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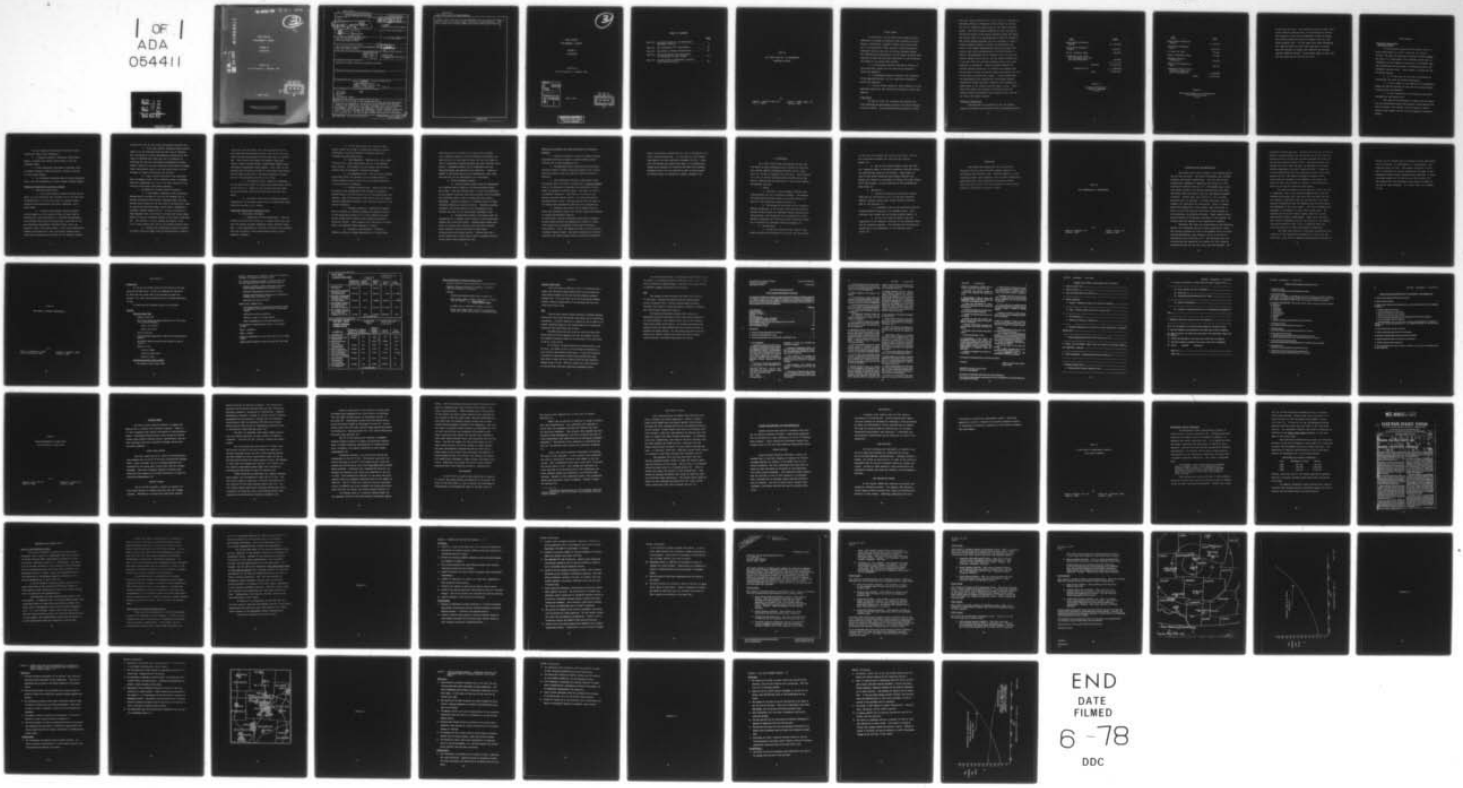

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CASE STUDIES

ENVIRONMENT & ENERGY

VOLUME II

SOLUTIONS

Edited by

Lt Col Patrick J. Sweeney, PhD

April 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: LS-29

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER: (14) AFIT/LS-29

4. TITLE (and Subtitle): CASE STUDIES - ENVIRONMENT (and) ENERGY VOLUME II. SOLUTIONS (6)

5. TYPE OF REPORT & PERIOD COVERED: Textbook

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): (10) Lt Col Patrick J. Sweeney, PhD

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Dept of Functional Management
AFIT/LSGM, WPAFB OH 45433

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Dept of Research & Administrative Management (11)
AFIT/LSGR, WPAFB OH 45433

12. REPORT DATE: Apr[illegible]78

13. NUMBER OF PAGES: 73

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) (12) 78p.

15. SECURITY CLASS. (of this report): UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
Approved for public release IAW AFR 190-17

JERRAL F. GUESS, Captain, USAF
Director of Information 5 May 78

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Case Study
Environment
Energy
Environmental Impact
NEPA

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
During the last few years it has become apparent that few good case studies concerning environmental or energy issues are available for the graduate student or the professional. In order to attempt to fill this void we have put together a short book of five cases--four that deal primarily with environmental issues and one that highlights a typical problem in the energy arena. This book is divided into two volumes so that it may be utilized as a classroom aid. The first volume includes the scenario or background

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20. and provides the basis for the development of a case which the student is asked to solve. The second volume is the set of "school solutions." Each case is taken from an actual problem that existed and required solution.

3

CASE STUDIES

ENVIRONMENT & ENERGY

VOLUME II

SOLUTIONS

Edited by

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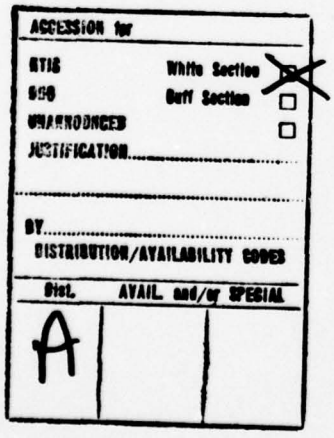

April 1978

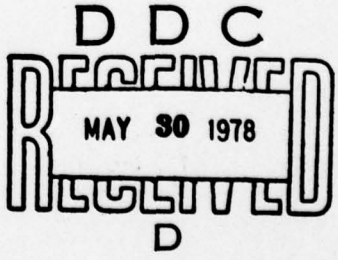

TABLE OF CONTENTS

CASE #1

AIR FORCE PLANT NO. 44 WASTEWATER TREATMENT PROJECT

By

James E. Judkins, BSCE, EIT
1st Lt, USAF

Donald J. Webb, BSCE, EIT
Captain, USAF

ACTION TAKEN

In late 1973, the Air Force gave Hughes Aircraft permission to engage an architect and engineering firm to design a waste-water treatment system which would route all of the industrial waste through a sophisticated pre-treatment facility and into the Tucson sanitary system. The architect and engineering firm and Hughes Aircraft were required to make the following submittals to the AF during the design of the waste-water system:

1. A preliminary analysis and design concept of the waste-water system for the Supervising Engineer's review and approval.

2. A preliminary design submittal (50% complete) of the approved concept, for the Supervising Engineer's review and approval.

3. A final design submittal (100% complete) of the approved concept for the Supervising Engineer's review and approval.

A New Twist

In June of 1974, the architect and engineering firm submitted the preliminary analysis and design concept to the Air Force. The engineering firm had done a little

more work than had been called for in that it presented an alternate concept in addition to the concept of routing all of the industrial waste-water to the Tucson sanitary system. The first concept analyzed the cost involved in routing the waste to the Tucson sanitary system and found the initial cost to be approximately $3,787,300 (Figure 5). The second concept analyzed the cost involved in using a reverse osmosis system to reclaim the waste-water for reuse in the Hughes manufacturing process and found the initial cost to be approximately $3,222,000 (Figure 6). From an environmental and an economic point of view, the reverse osmosis system was by far the better alternative. It met the 1985 zero pollution deadline and it was less expensive to construct. Hughes Aircraft favored the reverse osmosis system for it provided the company with the ability to reuse its process water and prolong the life of the plant's ground water supply. From an operations and maintenance cost perspective, the reverse osmosis alternative proved more cost effective than routing the waste-water to the Tucson sanitary system (6:23). Thus, a total life cycle cost analysis (30 years) found the reverse osmosis alternative more economical for both the Air Force and Hughes Aircraft.

Technical Feasibility

The decision as to whether or not the reverse osmosis alternative was feasible from an engineering point

ITEM		COST
Waste-water Collection System		$ 568,400
Waste-water Treatment Plant		1,693,600
18-in. Diameter Sewer		630,000
Incidental Costs (10% for engineers admin fee and 5% contingency)		434,000
	Subtotal	$3,326,000
Connection Fee		461,300
	Total	$3,787,300

Figure 5

Alternate Concept No. 1
Sanitary Disposal
(6:V)

ITEM	COST
Waste-water Collection System	$ 568,400
Waste-water Treatment Plant	1,693,600
0.5 mgd R.O. Unit	275,000
Spray Irrigation System	80,000
Emergency Storage Reservoirs	80,000
Waste Brine Evaporating Beds	105,000
Incidental Cost (10% for engineer's admin fee and 5% contingency)	420,000
TOTAL	$3,222,000

Figure 6

Alternate Concept No. 2 Reclamation
with Reverse Osmosis
(6:V)

of view was not easy. The Supervising Engineer spent many hours studying technical data and discussing the concept with experts in both the Environmental Protection Agency and industry before he convinced himself that the idea would actually work. He then spent more hours convincing his superiors that the idea would work and in the end made the decision to design and construct the reverse osmosis treatment system. Construction began in late 1975 and the plant was on line by July 1977.

NEWS RELEASE

Industrial Waste-Water
Treatment Plant

A new Industrial Waste-Water Treatment Plant is being constructed at U.S.A.F. Plant No. 44, Tucson, Arizona; and shall be operated by Hughes Aircraft Company. The plant is a replacement of an existing system that is inadequate in both capacity and quality of treatment with the reclamation and the reuse of treated waste-water for industrial process water. This project is unique for the following reasons:

1. It is the first of its kind in reference to reclamation and reuse of treated waste-water.

2. It will result in the reduction of groundwater demand by 300,000 gallons per day from two existing wells located within the facility.

3. It will achieve the environmental objectives stressed for the Tucson area.

This project was designed to comply with all existing and anticipated future requirements established by the City of Tucson, Pima County, State of Arizona, United States Public Health Service and Environmental Protection Agency.

The new Industrial Waste-Water Treatment System consists of three major components:

1. A separate system of industrial waste-water sewers to collect and convey liquid waste to the new treatment plant.

2. A new Industrial Waste-Water Treatment Plant to oxidize cyanide, reduce hexavalent chromium, and precipitate heavy metals.

3. An additional treatment step to remove dissolved solids and the reclamation of water through reverse osmosis.

Industrial Waste-Water Collection System.

1. Off-Site Trunk Sewers:

a. A six inch general industrial-waste gravity sewer is to be installed from Building 830 to the east side of Building 801, for the collection of discharge from a satellite plating/cleaning operation, degreaser, and a paint booth.

b. A twelve inch general industrial-waste gravity sewer is to be installed from the east side of Building 801, then due south to a location approximately four hundred feet south of Building 801, then west to the new Industrial Waste-Water Treatment Plant; also, two parallel lines in the same trench; a four inch concentrated chromic acid waste and a four inch dilute cyanide waste force mains (connections provided for the Chemical Storage

Building 817 and for the future Maintenance Building 816).

c. A six inch general industrial-waste gravity sewer is to be installed from the east side of Building 833, due south to a point approximately seventy-five feet south of Building 833, then west for a connection to Buildings 834 and 835, proceeding southwesterly through E-gate, then on to the new Industrial Waste-Water Treatment Plant (paralleling this, a six inch waste brine line for drainage of sumps at Buildings 834 and 835).

d. Other utility lines are to be installed; such as domestic water, fire protection water, reclaimed water and compressed air, set in the same trench with the off-site trunk sewer lines where possible.

2. Building 801 Internal Waste Collection:

a. A new general industrial waste collection system shall be located on the roof of Building 801 to provide collection from various locations other than the process area located on the east side of Building 801, such as satellite plating/cleaning, paint booths, degreasers, cleaners, cooling towers and etc. At each location is a sump equipped with a lift pump to collect and convey waste-waters to the new collection system on the roof of Building 801. This system, in turn, conveys the wastes to the G.I.W. sump located east side of the Etched Circuitry Area.

b. Process area collection consists of existing drain lines and sumps with the modification of some of

the drain lines and sumps, plus the installation of two new sumps and the collection sewer lines to the new trunk lines located approximately seventy feet east of Building 801. This collection consists of general industrial wastes, dilute cyanide wastes, concentrated chromic acid, and other concentrated liquid wastes. Also, part of the process area collection system is a new floor drain system for the DeBurr Area with a new pumice separator located prior to the discharge into the G.I.W. line.

c. All existing minor industrial discharges to the storm sewer shall be removed and reconnected, either to the new G.I.W. system or the existing sanitary sewer. This will provide zero-dry-weather-flow from the storm sewer.

d. All major industrial discharges presently connected to the sanitary sewer shall be removed and reconnected to the new G.I.W. system.

Industrial Waste-Water Treatment Plant.

1. Continuous Processes:

a. Comminutor and Flow Measurement: The comminutor will grind all solids to a uniform small size suitable for passing through subsequent water treatment equipment. Flow measurement is used for indicating and recording flow and to obtain a flow proportional signal to pace chemical treatment.

b. If for some reason the treatment plant cannot handle the volume of waste-water before or during processing, it can be diverted to holding ponds and returned for processing later.

c. Grit separator: Removes sand, grit, metal fillings, etc., that would settle out in a low-velocity water stream. Grit removed in this manner significantly reduces wear on subsequent treatment equipment.

d. pH adjustment tank: The pH of the incoming waste-water shall be adjusted to 6.5 automatically by adding sulfuric acid to lower the pH or sodium hydroxide to raise the pH as necessary.

e. Sulfide precipitation: Sodium sulfide shall be added to the pH-adjusted waste streame to produce a concentration of 25,000 gallons to one by proportional flow control. Most of the soluble heavy metals will be removed from the waste-water stream in the clarifier-section of the reactor clarifier.

f. Chromate reduction: Hexavalent chromium will be reduced to trivalent chromium by reducing the pH of the waste-water stream to 2.5 with sulfuric acid and adding liquid sulfur dioxide under oxidation-reduction potential control. This reaction will take place in redox tanks, two complete batch reactors in series.

g. Flotation clarification: Following chromate reduction, sodium hydroxide and a liquid poly-

electrolyte will be added to the twelve inch transfer line (chromate reduction tank-to-flotation clarifier) and mixed with an in-line type of mixer, pH will be raised to ten to precipitate reduced chromium and other residual heavy metals. Suspended solids will be coagulated with the polyelectrolyte and removed by air flotation. Sludge is pumped to the decanting and oil concentration tank, then the scum and oil are destroyed by an incinerator.

2. Batch Treatment Process:

a. Dilute cyanide wastes shall be transported to a holding tank by means of the dilute cyanide force main sewer. From the holding tank, it will be transferred to the cyanide oxidation tank where cyanide will be oxidized with chlorine under a high pH maintained with sodium hydroxide. Chlorine oxidation of cyanides shall be under oxidation-reduction potential control. Following cyanide treatment, the dilute bath will be discharged to the influent wet well of the Waste-Water Treatment Plant.

b. Concentrated chromic acid wastes shall be transported to a holding tank by means of the concentrated chromic acid force main sewer. Concentrated chromic acid shall be reduced with sulfuric acid and sulfur dioxide under automatic control followed by heavy-metal-precipitation with sodium sulfide. Concentrated acid wastes stabilized in this manner shall be pumped directly to the waste brine evaporating beds.

Additional Treatment and Water Reclamation, Continuous Process.

1. Gravity filtration is used to remove residual suspended solids by automatic, granular-media gravity filters; pH is then adjusted to six.

2. Diatomaceous earth filtration utilizes pressurized filters to remove dissolved organics and calcium. Chlorine contact tanks are used for further removal of organics.

3. The pretreated industrial waste-water after filtration shall be further treated with a reverse osmosis step to ion exchange or permeate the production of pure water to reclaim as process water. The water is sent to a clearwell reservoir. From there it is sent to the process area and cooling towers, for reuse through the reclaimed water lines. The waste brine shall be sent to the waste brine evaporating beds for solar evaporation.

4. Domestic well water can be added during or after the filtration and/or the reverse osmosis processing as demand requirements indicate.

In conclusion, the new Industrial Waste-Water Treatment System should provide the capabilities needed to comply with present and anticipated future waste discharge requirements. Also, the design provides the most advance treatment methods known. The water reclamation and reuse provides cost effectiveness which includes environmental,

social and economic considerations, and in conformance with local planning objectives. It also complies with federal requirements for best available treatment by 1983. Along with the benefitting items noted above, it provides much needed space adjacent to Building 801 where the existing treatment plant is to be removed as part of this project to provide space for production support equipment (2).

IN RETROSPECT

As a rule, every large construction project has its share of minor problems and the project to construct the reverse osmosis reclamation facility at Air Force Plant No. 44 was no exception to this rule. The following is a list of several problems which occurred during the design, construction and operation of the reverse osmosis reclamation facility.

1. Design

a. Portions of the treatment building were underdesigned for the anticipated loadings. Fortunately, the Supervising Engineer caught the mistake during his review of the structural design analysis (1).

b. The design of the plant did not include a testing laboratory as it was felt that the University of Arizona could provide the necessary testing capabilities. Unfortunately, the University can not provide the rapid response necessary for such testing and efforts are underway to provide the necessary testing equipment (7).

2. Construction

a. During the testing of the several large ponds everyone was surprised to find that the wave action

of the water was eroding the banks of the ponds. Rip-rap was installed to protect the banks and the erosion ceased (7).

b. One of the reverse osmosis units was used on a temporary basis in the main production facility during the construction phase of the project. Algae began to grow on the spiral membranes and several chemical compounds were tested in an attempt to inhibit the algae growth. As of the present, no known solution to this problem has been found (7).

3. Operations

a. Several pH monitoring and control instruments had not functioned as well as had been expected. However, several rather small design changes corrected most of the problems (2).

b. A detergent used in the production facility caused excessive foaming in the treatment plant. The detergent was changed and the foaming problem ceased (7).

c. An air line from the plant's main air compressor to the pneumatic controls in the treatment plant did not function properly. This problem was alleviated by installing an air compressor in the treatment plant itself (7).

CONCLUSION

The design and construction of a waste-water treatment facility which includes reverse osmosis is a challenging and difficult task. Reverse osmosis is a new technology which, until recently, has not been economically competitive with other waste-water treatment systems. Time alone will tell us the true benefits of using reverse osmosis in waste-water treatment plants.

CASE #2

THE INTERSTATE 675 CONTROVERSY

By

Robert W. Bennett, BS
Captain, USAF

James R. Berry, BS
Captain, USAF

CONCLUSION AND RECOMMENDATIONS

The project for I-675 has been on the drawing boards now for over 20 years. All sorts of problems have surfaced hindering the actual construction. Over $23 million has already been expended in completing the section of I-675 from North Fairfield Road to I-70. The highway was to provide easier access to the Wright-Patterson Air Force Base and Wright State University areas for the people southeast of Dayton. Without this last section of I-675, neither objective will be realized. It seems inevitable that the highway will eventually be constructed. There is support behind the completion of the highway, both from those in favor of I-675 and from the majority of those opposed to the completion as presently designed. Those opposed object mainly because of the present alignment of the highway, not because they are opposed to the completion in general.

Meanwhile the costs for construction of the remaining portion are increasing with the rising construction costs. The original estimate of cost of the highway from I-75 north through Beavercreek, past Fairborn, and to I-70 west of Springfield was $78 million (13). The estimated cost for constructing the remaining 16.53 miles of I-675, based on estimated prices for the year 1976, was $106,009,000. The

estimated right-of-way cost, including the cost for relocating families and businesses, was $20,783,500, of which, when the EIS was written, $13,801,500 had been expended for rights-of-way presently held by ODOT (14:18). The third quarter 1977 highway bid price index for Ohio, as reported by the state highway department, was 219.8 (Base:1967=100). During the one year period from the third quarter of 1976 to the third quarter of 1977, the index increased 12 percent (3:97). Even though the outcome of the highway is not known, one aspect of the I-675 problem is certain - the construction costs are rising with each and every delay.

No rigorous solution can be made until the final EIS is completed. Due to the numerous comments ODOT received concerning the draft EIS, many feel that the draft EIS did not present a sufficient case for any decision to be made. Numerous alternatives and realignments must be investigated and addressed in the final report. Oak Creek residents have suggested a realignment to avoid their wooded area. The Regional Air Pollution Control Agency would like to see mass transit further investigated. Some county officials have tried to compromise and get the portion of the highway from North Fairfield Road to US 35 completed while the remaining section is under environmental assessment.

The next step should be a thorough investigation and analysis of the alternatives presented as a result of the draft EIS. Once this is completed satisfactorily the entire

project can be assessed and the optimum solution determined from an economic, an environmental, a requirements, and a practical point of view. The present situation is still one of uncertainty as can be attested by Ted Baker of the Montgomery-Greene County Transportation Committee, "I doubt seriously anyone will be driving on I-675 by 1982 [7]." The authors feel the following clause should be added to the end of that statement: if in fact there is a highway at all!

CASE #3

NEW TERMS IN ENERGY CONSERVATION

By

David F. Manchester, BSCE
First Lieutenant, USAF

Ronald L. Schuldt, BSME
Captain, USAF

THE SOLUTION

Introduction

At 1300 the two colonels arrive and the briefing of the usual weekly topics takes place. At 1340, Col. Hagerman then introduces Lt. Smith "who will answer some of the questions you asked this morning." Col. Jones reminds everyone that he has another appointment at 1400.

Lt. Smith uses the following outline for his briefing.

Briefing

Executive Order 12003

-Signed 20 July 1977

-Must reduce energy consumption/square foot of floor space in all Federal Buildings

  -20% in all existing

  -45% in all future

-1975 is base year

-Federal Energy Administration (FEA) will provide detailed guidance

-All Federal agencies present yearly reports to FEA for approval

-Reports to show

  -Plans to comply

  -Based on energy audits

  -Results to date

Building Energy Audit Program (BEAP)

-AF response to Exec. Order 12003

-Physical inspection of a facility to determine alternatives available to accomplishing energy savings

-Use computer simulation programs to determine potential cost and energy savings through various alternatives

  -Programs calculate cooling and heating loads and annual energy consumption on an hourly basis

  -Calculate environmental heat gains and losses

  -Analyze various physical factors such as insulation, building size, orientation, etc.

  -Calculate life cycle cost data

-BEAPP (Pilot Program) goals

  -To evaluate Trane Air Conditioning Economics (TRACE) and Building Load Analysis and System Therodynamics (BLAST)

  -Evaluate AF in-house capability

  -Develop a cadre of AF energy experts

  -Make recommendations for AF wide implementation

-Accomplished at Wright-Patterson AFB on 11 buildings by AFLC

-TRACE - commercial

-BLAST - AF/ARMY

-BLAST not supportable by AF at this time for such a large demand

-BEAPP produced results as shown on slide (see next page)

Figure 2: Audit of Building No. 485 (TRACE).

BLDG 20485
AVIONICS ENG (ASD)

ALTERNATIVES (TRACE)

CONSTRUCTED: 1970
61 794 SQ. FT.

	ESTIMATED ENERGY USE (BTU/SF/YR)	PERCENT ENERGY REDUCTION	FIRST YR ENERGY COST	PROJECT COST	YEARS PAYBACK
1. EXISTING BLDG TSTAT 72°F	374,542	—	$77,174	—	—
2. ACTIVATE ECONOMIZER, REDUCE O.A., TSTAT 68°F YEAR ROUND	314,192	19.2%	$66,143	$480	<< 1 MON
3. ACTIVATE ECONOMIZER, REDUCE O.A. (HIGH EFF DAMPERS), EMCS, TSTAT 68°F YEAR ROUND	163,353	56.4%	$40,838	$29,100	< 1 YR(X)
4. VAV SYSTEM, ACTIVATE ECONOMIZER, REDUCE O.A., EMCS, TSTAT 78°F SUM, 68°F WINTER	114,492	69.4%	$31,545	$171,625	4 YR
5. VAV SYSTEM, SAME AS ALT 4, INSULATE ROOF & WALLS, TSTAT 78°F SUMMER, 68°F WINTER	101,900	72.8%	$30,072	$295,000	5 YR

(X) RECOMMENDED

Figure 3: Audit of Building No. 4024 (BLAST).

BLDG 34024 WPAFB
AIRCRAFT CORROSION CONTROL FACILITY

ALTERNATIVES (BLAST)

CONSTRUCTED: 1963
41,794 SQ. FT.

ALTERNATIVES	ESTIMATED ENERGY USE (BTU/FT²/YR)	PERCENT ENERGY REDUCTION	ANNUAL ENERGY SAVINGS ($/YR)	PROJECT COST ($)	YEARS PAYBACK
1. EXISTING BLDG	114,900	—	—	—	—
2. REDUCE THROTTLING RANGE TO 2°F	108,300	5.7	480	24	0.05
3. REPLACE LIGHTING WITH H.I.D.		11.7	3,497	16,200	4.25
4. INSTALL NIGHT & WEEKEND RESET	75,300	34.5	2,951	900	0.3
5. NIGHT & WEEKEND RESET W/REDUCED TR	68,000	40.7	3,705	924	0.25
6. NIGHT & WEEKEND RESET WITH REDUCED TR & W/H.I.D LIGHTING	54,400	52.7	7,215	17,124	2.4 (X)
7. ADD ONE INCH INSULATION TO WALLS & ROOF	105,100	8.5	2,177	125,100	26
8. ADD THREE INCHES OF INSULATION	98,600	14.2	2,544	183,500	27

(X) RECOMMENDED

Energy Conservation Investment Program (ECIP)

-Money set aside for energy conservation retrofit projects

-Requires computer simulation of buildings to determine need for and effect of the project

-Criteria

-Projects must payback within their economic life

-Must produce energy savings to cost ratios as figured with the formula: $E/C = \frac{\text{MBTU Saved/Yr}}{\text{Dollar Cost in 1000's}}$

-A simple form is submitted to justify the project

-Nearly full energy credit is given for converting to solar, wind, refuse derived fuel, or geothermal energy

ANALYSIS

Executive Order 12003

Since this order is reprinted in full it is necessary only to comment that the Federal Energy Administration had not provided the final detailed guidance at the time this case study was prepared, February 1978. At the same time, the Air Force had nearly completed computer simulation energy audits of its buildings which were over 30,000 square feet in area.

BEAP

There are many computer programs available to simulate building heating and cooling loads and heating, ventilating, and air conditioning requirements. A computer simulation is required by the Air Force on all projects requiring heating for over 40,000 square feet or heating and cooling for over 10,000 square feet of area.

The TRACE program was used during the initial Air Force wide audits because the Trane company had not only the hardware, but also the software and manpower needed for the processing of the large volume of data in a short period.

In the future, the BLAST program may be used much more in the Air Force. One reason is that it can now simulate the addition of a solar collector system whereas TRACE cannot. It also has the ability to simulate the many separate heating/cooling systems which might exist within a single Air Force structure which has been modified or expanded during its life. TRACE can simulate this latter occurance but only by using a much more complicated programming routine.

For future design projects, the programming documents must include the results of a preliminary simulation according to the FY 1980 - FY 1985 Military Construction Program Guidance. This will mean an added emphasis on simulation programs in-house and via AE services.

ECIP

This program is still relatively small $36.1 million in the FY 1980 budget. Currently the projects with the shortest payback periods are approved first. This has included adding insulation, electronic pilot lights for stoves and furnaces, automatic air dampers, and a few alternate energy source projects.

The Application Engineering Program allows a base to do experimental projects using methods outside those normally approved in Air Force regulations. This program could be used for the alternate energy source (wind, solar) projects. The attached documentation will dispell the myth that experiemental projects are swamped by masses of paperwork and endless reports. The civil engineering officer who finds himself in Lt. Smith's position could easily earn himself a better rating by getting a few projects going under this program.

DEPARTMENT OF THE AIR FORCE
Headquarters US Air Force
Washington DC 20330

AF REGULATION 93-8

11 June 1973

Special Civil Engineering Activities

APPLICATIONS ENGINEERING PROGRAM

This regulation establishes a program for field testing and evaluating new materials, equipment, and methods to meet Air Force civil engineering requirements. It explains how engineering units can establish projects under this program, to evaluate specific materials and equipment. It applies to all functions (including operations and maintenance, design, construction, plans, etc.) and to all levels of Air Force civil engineering.

1. Terms Explained:

a. Applications Engineering (AE) Program. A program to evaluate new products, systems and equipment selectively, through in-service field application, evaluation, and performance comparison with existing products, systems, and equipment for possible use by the Air Force. (This program does not apply to equipment evaluated under the Maintenance Evaluation Program established by AFR 66-8).

b. Applications Engineering Program Officer. The person in each command who is designated to monitor and coordinate the command AE Program.

c. Applications Engineering Project. An approved request for field application, evaluation, and performance comparison of equipment, systems or products.

d. Field Application. The installing and testing of the AE project in Air Force real property facilities by in-house or contractor personnel.

e. Field Evaluation. The collection and appraisal of performance data on the AE project.

f. Performance Comparison. The comparing of data gathered on new products, with existing products performing under similar circumstances.

Supersedes AFR 93-8, 6 January 1971. (For summary of revised, deleted, or added material, see signature page.)

OPR: PREE

DISTRIBUTION: F

g. Industry Proposal. Any nongovernment proposal recommending the use of new product, system, or equipment not presently being used by Air Force Civil Engineering.

2. Program Objectives. This program is designed:

a. To provide a way to apply, evaluate, and compare new products, systems and equipment with products, systems, and equipment normally used by Air Force civil engineering.

b. To broaden participation in the program at all levels of the civil engineering organization and to create a central point which will:

(1) Control field evaluations to prevent duplications;

(2) Disseminate evaluation results; and

(3) Provide the Air Force with the results of proposals from industry on new products and materials.

c. To use available professional knowledge, practical experience, and other civil engineering resources to evaluate new products, system, and equipment.

3. Eligibility for Projects. This program may not be used for the sole purpose of using materials that violate existing criteria. Before an AE project will be approved, it must offer substantial benefits to the Air Force; also, before it can be considered under this program, an affirmative answer to these two questions is mandatory:

a. Will it be possible through a test of this product, system, or equipment to gather accurate data on its initial and maintenance cost and can these costs be compared against a project using normally accepted procedures?

b. Is the scope of the proposed project confined to reasonable limits consistent with the test objectives? (This point is important, since the effort will be exploratory and the anticipated advantages have not been conclusively demonstrated.)

4. Funding. Special funding is not available for "field application and evaluation" purposes; consequently, the basic project must be justified, approved, and funded according to standard procedures. Each proposed field application and evaluation must have HQ USAF approval before it is included in the program. This procedure is intended to provide a centralized control which will eliminate any unnecessary duplication.

5. Industry Proposals. Industry representatives frequently propose new products, systems, and equipment for Air Force use. Each unit that desires to use such a product should apply for AE project approval as explained in paragraph 10, or should advise the industry representative to forward information on the product to Air Force Civil Engineering Center (AFCEC) in the format shown in attachment 2. The industry representative may also make an appointment with AFCEC to discuss the product.

6. Responsibilities of the Base Civil Engineer. The base CE will:

a. Make a technical review of each request for an AE project, recommend approval or disapproval, and forward it to the command AE program officer.

b. Make sure that each AE project plan is followed closely, and that any deviation is reported to the command AE program officer.

c. Semiannually, submit to the command Ae program officer a "Status Report on AE Projects," RCS: HAF-PRE(SA) 7125. (Use the format in attachment 3). In the final semiannual report, summarize the completed project including the conclusions and recommendations in the report; also, attach any significant analytical data and any appropriate photographs.

d. Forward each unsolicited industry proposal to the command AE program officer.

7. Responsibilities of the Major Command (MAJCOM). Each Major Command will appoint an AE program officer and will furnish his name, symbol, and extension to AFCEC. This program officer will:

a. Receive each request for an AE project that originates within the command, assure that it is given an adequate technical review, and forward it, with recommendations, to AFCEC within 30 days of receipt.

b. Assure that a semiannual report is prepared on the status of each command AE

project and forwarded to AFCEC with comment by 1 April and 1 October each year.

c. Forward each industry proposal to AFCEC, with comments and recommendations.

8. Responsibilities of The Air Force Civil Engineering Center (AFCEC). AFCEC will conduct the AE Program as follows:

a. Obtain HQ USAF/PREE (or PREN) approval or disapproval for each request for an AE project.

b. Review and analyze each project report and the comments that accompany it.

c. Publish a semiannual status report on all AE projects.

d. Within 30 days after project completion, forward the results, with recommendations, to HQ USAF.

e. Evaluate each industry proposals and provide results to HQ USAF with recommendations.

f. Maintain a list of command AE program officers.

g. Recommend duration of test.

9. Responsibilities of HQ USAF. HQ USAF/PREE provides policy guidance and implementation directions for all civil engineering applications (except for guidance on family housing, which is provided by HQ USAF/PREN); as applicable, PREE and PREN also:

a. Approve or disapprove each request for an AE project.

b. When a project is completed (or a report on an industry proposal is received), make the final determination on whether to reject or accept a new product, system, or equipment.

c. Terminate a study that is still underway when it reaches the point where the study proves conclusively that the results will be unsatisfactory.

d. If the results of a completed project were favorable, determining whether they are important enough to publish in standard criteria.

e. Approve all waivers to existing criteria, where required, before including an AE project in the program.

10 How To Establish A Project. Personnel performing civil engineering functions may originate AE projects. To establish a project:

a. Prepare:

(1) An application for the project. (Use the format shown in attachment.)

(2) A format for presenting project data (attachment 2). The importance of following this format cannot be over-emphasized: if any of the required information is omitted, it will cause a delay in processing the application.

b. Submit the application, with the product data format, as follows:

(1) At base level, to the base civil engineer.

(2) At Major Command level, to the Major Command AE program monitor.

(3) At headquarters level, to HQ USAF/PREE (or PREN, as applicable).

BY ORDER OF THE SECRETARY OF THE AIR FORCE

OFFICIAL

JOHN D. RYAN, General, USAF
Chief of Staff

DWIGHT W. COVELL, Colonel, USAF
Director of Administration

SUMMARY OF REVISED, DELETED, OR ADDED MATERIAL

This revision changes program responsibilities from HQ USAF/PREC to HQ USAF/PREE, HQ USAF/ PREN, and AFCEC.

FORMAT FOR INITIAL APPLICATION FOR AE PROJECT

1. Proposed Project Title_____

2. Major Command_____

3. Base and Facility Where Test Will Occur_____

_____

4. Project Description:

a. Objective (Establish the goals of the proposed evaluation):_____

_____

b. Scope (Include quantity, cost per unit, and give unit):_____

_____

c. Life Expectancy:_____

d. Method and Frequency of Maintenance:_____

_____

e. Estimated Semiannual Cost of Maintenance (include Expenditures for Equipment, Supplies, Etc):_____

_____

f. Project Requirements (DD Form 1391, Work Orders, Etc):_____

_____

5. Project Plan and Schedule (Must include time frame for doing project, starting at time application is approved):_____

_____

6. Other Considerations (Aesthetics/Accoustics/Recoverability, etc)._____

_____

_____

7. Standard Procedure Data:_____

a. Standard Method, Product, Equipment Used:_____

_____

b. Selection and Location of a Project Which Will Privide comparable data:_____

_____

(1) Scope, Quantity, and Date of Installation:_____

(2) Initial Cost:_____

(3) Average Semiannual Maintenance Cost to Date:_____

_____

(4) Method of Maintenance:_____

_____

(5) Comments Concerning Performance of Product/System/or Equipment to Date:_____

_____

8. Orginator's typed name, grade, and title, with signature_____

_____

Note: As the application is processed through channels the following are added:

9. Base Civil Engineer's Recommendations; with typed Name, Grade and Signature.

10. Major Command AE Officer's Recommendations; with Typed Name, Grade, Title, and Signature.

11. AFCEC Recommendations; with Typed Name, Grade, Title, and Signature.

12. HQ USAF Approving Authority's Typed Name, Grade, Title, and Signature.

13. Action: Approved: Disapproved:

Project No._____

Project Title_____

FORMAT FOR PRESENTING PRODUCT DATA

1. PRODUCT NAME:
Give both proprietary and non-proprietary generic name.

2. MANUFACTURER:
Give name and address of manufacturer and name and telephone number of technical representative nearest Panama City, Florida. Where no local representative is available, give name, address, and telephone number of person to be contacted for technical discussions.

3. PRODUCT DESCRIPTION. This should include concise, accurate statements, outlining where applicable:
a. Basic use
b. Limitations
c. Composition
d. Components
e. Sizes and shapes
f. Accessories
g. Finishes
h. Colors
i. Reference standards applicable (that is, ASTM, USASI, etc.)

4. TECHNICAL DATA:
Give physical and chemical data, test reports, etc.

5. INSTALLATION:
Give brief description of installation techniques to be followed.

6. AVAILABILITY AND COST:
a. Indicate national or regional availability; if regional, give regions.
b. Indicate material and labor cost, to enable determination of economics.

7. GUARANTIES AND WARRANTIES:
Indicate the manufacturer's standard guarantee or warranty period and coverage.

8. MAINTENANCE:
Indicate the normal maintenance procedures and cycles.

9. COMPETITION WITH OTHER SIMILAR PRODUCTS:
Indicate other products with which this item is competitive.

FORMAT FOR STATUS REPORT ON AN AE PROJECT: HAF-PRE(SA) 7125

1. Title, project number, and the date it was started.

2. Major command and base.

3. Project status: (Furnish the following data on the tested material and on the standard procedure.)

   a. Initial installed cost of product.

   b. Method and frequency of maintenance.

   c. Maintenance cost for the past 6 months.

   d. How the material is performing and any difficulties that have been encountered.

   e. Any other pertinent data for evaluation.

   f. Recommendations. (On the final report, include recommendations for acceptance or rejection; also, include recommendations on any regulations, manuals, etc. that should be changed.)

4. Any deviations from the plan or schedule.

5. Author's typed name, grade, and title, with signature.

As the report moves through channels, the following are added:

6. Major command AE officer—Comments (if any); signature.

7. AFCEC—Comments (if any); signature.

8. HQ USAF/PREE—Final review. Forward comments, if any, to base CE through project channels. Signature.

CASE #4

WRIGHT-PATTERSON AIR FORCE BASE

AIR POLLUTION--A CASE STUDY

By

James R. Holt, BS, PE
Captain, USAF

Richard W. Laske, BS
Captain, USAF

ACTIONS TAKEN

The first action taken in efforts to improve air quality was to identify air pollution sources. Tables 6, 7, and 8 summarize the sources and nature of the pollutants found. Following identification, major pollution sources (spray paint booths, heating plants, incinerators, and the fire training area) were controlled through various construction programs.

SPRAY PAINT BOOTHS

The first major action to control identified pollution sources was in the FY 70 Military Construction Program (MCP). Water scrubber type air cleaning equipment was installed on all spray paint booths that were not already equipped. The water scrubbers removed air-borne paint particles from exhaust fan systems effectively to meet air pollution requirements (2).

HEATING PLANTS

The FY 72 MCP included a project to convert all coal-fired boilers to natural gas with fuel oil standby systems. Conversion to natural gas would have insured

compliance with air quality standards. The project was approved and 90 percent designed when oil and natural gas shortages prompted a moratorium on conversions. Congress subsequently approved a change to utilize the $4.1 million programmed for the project to install two electrostatic precipitators (ESP) on Building 1240 (Kittyhawk Center heating plant) and provide an underground connecting line to Building 271 (AFLC heating plant) (2).

The ESP's at Building 1240 remove enough particulate from boiler emissions to meet current air quality standards. The ESP's do not, however, control the sulfur oxides.

The line connecting 1240 and 271 is rarely used. The boilers in 1240 do not have sufficient capacity to satisfy Kittyhawk Center and AFLC winter heating demand. The AFLC summer hot water requirements cannot be met by Building 1240 because the large capacity boiler (100 MBTUH) is shut down for cleaning and testing. As a result, the air quality improvements which might have resulted by shutting down Building 271 have not occurred (2).

WPAFB submitted an additional air quality improvement project for consideration under the FY 75 MCP. The $33 million project scope was to include consolidation of the capacity of five base heating plants into two. The two central plants would have contained electrostatic precipitators to bring the entire base heating system into compliance with particulate emission standards (2).

Specific provisions of the project included three 130 MBTUH high temperature hot water boilers in Building 1240 and three 140,000 pounds of steam/hour boilers in Building 770. Distribution lines from 1240 would service areas previously heated by Buildings 271 and 170. Distribution lines from 770 would service areas previously heated by Building 66. Heating plants 271, 170, and 66 would have been shut down entirely (2).

The FY 75 MCP project was rejected by Congress pending further analysis of energy and pollution requirements at WPAFB including consideration of refuse derived fuel, scrubbers, and general reduction of base energy requirements (2).

Following analysis, the project was revised and resubmitted in the FY 77 MCP. The project scope was virtually the same as the FY 75 MCP except boiler sizes were reduced and distribution lines were programmed above ground where possible. Estimated cost remained $33 million, the project was approved, and design was completed at the end of 1976. The construction contract is now about one-third complete with an estimated completion date of the summer of 1980 (2). The FY 77 MCP will bring the central base heating up to Federal and state standards for particulate emissions but will not affect the sulfur dioxide problem (2).

At present there is a conflict between WPAFB and the regional office of the Environmental Protection Agency

(EPA). The EPA developed base point source emission standards on a mathematical model based on the current, five plant, heating system. WPAFB contends that a model based on the future two plant concept would be less restrictive. As a result of the two plant model, EPA has determined the base must burn 0.25 percent sulfur content coal to meet sulfur dioxide emission standards (by comparison, coal with less than 1.0 percent sulfur content is considered low sulfur coal and the base now purchases 0.68 percent coal). Actual emission tests using 0.68 percent coal revealed a much lower sulfur dioxide level than projected from the EPA model. The EPA has upheld its five plant model but will allow rework using a two plant concept at WPAFB expense. The base Environmental Engineering Office feels that a model based on two plants would eliminate the prospect of buying higher priced 0.25 percent coal because the plants will have better equipment, higher stacks, and better locations. WPAFB will not pursue control of sulfur dioxide emissions until this modeling problem is resolved (2).

INCINERATORS

In the 72 MCP, projects were submitted to Congress to replace the paper burning incinerators at Buildings 305 (Area B) and 294 (Area C), and to replace the pathological incinerators at Buildings 830 (Area C) and 838 (Area B).

The projects were approved for a total cost of around $300,000 (2).

WPAFB took an innovative approach in using a performance type specification. The contractor was required to verify that the equipment provided met Federal and state air pollution standards. The projects were awarded and near completion when Headquarters Air Force rejected the idea of using performance type specifications on pollution abatement equipment.* The projects were completed as contracted and the four incinerators meet current air pollution standards (2).

Later, the silver recovery incinerator at Building 294 (Area C) was replaced. In this project, the contractor was free of contractual restraint with regard to air pollution. This incinerator burns over a slow cycle to recover the silver used in film. Even though the emissions are clear and free of solid particulate, the incinerator produces chemical gases that condense to particulates upon cooling. Because of the condensable gases, the incinerator cannot pass EPA point source standards. Further actions are pending (2).

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*Recently, Headquarters Air Force decided that pollution constraints can be included in performance contract specifications.

FIRE TRAINING AREA

Fire training areas are exempt from pollution control in Federal and state regulation. However, several areas around WPAFB have ordinances against open burning. Although the fire training facilities are exempted from pollution control, visible smoke from base fire training activities became a political consideration in forcing area residents to comply with open burning ordinances. To cooperate with local communities, the usage of the fire training area has been reduced and WPAFB now has a variance with the Greene County Board of Health to allow twelve burnings per year. In addition, WPAFB has a $400,000 project under design to construct a new clean burning fire training area (2).

The proposed fire training area burns jet fuel without producing black clouds of smoke and without reducing the ferocity of the flames. The jet fuel is introduced below the water level in a flooded gravel bed. Water is misted just above the surface of the burning fuel. This method of burning eliminates the clouds of smoke but does not eliminate other pollutants. The Greene County Board of Health is now becoming concerned with the "total" pollutants coming from that fire training activity (2).

FUTURE REQUIREMENTS AND RECOMMENDATIONS

Current actions have and will eliminate many serious air quality problems on WPAFB. Particulate emissions will be virtually nil upon completion of the FY 77 heating plant project. Other significant pollutants require continued action by the base Environmental Engineering Office.

SULFUR DIOXIDE

Sulfur dioxide emissions represent a nearly untouched area in the base campaign to improve air quality. Although ambient air quality in the WPAFB area is well within standards, the base contributes far more than its share of this substance as evidenced by non-compliance with point source standards. The modeling concept dispute must be settled, by use of USAF resources if necessary. Also, alternatives in reducing sulfur dioxide emissions must be studied. The use of lower sulfur content coal, scrubbers, and refuse derived fuel may be possible solutions.

INCINERATORS

A problem still remains with the film burning incinerator at Building 294. Interim satisfactory operation may possibly be achieved by including a high percentage of paper but efficiency of silver recovery may be reduced. The long run solution must be modification to eliminate condensible particulate, and retesting. A condenser and electrostatic precipitator may be necessary to insure total compliance.

FIRE TRAINING

The fire training area represents an essential base activity which may possibly be jeopardized by future political/environmental considerations. Although presently exempt, the status of the fire pit in light of the political atmosphere and air quality standards should be closely monitored. Actions to date exemplify close coordination and cooperation between the base and community on environmental problems.

THE CONTINUING EFFORT

In the future, WPAFB must continue to identify and categorize pollution sources. For example, ASD operates a firing range at which aircraft fuel tanks are destructively tested in a wind tunnel. Resulting vaporization of fuel

constitutes a significant hydrocarbon course. Continued aggressive action to identify and control pollution sources is necessary to establish leadership in the effort to improve the environment.

CASE #5

A CASE STUDY OF MONTGOMERY COUNTY'S SOLID WASTE PROBLEM

By

Hugh K. DeLong, III, BS
Captain, USAF

Robert M. Julsonnet, BSCE
Captain, USAF

Montgomery County's Decision

The Montgomery County Commissioners decided to select Plan D (resource recovery) (9). Although this plan involved the largest initial investment of capital, it produced the lowest long-term cost. It is imperative that the reader understand the importance of timing in this decision. Resource recovery becomes economically feasible and desirable in the near future only if there exists a firm market for the purchase of steam from the waste heat of organic materials combustion. The reader is reminded that

> In December, county officials and representatives of Cargill, Inc., met in Minneapolis to determine the feasibility of building a resource recovery system to convert trash into steam for sale to the company's facility in North Dayton /3:13 Jan 78/.

The outcome was a mutual decision to work toward a resource recovery plan that would produce steam for Cargill to use in their corn processing plant. Cargill has a need

for all of the steam that Montgomery County can produce from refuse burning. Cargill must stop using their oil-fired boilers for both ecological and economic reasons (3:12 Nov 77). If they do not use the Montgomery County Resource Recovery steam they will have to buy coal-fired boilers. For additional insight, the reader's attention is directed to the Dayton Daily News editorial on the next page of this case study.

This editorial identified the crucial and necessary decision of the City of Dayton to bind itself to a long-term contract with Montgomery County for refuse delivery. The importance of Dayton's participation in this solid waste venture is highlighted in the following figures:

PROJECTED SOLID WASTE (TONS/YEAR)

Year	Montgomery County	Dayton
1980	507,171	741,529
1990	700,883	1,048,580
2000	846,539	1,285,600

Clearly, more than half of the refuse expected to provide fuel for a resource recovery plant would come from Dayton (8:III,22).

In summary, Montgomery County decided upon resource recovery after getting Dayton's promised support and before Cargill had purchased steam from other sources.

DAYTON DAILY NEWS

James M. Cox, Publisher 1898-1957 — James M. Cox Jr., Publisher 1957-1974

David E. Easterly, president; Arnold Rosenfeld, editor;
Joe Fenley, managing editor; Tom Teepen, editor of the editorial pages

Down to the wire on waste recovery chance

Though the City of Dayton is asking for yet a little more time to make its decision on whether to participate in Montgomery County's proposed trash disposal plan, and will get it, any further delay could wreck a good opportunity for the city and county.

Montgomery County commissioners have to decide very soon whether to adopt the expensive ($72 million) but promising waste resource recovery system. Dayton's city hall leaders have dived into the data provided by the county's consultants. Dayton has hired Battelle Memorial Institute of Columbus as its own consultant.

Now Dayton officials believe they can come up with a decision by March 1. This could be the last delay that can be squeezed out of Cargill, Inc., which also has its back to the wall and has been patient, beyond the call of duty, with the local governments.

Cargill would be an extraordinarily good customer for steam because of the large amount it would buy in continuous quantities. If a county-Cargill agreement should fall through, the county might find other steam customers, but not likely with these advantages and most likely with the result of adding $3 per ton to disposal tons, according to some earlier studies.

The city still has some unanswered questions and wants to know the basis for some of the county consultants' assumptions. It is necessary to have those questions resolved. But the city doesn't have the luxury of time to run down too many dead-end streets, looking for some alternative that sounds cheaper in theory but won't stand up to an in-depth study.

Cargill is not unfairly "pressuring" anyone, as one former county commissioner charged in a cheap shot. Cargill is giving up expensive oil-fired boilers for its corn processing plant and will either buy steam or put in its coal-fired boilers. Cargill set a deadline for a county decision last August, then granted a delay until January, then granted another delay until Feb. 15 and now has agreed to wait until March 1.

Meanwhile, Cargill has to get permits and waivers for its proposed coal-fired boilers, and has to begin construction by Dec. 1 in order to come under certain regulations of the Clean Air Act. That doesn't allow slack time. Cargill has ordered development of coal-fired boilers in case the county deal doesn't come through; cancellation charges will increase as delays are extended. Construction costs also rise with delays. Even if the city and county agree on the proposed garbage-into-steam plan now, negotiations with Cargill will take time.

Fortunately, the city has been pushing ahead with an attitude of cooperation with the county, and all three parties have tried to make allowance for the pressure created by circumstances. But this is deadline time, and the city now has to resolve its questions without getting caught on a search for a solution that isn't.

REVIEWING THE CURRENT FACTS

Scope Of The Technical Review

The list of feasible solutions has already been discussed, but it must be re-emphasized that the issuance of the EPA Consent Order significantly reduced the scope of possible technical review (11). Fortunately, the expertise of the EPA resulted in the elimination from consideration of alternatives which would have been difficult for Montgomery County to study, review, and implement prior to the expiration of the maximum possible extension of air quality standards by 15 April 1980 (11).

It is the authors' personal opinion that the four plans identified by EPA permitted sufficient breadth of investigation while minimizing the amount of study required prior to selection and implementation.

Unfortunately the solid waste problem seems to be overstudied. It appeared that the County Commissioners used consulting firms to study every conceivable problem that might exist in Montgomery County's solid waste management area. It is the authors' opinion that these firms were used for their ability to delay the decision-making process. In this manner, the Commissioners could wait and select a proven system that would be acceptable in the future.

In the late 1960's incineration was recognized as "the way to go" with refuse, and the Montgomery County Reduction Plants were two of the first municipal solid waste incinerators operated in the United States. Unfortunately, it was this lead that forced Montgomery County to deal with and solve the numerous operational problems encountered in large-scale incinerator operation. In fact, it is quite probable that Montgomery County's problems with their incinerators were the stimulus for most of the municipal solid waste market to turn to resource or energy recovery as a better solution to the problem.

The current delay in selecting a solid waste disposal system has enabled the Montgomery County Commissioners to utilize a scope of technical review commensurate with the technical nature of the problem. Any delaying caused by apparently excessive technical review has been overshadowed by the knowledge gained from other municipalities who implemented the energy or resource recovery systems during the period from July, 1974, (7) until the present time.

Discussing The Decision-Making Process

There were two main phases to the decision-making process that Montgomery County employed. Initially, the Commissioners had to agree upon the assumptions necessary for the economic computations. For example, had the Commissioners agreed upon a short-range perspective in

lieu of a long-range perspective, they probably would have selected landfill as the solution due to its inherent short-range efficiency. All of the assumptions used in the various comparisons were logical and supportable.

The second main phase of the decision-making process was the "selling" of the optimal solution to the people of Montgomery County. Because of the necessarily political orientation of all three Commissioners, this "selling" was done through appropriate use of the mass media. For example, the two main area newspapers (The Dayton Daily News and The Journal Hearld) have been kept abreast of every new development in the long and complicated route that led to today's current situation. Now, the vast majority of Montgomery County residents realize that to solve the current problem it is going to cost more money, regardless of the solution technique selected. Therefore, most people are concerned with minimizing the long-range increase in cost. Consequently, the resource recovery (Plan D) plan has essentially "sold" itself.

In review, it is important to note that the two critical areas of this decision-making situation--specifying assumptions and publicity--were both handled in an appropriate manner by the Montgomery County Commissioners.

The Plan D solution is the best choice.

APPENDIX A

OPTION A - TRANSFER HAUL AND SANITARY LANDFILL (5)

Advantages

1. Landfill, at least in the short run, is the least cost alternative.
2. Availability of several existing landfills allows this option to be implemented within 4-6 months.
3. Minimal air pollution problems compared to other processing methods are inherent in landfill.
4. Sites being considered for acquisition by private firms indicate long-term availability (10-15 years).
5. Landfill involves low initial capital investment under current OEPA requirements.
6. Landfill is required in all cases, as a final sink, regardless of what system the County employs.
7. Landfills are capable of receiving any and all types of waste.
8. Landfills may provide additional land recreation areas as a finished product. This may be factored into long-term area land use planning.
9. Landfill presents a total solution to the County.

Disadvantages

1. Recovery of potentially valuable materials is virtually eliminated when wastes are buried and covered, with the exception of possible methane recovery - a difficult and long-term process.
2. Landfills require large amounts of land area normally located at considerable distances from collection areas, thereby increasing haul distances and overall transportation cost.

OPTION A (Continued)

3. Landfills must be properly operated. Otherwise a landfill can quickly degenerate into an environmental insult and be cited by Departments like OEPA for improvement or shutdown.
4. Landfills are usually subject to the most vehement of all public opposition against solid waste facilities.
5. The completed fill has limited use. Special costly design and construction procedures must be used for building on landfills sue to settlement and gas production factors.
6. Landfills must be properly designed and vented. Odor resulting therefrom can be a problem to neighboring residents. Odor mitigation procedures, charcoal filtration, for example, can be extremely expensive, and produce additional waste from the spent filtration beds.
7. Unless specially engineered, contamination of ground and surface water supplies can occur. The construction of a landfill may therefore require lining with an impermeable membrane (natural or artificial), subsurface drainage systems, leachate collection, storage and treatment. These additions significantly increase the initial and continuing costs of landfill operation.
8. The quality of leachate varies with many parameters, but mainly with the quantity of refuse deposited. The less refuse in-place, the lesser the environmental considerations. Landfill with no processing involves the highest refuse quantity placement.
9. Several state solid waste agencies have mandated strict landfill engineering controls. Pennsylvania is one of the most stringent

OPTION A (Concluded)

in its lining and leachate treatment requirements. In inland areas, where aquifers may be affected, stronger safeguards may be anticipated. Future landfill requirements in Ohio could result in higher landfill costs than at present.

10. Montgomery County is committed to utilization of waste for recovery of a useful product. Simple burial of a potential resource is inconsistent with current philosophy in Montgomery County.
11. The existing $7 million bond indebtedness must be retired at the outset.
12. The City of Dayton has expressed a desire to continue its operations similar to the present. Landfill, depending on location, may impose an additional haul cost to Dayton, decreasing the City's desire to participate in the County plan.

Re: Solid Waste
Montgomery County

December 19, 1977

Montgomery County Environmental Services
P. O. Box 972
451 West Third Street
Dayton, Ohio 45422

This report letter is a reply to your request for information regarding the solid waste disposal management practices in counties surrounding Montgomery County. The names of several individuals with responsibilities for dealing with solid waste problems in these counties are included. Copies of the solid waste disposal law and regulations governing the opening of new landfills are attached. Copies of individual disposal site questionnaires for relevant sites are also included. Judgments and recommendations have been made to further clarify the solid waste disposal management situation in a county and the future paths that seem most practical and reasonable.

Butler County

This county is located southwest of Montgomery County. There are currently five (5) licensed solid waste disposal sites in Butler County:

1. Butler County Sanitary Landfill, located 3 miles south of Trenton. This is a governmentally operated landfill serving all of Butler County. The site has a life expectancy of 20 years +, but it is unlikely that the County Administration would accept waste from outside the county. Contact: James Hinchberger, County Sanitary Engineer.

2. Oxford Sanitary Landfill. This landfill is a small municipally operated site which serves Oxford only.

3. Champion International Corp. This site is located south of Hamilton and is a disposal site for paper pulp only.

4. Fairfield Industrial Development located approximately 3 miles southeast of Hamilton. This is a privately operated landfill with a life expectancy of ten (10) +

years. The landfill recently lost a large volume of waste which was coming from the City of Fairfield. The Fairfield waste now goes to Rumpke's Landfill in Hamilton County. This landfill could accept waste from Montgomery County. Contact: Gary Woganstahl, landfill manager, telephone: 867-1268.

5. Schlichter Co. Inc. Landfill. This landfill is located approximately 6 miles southwest of Hamilton. The site is privately operated and has a long life expectancy, 15-20 years. But, this site is located very poorly hydrogeologically and its use by Montgomery County would not be recommended.

Greene County

This county is located directly east of Montgomery County. There are currently four (4) licensed solid waste disposal sites in Greene County:

1. Xenia City Sanitary Landfill. This landfill is located on the northwest edge of Xenia and serves the residents of Xenia only.

2. Fairborn City Landfill. This landfill is located on the southwest edge of Fairborn and serves the residents of Fairborn only.

3. Armentrout Landfill. This landfill is located approximately 3 miles west of Xenia. The landfill is privately owned and operated. This landfill is approved for non-putrescible wastes only. In addition this landfill has a short life expectancy, 1 to 2 years.

4. Cedarville Village Incinerator. This disposal facility is a small volume batch type incinerator for use by Cedarville residents only.

A serious solid waste disposal problem exists in Greene County at this time. There is no licensed landfill in Greene County to serve the areas outside the major cities. Most of the waste collected by commercial haulers or hauled by individuals must be taken to a landfill outside the county (to Clark Co. or Montgomery Co.). As a result, promiscuous, unauthorized open dumping in Greene County is on the increase.

It is recommended that you contact Greene County officials regarding a regional approach to long term solid waste management, resource recovery, etc. Contact: Tim Denger, Assistant Sanitary Engineer, telephone 372-8043.

Clark County

This county is located northeast of Montgomery County. There are currently three (3) licensed solid waste disposal sites in Clark County. Clark County has two privately operated landfills with relatively long life expectancies which could accept solid waste from Montgomery County.

1. Limestone City Reclamation Project. This site is located 3 miles west of Springfield just off State Route 4. The site has a life expectancy of 20 + years. Contact: Rod Christian, telephone: 323-3442.

2. North Sanitary Landfill. This site is located northwest of Springfield three miles west of Tremont City. The site has a life expectancy of 20 + years. Contact Ray Davis, telephone 278-0821.

3. Clark County Landfill. This is a small privately operated site which does not have the space to dispose of large volumes of waste from Montgomery County.

Miami County

This county is located north of Montgomery County. This county currently faces a similar problem to Montgomery County. A non-complying incinerator is soon to be closed. Miami County has not sought an approved landfill in the county nor is there a licensed private landfill in the county. Miami County plans to convert the incinerator to a transfer station and haul their waste to a landfill outside the county. This is expected to occur in 1978.

Darke County

This county is located northwest of Montgomery County. There are no landfills in Darke County currently that could serve Montgomery County and none proposed.

Preble County

This county is located west of Montgomery County. There are two (2) licensed landfills in Preble County.

1. Preble County Sanitary Landfill. This site is located four (4) miles south of Eaton at State Route 127. The site is operated by the Preble County Sanitary Engineer. The site has a long life expectancy of 20 + years but it is unlikely

that Preble County would permit Montgomery County waste on a large scale to be disposed in the Preble County landfill.

2. Monroe Township Landfill. This is a small governmentally operated site that could not accept Montgomery County waste.

Preble County has the potential to be one of the best counties for locating new environmentally sound landfills. But, the political hurdles for developing a landfill in Preble County for Montgomery County waste may be hard to negotiate. Contact: Kenneth Yost, Preble County Engineer

Warren County

This county is located southeast of Montgomery County. There are currently three (3) licensed solid waste disposal sites in Warren County.

1. Lebanon City Landfill. This landfill is for the use of Lebanon City only.

2. Franklin Solid Waste Disposal. This site is for the residue from a wet process system for the recovery and disposal of municipal solid wastes. The site could not receive Montgomery County Waste.

3. Stubbs Mill Sanitary Landfill, Inc. This is a private site located eight miles south of Lebanon. The site has a long life expectancy and could receive Montgomery County Waste. Contact: Dick Clark, operator, telephone, 771-7097.

Warren County like Preble County has the potential to be one of the best counties for locating new environmentally sound landfills. However, the political hurdles for developing a landfill in Warren County for Montgomery County waste may be hard to clear.

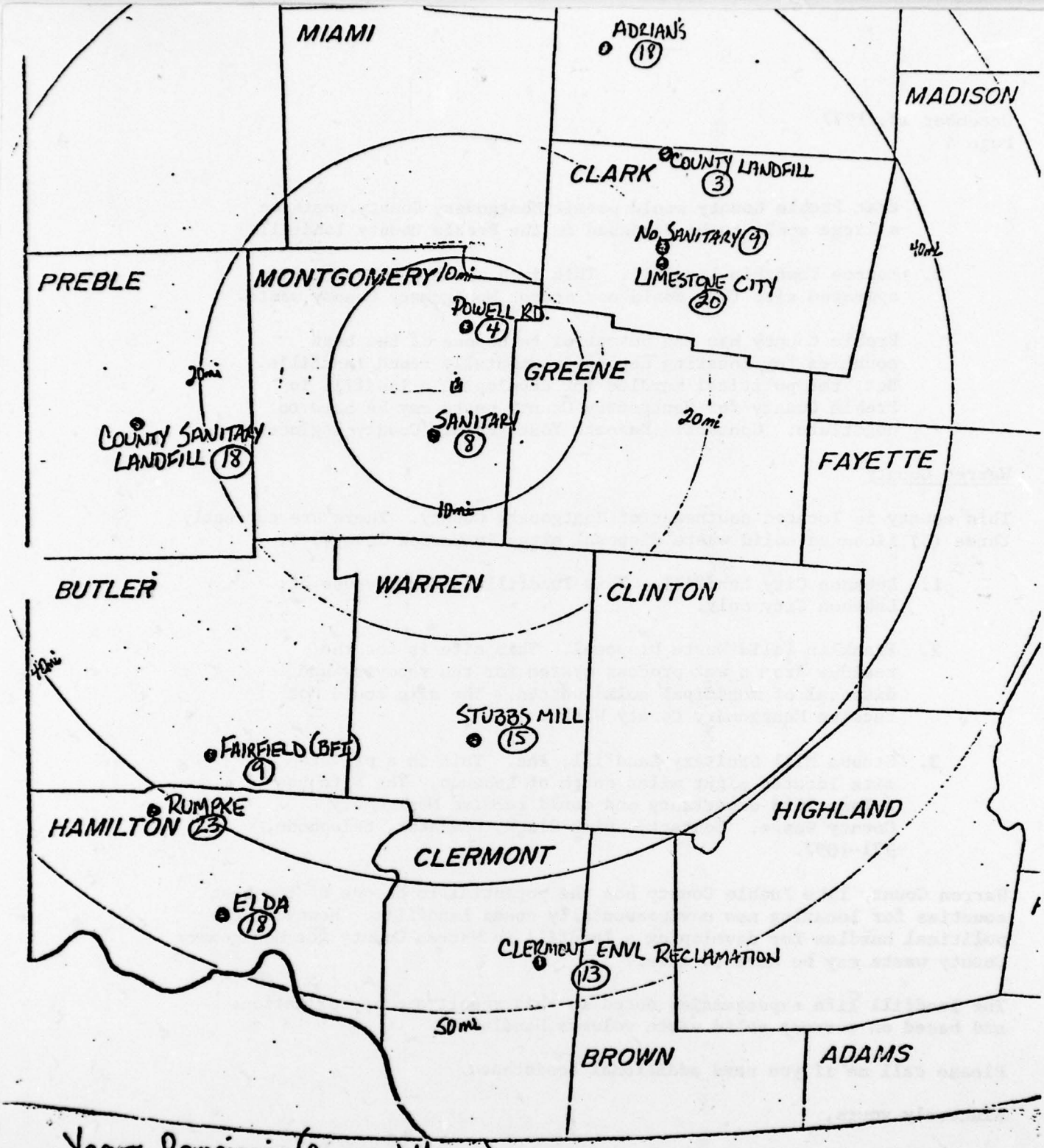
The landfill life expectancies noted in this report are approximations and based on current solid waste volumes handled.

Please call me if you need additional assistance.

Sincerely yours,

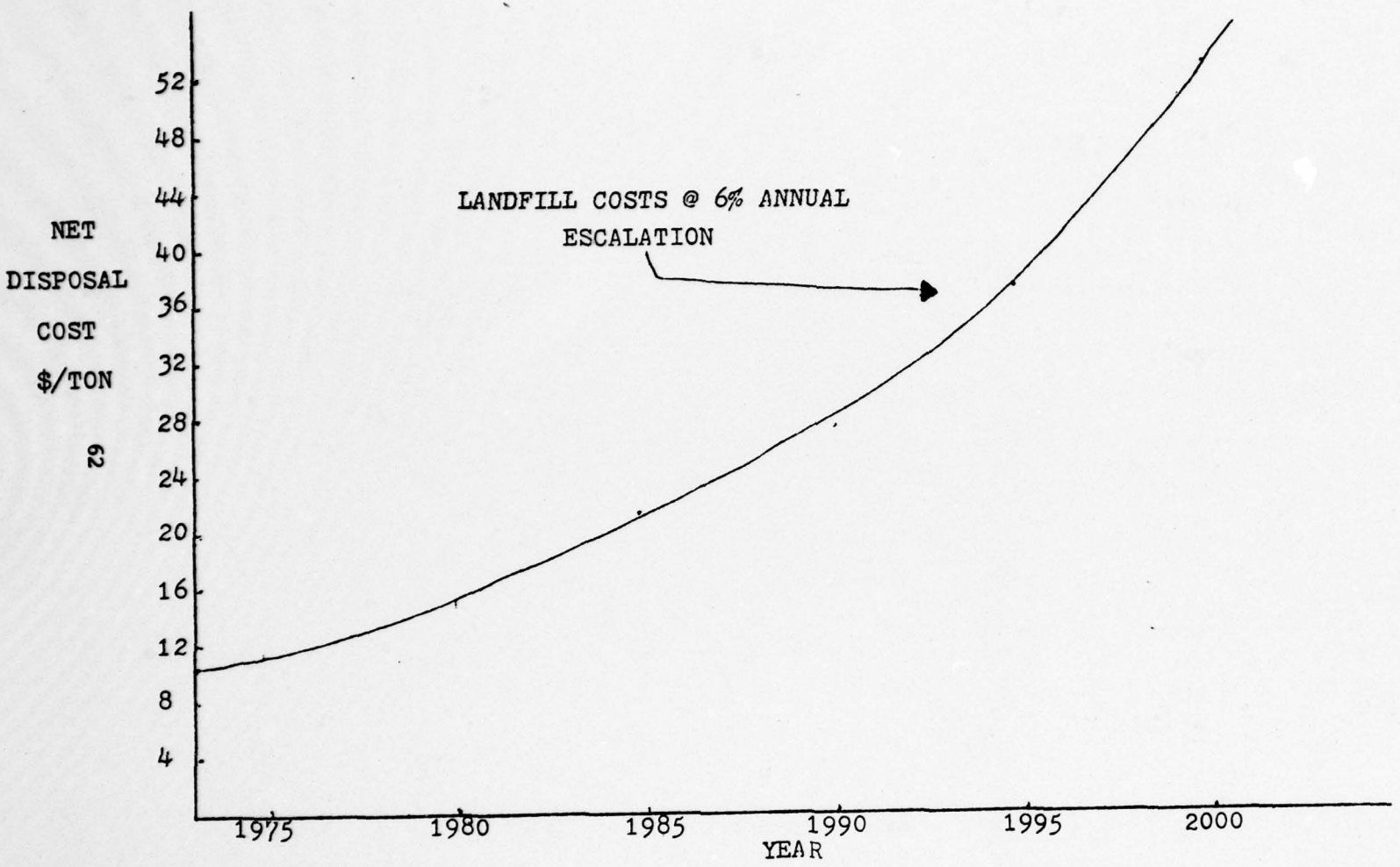
MJM:sjs

Enclosures
cc:



, Years Remaining (Current Usage)

Source: Ohio EPA 1976



PROJECTED LANDFILL COST (5). MITRE CORP.

APPENDIX B

OPTION B - UPGRADE NORTH AND SOUTH INCINERATORS WITH ELECTROSTATIC PRECIPITATORS TO MEET AIR POLLUTION CODE AT EXISTING CAPACITY; LANDFILL EXCESS (5)

Advantages

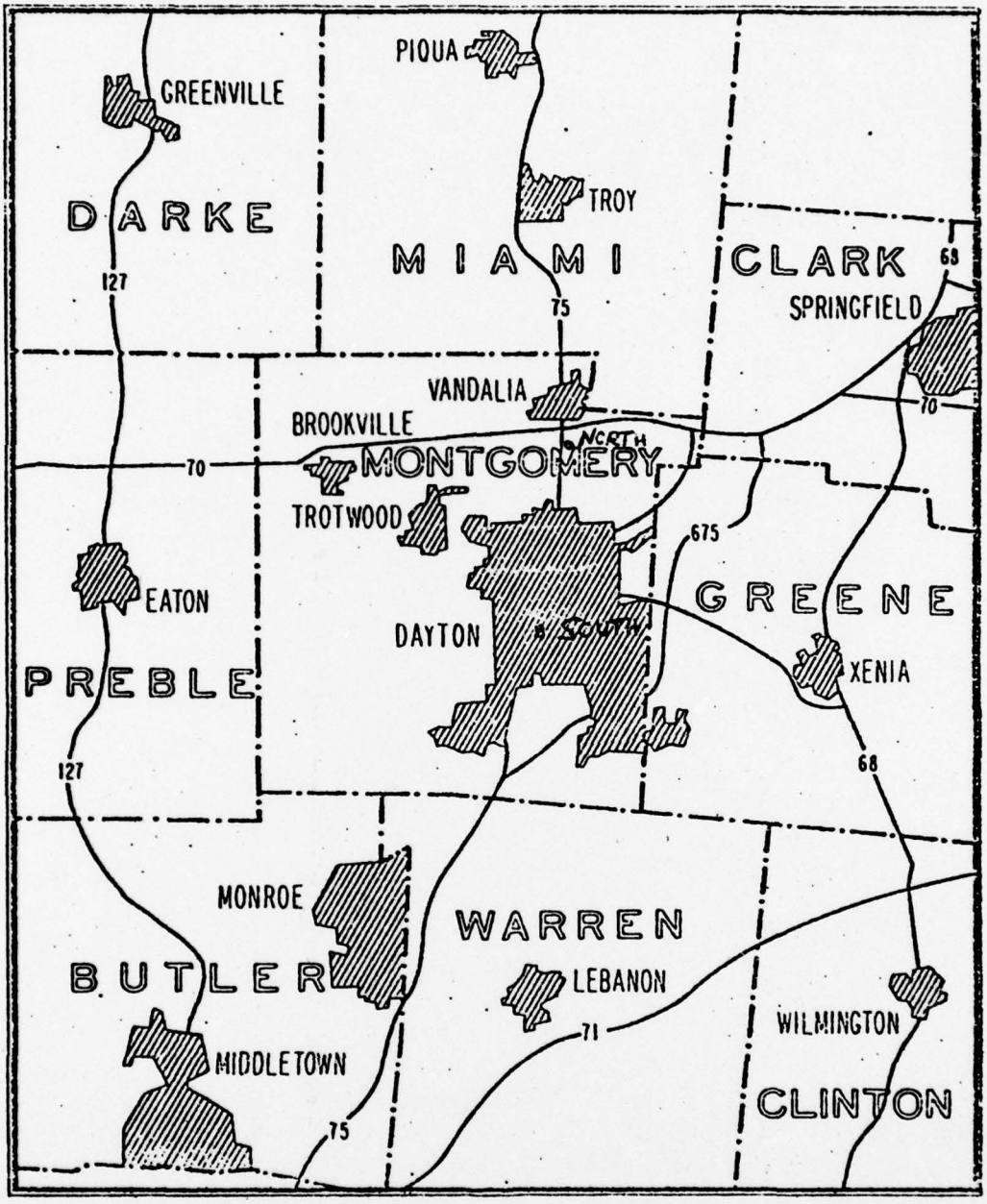
1. Existing incinerator equipment will be utilized, thus continuing operation toward retirement of bond indebtedness. The land indebtedness must be borne by the County regardless of the option chosen.
2. Basically good plants, the incinerators will reduce volume and weight of refuse to be landfilled, reducing leachate quantity and quality.
3. By continuing to process waste itself, the County returns a higher degree of control over its solid waste problem. This may be critical in times of slowdown, strikes or other unforeseen work stoppages.
4. The amount of capital required for construction is the least of Options B, C and D involving capital construction.
5. The City of Dayton is likely to continue operations as at present, and continue using the County's incinerators, because their collection operations will not require modification if dumping points remain intact.

Disadvantages

1. The incinerators are generally held in public disfavor. The south incinerator, particularly, is a politically sensitive site, with people daily awaiting its closing.

OPTION B (Continued)

2. Upgrading of incinerators will add approximately million dollars to the County's existing debt, with no return.
3. The incinerators will then operate in compliance with the air pollution code. Nothing more will be gained.
4. By continuing to operate at current levels, the County must still landfill 20% of its total refuse. Incinerator upgrading does not present a total solution to the County.
5. Upgrading of the incinerators without utilization of waste for recovery of a useful product - simple thermal volume reduction of the material - is inconsistent with the philosophy of recovery in Montgomery County. Some benefit from waste processing is desired. Benefits lacking are reduced landfill quantities and financial return in the form of energy recovery credits.
6. The County must bear the increased bond indebtedness for any capital improvements made by it.


PIQUA
GREENVILLE
TROY
DARKE
MIAMI
CLARK
68
127
75
SPRINGFIELD
VANDALIA
70
BROOKVILLE
NORTH
70
MONTGOMERY
TROTWOOD
675
EATON
GREENE
DAYTON
SOUTH
PREBLE
XENIA
127
68
MONROE
WARREN
BUTLER
LEBANON
71
WILMINGTON
MIDDLETOWN
75
CLINTON

APPENDIX C

OPTION C - MODIFIED RESOURCE RECOVERY - INCINERATOR UPGRADING WITH ADDITIONAL CAPACITY TO PRODUCE STEAM FOR SALE TO BEST MARKET

Advantages

1. Some existing incinerator equipment will be utilized, thus continuing operation toward retirement of bond indebtedness. The bond indebtedness must be borne by the County regardless of system chosen. In this case, at least part of the issue can be retired over time.
2. The County will be able to process all refuse through the incinerators, reducing dependence on landfill and rendering more control to the County.
3. Incremental capital cost over and above Option B is not excessive, considering that some return on investment will be derived from energy credits.
4. Assuming that markets dictate termination of the South plant's operation, then the goal of closing the South plant for political reasons is realized.
5. The County will have a total solution to the problem, retaining control over all waste receipts, other than residue disposal.
6. The County will have a solid waste system which is consistent with its current philosophy, i.e., deriving economic and environmental benefits from the waste processing.

Disadvantages

1. The incinerators are generally held in public disfavor, especially the south incinerator. Opposition would be lessened by closing the south incinerator, but opposition to the North plant will continue.

OPTION C (Continued)

2. The upgrading of the incinerators will nearly double the amount of debt currently outstanding on the two incinerators.
3. The County must continue to landfill residue, and will contract for the disposal capability, for the foreseeable future.
4. Life expectancy of equipment with varying lifetimes is cumbersome in establishing a comprehensive financing arrangement, and in determining technological life expectancy.
5. There is minor additional steam loss associated with location of the North plant vis-a-vis the Cargill plant location.
6. Control of refuse can be very difficult, but is required by this option, to guarantee tonnage for economical steam recovery.

APPENDIX D

OPTION D - FULL SCALE RESOURCE RECOVERY (5)

Advantages

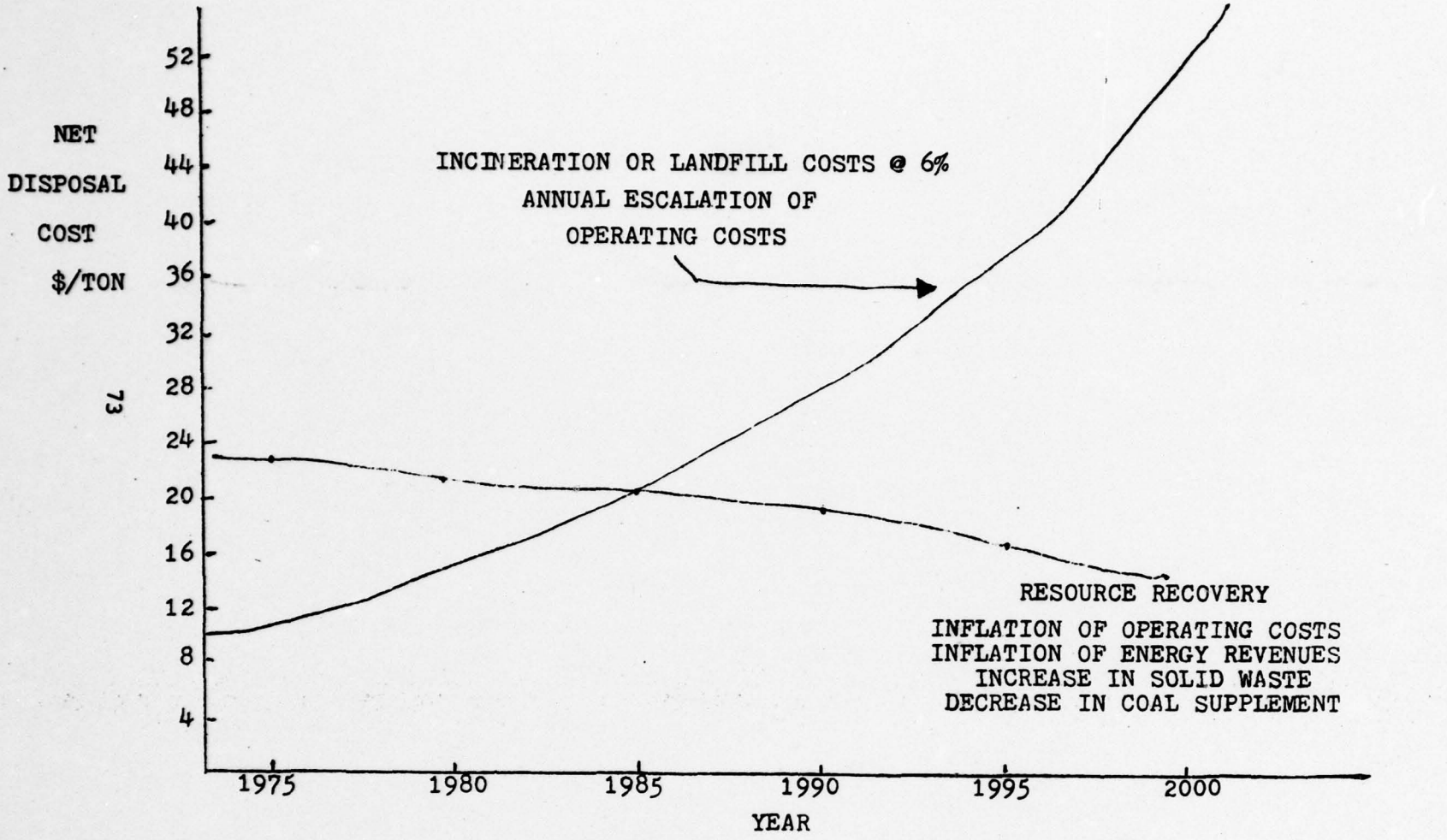
1. The County will be able to remove itself from the solid waste business, since its only function now is processing. This function will be privately handled.
2. There will be no initial capital investment on the part of the County, thus holding down level of bond indebtedness by the County.
3. The County will be able to pay for the facility by an annual or per ton service fee basis. This will be reflected in the annual O&M budget, and can be more politically palatable then.
4. Both incinerators will be closed, eliminating a politically sensitive problem.
5. The new facility will be constructed and designed throughout to operate in compliance with the existing code.
6. The new facility could be sited and designed architecturally to enhance the surrounding areas and remain environmentally acceptable.
7. The County will have a long-term contract subject to cost-of-living escalators and energy credit formulas, which will minimize speculation concerning future prices and annual costs.

Disadvantages

1. The entire $7 million outstanding bond indebtedness will have to be assumed into the cost of the new plant.

OPTION D (Continued)

2. The County's control will be one step further removed since the County will operate nothing and will merely pay the bill.
3. There is inherent waste in abandoning facilities which are basically sound, with good existing equipment. The pit and crane, infeed equipment, combustion chamber and ash handling equipment are in good condition. The problems are capacity and air pollution. If the two plants became transfer stations, then the pits crane and changing chute at least can be salvaged, but the remainder of the equipment must be abandoned.
4. The County is then subject to several subcontractors: the processor, the hauler, and the landfill operator.
5. A residue landfill will be required, and must be sized for residuals over the long term.
6. The return on investment should be reasonable in order to limit the tipping fee or annual charge. This charge is related to initial cost, energy credits and materials credits. Control of refuse is difficult, but may be necessary, in order to guarantee tonnage to the facility, in this option.



COMPARISON OF PLANS A, B, AND D (5)

MITRE CORP.