Progress</i> as being very useful and of great value to many other government agencies.
20-2	Report 55	Illinois Div. H, Bur. R&D	A committee within the Illinois Highway Research Council, having the assignment of developing a system of establishing research priorities for the Division's program, uses the method outlined for structuring research programs.
20-3	—	California Div. of Hwys.	Although not yet published, results from the second year of research are being used as background for installing surveillance and control systems and in planning alternative methods of improving operations on the Los Angeles Area freeway system.
20-5	Synthesis 1 Synthesis 2	Conn. DOT Lab. de Eng., Angola	As a basis for current signing patterns from Maintenance. Translated into Portuguese.
	Synthesis 4	California Div. of Hwys.	As a basic document in the continuing development of Division practices and procedures to cope with the bridge deck deterioration problem. Also used as a guide for those lines of research that will yield the highest return.
		U.S. DOT N. Mex. SHD	In preparation of <i>Instructional Memorandum 40-2-70</i> .
	Synthesis 5	Ctr. for PW	In revising the Department's <i>Bridge Construction Manual</i> . Translated into Spanish as an "Information Bulletin" of the Transport and Soil

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
		Studies and Exper. (Spain) La DOH	Mechanics Laboratory. As procedural guide to emergency measures to contain and/or control scour at bridge sites.
Synthesis 6		Conn. DOT	In project scheduling.
Synthesis 7		92nd Cong., 1 Sess.	See Project 1-12.
Synthesis 10		Conn. DOT	Provided justification for motorist aid call-box system.
Synthesis 11		Conn. DOT AASHTO	By Maintenance in training personnel for equipment responsibilities. As a text in Highway Management Course (conducted by the Highway Management Institute at the Univ. of Mississippi).
Synthesis 12		Conn. DOT	As a basis for Maintenance Telecommunication System.
Synthesis 14		Tex. Hwy. Dept.	Recommended to District offices as a reference to answer skid-resistance questions from both Departmental and non-Departmental personnel.
Synthesis 16		Conn. DOT	To provide guidelines for skid-resistance program.
Synthesis 18		Conn. DOT Tex. HD and Tex. Div., FHWA	Reference source for design of CRC pavements. As background information in plan preparation and review; construction supervision and inspection; maintenance activity.
Synthesis 21		Bur. of Transportation Stats.	Included as reference material in CD-ROM guide on the implementation of linear referencing systems.
Synthesis 24		Conn. DOT	As input into snow and ice policy.
Synthesis 32		Conn. DOT	As backup for studded-tire legislation.
Synthesis 37		Upper Plains States Innovation Group	Used in stabilization handbook for local governments.
Syntheses 56 and 60		Texas SDH and Public Transp.	For review by district offices prior to Pavement Rehabilitation Conference.
Synthesis 81		Texas SDH and Public Transp. FHWA	Text material for Corridor Management Team Conference. Participants included city and state personnel from 12 largest urban areas within Texas. Also used as text for Urban Traffic Operations and Management Seminar. As source material in short courses on Organization and Management of Ridesharing.
Syntheses 81 and 93		FHWA	Used in National Highway Institute training courses for TSM and Ridesharing.
Synthesis 86		TRB	Used for an article in <i>TR News</i> "Research Pays Off."
Synthesis 118		Va. Polytechnic Inst.	Portions used for a class in the spring of 1995 at Virginia Polytechnic Institute and State University.
Synthesis 133		Bur. of Transportation Stats.	Included as reference material in CD-ROM guide on the implementation of linear referencing systems.
Synthesis 157		Ecole Polytechnique de Montreal	Several figures used in a book published in the French language by the Department of Civil Engineering.
Synthesis 161		Kansas DOT	Portions reprinted in a newsletter.
Synthesis 164		FHWA	Used in training seminars on motor fuel tax evasion for auditors and investigators arranged by the Federation of Tax Administrators for FHWA.
Synthesis 180		FHWA	Selected figures were used in "Instructors' Guide for Surface Rehabilitation Techniques."
Synthesis 184		NY DOT	Support for a sole-source litter and debris retrieval and disposal system thereby minimizing unnecessary administrative requirements.
Syntheses 190 and 195		FHWA	Used in policy decision making at federal and state level; also used in workshops.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
20-6	Res. Dig. 11	Md. Rds. Comm.	In a case before September 1969 term, State Court of Appeals.
	Syntheses 96 and 99	FHWA	As a supplement to the training sessions on drainage and overlay designs in a "Pavement Design Training Course."
	Res. Dig. 11 and others	Colorado DOH	Used on several occasions involving condemnation cases and other legal matters. Digests noted as being extremely helpful in view of their discussions of current problems and consequent saving of legal staff time.
	Res. Results Digest 3	Sec. of Transp.	Included <i>in toto</i> in 1970 Annual Report to the Congress in respect to progress made in administration of the highway relocation assistance program as enacted under the Federal-Aid Highway Act of 1968.
	Res. Results Digests	Virginia Atty. Genl. Office	As an aid to maintaining a current awareness of legal research of an original nature, as a basis for further research by personnel of the Office, and as a point of departure for reviews of settled law.
	Res. Dig. 25	U. Wis., Dept. Eng.	As a text in short course on Urban Transportation Planning.
	Legal Research Digests	American Samoa Government	To resolve issues similar to those found elsewhere in the United States of America
20-7	Agency final report (Task 4)	92nd Cong., 1st Sess.	"Lateral Accelerations and Lateral Tire-Pavement Forces in a Vehicle Traversing Curves Relating to Available Pavement Skid-Resistant Measures." See Project 1-12.
	Report 157	Conn. DOT	In developing the scrap tire attenuation system.
	Res. Dig. 98	FHWA	To analyze Oklahoma DOT structure upgrading program.
	Agency final report (Task 8)	N.Y. DOT	As primary source of information on energy used in construction and maintenance of transportation facilities for estimation of energy savings by Transportation System Management (TSM) actions. TSM actions were estimated to save 37.1 million gal of gasoline in the State of N.Y. during the 1978 calendar year.
		FHWA	As the primary source document for preparing the Workshop Notes for Energy Requirements for Transportation Systems.
	Agency final report (Task 12)	AASHTO	Published by AASHTO as <i>Guidelines on Citizen Participation in Transportation Planning</i> .
	Agency final report (Task 16)	North Central Council of Governments	As an aid in the validation of a survey regarding hazardous materials shipments.
	Agency final report (Task 18)	AASHTO	Published by AASHTO in 1983 as the 13th Edition of the <i>Standard Specifications for Highway Bridges</i> .
	AASHTO Guide for Design of Pavement Structures (Task 24)	States, Counties, Cities, Consultants W. Va. Univ	In addition to copies distributed free to AASHTO members, more than 29,000 copies of the document have been purchased from AASHTO by the various users. Primary basis for development of pavement design manual for W. Va. DOH.
	AASHTO Software Program DNPS 86/PC™ (Task 28)	States, Counties, Cities, Consultants	This personal computer program for new pavement design is based on the <i>AASHTO Guide for Design of Pavement Structures</i> and greatly simplifies implementation of the Guide. Under a licensing agreement, copies of the program have been sold by AASHTO to potential users.
	Agency final report (Task 32)	AASHTO	Adopted by the Subcommittee on Bridges and Structures as a Guide Specification in 1988.
AASHTO Guidelines for Pavement Management Systems (Task 38)	AASHTO	Adopted and published by AASHTO, July 1990	
Agency final report (Task 45)	AASHTO	Adopted by AASHTO in 1994 as the new Division I-A of the <i>AASHTO Standard Specifications for Bridges</i> .	
Agency final report (Task 46)	AASHTO	Published by AASHTO in 1993 as the <i>AASHTO Guidelines for Bridge Management Systems</i> .	

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
	Agency final report (Task 48)	AASHTO	Adopted by the Highway Subcommittee on Construction, with minor modifications, as Section 100 of the <i>Guide Specifications for Highway Construction</i> .
	Agency final report (Task 54)	AASHTO	Published by AASHTO in 1993 as the <i>AASHTO Guide to Metric Conversion</i> .
20-12	Agency report	FHWA	In preparation of handbook on "Air Pollution Control for Construction and Maintenance."
20-13	Report 193	Metro. Expy. Public Corp. Tokyo, Japan	Translated into Japanese and distributed within the Corporation.
20-15	Report 218	Florida Dept. of Environ. Regs.	To write rules related to wetland protection.
20-16	Report 198	AASHTO	Findings used in testimony before U.S. Senate.
20-22	Report 310	FHWA	A primary reference for National Highway Institute course on hazardous waste and project development.
20-24(3)	Reports 347 and 347/II	City University of New York	Used to establish career programs between community colleges and transit agencies.
20-24(3)A	Agency report and Res. Results Digest 196-Revised	AASHTO	Developed prototype material for AASHTO's educational outreach program called TRAC <u>TR</u> ansportation and <u>C</u> ivil Engineering).
20-27	Report 358	FHWA Pooled-Fund Study	The report served as the cornerstone for a cooperative effort by 42 states to develop the next level architecture for a GIS-based client-server system to address the ISTEA management systems.
	Report 359	Bur. of Transportation Stats.	Included as reference material in CD-ROM guide on the implementation of linear referencing systems.
	Res. Results Dig. 191	Bur. of Transportation Stats.	Included as reference material in CD-ROM guide on the implementation of linear referencing systems.
20-27(2)	Res. Results Dig. 218	Bur. of Transportation Stats.	Included as reference material in a CD-ROM guide (and at the bureau's website) on the implementation of linear referencing systems.
	Agency final report	Utah DOT	The information engineering model developed in the research was used as a template for the development of the basic architecture for the state's highway engineering information plan. The agency was able to develop the plan in 4 months and with a savings of several hundred thousand dollars.
20-32	Agency report	Bur. of Transportation Stats. Ellisvier Publish. Co.	The bureau is making the Transportation Research Thesaurus (TRT) available on a CD-ROM and the bureau's internet site. The TRT is being considered as the basis for organizing the bureau's transportation information resources. Used the TRT as the basis for a comprehensive index of the publications of the company.
20-33	Report 382	RAND	Reprinted in the RAND reprint series.
20-38	Agency final report	Wyo. DOT	Proved useful in developing a manual on the conduct of research.
21-4	Report 378	Golder Assoc., Inc.	Material included in borehole abandonment guidelines developed for the Ontario Ministry of Transportation.
22-2	Res. Results Dig. 84, 102, 124	State highway agencies	Breakaway cable terminal (BCT) installed as a guardrail end treatment in at least 40 states since 1973.
		FAA	To install breakaway cable terminals as part of a demonstration project on the Dulles Airport Access Highway.
	Report 153	AASHTO	Referenced in Section 1.1.9A(2), Loadings and Geometrics, of the 1975 "Interim Bridge Specifications."
	Res. Results Dig. 84, 102	Australian state hwy. agencies	Breakaway cable terminal (BCT) installed as a guardrail and treatment in at least two Australian states.

TABLE 2 (continued)

NCHRP PROJECT	NCHRP PUBLICATION	USERS	HOW USED
22-2(4)	Report 230	State hwy. agencies, FHWA, and full-scale, crash-testing agencies	As the guide for developing and evaluating highway safety hardware.
22-4	Report 289	Spanish hwy. engineering firm	Energy Absorption Systems Inc. (USA) working cooperatively with a Spanish firm, Bionda, S.A., translated the report into Spanish in metric units and used for selecting highway safety appurtenances for installation on highways in Spain.
22-7	Report 350	FHWA-AASHTO Australian Government U. S. Cong.	Crash test results used in updating the AASHTO Barrier Guide and by individual states in selecting barrier designs. Followed lead of FHWA and adopted recommended procedures for crash testing as the national standard.
22-09	Agency report	AASHTO	The NHS Legislation, Section 328, cites the report as the standard for crash testing of roadside barriers on the National Highway System (NHS). The Roadside Safety Analysis Program (RSAP) developed in the project is being reviewed by the AASHTO Task Force for Roadside Safety as a replacement for the ROADSIDE software that has been part of the <i>Roadside Design Guide</i> for 10 years.
22-10	---	AASHTO-ARTBA-AGC Joint Committee	Adopted materials developed in the project as the <i>Standard Guide to Barrier Hardware</i> . Metric diagrams of crashworthy traffic barriers derived from this guide were used to update the <i>Roadside Design Guide</i> . AASHTO is distributing the <i>Standard Guide to Small Sign Support Hardware</i> to provide detailed design information on crashworthy sign supports in metric formats to its member departments.
24-4	Report 343	John Wiley and Sons, Inc.	Material included in textbook: <i>Design of Highway Bridges</i> , by R.M. Barker and J.A. Puckett, June 1996 (estimated).
25-1	Agency draft final report	U.S. Army Corps of Engineers Waterways Experiment Station	As a resource document.

TABLE 3
PUBLISHED REPORTS OF THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
*	A Critical Review of Literature Treating Methods of Identifying Aggregates Subject to Destructive Volume Change When Frozen in Concrete and a Proposed Program of Research—Interim Report (Proj. 4-3(2)), 81 p., \$1.80	• 23	Methods for Reducing Corrosion of Reinforcing Steel (Proj. 6-4), 22 p., \$1.40
• 1	Evaluation of Methods of Replacement of Deteriorated Concrete in Structures (Proj. 6-8), 56 p., \$2.80	• 24	Urban Travel Patterns for Airports, Shopping Centers, and Industrial Plants (Proj. 7-1), 116 p., \$5.20
2	An Introduction to Guidelines for Satellite Studies of Pavement Performance (Proj. 1-1), 19 p., \$1.80	• 25	Potential Uses of Sonic and Ultrasonic Devices in Highway Construction (Proj. 10-7), 48 p., \$2.00
• 2A	Guidelines for Satellite Studies of Pavement Performance, 85 p. +9 figs., 26 tables, 4 p., \$3.00	• 26	Development of Uniform Procedures for Establishing Construction Equipment Rental Rates (Proj. 13-1), 33 p., \$1.60
• 3	Improved Criteria for Traffic Signals at Individual Intersections—Interim Report (Proj. 3-5), 36 p., \$1.60	• 27	Physical Factors Influencing Resistance of Concrete to Deicing Agents (Proj. 6-5), 41 p., \$2.00
• 4	Non-Chemical Methods of Snow and Ice Control on Highway Structures (Proj. 6-2), 74 p., \$3.20	• 28	Surveillance Methods and Ways and Means Communicating with Drivers (Proj. 3-2), 66 p., \$2.60
• 5	Effects of Different Methods of Stockpiling Aggregates—Interim Report (Proj. 10-3), 48 p., \$2.00	• 29	Digital-Computer-Controlled Traffic Signal System for a Small City (Proj. 3-2), 82 p., \$4.00
• 6	Means of Locating and Communicating with Disabled Vehicles—Interim Report (Proj. 3-4), 56 p., \$3.20	• 30	Extension of AASHO Road Test Performance Concepts (Proj. 1-4(2)), 33 p., \$1.60
• 7	Comparison of Different Methods of Measuring Pavement Condition—Interim Report (Proj. 1-2), 29 p., \$1.80	• 31	A Review of Transportation Aspects of Land-Use Control (Proj. 8-5), 41 p., \$2.00
• 8	Synthetic Aggregates for Highway Construction (Proj. 4-4), 13 p., \$1.00	• 32	Improved Criteria for Traffic Signals at Individual Intersections (Proj. 3-5), 134 p., \$5.00
• 9	Traffic Surveillance and Means of Communicating with Drivers—Interim Report (Proj. 3-2), 28 p., \$1.60	• 33	Values of Time Savings of Commercial Vehicles (Proj. 2-4), 74 p., \$3.60
• 10	Theoretical Analysis of Structural Behavior of Road Test Flexible Pavements (Proj. 1-4), 31 p., \$2.80	• 34	Evaluation of Construction Control Procedures—Interim Report (Proj. 10-2), 117 p., \$5.00
• 11	Effect of Control Devices on Traffic Operations—Interim Report (Proj. 3-6), 107 p., \$5.80	• 35	Prediction of Flexible Pavement Deflections from Laboratory Repeated-Load Tests (Proj. 1-3(3)), 117 p., \$5.00
• 12	Identification of Aggregates Causing Poor Concrete Performance When Frozen—Interim Report (Proj. 4-3(1)), 47 p., \$3.00	• 36	Highway Guardrails—A Review of Current Practice (Proj. 15-1), 33 p., \$1.60
• 13	Running Cost of Motor Vehicles as Affected by Highway Design—Interim Report (Proj. 2-5), 43 p., \$2.80	• 37	Tentative Skid-Resistance Requirements for Main Rural Highways (Proj. 1-7), 80 p., \$3.60
• 14	Density and Moisture Content Measurements by Nuclear Methods—Interim Report (Proj. 10-5), 32 p., \$3.00	• 38	Evaluation of Pavement Joint and Crack Sealing Materials and Practices (Proj. 9-3), 40 p., \$2.00
• 15	Identification of Concrete Aggregates Exhibiting Frost Susceptibility—Interim Report (Proj. 4-3(2)), 66 p., \$4.00	• 39	Factors Involved in the Design of Asphaltic Pavement Surfaces (Proj. 1-8), 112 p., \$5.00
• 16	Protective Coatings to Prevent Deterioration of Concrete by Deicing Chemicals (Proj. 6-3), 21 p., \$1.60	• 40	Means of Locating Disabled or Stopped Vehicles (Proj. 3-4(1)), 40 p., \$2.00
• 17	Development of Guidelines for Practical and Realistic Construction Specifications (Proj. 10-1), 109 p., \$6.00	• 41	Effect of Control Devices on Traffic Operations (Proj. 3-6), 83 p., \$3.60
• 18	Community Consequences of Highway Improvement (Proj. 2-2), 37 p., \$2.80	• 42	Interstate Highway Maintenance Requirements and Unit Maintenance Expenditure Index (Proj. 14-1), 144 p., \$5.60
• 19	Economical and Effective Deicing Agents for Use on Highway Structures (Proj. 6-1), 19 p., \$1.20	• 43	Density and Moisture Content Measurements by Nuclear Methods (Proj. 10-5), 38 p., \$2.00
• 20	Economic Study of Roadway Lighting (Proj. 5-4), 77 p., \$3.20	• 44	Traffic Attraction of Rural Outdoor Recreational Areas (Proj. 7-2), 28 p., \$1.40
• 21	Detecting Variations in Load-Carrying Capacity of Flexible Pavements (Proj. 1-5), 30 p., \$1.40	• 45	Development of Improved Pavement Marking Materials—Laboratory Phase (Proj. 5-5), 24 p., \$1.40
• 22	Factors Influencing Flexible Pavement Performance (Proj. 1-3(2)), 69 p., \$2.60		

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NOTE: Out-of-print publications marked with a bullet (•) are available only in microfiche from the Transportation Research Board. See final page of this document for ordering information.

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
• 46	Effects of Different Methods of Stockpiling and Handling Aggregates (Proj. 10-3), 102 p., \$4.60	• 71	Analytical Study of Weighing Methods for Highway Vehicles in Motion (Proj. 7-3), 63 p., \$2.80
• 47	Accident Rates as Related to Design Elements of Rural Highways (Proj. 2-3), 173 p., \$6.40	• 72	Theory and Practice in Inverse Condemnation for Five Representative States (Proj. 11-2), 44 p., \$2.20
• 48	Factors and Trends in Trip Lengths (Proj. 7-4), 70 p., \$3.20	• 73	Improved Criteria for Traffic Signal Systems on Urban Arterials (Proj. 3-5), 55 p., \$2.80
• 49	National Survey of Transportation Attitudes and Behavior—Phase I Summary Report (Proj. 20-4), 71 p., \$3.20	• 74	Protective Coatings for Highway Structural Steel (Proj. 4-6), 64 p., \$2.80
• 50	Factors Influencing Safety at Highway-Rail Grade Crossings (Proj. 3-8), 113 p., \$5.20	• 74A	Protective Coatings for Highway Structural Steel—Literature Survey (Proj. 4-6), 275 p., \$8.00
• 51	Sensing and Communication Between Vehicles (Proj. 3-3), 105 p., \$5.00	• 74B	Protective Coatings for Highway Structural Steel—Current Highway Practices (Proj. 4-6), 102 p., \$4.00
• 52	Measurement of Pavement Thickness by Rapid and Nondestructive Methods (Proj. 10-6), 82 p., \$3.80	• 75	Effect of Highway Landscape Development on Nearby Property (Proj. 2-9), 82 p., \$3.60
• 53	Multiple Use of Lands Within Highway Rights-of-Way (Proj. 7-6), 68 p., \$3.20	• 76	Detecting Seasonal Changes in Load-Carrying Capabilities of Flexible Pavements (Proj. 1-5(2)), 37 p., \$2.00
• 54	Location, Selection, and Maintenance of Highway Guardrails and Median Barriers (Proj. 15-1(2)), 63 p., \$2.60	• 77	Development of Design Criteria for Safer Luminaire Supports (Proj. 15-6), 82 p., \$3.80
• 55	Research Needs in Highway Transportation (Proj. 20-2), 66 p., \$2.80	• 78	Highway Noise—Measurement, Simulation, and Mixed Reactions (Proj. 3-7), 78 p., \$3.20
• 56	Scenic Easements—Legal, Administrative, and Valuation Problems and Procedures (Proj. 11-3), 174 p., \$6.40	• 79	Development of Improved Methods for Reduction of Traffic Accidents (Proj. 17-1), 163 p., \$6.40
• 57	Factors Influencing Modal Trip Assignment (Proj. 8-2), 78 p., \$3.20	• 80	Oversize-Overweight Permit Operation on State Highways (Proj. 2-10), 120 p., \$5.20
• 58	Comparative Analysis of Traffic Assignment Techniques with Actual Highway Use (Proj. 7-5), 85 p., \$3.60	• 81	Moving Behavior and Residential Choice—A National Survey (Proj. 8-6), 129 p., \$5.60
• 59	Standard Measurements for Satellite Road Test Program (Proj. 1-6), 78 p., \$3.20	• 82	National Survey of Transportation Attitudes and Behavior—Phase II Analysis Report (Proj. 20-4), 89 p., \$4.00
• 60	Effects of Illumination on Operating Characteristics of Freeways (Proj. 5-2), 148 p., \$6.00	• 83	Distribution of Wheel Loads on Highway Bridges (Proj. 12-2), 56 p., \$2.80
• 61	Evaluation of Studded Tire—Performance Data and Pavement Wear Measurement (Proj. 1-9), 66 p., \$3.00	• 84	Analysis and Projection of Research on Traffic Surveillance, Communication, and Control (Proj. 3-9), 48 p., \$2.40
• 62	Urban Travel Patterns for Hospitals, Universities, Office Buildings and Capitols (Proj. 7-1), 144 p., \$5.60	• 85	Development of Formed-in-Place Wet Reflective Markers (Proj. 5-5), 28 p., \$1.80
• 63	Economics of Design Standards for Low-Volume Rural Roads (Proj. 2-6), 93 p., \$4.00	• 86	Tentative Service Requirements for Bridge Rail Systems (Proj. 12-8), 62 p., \$3.20
• 64	Motorists' Needs and Services on Interstate Highways (Proj. 7-7), 88 p., \$3.60	• 87	Rules of Discovery and Disclosure in Highway Condemnation Proceedings (Proj. 11-1(5)), 28 p., \$2.00
• 65	One-Cycle Slow-Freeze Test for Evaluating Aggregate Performance in Frozen Concrete (Proj. 4-3(1)), 21 p., \$1.40	• 88	Recognition of Benefits to Remainder Property in Highway Valuation Cases (Proj. 11-1(2)), 24 p., \$2.00
• 66	Identification of Frost-Susceptible Particles in Concrete Aggregates (Proj. 4-3(2)), 62 p., \$2.80	• 89	Factors, Trends, and Guidelines Related to Trip Length (Proj. 7-4), 59 p., \$3.20
• 67	Relation of Asphalt Rheological Properties to Pavement Durability (Proj. 9-1), 45 p., \$2.20	• 90	Protection of Steel in Prestressed Concrete Bridges (Proj. 12-5), 86 p., \$4.00
• 68	Application of Vehicle Operating Characteristics to Geometric Design and Traffic Operations (Proj. 3-10), 38 p., \$2.00	• 91	Effects of Deicing Salts on Water Quality and Biota—Literature Review and Recommended Research (Proj. 16-1), 70 p., \$3.20
• 69	Evaluation of Construction Control Procedures—Aggregate Gradation Variations and Effects (Proj. 10-2A), 58 p., \$2.80	• 92	Valuation and Condemnation of Special Purpose Properties (Proj. 11-1(6)), 47 p., \$2.60
• 70	Social and Economic Factors Affecting Intercity Travel (Proj. 8-1), 68 p., \$3.00	• 93	Guidelines for Medial and Marginal Access Control on Major Roadways (Proj. 3-13), 147 p., \$6.20
		• 94	Valuation and Condemnation Problems Involving Trade Fixtures (Proj. 11-1(9)), 22 p., \$1.80
		• 95	Highway Fog (Proj. 5-6), 48 p., \$2.40

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
• 96	Strategies for the Evaluation of Alternative Transportation Plans (Proj. 8-4), 111 p., \$5.40	• 123	Development of Information Requirements and Transmission Techniques for Highway Users (Proj. 3-12), 239 p., \$9.60
• 97	Analysis of Structural Behavior of AASHO Road Test Rigid Pavements (Proj. 1-4(1)A), 35 p., \$2.60	• 124	Improved Criteria for Traffic Signal Systems in Urban Networks (Proj. 3-5), 86 p., \$4.80
• 98	Tests for Evaluating Degradation of Base Course Aggregates (Proj. 4-2), 98 p., \$5.00	• 125	Optimization of Density and Moisture Content Measurements by Nuclear Methods (Proj. 10-5A), 86 p., \$4.40
• 99	Visual Requirements in Night Driving (Proj. 5-3), 38 p., \$2.60	• 126	Divergencies in Right-of-Way Valuation (Proj. 11-4), 57 p., \$3.00
• 100	Research Needs Relating to Performance of Aggregates in Highway Construction (Proj. 4-8), 68 p., \$3.40	• 127	Snow Removal and Ice Control Techniques at Interchanges (Proj. 6-10), 90 p., \$5.20
• 101	Effect of Stress on Freeze-Thaw Durability of Concrete Bridge Decks (Proj. 6-9), 70 p., \$3.60	• 128	Evaluation of AASHO Interim Guides for Design of Pavement Structures (Proj. 1-11), 111 p., \$5.60
• 102	Effect of Weldments on the Fatigue Strength of Steel Beams (Proj. 12-7), 114 p., \$5.40	• 129	Guardrail Crash Test Evaluation—New Concepts and End Designs (Proj. 15-(2)), 89 p., \$4.80
• 103	Rapid Test Methods for Field Control of Highway Construction (Proj. 10-4), 89 p., \$5.00	• 130	Roadway Delineation Systems (Proj. 5-7), 349 p., \$14.00
• 104	Rules of Compensability and Valuation Evidence for Highway Land Acquisition (Proj. 11-1), 77 p., \$4.40	• 131	Performance Budgeting System for Highway Maintenance Management (Proj. 19-2(4)), 213 p., \$8.40
• 105	Dynamic Pavement Loads of Heavy Highway Vehicles (Proj. 15-5), 94 p., \$5.00	• 132	Relationships Between Physiographic Units and Highway Design Factors (Proj. 1-3(1)), 161 p., \$7.20
• 106	Revibration of Retarded Concrete for Continuous Bridge Decks (Proj. 18-1), 67 p., \$3.40	• 133	Procedures for Estimating Highway User Costs, Air Pollution, and Noise Effects (Proj. 7-8), 127 p., \$5.60
• 107	New Approaches to Compensation for Residential Takings (Proj. 11-1(10)), 27 p., \$2.40	• 134	Damages Due to Drainage, Runoff, Blasting, and Slides (Proj. 11-1(8)), 24 p., \$2.80
• 108	Tentative Design Procedure for Riprap-Lined Channels (Proj. 15-2), 75 p., \$4.00	• 135	Promising Replacements for Conventional Aggregates for Highway Use (Proj. 4-10), 53 p., \$3.60
• 109	Elastomeric Bearing Research (Proj. 12-9), 53 p., \$3.00	• 136	Estimating Peak Runoff Rates from Ungaged Small Rural Watersheds (Proj. 15-4), 85 p., \$4.60
• 110	Optimizing Street Operations Through Traffic Regulations and Control (Proj. 3-11), 100 p., \$4.40	• 137	Roadside Development—Evaluation of Research (Proj. 16-2), 78 p., \$4.20
• 111	Running Costs of Motor Vehicles as Affected by Road Design and Traffic (Proj. 2-5A and 2-7), 97 p., \$5.20	• 138	Instrumentation for Measurement of Moisture—Literature Review and Recommended Research (Proj. 21-1), 60 p., \$4.00
• 112	Junkyard Valuation—Salvage Industry Appraisal Principles Applicable to Highway Beautification (Proj. 11-3(2)), 41 p., \$2.60	• 139	Flexible Pavement Design and Management—Systems Formulation (Proj. 1-10), 64 p., \$4.40
• 113	Optimizing Flow on Existing Street Networks (Proj. 3-14), 414 p., \$15.60	• 140	Flexible Pavement Design and Management—Materials Characterization (Proj. 1-10), 118 p., \$5.60
• 114	Effects of Proposed Highway Improvements on Property Values (Proj. 11-1(1)), 42 p., \$2.60	• 141	Changes in Legal Vehicle Weights and Dimensions—Some Economic Effects on Highways (Proj. 19-3), 184 p., \$8.40
• 115	Guardrail Performance and Design (Proj. 15-1(2)), 70 p., \$3.60	• 142	Valuation of Air Space (Proj. 11-5), 48 p., \$4.00
• 116	Structural Analysis and Design of Pipe Culverts (Proj. 15-3), 155 p., \$6.40	• 143	Bus Use of Highways—State of the Art (Proj. 8-10), 406 p., \$16.00
• 117	Highway Noise—A Design Guide for Highway Engineers (Proj. 3-7), 79 p., \$4.60	• 144	Highway Noise—A Field Evaluation of Traffic Noise Reduction Measures (Proj. 3-7), 80 p., \$4.40
• 118	Location, Selection, and Maintenance of Highway Traffic Barriers (Proj. 15-1(2)), 96 p., \$5.20	• 145	Improving Traffic Operations and Safety at Exit Gore Areas (Proj. 3-17), 120 p., \$6.00
• 119	Control of Highway Advertising Signs—Some Legal Problems (Proj. 11-3(1)), 72 p., \$3.60	• 146	Alternative Multimodal Passenger Transportation Systems—Comparative Economic Analysis (Proj. 8-9), 68 p., \$4.00
• 120	Data Requirements for Metropolitan Transportation Planning (Proj. 8-7), 90 p., \$4.80	• 147	Fatigue Strength of Steel Beams with Welded Stiffeners and Attachments (Proj. 12-7), 85 p., \$4.80
• 121	Protection of Highway Utility (Proj. 8-5), 115 p., \$5.60		
• 122	Summary and Evaluation of Economic Consequences of Highway Improvements (Proj. 2-11), 324 p., \$13.60		

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
• 148	Roadside Safety Improvement Programs on Freeways—A Cost-Effectiveness Priority Approach (Proj. 20-7), 64 p., \$4.00	174	Highway Noise—A Design Guide for Prediction and Control (Proj. 3-7), 193 p., \$9.60
149	Bridge Rail Design—Factors, Trends, and Guidelines (Proj. 12-8), 49 p., \$4.00	175	Freeway Lane Drops (Proj. 3-16), 72 p., \$4.80
• 150	Effect of Curb Geometry and Location on Vehicle Behavior (Proj. 20-7), 88 p., \$4.80	176	Studded Tires and Highway Safety—Feasibility of Determining Indirect Effects (Proj. 1-13(2)), 42 p., \$4.00
• 151	Locked-Wheel Pavement Skid Tester Correlation and Calibration Techniques (Proj. 1-12(2)), 100 p., \$6.00	177	Freight Data Requirements for Statewide Transportation Systems Planning—Research Report (Proj. 8-17), 196 p., \$8.80
• 152	Warrants for Highway Lighting (Proj. 5-8), 117 p., \$6.40	178	Freight Data Requirements for Statewide Transportation Systems Planning—User's Manual (Proj. 8-17), 155 p., \$7.40
153	Recommended Procedures for Vehicle Crash Testing of Highway Appurtenances (Proj. 22-2), 19 p., \$3.20	179	Evaluating Options in Statewide Transportation Planning/Programming—Issues, Techniques, and Their Relationships (Proj. 8-18), 91 p., \$5.60
• 154	Determining Pavement Skid Resistance Requirements at Intersections and Braking Sites (Proj. 1-12), 64 p., \$4.40	• 180	Cathodic Protection for Reinforced Concrete Bridge Decks—Laboratory Phase (Proj. 12-13), 135 p., \$7.00
• 155	Bus Use of Highways—Planning and Design Guidelines (Proj. 8-10), 161 p., \$7.60	181	Subcritical Crack Growth and Fracture of Bridge Steels (Proj. 12-14), 82 p., \$5.60
• 156	Transportation Decision-Making—A Guide to Social and Environmental Considerations (Proj. 8-8(3)), 135 p., \$7.20	182	Economic Evaluation of Ice and Frost on Bridge Decks (Proj. 6-11), 73 p., \$4.80
157	Crash Cushions of Waste Materials (Proj. 20-7), 73 p., \$4.80	183	Studded Tires and Highway Safety—An Accident Analysis (Proj. 1-13), 70 p., \$4.80
• 158	Selection of Safe Roadside Cross Sections (Proj. 20-7), 57 p., \$4.40	• 184	Influence of Combined Highway Grade and Horizontal Alignment on Skidding (Proj. 1-14), 33 p., \$3.20
• 159	Weaving Areas—Design and Analysis (Proj. 3-15), 119 p., \$6.40	185	Grade Effects on Traffic Flow Stability and Capacity (Proj. 3-19), 110 p., \$6.40
• 160	Flexible Pavement Design and Management—Systems Approach Implementation (Proj. 1-10A), 53 p., \$4.00	• 186	Travel Estimation Procedures for Quick Response to Urban Policy Issues (Proj. 8-12A), 70 p., \$5.60
• 161	Techniques for Reducing Roadway Occupancy During Routine Maintenance Activities (Proj. 14-2), 55 p., \$4.40	187	Quick-Response Urban Travel Estimation Techniques and Transferable Parameters—User's Guide (Proj. 8-12A), 229 p., \$10.20
162	Methods for Evaluating Highway Safety Improvements (Proj. 17-2A), 150 p., \$7.40	188	Fatigue of Welded Steel Bridge Members Under Variable-Amplitude Loadings (Proj. 12-12), 113 p., \$6.40
163	Design of Bent Caps for Concrete Box-Girder Bridges (Proj. 12-10), 124 p., \$6.80	• 189	Quantifying the Benefits of Separating Pedestrians and Vehicles (Proj. 20-10), 127 p., \$7.00
164	Fatigue Strength of High-Yield Reinforcing Bars (Proj. 4-7), 90 p., \$5.60	190	Use of Polymers in Highway Concrete (Proj. 18-2), 77 p., \$5.60
165	Waterproof Membranes for Protection of Concrete Bridge Decks—Laboratory Phase (Proj. 12-11), 70 p., \$4.80	• 191	Effect of Air Pollution Regulations on Highway Construction and Maintenance (Proj. 20-12), 81 p., \$7.00
166	Waste Materials as Potential Replacements for Highway Aggregates (Proj. 4-10A), 94 p., \$5.60	192	Predicting Moisture-Induced Damage to Asphaltic Concrete (Proj. 4-8(3)), 46 p., \$5.20
167	Transportation Planning for Small Urban Areas (Proj. 8-7A), 71 p., \$4.80	193	Beneficial Effects Associated with Freeway Construction—Environmental, Social, and Economic (Proj. 20-13), 110 p., \$7.80
168	Rapid Measurement of Concrete Pavement Thickness and Reinforcement Location—Field Evaluation of Nondestructive Systems (Proj. 10-8), 63 p., \$4.80	194	Traffic Control in Oversaturated Street Networks (Proj. 3-18(2)), 152 p., \$9.60
169	Peak-Period Traffic Congestion—Options for Current Programs (Proj. 7-10), 65 p., \$4.80	195	Minimizing Premature Cracking in Asphaltic Concrete Pavement (Proj. 9-4), 51 p., \$6.00
• 170	Effects of Deicing Salts on Plant Biota and Soils—Experimental Phase (Proj. 16-1), 88 p., \$5.60	196	Reconditioning Heavy-Duty Freeways in Urban Areas (Proj. 14-4), 60 p., \$6.40
171	Highway Fog—Visibility Measures and Guidance Systems (Proj. 5-6A), 40 p., \$4.00	197	Cost and Safety Effectiveness of Highway Design Elements (Proj. 3-25), 237 p., \$10.60
• 172	Density Standards for Field Compaction of Granular Bases and Subbases (Proj. 4-8(2)), 73 p., \$4.80	198	State Laws and Regulations on Truck Size and Weight (Proj. 20-16), 117 p., \$7.20
173	Highway Noise—Generation and Control (Proj. 3-7), 174 p., \$8.00		

TABLE 3 (continued)

REPORT		REPORT	
NO.	TITLE, TOPIC, PAGES, PRICE	NO.	TITLE, TOPIC, PAGES, PRICE
199	Evaluating Options in Statewide Transportation Planning/Programming—Techniques and Applications (Proj. 8-18), 190 p., \$9.00	220	Erosion Control During Highway Construction—Research Report (Proj. 16-3), 30 p., \$5.60
200	Monitoring Carbon Monoxide Concentrations in Urban Area (Proj. 20-14), 41 p., \$5.20	221	Erosion Control During Highway Construction—Manual on Principles and Practices (Proj. 16-3), 108 p., \$14.40
201	Acceptance Criteria for Electroslag Weldments in Bridges (Proj. 10-10), 44 p., \$5.20	222	Bridges on Secondary Highways and Local Roads—Rehabilitation and Replacement (Proj. 12-20), 132 p., \$9.20
• 202	Improved Pavement-Shoulder Joint Design (Proj. 14-3), 103 p., \$7.20	• 223	Maintenance Levels-of-Service Guidelines (Proj. 14-5), 118 p., \$8.80
• 203	Safety at Narrow Bridge Sites (Proj. 20-7, Task 7), 63 p., \$6.00	224	Guidelines for Recycling Pavement Materials (Proj. 1-17), 137 p., \$9.20
204	Bridge Deck Joint-Sealing Systems—Evaluation and Performance Specification (Proj. 10-11), 46 p., \$5.60	225	Plastic Pipe for Subsurface Drainage of Transportation Facilities (Proj. 4-11), 153 p., \$9.60
205	Implementing Packages of Congestion-Reducing Techniques—Strategies for Dealing with Institutional Problems of Cooperative Programs (Proj. 7-10(2)), 128 p., \$7.60	226	Damage Evaluation and Repair Methods for Prestressed Concrete Bridge Members (Proj. 12-21), 66 p., \$7.20
206	Detection and Repair of Fatigue Damage in Welded Highway Bridges (Proj. 12-15 & 12-15(2)), 85 p., \$6.80	227	Fatigue Behavior of Full-Scale Welded Bridge Attachments (Proj. 12-15(3)), 47 p., \$6.40
• 207	Upgrading of Low-Quality Aggregates for PCC and Bituminous Pavements (Proj. 4-12), 91 p., \$7.20	228	Calibration of Response-Type Road Roughness Measuring Systems (Proj. 1-18), 81 p., \$7.60
208	Market Opportunity Analysis for Short-Range Public Transportation Planning—Procedures for Evaluating Alternative Service Concepts (Proj. 8-16), 80 p., \$6.80	229	Methods for Analyzing Fuel Supply Limitation on Passenger Travel (Proj. 8-23), 132 p., \$9.20
209	Market Opportunity Analysis for Short-Range Public Transportation Planning—Transportation Services for the Transportation Disadvantaged (Proj. 8-16), 52 p., \$6.00	230	Recommended Procedures for the Safety Performance Evaluation of Highway Appurtenances (Proj. 22-2(4)), 42 p., \$6.00
210	Market Opportunity Analysis for Short-Range Public Transportation Planning—Economic, Energy, and Environmental Impacts (Proj. 8-16), 45 p., \$6.00	231	State Transportation Finance Within the Context of Energy Constraints (Proj. 8-22), 86 p., \$7.60
211	Market Opportunity Analysis for Short-Range Public Transportation Planning—Goals and Policy Development, Institutional Constraints, and Alternative Organizational Arrangements (Proj. 8-16), 161 p., \$9.20	232	Guidelines for Selection of Ramp Control Systems (Proj. 3-22A), 108 p., \$8.40
• 212	Market Opportunity Analysis for Short-Range Public Transportation Planning—Method and Demonstration (Proj. 8-16), 132 p., \$10.00	233	Selecting Traffic Signal Control at Individual Intersections (Proj. 3-27), 133 p., \$9.20
—*	Freeway Traffic Management (Proj. 20-3D), 68 p., \$4.00	234	Galvanic Cathodic Protection for Reinforced Concrete Bridge Decks—Field Evaluation (Proj. 12-13A), 64 p., \$6.80
213	Bayesian Methodology for Verifying Recommendations to Minimize Asphalt Pavement Distress (Proj. 9-4A), 52 p., \$6.00	235	Effectiveness of Changeable Message Displays in Advance of High-Speed Freeway Lane Closures (Proj. 3-21(2)), 49 p., \$7.00
• 214	Design and Traffic Control Guidelines for Low-Volume Rural Roads (Proj. 20-7, Task 13), 41 p., \$5.60	236	Evaluation of Traffic Controls for Highway Work Zones (Proj. 17-4, 17-4(2)), 189 p., \$12.00
• 215	Pavement Management System Development (Proj. 20-7, Task 15), 32 p., \$5.20	• 237	Locating Voids Beneath Pavement Using Pulsed Electromagnetic Wave Techniques (Proj. 10-14), 40 p., \$6.80
216	The No-Action Alternative—Research Report (Proj. 811), 72 p., \$6.80	238	Estimating Exceedances and Design Values from Data Collected by Urban Ozone Monitoring Networks (Proj. 20-14A), 121 p., \$9.60
217	The No-Action Alternative—Impact Assessment Guidelines (Proj. 8-11), 174 p., \$9.60	239	Multiple-Service-Level Highway Bridge Railing Selection Procedures (Proj. 22-2(3)), 161 p., \$10.40
• 218A	Ecological Effects of Highway Fills on Wetlands—Research Report (Proj. 20-15), 34 p., \$5.20	240	A Manual to Determine Benefits of Separating Pedestrians and Vehicles (Proj. 20-10(2)), 56 p., \$7.20
• 218B	Ecological Effects of Highway Fills on Wetlands—User's Manual (Proj. 20-15), 99 p., \$7.20	241	Guidelines for Using Vanpools and Carpools as a TSM Technique (Proj. 8-21), 154 p., \$10.40
• 219	Application of Traffic Conflict Analyses at Intersections (Proj. 17-3), 109 p., \$7.60	242	Ultrasonic Measurement of Weld Flaw Size (Proj. 10-13), 76 p., \$8.00
		243	Rehabilitation and Replacement of Bridges on Secondary Highways and Local Roads (Proj. 12-20), 46 p., \$6.80

* Special publication

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
244	Concrete Sealers for Protection of Bridge Structures (Proj. 12-19A), 138 p., \$10.00	270	Parameters Affecting Stopping Sight Distance (Proj. 15-8), 169 p., \$11.20
245	Methodology for Evaluating Highway Air Pollution Dispersion Models (Proj. 20-18), 85 p., \$8.40	271	Guidelines for Evaluation and Repair of Damaged Steel Bridge Members (Proj. 12-17A), 64 p., \$7.60
• 246	Predicting Moisture-Induced Damage to Asphaltic Concrete—Field Evaluation (Proj. 4-8(3)) 50 p., \$7.20	272	Performance of Weathering Steel in Bridges (Proj. 10-22), 164 p., \$12.00
247	Effectiveness of Clear Recovery Zones (Proj. 17-5) 68 p., \$7.20	273	Manual for the Selection of Optimal Maintenance Levels of Service (Proj. 14-5(2)), 81 p., \$9.20
248	Elastomeric Bearings Design, Construction, and Materials (Proj. 10-20), 82 p., \$8.40	274	Use of Antistripping Additives in Asphaltic Concrete Mixtures—Laboratory Phase (Proj. 10-17), 50 p., \$7.60
249	Peak-Hour Traffic Signal Warrant (Proj. 3-20A), 71 p., \$7.60	275	Pavement Roughness and Rideability (Proj. 1-23), 69 p., \$8.80
250	New Approaches to Understanding Travel Behavior (Proj. 8-14A), 142 p., \$10.00	276	Thermal Effects in Concrete Bridge Superstructures (Proj. 12-22), 99 p., \$9.60
251	Assessment of Deficiencies and Preservation of Bridge Substructures Below the Waterline (Proj. 10-16), 80 p., \$8.40	277	Portland Cement Concrete Pavement Evaluation System (COPES) (Proj. 1-19), 175 p., \$12.80
252	Adding Dust Collector Fines to Asphalt Paving Mixtures (Proj. 10-19), 90 p., \$8.40	278	Cathodic Protection of Concrete Bridge Substructures (Proj. 12-19B), 60 p., \$8.40
253	Application of Disaggregate Travel Demand Models (Proj. 8-13(2)), 207 p., \$12.40	279	Intersection Channelization Design Guide (Proj. 3-30), 153 p., \$25.00
254	Shoulder Geometrics and Use Guidelines (Proj. 1-22), 71 p., \$7.60	280	Guidelines for Evaluation and Repair of Damaged Prestressed Concrete Bridge Members (Proj. 12-21), 84 p., \$9.20
255	Highway Traffic Data for Urbanized Area Project Planning and Design (Proj. 8-26), 191 p., \$11.60	281	Joint Repair Methods for Portland Cement Concrete Pavements—Design and Construction Guidelines (Proj. 1-21), 83 p., \$9.20
256	Partial Lighting of Interchanges (Proj. 5-9), 81 p., \$8.40	282	Multilane Design Alternatives for Improving Suburban Highways (Proj. 2-13), 71 p., \$8.50
257	Long-Term Rehabilitation of Salt-Contaminated Bridge Decks (Proj. 18-2(3)), 32 p., \$6.40	283	Training Aid for Applying NCHRP Report 263—Simplified Procedures for Evaluating Low-Cost TSM Projects (Proj. 7-11A), 34 p., \$7.20
258	Control of Air Content in Concrete (Proj. 10-18), 84 p., \$8.40	284	Evaluation of Procedures Used to Measure Cement and Water Content in Fresh Concrete (Proj. 10-25), 76 p., \$9.20
259	Design of Emulsified Asphalt Paving Mixtures (Proj. 9-5), 97 p., \$8.80	285	Evaluating Alternative Maintenance Strategies (Proj. 14-6), 86 p., \$10.40
260	Application of Statewide Freight Demand Forecasting Techniques (Proj. 20-17A), 210 p., \$12.80	286	Evaluation of Fatigue Tests and Design Criteria on Welded Details (Proj. 12-15(5)), 66 p., \$8.40
261	Cost-Effectiveness of Transportation Services for Handicapped Persons—Research Report (Proj. 8-27), 130 p., \$9.60	287	Load Distribution and Connection Design for Precast Stemmed Multibeam Bridge Superstructures (Proj. 12-24), 137 p., \$11.80
262	Planning Transportation Services for Handicapped Persons—User's Guide (Proj. 8-27), 74 p., \$8.00	288	Evaluating Grade-Separated Rail-Highway Crossing Alternatives (Proj. 3-31), 87 p., \$10.80
263	Simplified Procedures for Evaluating Low-Cost TSM Projects—User's Manual (Proj. 7-11), 209 p., \$12.80	289	Performance of Longitudinal Traffic Barriers (Proj. 22-4), 169 p., \$13.20
264	Guidelines for the Management of Highway Runoff on Wetlands (Proj. 25-1), 166 p., \$10.80	290	Reinforcement of Earth Slopes and Embankments (Proj. 24-2), 323 p., \$40.00
265	Removal of Lead-Based Bridge Paints (Proj. 10-23), 72 p., \$8.00	291	Development of Pavement Structural Subsystems (Proj. 1-10B), 59 p., \$8.80
266	Forecasting Inputs to Transportation Planning (Proj. 8-24), 117 p., \$9.60	292	Strength Evaluation of Existing Reinforced Concrete Bridges (Proj. 10-15), 133 p., \$14.00
267	Steel Bridge Members Under Variable Amplitude Long Life Fatigue Loading (Proj. 12-15(4)), 26 p., \$6.40	293	Methods of Strengthening Existing Highway Bridges (Proj. 12-28(4)), 114 p., \$12.00
268	Influence of Asphalt Temperature Susceptibility on Pavement Construction and Performance (Proj. 1-20), 62 p., \$7.60		
269	Paving with Asphalt Cements Produced in the 1980's (Proj. 1-20), 28 p., \$6.40		

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
294A	Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas—Research Report (Proj. 20-19), 92 p., 10.40	318	Roadside Safety Design for Small Vehicles (Proj. 22-6), 70 p., \$10.00
294B	Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas—State-of-the-Art Report (Proj. 20-19), 165 p., \$12.40	319	Recommended Guidelines for Redundancy Design and Rating of Two-Girder Steel Bridges (Proj. 12-28(10)), 142 p., \$13.00
295	Automated Field Survey Data Collection System (Proj. 20-21), 107 p., \$13.20	320	Guidelines for Converting STOP to YIELD Control at Intersections (Proj. 17-7), 49 p., \$9.00
296	Durability of In-Place Concrete Containing High-Range Water-Reducing Admixtures (Proj. 10-32), 63 p., \$10.40	321	Welded Repair of Cracks in Steel Bridge Members (Proj. 12-27), 46 p., \$8.00
297	Evaluation of Bridge Deck Protective Strategies (Proj. 12-32), 80 p., \$12.00	322	Design of Precast Prestressed Bridge Girders (Proj. 12-29), 97 p., \$11.00
298	Performance of Elastomeric Bearings (Proj. 10-20), 100 p., \$12.00	323	Travel Characteristics at Large-Scale Suburban Activity Centers (Proj. 3-38(2)), 106 p., \$11.00
299	Fatigue Evaluation Procedures for Steel Bridges (Proj. 12-28(3)), 94 p., \$11.20	324	Evaluation of Safety Roadside Rest Areas (Proj. 2-15), 129 p., \$12.00
300	Bridge Management Systems (Proj. 12-28(2)), 74 p., \$10.40	325	Low Temperature Behavior and Acceptance Criteria for Elastomeric Bridge Bearings (Proj. 10-20), 69 p. \$9.00
301	Load Capacity Evaluation of Existing Bridges (Proj. 12-28(1)), 104 p., \$11.60	326	Development of a Roadway Design/Graphics Interface System (Proj. 15-10), 18 p., \$8.00
302	Fatigue and Fracture Evaluation for Rating Riveted Bridges (Proj. 12-25), 86 p., \$11.20	327	Determining Asphaltic Concrete Pavement Structural Properties by Nondestructive Testing (Proj. 10-27), 105 p., \$11.00
303	Feasibility of a National Heavy Vehicle Monitoring System (Proj. 3-34), 68 p., \$10.00	328	Forecasting the Basic Inputs to Transportation Planning at the Zonal Level (Proj. 8-24A) 55 p., \$9.00
304	Determining Deteriorated Areas in Portland Cement Concrete Pavements Using Radar and Video Imaging (Proj. 10-28), 107 p., \$14.00	329	Using Market Research to Improve Management of Transportation Systems (Proj. 20-24(1)), 75 p., \$10.00
305	Environmental Monitoring and Evaluation of Calcium Magnesium Acetate (CMA) (Proj. 4-17), 160 p., \$13.60	330	Effective Utilization of Street Width on Urban Arterials (Proj. 3-38(5)), 49 p., \$9.00
306	Correlation of Bridge Load Capacity Estimates with Test Data (Proj. 12-28(8)), 75 p., \$11.20	331	Strategic Planning and Management Guidelines for Transportation Agencies (Proj. 8-28), 49 p., \$9.00
307	Public and Private Partnerships for Financing Highway Improvements (Proj. 2-14), 83 p., \$11.20	332	Framework for Development of Performance-Related Specifications for Hot-Mix Asphaltic Concrete (Proj. 10-26A), 118 p., \$12.00
308	Pavement Roughness and Rideability—Field Evaluation (Proj. 1-23(2)), 48 p., \$9.00	333	Guidelines for Evaluating Corrosion Effects in Existing Steel Bridges (Proj. 12-28(7)), 140 p., \$30.00
309	Protection of Pipelines Through Highway Roadbeds (Proj. 15-9), 21 p., \$8.00	334	Improvements in Data Acquisition Technology for Maintenance Management Systems (Proj. 14-10), 51 p., \$9.00
310	Dealing with Hazardous Waste Sites—A Compendium for Highway Agencies (Proj. 20-22), 107 p., \$12.00	335	Acceptance Criteria for Steel Bridge Welds (Proj. 10-31), 26 p., \$7.00
311	Predicting Stop-and-Go Traffic Noise Levels (Proj. 25-2), 97 p., \$11.00	336	Distortion-Induced Fatigue Cracking in Steel Bridges (Proj. 12-28(6)), 43 p., \$10.00
312	Condition Surveys of Concrete Bridge Components—User's Manual (Proj. 12-28(5)), 84 p., \$11.00	337	Service Vehicle Lighting and Traffic Control Systems for Short Term and Moving Operations (Proj. 17-6A), 56 p., \$10.00
313	Corrosion Protection of Prestressing Systems in Concrete Bridges (Proj. 4-15) 25 p., \$8.00	338	Asphalt-Aggregate Mixture Analysis System—AAMAS (Proj. 9-6(1)), 185 p., \$20.00
314	Guidelines for the Use of Weathering Steel in Bridges (Proj. 10-22), 98 p., \$16.00	339	Effects of the Quality of Traffic Signal Progression on Delay (Proj. 3-38C), 100 p., \$11.00
315	Potential Benefits of Geosynthetics in Flexible Pavement Systems (Proj. 10-33), 56 p., \$9.00	340	Assessment of Advanced Technologies for Relieving Urban Traffic Congestion (Proj. 3-38(1)), 98 pp. \$11.00
316	Laboratory Evaluation of Piles Installed with Vibratory Drivers (Proj. 24-3), 51 p., \$9.00	341	Bond and Insurance Coverages for Highway Construction Contractors (Proj. 20-26), 47 p., \$8.00
317	Transient Protection, Grounding, and Shielding of Electronic Traffic Control Equipment (Proj. 10-34), 84 p., \$11.00	342	Primer on Transportation, Productivity and Economic Development (Proj. 2-17(1)), 127 p., \$12.00

TABLE 3 (continued)

NO.	REPORT TITLE, TOPIC, PAGES, PRICE	NO.	REPORT TITLE, TOPIC, PAGES, PRICE
343	Manuals for the Design of Bridge Foundations: Shallow Foundations, Driven Piles, Retaining Walls and Abutments, Drilled Shafts, Estimating Tolerable Movements, Load Factor Design Specifications and Commentary (Proj. 24-4), 308 p., \$45.00	366	Guidelines for Effective Maintenance-Budgeting Strategies (Proj. 14-9(1)), 48 p., \$16.00
344	Maintenance Contracting (Proj. 14-9(3)), 111 p., \$9.00	367	Long-Term Performance of Geosynthetics in Drainage Applications (Proj. 15-13), 60 p., \$21.00
345	Single Point Urban Interchange Design and Operations Analysis (Proj. 3-40), 101 p., \$12.00	368	Impacts of Environmental, Health, and Safety Regulations on Highway Maintenance (Proj. 14-9(5)), in preparation.
346	Implementation Strategies for Sign Retroreflectivity Standards (Proj. 5-11), 44 p., \$9.00	369	Use of Shoulders and Narrow Lanes to Increase Freeway Capacity (Proj. 3-43), 78 p., \$25.00
347	Civil Engineering Careers: Awareness, Retention, and Curriculum (Proj. 20-24(3)), 118 p., \$12.00	370	Performance of Epoxy-Coated Reinforcing Steel in Highway Bridges (Proj. 10-37), 154 p., \$31.00
347—Part II	Civil Engineering Careers: A User's Guide for Awareness, Retention, and Curriculum Programs (Proj. 20-24(3)), 108 p., \$25.00	371	State Departments of Transportation—Strategies for Change (Proj. 20-24(9)), 134 p., \$31.00
348	Access Management Guidelines for Activity Centers (Proj. 3-38(7)), 112 p., \$12.00	372	Support Under Concrete Pavements (Proj. 1-30), 50 p., \$21.00
349	Maintenance Considerations in Highway Design (Proj. 14-9(2)), 82 p., \$10.00	373	Use of Antistripping Additives in Asphaltic Concrete Mixtures (Proj. 10-17) 52 p., \$21.00
350	Recommended Procedures for the Safety Performance Evaluation of Highway Features (Proj. 22-7), 132 pp., \$13.00	374	Effect of Highway Standards on Safety (Proj. 17-9), 82 p., \$25.00
351	Hazardous Wastes in Highway Rights of Way (Proj. 20-28), 114 p., \$28.00	375	Median Intersection Design (Proj. 15-14(2)), 100 p., \$25.00
352	Inelastic Rating Procedures for Steel Beam and Girder Bridges (Proj. 12-28(12)), 112 p., \$13.00	376	Customer-Based Quality in Transportation (Proj. 20-24(10)), 56 p., \$22.00
353	Effects of Heavy-Vehicle Characteristics on Pavement Response and Performance (Proj. 1-25(1)), 126 p., \$15.00	377	Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements (Proj. 20-24(7)), 158 p., \$35.00
354	Resistance of Welded Details Under Variable Amplitude Long-Life Fatigue Loading (Proj. 12-15(5)), 32 p., \$10.00	378	Recommended Guidelines for Sealing Geotechnical Exploratory Holes (Proj. 21-4), 50 p., \$20.00
355	Notch Toughness Variability in Bridge Steel Plates (Proj. 12-31), 62 p., \$21.00	379	Guidelines for the Development of Wetland Replacement Areas (Proj. 25-3), 448 p., \$65.00
356	Anchorage Zone Reinforcement for Post-Tensioned Concrete Girders (Proj. 10-29), 204 p., \$41.00	380	Transverse Cracking in Newly Constructed Bridge Decks (Proj. 12-37), 126 p., \$32.00
357	Measuring State Transportation Program Performance (Proj. 20-24(6)A), 96 p., \$24.00	381	Report on the 1995 Scanning Review of European Bridge Structures (Proj. 20-36), 30 p., \$18.00
358	Traffic Barriers and Control Treatments for Restricted Work Zones (Proj. 17-8), 112 p., \$25.00	382	Facilitating the Implementation of Research Findings: A Summary Report (Proj. 20-33), 18 p., \$18.00
359	Adaptation of Geographic Information Systems for Transportation (Proj. 20-27), 70 p., \$24.00	383	Intersection Sight Distance (Proj. 15-14(1)), 108 p., \$28.00
360	Professional Development of Maintenance Engineers and Managers (Proj. 14-9(6)), 116 p., \$25.00	384	Plasma Arc Cutting of Bridge Steels (Proj. 10-40), 92 p., \$27.00
361	Field Demonstrations of Advanced Data Acquisition Technology for Maintenance Management (Proj. 14-10), 116 p., \$25.00	385	Comparison of the 1994 <i>Highway Capacity Manual's</i> Ramp Analysis Procedures and the FRESIM Model (Proj. 3-37(2)), 118 p., \$28.00
362	Roadway Widths for Low-Traffic-Volume Roads (Proj. 15-12), 112 p., \$25.00	386	Design and Evaluation of Large-Stone Asphalt Mixes, (Proj. 4-18), 142 p., \$34.00
363	Role of Highway Maintenance in Integrated Management Systems (Proj. 14-9(4)), 148 p., \$28.00	387	Planning Techniques to Estimate Speeds and Service Volumes for Planning Applications (Proj. 3-55(2)), 146 p., \$34.00
364	Public Outreach Handbook for Departments of Transportation (Proj. 20-24(5)), 42 p., \$24.00	388	A Guidebook for Forecasting Freight Transportation Demand (Proj. 8-30), 164 p., \$39.00
		389	Macroeconomic Analysis of the Linkages Between Transportation Investments and Economic Performance (Proj. 2-17(3)), 83 p., \$25.00
		390	Constructibility Review Process for Transportation Facilities (Proj. 10-42), 88 p., \$25.00

TABLE 3 (continued)

REPORT		REPORT	
NO.	TITLE, TOPIC, PAGES, PRICE	NO.	TITLE, TOPIC, PAGES, PRICE
391	Constructibility Review Process for Transportation Facilities--Workbook (Proj. 10-42), 184 p., \$25.00	397A	Sonar Scour Monitor: Installation, Operation, and Fabrication Manual (Proj. 21-3), 38 p., \$20.00
392	Pavement Marking Materials: Assessing Environment-Friendly Performance (Proj. 4-22), 60 p., \$24.00	397B	Magnetic Sliding Collar Scour Monitor: Installation, Operation, and Fabrication Manual (Proj. 21-3), 40 p., \$20.00
393	Design and Construction Guidelines for Downdrag on Uncoated and Bitmen-Coated Piles (Proj. 24-5), 118 p., \$29.00	398	Quantifying Congestion (Proj. 7-13), Vol. 1, 102 p., \$28.00; Vol. 2, 104 p., \$28.00
394	Improving Transportation Data for Mobile Source Emission Estimates (Proj. 25-7), 128 p., \$34.00	399	Long-Term Availability of Multimodal Corridor Capacity (Proj. 8-31), 196 p., \$51.00
395	Capacity and Operation Effects of Midblock Left-Turn Lanes (Proj. 3-49), 135 p., \$34.00	400	Determination of Stopping Sight Distances (Proj. 3-42), 122 p., \$30.00
396	Instrumentation for Measuring Scour at Bridge Piers and Abutments (Proj. 21-3), 110 p., \$29.00	401	Guidance Manual for Managing Transportation Planning Data (Proj. 8-32(5)), 32 p., \$20.00

TABLE 4
PUBLISHED SYNTHESSES OF THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

SYNTHESIS OF HIGHWAY PRACTICE		SYNTHESIS OF HIGHWAY PRACTICE	
NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE	NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE
1	Traffic Control for Freeway Maintenance (Topic 1), 47 p., \$2.20	31	Highway Tunnel Operations (Topic 5-08), 29 p., \$3.20
• 2	Bridge Approach Design and Construction Practices (Topic 2), 30 p., \$2.00	32	Effects of Studded Tires (Topic 5-13), 46 p., \$4.00
• 3	Traffic-Safe and Hydraulically Efficient Drainage Practice (Topic 4), 38 p., \$2.20	33	Acquisition and Use of Geotechnical Information (Topic 5-03), 40 p., \$4.00
• 4	Concrete Bridge Deck Durability (Topic 3), 28 p., \$2.20	• 34	Policies for Accommodation of Utilities on Highway Rights-of-Way (Topic 6-03), 22 p., \$3.20
• 5	Scour at Bridge Waterways (Topic 5), 37 p., \$2.40	35	Design and Control of Freeway Off-Ramp Terminals (Topic 5-02), 61 p., \$4.40
• 6	Principles of Project Scheduling and Monitoring (Topic 6), 43 p., \$2.40	36	Instrumentation and Equipment for Testing Highway Materials, Products, and Performance (Topic 6-01), 70 p., \$4.80
7	Motorist Aid Systems (Topic 3-01), 28 p., \$2.40	• 37	Lime-Fly Ash-Stabilized Bases and Subbases (Topic 6-06), 66 p., \$4.80
• 8	Construction of Embankments (Topic 9), 38 p., \$2.40	38	Statistically Oriented End-Result Specifications (Topic 6-02), 40 p., \$4.00
• 9	Pavement Rehabilitation—Materials and Techniques (Topic 8), 41 p., \$2.80	• 39	Transportation Requirements for the Handicapped, Elderly, and Economically Disadvantaged (Topic 6-07), 54 p., \$4.40
• 10	Recruiting, Training, and Retaining Maintenance and Equipment Personnel (Topic 10), 35 p., \$2.80	40	Staffing and Management for Social, Economic, and Environmental Impact Assessments (Topic 7-02), 43 p., \$4.00
• 11	Development of Management Capability (Topic 12), 50 p., \$3.20	• 41	Bridge Bearings (Topic 6-09), 62 p., \$4.80
12	Telecommunications Systems for Highway Administration and Operations (Topic 3-03), 29 p., \$2.80	42	Design of Pile Foundations (Topic 5-04), 68 p., \$4.80
13	Radio Spectrum Frequency Management (Topic 3-03), 32 p., \$2.80	43	Energy Effects, Efficiencies, and Prospects for Various Modes of Transportation (Topic 7-05), 57 p., \$4.80
• 14	Skid Resistance (Topic 7), 66 p., \$4.00	44	Consolidation of Concrete for Pavements, Bridge Decks, and Overlays (Topic 7-01), 61 p., \$4.80
• 15	Statewide Transportation Planning—Needs and Requirements (Topic 3-02), 41 p., \$3.60	• 45	Rapid-Setting Materials for Patching of Concrete (Topic 6-05), 13 p., \$2.40
16	Continuously Reinforced Concrete Pavement (Topic 3-08), 23 p., \$2.80	46	Recording and Reporting Methods for Highway Maintenance Expenditures (Topic 7-04), 35 p., \$3.60
17	Pavement Traffic Marking—Materials and Application Affecting Serviceability (Topic 3-05), 44 p., \$3.60	47	Effect of Weather on Highway Construction (Topic 5-07), 29 p., \$3.20
• 18	Erosion Control on Highway Construction (Topic 4-01), 52 p., \$4.00	48	Priority Programming and Project Selection (Topic 7-07), 31 p., \$3.20
• 19	Design, Construction, and Maintenance of PCC Pavement Joints (Topic 3-04), 40 p., \$3.60	49	Open-Graded Friction Courses for Highways (Topic 8-09), 50 p., \$4.00
20	Rest Areas (Topic 4-04), 38 p., \$3.60	• 50	Durability of Drainage Pipe (Topic 5-09), 37 p., \$3.60
21	Highway Location Reference Methods (Topic 4-06), 30 p., \$3.20	51	Construction Contract Staffing (Topic 8-02), 62 p., \$6.00
• 22	Maintenance Management of Traffic Signal Equipment and Systems (Topic 4-03), 41 p., \$4.00	52	Management and Selection Systems for Highway Maintenance equipment (Topic 8-08), 17 p., \$4.40
23	Getting Research Findings into Practice (Topic 11), 24 p., \$3.20	53	Precast Concrete Elements for Transportation Facilities (Topic 8-05), 48 p., \$5.60
• 24	Minimizing Deicing Chemical Use (Topic 4-02), 58 p., \$4.00	54	Recycling Materials for Highways (Topic 8-01), 53 p., \$5.60
25	Reconditioning High-Volume Freeways in Urban Areas (Topic 5-01), 56 p., \$4.00	55	Storage and Retrieval Systems for Highway and Transportation Data (Topic 8-06), 30 p., \$4.80
• 26	Roadway Design in Seasonal Frost Areas (Topic 3-07), 104 p., \$6.00	56	Joint-Related Distress in PCC Pavement—Cause, Prevention and Rehabilitation (Topic 7-06), 36 p., \$5.20
• 27	PCC Pavements for Low-Volume Roads and City Streets (Topic 5-06), 31 p., \$3.60	• 57	Durability of Concrete Bridge Decks (Topic 9-01), 61 p., \$6.00
28	Partial-Lane Pavement Widening (Topic 5-05), 30 p., \$3.20	58	Consequences of Deferred Maintenance (Topic 10-01), 24 p., \$4.40
29	Treatment of Soft Foundations for Highway Embankments (Topic 4-09), 25 p., \$3.20		
• 30	Bituminous Emulsions for Highway Pavements (Topic 6-10), 76 p., \$4.80		

TABLE 4 (continued)

SYNTHESIS OF HIGHWAY PRACTICE		SYNTHESIS OF HIGHWAY PRACTICE	
NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE	NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE
59	Relationship of Asphalt Cement Properties to Pavement Durability (Topic 8-11), 43 p., \$5.60	90	New-Product Evaluation Procedures (Topic 12-12), 34 pp., \$6.80
60	Failure and Repair of Continuously Reinforced Concrete Pavement (Topic 9-08), 42 p., \$5.60	91	Highway Accident Analysis Systems (Topic 12-03), 69 pp., \$7.60
61	Changeable Message Signs (Topic 9-03), 37 p., \$5.60	92	Minimizing Reflection Cracking of Pavement Overlays (Topic 11-04), 38 pp., \$6.80
62	State Resources for Financing Transportation Programs (Topic 9-09), 34 p., \$5.20	93	Coordination of Transportation System Management and Land Use Management (Topic 12-08), 38 pp. \$6.80
63	Design and Use of Highway Shoulders (Topic 8-03), 26 p., \$4.80	94	Photologging (Topic 8-10), 38 p., \$6.80
64	Bituminous Patching Mixtures (Topic 8-12), 26 p., \$4.80	95	Statewide Transportation Planning (Topic 13-05), 54 p., \$7.20
65	Quality Assurance (Topic 9-05), 42 p., \$5.60	96	Pavement Subsurface Drainage Systems (Topic 11-07), 38 p., \$6.80
66	Glare Screen Guidelines (Topic 9-11), 17 p., \$4.40	97	Transit Ownership/Operation Options for Small Urban and Rural Areas (Topic 13-06), 28 p., \$6.40
67	Bridge Drainage Systems (Topic 10-06), 44 p., \$5.60	98	Resealing Joints and Cracks in Rigid and Flexible Pavements (Topic 12-04), 62 p., \$7.20
68	Motor Vehicle Size and Weight Regulations, Enforcement, and Permit Operations (Topic 10-04), 45 p., \$6.00	99	Resurfacing with Portland Cement Concrete (Topic 13-04), 90 p., \$8.40
69	Bus Route and Schedule Planning Guidelines (Topic 7-09), 99 p., \$8.00	100	Managing State Highway Finance (Topic 13-03), 23 p., \$6.40
70	Design of Sedimentation Basins (Topic 9-10), 54 p., \$6.80	101	Historic Bridges: Criteria for Decision Making (Topic 13-11), 84 p., \$8.00
71	Direction Finding from Arterials to Destinations (Topic 9-07), 50 p., \$6.40	102	Material Certification and Material-Certification Effectiveness (Topic 14-05), 24 p., \$6.00
72	Transportation Needs Studies and Financial Constraints (Topic 11-01), 54 p., \$6.80	103	Risk Assessment Process for Hazardous Materials Transportation (Topic 13-10), 36 p., \$6.40
73	Alternative Work Schedules: Impacts on Transportation (Topic 9-06), 54 p., \$6.80	104	Criteria for Use of Asphalt Friction Surfaces (Topic 14-08), 41 p., \$6.80
74	State Transit-Management Assistance to Local Communities (Topic 10-11), 35 p., \$6.00	105	Construction Contract Claims: Causes and Methods of Settlement (Topic 13-01), 58 p., \$7.20
75	Transit Boards—Composition, Roles, and Procedures (Topic 11-09), 24 p., \$6.20	106	Practical Guidelines for Minimizing Tort Liability (Topic 14-01), 40 p., \$6.80
76	Collection and Use of Pavement Condition Data (Topic 10-05), 74 p., \$8.00	107	Shallow Foundations for Highway Structures (Topic 12-06), 38 p., \$6.80
77	Evaluation of Pavement Maintenance Strategies (Topic 11-08), 56 p., \$7.40	108	Bridge Weight Limit Posting Practice (Topic 13-08), 30 p., \$6.40
78	Value Engineering in Preconstruction and Construction (Topic 11-02, 03), 23 p., \$6.40	109	Highway Users of Epoxy with Concrete (Topic 14-12), 68 p., \$8.80
79	Contract Time Determination (Topic 11-10), 45 p., \$7.20	110	Maintenance Management Systems (Topic 14-06), 49 p., \$8.00
80	Formulating and Justifying Highway Maintenance Budgets (Topic 10-03), 49 p., \$7.20	111	Distribution of Wheel Loads on Highway Bridges (Topic 14-22), 21 p., \$7.20
81	Experiences in Transportation System Management (Topic 11-14), 88 p., \$8.40	112	Cost Effectiveness of Hot-Dip Galvanizing for Exposed Steel (Topic 15-19), 28 p., \$7.20
82	Criteria for Evaluation of Truck Weight Enforcement Programs (Topic 12-02), 74 p., \$7.20	113	Administration of Research, Development, and Implementation Activities in Highway Agencies (Topic 14-11), 49 p., \$8.00
83	Bus Transit Accessibility for the Handicapped in Urban Areas (Topic 11-13), 73 p., \$7.60	114	Management of Traffic Signal Maintenance (Topic 14-02), 133 p., \$10.80
84	Evaluation Criteria and Priority Setting for State Highway Programs (Topic 12-01), 32 p. \$6.40	115	Reducing Construction Conflicts Between Highways and Utilities (Topic 14-03), 72 p., \$8.80
85	Energy Involved in Construction Materials and Procedures (Topic 12-09), 34 p., \$6.40	116	Asphalt Overlay Design Procedures (Topic 14-04), 66 p., \$8.40
86	Effects of Traffic-Induced Vibrations on Bridge-Deck Repairs (Topic 10-21), 40 p., \$6.80	117	Toll Highway Financing (Topic 15-01), 29 p., \$7.20
87	Highway Noise Barriers (Topic 12-07), 82 p., \$7.20		
88	Underwater Inspection and Repairs of Bridge Substructures (Topic 10-08), 77 p., \$7.60		
89	Geotechnical Instrumentation for Monitoring Field Performance (Topic 11-06), 46 p., \$6.80		

TABLE 4 (continued)

SYNTHESIS OF HIGHWAY PRACTICE		SYNTHESIS OF HIGHWAY PRACTICE	
NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE	NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE
118	Detecting Defects and Deterioration in Highway Structures (Topic 15-03), 52 p., \$8.00	146	Use of Consultants for Construction Engineering and Inspection (Topic 18-01), 64 p., \$9.00
119	Prefabricated Bridge Elements and Systems (Topic 15-10), 75 p., \$8.80	147	Treatment of Problem Foundations for Highway Embankments (Topic 18-04), 72 p., \$9.00
120	Professional Resource Management and Forecasting (Topic 15-08), 14 p., \$6.80	148	Indicators of Quality in Maintenance (Topic 18-12), 114 p., \$11.00
121	Energy Conservation in Transportation (Topic 14-09), 25 p., \$7.20	149	Partnerships for Innovation: Private-Sector Contributions to Innovation in the Highway Industry (Topic 19-23), 45 p., \$8.00
122	Life-Cycle Cost Analysis of Pavements (Topic 15-07), 136 p., \$10.80	150	Technology Transfer in Selected Highway Agencies (Topic 19-08), 38 p., \$8.00
123	Bridge Designs to Reduce and Facilitate Maintenance Repairs (Topic 12-11), 65 p., \$8.40	151	Process for Recapitalizing Highway Transportation Systems (Topic 19-06), 43 p., \$8.00
124	Use of Weigh-In-Motion Systems for Data Collection and Enforcement (Topic 16-02), 34 p., \$7.60	152	Compaction of Asphalt Pavement (Topic 19-04), 42 p., \$8.00
125	Maintenance Activities Accomplished by Contract (Topic 14-07), 42 p., \$8.00	153	Evolution and Benefits of Preventive Maintenance (Topic 18-11), 69 p., \$9.00
126	Equipment for Obtaining Pavement Condition and Traffic Loading Data (Topic 15-04), 117 p., \$11.20	• 154	Recycling of Portland Cement Concrete Pavements (Topic 17-06), 46 p., \$8.00
127	Use of Fly Ash in Concrete (Topic 16-07), 66 p., \$8.40	155	Sign Evaluation and Replacement Programs: Policies and Criteria for Freeways and Expressways (Topic 19-07), 37 p., \$8.00
• 128	Methods of Identifying Hazardous Highway Elements (Topic 15-06), 80 p., \$10.00	156	Freeway Incident Management (Topic 18-08), 23 p., \$7.00
129	Freezing and Thawing Resistance of High-Strength Concrete (Topic 16-05), 31 p., \$7.60	157	Maintenance Management of Street and Highway Signs (Topic 16-03), 134 p., \$12.00
130	Traffic Data Collection and Analysis: Methods and Procedures (Topic 15-11), 58 p., \$8.40	158	Wet Pavement Safety Programs (Topic 16-06), 54 p., \$8.00
131	Effects of Permit and Illegal Overloads on Pavements (Topic 15-05), 99 p., \$10.40	159	Design and Construction of Bridge Approaches (Topic 18-03), 45 p., \$8.00
132	System-Wide Safety Improvements: An Approach to Safety Consistency (Topic 17-01), 20 p., \$6.80	160	Cold-Recycled Bituminous Concrete Using Bituminous Materials (Topic 18-09), 105 p., \$11.00
133	Integrated Highway Information Systems (Topic 17-02), 31 p., \$7.60	161	Computer-Aided Design and Drafting Systems (Topic 19-01), 24 p., \$7.00
134	D-Cracking of Concrete Pavements (Topic 17-08), 33 p., \$7.60	162	Signing Policies, Procedures, Practices, and Fees for Logo and Tourist-Oriented Directional Signing (Topic 20-03), 41 p., \$8.00
135	Pavement Management Practices (Topic 17-10), 139 p., \$12.40	163	Innovative Strategies for Upgrading Personnel in State Transportation Departments (Topic 18-02), 35 p., \$7.00
136	Protective Coatings for Bridge Steel (Topic 15-09), 107 p., \$11.00	164	Measure to Curtail State Fuel Tax Evasion (Topic 20-02), 14 p., \$7.00
137	Negotiating and Contracting for Professional Engineering Services (Topic 18-05), 75 p., \$10.00	165	Transportation Telecommunications (Topic 19-10), 92 p., \$10.00
138	Pavement Markings Materials and Application for Extended Service Life (Topic 18-06), 45 p., \$8.00	166	Traffic Signal Control Equipment: State of the Art (Topic 20-08), 43 p., \$8.00
139	Pedestrians and Traffic-Control Measures (Topic 17-11), 75 p., \$9.00	167	Measurements, Specifications, and Achievement of Smoothness for Pavement Construction (Topic 19-12), 34 p., \$8.00
140	Durability of Prestressed Concrete Highway Structures (Topic 15-02), 65 p., \$9.00	168	Contract Management Systems (Topic 18-10), 74 p., \$9.00
141	Bridge Deck Joints (Topic 16-10), 66 p., \$9.00	169	Removing Concrete from Bridges (Topic 20-07), 42 p., \$8.00
142	Methods of Cost-Effectiveness Analysis for Highway Projects (Topic 13-02), 22 p., \$7.00	170	Managing Urban Freeway Maintenance (Topic 16-09), 26 p., \$7.00
143	Uniformity Efforts in Oversize/Overweight Permits (Topic 19-02), 79 p., \$10.00		
144	Breaking/Cracking and Seating Concrete Pavements (Topic 17-09), 39 p., \$8.00		
145	Staffing Considerations in Construction Engineering Management (Topic 17-13), 42 p., \$8.00		

TABLE 4 (continued)

SYNTHESIS OF HIGHWAY PRACTICE		SYNTHESIS OF HIGHWAY PRACTICE	
NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE	NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE
171	Fabrics in Asphalt Overlays and Pavement Maintenance (Topic 20-01), 72 p., \$9.00	199	Recycling and Use of Waste Materials and By-Products in Highway Construction (Topic 22-10), 84 p., \$20.00
172	Signal Timing Improvement Practices (Topic 19-03), 88 p., \$11.00	200	Underwater Bridge Maintenance and Repair (Topic 22-04), 54 p., \$16.00
173	Short-Term Maintenance Systems (Topic 20-5), 44 p., \$8.00	201	Multimodal Evaluation in Passenger Transportation (Topic 23-04), 57 p., \$15.00
174	Stormwater Management for Transportation Facilities (Topic 13-07), 82 p., \$9.00	202	Severity Indices for Roadside Features (Topic 23-09), 54 p., \$12.00
175	Moisture Damage in Asphalt Concrete (Topic 19-09), 90 p., \$10.00	203	Current Practices in Determining Pavement Condition (Topic 22-07), 57 p., \$15.00
176	Bridge Paint: Removal, Containment, and Disposal (Topic 20-09), 60 p., \$9.00	204	Portland Cement Concrete Resurfacing (Topic 23-10), 56 p., \$15.00
177	Freeway Corridor Management (Topic 18-07), 64 p., \$9.00	205	Performance and Operational Experience of Crash Cushions (Topic 24-03), 74 p., \$16.00
178	Truck Escape Ramps (Topic 21-12), 56 p., \$9.00	206	Highway Tort Liability Management Programs (Topic 20-22), 40 p., \$11.00
179	Latex-Modified Mortars and Concretes (Topic 20-12), 58 p., \$9.00	207	Managing Roadway Snow and Ice Control Operations (Topic 23-03), 85 p., \$19.00
180	Performance Characteristics of Open-Graded Friction Courses (Topic 20-01), 44 p., \$8.00	208	Development and Implementation of TCP for Highway Work Zones (Topic 21-08), 48 p., \$12.00
181	In-Service Experience with Traffic Noise Barriers (Topic 20-11), 62 p., \$8.00	209	Sealers for Portland Cement Concrete Highway Facilities (Topic 24-12), 68 p., \$16.00
182	Performance and Operational Experience of Truck-Mounted Attenuators (Topic 22-01), 54 p., \$9.00	210	Road Pricing for Congestion Management: A Survey of International Practice (Topic 24-02), 65 p., \$15.00
183	Knowledge Based Expert Systems in Transportation (Topic 22-09), 52 p., \$9.00	211	Design, Construction, and Maintenance of PCC Pavement Joints (Topic 17-05), 50 p., \$12.00
184	Disposal of Roadside Litter Mixtures (Topic 22-08), 52 p., \$12.00	212	Performance-Related Specification for Highway Construction and Rehabilitation (Topic 23-05), 48 p., \$14.00
185	Preferential Lane Treatments for High-Occupancy Vehicles (Topic 21-02), 80 p., \$10.00	213	Effective Use of Park-and-Ride Facilities (Topic 23-13), 45 p., \$11.00
186	Supplemental Advance Warning Devices (Topic 21-09), 84 p., \$19.00	215	Determination of Contract Time for Highway Construction Projects (Topic 24-04), 43 p., \$11.00
187	Rapid Test Methods for Asphalt Concrete and Portland Cement Concrete (Topic 23-02), 48 p., \$10.00	216	Implementation of Technology from Abroad (Topic 24-11), 44 p., \$11.00
188	Management Training and Development Programs (Topic 21-03), 56 p., \$15.00	217	Consideration of the 15 Factors in the Metropolitan Planning Process (Topic 25-13), 57 p., \$17.00
189	Pavement Structural Design Practices (Topic 21-13), 46 p., \$11.00	219	Photographic Enforcement of Traffic Laws (Topic 22-11), 67 p., \$18.00
190	Criteria for Qualifying Contractors for Bidding Purposes (Topic 21-14), 40 p., \$11.00	220	Waterproofing Membranes for Concrete Bridge Decks (Topic 25-09), 69 p., \$18.00
191	Use of Rumble Strips to Enhance Safety (Topic 22-13), 80 p., \$19.00	221	Assessing the Effects of Highway-Widening Improvements on Urban and Suburban Areas (Topic 24-13), 43 p., \$13.00
192	Accident Data Quality (Topic 23-01), 48 p., \$11.00	222	Pavement Management Methodologies to Select Projects and Recommend Preservation Treatments (Topic 24-05), 96 p., \$22.00
193	Hot In-Place Recycling of Asphalt Concrete (Topic 21-10), 69 p., \$16.00	223	Cost-Effective Preventive Pavement Maintenance (Topic 25-10), 103 p., \$22.00
194	Electronic Toll and Traffic Management (ETTM) Systems (Topic 24-06), 64 p., \$15.00	224	Longitudinal Occupancy of Controlled Access Right-of-Way by Utilities (Topic 24-08), 39 p., \$13.00
195	Use of Warranties in Road Construction (Topic 23-07), 65 p., \$15.00	225	Left-Turn Treatments at Intersections (Topic 24-08), 86 p., \$22.00
196	Highway Maintenance Procedures Dealing with Hazardous Material Incidents (Topic 21-11), 60 p., \$15.00	226	Remediation of Petroleum-Contaminated Soils (Topic 26-01), 88 p., \$22.00
197	Corridor Preservation (Topic 23-06), 43 p., \$11.00		
198	Uses of Recycled Rubber Tires in Highways (Topic 22-02), 162 p., \$23.00		

TABLE 4 (continued)

SYNTHESIS OF HIGHWAY PRACTICE		SYNTHESIS OF HIGHWAY PRACTICE	
NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE	NO.	TITLE, PROJECT 20-5, TOPIC, PAGES, PRICE
227	Collecting and Managing Cost Data for Bridge Management Systems (Topic 25-06), 49 p., \$15.00	239	Pavement Subsurface Drainage Systems (Topic 25-07), 44 p., \$15.00
228	Reduced Visibility Due to Fog on the Highway (Topic 23-12), 51 p., \$15.00	240	Toll Plaza Design (Topic 25-11), 113 p., \$25.00
229	Applications of 3-D and 4-D Visualization Technology in Transportation (Topic 25-01), 73 p., \$19.00	241	Truck Operating Characteristics (Topic 22-12), 62 p., \$20.00
230	Freight Transportation Planning in the Public Sector (Topic 25-02), 47 p., \$15.00	242	Trenchless Installation of Conduits Beneath Roadways (Topic 27-01), 76 p., \$23.00
231	Managing Contract Research Programs (Topic 25-14) 92 p., \$23.00	243	Methods for Capital Programming and Project Selection (Topic 27-09), 85 p., \$23.00
232	Variability in Highway Pavement Construction (Topic 26-02), 38 p., \$14.00	244	Guardrail and Median Barrier Crashworthiness (Topic 25-04), 160 p., \$27.00
233	Land Development Regulations that Promote Access Management (Topic 26-06), 45 p., \$14.00	245	Traffic Signal Control Systems Maintenance Management Practices (Topic 27-11), 63 p., \$19.00
234	Settlement of Bridge Approaches (The Bump at the End of the Bridge) (Topic 26-07), 57 p., \$15.00	246	Outsourcing of State Highway Facilities and Services (Topic 27-06), 69 p., \$20.00
235	Application of Full-Scale Accelerated Pavement Testing (Topic 26-07), 110 p., \$23.00	247	Stabilization of Existing Subgrades to Improve Constructibility During Interstate Pavement Reconstruction (Topic 27-03), 75 p., \$20.00
236	Methods for Household Travel Surveys (Topic 26-03), 57 p., \$15.00	248	Evaluating and Measuring the Effectiveness of Training (Topic 26-09), 28 p., \$15.00
237	Changeable Message Signs (Topic 23-11), 57 p., \$19.00	251	Lead-Based Paint Removal for Steel Highway Bridges (Topic 28-04), in press
238	Performance Measurement in State Departments of Transportation (Topic 25-15), 69 p., \$20.00	253	Dynamic Effects of Pile Installation on Adjacent Structures (Topic 25-16), in press

TABLE 5
NCHRP RESEARCH RESULTS DIGESTS^a

DIGEST NO.	PROJECT NO.	TITLE, PAGES, PRICE
3	20-6	Relocation Assistance Under Chapter Five of the 1968 Federal-Aid Highway Act, 18 p., \$1.00
6	20-6	Standing to Sue for Purposes of Securing Judicial Review of Exercise of Administrative Discretion in Route Location of Federal-Aid Highways, 9 p., \$1.00
11	20-6	Valuation Changes Resulting from Influence of Public Improvements, 25 p., \$1.00
14	12-3	Waterproof Expansion Joints for Bridges, 3 p., \$1.00
19	20-6	Advance Acquisition Under the Federal-Aid Highway Act of 1968, 21 p., \$1.00
20	19-1	Budgeting for State Highway Departments, 4 p., \$1.00
22	20-6	Valuation in Eminent Domain as Affected by Zoning, 19 p., \$1.00
25	20-6	Federal Environmental Legislation and Regulations as Affecting Highways, 35 p., \$1.00
31	20-6	Proposed Legislation to Authorize Joint Development of Highway Rights-of-Way, 12 p., \$1.00
32	20-6	Changes in Existing State Law Required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 13 p., \$1.00
39	20-6	Legal Effect of Representations as to Subsurface Conditions, 17 p., \$1.00
40	20-6	Appeal Bodies for Highway Relocation Assistance, 16 p., \$1.00
41	20-6	Trial Strategy and Techniques to Exclude Noncompensable Damages and Improper Valuation Methods in Eminent Domain Cases, 24 p., \$1.00
42	20-6	Supplemental Condemnation: A Discussion of the Principles of Excess and Substitute Condemnation, 20 p., \$1.00
45	20-6	Exclusion of Increase or Decrease in Value Caused by Public Improvement for Which Lands Are Condemned, 24 p., \$1.00
47	20-6	Trial Strategy and Techniques Using the Comparable Sales Approach to Valuation, 13 p., \$1.00
48	10-9	Surface Condition Rating System for Bituminous Pavements, 24 p., \$1.50
54	20-6	Trial Strategy and Techniques Using the Income Approach to Valuation, 31 p., \$1.00
55	20-7	Side-Friction Factors in the Design of Highway Curves (Task 4), 9 p., \$1.00
67	15-2	Field Evaluation of Tentative Design Procedure for Riprap-Lined Channels, 4 p., \$1.00
68	20-6	The Meaning of Highway Purpose, 15 p., \$1.00
76	22-3, 3A	Field Evaluation of Vehicle Barrier System, 3 p., \$1.00
77	20-7	Earth-Berm Vehicle Deflector (Task 3), 3 p., \$1.00
78	3-20	Traffic Signal Warrants---A Bibliography, 42 p., \$1.00
79	7920-6	Personal Liability of State Highway Department Officers and Employees, 22 p., \$3.00
80	20-6	Liability of State Highway Departments for Design, Construction, and Maintenance Defects, 49 p., \$5.00
81	22-1A	Crash Testing and Evaluation of Attenuating Bridge Railing System, 10 p., \$1.00
82	1-15	Design of Continuously Reinforced Concrete Pavements for Highways, 12 p., \$1.00
83	20-6	Liability of State and Local Governments for Snow and Ice Control, 16 p., \$3.00
84	22-2	Breakaway Cable Terminals for Guardrails and Median Barriers, 18 p., \$1.00
85	12-16	Bridge Deck Repairs, 22 p., \$1.00
89	1-12(3)	Guidelines for Skid-Resistant Highway Pavement Surfaces, 12 p., \$1.00
91	3-21	Motorist Response to Guide Signing, 9 p., \$1.00
95	20-6	Legal Implications of Regulations Aimed at Reducing Wet-Weather Skidding Accidents on Highways, 31 p., \$3.00
97	3-23	Guidelines for Uniformity in Traffic Control Signal Design Configurations, 8 p., \$1.00
99	20-6	Liability of the State for Highway Traffic Noise, 14 p., \$3.00
100	20-5	Safe Conduct of Traffic Through Highway Construction and Maintenance Zones, 5 p., \$1.00
102	22-2	Modified Breakaway Cable Terminals for Guardrails and Median Barriers, 13 p., \$1.00
103	20-6	Payment of Attorney Fees in Eminent Domain and Environmental Litigation, 24 p., \$3.00
105	3-26	Selected Acoustical Parameters of Highway Noise Barriers, 8 p., \$1.00
106	20-5	Use of Waste Materials in Highway Construction and Maintenance, 2 p., \$1.00
108	20-6	Trial Strategy and Techniques in Highway Contract Litigation, 31 p., \$3.00
109	20-6	Control of Conflicts of Interest in Highway Construction Contract Administration, 56 p., \$3.00
110	20-6	Liability of State and Local Governments for Negligence Arising out of the Installation and Maintenance of Warning Signs, Traffic Lights, and Pavement Markings, 14 p., \$3.00
111	20-6	Trial Aids in Highway Condemnation Cases, 11 p., \$3.00
112	20-6	Legal Implications of Control of Access to Uncontrolled-Access Highways, 22 p., \$3.00
113	20-6	Right to Compensation in Eminent Domain for Abrogation of Restrictive Covenants, 12 p., \$3.00
114	20-11	Energy Analysis Methodology for Assessing Environmental Impacts, 7 p., \$1.00
115	Var.	NCHRP Research on the Durability of Reinforced Concrete Bridge Components, 6 p., \$1.00
116	20-6	Payments to Public Utilities for Relocation of Facilities in Highway Rights-of-Way, 35 p., \$3.00
119	20-6	Recovery of Condemnation Blight Under Inverse Law, 11 p., \$3.00

TABLE 5 (continued)

DIGEST NO.	PROJECT NO.	TITLE, PAGES, PRICE
121	21-2(3)	Development and Field Evaluation of Prototype Soil Moisture Sensors, 3 p., \$1.00
122	3-26	Noise Barrier Acoustical Parameters---Experimental Results, 5 p., \$1.00
123	4-9	Evaluation of Preformed Elastomeric Pavement Joint Sealing Systems, 7 p., \$1.00
126	3-18(4)	Performance Evaluation of Signalized Network Control Strategies, 4 p., \$1.00
127	8-19	The Vehicle-Miles of Travel---Urban Highway Supply Relationship, 7 p., \$1.00
129	20-6	Legal Implications of Highway Department's Failure to Comply with Design, Safety, or Maintenance Guidelines, 17 p., \$3.00
133	1-16	Evaluation of Winter-Driving Traction Aids, 7 p., \$1.00
134	20-6	Procedural Aspects of Inverse Condemnation---Title on Interest Acquired by Transportation and Other Public Agencies, 13 p., \$3.00
135	20-6	Liability of the State for Injury-Producing Defects in Highway Surface, 14 p., \$3.00
136	20-6	State Highway Programs Versus the Spending Powers of Congress, 18 p., \$3.00
137	20-6	The Effects of Federal and State Public Information Acts on Highway and Transportation Department Activities, 23 p., \$3.00
138	20-6	Legal Aspects of Historic Preservation in Highway Programs, 27 p., \$3.00
141	20-6	Liability of State Highway Departments for Defects in Design, Construction, and Maintenance of Bridges, 20 p., \$3.00
145	20-6	First Amendment Aspects of Control of Outdoor Advertising, 31 p., \$5.00
146	20-6	Minority and Disadvantaged Business Enterprise Requirements in Public Contracting, 31 p., \$5.00
147	20-6	Mineral Rights in Rights-of-Way: Acquisition, Valuations, and Disposition, 15 p., \$5.00
149	20-6	Exaction of Right-of-Way by Exercise of Police Power, 13 p., \$5.00
150	20-6	Planning and Precondemnation Activities as Constituting a Taking Under Inverse Law, 14 p., \$5.00
151	20-6	Liability of State for Injury or Damage Occurring in Motor Vehicle Accident Caused by Trees, Shrubbery, or Other Vegetative Obstruction Located in Right-of-Way or Growing on Adjacent Private Property, 20 p., \$5.00
152	20-6	Enforceability of the Requirement of Notice in Highway Construction Contracts, 17 p., \$5.00
153	20-6	Liability of the State for Injuries Caused by Obstruction or Defects in Highway Shoulder or Berm, 19 p., \$5.00
154	20-6	Trial Strategy and Techniques in Enforcing Laws Relating to Truck Weights and Sizes, 35 p., \$5.00
157	20-6	Supplement to Licensing and Qualification of Bidders in Selected Studies in Highway Law, 19 p., \$5.00
158	20-6	Legal Procedural Issues Related to Relocation Assistance, 25 p., \$5.00
160	20-6	Acquisition of Uneconomic Remnants Under 23 U.S.C. 109(f), 13 p., \$5.00
161	2-14	Public and Private Partnerships for Financing Highway Improvements, 34 p., \$5.00
163	20-6	Supplement to Competitive Bidding and Award of Construction Contracts in <i>Selected Studies in Highway Law</i> , 32 p., \$6.00
164	20-6	Rights of Abutting Property Owner Upon Conversion of Uncontrolled-Access Road into Limited-Access Highway, 14 p., \$6.00
165	20-6	Legal Techniques for Reserving Right-of-Way for Future Projects Including Corridor Protection, 44 p., \$6.00
167 ^b	Var.	NCHRP Research on Bridge Engineering, 8 p., \$3.00
169	10-24	Rapid Replacement of Portland Cement Concrete Pavement Segments, 11 p., \$4.00
170	20-24	Research Program Design Administration of Highway and Transportation Agencies, 5 p., \$3.00
171	10-20	Pot Bearings and PTFE Surfaces, 14 p., \$4.00
173	20-24(2)	Guidelines for Establishing Executive Management Information Systems for State Departments of Transportation, 7 p., \$4.00
174	10-25A	Determination of Water-Cement Ratio in Fresh Concrete, 4 p., \$4.00
175	Var.	NCHRP Research on Construction Engineering, 7 p., \$4.00
177	Var.	NCHRP Research on Maintenance Engineering, 7 p., \$4.00
178	4-16	Service Life and Cost of Pavement Marking Materials, 16 p., \$4.00
179	2-14	Financing Highway Improvements Through Public and Private Partnerships, 7 p., \$4.00
180	2-27	Implementation of Geographic Information Systems (GIS) in State DOTs, 31 p., \$6.00
181	1-27	Video Image Processing for Evaluating Pavement Surface Distress, 4 p., \$4.00
182 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$4.00
183	20-24	Administration of Highway and Transportation Agencies "Project 20-24 Series," 6 p., \$4.00
184	Var.	NCHRP Research on Pavements, 8 p., \$4.00
185	20-23	NCHRP Supports Advances in Differential GPS Satellite Surveying, 4 p., \$4.00
186	20-7	Data Interchange Standards for Bridge Management Systems and Integrated Highway Information Systems, 20 p., \$6.00
187	12-26	Distribution of Wheel Loads on Highway Bridges, 32 p., \$6.00

TABLE 5 (continued)

DIGEST NO.	PROJECT NO.	TITLE, PAGES, PRICE
188	10-30(3)	Ultrasonic Nondestructive Testing for Deterioration of High-Strength Steel Components Embedded in Concrete, 4 p., \$4.00
189	21-3	Instrumentation for Measuring Scour at Bridge Piers and Abutments, 8 p., \$4.00
190 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$4.00
191	20-27	Management Guide for Implementation of Geographic Information Systems (GIS) in State DOTs, 48 p., \$8.00
192	3-41	Procedures for Determining Work Zone Speed Limits, 48p., \$8.00
193	20-24	Administration of Highway and Transportation Agencies "Project 20-24 Series," 8 p., \$6.00
194	22-5A	Low-Service-Level Guardrail Systems, 14 p., \$8.00
195 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$6.00
196	20-24(3)A	A Unique, Hands-on Educational Program for High School Mathematics and Science Classes, 6 p., \$4.00
196	20-24(3)A	A Unique, Hands-on Educational Program for High School Mathematics and Science Classes, 6 p., \$4.00 (Revised)
197	10-35	Fatigue Behavior of Welded and Mechanical Splices in Reinforcing Steel, 12 p., \$8.00
199	20-23	Rapid Static Surveying Using the Global Positioning System, 6 p., \$4.00
200	2-17(1)	Objectives and Decision Criteria for Infrastructure Investment, 20 p., \$8.00
201	15-11A, 11	BRI-STARS (<u>B</u> RIDGE <u>S</u> TREAM <u>T</u> UBE MODEL for <u>A</u> LLUVIAL <u>R</u> IVER <u>S</u> IMULATION), 4 p., \$4.00
202	2-17(5)	Congestion Impacts on Business and Strategies to Mitigate Them, 12 p., \$8.00
203 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$6.00
204	20-36	Winter Maintenance Technology and Practices---Learning from Abroad, 16 p., \$8.00
205	5-12	Requirements for Application of Light Emitting Diodes (LEDs) to Traffic Control Signals, 12 p., \$8.00
206	20-25(2)	Training for Highway Construction Personnel, 6 p., \$6.00
207	20-33	On the Implementation of Research Findings in Surface Transportation, 8 p., \$6.00
208	10-32A	Durability Testing of High-Strength Concrete Containing High-Range, Water-Reducing Admixtures, 10 p., \$6.00
209 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$6.00
210	20-5	Effects of Highway Bypasses on Rural Communities and Small Urban Areas, 22 p., \$13.00
211	2-17(6)	Current State Practices in the Transportation-Tourism Interface, 10 p., \$6.00
212 ^b	20-5	Continuing Project to Synthesize Information on Highway Problems, 8 p., \$6.00
213	21-5	Nondestructive Testing of Unknown Subsurface Bridge Foundations--Results of NCHRP Project 21-5, 42 p., \$14.00
214	3-39(2)	On-Site Evaluation and Calibration Procedures for Weigh-In-Motion Systems, 4 p., \$13.00
215	10-37B	Protocol for In-Service Evaluation of Bridges with Epoxy-Coated Reinforcing Steel, 4 p., \$13.00
216	5-13	Illumination Guidelines for Nighttime Highway Work, 8 p., \$13.00
217	8-33	Relationships Between Implemented Transportation Control Measures and Measured Pollutant Levels, 12 p., \$14.00
218	20-27(2)	A Generic Data Model for Linear Referencing System, 28 p., \$14.00
219	20-5	Continuing Project to Synthesize Information on Highway Problems, 9 p., \$14.00
220	17-13	Strategies for Improving Roadside Safety, 8 p., \$15.00

^a See Table 1 for project titles. All items listed are final publications except where noted. Numbers missing from the series have been superseded by a later publication. See final page of this document for ordering information.

^b Progress reports are superseded annually.

TABLE 6
NCHRP LEGAL RESEARCH DIGESTS^a

DIGEST NO.	PROJECT NO.	TITLE, PAGES, PRICE
2	20-6	Supplement to Liability of State Highway Departments for Design, Construction, and Maintenance Defects, 20 p., \$6.00
3	20-6	Supplement to Liability of State and Local Governments for Negligence Arising Out of the Installation and Maintenance of Warning Signs, Traffic Lights, and Pavement Markings, 10 p., \$3.00
4	20-6	Supplement to Personal Liability of State Highway Department Officers and Employees, 9 p., \$3.00
5	20-6	Supplement to Labor Standards in Federal-Aid Highway Construction Contracts, 20 p., \$6.00
6	20-6	Impact of the Discretionary Function Exception on Tort Liability of State Highway Departments, 25 p., \$6.00
7	20-6	Liability of Public Agencies Arising Out of Rejection of Bids and Misaward of Contracts, 17 p., \$6.00
8	20-6	Continuing Project on Legal Problems Arising Out of Highway Programs, 11 p., \$6.00
9	20-6	Supplement to Liability of State and Local Governments for Snow and Ice Control, 11 p., \$6.00
10	20-6	Supplement to Liability of the State for Injury-Producing Defects in Highway Surface, 10 p., \$6.00
11	20-6	Impact of 42 U.S.C. Section 1983 (Civil Rights Act) on Highway Departments, Personnel, and Officials, 21 p., \$6.00
12	20-6	Suspension, Debarment, and Disqualification of Highway Construction Contractors, 27 p., \$6.00
13	20-6	Civil RICO (Racketeer Influenced and Corrupt Organizations Act) Applications in the Highway Construction Industry, 28 p., \$6.00
14	20-6	Supplement to Liability of State Highway Departments for Defects in Design, Construction, and Maintenance of Bridges, 12 p., \$6.00
15	20-6	The Application of NEPA (National Environmental Policy Act) to Federal Highway Projects, 22 p., \$6.00
16	20-6	Supplement to Payment of Attorney Fees in Eminent Domain and Environmental Litigation, 17 p., \$6.00
17	20-6	Public Duty Defense to Tort Liability, 20 p., \$6.00
18	20-6	Supplement to Planning and Precondemnation Activities as Constituting a Taking Under Inverse Law 10 p., \$6.00
19	20-6	Continuing Project on Legal Problems Arising Out of Highway Programs, 11 p., \$6.00
20	20-6	Supplement to Legal Aspects of Historic Preservation in Highway and Transportation Programs, 39 p., \$6.00
21	20-6	Supplement to Liability of the State for Highway Traffic Noise, 8 p., \$6.00
22	20-6	Authority of State Departments of Transportation to Mitigate the Environmental Impact of Transportation Projects, 12 p., \$6.00
23	20-6	Supplement to Valuation Changes Resulting from Influence of Public Improvements, 24 p., \$6.00
24	20-6	Continuing Project on Legal Problems Arising Out of Highway Programs, 8 p., \$6.00
25	20-6	Minority and Disadvantaged Business Enterprise Requirements in Public Contracting, 28 p., \$6.00
26	20-6	Legal Implications of Highway Department's Failure to Comply with Design, Safety, or Maintenance Guidelines, 12 p., \$6.00
27	20-6	Liability of the State for Injury or Damage Occurring in Motor Vehicle Accident Caused by Trees, Shrubbery, or Other Vegetative Obstruction Located in Right-of-Way or Growing on Adjacent Private Property, 12 p., \$6.00
28	20-6	Preventing and Defending Against Highway Construction Claims: The Use of Changed or Differing Site Condition Clauses and New York State's Use of Exculpatory Contract Provisions and No Claims Clauses, 52 p., \$8.00
29	20-6	Highways and the Environment: Resource Protection and the Federal Highway Program, 46 p., \$8.00
30	20-6	Legal Issues Relating to the Acquisition of Right of Way and the Construction and Operation of Highways over Indian Lands, 26 p., \$8.00
31	20-6	Federal Air Quality Laws Governing State and Regional Transportation Planning, 32 p., \$8.00
32	20-6	Federalism and the Intermodal Surface Transportation Efficiency Act of 1991, 24 p., \$8.00
33	20-6	Freedom of Information Acts Federal Data Collections, and Disclosure Statutes Applicable to Highway Projects and the Discovery Process, 28 p., \$8.00
34	20-6	Transportation Agencies as Potentially Responsible Parties at Hazardous Waste Sites, 32 p., \$8.00
35 ^b	20-6	Continuing Project on Legal Problems Arising Out of Highway Programs, 8 p., \$6.00
36	20-6	Photographic Traffic Law Enforcement, 43 p., \$15.00
37	20-6	Indemnification and Insurance Requirements for Design Consultants and Contractors on Highway Projects, 25 p., \$14.00
38	20-6	Risk Management for Transportation Programs Employing Written Guidelines as Design and Performance Standards, 21 p., \$14.00
39	20-6	Liability of Contractors to State Transportation Departments for Latent Defects in Construction after Project Acceptance, 14 p., \$14.00

^a Supplements and new papers will be published in an Addendum to the 4-volume *Selected Studies in Highway Law*.

^b Progress reports are superseded annually.

TABLE 7
NCHRP WORLD WIDE WEB DOCUMENTS*

WEB DOCUMENT	PROJ. NO.	TITLE, PAGES
1	1-31	Smoothness Specifications for Pavements—Contractor's Final Report; 540 p.
2	3-51	Communications Mediums for Intelligent Transportation Systems—Contractor's Appendix A; 540 p.
3	8-32(5)	Multimodal Transportation Planning Data—Contractor's Final Report; 192 p.
4	8-32(5)	Multimodal Transportation Planning Data—Compendium to Contractor's Final Report; 236 p.
5	3-46	Capacity and Level of Service at Unsignalized Intersections. Volume 1, Two-Way Stop-Controlled Intersections—Contractor's Final Report; 134p.
6	3-46	Capacity and Level of Service at Unsignalized Intersections. Volume 2, All-Way, Stop-Controlled Intersections—Contractor's Final Report; 72 p.

*See NCHRP homepage www2.nas.edu/trbcrp

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Abbreviations used without definitions in TRB publications:

AASHTO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
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