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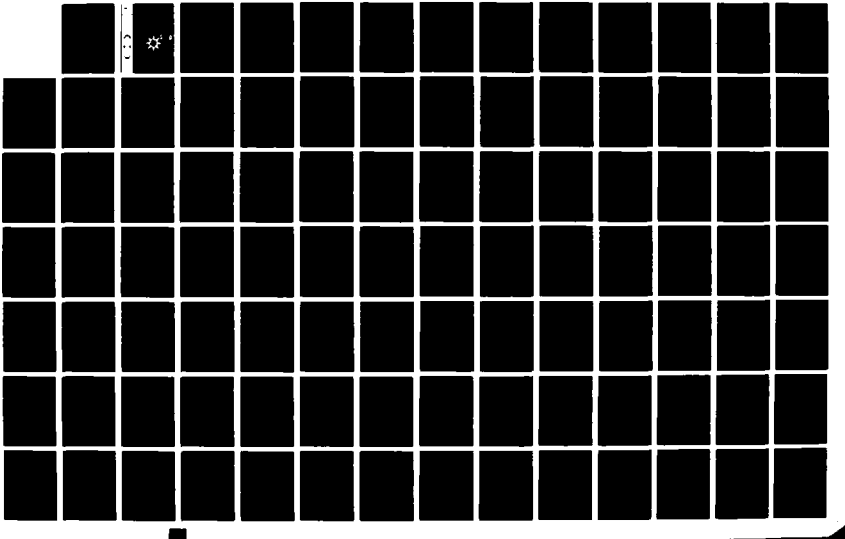

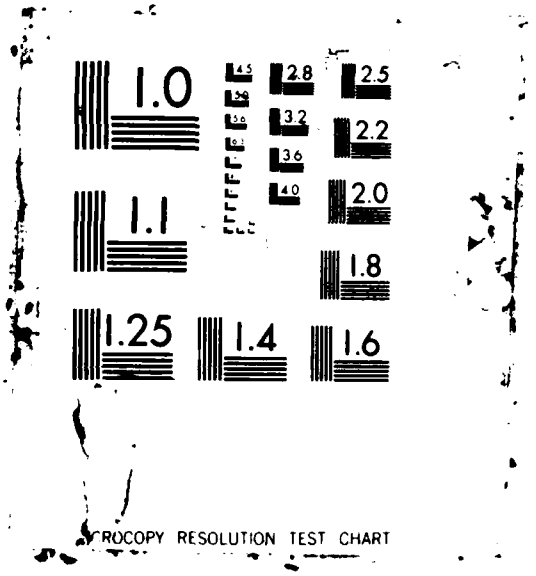
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GEOTECHNICAL LABORATORY

STRUCTURES LABORATORY

ENVIRONMENTAL LABORATORY

COASTAL ENGINEERING RESEARCH CENTER

INFORMATION TECHNOLOGY LABORATORY

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GRADUATE EDUCATION: EXPERIENCES AND PREFERENCES OF WES ENGINEERS AND SCIENTISTS

by

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Office of Technical Programs and Plans

DEPARTMENT OF THE ARMY
Waterways Experiment Station, Corps of Engineers
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Since the mid-1960's, there have been two Corps-of-Engineers-sponsored programs offering graduate-level education to engineers and scientists at the US Army Engineer Waterways Experiment Station (WES) in Vicksburg, Mississippi. One program is offered onsite. Through the other, a few applicants are selected each year to pursue job-related studies at a university of their choosing. This report provides information on participation in both programs, including historical data and participants' opinions on the value of their experience. The report also presents the results of an anonymous survey (44-percent response rate) of WES engineers and scientists as to preferences for graduate education. The report is a resource for planning and implementing expansion of the onsite graduate program.

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Engineering education
Information exchange

SUMMARY

The work force at the US Army Engineer Waterways Experiment Station (WES) includes nearly 700 professionals in 28 types of scientific and 12 types of engineering positions. Collectively the professionals have been educated in an even greater number of disciplines and specializations which provide WES with a strong technical base. Station-wide, nearly 20 percent have a doctorate, a third have a master's degree, and nearly half have a bachelor's degree. WES' management is cognizant of the importance of graduate-level education opportunities in hiring, retaining, motivating, and upgrading employees.

Since the mid 1960's, both a long-term training program and the Vicksburg Graduate Center with courses from Mississippi State University have been available and on the average have attracted about 160 employees (instances of training) per year. To date (spring 1986), about 3,410 students (instances of training) have benefited from the Graduate Center including nearly 60 who have completed a master's degree. Of the 143 individuals who have participated in long-term training, nearly 40 percent are known to have subsequently completed an advanced degree; thus far about 1 in 5 completes the requirements for a doctorate. These statistics evidence a strong and continuing interest by WES employees in graduate-level education.

This report presents information on the experience of WES professionals in the two modes of graduate training available to them and assesses their preferences for how those modes could be improved. At the time that this study was undertaken, plans were under way to expand the existing Graduate Center to offer more programs and to involve two additional universities. The information provided in this report will be useful in implementing the Center's expansion to best serve employee interests and needs.

Major Findings

Based on analysis of the data and opinions collected for this study, the key findings relevant to the Center's development are:

- Job satisfaction is fairly high; nearly half are satisfied at least most of the time. The one factor that most strongly explains job satisfaction is the perception that the current job is preparation for future ones with greater responsibility.

- Expectations for remaining at WES are high. Ninety-one percent have some expectation for where they will be in the work force 5 years from now. Of these, 81 percent expect to remain at WES and 52 percent expect to still be occupying their current position. Those who have had some experience with the Graduate Center are more likely to expect to remain at WES.
- Overall, employees believe that technical competence is the most important qualification for achieving career objectives.
- The primary motivational factor in employee interest in seeking graduate-level training is professional development; this is more important than earning a degree.
- WES engineers and scientists feel confident about their technical capabilities. However, even though 94 percent agree that they have the necessary technical skills to perform their job, 84 percent believe they could perform their job better if they obtained training in certain areas.
- Overall, half of those responding to an anonymous survey say that they plan to earn a graduate degree, including about a quarter who plan to earn a doctorate. About a third will probably take courses and about a fifth have no plans for any graduate education. Of respondees with a doctorate, two thirds would like to earn another graduate degree.
- Certain factors seem to predispose an interest in graduate education. Employees below GS-13, less than 45 years of age, and who have worked at WES less than 15 years are most likely to be interested. Further, those who have taken courses through the Center or have gone on long-term training are more interested; this suggests individual commitment and dedication to continuing graduate study.
- If actually given the opportunity to go anywhere to school, 20 percent would go either to Mississippi State University or Texas A&M University. About two thirds would study an engineering discipline and a third would go for study in the sciences; interest in physical sciences would outweigh biological sciences by seven to one.
- There is a substantial interest in both computer science and business/management.
- The Graduate Center has had a definite positive impact on self-perception of various job performance capabilities; the strongest impact has been on improving technical capabilities.
- For long-term trainees, the strongest factor in choice of school is the school's academic reputation for the academic area of interest.
- There is a clear relationship between the Center and long-term training. Nearly two thirds of those participating in long-term training have taken courses at the Center and close to 20 percent earned their master's degree through the Center. Further, not only are Center graduates more motivated to seek a doctorate, but they are also more likely to complete the requirements and in a shorter time.
- More than three fourths of survey respondees said they would enroll in courses in the expanded Center; only about 1 percent indicated

that they definitely would not take courses. Those who are most sure they will take courses are those with a bachelor's degree, those at nonsupervisory levels, and those who have taken some course work at the Center. The proportion of scientists who said they would take courses is slightly greater than the engineers; this may be more indicative of their expectations of the Center's expansion than their intentions.

- If for no other reason, nearly a third of those who would take courses at the Center would do so because the course was interesting; virtually all would take courses in order to improve job performance; and about two thirds would do so to improve their potential for other positions.
- The expanded Center would attract enrollment. In fact, two thirds of those who have never taken courses at the Center say they expect to enroll in the expanded Center.
- Academic areas planned for the expanded Center would nominally be responsive to the academic interests of 77 percent of WES professionals (assuming that survey responses are representative).

Recommendations

At the earliest stage of planning for an expanded Center it was realized that more attention needed to be given to course offerings, particularly to sequencing or scheduling courses so that, over time, a coherent degree program is given. This need is strongly confirmed by this study; if this were the only change made to the existing Center, it would be a considerable improvement. With the expansion of the Center it is a necessity. The establishment of an Administrator to oversee the coordination of student interest with program offerings is a significant step. Other major specific recommendations are listed below. Many of these are already being addressed as the Center's expansion progresses.

- Offer more courses in mathematics and statistics. The possible need for named degree programs in these areas should be assessed after the expanded Center has been in operation for 2 or 3 years.
- Offer more courses in the biological/ecological sciences. At this time, interest in these areas is both too diverse and too specific to offer named degree programs (e.g. fisheries biology). Instead, for these areas, the Center should: (a) focus on courses having broad appeal to specializations in these areas; (b) periodically survey for interest in the specialized topics in these areas, and (c) try to offer a biological/ecological course every other semester.
- Periodically offer a course in business or management.

- Clarify university and degree program requirements and procedures. The planned-for Graduate Center catalog or brochure should accomplish this.
- For degree students, assign an on-station advisor.
- Require supervisors to give more attention to their employees' Individual Development Plans.
- Encourage a more positive environment for degree students to work on research projects for completion of a thesis or dissertation. As is, an individual's supervisor's attitude is a key factor in likelihood of degree completion.
- Arrange for video-taping classes in order to alleviate TDY conflicts. Interruption from TDY is the major reason for failure to complete courses.
- Establish a better means of communication for needs, surveys, and notifications.
- Establish a student advisory committee by identifying a student point-of-contact in each major area of course interest. This committee would serve to keep track of evolving student interest within areas.
- Coordinate with Hinds Junior College to ensure that prerequisite undergraduate courses are available as needed.
- Provide for a formal means of recognizing the efforts of on-station student advisors.
- Review the selection and notification process for long-term trainees.
- Guard against placing too much emphasis on degree programs. By necessity, planning and implementing these programs will require considerable effort and attention, but keep in mind that the overwhelmingly strong motivation for taking courses is professional development.

CONTENTS

GRADUATE EDUCATION: EXPERIENCES AND PREFERENCES OF WES ENGINEERS AND SCIENTISTS

PART I: INTRODUCTION

Objectives

1. The primary purpose of this study is to make recommendations regarding graduate-level education for engineers and scientists (E&S) at the US Army Engineer Waterways Experiment Station (WES). The study was prompted by the WES Executive Office's interest in expanding the educational opportunities available to E&S. WES' leadership recognizes graduate-level training as an important factor in hiring, retaining, motivating, and upgrading employees. Unfortunately, unlike its sister laboratories in the Corps, WES is not within reasonable commuting range of any institution offering graduate programs in engineering or the sciences. Since 1965, this deficiency has been offset by the arrangement with the College of Engineering at Mississippi State University (MSU) whereby programs in civil engineering and engineering mechanics have been extended on location to WES through the Vicksburg Graduate Institute. In addition, since 1963, long-term training programs have been available to WES employees. The purposes of this study are:

a. Assess the use of the Vicksburg Graduate Institute including any observations that WES students may have.

b. Examine participation in long-term training and how WES participants regard that experience.

c. Obtain the views of WES E&S on how they feel about expanding graduate-level training available through the Vicksburg Graduate Center and how they feel about their professional development.

d. Develop recommendations for carrying out the expansion of graduate education opportunities at WES.

At the same time that this study was being conducted, the author was working to coordinate the expansion of the Vicksburg Graduate Center into the WES Graduate Institute through the addition of Texas A&M University and Louisiana State University.

Sources of Data and Information

2. The major source of information for E&S opinions and perceptions was a survey conducted in April 1986 as part of this study. The survey was conducted through a questionnaire sent directly to every engineer and scientist in a laboratory,* the Instrumentation Services Division (ISD), and the Automation Technology Center (ATC).** Of 652 questionnaires, 285 were returned, for a response rate of 44 percent. Response to the survey was voluntary and anonymous. The survey consisted of three parts: the first to be completed by any recipient who had ever enrolled in a course taught through the Vicksburg Graduate Institute; the second to be completed by any recipient who had participated in a long-term training program; and the third to be completed by every recipient. The frequency of responses to the survey along with responses to the open-ended questions are tabulated in Appendix A. It may be argued that the survey results are biased because persons who have a real interest in graduate education are more likely to submit a return than those who have little or no such interest or those who have some concern about the relationship between their job and their training. A comparison of survey respondees to the WES population of E&S in terms of proportionate numbers of E&S suggests that the responses are biased towards engineers, particularly civil engineers (Table 1). Undoubtedly a bias exists; nevertheless, the survey results provide considerable useful information that could not have been obtained any other way.

3. Other data sources included the following from the Training Office:

   a. A listing of personnel who have completed a master's degree through the Vicksburg Graduate Center, 1965 to 1983.

   b. A listing of courses and instructors at the Vicksburg Graduate Center, by semester, from fall 1972 to present.

   c. A listing of WES employees who have participated in a long-term training program and the institution each attended, 1963 to present.

4. Other data sources were:

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* The Office of Personnel furnished the list of names of E&S in these elements. The list included eight persons listed as experts or consultants.

** During the study, ATC and several other support elements were organized to form a sixth laboratory, the Information Technology Laboratory (ITL).

a. The Office of Personnel listing of E&S personnel in the laboratories (including ITL) which included educational level and position title.

b. The tabulation of information compiled by the Office of Technical Programs and Plans in 1985 for the Executive Office on the educational (academic degree) history of E&S.

PART II: STATISTICAL PROFILE OF WES ENGINEERS AND SCIENTISTS

Historical Changes and Trends

5. The number of civilians employed at WES nearly doubled in the last 25 years: from about 900 in 1962 to a record high of 1,775 in 1985 (Laboratory of the Year Report, 1985). During the same period, the professional staff of engineers and scientists grew even faster. The 1985 total of 684 civilian professionals (Laboratory of the Year Report, 1985) is more than triple the 1962 estimate of 225 (Summary of Capabilities, 1962). Engineers and scientists now account for nearly 40 percent of the total staff, which is a dramatic increase from the 25 percent in the 1960's.

6. The 684 technical civilian professionals include 418 engineers and 266 scientists. Engineers have always outnumbered scientists, but since 1976 at least, the difference may be slightly decreasing. In 1976, 64 percent of professionals were engineers. This margin dropped to 61 percent in 1981, and 60 percent in 1983. Currently (Laboratory of the Year Report, 1985), it appears to be about 62 percent.

7. Over the years, the educational level of the professional staff has steadily increased (Table 2). Doctorates were fairly rare in 1969, possessed by about 2 percent of the total civilian staff and 8.5 percent of the professional staff. Today, 1 in 14 (7 percent) civilian employees holds a doctorate while 1 in 5 (19 percent) of the professionals do. With the increase in master's degrees and doctorates, the proportion of professionals with a bachelor's degree has actually decreased from about 75 percent in 1969 to less than 50 percent today.

8. With the recent expansion and diversification of WES, notably through the establishment of the Environmental Effects Laboratory in 1973 and the relocation of the Coastal Engineering Research Center in 1983, the numbers of professionals not only increased but their distribution among disciplines also changed. For example, from 1976 through 1978, new hires among scientists outnumbered new hires among engineers by 1.4 to 1 (92 hires as compared with 66). Most of these newly hired scientists represented the biological sciences, including: 18 biologists, 4 limnologists, 3 zoologists, 3 fishery biologists, 3 microbiologists, and 10 in various other biological specializations. About two thirds of the engineers hired during those years were civil

engineers (46 out of 66). Between 1982 and 1985, the disciplines that saw the greatest increase at WES were:

Discipline	Percent Change 1982 to 1985	Actual No. 1982	Actual No. 1985
Oceanographers	+ 171	7	19
Computer scientists	+ 140	5	12
Civil engineers	+ 59	161	257
Hydraulic engineers	+ 47	79	116
Biologists	+ 22	50	61

New disciplines not represented prior to 1985 include operations researchers, agronomists, entomologists, and landscape architects. These changes are indicative of recent developments at WES.

Current Distribution of E&S in the Technical Elements

9. With few exceptions, E&S work in one of these technical elements: a laboratory (including ITL), Instrumentation Services Division, or Engineering and Construction Services Division. Current figures* show that 662 of the total 684 work in one of these elements (Table 3). The greatest concentration of engineers is in the Geotechnical Laboratory (107) while the greatest concentration of scientists is in the Environmental Laboratory (126). In terms of E&S composition, these two laboratories are mirror images of each other: the ratio of engineers to scientists in GL is 3:1 while in EL it is 1:3.

10. By job title, there are 12 types of engineers and 28 types of scientists (Table 4). Because there are so few of some types, the actual distribution is rather meaningless if displayed across each element at the Station. However, consideration of the two largest representations within each element is helpful in giving a comparative approximation of the disciplines characterizing each element (Table 5). In examining the distribution of types of engineers and scientists, some interesting observations can be made:

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* The actual number of employees constantly changes. Figures given as current, for the technical elements, in this report refer to the best estimate of what was actual in the spring of 1986 according to a listing of WES professionals provided by the Office of Personnel.

- Among scientists:
  - Of the 28 types, 18 are found only in the Environmental Laboratory.
  - Forty-seven percent of the scientists are in the Environmental Laboratory.
  - Of the 28 types, 16 are represented by fewer than five individuals.
  - Seventy-three percent are in some area of the physical sciences; 27 percent (total of 71) are in the biological sciences.
  - None of the disciplines is dominant; the five most prevalent ones barely constitute a majority:

Biologists	(13 percent)
Physicists	(12 percent)
Geologists	(10 percent)
Physical scientists	(9 percent)
Mathematicians	(8 percent)
	52 percent

- Among engineers:
  - The majority of engineers are civil engineers (50 percent).
  - Collectively, the civil and hydraulic engineers make up 79 percent of engineers at WES.
  - Five of the twelve types are represented by fewer than five individuals (electrical, chemical, bioengineering, geological, and materials research engineers).
  - The only type of engineers found in each laboratory is civil.
  - Although the Environmental Laboratory has fewer engineers than any other laboratory (10 percent of the Station's total), it has 14 percent of the civil engineers--this is seven times as many as in either the Hydraulics Laboratory or the Coastal Engineering Research Center.
  - The Environmental Laboratory has more different types of engineers (8 out of 12) than any other element.

Current Educational Level of E&S

11. Station-wide, nearly 20 percent of the E&S have a doctorate, a third have a master's degree, and nearly half have a bachelor's degree (Table 6). Although engineers outnumber scientists, more scientists than engineers have a doctorate (78 to 49 by count). Thirty percent of the scientists have a doctorate as compared with 12 percent of the engineers. The

proportion with master's degrees is about the same: 33 percent of the engineers and 31 percent of the scientists. For more than half of the engineers (55 percent), a bachelor's is their highest degree as compared with about a third (36 percent) of the scientists.

12. Consideration of the educational levels of E&S within the laboratories presents some comparisons (Table 7). The laboratory with the highest proportion of doctorates is Environmental (32 percent), followed by the Coastal Engineering Research Center (26 percent). The high educational level within Environmental is underscored by the fact that it has slightly more doctorates than bachelor's degrees. In contrast, in Structures and Hydraulics about 10 percent of the E&S hold a Ph.D. Structures has the highest proportion of E&S with a bachelor's degree: 63 percent.

13. Table 8 compares the educational levels of the prevalent disciplines. Overall, there is no real difference between the civil and hydraulic engineers with the exception that a greater proportion of the civil engineers have earned just the bachelor's degree. Among the predominant types of scientists, the biologists and physical scientists have the most education: about a fourth have a doctorate, while just over a third have a bachelor's degree. By comparison, about half of the physicists and geologists have achieved a bachelor's degree as have 64 percent of the mathematicians.

Age and Length of Time with WES

14. For each of the (then) five laboratories, the Office of Technical Programs and Plans (OTP&P) survey collected information on the age and years of employment at WES for each engineer and scientist (survey total = 588) (Table 9). By laboratory, the mean age range is only 4.1 years with Geotechnical having the oldest (40.8) and Hydraulics the youngest (36.9). The range of average number of years at WES is 7.2 years: from 13.7 years in Geotechnical to 6.5 in Coastal Engineering. (The relocation of CERC to WES in 1983 is a factor in that figure.)

15. For comparison, the voluntary survey conducted for this study determined an overall average age of 36.5 and an average service time at WES of 10.5 years. These results were obtained from 285 responses from each laboratory and ISD.

Years Since Respondents Last Took a Graduate-Level Course

16. Based on 285 responses to the survey, nine have never taken a graduate-level course and 28 were enrolled at the time of the survey. Overall, an average of 7.5 years has elapsed since completion of a graduate-level course. Groups whose elapsed time is longer than average are scientists and top- and mid-level management:

Group	Average Number of Years Since Completed a Course
Engineers	6.8
Scientists	9.4
Top-level management	15.2
Mid management	12.2
First-line supervisor	6.6
All responses	7.5

Twenty-eight percent have not taken a course since completing their degree, including 68 percent of those with a doctorate, 28 percent of those with a master's degree, and 16 percent of those with a bachelor's degree.

PART III: PERCEPTION OF JOB PERFORMANCE AND CAREER

Job Satisfaction

17. The survey asked a number of questions to probe attitudes on job satisfaction and plans for career development. Survey results indicated that overall job satisfaction is fairly high: 41 percent are satisfied most of the time while 6 percent are satisfied all of the time. Only 1 percent are seldom satisfied and the number who are never satisfied is negligible. Satisfaction does not appear to be related to age, time in grade, time at WES, or educational level; in each differentiation, between 47 and 52 percent are satisfied with their job most of the time. There is a tendency for job satisfaction to vary with grade level. Overall, satisfaction is slightly depressed at grades 12 and 13 as compared with both higher and lower grades:

Grade Level	Percent Satisfied at Least Most of the Time	Number of Responses
SES	100	6
15	60	15
14	48	21
13	46	72
12	42	81
11	49	49
9	56	18
7	31	13
5	100	3
		278

Job satisfaction appears to be more clearly associated with the upper supervisory levels. Nearly three fourths of the mid- and top-level supervisors are satisfied at least most of the time. Satisfaction does drop among first-line supervisors, but even so, 96 percent are satisfied about half the time:

Supervisory/Mgmt.	Percent Satisfied at Least Most of the Time	Percent Satisfied at Least Half the Time	Number of Responses
Top level	75	92	12
Mid level	71	96	24
First Line	44	96	66
Nonsupervisory	43	92	179
			281

The one factor in the survey that most strongly explains job satisfaction is the perception that the current job is preparation for future jobs with greater responsibilities:

Current Job is Preparation for Greater Responsibilities	Percent Satisfied All the Time	Percent Satisfied at Least Most of the Time	Percent Occasionally or Seldom Satisfied	Number of Responses
Definitely not	0	10	30	10
Probably not	3	19	13	31
Undecided	3	20	7	29
Probably yes	2	43	5	125
Definitely yes	14	77	4	88
				283

As shown, nearly a third believe that their job is definitely preparing them for more responsible positions.

Job Performance and Expertise

18. When asked about the most important factor in the performance of their job, an overwhelming 64 percent selected technical knowledge; research and development management skills came in at a distant second at 16 percent. The emphasis on technical expertise is borne out by the fact that, overall, respondees believe that technical competence is the most important qualification for achieving career objectives. Right behind in importance to career are work experience in second place and academic background in third place.

Assessment of Competence and General Need for Skills

19. A full 15 percent of the respondees describe themselves as having "very complete mastery" of their specialty area and 20 percent say they are "very often" asked to provide assistance in their technical or professional area to persons or projects outside of the Corps. Further, 94 percent agree that they have the necessary technical skills to perform their job.

20. Overall then, it is clear that WES engineers and scientists feel confident about their technical capabilities. Nevertheless, they are not complacent: 84 percent believe they could perform their current job better if

they took training in certain areas, including 35 percent of all respondees who "strongly agree" that this is true. Additionally, 11 percent described their competency as "knowledgeable" and 6 percent as "still learning." Some knowledge of the characteristics of these groups would have application to the design of an effective program of graduate opportunities in support of the continued technical strength, growth, and prestige of WES.

21. First, there are those who "strongly agree" that, given training, they could perform their jobs better. Better than a third of the respondees are in this group. On the average, this respondee is 34 years old, a GS 11 or 12 (actual mean of 11.7), has worked 35 months at his current level, has been with WES for 6.6 years, and has been with the Corps for 8.0 years. Overall, respondees in this group are younger and at a lower grade than other groups (Table 10). Additionally, they tend to spend a greater percent of their time in actual research activities than do the other groups. Not surprisingly, most of those (about half) in this group have only a bachelor's degree; however, more than a third have a master's degree and 15 percent have a doctorate. Sixty-seven percent of this group have nonsupervisory positions; this accounts for 38 percent of all nonsupervisory respondees (compared with about a third of the mid-level and first-line mangers and 8 percent of the top-level management).

22. Second, there are those who describe their competency as "knowledgeable" or "still learning." Although this group is small (less than a fifth of all responses), it is an important target for graduate-level education. Persons in this group are at the entry level in their career. Overall, they are younger (mean = 29) and working at a lower grade level (about GS 9+) than the group just described (Table 11). Further, they spend an even greater portion of their time in research tasks (65 to 86 percent). Collectively, the majority (70 percent) of those "still learning" and "knowledgeable" have a bachelor's degree; this includes 27 percent of all respondees with a bachelor's degree. Similarly, 80 percent hold nonsupervisory positions and represent 10 percent of all nonsupervisory respondees.

Career Objectives

23. The survey asked recipients what they believed to be the most important qualifications for attaining their own career objectives. For all responses, the results are as follows:

1st: Technical Competence

2nd: Work Experience

3rd: Academic Background

4th: Managerial Competence

5th: Professional Development Activities

Since technical competence is directly related to work experience as well as academic background, its attributed importance is particularly great. It is interesting to note how the rankings compare when responses are sorted by supervisory level, self-assessment of competence, and level of education (Table 12). Basically, those with no more than an bachelor's degree, or in a nonsupervisory position, or in the lower competency levels give more importance to work experience and academics. Those at the upper levels of management, or with a doctorate, or having confidence in their competence attribute more importance to managerial competence. Regardless of how groups are discriminated, however, technical competence and work experience are viewed as key factors in career development.

Expectations for Five Years From Now

24. Where do WES engineers and scientists see themselves in five years? The answer to this can be taken as some indication of long-term career expectations and how job experience aligns with those expectations. It is not necessarily a clear indication of job satisfaction or morale. It is something to be aware of in planning.

25. Discounting those who expect to be retired (2 percent) and those that could not answer the question (7 percent), 91 percent of the respondees have some expectation for where they will be in the work force five years from now. Of these, 85 percent expect to stay with the Corps and 81 percent will still be at WES. Slightly more than half (52 percent) of those expecting to remain at WES see themselves still occupying their current position.

26. The breakdown of those who expect to leave WES for other positions (19 percent of those who will remain in the work force) is as follows:

Expected Employer	Percentage
Private industry	27
Consulting firm	13
Other Federal agency	29
Other Corps office	18
Miscellaneous	13
	100 (n = 48 of 285 responses)

27. Although expectations of staying with WES are high regardless of age, grade level, educational or supervisory level, etc., some tendencies are apparent when the responses within groups are examined (Table 13). These tendencies are expectable. For example, the groups with the strongest tendency to stay with WES are those in top- or mid-level management, those with a doctorate, and those who think they have complete mastery within their specialty area. Even those few (n = 8) that believe they lack the skills to perform their jobs are highly likely to stay with WES; however, in general, they expect to be in another position. Those most likely to leave are those who are satisfied with their job only half the time or less: 34 percent of this group expects to have a job elsewhere in five years. Comparatively, in terms of educational level and plans for graduate education, the expectation for remaining at WES is shown below. These figures suggest that education could aid in employee retention and that those planning to earn a master's degree are a major target group.

Current Educational Level and Educational Plans	Percent of Work Force Expecting to Still Be at WES Five Years From Now*
Have BS	79
Have MS	80
Have Ph.D.	86
Plan to take graduate courses	80
Plan to earn MS	77
Plan to earn Ph.D.	85
Have no plans	82

* Retirees and those who do not know where they expect to be in five years are excluded.

28. Within any given group (for example, groups by grade level, supervisory level, years at WES) the ones most likely to leave WES are those who are in someway more junior (younger, lower grade level, etc.). This is to be expected, but what is interesting is that this tendency for change among the more junior staff also differentiates two groups among those who expect to remain with WES: those who expect to be in the same position are generally older than those who expect to be in a different position (Table 14).

PART IV: USE OF THE GRADUATE CENTER

Background Information

29. The College of Engineering at Mississippi State University (MSU) has been offering graduate courses and master's degree programs in engineering since the fall semester of 1965 through the Vicksburg Graduate Center at WES. By arrangement, WES provides facilities, basic logistical support, and some professors and advisors, while MSU provides professors, advisors, and institutional administration. The degree programs that have been available are Engineering Mechanics and Civil Engineering with specializations in hydraulics, structures, and soil mechanics. Although records are incomplete, it is estimated that an average of about 160 students have been enrolled in courses each year. Based on this estimate, about 3,410 students have benefited from the program. Better than 95 percent have been WES employees with the remainder coming from the Vicksburg District and local private industry. Again, because records are incomplete, the precise number who have earned a Master of Science degree through the Vicksburg Graduate Center is unknown. However, the number of graduates is estimated to be between 55 and 60 for the period from fall 1965 through spring 1986, an average of about three per year.

30. A listing of courses known to have been taught at the Center, along with the frequency and the instructors is given in Appendix B. Although the program is conducted by the MSU College of Engineering, a few courses in the biological sciences have been possible. As is apparent, WES has contributed well to the faculty; however, for degree earners at least nine semester hours must have been taught by MSU faculty.

General Information on Those Responding to the Survey

31. Of the 285 who responded to this study's survey, 197 (69 percent) have completed at least one course through the Graduate Center. Of these, 32 have earned a master's degree through the Center: this is slightly more than 50 percent of all those estimated to have completed their degree this way. On the average, they have completed five courses. Although the number of courses ranges from 1 to 28, most (90 percent) have taken 10 or less.

32. The historical perspective of the responses is good: 18 percent

first enrolled in the 1960's, including 4 individuals who enrolled in 1965, the first year of the Center. However, 27 percent first enrolled within the last three years (since 1983). While 20 percent have not taken a course since 1977, at least 45 percent completed a course within the last four semesters (1985 and spring 1986).

33. Only 4 percent were not employed at WES at the time they took their first course; nearly all of these were employed by another Corps office.

Areas of Specialization

34. The most frequent area of specialization was hydraulics (34 percent), followed by soil mechanics (29 percent), and structures (12 percent). Fully one fourth concentrated on courses in mathematics and statistics. In terms of area of specialization, the average number of courses taken is:

Area	Mean No. Courses	No. Responses
Hydraulics	4.5	64
Structures	5.6	23
Soil mechanics	5.9	57
Other	3.8	50

Problems in Course Completion

35. Among survey respondees who have enrolled in courses at the Center, about one third have had to withdraw from a course. Of these, the reason most often given (48 percent) is interference from TDY assignments:

Reason for Inability to Complete Course	Percent Frequency (n = 61)
Travel intervened	48
Not as anticipated, not useful	21
Instructor poorly prepared	13
Personal reasons	7
Instructor's style	3
Poor health	2
Subject matter too difficult	2
Other	4
	100

Degree Completion

36. Although it has been nearly 20 years since the first person completed the MSU Master of Science program through the Center, a high proportion, slightly more than half (32), of all those known to have earned their master's degree this way responded to the survey. Among the survey respondees, 16 percent of those who have ever enrolled in a course at the Center have also completed their master's degree there.*

37. According to the survey responses, the average time elapsed for degree completion was 62 months, the mode was 60 months, and the range was 21 months to 12 years. Of the 32 who completed the degree, 14 were unable to complete at least one of the courses in which they enrolled.

38. In terms of area of specialization, the 32 degree earners are distributed as follows:

Civil Engineering, Hydraulics	6	
Civil Engineering, Structural	2	
Civil Engineering, Soil Mechanics	18	(56%)
Engineering Mechanics	2	
Other	4	
Total	32	

The four "other" included two who stated that their course work emphasized statistics, one who stated geology, and one who simply stated civil engineering.

Current Supervisory Status and Grade Level of Center Graduates

39. Most of the 32 respondees who obtained their master's degree through the Center (including 11 who later earned a doctorate) now occupy non-supervisory positions (68 percent) and typically are working at the GS 13 level (44 percent). None of the graduates is in top-level management or above

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* It is interesting to note that of the 32 respondees who earned their master's degree through the Center, 15 later participated in the long-term training program including 7 who went on to earn a doctorate. All of the Center graduates who subsequently earned a doctorate did so through the long-term training program. Experience with this program is covered in Part V of this report.

the GS 14 level. The next two tabulations display the survey results for all supervisory levels and grade levels and compare the Center graduates with those who have taken courses at the Center and those who have never enrolled in the Center. Although these tables do not consider how much time has elapsed since the degree was earned, some observations can be made. No causal-effect relationships are drawn or intended.

40. In terms of supervisory status of those with at least a master's degree, Center graduates are more likely to be in a nonsupervisory position than the other two groups and are slightly more likely to be in a mid-level management position.

Current Supervisory Level	Earned MS Through Center (n = 31)	Completed Center Courses (n = 66)	Never Enrolled in Center Courses (n = 58)	All Responses (n = 281)
Top-level management	0	2%	14%	4%
Mid-level management	10%	9%	5%	9%
First-line supervisor	22%	25%	26%	23%
Nonsupervisory	68%	64%	55%	64%
	100%	100%	100%	100%

41. For each of the three groups, as well as for overall, respondees are most often at the GS 12 or 13 level. The greatest differences in the groups occur at grade 14 and higher. Of those responding to the survey, proportionately more Center graduates (19%) are at grade 14, but none are above this level.

Current Grade Level	Earned MS Through Center (n = 31)	Completed Center Courses (n = 66)	Never Enrolled in Center Courses (n = 60)	All Responses (n = 270)
SES	0	3%	5%	2%
15	0	4%	15%	6%
14	19%	9%	5%	7%
13	45%	33%	30%	26%
12	29%	30%	27%	29%
11	7%	17%	12%	17%
9	0	2%	5%	8%
7	0	2%	1%	5%
	100%	100%	100%	100%

Future Plans of Center Graduates

42. When asked where they expected to be in five years, the majority (78 percent) of those who obtained a master's degree through the Center indicated that they expected to remain with WES; 52 percent expect to still be working in their current position. The following tabulation shows how this group compares with other groups of responses; this information suggests that those who have had some experience with the Center are more likely to expect to remain at WES.

	Percent Expecting to be at WES in Five Years		
Group of Survey Responses	In Same Position	In Different Position	Total
Have earned MS through Center (n = 31)	52	26	78
Have taken courses through Center (n = 159)	40	36	76
Have never enrolled in Center (n = 88)	31	33	64
All responses (n = 278)	38	35	73

43. In terms of academic plans, Center graduates (32) have already established a record: nearly 50 percent (15) were later selected for long-term training of which almost half (7) have earned a doctorate and a third (5) are still working on their doctorate. Of those whose highest degree is a master's earned through the Center, nearly half (47 percent) plan to earn a doctorate and 37 percent plan to take additional graduate courses. In fact, 40 percent of the Center graduates have taken additional courses at the Center since completing their master's degree. As a group, their plans for further graduate education are similar to other definable groups of master's degree holders at WES.

Plans for Further Graduate Education	Respondees with Highest Degree a Master's: Earned Through Center (n = 19)	Took Courses Through Center (n = 51)	No Experience with Center (n = 32)	Total (n = 102)	All Responses (n = 279)
Take courses only (location not specified)	37%	35%	25%	32%	31%
Earn another MS	0%	2%	6%	3%	25%
Earn Ph.D.	47%	53%	53%	52%	27%
No plans	16%	10%	16%	13%	17%
Total	100%	100%	100%	100%	100%

This comparison also serves to suggest that those who have had an experience with the Center are more likely to be interested in taking graduate courses.

Assessment of Quality of Experience

44. Several of the survey questions are useful in assessing how valuable students have found the Center to be. These include recommendations for the Center, benefits from the Center, satisfaction with the Center, and impact on job.

Recommendations to others

45. Thirty-nine percent of all those who have taken a course said that they frequently and actively encourage others to enroll. The more courses taken, the more frequent the encouragement:

Frequency of Active Encouragement	Percent of Responses (n = 195)	Mean Number of Courses Taken
Very frequently	13	7
Frequently	26	5
Sometimes	41	5
Seldom	15	4
Never	5	2
	100%	$\bar{x}$ = 5

46. When asked for advice on taking courses at the Center, 89 percent said they strongly recommend it and none indicated not recommending it. The percentage increases among Center graduates:

Strength of Recommendation	Center Graduates (n = 32)	Completed Center Courses (n = 159)	All Responses (n = 191)
Very strongly	59%	26%	32%
Strongly	31%	62%	57%
Weakly	3%	3%	3%
Very weakly	0%	6%	<1%
Recommended not to	0%	0%	0%
No one asks	6%	8%	8%
	100%	100%	100%

Benefits realized

47. Another measure of quality of experience is how well the Center met expectations, or how the benefits realized from courses completed at the Center compare with the motivation for taking the courses. In rank order, the overall results are as follows:

Rank	Motivating Factors	Benefits Realized
1st	Professional development	Learned more in an area in which had some training
2nd	Desire to learn more in an area in which already had some training	Professional development
3rd	Desire to earn MS	Learned more in an area in which had little/no training

Among those who obtained a master's degree through the Center, the most important motivating factors and benefits realized are different, but not surprising:

Rank	Motivating Factors	Benefits Realized
1st	Desire to earn MS	Earned MS
2nd	Professional development	Learned more in an area in which had training
3rd	Learn more in an area in which had training	Professional development

48. Particularly interesting about the responses is the fact that cost, location, and prospects for promotion or a better job were extremely weak motivating factors; next to choices like professional development and desire to learn, they were rarely selected. Also, while the desire to catch up on innovations or to take a course as a refresher were certainly strong factors, they were still relatively weak.

Satisfaction with Center

49. The survey also included a 9-point scale to indicate satisfaction with the overall performance of the Center in delivering courses. Satisfaction is genuinely high, especially among Center graduates, nearly a third of whom selected the highest level of satisfaction.

9-Point Scale		Center Graduates (n = 32)	Those Who Have Completed Courses (n = 161)	All Responses (n = 193)
Highly Satisfied =	1	31%	12%	16%
	2	22%	24%	23%
	3	25%	36%	34%
	4	7%	12%	11%
No Strong Opinion =	5	6%	10%	10%
	6	6%	2%	2%
	7	0%	3%	2%
	8	0%	0%	0%
Highly Unsatisfied =	9	3%	1%	2%
		100%	100%	100%

50. Respondees were also asked to indicate how satisfied they were with the performance of the Center in nine specific areas. In most aspects the Center was evaluated fairly highly, but based on responses, it is clear that improvement is needed in certain areas, particularly in the selection of courses in any given semester. Classroom facilities and general equipment available in the classroom are the most satisfactory areas. Nearly half indicated that laboratory equipment was not applicable to the courses they took; however, for courses in which it was applicable, satisfaction was high.

Level of Satisfaction	Area of Performance
Generally highly satisfied	Classroom facilities
	Laboratory facilities (where applicable)
	General equipment (blackboards, audiovisual aids, etc.)
Generally satisfied	Notification of course offerings
	Availability of reference materials
	Administration of the Center
	Interest in student's needs
Generally marginally satisfied	Responsiveness to suggestions on course offerings
Generally marginally unsatisfied	Selection of courses in any given semester

Impact on job

51. Perhaps the key measure in evaluating the quality of the experience for students at the Center is how they perceive any impact on their jobs. The survey included six statements to which recipients could indicate how strongly they agreed or disagreed or whether they had no opinion. As shown in Table 15, for all the responses and for each statement, the impact has been positive for more than 50 percent of the students. The impact has been especially positive for those who completed their master's degree through the Center.

52. Understandably, the impacts on capabilities to perform a job are greater than the impacts on job advancement. In general, the impacts on capability to perform are strongly positive. According to these responses, the strongest impact of the Center has been on improving technical capabilities: 97 percent of all students, including all of those graduating through the Center, agreed that their courses had had this effect.

53. The greatest difference between Center graduates and those who have only taken courses is with the statement on impact on job responsibilities, a 30-percent difference. This suggests that along with the acquisition of a graduate degree comes a new status in responsibility.

Students' Recommendations for Improving the Center

54. The full text of students' recommendations for improving the Center is given in Appendix A. The majority of the recommendations focus on courses offered, degree program structure, teacher's capability, and access to advisors.

Courses offered

55. In general it was recommended that a greater variety of courses be offered both within and outside of existing degree programs. Specific areas in which courses are needed were named, with math and statistics being named the most often.

56. Suggestions were also made to offer multidisciplinary courses that would attract a broad base of interest (e.g. experimental design) and to stagger the emphasis in discipline areas. This would not only serve a large cross section of students representing different academic backgrounds, but would also take the pressure off students in certain areas for which there is an overload of courses.

Degree program structure

57. Next to offering a greater variety of courses, the most frequent recommendation was to structure offered programs. This would involve setting up a schedule of courses within a program and establishing how often or in what semesters they could be expected to be offered.

Teacher's capability

58. There were several remarks about the lack of commitment by some teachers who did not seem adequately prepared or who were absent too much on TDY. There were also comments questioning the teaching ability of some or the level at which they teach. Derogatory comments seemed to be confined to faculty from WES.

59. The extent of the problem is not known; complaints about faculty could probably never be completely avoided, but some suggestions were made:

a. Raise their compensation; this would make the positions more competitive and would encourage a greater expenditure of effort.

b. Require faculty to have a doctorate.

c. Screen for teaching ability.

d. Give serious consideration to students' course evaluations.

e. Consider the possibility of hiring retired WES personnel.

Access to advisors

60. Basically what seems to be needed is more contact with advisors. Persons on the WES staff can serve as advisors and in many cases this has worked out well.

61. Among the comments were recommendations for degree counseling, an orientation session for prospective master's students, and identification of ways to help with research and degree completion. This also overlaps with an expressed need for clarification of procedures and requirements.

Miscellaneous

62. A variety of other suggestions were made:

a. Textbooks and reference materials. If at all possible, a textbook is preferred. If none is available, then a full set of legible notes or readings should be provided. The library should have the necessary materials to support outside readings or research.

b. Disruption of TDY. This has been the primary reason for inability to complete a course. Although students would like relief from TDY, their job does come first. Barring working out some arrangement with supervisor and instructor, the only possibly viable solution would be videotaped lectures.

c. Identification of students' needs. Several suggestions were made for conducting periodic surveys for assessing student interest and need for courses. One suggested designating a student point of contact within each area to help in relaying and coordinating needs for certain courses.

d. Doctoral programs. Clearly there are those who would like to see doctoral programs brought to WES through the Center. However, course work towards a doctorate can be completed at the Center under the existing arrangements with MSU, with only one year of residency required at MSU.

e. Nonuniversity courses. A few recommended that the Center offer practical job-related courses which could perhaps be team-taught. These could not be offered for academic credit, but the possibility of a Continuing Education Unit (CEU) credit system was mentioned.

f. Center Objectives. Several pointed out that the Center needs to clarify its objectives and to recognize that it is here to retrain engineers and scientists in addition to enabling civil engineers with bachelor's degrees to earn a master's degree. The value of the Center is in its role in professional development and personal satisfaction.

PART V: PARTICIPATION IN LONG-TERM TRAINING

Compilation of Facts on Long-Term Training

63. The purpose of this compilation is to provide an overview of facts on long-term training of WES employees, in particular to summarize the data on how many have participated in the program, where they went to school, and what they studied. This information should be useful in planning an expanded graduate studies program at the WES Graduate Institute.

64. The data tabulated for this overview were obtained from two sources: records maintained in the Office of Personnel, Training and Development Branch (LMVOP-T); and a quick questionnaire sent to long-term trainees still employed at WES and not away on training this year (n = 103). This questionnaire asked for:

a. Verification of school attended and academic year.

b. Where employed at WES at the time.

c. Major and minor concentrations of studies.

d. Year, level, and field of any degree earned.

e. List of courses taken.

Eighty-six percent (n = 90) of the questionnaires were returned. Knowledge of the study programs of 7 others brought the total to 97 (94%).

Number of participants

65. The records show 145 WES participants in long-term training over the last 23 years (1963-1986), including 7 who are away this school year (1985-1986) (Table 16). Actually, a total of 143 individuals have participated because two persons were sent twice. Despite the number of years, employee retention has been good: only 33 are no longer employed at WES and of these 2 have died and at least 4 retired. Of the remaining 27 thought to still be active in the work force, at least 12 are still employed by the Corps. Of those who resigned from the Corps and whose employment is known, two are university professors, two are with the Defense Nuclear Agency, two are in private consulting, and one has his own business. Among those who resigned or who transferred to other Corps offices, the average length of time that elapsed from the time of the training until the time they left is 6.6 years, with a range of 0 to 15 years.

Institutions attended

66. Subject to constraints of school admissions and justification in relation to job responsibilities, participants in long-term training are able to select the school of their choice. From WES, they have gone to 42 different institutions including the Board of Engineers for Rivers and Harbors (BERH) program and the International Course in Hydraulic Engineering at Delft, The Netherlands (Table 17).

67. By far, the most frequently attended schools are Texas A&M (23), Colorado State University (17), and Mississippi State University (14). Sixteen schools have received at least three trainees; collectively, they account for 74 percent (or 107) of those sent.

68. The 42 institutions attended are located in 28 states as well as the District of Columbia and two foreign countries (The Netherlands and England). The majority are state-operated schools with nationally recognized standings.

Primary areas of study

69. Those who returned the questionnaire named 28 areas as their primary field of study while on long-term training. Table 18 simply reshuffles the data of Table 17 to indicate the frequency with which academic areas were named. The top two areas, civil engineering (emphasis unspecified) and geotechnical engineering, were named with equal frequency. The next three most popular areas are hydraulics engineering, coastal/ocean engineering, and soils/soil mechanics. One of these five areas was named by nearly half of those responding. Fourteen areas were named only once and are dominated by biological and mathematical disciplines.

Degree completion

70. Fifty-six are known to have earned a graduate degree subsequent to long-term training and 18 reported being in the process of earning one (Table 19). Excluding the 7 persons who are now on long-term training, the 56 known degree earners represent 39 percent of all those (143) sent. If the number in progress (18) is included with this, then 74 trainees or 52 percent will have earned a degree.

71. Thirty-one are known to have completed a master's degree, and at least 25 are known to have earned a doctorate.

Degree-granting
institutions and degree areas

72. The 31 master's degrees (including four certificates from Delft) were earned at 16 institutions. Five came from the University of Florida and at least two each from Mississippi State University, Colorado State, Texas A&M, and University of California. Table 20 shows the distribution of master's degrees by school and by discipline.

73. Of the 25 known doctorates, 10 were earned at Texas A&M; 8 of those were in civil engineering, primarily with a specialization in geotechnical engineering. Other schools at which more than one doctorate was earned are Mississippi State University, Vanderbilt, and the University of Illinois. Table 21 shows where the 25 known doctorates are from and in what field.

74. At least 17 trainees are expecting to complete their master's or doctorate in 1986 or 1987 (Table 22). Degrees are in progress from 14 different schools and most (10) will be in civil engineering including 45 doctorates with a civil engineering specialization in geotechnical engineering.

75. Those earning a master's degree took anywhere from one to nine years after returning from long-term training, but nearly half earned the degree during the training. The average amount of time that elapsed in earning a master's degree was 1.3 years.

76. Most of the doctorates were earned at about the fourth or fifth year after long-term training; four were completed within one year and one in nine years. The average amount of time that elapsed in earning a doctorate was 3.9 years.

Examination of Data and Opinions Obtained Through the Anonymous Survey

77. Of the 285 questionnaires returned, 66 (23 percent) were completed by someone who has participated in a long-term training program. These 66 account for 46 percent of the 143 WES employees who have been selected for long-term training over the last 23 years (school years 1963-1964 through 1985-1986) and 64 percent of all those (n = 103) who have completed long-term training and are currently employed at WES.

78. Although 50 percent completed their training within the last eight years, the responses include at least one student from each of the last 23 school years. As a group, they are an average of 42 years old, a GS 13, have

worked at their current level for five years, have been employed at WES for fifteen years, completed their long-term training nine years ago, and last completed a graduate-level course six years ago. Three fourths (76 percent) are engineers.

79. Seventeen percent of this group of respondees earned a master's degree through the Vicksburg Center prior to going on long-term training. Fourteen percent have never enrolled in any courses at the Center.

Degree completion

80. Collectively, the 66 have earned 25 advanced degrees, including 11 doctorates. One third (22) are still working to complete degree requirements, including 21 who are working on a doctorate. If all are successful, then 71 percent will have earned an advanced degree. Of the 11 who graduated through the Vicksburg Center, 7 have gone on to complete a degree through long-term training and four are still working on their doctorate.

81. The average time elapsed for completing a master's degree (14 responses) is 13 months and for a doctorate (11 responses) is 45 months (Table 23). For those still working on a degree, they estimate it will have taken an average of 12 months (one response) for the master's and 6.5 years for the doctorate (21 responses).

Motivation and benefits

82. The strongest motivating factors and most significant benefits are listed below in rank order:

Rank	Motivation	Benefit
1st	Professional development	Professional development
2nd	Desire to earn a doctorate	Learn more in a subject area which respondee had some training or experience
3rd	Desire to learn	Personal satisfaction

While earning a higher degree or improving the prospects for job potential are logical outcomes of graduate education, these are not the primary goals or benefits. Individuals on long-term training are genuinely driven by a need for professional development and a desire to learn. Those who realized an unexpected bonus from the experience frequently mentioned their gains in professional recognition, professional contacts, and a broadening of horizons. Nevertheless, when asked if, in hindsight, they would change anything about

their long-term training program, many indicated they would put more emphasis on acquiring a degree.

83. Although job promotion and improved job prospects were not significant benefits to this group of 66 trainees as a whole, several did count these among their benefits: 10 said they were promoted, 9 said the experience improved their credentials to get a better job at WES, and 3 said they got a better job at WES.

Factors in choice of school

84. By far, the strongest factor in choice of school is the school's academic reputation for the area of study of interest. Trailing this are four factors of nearly equal importance: reputation of professors, degree requirements relative to constraints of long-term training, and the overall reputation of the school. Of least importance was the comparison of degree requirements among schools.

Applicability to job

85. Since the cost of the training is covered by the government, its approval is based on a justification which clearly shows a relationship between the training requested and the job requirements. A logical part of the consideration of applicability to the job is the development of a plan for use of the training. Trainees and their supervisors are encouraged to develop such a plan prior to training, but only 36 percent said that this had been done. Whether or not a plan was developed seems to be related to the year the training was taken: for the years 1970 through 1980, when 22 of the respondees were sent away, none prepared a plan prior to departure. This may suggest changes in guidance.

86. Participants were also asked if they believed that discussions with their supervisor subsequent to the training as to the application of the training had been sufficient. Overall, responses were fairly evenly split: about a third had no opinion. Among those who earned a doctorate, satisfaction with the adequacy of posttraining discussion increases: 55 percent agree compared with 27 percent who disagree.

87. The data cannot prove that long-term trainees are increasingly more likely to be using the experience to earn a doctorate:

Year of Long-Term Training Experience	No. of Trainees	No. Who Subsequently Earned Ph.D.	No. Who Will Earn Ph.D.
1964-69	22	4 (18%)	--
1970-74	37	7 (19%)	--
1975-79	28	5 (18%)	6 (21%)*
1980-84	44	4 (10%)	9 (30%)

* Expectations for degree completion for the trainee from the 77-78 academic year are low; his time limit will soon be up and he has not begun his doctoral research.

For the first three five-year periods, the percent of trainees earning a doctorate has held fairly steady at about 18 percent. However, if all those who are now working towards a doctorate do complete the requirements, then the percentage increases substantially. As shown in Table 19, at least 14 percent (20 trainees) are known to have earned a doctorate; another 5 percent are thought to have earned one. Thus far, it appears that about 1 in 5 completes the requirements for the doctorate.

Relationship of Graduate Center to long-term training

88. Data from the anonymous survey give evidence of a relationship between course work at the Center and the long-term training program, particularly in success in earning a doctorate (Table 24). Of the 66 respondees who participated in long-term training, 59 percent had completed courses at the Center including 17 percent who had earned their master's degree there. For this group, not only are Center graduates more motivated to seek a doctorate, but they are also more likely to complete the requirements and in a shorter time.

Continuation with graduate training

89. Fifty-five percent of the trainees responding to the anonymous survey have taken graduate-level courses after returning from long-term training. However, this percentage is not indicative since it was based on a total that includes persons who returned within the last two years. More realistically, about 69 percent have taken additional graduate courses. Among those who do take more courses, most (69 percent) do so within five years of returning. Nevertheless, 14 percent were still enrolling in courses ten or more years after their long-term training.

90. In terms of graduate education goals, 43 percent plan to earn a graduate degree and 33 percent expect to continue to enroll in courses. Fully half of those who now hold a master's degree intend to earn a doctorate. Half of those who have a doctorate plan to continue to take graduate courses. These figures suggest individual commitments to continuing graduate-level education.

Recommendations for the
long-term training program

91. Participation in the long-term training program proved to be a valuable experience for most if not all of the trainees. Some of their comments suggest where they would like to see changes in the program:

a. More time between announcement of selection and departure to enable student to better set up program.

b. Option of extension for a semester.

c. More commitment from WES in completing degree requirements.

d. Follow-ups to ensure that the employee's job assignments take advantage of his training.

92. Even those who have not participated in the program made a few recommendations:

a. Selection criteria should focus on the applicant's qualities; political factors should not be part of the competition.

b. Selection process should be clearer and those who are not selected should be formally told why by the Laboratory Chief.

PART VI: PREFERENCES FOR GRADUATE EDUCATION

Plans for Graduate Education

General goals

93. The survey asked individuals about their personal plans or goals for graduate education. Half (51 percent) plan to earn a graduate degree, including 26 percent who plan to earn a doctorate (Table 25). Thirty-one percent will probably take courses and 17 percent have no plans (Table 25).

94. On the average, those who do not have plans for further graduate education are at least a GS 13, 45 years of age, and have worked at WES for more than 16 years. This group has advanced far enough that many do not perceive that training would improve either their job potential or their job performance. A clearer concept of the age and career level factors can be gained by examining Table 26, which separates responses based on current level of education. Regardless of degree now held, those who have no plans for further education are significantly older, higher graded, and have more years at WES.

95. Table 27 shows how supervisory levels compare in terms of educational plans. Those seeking degrees are most likely to be first-line supervisors (53 percent) or persons with no supervisory duties (59 percent). For these two levels, only about one in ten has no plans. About half of those at mid-level management plan to at least take courses as do fully a quarter of those in top-level management.

Specific wishes

96. The survey also asked respondees to identify what graduate program, i.e., a dream program, they would want if they could choose any school and academic area. They were to assume that they would be able to complete the program and that all expenses would be paid. Of the 274 who responded to this question, 14 percent did not know what they would choose and 20 percent were not interested in any programs.

97. Just over two thirds (189 responses) then, did indicate a dream program. In terms of current degree held, these 189 break out as follows: 46 percent hold a bachelor's, 41 percent a master's, and 13 percent a doctorate. Interestingly enough a large portion (62 percent) of those with a doctorate would seek another graduate degree: 31 percent would go for a master's

and 31 percent for another doctorate. Collectively, the 189 respondees named 42 different institutions and 32 programs (Table 28); 42 percent would pursue a master's, 48 percent would pursue a doctorate, and 4 percent would go for postdoctorate study (Table 29). Six percent were not sure if they would go for a degree, but would take courses. Ten schools were named at least five times and account for 54 percent of the responses. Together, the two most frequently named schools (Mississippi State University and Texas A&M University) alone captured a fifth of the responses:

Institutions Named Most Frequently (≥ 5 Responses)	Percent Response	Cumulative Percent
Mississippi State University	12	12
Texas A&M University	9	21
Colorado State University	7	28
Louisiana State University	5	33
University of Florida	4	37
University of Texas	4	41
Harvard University	4	45
Georgia Tech	3	48
Massachusetts Institute of Technology	3	51
Stanford	3	54

98. Sixteen of the 32 programs named were in engineering and include 66 percent of all responses. Of the 16 sciences programs, 12 were in the physical sciences and account for 89 percent of the responses in the science programs named.

Program Area	Percent Response
Civil Engineering, no specialization named	10
All Other Engineering (15 programs)	56
Subtotal Engineering (16 programs)	66%
Physical Sciences (12 programs)	29
Biological Sciences (4 programs)	4
Subtotal Sciences (16 programs)	33%
No Specific Area Named	1%
Total	100%

99. The eleven most frequently named programs (five or more responses) represent 74 percent of the responses. These programs are:

Programs Named Most Frequently (≥ 5 Responses)	Percent Response	Cumulative Percent
Civil Engineering, no specialization named	10	10
Hydraulic Engineering	10	20
Geotechnical Engineering	10	30
Coastal Engineering	9	39
Computer Science	7	46
Business/Management	7	53
Structural Engineering	6	59
Electrical Engineering	4	63
Environmental Engineering	4	67
Engineering Mechanics	4	71
Geology	3	74

There are several surprises in the programs named: first, that interest in the biological sciences is so low, and second, that interest in computer science and business/management is so high. The low response for the biological program is partially a reflection of the skewness in survey responses; as shown earlier in Table 1, engineers, particularly civil engineers, proportionately overloaded the responses. However, it should also be remembered that although WES has an Environmental Laboratory, there are relatively few pure biological scientists: by job title, only about 11 percent are scientists in a biological discipline (Table 1). Also, it should be noted that several of those whose interests are more biologically than physically oriented are actually engineers, e.g., environmental and water resources engineers. Responses for these two programs alone totaled 6 percent of the programs named. The high response rate for business/management and computer science (collectively 14 percent of the responses) may be indicative of a need for skills and knowledge to complement existing expertise.

Preferences for the Graduate Center

100. WES engineers and scientists were asked several questions about the possible expansion of the Graduate Center in order to get a collective idea of

what they would like to see in the Center and whether or not they expected to enroll. Close to three quarters would like to see more degree programs offered as well as a greater diversity of courses in nondegree areas. Overall, the scientists are more interested than the engineers in seeing an expansion:

	Engineers	Scientists	All
Yes, Center should offer more degree programs	68%	93%	74%
Yes, Center should offer broad range of courses in nondegree programs	63%	90%	70%

101. If the Center were to expand its course offerings and degree programs to other schools, 78 percent said they would enroll in courses, including a slightly greater proportion of scientists than engineers. Only about 1 percent indicated that they definitely would not take courses at the Center.

Degree programs they would like to see

102. Appendix A contains a full listing of degree programs that respondees would like to see offered through the expanded Center. These include programs in the biological sciences, business and management, chemistry, computer science, ecology and environmental science, various areas in engineering, geology, geophysics, law, marine science, mathematics, meteorology, oceanography, physics, urban planning, public administration, remote sensing, and statistics.

103. The most frequently named degree program is computer science, 54 respondees (19 percent) specifically name this program or some aspect of it. Other of the more frequently named (≥ 10 responses) programs included are, in order:

Program Area	No. Responses
Coastal and Ocean Engineering	35
Ecology and Environmental Sciences	27
Mathematics	27
Electrical Engineering	25
Geology	25
Environmental Engineering	21
Biological Sciences	13
Mechanical Engineering	11
Geophysics	11
Business and Management	10
Physics	10
Statistics	10

In actuality, the tally for both the biological sciences and the ecology and environmental sciences is actually the summation of responses that fit within these broad groupings (e.g., fisheries biology, botany, wildlife management, etc.).

104. The survey also asked what nondegree programs should be offered, i.e., in what academic areas should courses be given even though the degree could not be obtained through the Center. The list was basically the same as that for degree programs, which indicates that for any given academic area there are those who are interested in a degree as well as those who are not. Many made the point that more courses are needed in mathematics, statistics, and biological and environmental sciences. It is not clear from the survey if there is sufficient demand to warrant titled degree programs in these areas. In terms of degree offerings, the biological/environmental area is a particularly difficult question--first because of the range of interests at WES and second because of the large proportion of scientists holding doctorates in these areas.

Interest in courses

105. If the Center offered all the courses that were identified in response to the survey's request to "specify what courses, in any subject area, that you would be interested in taking," then the Center would be providing a range nearly equivalent to a university. The list (Appendix A) includes everything from climatology and communication skills to foreign languages and farm pond management. The object of the question was to gain some idea of the breadth of interest and in what areas it may be strongest. The results clearly show that interest is extremely wide and that it is strongest in those areas identified by respondees for degree programs.

106. When asked if they would expect to take courses through the expanded Center, the overwhelming majority said yes and only a few indicated that they would not (by actual count, only four said they definitely would not take courses):

Expectations of Taking Courses	Percent Response: All Respondees (n = 283)	Have Taken Center Courses (n = 192)	Have Never Taken Center Courses (n = 90)
Yes or probably yes	78	84	66
No or probably no	15	9	26
Don't know	7	7	8
	100%	100%	100%

The expanded Center would attract enrollment: the total percentage of those who would be likely to take courses (78%) is slightly greater than the percent of respondees who have taken at least one course (69%). In fact, 66 percent of the 90 respondees who have never taken courses at the Center expect to take courses, including 30 percent who said they would definitely take courses. However, those who have prior experience with the Center are more likely to take courses than those who have not. The small percentage of "don't knows" suggests that employees already have definite ideas about their participation in the Center.

107. Since the majority do expect to take courses, it is interesting to look more closely at just the "yes" responses of different groups in order to better understand which are most likely to enroll. The following gives a quick comparative summary of groups defined on the basis of educational level, supervisory status, and prior experience with the Center (Tables 30 and 31 display the complete response for levels of education and supervision):

Group	Percent Response, Expect to Take Courses: Definitely Yes	Probably Yes	Total
All responses (n = 283)	36	42	78
Highest degree:			
Bachelor's (n = 120)	45	36	81
Master's (n = 103)	35	49	84
Doctorate (n = 52)	9	8	17
Supervisory level:			
Top mgmt. (n = 12)	0	42	42
Mid level (n = 23)	22	48	70
First line (n = 66)	33	47	80
Nonsupervisory (n = 179)	41	40	81

(Continued)

Group	Percent Response, Expect to Take Courses: Definitely Yes	Probably Yes	Total
Experience with center:			
None (n = 90)	30	36	66
At least one course (n = 192)	38	46	84
Courses only (n = 160)	41	45	86
Center Graduate (n = 32)	19	50	69
Professional group:			
Engineers (n = 209)	34	43	77
Scientists (n = 72)	42	40	82

Accordingly, those who are most sure that they will take courses are those with a bachelor's, those at nonsupervisory levels, and those who have taken some course work at the Center. These results are not surprising; what is interesting, however, is how high the "yes" response is among those with a doctorate (17 percent) and those at the top level of management (42 percent). It is also interesting that the proportion of scientists who expect to take courses is slightly greater than the engineers.

108. Consideration of the responses in terms of age, grade, years at WES, and number of courses taken at the Center is also revealing in separating those most likely to take courses from those least likely to take courses:

Expectations for Taking Courses	Mean Age	Mean Grade	Mean No. Years at WES	Mean No. Courses Taken
Definitely yes	33	11.2	6	2.9
Probably yes	37	12.1	10	3.9
Probably not	44	13.4	14	2.4
Definitely not	52	13.0	26	1.0
Don't know	38	12.3	13	4.1
Overall mean	37	12.0	9	3.3

The step intervals from definitely yes, to probably yes, to probably not, and definitely not are pronounced. Employees who are at least in their late forties, in grade 13, and with 15 years or more of service at WES are not likely to take courses. The calculation of mean number of courses taken suggests that some individuals are simply more dedicated to taking courses

than others. This dedication factor is also demonstrated by comparing the "no" responses of those who have taken at least one Center course with those who have not (9 percent to 26 percent). Fully a quarter of those who have not yet taken a course do not expect to enroll in a expanded Center; it is likely that, regardless of course offerings, a large proportion of this group would never take any courses.

109. Several respondees took the time to make further suggestions on courses offered. Although the Center was established to offer graduate courses, specific requests were written up for undergraduate courses, primarily to remove deficiencies and prerequisites for graduate training, but also to provide some refresher courses. Further, some indicated a need for humanities courses to enable an overall perspective on other pure disciplinary courses and remind employees that ultimately their work is for the good of civilization. Others, cognizant of a tension between engineers and non-engineers, recommended engineering courses for the nonengineer and vice versa.

Reasons for taking courses

110. For those who do expect to take courses, it is interesting to know why they would do so. The motivation of professional development, which, as shown earlier, was the primary factor behind taking courses at the Center as well as for applying to long-term training, is probably the key. The survey did ask three questions that help in further understanding why WES engineers and scientists would be interested in graduate training. The survey asked how well respondees agreed with the need for training to:

a. Better perform their current jobs.

b. Improve their potential for obtaining another position.

c. Take courses of interest even though they have little or no relation either to current or likely future jobs.

Among those who would definitely take courses (n = 100): 98 percent agree that, with training, they could perform better in their current job; 66 percent agree that they would be interested in training as a means to improve job potential; and 46 percent agree that they would take courses having little or no relation to their job:

Reasons for Need for Training	Expectations for Taking Courses: Definitely Yes (n = 100)	Probably Yes (n = 120)	Probably Not (n = 38)	Definitely Not (n = 4)	Don't Know (n = 20)
To perform better in current job:					
Strongly agree	55	35	7	0	4
Agree	43	61	17	1	13
	98	96	24	1	17
Total	(98%)	(80%)	(63%)	(25%)	(85%)
To improve potential for other positions:					
Strongly agree	35	21	4	0	2
Agree	31	47	9	0	6
	66	68	13	0	8
Total	(66%)	(57%)	(35%)	(0%)	(40%)
To take courses of interest:					
Strongly agree	9	7	1	0	0
Agree	37	31	10	1	5
	46	38	11	1	5
Total	(46%)	(32%)	(29%)	(25%)	(25%)

The desire to improve job performance is very high, as might be expected. However, the fact that more than a third of those who plan to take courses would take courses having little or no relation to the job may surprise some. To put this need in a different perspective, those who would either definitely or probably take courses at the Center and who would also take courses because the course is interesting (n = 84) represent 30 percent of all respondees. If this figure can reliably be extrapolated to the entire population of WES engineers and scientists, it means that, if for no other reason, 30 percent would take courses because they are interesting.

Reaction to idea of required enrollment

111. In considering the possibility of an expanded Center and its purposes, two large questions are raised: first, will there be sufficient student demand, and second, will those who need to take advantage of courses in order to maintain contact with their field do so? A solution that would certainly resolve both issues would be to require all E&S either to audit, or to take for credit, one graduate-level course every three years. Whether for credit or audit, nearly half disagree with such a requirement, and, if the open-ended comments are any indication, would strongly oppose the requirement. First, consider how the various supervisory levels regard the idea:

Level of Agreement	Top Level (n = 12)		Mid Level (n = 24)		First Line (n = 66)		Nonsupervisory (n = 179)	
	Credit	Audit	Credit	Audit	Credit	Audit	Credit	Audit
Strongly agree	25	25	21	21	21	17	14	16
Agree	17	8	21	25	29	23	20	21
No opinion	0	0	4	4	12	23	17	17
Disagree	25	25	33	29	27	22	30	30
Strongly disagree	33	42	21	21	11	15	19	16
	100%	100%	100%	100%	100%	100%	100%	100%

In comparing reactions to audit and credit within any given level, there is not a big difference between opinions. However, with the exception of first-line supervisors, disagreement to the idea increases with management level. Some respondees inserted explosive comments in the margin to the effect that they had better things to do, didn't want to be told what to do, and doubted that they could legally be required to do so.

112. In fact, if there were to be a time-period requirement for audit or credit, the real concern should be misuse of it. The idea has merit, but is prone to problems; for example, as the end of the time period approaches, an employee might be forced to take any course offered in order to fulfill the requirement. In face of the opposition, if the idea is to work, its implementation must be well planned.

Preferences for timing and format of course offerings

113. In terms of which semester, fall is most preferred: 45 percent like fall as compared with 35 percent who like spring and 14 percent who like summer. Between a quarter and a third are indifferent to semester, but 34 percent do dislike summer.

114. Respondees are more particular about time of day and number of sessions per week than they are about semester. According to the survey, afternoon is the best time to offer courses: 86 percent like this time compared with 34 percent who like evening. Two sessions per week is preferred, especially if offered on Tuesdays and Thursdays: 59 percent like that schedule compared with only 14 percent who do not. Two sessions on Wednesdays and Fridays is definitely not preferred: 68 percent dislike this option while

only 13 percent like this option. Reaction to a once a week offering is more evenly distributed: 45 percent like it but 33 percent do not.

115. As for format, lectures are overwhelmingly preferred (84 percent) but seminars are certainly acceptable (liked by 65 percent). Video-taped lectures are generally disliked by about half. The idea of satellite transmission got mixed reviews probably because the advantage of access to a greater variety of teachers and courses is offset by the lack of familiarity with this technique. Nevertheless, 37 percent said they liked it compared with 27 percent who did not.

Reactions to and suggestions for the Center's expansion

116. At the time that the anonymous survey was distributed, work was already under way to expand the Graduate Center. Employees at WES knew something about this and the introduction to the survey also stated that an expansion was under way. The survey included a section which encouraged remarks on this effort. The full text of these comments is given in Appendix A; a summary of the main points is given here.

117. In general, the reaction to expansion was positive. The possibility of involving additional institutions and programs was welcomed. Some advice was also offered: for example, to develop a structure for degree programs and to deliver a diversity of courses in nondegree areas. Several hoped to see undergraduate courses and doctoral programs and more than a few had visions of unlimited numbers of universities and course offerings.

118. Most had their own interests and educational needs in mind, but a few did consider overall ramifications of undertaking an expansion and the impacts on WES. Primarily they noted that the Center, particularly if enlarged, is a great asset to WES. However, cautions were voiced concerning the character that the Center takes on. There was concern that it could become too degree oriented, that WES could become a university, which poses two possible dangers:

a. Turning out technically knowledgeable employees, only to lose them to the management echelons.

b. Encouraging an emphasis on problem analysis rather than on getting the job done.

There was also some concern about the quality of degree programs implemented through the Center, how much would be sacrificed in structuring programs to

suit the fairly narrow range of demand of WES employees. Secondarily, they recognize that the Center could enable WES E&S, even those with a doctorate, to continue their exposure to the learning process and to maintain a closer link to the academic aspect of their fields.

119. For whatever reason, it was clear from the comments that some misinterpreted the expansion, seeing it as being undertaken to provide more master's degree programs in engineering. They criticized the expansion for not offering doctoral training and for not offering degree and nondegree programs in the sciences; for example:

a. "Ph.D. programs do not seem to be considered. I already have a master's, there is no assistance in getting a Ph.D."

b. "Needs of scientists should be considered in long-range plans for the Center."

Nevertheless, others did recognize that residency requirements for a doctorate are necessary and that one value to the expanded Center would be as a supplement to the long-term training program. Others recognized that completing some course work at WES would enable long-term trainees to take more advantage of their time away at school, whether it be for a doctorate or not and whether their interests were in engineering or the sciences.

120. Beyond recommendations for course and program needs, some specific suggestions were made for the Center's operation:

a. Expand the library facilities to support courses offered outside of engineering.

b. Share cost of graduate-level training between WES or the Corps and the student.

c. Do not require a course to be taken every three years; this conflicts with the Individual Development Plan.

d. Develop a plan for alleviating the TDY conflict.

PART VII: COMPARISON OF INDICATED PREFERENCES WITH ONGOING PLANS FOR AN EXPANDED CENTER

121. At the time that the survey for preferences and experiences in graduate education was circulated, plans were already under way to expand the Center to include Louisiana State University and Texas A&M University along with Mississippi State University and to expand degree offerings to include a total of 13 areas: five in civil engineering (hydraulics, structures, geotechnical, environmental, and water resources) along with engineering mechanics, engineering geology, ocean engineering, oceanography, marine science, geophysics, electrical engineering, and computer science. How do these plans compare with what long-term trainees have sought and what employees would like to pursue (i.e. their dream program)?

Comparison with Preferences Evident From Long-Term Training

Choice of studies in long-term training

122. Table 32 organizes the data from Table 18 to relate the programs taken by trainees to those proposed for the Institute. This relationship does not differentiate trainees by those seeking a master's, those seeking a doctorate, or those not seeking a graduate degree. With knowledge of 94 percent of former long-term trainees, presumably the distribution shown in Table 32 is not too different from that which could be shown for a 100-percent response of all former trainees.

123. Based on the response, about a third of the trainees would relate to the geotechnical and hydraulics engineering programs. About one in five would correspond to environmental engineering, engineering mechanics, or ocean/coastal engineering and slightly more than one in ten to programs in electrical engineering, marine science, and structural engineering.

124. If it is assumed that the 12 nonspecific civil engineering responses could be matched with a program proposed by the Institute, then programs of 80 of the 97 respondees (83 percent) would relate to areas offered by the Institute.

Choice of institution
in long-term training

125. The long-term training studies that relate to the programs proposed for the Institute were taken at 24 different institutions, including 9 schools where trainees studied geotechnical engineering (Table 33). For most programs, trainees are distributed across several institutions, but for certain program areas a particular school does seem to have been favored. These programs, institutions, and percentage of students attracted are:

Program	Institution	Percent of Trainees
Geotechnical Engineering	Texas A&M	33%, n = 21
Hydraulic Engineering	Colorado State	66%, n = 9
Marine Science	Louisiana State	66%, n = 6
Environmental Engineering	University of Florida	75%, n = 4
Electrical Engineering	Mississippi State	50%, n = 4

Texas A&M is well represented among the programs. Trainees went there for studies in 5 of the 12 proposed areas: geotechnical engineering, ocean/coastal engineering, oceanography, engineering geology, and geophysics.

Degrees earned
through long-term training

126. Because of on-campus residency requirements, students will not be able to finish a doctorate through the Institute, but can certainly complete course work leading to a doctorate. Students will continue to be able to complete a master's and will have a wider range of programs to choose from. Long-term trainees are known to have earned either a master's or doctorate in all but one of the programs proposed: computer science (Table 34). However, since ATC (now ITL) has sent five employees on long-term training (Table 16), degrees may have been earned in this area. The two doctorates tabulated in environmental engineering and water resources engineering are from Vanderbilt; their degrees are actually in environmental and water resources engineering.

127. Within programs proposed for the Institute and among the 68 long-term trainees known to have studied in these academic areas, 35 (50 percent) have earned a graduate degree including 13 (18 percent) who completed a doctorate (Table 34). Another 18 are still working towards a degree and if successful, a total of 47 long-term trainees will have completed a degree within

a proposed program. This figure represents 68 percent of the 97 trainees for whom information on their study program was known and 31 percent of all 143 trainees; while it is not accurate because the data base is incomplete, it does provide a rough estimate of degree success in long-term training with respect to degree programs planned for the Institute.

128. Twenty-one trainees have earned degrees in programs that are not being considered for the Institute; this includes 13 who earned degrees in civil engineering and who could presumably be matched with an Institute program if they had provided information on their emphasis/specialization. The 12 who have or will have earned degrees in disciplines that are clearly outside of the Institute's program are scattered over 10 fields (Table 34), but a third are in the ecological sciences.

Comparison with Preferences Expressed in Dream Program

Studies respondees would choose

129. As shown in Table 35, 66 percent of the responding E&S named an academic field of study that is under consideration for the Institute. The percent could be raised to 77 percent if it is assumed that those who did not name a specialization within civil engineering could be included. If this tabulation is representative of the training interests and needs of the entire population of WES professionals, then the major areas of interest will be covered. Additionally, the programs proposed for the Institute will also encompass several of the areas that were named but are not specifically being planned for: for example, physics, mathematics, and hydrology, and to some extent mechanical engineering and meteorology.

130. Some of the proposed programs appear to have fairly weak interest, especially when compared with certain programs that are not being considered for the Institute. The weak Institute programs include marine science, oceanography, and geophysics. The strongest interest in a non-Institute program is business/management, which accounts for 7 percent of the total response and nearly a third of the interest outside of Institute programs.

Institutions respondees would choose

131. Collectively, the 145 responses named 33 institutions (Table 36). Within any given area, several schools were named, but in some instances a particular school did attain a relatively higher percent of responses; by program area, these institutions are:

Program Area	Institution	Percent Response
Geotechnical Engineering	Texas A&M	77%, n = 18
Hydraulic Engineering	Colorado State	24%, n = 21
Structural Engineering	University of Texas	25%, n = 12
Water Resources Engineering	Colorado State	75%, n = 75
Electrical Engineering	Mississippi State	75%, n = 8
Ocean/Coastal Engineering	University of Florida	35%, n = 17

132. The most frequently named schools, both in terms of number of proposed programs they were named for and number of times named, are Texas A&M University, Mississippi State, and University of Texas:

	Texas A&M	Mississippi State	University of Texas
Number of proposed programs	8	7	5
Number of responses	14	22	8

Collectively, one of these three schools was named by 44 percent of those who could identify the school they would prefer within one of the proposed programs.

Degrees respondees would pursue

133. A total of 128 (88 percent) of those who named a proposed program would be seeking a degree (Table 37). Most of these would go after a doctorate (54 percent as compared with 46 percent seeking a master's). About 5 percent would be interested in postdoctoral studies, and the rest (about 7 percent) would either just take courses or were not sure if they would want a degree within one of the proposed programs.

134. If responses are representative of WES E&S, then, overall, the proposed Institute would nominally be responsive to 77 percent of the E&S, including 75 percent of those seeking a master's and 77 percent who would work towards a doctorate:

	Seeking Master's	Seeking Doctorate	Total Responses
Responses within proposed programs	59	69	145
Responses not within proposed programs	20	21	44
Total	79	90	189

Table 1

Total Number of Engineers and Scientists at WES Versus Numbers Responding to Survey*

	1986 Personnel Office Data		Survey Responses		Percent Distortion in Response
	Number	Percent	Number	Percent	
Engineers					
Civil	198	30	154	54	+24
Others	198	30	59	21	- 9
Subtotal	396	60	213	75	+15
Scientists					
Physical	195	29	53	18	-11
Biological	71	11	19	7	- 4
Subtotal	266	40	72	25	-15
Total	662	100	285	100	

* Response rate = 43 percent.

Table 2

Changes in WES Professional Staff, 1969 to 1986

Year	Total Civilian Staff	Total Professional Civilian Staff (E&S)	Educational Level, Professional Staff			
			No Degree	BS	MS	Ph.D.
1969*	1,350	349	~20	~260	~70	~30
1975*	1,474	444	14	250	119	61
1980*	1,400	514	0	367	166	79
1985**	1,775	684	0	336	217	131
Spring of 1986†	--	662	7	311	217	127

* Activities Summary (1969, 1975, 1980).
** Laboratory of the Year Report (1985).
† Figured from data on WES professionals provided by Office of Personnel.

Table 3

Distribution of Engineers and Scientists within the Major Technical Elements at WES*

Element	Engineers	Scientists	Total	Percent Engineers
Hydraulics Laboratory (HL)	75	15	90	83
Geotechnical Laboratory (GL)	107	34	141	76
Structures Laboratory (SL)	83	32	115	72
Environmental Laboratory (EL)	41	126	167	25
Coastal Engineering Research Center (CERC)	49	39	88	56
Information Technology Laboratory (ITL)	12	14	26	46
Instrumentation Services Division (ISD)	19	6	25	76
Engineering and Construction Services Division (E&CSD)	10	0	10	100
Total	396	266	662	60

* Permanent civilian employees, spring 1986.

Table 4

Numbers of WES Engineers and Scientists, by Job Title

Engineers	
Civil	198
Hydraulic	116
Structural	32
Electronics	19
Mechanical	9
General	8
Environmental	6
Electrical	3
Chemical	2
Bioengineer	1
Geological	1
Materials Research	1
	396

Scientists	
Biologists	35
Physicists	32
Geologists	26
Physical Scientists	25
Mathematicians	22
Oceanographers	17
Chemists	11
Computer Scientists	10
Geophysicists	10
Ecologists	7
Wildlife Biologists	7
Aquatic Biologists	5
Soil Scientists	5
Hydrologists	4
Statisticians	4
Limnologists	4
Botanists	3
Outdoor Recreation Planners	2
Geographers	1
Fisheries Biologists	1
Zoologists	1
Marine Biologists	1
Plant Physiologists	1
Entomologists	1
Agronomists	1
Landscape Architects	1
Operation Research Analysts	1
Other (Experts/Consultants)	24
	264

Table 5

Predominant Types of Engineers and Scientists in Each Element

Element	Engineers		Scientists	
	1st Largest Type	2nd Largest Type	1st Largest Type	2nd Largest Type
HL	Hydraulic	Civil	Mathematicians (tie)	Oceanographers
GL	Civil	Mechanical	Geologists	Geophysicists
SL	Civil	Structural	Physicists	Geologists
EL	Civil	Environmental	Biologists	Physicists
CERC	Hydraulic	Civil	Physical Scientists	Oceanographers
ITL	Civil	--	Computer Scientists	Mathematicians
ISD	Electronics	General	Physicists	--
E&CSD	Civil	Mechanical/ Electrical	--	--

Table 6

Comparison of Educational Level of Engineers and Scientists, Highest Degree Earned

Level	Engineers		Scientists		Total	
	No.	Percent	No.	Percent	No.	Percent
Ph.D. or postdoctorate	49	12%	78	30%	127	19
Master's or post-Master's	132	33%	85	31%	217	33
BS or post BS	215	55%	96	36%	311	47
No degree	0	0	7	3%	7	1
Total	396	100%	266	100%	662	100

Table 7

Educational Level of Engineers and Scientists

by Organizational Element

Element	Ph.D. or more	MS or more	BS or more	College, No degree	Total
HL	9 (10%)	33 (37%)	47 (52%)	1 (1%)	90 (100%)
GL	26 (19%)	44 (31%)	71 (50%)	0	141 (100%)
SL	10 (9%)	32 (27%)	72 (63%)	1 (1%)	115 (100%)
EL	53 (32%)	66 (40%)	47 (28%)	1 (21%)	167 (100%)
CERC	23 (26%)	34 (39%)	31 (35%)	0	88 (100%)
ITL	5 (19%)	3 (12%)	14 (54%)	4 (15%)	26 (100%)
ISD	1 (47%)	4 (16%)	20 (80%)	0	25 (100%)
E&CSD	0	1	9	0	10
	127	217	311	7	662

Table 8

Educational Level of Predominant Types of Engineers and Scientists

Type	Ph.D. or more	MS or more	BS or more	College, No degree	Total
Engineers					
Civil	28 (14%)	64 (33%)	105 (53%)	0	197 (100%)
Hydraulic	15 (13%)	50 (43%)	51 (44%)	0	116 (100%)
Scientists					
Biologists	8 (23%)	13 (37%)	13 (37%)	1 (3%)	35 (100%)
Physicists	5 (15%)	12 (38%)	15 (47%)	0	32 (100%)
Geologists	4 (15%)	8 (31%)	13 (50%)	1 (4%)	26 (100%)
Physical Scientists	6 (24%)	10 (40%)	9 (36%)	0	25 (100%)
Mathematicians	1 (4%)	6 (27%)	14 (64%)	1 (4%)	22 (99%)

Table 9

Results of OTP&P-Conducted Survey, Winter 1985, on Age and Years of Employment

Laboratory	Number	Mean Age	Mean Number of Years at WES
HL	80	36.9	10.9
GL	133	40.8	13.7
SL	134	37.2	10.9
EL	156	39.1	9.1
CERC	85	36.7	6.5
Total	588	38.1	10.2

Table 10

Characteristics of Respondees That Strongly Agree That Training Could Improve Their Job Performance

	Mean Response, by Group			
Characteristic	Strongly Agree n = 100	Agree n = 134	Disagree/ Strongly Disagree n = 20	Overall n = 278
Age	34	36	45	36
Grade level	11.68	11.95	13.04	11.97
Months at current level	35	43	63	42
Years at WES	6.6	10.3	15.5	9.4
Years with Corps	8.0	11.3	16.8	10.5
Percent of time in research and development	60	53	43	55

Table 11

Characteristics of Respondees That Describe Themselves as Knowledgeable or Still Learning

Characteristic	Mean Response, by Group			
	Still Learning n = 17	Knowledgeable n = 30	Mastery n = 42	Overall n = 279
Age	28	30	42	36
Grade level	9.12	10.60	13.[illegible]7	11.97
Months at current level	23	22	46	42
Years at WES	4.0	3.1	12.4	9.4
Years with Corps	3.8	3.7	14.2	10.5
Percent of time in research and development	86	65	45	55

Table 12

Comparison of Rankings of Qualifications for Career Development

By Supervisory Level

	Top Management (n = 12)	Middle Management (n = 24)	Nonsupervisory (n = 179)
1st:	Technical competence	Technical competence	Technical competence
2nd:	Managerial competence	Managerial competence	Work experience
3rd:	Work experience	Work experience	academics

By Self-Assessment of Competence

	Mastery (n = 43)	Knowledgeable and Still Learning (n = 47)
1st:	Technical competence	Work experience
2nd:	Work experience	Technical competence
3rd:	Managerial competence	Academics

By Educational Level

	Ph.D. (n = 52)	MS (n = 103)	BS (n = 120)
1st:	Technical competence	Technical competence	Work experience
2nd:	Work experience	Work experience	Technical competence
3rd:	Managerial competence	Managerial competence	Academics

Table 13

Characteristics of Those Respondees Expecting to Remain at WES

Characteristic	Percent of Work Force* Expecting To Remain at WES: In Same Position	In Different Position	Total %	n
Educational level				
BS	45.7	33.0	78.7	105
MS	39.0	41.0	80.0	92
Ph.D.	38.7	46.9	85.6	49
Competence level				
Mastery	41.0	46.1	87.1	39
Learning/knowledgeable	34.9	37.2	72.1	43
Management level				
Top/Mid	59.0	34.0	93.0	32
Nonsupervisory	39.0	37.5	76.5	160
Job satisfaction				
All/most of time	44.6	35.3	79.9	130
Half time or less	34.3	31.3	65.6	67
Have skills to perform				
Agree/strongly agree	41.8	38.4	80.2	239
Disagree/strongly disagree	37.5	50.0	87.5	8

* Work force excludes those expecting to be retired in five years as well as those who could not indicate where they expected to be employed.

Table 14

Comparison of Characteristics of Respondees Who Expect to Retain Their WES Position Five Years From Now With Those Who Expect to Hold a Different WES Position

Characteristic	Same WES Position		Different WES Position		Entire Work Force Population*	
	Mean	n	Mean	n	Mean	n
Age	38	106	36	96	36	249
GS level	12.2	105	12.0	95	11.9	247
Months at current level	47	104	41	95	43	246
Years at WES	12.0	104	8.2	95	9.5	260
BS, mean age	35	47	31	34	33	102
MS, mean age	39	36	36	38	37	92
Ph.D., mean age	43	19	42	23	42	49
Plan to earn MS, mean age	31	29	28	20	30	63
Plan to earn Ph.D., mean age	33	23	35	34	34	67
Have no plans, mean age	48	19	41	14	44	40

* Number who have some expectation of where they will be in five years; excludes retirees and those who do not know.

Table 15

Impact of Center Courses on Students' Perception of Job Capabilities and Job Advancement

Statement of Impact on Job	Percentage of Responses Indicating Agreement* with Statement of Impact: Center Graduates (n = 31)	Enrolled in Courses (n = 161)	All Responses (n = 196)
In general, the courses enabled me to better perform the duties of the job I held at the time	100	83	86
In general, I believe the courses I took will have value to me in accomplishing jobs I am likely to have in the future	94	84	86
In general, the courses improved my technical capabilities	100	96	97
In general, the courses have enhanced my promotion potential	69	61	62
In general, the courses increased my job satisfaction	88	70	73
In general, I believe the courses have increased my job responsibilities	75	48	54

* Percent of those responding "Agree" or "Strongly Agree."

Table 16

Number of WES Employees Sent on Long-Term Training, 1963-1986

by Academic Year and Element*

Academic Year	Originating Organizational Element											
	S&PL	Conc	MESL	WEL	SL	GL	HL	EL	CERC	ATC	ISD	Total
63-64	1											1
64-65			1	1								2
65-66	1										1	2
66-67	1	1	1				1					4
67-68	2	1	1	1			2					7
68-69	1	1	1	1	1		1					6
69-70	1	1		1	1		1	1				6
70-71	3	1		2	1		1					8
71-72	3		2	1	1		1	1				9
72-73	3		2	1	1		1					8
73-74	2		1				1	1		1		6
74-75				2	1		1	2				6
75-76	2		1				1					4
76-77	1						1	2		1		5
77-78	2				1		2	2				7
78-79	1				1		3	1				6
79-80					1	2	2	4				9
80-81					1	3	1	4		1		10
81-82						3	1	4		1	1	10
82-83					1	2		3		1		7
83-84					1	1	2	3	1			8
84-85					1	2	1	2	1			7
85-86					2	1	1	1	1		1	7
Total	24	5	10	10	15	14	25	31	3	5	3	145

* Some of these abbreviations refer to old laboratory designations: S&PL = Soils and Pavements Laboratory; Conc = Concrete Laboratory; MESL = Mobility and Environmental Systems Laboratory; WEL = Weapons Effects Laboratory.

Table 17

Choice of Institution and Major Studies of Long-Term Trainees

Institution	Actual No. Trainees	Major Studies Based on 94 Survey Responses (Sum May Not Equal Actual No. of Trainees at the Institution)	
Texas A&M	23	Coastal Engineering	(2)
		Geotechnical Engineering	(4)
		Soils, Soil Mechanics	(3)
		Engineering Geology	(1)
		Civil Engineering	(4)
		Ecology	(1)
		Geophysics	(1)
		Oceanography	(1)
Colorado State	17	Hydraulic Engineering	(6)
		Numerical Modeling	(1)
		Structural Engineering	(1)
		Water Resources Engineering	(1)
		Civil Engineering	(1)
Miss. State Univ.	14	Structural Engineering	(1)
		Wildlife Management	(1)
		Electrical/Electronic Engineering	(2)
		Soil Mechanics	(1)
		Civil Engineering	(1)
Univ. Illinois	7	Geotechnical Engineering	(2)
		Civil Engineering	(1)
		Rock Mechanics	(1)
Univ. Florida	7	Aquatic Ecology	(1)
		Engineering Mechanics	(1)
		Coastal/Ocean Engineering	(2)
		Environmental Engineering	(3)
Louisiana State	5	Marine Sciences	(4)
		Civil Engineering	(1)
Purdue	4	Hydraulic Engineering	(1)
		Geotechnical Engineering	(1)
		Finite Element Analysis	(1)
Univ. Calif.-Berkeley	4	Geotechnical Engineering	(2)
		Soil Mechanics	(1)

(Continued)

Table 17 (Continued)

Institution	Actual No. Trainees	Major Studies Based on 94 Survey Responses (Sum May Not Equal Actual No. of Trainees at the Institution)	
Univ. Colorado	4	Geotechnical Engineering	(2)
		Concrete Behavior (Structural Engineering)	(1)
		Physics/Geophysics	(1)
Delft Tech. Univ.	4	Coastal Engineering	(2)
		Hydraulics Engineering	(2)
Virginia Polytech	4	Civil Engineering	(1)
		Engineering Mechanics	(1)
		Systems Analysis	(1)
Vanderbilt	3	Engineering Management	(1)
		Environmental Engineering	(1)
		Water Resources	(1)
Univ. Miami	3	Engineering Management/ Management Science	(2)
		Ocean Engineering	(1)
Southwestern La.	3		
Oklahoma State	3	Structural Engineering	(1)
Penn State	3	Civil Engineering	(1)
		Rock Mechanics	(1)
		Geotechnical Engineering	(1)
George Wash. Univ.	2		
Colorado School Mines	2	Earthquake Engineering	(1)
Florida State	2	Statistics	(1)
Stanford	2	Water Resources Engineering	(1)
Univ. Alabama	2	Engineering Mechanics	(2)
Univ. Delaware	2	Marine Science	(1)
Univ. Oklahoma	2	Civil Engineering	(1)
Univ. Texas	2	Water Resources Engineering	(1)
		Engineering Mechanics	(1)

(Continued)

Table 17 (Concluded)

Institution	Actual No. Trainees	Major Studies Based on 94 Survey Responses (Sum May Not Equal Actual No. of Trainees at the Institution)	
William & Mary	2	Marine Biology	(1)
Univ. Michigan	2	Soil Mechanics	(1)
Univ. Minnesota	1		
Oregon State	1		
BERH	1	Planners Association Program	(1)
Case Western	1		
Cornell	1	Time Series Analysis	(1)
Imperial College	1		
Georgia Tech	1		
Michigan State	1		
North Carolina State	1		
Tulane	1		
Univ. Arkansas	1		
Univ. Kansas	1	Electrical Engineering	(1)
Univ. Maryland	1	Civil Engineering	(1)
Univ. Massachusetts	1	Environmental Science	(1)
Univ. Missouri-Columbia	1	Wildlife Biology	(1)
Univ. Washington	1		
Univ. Wisconsin	1	Electrical Engineering	(1)

Total of 145 trainees at 42 institutions.

Table 18

Major Studies Named by Trainees*

Major Field of Study**	Number of Times Named
Civil Engineering (emphasis not specified)	12
Geotechnical Engineering	12
Civil Engineering, Hydraulics or Hydraulics Engineering	9
Coastal/Ocean Engineering	7
Civil Engineering, Soils or Soil Mechanics	6
Marine Sciences/Marine Biology	6
Engineering Mechanics	5
Civil Engineering, Structural Engineering	4
Electrical/Electronic Engineering	4
Environmental Engineering	4
Water Resources Engineering	4
Engineering Management	3
Rock Mechanics	2
Geophysics	2
Environmental Sciences	2
Oceanography	1
Engineering Geology	1
Ecology	1
Numerical Modeling	1
Wildlife Management	1
Finite Element Analysis	1
Earthquake Engineering	1
Statistics	1
Aquatic Ecology	1
Materials Science	1
Time Series Analysis	1
Mining Engineering	1
Water Resources Planning (BERH Program)	1
Wildlife Biology	1
Systems Analysis	1
	96

* Based on 97 responses.
** 28 areas of study named.

Table 19

Total Degrees Earned by Long-Term Trainees

(Based on 97 Responses)

Degree Level	Known Earned	Known in Progress	Total
Master's*	31	1	32
Doctorate	25	17	42
Total	56	18	74

* Includes four master's equivalents from the Delft.

Table 20

Master's Degrees Earned by Long-Term Trainees

by Institution and Discipline*

Institution	No.	Discipline
Univ. Florida	5	Coastal/Ocean Engineering (2); Environmental Engineering/Environmental Engineering Science (3)
Delft (MS equiv.)	4	Hydraulics or Coastal Engineering (4)
Colorado State	4	Civil Engineering (1); Civil Engineering - Hydraulic Engineering (3)
Miss. State Univ.	3	Electrical Engineering (1); Civil Engineering (1); Engineering Mechanics (1)
Texas A&M	2	Civil Engineering - Geotechnical (1); Civil Engineering - Coastal (1)
Univ. Calif.	2	Engineering - Geotechnical (1); Engineering Science - Geotechnical (1)
Purdue	2	Civil Engineering - Hydraulic Engineering (1); Materials Science (1)
Florida State	1	Statistics
Univ. Oklahoma	1	Environmental Science (with major study in Civil Engineering)
Penn State	1	Mining Engineering
Univ. Texas - Austin	1	Engineering Mechanics
Vanderbilt	1	Engineering Management
Stanford	1	Civil Engineering - Water Resources
Univ. Kansas	1	Electrical Engineering
Virginia Polytech	1	Environmental Science and Engineering
Univ. Miami	1	Management Science
	31	

* Based on 97 survey responses.

Table 21

Doctorates Earned by Long-Term Trainees

by Institution and Discipline*

Institution	No.	Discipline
Texas A&M	10	Oceanography (1); Geophysics (1); Civil Engineering (8)
Miss State Univ.	3	Electrical Engineering (1); Wildlife Management (1); Civil Engineering (1)
Vanderbilt	2	Environmental & Water Research Engineering (2)
Univ. Illinois	2	Civil Engineering - Geotechnical (2)
Louisiana State	1	Marine Sciences
Oklahoma State	1	Civil Engineering - Structural
Penn State	1	Civil Engineering - Hydraulics
Univ. Delaware	1	Marine Biology
Univ. Michigan	1	Civil Engineering - Geotechnical
Univ. Florida	1	Engineering Mechanics
Colorado State Univ.	1	Civil Engineering
Univ. Arkansas	1	Civil Engineering
	25	

* Based on 97 survey responses.

Table 22

Degrees Known to Be Expected (1986-87) by Long-Term Trainees

by Institution and Discipline

Institution	MS	Ph.D.	Discipline
Texas A&M	0	4	Civil Engineering - Geotechnical (2); Wildlife & Fish Science (1); Engineering Geology (1)
Miss State Univ.	0	1	Civil Engineering - Soil Mechanics (1)
Virginia Polytech	0	2	Civil Engineering - Geotechnical (1); Engineering Mechanics (1)
Univ. Florida	0	1	Aquatic Ecology (1)
Louisiana State	0	1	Civil Engineering (1); Marine Science (1)
Univ. Maryland	0	1	Civil Engineering (1)
Univ. Colorado	0	1	Geotechnical Engineering (1)
Univ. Calif.	0	1	Civil Engineering - Geotechnical (1)
Univ. Missouri	0	1	Wildlife Biology (1)
William & Mary	0	1	Marine Biology (1)
Univ. Massachusetts	0	1	Environmental Sciences (1)
Colorado State Univ.	0	1	Civil Engineering - Hydraulics (1)
Penn State		1	Civil Engineering - Geotechnical (1)
Univ. Illinois	1	0	Civil Engineering (Rock Mechanics) (1)
	1	17	

* Based on 97 survey responses.

Table 23

Years Elapsed in Earning Degrees, Long-Term Trainees*

Number Years Elapsed	Master's # Trainees	Master's Institutions	Doctorate # Trainees	Doctorate Institutions	Total Degrees
0	15	Stanford (1) Texas A&M (1) Colorado State (3) Univ. Kansas (1) Purdue (2) Univ. Calif. (2) Univ. Florida (4) Miss. State (1)	--	--	15
1	4	Univ. Texas - Austin (1) Vanderbilt (1) Colorado State (1) Univ. Oklahoma (1)	4	Miss. State (2) Texas A&M (2)	8
2	4	Miss. State (2) Texas A&M (1) Univ. Florida (1)	3	Texas A&M (2) Penn State (1)	7
3	1	Virginia Polytech	4	LSU Univ. Ark. Texas A&M Oklahoma State	5
4	1	Texas A&M	5	Univ. Florida Miss. State Colorado State Texas A&M (2)	6
5	--	--	5	Vanderbilt (2) Texas A&M (2) Univ. Ill. (1)	5
6	1	Florida State	1	Univ. Delaware	2
7	--		1	Univ. Mich.	1
8	--		1	Univ. Ill.	1
9	1	Univ. Miami	1	Texas A&M	2
Total	27**		25		52
Avg # years	1.3		3.9		

* Degrees known to have been earned.

** Does not include 4 trainees at Delft, earning a master's equivalent.

Table 24

Long-Term Trainees' Experience with Graduate Center

Relationship to Center	No. Students	Ph.D. A Primary Motivation for Long-Term Training	Ph.D. Earned	Average Time To Complete Ph.D., months
Center graduate	15	10	6	42
Center enrollees	37	16	4	62
Never enrolled	14	6	1	12
Total	66	32	11	46

Table 25

Plans for Type of Graduate Education

Type of Graduate Education	Percent Responses (n = 279)	Average Age	Average Grade Level	Average Years at WES
Just take courses	31	39	12.5	11.0
Earn master's	25	30	10.6	5.1
Earn doctorate	26	34	11.8	6.6
No plans	17	45	13.3	16.5
Overall average	--	36	11.9	9.3

Table 26

Plans for Graduate Education, by Current Highest Degree

Type of Graduate Education	Have Bachelor's (n = 119)				Have Master's (n = 102)				Have Doctorate (n = 49)			
	Percent	Avg. Age	Avg. Grade	Avg. Years at WES	Percent	Avg. Age	Avg. Grade	Avg. Years at WES	Percent	Avg. Age	Avg. Grade	Avg. Years at WES
Just take courses	20	37	11.6	11.4	32	39	12.5	12.1	55	41	13.3	9.5
Earn master's	55	30	10.6	5.2	3	41	11.0	5.0	2	29	11.0	1.0
Earn doctorate	12	32	11.0	5.3	52	33	11.9	6.6	6	39	12.7	10.0
No plans	13	46	12.2	18.6	13	46	13.3	18.8	37	44	14.1	13.2
	100	33	11.7	8.2	100	37	12.2	9.9	100	42	13.5	10.7

Table 27

Plans for Graduate Education by Supervisory Level

Plans	Top-Level Management (n = 12)	Mid-Level Management (n = 22)	First-Line Supervisors (n = 65)	Nonsupervisory (n = 177)
Just take courses	26	46	34	29
Earn master's	8	5	22	31
Earn doctorate	8	9	31	28
No plans	58	40	13	12
	100%	100%	100%	100%

Table 28

Dream Program: Institutions and Disciplines

Institution	Number Responses	Disciplines
Mississippi State Univ.	23	Geotechnical Engineering, Electrical Engineering, Environmental Engineering, Civil Engineering, Hydraulic Engineering, Structural Engineering, Computer Science, Engineering Mechanics, Mathematics
Texas A&M Univ.	17	Environmental Engineering, Geotechnical Engineering, Civil Engineering, Hydraulic Engineering, Structural Engineering, Coastal Engineering, Computer Science, Geology, Physics, Meteorology, Oceanography, Engineering Geology, Public Administration
Colorado State Univ.	13	Environmental Engineering, Civil Engineering, Hydraulic Engineering, Computer Science, Water Resources Engineering, Wildlife Ecology
Louisiana State Univ.	9	Electrical Engineering, Environmental Engineering, Hydraulic Engineering, Business/Management, Marine Science, Chemical Engineering, Coastal Geology
Univ. Florida	8	Coastal Engineering, Aquatic Ecology
Univ. Texas	8	Environmental Engineering, Geotechnical Engineering, Structural Engineering, Electrical Engineering, Engineering Mechanics
Harvard	7	Business/Management, Public Administration
Georgia Tech	5	Civil Engineering, Business/Management, Computer Science

(Continued)

Table 28 (Continued)

Institution	Number Responses	Disciplines
Mass. Inst. Tech.	5	Geotechnical Engineering, Computer Science, Hydraulic Engineering, Business/Management
Stanford	5	Geology, Water Resources Engineering, Business/Management, Engineering Mechanics
Virginia Polytechnic	4	Recreation and Resource Economics, Geotechnical Engineering, Engineering Mechanics
Univ. Iowa	4	Hydraulic Engineering, River Engineering
Univ. California - Berkeley	4	Geotechnical Engineering, Geology
Colorado School Mines	4	Geology, Geophysics
Florida State Univ.	3	Meteorology, Marine Science
Cornell	2	Civil Engineering, Environmental Engineering
Univ. Mississippi	2	Chemical Engineering, Engineering Geology
Univ. Southern Mississippi	2	Computer Science
Univ. Southern California	2	Hydraulic Engineering, Computer Science
Univ. Minnesota	2	Hydraulic Engineering, Mathematics
Cambridge	1	Geotechnical Engineering
Carnegie Mellon	1	Computer Science
Clemson	1	Natural Resources
Dalhousie	1	Coastal Geology

(Continued)

Table 28 (Concluded)

Institution	Number Responses	Disciplines
Iowa State	1	Hydraulic Engineering
Johns Hopkins	1	Remote Sensing
California Tech.	1	Civil Engineering
Mississippi College	1	Physics
Oklahoma State	1	Structural Engineering
Oregon State	1	Ocean Engineering
Princeton	1	Environmental Engineering
Purdue	1	Geotechnical Engineering
Univ. California - Los Angeles	1	Geotechnical Engineering
Univ. Arizona	1	Hydrology
Univ. Arkansas	1	Fisheries Biology
Univ. Colorado	1	Geotechnical Engineering
Univ. Delaware	1	Coastal Engineering
Univ. Dundee	1	Civil Engineering
Univ. Illinois	1	Structural Engineering
Univ. Sydney	1	Coastal Engineering
Vanderbilt	1	Engineering Management
Mixture of Schools	[illegible]	Geotechnical Engineering
Don't Know Which School	[illegible]	
Totals [illegible] Institutions	[illegible] Responses	[illegible] Disciplines

Table 29

Dream Program: Academic Disciplines and Degree

Discipline	Degree				
	None or Don't Know	Master's	Doctorate	Post Doc.	Total Responses
Civil Engineering, no specialization given	1	10	8	1	20
Hydraulic Engineering	3	5	11	0	19
Geotechnical Engineering	1	5	10	2	18
Coastal Engineering	0	7	9	1	17
Computer Science	1	9	3	0	13
Business/Management	1	10	2	0	13
Structural Engineering	0	6	5	1	12
Electrical Engineering	0	4	4	0	8
Engineering Mechanics	0	3	4	0	7
Geology	0	2	4	0	6
Physics	0	1	3	0	4
Water Resources Engineering	0	1	3	0	4
Remote Sensing	0	0	3	0	3
Geophysics	1	2	0	0	3
Mathematics	0	0	2	1	3
Meteorology	0	2	1	0	3
Marine Science	1	1	1	0	3
Aquatic Ecology, Fisheries Biology	0	0	2	0	2
Chemical Engineering	0	1	1	0	2
Coastal Geology	0	0	1	1	2

(Continued)

Table 29 (Concluded)

Discipline	Degree				
	None or Don't Know	Master's	Doctorate	Post Doc.	Total Responses
Engineering Geology	1	1	0	0	2
Engineering Management	0	1	1	0	2
Mechanical Engineering	1	0	1	0	2
Public Administration	1	0	1	0	2
River Engineering	0	0	2	0	2
Construction Engineering	0	1	0	0	1
Hydrology	0	0	1	0	1
Material Science	0	1	0	0	1
Natural Resources	0	1	0	0	1
Oceanography	0	0	1	0	1
Recreation	0	0	1	0	1
Wildlife Ecology	0	0	1	0	1
Can't Name Area	0	1	1	0	2
Total	12	79	90	8	189
	(6%)	(42%)	(48%)	(47%)	

Table 30

Expectations of Taking Courses by Current Highest Degree Held

Expectations of Taking Courses	Percent Responses		
	Bachelor's (n = 120)	Master's (n = 103)	Doctorate (n = 52)
Definitely yes	45	35	15
Probably yes	36	49	44
Probably not	9	8	35
Definitely not	2	1	0
Don't know	8	7	6
	100%	100%	100%

Table 31

Expectations of Taking Courses by Current Supervisory Position

Expectations of Taking Courses	Percent Response			
	Top-Level Management (n = 12)	Mid-Level Management (n = 23)	First-Line Supervisors (n = 66)	Nonsupervisory (n = 179)
Definitely yes	0	22	33	41
Probably yes	42	48	47	40
Probably not	58	13	11	11
Definitely not	0	4	1	1
Don't know	0	13	8	7
	100	100	100	100

Table 32

Number of Long-Term Trainees by Field of Major Study as Compared with Degree Programs Proposed for Institute*

Major Study	Number Trainees*
Proposed programs	
Geotechnical Engineering	21
Hydraulic Engineering	9
Ocean/Coastal Engineering	7
Marine Science (incl. Marine Biology)	6
Engineering Mechanics	5
Structural Engineering	4
Water Resources Engineering	4
Environmental Engineering	4
Electrical Engineering	4
Geophysics	2
Engineering Geology	1
Oceanography	1
Computer/Information Science	0
	68
Other fields	
Civil Engineering (emphasis not specified)	12
Ecology/Wildlife Management/Wildlife Biology	4
Engineering Management	3
Environmental Science	2
Numerical Modeling	1
Systems Analysis	1
Statistics	1
Finite Element Analysis	1
Time Series Analysis	1
Materials Science	1
Mining Engineering	1
Water Resources Planning	1
	29

* Based on 97 survey responses.

** Total for geotechnical engineering includes trainees in earthquake engineering, rock mechanics, soils, and soil mechanics.

Table 33

Where Long-Term Trainees Have Gone, in Terms of Degree Programs Proposed for Institute

Program	Institution and Number of Students
Geotechnical Engineering (21)*	Texas A&M (7), Univ. Ill. (3), Purdue (1), Univ. Calif. (3), Univ. Colorado (2), Miss. State (1), Penn State (2), Colorado Sch. Mines (1), Univ. Mich. (1)
Hydraulic Engineering (9)	Colorado State (6), Purdue (1), Delft (2)
Ocean/Coastal Engineering (7)	Texas A&M (2), Univ. Florida (2), Univ. Miami (1), Delft (2)
Marine Science (6)	Louisiana State (4), William and Mary (1), Univ. Delaware (1)
Engineering Mechanics (5)	Virginia Polytech (1), Univ. Alabama (2), Univ. Texas (1), Univ. Florida (1)
Water Resources (4)	Colorado State (1), Vanderbilt (1), Univ. Texas (1), Stanford (1)
Structural Engineering (4)	Oklahoma State (1), Colorado State (1), Mississippi State (1), Univ. Colorado (1)
Environmental Engineering (4)	Univ. Florida (3), Vanderbilt (1)
Electrical Engineering (3)	Mississippi State (2), Univ. Kansas (1), Univ. Wisconsin (1)
Geophysics (2)	Texas A&M (1), Univ. Colorado (1)
Engineering Geology (1)	Texas A&M (1)
Oceanography (1)	Texas A&M (1)
Computer Info Science (1)	One response to survey

* Total includes 12 in geotechnical engineering, 1 in earthquake engineering, 2 in rock mechanics, and 6 in soils or soil mechanics.

Table 34

Degrees Known Earned or Expected (1986-1987) by Long-Term Trainees Compared with Degree Programs Proposed by Institute

Program	Master's		Doctorate		Total
	Earned	Expected	Earned	Expected	
Proposed					
Geotechnical Engineering	3	1	3	6	13
Water Resources	1	0	--	--	1
Structural Engineering	--	--	1	0	1
Environmental Engineering	3	0	2*	0	5
Hydraulic Engineering	6	0	1	1	8
Engineering Mechanics/ Engineering Science	2	0	1	1	4
Ocean/Coastal Engineering	5	0	--	--	5
Oceanography	--	--	1	0	1
Geophysics	--	--	1	0	1
Marine Science (incl. Marine Biology)	--	--	2	2	4
Engineering Geology	--	--	--	1	1
Computer/Information Science	--	--	--	--	--
Electrical Engineering	2	0	1	0	3
Subtotal	22	1	13	11	47
Other					
Civil Engineering (emphasis not specified)	2	0	11	2	15
Statistics	1	0	--	--	1
Engineering Management	1	0	--	--	1
Management Science	1	0	--	--	1
Wildlife Management	--	--	1	0	1
Material Science	1	0	--	--	1
Environmental Science & Engineering	2	0	0	1	3
Aquatic Ecology	--	--	0		
Mining Engineering	1	0	--		
Wildlife Biology	--	--	0	1	
Wildlife and Fisheries Science		--	0		
Subtotal	9	0	12	6	
Grand Total	31	1	25		

* Degree actually in environmental and water resources engineering.

Table 35

Dream Programs Tabulated by Major Field of Study Proposed for Institute*

Field of Study	Number Responses
Proposed programs	
Geotechnical Engineering	18
Hydraulic Engineering	21 (including 2 in river engineering)
Structural Engineering	12
Water Resources Engineering	4
Environmental Engineering	8
Electrical Engineering	8
Engineering Mechanics	7
Ocean/Coastal Engineering	17
Oceanography	1
Marine Science	3
Computer Science	13
Geology	10
Geophysics	3 (including 2 each in engineering geology and coastal geology)
Subtotal	125 + 20 = 145**
Other fields	
Business/Management	13
Physics	4
Remote Sensing	3
Mathematics	3
Meteorology	3

(continued)

* Based on 189 responses.

** Twenty named civil engineering but did not name the particular specialization. Presumably most, if not all, would be within the specializations proposed.

Table 35 (Concluded)

Field of Study	Number Responses
Other fields (continued)	
Aquatic Ecology, Fisheries Biology	2
Chemical Engineering	2
Engineering Management	2
Mechanical Engineering	2
Public Administration	2
Construction Engineering	1
Hydrology	1
Natural Resources	1
Recreation, Resource Economics	1
Wildlife Ecology	1
Material Science	1
Subtotal	42
Can't Name an Area	2
Total	189

Table 36

Where Respondees Would Like to Carry Out Their Dream Program

(of Programs Proposed for Institute)*

Program	Institution and Number of Students
Geotechnical Engineering (18)	Massachusetts Inst. Tech. (2), Texas A&M (3), Mississippi State (1), Univ. Texas (2), Purdue (1), Univ. California - Berkeley (2), Univ. Colorado (1), Virginia Polytechnic (2), Cambridge (1), Univ. California - Los Angeles (1), Don't Know (1), Mixture of Schools (1)
Hydraulic Engineering (21)	Univ. Iowa (4), Louisiana State (2), Mississippi State (2), Colorado State (5), Massachusetts Inst. Tech. (1), Texas A&M (1), Univ. Minnesota (1), Univ. Southern California (1), Iowa State (1), Don't Know (3)
Structural Engineering (12)	Mississippi State (1), Texas A&M (1), Oklahoma State (1), Univ. Illinois (1), Univ. Texas (3), Don't Know (5)
Water Resources Engineering (4)	Colorado State (3), Stanford (1)
Environmental Engineering (8)	Louisiana State (1), Mississippi State (2), Texas A&M (1), Princeton (1), Univ. Texas (1), Cornell (1), Colorado State (1)
Electrical Engineering (8)	Mississippi State (6), Univ. Texas (1), Louisiana State (1)
Engineering Mechanics (7)	Mississippi State (2), Univ. Texas (1), Virginia Polytech (1)
Ocean/Coastal Engineering (17)	Texas A&M (2), Univ. Delaware (1), Univ. Florida (6), Oregon State (1), Univ. California - Berkeley (1), Univ. Sydney (1), Don't Know (5)
Oceanography (1)	Texas A&M (1)
Marine Science (3)	Louisiana State (1), Florida State (1), Don't Know (1)

(Continued)

* Total of 125 responses for 31 schools. If civil engineering, unspecified, is added in, the total is 145 responses at 33 schools.

Table 36 (Concluded)

Program	Institution and Number of Students
Computer Science (13)	Carnegie Mellon (1), Colorado State (1), Louisiana State (1), Mississippi State (1), Texas A&M (1), Univ. Southern Miss. (2), Georgia Tech. (1), Massachusetts Inst. Tech. (1), Univ. Southern California (1), Don't Know (3)
Geology (10)	Colorado School Mines (1), Texas A&M (2), Univ. California - Berkeley (1), Stanford (1), Univ. Mississippi (1), Louisiana State (1), Dalhousie (1), Don't Know (2)
Geophysics (3)	Colorado School Mines (3)
Civil Engineering, emphasis unspecified (20)	Colorado State (2), Georgia Tech. (3) Mississippi State (7), Texas A&M (2), California Tech. (1), Cornell (1) Univ. of Dundee (1), Don't Know (3)

Table 37

Degrees Respondees Would Pursue in Dream Program*

Proposed Program	No Degree or Don't Know	Post. Doc.	Degree		
			Master's	Doctorate	Total
Geotechnical Engineering	1	2	5	10	15
Hydraulic Engineering	3	0	5	13	18
Structural Engineering	0	1	6	5	11
Water Resources Engineering	0	0	1	3	4
Environmental Engineering	1	1	3	3	6
Electrical Engineering	0	0	4	4	8
Engineering Mechanics	0	0	3	4	7
Ocean/Coastal Engineering	0	1	7	9	16
Oceanography	0	0	0	1	1
Marine Science	1	0	1	1	2
Computer Science	1	0	9	3	12
Geology	1	1	3	5	8
Geophysics	1	0	2	0	2
Subtotal	9	6	49	65	120
Plus, Civil Engineering, unspecified (20)	1	1	2	5	15
Total	30		94	144	238

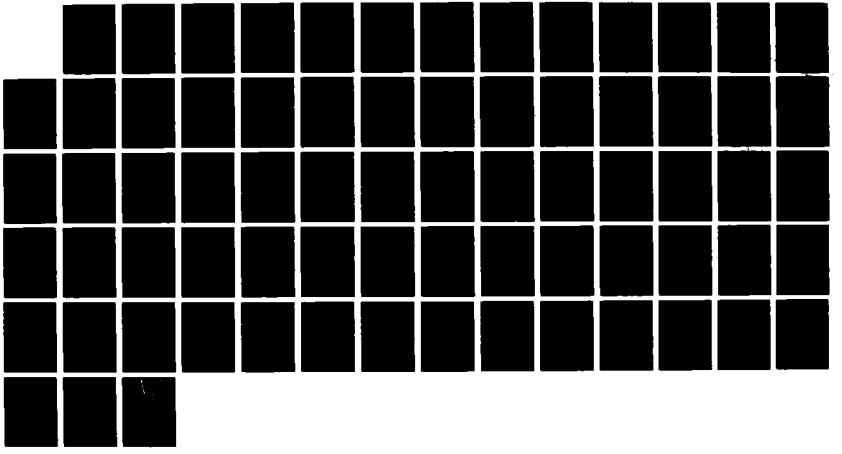
Total responses = 135 + 30 = 345

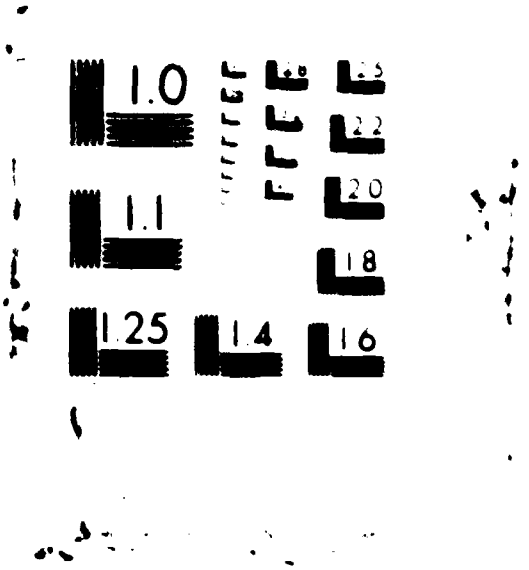
* Of programs proposed for Institute.

APPENDIX A: SURVEY FOR INFORMATION AND OPINIONS ON GRADUATE-LEVEL TRAINING

AD-A179 552 GRADUATE EDUCATION EXPERIENCES AND PREFERENCES OF WES (WATERWAYS EXPERIME..(U) ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS OFFIC.. M K VINCENT 2/2

UNCLASSIFIED MAR 87 WES/TR/O-87-1 F/G 5/9 NL




1.0
1.1
1.25
1.4
1.6
2.2
2.0
1.8

Frequencies Tabulation, 285 responses

PART I: USE OF THE VICKSBURG GRADUATE CENTER (if you have ever taken a course at the Center, please complete all of Part I)

Of a total of 285 respondees, 197 have taken at least one course at the Center.

A. Extent of Use of the Center

1. How many courses have you completed at the Center?

$\bar{x} = 5$ number of courses n = 197

2. The courses you have completed at the Center were primarily in which areas of specialization? (please check one box).

%		
[34]	Hydraulics	n = 195
[12]	Structures	
[29]	Soil Mechanics	
[25]	Other (please specify) _____	

3. In what semester (spring, summer, or fall) and year did you first enroll in a course at the Center?

_____ semester and year	Spring	40%
	Summer	15%
	Fall	45%

n = 183

4. In what semester (spring, summer, or fall) and year did you last enroll in a course at the Center?

_____ semester and year	Spring	58%
	Summer	14%
	Fall	28%

n = 179

5. At the time you completed your first course at the Center, were you employed at WES? (please check the most appropriate box)

%		
[96]	Yes	n = 196
[3]	No, I was employed at another Corps office	
[1]	No, I was not employed by the Corps	
[0]	No, I was unemployed	

6. Have you ever enrolled in a course at the Center, but not completed it?

[ ] Yes 31% [ ] No 61% n = 197

7. If you answered "yes" to the previous question (# 6), which of the following best describes the reason why you did not complete the course? (please check the one most appropriate box).

	%
[2]	Poor health
[48]	Travel interfered
[7]	Personal reasons
[21]	Not what I anticipated, not useful to me
[2]	Subject matter too difficult
[0]	Subject matter too easy
[3]	Did not like the instructor's style
[0]	Disagreed with the information presented
[0]	Did not receive passing grade
[18]	Other (please specify) including 6 who withdrew because instructor was poorly prepared.

n = 61

8. Have you earned a master's degree through the Center?

[ ] Yes 30 (16%) [ ] No 164 (84%) n = 194

9. If you have earned a master's degree through the Center, how many months elapsed from the time you began the first course in your degree program until the time you completed the last course?

$\bar{x}$ = 62 months elapsed range = 21 months to 12 years n = 30

10. If you have earned the degree through the Center, have you completed further graduate-level work since earning the degree at the Center?

	%
[33]	Yes, I have completed additional graduate-level courses at the Center
[10]	Yes, I have completed additional graduate-level courses, but not at the Center
[30]	Yes, and I have earned another graduate degree (either at the Center or elsewhere)
[20]	No, I have not completed any additional graduate-level courses (either at the Center or elsewhere)
[7]	Yes, at Center and also elsewhere

n = 30

11. How often do you actively encourage others to take courses at the Center even though they have not asked for your advice?

	%
[13]	Very Frequently
[26]	Frequently
[41]	Sometimes
[16]	Seldom
[5]	Never

n = 196

12. When others do ask you for advice on taking courses at the Center, how strongly do you recommend that they do so?

%

[32] Very Strongly
[57] Strongly
[3] Weakly
[<1] Very Weakly
[0] I recommend that they not take courses at the Center
[8] No one ever asks me

n = 194

B. General Satisfaction with the Center

1. In general, what motivated you to take courses at the Center? Please select the three most relevant factors and rank them in order of strength in motivating you. (1 = strongest motivating factor, 2 = second strongest factor, 3 = third strongest factor).

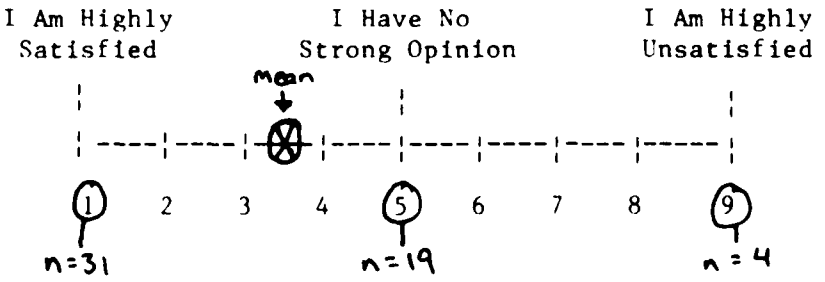
[5] Catch up with recent innovations in my field
[ ] Refresher course
[4] Desire to learn something in a subject area in which I had had little or no training or job experience
* [2] Desire to learn more in a subject area in which I had had some training or job experience
[ ] Reputation of instructor
* [3] Desire to earn a master's degree
* [1] Professional development
[6] Personal satisfaction
[ ] Peer pressure
[ ] Supervisor's pressure
[7] Pending job responsibilities
[ ] Hope for promotion
[ ] Location/accessibility
[ ] Cost
[ ] Improve credentials for job prospects at WES
[ ] Improve credentials for job prospects away from WES
[ ] Other (please specify) _____
[ ] Other (please specify) _____

2. In general, what benefits have you realized from the courses you completed at the Center? Please select the three most outstanding benefits and rank them in order of significance to you. (1 = most significant, 2 = second most significant, 3 = third most significant).

[6] Acquired training in recent innovations in my field
[ ] Refresher training
* [3] Learned something in a subject area in which I had had little or no training or job experience
* [1] Learned more in a subject area in which I had some training or job experience
[ ] Professional interaction with instructor
[5] Earned a master's degree
* [2] Professional development

[4] Personal satisfaction
[ ] Peer admiration
[ ] Supervisor's regard of me
[ ] Change in responsibilities of job I held
[ ] Promotion
[ ] Location/accessibility
[ ] Cost
[7] Improved credentials for better job at WES
[ ] Acquired a better job at WES
[ ] Improved potential for better job away from WES
[ ] Other (please specify) _____
[ ] Other (please specify) _____

5. In general, how do you feel about the overall performance of the Center in delivering the courses you took. (please circle a number on the following scale).



n=196

C. Satisfaction with Specific Aspects of the Center

1. Please indicate how you feel about the Center's performance in the following areas. (For each item listed, place a check in the one box which best corresponds to your feelings.)

⊗ mean	I am Highly Satisfied	I am Satisfied	I Have No Opinion	I am Unsatisfied	I am Highly Unsatisfied	Not Applicable	n
			%				
Classroom facilities (e.g. size, lights)	[42] ⊗	[54]	[2]	[2]	[<1]	[0]	196
General equipment (e.g. blackboards, AV aids)	[37] ⊗	[57]	[5]	[<1]	[<1]	[0]	196
Laboratory equipment	[7]	[14]	[30]	[4] ⊗	[2]	[43]	194
Availability of reference materials	[22]	[52] ⊗	[11]	[10]	[1]	[4]	195
Notification of course offerings	[22]	[54] ⊗	[6]	[14]	[4]	[<1]	196
Selection of courses in any given semester	[4]	[34]	[14] ⊗	[38]	[10]	[0]	196
Center's interest in students' needs	[10]	[47] ⊗	[26]	[15]	[3]	[0]	195
Center's responsiveness to suggestions on course offerings	[8]	[30]	⊗ [43]	[9]	[5]	[5]	196
Administration of the Center	[14]	[51] ⊗	[31]	[3]	[1]	[<1]	196

D. Impact on Your Job

1. Consider the courses you took at the Center in a collective sense and then indicate how you feel about the following statements. (For each statement, please check one block on each line.)

⊗ mean	Strongly Agree	Agree	No Opinion %	Disagree	Strongly Disagree	n
In general, the courses enabled me to better perform the duties of the job I held at the time	[27]	⊗ [59]	[9]	[5]	[<1]	196
In general, I believe the courses I took will have value to me in accomplishing jobs I am likely to have in the future	[34] ⊗	[52]	[10]	[4]	[<1]	196
In general, the courses improved my technical capabilities	[37] ⊗	[60]	[2]	[1]	[0]	196
In general, the courses have enhanced my promotion potential	[20]	[43] ⊗	[21]	[12]	[4]	196
In general, the courses increased my job satisfaction	[20]	[53] ⊗	[21]	[6]	[<1]	196
In general, I believe the courses have increased my job responsibilities	[17]	[37] ⊗	[25]	[19]	[3]	194

E. Your Recommendations for the Center

1. Because you have taken courses at the Center, your ideas for ways to improve it would be very useful. If you could dictate one or two actions to improve any aspect of the performance of the Center, what would they be?

a. See pages A21-A31.

b. _____

2. Do you have any additional comments you would like to share concerning the Vicksburg Center?

a. See pages A32-A36.

b. _____

PART II: USE OF LONG-TERM TRAINING PROGRAMS (if you have ever participated in a Corps-sponsored long-term training program, please complete all of Part II)

1. In general, what really motivated you to apply for acceptance in a Corps-sponsored long-term training program? Please select the three most relevant factors and rank them in order of strength in motivation. (1 = strongest motivating factor, 2 = second strongest factor, 3 = third strongest factor).

n = 65

- [5] Catch up with recent innovations in my field
- [ ] Refresher training
- *[3] Desire to learn
- [ ] Desire to earn a master's degree
- *[2] Desire to earn a doctoral degree
- *[1] Professional development
- [ ] Personal satisfaction
- [ ] Peer pressure
- [ ] Supervisor's pressure
- [ ] Pending job responsibilities
- [4] Possibility of promotion
- [ ] Expenses paid
- [ ] Desire to "get away from it all"
- [ ] Improve credentials for job prospects at WES
- [ ] Improve credentials for job prospects away from WES
- [ ] Other (please specify) _____
- [ ] Other (please specify) _____

2. In general, what benefits have you realized from your long-term training experience? Please select what you feel have been the three most outstanding benefits to you and rank them in order of their significance. (1 = most significant, 2 = second most significant, 3 = third most significant).

n = 65

- [4] Received training in recent innovations in my field
- [5] Refresher training
- [ ] Learned something in a subject area in which I had little or no training or job experience
- *[2] Learned more in a subject area in which I had training or job experience
- [ ] Earned a master's degree
- [ ] Earned a doctoral degree
- *[1] Professional development
- *[3] Personal satisfaction
- [ ] Peer admiration
- [ ] Supervisor's regard of me
- [ ] Change in responsibilities of job I held
- [ ] Promotion
- [ ] Refreshing change of pace
- [ ] Improved credentials to get a better job at WES
- [ ] Acquired a better job at WES
- [ ] Improved credentials to get a better job elsewhere

[ ] Other (please specify) _____
[ ] Other (please specify) _____

3. What were the two most important factors in your choice of school? (1 = most important factor; 2 = second most important factor)

[4] Overall academic reputation
*[1] Reputation for area of study I was interested in
*[2] Reputation of professors; chance to work with particular professor(s)
[ ] Location, proximity to Vicksburg
[ ] Location, attractions in the area
[ ] Degree requirements as compared to other schools considered
[3] Degree requirements relative to constraints of long-term training program
[ ] Willingness of faculty to develop a program to suit my needs and constraints
[ ] Other (please specify) _____

n = 65

4. In conjunction with, and prior to your long-term training, did you and your supervisor develop a Plan for Utilization?

36% [ ] Yes
64% [ ] No

n = 66

5. Subsequent to your long-term training, the number of times your supervisor(s) has talked to you about the applicability of your long-term training to your job has been sufficient.

%
[11] Strongly agree
[20] Agree
[31] No opinion
[26] Disagree
[12] Strongly disagree

n = 65

6. How much time has elapsed since you completed the long-term training?

$\bar{x} = 9.4$ Years

n = 65

7. If you earned a degree through long-term training, how much time elapsed from the time you completed the training to the time you earned the degree (put 0 if degree was earned upon completion)?

$\bar{x} = 30$ Months

(11 earned upon completion)

for MS, $\bar{x}$ = 20 months (n=15)
for PhD, $\bar{x}$ = 45 months (n=11)

n = 26

8. If you are still working on completing a degree program begun during long-term training, how much time do you estimate will have elapsed from the time you completed the training to the time you will earn the degree?

$\bar{X} = 57$ Months — for MS, $\bar{X}$ = 12 months (n = 1); for PhD, $\bar{X}$ = 51 months (n = 21); (2 could not estimate time to completion) } n=24

9. If you returned from long-term training to finish degree requirements, how supportive was your supervisor in adjusting your work assignments to enable you to conduct the necessary research and/or writing to complete the requirements? (please check the most appropriate box)

%	
[16]	Extremely supportive
[14]	Quite supportive
[14]	Reasonably supportive
[19]	Somewhat supportive
[23]	Unsupportive
[8]	I was not pursuing a degree
[6]	I completed all requirements while on training

n=51

10. How did the actual benefits of the training compare to the benefits you had hoped to realize?

%	
[17]	Much greater than I had expected
[23]	Somewhat greater than I had expected
[41]	About what I had expected
[8]	Somewhat less than I had expected
[12]	Much less than I had expected
[0]	I don't know

n=66

11. Were there "bonuses" to the long-term training that you had not expected?

47%	53%	
[ ] Yes	[ ] No	n=66

12. If you answered "Yes" to question 11 above, please briefly describe

See pages A37-A38.

13. How often do you encourage others to apply for acceptance in the long-term training program?

%	
[29]	Very Frequently
[47]	Frequently
[21]	Sometimes
[2]	Seldom
[2]	Never

n=66

14. Consider the courses you took during long-term training in a collective sense and then indicate how you feel about the following statements. (For each statement, please check one block on each line.)

⊗ mean	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	n
			%			
In general, the training enabled me to better perform the duties of the job I held at the time	[41]	⊗ [53]	[0]	[6]	[0]	66
In general, I believe the training will have value to me in accomplishing jobs I am likely to have in the future	[47]	⊗ [46]	[3]	[5]	[0]	66
In general, the training improved my technical capabilities	[65]	⊗ [35]	[0]	[0]	[0]	66
In general, the training has enhanced my promotion potential	[29]	[38]	⊗ [11]	[14]	[9]	66
In general, the training increased my job satisfaction	[36]	⊗ [44]	[11]	[9]	[0]	66
In general, I believe the training has increased my job responsibilities	[33]	[41]	⊗ [8]	[15]	[3]	66

15. In hindsight, if you could change any aspect (e.g. the institution, the courses, etc.) of the long-term training you took, what would it be?

See pages A39-A40.

16. Do you have any additional comments you would like to share about your long-term training experience?

See pages A41-A43.

PART III: RECOMMENDATIONS AND GENERAL INFORMATION (please complete this entire part)

A. Your Recommendations for the Vicksburg Center

At present, the Center offers the master's degree in civil engineering and engineering mechanics with specializations in hydraulics, structures, and soil mechanics.

1. Depending on student interest and demand, the master's degree could be offered in other technical fields or specializations in engineering. As a WES employee, what other engineering fields or areas of specialization would you like to see offered at the Center?

n=274

%
[19] None, in my opinion the current degree programs offered are fine
[7] I don't really care
[74] In my opinion, the Center should consider expanding its degree programs to include these additional specialties in engineering or other technical fields in which to offer a master's degree:

a. See pages A57-A59.

b. _____

c. _____

2. The Center could expand its course offerings to a broader range of technical disciplines even though it might not offer a degree in them. In what other disciplines would you like to see courses given at the Center?

n = 276

%
[9] None, in my opinion the range of courses that has been offered outside of the current degree programs is fine
[2] I don't really care what courses are offered
[17] I don't know/I am not familiar with what courses have been offered outside of the current degree program
[70] In my opinion, the Center should consider expanding to include courses in these additional disciplines:

a. _____

b. _____

c. _____

[illegible] statements.

a. The Center should expand its engineering studies program to enable students to obtain credits and degrees from other schools in the Washington area.

%	
48	Strongly Agree
37	Agree
12	No opinion
3	Disagree
1	Strongly Disagree

n = 284

b. WES should require its engineers and scientists to enroll for credit or audit in at least one course or seminar each within every three-year period.

%	
17	Strongly Agree
22	Agree
14	No opinion
29	Disagree
19	Strongly Disagree

n = 284

c. WES should require its engineers and scientists to enroll for audit in at least one course or seminar each within every three-year period.

%	
17	Strongly Agree
21	Agree
17	No opinion
27	Disagree
18	Strongly Disagree

n = 280

4. If the Center were to expand its course offerings and degree programs to enable WES employees to earn academic credit and obtain degrees from other schools, do you think you would take any of the courses offered?

%	
[36]	Definitely yes
[42]	Probably yes
[13]	Probably not
	Definitely not
	Don't know

n = 283

5. What would be your "wish list" for courses at the Center? Please specify what courses, in any subject area, that you would be interested in taking if they were offered:

a. See pages C-2 - A67.

b. _____

c. _____

d. _____

6. What are your preferences for timing and format of course offered at the Center? (please circle the most appropriate number on each line)

⊗ = mean

	Like		Indifferent		Dislike	
	5	4	3	2	1	
Courses in the spring	35	19	⊗ 33	9	5	n=269
Courses in the summer	14	10	29	⊗ 13	34	n=269
Courses in the fall	45	⊗ 24	26	3	3	n=270
Courses in the afternoon	54	⊗ 32	9	3	2	n=269
Courses in the evening	13	21	⊗ 19	21	26	n=267
Two sessions/week (Mon & Wed)	19	28	⊗ 27	14	11	n=264
Two sessions/week (Tue & Thu)	33	⊗ 26	27	8	6	n=266
Two sessions/week (Wed & Fri)	4	9	20	⊗ 25	43	n=260
One session/week	25	20	⊗ 22	15	18	n=268
Lectures	40	⊗ 44	14	1	<1	n=274
Seminars	21	44	⊗ 25	7	4	n=272

Video-taped lectures	7	17	28	22	25	n=272
Courses transmitted via satellite from other universities	12	25	36	14	13	n=270

B. Professional Development

1. How would you describe your technical competence inside your specialty area

%	
15	Very complete master
45	Stronger than average working knowledge
23	Average working knowledge for a specialist
11	Knowledgeable, but will use more experience
6	Still learning

n = 284

2. How often are you asked for assistance in your technical or professional area by people and groups outside the corps

%	
17	Very often
24	Often
34	Sometimes
13	Rarely
7	Very rarely
6	Never

n = 284

3. What is the most important [illegible] your present job?

%	
64	[illegible]
9	Human relations
7	[illegible] management
16	[illegible] management skill
4	[illegible]

n = 284

4. What [illegible] reading or [illegible] three and then rank [illegible] most important to you?

5	[illegible]
3	[illegible]
* 2	[illegible]

n = 284

[ ] Visibility of projects to which assigned
[ ] Field of specialization
* [1] Technical competence
[4] Managerial competence
[ ] Other (please specify) _____

5. Do you think your present job is preparing you to assume future positions of greater responsibility?

%	
[4]	Definitely not
[11]	Probably not
[10]	Undecided
[44]	Probably yes
[31]	Definitely yes

n = 283

6. Check one of the following to show how much of the time you feel satisfied with your job.

%	
[6]	All the time
[41]	Most of the time
[28]	A good deal of the time
[9]	About half of the time
[5]	Occasionally
[1]	Seldom
[<1]	Never

n = 284

7. How do you feel about the following statements?

⊗ = mean	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	n
			%			
I have the necessary technical skills to perform my job	[35]	[59]	[3]	[2]	[<1]	284
I could perform my current job better if I took training in certain areas	[36]	[48]	[9]	[7]	[<1]	283
I am interested in taking courses in certain areas to improve my potential for obtaining another position	[22]	[33]	[23]	[19]	[3]	283
I am interested in taking courses having little no relation to my present or likely future job	[6	[30]	[21]	[32]	[11]	284

8. I am satisfied with the Career Development Plan that my supervisor and I have constructed. (please check the one most appropriate box)

%	
[6]	Strongly Agree
[44]	Agree

[21] No Opinion
[6] Disagree
[2] Strongly disagree
[14] I don't have a Career Development Plan
[7] I don't know what a Career Development Plan is

9. At your own expense, how many graduate-level courses have you taken during the last 5 years in engineering and technical sciences?

$\bar{X} = 1.4$ Number of Courses range = 1 to 30 n=63

10. At your own expense, how many business or management courses have you taken during the last 5 years?

$\bar{X} = .3$ Number of Courses range = 1 to 10 n=30

11. How long has it been since you last completed a graduate-level course in a technical subject area?

$\bar{X} = 7.5$ years Number of Years n=279

9 have never taken graduate level course
28 are currently enrolled in a graduate course

12. How often do you encourage others to enroll in graduate-level studies?

	%
[16] Very frequently	
[34] Frequently	
[37] Sometimes	n=283
[10] Seldom	
[3] Never	

13. During your employment at WES, have you ever applied for acceptance in a graduate degree program?

[34] Yes, through the Vicksburg Graduate Center
[21] Yes, through a Corps long-term training program
[6] Yes, but not through the Center or a Corps program n=282
[34] No, I have not applied to any graduate program

6 Applied thru Center and another program

14. What do you see as the greatest obstacle(s) to getting the training you need or would like? (Select two and rank: 1 = greatest obstacle, 2 = second greatest obstacle)

[4] None, there are no obstacles
[ ] None, I am not interested in any more training
*[2] Too much TDY
[ ] Cost
[ ] Personal motivation
[ ] My supervisor n=276
[5] My family situation
[ ] I can't decide what I need
*[1] Lack of available training

[ ] Not sufficiently job related to justify
[3] Other (please specify) workload, time

15. Which of the following best describes your plans or goals for further formal graduate-level education? (please check the one most appropriate box)

%

[31] I do not plan to pursue a degree, but I will probably take further graduate-level courses
[25] I plan to earn a master's degree
[26] I plan to earn a Ph.D.
[17] I have no plans or goals for further graduate-level education

n=279

16. If you knew you would be accepted in and be allowed to complete, all expenses paid, the graduate program of your choice, which program/field of study, school, and degree level would you elect? (please specify the following) See pages A44-A50.

33 programs named my choice for program/field of study

42 schools named my choice of school

MS=43%; Ph.D.=52%; Post Doc.=5% the degree I would be pursuing

n = 184

[ ] At present I don't know what my choice would be

[ ] At present I would not be interested in such an offer

17. For each degree you have earned, please list the degree, year earned, and discipline in which the degree was earned:

Degree	Year Earned	Discipline Earned In (and area of specialization if applicable)
highest degree earned:		Bachelors 44%
		Masters 38%
		Ph.D. 19%

18. Which of the following best describes where you see yourself in 5 years? (please check only the most appropriate box).

%

[2] Retired
[5] In private industry
[2] Consulting practice
[5] With another Federal agency
[0] With a state, local, or other public agency
[39] With WES and in the same position I'm in now
[35] With WES but in a different position

n=278

[3] With another Corps office
[2] Other (please specify) _____
[7] I haven't thought about it and cannot answer

C. General Information

1. What is your age? $\bar{x}$ = 36.5 Years range 22 to 73 n=279

2. What is your current GS or GM level? (If you are at the Executive Service Level, just put ES in the blank)

$\bar{x}$ = 12 range = 5 to SES n=278

3. How long have you worked at this level? $\bar{x}$ = 42 Months n=277
range = 1 month to 18 years

4. What is your occupational series OR job title?

(The series number appears on all of your personnel and pay actions; if you cannot find it or it is more convenient to you, please write in your job title instead)

Civil Engineers = 55%

_____ Series Number

OR n=276

_____ Job Title

5. How many years have you been employed at WES?

$\bar{x}$ = 9.4 Years range = <1 to 42 years n=282

6. How many years have you been employed by the Corps? n=276

$\bar{x}$ = 10.5 Years range = <1 to 45 years

7. On the average, about how often do you go on TDY?

%
[41] Once a week
[16] 2 or 3 times a month
[33] Once every 4 to 6 weeks
[26] Once every 3 months n=283
[13] Once every 6 months
[12] Once a year or less

8. On the average, about how often do you go on extended TDY (trips of 1 to 2 weeks or more)?

%
[12] At least once every 3 months
[17] At least once every 6 months n=283
[27] About once per year
[44] Less often than every year

9. What is your supervisory position status?

%	
[4]	Top-level management
[9]	Middle manager
[24]	First-line supervisor
[64]	No supervisory duties

n = 281

10. How many different job positions have you occupied for at least 1 year during the last 10 years?

%	
[32]	1
[34]	2
[21]	3
[12]	4 or more

n = 282

11. How is your work time distributed among tasks in R&D management, administration/personnel management, and application of technical knowledge and skills in research? Please indicate, in terms of percent, how your time is typically distributed among these three types of tasks.

$\bar{x}$ = 29 % of time in R&D management tasks — n = 220
range = 1 to 100%

$\bar{x}$ = 28 % of time in personnel management and/or administrative tasks — n = 226
range = 1 to 90%

$\bar{x}$ = 55 % of time in application of technical skills & knowledge to conduct research
range = 2 to 100%

12. Do you have any further comments or thoughts you would like to share?

See pages A51-A56.

Please return the completed questionnaire to Marv Vincent, OTP&P (WESEV) by 30 April 1986.

THANK YOU

Recommendations for Improving the Center

The courses in a given field do not follow a sequence and seem to be scheduled somewhat randomly and seem to be unrelated at times. (001)

Some key courses in Soil Mechanics have never been offered. Example: slope stability - foundation engineering. (001)

Offer a larger variety of courses. (002)

More information from staff on courses needed. (003)

Broader base of basics, such as basic math and engineering courses. (004)

Make sure that the WES person teaching the course has sufficient time to do so. (005)

Make more courses available. (005)

Refresher undergraduate courses. (007)

Courses tailored to specific needs of WES employees in their particular research area. (007)

Ask students what courses they need a semester before, then offer those courses. (009)

Availability of textbooks (usually out of print, etc.) has been a problem--perhaps teachers should put their notes together and hand them out as a reference or publish, since no textbooks are in print any longer. (009)

Coordinate offerings by semester so that no progress gaps occur toward degree. (010)

Require Ph.D. for instructors. (010)

Relief from TDY while taking course - very easy to fall behind the rest of the class. (012)

None seem quite satisfactory. (013)

Increase course selection. (015)

Obtain a Ph.D. program. (015)

Try to realize that even though WES is part of the Corps of Engineers that non-Engineers also work here and contribute to the work effort. (018)

Center should offer more courses in signal processing. Various labs at WES need expertise. (020)

Some additional fields of learning. (045)

In this area, few EE courses are offered. Image processing and artificial intelligence courses should also be conducted. (020)

Advance schedule of courses to be offered - course sequencing. (022)

Teach courses for geologists, geophysicists, etc. (025)

I much prefer a course in which a textbook is used. Often this is not the case for Vicksburg courses. I feel it is particularly important here because the instructors tend to be gone a lot. (027)

More advanced CS courses with TA's and graders. (030)

More mathematics courses with TA's and graders. (030)

More formal setup of areas of concentration for master's, i.e. coastal, hydraulic, environmental, etc. (037)

Courses on a regular basis from the programs listed. (037)

Offer a greater variety of courses. The present curriculum focuses on engineering. There are scientists at WES. Very few nonengineering or nonadvanced engineering courses are offered. I have taken the courses I thought pertained to my job responsibilities and background (3 courses in 18 years). (041)

Develop a class schedule so students could plan their curriculum in advance (more then just by semester). (046)

Improve quality of instructors. Some instructors have taught when their government workload did not allow proper preparation. (046)

Offer more courses in more diversified disciplines in a particular semester. (050)

I believe that bringing in other schools is a good idea. (055)

A wider course selection would improve things; hydraulics, structures, and soils have almost all the courses. (055)

Have faculty advisors in the various disciplines be available at WES once a semester for consultation. (061)

Develop programs for Ph.D. or professional development degree beyond master's. (062)

Offer more courses geared to mechanical engineers. (063)

Specify the degree program and courses required for completing the degree. (063)

Offer refresher calculus to help older students transition back to math involved in other courses. (064)

Try to encourage more university professors to participate. (065)

Replace blackboards with new versions of chalkless boards, provide better desks (others are too small). (066)

Inform people in Blast Load Generator Building quicker about courses being offered. (066)

More off-station instructors. (067)

Teach courses in morning hours when mind is fresher. (067)

Be selective on instructors. Screen for teaching ability and knowledge of subject. (068)

Offer more electives: English, language (for Ph.D. requirement), computer science, and math courses. (069)

Try to provide a way for time spent taking courses at WES to fulfill the residency requirements for a Ph.D. at MSU. (069)

Offer courses in EE and math (8000 level). (070)

When a course such as Ed Thompson's Frequency Analysis which is taught from a EE text is offered, allow it to count as EE credit so that EE's can use it in their programs (i.e. multiple course numbers when applicable). (070)

Expand course offerings in basic as well as advanced hydraulics, etc. (071)

Expand curriculum to include courses in science as well as engineering to appeal to the scientific staff. (071)

Offer more classes in water resources, groundwater, and environmental engineering. (073)

Request that WES employees who have not taught recently will teach courses in the future. (076)

Confer with Graduate Center concerning class notes. (076)

Many courses are conducted with no homework. Most courses (graduate) need some amount of assigned outside work. (077)

More course offerings, advisor visits. (080)

Improved ventilation system. (080)

Improve degree counseling. (083)

Develop a well-programmed curriculum rather than the courses available by instructors. (086)

Define the Center's objectives. (086)

Should offer one course per laboratory (too many hydraulics classes offered now). (087)

I think a pseudo correspondence-type course would be helpful. It is difficult to maintain an instructor's pace due to travel, job deadlines, etc. Perhaps "canned" courses would help. (089)

Increase breadth of course offerings. (090)

Establish budget for use of instructors in acquiring films, taking field trips, etc. (090)

I am an electronics engineer and as such would like to see more electrical engineering courses taught. (091)

Wider selection of courses to include more science and business/ management material; improve the quality of the instructors. (092)

More courses of wider areas, such as technical and management courses. (093)

I would suggest a recycling of courses, especially those in math areas. (094)

I would like to see a survey of what type of courses are wanted (long or short range). (094)

There should be immediate interaction with an advisor to plan a program outline starting with the first course or perhaps an orientation session with prospective master's candidates concerning requirements, etc. (095)

Graduate students at the Center are required to take a minimum of 9 semester hours from MSU professors. However, hardly any MSU professors come down to teach structures courses. Almost all of these courses are taught by local professors. (096)

Some sort of structural "Program of Study" should be laid out for each discipline. Something that says certain classes will be offered during certain semesters. (097)

A concentrated effort should be made to identify prospective students. On the division level, someone actively involved with the Center should be appointed to relay the sentiments of the students to the ones in charge, i.e., more points of contact need to be established. (097)

Include more geology-oriented courses. (099)

Offer courses so that one could work towards a Ph.D. (100)

It always seems that the time between the course announcement and submitting the DD 1556 is so short. I suggest announcing the courses as early as possible. (101)

Larger course selection. (104)

More qualified instructors. (104)

Send a suggestion form for classes which might be taught (not just an interest form). (106)

Make an MS program available for scientists. (109)

Offer courses such that scientists could get an undergraduate engineering degree. (109)

Wider variety of courses and workshops. (110)

New instructors from new institutions. Appreciation at many levels of technical quality of courses need to be increased. (111)

Increase the number of available courses. Take advantage of laboratory facilities on station. (114)

I would like to see more courses offered, especially mathematics, since almost anyone could use it. There should be some order, following a curriculum instead of random offerings. (116)

It would be better to have classes of shorter length more days per week. I lose some concentration at the end of a 3-hour technical seminar. Need to move AV screen so professor does not block it while using overhead projector. (119)

Raise the pay to attract instructors. Recognize that teaching a course is more important/demanding/etc., than publishing a paper. (122)

Need post-Ph.D. courses - could be practical job related courses taught by WES employees. Develop courses with teams of teachers. Where one teaches two or three weeks each, each covering a subject. (123)

Greater use of instructors having established prestige, i.e. "patriarchs" of the professions. Establish CEU credit system with appropriate offerings by visiting dignitaries. (126)

Offer more specialized courses in coastal work. Offer a wider course selection so all major fields can be represented. (127)

Start a doctoral program. (135)

More courses in math and statistics including refresher courses in calculus and D.E. (135)

Offer more variety in courses. (136)

More courses offered. Make sure classes will be scheduled twice a week (3 hours once a week is not an ideal situation). (138)

Plan course offerings several semesters ahead of time so students can plan. (142)

Not a problem with the Center, but I feel the requirements of work (homework, etc.) are too lax. With the many tasks to be done at work and home, if I am not required to do something, I find it difficult to motivate myself. However, the instructors may realize we have many tasks at work and home and therefore hold off in making assignments. (143)

I rarely receive notification of course offerings before registration. (145)

Offering additional courses in mechanical or electrical engineering. (146)

More course work in environmental engineering is needed. Personally, I need to earn credits toward a Ph.D. Flexibility is needed for individual career goals. (147)

Need more hydraulics and/or sedimentation courses. (152)

Increase course selection - soils and pavements. (158)

An advisor should be assigned for the students. (162)

Offer more courses in hydraulics and math. (165)

Offer more types of hydraulics courses. They are not offered every semester. One semester might be all structures and thus the next might have a couple of hydraulics courses. (166)

Offer a larger variety of courses. (168)

Periodically survey employees to find out course needs. Presently, we are given the option of selecting from a few courses each semester. There are courses needed with Professors available and capable of teaching the material which are never or rarely offered. (169)

Course scopes are narrow and repeated. Need more courses that cover work areas existing at WES. (171)

I wish more courses could be offered. At least one from each field of engineering per semester, plus a math or physics course. Also any morning classes would be useful. (173)

Be sure the WES employees who teach classes are highly committed to them (not absent a lot or poorly prepared). (177)

A wider selection of course offerings, electrical engineering, meteorology, and statistics. Better access to reference materials, expand the WES Library. (179)

Increase the variety of courses offered. (180)

Need more courses offered. Sometimes must wait years to get a particular course. (181)

Acquire equipment that would allow reception of live lectures from various universities. Same for taped lectures. (184)

Better method for defining course needs. Encourage more interest in MSU staff with WES students. (186)

Initiate on-station Ph.D. program. (188)

More courses. (191)

Broaden courses taught at Center to include disciplines other than civil engineering. (193)

Increase courses in the biological/ecological fields. (199)

Reduce management pressures to take courses and let individuals select their own pace. (203)

Wider variety and selection of courses. (208)

Many of the courses taught at the Center are assigned "Special Problems" course number by Mississippi State. Only two such courses may be counted for degree requirements. Organization of courses into degree-granting curricula is greatly needed. (209)

A short course format (class all day for several days) for 1-3 hr graduate credit would fit in with my work schedule better. (210)

In my opinion, the Center is operating idealistically. (211)

A broader variety of courses offered. (214)

Management science courses. (214)

Minimize the number of graduate courses that meet only once each week. Two or three shorter classes are more effective. (215)

WES instructors sometimes travel a lot and miss class. Need to set priorities and rules to minimize this shortcoming. (215)

Offer night courses, i.e., class times after 1800 hr. (217)

Offer more undergraduate courses. Junior, senior courses in other sciences such as thermodynamics, heat transfer, etc. (217)

Offer more courses in geotechnical area. (218)

Faculty should not teach when they have heavy travel requirements. (219)

Courses that are taught in two 1-1/2-hr blocks are preferable to one 3-hr/week courses. (219)

I am a little out of date on these matters, so I hesitate to respond. Only one of the four courses I took, however, was what I considered a top notch graduate-level course. What I am suggesting, I guess, is that great care be taken in selecting professors. (221)

Offer a wider course selection (most courses offered are in the structural/civil area). (222)

Do not require classes to have 10+ students before they can meet. (222)

Have a wider spectrum for courses. (223)

Expand from engineering to computer programs. (224)

Have someone available to the student to advise in the preparation for completion of the degree, i.e. required courses, library requirements for thesis, defense of thesis, time limitations, and need for a major professor. (228)

The Center here or MSU should be more helpful in laying out a check list of items to be completed to receive a degree. (229)

I feel that at times the courses are not demanding enough of the student (due to travel I suppose). (229)

Courses and restrictions. Obtain thesis advisor (adjunct Prof.). Register for thesis research. Layout of thesis. Graduate fees. Bonding fees. Orals. Procedure in general. (229)

Offer more courses in environmental engineering and other related fields. (233)

Offer more courses in general. (233)

Set up a schedule, say towards a master's degree, that people know the courses would be offered and you could actually get a degree, instead of getting half-way there and nothing else offered. (234)

Engineering/mathematics/computer technician level courses for WES technical support employees. (237)

Offer more technical courses. (238)

Addition of better colleges and universities to program such as TAMU and LSU; this is a step in the right direction. MSU and Jackson State are not likely to attract and keep the best people for long. (240)

Broader selection--as per objectives of adding other institutions. (265)

Always offer a multidisciplined course such as statistics, experimental design, math, mechanics course for everyone. (267)

Try to offer a specific course say in geotechnical, hydraulics, or structures every other course period. (267)

Offer general-based courses in electrical engineering, instrumentation, geophysics, physics (probably life science, also) for graduate credit. (269)

Increase the availability of reference material in Library; more emphasis on laboratory interaction. (269)

Wider selection of courses/programs. Some graduate geology/petrology courses. (271)

Materials courses: concrete (by Mather, Buck, etc.) asphalt (Ray Brown). (271)

Offer a wider range of graduate material, for example, remote sensing, computer analysis. (273)

Have real professors instead of WES employees trying to earn a few easy ($) dollars. (276)

If the teachers have unsatisfactory evaluations from the students, DO NOT let them teach again! (276)

More course offerings. (277)

Pay more attention to the course evaluations we are required to complete. (278)

I did not receive this survey until 20 May 1986. Unfortunately, this happens often. We do not know what courses are being taught unless we ask. (279)

Education within the government is not considered for promotion, especially for the lower GS levels (12 or below). There is little incentive to go to school and take away from other activities. Therefore, fewer people take advantage of these courses. I have a MSCE (Ph.D. expected this year) and I am presently working on a master's degree in engineering mechanics. I am doing this for personal satisfaction only. (279)

Demand WES teachers have enough time to adequately prepare for teaching. (280)

Broader spectrum of subject areas for which courses are offered. (281)

More interaction between the Center admin. and students to assist/advise toward degree completion. (281)

Several courses have been offered two to three times in last 2-3 years. Offer new courses. (283)

Do not offer several courses in one area per semester, i.e. only one EM course. (283)

Add video classroom facility (not necessarily realtime). (285)

Add physics/geophysics curriculum. (285)

Additional Comments Concerning Center

The classrooms are frequently overcrowded; under less crowded conditions, they would be excellent. (001)

Three-hour classes are too LONG! Two 90-min sessions would be better in my opinion. (001)

Formalize thesis topic project assignments; emphasize supervisory obligation to help find and assign thesis quality project. (010)

Mr. Renaud has done an excellent job with his resources. (015)

Remote sensing, geology, life sciences courses should also be made available to employees. (018)

Provide an opportunity for persons without a degree to complete requirements. (018)

Propose having separate facility/building with adequate space. (022)

I would like to see an audit policy encouraged. There are courses I sometimes would like to take but cannot because of other commitments which do not allow me to participate full time in a course. (027)

Need more CS and mathematics courses. (030)

The Center seems more oriented toward application than to theory. I would like to see more mathematics classes offered. (046)

Offering of selected undergraduate technical courses would be helpful to people in their jobs. (055)

Its existence is a primary reason I wanted to work at WES. (061)

I have taken three courses at the R&D Center in Jackson. In several of these courses most of the students were from WES. I think they should have been given in Vicksburg. (069)

The Center has become more open to the needs of the entire WES engineering community, a complete reversal of their previous stand (when I submitted a suggestion that they offer EE courses) that they did not think there was enough interest to offer any EE courses. I am happy to see this and hope that this interest in other engineering disciplines will continue. (070)

Survey existing staff for areas of expertise and courses they would like to take/teach. (071)

Offer short courses (2-3 weeks; intensive, such as 3-4 times weekly in afternoons) bringing recognized experts on station. (071)

Have classes taught twice a week for 1-1/2 hr instead of 3 hr straight. (073)

Has been good for additional education but does not make it much easier to get. (080)

Advanced degrees due to course offerings and lack of advisor/ administration involvement. (080)

I strongly believe that the Center should be used to retrain the WES engineers and scientists as well as to provide a degree program to young professionals. (086)

Offer a course in numerical analysis. (091)

Offer a course in digital signal processing. (091)

Day courses in early morning would be nice. (093)

More consideration to class site could alleviate persons getting "bumped" from classes. (095)

Linda Warnock has always been extremely helpful with any problems I had concerning the Vicksburg Center. She does her job well. (101)

I strongly advise our young engineers to take graduate courses for their personal satisfaction and professional development - not for the nonexistent peer acceptance or promotion capability. (111)

It would be helpful to have graduate catalogs available and someone to answer questions about requirements. (116)

Need coffee machine, better parking, and better parking lot lighting for late classes. (119)

MSU may drop the Center. Should take action soon to involve more universities. (122)

The Center has always met my needs. The expanded concept is a great step forward. (126)

Offer more classes of the same subject if demand exists. Parking at classrooms is too limited. (127)

An excellent program. (135)

I truly enjoyed the opportunity to learn in such a convenient and cheap (for me) location. (143)

The course selection in hydraulics and environmental areas has been good but the summer 1986 selection was not. The selection in Jackson [illegible] is good and most of the students will probably come from WES. (144)

The opportunity for continued education is a major drawing card for WES. Our research programs will always need bright, young scientists and engineers who are willing to come up through the ranks. Without a continuing education program, our ability to recruit and keep self-motivated, entry level people will suffer. The reason I have stayed on at WES is because I hope to continue my education. I know this is true for others also. (147)

Taking one class at a time, it can be difficult to complete enough course work in 6 years to get a master's. There seems to be no guarantee from one semester to the next that a class will be offered in my respective field of study. (164)

There are many physicists on the station. How about courses for them? (177)

I took one course (fall 80) using the "magic blackboard" via phone hookup to a professor in Starkville. I did not like it--it was hard to communicate. (210)

I would strongly like to see more environmental courses offered. (211)

Might tap the pool of retirees in the area. Lots of good experience and knowledge out there not being shared with students. Check on some of them as instructors. They sure would be present for every class. (215)

Overall, I think it is a very good program. (218)

Add more electrical engineering courses and also courses in applied mathematics and physics. (223)

I think it is a very important part of the whole picture that makes WES an excellent place to work. These courses keep us, the researchers, in tune with the educators. A very <u>important</u> relationship. (233)

Would like to see a nonthesis master's degree in engineering mechanics. (237)

Offer courses to lead to an undergraduate degree here on base (technical, engineering). (238)

Courses in coastal engineering, mathematics, statistics with experts in field while on sabbatical at WES. (240)

Not necessary to have courses in degree program. Many who already have advanced degrees interested in continuing development and improvement. (240)

Generally a good program. We are lucky to have such a program in Vicksburg. (243)

I would like see the Center expanded to offer more courses and Ph.D.'s. (244)

Shape long-term schedule to meet needs of students for job skill improvement and to meet requirements for advanced degrees. (251)

Get some soils and geotechnical classes, please. (257)

Attach some significance to getting a promotion. Recognize people earning degrees. Cash award, certificate of appreciation. (261)

It has raised the technical qualifications/quality of WES. This increase in technical quality has been noticed by other agencies that deal with WES. (265)

Since the courses are free, I think participation should be strongly encouraged for non-master's professionals. (Reviewed for consideration for GS 13). (267)

The Vicksburg Center offers an excellent opportunity for professional development for a cost of nothing more than a little time by the individual. (267)

Presence of Center is excellent; courses tend to be intensive in "narrow areas." Some "general courses" would be good. (269)

Need to encourage more qualified people to teach classes. (275)

Try to bring in instructors from outside WES (instructors from various universities) to teach classes. (275)

Two out of the three classes I took were just awful. The teachers were not prepared, and consequently only part of the material was covered. My biggest complaint is that the courses were not taught at graduate levels; I learned more in my undergraduate classes. (276)

Twice I have had the misfortune of taking a class taught by a particular "professor" who regularly came to class unprepared, put off grading homework until it was too late to do any good, and, in general, could not care less about the subject matter or his students. The last class was dropped by myself and a significant percentage (perhaps half) of the other students and yet this "professor" continues to teach the course. Have the evaluations been ignored? It is a class I would like to take but cannot justify the waste of time it has proven to be under this professor. (277)

The graduate program is geared towards BSCE, obtaining their master's degree. There are a lot of engineers on station (majority?) who have advanced degrees and would welcome the opportunity to further specialize (math, applied physics, computer science, etc.). For example, I have taken two math courses in Jackson and in both of those classes six to ten engineers from WES drove over there, usually at their own expense. Why aren't more specialized classes taught for those of us who are interested in professional development? I have talked to Personnel-Training about offering more math, computers, etc., yet, they offer the same courses. Why not offer master's degree programs in computer science, math, applied physics, etc.? At least see if an interest is there. (279)

I have seen little evidence that promotion is significantly affected by purely technical competence at the higher grade levels. This impacts on motivation to use the VGC facilities. (285)

Notify prospective students early on if the class will not be offered (this would give opportunity to sign up in Jackson). Offer more classes with university professors. (164)

Unexpected Bonuses to Long-Term Training

Brought finite differential stress wave propagation in earth materials business to WES in a big way. (012)

Professional and social contacts established on long-term training. (013)

Leadership in technical societies. (024)

Promotion. (044)

Better promotional potential; more direct job application than I had anticipated. (070)

Only time in my life I saved money. (089)

Prevented job burn-out. (090)

Expanded the potential of family members by allowing them to move and associate with another area and persons. (093)

Diversified my background; had MS in physics and earned MS in environmental engineering while on long-term training. (109)

The Ph.D. degree is still regarded highly outside of WES. (111)

The professional contacts with professors/students. The satisfaction of performing the class work - a highly focused job of set time constraints. (123)

Professional recognition, Corps-wide recognition, promotion and job opportunities in Corps, profound effect on career and professional status. (126)

Opportunities for broadening career field. (129)

Professional contacts in university and with other Corps employees on program. (139)

Financial gain per diem benefits were generous. (140)

I thought that my long-term training would lead to a MS degree in civil engineering, and that along the way I would develop skills and abilities that would enable me to do a better job. Overall, I hoped to be happier with myself and my job. The unexpected bonus was a reorientation of my thinking and approach from one of blind empiricism to fundamentals and governing principles. This has had a significant positive impact on my understanding of governing principles, which in turn has improved my professional reputation within and outside WES. (147)

Personal contacts with authorities in civil engineering. (157)

Broaden acquaintances with professional people of other countries and cultures. (163)

Best year of my life to date. Broaden horizons beyond belief--Renaissance. (181)

When you are gone for a year, you are virtually passed over by others remaining behind; also, long-term training is looked at as a giant reward and used against you for evaluations, etc. "I cannot give everybody a...rating and since you went to long-term training and...did not and has worked equally hard, I am giving it to him." (200)

Direct application to ongoing work. (201)

Long-term contacts with faculty and students. (208)

My family enjoyed a year in Colorado. (210)

Additional professional contacts, better able to recruit employees from that school. (214)

Got back into academic atmosphere and redeveloped study skills. (230)

Financial benefits were helpful. (242)

The main bonuses were from the professional relationships I developed with the professors at the school and confidence in myself in being able to perform at that level. (244)

Opportunity to work in another world-renounced hydraulics lab. World-wide professional contacts. (250)

Extended absence from the job allowed me to critically examine WES, my position, and the work we do from a fresh, more objective perspective, particularly when trying to apply the stuff I was learning to my position/assignments at WES. (252)

The pleasure of studying a new field of endeavor. (259)

Improved my reputation nationally and internationally. (267)

Exposure to laser physics applications--when emphasis of training was on geophysics. (269)

Broadened promotion outlook considerably. (271)

Reordered priorities, motivated to further study due to feeling that I had lost stature in my field. (285)

Aspects of Long-Term Training That Trainees Would Change if They Had It to Do Over

As regards to degree requirements, I would avoid the foreign language requirement, but not as the sole reason to avoid my specific institution. (013)

I probably would be more "degree" oriented. At the time, I was more interested in taking courses than pursuing a degree. (027)

I only had two semesters approved. This contributed to the inordinate amount of time required to complete course work, project, and thesis for graduation. Full year needed. (044)

I would not change anything in regard to the potential my training has for the Corps. (051)

The long-term training program is fantastic, it has benefited both the Government and myself much more than the cost and lost time. (070)

No change. (077)

Courses taken were not ones that are of concern to my job--to a great degree. (093)

Time to get advanced degree. (110)

I attended Texas A&M Univ. and can think of no positive manner to improve this fine University. (111)

A 2-year period to allow a 1-year start on research topic and dissertation. This year could also be taken at WES. (124)

It should have been a degree program (MS). (126)

Not have a WES contractor on graduate committee. (135)

I would change some of the course work. (147)

Both the institution and the courses. (155)

I would choose an institution such as my old alma mater - I feel I was coached by my supervisor to attend a school in which I was unable to complete my master's degree. If I had attended graduate school at my alma mater, I feel I would have completed my master's. (163)

I would change institutions; the school I attended required an extremely heavy course load for all three semesters. I would now choose a school that allowed the summer semester to be used to conduct a literature review and prepare proposals. (180)

It is very difficult to complete dissertation upon returning to WES. Reason: either the job must suffer or the dissertation must suffer. I must support a family, so dissertation must suffer. (181)

I would change some courses and tailor them more to what I am doing now. That would be difficult without hindsight. (200)

Too many hours per semester are needed to complete requirements in a 1-year program. (201)

I would attend the same school where I received my MS and would pursue a degree in the same discipline as my MS. Changing schools and disciplines at the Ph.D. level was, in retrospect, unadvised. (210)

I would not pursue the degree. Tremendous amount of stress and effort to achieve something that has no positive effect on the job. (212)

No changes. (218)

Although not a requirement, I think the program should be adjusted to enable the employee to receive a degree. It improves satisfaction in the program and would boost its potential to the Corps. I have been so busy since I returned to WES that the only time I can spend on my dissertation is at home and after hours. (227)

Would change some courses. (242)

I was very satisfied with the program. (244)

Cannot think of anything. It was great. (252)

Institution. (254)

I would push my supervisors much much harder to get that degree. (259)

None. (265)

After completion of research for dissertation, I would have liked to have my supervisors remove all administrative requirements (progress reports, line item reviews, COEMIS problems, Appendix I's), so I could complete the dissertation. (267)

I might select a larger school where a strong combination of geophysics, optical physics, and electrical engineering expertise would be co-located. (269)

Better job selecting dissertation topic/work load. (271)

Ignore issue of formed acceptance in graduate school; choose school for curriculum. Not seek advice of departmental advisors; make own schedule. Take some refresher courses (noncredit) at junior/senior level. Establish relation with department before going, through work. (285)

Additional Comments on Long-Term Training

I have never worked harder in my life. My family life was nil. You can imagine my opinion of BS degree supervisors who consider it a year's paid vacation. The mentality lives! (010)

The present practice of the Government: (1) paying thesis in absentia tuition is extravagant. The Government gets no real benefit. The practice of allowing the student to choose TDY or PCS (whichever is more economically beneficial to the student) is extravagant. The individual who is selected for long-term training gets a $40 to 50K perk as it is without these extra little goodies and I think they should be taken away. (012)

I would repeat the experience immediately if given the opportunity, and I highly recommend the program to qualified individuals. (013)

Let people know as far ahead of time that they are going. I had three weeks. (034)

It was a refreshing change of pace. (044)

Very good experience. (045)

I have not realized any benefits from the Corps for the time I put into my long-term training (40 hr/week). The response I received when I returned is that it was good for me to be back and it is good for the Corps that the education is there if needed.

Change commitment from 3 to 5 years to reduce number of people who train and then leave 3 years later. (077)

Pick an institution which is set up toward a degree for the year's work without return requirements. (083)

Difficult but fulfilling. (085)

Students should be notified of acceptance earlier. Additional stay-over for one semester at institutions should be available if necessary. (093)

I would recommend to any intelligent engineer or others from a standpoint of improved capabilities. (111)

Work hard but also enjoyed the college activities (which Vicksburg does not provide)!!! (123)

Needs more support and concern from WES as far as completion of advanced studies. When I returned I had more work and projects to be accomplished and was not given the time nor the opportunity to complete my requirements. WES verbal and actual commitments are two entirely different things. (124)

The impact on my career has been of immeasurable value. (126)

Strongly support the program and encourage others to participate. A real benefit for the individual and the Corps! (129)

Great program. A major reason I remained at WES. (140)

I cannot overemphasize what long-term training has meant to me. Career-wise, I cannot imagine a more positive step for me to make. (147)

Long-term training could be better utilized if the participants were chosen a year in advance and given that lead time to organize their program, work with advisor, begin literature reviews, etc. (155)

The candidate applying for long-term training should be required to state the university he will attend and course of study he will pursue. (157)

I would do it again! (200)

I would recommend it to others. (201)

Ph.D. programs tend to train people for performing research that is more basic ("pure" research) rather than the type of applied research and consulting we spend so much of our time on here at WES. Also, most engineers and scientists at WES above the GS 11 level (in my experience) spend as much or more time with management and administration than technical work. We have a "catch 22" that is endemic to the engineering profession--go off on long-term training, pursue a Ph.D., and become technically competent so you can get your GS 13 and become a manager. (210)

WES should shoulder costs of continuing enrollment during pursuit of degree. Supervisors should be supportive of the requirements of degree-seekers. Aggressive pursuit of degree should be viewed as indicative of the dedication of the employee; instead, it is seen as a "perk" that removes one from eligibility for performance awards, promotion, etc. (212)

Hard work but definitely worth the experience. (218)

Twice, I have gone back to school for 2-year periods--once in connection with job activities and once in connection with long-term training. In both cases, I was assigned to positions closely related to the long-term training upon my return. This seems like a major oversight in resources if it's a common practice. Follow-ups should be made in all cases to ensure that training is put to full use. (221)

I think if the training is to be designed to improve the employee's responsibilities, his job at WES, time should be programmed to ensure that a degree will be earned as part of the training. (227)

I feel a sense of gratitude to the Government and more loyalty to the Corps. (230)

A great opportunity for the individuals of substantial benefit to the Corps when employees remain for the remainder of their career. (242)

Dr. Radha was extremely supportive and helpful [illegible] the long-term training and in conducting the research on my return. This is extremely important t my high satisfaction in the program. [illegible]

It was the most important decision I have made in developing my professional career. [illegible]

Long-term training is a gift worth about $[illegible] at least that benefits the individual and the Corps. Individuals should line up for this opportunity since we at WPS are among the privileged few within the government with this opportunity. [illegible]

It may be an idealistic view, but long-term training is not for pursuit of degrees--these credentials should be to the individual's benefit and pursuit, with liberal government granting of leave without pay. Make the course selection fit future job assignments with agreed upon responsibilities. [illegible]

This was particularly difficult for physics as there is little contact with the physics department at WPS. [illegible]

Dream Program

(Graduate Programs and Institutions Named If Respondee Had Choice to Go Anywhere, No Restrictions)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Civil Engineering, No Specialization Named	20	1	10	8	1	MS: Colorado State (1), Georgia Tech. (1), Mississippi State (7), Texas A&M (1) Ph.D.: California Tech. (1), Colorado State (1), Cornell (1), Georgia Tech. (2), Texas A&M (1), Don't Know (2) Post. Doc.: Univ. Dundee (1), Don't Know (1)
Hydraulic Engineering	19	3	5	11	0	MS: Louisiana State (2), Mississippi State (1), Univ. Iowa (1), Don't Know (1) Ph.D.: Colorado State (5), Massachusetts Inst. Tech. (1), Texas A&M (1), Univ. Iowa (1), Univ. Minnesota (1), Don't Know (2) Don't Know Degree: Mississippi State (1), Univ. Southern Calif. (1), Iowa State (1)

(Continued)

Dream Program (Continued)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Business, Management	13	1	10	2	0	MBA: Harvard (5), Stanford (2), Don't Know (1) MS: Louisiana State (1), Georgia Tech. (1) Ph.D.: Harvard (1), Massachusetts Inst. Tech. (1), Don't Know (1)
Structural Engineering	12	0	6	5	1	MS: Mississippi State (1), Don't Know (4), Texas A&M (1) Ph.D.: Oklahoma State (1), Univ. Illinois (1), Univ. Texas (2), Don't Know (1) Post. Doc.: Univ. Texas (1)
Electrical Engineering	8	0	4	4	0	MS: Mississippi State (3), Univ. Texas (1) Ph.D.: Louisiana State (1), Mississippi State (3)

(Continued)

Dream Program (Continued)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Environmental Engineering	8	1	3	3	1	MS: Louisiana State (1), Texas A&M (1) Ph.D.: Mississippi State (1), Princeton (1), Univ. Texas (1) Post. Doc.: Cornell (1) None: Colorado State (1)
Geotechnical Engineering	18	1	5	10	2	MS: Massachusetts Inst. Tech. (1) Texas A&M (2), Mississippi State (1), Univ. Texas (1) Ph.D.: Purdue (1), Univ. Calif., Berkeley (1), Massachusetts Inst. Tech. (1), Univ. Colorado (1), Virginia Polytechnic (2), Cambridge (1), Texas A&M (1), Univ. Texas (1), Univ. Calif., LA (1) Post. Doc.: Univ. Calif. (1), Mixture of Schools (1), Don't Know

(Continued)

Dream Program (Continued)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Coastal Engineering	17	0	7	9	1	MS: Texas A&M (2), Univ. Delaware (1), Univ. Florida (2), Don't Know (1), Oregon State (1) Ph.D.: Univ. Calif., Berkelev (1), Univ. Florida (4), Don't Know (4) Post. Doc.: Univ. Svdnev (1)
Computer Science	13	1	9	3	0	MS: Carnegie Mellon (1), Colorado State (1), Louisiana State (1) Mississippi State (1), Texas A&M (1), Univ. Southern Miss. (2), Don't Know (2) Ph.D.: Georgia Tech. (1), Massachusetts Inst. Tech. (1), Univ. Southern Calif. (1) Don't Know (1)
Engineering Mechanics	7	0	3	4	0	MS: Mississippi State (1), Don't Know (2) Ph.D.: Mississippi State (1), Stanford (1), Univ. Texas (1), Virginia Polytech (1)

(Continued)

(Sheet 4 of 7)

Dream Program (continued)

Area of Study	Total No.	None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Ecology	4			3	1	MS: Colorado School of Mines (1), Texas A&M (1) Ph.D.: Univ. Calif. - Berkeley (1), Don't Know (1), Stanford (1)
Physics	3	1	1	1		MS: Mississippi College (1) Ph.D.: Texas A&M (1), Don't Know (1)
Water Resources Engineering	3	0	1	3	1	MS: Colorado State (1) Ph.D.: Colorado State (1), Stanford (1)
Remote Sensing	3	0	0	3	1	Ph.D.: Johns Hopkins (1), Don't Know (2)
Geophysics	4	1	2	0	1	MS: Colorado School of Mines (2), Don't Know (1), Colorado School of Mines (1)
Mathematics	3	0	0	2	1	Ph.D.: Univ. Minnesota (1), Mississippi State (1) Post. Doc.: Univ. Florida (1)

(continued)

(Sheet 3 of 3)

Dream Program (Continued)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Meteorology	3	0	1	1	0	MS: Florida State (1) Ph.D.: Texas A&M (1)
Marine Science	3	1	1	1	0	MS: Florida State (1) Ph.D.: Don't Know (1) Don't Know Degree: Louisiana State (1)
Aquatic Ecology, Fisheries Biology	2	0	0	2	0	Ph.D.: Univ. Florida (1), Univ. Arkansas (1)
Chemical Engineering	2	0	1	1	0	MS: Univ. Mississippi (1) Ph.D.: Louisiana State (1)
Coastal Geology/Processes	2			1	1	Ph.D.: Louisiana State (1) Post. Doc.: Dalhousie (1)
Engineering Geology	2	1	1	0	0	MS: Univ. Mississippi (1) Don't Know Degree: Texas A&M (1)
Engineering Management	2		1	1		MS: Vanderbilt (1) Ph.D.: Don't Know (1)

(Continued)

Dream Program (Concluded)

Area of Study	Total No.	Number by Degree: None, Don't Know	MS	Ph.D.	Post. Doc.	Institutions
Mechanical Engineering	2	1		1		Ph.D.: Don't Know (1)
						Don't Know Degree: (1)
Public Administration	2		1	1		MPA: Texas A&M (1)
						Ph.D.: Harvard (1)
River Engineering	2			2		Ph.D.: Univ. Iowa (2)
Construction Engineering	1		1			Don't Know School: (1)
Hydrology	1			1		Ph.D.: Univ. Arizona (1)
Material Science	1		1			Don't Know School: (1)
Natural Resource	1		1			MAG: Clemson (1)
Oceanography	1			1		Ph.D.: Texas A&M (1)
Recreation, Resource Econ.	1			1		Ph.D.: Virginia Polytech (1)
Wildlife Ecology	1			1		Ph.D.: Colorado State (1)
Can't Name Area	2	—	1	1	—	
Total	189	12	79	90	8	42 Institutions

Further Comments

I also feel a few business management courses would be warranted. WES engineers typically are responsible for managing and organizing projects worth many thousands of dollars. Proper organization and management will lead to more effective use of resources available. (001)

I also feel that a graduate program in engineering or other technical fields should include courses in the humanities. I feel this is important because engineers should have some kind of an idea of the impact technology has on the society in which they live. (001)

Requiring a course for scientists every 3 years is a conflict of IDP. It should not be required. (004)

I would like to stress that a person with a terminal degree (Ph.D.) has not reached the end of the learning process, and that Graduate Center course offerings should not be limited to degree programs. (006)

As long as an advanced degree is only affecting promotion of GS employees while BS degree persons are promoted in the GM ladder, you have a basic leadership problem - a double standard! I have been a supervisor of two branches - I speak with some authority. (010)

I strongly agree that schools other than MSU should be included in the Center. The same classes are always available, so varied curricula would help. Also, MSU is not what I consider a top engineering school, and even though it does not hold me back from taking classes, the standing of a school like Texas A&M would definitely increase the "credibility" of those who do. (011)

The most important thing I do is critically review other people's technical reports. To do this well I cannot know too much about the subject areas covered by my laboratory. Must keep learning to stay ahead or equal to the authors. (012)

Dr. Whalin, I feel the selection for long-term training should be competitive within the Laboratories. It should not be based on political factors, such as what Division you work in. The best qualified person in the Laboratory should go. (015)

Would reconsider use of Texas A&M and their "production-line" systems of conferring Ph.D. degrees. (022)

It would be interesting to see who is doing the most of what WES is noted for. It is not our Ph.D. who soon get caught-in-the-updraft and into management where their technical impact is minimal. For God's sake, let's don't turn WES into a University! We are noted for getting the job done, not study and analysis of "the problem" (like CERL?). (035)

This form asked questions for prospective students, not prospective teachers. So some questions were not applicable, or the results misleading. There may be interest in the Institute, but not as a student. (036)

I would like to see a systematic program leading to a master's degree in each area of specialization at WES. Also courses to meet special needs of people who already have advanced degrees. (037)

TDY is my biggest obstacle to taking courses. I would welcome any plan that could accommodate people in this same position. Computer science courses, math courses up through calculus including "refresher" courses to bring me up to a level where I can begin to take graduate courses in civil engineering should be offered. (038)

Basic engineering courses for nonengineers (nongraduate-level engineering, e.g. strength of material, etc.) Purpose is not to make engineers out of nonengineers, but to enable engineers and nonengineers to communicate and work together more efficiently. (041)

I realize this is directed toward the Vicksburg Center, but your data base might want to consider the fact that I have taken four courses from the Jackson Engineering Center because I cannot get the equivalent here. (043)

Expanding the Center is a good idea, but unless Ph.D. level training becomes available, I probably would not take advantage of it in the near future. (046)

Current computer science courses sponsored by JSU have proven to be on old technology, poorly taught, poorly supported administratively, and from an office headed by a professional without Ph.D. status. This technology is therefore lacking at WES. (048)

Pursuing a degree is only meaningful and worthwhile if it is offered by a "reputable" university. WES is recognized as an "outstanding" R&D organization, and should offer graduate degrees from universities that could attract and maintain its staff. (049)

Training is helpful but I am told, from supervision, that it does not add to promotion potential in my current job location. (049)

The Graduate Center is excellent for young engineers and scientists plus technical specialists. For middle/upper level management, it must be voluntary unless 50-75% of administrative red tape is eliminated (noble idea, but probably undoable). (057)

Manpower needs are not being met, making it harder to concentrate on professional development. (065)

How long I continue to work at WES is proportionate to how available EE courses are at WES or Jackson. I think some undergraduate courses could be a great help as refresher courses or to help many of our technicians get their BS. (069)

I am very pleased that a more diversified training program at WES is being explored; I feel this will benefit present employees as well as pave the way for hiring future employees. (070)

Would like to see another school offering classes at Center along with MSU. (073)

I have not applied for acceptance in a graduate degree program even though that is my goal because I am at the mercy of the courses that are eventually offered. (076)

Applied for ILIR study to complete dissertation but was denied--very discouraging! (079)

I have enjoyed and gained from the Graduate Center but I am not actively pursuing advanced degrees. If they happen as a result of the courses taken, then so much the better. (080)

Short courses offered by the US Fish and Wildlife Service in conjunction with Colorado State University and the Fishery Academy have been extremely helpful in improving my technical competence. (081)

Responsibilities as team leader too demanding to allow pursuit of degree program! (085)

The Center is a great asset to WES. It should not only be a degree-program-oriented training Center. It should provide a continuing education to engineers and scientists who have left school a long time ago. (086)

I am glad to see this survey. (087)

I feel more electrical engineering courses should be offered. I also think more math courses should be offered. In particular, I would like to see a numerical analysis course and a digital signal processing course offered. (091)

The options for long-term training should be more diversified (i.e. more semester appointments). Consequently, the requirements could be less stringent for some options. (095)

I think there would be a lot of interest from the District personnel also. (099)

Ph.D. programs do not seem to be considered. I already have my master's; there is no assistance in getting a Ph.D. (100)

I would like to see more projects in the field as part of my professional development program. (105)

Yes, in order to utilize gained knowledge, you must ensure that supervisors are all well trained. Select your supervisors from among those who are technically up to speed, and <u>not</u> from those who did not pursue anything technically. (107)

Needs of scientists should be included in long range plans for Center. (109)

Attainment of advanced degrees has been of little value for my professional advancement at WES. Perhaps upon retirement in the future, and, in a different work environment, there may be a better pay off for the amount of work, time, and sweat invested. (112)

Enthusiastically encourage the development/expansion of the Vicksburg Center. (114)

No, but I really appreciate your interest. (116)

We are in desperate need of trained numerical modelers. My workload is amplified by others in my division not being able to complete their work due to technical inadequacies. (119)

I am an instructor. You need another questionnaire to cover the needs, desires, etc., of instructors which are largely ignored herein. (122)

The percentage of time devoted to administration has dramatically increased in last 3 years to a disgraceful level. This is a real waste! (126)

Strongly support the Center and would like to see it expanded to include public administration and environmental courses. Would be a good supplement to long-term training. Could get some courses done at WES and take full advantage of one year on campus. (129)

The tendency to pile work on the more competent employees can burn an engineer/scientist out. I feel squeezed to produce here. (130)

Potential Problem: If courses are offered outside of engineering (e.g. in recreation), there are no Library facilities nearby to support them. LSU is closest land grant college with Library resources. This is the problem I have now in trying to complete my master's. Lack of available resources. (131)

A resident Ph.D. program would be most desirable from my point of view. (136)

I prefer to have personal computers that are available to other engineers. It is not fair the personal computers should be available to operate without going into someone's office. (146)

The continued interest in upgrading the technical expertise at WES through academic programs is very encouraging. (147)

The key to success for the Center is broadening the scope of the program by moving into nonengineering fields. (149)

Did not include professional development assignments which are important to advancement. (151)

This seems to address engineers only. There are numerous other professions at WES, i.e. biologist, chemist, physicist, computer scientist, geologist, etc. I would like to see training opportunities in these areas also at both graduate and undergraduate levels. (159)

Graduate programs at WES should be expanded to include Ph.D. level work which would apply to resident requirements. (167)

This is very important! I am glad to see management give it some time. (177)

Yes, my answer to 11 above is unfortunate. My major skills are in research, but due to the present system, I am required to spend too much time on R&D management and personnel management. (179)

The Vicksburg Graduate Center is very important to WES and the program should be expanded. I support my employees' use of the Center, even though for my own technical educational needs I rely on independent study. In particular, the degree programs should be examined to meet the needs of those in scientific disciplines such as the earth sciences. (Item 14) TDY and course schedule conflicts are often a problem to engineers and scientists whose work involves much field work. (198)

Graduate-level classes need to be interrelated. Higher level courses should build on lower level courses dealing with the same and similar topics. This structure has rarely been present in past offerings. (209)

Yes, I think for the long-term training program that applicants ought to be interviewed and informed by February or March if they are chosen. Those who are not chosen for long-term training (WES or OCE) ought to be given an established order so that applicants can know when in the future they can expect to be chosen. (217)

I believe costs of graduate-level training should be shared between WES or the Corps and the student. Presently, it is too much of a giveaway. Cost-sharing would sort out those with genuine interests. Also a policy on student time should be spelled out, i.e. are class times to be on good time, student time, or shared? (221)

I am satisfied with my goals and job description; however, I do not experience these goals or job. (224)

Perhaps refresher engineering courses on the undergraduate level could be considered. Also undergraduate courses which may serve as prerequisites of graduate courses. (225)

The selection process for long-term training is very poor; it generates considerable frustration throughout the laboratory. There needs to be a definite system by which the selection is made. When someone applies and is not selected, the Laboratory Chief should discuss with him in person why he was not selected and at what point in the future he should logically expect to be accepted if he improves these areas. The criteria should include class performance if the classes are in the WES Center. The teachers should be asked

about the student's performance. This would cause students to be more serious about the classes, and we would not be sending employees on long-term training who are poor students. (229)

I think that a Graduate program will benefit WES by keeping its engineers and scientists on the "cutting edge" of technology and allow WES employees to expand themselves and WES and not let anyone become stagnant. (233)

Definitely step in right direction adding TAMU and LSU. Need to pursue others as well. Need more than 1 year to complete graduate training at better universities. Try to get best schools in respective fields of science and engineering. (240)

Make sure course instructors are "qualified" to teach. Certain courses have been a waste of time and money. (257)

At upper GS levels, there is, and can be expected, significant management overhead, but we must insist that these upper GS's stay in contact with the academic/research environment--but "time" is a problem. (269)

I think offering a broader spectrum of classes through several universities is an excellent idea. This would also allow the ambitious students (engineers) who cannot leave Vicksburg for family reasons an opportunity to obtain graduate degrees in other than civil engineering. I have heard rumors about a Ph.D. program along similar guidelines as the master's degree. This would provide a lot of opportunities that are not presently available to WES employees. (279)

What about combining the WES and Jackson campus into one office. This office could be partially funded by the state and WES. (279)

Good luck. (284)

Fields the Center Should Consider in Expanding Its Degree Programs

(Tabulation of 285 Responses)

Biological Sciences

Fisheries Biology
Wildlife Biology (2)
Biological Sciences (8)
Zoology
Botany

Business, Management

Business Management
Business Administration
Business and Accounting
Management Science
Management, Bas

Chemistry

Computer Science

Computer Science
Including
Computer Science, Mi
Information Processing
Computer Programming
Computer
Computer Science Mathematics
Computer
Computer

Ecology, Environmental

Wildlife Management
Environmental
Applied

Engineering

Chemical Engineering
Coastal or Ocean Engineering (35)
Computer Engineering (4)
Construction Engineering
Electrical/Electronic Engineering (25)
Environmental Engineering (21)
General Engineering
Engineering Geology (7)
Geological Engineering (3)
Geotechnical Engineering (4)
Hydraulic Engineering (2)
Sedimentation Engineering
Industrial Engineering
Materials Engineering (2)
Engineering Mechanics (4)
Mechanical Engineering (11)
Applied Mechanics
Engineering Management (4)
Structural Engineering (4)
Water Resources Engineering

Geology

Geology (11)
Sedimentology
Coastal Geology
Hydrogeology
Marine Geology

[illegible]

[illegible]

Remote Sensing (2)

Statistics (and Experimental Design) (10)

Courses that Respondees Would be Interested in Taking if Offered at the Institute

(Tabulation of 285 Responses)

Acoustics Related to Earth Sciences
Advanced Engineering Mathematics
Analysis and Measurement of Random Data
Applied Complex Variables (2)
Applied Mathematics
Artificial Intelligence (3)
Asphalt Materials
Beach Processes
Benthic Ecology
Bioengineering
Botany
Boundary Elements
Boundary Layer Theory (atmosphere & ocean)
Business and Management (3)
Calculus (2)
Chemistry, Analytical/Physical
Chemodynamics: Fate of Chem in the Environment (LSU) (3)
Climatology
Closed Conduits
Conversational Italian
Coastal Courses (specialized)
Coastal Engineering (7)
Coastal Engineering, Intro To
Coastal Erosion Control
Coastal Morphology
Coastal Numerical and Physical Models
Coastal Processes
Coastal Sediment Transport (3)
Coastal Sedimentation
Coastal Structure Design
Coastal Structures
Coastal Structures, Planning and Design Of
Communication Skills
Compressible - Incompressible Fluid Flow
Computational Hydraulics (1)
Computer Engineering
Computer Graphics
Computer Languages
Computer Programming
Computer Programming for Structural Engineers
Computer Programming in ADA Language
Computer Programming in Basic (2)
Computer Programming in Basic, Advanced
Computer Programming in Fortran - Advanced (3)
Computer Programming (other than Basic and Fortran)

Note: Numbers in parentheses indicate number of responses greater than 1.

Computer Programming - Fortran (3)
Computer Programming in C - Language (4)
Computer Programming in Pascal (2)
Computer Science (18)
Computer Science (compilers)
Computer Science - Graphics Programming
Computer Science - Image Processing
Computer Science - Numerical Methodology
Computer Science - Principles of ADP
Computer Technology (PC oriented)
Computers
Computers (scientific PC use)
Computers, Engineers Use/Misuse
Computer Techniques for Solving Engineering Problems
Computers, Personal (2)
Concrete
Concrete Materials
Constitutive Mooring in Geotechnical Engineering (2)
Construction Management
Construction Management, Law and Surveying
Contract Specification Law
Current Engineering Issues (seminar civil, hydr, struc, soils)
Differential Equations (4)
Digital Electronics
Digital Remote Sensing
Digital Signal Processing (3)
Digital Signal Processing, Advanced
Dutch
Dynamics
Dynamics of Offshore Structures
Earth Sciences
Earth Structures - Stability, Analysis, Design (2)
Earthquake Engineering (2)
Earthquake Seismology
Ecological Modeling
Ecology, Advanced
Ecology, Marine Invertebrate
Ecology, Numerical
Economics
Economics of Natural Resources (2)
Economics, Basic
Elastic Stability
Elasticity Theory (4)
Electrical Engineering (3)
Electromagnetics for Radar Applications
Electronics (2)
Employee Management
Energy Methods (2)
Engineering Administration
Engineering Decision Making
Engineering Design
Engineering Economy

Engineering Geology (3)
Engineering Geology, Advanced
Engineering Geology, Intermediate
Engineering Management (5)
Engineering Mechanics (2)
Engineering Mechanics - Structures
Engineering Seismology (2)
English Composition
English Grammar
Environmental Science
Environmental Chemistry
Environmental Courses
Environmental Engineering
Environmental Impact Assessment
Environmental Law/Policy (3)
Environmental Related Courses
Error Correcting Digital Codes (2)
Experimental Design (5)
Experimental Stress Analysis
Expert Systems (knowledge engineering) (2)
Farm Pond Management
Feedback Control Systems II
Finite Element Analysis in Structural Engineering
Finite Elements for Reinforced Concrete Structures
Finite Elements, Advanced
Fisheries Biology (2)
Fisheries Management
Fluid Dynamics, Advanced (2)
Fluid Flow
Fluid Mechanics
Fluid Mechanics (refresher courses)
Fluid Mechanics Theoretical
Fluvial Geomorphology (2)
Foreign Languages
Foundation Engineering (2)
Foundation/Structure Treatment (Repair)
Fourier Series
Fracture Mechanics
French (2)
Geo Info Sys Data Base (construction/maint/use) (3)
Geochemistry
Geohydraulics
Geohydrology
Geological Engineering
Geology (8)
Geology, for Engineers
Geology, Global
Geology, Marine (including sedimentology and geochem)
Geology, Numerical Analysis In
Geology, Pleistocene
Geology, Regional
Geology, Submarine
Geomorphology (4)

Geodynamics
Geophysical Data Processing/Interpretation (2)
Geophysical Fluid Dynamics
Geophysical Methods (seismology)
Geophysics (4)
Geostatistical Applications
Geotech Materials
Geotech Seminars
Geotechnical Engineering
Geotechnical Engineering, Probabilistic Methods In
Geotechnical Engineering, Tunnelling Methods
Geotechnical (4)
German (3)
Global Techtonics
Gravitational and Magnetic Fields
Groundwater and Seepage
Groundwater Computer Modeling
Groundwater Flows
Groundwater Geology
Groundwater Hydrology (3)
Groundwater Modeling (3)
Groundwater (3)
Grouting
Habitat Management Techniques (HEP, HES, WET, etc.)
Hazardous Waste Management
Heat Transfer
Hydraulic Design
Hydraulic Structures (5)
Hydraulics
Hydraulics, Basic
Hydraulics, Computational
Hydrodynamics
Hydrogeology
Hydrology (6)
Hydrology, Methods in Statistical (2)
Image Processing
Income Tax Preparation
Indeterminate Structures
Industrial Hygiene/Safety
Information Theory and Coding Theory, Intro To
Information and Coding Theory, Intro To
Instrumental Methods
Instrumentation (any type)
Instrumentation, Advanced
Instrumentation, Intro To
Interface Between Host and Microsystems
Investment Procedures
Land Use Planning
Land Use and Management
Laser Technology
Legal Issues for Engineers
Liberal Arts (history, languages, etc.)

Limnology and Water Chemistry
Limnology (5)
Management Courses (4)
Management of R&D
Management Principles
Marine Biology
Marine Sciences (2)
Marketing and Advertising
Materials Studies (2)
Math (refresher - statistics, linear algebra, etc.) (2)
Math (up through calculus)
Mathematics for Engineers, Advanced
Mathematics (10)
Mathematics (higher, advanced) (2)
Mathematics, High Level
Math, Review
Matrix Operations
Mechanical Engineering (2)
Mechanical Systems Instrumentation
Mechanical Vibration
Mechanics of Materials, Advanced
Meteorology, Intro To
Meteorology (2)
Microcomputer Applications
Microcomputer Structures
Microprocessors
Microwave Theory (2)
Modeling
Modern Higher Algebra I
Modern Physics Seminar
Multivariate Calculus
Natural Resource Management
Navigation and Flood Control Facilities, Design Of
Nonlinear Analysis in Engineering
Nonlinear Wave Theory
Numerical Analysis Methods
Numerical Analysis (5)
Numerical Analysis, Elementary Applied
Numerical Methods (4)
Numerical Modeling of Harbors
Numerical Modeling - Theory, Principles (3)
Numerical Simulation
Numerical Solution Partial Differential Equations
Oceanography (4)
Oceanography - Biological
Oceanography - Chemical
Oceanography - Geological
Oceanography - Physical (2)
Open Channel Flow (4)
Open Channel Hydraulics, Advanced
Open Channel Hydraulics, Intro To
Operational Mathematics (2)
Operations Research/Optimization

Optimization
Partial Differential Equations (3)
Pavement Design (4)
Pavement Design - Advanced
Pavement Design - Flexible
Pavement Design - Rigid
Pavement Materials
Pavements (3)
Plate Tectonics
Petrography (2)
Physical Chemistry
Physical Mechanics
Physics of the Earth
Physics (7)
Physics, High Level
Physics, Optical
Physics, Solid State
Plasticity (2)
Plates and Shells
Port Engineering
Potential Field Methods
Principles of Communication Engineering I
Probability Theory and Random Processes (2)
Project Management (critical path or other)
Public Administration/Policy (2)
Public Works Topics (water distr, sanitary sewers, utilities)
Quality Control/Deming Approach
Radar System Analysis (2)
Real Time Computing Systems
Real World
Regression Analysis (2)
Reinforced Concrete, Advanced
Remote Sensing Capabilities and Techniques
Remote Sensing (6)
Remote Sensing, Modern Methods Of
Resource Management (recreation and land)
River Dynamics
River Engineering
River Mechanics (2)
River Morphology
River Sediment Transport
Rock Mechanics, Fracture Mechanics (4)
Sales Psychology
Sampled Data Control System
Satellite Image Processing
Scientific Methods
Sediment Transport (5)
Sediment Transport, Basic
Sedimentation (4)
Seepage (groundwater flow, natural soils)
Seismic Data Processing
Seismic Design
Seismic Exploration

Seismology (3)
Similitude
Site and Soil Improvement
Slope Stability
Social Science Survey Design
Sociology Courses
Soil Dynamics - Basics (2)
Soil Hydraulics and Seepage
Soil Mechanics (2)
Soil Mechanics - Advanced
Soil Mechanics - Theoretical (3)
Soil Structure Interaction
Soil Science
Soils Consolidation
Soils Testing Lab
Soils, Problem Soils of the World
Solar Engineering
Spanish (2)
Spectral Analysis of Ocean Waves
Spectral Analysis Techniques
Stability of Structures
Statistical Analysis/Methods (2)
Statistical Procedures, Advanced
Statistical Software Programs
Statistics and Probability
Statistics and Sampling Design (2)
Statistics for Biological Scientists (2)
Statistics for the Social Sciences
Statistics and Probability Theory for Engineers, Advanced
Statistics (15)
Statistics - Basic (2)
Statistics, Applied (2)
Statistics, Multivariate
Steel Structures, Advanced
Stochastic Processes
Strength of Materials
Stress Analysis, Advanced
Stress/Health
Structural Design/Dynamics, Advanced (2)
Survey Design
Survey Research Methods
Systems Ecology
Technical Opportunities in the 1990's
Tensor Analysis Applied to Fluid Mechanics
Terrestrial Systems Ecology
Thermodynamics
Tidal Inlet Morphology/Physiology
Timber Design
Time Series Analysis (3)
Tort Liability Law
Toxicology
Turbulence

Unit Operation I
Unit Operation II
Unit Operation System
Unit Operations
Unit Operations for Environmental Engineers - Bio
Unit Operations for Environmental Engineers - Phy and Chem
Unix System Applications (2)
Unsteady Flow (2)
Variable Calculus
Vibrations, Calculus of
Viscous Flow
Volcanology
Water Chemistry (2)
Water Law
Water Quality Modeling
Water Resources Planning (2)
Water Resources (2)
Water Wave Mechanics
Wave Forces on Structures (2)
Wave Motion in Continuous Media
Wave Theory
Wetland Ecology (2)
Wildlife Ecology (2)
Wood Structures

APPENDIX B: COURSES TAUGHT AT THE VICKSBURG GRADUATE CENTER, SPRING 1972 - SPRING 1986

Courses Taught Spring 1972 to Spring 1986

Course	Course Title	Semester	Year	Instructor	Facility
	Random Variations	Summer	1973	Regl	MSU
ASE 8383	Numerical Fluid Mechanics	Spring	1984	Bernard, R. S.	WES
ASE 8423	Computational Fluid Dynamics II	Spring	1985	Bernard, R. S.	WES
BOT 7004	Aquatic and Wetland Plants	Fall	1981	Rogers, K. E.	WES
CE 6523	Open Channel Hydraulics	Spring	1973	Yung-Huang, K.	VED
CE 6523	Open Channel Hydraulics	Spring	1975	Yung-Huang, K.	VED
CE 6523	Open Channel Hydraulics	Fall	1976	Tuttle, J. R.	LMVD
CE 6523	Open Channel Hydraulics	Summer	1977	Zitta, V. L.	MSU
CE 6523	Open Channel Hydraulics	Spring	1980	Zitta, V. L.	MSU
CE 6523	Open Channel Hydraulics	Spring	1981	Zitta, V. L.	MSU
CE 6523	Open Channel Hydraulics	Spring	1982	Zitta, V. L.	MSU
CE 6523	Open Channel Hydraulics (2 sessions)	Summer	1984	Zitta, V. L.	MSU
CE 7433	Foundations	Spring	1975	Alhussaini, M.	WES
CE 7433	Foundations	Fall	1977	Alhussaini, M.	WES
CE 7513	Hydraulics of Closed Conduits	Summer	1981	Walski, T. M.	WES
CE 7513	Hydraulics of Closed Conduits	Spring	1985	Walski, T. M.	WES
CE 8413	Theoretical Soil Mechanics	Fall	1974	Sherman, C.	WES
CE 8453	Physical Properties of Soils	Spring	1974	Townsend, F.	WES
CE 8453	Physical Properties of Soils	Fall	1976	Haliburton, T.	WES
CE 8453	Physical Properties of Soils	Spring	1980	Sherman, W. C.	WES
CE 8523	Unsteady Flow in Open Channels	Fall	1984	Zitta, V. L.	MSU
CE 8533	Waterways	Fall	1973	Yung-Huang, K.	VED
CE 8533	Hydraulic Structures	Fall	1977	Zitta, V. L.	MSU
CE 8533	Waterways (Hydraulic Design II)	Summer	1978	Zitta, V. L.	MSU
CE 8543	Engineering Similitude	Spring	1977	Morris, D. H.	MSU
CE 8543	Engineering Similitude	Summer	1981	Zitta, V. L.	MSU
CE 8553	Hydraulic Structures	Spring	1977	Grace, J.	WES
CE 8553	Hydraulic Structures	Spring	1978	Tuttle, J. R.	LMVD
CE 8553	Hydraulic Structures	Fall	1983	Brown, B. J.	WES
CE 8563	Groundwater Hydrology (Seepage)	Spring	1972	Kaufman, R. I.	
CE 8563	Groundwater Hydrology (Seepage)	Fall	1973	Kaufman, R. I.	LMVD
CE 8563	Groundwater Hydrology (Seepage)	Spring	1975	Kaufman, R. I.	LMVD
CE 8563	Groundwater Hydrology (Seepage)	Fall	1979	Kaufman, R. I.	LMVD
CE 8573	Groundwater Resource Evaluation	Fall	1981	Zitta, V. L.	MSU
CE 8584	Groundwater Hydrology (Seepage)	Spring	1984	Kaufman, R. I.	LMVD
CE 8593	Sediment Transport	Summer	1980	Zitta, V.	MSU
CE 8603	Methods in Statistical Hydrology	Summer	1982	Link, L. E.	WES
CE 8613	Theory of Plates and Shells	Spring	1976	Kiger, S. A.	WES
CE 8623	Structural Statics	Spring	1974	Kiger, S. A.	WES
CE 8633	Structural Dynamics	Fall	1977	Kiger, S. A.	WES
CE 8643	Structural Statics	Fall	1979	Kiger, S. A.	WES
CE 8643	Structural Statics	Fall	1983	Kiger, S. A.	WES
CE 8653	Structural Dynamics	Spring	1985	Kiger, S. A.	WES
CE 8663	Applied Methods of Statistical Analysis	Summer	1977	Regl	MSU
CE 8673	Analysis of Systems by Statistical Simulation	Fall	1977	Mabloch, J. L.	WES
CE 8683	Irrigation Practices and Principles	Spring	1977	Heller, L.	
CE 8693	Finite Element Methods in Structural Engineering	Fall	1978	Desai, C.	WES
CE 8703	Earth and Earth-Rock Dams	Fall	1974	Sherman, C.	WES
CE 8713	Groundwater Flow Analysis	Spring	1974	Griffis, F.	WES
CE 8723	Water Resources	Spring	1977	Wallis, B.	WES
CE 8733	Water Resources Planning	Fall	1977	Haliburton, T.	WES
CE 8743	Water Resources Systems Analysis	Fall	1977	Shahani, B.	WES
CE 8753	Water Resources Planning and Management	Fall	1977	Griffis, F. H.	WES
CE 8763	Reservoir Operations	Fall	1977	Banes, D.	WES
CE 8773	Water Quality Modeling	Spring	1977	Banes, D.	WES
CE 8783	Water Resources Planning	Spring	1977	Haliburton, T.	WES
CE 8793	Water Resources Systems	Spring	1977	Sherman, W. C.	WES

Course	Course Title	Semester	Year	Instructor	Facility
E 8913	Finite Element Method in Civil Engr	Fall	1977	Radhakrishnan	WES
E 8913	Foundation & Earth Retaining Design	Spring	1978	Alhussaini, M.	WES
E 8913	Advanced Concepts, Hydrologic Analysis	Fall	1978	Link, L. E.	WES
E 8913	Coastal Processes	Spring	1979	Whalin, R. W.	WES
E 8913	Optimization Methods & Applications	Fall	1979	Wilson, H. B.	WES
E 8913	Foundations of Solid Mechanics	Fall	1980	Norman, C. D.	WES
E 8913	Finite Element Method in Civil Engr	Spring	1980	Radhakrishnan	WES
E 8913	Remote Sensing Applic in Civil Engr	Fall	1980	Link, L. E.	WES
E 8913	Shear Strength and Consolidation	Fall	1981	Cooley, L. A.	VED
E 8913	Finite Element Method in Civil Engr	Fall	1981	Radhakrishnan	WES
E 8913	Reinforced Concrete Structures	Summer	1981	Norman, C. D.	WES
E 8913	Remote Sensing Applic in Civil Engr	Fall	1982	Link, L. E.	WES
E 8913	Geotechnical Field Invest & Lab Testing	Fall	1982	Torrey, V. H.	WES
E 8913	Shear Strength and Consolidation	Fall	1983	Cooley, L. A.	VED
E 8913	Critical State Soil Mechanics	Spring	1983	Rohani, B.	WES
E 8913	Soil Engineering for Transp Facilities	Fall	1983	Ahlvin, R. G.	WES
E 8913	Soil-Structure Interaction	Spring	1983	Radhakrishnan	WES
E 8913	Adv Reinforced Concrete Structures	Summer	1983	Norman, C. D.	WES
E 8913	Time Series Analysis	Fall	1983	Thompson, E. F.	WES
E 8913	Hydrodynamics	Fall	1983	Camfield, F. E.	WES
E 8913	Coastal Wave Hydrodynamics	Spring	1984	Chen, H. S.	WES
E 8913	Finite Element Method in Civil Engr	Fall	1984	Radhakrishnan	WES
E 8913	Soil-Structure Interaction	Fall	1985	Radhakrishnan	WES
E 8913	Intr Riverine & Coastal Sediment Trnsprt	Spring	1985	Swain, A.	WES
E 8913	Tidal Hydraulics	Spring	1986	McAnally, W. H.	WES
E 8913	Fundamentals Finite Element Techniques	Spring	1986	Chen, H. S.	WES
E 8913	Soil-Structure Interaction	Spring	1986	Radhakrishnan	WES
E 8913	Advanced Reinforced Concrete Structures	Spring	1986	Norman, C. D.	WES
E 8913	Stream & Estuarine Analysis	Spring	1980	Shindala, A.	MSU
E 8913	Systems Analysis	Spring	1973	Griffis, F.	WES
E 8913	Modeling in Physical Hydrology	Fall	1980	Singh, B.	MSU
E 8913	Hydrologic Systems	Fall	1981	Link, L. E.	WES
E 8913	Water Resources Planning	Summer	1979	Regl, R.	MSU
E 8913	Adv Waste Treatment Processes, San Engr	Spring	1979	Shindala, A.	MSU
E 8913	Water Resources I	Fall	1972	Daggett, L.	WES
E 8913	Water Resources I	Fall	1976	Mahloch, J. L.	WES
E 8913	Water Resources I	Fall	1985	Mahloch, J. L.	WES
E 8913	Water Resources II	Fall	1974	Yung-Huang, K.	VED
E 8913	Advanced Momentum, Heat & Mass Transfer	Summer	1985	Hill, D. O.	MSU
E 8913	Special Topics in Electrical Engr	Fall	1985	Owens, J. K.	MSU
E 8913	Optimal Control Systems	Spring	1982	Mitchell, J. R.	MSU
E 8913	Vibrations	Summer	1975	Regl	MSU
E 8913	Vibrations	Fall	1978	Kiger, S. A.	WES
E 8913	Vibrations	Summer	1984	Bobbitt, C. W.	MSU
E 8913	Structural Dynamics	Spring	1981	Bobbitt, C. W.	MSU
E 8913	Advanced Mechanics of Materials	Spring	1975	Morris, D.	MSU
E 8913	Advanced Mechanics of Materials	Spring	1982	Kiger, S. A.	WES
E 8913	Advanced Mechanics of Materials	Fall	1985	Kiger, S. A.	WES
E 8913	Index Notation & Cartesian Sensors	Summer	1983	Kiger, S. A.	WES
E 8913	Mechanics of Continuous Media	Spring	1976	Sadd, M. H..	MSU
E 8913	Energy Principles	Summer	1975	Regl	MSU
E 8913	Structural Vibrations	Fall	1984	Bobbitt, C. W.	MSU
E 8913	Advanced Plasticity	Spring	1976	Morris, D. H.	MSU
E 8913	Advanced Plasticity	Summer	1985	Peters, J. F.	WES
E 8913	Advanced Plasticity	Spring	1984	Kiger, S. A.	WES
E 8913	Advanced Mechanics of Continuous Media	Spring	1974	Sadd, M. H.	MSU
E 8913	Advanced Mechanics of Continuous Media	Spring	1977	Sadd, M. H.	MSU
E 8913	Advanced Plasticity	Spring	1979	Sadd, M. H.	MSU
E 8913	Advanced Plasticity	Fall	1982	Norman, C. D.	WES

(Continued)

Course	Course Title	Semester	Year	Instructor	Facility
EM 8244	Theory of Plasticity	Spring	[illegible]	Sadd, M.	MSE
EM 8423	Theory of Plasticity	Spring	[illegible]	Norman, [illegible]	MSE
GG 6323	Applied Geophysics	Spring	[illegible]	Butler, [illegible]	WES
GG 6503	Geomorphology	Spring	[illegible]	Smith, [illegible]	WES
GG 6603	Engineering Geology I	Fall	[illegible]	[illegible]	
GG 6603	Engineering Geology II	Spring	[illegible]	[illegible]	
GG 6603	Engineering Geology	Fall	[illegible]	Harris, [illegible]	WES
GG 6603	Engineering Geology I	Fall	[illegible]	Harris, [illegible]	WES
GG 8623	Electrical and Electromagnetic Methods	Spring	[illegible]	Butler, [illegible]	WES
IE 6123	Engineering Statistics I	Summer	[illegible]	Brown, [illegible]	MSE
IE 6123	Engineering Statistics I	Fall	[illegible]	Bozzer, [illegible]	WES
IE 6123	Engineering Statistics I	Spring	[illegible]	Mlakar, P. F.	WES
IE 6123	Engineering Statistics I	Summer	[illegible]	Sitta, [illegible]	MSE
IE 6123	Engineering Statistics I	Summer	[illegible]	Mlakar, P. F.	WES
IE 6123	Engineering Statistics I	Summer	[illegible]	Parker, M. [illegible]	MSE
IE 6413	Operations Research I	Summer	[illegible]	Brown, [illegible]	MSE
IE 6413	Operations Research I	Summer	[illegible]	Sanchez, P. A.	MSE
IE 7123	Engineering Statistics II	Summer	[illegible]	Sanchez, P. A.	MSE
IE 7123	Engineering Statistics II	Spring	1980	Mlakar, P. F.	WES
IE 7123	Engineering Statistics II	Spring	1981	Mlakar, P. F.	WES
MA	Applied Mathematics III	Spring	1977	Rohani, B.	WES
MA 2353	Differential Equations	Fall	1972	Iessem, A.	WES
MA 7003	Methods Applied Math for Engineers	Summer	1978	Regl, R.	MSE
MA 7003	Methods Applied Mathematics for Engr	Spring	1981	Whalin, R. W.	WES
MA 7003	Methods of Applied Mathematics for Engr	Summer	1985	Whalin, R. W.	WES
MA 7212	Applied Mathematics	Fall	197[illegible]	Whalin, R. W.	WES
MA 7753	Applied Complex Variables	Fall	197[illegible]	Baladi, G.	WES
MA 8253	Operational Mathematics	Spring	1975	Sadd, M.	MSE
MA 8393	Numerical Solution Partial Differentials	Spring	1982	Bernard, R. S.	WES
MA 8993	Matrix and Vector Analysis	Summer	1980	Wilson, H. B.	WES
ME 6213	Mechanical Systems Analysis	Spring	1979	Bobbitt, C. W.	MSE
ME 6213	Mechanical Systems Analysis	Fall	1985	Bobbitt, C. W.	MSE
ME 8203	Applied Elasticity	Fall	1972	Sadd or Morris	MSE
ME 8213	Engineering Analysis I	Summer	1974	Regl	MSE
ME 8213	Engineering Analysis I	Summer	1976	Sadd, M. H.	MSE
ME 8423	Stress Analysis II	Spring	1973	Morris, D.	MSE
WL 7123	Fishery Biology	Spring	1978	Schramm, H. L.	WES

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