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UNITED STATES ARMY MATERIEL COMMAND
HERBICIDE TRAINING CONFERENCE

10 - 14 SEPTEMBER 1973

PRESENTED BY THE
U. S. ARMY MATERIEL COMMAND
INSTALLATIONS AND SERVICES AGENCY
ROCK ISLAND, ILLINOIS

AT

COLORADO SPRINGS, COLORADO
ANTLERS PLAZA HOTEL

WILLIAM C. TREFZ
COLONEL, CE
COMMANDING OFFICER
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SERVICES AGENCY

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Orlando, Florida 32804

CPT Allan L. Young
Department of Life and Behavioral Sciences
U. S. Air Force Academy
Colorado Springs, Colorado 80840

ROSTER OF ATTENDING PERSONNEL

	NAME	INSTALLATION
1.	Aiken, David W.	Sunflower Army Ammunition Plant
2.	Allan, Hugh	Fort Monmouth
3.	Altom, H. T.	Milan Army Ammunition Plant
4.	Anderson, Wayne D.	White Sands Missile Range
5.	Andrade, George E., II	Riverbank Army Ammunition Plant
6.	Antener, Lloyd	U. S. Air Force Academy
7.	Arvin, Luther	Jefferson Proving Ground
8.	Ayers, John J.	Sierra Army Depot
9.	Bailey, Frederick	Rock Island Arsenal
10.	Barkow, Roland	Fort Richardson
11.	Barnett, Melvin D.	Lexington-Blue Grass Army Depot
12.	Bean, Arty	Fitzsimons General Hospital
13.	Berg, Roy T.	Sharpe Army Depot
14.	Black, Richard	Rock Island Arsenal
15.	Blea, Armando R.	U. S. Air Force Academy
16.	Brace, James P.	Sacramento Army Depot
17.	Brundige, Merritt C.	Watervliet Arsenal
18.	Bowers, Samuel	Fort Wainwright
19.	Burmood, Oran	Pueblo Army Depot
20.	Byers, Robert A.	Joliet Army Ammunition Plant
21.	Castronovo, Vincent C.	U. S. Air Force Academy
22.	Castillo, Joe H.	Fort Huachuca
23.	Click, Wilmer G.	Pine Bluff Arsenal
24.	Coakley, Joseph F.	Fort Monmouth
25.	Corona, John	Sacramento Army Depot
26.	Creswell, John L.	Iowa Army Ammunition Plant
27.	Degler, Gerald L.	Jefferson Proving Ground
28.	Deuel, Kenneth Y.	Dugway Proving Ground
29.	Douthit, Harold G.	Anniston Army Depot
30.	Drawdy, James O.	Charleston Army Depot
31.	Dykla, Thomas J.	Granite City Army Installation
32.	Estes, Marvin G.	Lone Star Army Ammunition Plant
33.	Fralix, James E.	Redstone Arsenal
34.	Gallardo, Frank	Fitzsimons General Hospital
35.	George, Michael	Picatinny Arsenal
36.	Gibson, David A.	Frankford Arsenal
37.	Gram, James M.	Volunteer Army Ammunition Plant
38.	Gransky, Wojoech	Aberdeen Proving Ground
39.	Greaney, Wilbur C.	Granite City Army Installation
40.	Greenlee, Wayne A.	U. S. Air Force Academy
41.	Gullett, Donald W.	Kansas Army Ammunition Plant
42.	Harris, Charles S.	Fort Wainwright
43.	Hartman, William J.	Savanna Army Depot
44.	Hockensmith, Miles	Letterkenny Army Depot
45.	Hemmen, Richard	Fort Greely
46.	Hill, Bennie	Anniston Army Depot
47.	Hodge, Charles N.	Savanna Army Depot
48.	Hoye, James	Frankford Arsenal
49.	Hurt, Orlyn E.	Savanna Army Depot
50.	James, Robert	Aberdeen Proving Ground

ROSTER OF ATTENDING PERSONNEL (Continued)

	NAME	INSTALLATION
51.	Janecek, Charles A.	Cornhusker Army Ammunition Plant
52.	Jefferson, Leroy	Letterkenny Army Depot
53.	Jenkins, Ralph	Holston Army Ammunition Plant
54.	Jennings, Ralph E.	Seneca Army Depot
55.	Jinks, Lamar P.	Atlanta Army Depot
56.	Johnson, E. C.	Milan Army Ammunition Plant
57.	Johnson, Ruben	Fort Carson
58.	Kelecheck, George E.	Harry Diamond Laboratories
59.	Kelly, Joseph T., Jr.	Tooele Army Depot
60.	Kempf, Glen E.	Longhorn Army Ammunition Plant
61.	Kirkpatrick, Rodger	Rock Island Arsenal
62.	Kirsch, Kenneth P.	Ravenna Army Ammunition Plant
63.	Knackstedt, Edward L., Jr.	New Cumberland Army Depot
64.	Kozuszek, Charles	Natick Laboratories
65.	Krantz, George C.	Rocky Mountain Arsenal
66.	Krupa, Leo	HQ, U. S. Army, Alaska
67.	Lady, Joe	Holston Army Ammunition Plant
68.	Laganosky, Thomas J.	New Cumberland Army Depot
69.	Leweck, Donald J.	Harry Diamond Laboratories
70.	Limpus, Leroy D.	Red River Army Depot
71.	Luke, Roy	Badger Army Ammunition Plant
72.	Manchego, Telesfero	U. S. Air Force Academy
73.	Marshall, Gary W.	Newport Army Ammunition Plant
74.	Martinez, Jose	U. S. Air Force Academy
75.	Mascarenas, Pete A.	Rocky Mountain Arsenal
76.	Mattson, Willard	U. S. Army Tank-Automotive Command
77.	Miller, Olin	Aberdeen Proving Ground
78.	McClellan, Walter F.	Indiana Army Ammunition Plant
79.	McGeorge, Blaine E.	Lexington-Blue Grass Army Depot
80.	Mirabal, Isidro	U. S. Air Force Academy
81.	Moore, Joe	U. S. Air Force Academy
82.	Montano, Ralph	Fort Wingate Depot Activity
83.	Musgrove, Tommy	Red River Army Depot
84.	Nance, James B.	Lima Army Modification Center
85.	Newby, John	U. S. Air Force Academy
86.	Orona, Isaac C.	White Sands Missile Range
87.	Ortivez, Mike	U. S. Air Force Academy
88.	Pace, Johnnie W.	Anniston Army Depot
89.	Paripovich, Pete	Pueblo Army Depot
90.	Patterson, Donald W.	Sierra Army Depot
91.	Paulich, Donald	Tooele Army Depot
92.	Peck, Elwood	HQ, U. S. Army, Alaska
93.	Pluff, Kenneth R.	Twin Cities Army Ammunition Plant
94.	Rezac, Melvin W.	U. S. Air Force Academy
95.	Richardson, Gene K.	Louisiana Army Ammunition Plant
96.	Riley, Walter	Fort Richardson
97.	Rivera, Gilbert P.	Yuma Proving Ground
98.	Rivera, Jesus M.	Fort Huachuca
99.	Samples, Porter	Radford Army Ammunition Plant
100.	Sanchez, Joe T.	U. S. Air Force Academy

ROSTER OF ATTENDING PERSONNEL (Continued)

	NAME	INSTALLATION
101.	Schonberger, John R.	Lake City Army Ammunition Plant
102.	Sears, Reginald A.	Fort Monmouth
103.	Souza, Manuel G.	Army Materials & Mechanics Research Center
104.	Stec, Anthony	Tobyhanna Army Depot
105.	Studdard, Randall L.	Alabama Army Ammunition Plant
106.	Talton, Moses L.	Fort Huachuca
107.	Tafoya, Ismael	U. S. Air Force Academy
108.	Teiken, Harold	Fort Greely
109.	Thatcher, Milton L.	Yuma Proving Ground
110.	Thompson, Wallace	Fort Richardson
111.	Torres, Richard	U. S. Air Force Academy
112.	Towery, Leon	Redstone Arsenal
113.	Trujillo, Leo	U. S. Air Force Academy
114.	Vian, James L.	Savanna Army Depot
115.	Vigil, Art	U. S. Air Force Academy
116.	Vigil, Nash	U. S. Air Force Academy
117.	Walker, Harold	Aberdeen Proving Ground
118.	Washington, Colie	Charleston Army Depot
119.	Williams, Dale	U. S. Air Force Academy
120.	Williams, Ferris R.	Tooele Army Depot

AGENDA

U. S. ARMY MATERIEL COMMAND HERBICIDE TRAINING
COLORADO SPRINGS, COLORADO
MONDAY, 10 SEPTEMBER 1973

First Day

Morning Session
El Paso Room

Chairman: Mr. Carl J. Anderson

TIME	SUBJECT	PRESENTED BY
0800-0900	Registration	Staff Personnel
0900-0915	Welcome to Conference	Mr. Clayton J. Banta
0915-0930	Objectives of Herbicide Training Program	Mr. Carl J. Anderson
0930-1000	Department of Army Policy for Herbicide Use	Mr. Vance W. Mays
1000-1030	Break	
1030-1100	History and Development of Pesticides	Dr. Bert L. Bohmont
1100-1130	Cultural and Other Methods of Weed Control	Mr. Eugene Heikes
1130-1145	Discussion Period	Staff Personnel
1145-1300	Lunch	

MONDAY, 10 SEPTEMBER 1973

First Day

Afternoon Session
El Paso Room

Chairman: Mr. Ferris R. Williams

TIME	SUBJECT	PRESENTED BY
1300-1345	Aquatic Weed Control	Dr. Peter A. Frank
1345-1415	What to Look for on the Pesticide Label	Dr. Bert L. Bohmont
1415-1430	Break	
1430-1515	Weed Identification	Mr. Eugene Heikes
1515-1545	Safety in Mixing, Calibration, Storage, and Use of Herbicides	Mr. Olin Miller
1545-1615	Calculations Required for Herbicide Use	Mr. Donald M. Bandel
1615-1645	Polymerized Soil Sterilants for Roadsides	Dr. Wayne G. McCully
1645-1700	Discussion Period	Staff Personnel

TUESDAY, 11 SEPTEMBER 1973

Second Day

Morning Session
El Paso Room

Chairman: Mr. Richard Black

TIME	SUBJECT	PRESENTED BY
0800-0815	Announcements	Staff Personnel
0815-0915	New Day and New Challenges	Mr. Lyle R. McCutchen
0915-1015	Herbicides for Selective and Non-selective Weed Control	Mr. Henry Stuit
1015-1030	Break	
1030-1115	Du Pont Industrial Herbicides	Mr. Turney J. Hernandez
1115-1145	Spray Nozzles for Herbicide Use	Mr. A. B. Buhl
1145-1200	Discussion	Staff Personnel
1200-1330	Lunch	

TUESDAY, 11 SEPTEMBER 1973

Second Day

Afternoon Session
El Paso Room

Chairman: Mr. Charles A. Janecek

TIME	SUBJECT	PRESENTED BY
1330-1400	Turf Weeds and Disease Control	Mr. Howard Kohrmann
1400-1445	Diquat-Paraquat Weed Control	Mr. A. W. Woolridge Mr. W. D. Hogan
1445-1500	Break	
1500-1545	Weed Control on Non Crop Areas	Mr. Oscar Coindreau Mr. Herbert E. Raab
1545-1615	Vegetation Control with Maleic Hydrazide	Mr. John D. Kitsmiller
1615-1645	Algae Control and Maintenance	Dr. David T. Schulteis
1645-1700	Discussion Period	Staff Personnel

WEDNESDAY, 12 SEPTEMBER 1973

Third Day

Morning Session
Tour

Chairman: Mr. Vincent Castronovo

TIME	SUBJECT	PRESENTED BY
0800-1200	Tour Air Force Academy	Mr. Vincent Castronovo

Afternoon Session
Tour

Chairman: Mr. Durwood Davis

TIME	SUBJECT	PRESENTED BY
1200-1300	Lunch, Officers Club, Fort Carson	
1300-1700	Tour Fort Carson	Mr. Durwood Davis

THURSDAY, 13 SEPTEMBER 1973

Fourth Day

Morning Session
El Paso Room

Chairman: Mr. Archie M. Schmidt

TIME	SUBJECT	PRESENTED BY
0800-0815	Announcements	Staff Personnel
0815-0845	Uses of Herbicides in Forest Management on Military Reservations	Mr. Wilmer G. Click
0845-0915	Weed Control in Western United States	Mr. Wayne D. Anderson
0915-1015	Environmental Impact Statements and Assessments	Mr. Vance W. Mays
1015-1030	Break	
1030-1115	Environmental Effects of Herbicides	CPT Allan L. Young
1115-1130	Discussion	Staff Personnel
1130-1300	Lunch	

THURSDAY, 13 SEPTEMBER 1973

Fourth Day

Afternoon Session
El Paso Room

Chairman: Mr. Leon Towery

TIME	SUBJECT	PRESENTED BY
1300-1345	Formulations and Effectiveness of Phenoxy Herbicides and Amatrole	Mr. Lee Van Deren
1345-1415	Banvel (Dicamba) for Industrial Brush Control	Mr. Richard W. Fields
1415-1430	Break	
1430-1515	Spraying Equipment for Herbicide Use	Mr. Victor M. Jouffray
1515-1545	Vegetation Management	Mr. L. V. Braghetta
1545-1615	Reporting the Use of Herbicides	Mr. Donald M. Bandel
1615-1630	Vegetation Control and Wildlife Management	Mr. William M. Kornman
1630-1700	Discussion Period	Staff Personnel

FRIDAY, 14 SEPTEMBER 1973

Fifth Day

Morning Session

Chairmen: Mr. Carl J. Anderson - Pueblo Room
Mr. Donald M. Bandel - Cheyenne Room
Mr. William M. Kornman - Manitou Room

TIME	SUBJECT	PRESENTED BY
0800-0815	Announcements	Staff Personnel
0815-0900	Critique of Program	Staff Personnel
0900-1200	Written Examination to Determine Eligibility for Certification	

DEPARTMENT OF THE ARMY
Office of the Chief of Engineers
Washington, D. C. 20314

DAEN-MCC-E

ER 1105-3-1

Regulation
No. 1105-3-1

15 December 1972

Planning
ENVIRONMENTAL IMPACT ASSESSMENTS AND IMPACT STATEMENTS

1. Purpose. The purpose of this regulation is to provide guidance on the need, preparation, coordination, and review of environmental assessments and environmental impact statements (EIS).

2. Applicability. This regulation is applicable to the Directorate of Military Construction, Office of the Chief of Engineers (OCE) and all Corps of Engineers Installations and Activities performing military construction.

3. References.

a. The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190; 83 Stat. 852)

b. Executive Order 11514, Protection and Enhancement of Environmental Quality, 5 March 1970 (35 F.R. 4247, March 7, 1970)

c. Executive Office of the President, Council on Environmental Quality, "Statements on Major Federal Actions Affecting the Environment," 23 Apr 71, (36 Federal Register 79,7724 (1971)).

d. Executive Office of the President, Office of Management and Budget (OMB) Circular No. A-95

e. DAAG-PAP(M) (1 Sep 71) DALO-IN Letter, Subject: Environmental Consideration in DA Actions. RCS DD-H&E(AR) 1068, 21 Oct 1971

f. DOD Directive 6050.1, 9 Aug 71, subject: Environmental Considerations in DOD Actions.

4. Policy. NEPA obligates federal agencies to pursue a policy of program planning and implementations which minimizes the adverse effects and maximizes the beneficial effects on the environment. Compliance with NEPA requires an assessment of the effect on the environment of implementing proposed programs. For projects that are "Major Actions Significantly Affecting the Quality of the Human Environment" this assessment must be documented in an environmental impact statement. (See Figure 1). If the action is not a major action significantly affecting the quality of the human environment but will be environmentally controversial, then an impact statement is also required. A documented environmental

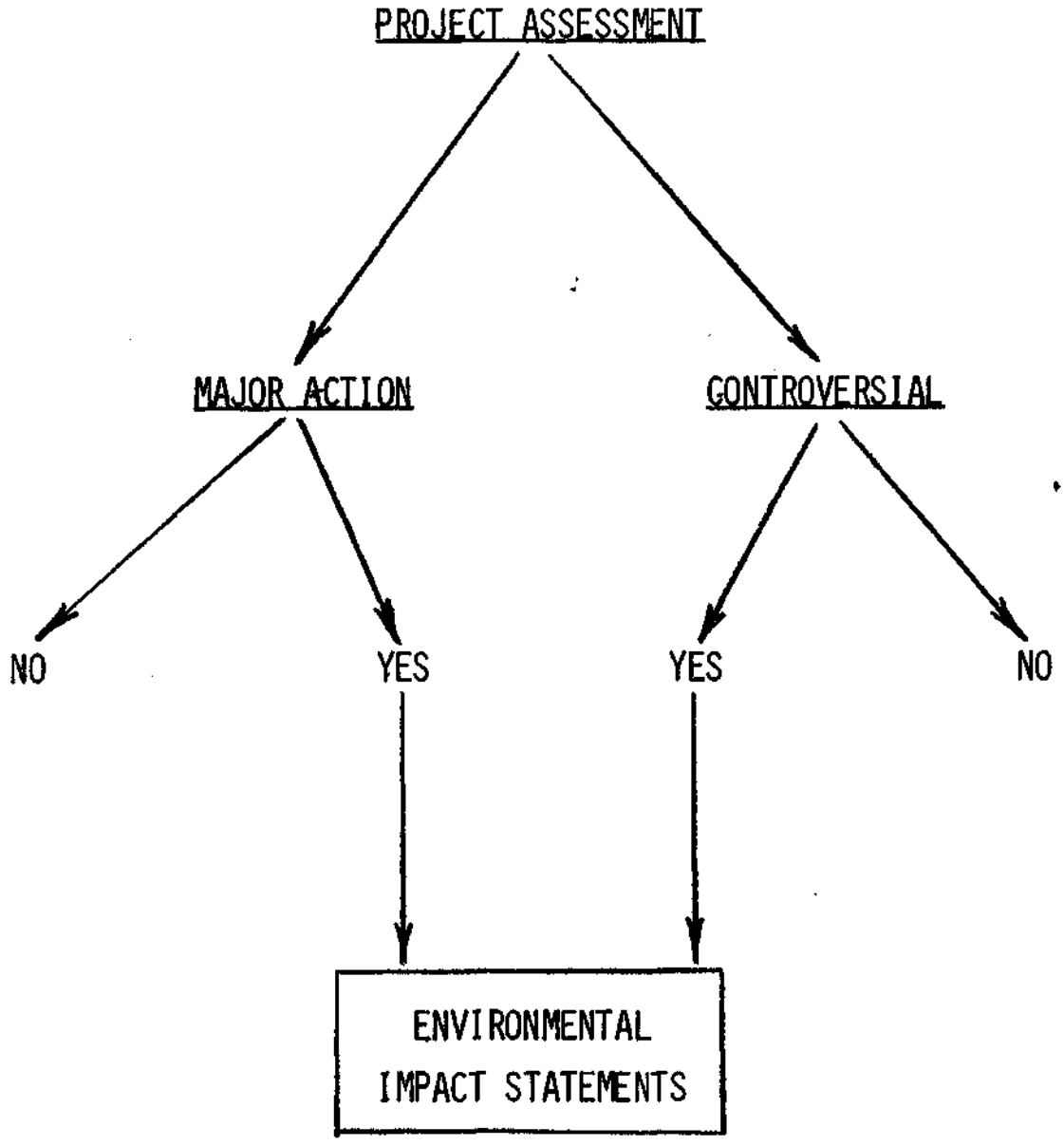

PROJECT ASSESSMENT
MAJOR ACTION
CONTROVERSIAL
NO
YES
YES
NO
ENVIRONMENTAL
IMPACT STATEMENTS

Figure 1

assessment is required for projects even though they do not represent a major action significantly affecting the quality of the human environment or a controversial action in order to positively demonstrate that the environmental consequences were thoroughly and adequately considered in compliance with NEPA (See Appendix B). It is the policy of the Chief of Engineers to take a leading role in fulfilling the spirit and intent of PL 91-190 and in implementing Executive Orders and Council on Environmental Quality (CEQ) Guidelines. To this end, staff elements, divisions, districts, and other activities will properly assess and document the environmental consequences of all of their proposed major actions. In formulating plans or decisions, the impact on the human environment will be fully considered from initial concept through development and execution. Early and continual coordination with appropriate local, state and federal agencies and the interested public, will be accomplished to develop, analyze and consider all reasonable and feasible alternatives and measures which will enhance, protect, preserve and restore the quality of the human environment. The human environment will be considered together with technical and economic consideration to insure balanced decision making in the best public interest. For military construction activities, the proponent (major user or installation commander) of the planned project is responsible for early project assessment. Districts will coordinate with using services to promote early development of assessments or impact statements in order to assure that assessment submissions are timely and do not delay design and construction schedules. Districts must review and consider, prior to concept design, the factors and assumptions included in the environmental assessment and/or statement prepared for that project. Districts will assist within available resources in preparing assessments and impact statements for all projects when requested to do so by a using service.

5. General. Preparation of environmental assessments and environmental impact statements shall be based on considerations discussed in the CEQ guidelines and the following directions which are intended to assure consistency of effort in the preparation of statements for proposed actions:

a. A careful objective detailing of environmental impacts, alternatives, and implications of proposed actions, activities and projects should give reviewers both within and outside the Department of the Army, insight into the particulars associated with the actions, activities or projects. The general public, environmental action groups, special interest associations, governmental agencies, and Congressional

committees will expect the assessments and statements to be a valid source of information on proposed actions, activities and projects, as well as a reflection of how the Department of the Army views environmental factors and seeks to accommodate them. Since the assessments and statements must be made available to the public, whenever possible, it must be assumed that they will receive careful evaluation. Assessments and statements should be systematic presentations of environmental impacts, both favorable and adverse.

b. An assessment and statement should describe physical and environmental aspects sufficiently to permit evaluation by independent appraisal of the favorable and adverse environmental effects of each proposal. It should be simple and concise, yet include all pertinent facts. Length will depend upon the particular proposal and the nature of its impact.

c. A statement should not be limited to ultimate conclusions, but should contain in support of each conclusion , a thorough evaluation of all factors affecting the potential environmental impact of the proposed major action or legislation.

d. Rather than serving as a means of assisting or supporting project justification, a statement or assessment should include a complete and objective appraisal of the environmental effects, both beneficial and adverse, and of available alternatives. A full description of each of the alternatives shall be included. In no case should adverse effects, either real or potential, be ignored or slighted in an attempt to justify an action previously recommended. Similarly, care must be taken to avoid overstating favorable effects.

e. Care shall be exercised to insure that the cumulative effects of many small projects, themselves not significant, are evaluated. In addition, primary as well as secondary effects must be considered.

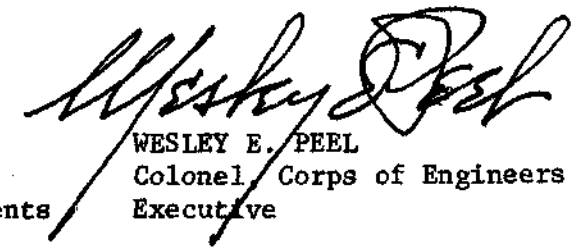
f. In developing and obtaining the necessary information for the preparation of assessments and statements, consultations with Federal, State and local agencies are encouraged at appropriate times. It is not recommended that formal written inquiries be made at the environmental assessment phase.

g. Appendix A provides guidance on implementation of this regulation. Appendix B furnishes instructions on Environmental Impact Assessment methodology. Appendix C amplifies Environmental Impact Statement procedures.

6. Nature of Environmental Quality. Environmental quality is the aggregate of subjective and objective expressions of the capability of the environment to serve the full range of man's needs. On the one hand, its dimensions include things as specific as physical measures of the condition of land, water, and air, generally expressed as standards; on the other hand, things as illusive as the spiritual and therapeutic value of beautiful natural scenery, or the knowledge of such existing areas.

7. Environmental Quality Objective. The environmental quality objective is to preserve or enhance resources and amenities that have ecological, cultural, aesthetic, or other values which make them significant in terms of environmental quality. Ecological values pertain to the structure and function of ecosystems -- in essence man's habitat. Aesthetic values are attributed to man's sensory perception of the environment.

FOR THE CHIEF OF ENGINEERS:



WESLEY E. PEEL
Colonel, Corps of Engineers
Executive

3 Appendices
APP A Military Construction
APP B Environmental Assessments
APP C EIS

APPENDIX A

MILITARY CONSTRUCTION IMPLEMENTATION

1. General. Current guidance charges the using service with responsibility for the preparation of environmental assessments and impact statements. Military Construction elements in OCE, Division and District offices, have no approval authority. They serve generally in an advisory capacity, providing review for technical adequacy. However, Districts and Divisions responsible for design and construction of a facility must obtain copies of environmental assessments or impact statements before initiation of design and the design must reflect the environmental considerations.

2. Directorate of Military Construction Staff Actions.

a. The Director of Military Construction, assisted by the Assistant Director of Military Construction for Environment, DAEN-MCZ-E, is responsible for environmental assessments and statements prepared in connection with Directorate staff actions; the technical review of EIS prepared in support of the Military Construction, Army (MCA) program; and for the technical review of specific areas in EIS prepared by other agencies.

b. Individual elements of the Directorate of Military Construction are responsible for initiating environmental assessments, of any of their proposed staff actions, which could have a possible significant affect on the quality of the human environment. Where the impact of these actions is judged to be significant or adverse, a draft statement and final statement will be prepared.

3. Military Construction Divisions and Districts.

a. As the primary point of contact for planning, design and construction, Divisions and Districts are in a position to maintain close liaison with using services. To insure adequate consideration of the environment and its timely place in the decision making process, using services must be encouraged to prepare assessments early in project development. Delay in considering environmental consequences may jeopardize approval, design, and construction schedules. Hence, it is to the advantage of Districts to insure that using services are advised of assessment and impact statement requirements. Normally, Districts possess more experience and technical capability in making

environmental studies and in preparing engineering reports and recommendations than the using services. In that regard, Districts will assist using services in the development of assessments and impact statements when requested and within the resources of the District. Funds will be provided in accordance with ER 415-35-1.

b. Divisions, Districts and other field activities will assess and coordinate the environmental consequences of any of their proposed internal actions. A draft and final statement will be prepared where the impact of actions is judged to meet the requirement for environmental statements. Copies of each draft and final statement will be coordinated in accordance with the instructions in reference 3e.

4. OCE Review of Environmental Impact Statements. Environmental impact statements that are sent to the Office of the Chief of Engineers for review and comment will be processed by the Directorate or independent office having primary responsibility and coordinated as required with other Directorates and independent offices. Normally, a review of an impact statement will be for technical adequacy and completeness. It is emphasized that OCE has no approval or disapproval authority over impact statements prepared by the proponent for action by the using service.

a. Directorate of Military Construction. Program and Planning Division (DAEN-MCP) is designated as the central coordinating point for processing of EIS which are under the cognizance of the Directorate of Military Construction. Review responsibilities for EIS are assigned as follows:

(1) Major MCA. EIS submitted with program development material for MCA projects, will be reviewed by OCE for technical adequacy and for potential impact on Army installations. Coordination and preparation of reviews will be conducted by DAEN-MCP, with assistance from DAEN-MCE and DAEN-MCF.

(2) Minor MCA and NAF Projects: EIS prepared and submitted with these type projects will be reviewed by OCE for technical adequacy to determine the impact on Army installations and facilities engineering activities. Coordination and preparation of reviews will be conducted by DAEN-MCF.

(3) Facilities Operation and Maintenance Activities. EIS prepared in connection with facilities engineering operation and maintenance activities will be reviewed by OCE for technical adequacy and for potential impact on active or planned Army installations. Coordination and preparation of reviews will be conducted by DAEN-MCF.

(4) Installation Master Plans: EIS prepared and submitted in conjunction with installation master plans will be reviewed by OCE for technical adequacy to determine the potential impact to Army and adjacent installations and activities. Coordination and preparation of reviews will be conducted by DAEN-MCE.

(5) All other. Responsibility for review of miscellaneous impact statements under cognizance of Directorate of Military Construction will be assigned and monitored by DAEN-MCP on a case by case basis.

b. Other Directorates and Independent Offices. Responsibility for review of EIS under the cognizance of independent offices and Directorates will be as provided for by the Director or Chief concerned.

c. Others.

(1) The objective of reviewing environmental impact statements drafted by other agencies on proposed legislation and major actions is to provide constructive assistance. Within the area of their expertise and jurisdiction, elements will evaluate the environmental impacts of the proposed actions, initiatives for preservation and enhancement, solutions to problems, and alternatives to proposed actions contained in the statements. In this review process, elements will also advise the agency of additional ecological opportunities and consequences, and where appropriate, monetary and environmental benefits and costs involved, along with impacts and alternatives which have been overlooked or inadequately treated. Similarly, where applicable, comments and advice will reflect the anticipated effects of the proposals on national and regional economic welfare, environmental quality, and social well-being. Responsibility for essential legality of environmental impact statements, however, rests with the originating agency, and there is no need to express opinions on these aspects. If, in the course of review, it is observed that some obvious environmental impact outside the interest of the Corps of Engineers has not been included or has been inadequately treated, the comments may appropriately indicate the presumption that the draft statement is being reviewed by the agency responsible for that area of impact.

(2) In order to insure that a coordinated reply is furnished the agency requesting comments on their impact statements, it is essential that OCE elements coordinate their review and comments with Divisions and Districts as well as with facility engineers. In essence, the Military Construction staff element having responsibility for review is responsible for complete coordination.

(3) Comments should be clearly and carefully composed, substantive in nature, and complete but concise in coverage. Keep in mind that the

comments and any accompanying papers will be made available to the Council on Environmental Quality, the Congress, and the public. Positive or negative comments will be objective and constructive in the areas of special Corps expertise. The order of discussion should follow that of the draft statement. Each question discussed should be summarized concisely. The approach to review of impact statements should involve a professional and interdisciplinary approach. Coordination and preparation of these reviews will be conducted by the staff element most competent in the subject area.

5. Technical Guidance. Appendix B shows Corps-wide guidance in environmental assessment. Guidance on environmental impact statements is contained in Reference 3e and Appendix C.

APPENDIX B

PROCEDURE FOR ENVIRONMENTAL IMPACT ASSESSMENT

1. General. To be done properly, assessments require a rigorous and thorough examination in detail to evaluate the effect the proposed project will have on man and his environment. In the early phases of project development, emphasis should be given to the alternatives and evaluation of each in light of all factors. In addition to the ecological and environmental quality aspects, man's aesthetic, social well-being, and human interests, must be examined. Evaluation of the total spectrum of man's environmental involvment can only lead to better decision making. Ultimately each environmental assessment must answer two questions for the decision maker:

a. Will the proposed action, acquisition, construction, and/or operation of the facility, etc., have a significant effect on the environment?

b. Will the effect of this action result in an impact which is controversial?

If the answer to either of these questions is "yes" then a detailed draft environmental impact statement complying fully with the requirements of section 102(2)(C) of the NEPA and current CEQ guidelines, must be prepared. Contrary to the opinions of some decision makers and environmental activists, significant affects both detrimental and beneficial should be discussed. Even if on balance, the net effect is expected to be beneficial, an environmental impact assessment must be prepared. Documented assessments are required for projects that are not major actions or non-controversial in order to demonstrate that the environmental consequences were adequately considered in compliance with PL 91-190.

2. Procedure for Impact Assessment. To ensure that all major impacts are identified and evaluated, a two step procedure which is comprehensive, systematic, and interdisciplinary is recommended. These steps are:

a. Step 1 - Identification of Impact

(1) Define baseline for area considered in evaluation.
(2) Identify potential problem.
(3) Define major impacts.
(4) Estimate the changes.
(5) Translate the changes into specific indicators.

b. Step 2 - Evaluation of Impact Using an Impact Matrix

(1) Determine the significance of each change.
(2) Transform changes and significance into specific indicators.
(3) Define a general direction for each indicator and express it in Impact Matrix.

3. Determination of Impacts. The initial step for an environmental impact assessment is an identification of changes that would be caused by the implementation of various alternatives. These changes may take place in: the amount of critical pollutants in the area; the aesthetic characteristics; the economic base; the life patterns or culture of a region. To determine the changes produced by a specific alternative, it is necessary to relate the alternative to baseline conditions which describe the present day quality of the area. By this comparison, it is possible to determine whether or not a change would occur. The changes are then translated into the indicators of ecology, environmental quality, aesthetics, and human interest. Impacts differ by geographic areas depending on the alternatives considered and the specific objective being evaluated. They may have local, regional, and national effects. It is important to delineate the extent of the impacted areas to insure that all the major changes are evaluated and that time is not wasted discussing minor considerations.

4. Structure for Impact Assessment. The objectives of ecology, environmental quality, aesthetics, and human interest provide the base for evaluating the impacts of each alternative. Because these objectives are often open to broad interpretations due to their general nature, they should be discussed only in general terms. Chart B-1 shows the topics to be considered under each objective.

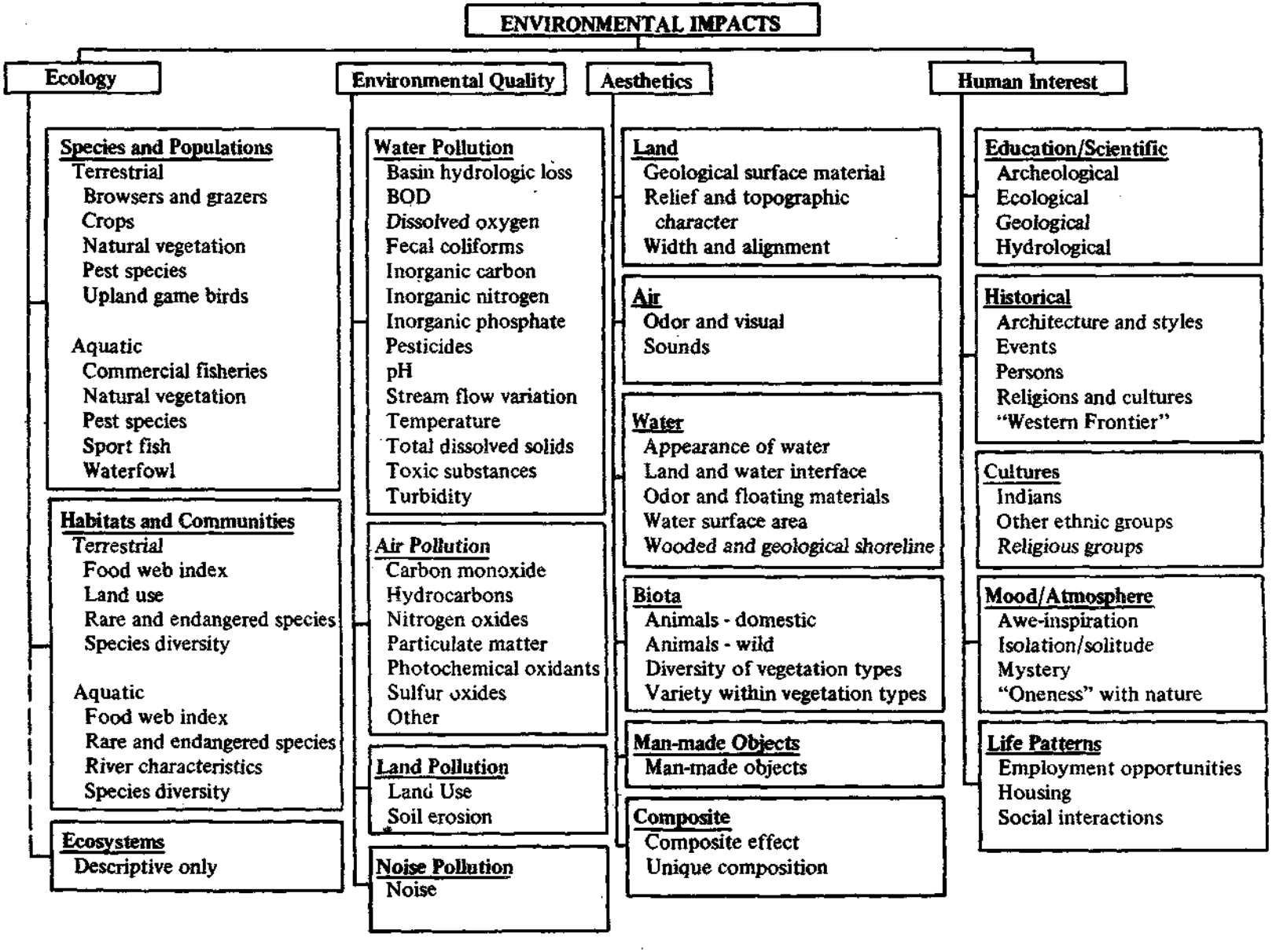
a. Ecology. Many of man's actions affect nature by altering the relationships that exist between the various organisms and their environment. These actions can cause either temporary or permanent changes in processes and components, such as the growth, maintenance, and reproduction of organisms; the relationships that exist between organisms; and the entire ecosystem. By evaluating these changes it is possible to determine the probable impact and the related importance of ecological changes. Specifically, ecological changes may be categorized into the following components:

(1) Species & Populations: Territorial (Land); Aquatic (Water)

(2) Habitats & Communities: Territorial (Land); Aquatic (Water)

(3) Ecosystems: (Narrative description only)

CHART B-1


ENVIRONMENTAL IMPACTS
Ecology
Species and Populations
Terrestrial
Browsers and grazers
Crops
Natural vegetation
Pest species
Upland game birds
Aquatic
Commercial fisheries
Natural vegetation
Pest species
Sport fish
Waterfowl
Habitats and Communities
Terrestrial
Food web index
Land use
Rare and endangered species
Species diversity
Aquatic
Food web index
Rare and endangered species
River characteristics
Species diversity
Ecosystems
Descriptive only
Environmental Quality
Water Pollution
Basin hydrologic loss
BOD
Dissolved oxygen
Fecal coliforms
Inorganic carbon
Inorganic nitrogen
Inorganic phosphate
Pesticides
pH
Stream flow variation
Temperature
Total dissolved solids
Toxic substances
Turbidity
Air Pollution
Carbon monoxide
Hydrocarbons
Nitrogen oxides
Particulate matter
Photochemical oxidants
Sulfur oxides
Other
Land Pollution
Land Use
Soil erosion
Noise Pollution
Noise
Aesthetics
Land
Geological surface material
Relief and topographic character
Width and alignment
Air
Odor and visual
Sounds
Water
Appearance of water
Land and water interface
Odor and floating materials
Water surface area
Wooded and geological shoreline
Biota
Animals - domestic
Animals - wild
Diversity of vegetation types
Variety within vegetation types
Man-made Objects
Man-made objects
Composite
Composite effect
Unique composition
Human Interest
Education/Scientific
Archeological
Ecological
Geological
Hydrological
Historical
Architecture and styles
Events
Persons
Religions and cultures
"Western Frontier"
Cultures
Indians
Other ethnic groups
Religious groups
Mood/Atmosphere
Awe-inspiration
Isolation/solitude
Mystery
"Oneness" with nature
Life Patterns
Employment opportunities
Housing
Social interactions

b. Environmental Quality. Environmental quality involves the preservation or enhancement of the natural resources (land, water, air) possessing values which make them significant to an ecosystem. The treatment and disposal of waste has impact on man's health. Because toxic compounds, infections, or irritating agents impact on the public health and general welfare of society, consideration in an impact assessment is of utmost importance. Hygienic risk can be transferred to man through water and air directly or through other agents such as plants and animals. Environmental quality for humans may be evaluated by the following various pollution characteristics:

(1) Water Pollution
(2) Air Pollution
(3) Land Pollution
(4) Noise Pollution

c. Aesthetics. Aesthetics pertains to the quality or condition of the environment as perceived by individuals, including the sensing of the presence or absence of color, odor, taste, smell, and visual considerations. Individuals vary widely in their responses to these external stimuli in the environment, thus, it is important to systematically consider and analyze the following as parameters in the comparison of alternatives:

(1) Land
(2) Air
(3) Water
(4) Biota
(5) Man-made Objects
(6) Composition

d. Human Interest. Many of man's actions affect other individuals in society by changing necessities for human life, emotional lives, population density, impact on public services, tax structure or general enjoyment of life. Because man is included in the environmental system, these changes must be considered in the evaluation of alternatives. Social well-being involves the equitable distribution of income both real and psychic, and how this distribution affects individuals or groups in society. Alternatives are evaluated in terms of their impact upon hygienic, aesthetic, and social opportunity characteristics. By determining these changes and evaluating their significance, it is possible to assess human interest objectives, such as:

(1) Education/Scientific
(2) Historical
(3) Cultures
(4) Mood/Atmosphere
(5) Life Patterns

5. Evaluation of Impacts Using an Impact Matrix.

a. Each of the defined impacts will be evaluated to determine the significance of changes. This significance is determined by knowledge of:

(1) Magnitude
(2) Direction (positive or negative)
(3) Individuals or groups affected
(4) Importance in the entire system

The necessary information needed for the assessment of alternatives is determined by following the above procedure of impact identification and evaluation. Numerous changes occur for each baseline objective - ecology, environmental quality, aesthetics, human interest, and for each alternative. A general overview of the alternative impacts is difficult to obtain. An impact matrix may be used to focus on this general overview.

b. Impact Matrix. The environmental impact matrix is a tool or method of transforming all the changes and their significance into several indices. The indices can then be easily used to completely evaluate each alternative. The matrix, Table B-1, consists of a list of general indicators representing the four objectives on the left side of the matrix and across the top the list of the alternatives to be evaluated. Each cell in the matrix represents a "subtotal" of impact and significance. The value placed in each of the cells in the matrix is determined by judgment. This judgment approach does not appear to present a serious limitation to the systematic evaluation of objectives. The subtotal value for each cell is expressed in the matrix in the following ways:

\+ Indicates that the major direction of the impacts represented by the indicator is positive or beneficial.

\- Indicates that the major direction of the impacts represented by the indicator is adverse or negative.

0 Indicates that there is no major direction of the impacts represented by the indicator.

+/- Indicates that there are two significant directions of the impacts represented by the indicator, positive and negative.

It is emphasized that these qualitative values (+, 0, -, +/-) indicate only a general direction of that indicator for the alternative considered. A negative (-) entry should be viewed as a "red flag" indicating possible problems or adverse impacts that could result from implementation of the respective alternative. For this reason, matrix cell entries cannot be compared between alternatives, within an alternative, between objectives or totaled to obtain a single index value. To make this type of comparison it would be necessary to weight each indicator and have quantitative as well as qualitative values in each cell. It is generally felt that a weighted approach, while reducing the subjectivity of the evaluation, tends to add together factors too diverse to represent a true picture when the sums are considered.

6. Format. Environmental assessment will be prepared using format of Figure B-1.

TABLE B-1 IMPACT MATRIX STRUCTURE

OBJECTIVES Indicators	Alternatives 1	2	3	
Ecology				
Species and Populations				
Habitats and Communities				
Ecosystems				
Environmental Quality				
Water Pollution				
Air Pollution				
Land Pollution				
Noise Pollution				
Aesthetics				
Land				
Air				
Water				
Biota				
Man-made Objects				
Composition				
Human Interest				
Educational/Scientific				
Historical				
Cultural				
Mood/Atmosphere				
Life Patterns				

DEPARTMENT OF THE ARMY

(District Title)

ENVIRONMENTAL ASSESSMENT

(Project Title)

(Date Prepared)

Prepared by:

_____

(Name and Title)

Approved by:

_____

(Name and Title)

Figure B-1

PART I - INTRODUCTION

1. Project Location

Describe the proposed site, general and exact location - maps and photographs as required.

PART II - ENVIRONMENTAL INVENTORY

2. Environmental Setting Without the Action

a. Physical - Geological elements, climate, topography, unique features, air and water quality.

b. Biological - Flora and fauna, zoological elements, rare or endangered species.

c. Cultural - Land use, population density and trends, regional development, transportation systems, cultural patterns, utilities.

d. Ecological relationships - Air and water pollution, health hazards.

e. Others -

PART III - PROPOSED ACTION

3. Action Description

Describe the proposal by name and specific location and summarize its objectives, purpose and the activities which will ensue if it is adopted. Provide technical data adequate to permit a complete understanding and a careful assessment of environmental impact. Where relevant, maps and diagramatic sketches should be provided.

Identify the probable direct and secondary environmental consequences of the proposed action, activity or project. This shall include commentary on the direct impact on man's health and welfare and his surroundings. Threats to other forms of life and their ecosystems shall be included. (Examples of primary and secondary environmental consequences that should be identified are the primary military aircraft operations and the secondary impact on future land use which may result from such operations.) The direct and indirect effects of the following environmental items will be included in all environmental assessments for applicable actions, activities, and projects. Any of the items that are not applicable for the action, activity or project will still be included and noted as being not applicable.

4. Air Quality

5. Water Quality

6. Land Use - Urbanization or increased density, changes in land use or zoning.

7. Noise - Sound and noise levels

8. Visual Aesthetics

9. Traffic - Railway, automotive, air, water, pipeline, electrical or communications transmissions.

10. Waste Disposal - Solid waste, sewage, other materials.

11. Wildlife

12. Vegetation

13. Historical

14. Others

PART IV - ALTERNATIVES

Describe various alternatives considered, why each was not recommended, and the benefits and detriments of each. Include the alternative of no action.

PART V - CONCLUSIONS

1. This action (will)(will not) have a significant adverse affect on the environment.

2. This action (will)(will not) have a beneficial affect on the environment.

3. The affect of this action (will)(will not) be environmentally controversial.

4. An Environmental Impact Statement (will)(will not) be prepared.

(Appendices if required)

APPENDIX C

PROCEDURE FOR ENVIRONMENTAL IMPACT STATEMENTS

1. General. Preparation of environmental statements will be based on considerations discussed in the CEQ Guidelines and the detailed guidance set forth in this appendix. These directions are intended to assure consistency of effort in preparing statements and are not proposed to induce unthinking uniformity or limit flexibility when preparing the statements. These statements have several levels of importance with reference to the decision-making process, relations with the public, and internal project planning activities. A careful, objective detailing of environmental impacts, alternatives, and implications of a proposed project should give reviewers insight into the particular trade-offs and commitments associated with the action. The general public, environmental action groups, trade and special interest associations, governmental agencies, and Congressional committees will all expect the statements to be a valid source of information on project effects, as well as a reflection of how the agency views environmental factors and seeks to accommodate them. Since the statements will be made available to the public and may receive broad exposure in the media, it can be assumed that they will receive careful scrutiny. Most importantly, preparation of statements should cause systematic consideration of environmental impacts. An imaginative evaluation of alternatives and their implications should begin in the earliest stages of project formulation, with planners contemplating the criteria and range of information to be employed in preparation of final statements. Districts shall utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision-making which may have an impact on man's environment. Each statement must reflect that the particular economic and technical benefits of the proposed action have been assessed and weighed against the environmental costs. It is advisable, in the early stages of drafting an environmental statement, to consult with those Federal, State, and local agencies possessing environmental expertise on potential impacts of a proposed action. This will assist in providing the necessary data and guidance for the analysis required to be included in environmental statements.

2. Preliminary Work. In order to assure a comprehensive treatment of environmental concerns, a check list of pertinent environmental elements should be compiled. A discussion of these elements should establish their importance, placing emphasis on whether they are

unique, endangered, old, popular, etc. In essence explore the ecological, aesthetic, cultural and other values which appear to make the elements environmentally significant. The manner in which economic considerations affect those values should also be discussed.

3. Format. Environmental statements will constitute a document separate from other papers and consist of the cover sheet, summary sheet, statement, and letters of coordination. All information will be typed single-spaced on one side of the page only. To facilitate review, draft statements may be prepared in double-space format.

4. Cover Sheet. This will be prepared on plain bond and will contain the following:

(1) Date
(2) Type of statement: Draft/Final Environmental Statement
(3) Official Project name.
(4) Preparing office.

5. Summary Sheet. This will be prepared on plain bond and will follow exactly the format prescribed by Appendix I of the CEQ "Guidelines."

6. Technical Content of Statement. The body of the environmental statement will contain separate sections listed below with the length of each being adequate to identify and develop the required information. Sketches and photos may be incorporated, if they will be particularly helpful in describing the environmental setting or environmental impacts.

a. Project Description. Describe the proposal by name, specific location, and purposes. Delineate the project purpose and the plan the proposal entails. It is most important that a clear word picture be presented. Leave out technical specifications unless they are important to the understanding of the project.

b. Environmental Setting Without the Project. Describe the area, the present level of economic development, existing land and water uses, and other environmental determinants. Discuss in detail the environmental setting focusing on the immediate area without ignoring important information on topography, vegetation, animal life, historical, archeological, geological features, and social and cultural habits and customs in adjacent areas. Discuss population trends and trends of agriculture and industry. Discuss the interrelation of projects and alternatives proposed, under construction or in operation by any agency or organization.

c. The Environmental Impact of the Proposed Action.

(1) Identify environmental impacts viewed as changes or conversions of environmental elements which result directly or indirectly from: land loss and land use changes; urbanization; changes in water features and characteristics; air quality; wildlife; etc. Discuss impact upon the economy and social conditions and identify environmental elements which may be modified or lost. Such impacts shall be detailed in a dispassionate manner to provide a basis for a meaningful treatment of the trade-offs involved. Quantitative estimates of losses or gains will be set forth whenever practical. Discuss both the beneficial and detrimental impacts of the environmental changes or conversions placing some relative value on the impacts described. Discuss these effects not only with reference to the project area, but in relation to any applicable region, or ecosystem. A thoughtful assessment of the environmental elements should aid in determining impacts.

(2) Identify remedial, protective, and mitigation measures which would be taken as a part of the proposed action to eliminate, or compensate for, any detrimental aspects. Such measures taken for the minor or short-lived negative aspects of the project will be discussed in this section. The adverse effects which cannot be satisfactorily dealt with will be considered separately in greater detail along with their abatement and mitigation measures.

d. Any Adverse Environmental Effects Which Cannot Be Avoided Should The Proposal Be Implemented. Discuss only those detrimental aspects of the proposed action which cannot be eliminated either within the framework of responsibility of those agencies or groups who identified the problem, or by alternative measures as a part of the proposed action. This discussion will identify the nature and extent of the adverse effects and the parties affected. It should include a discussion of adverse effects or objections raised by others. The loss of a given acreage of wetland by filling may be mitigated by purchase of a comparable land area, but this does not eliminate the adverse effect. Certainly the effect on the altered elements will not disappear simply because additional land is purchased. Also, discuss impacts such as water or air pollution, undesirable land use patterns, damage to life systems, urban congestion, threats to health, or other consequences adverse to the national environmental goals. Present and comment on the objections of all concerned parties.

e. Alternatives To The Proposed Action. Describe the various alternatives considered, their general environmental impact, and the reason(s) why each was not recommended. Identify alternatives as

to their beneficial and detrimental effects on the environmental elements, specifically taking into account the alternative of no action. This latter alternative requires a projection of the future environmental setting if the project is not accomplished (including both natural and man-induced changes). Discuss economically justified alternatives predicated upon standard evaluation methods. Additionally, insofar as possible, identify and evaluate other ways of providing functions similar to those provided by the proposed project but which were specifically formulated with environmental quality objectives in mind. Discuss other possible solutions which may be outside your authority.

f. The Relationship Between Local Short-term Uses of Man's Environment and The Maintenance and Enhancement of Long-term Productivity. Assess the cumulative and long-term impacts of the proposed action with the view that each generation is a trustee of the environment for succeeding generations. The range of beneficial uses of the environment that pose long-term risks to health or safety must be considered. The propriety of any action should be weighed against the potential for damage to man's life support system - the biosphere - thereby guarding against the short-sighted foreclosure of future options or needs. It is appropriate to make such evaluations on land-use patterns and development, alterations in the organic productivity of biological communities and ecosystems, and modifications in the proportions of environmental components (water, uplands, wetland, vegetation, fauna) for a region or ecosystem. The long-term implications of these changes are directly related to the degree that the losses are sizeable or unique.

g. Any Irreversible and Irretrievable Commitments of Resources Which Would Be Involved In The Proposed Action Should It Be Implemented. Discuss irrevocable uses of: resources, changes in land use, destruction of archeological or historical sites, unalterable disruptions in the ecosystem, and other effects that would curtail the diversity and range of beneficial uses of the environment should the proposal be implemented.

7. Coordination With Others. The coordination and public participation efforts will be summarized in this section under three subheadings: Public Participation, Government Agencies, and Citizen Groups.

a. Public Participation. This section will briefly summarize the public participation efforts accomplished, indicating number of public meetings (if any), informal meetings conducted and a brief discussion of environmental issues identified, if any.

b. Government Agencies. Each government agency with whom coordination of the environmental statement has been accomplished will be listed. All comments will be included in the revised statements incorporating changes where necessary. Additionally, each separate, relevant and appropriate view expressed concerning the environmental effects of the proposal will be summarized in a comment and appropriately discussed in a response. If an agency did not provide comments on the statement, "No comments received" will be placed under the agency name.

c. Citizen Groups. The objective of this section is to clearly set forth the magnitude and breadth of concerns of private citizens and conservation groups regarding specific identifiable environmental impacts related to the project. The environmental issues and impacts identified by citizens and conservation groups will be incorporated in the statement where appropriate. All views expressed concerning the environmental effects of the proposal will be set forth in a comment and appropriately discussed in a response, as are those from government agencies. To give appropriate coverage and avoid duplication of response to the same environmental concern, the environmental issues raised may be consolidated or combined into appropriate groups. Source of the comments should be clearly identified.

d. Correspondence. Copies of all correspondence received from governmental agencies, citizens, and conservation interests, will be attached to the statement.

8. Submission and Distribution of Draft Environmental Statements

a. Utilizing the applicable clearing house (Reference 3d), copies of the draft environmental statement shall be sent to each Federal agency, and each affected State and local agency. Seven copies shall be sent to EPA whenever the statement relates to air or water quality, noise abatement and control, pesticide regulation, solid waste disposal, or radiation criteria and standards. Ten copies shall be sent to the Council on Environmental Quality.

b. Each agency shall be given 30 calendar days in which to submit comments (except that EPA shall be given 45 calendar days) and shall be advised that if no reply is received within the specified period, it will be presumed that there is no objection to the draft statement. The transmittal letters shall also indicate that the statement is based on information currently available.

9. Preparation of Final Environmental Statements. Whenever a draft environmental statement is prepared, a final statement must also be

prepared. Preparation of the final statement requires attaching all comments received on the draft statement from Federal, State, and local agencies and officials, and a revision of the draft to take these comments into consideration.

10. Time Requirements for Preparation and Submission of Draft and Final Environmental Statements.

a. To the maximum extent practicable, no administrative action is to be taken sooner than 90 calendar days after a draft environmental statement has been circulated for comment and furnished to CEQ. Action is not to be taken sooner than 30 calendar days after the final text of the environmental statement has been made available to CEQ and the public. If the final text of an environmental statement has been furnished to CEQ and made public, the 30-day period and 90-day period may run concurrently.

b. Time requirements prescribed herein shall be followed to the maximum extent practical, except where: (1) advance public disclosure of a proposed action will result in increased costs to the Government; (2) emergency circumstances make it necessary to proceed without conforming to time requirements; (3) there would be impaired program effectiveness if such time requirements were followed.

11. Additional Guidance. Reference 3d will be used for additional guidance.

August 1973

WEED CONTROL IN THE SEMI-ARID WESTERN U.S.

I. INTRODUCTION.

A. Definitions.

1. A weed is any plant growing in an area where its presence is undesirable.
2. Weed control is any management practice which either eliminates weeds or reduces them to a non-objectionable condition.

B. Reasons for weed control.

1. Improve appearance of an area.
2. Increase desired plants.
3. Reduce health hazard.
   a. Pollens, poisons.
   b. Snake cover.
4. Reduce plant residue.
   a. Fire hazard
   b. Drainage obstruction.
   c. Sand duning.
   d. Target zone visability.
   e. Electric and electronic problems.
5. Past practice - not always a very good reason!

C. Major methods of weed control.

1. Natural control.
   a. Plant competition - always first consideration.
      (1.) Decorative - lawns, native.
      (2.) Erosion control.
      (3.) Long term - low cost.
   b. Climatic - dry/wet seasons, frost, etc.
   c. Biologic - mainly grazing.
2. Mechanical control.
   a. Croping - outleasing.
   b. Cultivation.
      (1.) May be benifical to desired plants.
      (2.) Control depends on variety, stage of growth, etc.
   c. Mowing.
      (1.) May not destroy weed - needs repeating.
      (2.) Reduces size, seeding, improves appearances.
      (3.) Height of cut determined by plant, area use, etc.
      (4.) Generally cheapest method and should always be considered.
   d. Burning.
      (1.) Reduces trash, seed, visability, snake cover.
      (2.) May not be allowed - smoke, fire, severity, laws.
      (3.) May be expensive - cheaper than hand removal.
3. Chemical control.
   a. Contact herbicides - kills above ground growth.
   b. Systemic herbicides - absorbed and translocated.
      (1.) Generally specific.
      (2.) Can often be combined for broader control.
   c. Pre-emergent herbicides - controls new seedlings.
      (1.) Often specific.
      (2.) Often residual.
   d. Sterilant herbicides - kills all vegetation.
      (1.) Applied to soil.
      (2.) Generally highly residual.
   e. Growth innibitors - largely experimental.

II. CONTROL OF WESTERN WEEDS.

A. Plants.

1. Often sparce, hard to reestablish.
2. May be tough, waxy.

B. Soils - often sandy, alkaline.

C. Climate.

1. Temperatures - may be very high -Southwest.
2. Low rainfal - seasonal.
3. Winds.

III, CHEMICAL CONTROL OF WESTERN WEEDS.

A. Contact herbicides.

1. Advantages/disadvantages.
   a. Low hazard to nearby decoratives - usually.
   b. Selective and non-selective kill of above ground growth.
   c. Often does not kill roots.
   d. Usually little residual.
   e. Expensive - but much less than hand removal.
2. Examples.
   a. Fortified oils, solvents - some stain, some inflammable.
   b. Cacodylic acid (SB) - arsenic.
   c. Paraquat (NOT SB) - Toxic.
   d. Amitrole - selective, residual.
3. Application.
   a. Controls most annuals, reduces growth
   b. Normally have to wet foliage - 50 to 100 gal/A.

B. Systemic herbicides.

1. Advantages/disadvantages.
   a. May be extremely hazardous to nearby decoratives.
   b. Selective.
   c. Normally kills entire plant - including perennials.
   d. May be very low cost.
   e. May contaminate equipment - 2,4-D.
   f. Usually non-residual.
   g. May be combined for broad control.
2. Examples.
   a. 2,4-D (2,4,5-T)
   (1.) Selective - broadleaf, including R. thistle.
   (2.) Low cost, low volume.
   (3.) Low human toxicity - 2,4,5-T ???
   (4.) High decorative toxicity, contaminant.
   (5.) Use low volatile.
   b. Dalapon.
   (1.) Selective - grasses, including juniper.
   (2.) Low toxicity, low corrosivity, low contaminate, low volatility.
   c. 2,4-D/dalapon - gives broad control.
   d. Picloram and silvex.
   (1.) Broadleaf and woody control.
   (2.) Less volatile than 2,4-D.
   (3.) Picloram - some soil residual.
3. Application.
   a. Apply to growing plant - use surfactant.
   b. Little residual - repeat applications.
   c. Often use low volume.

C. Pre-emergent herbicides.
1. Advantages/disadvantages.
a. Apply before plant emerges.
b. Short to medium residual.
c. Usually specific.
2. Examples.
a. Benefin, bensulide (Not SB) - lawns, greens.
b. Dacthal - lawns.
c. Dicamba - grass, not near ornamentals.
d. Fenac (Not SB) - very effective on R. thistle and puncture vine - residual, toxic to ornamentals.

D. Soil sterilants.
1. Advantages/disadvantages.
a. Normally controls all growth.
b. Residual - 1 to 5 years (or more).
c. High cost.
d. Normally requires moisture, depends on barrier.
e. DO NOT USE NEAR ORNAMENTAL AREAS.
2. Examples.
a. Simazine and monuron.
b. Bromocil - good long range control.
c. Many others.
3. Application.
a. Normally in winter or before rainy season.
b. Apply to soil.
c. Generally wettable powder - requires agitation.
d. Avoid disturbing soil afterwards.
e. May have to water in.

IV. SUMMARY
A. Principles of weed control.
1. Don't create control problems.
2. Use plant competition, croping, mowing.
3. Use chemicals as secondary control or to improve stands.
4. Know your chemicals; use them wisely.

USAMC HERBICIDE TRAINING CONFERENCE
TOUR OF THE UNITED STATES AIR FORCE ACADEMY

Meet at South Gate

1. Turn north at South Gate to Kettle Lakes.

   Discuss: Afforestation
   Native grasses
   Fish program
   Sportsmens Club

2. Return to South Gate Blvd and proceed north.

   Discuss: Living snow fence.

3. Turn south into Pine Drive.

   Discuss: Ice Lake
   Food plots

4. Turn south onto Pine Loop and proceed to Nature Trail.

   Discuss: Nature trail use.
   Herbicide use.

5. Return to Pine Loop, west on Pine Loop through Pine Valley Housing to Community Center Drive; continue east to the Community Center. Coffee break at cafeteria. Herbicide Program in Housing.

   Discuss: Hillside stabilization.
   Function of Community Center.

6. Continue east on Community Center Drive to Stadium Blvd.

   Discuss: Solid Waste Recycling.
   Tree Pest Control.

7. Turn north on Stadium Blvd to Falcon Stadium.

   Discuss: Falcon Stadium operation with Stadium Manager.

8. Return to Stadium Blvd to sod holding and forestry operations area.

   Discuss: Sod bank.
   Firewood selling operation.
   Spray rig for Paraquat on sprinkler heads.

9. Return to Stadium Blvd; turn north to Parade Loop. Turn left to Eisenhower Golf Course and to Reservoir #4.

   Discuss: Aerifiers
   Reuse of wastewater

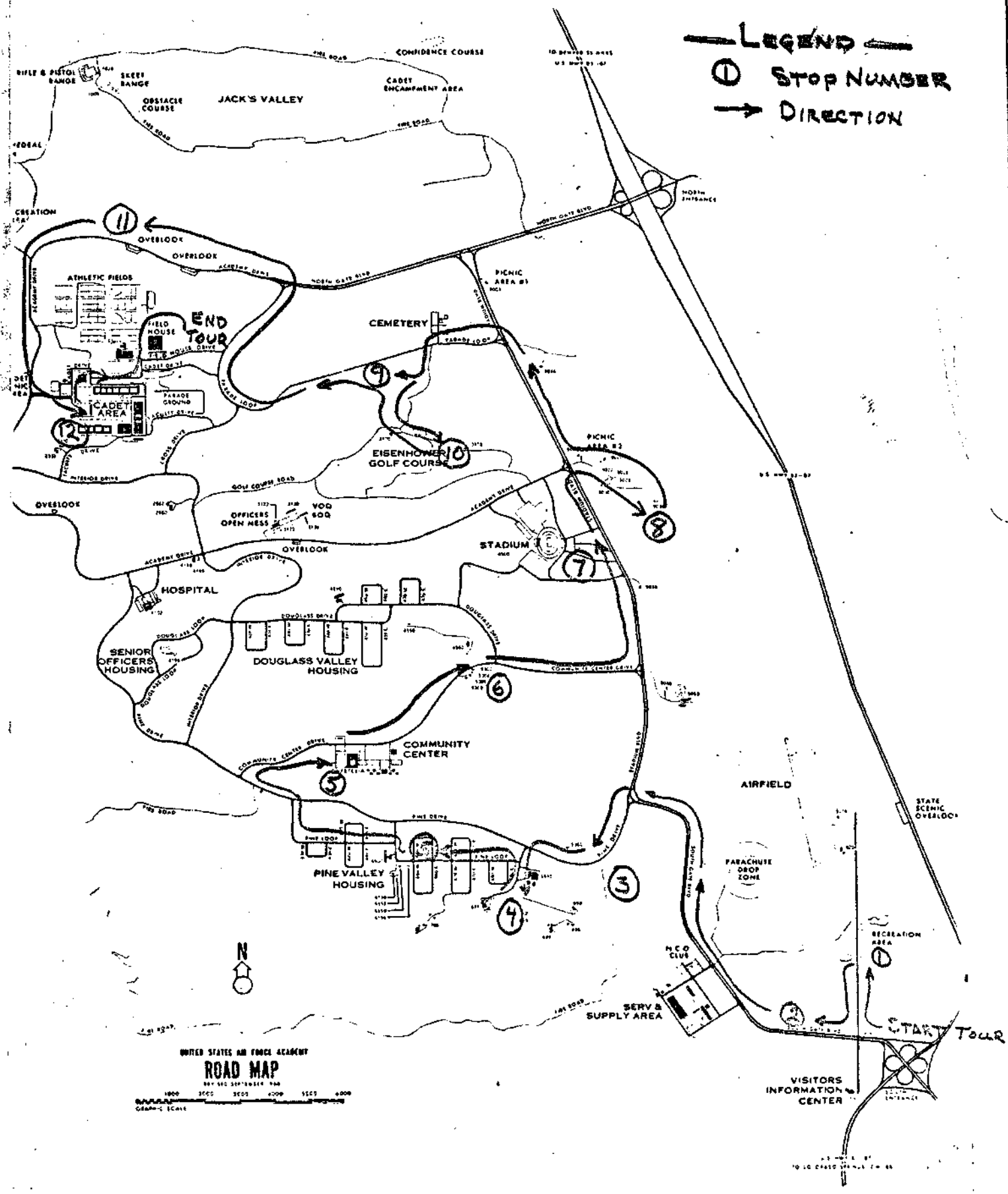
10. Continue to Golf Course Maintenance Bldg.

    Discuss: Golf Course Maintenance

11. Return to Parade Loop. Proceed west, then north to North Gate Blvd. Stop at 2nd overlook.

    Discuss: Burn area
    Diversion ditches
    Road shoulder stabilization
    Athletic fields
    Compost operation

12. Proceed to Cadet Chapel; then Field House tours. Answer any questions concerning the Air Force Academy Land Management Program.


LEGEND
① STOP NUMBER
→ DIRECTION
RIFLE & PISTOL RANGE
SKEET RANGE
OBSTACLE COURSE
JACK'S VALLEY
CONFIDENCE COURSE
CADET ENCAMPMENT AREA
CREATION
OVERLOOK
ATHLETIC FIELDS
FIELD HOUSE
END TOUR
CEMETERY
CADET AREA
PARADE GROUND
EISENHOWER GOLF COURSE
PICNIC AREA #2
OFFICERS OPEN MESS
VOQ
BOQ
STADIUM
HOSPITAL
SENIOR OFFICERS HOUSING
DOUGLASS VALLEY HOUSING
COMMUNITY CENTER
PINE VALLEY HOUSING
AIRFIELD
PARACHUTE DROP ZONE
STATE SCENIC OVERLOOK
RECREATION AREA
N.C.O. CLUB
SERV & SUPPLY AREA
START TOUR
VISITORS INFORMATION CENTER
N
UNITED STATES AIR FORCE ACADEMY
ROAD MAP

CALCULATIONS USEFUL IN HERBICIDE APPLICATION

Although granular herbicides are becoming increasingly popular, the majority of weed control chemicals are still being applied as liquids with a sprayer. With newer and more potent herbicides available the need for accuracy in applying them has become more pressing. A miscalculation in calibrating a sprayer or mixing a spray solution could well be disastrous or result in a complete waste of effort. Let's hope none of us ever make the unemployment line because of a misplaced decimal point.

It is most important that a sprayer be carefully calibrated before the actual spraying is started in order to find the number of gallons of liquid being applied per acre. When this has been determined the proper amount of weed killer can be added to the sprayer tank.

Calibration of Boom-Type Sprayers

1. Before calibration or field operations are performed, the following procedure should be followed:

a. Clean the supply tank and fill it with clean water.

b. Clean suction and line strainers.

c. Remove all nozzle tips, nozzle strainers and boom-end caps.

d. Start the sprayer and flush the hoses and boom with clean water until all are clear of obstructions.

e. Inspect nozzle tips and strainers for defects, wear and cleanliness; make sure all tips are the same type and size.

f. Replace the nozzles and strainers; check for proper operation and alignment.

g. Check all connections for leaks.

h. Adjust the pressure regulator to desired operating pressure. Operate sprayer with water and check nozzle discharge for uniformity. This can be done by placing containers under each nozzle, operate sprayer for a few minutes, then check to see if the same amount of water is in each container. This procedure will detect worn, defective or incorrect nozzles.

2. Speed Calculations:

The first step in calibration is to accurately determine the speed of the tractor or spray vehicle. Speedometers are often inaccurate and will cause

errors in application rate.

a. Place two stakes in the ground 176 feet apart in the field to be sprayed.

b. Bring the vehicle up to a preselected speed of approximately 3 to 4 mph before passing the first stake and maintain this speed until you have passed the second stake.

c. Refer to Table 1 for the speed of the vehicle. Speeds not listed may be calculated from the formula at the bottom of the Table. The throttle should be marked at this setting so the same speed may be repeated in the future.

TABLE 1

Time required to drive 176 ft (seconds)	Speed (miles per hour)
120	1
60	2
40	3
30	4
24	5
20	6
17	7

To determine speed at times other than those shown in Table 1, use the formula:

$$\text{mph} = \frac{120}{\text{time in seconds}}$$

3. Calibrating the Sprayer:

There are various methods for calibrating boom-type broadcast sprayers. Two of these methods will be described here.

a. Calibration by spraying 1/4 acre.

(1) Set the pressure on the sprayer and determine vehicle speed.

(2) Determine effective boom width in feet.

(3) Measure off a sufficient distance to cover 1/4 acre as shown on the following Table:

TABLE 2

Width of Boom (feet)	Linear Feet to Cover 1/4 Acre
16	681
18	605
20	545
22	495
24	454
28	389
30	363

$$\text{Linear Feet to Cover 1/4 Acre} = \frac{10890}{\text{Width of Boom in Feet}}$$

The measured distance can be on a roadway or in the field, whichever is desirable.

(4) Fill the tank to a known mark with water only.

(5) Drive the sprayer at the previously set speed and pressure over the measured acre. Be sure that the sprayer is turned on and the nozzles are delivering a good spray immediately at the start of the area and turned off immediately at the end. Be sure to travel only at the set speed and pressure.

(6) Measure carefully the amount of water needed to refill the tank to the exact original level. This amount multiplied by 4 is the quantity of water your sprayer delivers per acre.

(7) As a general formula which may be used for any width boom, over any size area, use the following:

$$\text{Gallons per Acre} = \frac{43560 \times \text{gallons used}}{\begin{matrix}\text{Distance} & \text{Swath} \\ \text{Traveled} \times & \text{Width} \\ \text{in feet} & \text{in feet}\end{matrix}}$$

(8) Example: If 2 gallons of water were sprayed on a 454 foot strip using a 12 foot boom, what would be the rate per acre?

$$\text{g.p.a.} = \frac{43560 \text{ ft}^2/\text{a} \times 2 \text{ gal}}{454 \text{ ft} \times 12 \text{ ft}} = 15.99 \text{ g.p.a.}$$

or

Since a 24 ft boom will cover 1/4 acre in 454 ft, a 12 ft boom would cover 1/8 acre in 454 ft, therefore g.p.a. = 2 gal x 8 = 16 g.p.a.

b. Calibration by the one nozzle discharge method.

(1) Catch the discharge from one nozzle in a pint jar as the sprayer is being operated at the predetermined pressure and speed.

(2) Measure the distance, in feet, traveled while collecting the pint. Then determine the rate of application per acre from Table 3.

(3) Example: If it takes 200 feet to collect one pint of spray and the nozzle spacing on the boom is 18 inches, the rate per acre is 18 gallons.

TABLE 3

Distance traveled to collect 1 pint	Gallons applied per acre when discharge equals 1 pint and nozzles are spaced at intervals of 12 inches	15 inches	18 inches	20 inches
Feet	gallons	gallons	gallons	gallons
40	136	109	91	82
50	110	87	73	65
60	91	73	60	54
70	80	62	52	47
80	68	55	45	41
90	62	49	40	36
100	55	44	36	33
110	50	40	33	30
120	46	37	30	27
130	42	34	28	25
140	39	31	26	23
150	36	29	24	22
160	34	28	22	20
180	31	24	20	18
200	28	22	18	17
220	25	20	16	15
240	23	18	15	14
260	21	17	14	13
280	20	16	13	12
300	18	15	12	11
400	14	11	9	8

Mixing of Spray Materials:

Usually the pounds of active ingredient or acid equivalent per gallon are given on the label of liquid herbicides. The percent is given on labels of powder, granules, and other dry materials.

To calculate the amount of liquid herbicide required when the rate is expressed in pounds per acre use the following formula:

$$\frac{\text{Rate in pounds per acre}}{\text{Pounds of herbicide per gallon}} = \text{gallons per acre}$$

Example: If the rate desired is 2 pounds of active ingredient or acid equivalent per acre and the herbicide concentrate contains 4 pounds per gallon, then

$$\frac{2}{4} = 1/2 \text{ gallon of herbicide concentrate per acre}$$

Sometimes the herbicide is recommended to be applied at a certain poundage per quantity of water. Use the formula above by merely substituting the quantity of water for acres.

Example: If the herbicide is to be applied at 2.5 pounds per 100 gallons of water and the herbicide concentrate contains 2 pounds per gallon, then $\frac{2.5}{2.0}$ = 1 1/4 gallon of herbicide concentrate per 100 gallons of water.

To calculate the amount of dry product required when the rate per acre is given, use the following:

$$\frac{100}{\text{Percent active ingredient}} \times \text{rate per acre} = \text{pounds product per acre.}$$

Example: If the rate is 15 pounds, active ingredient, per acre, and the percent of active ingredient in the product is 75, then

$$\frac{100}{75} \times 15 = 20 \text{ pounds of the herbicide product per acre.}$$

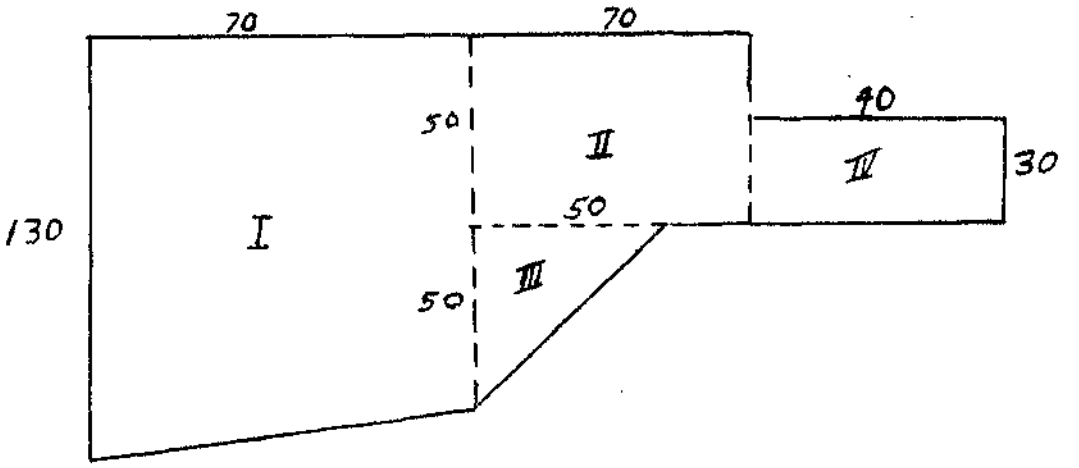
Area Determination:

An estimate of the size of an area to be treated with herbicide should be made before work is started. This is necessary so that the proper amount of herbicide can be obtained and sufficient time allowed to complete the job. By knowing the size of areas being treated, a check can be made on the calibration of the sprayer as work progresses. Where time will permit, it is suggested that assistance be obtained from the engineering staff in

determing area sizes. If the size of an area is not known and engineering assistance is not available, an estimate can be made by laying the area off into squares, rectangles, trapezoids, and triangles and determining the necessary dimensions by ground measurements.

Example:

Determine the acreage of the following area:



Area I (trapezoid) = $\frac{130 + 100}{2}$ x 70 = 8050 sq yds.

Area II (rectangle) = 50 x 70 = 3500 sq yds.

Area III (triangle) = $\frac{50}{2}$ x 50 = 1250 sq yds.

Area IV (rectangle) = 40 x 30 = 1200 sq yds.

TOTAL = 14,000 sq yds = $\frac{14,000}{4,840}$ = 2.9 acres

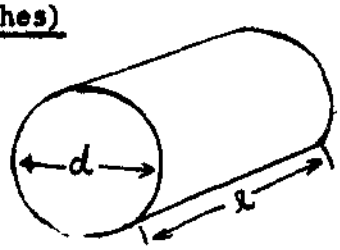
Capacity of Sprayer Tanks:

If the capacity of your sprayer tank is not known, there are several methods by which it can be determined. The most accurate method would be to use a container of known volume (5 or 10 gallon) and fill the tank, keeping record of the amount of water used. A second method would be to calculate the tank capacity using its dimensions. Caution should be exer-

cised when using the second method, especially if the tank is not square or circular. Use the following formula when calculating the tank capacity from its dimensions:

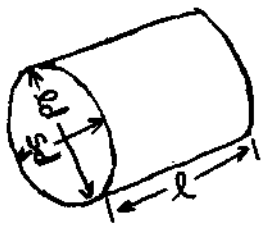
(All measurements in inches)

Cylindrical tanks:



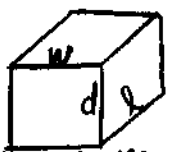
Gal = length (ℓ) x square of diameter (d) x 0.0034

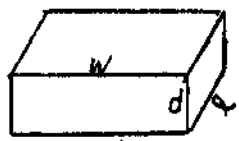
Tanks with elliptical cross section:



Gal = length (ℓ) x short diameter (sd) x longer diameter (ℓd) x 0.0034

Rectangular tank with square or oblong cross section:





Gal = length (ℓ) x width (w) x depth (d) x 0.004329

Example:

What is the capacity of a tank with an elliptical cross section which has the following measurements:

Length	=	60 in
Long diameter	=	40 in
Short diameter	=	18 in

Gal = 60 x 18 x 40 x 0.0034 = 147 gal

Sample Problems

1. It is desired to control broad-leaved weeds on the golf course using 2, 4-D at 1 pound acid equivalent per acre. The herbicide is available in a formulation containing 2 pounds acid equivalent per gallon. In calibrating the sprayer, which has a 20 foot boom, 12 gallons of water was used in traveling 545 feet. The spray tank will hold 150 gallons. Prepare the proper spray mixture.

a. A 20 foot boom covers 1/4 acre when traveling 545 ft. Therefore g.p.a. = 12 x 4 = 48.

b. $\frac{1 \text{ lb } 2,4\text{-D/a}}{2 \text{ lb } 2,4\text{-D/gallon}}$ = 1/2 gallon herbicide concentrate per acre

c. $\frac{150 \text{ gal tank}}{48 \text{ gal/acre}}$ = 3 acres

Therefore add 1 1/2 gallon of herbicide concentrate to each tank full of spray material.

2. You are treating a fence row with a granular herbicide containing 5% active ingredient. How much material would be required to treat 12 inches on each side of a 500 foot fence with 3 lb/acre active ingredient?

a. 2 ft x 500 ft = 1000 ft^2 to be treated.

b. $\frac{100}{5\%}$ x 3 lb/a = 60 lb/a of herbicide product.

c. $\frac{1000 \text{ ft}^2 \text{ x } 60 \text{ lb/a}}{43{,}560 \text{ ft}^2\text{/acre}}$ = 1.4 lb of herbicide product.

3. How many pounds of simazine 80W are needed in a spray tank holding 150 gallons if we spray 30 gallons per acre and apply 4 lbs/a simazine active ingredients?

a. $\frac{150}{30}$ = 5 acres to be treated per tank full.

b. $\frac{100}{80}$ x 4 = 5 lbs product per acre.

c. 5a x 5 lbs/a = 25 lbs per spray tank.

Calibrating a Knapsack or Hand Sprayer

1. Lay out a square rod area ($16\frac{1}{2}$ ft x $16\frac{1}{2}$ ft).

2. Determine time in seconds to spray this area in normal manner.

3. Catch the spray from the nozzle or nozzles used for the time period determined in Step 2.

4. Calculate rate per acre as follows: Pints caught x 20 = gallons per acre

Pints of Spray Caught	Rate in Gals/Acre
1/4	5.0
3/8	7.4
1/2	10.0
5/8	12.5
3/4	15.0
1	20.0
1-1/4	25.0
1-1/2	30.0
1-3/4	35.0
2	40.0

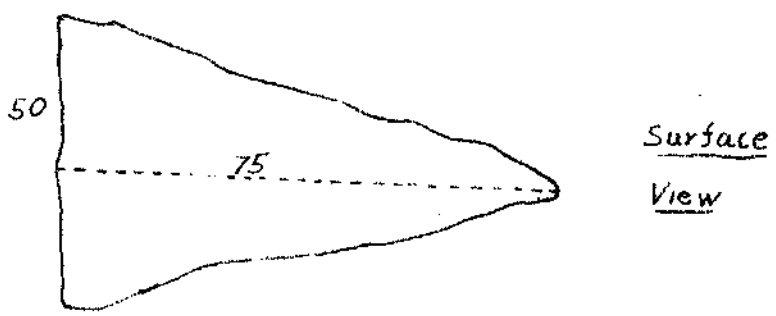
Aquatic Weed Control

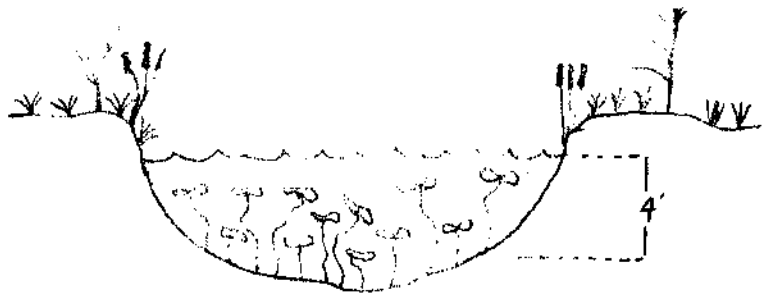
Generally floating, emersed, and marginal weeds (some part of the plant is above water) are treated with herbicides on a rate per acre basis. To determine the quantity of herbicide required, compute the surface area to be treated and apply at the recommended rate per acre.

Submersed weeds (tops mostly under water) are usually treated with herbicides on a parts per million of water basis. It is necessary to compute the approximate volume of water to be treated. The following formula may be used:

$$\frac{\text{Surface area x average depth x } 62.4}{1{,}000{,}000} = \text{Million parts of water in lbs.}$$

Example: Treat the following pond for algae with copper sulfate at 1 ppm.





Cross Section

$$\text{Surface Area} = \frac{50}{2} \times 75 = 1875 \text{ ft}^2$$

$$\frac{1875 \times 4 \times 62.4}{1{,}000{,}000} = 0.5 \text{ million lbs of water}$$

Therefore, treatment at 1ppm would require 0.5 lbs of copper sulfate.

Abbreviations, Constants and Formulas Used in Herbicide Application

Abbreviations

ft	=	feet
gpa	=	gallons per acre
gpm	=	gallons per minute
lb/a	=	pounds per acre
mph	=	miles per hour
psi	=	pressure, pounds per square inch
sq ft	=	square feet
gal	=	gallons
ppm	=	parts per million

Constants

1 acre = 43,560 square feet = 4,840 square yards
1 mile = 5,280 feet = 1,760 yards
1 mph = 88 feet per minute
1 yard = 3 feet
1 level tablespoon = 3 level teaspoons
1 fluid ounce = 2 tablespoons
1 cup = 8 fluid ounces = 16 tablespoons
1 pint = 2 cups = 16 fluid ounces
1 quart = 2 pints = 32 fluid ounces
1 gallon = 4 quarts = 128 fluid ounces
1 pound = 16 ounces
1 ton = 2000 pounds
1 gallon water = 8.355 pounds
1 cubic foot water = 62.43 lbs.

TABLE 4

Approximate Amounts of Actual Pesticide Contained in Different Liquid Concentrates

Concentrate % Active Ingredients	Amount Actual Chemical Contained Per Gallon	Quart	Pint	Cup
AS ACID EQUIVALENT				
10-20	1 lb	1/4 lb	2 oz	1 oz
15-20	1 1/2 lb	6 oz	3 oz	1 1/2 oz
23-25	2 lb	1/2 lb	1/4 lb	2 oz
33-35	3 lb	3/4 lb	6 oz	3 oz
40-50	4 lb	1 lb	1/2 lb	1/4 lb
60-65	6 lb	1 1/2 lb	3/4 lb	6 oz
70-75	8 lb	2 lb	1 lb	1/2 lb

TABLE 5

Equivalent Parts of U.S. Gallon

Cups	Pints	Tablespoon	Teaspoon	Decimal Equivalent	Fl. Oz.
1	1/2	16	48	.06	8
2	1	32	96	.12	16
3	1 1/2	48	144	.19	24
4	2	64	192	.25	32
5	2 1/2	80	240	.31	40
6	3	96	288	.37	48
7	3 1/2	112	336	.44	56
8	4	128	384	.50	64
9	4 1/2	144	432	.56	72
10	5	160	480	.62	80
11	5 1/2	176	528	.69	88
12	6	192	576	.75	96
13	6 1/2	208	624	.81	104
14	7	224	672	.87	112
15	7 1/2	240	720	.94	120
16	8	256	768	1.00	128

Formulas

1. To calculate amount of material a sprayer is applying:

$$\text{gpa} = \frac{43560 \times \text{gal used}}{\text{Distance traveled in feet} \times \text{Swath width in feet}}$$

2. To calculate the amount of liquid herbicide concentrate required:

$$\text{gpa} = \frac{\text{Rate in lb/a}}{\text{lbs of herbicide per gal}}$$

3. To calculate the amount of dry herbicide product required:

$$\text{lbs product/a} = \frac{100}{\text{\% active ingredient}} \times \text{rate in lbs/a}$$

4. To calculate ground speed where a certain gallonage per acre is desired, and ground speed can be varied:

$$\text{mph} = \frac{495 \times \text{gpm per nozzle}}{\text{Nozzle spacing (ft)} \times \text{gpa}}$$

5. To calculate the nozzle capacity (gpm) required:

$$\text{gpm} = \frac{\text{gpa} \times \text{speed (mph)} \times \text{nozzle spacing (in)}}{5940}$$

6. To calculate the boom length required:

$$\text{Length boom (ft)} = \frac{43560 \times \text{acres to be sprayed}}{\text{No working hours} \times \frac{\%\ \text{time spent}}{\text{spraying}} \times 5280 \times \text{speed (mph)}}$$

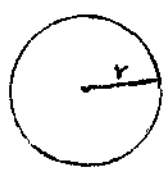
7. To calculate the pump output in gpm required:

$$\text{gpm} = \frac{5280 \times \text{mph} \times \text{boom length} \times \text{gpa}}{60 \times 43560}$$

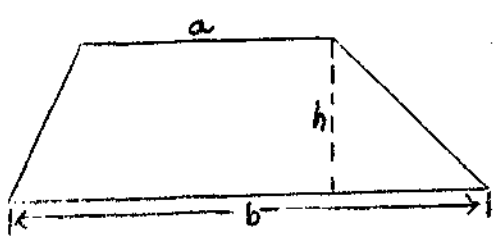
8. Area of a square or rectangle = length x width

9. Area of a triangle = 1/2 base x height

10. Area of a circle = 3.1416 x radius x radius



11. Area of a trapezoid = 1/2 (a + b) h



USAMC HERBICIDE TRAINING CONFERENCE
TOUR OF FORT CARSON

ITINERARY

A. Cantonment Area (2 hrs. maximum including travel)

Site No. 1 - Sheridan Street windbreaks and Old Reliable Park drainage (10 minute stop).

Site No. 2 - Ellis Street drainage problem (10 minute stop).

Site No. 3 - Mule Barn Area - Maintenance problems and improvements made (no stop).

Site No. 4 - Installation Maintenance erosion control seeding and structures (30 minute stop).

Site No. 5 - Drive through old Banana Belt Area to show new construction and related problems (no stop) on way to -

Site No. 6 - Tree planting with Vermeer spade in area of Cottonwood Junction (30 minute stop).

B. Down Range Areas (2 hrs. including travel)

Site No. 7 - Mary Ellen Ranch Area - Wildlife improvement and agricultural use and development (30 minute stop maximum).

Site No. 8 - Trip to Sullivan Park - dam construction (time permitting) (possibly 15 minutes at site).

RESUME OF POINTS ON ITINERARY

Site No. 1 - Windbreaks are 5 years old. Area mowed every 1-2 weeks. Any weed control using dacamine is done very carefully. Park area is being developed by Special Services. Large drainage ditch through park is designed to carry up to 400 c.f.s. storm run off. Storm of August, 1970, inundated entire Park area. Old reservoir area to east of Park will be planned later to eliminate remaining drainage problems and possible recreational area use. (This will be a slow drive through without a pause for explanation, etc.)

Site No. 2 - Soils are basically Pierre Shale (clay) and over 100' deep. Above normal precipitation of past 12 months gave rise to water table and deposits of salts. We began interceptor ditch this past winter but excessive water limited our work and will have to complete this fall. This type of job normally involves a grid of augered holes to determine water table levels and direction of flow and eventual installation of perforated metal pipe laid at right angles and directed toward outfall.

Site No. 3 - This entire area had been very poorly maintained. Much of the area has been improved with seeding, sodding, plantings, and better drainage. Watering facilities remain grossly inadequate but this shows what can be accomplished with continual personal care. A Major Vestal (Brigade XO) has been the prime mover in the improved care program here. (No stop is planned - simply a slow drive through).

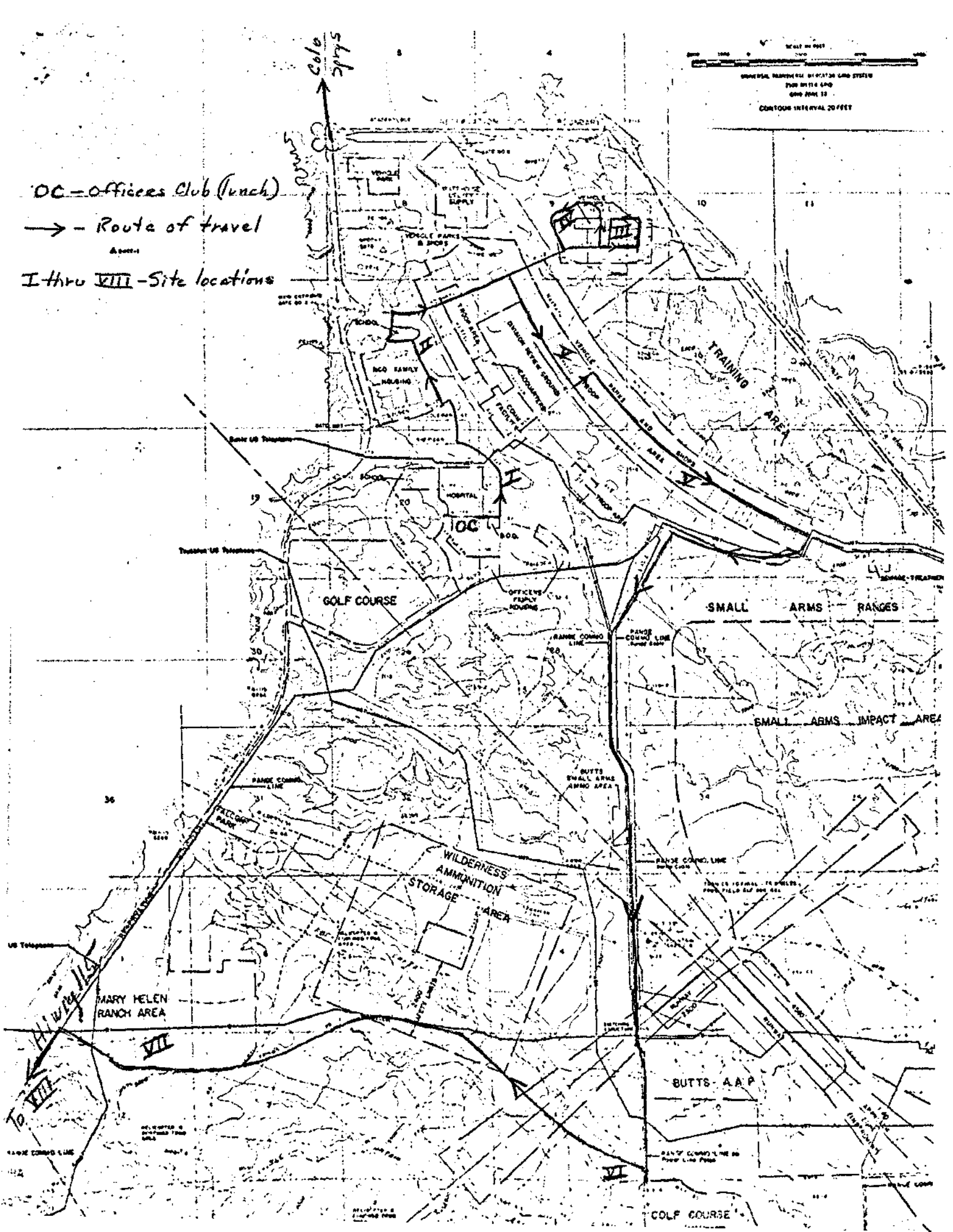
Site No. 4 - This area was left, after construction of new buildings and vehicle storage, in a barren raw condition with no attention given to heavy runoff during storms. Slopes were rilling and primary waterway was developing headcuts. All new ditching, seeding and structural work was done by the Grounds Section during February-March 1972. Establishment of a good ground cover remains entirely dependent on natural precipitation. (This will be a stop of up to 30 minutes for explanation and discussion.)

Site No. 5 - This will be a drive through of the old W.W. II Barracks Area to show extent of reconstruction program and some explanation will be given of problems that remain in grounds maintenance. (Stops are not planned and route will go directly from here to the next site located 5-6 miles southwest.)

Site No. 6 - Our two 44" Vermeer trees spades were purchased in 1972 and in the first 9 months had transplanted over 500 trees. Adjacent "tree farm" area was planted 10-12 years ago and provides source for replacements needed in the cantonment area. (A stop of approximately 30 minutes can be made here to watch machines in operation.)

Site No. 7 - This was formerly an old operating ranch headquarters area. Water rights and agricultural irrigation facilities were purchased along with the acquisition of land and we now are developing this area for recreation, wildlife and possible agricultural use using these same original facilities. Maintenance of firebreaks involves use of both 2-4-D and infrequently equipment such as maintainers. (A stop of 30-40 minutes is allowed for.)

Site No. 8 - This area is typical of the down range training areas. The dam to be visited was build by the 52d Engineers as O.J.T. Dams such as this are primarily for erosion control. Range land pitting to be seen in the area compliments work such as the dam construction. (This visit will be made only if time allows - time should be sufficient. Plan is to be back at the cantonment no later than 5 P.M.)


OC – officers Club (lunch)
→ – Route of travel
I thru VIII – Site locations
CONTOUR INTERVAL 20 FEET
TRAINING AREA
SMALL ARMS RANGES
SMALL ARMS IMPACT AREA
GOLF COURSE
OC
HOSPITAL
SCHOOL
BOQ FAMILY HOUSING
OFFICERS FAMILY HOUSING
BUTTS SMALL ARMS AMMO AREA
WILDERNESS AMMUNITION STORAGE AREA
MARY HELEN RANCH AREA
BUTTS - A A P
GOLF COURSE
RANGE CONTROL LINE
I
II
III
IV
V
VI
VII
VIII
To VIII

REPORTING THE USE OF HERBICIDES

Current regulations require the use of herbicides be reported on the monthly Pest Control Summary Report (DD Form 1532) and the Annual Installation Natural Resources Report (DA Form 2785-R). Reporting the use of pesticides by agricultural lessees and golf courses is not specifically required at the present. The policy has been to report only pesticides used by the Facilities Engineer in his maintenance operations including applications by contractors. Clarification of this matter is expected in the near future and it is anticipated that all pesticides used on the installation, regardless of the user, will be reported.

The attached copies of each report show examples of how these forms should be prepared.

Installation Natural Resources Report:

List herbicides by the common name only. Do not use trade names such as Telvar-W, Tordon, Brush Killer, Weed-B-Gone, or Pramitol.

Pest Control Summary Report:

Examples are given showing the use and reporting of standard and commonly used non-standard herbicides. Example numbers correspond to line numbers on the DD Form 1532.

1. Amitrole (6840-833-1217) Applied in solution with 100 gal. of water to control brush at 4 lbs. of 90% concentrate per acre.

2. Borate-Bromacil (Borocil, 6840-027-6467) Granular non-selective herbicide applied at 200 lbs. material per acre. 4% Bromacil, 94% borates.

3. Bromacil (Hyvar, 6840-890-2146) Wettable powder, non-selective, applied at 5 lbs. of 80% concentrate in 30 gal. of water per acre.

4. Cacodylic Acid (Phytar, 6840-926-9094) Concentrated solution, contact herbicide, used to kill vegetation around ornamentals, applied at 1 gal. concentrate containing 2.48 lbs./gal. in 100 gal. water per acre.

5. Chlorate-Borate (Polybor-chlorate, 6840-684-8975) Non-selective, applied in solution, 870 lbs. of concentrate containing 73% borates and 25% chlorates in 435 gal. of water per acre.

6. Dacthal (6840-681-9475) 75% wettable powder used for preemergence control of annual vegetation. Applied at 10 lbs. per acre in 40 gal. of water.

7. Dalapon (6840-577-4204) Water soluble concentrate containing 85% active ingredients, applied at 30 lbs. per acre in 200 gal. water to control cattails along drainage ditch.

8. Dicamba (Banvel-D, 6840-905-4304) Water soluble liquid containing 49% dicamba or 4 lbs. per gal. Applied to control brush at 2 gal. concentrate in 100 gal. water per acre.

9. Diquat (6840-815-2799) Water soluble concentrate containing 35.3% diquat or 2 lbs. per gal. Applied to pond for control of floating weeds at 1/2 gal. concentrate in 150 gal. water per surface acre.

10. Diuron (Karmex, 6840-825-7790) Wettable powder containing 80% active ingredients. Applied to control all vegetation at 50 lbs. per acre in 100 gal. water.

11. DSMA (6840-965-2071) Water soluble powder containing 63% active ingredients. Applied to control dallisgrass in turf at 5-1/2 lbs. concentrate in 200 gal. water per acre.

12. Monuron (Telvar, 6840-514-0644) 80% wettable powder applied for nonselective control of vegetation at 40 lbs. concentrate per acre in 75 gal. of water.

13. Picloram (Tordon, 6840-990-1464) Granules containing 11.6% active ingredients. Applied at 70 lbs. per acre for broadcast control of dense stands of brush.

14. Picloram-2,4-D (Tordon 101, 6840-629-1638) Water soluble concentrate containing 5.7% picloram and 21.2% 2,4-D acid equivalent. Applied to control brush at 2 quarts concentrate in 20 gal. water per acre.

15. Silvex (6840-882-4810) Emulsifiable concentrate containing 4 lbs. acid per gal. Applied to control chickweed in turf at 1-1/2 quarts concentrate in 40 gal. water per acre.

16. Simazine (Princep, 6840-781-8195) 80% wettable powder, preemergence herbicide. Applied around ornamentals at 2-1/2 lbs. in 30 gal. water per acre.

17. 2,4-D Amine (6840-664-7060) Water soluble concentrate used to control broadleaf weeds. Applied to control dandelions in turf at 1 quart of concentrate (4 lbs. acid per gal.) in 40 gal. water per acre.

18. 2,4-D Low Volatile Ester (6840-577-4194) Emulsifiable concentrate used to control broadleaf weeds. Applied to control honeysuckle on fences at 1/2 gal. of concentrate (4 lbs. acid per gal.) in 50 gal. water per acre.

19. 2,4-D, 2,4,5-T Mixture (6840-825-7792) Emulsifiable concentrate used to control brush. Applied to control woody growth on right-of-way at 3 quarts concentrate (4 lbs. acid per gal.) in 100 gal. water per acre.

20. Fenac (6840-929-7951) Soluble concentrate containing 1.5 lbs. acid per gal. Used to control grasses and weeds. Applied to control Canada thistle at 12 gal. concentrate in 75 gal. water per acre.

21. Silvisar, 50% Cacodylic Acid in soluble liquid. Used in tree injector to kill undesirable species at approximately 4 ml per tree.

22. Copper sulfate (6840-063-3981) Used to control algae in a 14 acre lake, average depth of 4 ft., treated at 1 ppm. Required 152 lbs. of 95% material.

23. Atratol 8P. Pelleted herbicide containing 8% atrazine compounds, 40% sodium chlorate and 47% sodium metaborate. Applied for non-selective control at 400 lbs. per acre. Show only first two chemicals on report.

24. Pramitol 25E. Emulsifiable concentrate containing 1.97 lbs. prometone per gal. Applied 10 gal. of concentrate in 75 gal. water per acre for non-selective control of vegetation.

25. Tersan 1991 turf fungicide. Wettable powder containing 50% Benomyl. Applied to golf greens at 2 oz. per 1000 ft^2 in 3 gal. water.

26. Tupersan. Wettable powder, preemergence weed killer containing 50% siduron. Applied 20 lbs. per acre in 100 gal. water to fairways.

27. MH-30 (SLO-GRO, Maleic Hydrazide). Water soluble liquid containing 3 lbs. active ingredients per gal. was applied to a steep bank to reduce mowing. 1-1/3 gal. of concentrate was mixed with 50 gal. of water and applied on one acre.

28. Daconil 2787 turf fungicide (common name chlorothalonil) Wettable powder contains 75% active ingredients. Applied to golf greens at 4 oz. in 10 gal. water per 1000 ft^2.

29. Diesel oil applied to kill all vegetation, using full strength and applied on one acre using 150 gal. Diesel oil weighs 7.25 lbs./gal.

INSTALLATION NATURAL RESOURCES REPORT
PART I - LAND MANAGEMENT
(including Soil and Water Conservation)
(AR 420-74)

FISCAL YEAR

REPORTS CONTROL SYMBOL
DD-M (A) 670

INSTALLATION: SAMPLE

1. GROUNDS CLASSIFICATION (Acres)			2. LAND MANAGEMENT PLAN			
Improved	Semi-Improved	Unimproved[1]	Required [ ] Yes [ ] No	Date of Original Plan	Date of last revision	Is Plan Current? [ ] Yes [ ] No

3. LANDSCAPE PLANTING PLAN			4. SOIL SURVEYS	
Required [ ] Yes [ ] No	Date Approved	Percent of planting prescribed in plan accomplished	Required [ ] Yes [ ] No	Acres Completed

5. OUTLEASES	NUMBER	ACRES	CASH RENTAL	VALUE OF MAINTENANCE SERVICES	CONSERVATION BENEFITS[2]	VALUE AS FIRE PREVENTION[3]	TOTAL BENEFITS
Grazing							
Crop or Hay							
TOTAL							

Are soil and water conservation provisions included in lease(s)? [ ] Yes [ ] No

6. CONSTRUCTION AND O&M PROJECTS REQUIRING CONSERVATION MEASURES[4]

FY PROPOSED PROJECTS		FY COMPLETIONS	
Project Number	Estimated Cost	Project Number	Cost

7. HERBICIDE TREATMENTS

Kind of Herbicide (Common Name)[5]	Strength of Concentrate[6]	Application rate of Concentrate	Name of Vegetation Eradicated	Acres Treated
Monuron	80%	35 lbs/Acre	All	30
2,4-D - 2,4,5-T	2 lbs each/gal	½ gal/Acre	Woody Vegetation	15
Dalapon	85%	30 lbs/Acre	Bermuda Grass	7
MH-30	3 lbs/gal	2 gal/Acre	Growth Retardant	21
Dacthal	75%	11 lbs/Acre	Crabgrass	136
Borate Bromacil	98%	500 lbs/Acre	All	72

FOOTNOTES:
1. Do not include forest land (see Part II).
2. Cost soil and water Benefits performed by lessee.
3. See Chapter 4, Section IV, AR 420-74.
4. Indicate by asterisk, projects contributing to natural beauty.
5. e. g., Monuron; 2, 4-D; Silvex
6. Pounds per gallon or percent of active ingredient.

DA FORM 2785-R, 1 Jun 66

PEST CONTROL SUMMARY REPORT

SER. CODE	C.O. CODE	UNIT IDENT CODE	YR.	MO.	REPORT CONTROL SYMBOL
					DD– I&L (AR) 1080

TO:

FROM: (Installation or Activity)

S A M P L E

AREA/DISTRICT/COMMAND

LINE	PEST			OPERATION				PESTICIDE										MAN-HOURS		
	NAME	CHECK b		NAME	TOTAL UNITS TREATED	UNIT	BLDG. AND TERRAIN TREATED	NAME	FORM	APPLICATION		FINAL CONC. IN %	RATE (Per Area Unit)				CHECK p		SURVEY	LABOR	SUPERVISOR
		A	I							AMOUNT	UNIT		1ST RATE		2D RATE		SS	NS			
	a			c	d	e	f	g	h	i	j	k	POUNDS l	% m	POUNDS n	% o			q	r	s
1	BRUSH			SPPDEQ	21	AC	SPW	AMITROLE	SLN	2100	GA		3.6	100			X				
2	ALLVEG			DGPDEQ	5	AC	OPX	MBB	GRN	1000	LB		8	100	188	100	X				
3	ALLVEG			SPPDEQ	1	AC	OPX	BROMACIL	SUS	30	GA		4	100			X				
4	MXGRABDLVD			SPHAND	2	AC	OPG	ARSENICORG	SLN	202	GA		2.5	100				X			
5	ALLVEG			SPPDEQ	3	AC	OPX	MCB	SLN	1305	GA		635	100	217	100	X				
6	MXGRABDLVD			SPPDEQ	130	AC	OPG	DCPA	SUS	5200	GA		7.5	100			X				
7	AQUATICWDS			SPPDEQ	7	AC	WO1	DALAPON	SLN	1400	GA		25.5	100			X				
8	BRUSH			SPPDEQ	11	AC	SPW	DICAMBA	SLN	1122	GA		8	100			X				
9	AQUATICWDS			SPPDEQ	2	AC	WO1	DIQUAT	SLN	301	GA		1	100			X				
10	ALLVEG			SPPDEQ	12	AC	OPG	DIURON	SUS	1200	GA		40	100			X				
11	GRASSYWEED			SPPDEQ	140	AC	OPG	ARSENICORG	SLN	28000	GA		3.5	100			X				
12	ALLVEG			SPPDEQ	9	AC	OPX	MONURON	SUS	675	GA		32	100			X				
13	BRUSH			DGHAND	4	AC	OPB	PICHLORAM	GRN	280	LB		8	100			X				
14	BRUSH			SPPDEQ	25	AC	OPB	OCOPICHLORAM24D	SLN	512	GA		0.25	100	1	100	X				
15	BDLVDWEEDS			SPPDEQ	75	AC	OPG	SLVEX	EML	3028	GA		1.5	100			X				
16	MXGRABDLVD			SPHAND	4	AC	OPG	SIMAZINE	SUS	120	GA		2	100			X				
17	BDLVDWEEDS			SPPDEQ	110	AC	OPG	24D	SLN	4427	GA		1	100			X				
18	BDLVDWEEDS			SPPDEQ	5	AC	OPB	24D	EML	251	GA		2	100			X				

DD FORM 1 APR 69 1532

(REPLACES DD FORM 1532, 1 MAY 1965, WHICH IS OBSOLETE AS OF 1 JULY 1971.)

PEST CONTROL SUMMARY REPORT

SER. CODE	C.D. CODE	UNIT IDENT CODE	YR.	MO.	REPORT CONTROL SYMBOL
					DD- I&L (AR) 1080

TO:

FROM: (Installation or Activity)

SAMPLE

AREA/DISTRICT/COMMAND

LINE	PEST			OPERATION				PESTICIDE										MAN-HOURS		
	NAME a	CHECK b A	CHECK b I	NAME c	TOTAL UNITS TREATED d	UNIT e	BLDG. AND TERRAIN TREATED f	NAME g	FORM h	APPLICATION AMOUNT i	APPLICATION UNIT j	FINAL CONC. IN % k	RATE (Per Area Unit) 1ST RATE POUNDS l	1ST RATE % m	2D RATE POUNDS n	2D RATE % o	CHECK p SS	CHECK p NS	SURVEY q	LABOR r	SUPERVISOR s
19	BRUSH			SPPDEQ	11	AC	OPB	M22	EML	1108	GA		1.5	100	1.5	100	X				
20	BDLVDWEEDS			SPPDEQ	2	AC	OPG	FNAC	SLN	174	GA		18	100			X				
21	BRUSH			SYSTEMAPP	2400	EA	DEW	ARSENICORG	SLN	2.5	GA	50						X			
22	AQUATICWDS			DGHAND	14	AC	WO1	COPPERSULF	DUS	152	LB		10	100			X				
23	ALLVEG			DGPDEQ	7	AC	OPX	OCOATRAZINE CHLORATE BORATE	GRN	2800	LB		32	100	160	100		X			
24	ALLVEG			SPPDEQ	13	AC	OPX	OTRPROMETONE	EML	1105	GA		20	100				X			
25	TURFDIS			SPPDEQ	2	AC	GFG	OWOBENOMYL	SUS	261	GA		2.7	100				X			
26	GRASSYWEED			SPPDEQ	75	AC	GFG	SIDURON	SUS	7500	GA		10	100				X			
27	GRASSYWEED			SPPDEQ	6	AC	OPG	MLEICHYDRA	SLN	308	GA		4	100				X			
28	TURFDIS			SPPDEQ	2	AC	GFG	OWOCHLOROTHALONIL	SUS	871	GA		8.2	100				X			
29	ALLVEG			SPHAND	1	AC	OPX	HERBOIL	OLP	150	GA		1087	100				X			

DD FORM 1 APR 64 1532

(REPLACES DD FORM 1532, 1 MAY 1965, WHICH IS OBSOLETE AS OF 1 JULY 1971.)