Lake DeSmet Master Plan

Powder/Tongue Basin Advisory Group Mtg.

Story, Wyoming

November 19, 2003

Wyoming Water Development Commission (WWDC)

Lake DeSmet Counties Coalition Joint Powers Board (LDCC)

Watts & Associates

Scope of Study
Lake DeSmet Master Plan

- Develop a management plan for the Lake DeSmet Counties Coalition JPB
- Assess the condition of existing facilities
- Identify long-term improvements necessary to operate the reservoir in the manner intended
- Recommend an annual budget for the proper upkeep of the reservoir, based on the existing management and ownership structure

Study Objectives

Lake DeSmet Master Plan

- Incorporate the findings from previous studies
- Recount the history of the reservoir
- Describe reservoir system components
- Identify components owned by LDCC JPB
- Incorporate public input
- Estimate reservoir water yield
- Identify potential uses of DeSmet water
- Evaluate economics associated with multiple uses

Study Objectives

Lake DeSmet Master Plan

- Analyze tradeoffs associated with multiple uses (consumptive vs. recreation uses)
- Assess the condition of existing facilities
- Identify the need for additional study
- Suggest improvements required for proper upkeep
- Estimate improvement costs and develop a suggested budget
- Identify funding sources for improvements

History
Lake DeSmet Master Plan

- Originally, Lake DeSmet was a natural lake. Runoff from Shell Creek was stored in Lake DeSmet where it evaporated, creating a “brackish body of water.”
- The lake was converted to an off-channel storage reservoir for agricultural users in 1921 by constructing a dam at the north end and diverting water from Piney Creek through an intake canal into the reservoir.

History
Lake DeSmet Master Plan

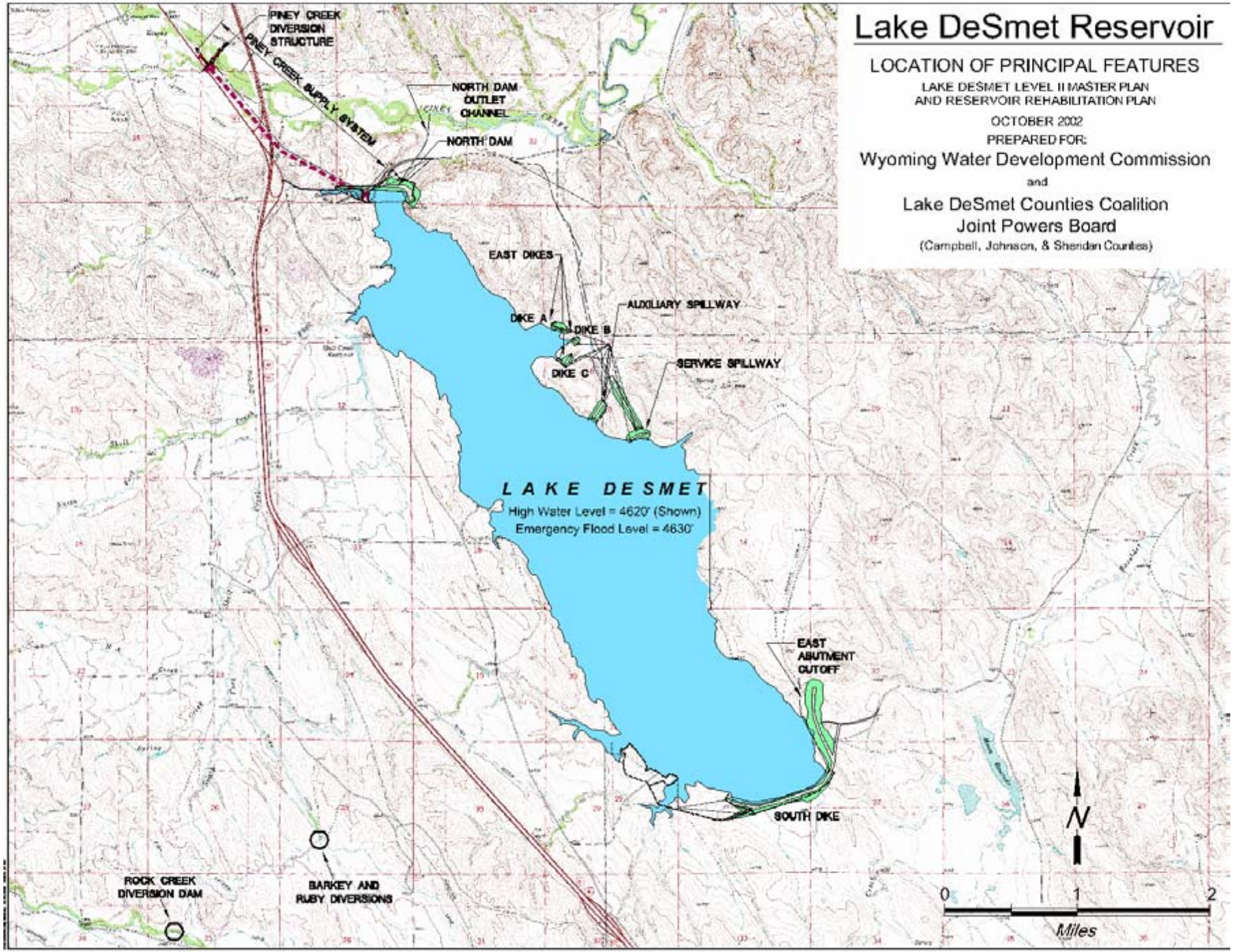
- The Reynolds Mining Corporation acquired the reservoir, surrounding land and associated mineral resources in the 1950's.
- Through the late 1960's a campaign was undertaken to expand the reservoir as a promotional tool for potential coal development in the area.
- New supply systems from Piney Creek and Clear Creek were planned and the reservoir was enlarged for storage of all available water.

History
Lake DeSmet Master Plan

- In the early 1970's, Texaco, Inc. purchased all of the interests in Lake DeSmet, surrounding land and associated mineral resources from Reynolds.
- Texaco completed the reservoir enlargement to its current capacity by the late 1970's.
- Texaco operated Lake DeSmet Reservoir until early 2001, when the current owner, the Lake DeSmet Counties Coalition acquired it.

History
Lake DeSmet Master Plan

- Aside from existing delivery contracts transferred upon acquisition of the reservoir, available water in the reservoir has never been realized for its intended purpose.
- The LDCC JPB requested assistance from the Wyoming Water Development Commission to fund a Master Plan for identifying future needs and best management practices for the reservoir.



Lake DeSmet Reservoir

LOCATION OF PRINCIPAL FEATURES

LAKE DESMET LEVEL II MASTER PLAN
AND RESERVOIR REHABILITATION PLAN

OCTOBER 2002

PREPARED FOR:

Wyoming Water Development Commission

and

Lake DeSmet Counties Coalition
Joint Powers Board
(Campbell, Johnson, & Sheridan Counties)

Lake DeSmet Ownership

Water Storage Rights

- Total Capacity @ HWL = 234,987 acre-ft.
  - Lake DeSmet Energy Company 62,199 acre-ft.
  - Lower Clear Creek Users 11,800 acre-ft.
  - Other irrigation users (Box Elder) 875 acre-ft.
- Total stored amount controlled by LDCC:

160,113 acre ft.

Lake DeSmet Ownership

Water Storage Rights

- Of this 160,113 acre-ft of stored water controlled by LDCC:
  - **10,720 acre-ft** is committed to long-term contract water users, from shareholders of the former LDRC (1920's).
  - **38, 960 acre-ft** is below the reservoir outlet and is unavailable for consumptive uses (dead storage)
- **110,000 acre-ft** of the stored water controlled by LDCC, not committed for other uses, is available for annual development.

TABLE 4-1
STORAGE AND SUPPLY PERMITS
PERTAINING TO
LAKE DESMET RESERVOIR

STORAGE PERMITS					SUPPLY PERMITS				
Permit (1)	Date (2)	Amount (acre feet) (3)	Cumulative Amount (acre feet) (4)	Description (5)	Permit (6)	Date (7)	Source of Supply (8)	Amount (c.f.s.) (9)	Conveyance Facility (10)
6225R	2-2-55	38,960	38,960	2nd. Enl. (Inactive storage)	5788E 5789E	4-26-55 4-26-55	Rock Creek Piney Creek	500 865	Lake DeSmet Ditch Piney Creek Tunnel
973R	1-12-07	25,000	63,960	Original Permit	15779	2-18-20	Piney Creek	1,000	Piney Creek
5829R	4-3-50	30,129	94,089	1st. Enl.	5550E 5551E 5552E	4-3-50 4-3-50 4-3-50	Piney Creek Little Piney Creek Rock Creek	865 400 192	Piney Creek Tunnel Piney Creek Tunnel Lake DeSmet Ditch
7009R	2-25-55	17,738	111,827	3rd. Enl.	22928 22929 22930 6217E	2-25-55 2-25-55 2-25-55 11-13-63	Clear Creek French Creek Rock Creek Piney Creek	580 200 200 865	Clear Creek Supply System Clear Creek Supply System Clear Creek Supply System Piney Creek Tunnel
6226R	2-4-55	8,902	120,729	1st. Transf. (Box Elder)	21580 5788E 5789E	2-4-55 4-26-55 4-26-55	Shell Creek Rock Creek Piney Creek	360 500 865	– Lake DeSmet Ditch Piney Creek Tunnel
7289R	4-15-57	36,834	157,563	2nd Transf. (Healy)	–	–	Clear Creek		Clear Creek Supply System
7290R	10-14-57	13,725	171,288	3rd Transf. (Enl. Healy)	–	–	Clear Creek		Clear Creek Supply System
7291R	11-13-63	37,340	208,628	4th Transf. (Piney Cr.)	–	–	Piney Creek		PineyCreek Tunnel
7533R	8-16-39	11,640	220,268	5th Transf. (Camp Comfort)	–	–	Clear Creek		Clear Creek Supply System
6227R	3-8-55	1,304	221,572	6th Transf. (Shell Cr.)	–	–	Shell Creek		–
7532R	4-16-57	740	222,312	7th Transf. (Shell Cr. Enl.)	–	–	Shell Creek		–
1300R	8-31-06	875	223,187	8th Transf. (Moore)	–	–	Rock Creek		Via Lake DeSmet Reservoir
7292R	2-21-68	11,800	234,987	9th Transf. (Box Elder)	6352E	2-21-68	Piney Creek	500	Lake DeSmet Intake Ditch (Old Leiter Ditch)

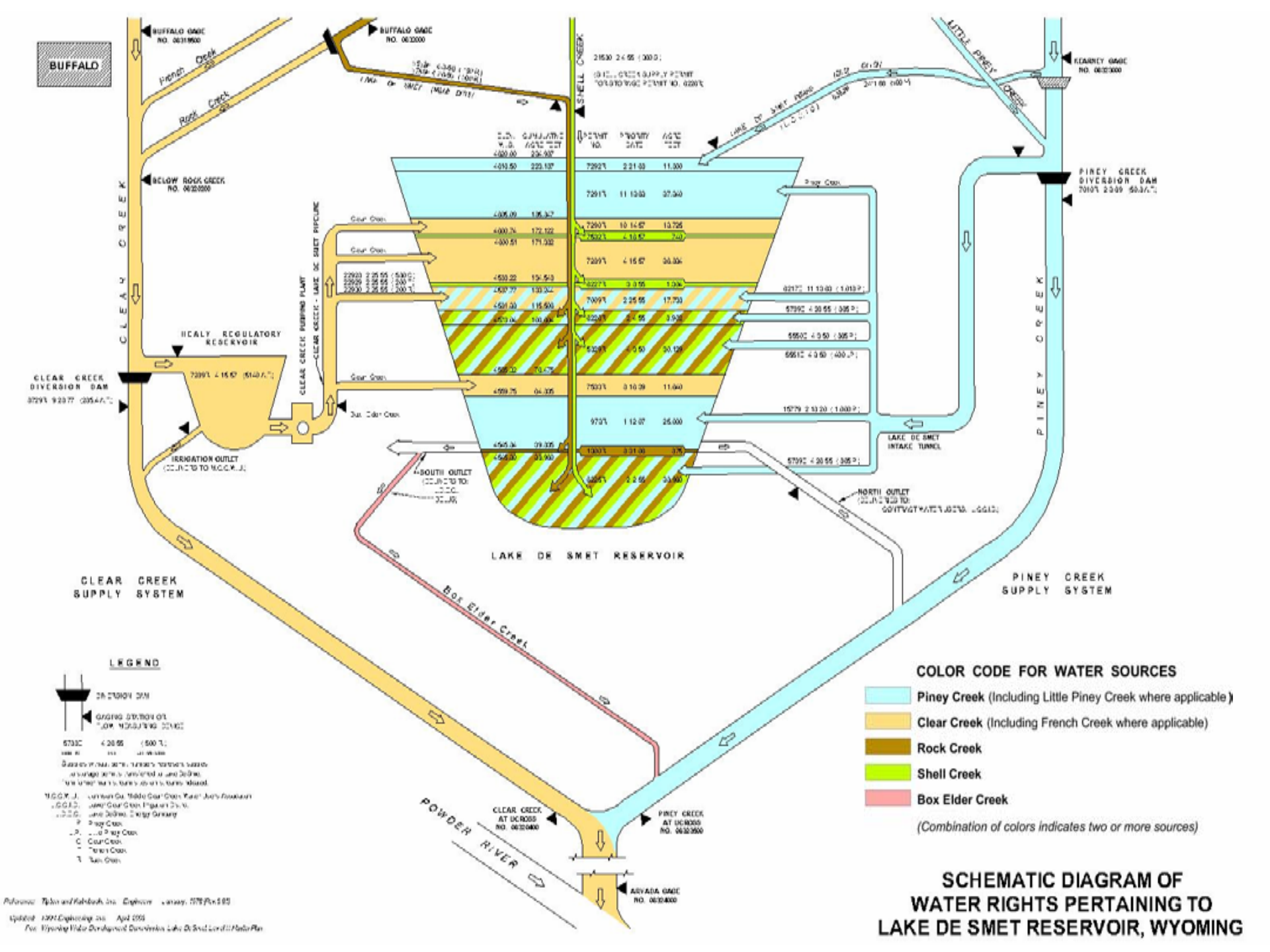
STORAGE PERMIT OWNERSHIP KEY:

Lake DeSmet Counties Coalition JPB | Lake DeSmet Energy Company II | Belus Family | Lower Clear Creek Irrigation District

NOTE: Storage permits for which no supply permits are indicated pertain to transfers of storage from former main stream reservoir sites and hence do not have separate supply permits.

Reference: *THE LAKE DE SMET PROJECT, Technical Record of Design and Construction*, Tipton and Kalmbach, Inc. Engineers, Denver, Colorado, May 1977.

Updated: HKM Engineering Inc., Sheridan, Wyoming, April 2003.
For: Wyoming Water Development Commission Lake DeSmet Level II Master Plan.



SCHEMATIC DIAGRAM OF WATER RIGHTS PERTAINING TO LAKE DE SMET RESERVOIR, WYOMING

LDCC Water Yield Estimate

Lake DeSmet Counties Coalition Joint Powers Board Ownership

- Of the 110,000 acre-ft of LDCC stored water, not committed for other uses, HKM estimates 28,000 acre-ft is available for consumptive uses on a firm-yield basis (dependable amount available every year).
- This estimate was derived from theoretical operational studies of the reservoir performed on a long-term basis (1950-2002) based on historic stream flow, precipitation and diversion records, adjusted for present-day ownership of storage rights by LDCC.

LDCC Water Yield Estimate

Lake DeSmet Counties Coalition Joint Powers Board Ownership

Six Reservoir Management Scenarios were developed

- *Scenarios 1 thru 3:*

  (1) 28,000, **(2)** 14,000 and **(3)** Zero acre-ft released for consumptive use from LDCC JPB appropriations, ***all remaining water*** not controlled by LDCC JPB is released for consumptive use, annually.

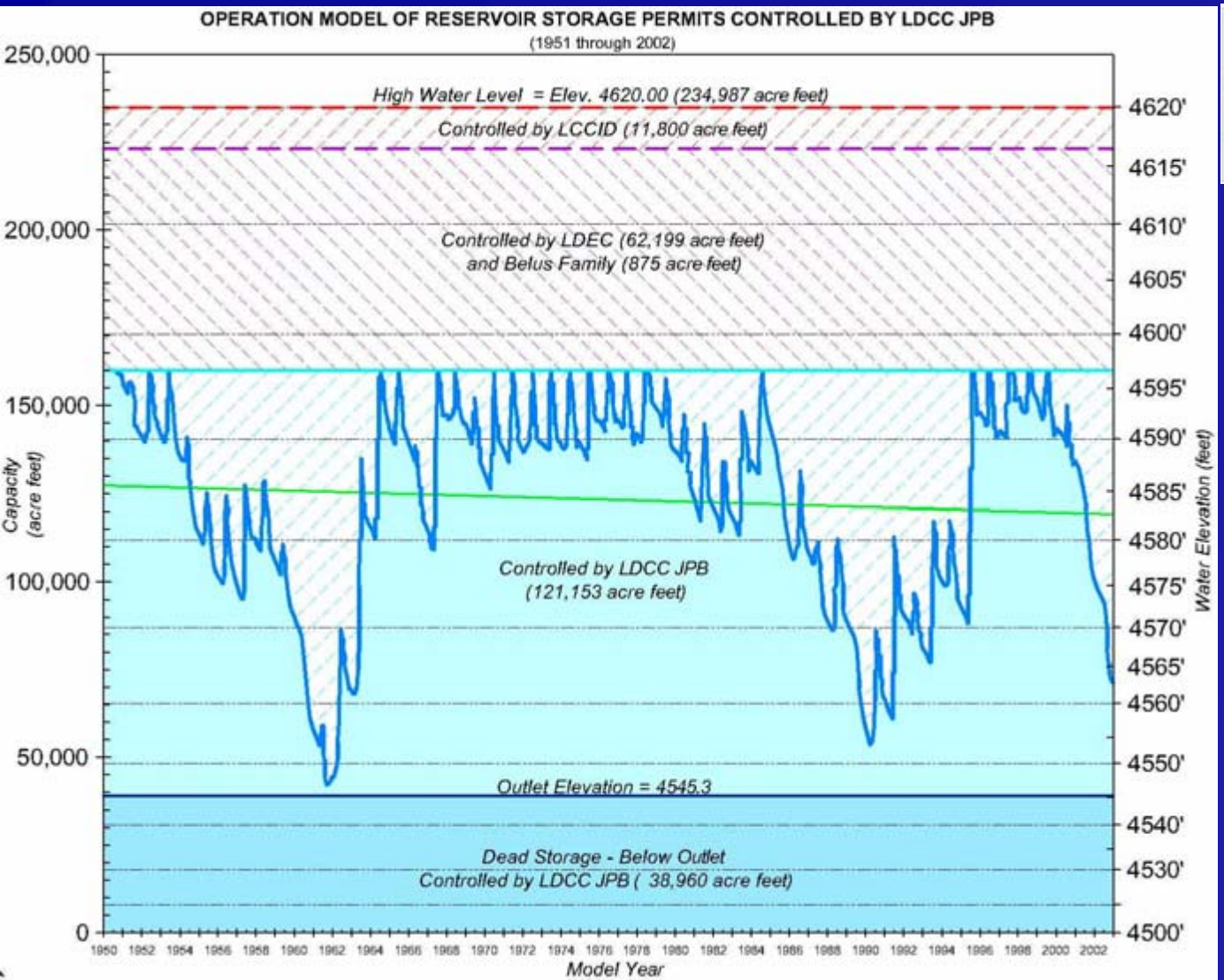
- *Scenarios 4 thru 6:*

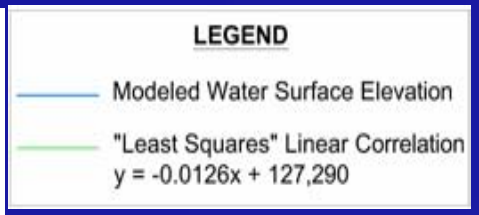
  (1) 28,000, **(2)** 14,000 and **(3)** Zero acre-ft released for consumptive use from LDCC JPB appropriations, ***all remaining water*** not controlled by LDCC JPB remains in storage, on an annual basis.

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 1

Assumptions:

- 28,000 acre-feet of available water controlled by LDCC JPB is released annually for consumptive uses.
- All remaining water not controlled by LDCC JPB is released for consumptive uses.





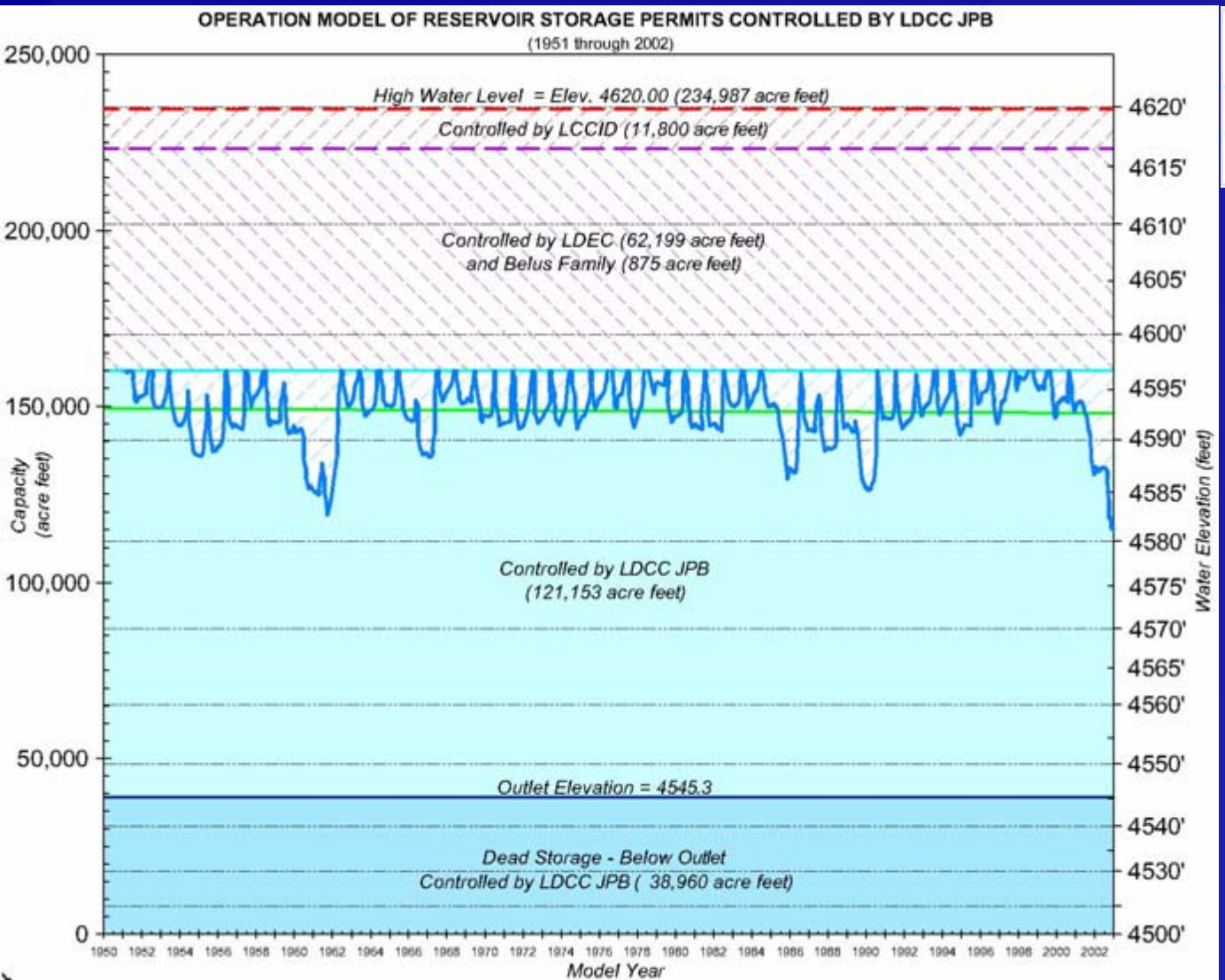
Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 2

Assumptions:

- 14,000 acre-feet of available water controlled by LDCC JPB is released annually for consumptive uses.
- All remaining water not controlled by LDCC JPB is released for consumptive uses.



LEGEND

Modeled Water Surface Elevation

"Least Squares" Linear Correlation
y = -0.002x + 149,160

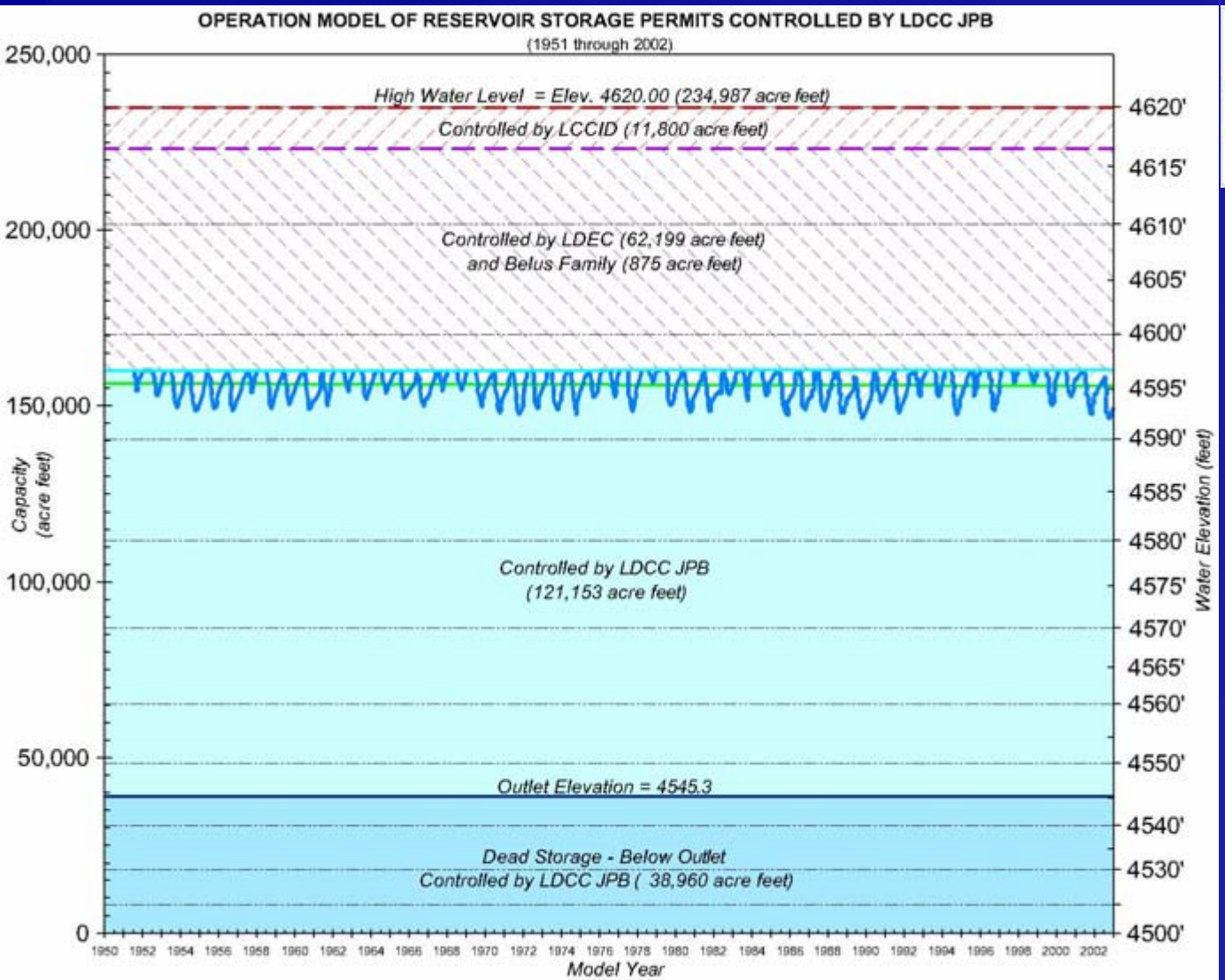
Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 3

Assumptions:

- All available water controlled by LDCC JPB is stored for non-consumptive uses.
- All remaining water not controlled by LDCC JPB is released for consumptive uses.



LEGEND

Modeled Water Surface Elevation

"Least Squares" Linear Correlation
Y = 0.0008x + 156,220

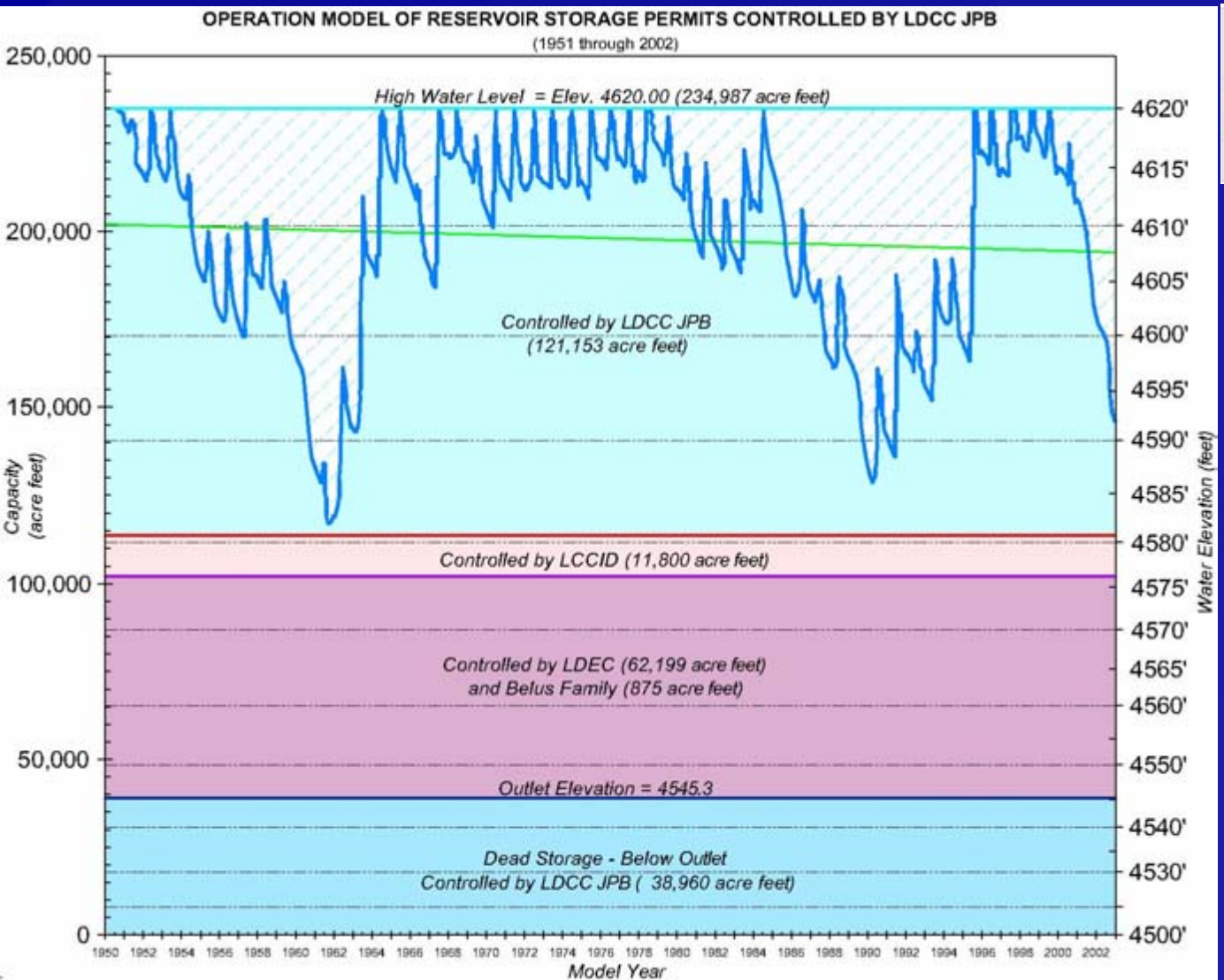
Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 4

Assumptions:

- 28,000 acre-feet of available water controlled by LDCC JPB is released annually for consumptive uses.
- All remaining water not controlled by LDCC JPB is stored for non-consumptive uses.



LEGEND

Modeled Water Surface Elevation

"Least Squares" Linear Correlation
y = -0.0126x + 127,290

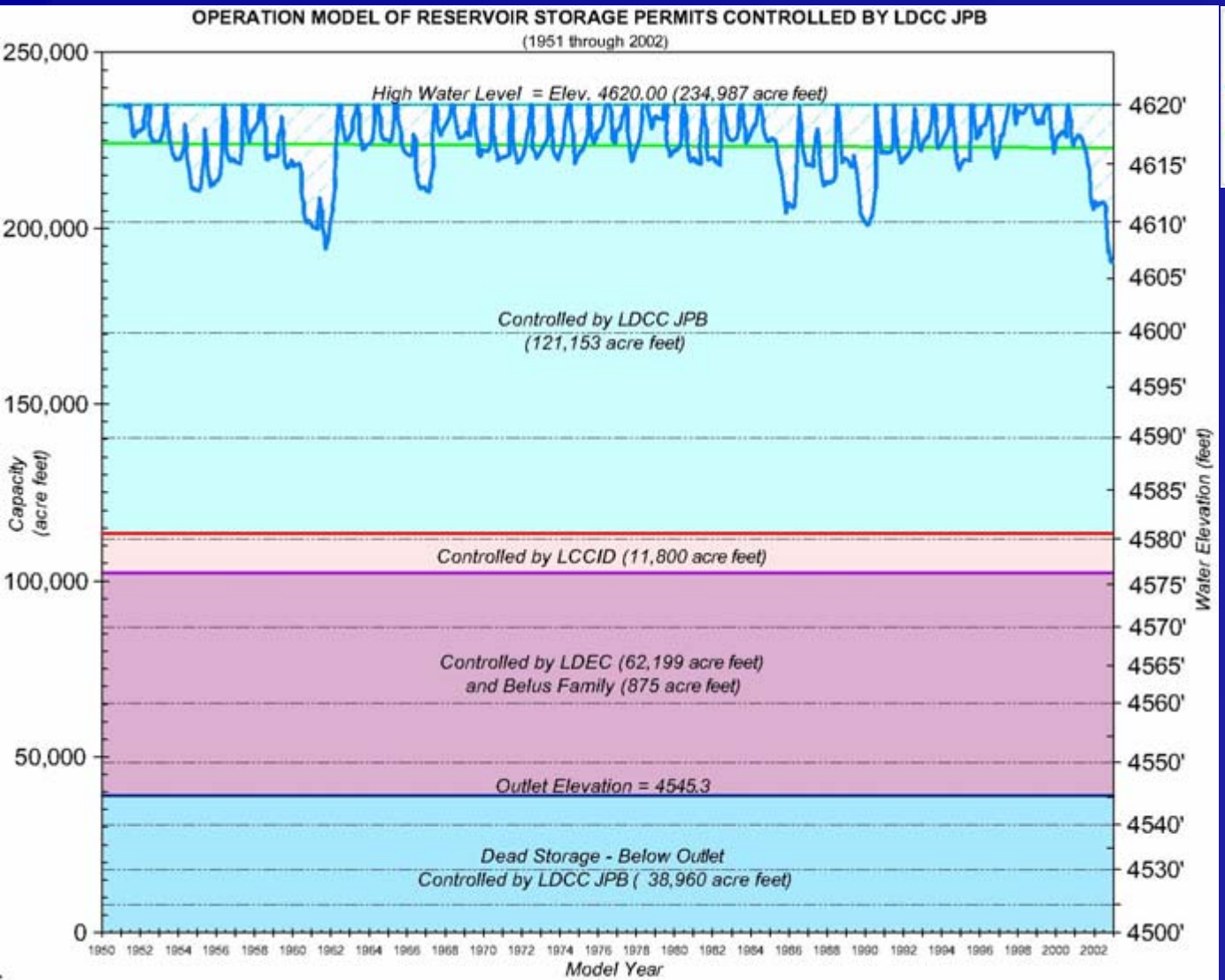
Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 5

Assumptions:

- 14,000 acre-feet of available water controlled by LDCC JPB is released annually for consumptive uses.
- All remaining water not controlled by LDCC JPB is stored for non-consumptive uses.



LEGEND

- Modeled Water Surface Elevation
- "Least Squares" Linear Correlation
  y = -0.002x + 149,160

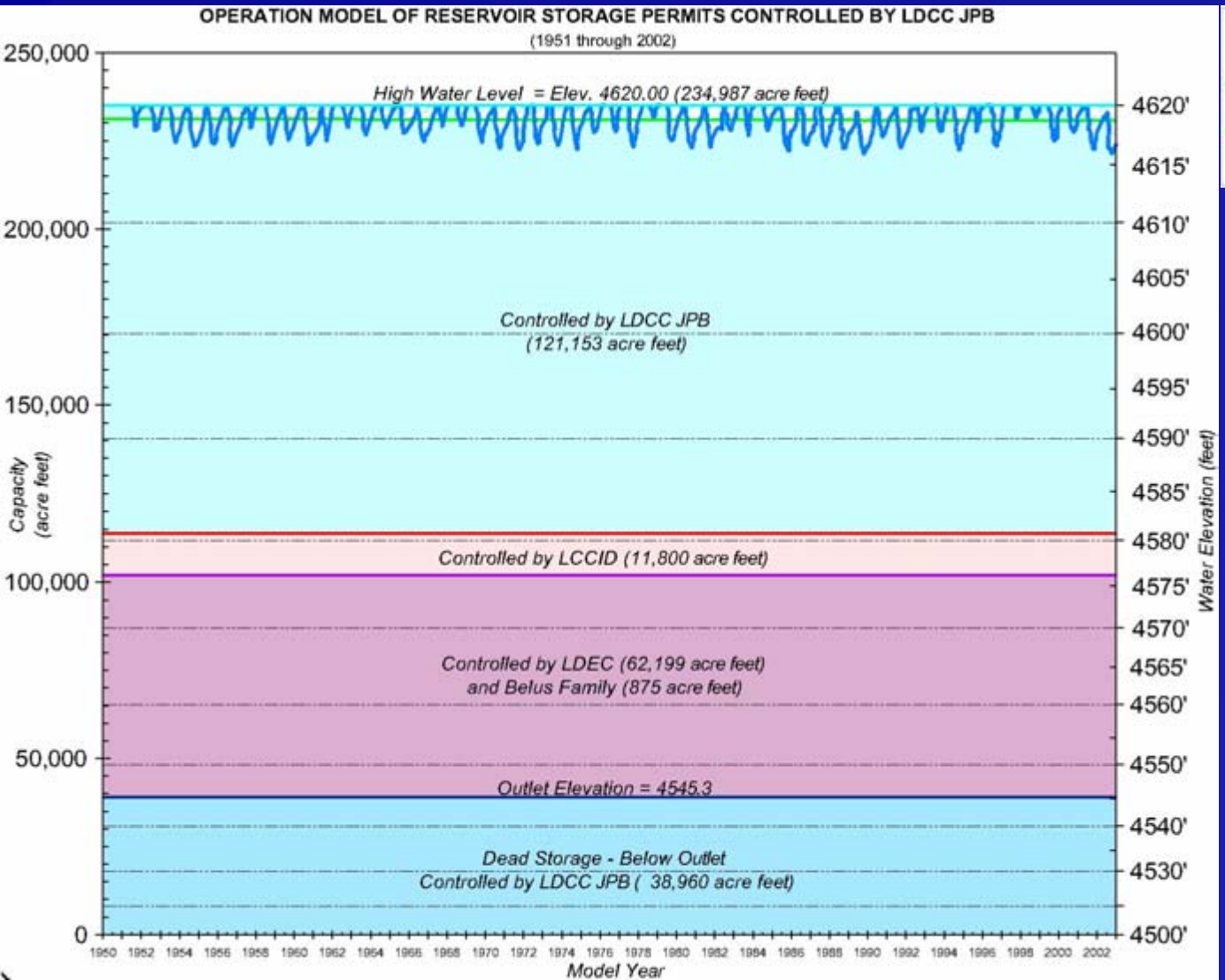
Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

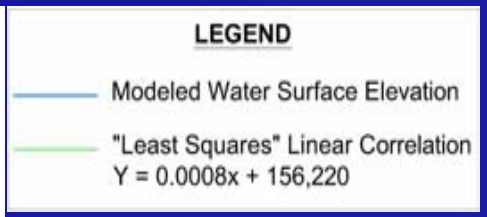
By: HKM Engineering, Sheridan, Wyoming

LAKE DE SMET LEVEL II MASTER PLAN:
PROPOSED RESERVOIR MANAGEMENT SCENARIO NO. 6

Assumptions:

- All available water controlled by LDCC JPB is stored for non-consumptive uses.
- All remaining water not controlled by LDCC JPB is stored for non-consumptive uses.





Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

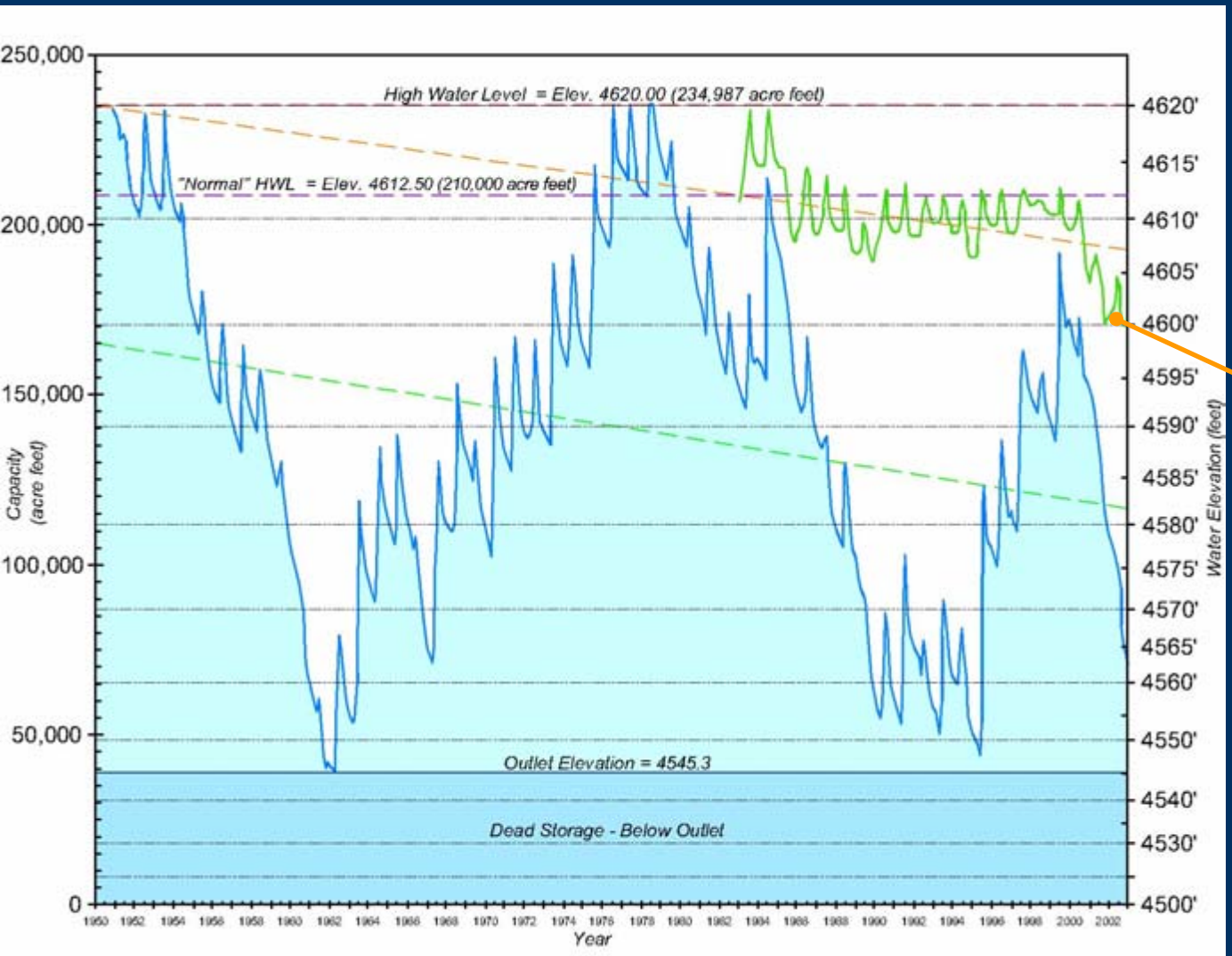
Lake DeSmet Water Yield Estimate

Entire Reservoir (All Storage Appropriations)

- An analysis of the water yield for all supply sources was performed
  - Piney Creek
  - Shell Creek and Rock Creek Diversions
  - Clear Creek, via Healy Reservoir, pump station and pipeline to DeSmet.
- From this analysis, HKM estimates 48,000 acre-ft is available on a firm yield basis.

LAKE DE SMET LEVEL II MASTER PLAN:
Operation Model of Lake DeSmet with 48,000 Acre Ft Annual Release

(1951 through 2002)



END OF EXISTING BOAT RAMP ELEV. = 4600' ±

(BARKEY DRAW, MIKESELL POTTS AND MONUMENT AREAS)

Prepared For:
Wyoming Water Development Commission
Lake DeSmet Counties Coalition JPB
April, 2003

By: HKM Engineering, Sheridan, Wyoming

Lake DeSmet Water Yield Estimate

Entire Reservoir (All Storage Appropriations)

- Previous studies for shorter study periods estimate an available firm yield of 63,000 acre-ft for the entire reservoir.
- HKM estimates an available firm yield of 48,000 acre-ft for a longer study period and conservative modeling assumptions.
- For purposes of this study, 55,000 acre-ft is the estimated firm yield for the entire reservoir

Existing and Potential Uses

Lake DeSmet Master Plan

- Municipal
- Irrigation
- Industrial
- Hydropower
- Recreation

Lake DeSmet Economic Analysis

Prepared by
Gary Watts
Watts & Associates, Inc.
Laramie, WY
In Conjunction With
HKM Engineering Inc.

Objective

- Evaluate the economic tradeoffs among potential competing uses of lake DeSmet water, including:
  - Recreation
  - Irrigation
  - Municipal uses
  - Industrial uses

Current Recreational Usage

- Vehicle Counts
- Activity Day Estimates
- Catch Estimates
- Fee Collection Information

Vehicle Counts

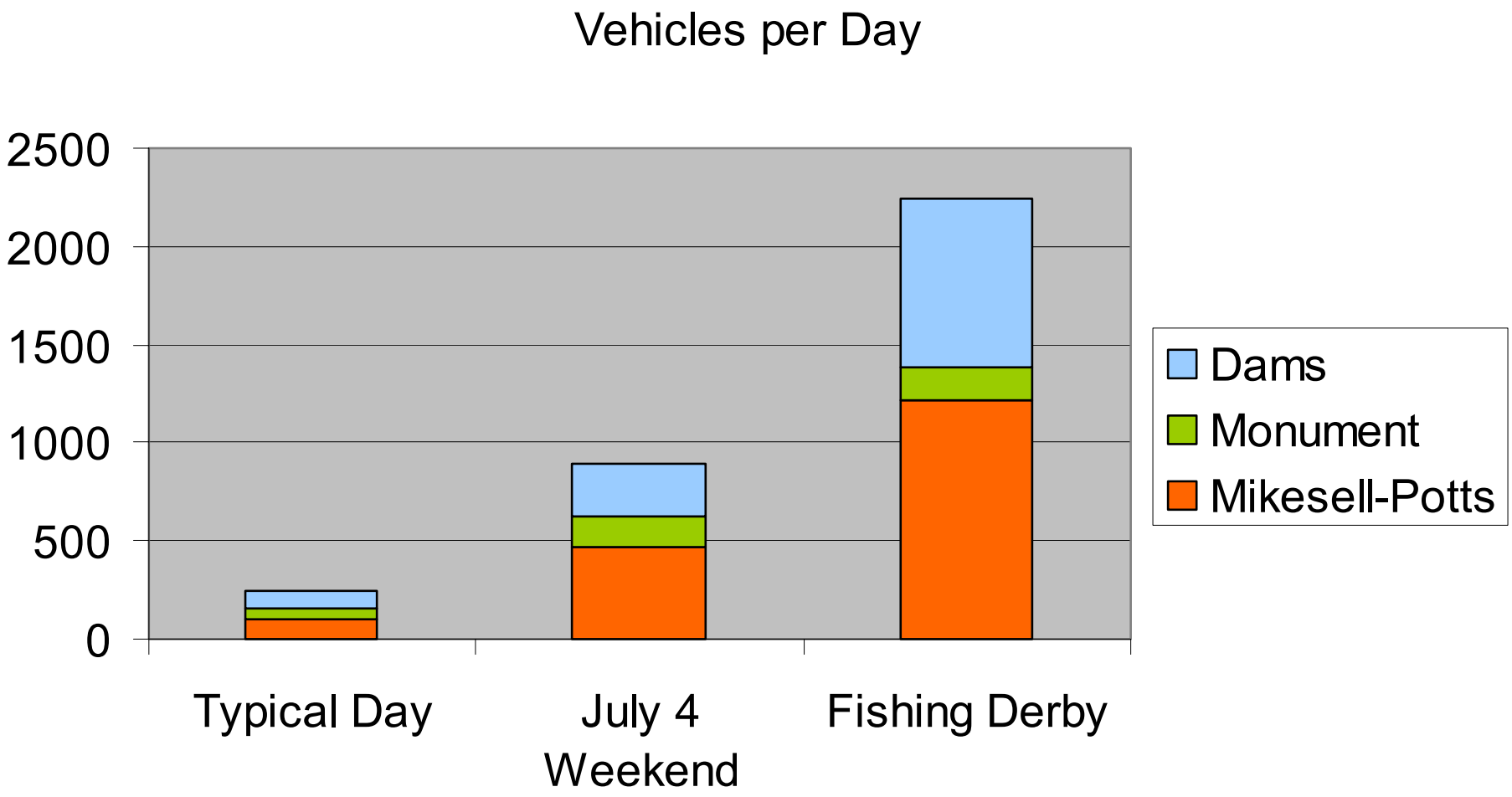


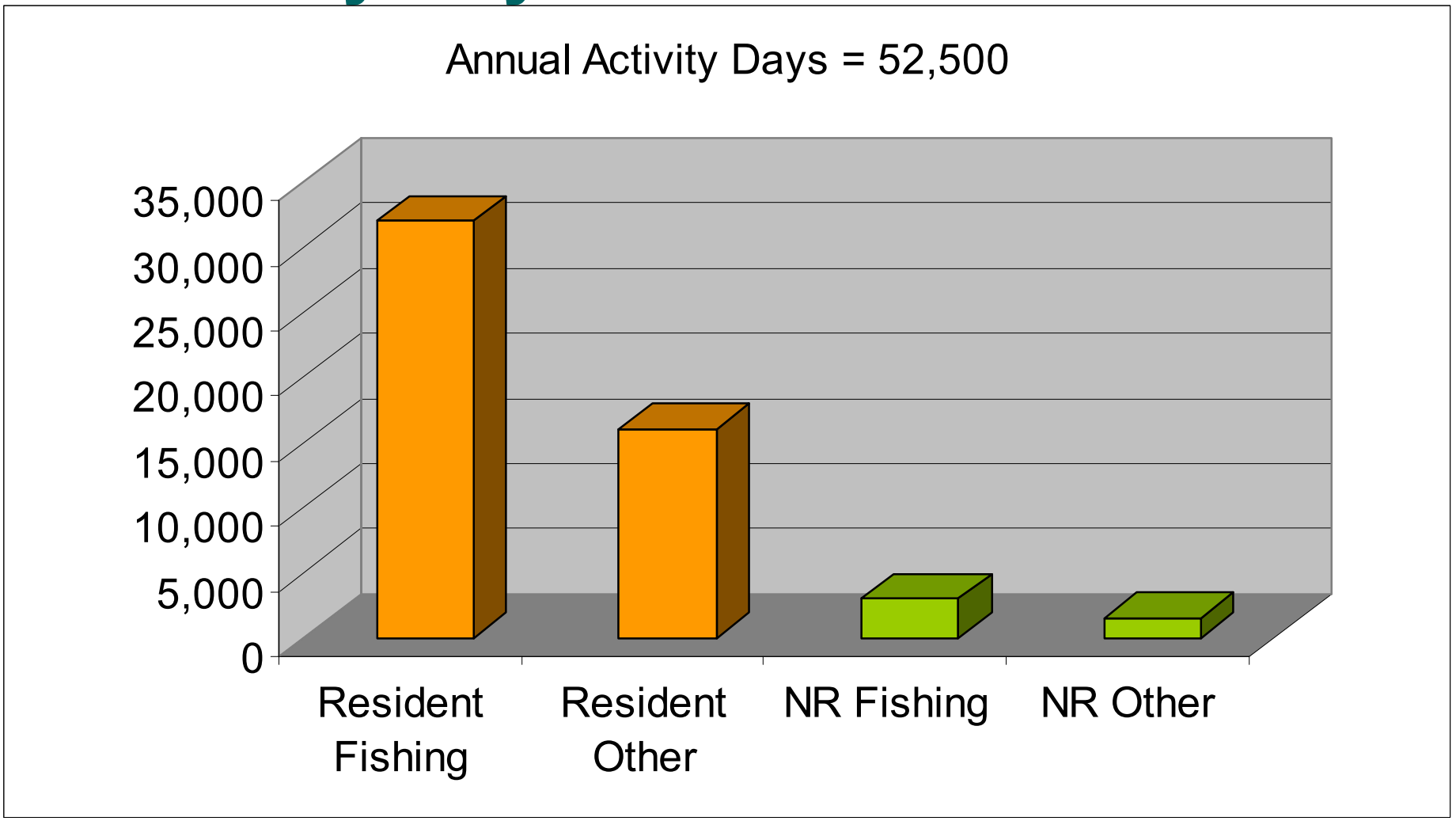
TABLE 5-7. Vehicles per Typical Day

Location	Vehicles / day
South Dam	59
Mikesell-Potts Entrance	104
Monument Entrance	51
North Dam	28
Total	**242**

Table 5-9.

Location	Vehicles / day-event oriented	
	Fishing Derby	4th of July Weekend
South Dam	783	213
Mikesell-Potts Entrance	1221	466
Monument Entrance	159	160
North Dam	71	58
Total	2234	897

Activity Day Estimates



Current Recreation Benefits

- Expenditures = $4 million annually
  (WGFD estimate)

- Net Benefits = $ from Non-residents
  + enjoyment by residents
  = $1.4 million annually

Current Irrigation Benefits

- Annual Releases (AF) = 13,500
- Estimated benefit (AF) = $75
  (direct plus indirect)
- Total annual benefit = $1.1 million

Current Benefit Summary

Annual Net Benefits

– Recreation	$1.4 million
– Irrigation	1.0 million
	$2.4 million

Present Value (50 years) = $56.3 million

Current Problem

- Coalition JPB needs $75,000 to $150,000 annually to operate reservoir.
- Benefits are large but revenues from user fees are insufficient to operate and maintain the reservoir:
  - No income from recreation fees.
  - Little income from irrigation.

Potential Solutions

- Option #1 – Manage reservoir primarily for existing users and enhance revenues to cover O&M costs.

- Option #2 – Market additional water to generate operating revenue and promote economic growth.

Revenue Enhancement Options

- Use general tax revenues
- Impose Recreational User fees
- Sell additional storage

2003 Creel Survey (38 Responses)

Option	% In Favor
Daily recreation fee	39
Annual recreation fee	47
General tax increase	21
None of the above	21

Keyhole State Park Fees (Daily Access)

Category	Type	Fee
Resident	Daily	$2
	Annual	$25
Non-resident	Daily	$4
	Annual	$40

Optimistic Revenue Example For Lake DeSmet

Permit	Fee	# Sold	Revenue
Annual	$30	800	$24,000
Daily	$3	10,000	$30,000
TOTAL REVENUE			$54,000

Potential Solutions

- Option #1 – Manage reservoir primarily for existing users and enhance revenues to cover O&M costs.

- Option #2 – Market additional water to generate operating revenue and promote economic growth.

Recreational Impacts From New Depletions

Depletions	Drawdown	Impact
Current	7 feet	None
+14K AF	12 feet	Moderate
+28K AF	17 feet	Major
+45K AF	Up to 65’	Devastating

Annual Economic Benefits of Hypothetical 5,000 AF Depletion

Use	AF	$/AF	$Benefit
Irrigation	2,000	75	150,000
Municipal	1,000	350	350,000
Industrial	2,000	500	1,000,000
			$1,500,000

Revenue Potential for Hypothetical 5,000 AF Sale

Use	AF	$/AF	$Benefit
Irrigation	3,000	10	30,000
Municipal	1,000	100	100,000
Industrial	1,000	200	200,000
			$330,000

Potential Problem #1

- County Coalition Controls only 28,000 AF out of 48,000 AF of firm reservoir yield.

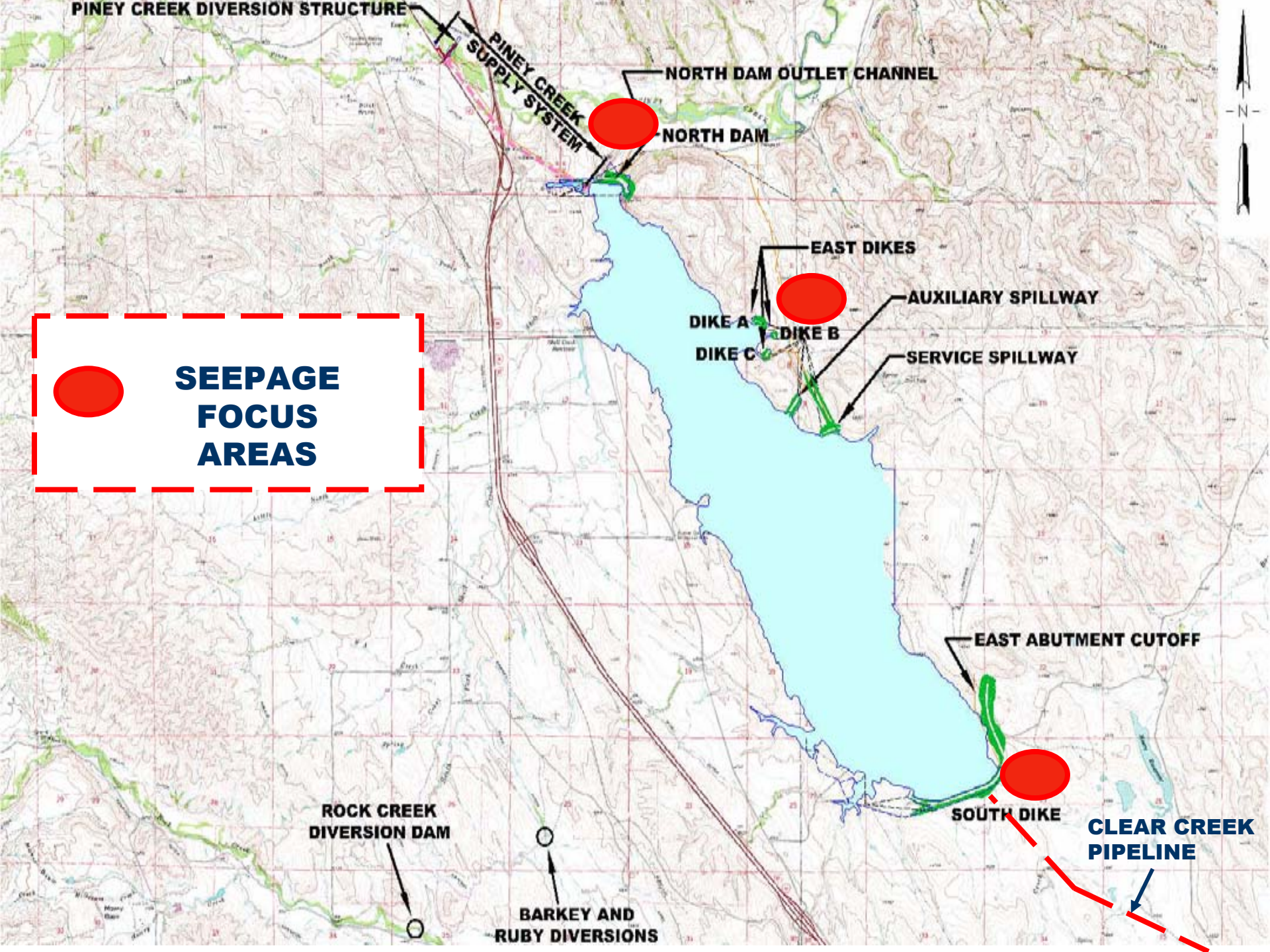
- If the other 20,000 AF of yield is developed, major recreational impacts could result from relatively small additional depletions.

Potential Problem #2

- Market for additional water is soft under current conditions.
- Revenue enhancement will still be needed until markets improve.

Conclusions

- Lake DeSmet is a very valuable economic asset for Johnson, Sheridan, and Campbell counties.
- Area residents and elected officials must weigh tradeoffs between current uses and potential for development.
- To preserve and enhance that asset, sufficient funds are needed to cover costs and acquire additional storage.
- These funds could be generated by selling modest amounts of water without significant impacts.


PINEY CREEK DIVERSION STRUCTURE
PINEY CREEK SUPPLY SYSTEM
NORTH DAM OUTLET CHANNEL
NORTH DAM
EAST DIKES
AUXILIARY SPILLWAY
DIKE A
DIKE B
DIKE C
SERVICE SPILLWAY
SEEPAGE FOCUS AREAS
EAST ABUTMENT CUTOFF
SOUTH DIKE
CLEAR CREEK PIPELINE
ROCK CREEK DIVERSION DAM
BARKEY AND RUBY DIVERSIONS
N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Reservoir Elevation Versus Seepage Flow

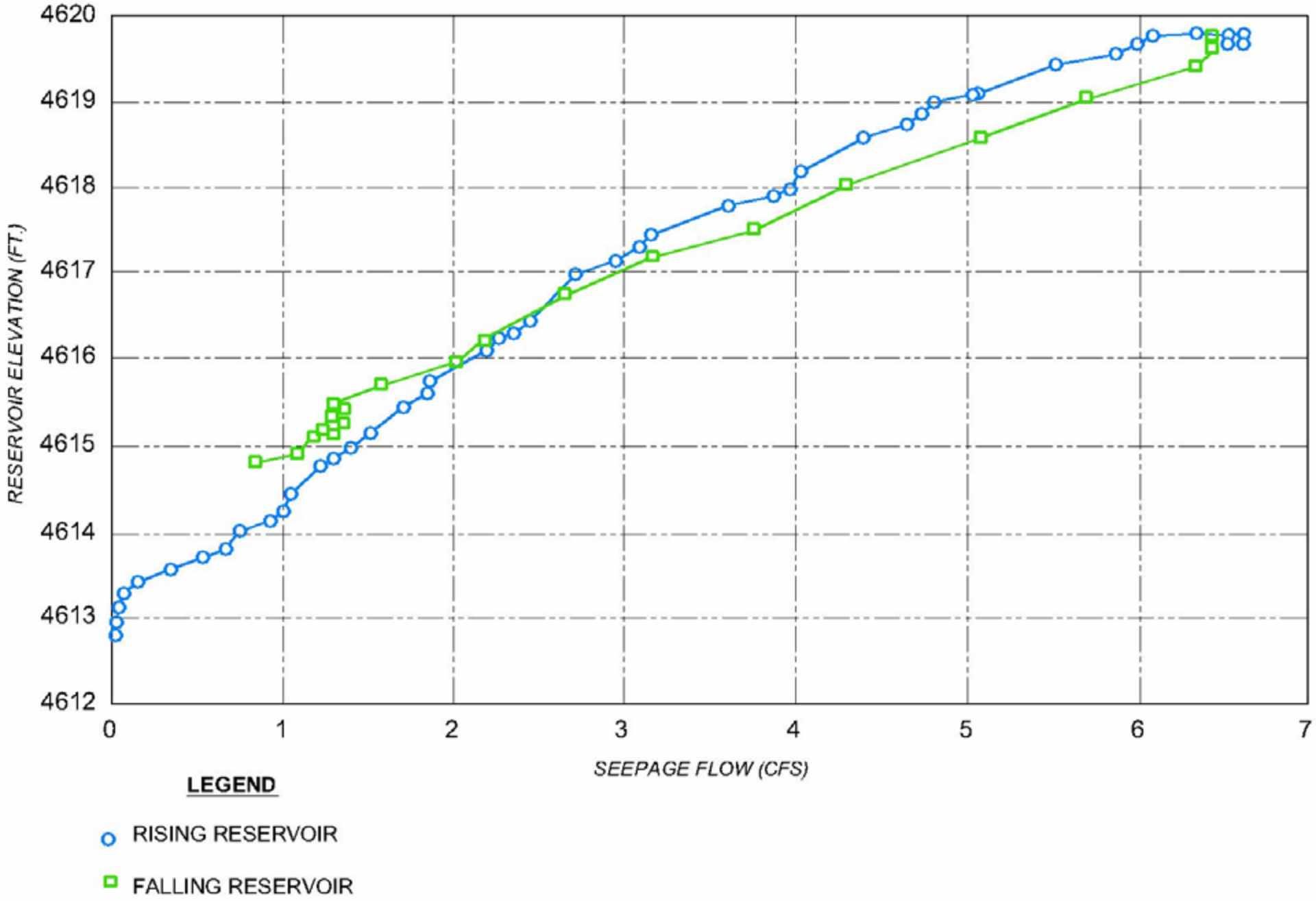


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TABLE 7.3 INSPECTION AND MAINTENANCE SCHEDULE

RESERVOIR SYSTEM COMPONENT	INSPECTION AND/OR MAINTENANCE ACTIVITY	FREQUENCY	INSPECTION AND MAINTENANCE COSTS (2003 DOLLARS)		
			ESTIMATED ANNUAL COSTS ROUTINE INSPECTIONS & MAINTENANCE ITEMS	ESTIMATED COSTS (PER EACH) NON-ROUTINE INSPECTIONS AND ADDITIONAL STUDY ITEMS	
			LDCC JPB OBLIGATIONS (TOTAL)	TOTAL	REMARKS
CONVEYANCE SYSTEMS					
PINEY CREEK DIVERSION DAM					
Water gate, 15" x 15" slide gate, manually operated	Refer to O&M Manual	Per O&M Manual	250		
Summer gate, 4' x 4' slide gate, manually operated			250		
Sluice gate, 4' x 6' slide gate manually operated			500		
Diversion gate, 9' x 12' fixed-wheel gate with electric hoist			1,000		
Concrete Diversion Dam			1,000		
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)			750		
Diversion pond and impoundment dikes			500		
Stream gauging station near Kearney	obtain monitoring records	weekly	250		
PINEY CREEK DIVERSION TUNNEL					
Inlet shaft	Refer to O&M Manual	Per O&M Manual	500		
Diversion tunnel			2,000		
Outlet shaft			500		
Flap gate at outlet			200		
Piezometers			250		
Flow recorder at Inlet			250		
Underwater inspections	Inspect inaccessible (underwater) components, in addition to inspection procedures from O&M manual	Once every 10 yrs., or sooner per tunnel headloss results from O&M manual procedure.	-	40,000	100% WWDC Level II Funding
SHELL CREEK BASIN					
Stream gauging station below Shell Creek Reservoir	monitor and record stream flow data	weekly	2,500		
ROCK CREEK DIVERSION DAM					
Install access bridge	not applicable (rehab consideration)	-na-			
Replace rock & membrane diversion with permanent structure	not applicable (rehab consideration)	-na-			
Assessment fees (Lake DeSmet Ditch Co.)	coordination w/ Ditch Co.	on-going	1,025		
LAKE DESMET DITCH					
Flow measurement device (flume)	obtain monitoring records	weekly (when in use)	500		
Rehab conveyance facilities to Lake DeSmet (pipeline, ditch)	evaluate conveyance alternatives	one time		15,000	100% WWDC Level II Funding
Assessment fees (Lake DeSmet Ditch Co.)	coordination w/ Ditch Co.	on-going	1,025		
DELIVERY SYSTEMS					
NORTH DAM OUTLET WORKS					
Hydraulically-operated 2'-9"x2'-9" high pressure regulating slide gates	Refer to O&M Manual	Per O&M Manual	1,000		
Hydraulically-operated 36" butterfly guard valves			1,000		
Control cabinet for control of regulating gates and guard valves			500		
Electrical control panel			250		
Reservoir level indicator			100		
Flow recorder			100		
Ventilation fan			100		
Sump pump			100		
Control structure heater (electric)			100		
Electrical power distribution panelboard			100		
Control building (including lights, outlets, doors, windows, etc.)			250		
Concrete valve chamber (dam core)			250		
Inspection conduit and delivery conduit			2,000		
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)			1,000		
Measuring devices (Parshall Flume and metering sump w/ recorder)			250		
Underwater inspections	Inspect inaccessible (underwater) components, in addition to inspection procedures from O&M manual	Once every 10 yrs., or sooner per tunnel headloss results from O&M manual procedure.	-	20,000	100% WWDC Level II Funding
Stream gauging station on Piney Creek, near outlet channel	obtain monitoring records	weekly (when in use)	200		
		SUBTOTAL (THIS PAGE) =	$ 20,550	$ 75,000	

TABLE 7.3 INSPECTION AND MAINTENANCE SCHEDULE

RESERVOIR SYSTEM COMPONENT	INSPECTION AND/OR MAINTENANCE ACTIVITY	FREQUENCY	INSPECTION AND MAINTENANCE COSTS (2003 DOLLARS)		
			ESTIMATED ANNUAL COSTS ROUTINE INSPECTIONS & MAINTENANCE ITEMS LDCC JPB OBLIGATIONS (TOTAL)	ESTIMATED COSTS (PER EACH) NON-ROUTINE INSPECTIONS AND ADDITIONAL STUDY ITEMS TOTAL	REMARKS
Butterfly valve (60-inch) in Clear Creek - Lake Desmet pipeline	Refer to O&M Manual	Per O&M Manual	500		
Butterfly valve (54 inch) in outlet pipeline			500		
Bypass (10") between 60-inch pipeline and 54-inch pipe			250		
Control cabinet for 54-inch and 60-inch butterfly valves			250		
Electrical control panel			100		
Sump pump			100		
Ventilation fan			100		
Electrical distribution panelboard			100		
Control building (including lights, outlets, doors, windows, etc.)			100		
Valve chamber (below control building)			100		
Connection structure (at toe of South Dam)			50		
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)			1,000		
Underwater inspections	Inspect inaccessible (underwater) components, in addition to inspection procedures from O&M manual	Once every 10 yrs., or sooner per tunnel headloss results from O&M manual procedure.	-	15,000	100% WWDC Level II Funding
Boxelder Creek measuring device (flume)	monitor and record stream flow data	daily (when releasing)			
IMPOUNDMENT STRUCTURES					
NORTH DAM					
Routine monitoring wells/piezometers	record depths	monthly	5,000		
Routine monitoring of seepage locations at east and west abutments	Refer to O&M Manual	Per O&M Manual	1,500		
In-depth monitoring of wells/piezometers and seepage locations	Evaluate routine data collected & assess under varying reservoir surface elevations.	one time	-	12,500	100% WWDC Level II Funding
Sub-surface geotechnical investigations	Perform geotechnical (drilling) investigations to observe sub-surface conditions to supplement existing logs.	one time	-	100,000	100% WWDC Level II Funding
SOUTH DAM AND EAST ABUTMENT CUT-OFF					
Routine monitoring wells/piezometers	record depths	monthly	2,000		
Routine monitoring of seepage locations at cut-off & toe of South Dam	Refer to O&M Manual	Per O&M Manual	1,000		
In-depth monitoring of wells/piezometers and seepage locations	Evaluate routine data collected and assess under varying reservoir surface elevations.	one time	-	7,500	100% WWDC Level II Funding
EAST DIKES AND SPILLWAYS					
Dike A	Refer to O&M Manual	Per O&M Manual	250		
Dike B			250		
Dike C			250		
Service Spillway and Dam			500		
Auxiliary Spillway			250		
Access road			500		
Routine monitoring wells/piezometers	record depths	monthly	2,000		
Routine monitoring of seepage locations at cut-off & toe of South Dam	Refer to O&M Manual	Per O&M Manual	1,000		
In-depth monitoring of wells/piezometers and seepage locations	Evaluate routine data collected & assess under varying reservoir surface elevations.	one time	-	10,000	100% WWDC Level II Funding
RECREATION FACILITIES					
MIKESELL-POTTS RECREATION AREA (JOHNSON COUNTY)					
Boat launching facilities (Managed by Wyoming G&F)	Observe during low reservoir surface elevation.	annually	150		
MONUMENT AREA (WYOMING G&F)					
Boat launching facilities	Observe during low reservoir surface elevation.	annually	150		
LAKE DESMET FISHERY AND ENVIRONMENTAL					
Water quality impacts	Establish water quality baseline	one time		200,000	50% WWDC Level II, 25% G&F, 25% DEQ or CBM
		SUBTOTAL THIS PAGE =	$ 17,950	$ 345,000	
		SUBTOTAL PREVIOUS PAGE =	$ 20,550	$ 75,000	
		TOTAL =	**$ 38,500**	**$ 420,000**	

TABLE 7.3 (CONTINUED)
INSPECTION AND MAINTENANCE SCHEDULE

TABLE 7.4 REHABILITATION SCHEDULE

RESERVOIR SYSTEM COMPONENT	SUGGESTED REHABILITATION ACTIVITY	ESTIMATED REHABILITATION YEAR	REHABILITATION COSTS (2003 DOLLARS) UTILIZING FUNDING CONTRIBUTIONS FROM VARIOUS SOURCES						POTENTIAL FUNDING SOURCES AND COST SHARING SCENARIOS
			ESTIMATED TOTAL COSTS			AVERAGE ANNUAL BUDGET COSTS			
			LDCC JPB	OTHER SOURCES	TOTAL	LDCC JPB	OTHER SOURCES	TOTAL	
CONVEYANCE SYSTEMS									
PINEY CREEK DIVERSION DAM									
Winter gate, 15' x 15' slide gate, manually operated	Major overhaul - replace seats, shafts, operators, etc.	2015	3,750	3,750	7,500	300	300	600	50% LDCC JPB, 50% WWDC
Summer gate, 4' x 4' slide gate, manually operated	Major overhaul - replace seats, shafts, operators, etc.	2004	7,500	7,500	15,000	7,500	7,500	15,000	50% LDCC JPB, 50% WWDC
Sluice gate, 4' x 6' slide gate manually operated	Major overhaul - replace seats, shafts, operators, etc.	2015	8,750	8,750	17,500	750	750	1,500	50% LDCC JPB, 50% WWDC
Diversion gate, 9' x 12' fixed-wheel gate with electric hoist	Major overhaul - replace seats, shafts, operators, etc.	2025	15,000	15,000	30,000	700	700	1,400	50% LDCC JPB, 50% WWDC
Concrete Diversion Dam								-	
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)	Replace components	2025	25,000	-	25,000	1,100	-	1,100	50% LDCC JPB, 50% WWDC
Diversion pond and impoundment dikes								-	
Stream gauging station near Kearney	Add telemetry	2020	3,000	9,000	12,000	175	525	700	25% LDCC JPB, 25% WWDC, 25% SEO, 25% USGS
PINEY CREEK DIVERSION TUNNEL									
Inlet shaft								-	
Diversion tunnel								-	
Outlet shaft								-	
Flap gate at outlet	Major overhaul or replacement	2030	20,000	20,000	40,000	750	750	1,500	50% LDCC JPB, 50% WWDC
Piezometers								-	
Flow recorder at Inlet	Add telemetry	2020	4,000	4,000	8,000	250	250	500	50% LDCC JPB, 50% WWDC
Underwater inspections								-	
SHELL CREEK BASIN									
Stream gauging station below Shell Creek Reservoir	Add telemetry	2020	3,000	9,000	12,000	175	525	700	25% LDCC JPB, 25% WWDC, 25% SEO, 25% USGS
ROCK CREEK DIVERSION DAM									
Install access bridge	Install access bridge to diversion dam across Rock Creek	2033	5,000	15,000	20,000	175	525	700	25% LDCC JPB, 25% WWDC, 50% LDEC
Replace rock & membrane diversion with permanent structure	Construct permanent concrete diversion structure in Rock Creek	2033	37,500	112,500	150,000	1,250	3,750	5,000	25% LDCC JPB, 25% WWDC, 50% LDEC
Assessment fees (Lake DeSmet Ditch Co.)								-	
LAKE DESMET DITCH									
Flow measurement device (flume)	Add telemetry	2020	3,000	9,000	12,000	175	525	700	25% LDCC JPB, 25% WWDC, 50% LDEC
Rehab conveyance facilities to Lake DeSmet (pipeline, ditch)	Improve conveyance facility from Lake Desmet Ditch to Reservoir	2010	31,250	93,750	125,000	4,475	13,425	17,900	25% LDCC JPB, 50% WWDC, 25% NRCS
Assessment fees (Lake DeSmet Ditch Co.)								-	
DELIVERY SYSTEMS									
NORTH DAM OUTLET WORKS									
Hydraulically-operated 2'-9"x2'-9" high pressure regulating slide gates	Major overhaul - replace seats, shafts, operators, etc.	2025	50,000	50,000	100,000	2,250	2,250	4,500	50% LDCC JPB, 50% WWDC
Hydraulically-operated 36" butterfly guard valves	Major overhaul - replace seats, shafts, operators, etc.	2025	40,000	40,000	80,000	1,800	1,800	3,600	50% LDCC JPB, 50% WWDC
Control cabinet for control of regulating gates and guard valves	Replace electrical components	2010	2,500	2,500	5,000	350	350	700	50% LDCC JPB, 50% WWDC
Electrical control panel	Replace electrical components	2030	7,500	7,500	15,000	300	300	600	50% LDCC JPB, 50% WWDC
Reservoir level indicator								-	
Flow recorder	Replace	2015	1,000	1,000	2,000	100	100	200	50% LDCC JPB, 50% WWDC
Ventilation fan	Replace mechanical	2025	2,500	2,500	5,000	100	100	200	50% LDCC JPB, 50% WWDC
Sump pump	Replace	2015	1,000	1,000	2,000	100	100	200	50% LDCC JPB, 50% WWDC
Control structure heater (electric)	Replace	2010	1,000	1,000	2,000	150	150	300	50% LDCC JPB, 50% WWDC
Electrical power distribution panelboard	Replace electrical components	2030	3,500	3,500	7,000	150	150	300	50% LDCC JPB, 50% WWDC
Control building (including lights, outlets, doors, windows, etc.)	Add telemetry	2020	15,000	15,000	30,000	900	900	1,800	50% LDCC JPB, 50% WWDC
Concrete valve chamber (dam core)								-	
Inspection conduit and delivery conduit								-	
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)	Replace components	2025	7,500	7,500	15,000	350	350	700	50% LDCC JPB, 50% WWDC
Measuring devices (Parshall Flume and metering sump w/ recorder)	Add telemetry	2020	4,000	4,000	8,000	250	250	500	50% LDCC JPB, 50% WWDC
Underwater inspections								-	
Stream gauging station on Piney Creek, near outlet channel	Add telemetry	2020	1,250	3,750	5,000	75	225	300	25% LDCC JPB, 25% WWDC, 25% SEO, 25% USGS
SOUTH DAM OUTLET WORKS									
Butterfly valve (60-inch) in Clear Creek - Lake Desmet pipeline	Major overhaul - replace seats, shafts, operators, etc.	2030	20,000	20,000	40,000	750	750	1,500	50% LDCC JPB, 50% WWDC
Butterfly valve (54 inch) in outlet pipeline	Major overhaul - replace seats, shafts, operators, etc.	2030	20,000	20,000	40,000	750	750	1,500	50% LDCC JPB, 50% WWDC
Bypass (10") between 60-inch pipeline and 54-inch pipe	Major overhaul - replace seats, shafts, operators, etc.	2025	7,500	7,500	15,000	350	350	700	50% LDCC JPB, 50% WWDC
Control cabinet for 54-inch and 60-inch butterfly valves	Replace electrical components	2015	2,500	2,500	5,000	200	200	400	50% LDCC JPB, 50% WWDC
Electrical control panel	Replace electrical components	2015	7,500	7,500	15,000	650	650	1,300	50% LDCC JPB, 50% WWDC
Sump pump	Replace	2020	1,000	1,000	2,000	50	50	100	50% LDCC JPB, 50% WWDC
Ventilation fan	Replace mechanical	2030	2,500	2,500	5,000	100	100	200	50% LDCC JPB, 50% WWDC
Electrical distribution panelboard	Replace electrical components	2030	3,500	3,500	7,000	150	150	300	50% LDCC JPB, 50% WWDC
Control building (including lights, outlets, doors, windows, etc.)	Add telemetry	2020	7,500	7,500	15,000	450	450	900	50% LDCC JPB, 50% WWDC
Valve chamber (below control building)								-	
Connection structure (at toe of South Dam)								-	
Miscellaneous metals (fences, handrails, ladders, trashracks, etc.)	Replace components	2025	7,500	7,500	15,000	350	350	700	50% LDCC JPB, 50% WWDC
Underwater inspections								-	
Boxelder Creek measuring device (flume)	Add telemetry	2020	4,000	4,000	8,000	250	250	500	50% LDCC JPB, 50% WWDC
		SUBTOTAL (THIS PAGE) =	387,000	530,000	917,000	28,700	40,600	69,300	

TABLE 7.4
REHABILITATION SCHEDULE

TABLE 7.4 REHABILITATION SCHEDULE

RESERVOIR SYSTEM COMPONENT	SUGGESTED REHABILITATION ACTIVITY	ESTIMATED REHABILITATION YEAR	REHABILITATION COSTS (2003 DOLLARS) UTILIZING FUNDING CONTRIBUTIONS FROM VARIOUS SOURCES						POTENTIAL FUNDING SOURCES AND COST SHARING SCENARIOS
			ESTIMATED TOTAL COSTS			AVERAGE ANNUAL BUDGET COSTS			
			LDCC JPB	OTHER SOURCES	TOTAL	LDCC JPB	OTHER SOURCES	TOTAL	
IMPOUNDMENT STRUCTURES (CONTINUED)									
NORTH DAM									
Routine monitoring wells/piezometers								-	
Routine monitoring of seepage locations at east and west abutments								-	
In-depth monitoring of wells/piezometers and seepage locations	Extend diaphragm cut-off wall	2025	1,000,000	1,000,000	2,000,000	45,450	45,450	90,900	50% LDCC JPB, 50% WWDC
Sub-surface geotechnical investigations								-	
SOUTH DAM AND EAST ABUTMENT CUT-OFF									
Routine monitoring wells/piezometers								-	
Routine monitoring of seepage locations at cut-off & toe of South Dam								-	
In-depth monitoring of wells/piezometers and seepage locations								-	
EAST DIKES AND SPILLWAYS									
Dike A								-	
Dike B								-	
Dike C								-	
Service Spillway and Dam	Replace miscellaneous metals (trashrack, railings, vortex veins, etc.)	2030	7,500	7,500	15,000	300	300	600	50% LDCC JPB, 50% WWDC
Auxiliary Spillway								-	
Access road	Improve access road (grading, culverts and gravel surfacing)	2020	30,000	30,000	60,000	1,750	1,750	3,500	50% LDCC JPB, 50% GAME AND FISH
Routine monitoring wells/piezometers								-	
Routine monitoring of seepage locations at cut-off & toe of South Dam								-	
In-depth monitoring of wells/piezometers and seepage locations								-	
RECREATION FACILITIES									
MIKESELL-POTTS RECREATION AREA (JOHNSON COUNTY)									
Boat launching facilities (Managed by Wyoming G&F)	Lengthen boat ramps, if reservoir is operated below elev. 4600	2025	-	75,000	75,000	-	3,400	3,400	100% Game and Fish
MONUMENT AREA (WYOMING G&F)									
Boat launching facilities	Lengthen boat ramps, if reservoir is operated below elev. 4600	2025	-	75,000	75,000	-	3,400	3,400	100% Game and Fish
LAKE DESMET FISHERY AND ENVIRONMENTAL									
Water quality impacts									
		SUBTOTAL (THIS PAGE) =	387,000	530,000	917,000	28,700	40,600	69,300	
		SUBTOTAL (PREVIOUS PAGE) =	1,037,500	1,187,500	2,225,000	47,500	54,300	101,800	
		TOTAL =	**1,424,500**	**1,717,500**	**3,142,000**	**76,200**	**94,900**	**171,100**	

TABLE 7.4 (CONTINUED)
REHABILITATION SCHEDULE

TABLE 7.5 SUGGESTED BUDGET (FY 2004 THROUGH FY 2034)

YEAR	EXPENDITURES											REVENUE					ENDING BALANCE	REHABILITATION (CAPITAL EXPENDITURES) ACCOUNT			
	UTILITIES, BONDS, INSURANCE AND OTHER MISC. ADMINISTRATIVE EXPENSES						TOTAL MISCELLANEOUS ADMINISTRATIVE EXPENSES	OPERATIONS & CONTRACT MANAGEMENT	ROUTINE INSPECTION & MAINTENANCE	REHABILITATION RESERVE	TOTAL ANNUAL EXPENDITURES	LWC OPERATIONS & MAINTENANCE REIMBURSEMENT	COUNTY CONTRIBUTIONS	CARRY OVER CASH BALANCE	WATER SALES	TOTAL ANNUAL REVENUE		REVENUE	EXPENDITURES		
	Utilities	Legal Fees	Audit Services	Performance Bond	Liability Insurance	OSSV Compliance												REHABILITATION RESERVE	2003 DOLLARS	FUTURE VALUE i=2.5%	ENDING BALANCE REHABILITATION ACCOUNT
2004	$ (1,700)	$ (5,000)	$ (5,000)	$ (600)	$ (600)	$ (4,000)	$ (17,300)	$ (20,000)	$ (38,500)	$ (76,200)	$ (152,000)	$ 15,600	$ 40,000	$ 14,488	$ 81,712	$ 152,000	$ -	$ 76,200	$ (7,500)	$ (7,688)	$ 68,512
2005	(1,740)	(5,125)	(5,125)	(620)	(620)	(4,100)	(17,730)	(20,500)	(39,463)	(78,105)	(155,800)	16,196	41,000	-	98,605	155,800	-	78,105		-	146,618
2006	(1,786)	(5,253)	(5,253)	(641)	(641)	(4,203)	(18,176)	(21,013)	(40,449)	(80,058)	(159,695)	16,600	42,025	-	101,070	159,695	-	80,058		-	226,676
2007	(1,831)	(5,384)	(5,384)	(662)	(662)	(4,308)	(18,630)	(21,538)	(41,460)	(82,059)	(163,687)	17,016	43,076	-	103,597	163,687	-	82,059		-	308,734
2008	(1,878)	(5,519)	(5,519)	(683)	(683)	(4,416)	(19,096)	(22,076)	(42,497)	(84,111)	(167,780)	17,442	44,153	-	106,187	167,780	-	84,111		-	392,845
2009	(1,923)	(5,657)	(5,657)	(705)	(705)	(4,524)	(19,573)	(22,628)	(43,559)	(86,213)	(171,974)	17,878	45,256	-	108,841	171,974	-	86,213		-	479,059
2010	(1,971)	(5,798)	(5,798)	(726)	(726)	(4,636)	(20,063)	(23,194)	(44,648)	(88,368)	(176,273)	18,325	46,388	-	111,563	176,273	-	88,368	(34,750)	(41,307)	626,120
2011	(2,021)	(5,943)	(5,943)	(951)	(951)	(4,755)	(20,564)	(23,774)	(45,764)	(90,578)	(180,680)	18,781	47,548	-	114,352	180,680	-	90,578		-	816,698
2012	(2,071)	(6,092)	(6,092)	(975)	(975)	(4,874)	(21,078)	(24,368)	(46,909)	(92,842)	(185,197)	19,251	48,736	-	117,210	185,197	-	92,842		-	709,540
2013	(2,123)	(6,244)	(6,244)	(999)	(999)	(4,995)	(21,605)	(24,977)	(48,081)	(95,163)	(189,827)	19,732	49,955	-	120,141	189,827	-	95,163		-	604,703
2014	(2,176)	(6,400)	(6,400)	(1,024)	(1,024)	(5,120)	(22,145)	(25,602)	(49,283)	(97,542)	(194,573)	20,225	51,203	-	123,144	194,573	-	97,542		-	902,248
2015	(2,231)	(6,560)	(6,560)	(1,050)	(1,050)	(5,248)	(22,699)	(26,242)	(50,515)	(99,961)	(199,417)	20,731	52,483	-	126,223	199,437	-	99,981	(24,500)	(32,960)	969,277
2016	(2,286)	(6,724)	(6,724)	(1,076)	(1,076)	(5,380)	(23,267)	(26,898)	(51,778)	(102,461)	(204,403)	21,249	53,795	-	129,378	204,422	-	102,461		-	1,071,756
2017	(2,343)	(6,892)	(6,892)	(1,103)	(1,103)	(5,514)	(23,848)	(27,570)	(53,073)	(105,043)	(209,534)	21,780	55,140	-	132,613	209,534	-	105,040		-	1,176,600
2018	(2,402)	(7,065)	(7,065)	(1,130)	(1,130)	(5,652)	(24,444)	(28,259)	(54,399)	(107,669)	(214,772)	22,325	56,519	-	135,928	214,772	-	107,669		-	1,284,469
2019	(2,462)	(7,241)	(7,241)	(1,159)	(1,159)	(5,793)	(25,055)	(28,966)	(55,759)	(110,360)	(220,141)	22,883	57,932	-	139,326	220,141	-	110,360		-	1,394,829
2020	(2,524)	(7,423)	(7,423)	(1,188)	(1,188)	(5,938)	(25,682)	(29,690)	(57,153)	(113,119)	(225,645)	23,455	59,380	-	142,809	225,645	-	113,119	(75,750)	(115,283)	1,292,696
2021	(2,587)	(7,609)	(7,609)	(1,217)	(1,217)	(6,085)	(26,324)	(30,432)	(58,582)	(115,947)	(231,286)	24,042	60,865	-	146,380	231,286	-	116,947		-	1,606,633
2022	(2,651)	(7,799)	(7,799)	(1,248)	(1,248)	(6,238)	(26,982)	(31,193)	(60,047)	(118,846)	(237,069)	24,643	62,386	-	150,039	237,068	-	118,846		-	1,827,475
2023	(2,718)	(7,993)	(7,993)	(1,279)	(1,279)	(6,395)	(27,657)	(31,973)	(61,548)	(121,817)	(242,995)	25,259	63,946	-	153,790	242,995	-	121,817		-	1,746,298
2024	(2,786)	(8,193)	(8,193)	(1,311)	(1,311)	(6,554)	(28,348)	(32,772)	(63,087)	(124,863)	(249,070)	25,890	65,545	-	157,605	249,040	-	124,863		-	1,674,159
2025	(2,855)	(8,398)	(8,398)	(1,344)	(1,344)	(6,718)	(29,057)	(33,592)	(64,664)	(127,984)	(255,296)	26,537	67,183	-	161,576	255,296	-	127,984	(1,155,000)	(1,988,495)	13,728
2026	(2,927)	(8,608)	(8,608)	(1,377)	(1,377)	(6,886)	(29,783)	(34,431)	(66,280)	(131,184)	(261,679)	27,201	68,863	-	165,615	261,679	-	131,184		-	144,912
2027	(3,000)	(8,823)	(8,823)	(1,412)	(1,412)	(7,058)	(30,528)	(35,292)	(67,938)	(134,463)	(268,221)	27,881	70,584	-	169,756	268,221	-	134,463		-	279,375
2028	(3,075)	(9,044)	(9,044)	(1,447)	(1,447)	(7,235)	(31,291)	(36,175)	(69,636)	(137,825)	(274,928)	28,578	72,349	-	173,899	274,826	-	137,825		-	417,200
2029	(3,152)	(9,270)	(9,270)	(1,483)	(1,483)	(7,416)	(32,073)	(37,079)	(71,377)	(141,271)	(281,800)	29,292	74,158	-	178,349	281,800	-	141,271		-	556,470
2030	(3,230)	(9,501)	(9,501)	(1,520)	(1,520)	(7,601)	(32,875)	(38,006)	(73,161)	(144,802)	(288,844)	30,025	76,012	-	182,806	288,844	-	144,802	(84,500)	(184,589)	636,684
2031	(3,311)	(9,738)	(9,738)	(1,558)	(1,558)	(7,791)	(33,697)	(38,956)	(74,990)	(148,422)	(296,066)	30,775	77,912	-	187,379	296,066	-	148,422		-	697,106
2032	(3,394)	(9,982)	(9,982)	(1,597)	(1,597)	(7,986)	(34,539)	(39,930)	(76,865)	(152,103)	(303,467)	31,545	79,860	-	192,063	303,467	-	152,103		-	836,239
2033	(3,479)	(10,232)	(10,232)	(1,637)	(1,637)	(8,186)	(35,403)	(40,928)	(78,787)	(155,906)	(311,054)	32,333	81,856	-	196,864	311,054	-	155,906	(42,500)	(89,147)	906,029
2034	(3,566)	(10,488)	(10,488)	(1,678)	(1,678)	(8,390)	(36,288)	(41,951)	(80,756)	(159,804)	(318,930)	33,142	83,903	-	201,785	318,830	-	159,835		-	1,066,960
																			$ (1,424,500)		

EXPENSES BASED ON A 2.5% AVERAGE ANNUAL INFLATION RATE

Lake DeSmet Master Plan

Thank You!

Wyoming Water Development Commission (WWDC)

Lake DeSmet Counties Coalition Joint Powers Board (LDCC)

HKM ENGINEERING

Watts & Associates