Mississippi Valley Division,
Regional Planning and Environment Division South

Hatchie/Loosahatchie Mississippi River Mile 775-736, TN and AR

Feasibility Report with Integrated Environmental Assessment

Appendix 7 – Economic and Social Considerations

February 2023

Contents

Section 1 **Cost-Effective and Incremental Cost Analyses** **5**
1.1 Iterations 5
1.2 Round 1 6
1.3 Round 2 26
1.4 Round 3 34
Section 2 **Other Social Effects** **39**
2.1 Purpose 39
2.2 Study Area 39
2.3 Overview of Other Social Effects: 39
Section 3 **Community Characteristics & Other Social Effects Factors** **39**
3.1 Socioeconomics: 39
3.1.1 Population: 39
3.1.2 Median Age: 40
3.1.3 Income per Capita: 40
3.1.4 Employment: 40
3.2 Other Social Effects: Existing Conditions 41
3.2.1 Leisure & Recreation: 41
3.2.2 Economic Vitality: 42
Section 4 **Other Social Effects Evaluation of Alternatives** **42**
4.1 Leisure & Recreation: 42
4.2 Economic Vitality 42
Section 5 **Summary of Alternative Analysis** **43**
Section 6 **Regional Economic Development (RED)** **44**
6.1 General 44
6.2 Description of Metrics 44
6.3 Assumptions 45
6.4 Results 45
References and Resources **47**
List of Acronyms and Abbreviations **48**

LIST OF TABLES

Table A7:1-1. HGM Plantings 6
Table A7:1-2. HGM No plantings 7
Table A7:1-3 Riverine Eddy 8

Table A7:1-4. Invertebrate 8
Table A7:1-5. Unidirectional 8
Table A7:1-6. Borrow 9
Table A7:1-7. Bidirectional 9
Table A7:1-8. Isolation 10
Table A7:1-9. Objective 1 26
Table A7:1-10. Objective 2 27
Table A7:1-11. Objective 3 28
Table A7:1-12. A, B, and C 34
Table A7:1-13. C3 Measures and Average Annual Costs 37
Table A7:3-1. 40
Table A7:3-2. 40
Table A7:3-3. 41

LIST OF FIGURES

Figure A7:1-1. Full Range of Solutions: HGM Planting 11
Figure A7:1-2. Incremental Cost Output for the Best Buy Plans: HGM Planting 12
Figure A7:1-3. Full Range of Solutions: HGM No Planting 13
Figure A7:1-4. Incremental Cost and Output for the Best Buy Plans: HGM No Planting 14
Figure A7:1-5. Full Range of Solutions: Invertebrate 15
Figure A7:1-6. Incremental Cost and Output for the Best Buy Plans: Invertebrate 16
Figure A7:1-7. Full Range of Solutions: Riverine 17
Figure A7:1-8. Incremental Cost and Output for the Best Buy Plans: Riverine 18
Figure A7:1-9. Full Range of Solutions: Unidirectional 19
Figure A7:1-10. Incremental Cost and Output for the Best Buy Plans: Unidirectional 20
Figure A7:1-11. Full Range of Solutions: Bidirectional 21
Figure A7:1-12. Incremental Cost and Output for the Best Buy Plans: Bidirectional 22
Figure A7:1-13. Full Range of Solutions: Isolation 23
Figure A7:1-14. Incremental Cost and Output for the Best Buy Plans: Isolation 24
Figure A7:1-15. Full Range of Solutions: Borrow 25
Figure A7:1-16. Incremental Cost and Output for the Best Buy Plans: Borrow 26
Figure A7:1-17. Full Range of Solutions: Objective 1 29
Figure A7:1-18. Incremental Cost and Output for the Best Buy Plans: Objective 1 30

Figure A7:1-19. Full Range of Solutions: Objective 2 31
Figure A7:1-20. Incremental Cost and Output for the Best Buy Plans: Objective 2 32
Figure A7:1-21. Full Range of Solutions: Objective 3 33
Figure A7:1-22. Incremental Cost and Output for the Best Buy Plans: Objective 3 34
Figure A7:1-23. Full Range of Solutions: Final Array 36
Figure A7:1-24. Incremental Cost and Output for the Best Buy Plans: Final Array 37

Section 1
COST-EFFECTIVE AND INCREMENTAL COST ANALYSES

For environmental planning, where traditional benefit-cost analysis is not possible because costs and benefits are expressed in different units, two analytical methods are used to assist Corps planners in the decision process. First, cost-effectiveness (CE) analysis is conducted to ensure that the least cost solution is identified for each possible level of environmental output. Subsequent incremental cost analysis (ICA) of the cost-effective solutions is conducted to reveal changes in costs for increasing levels of environmental outputs. In the absence of a common measurement unit for comparing the non-monetary benefits with the monetary costs of environmental plans, cost-effectiveness and incremental cost analysis are valuable tools to assist in decision making.

It is important to keep in mind that the most useful information developed by these two methods is what it tells decision makers about the relative relationships among solutions – that one will likely produce greater output than another, or one is likely to be more costly than another – rather than the specific numbers that are calculated. Furthermore, these analyses will usually not lead, and are not intended to lead, to a single best solution (as in economic cost-benefit analysis); however, they will improve the quality of decision making by ensuring that a rational, supportable approach is used in considering and selecting alternative methods to produce environmental outputs.

To perform the CE/ICA, use was made of the IWR Planning Suite Decision Support Software developed by the US Army Corps of Engineers Institute for Water Resources (IWR). IWR Planning Suite has been developed to assist with plan comparison by conducting cost-effectiveness and incremental cost analyses, identifying the plans which are the best financial investments ("Best Buys"), and displaying the effects of each on a range of decision variables. The software is available via the IWR Planning Suite Internet. The latest version (2.0.9.1) has been certified for use by USACE Headquarters, meaning that it has been reviewed and certified by the appropriate Planning Center of Expertise (PCX) and represents a corporate approval that the model is sound and functional.

1.1 ITERATIONS

Multiple iterations of the IWR Planning Suite were used to identify efficient measures and combinations of measures to form the final array of alternatives and ultimately the TSP selection.

Costs and benefits were developed for 83 management measures across all complexes with benefits for each ecological measure being determined by the associated model. The measures from the best buys for each ecological model, and subsequently for each objective,

were combined and reassessed in multiple iterations of CE/ICA to identify a final array of plans ("best of the best" plans on the efficient frontier).

1.2 ROUND 1

The first round of IWR Planning Suite runs were conducted on ecological measures using ecological benefits and parametric costs estimates (construction, real estate, OMRR&R, and Adaptive Management and Monitoring). Subsequently, 956 cost-effective plans and 92 best buy plans were identified. Measures that were included in the best buy plans were retained and moved forward to the second iteration. Non-efficient and cost-effective measures were examined based on habitat weighting, and in cases where an important habitat would be screened out, it was retained until the next round. Sixty-four measures were retained and moved to the 2nd round of CE/ICA. See Figures 1 – 16 for the full range of solutions (where possible) and the incremental cost and output for the best buy plans.

Table A7:1-1. HGM Plantings

Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
BR_6	Brandywine	BLH (floodplain)	66	$15,400
BR_7	Brandywine	BLH (floodplain)	48	$34,413
BR_8	Brandywine	BLH (floodplain)	133	$45,903
BR_9	Brandywine	BLH (floodplain)	31	$14,603
BR_11	Brandywine	BLH (floodplain)	626	$106,654
BR_15	Brandywine	Seasonally herbaceous wetland (aquatic & floodplain)	203	$171,579
HB_1	HopefieldPoint	Seasonally herbaceous wetland (aquatic & floodplain)	9	$15,936
I35_2	Island35_DeanIsland	BLH (floodplain)	65	$18,204
I35_6b	Island35_DeanIsland	BLH (floodplain)	25	$5,706
I35_9b	Island35_DeanIsland	BLH (floodplain)	27	$4,947
I35_12a	Island35_DeanIsland	Cypress - Tupelo (floodplain)	32	$3,827
I40_1a	Island 40_41	BLH (floodplain)	46	$10,299
I40_2a	Island 40_41	BLH (floodplain)	36	$75,381
I40_7b	Island 40_41	BLH (floodplain)	116	$18,138
M_6	Meeman_Shelby	Moist Soil (aquatic & floodplain)	14	$36,894

RL_4	RedmanPoint_LoosahatchieBar	BLH (floodplain)	676	$184,179
RCP_1	Richardson_CedarPoint	Cypress - Tupelo (floodplain)	19	$3,280
RCP_2	Richardson_CedarPoint	Seasonally herbaceous wetland (aquatic & floodplain)	177	$33,218
S_8	Sunrise_Island34	Cypress - Tupelo (floodplain)	30	$7,790
S_9	Sunrise_Island34	BLH (floodplain)	1,614	$631,592
S_10	Sunrise_Island34	Riverfront Forest - Riparian buffers (floodplain)	36	$8,767

Table A7:1-2. HGM No plantings

Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
HT_6	HatchieTowhead_Randolph	Riverfront Forest - Riparian buffers (floodplain)	26	$12,257
HT_8	HatchieTowhead_Randolph	Riverfront Forest - Riparian buffers (floodplain)	3.4	$40,741
HB_2c	HopefieldPoint_BigRiverPark	Seasonally herbaceous wetland (aquatic & floodplain)	39	$46,305
I35_7h	Island35_DeanIsland	Riverfront Forest - Riparian buffers (floodplain)	18	$1,886
I35_12b	Island35_DeanIsland	Riverfront Forest - Riparian buffers (floodplain)	126	$12,964
I40_3	Island40_41	Riverfront Forest - Riparian buffers (floodplain)	102	$13,897
M_5	MeemanShelbyForest_EagleLake	Cypress - Tupelo (floodplain)	8	$2,281
M_11	MeemanShelbyForest_EagleLake	Moist Soil (aquatic & floodplain)	24	$18,074
M_13	MeemanShelbyForest_EagleLake	BLH (floodplain)	29	$34,699
RCP_3	Richardson_CedarPoint	Riverfront Forest - Riparian buffers (floodplain)	177	$107,340
RCP_4	Richardson_CedarPoint	Riverfront Forest - Riparian buffers (floodplain)	69	$2,593

Table A7:1-3 Riverine Eddy

Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
Br_5	Brandywine	BLH (floodplain)	444.609	$43,931
I35_7g	Island35_DeanIsland	Secondary Channels (lotic aquatic)	2.67	$53,096
M_1	MeemanShelbyForest_EagleLake	Secondary Channels (lotic aquatic)	5.35	$106,329

Table A7:1-4. Invertebrate

Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
Br_2	Brandywine	Secondary Channels (lotic aquatic)	83.952	$4,019
D_3	Densford	Secondary Channels (lotic aquatic)	99	$3,845
HT_2	HatchieTowhead_Randolph	MC/Main Channel Border (lotic aquatic)	22.275	$460,448
M_14	MeemanShelbyForest_EagleLake	Secondary Channels (lotic aquatic)	586.08	$3,863
RL_6	RedmanPoint_LoosahatchieBar	Secondary Channels (lotic aquatic)	625.68	$3,995
S_7	Sunrise_Island34	Secondary Channels (lotic aquatic)	100.584	$3,932

Table A7:1-5. Unidirectional

Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
Br_1	Brandywine	Secondary Channels (lotic aquatic)	22.58	$8,491
Br_4	Brandywine	Meander Scarp/ tertiary channels (lotic aquatic)	112.15	$304,528

I35_3	Island35_DeanIsland	Meander Scarp/ tertiary channels (lotic aquatic)	44.67	$345,638
I35_7a	Island35_DeanIsland	Secondary Channels (lotic aquatic)	59.62	$9,750
S_4	Sunrise_Island34	Meander Scarp/ tertiary channels (lotic aquatic)	275.45	$432,219

Table A7:1-6. Borrow

				Average
Measure	**Island**	**Habitat**		**Annual**
ID	**Complex**	**Addressed**	**AAFCU**	**Costs**
Br_14	Brandywine	Borrow Areas (lentic aquatic)	4.41	$100,640
Br_16	Brandywine	Borrow Areas (lentic aquatic)	3.76	$112,750
D_2	Densford	Borrow Areas (lentic aquatic)	5.27	$184,093
HB_3	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.41	$19,510
HB_4	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.63	$22,618
HB_5	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.41	$19,510
HB_6	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	2.75	$41,264
HB_7	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.83	$25,725
HB_8	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	3.22	$50,587
HB_9	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	2.58	$38,156
I40_7a	Island40_41	Borrow Areas (lentic aquatic)	4.52	$90,987

Table A7:1-7. Bidirectional

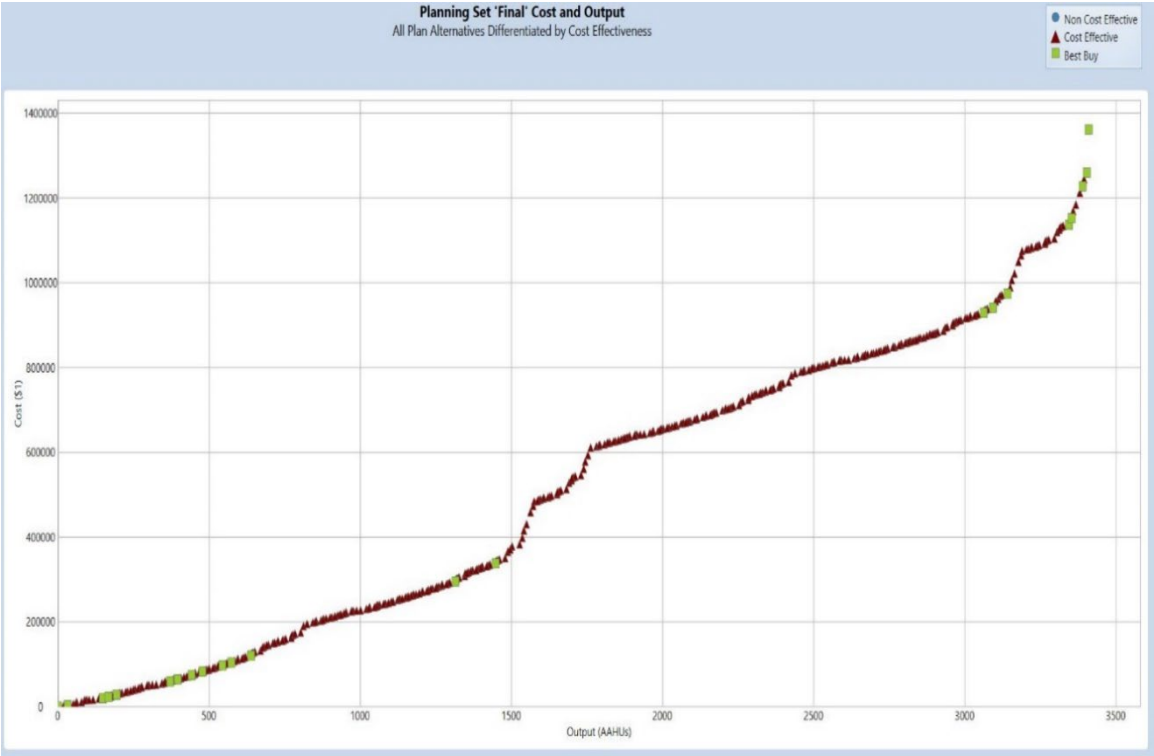
				Average
Measure	**Island**	**Habitat**		**Annual**
ID	**Complex**	**Addressed**	**AAFCU**	**Costs**

Br_10	Brandywine	Slough (lentic aquatic)	0.06	$2,307
Br_12	Brandywine	Slough (lentic aquatic)	2.98	$19,107
Br_13	Brandywine	Slough (lentic aquatic)	4.76	$62,271
D_1	Densford	Slough (lentic aquatic)	3.85	$13,733
HT_1	HatchieTowhead_Randolph	Slough (lentic aquatic)	0.47	$26,953
HT_4	HatchieTowhead_Randolph	Slough (lentic aquatic)	4.69	$23,836
HT_7	HatchieTowhead_Randolph	Slough (lentic aquatic)	0.07	$3,877
HT_10	HatchieTowhead_Randolph	Slough (lentic aquatic)	0.04	$2,896
HB_2ab	HopefieldPoint_BigRiverPark	Slough (lentic aquatic)	0.55	$19,393
I35_6c	Island35_DeanIsland	Borrow Areas (lentic aquatic)	0.1	$6,673
I35_8_a	Island35_DeanIsland	Slough (lentic aquatic)	7.64	$115,326
I35_10a	Island35_DeanIsland	Slough (lentic aquatic)	0.02	$3,678
I35_11	Island35_DeanIsland	Slough (lentic aquatic)	0.76	$33,601
I40_1b	Island40_41	Slough (lentic aquatic)	2.44	$27,359
I40_2b	Island40_41	Slough (lentic aquatic)	0.89	$19,294
I40_4	Island40_41	Slough (lentic aquatic)	0.22	$6,170
I40_5	Island40_41	Slough (lentic aquatic)	1.17	$18,704
RL_3	RedmanPoint_LoosahatchieBar	Secondary Channels (lotic aquatic)	0.42	$3,701
RL_7	RedmanPoint_LoosahatchieBar	Slough (lentic aquatic)	4.68	$22,337
S_1	Sunrise_Island34	Slough (lentic aquatic)	0.93	$12,054
S_2	Sunrise_Island34	Slough (lentic aquatic)	0.12	$3,089
S_6	Sunrise_Island34	Secondary Channels (lotic aquatic)	46	$2,495

Table A7:1-8. Isolation

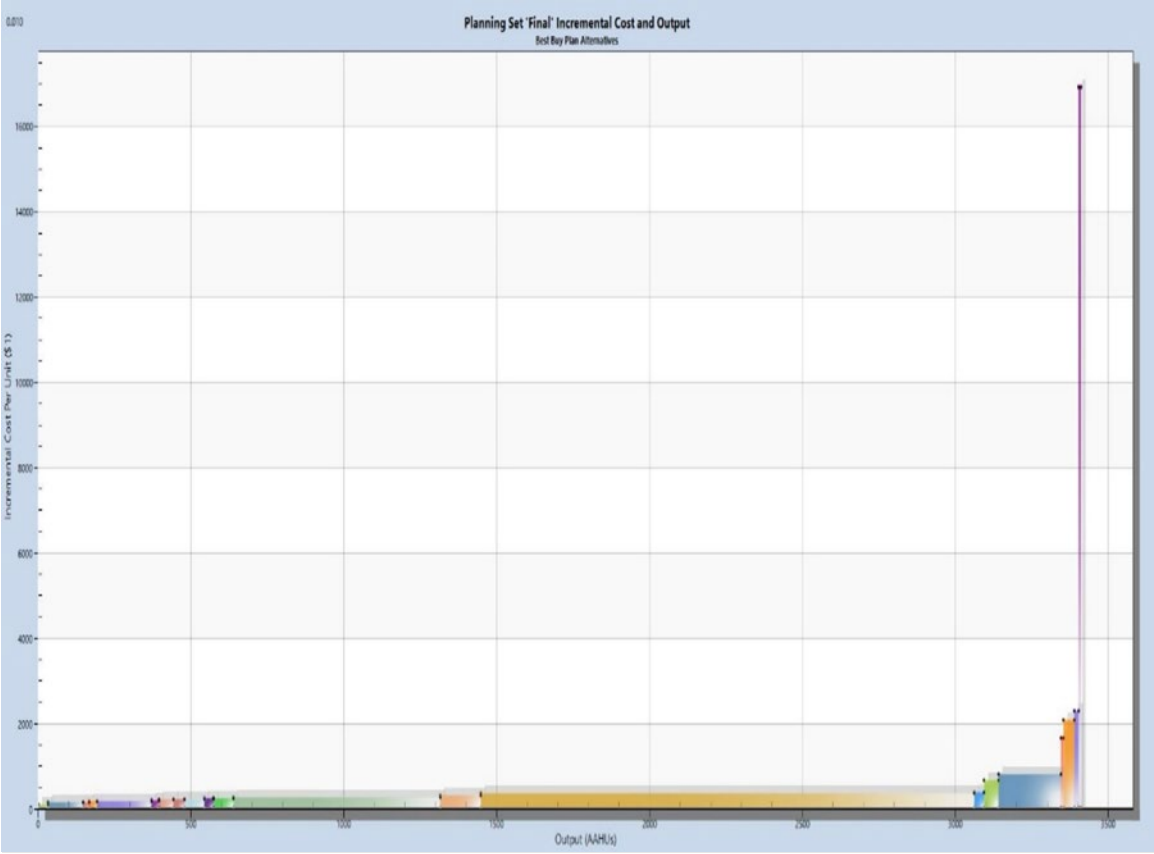
Measure ID	Island Complex	Habitat Addressed	AAFCU	Average Annual Costs
HB_10	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	0.6	$3,514
I35_4b	Island35_DeanIsland	Borrow Areas (lentic aquatic)	0.11	$2,740
I35_5c	Island35_DeanIsland	Slough (lentic aquatic)	0.33	$7,881
I40_6	Island40_41	Borrow Areas (lentic aquatic)	1.48	$6,421

Figure A7:1-1. Full Range of Solutions: HGM Planting



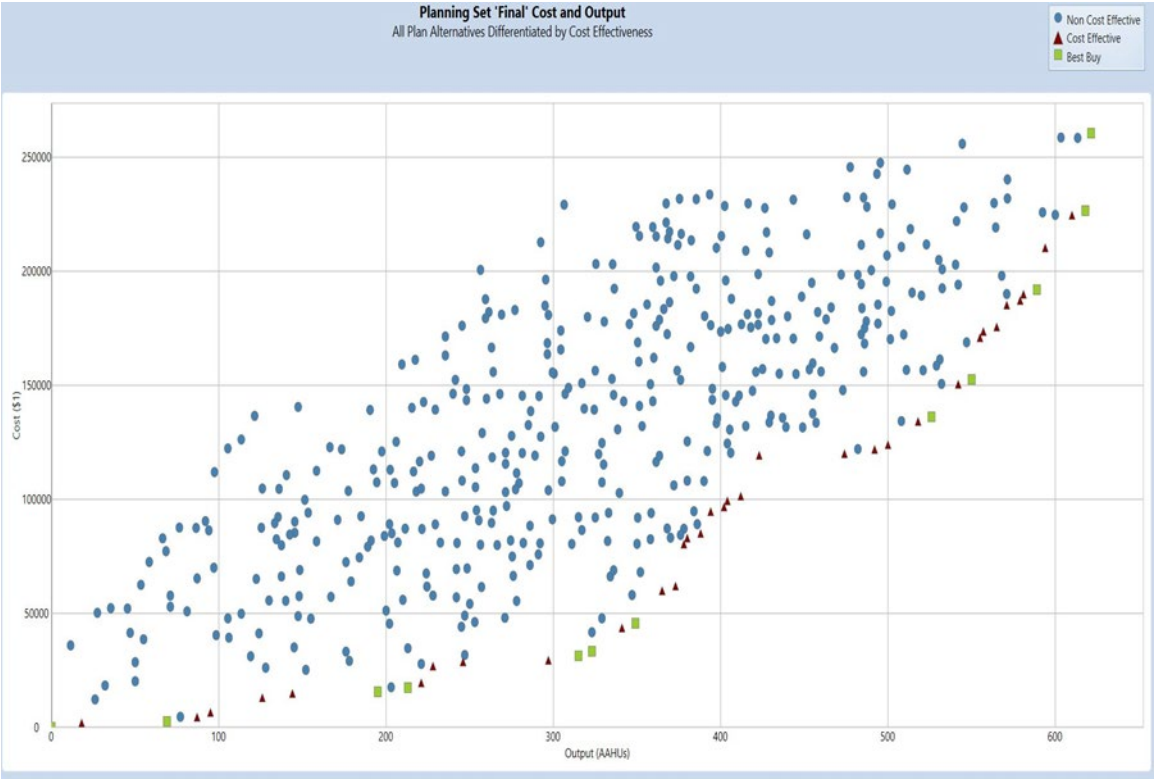
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-2. Incremental Cost Output for the Best Buy Plans: HGM Planting



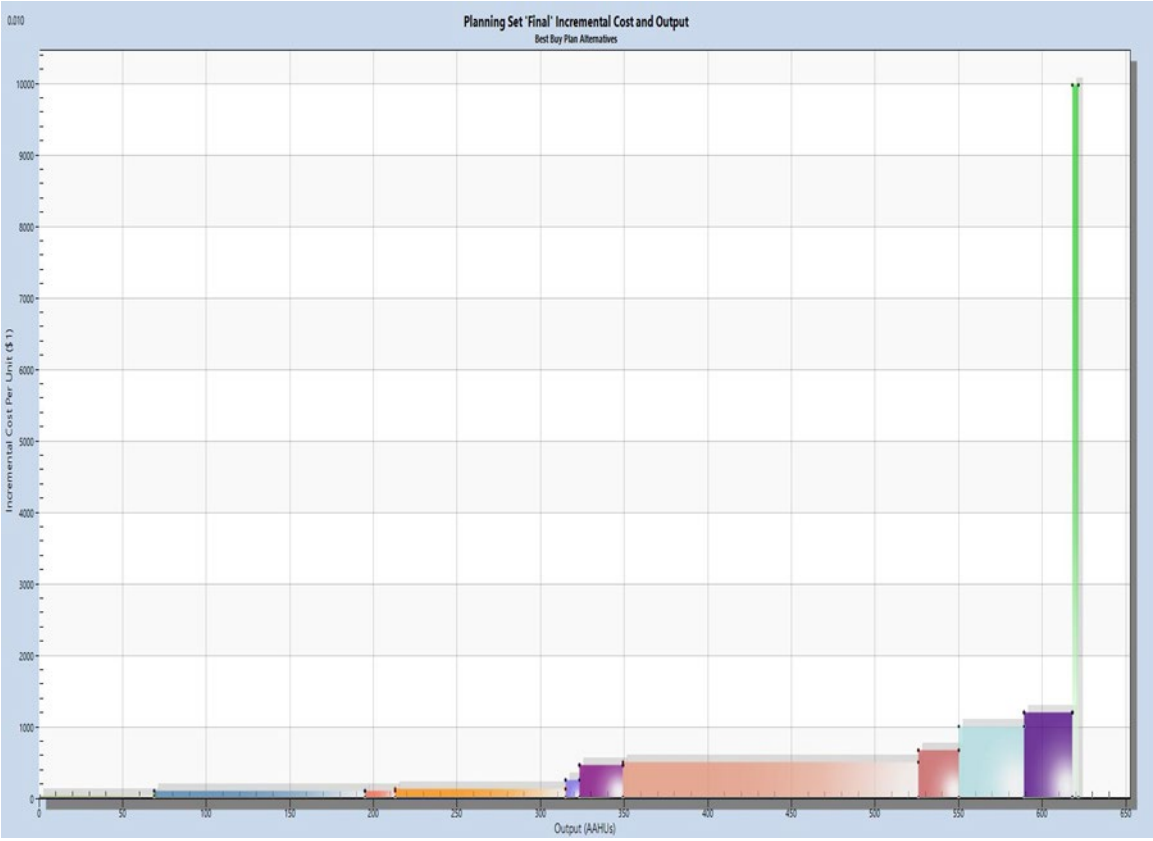
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-3. Full Range of Solutions: HGM No Planting



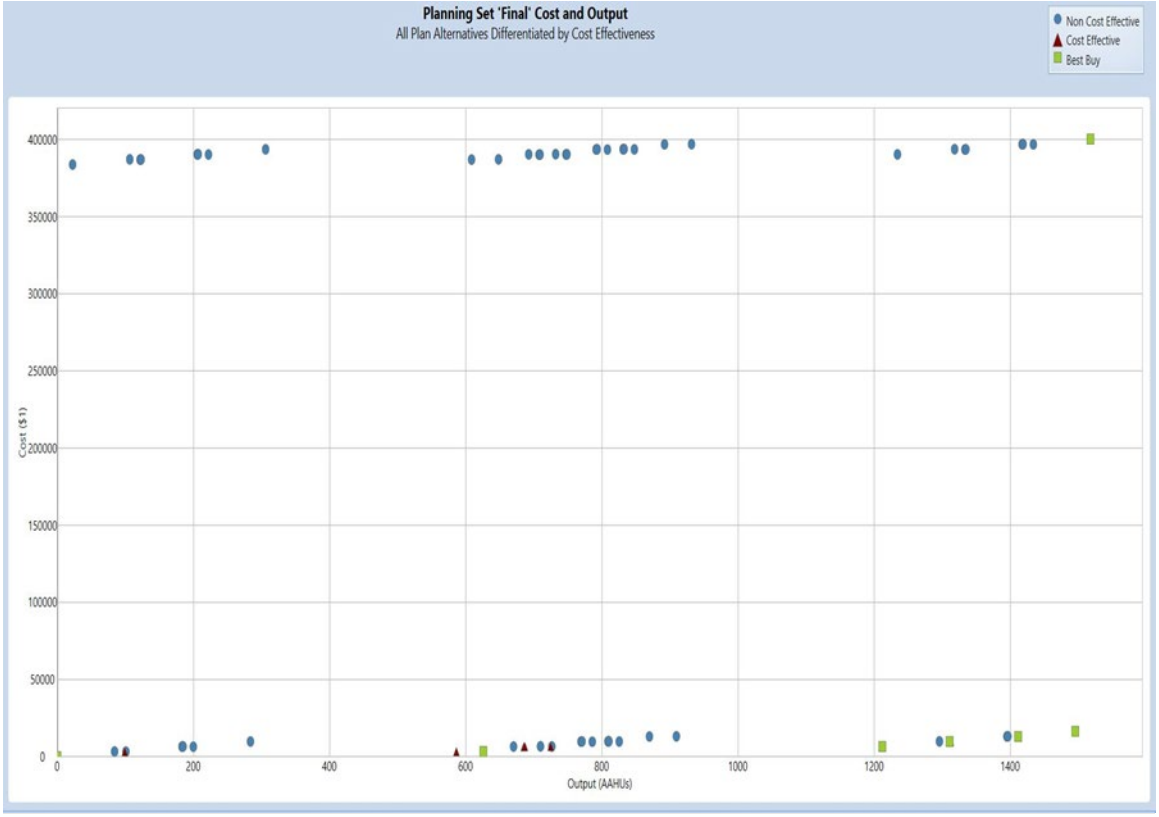
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-4. Incremental Cost and Output for the Best Buy Plans: HGM No Planting



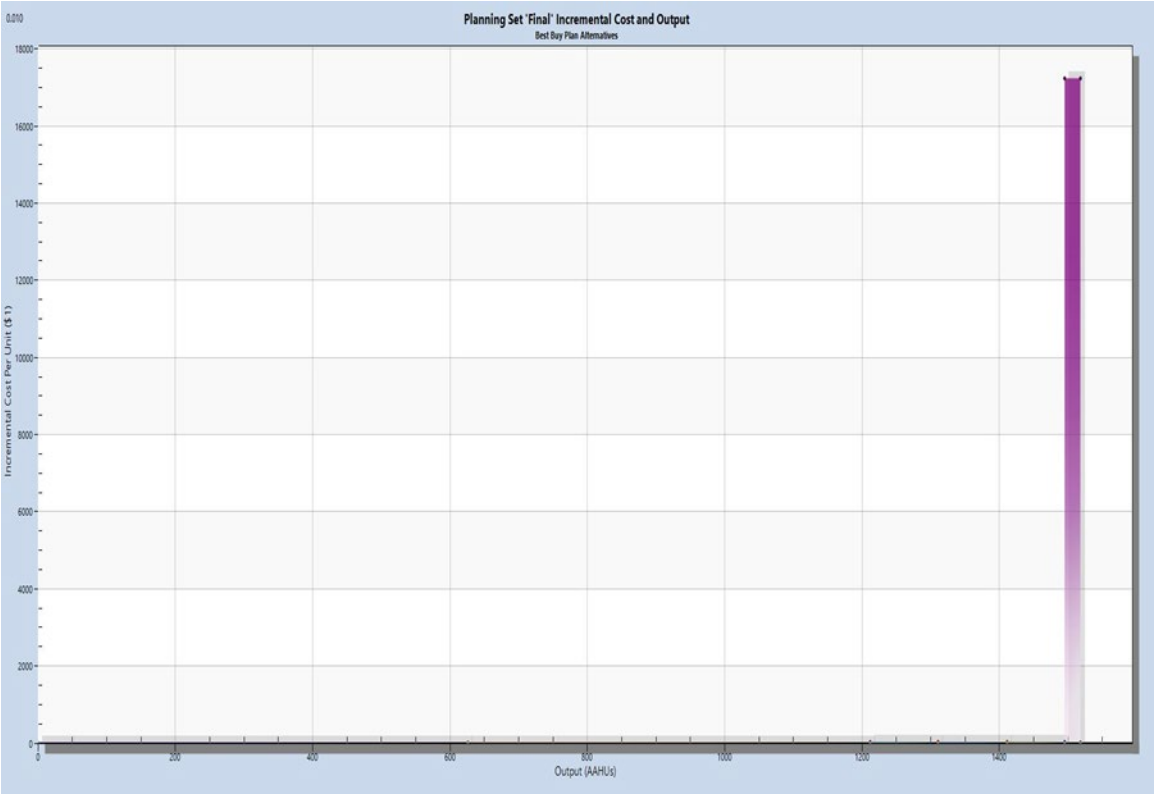
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-5. Full Range of Solutions: Invertebrate



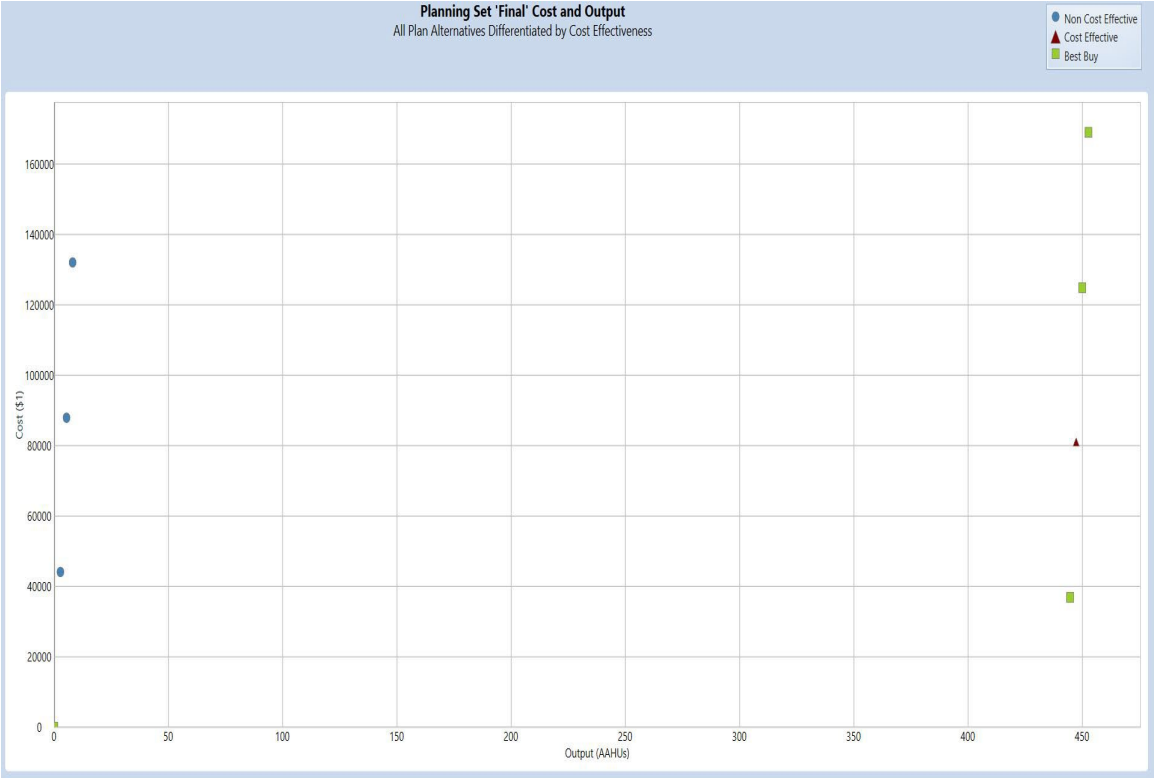
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-6. Incremental Cost and Output for the Best Buy Plans: Invertebrate



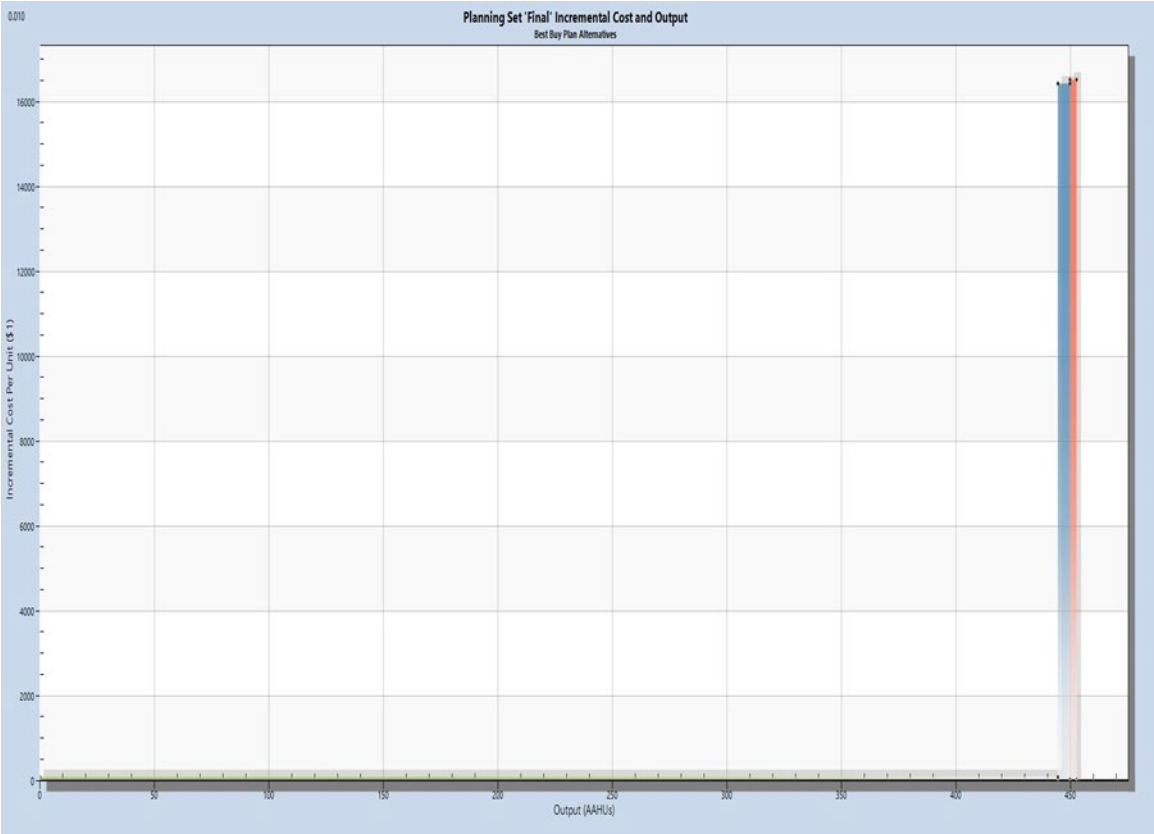
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-7. Full Range of Solutions: Riverine



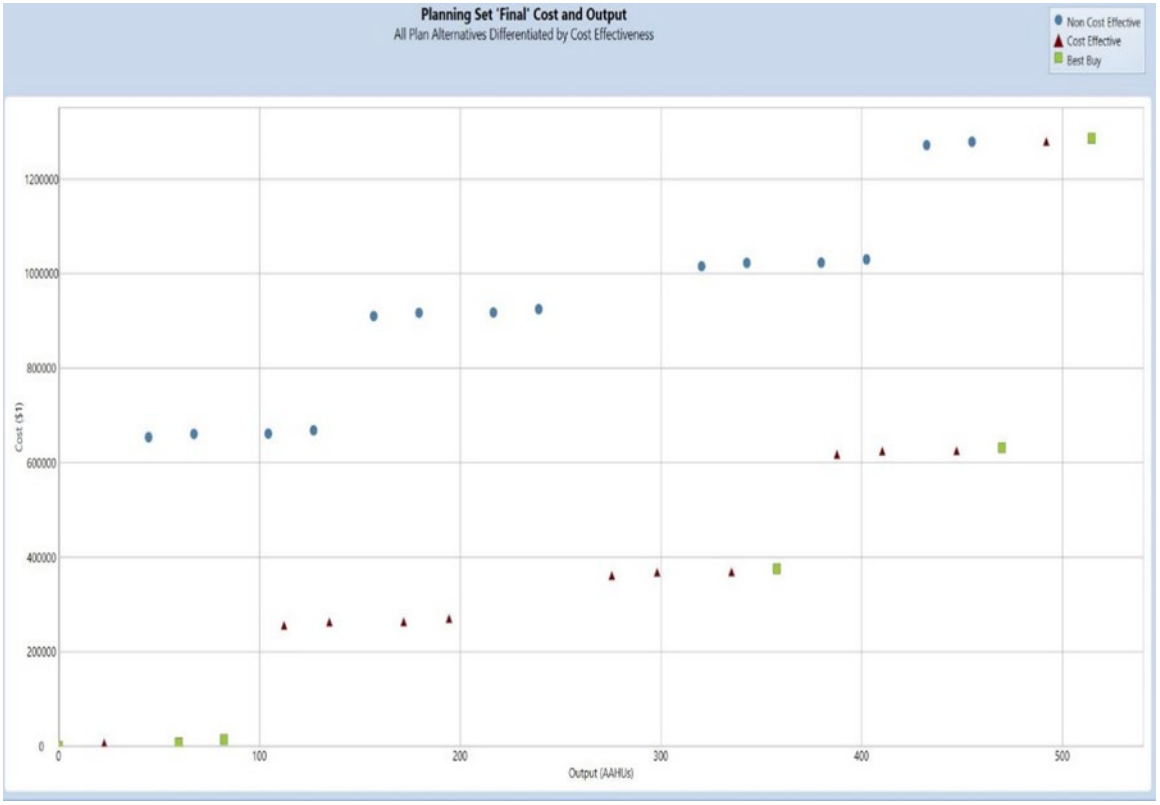
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-8. Incremental Cost and Output for the Best Buy Plans: Riverine



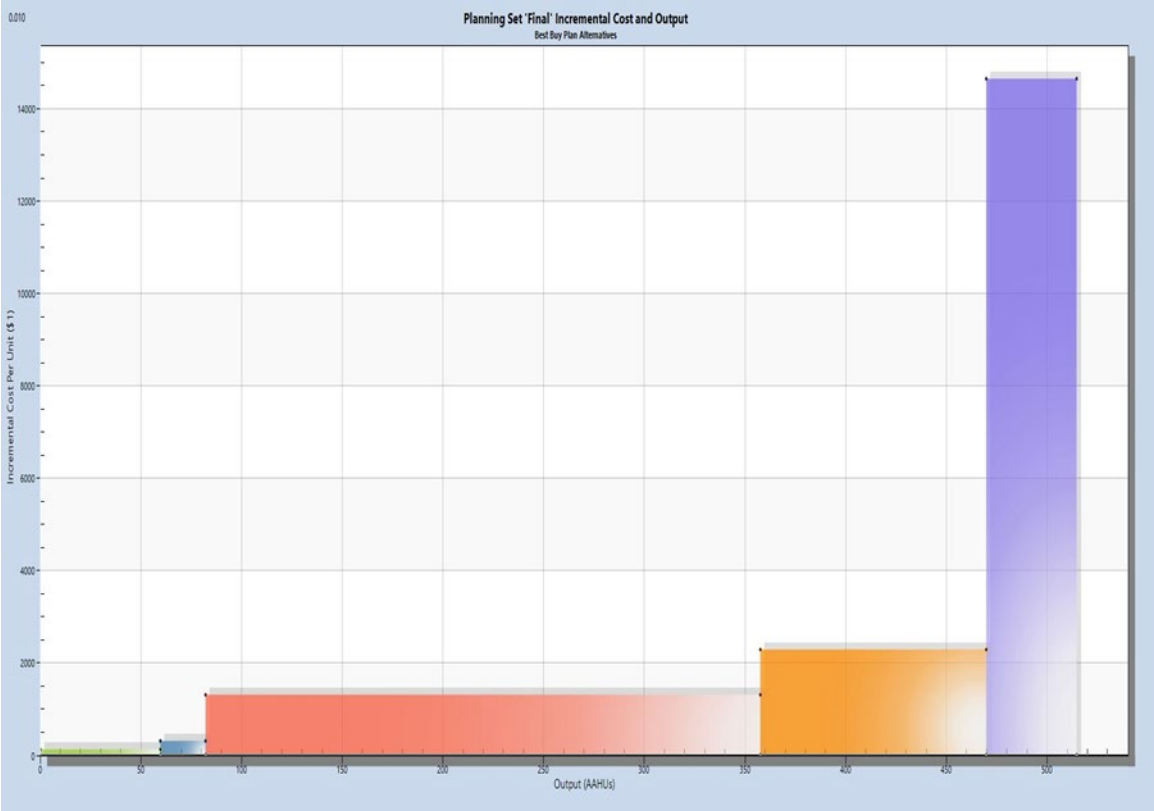
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-9. Full Range of Solutions: Unidirectional



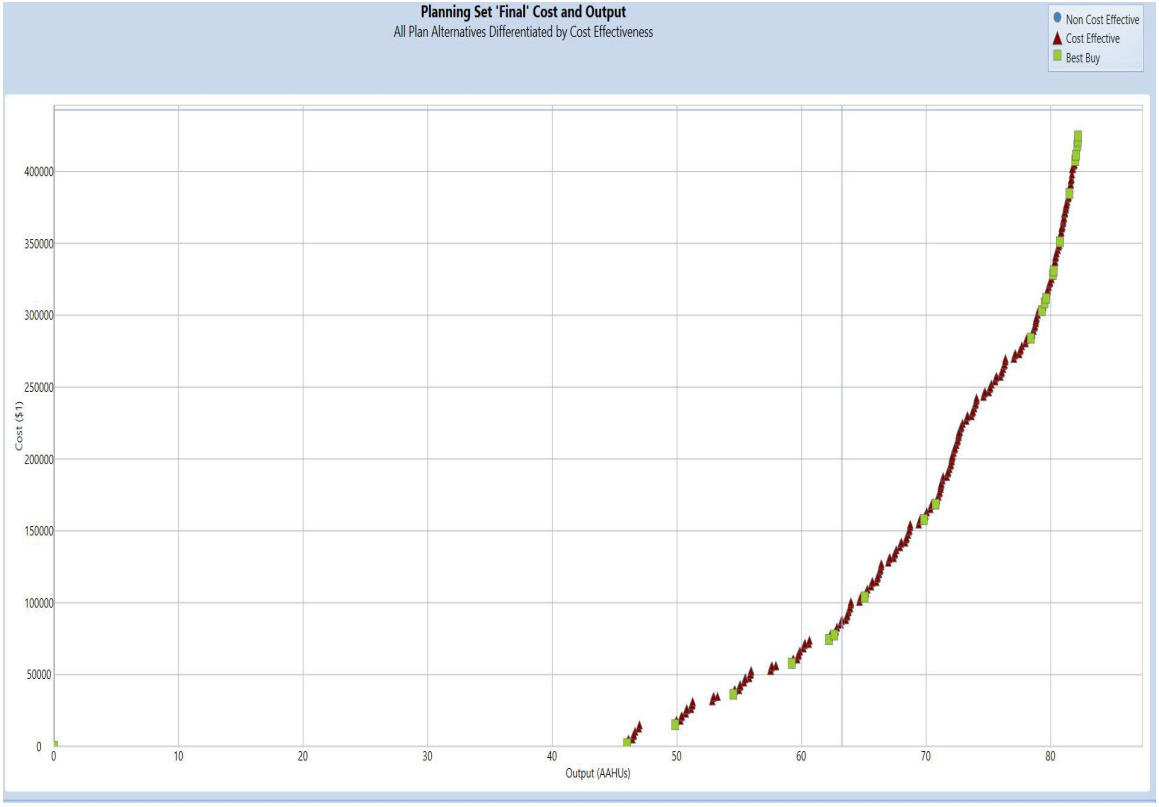
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-10. Incremental Cost and Output for the Best Buy Plans: Unidirectional



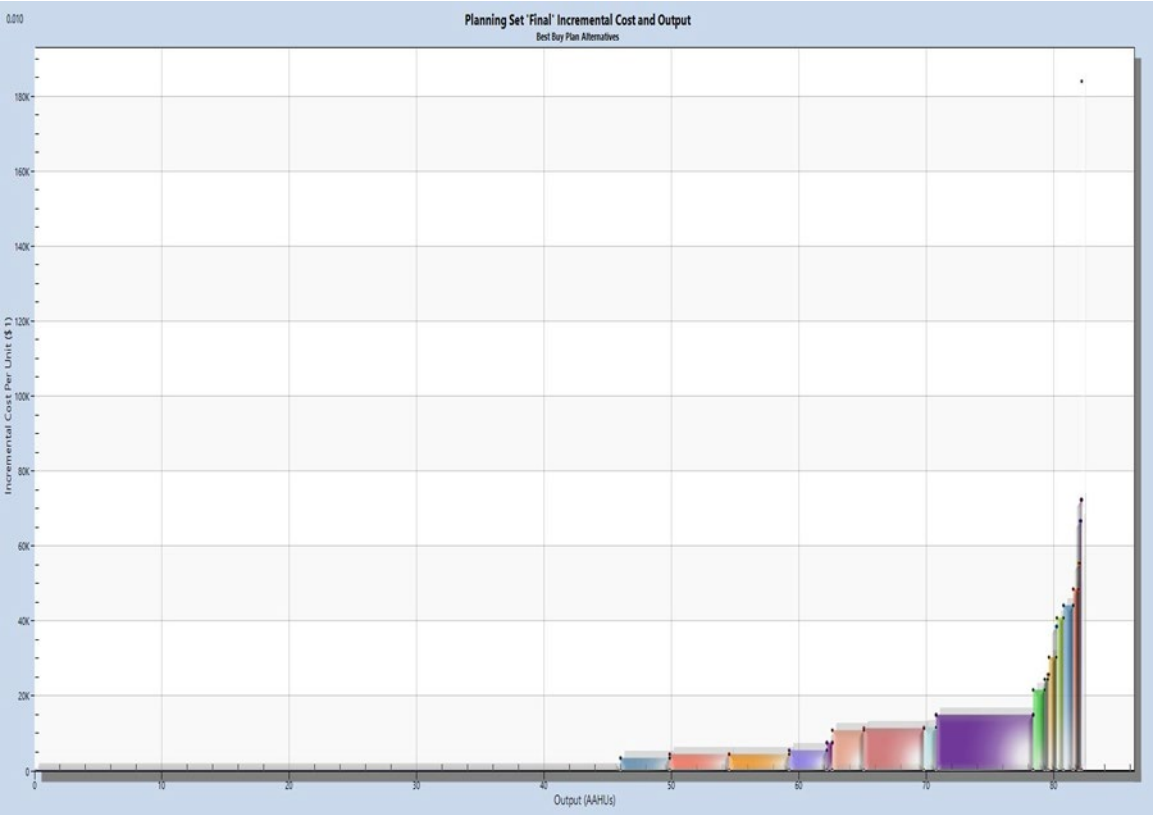
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-11. Full Range of Solutions: Bidirectional



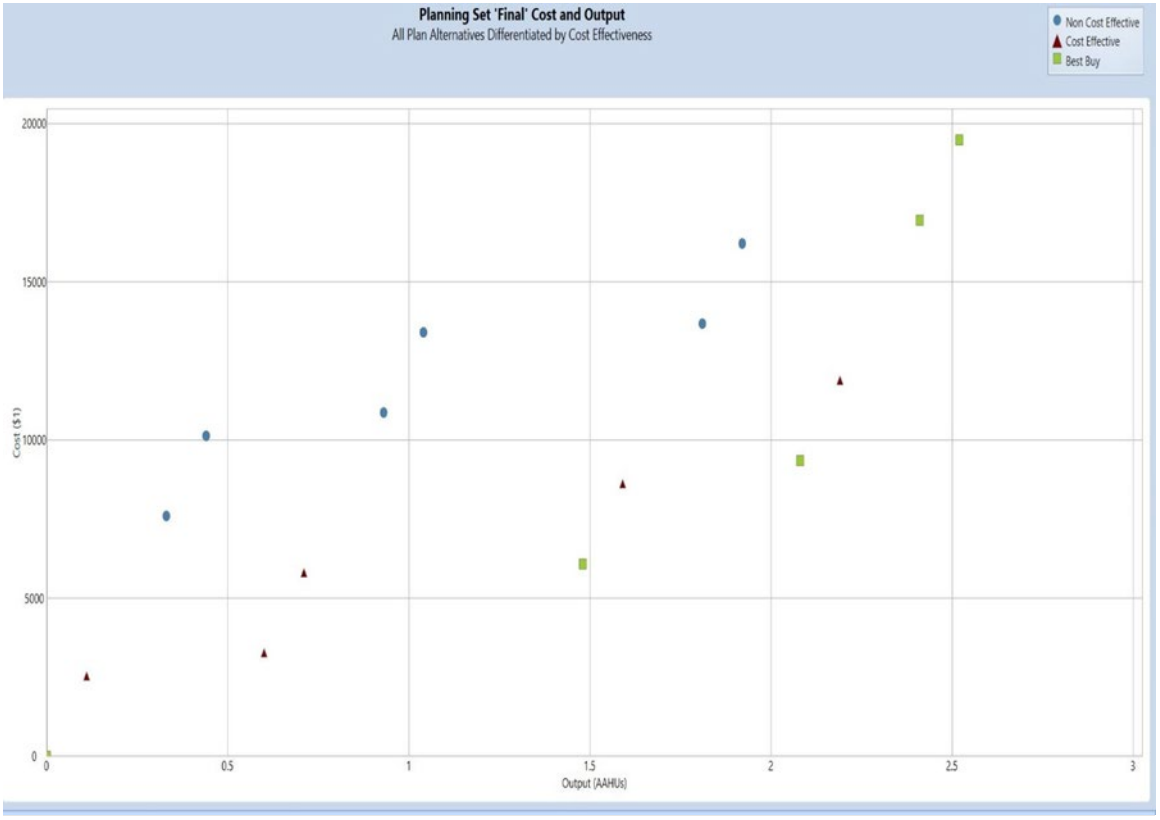
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-12. Incremental Cost and Output for the Best Buy Plans: Bidirectional



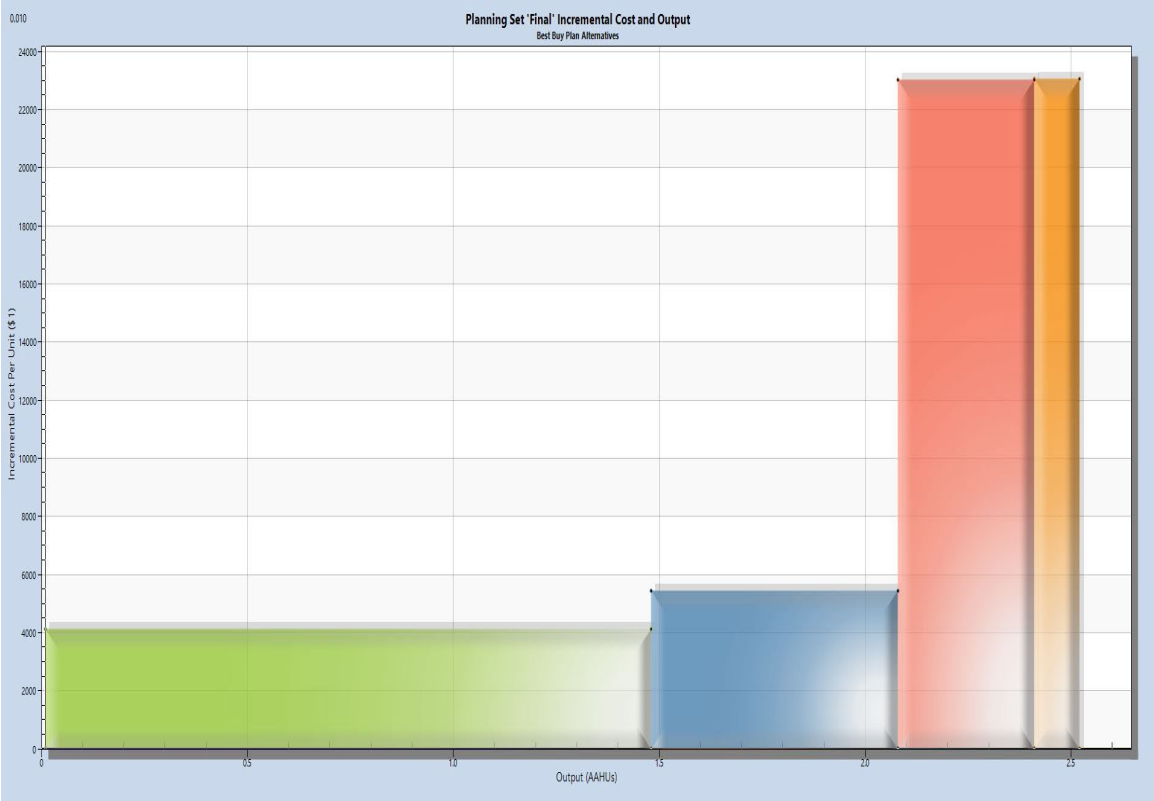
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-13. Full Range of Solutions: Isolation



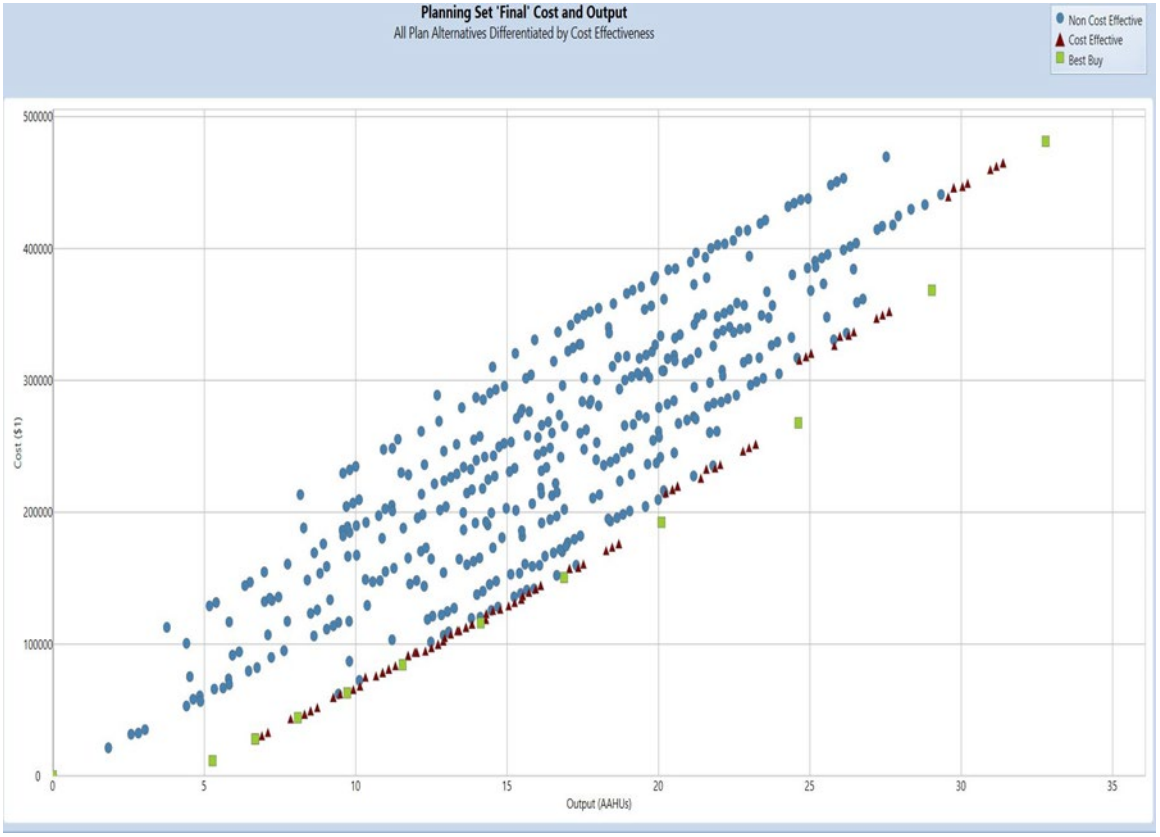
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-14. Incremental Cost and Output for the Best Buy Plans: Isolation



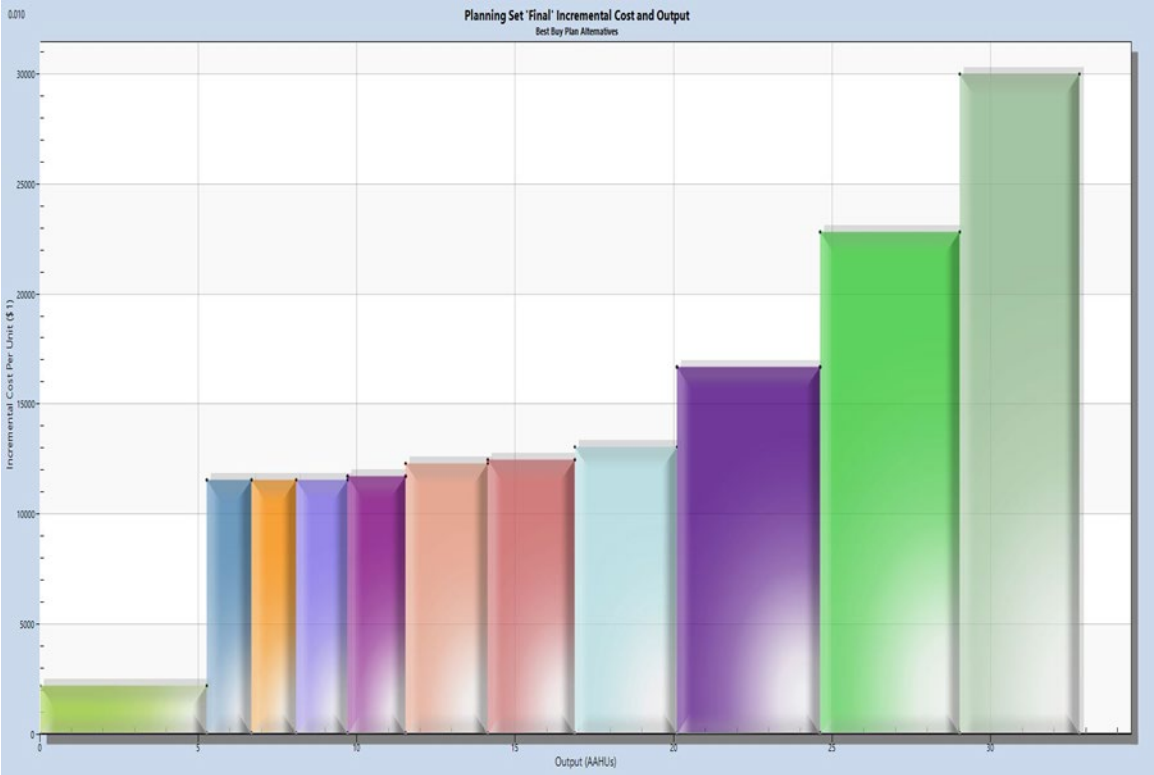
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-15. Full Range of Solutions: Borrow



Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-16. Incremental Cost and Output for the Best Buy Plans: Borrow



Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

1.3 ROUND 2

For the second round of CE/ICA, the remaining measures were grouped by objective and all measures under each objective were combined and run together. As a result, 833 cost-effective plans and 68 best buy plans were identified. Non-efficient and cost-effective measures were examined based on the technical significance of habitats, and in cases where an important habitat would be screened out, it was retained until the next round. Fifty-eight measures were retained and grouped into 27 measure groups based on synergy and overlapping benefit areas. Twenty-seven measure groups (C) moved to the 3rd round of CE/ICA and were run as separate combinable features. Two additional alternatives based on diversity (A) and efficient measures on public lands (B) were run alongside the 27 combinable alternatives. See Figures 17 – 22 for the full range of solutions (where possible) and the incremental cost and output for the best buy plans.

Table A7:1-9. Objective 1

				Average

Measure ID	Island Complex	Habitat Addressed	AAFCU	Annual Costs
BR_6	Brandywine	BLH (floodplain)	66	$15,400
BR_7	Brandywine	BLH (floodplain)	48	$34,413
BR_8	Brandywine	BLH (floodplain)	133	$45,903
BR_11	Brandywine	BLH (floodplain)	6	$106,654
HT_6	HatchieTowhead_Randolph	Riverfront Forest - Riparian buffers (floodplain)	26	$12,257
HB_1	HopefieldPoint_BigRiverPark	Seasonally herbaceous wetland (aquatic & floodplain)	9	$15,936
HB_2c	HopefieldPoint_BigRiverPark	Seasonally herbaceous wetland (aquatic & floodplain)	39	$46,305
I35_2	Island35_DeanIsland	BLH (floodplain)	65	$18,204
I35_6b	Island35_DeanIsland	BLH (floodplain)	25	$5,706
I35_7h	Island35_DeanIsland	Riverfront Forest - Riparian buffers (floodplain)	18	$1,886
I35_9b	Island35_DeanIsland	BLH (floodplain)	27	$4,947
I35_12a	Island35_DeanIsland	Cypress - Tupelo (floodplain)	32	$3,827
I35_12b	Island35_DeanIsland	Riverfront Forest - Riparian buffers (floodplain)	126	$12,964
I40_1a	Island40_41	BLH (floodplain)	46	$10,299
I40_3	Island40_41	Riverfront Forest - Riparian buffers (floodplain)	102	$13,897
I40_7b	Island40_41	BLH (floodplain)	116	$18,138
M_5	MeemanShelbyForest_EagleLake	Cypress - Tupelo (floodplain)	8	$2,281
M_6	MeemanShelbyForest_EagleLake	Moist Soil (aquatic & floodplain)	14	$36,894
M_11	MeemanShelbyForest_EagleLake	Moist Soil (aquatic & floodplain)	24	$18,074
RCP_1	Richardson_CedarPoint	Cypress - Tupelo (floodplain)	19	$3,280
RCP_2	Richardson_CedarPoint	Seasonally herbaceous wetland (aquatic & floodplain)	177	$33,218
RCP_4	Richardson_CedarPoint	Riverfront Forest - Riparian buffers (floodplain)	69	$2,593
RL_4	RedmanPoint_LoosahatchieBar	BLH (floodplain)	676	$184,179
S_8	Sunrise_Island34	Cypress - Tupelo (floodplain)	30	$7,790
S_10	Sunrise_Island34	Riverfront Forest - Riparian buffers (floodplain)	36	$8,767

Table A7:1-10. Objective 2

				Average
Measure	Island	Habitat		Annual

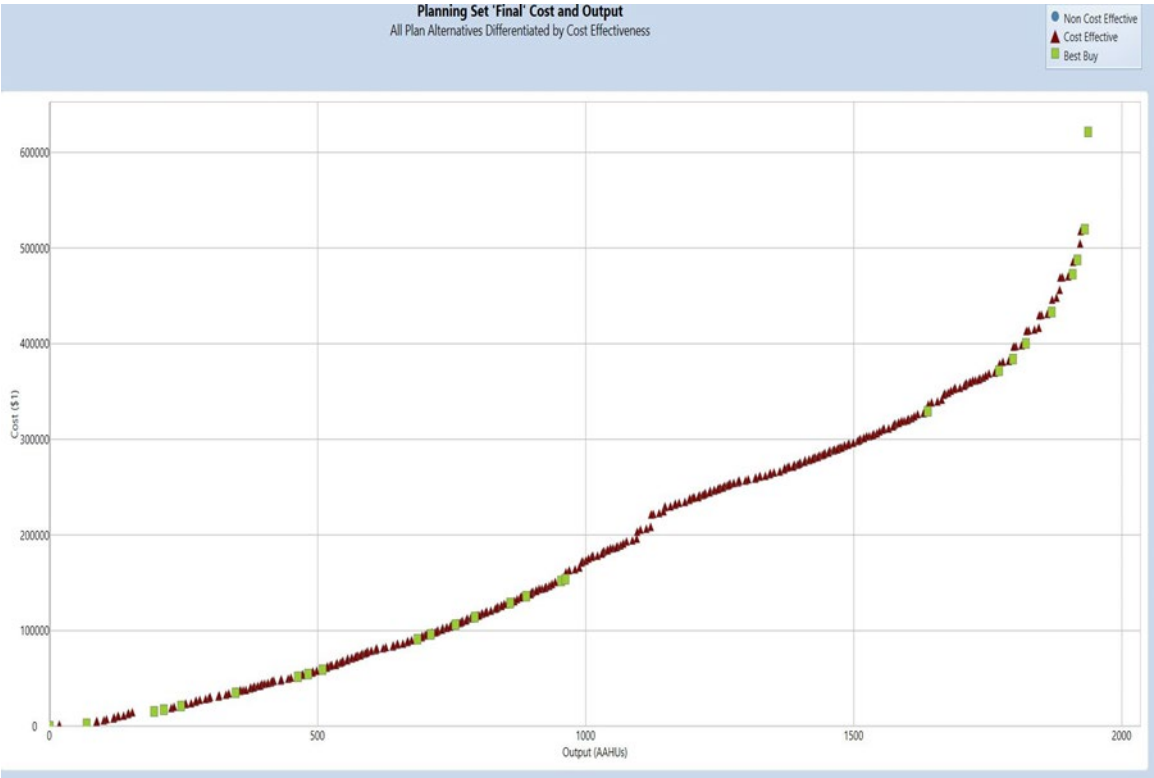
ID	Complex	Addressed	AAFCU	Costs
Br_1	Brandywine	Secondary Channels (lotic aquatic)	22.58	$8,491
Br_2	Brandywine	Secondary Channels (lotic aquatic)	83.952	$4,019
Br_4	Brandywine	Meander Scarp/ tertiary channels (lotic aquatic)	112.15	$304,528
Br_5	Brandywine	BLH (floodplain)	444.609	$43,931
D_3	Densford	Secondary Channels (lotic aquatic)	99	$3,845
HT_2	HatchieTowhead_Randolph	MC/Main Channel Border (lotic aquatic)	22.275	$460,448
I35_3	Island35_DeanIsland	Meander Scarp/ tertiary channels (lotic aquatic)	44.67	$345,638
I35_7a	Island35_DeanIsland	Secondary Channels (lotic aquatic)	59.62	$9,750
M_1	MeemanShelbyForest_EagleLake	Secondary Channels (lotic aquatic)	5.35	$106,329
M_14	MeemanShelbyForest_EagleLake	Secondary Channels (lotic aquatic)	586.08	$3,863
RL_6	RedmanPoint_LoosahatchieBar	Secondary Channels (lotic aquatic)	625.68	$3,995
S_4	Sunrise_Island34	Meander Scarp/ tertiary channels (lotic aquatic)	275.45	$432,219
S_7	Sunrise_Island34	Secondary Channels (lotic aquatic)	100.584	$3,932

Table A7:1-11. Objective 3

				Average
Measure	Island	Habitat		Annual
ID	Complex	Addressed	AAFCU	Costs
Br_12	Brandywine	Slough (lentic aquatic)	2.98	$19,107
Br_13	Brandywine	Slough (lentic aquatic)	4.76	$62,271
D_1	Densford	Slough (lentic aquatic)	3.85	$13,733
D_2	Densford	Borrow Areas (lentic aquatic)	5.27	$184,093
HT_1	HatchieTowhead_Randolph	Slough (lentic aquatic)	0.47	$26,953
HT_4	HatchieTowhead_Randolph	Slough (lentic aquatic)	4.69	$23,836
HB_2ab	HopefieldPoint_BigRiverPark	Slough (lentic aquatic)	0.55	$19,393
HB_3	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.41	$19,510
HB_4	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.63	$22,618
HB_5	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.41	$19,510
HB_6	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	2.75	$41,264
HB_7	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	1.83	$25,725
HB_8	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	3.22	$50,587
HB_9	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	2.58	$38,156
HB_10	HopefieldPoint_BigRiverPark	Borrow Areas (lentic aquatic)	0.6	$3,514

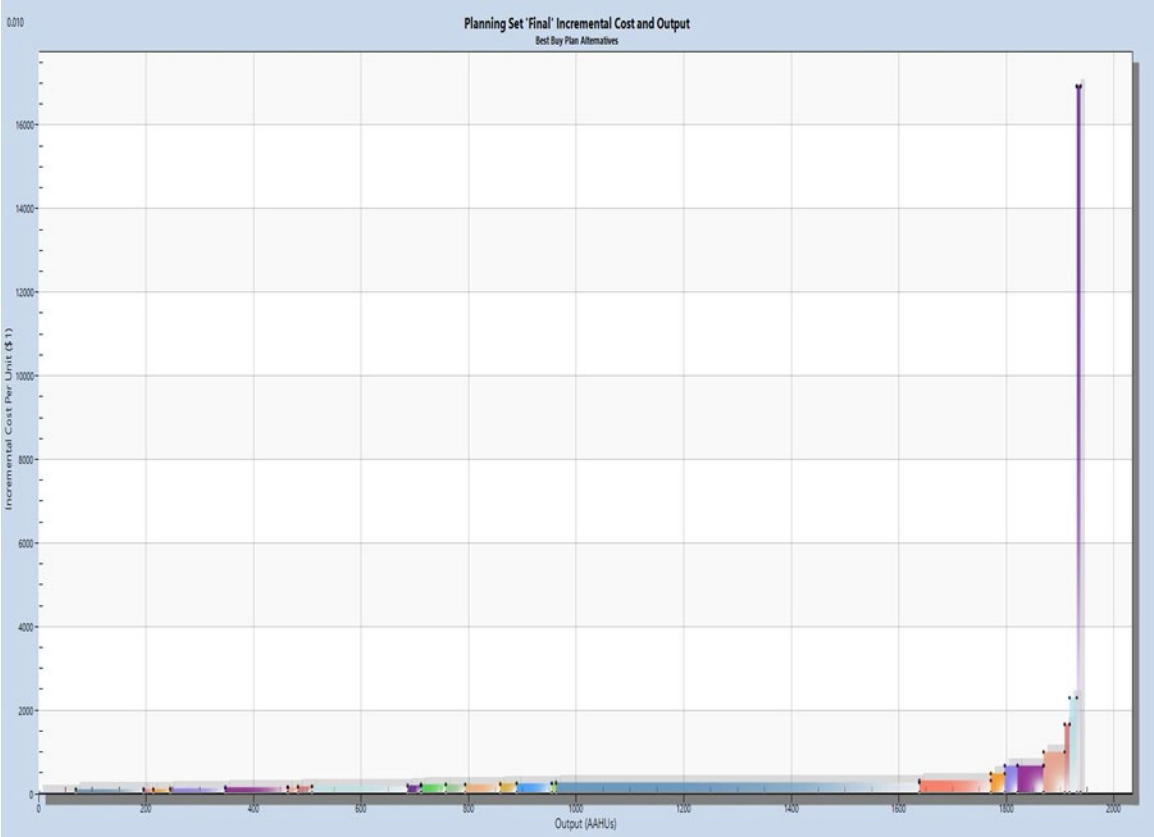
I35_4b	Island35_DeanIsland	Borrow Areas (lentic aquatic)	0.11	$2,740
I35_5c	Island35_DeanIsland	Slough (lentic aquatic)	0.33	$7,881
I40_1b	Island40_41	Slough (lentic aquatic)	2.44	$27,359
I40_4	Island40_41	Slough (lentic aquatic)	0.22	$6,170
I40_5	Island40_41	Slough (lentic aquatic)	1.17	$18,704
I40_6	Island40_41	Borrow Areas (lentic aquatic)	1.48	$6,421
I40_7a	Island40_41	Borrow Areas (lentic aquatic)	4.52	$90,987
RL_3	RedmanPoint_LoosahatchieBar	Secondary Channels (lotic aquatic)	0.42	$3,701
RL_7	RedmanPoint_LoosahatchieBar	Slough (lentic aquatic)	4.68	$22,337
S_1	Sunrise_Island34	Slough (lentic aquatic)	0.93	$12,054
S_6	Sunrise_Island34	Secondary Channels (lotic aquatic)	46	$2,495

Figure A7:1-17. Full Range of Solutions: Objective 1



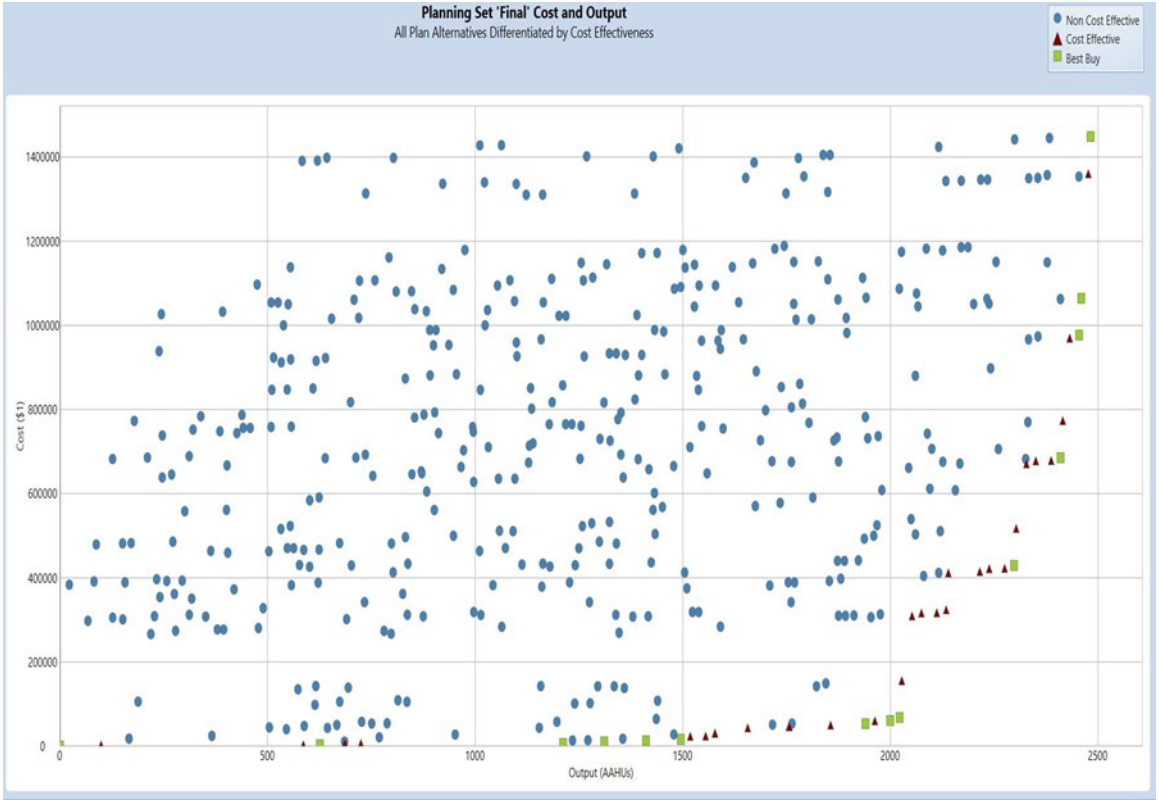
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-18. Incremental Cost and Output for the Best Buy Plans: Objective 1



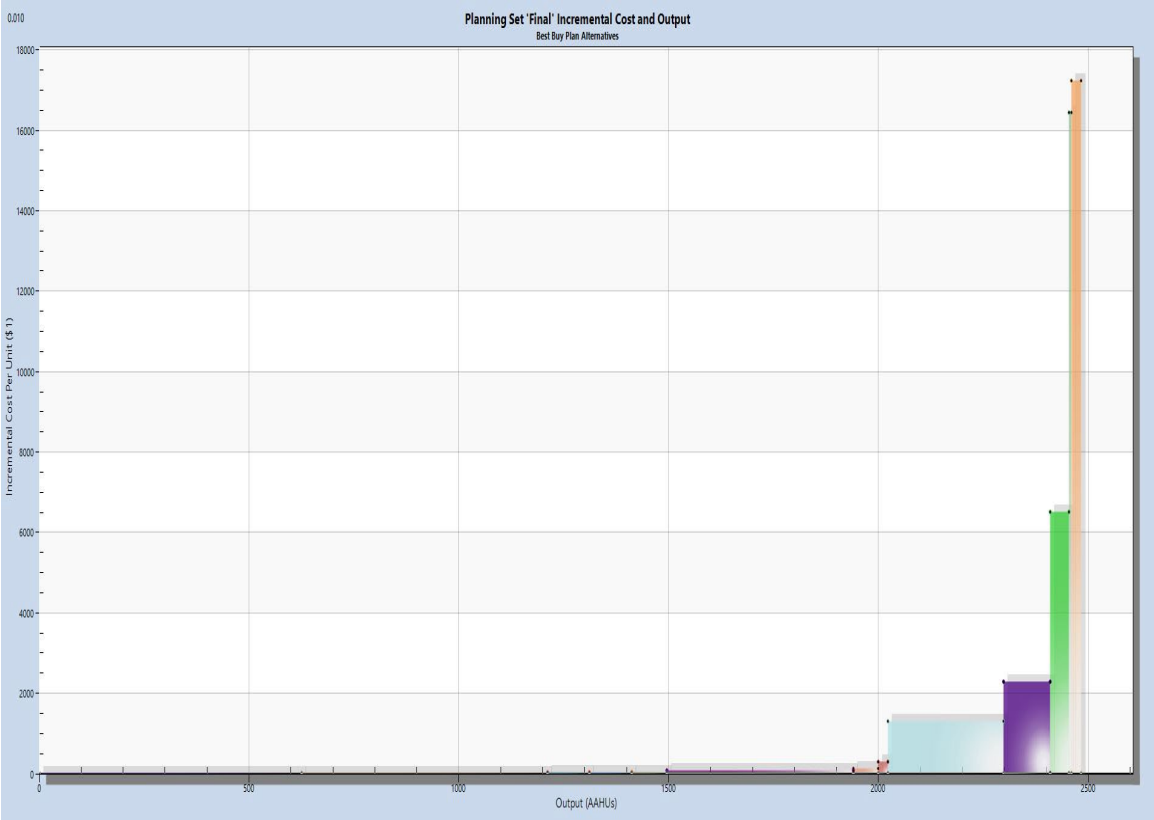
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-19. Full Range of Solutions: Objective 2



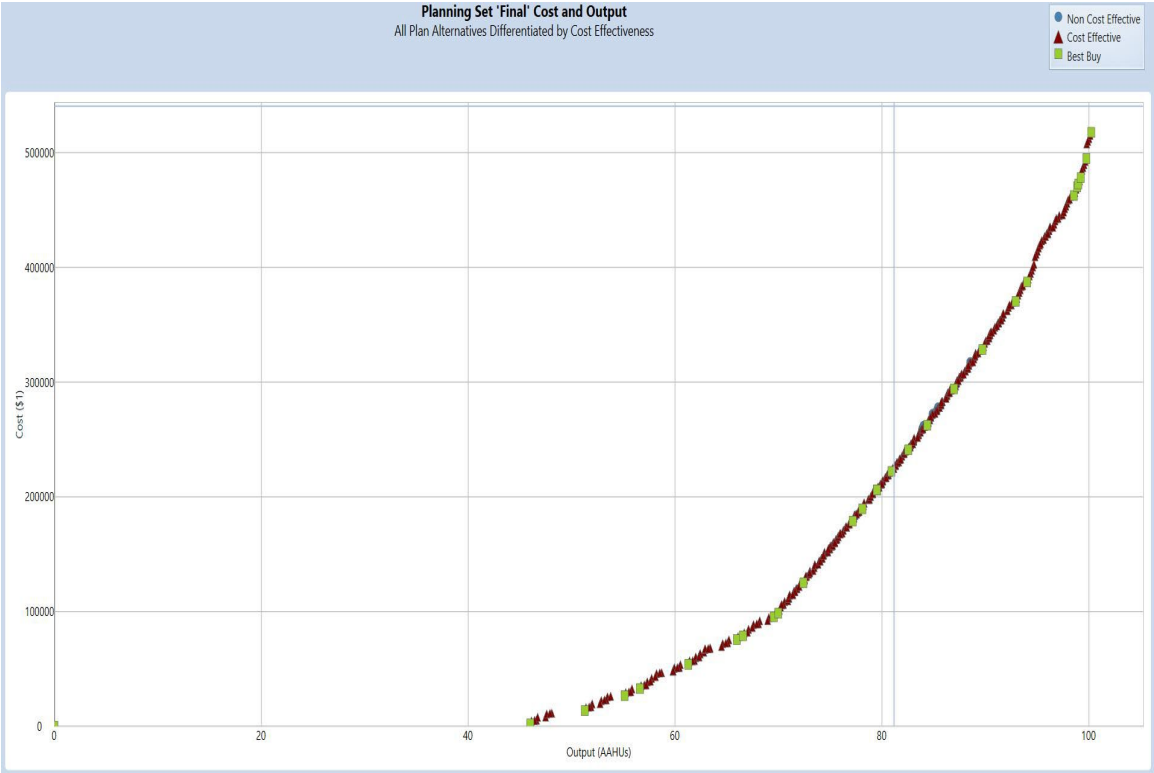
Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-20. Incremental Cost and Output for the Best Buy Plans: Objective 2



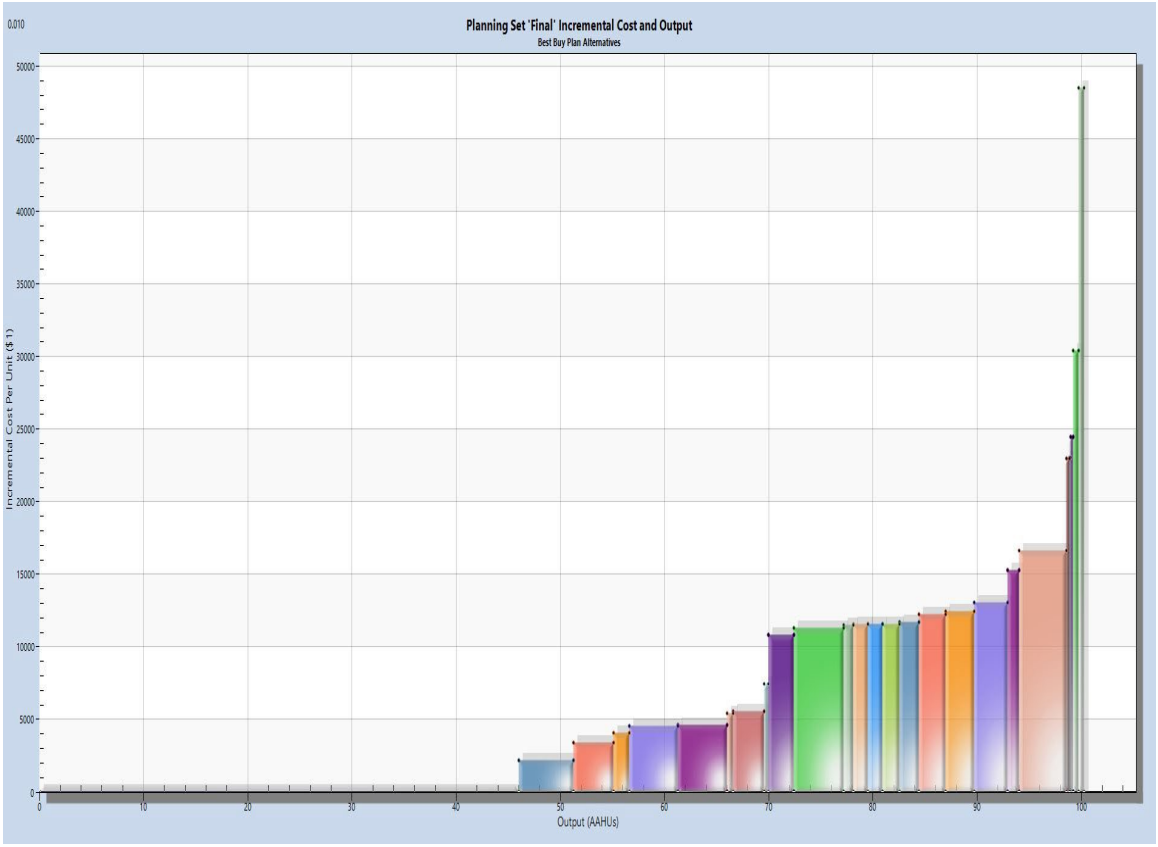
Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Figure A7:1-21. Full Range of Solutions: Objective 3



Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-22. Incremental Cost and Output for the Best Buy Plans: Objective 3



Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

1.4 ROUND 3

The 3rd round resulted in 501 cost-efficient plans and 27 best buy plans. The CE/ICA results were used to identify the final array of alternatives based on the break points in the scatter plot of average annual costs and benefit outputs and the bar chart of the resulting best buys. Technical significance of habitats was also considered in the identification of the final array. See Figures 23 – 24 for the full range of solutions (where possible) and the incremental cost and output for the best buy plans.

Table A7: 1-13 displays the Tentatively Selected Plan's (C3) measures and average annual costs.

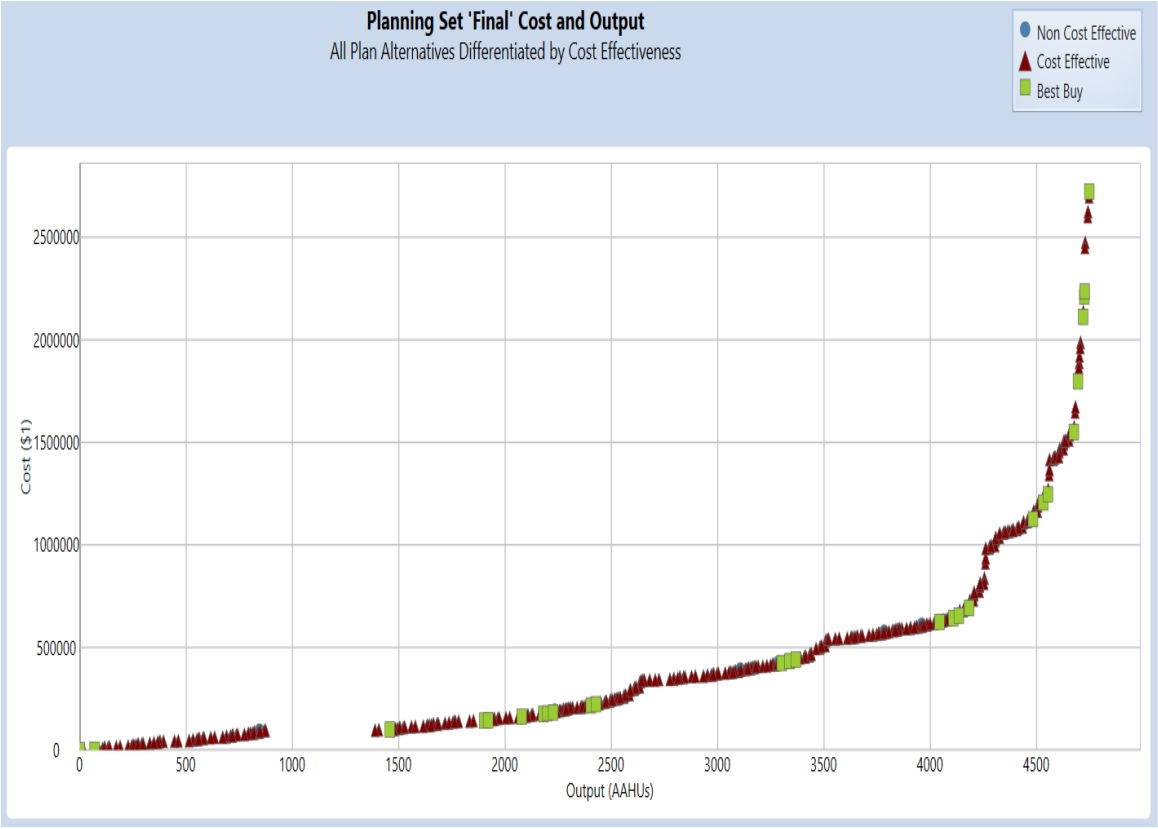
Table A7:1-12. A, B, and C

				Average

				Annual
Grouping		**Measures**	**AAFCU**	**Costs**
A		BR_1, BR_2, BR_5, BR_6, D_1, D_2, D_3, HB_10, HT_4, I35_2, I35_6b, I35_7a, I35_7h, I35_9b, I35_12a, I35_12b, I40_1a, I40_3, I40_6, I40_7b, M_5, M_14, RCP_1, RCP_2, RCP_4, RL_6, RL_7, S_4, S_6, S_7, S_8, S_10	3,112	$933,261
B		BR_1, BR_2, BR_5, D_3, HB_1, HB_3, HB_4, HB_5, HB_6, HB_7, HB_8, HB_9, I35_7a, M1, M5, M6, M11, M14, RL_3, RL_6, S_4, S_6, S_7	2,206	$917,123
C	1	BR_12, BR_13, HB_3, HB_4, HB_5, HB_6, HB_7, HB_8, HB_9, RL_3, S_1	24.04	$314,502
	2	BR_4	121.88	$304,528
	3	BR_5	444.609	$43,931
	4	BR_6, BR_7, BR_8, BR_11	873	$200,903
	5	HB_1, HB_2ab, HB_2c	48.56	$81,633
	6	HT_1, HT_2	22.11	$487,401
	7	HT_6	26	$12,257
	8	I35_12a, I35_12b	158	$16,792
	9	I35_2	65	$18,204
	10	I35_6b	25	$5,706
	11	I35_7h	18	$1,886
	12	I35_9b	27	$4,947
	13	I40_1a, I40_1b	48.47	$37,659
	14	I40_3	102	$13,897
	15	I40_4, I40_5	1.41	$24,873
	16	I40_6, I40_7a	6	$97,409
	17	M_5, M_6	21.73	$39,174
	18	RCP_1	19	$3,280
	19	RCP_2	177	$33,218
	20	RCP_4	69	$2,593
	21	RL_4	676	$184,179
	22	D_1, D_2, HB_10, HT_4, RL_7	19.23	$247,514
	23	S_10	36	$8,767
	24	S_4	300.16	$432,219

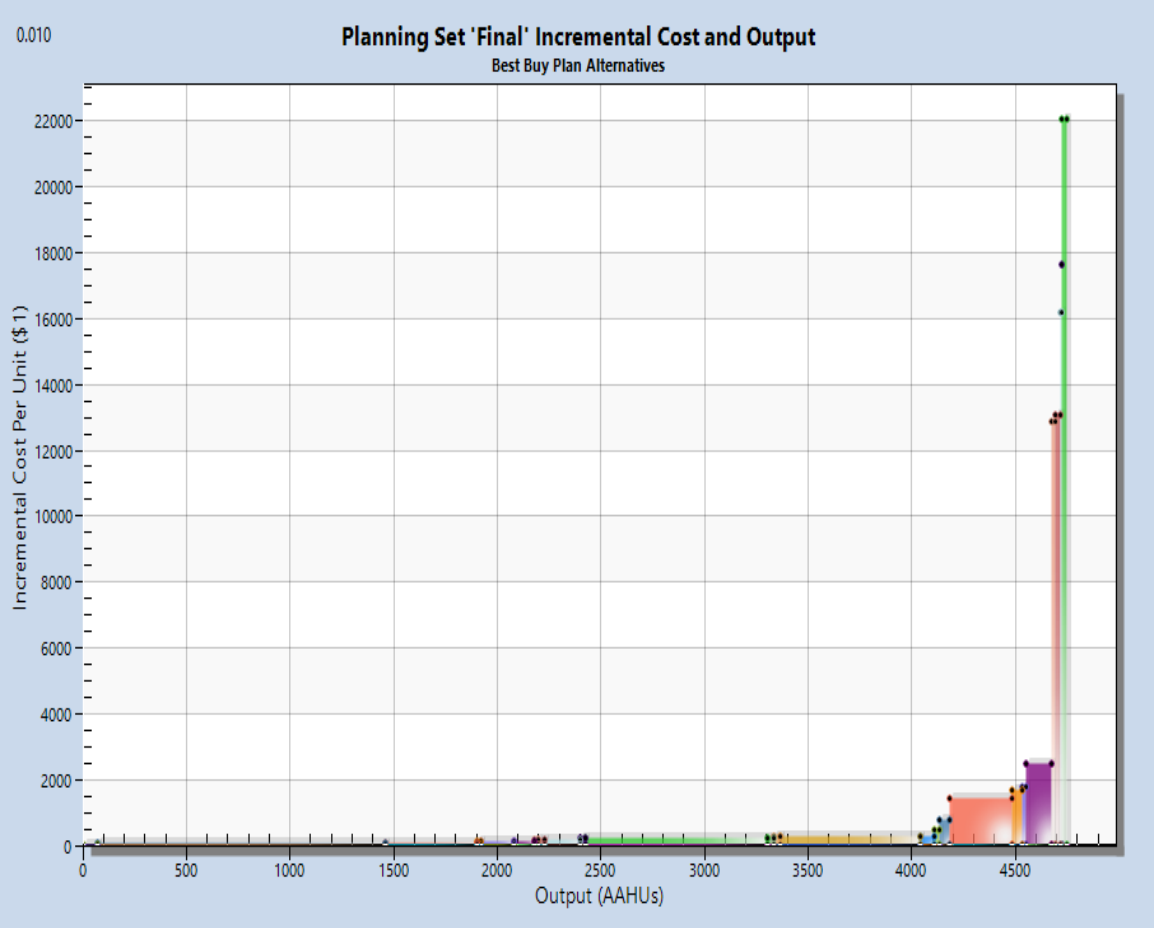
	25	BR_1, BR_2, D_3, I_35_7a, I_35_7g, M_14, RL_3, RL_6, S_6, S_7	1,388.263	$97,187
	26	S_8	30	$7,790

Figure A7:1-23. Full Range of Solutions: Final Array



Note: The X-axis is total AAHUs; the Y-axis is the total cost ($).

Figure A7:1-24. Incremental Cost and Output for the Best Buy Plans: Final Array



Note: The X-axis is total AAHUs; the Y-axis is the incremental cost per AAHU.

Table A7:1-13.
C3 Measures and Average Annual Costs

Name of Measure	Average Annual Cost
BR_1	$ 8,491
BR_2	$ 4,019
BR_4	$ 304,528
BR_5	$ 43,931
BR_6	$ 14,989

BR_7	$	34,206
BR_8	$	45,685
BR_11	$	106,022
D_3	$	3,845
HB_1	$	15,936
HB_2ab	$	19,393
HB_2c	$	46,305
HT_6	$	12,257
I35_2	$	18,204
I35_6b	$	5,706
I35_7a	$	9,750
I35_7g	$	53,096
I35_7h	$	1,886
I35_9b	$	4,947
I35_12a	$	3,827
I35_12b	$	12,964
I40_1a	$	10,299
I40_1b	$	27,359
I40_3	$	13,897
M_5	$	2,281
M_6	$	36,894
M_14	$	3,863
RCP_1	$	3,280
RCP_2	$	33,218
RCP_4	$	2,593
RL_3	$	3,701
RL_4	$	184,179
RL_6	$	3,995
S_4	$	432,219
S_6	$	2,495
S_7	$	3,932
S_8	$	7,790
S_10	$	8,767
M_2	$	13,278
LW_1	$	5,125
TOTAL	$	1,569,154

Note: Costs are shown at the 2023 price level and were annualized using the current FY23 Federal discount rate of 2.5 percent over a 50-year period of analysis.

Measures M_2 and LW_1 are recreational features and were added to C3.

Section 2
OTHER SOCIAL EFFECTS

2.1 PURPOSE

The purpose of this appendix is to consider the other social effects account of the Hatchie-Loosahatchie Mississippi River Mile 775-736, TN and AR Planning Study. This appendix was prepared in accordance with the Planning Guidance Notebook (ER 1105-2-100) as well as the Institute for Water Resources 09-R-4 and 2013-R-03.

2.2 STUDY AREA

The study area is composed of a 39-Mile reach along the Mississippi River beginning at the Hatchie River and extending just south of the Wolf River Harbor. Additionally, there are 3 tributary rivers: Hatchie, Loosahatchie, and Wolf. The area is surrounded by five counties in Tennessee and Arkansas. Those counties are Lauderdale County, Tennessee, Tipton County, Tennessee, Shelby County, Tennessee, Mississippi County, Arkansas, and Crittenden County, Arkansas.

2.3 OVERVIEW OF OTHER SOCIAL EFFECTS:

The Other Social Effects Account (OSE) account includes effects, both indirect and direct, of a plan on social aspects including Economic Vitality, and Leisure & recreation.

Section 3
COMMUNITY CHARACTERISTICS & OTHER SOCIAL EFFECTS FACTORS

3.1 SOCIOECONOMICS:

3.1.1 Population:

The populations from 1970 – 2020 per the Census Bureau's decennial censuses are reported for Crittenden County, Arkansas, Mississippi County, Arkansas, Lauderdale County, Tennessee, Shelby County, Tennessee, and Tipton County, Tennessee in Table 2. In Lauderdale County, Tipton County, and Crittenden County, populations grew consistently over time. The Shelby County population grew at a higher rate starting in 1970 and had a significantly larger population than that of the other counties in the area. Mississippi County, Arkansas is the only county in the study area to experience a large contraction in population. This population decrease is largely due to the closure of the Eaker United States Air Force base in Blytheville, Arkansas (Agency, 2022).

Table A7:3-1.

Population by County (Thousands) 1970 - 2020						
County	**1970**	**1980**	**1990**	**2000**	**2010**	**2020**
Crittenden County, Arkansas	48.28	49.49	49.96	50.92	50.94	48.163
Mississippi County, Arkansas	62.28	59.47	57.56	51.85	46.38	40.685
Lauderdale County, Tennessee	20.33	24.5	23.57	27.11	27.73	25.143
Shelby County, Tennessee	724.13	776.21	828.45	898.21	928.63	929.744
Tipton County, Tennessee	28.08	33.01	37.9	51.58	61.15	60.97
Source: U.S. Census Bureau (BOC)						

3.1.2 Median Age:

The median age of Crittenden & Mississippi Counties in Arkansas is 35.3 and 36.8 respectively. These are just slightly older than the median age of Arkansas of 38.5. The median age of Lauderdale County, Tennessee is 39.1, Shelby County, Tennessee is 35.8, and Tipton County, Tennessee is 38 whereas the median age of Tennessee in its entirety is 39.2.

3.1.3 Income per Capita:

Income per Capita is represented by Table A7:3-2. The rate of growth for income per capita is consistent for all of the counties within the study area.

Table A7:3-2.

Income per Capita (USD) by County (1970 - 2020)						
County	**1970**	**1980**	**1990**	**2000**	**2010**	**2020**
Crittenden County, Arkansas	2847.00	6828.00	13275.00	20274.00	28962.00	41474.00
Mississippi County, Arkansas	2851.00	6807.00	13673.00	18748.00	28867.00	37730.00
Lauderdale County, Tennessee	2342.00	5917.00	12206.00	18160.00	22798.00	35267.00
Shelby County, Tennessee	3760.00	9744.00	19180.00	31733.00	39534.00	53855.00
Tipton County, Tennessee	2690.00	7353.00	14387.00	23533.00	30267.00	43147.00
Source: U.S. Bureau of Economic Analysis (BEA)						

3.1.4 Employment:

The unemployment rates of Crittenden County, Arkansas, Mississippi County, Arkansas, Lauderdale County, Tennessee, Shelby County, Tennessee, and Tipton County, Tennessee

are included in Table 4. The unemployment rates are consistent across the study area with Lauderdale and Tipton Counties in Tennessee having the lowest rates.

According to the Bureau of Labor Statistics Quarterly Census of Employment and Wages, employment industries as of 2020 in Mississippi County, Arkansas are led by trade, transportation and utilities followed by leisure & hospitality, manufacturing, and education and health services respectively. Industry in Crittenden County, Arkansas is mostly manufacturing followed by trade, transportation, and utilities. Lauderdale County, Tennessee employment is vastly attributed to Trade, Transportation, and Utilities as well as manufacturing. Shelby County, Tennessee has varying significant industries of employment with the largest being trade, transportation, and utilities followed by education and health services, professional and business services, and leisure and hospitality. In Tipton County, Tennessee the leading industries are trade, transportation, and utilities, manufacturing, education and health services, construction, and leisure and hospitality.

Table A7:3-3.

Unemployment Rates by County (2020)	
County	**Unemployment Rate (%)**
Crittenden County, Arkansas	5.8
Mississippi County, Arkansas	5.5
Lauderdale County, Tennessee	3.4
Shelby County, Tennessee	4.7
Tipton County, Tennessee	3.2
Source: U.S. Census Bureau (BOC)	

3.2 OTHER SOCIAL EFFECTS: EXISTING CONDITIONS

3.2.1 Leisure & Recreation:

Leisure & Recreation are very important to communities as they enhance the quality of life. The study area directly includes a vast number of areas for individuals in an urban area to recreate. These recreation activities include water-based activities such as boating and fishing, as well as camping and hiking. Significant recreation locations within the study area include the Lower Hatchie National Wildlife Refuge, Meeman-Shelby State Park, and Hopefield Point – Big River Park. In 2021, the Meeman-Shelby Forest State Park saw 763.5 thousand visitors an increase from 666.2 thousand visitors in 2020 (Economic Impact of Tennessee State Parks, 2021).

3.2.2 Economic Vitality:

Economic Vitality of a region refers to the quality of life of residents in the affected area as a result of the economy's capability to provide a good standard of living. (Dunning & Durden, 2009) The study area includes the Meeman-Shelby State Park as well as several other parks spanning the entirety of the study. According to the Tennessee Department of Environment & Recreation, the Meeman-Shelby State Park had an economic impact of $52.5 M in 2021 up from $44.3M in 2020. The economic impact was computed using lodging, shopping, and recreation expenditures. This economic impact follows the increase in visitors as outlined in section 2.2.5 Leisure & Recreation.

In each of the five counties included in the study area there are a considerable number of people employed by the leisure and hospitality industry. This industry employs 18% of Crittenden County, Arkansas, 12% of Tipton County, Tennessee, 10% of Shelby County, Tennessee, and 7% of both Mississippi County, Arkansas, and Lauderdale County, Tennessee.

Section 4
OTHER SOCIAL EFFECTS EVALUATION OF ALTERNATIVES

4.1 LEISURE & RECREATION:

Leisure and recreational opportunities are enhanced in all alternatives. Meander Scarps and Secondary channels are critical to endangered species. Alternatives that include measures to decrease habitat scarcity and promote endangered species provide a unique opportunity for recreation. All of the proposed alternatives include secondary channels, including Dike Notching, which provides recreational access. Alternatives A, B, C2, C5, and C7 provide 1 meander scarp to promote endangered species habitats while alternatives C3 and C4 include 2 meander scarps.

Additionally, all of the proposed alternatives include added recreation measures at Meeman Shelby State Park and Loosahatchie River Wolf River, which are both located north of Memphis, Tennessee.

4.2 ECONOMIC VITALITY

The unique opportunities that these alternatives provide increased eco-tourism in the area. This results in greater consumer spending for the local economies. All of the counties surrounding the study area have a number of individuals employed by the leisure and hospitality industry, as discussed in section 2.2.2 Economic Vitality of this appendix

Crittenden County, Arkansas has the highest employment by the hospitality industry. Measures in Brandywine, Island 40 – 41, Redman Loosahatchie Bar, and Hopefield Point –

Big River Park are in or directly surrounding Crittenden County, Arkansas. Alternatives including these complexes include the following: A, C3, C4, and C5.

Tipton county, Tennessee is the second largest county in the study for hospitality employment. Complexes that would affect this county would be Hatchie Towhead Randolph, Island 35 – Dean Island, Richardson Point Loosahatchie Bar, Densford, and Brandywine. The alternatives that include these complexes are A, C1, C2, C3, C4, and C5.

Shelby County, Tennessee has 10% of individuals working in the hospitality industry. Complexes in or directly surrounding this county include Brandywine, Island 40 – 41, Redman Point Loosahatchie Bar, and Hopefield Point Big River Park. Alternatives encompassing these complexes include A, C1, C2, C3, C4, and C5.

Lauderdale County, Tennessee and Mississippi County, Arkansas have the smallest number of individuals employed by the hospitality industry at 7% each. Complexes affecting Lauderdale County include Sunrise Island 34 and Hatchie Towhead Randolph. Alternatives encompassing these complexes are A, C1, C2, C3, C4, and C5. Complexes affecting Mississippi County include Sunrise Island 34, Island 35 – Dean Island, and Brandywine. All alternatives encompass these complexes.

Section 5
SUMMARY OF ALTERNATIVE ANALYSIS

C3 is the tentatively selected plan for the Hatchie-Loosahatchie Mississippi River Planning study. This alternative presents unique recreational opportunities as well as enhancement regarding economic vitality in the area. The meander scarp measures as well as secondary channels create habitats for endangered species which provide individuals with unique, accessible recreational opportunities. In addition, the plan would bring eco-tourism to the complexes in or surrounding each of the counties included in the study area.

Section 6
REGIONAL ECONOMIC DEVELOPMENT (RED)

6.1 GENERAL

The Regional Economic Development (RED) account addresses the impacts that the USACE expenditures associated with the construction of a coastal storm risk management system will have on the levels of income, output and employment throughout the region. These impacts are not included in the NED analysis, but can still be used by decision makers as part of their investment decision process.

This Regional Economic Development (RED) analysis employs input-output economic analysis, which measures the interdependence among industries and workers in an economy. This analysis uses a matrix representation of a regional economy to predict the effect that changes in one industry will have on other industries. The greater the interdependence among industry sectors, the larger the multiplier effect on the economy. Changes to government spending drive the input-output model to project new levels of sales (output), value added Gross Regional Product (GRP), employment, and income for each industry.

RECONS Version 2 was the specific input-output model used to estimate the regional economic development impacts of the Recommended Plan. The U.S. Army Corps of Engineers (USACE) Institute for Water Resources, Louis Berger, and Michigan State University developed the regional economic impact modeling tool, RECONS (Regional Economic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This modeling tool automates calculations and generates estimates of jobs, labor income, value added, and sales through the use of IMPLAN®'s multipliers and ratios, customized impact areas for USACE project locations, and customized spending profiles for USACE projects, business lines, and work activities. RECONS allows the USACE to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

6.2 DESCRIPTION OF METRICS

"Output" is the sum total of transactions that take place as a result of the construction project, including both value added and intermediate goods purchased in the economy. "Labor Income" includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income. "Value Added" or "Gross Regional Product" represents the value-added output of the study regions. This metric captures all final goods and services produced in the study areas because of the existence of the project. It is different from output in the sense that one dollar of a final good or service may have multiple transactions associated with it. "Jobs" is the estimated worker-years of labor required to build the project.

6.3 ASSUMPTIONS

Input-output analysis rests on the following assumptions. The production functions of industries have constant returns to scale, so if output is to increase, inputs will increase in the same proportion. Industries face no supply constraints; they have access to all the materials they can use. Industries have a fixed commodity input structure; they will not substitute any commodities or services used in the production of output in response to price changes. Industries produce their commodities in fixed proportions, so an industry will not increase production of a commodity without increasing production in every other commodity it produces. Furthermore, it is assumed that industries use the same technology to produce all of their commodities. For this analysis, the Long-Term Impacts and Contributions module was used to account for expenditures occurring throughout the period of analysis. The economic impacts results are presented for the entire period of analysis, aggregated for all 50 years for output, labor income, and value added. The number of jobs is presented as an average across all years included in the period of analysis.

6.4 RESULTS

The expenditures associated with All Work Activities, with Ability to Customize Impact Area and Work Activity at Rural are estimated to be $45,145,072. Of this total expenditure, $23,871,500 will be captured within the local impact area. The remainder of the expenditures will be captured within the state impact area and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures $45,145,072 support a total of 554.6 full-time equivalent jobs, $29,519,157 in labor income, $32,417,850 in the gross regional product, and $25,281,240 in economic output in the local impact area. More broadly, these expenditures support 1,214.4 full-time equivalent jobs, $66,242,662 in labor income, $79,433,783 in the gross regional product, and $122,075,593 in economic output in the nation.

Table A-7:6-1 summarizes these results.

Table A7:6-1. Regional Economic Development (RED) Summary

Area	Output	Jobs*	Labor Income	Value Added
Local				
Direct Impact	$23,871,500	434.3	$22,205,452	$19,839,099
Secondary Impact	$22,187,115	120.3	$7,313,705	$12,578,750
Total Impact	$46,058,615	554.6	$29,519,157	$29,519,157

State				
Direct Impact	$32,696,761	628.7	$30,705,066	$27,166,402
Secondary Impact	$30,671,670	167.0	$10,092,711	$17,375,961
Total Impact	$63,368,431	795.6	$40,797,777	$44,542,363
US				
Direct Impact	$45,042,918	873.9	$42,554,219	$37,568,664
Secondary Impact	$77,032,675	340.5	$23,688,443	$41,865,119
Total Impact	$122,075,593	1214.4	$66,242,662	$79,433,783

* Jobs are presented in average annual, full-time equivalence (FTE)

References and Resources

References

Agency, E. P. (2022, October 6). Federal Facilities/Base Closure in Arkansas. Retrieved from https://www.epa.gov/ar/federal-facilitiesbase-closure-arkansas

Dunning, M., & Durden, S. E. (2009, December). Handbook on Applying "Other Social Effects" Factors in Corps of Engineers Water Resources Planning 09-R-4. Retrieved from https://www.iwr.usace.army.mil/portals/70/docs/iwrreports/09-r-4.pdf

Economic Impact of Tennessee State Parks. (2021). Retrieved from Tennessee Department of Environment and Conservation: https://experience.arcgis.com/experience/cf9d29c40476498a847b3bafe15edead/

Weiss, J., Prakash, J., & Amarakoon, S. (2013, April). Applying Other Social Effects in Alternatives Analysis 2013-R-03. Retrieved from https://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2013-R-03.pdf

List of Acronyms and Abbreviations

Cost-Effectiveness	**CE**
Incremental Cost Analysis	**ICA**
Institute for Water Resources	**IWR**
Planning Center of Expertise	**PCX**
Other Social Effects Account	**OSE**
United State's Dollars	**USD**
Regional Economic Development	**RED**