



ARCHITECTURE & ENGINEERING, P.C.

OFFICES:

THE ARGUS BUILDING BROADWAY AT BEAVER POST OFFICE BOX 617 ALBANY, NY 12201-0617 (518) 431-3300

THE FLOUR MILL 1000 POTOMAC ST., NW WASHINGTON, DC 20007 (202) 471-5000

EIGHTY-ONE MAIN ST WHITE PLAINS, NY 10601 (914) 682-4850

Final Submittal

FAMILY HOUSING INSULATION ENERGY CONSERVATION OPPORTUNITY (ECO) STUDY

Ft. Belvoir, Virginia

Department of the Army Baltimore District U.S. Army Corps of Engineers

COE Project No. DACA 31-92-D-0061 Delivery Order NO. 0005

EYP Project No. 60592.00

NOVEMBER 1, 1995

EXECUTIVE SUMMARY



FORT BELVOIR, VIRGINIA

I. EXECUTIVE SUMMARY

A. INTRODUCTION

Six (6) family housing groups on the installation of Ft. Belvoir, including both detached and duplex type housing units, have been selected as 'prototypes' for this limited scope energy study. In general, these housing units are in good condition, but are not energy efficient by today's standard. In order to meet the requirements of Executive Order 12902 (March 8, 1994): Energy Efficiency and Water Conservation at Federal Facilities', various types of passive and active energy conservation measures were selected for detailed study to determine their viability based on life cycle cost analysis. 'Active' measures include those which require the installation of new or replacement electrical/mechanical equipment which would improve the energy lighting fixtures, programmable thermostats and whole house fans, etc. 'Passive' measures include those which improve the thermal characteristics of the structure, such as addition of insulation to exterior walls/attic/crawl space, addition of storm windows or replacement of single pane with double pane type, etc.

The intent of the study is to establish the current level of energy consumption for each of the prototype housing groups ('baselines'), and to recommend energy conserving options, known as 'Energy Conservation Opportunities' (ECOs), which demonstrate through heating and cooling load calculations and life cycle cost simulations to be economically viable. The ECOs which meet the criteria of Energy Conservation Investment Program (ECIP) are then packaged for funding requisition purposes, and recommendations for these prototypes may be applied to other housing groups on base with similar characteristics and projected performance.

ECIP analysis summaries for ECOs evaluated and recommended are included in this study and may be found in the Appendices.

B. PROJECT SUMMARY

Of a total of eleven(11) potential ECOs analyzed in this study, six(6) are being recommended for ECIP implementation for applicable housing groups:

- Insulation of exterior walls
- · Insulation of floor over unheated crawl spaces
- Selective installation of high efficiency fluorescent light fixtures
- Reactivation of existing whole house fans or installation of new ones
- Installation of programmable thermostats
- Insulation of domestic water heaters in unheated crawl spaces

DEPARTMENT OF THE ARMY



CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS P.O. BOX 9005 CHAMPAIGN, ILLINOIS 61826-9005

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Each of the housing areas was analyzed using the 'Multiple ECO' simulation of the ASEAM routine. The resultant projection in energy savings therefore do reflect the synergistic effect of the implementation of multiple ECOs.

The recommended ECOs have been packaged into seven(7) ECIP projects (two projects for the 'RIVER VILLAGE 1600 AREA' group, one for each of the other groups). This packaging approach makes it possible to compute the 'Savings-to-Investment Ratio' (SIR) and the payback period, with appropriate consideration of the synergistic effect. With all recommended ECOs implemented, the projected savings in energy for these six housing groups would be **13,161 MBtu** per year, or **24.5%** of the existing level. The savings in energy costs would be **\$171,686** per year, or **24.9%** of the existing level. The total cost of the seven ECIP packages, including SIOH and design fee, is **\$827,784**, for an average simple payback of 5 years.

Itemized energy/energy cost savings, first costs and SIR/pay backs for each housing group are included in TABLE 1: 'LIST OF ECO'S RECOMMENDED FOR IMPLEMENTATION' of the Executive Summary.

C. ENERGY CONSERVATION ANALYSIS

1. ECOs Investigated

A number of energy conservation opportunities (ECOs) have been investigated to determine their potential for more detailed analysis as described in this study:

- a. <u>HVAC Equipment and Controls:</u>
 - Furnace/air-conditioning system
 - Attic ventilation system
 - Whole house ventilation system
 - Domestic water heaters
 - Programmable thermostats

b. <u>Weatherization:</u>

- Insulation of envelope (wall, roof/attic, floor over crawl space, etc.)
- Storm windows and storm doors
- Weatherstripping
- Shading

c. <u>Lighting:</u>

- New fixtures
- Re-lamping of existing fixtures

2. ECOs Rejected

The following is a listing of the ECOs rejected after investigation. Explanations of rejection are provided in section 'IV. BUILDING ANALYSIS'.

- a. HVAC Equipment and Controls:
 - Furnace/air-conditioning unit replacement
 - New attic ventilation fans
 - Domestic water heater replacement
- b. <u>Weatherization:</u>
 - Add storm windows and storm doors
 - Add weatherstripping
 - Add Shading
 - Insulate basement Walls
- c. <u>Lighting</u>:
 - Re-lamping of existing fixtures
- 3. ECOs Recommended

Based on:

- a. Initial cost of each Energy Conservation Opportunity (ECO) as determined through local market research;
- b. Result of computer modeling of building air-conditioning and heating energy calculation program **ASEAM** and
- c. Result of life cycle cost analysis program BLCC

The following ECOs are recommended for implementation through the Energy Conservation Investment Program (ECIP) projects. Each of these ECOs has a Savings-to-Investment Ratio (SIR) of 1.25 or higher, and therefore meets the ECIP requirement. Energy and energy cost savings shown are for each housing unit group.

FORT BELVOIR, VIRGINIA

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TABLE 1: List of ECC)'s Recomme	ended for E	CIPP	rojects			
	1995 Cost	1995 Energy Cost	1995 E (M	nergy Sa BTU/YF	vings t)	E C C C C C C C C C C C C C C C C C C C	Simple Payback
ECO Description	(Including SIOH, Design (\$)	Savings (\$)	Elec	Gas	Total	Alle	Period (Year)
GERBER VILLAGE - 100 Area - No Basement (22 Units)					-		
1. Insulate Exterior Walls	95,524	11,264	433	600	1,033	1.9	8.5
2. Insulate over crawl space	17,380	4,642	156	311	467	4.3	3.8
3. Replace 3 Light Fixtures with Fluorescent type	7,766	815	54	(-)22	32	1.5	9.5
4. Activate whole house fan and install programmable thermostats	14,542	11,462	560	264	824	12.0	1.3
ECIP Project No. 1: Multiple ECO's 1 to 4	135,200	28,183	1,404	1,327	2,731	3.5	4.8
GERBER VILLAGE - 100 Area - With Basement (36 Units)							
1. Insulate Exterior Walls	129,709	18,000	688	972	1,660	7.2	2.2
2. Insulate over crawl space	22,498	4,176	150	185	335	2.9	5.4
3. Replace 3 Light Fixtures with Fluorescent type	12,701	1,260	92	(-)35	57	1 4	10
4. Activate whole house fan and install programmable thermostats	23,789	18,828	857	623	1,480	12.2	1.3
ECIP Project No. 2: Multiple ECO's 1 to 4	188,698	50,276	2,092	2,221	4,313	4.4	3.8

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	1995 Cost	1995 Energy Cost	1995 E) (M	nergy Sa BTU/YR	vings)		Simple Pavhack
ECO Description	(Including SIOH, Design (\$)	Savings (\$)	Elec	Gas	Total	SIR	Period (Year)
166-171 AREA - (12 Units)							
1. Insulate Exterior Walls	36,516	4,404	172	228	400	1.9	8.3
2. Insulate over crawl space	5,591	1,596	62	82	144	4.5	3.5
3. Replace 3 light fixtures with fluorescent type	4,234	420	27	6(-)	18	1.1	10.1
4. Activate whole house fans and install programmable thermostat	11,088	4,392	164	114	278	6.1	2.5
ECIP Project No. 3 Multiple ECO's: 1 to 4	57,429	10,176	475	316	162	2.7	5.6
T-400 AREA - T - SHAPE (20 Units)							
1 Replace 3 Light Fixtures with Fluorescent type	7,056	940	63	(-)27	36	1.3	7.5
2. Insulate water heaters	941	360	0	61	61	6.6	2.6
3. Install new whole house fans and programmable thermostat	25,379	7,240	364	137	501	4.3	3.5
ECIP Project No. 4: Multiple ECO's 1 to 4	33,380	8,465	421	175	596	3.8	3.9

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	1995 Cost	1995 Energy Cost	1995 Er (M)	nergy Sav BTU/YR	vings)	H S	Simple Payback
ECO Description	(Including SIOH, Design (\$)	Savings (\$)	Elec	Gas	Total	AIK	Period (Year)
T-400 AREA 'L' SHAPE (14 Units)							
1. Insulate over crawl space	21,210	6,510	231	483	. 659	4.9	3.3
2 Insulate water heaters	629	258	0	43	43	6.8	2.6
3. Replace 3 light fixtures with Fluorescent type	4,939	630	44	(-)23	21	1.8	7.9
4. Install new whole house fans and programmable thermostat	17,248	4,102	139	272	411	3.8	4.2
ECIP Project No. 5 Multiple ECO's : 1 to 4	47,118	13,930	560	672	1,232	4.6	3.4
RIVER VILLAGE 1600 AREA (188 Units)							
ECIP Project No. 6: 1. Replace 3 light fixtures with Fluorescent type	66,326	11,280	661	(-)63	598	2.5	5.9
ECIP Project No. 7: 1. Activate whole house fans and install programmable thermostat	238,564	46,582	2,435	621	3,056	2.8	5.1

4. ECIP Projects Developed

Per the direction of the Installation, seven(7) ECO packages have been developed based on ECIP project guidelines, as follows. ECIP Nos. 6 and 7, both for River Village 1600 Area, if combined, would exceed \$300,000 in cost. They are therefore packaged separately.

ECIP No. 1: Gerber Village 100 Areas with no basement (22 units)

- Insulate exterior walls
- Insulate over crawl space
- Replace 3 incandescent light fixtures with high efficiency fluorescent type
- Reactivate existing whole house fans
- Install programmable thermostats

ECIP No. 2: Gerber Village 100 Areas with basement (36 units)

- Insulate exterior walls
- Insulate over crawl space
- Replace 3 incandescent light fixtures with high efficiency fluorescent type
- Reactivate existing whole house fans
- Install programmable thermostats

ECIP No. 3: 166-171 Area (12 units)

- Insulate exterior walls
- Insulate over crawl space
- Replace 3 incandescent light fixtures with high efficiency fluorescent type
- Install new whole house fans
- Install programmable thermostats

ECIP No. 4: T-400 Area "T"-shape Houses (20 units)

- Replace 3 incandescent light fixtures with high efficiency fluorescent type
- Install new whole house fans
- Install programmable thermostats
- Insulate domestic water heaters

ECIP No. 5: T-400 Area "L"-shape Houses (14 units)

• Insulate over crawl space

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- Replace 3 incandescent light fixtures with high efficiency fluorescent type
- Install new whole house fans
- Install programmable thermostats
- Insulate domestic water heaters
- **ECIP No. 6**: River Village 1600 Area (188 units)
 - Replace 3 incandescent light fixtures with high efficiency fluorescent type

ECIP No. 7: River Village 1600 Area (188 units)

- Install new whole house fans
- Install programmable thermostats

The 'Life Cycle Cost Analysis Summary - Energy Conservation Investment Program (ECIP)' for each ECIP is attached herein as well as in Appendix I.

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LOCATION: <u>Ft. E</u> PROJECT TITLE: DISCRETE PORT ANALYSIS DATE:	<u>Belvoir, VA</u> <u>Housing Insulation</u> ION NAME: <u>Gerber</u> Jan '95_ ECO	REGION NO. <u>3</u> <u>Study (ECO) [,] Village 100 Area - No</u> NOMIC LIFE <u>20</u>	PROJECT NO. J FISCAL Y Basement: Multip PREPARE	DACA-31-92 D0061 EAR <u>95</u> le ECO's ER <u>EINHORN YAF</u> I	Del. Order 5 ECIP No1 FEE PRESCOTT
1.INVESTMENA.CONSTRUCB.SIOHC.DESIGN COD.TOTAL COSE.SALVAGE VF.PUBLIC UTIG.TOTAL INVE	IT COSTS: TION COST ST [°] T (1A+1B+1C) ALUE OF EXISTING LITY COMPANY REE ESTMENT (1D-1E-1F	\$ <u>120,714</u> <u>\$7,243</u> <u>\$7,243</u> <u>\$135,200</u> EQUIPMENT BATE)	\$\$	 \$ <u>135,200</u>	
2. ENERGY SA DATE OF NISTIR	<u>\VINGS (+)/COST(-):</u> -4942-1 USED FOR	DISCOUNT FACTORS	6 <u>(BOD O</u>	<u>t 1994)</u> DISCOUN	NT RATE: <u>3.1%</u>
ENERGY SOURCE A. ELEC B. DIST C. RESID D. NG G. OTHER H. DEMAND SAV I. TOTAL	COST S/ \$/MBTU(1) M \$_17.58 \$ \$ \$ \$ \$ \$ \$ (INGS	AVINGS IBTU/YR(2) 1,203 1,153 2,557	ANNUAL \$ SAVINGS(3) \$21,174 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	DISCOUNT FACTOR(4) 	DISCOUNTED SAVINGS(5) \$\$ \$\$\$\$_146,908\$\$\$\$\$\$\$
<u>3. NON-EN</u>	<u>IERGY SAVINGS (+)</u>	<u>OR COST (-):</u>			
A. ANNUA (1) DISCOL (2) DISCOL	_ RECURRING (+/-) INT FACTOR (TABLE INTED SAVINGS/CO	E A) ST (3A X 3A1)	\$		\$
B. NON-RE	ECURRING SAVINGS	S (+) OR COST (-)			
ITEM a b c d. TOT/	SAVINGS (COST (-) (1 - \$ - \$ AL \$	(+) YEAR OF () OCCUR. (2) (-) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	DISCOUNT FACTOR(3)	DISCOUNTED SAV (+)COST(+/-)(4) \$ \$ \$ \$ \$	'INGS/
C. TOTAL	NON -ENERGY DISC	COUNTED SAVINGS (3A2+3B4d)	\$	
<u>4. FIRST `</u> <u>5. SIMPLE</u> <u>6. TOTAL</u> <u>7. SAVINO</u>	YEAR DOLLAR SAVI PAYBACK (1G/4): NET DISCOUNTED SS TO INVESTMENT ENE	NGS (2I3+(3Bd1/YRS SAVINGS (2I5 + 3C): RATIO (SIR) 6/1G LIFE CYCLE CO ERGY CONSERVATIO	<u>S ECON LIFE))</u> : <u>3:</u> ST ANALYSIS SUI N INVESTMENT P	\$ <u>32,748</u> <u>4.8</u> <u></u> <u></u>	ÆARS

FT. BELVOIR FAMILY HOUSING INSULATION/ECO STUDY	FINAL SUBMISSION
FORT BELVOIR, VIRGINIA	NOVEMBER 1, 1995
LOCATION:Ft. Belvoir, VAREGION NO.3PROJECPROJECT TITLE:Housing Insulation Study (ECO)FISCALDISCRETE PORTION NAME:Gerber Village 10 0 Area - With Basement:MultANALYSIS DATE:Jan '95ECONOMIC LIFE20	CT NO. <u>DACA-31-92 D0061 Del. Order 5</u> YEAR <u>95</u> tiple ECO's ECIP No. <u>2</u> PREPARER <u>EINHORN YAFFEE PRESCOTT</u>
1.INVESTMENT COSTS:A.CONSTRUCTION COST\$ 168,480B.SIOH\$ 10,109C.DESIGN COST\$ 10,109D.TOTAL COST (1A+1B+1C)\$ 188,698E.SALVAGE VALUE OF EXISTING EQUIPMENTF.PUBLIC UTILITY COMPANY REBATEG.TOTAL INVESTMENT (1D-1E-1F)	\$ <u>-0-</u> \$ <u>-0-</u> \$ <u>188,698</u>
2. ENERGY SAVINGS (+)/COST(-): DATE OF NISTIR -4942-1 USED FOR DISCOUNT FACTORS (BOD	Oct 1994) DISCOUNT RATE: <u>3.1%</u>
ENERGY COST SAVINGS ANNUAL \$ SOURCE \$/MBTU(1) MBTU/YR(2) SAVINGS(3) A. ELEC \$ 17.58 2.092 \$ B. DIST \$ \$ \$ C. RESID \$ \$ \$	DISCOUNT DISCOUNTED FACTOR(4) SAVINGS(5)
3. NON-ENERGY SAVINGS (+) OR COST (-):	
A.ANNUAL RECURRING (+/-)\$(1)DISCOUNT FACTOR (TABLE A)\$(2)DISCOUNTED SAVINGS/COST (3A X 3A1)	\$
B. NON-RECURRING SAVINGS (+) OR COST (-)	
ITEM SAVINGS (+) YEAR OF DISCOUNT COST (-) (1) OCCUR. (2) FACTOR(3) a.	DISCOUNTED SAVINGS/ (+)COST(+/-)(4) \$ \$ \$ \$
C. TOTAL NON - ENERGY DISCOUNTED SAVINGS (3A2+3B4d)	\$ <u>0</u>
 FIRST YEAR DOLLAR SAVINGS (2I3+(3Bd1/YRS ECON LIFE)): SIMPLE PAYBACK (1G/4): TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C): SAVINGS TO INVESTMENT RATIO (SIR) 6/1G: 	\$ 50,276 3.8 YEARS \$ 857,084 4.4

FINAL SUBMISSION

FORT BELVOIR, VIRGINIA

NOVEMBER 1, 1995

LOCATION: <u>Ft. Belv</u> PROJECT TITLE: <u>H</u> DISCRETE PORTION ANALYSIS DATE:	oir, VA REGION NO. ousing Insulation Study (ECO) I NAME: <u>166-171 Area: Multiple EC</u> Jan '95ECONOMIC LIFE <u>20</u>	<u>3</u> PROJE FISCAL	CT NO. <u>DACA-31-9</u> YEAR <u>95</u> PREPARER <u>EIN</u>	2 D0061Del. Order 5 ECIP No. <u>3</u> HORN YAFFEE PRESCOTT
1.INVESTMENA.CONSTRUCB.SIOHC.DESIGN COD.TOTAL COSE.SALVAGE VF.PUBLIC UTIG.TOTAL INVE	IT COSTS: TION COST \$ ST \$ T (1A+1B+1C) \$ ALUE OF EXISTING EQUIPMENT LITY COMPANY REBATE STMENT (1D-1E-1F)	<u>51,276</u> <u>3,076</u> <u>3,076</u> <u>57,429</u>	\$ <u>0-</u> \$ <u>0-</u> \$	57,429
2. ENERGY SA DATE OF NISTIR -49	<u>VINGS (+)/COST(-):</u> 42-1 USED FOR DISCOUNT FACTO	RS <u>(BOI</u>	<u>D Oct 1994)</u>	DISCOUNT RATE: <u>3.1%</u>
ENERGY CO SOURCE \$/M A. ELEC \$_1 B. DIST \$ C. RESID \$ D. NG \$ G. OTHER \$ H. DEMAND SAVING I. TOTAL	ST SAVINGS IBTU(1) MBTU/YR(2) 7.58 475 6.079 316 iS 791	ANNUAL \$ SAVINGS(3) \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	DISCOUNT FACTOR(4) 	DISCOUNTED SAVINGS(5) \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$
3. NON-ENER	<u>GY SAVINGS (+) OR COST (-):</u>			
A. ANNUAL RE (1) DISCOUNT (2) DISCOUNT	ECURRING (+/-) FACTOR (TABLE A) ED SAVINGS/COST (3A X 3A1)	\$		\$0
B. NON-RECU	RRING SAVINGS (+) OR COST (-)			
ITEM a b c d. TOTAL	SAVINGS (+) YEAR OF COST (-) (1) OCCUR. (2) \$ \$ \$ \$ \$	DISCOUNT FACTOR(3)	DISCOUNTED SA (+)COST(+/-)(4 \$ \$ \$ \$0	VINGS/ ŀ)
C. TOTAL NO	N -ENERGY DISCOUNTED SAVINGS	3 (3A2+3B4d)	\$0	-
4.FIRST YEA5.SIMPLE PA6.TOTAL NE7.SAVINGS 1	R DOLLAR SAVINGS (213+(3Bd1/Yf YBACK (1G/4): T DISCOUNTED SAVINGS (215 + 30 TO INVESTMENT RATIO (SIR) 6/1	<u>rs econ life))</u> :)): I <u>G</u> :	\$ <u>10,176</u> <u>5.6</u> \$ <u>170,624</u> 2.7	YEARS

FT. BELVOIR FAMILY HOUSIN	IG INSULATION/ECO S	STUDY	FINAL	SUBMISSION
FORT BELVOIR, VIRGINIA			NC	DVEMBER 1, 1995
E	LIFE CYCLE CO NERGY CONSERVATIO	ST ANALYSIS SUMI N INVESTMENT PR	MARY OGRAM (ECIP)	
LOCATION: <u>Ft. Belvoir, VA</u> PROJECT TITLE: <u>Housing Insula</u> DISCRETE PORTION NAME: <u>T-</u> ANALYSIS DATE: <u>Jan '95</u>	REGION NO. ation Study (ECO) 400 Area "T"-shape units: ECONOMIC LIFE20	<u>3</u> PROJEC FISCAL Multiple ECO's	DT NO. <u>DACA-31-9</u> YEAR <u>95</u> PREPARER <u>EIN</u>	<u>2 D0061 Del. Order 5</u> ECIP №. <u>4</u> HORN YAFFEE PRESCOTT
1.INVESTMENT COSTS:A.CONSTRUCTION COSTB.SIOHC.DESIGN COSTD.TOTAL COST (1A+1B+10)E.SALVAGE VALUE OF EXF.PUBLIC UTILITY COMPAG.TOTAL INVESTMENT (11)	\$ \$ C) \$ ISTING EQUIPMENT NY REBATE D-1E-1F)	29,804 1,788 1,788 33,380	\$ <u>-0-</u> \$ <u>-0-</u> \$	33,380
2. ENERGY SAVINGS (+)/C DATE OF NISTIR -4942-1 USED I	: <u>OST(-):</u> FOR DISCOUNT FACTOF	RS <u>(BOD</u>	<u>Oct 1994)</u> D	DISCOUNT RATE: <u>3.1%</u>
ENERGY COST SOURCE \$/MBTU(1) A. ELEC \$_17.58 B. DIST \$ C. RESID \$ D. NG \$ G. OTHER \$ H. DEMAND SAVINGS I. TOTAL	SAVINGS MBTU/YR(2) 421 175 596	ANNUAL \$ SAVINGS(3) \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	DISCOUNT FACTOR(4) 	DISCOUNTED SAVINGS(5) \$115,532 \$
3. NON-ENERGY SAVINGS	<u> (+) OR COST (-):</u>			
 A. ANNUAL RECURRING ((1) DISCOUNT FACTOR (T) (2) DISCOUNTED SAVINGS 	+/-) ABLE A) S/COST (3A X 3A1)	\$	<u> </u>	\$

ITEM	SAVINGS (+)	YEAR OF	DISCOUNT	DISCOUNTED SAVINGS/
	COST (-) (1)	OCCUR. (2)	FACTOR(3)	(+)COST(+/-)(4)
a	\$			Φ
b	\$		<u> </u>	\$
C	\$			\$
d. TOTAL	\$			\$ <u>0</u>
TOTAL NON -E	NERGY DISCOU	NTED SAVINGS ((3A2+3B4d)	\$0
FIRST YEAR DO	OLLAR SAVINGS	(2I3+(3Bd1/YR	<u>S ECON LIFE)</u> :	<u>\$ 8,465</u>
SIMPLE PAYBA	ACK (1G/4):			<u> </u>
TOTAL NET DIS	SCOUNTED SAV	INGS (215 + 3C)	:	<u>\$ 137,830</u>

TOTAL NET DISCOUNTED SAVINGS (215 + 3C): SAVINGS TO INVESTMENT RATIO (SIR) 6/1G: <u>6.</u> 7.

C.

4. <u>5.</u>

3.8

FORT BELVOIR, VIRGINIA

FINAL SUBMISSION

NOVEMBER 1, 1995

LOCATION: Ft. Belvoir, VA REGION NO. 3 PROJECT NO. DACA-31-92 D0061 Del. Order 5 PROJECT TITLE: Housing Insulation Study (ECO) FISCAL YEAR 95 DISCRETE PORTION NAME: T-400 Area "L"-shape units: Multiple ECO's ECIP No. 5	T T
ANALYSIS DATE: Jan '95 ECONOMIC LIFE 20 FREPAREN EINTON CAN TAITEE PRESCOT 1. INVESTMENT COSTS: A. CONSTRUCTION COST \$	<u></u>
2.ENERGY SAVINGS (+)/COST(-):DATE OF NISTIR -4942-1 USED FOR DISCOUNT FACTORS(BOD Oct 1994)DISCOUNT RATE: 3.1%	-
ENERGY COST SAVINGS ANNUAL \$ DISCOUNT DISCOUNTED SOURCE \$/MBTU(1) MBTU/YR(2) SAVINGS(3) FACTOR(4) SAVINGS(5) A. ELEC \$ 17.58 560 \$ 9,845 15.61 \$ 153,677 B. DIST \$	
3. NON-ENERGY SAVINGS (+) OR COST (-):	
A.ANNUAL RECURRING (+/-)\$(1)DISCOUNT FACTOR (TABLE A)(2)DISCOUNTED SAVINGS/COST (3A X 3A1)\$	
B. NON-RECURRING SAVINGS (+) OR COST (-)	
ITEM SAVINGS (+) COST (-) (1) YEAR OF OCCUR. (2) DISCOUNT FACTOR(3) DISCOUNTED SAVINGS/ (+)COST(+/-)(4) a \$ \$ b \$ \$ c \$ \$ d. TOTAL \$ \$ \$	
C. TOTAL NON -ENERGY DISCOUNTED SAVINGS (3A2+3B4d) \$	
4. FIRST YEAR DOLLAR SAVINGS (2I3+(3Bd1/YRS ECON LIFE): \$ 13,930 5. SIMPLE PAYBACK (1G/4): 3.4YEARS 6. TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C): \$ 239,300 7. SAVINGS TO INVESTMENT_RATIO_(SIR) 6/1G: 4.6	

FT. BELVOIR FAMILY HOUSING INSULATION/ECO STUDY	
FORT BELVOIR, VIRGINIA	

FINAL SUBMISSION

FORT	BELVOIR,	VIRGINI
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NOVEMBER 1, 1995

LOCATION PROJECT DISCRETE ANALYSIS	N: <u>Ft. Belvoir, V</u> TITLE: <u>Housir</u> E PORTION NAN B DATE: <u>Jan</u>	AI ng Insulation Study /E: <u>River Village</u> 95_ ECONOM	REGION NO. <u>3</u> (ECO) 1600 Area: Rep /IC LIFE <u>20</u>	B PROJE FISCAL Dace 3 Light Fixtur	CT NO. <u>DACA-3</u> .YEAR <u>95</u> res with Fluoresce PREPARER <u></u>	<u>1-92 D0061 Del. Order 5</u> ent type ECIP No. <u>6</u> <u>EINHORN YAFFEE PRESCOTT</u>
1. IN A. Ci B. SI C. D D. T E. Si F. P G. T	IVESTMENT CO ONSTRUCTION IOH ESIGN COST OTAL COST (1/ ALVAGE VALUE UBLIC UTILITY OTAL INVESTM	<u>DSTS:</u> I COST E OF EXISTING EC COMPANY REBA IENT (1D-1E-1F)	\$ \$ \$ QUIPMENT TE	59,220 3,553 3,553 66,326	\$ <u>-0-</u> \$ <u>-</u> 0-	\$ <u>66,326</u>
<u>2. </u>	NERGY SAVINO NISTIR -4942-1	<u>GS (+)/COST(-):</u> USED FOR DISCO	OUNT FACTORS	6 <u>(BO</u>	<u>) Oct 1994)</u>	DISCOUNT RATE: <u>3.1%</u>
ENERGY SOURCE A. ELEC B. DIST C. RESID D. NG G. OTHEF H. DEMAN I. TOTAL	COST \$/MBTU \$_ <u>17.58</u> \$ \$ \$ R \$ ND SAVINGS	SAVINO (1) MBTU/ 661 9 (-) 6 598	GS YR(2) <u>3</u> 8	ANNUAL \$ SAVINGS(3) \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	DISCOUNT FACTOR(4) 	DISCOUNTED SAVINGS(5) \$\$ \$\$\$ \$\$\$ \$\$\$\$ \$\$\$\$
<u>3. N</u>	NON-ENERGY S	AVINGS (+) OR C	<u>OST (-):</u>	¢		
A. A (1) D (2) D	ANNUAL RECUP DISCOUNT FAC DISCOUNTED S	RRING (+/-) TOR (TABLE A) AVINGS/COST (3/	A X 3A1)	Þ		\$0
B. N	NON-RECURRIN	IG SAVINGS (+) C	OR COST (-)			
l' t c c c	TEM a b c d. TOTAL	SAVINGS (+) COST (-) (1) \$ \$ \$	YEAR OF OCCUR. (2)	DISCOUNT FACTOR(3)	DISCOUNTED (+)COST(+/ \$	SAVINGS/ '-)(4)
C. 1	TOTAL NON -EN	NERGY DISCOUN	TED SAVINGS (3A2+3B4d)	\$ <u>0</u>	
<u>4.</u> 5. <u>6.</u> 7. <u></u>	FIRST YEAR DO SIMPLE PAYBA TOTAL NET DIS SAVINGS TO IN	DLLAR SAVINGS CK (1G/4): COUNTED SAVIN IVESTMENT RAT	<u>(213+(3Bd1/YRS</u> <u>IGS (215 + 3C)</u> : FIO (SIR) 6/1G	<u>S ECON LIFE)</u> : <u>:</u> :	\$ <u>11,280</u> 5.9 \$ <u>173,36</u> 2.5)YEARS 7

FT. BELVOIR FAMILY HOUSING INSULATION	FINAL SUBMISSION		
T BELVOIR, VIRGINIA		NOVEMBER 1, 1995	
LIFE CY ENERGY CONSE	CLE COST ANALYSIS SUI	MMARY PROGRAM (ECIP)	
LOCATION: <u>Ft. Belvoir, VA</u> REGIC PROJECT TITLE: <u>Housing Insulation Study (ECO</u> DISCRETE PORTION NAME: <u>River Village 1600</u> , ANALYSIS DATE: <u>Jan '95</u> ECONOMIC LIF	N NO. <u>3</u> PROJI	ECT NO. <u>DACA-31-</u> L YEAR <u>95</u> <u>Fans & Prog. Thermo</u> PREPARER <u>EIN</u>	92 D0061 Del. Order 5 ostats ECIP No. <u>7</u> IHORN YAFFEE PRESCOTT
1.INVESTMENT COSTS:A.CONSTRUCTION COSTB.SIOHC.DESIGN COSTD.TOTAL COST (1A+1B+1C)E.SALVAGE VALUE OF EXISTING EQUIPMF.PUBLIC UTILITY COMPANY REBATEG.TOTAL INVESTMENT (1D-1E-1F)	\$ <u>213,003</u> \$ <u>12,780</u> \$ <u>12,780</u> \$ <u>238,564</u> ENT	\$0	<u>238,564</u>
2. ENERGY SAVINGS (+)/COST(-): DATE OF NISTIR -4942-1 USED FOR DISCOUNT	FACTORS <u>(BC</u>	D Oct 1994)	DISCOUNT RATE: <u>3.1%</u>
ENERGY COST SAVINGS SOURCE \$/MBTU(1) MBTU/YR(2) A. ELEC \$_17.58 2,435 B. DIST \$	ANNUAL \$ SAVINGS(3) \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	DISCOUNT FACTOR(4) 	DISCOUNTED SAVINGS(5) \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
 <u>NON-ENERGY SAVINGS (+) OR COST (-</u> A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVINGS/COST (3A X 3A) 	1)		\$0
B. NON-RECURRING SAVINGS (+) OR COS	ST (-)		
ITEM SAVINGS (+) YEAU COST (-) (1) OCCU a \$ b \$ c \$ d. TOTAL \$	R OF DISCOUNT IR. (2) FACTOR(3)	DISCOUNTED SA (+)COST(+/-)(4 \$ \$ \$ \$0	VINGS/ 4)
C. TOTAL NON -ENERGY DISCOUNTED S	\VINGS (3A2+3B4d)	\$ <u>0</u>	_
4.FIRST YEAR DOLLAR SAVINGS (213+(3)5.SIMPLE PAYBACK (1G/4):6.TOTAL NET DISCOUNTED SAVINGS (2)7.SAVINGS TO INVESTMENT RATIO (S)	<u>3Bd1/YRS ECON LIFE)</u> : <u>215 + 3C)</u> : IR) _ 6/1 <u>G</u> :	\$ 46,582 5.1 \$ 747,347 2.8	YEARS

5. Operational or Policy Change Recommendations

No operational or policy change is recommended for the housing units studied. Existing policy of the Housing Office has served the Installation well, and there is no compelling reason to change it.

D. ENERGY AND COST SAVINGS

See TABLE 2 for the following:

- 1. Projected energy and energy cost savings and
- 2. Projected percentage of energy saved.

TABLE 2: ENERGY AND ENERGY COST SAVINGS SUMMARY (Total of all six housing groups)

_	Existing Energy	Projected Energy	Savings in Energy/Cost:	Savings in Energy/Cost:
Category	Consumption/ Cost	Consumption/ Cost	Quantity	%
Energy/Year: Electricity (MBtu) Gas (MBtu) Total (MBtu)	30,014 23,789 53,803	22,039 18,603 40642	7,975 5,186 13,161	26.6 21.8 24.5 (average)
Energy Cost/Yr Dollars (\$)	689,452	517,766	171,686	24.9

NOTES:1.Utility costs based on \$ 17.575/MBtu (\$ 0.06/kWh) for electricity,
\$ 6.082/MBtu (\$ 0.68/therm) for natural gas.

2. Projected savings based on implementation of all seven(7) ECIP projects.