Attachment 4

Economics Update

26th Meeting of the NECC
July 20,1999

Presented by

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Economic Analysis Branch
US Army Corps of Engineers – Rock Island District

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Economics Update

26th NECC Meeting
20 July 1999

Topics

- Demand Curve Input
- Preliminary National Economic Development (NED) Analysis
- Regional Economic Development (RED) Analysis
- Next Activities

Demand Curve Input

Non - Grain Demand

Non - Grain Demand

- Statistical Estimations of Elasticities by Independent Contractor (by commodity group)
- Used Estimated Elasticities to Calculate Individual Movement 'N' Values

Demand Elasticities Non - Grain

Commodity	Elasticity
Coal	-0.765
Pet. Prod.	-0.690
Chemicals	-0.338
Prim. Met.	-0.551
Aggregates	-0.702
Food Prod.	-0.503

"N" Values Non - Grain

Commodity	Range	Wgt Avg
Coal	0.007 - 0.07	0.02
Pet. Prod.	0.060 - 3.40	1.09
Ind Chem	0.050 - 1.61	0.35
Ag Chem	0.002 - 0.62	0.11
Prim. Met.	0.005 - 1.22	0.43
Aggregates	0.004 - 3.00	0.91
Food Prod.	0.003 - 2.55	0.32

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Grain Demand

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Grain Demand

- Calculated a Weighted Average "N" Value
- Incorporates Information from the August 1998 Expert Elicitation Panel and the 1994 *Iowa Grain Flow Survey*

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Grain Demand

- Establish Range of "N" Values based on Expert Panel Observations
- Assign Weights based *Iowa Grain Flow Survey* Information
- Result: Weighted Average "N" Value = 1.2

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Preliminary National Economic Development (NED) Analysis

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Evaluation of Potential NED Plans

- Evaluation Does Not Include System Environmental Costs
- List of Potential NED Plans Is Not Necessarily Complete
- Evaluation Reflects Fastest Possible Implementation - Plans Not Optimized With Respect to Timing

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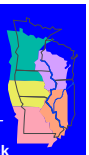
Improvement Measures



Measure	Average Time Savings	Average First Cost[2]
• Lock Extension	45 min	$95-125M/lock
• Guidewall Ext.	20 min upbound[1]	$36M/lock
w/ Powered Kevels	23 min downbound[1]	
• Adjacent Moorings	7-13 min/exchange	$50k/buoy $500k/cell

Notes:
1. Only applicable to turnback lockages.
2. Costs exclude impacts to navigation during construction, system environmental costs, and other life-cycle costs.

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UMR-IWWS Navigation Study
Mid Line Traffic Growth
Interest Rate = 6.375 Percent, 1997 Price Levels
($1,000's)

With Project Scenario	Base Year	Average Annual Rehab Cost Savings	Average Annual Navigation Benefits	Total Average Annual Benefits	First Costs Const. & Site Specific Environ. Costs	Average Annual Costs	Benefit/Cost Ratio	Average Annual Net Benefits	Avg. Annual Net Benefits Adj to 2013
A: Mooring Cells: 12,18,20,22,24	2004	0	1,030	1,030	700	125	8.27	905	1,579
B: Mooring Cells: 12,18,20,22,24 Powered Kevel Guidewalls 20-25	2008	0	27,709	27,709	190,241	18,252	1.52	9,457	12,882
C: Locks 20-25	2013	5,973	48,598	54,571	542,054	46,870	1.16	7,701	7,701
D: Locks 20-25 Powered Kevel Guidewalls 14-18	2013	5,973	68,928	74,901	705,175	63,002	1.19	11,899	11,899
E: Mooring Cells: 12,18,20,22,24 Locks 20-25 Powered Kevel Guidewalls 14-18	2013	5,973	72,523	78,496	705,875	63,223	1.24	15,273	15,273
F: Locks 20-25, 14-18	2017	13,931	102,807	116,738	1,076,785	107,176	1.09	9,562	7,468
G: Mooring Cells: 12,18,20,22,24 Locks 20-25 Powered Kevel Guidewalls 14-18, Peoria,LaGrange	2013	5,973	78,204	84,177	765,207	68,831	1.22	15,346	15,346
H: Locks 20-25, Peoria, LaGrange Powered Kevel Guidewalls 14-18	2015	8,980	96,613	105,593	1,066,298	101,286	1.04	4,307	3,806

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Scheduled Rehabilitation Expenditures Per Lock Site
($1,000,000)

	Locks: UM 14-18,24,25 Peoria, LaGrange		Locks: UM 20-22	
Year	Without Project	With Project	Without Project	With Project
2015	-	-	30	-
2020	30	-	-	-
2025	-	-	-	30
2030	-	30	-	-
2035	-	-	30	-
2040	30	-	-	-

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UMR-IWWS Navigation Study
Mid Line Traffic Growth
Interest Rate = 6.375 Percent, 1997 Price Levels
($1,000's)

With Project Scenario	Base Year	Average Annual Rehab Cost Savings	Average Annual Navigation Benefits	Total Average Annual Benefits	First Costs Const. & Site Specific Environ. Costs	Average Annual Costs	Benefit/Cost Ratio	Average Annual Net Benefits	Avg. Annual Net Benefits Adj to 2013
A: Mooring Cells: 12,18,20,22,24	2004	0	1,030	1,030	700	125	8.27	905	1,579
B: Mooring Cells: 12,18,20,22,24 Powered Kevel Guidewalls 20-25	2008	0	27,709	27,709	190,241	18,252	1.52	9,457	12,882
C: Locks 20-25	2013	5,973	48,598	54,571	542,054	46,870	1.16	7,701	7,701
D: Locks 20-25 Powered Kevel Guidewalls 14-18	2013	5,973	68,928	74,901	705,175	63,002	1.19	11,899	11,899
E: Mooring Cells: 12,18,20,22,24 Locks 20-25 Powered Kevel Guidewalls 14-18	2013	5,973	72,523	78,496	705,875	63,223	1.24	15,273	15,273
F: Locks 20-25, 14-18	2017	13,931	102,807	116,738	1,076,785	107,176	1.09	9,562	7,468
G: Mooring Cells: 12,18,20,22,24 Locks 20-25 Powered Kevel Guidewalls 14-18, Peoria,LaGrange	2013	5,973	78,204	84,177	765,207	68,831	1.22	15,346	15,346
H: Locks 20-25, Peoria, LaGrange Powered Kevel Guidewalls 14-18	2015	8,980	96,613	105,593	1,066,298	101,286	1.04	4,307	3,806

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UMR-IWWS Navigation Study
Total System Traffic
Mid Line Traffic Growth
(1,000 Tons)

Scenario	1992	2010	2015	2020	2030	2040	2050
Without Project	134,727	164,276	168,455	173,522	183,855	194,607	204,763
A: Mooring Cells:12,18,20,2	134,727	164,468	168,630	173,682	183,988	194,721	204,874
B: Mooring Cells:12,18,20,22,24 Guidewalls:20-25	134,727	168,647	173,261	178,537	189,578	200,847	211,358
C: Locks:20-25	134,727	171,223	176,005	181,603	192,903	204,736	215,904
D: Locks:20-25 Guidewalls:14-18	134,727	173,955	179,184	185,192	197,206	209,199	220,515
E: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18	134,727	174,217	179,489	185,517	197,611	209,721	221,220
F: Locks:20-25, 14-18	134,727	177,205	182,739	188,851	200,682	212,215	222,000
G: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18, Peo, LaG	134,727	174,665	180,003	186,175	198,720	211,719	224,276
H: Locks:20-25, Peo, LaGr Guidewalls:14-18	134,727	174,713	180,079	186,287	198,954	212,205	225,159

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UMR-IWWS Navigation Study
Percent of Forcast Traffic Accommodated
Mid Line Traffic Growth

Scenario	2010	2015	2020	2030	2040	2050
Without Project	93.0	91.7	90.6	88.0	85.1	82.1
A: Mooring Cells:12,18,20,2	93.1	91.8	90.7	88.1	85.1	82.2
B: Mooring Cells:12,18,20,22,24 Guidewalls:20-25	95.5	94.4	93.2	90.8	87.8	84.8
C: Locks:20-25	96.9	95.9	94.8	92.3	89.5	86.6
D: Locks:20-25 Guidewalls:14-18	98.5	97.6	96.7	94.4	91.4	88.4
E: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18	98.6	97.8	96.8	94.6	91.7	88.7
F: Locks:20-25, 14-18	100.3	99.5	98.6	96.1	92.8	89.0
G: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18, Peo, LaG	98.9	98.0	97.2	95.1	92.5	89.9
H: Locks:20-25, Peo, LaGr Guidewalls:14-18	98.9	98.1	97.2	95.2	92.7	90.3

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UMR-IWWS Navigation Study
System NED Savings
Mid Line Traffic Growth
($1000)

Scenario	2010	2015	2020	2030	2040	2050
Without Project	734,098	747,510	766,340	801,230	832,077	858,340
A: Mooring Cells:12,18,20,22	735,162	748,452	767,176	801,906	832,717	858,904
B: Mooring Cells:12,18,20,22,24 Guidewalls:20-25	754,255	769,684	793,687	830,898	862,905	888,520
C: Locks:20-25	770,491	786,363	807,592	851,174	886,159	915,611
D: Locks:20-25 Guidewalls:14-18	787,021	804,930	827,368	868,153	908,075	936,600
E: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18	788,751	806,918	829,466	870,681	911,333	941,002
F: Locks:20-25, 14-18	806,525	825,558	848,605	886,794	915,572	942,000
G: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18, Peo, LaG	793,025	812,165	835,631	880,790	928,790	966,226
H: Locks:20-25, Peo, LaGr Guidewalls:14-18	794,224	813,712	837,614	884,169	934,606	975,535

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UMR-IWWS Navigation Study
Incremental System NED Savings
Mid Line Traffic Growth
($1000)

Scenario	2010	2015	2020	2030	2040	2050
Without Project	-	-	-	-	-	-
A: Mooring Cells:12,18,20,2	1,064	942	836	676	640	564
B: Mooring Cells:12,18,20,22,24 Guidewalls:20-25	20,157	22,174	27,347	29,668	30,828	30,180
C: Locks:20-25	36,393	38,853	41,252	49,944	54,082	57,271
D: Locks:20-25 Guidewalls:14-18	52,923	57,420	61,028	66,923	75,998	78,260
E: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18	54,653	59,408	63,126	69,451	79,256	82,662
F: Locks:20-25, 14-18	72,427	78,048	82,265	85,564	83,495	83,660
G: Mooring Cells:12,18,20,22,24 Locks:20-25 Guidewalls:14-18, Peo, LaG	58,927	64,655	69,291	79,560	96,713	107,886
H :Locks:20-25, Peo, LaGr Guidewalls:14-18	60,126	66,202	71,274	82,939	102,529	117,195

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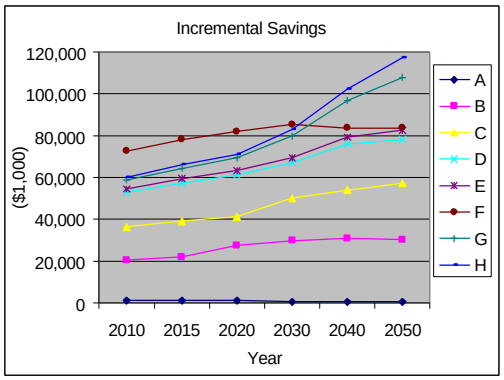

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UMR-IWW
Delay (hrs)
Without Project

Lock	2000	2005	2010	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
UM02	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8
UM03	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UM04	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UM05	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.7
UM05a	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
UM06	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9
UM07	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0
UM08	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1
UM09	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
UM10	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9
UM11	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5
UM12	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.2
UM13	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
UM14	4.2	4.4	4.3	4.4	4.4	4.4	4.5	4.5
UM15	4.9	5.1	5.0	5.1	5.1	5.1	5.1	5.1
UM16	4.5	4.7	4.7	4.8	4.8	4.9	4.9	4.9
UM17	5.8	6.1	6.2	6.3	6.4	6.4	6.5	6.5
UM18	5.0	5.3	5.3	5.4	5.5	5.6	5.7	5.7
UM19	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1
UM20	10.2	12.2	13.0	14.1	15.0	16.7	18.3	20.2
UM21	6.1	6.7	7.0	7.2	7.4	7.7	8.0	8.3
UM22	13.7	16.5	17.8	19.3	20.6	22.9	24.9	27.1
UM24	16.2	22.8	26.8	32.2	37.5	49.3	61.9	71.9
UM25	8.7	10.2	10.9	11.7	12.3	13.4	14.1	14.6
UM26	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1
UM27	1.1	1.1	1.2	1.2	1.2	1.3	1.4	1.4
LAGRAN	3.4	4.0	4.6	5.2	6.0	8.6	13.1	18.7
PEORIA	3.5	4.1	4.8	5.6	6.6	10.3	17.6	27.4
S.R.	2.2	2.3	2.4	2.5	2.7	2.9	3.2	3.4
MARSA	3.4	3.7	3.9	4.2	4.5	5.1	5.8	6.3
DRES	1.9	1.9	2.0	2.0	2.1	2.2	2.3	2.4
BRAN	2.3	2.4	2.5	2.7	2.8	3.0	3.3	3.5
LCKPRT	2.2	2.3	2.4	2.5	2.6	2.8	3.0	3.2
O'BRIEN	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Mooring Cells: 12, 18, 20, 22, 24

Lock	2005	2010	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6	0.6	0.6
UM02	1.9	1.9	1.9	1.9	1.8	1.8	1.8
UM03	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UM04	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UM05	1.8	1.8	1.8	1.7	1.7	1.7	1.7
UM05a	1.6	1.6	1.6	1.6	1.6	1.6	1.6
UM06	2.0	2.0	2.0	2.0	2.0	1.9	1.9
UM07	2.0	2.1	2.0	2.0	2.0	2.0	2.0
UM08	2.2	2.2	2.2	2.1	2.1	2.1	2.1
UM09	2.2	2.2	2.2	2.1	2.1	2.1	2.1
UM10	2.0	2.0	2.0	2.0	2.0	1.9	1.9
UM11	2.6	2.6	2.6	2.6	2.6	2.5	2.5
UM12	2.2	2.3	2.3	2.3	2.3	2.2	2.2
UM13	2.2	2.2	2.2	2.2	2.2	2.2	2.2
UM14	4.4	4.4	4.5	4.5	4.5	4.5	4.5
UM15	5.2	5.1	5.2	5.2	5.2	5.2	5.2
UM16	4.8	4.8	4.9	4.9	4.9	5.0	5.0
UM17	6.3	6.3	6.4	6.5	6.6	6.6	6.7
UM18	4.9	4.9	5.0	5.1	5.2	5.2	5.3
UM19	2.0	2.0	2.0	2.0	2.1	2.1	2.1
UM20	10.8	11.5	12.4	13.1	14.5	15.8	17.4
UM21	6.9	7.2	7.4	7.6	7.9	8.2	8.4
UM22	15.8	16.9	18.3	19.5	21.4	23.3	25.1
UM24	23.1	27.4	33.1	38.9	51.5	64.8	75.7
UM25	10.7	11.5	12.3	12.9	13.9	14.6	15.0
UM26	0.9	0.9	1.0	1.0	1.0	1.0	1.1
UM27	1.1	1.2	1.2	1.2	1.3	1.4	1.4
LAGRAN	4.0	4.6	5.2	6.0	8.6	13.1	18.7
PEORIA	4.1	4.8	5.6	6.6	10.3	17.6	27.4
S.R.	2.3	2.4	2.5	2.7	2.9	3.2	3.4
MARSA	3.7	3.9	4.2	4.5	5.1	5.8	6.3
DRES	1.9	2.0	2.0	2.1	2.2	2.3	2.4
BRAN	2.4	2.5	2.7	2.8	3.0	3.3	3.5
LCKPRT	2.3	2.4	2.5	2.6	2.8	3.0	3.2
O'BRIEN	0.5	0.5	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Mooring Cells: 12, 18, 20, 22, 24
Powered Kevels Guidewalls 20-25

Lock	2010	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6	0.6
UM02	1.9	1.9	2.0	1.9	1.9	1.9
UM03	1.9	1.9	1.9	1.9	1.9	1.9
UM04	1.9	1.9	1.9	1.9	1.9	1.9
UM05	1.8	1.8	1.8	1.8	1.8	1.8
UM05a	1.6	1.6	1.7	1.7	1.6	1.6
UM06	2.1	2.1	2.1	2.1	2.1	2.1
UM07	2.1	2.1	2.2	2.2	2.1	2.1
UM08	2.3	2.3	2.3	2.3	2.3	2.2
UM09	2.3	2.3	2.3	2.3	2.3	2.2
UM10	2.1	2.1	2.2	2.2	2.1	2.1
UM11	2.8	2.9	2.9	2.9	2.9	2.8
UM12	2.5	2.5	2.6	2.6	2.6	2.5
UM13	2.4	2.4	2.5	2.5	2.5	2.5
UM14	6.4	6.8	6.8	7.3	7.6	7.8
UM15	7.6	8.1	8.1	8.7	9.0	9.1
UM16	7.4	7.9	8.0	8.8	9.3	9.5
UM17	10.8	11.9	12.2	14.1	15.6	16.5
UM18	7.8	8.5	8.8	10.1	11.2	12.0
UM19	2.3	2.4	2.4	2.5	2.6	2.7
UM20	7.4	8.0	8.3	9.4	10.5	11.4
UM21	5.7	6.0	6.2	6.7	7.2	7.6
UM22	10.4	11.4	12.0	13.9	15.8	17.4
UM24	12.6	14.8	16.4	22.5	30.8	40.5
UM25	8.0	8.7	9.2	10.8	12.3	13.5
UM26	1.0	1.0	1.0	1.1	1.1	1.2
UM27	1.2	1.3	1.3	1.4	1.5	1.5
LAGRAN	4.6	5.2	6.0	8.7	13.2	18.8
PEORIA	4.8	5.6	6.7	10.5	18.0	27.8
S.R.	2.4	2.6	2.7	2.9	3.2	3.4
MARSA	4.0	4.2	4.5	5.2	5.9	6.4
DRES	2.0	2.1	2.1	2.2	2.3	2.4
BRAN	2.6	2.7	2.8	3.0	3.3	3.6
LCKPRT	2.4	2.5	2.6	2.8	3.1	3.3
O'BRIEN	0.5	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Locks 20-25

Lock	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6
UM02	2.0	2.0	2.0	2.0	1.9
UM03	1.9	1.9	1.9	1.9	1.9
UM04	1.9	1.9	1.9	1.9	1.9
UM05	1.8	1.8	1.9	1.8	1.8
UM05a	1.7	1.7	1.7	1.7	1.7
UM06	2.2	2.2	2.2	2.2	2.1
UM07	2.2	2.2	2.2	2.2	2.2
UM08	2.4	2.4	2.4	2.4	2.3
UM09	2.4	2.4	2.4	2.3	2.3
UM10	2.2	2.2	2.2	2.2	2.2
UM11	3.0	3.0	3.1	3.1	3.0
UM12	2.8	2.9	3.0	3.0	2.9
UM13	2.6	2.6	2.7	2.7	2.6
UM14	9.0	9.4	9.8	10.4	10.6
UM15	10.9	11.5	12.0	12.5	12.7
UM16	11.5	12.3	13.3	14.5	15.0
UM17	20.4	23.4	28.1	34.6	39.7
UM18	16.3	18.8	23.5	30.8	38.7
UM19	2.7	2.8	2.9	3.1	3.3
UM20	2.6	2.7	2.9	3.1	3.3
UM21	2.4	2.5	2.7	2.8	3.0
UM22	3.6	3.8	4.2	4.7	5.4
UM24	2.8	3.0	3.2	3.6	4.0
UM25	2.3	2.4	2.5	2.7	3.0
UM26	1.0	1.1	1.1	1.2	1.2
UM27	1.3	1.3	1.4	1.5	1.6
LAGRAN	5.2	6.1	8.7	13.3	18.9
PEORIA	5.7	6.8	10.6	18.3	28.5
S.R.	2.6	2.7	3.0	3.2	3.4
MARSA	4.3	4.6	5.3	6.0	6.6
DRES	2.1	2.1	2.2	2.3	2.4
BRAN	2.7	2.8	3.1	3.4	3.7
LCKPRT	2.5	2.6	2.9	3.1	3.3
O'BRIEN	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Locks 20-25
Powered Kevels Guidewalls 14-18

Lock	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6
UM02	2.1	2.1	2.1	2.1	2.1
UM03	2.1	2.1	2.1	2.1	2.0
UM04	2.0	2.0	2.0	2.1	2.0
UM05	1.9	1.9	1.9	2.0	1.9
UM05a	1.8	1.8	1.8	1.8	1.8
UM06	2.3	2.4	2.4	2.4	2.4
UM07	2.4	2.4	2.4	2.4	2.4
UM08	2.6	2.6	2.6	2.7	2.6
UM09	2.6	2.6	2.6	2.6	2.6
UM10	2.4	2.5	2.5	2.6	2.5
UM11	3.5	3.6	3.6	3.8	3.8
UM12	3.3	3.4	3.5	3.8	3.8
UM13	2.9	3.0	3.1	3.3	3.3
UM14	6.5	6.9	7.8	8.3	8.8
UM15	11.4	13.0	16.3	18.2	20.5
UM16	7.5	8.2	9.6	10.5	11.4
UM17	10.1	11.3	13.9	15.8	18.1
UM18	8.4	9.3	11.4	13.1	15.1
UM19	3.3	3.5	4.1	4.6	5.2
UM20	3.2	3.4	4.0	4.5	5.2
UM21	3.0	3.1	3.5	3.9	4.4
UM22	4.7	5.3	7.0	9.4	13.5
UM24	3.5	3.8	4.7	5.7	7.0
UM25	2.7	2.9	3.3	3.7	4.2
UM26	1.1	1.1	1.2	1.3	1.3
UM27	1.3	1.4	1.5	1.6	1.8
LAGRAN	5.2	6.1	8.7	13.2	18.8
PEORIA	5.7	6.8	10.6	18.3	28.4
S.R.	2.6	2.7	3.0	3.2	3.4
MARSA	4.3	4.6	5.3	6.0	6.6
DRES	2.1	2.1	2.2	2.3	2.4
BRAN	2.7	2.8	3.1	3.4	3.7
LCKPRT	2.5	2.6	2.9	3.1	3.3
O'BRIEN	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Mooring Cells: 12, 18, 20, 22, 24
Locks 20-25 Powered Kevel Guidewalls 14-18

Lock	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6
UM02	2.1	2.1	2.1	2.1	2.1
UM03	2.1	2.1	2.1	2.1	2.1
UM04	2.0	2.0	2.0	2.1	2.0
UM05	1.9	1.9	2.0	2.0	2.0
UM05a	1.8	1.8	1.8	1.8	1.8
UM06	2.4	2.4	2.4	2.4	2.4
UM07	2.4	2.4	2.4	2.4	2.4
UM08	2.6	2.6	2.6	2.7	2.7
UM09	2.6	2.6	2.6	2.7	2.6
UM10	2.4	2.5	2.5	2.6	2.6
UM11	3.5	3.6	3.7	3.9	3.8
UM12	3.0	3.1	3.2	3.4	3.5
UM13	3.0	3.0	3.1	3.4	3.4
UM14	6.6	7.1	8.1	8.6	9.2
UM15	11.9	13.6	17.5	19.9	23.1
UM16	7.7	8.5	10.1	11.1	12.3
UM17	10.5	11.8	14.8	17.1	20.2
UM18	8.1	9.0	11.1	12.9	15.2
UM19	3.4	3.6	4.2	4.8	5.6
UM20	2.4	2.5	2.8	3.1	3.3
UM21	2.9	3.1	3.6	4.1	4.8
UM22	3.8	4.1	5.1	6.3	8.1
UM24	3.0	3.2	3.8	4.4	5.3
UM25	2.7	2.9	3.4	3.9	4.5
UM26	1.1	1.1	1.2	1.3	1.4
UM27	1.3	1.4	1.5	1.7	1.8
LAGRAN	5.2	6.1	8.7	13.2	18.8
PEORIA	5.7	6.8	10.6	18.3	28.4
S.R.	2.6	2.7	3.0	3.2	3.4
MARSA	4.3	4.6	5.3	6.0	6.6
DRES	2.1	2.1	2.2	2.3	2.4
BRAN	2.7	2.8	3.1	3.4	3.7
LCKPRT	2.5	2.6	2.9	3.1	3.3
O'BRIEN	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Locks 20-25, 14-18

Lock	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.7
UM02	2.3	2.3	2.2	2.5
UM03	2.2	2.2	2.2	2.4
UM04	2.2	2.2	2.2	2.4
UM05	2.1	2.1	2.1	2.3
UM05a	1.9	1.9	1.8	2.0
UM06	2.5	2.5	2.6	2.9
UM07	2.6	2.7	2.6	2.9
UM08	3.0	3.0	2.9	3.3
UM09	2.9	3.0	2.9	3.2
UM10	2.8	2.9	2.9	3.2
UM11	4.5	4.7	4.6	5.1
UM12	4.4	4.7	4.8	5.3
UM13	3.7	4.0	4.0	4.5
UM14	2.6	2.8	3.0	3.3
UM15	3.0	3.2	3.4	3.7
UM16	2.4	2.6	2.7	3.0
UM17	3.1	3.3	3.5	3.9
UM18	2.6	2.8	2.9	3.3
UM19	5.2	6.5	7.7	8.6
UM20	4.9	6.2	7.3	8.1
UM21	4.1	4.9	5.5	6.1
UM22	9.5	17.2	30.4	33.7
UM24	5.6	7.5	9.4	10.4
UM25	3.7	4.4	4.9	5.5
UM26	1.1	1.2	1.3	1.5
UM27	1.5	1.6	1.7	1.9
LAGRAN	6.1	8.7	13.2	14.6
PEORIA	6.8	10.6	18.2	20.2
S.R.	2.7	3.0	3.2	3.6
MARSA	4.6	5.3	6.0	6.7
DRES	2.1	2.2	2.3	2.6
BRAN	2.8	3.1	3.4	3.7
LCKPRT	2.6	2.9	3.1	3.4
O'BRIEN	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Mooring Cells: 12, 18, 20, 22, 24
Lock 20-25
Powered Kevel Guidewalls 14-18, LaGrange, Peoria

Lock	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6
UM02	2.1	2.1	2.1	2.1	2.1
UM03	2.1	2.1	2.1	2.1	2.1
UM04	2.0	2.0	2.0	2.1	2.0
UM05	1.9	1.9	2.0	2.0	2.0
UM05a	1.8	1.8	1.8	1.8	1.8
UM06	2.4	2.4	2.4	2.4	2.4
UM07	2.4	2.4	2.4	2.4	2.4
UM08	2.6	2.6	2.6	2.7	2.7
UM09	2.6	2.6	2.6	2.7	2.6
UM10	2.4	2.5	2.5	2.6	2.6
UM11	3.5	3.6	3.7	3.9	3.8
UM12	3.0	3.1	3.2	3.4	3.5
UM13	3.0	3.0	3.1	3.4	3.4
UM14	6.6	7.1	8.1	8.6	9.2
UM15	11.9	13.6	17.5	19.9	23.0
UM16	7.7	8.5	10.1	11.1	12.3
UM17	10.5	11.8	14.8	17.1	20.2
UM18	8.1	9.0	11.1	12.9	15.2
UM19	3.4	3.6	4.2	4.8	5.6
UM20	2.4	2.5	2.8	3.1	3.3
UM21	2.9	3.1	3.6	4.1	4.8
UM22	3.8	4.1	5.1	6.3	8.1
UM24	3.0	3.2	3.8	4.5	5.4
UM25	2.7	2.9	3.4	3.9	4.6
UM26	1.1	1.1	1.2	1.3	1.5
UM27	1.4	1.4	1.6	1.8	2.0
LAGRAN	2.4	2.6	3.2	4.2	5.6
PEORIA	2.5	2.8	3.6	5.0	7.3
S.R.	2.6	2.8	3.2	3.7	4.4
MARSA	4.4	4.8	5.9	7.8	10.8
DRES	2.1	2.2	2.3	2.5	2.7
BRAN	2.7	2.9	3.2	3.7	4.4
LCKPRT	2.6	2.7	3.0	3.4	3.9
O'BRIEN	0.5	0.5	0.6	0.6	0.6

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UMR-IWW
Delay (hrs)
Locks 20-25, Peoria, LaGrange
Powered Kevel Guidewalls 14-18

Lock	2015	2020	2030	2040	2050
USA	0.4	0.4	0.4	0.4	0.4
LSA	0.5	0.5	0.5	0.5	0.5
UM01	0.6	0.6	0.6	0.6	0.6
UM02	2.1	2.1	2.1	2.1	2.1
UM03	2.1	2.1	2.1	2.1	2.0
UM04	2.0	2.0	2.0	2.1	2.0
UM05	1.9	1.9	1.9	2.0	1.9
UM05a	1.8	1.8	1.8	1.8	1.8
UM06	2.3	2.4	2.4	2.4	2.4
UM07	2.4	2.4	2.4	2.4	2.4
UM08	2.6	2.6	2.6	2.7	2.6
UM09	2.6	2.6	2.6	2.6	2.6
UM10	2.4	2.5	2.5	2.6	2.5
UM11	3.5	3.6	3.6	3.8	3.8
UM12	3.3	3.4	3.5	3.8	3.8
UM13	2.9	3.0	3.1	3.3	3.3
UM14	6.5	6.9	7.8	8.2	8.7
UM15	11.4	13.0	16.3	18.1	20.4
UM16	7.5	8.2	9.6	10.5	11.4
UM17	10.1	11.3	13.9	15.8	18.0
UM18	8.4	9.3	11.4	13.1	15.1
UM19	3.3	3.5	4.1	4.6	5.2
UM20	3.2	3.4	4.0	4.5	5.2
UM21	2.9	3.1	3.5	3.9	4.4
UM22	4.7	5.3	7.1	9.4	13.4
UM24	3.5	3.9	4.7	5.7	7.1
UM25	2.7	2.9	3.3	3.7	4.3
UM26	1.1	1.1	1.2	1.4	1.5
UM27	1.4	1.4	1.6	1.8	2.0
LAGRAN	1.1	1.2	1.3	1.4	1.7
PEORIA	1.3	1.3	1.5	1.7	2.1
S.R.	2.7	2.8	3.2	3.9	4.7
MARSA	4.5	4.9	6.1	8.3	12.3
DRES	2.1	2.2	2.3	2.5	2.7
BRAN	2.8	2.9	3.3	3.8	4.6
LCKPRT	2.6	2.7	3.0	3.5	4.0
O'BRIEN	0.5	0.5	0.6	0.6	0.6

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Regional Economic Development (RED) Analysis

RED Analysis

- Sources of Impacts
  - » Construction of Measures
  - » System Operation with Improvements
- Economic Parameters Evaluated
  - » Employment
  - » Income
  - » Output

RED Analysis

Total Construction Impacts
Employment Man-Yrs

	Alt B	Alt E	Alt H
Illinois	1,319	4,897	7,310
Iowa	59	1,213	1,266
Minnesota	70	336	408
Missouri	1,256	3,698	3,783
Wisconsin	105	412	540
Lower Miss	266	935	1,159
East US	1,137	4,237	5,354
West US	941	3,544	4,405
Total US	5,153	19,272	24,225

RED Analysis

Annual Transportation Savings Impacts
Employment Man-Yrs

	Alt B	Alt E	Alt H
Illinois	302	708	885
Iowa	104	247	282
Minnesota	136	321	369
Missouri	122	282	340
Wisconsin	26	62	75
Lower Miss	795	1,871	2,098
East US	313	734	878
West US	239	561	680
Total US	2,037	4,786	5,607

RED Analysis

Total Construction Impacts
Income ($Mil)

	Alt B	Alt E	Alt H
Illinois	36.0	133.7	198.5
Iowa	1.2	22.8	23.9
Minnesota	1.9	8.6	10.5
Missouri	27.4	80.8	82.9
Wisconsin	2.5	9.9	13.0
Lower Miss	6.1	21.4	26.5
East US	33.0	122.6	155.0
West US	24.2	91.1	113.4
Total US	132.3	491.0	623.6

RED Analysis

Annual Transportation Savings Impacts
Income ($Mil)

	Alt B	Alt E	Alt H
Illinois	4.4	10.4	14.9
Iowa	0.9	2.1	2.5
Minnesota	1.5	3.5	4.3
Missouri	1.6	3.8	5.1
Wisconsin	0.5	1.1	1.4
Lower Miss	12.3	29.0	33.4
East US	7.8	18.2	22.3
West US	5.0	11.7	14.8
Total US	34.0	79.8	98.7

Attachment 4

RED Analysis

Total Construction Impacts

Output ($Mil)

	Alt B	Alt E	Alt H
Illinois	105.9	392.9	579.1
Iowa	5.2	78.6	83.5
Minnesota	6.5	28.8	35.3
Missouri	82.5	244.7	252.7
Wisconsin	9.2	35.9	47.2
Lower Miss	24.4	85.4	105.3
East US	110.1	409.0	517.5
West US	88.1	332.0	414.4
Total US	432.0	1,607.1	2,034.9

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RED Analysis

Annual Transportation Savings Impacts

Output ($Mil)

	Alt B	Alt E	Alt H
Illinois	23.9	56.0	74.3
Iowa	8.3	19.6	22.6
Minnesota	9.1	21.4	25.1
Missouri	8.0	18.4	23.7
Wisconsin	2.1	5.0	6.2
Lower Miss	69.7	164.0	186.3
East US	29.8	69.8	84.8
West US	21.6	50.6	63.6
Total US	172.5	404.8	486.6

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Next Activities

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Next Activities

- Optimize Implementation of Measures
- Complete RED Analysis
- Complete Sensitivity Analysis
- Complete Emissions/Accidents/Spills Analysis

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Demand Curves

- Demand Specification

$$q = t * [(a - w) / (a - e)]^N$$

where:

t = 1992 equi water tonnage
a = min, same O-D, alt mode cost
w = water price
e = 1992 equi water price
N = parameter to shape function

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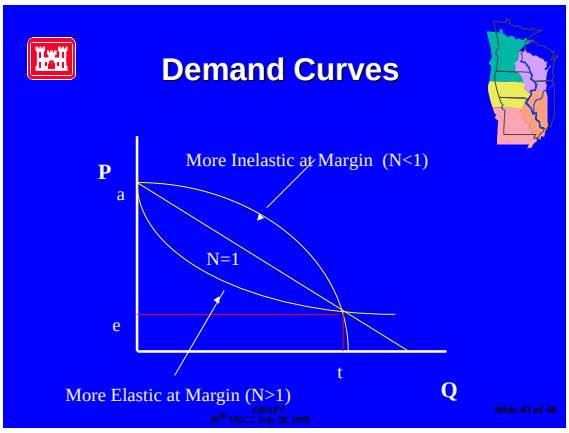
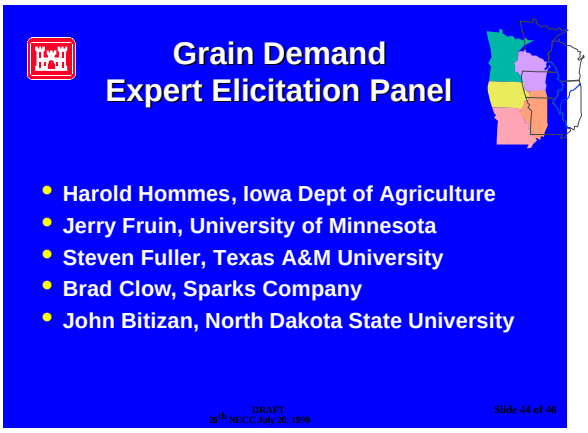
Attachment 4





Common Traffic Flows Between Locks - 1992

Percent that Uses:

Traffic Thru Lock:	UM14	UM15	UM16	UM17	UM18	UM19	UM20	UM21	UM22	UM24	UM25	UM26	UM27	LaGrge	Peoria
UM14	100.0	98.8	97.6	97.4	97.4	95.2	95.1	95.1	95.0	93.9	93.9	93.1	92.8	0.6	0.6
UM15	97.9	100.0	98.5	98.3	98.3	96.2	96.0	96.0	95.6	94.5	94.5	93.7	92.9	0.6	0.6
UM16	92.4	94.2	100.0	99.8	99.8	97.8	97.7	97.6	97.3	96.2	96.2	95.3	94.5	0.7	0.7
UM17	88.7	90.4	96.0	100.0	100.0	98.0	97.9	97.6	97.3	96.3	96.3	95.4	94.6	0.7	0.7
UM18	86.9	88.6	94.0	98.0	100.0	98.1	98.0	97.7	97.3	96.3	96.3	95.5	94.7	0.7	0.6
UM19	80.4	81.9	87.9	90.8	92.8	100.0	99.9	99.6	99.3	98.2	98.2	97.4	96.7	0.7	0.6
UM20	78.6	80.2	85.2	88.9	90.8	97.9	100.0	99.8	99.4	98.4	98.4	97.6	96.9	0.7	0.6
UM21	76.0	77.5	82.4	85.8	87.6	94.4	96.5	100.0	99.7	98.7	98.7	97.9	96.7	0.6	0.6
UM22	74.8	76.0	80.8	84.1	85.9	92.6	94.6	98.1	100.0	99.0	99.0	97.8	96.7	1.0	1.0
UM24	72.0	73.2	77.9	81.1	82.9	89.3	91.3	94.7	96.5	100.0	100.0	97.4	96.1	2.5	2.4
UM25	72.0	73.2	77.9	81.1	82.9	89.3	91.3	94.7	96.5	100.0	100.0	97.4	96.1	2.5	2.4
UM26	37.7	38.3	40.7	42.4	43.4	46.8	47.8	49.6	50.3	51.4	51.4	100.0	97.6	42.6	35.2
UM27	34.3	34.7	36.9	38.4	39.3	42.4	43.3	44.8	45.5	46.3	46.3	89.1	100.0	37.4	31.1
LaGrange	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	1.2	3.0	3.0	96.8	93.1	100.0	83.1
Peoria	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	1.3	3.2	3.2	88.4	85.5	92.0	100.0

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Common Traffic Flows Between Locks - 1992

Percentage that Uses:

Traffic Thru Lock:	LaGrange	Peoria	Strvd Rck	Mrslls	Drsdn Isl	Brndn Rd	Lckprt	Tm O'brn
LaGrange	100.0	83.1	53.4	47.2	40.3	33.8	33.3	16.1
Peoria	92.0	100.0	67.1	60.2	52.6	45.4	44.9	17.8
Strvd Rck	83.6	95.0	100.0	90.3	79.5	69.0	68.3	26.3
Mrslls	81.8	94.4	100.0	100.0	88.1	76.5	75.7	29.2
Drsdn Isl	76.3	90.1	96.1	96.1	100.0	87.3	86.5	32.1
Brndn Rd	72.0	87.5	94.0	94.1	98.4	100.0	99.0	37.0
Lckprt	71.8	87.4	93.9	94.0	98.4	100.0	100.0	37.3
Tm O'brn	74.7	74.7	77.9	78.0	78.6	80.3	82.6	100.0

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