ROZA IRRIGATION DISTRICT

COMPREHENSIVE WATER CONSERVATION PLAN

APPENDIX

APPENDICES FOR

COMPREHENSIVE WATER CONSERVATION PLAN

FINAL DOCUMENT

Prepared for

U.S.BUREAU OF RECLAMATION

WASHINGTON DEPARTMENT OF ECOLOGY

Submitted by

ROZA IRRIGATION DISTRICT

Yakima Project

Sunnyside, Washington

June 1998

APPENDIX I
COMPARATIVE BALANCE SHEET

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

PGMGL6400
GENERAL LEDGER
FINANCIAL STATEMENT

ROZA IRRIGATION DISTRICT
COMPARATIVE BALANCE SHEET
DECEMBER 31, 1995

	CURRENT PERIOD	PRIO PERIO
A S S E T S		
CURRENT ASSETS		
CASH		
CASH IN BANK-CHECKING	67.29	97.49
TOTAL CHECKING	67.29	97.49
CASH IN BANK-SAVINGS-O&M	265,251.16	449,349.38
CASH IN BANK-SAVINGS CONSTRUCTION	263,698.15	263,680.28
CASH IN BANK-SAVINGS LID	429.99	34,511.24
CASH IN BANK-SAVINGS PREPAIDS	7,299.52	3,408.31
CASH IN BANK-SAVINGS ADVANCE WATER		
CASH IN BANK-SAVINGS SP. CONST.	2,573.51	2,573.51
CASH IN BANK-SAVINGS RESERVE USBR		
CASH IN BANK-SAVINGS RESERVE OP		
CASH IN BANK-SAVINGS EQUIPMENT		
TOTAL SAVINGS	539,252.33	753,522.72
CASH ON HAND		
PETTY CASH	100.00	100.00
TOTAL CASH ON HAND	100.00	100.00
TOTAL CASH	539,419.62	753,720.21
RECEIVABLES		
ACCOUNTS RECEIVABLE	84,891.73	75,248.56
ACCOUNTS RECEIVABLE - LID		106,620.90
ASSESSMENTS RECEIVABLE- O & M		
ASSESSMENTS RECEIVABLE- CONST.		
ASSESSMENTS RECEIVABLE- LID		
ASSESSMENT RECEIVABLE - MISC. BILLS		
TOTAL CURRENT RECEIVABLES	84,891.73	181,869.46
DELINQUENT ASSESSMENTS- O & M	26,736.08	17,849.25
DELINQUENT ASSESSMENTS-	1,856.07	1,445.95

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COMPARATIVE BALANCE SHEET
DECEMBER 31, 1995

	CURRENT PERIOD	PRIOR PERIOD
CONST.		
DELINQUENT ASSESSMENTS-		
OP. RES.		
DELINQUENT ASSESSMENTS-		
LID		
DELINQUENT ASSESSMENTS-	9,387.58	596.16
MISC BILLS		
TOTAL DELINQUENT RECEIVABLES	37,979.73	19,891.36
DUE FROM USBR-CHANDLER	30,127.26	19,441.38
DUE FROM USBR-STORAGE	27,578.39	8,144.28
DUE FROM USBR-RESERVE WKS	38,488.05	37,393.91
DUE FROM USBR-HUBBARD DIT		
DUE FROM USBR-FISH FAC	37,101.11	29,050.87
DUE FROM USBR-CONSD STUDY		
TOTAL USBR RECEIVABLES	133,294.81	94,030.44
ACCRUED INTEREST ON INVESTMENTS	12,733.28	40,383.40
TOTAL ACCRUED INT ON INV	12,733.28	40,383.40
INTERFUND LOANS REC-O&M		
INTERFUND LOANS REC-CONST		
INTERFUND LOANS REC-LID		
TOTAL INTERFUND LOANS		
TOTAL RECEIVABLES	268,899.55	336,174.66
INVENTORY		
GAS & OIL	4,969.82	4,746.49
CHEMICALS	6,567.83	7,665.68
LUMBER		
VEHICLE SHOP	4,382.21	4,157.37
SUPPLIES	47,909.34	47,627.50
JOBS IN PROGRESS		
TOTAL INVENTORY	63,829.20	64,197.04
INVESTMENTS		
O & M	1,054,171.55	
CONSTRUCTION		
L.I.D.		
SPECIAL CONSTRUCTION	45,302.33	45,302.33
ADVANCE WATER	25,391.84	25,391.84
RESERVE USBR	288,000.00	288,000.00
RESERVE OP	116,305.83	116,305.83
EQUIPMENT		
TOTAL INVESTMENTS	1,529,171.55	475,000.00
PREPAIDS		

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	CURRENT PERIOD	PRIOR PERIOD
PREPAID INSURANCE	63,569.03	72,901.06
PREPAID O&M, POWER	509,121.98	635,216.33
PREPAID SVID JOINT DRAINS	3,142.11	26,721.50
DEPOSITS		
TOTAL PREPAIDS	575,833.12	734,838.89
TOTAL OTHER ASSETS	2,168,833.87	1,274,035.93
TOTAL CURRENT ASSETS	2,977,153.04	2,363,930.80
FIXED ASSETS		
LAND & LAND RIGHTS	185,130.03	185,130.03
ALLOW FOR DEPLETION LAND		
TOTAL LAND & LAND RIGHTS	185,130.03	185,130.03
TOTAL NON-DEPRECIABLE ASSETS	185,130.03	185,130.03
BUILDINGS	90,689.05	90,689.05
ACCUMULATED DEPRECIATION-BUILDINGS	81,620.28-	79,353.05-
STORAGE TANKS	49,700.00	49,700.00
ACC DEP/STORAGE TANKS	24,850.00-	19,880.00-
TOTAL BUILDINGS & TANKS	33,918.77	41,156.00
WW7-REREG	260,904.98	236,826.36
ACCUM DEP/WW7 REREG	49,773.14-	23,682.64-
WW6-REREG	336,280.37	336,280.37
ACCUM DEP/WW6 REREG	235,397.60-	201,769.23-
TOTAL WW6-REREG	312,014.61	347,654.86
CONST. & MAINT. EQUIPMENT	1,656,296.44	1,611,430.96
ACCUMULATED DEPRECIATION EQUIPMENT	1,205,306.54-	1,190,871.37-
TOTAL CONST. & MAINT. EQUIPMENT	450,989.90	420,559.59
MISC. EQUIPMENT	61,475.34	61,475.34
ACCUM DEP/MISC EQUIPMENT	51,135.79-	42,258.35-
TOTAL MISC. EQUIPMENT	10,339.55	19,216.99
OFFICE EQUIPMENT	117,265.60	96,920.42
ACCUMULATED DEPRECIATION OFFICE EQUIPMENT	95,928.51-	88,973.95-
TOTAL OFFICED EQUIPMENT	21,337.09	7,946.47
COMPUTER SOFT WARE	72,502.38	69,260.24
ACCUMULATED DEPRECIATION COMP SOFT WARE	63,348.89-	56,000.71-
TOTAL SOFT WARE	9,153.49	13,259.53

ROZA IRRIGATION DISTRICT
COMPARATIVE BALANCE SHEET
DECEMBER 31, 1995

	CURRENT PERIOD	PRIOR PERIOD
TOTAL DEPRECIABLE ASSETS	837,753.41	849,793.44
CONSTRUCTION IN PROGRESS		
USBR CONST OBLIG REC	6,420,330.35	6,690,839.33
LID CONST REC #W0187		
TOTAL CONST. RECEIVABLES	6,420,330.35	6,690,839.33
TOTAL ASSETS	10,420,366.83	10,089,693.60

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ROZA IRRIGATION DISTRICT
COMPARATIVE BALANCE SHEET

DECEMBER 31, 1995

L I A B I L I T I E S

CURRENT LIABILITIES

	CURRENT PERIOD	PRIOR PERIOD
ACCOUNTS PAYABLE- EXPENSE	65,937.13	69,002.72
ACCOUNTS PAYABLE- USBR CONST	270,508.95	270,731.19
ACCOUNTS PAYABLE- O & M		
ACCOUNTS PAYABLE- LID		
TOTAL ACCOUNTS PAYABLE	336,446.08	339,733.91
INTERFUND LOANS PAYABLE- EXPENSE		
INTERFUND LOANS PAYABLE- CONSTRUCTION		
INTERFUND LOANS PAYABLE- LID		
TOTAL INTERFUND LOANS PAYABLE		
ACCRUED INTEREST PAYABLE		
ACCRUED WAGES PAYABLE	27,546.51	26,715.26
ACCRUED ANN LEAVE PAYABLE	215,603.55	209,812.85
ACCRUED SICKLEAVE PAYABLE	222,821.07	195,790.68
ACCRUED SALES TAX PAYABLE	1,759.36	2,882.23
ACCRUED TAXES PAYABLE	734.44	
ACCRUED FICA TAXES	5,620.20	5,402.69
ACCRUED IND. INS. PAYABLE	13,526.00	16,333.96
ACCRUED UNION DUES		
ACCRUED W/H TAXES PAYABLE	4,144.48	4,277.92
ACCRUED RETIRE PAYABLE	22,019.63	24,544.34
ACCRUED MISC PAYROLL DED	658.00	1,084.81
TOTAL ACCRUED PAYABLE	514,433.24	486,844.74
DEPOSITS	7,299.52	3,408.29
DEPOSITS-EXTRA WATER		
DEPOSITS-FULL COST WATER		0.02
DEPOSITS-LID		116,029.24
PREPAYMENTS-REIMB JOB		
OVERPAYMENT		3,886.30
PREPAYMENTS ASSESSMENTS	298,080.20	323,287.99
TOTAL PREPAIDS	305,379.72	446,611.84
BONDS PAYABLE		
NOTES PAYABLE		
TOTAL BONDS & NOTES PAY		

ROZA IRRIGATION DISTRICT
COMPARATIVE BALANCE SHEET

	CURRENT PERIOD	PRIOR PERIOD
TOTAL CURRENT LIABILITIES	1,156,259.04	1,273,190.49
LONG TERM LIABILITES		
CONTRACT PAYABLE-USBR	6,149,821.37	6,420,330.35
CONTRACT PAYABLE-LID		
TOTAL USBR CONTRACT	6,149,821.37	6,420,330.35
TOTAL LONG TERM LIABILITIES	6,149,821.37	6,420,330.35
TOTAL LIABILITIES	7,306,080.41	7,693,520.84
E Q U I T Y		
CONTRIBUTION FROM GOVERNMENTAL UNITS		31,308.00
CONTIBUTION FROM CUSTOMERS		
TOTAL CONTRIBUTIONS		31,308.00
RESERVE USBR CONTRACT OB	288,000.00	288,000.00
RESERVE OPERATIONS EQUIPMENT	116,265.35	116,265.35
RESERVE FOR ADVANCE WATER	25,391.84	25,391.84
RESERVE FOR SP CONST	47,875.84	47,875.84
TOTAL RESERVES	477,533.03	477,533.03
UNAPPROPRIATED SURPLUS	1,887,331.73	1,361,474.26
INCOME SUMMARY	749,421.66	525,857.47
TOTAL EQUITY	3,114,286.42	2,396,172.76
TOTAL LIABILITY & EQUITY	10,420,366.83	10,089,693.60

ROZA IRRIGATION DISTRICT
Sunnyside, Washington
Comparative Balance Sheet
December 31, 1995 and 1994

ASSETS	1995	1994
Current Assets:		
Cash	$ 539,419.62	$ 753,720.21
Receivables:		
Assessments Receivable	37,979.73	19,891.36
Accounts Receivable	84,891.73	75,248.56
Due from Other Governmental Units	133,294.81	94,030.44
Accrued Interest	12,733.28	40,383.40
Inventory, at Lifo	63,829.20	64,197.04
Prepaid Expenses	575,833.12	734,838.89
TOTAL CURRENT ASSETS	1,447,981.49	1,782,309.90
Restricted Assets:		
Investments, at Costs	1,529,171.55	475,000.00
LID Receivable	- 0 -	106,620.90
Contract Receivable	6,420,330.35	6,690,839.33
TOTAL RESTRICTED ASSETS	7,949,501.90	7,272,460.23
Property and Equipment:		
Land	185,130.03	185,130.03
Buildings	90,689.05	90,689.05
Rereg Facilities	597,185.35	573,106.73
Const. & Maint. Equipment	1,656,296.44	1,611,430.96
Miscellaneous Equipment	61,475.34	61,475.34
Office Equip. & Comp. Soft.	189,767.98	166,180.66
Storage Tanks	49,700.00	49,700.00
	2,830,244.19	2,737,712.77
Less Accumulated Depreciation	1,807,360.75	1,702,789.30
NET PROPERTY AND EQUIPMENT	1,022,883.44	1,034,923.47
Deferred Compensation	152,614.89	111,199.12
TOTAL ASSETS	$10,572,981.72	$10,200,892.72

ROZA IRRIGATION DISTRICT
Sunnyside, Washington
Comparative Balance Sheet
December 31, 1995 and 1994

LIABILITIES	1995	1994
Current Liabilities		
(Payable from Current Assets):		
Vouchers Payable	65,937.13	69,002.72
Accrued Expenses	514,433.24	486,844.74
TOTAL CURRENT LIABILITIES (Payable from Current Assets)	580,370.37	555,847.46
Current Liabilities		
(Payable from Restricted Assets):		
Deposits	305,379.72	330,582.60
Contract Payable-USBR	270,508.95	270,731.19
Contract Payable-LID	- 0 -	116,029.24
TOTAL CURRENT LIABILITIES (Payable from Restricted Assets	575,888.67	717,343.03
TOTAL CURRENT LIABILITIES	1,156,259.04	1,273,190.49
Long-Term Liabilities:		
Contract Payable-USBR	6,149,821.37	6,420,330.35
Deferred Compensation	152,614.89	111,199.12
TOTAL LONG-TERM LIABILITIES	6,302,436.26	6,531,529.47
TOTAL LIABILITIES	7,458,695.30	7,804,719.96
EQUITY		
Contributed Capital, Net of Amortization	- 0 -	31,308.00
Retained Earnings:		
Reserve for USBR Contract	288,000.00	288,000.00
Reserve for Operations	116,265.35	116,265.35
Reserve for Advance Water	25,391.84	25,391.84
Reserve for Special Construction	47,875.84	47,875.84
Unreserved	2,636,753.39	1,887,331.73
TOTAL EQUITY	3,114,286.42	2,396,172.76
TOTAL LIABILITIES AND EQUITY	$10,572,981.72	$10,200,892.72

APPENDIX II
STATEMENT OF INCOME AND EXPENSE

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

PGMGL6400
GENERAL LEDGER
FINANCIAL STATEMENT

ROZA IRRIGATION DISTRICT
STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1994 FUNCTION REPORT

	YTD BALANCE	LYT BALANC
ASSESSMENT INCOME O&M	3,924,234.30	3,310,919.39
ASSESSMENT INCOME-CONST.	2,303.76	2,290.09
ASSESSMENT INCOME-LID		
TOTAL ASSESSMENT INCOME	3,926,538.06	3,313,209.48
INCOME DELINQ-FEES & CHAR		
TOTAL DELINQ INCOME		
INCOME USBR-CHANDLER	47,994.47	39,350.96
INCOME USBR-STORAGE	166,755.19	204,500.53
INCOME USBR-RESERVE WORKS	130,669.58	113,064.53
INCOME USBR-HUBBARD DITCH		
INCOME USBR-FISH FACILITS	191,298.65	145,942.04
INCOME USBR-CONSOL STUDY		
TOTAL INCOME USBR	536,717.89	502,858.06
INT INCOME/INV-O&M	30,410.88	7,084.96
INT INCOME/INV-CONST	5,872.95	1,445.00
INT INCOME/INV-LID	67.03	
INT INCOME/INV-SF CONST	3,032.40	1,650.11
INT INCOME/INV-RES USBR	17,565.83	9,918.24
INT INCOME/INV-RES OF	6,911.15	3,911.13
INT INCOME/INV-AD WATER	1,439.82	825.06
INT INCOME/INV-DEL ASSMT	4,336.83	1,849.16
INT INCOME/INV-OTHERS	32,816.34	37,152.55
TOTAL INTEREST INCOME	102,453.23	63,836.21
INCOME-RENTAL HOUSES	24,541.41	24,511.65
TOTAL RENTAL INCOME	24,541.41	24,511.65
INCOME-MISCELLANEOUS	156,177.93	123,388.94
INCOME-EXTRA WATER		13,067.20
INCOME-CO OP PIPE		
INCOME-TOE DRAIN CONST.		
INCOME-SULPHUR CREEK		
INCOME-JURY DUTY		
INCOME-FISH BIO		
INCOME 90/91 P-P CCW		
INCOME WW5 AUTO/CENT	965.32	6,253.71
INCOME WW5 AUTO	482.66	3,125.21
INCOME 94 LID GRANT	24,672.90	
INCOME-91/92 P/P REF 38		
INCOME-91/92 P/P CCW		15,485.51
INCOME-92/93 P/P REF 38	256,939.15	135,822.35
INCOME-WW7 REREG/CCW	71,423.19	19,326.81
INCOME-WW7 REREG/REF 38	59,512.67	16,112.36
INCOME-92/93 P/P CCW		
TOTAL MISC. INCOME	570,173.82	332,582.09
TOTAL INCOME	5,160,424.41	4,236,997.49

ROZA IRRIGATION DISTRICT
STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1994 FUNCTION REPORT

	YTD BALANCE	LYTD BALANCE
MAIN CANAL-LINED-BURNING	2,202.57	1,167.77
MAIN CANAL-LINED-CLEAN	1,293.14	12,561.90
MAIN-CANAL-LINED-CONST.	17.60	
MAIN CANAL-LINED-GROUTING	2,232.36	334.85
MAIN CANAL-LINED-REPAIR	41,931.68	13,017.88
MAIN CANAL-LINED-SEALING	8,927.66	2,981.54
MAIN CANAL-LINED-DRAINAGE	4,196.65	2,235.09
MAIN CANAL-LINED-REHAB COUNTRY CLUB		
TOTAL MAIN CANAL LINED	60,801.66	32,299.03
MAIN CANAL-UNLINED-BERM	245.12	12,271.34
MAIN CANAL-UNLINED-BURN	3,441.17	7,798.42
MAIN CANAL-UNLINED-CLEAN	9,240.98	8,236.54
MAIN CANAL-UNLINED-CORING	498.91	32.76
MAIN CANAL-UNLINED-REPAIR	3,631.36	10,284.63
TOTAL MAIN CANAL UNLINED	17,057.54	38,623.69
MAIN CANAL-GROUND WEEDS-SPRAYING	38,051.67	34,462.78
MAIN CANAL-GROUND WEEDS-PULLING	756.54	119.12
MAIN CANAL-GROUND WEEDS-MOWING	24,198.16	24,976.24
TOTAL MAIN CANAL GROUND WEEDS	63,006.37	59,558.14
MAIN CANAL-AQUATIC WEEDS	54,825.05	69,701.94
TOTAL MAIN CANAL-AQUATIC WEEDS	54,825.05	69,701.94
MAIN CANAL-STRUCTURES-CONSTRUCTING	4,102.42	7,000.17
MAIN CANAL-STRUCTURES-GROUTING	88.90	642.37
MAIN CANAL-STRUCTURES-REPAIRING	7,250.94	8,320.33
MAIN CANAL-AUTO STRUCTURE REPAIRING		
TOTAL MAIN CANAL STRUCTURES	11,442.26	15,962.87
MAIN CANAL-ROADS-CONST		
MAIN CANAL-ROADS-BRIDGES/ CATTLEGUARDS	3,559.17	250.42
MAIN CANAL-ROADS-REPAIR	2,454.71	5,173.40
TOTAL MAIN CANAL ROADS	6,013.88	5,423.82
MAIN CANAL-WASTEWAYS-BURN	3.20	781.00
MAIN CANAL-WASTEWAYS-CLEANING	201.84	457.66
MAIN CANAL-WASTEWAYS-		

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STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1994 FUNCTION REPORT

	YTD BALANCE	LY BALAN
GROUTING		
MAIN CANAL-WASTEWAYS-REPAIRING	968.63	2,100.58
MAIN CANAL-WASTEWAYS-SEALING		
MAIN CANAL-WASTEWAYS-SPRAYING		2,076.67
TOTAL MAIN CANAL-WASTEWAYS	1,173.67	5,415.91
MAIN CANAL- SI & TUNNELS-CLEANING	1,062.08	618.99
MAIN CANAL-SI & TUNNELS-GROUTING		
MAIN CANAL-SI & TUNNELS-REPAIRING	1,298.57	146.84
MAIN CANAL-SI & TUNNELS-SEALING		
TOTAL MAIN CANAL-SI & TUNNELS	2,360.65	765.83
WW2-UNION GAP FLUME-REPAIRS		
TOTAL UNION GAP FLUME		
TOTAL MAIN CANAL	216,681.08	227,751.23
EN CONDUIT SYS-REPAIRING	6,157.75	
EN CONDUIT SYS-LOCATING	653.27	
TOTAL EN CONDUIT SYSTEMS	6,811.02	
LATERAL-PIPED-CONSTRUCT	5,532.66	34,034.64
LATERAL-PIPED-REPAIRING	46,564.11	65,235.26
LATERAL-PIPED-LOCATING	3,341.32	3,100.58
TOTAL LATERAL PIPED	55,438.09	102,370.48
LATERAL-OPEN-BURNING	31,957.36	26,853.84
LATERAL-OPEN-CLEANING	68,993.92	57,146.31
LATERAL-OPEN-CORING	4,812.93	887.24
LATERAL-OPEN-REPAIRING	8,249.94	9,946.19
TOTAL LATERAL OPEN	114,014.15	94,833.58
LATERAL GROUND WEEDS-SPRAYING	21,358.27	27,297.85
LATERAL-GROUND WEEDS-PULLING	854.96	4,076.68
LATERAL-GROUND WEEDS-MOWING	29,296.76	40,577.11
TOTAL LATERAL GROUND WEED	51,509.99	71,951.64
LATERAL-AQUATIC WEEDS	15,233.63	6,596.72
TOTAL LATERAL AQUAT WEEDS	15,233.63	6,596.72

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	YTD BALANCE	LYTD BALANCE
LATERAL-STRUCTURES-CONSTRUCTING	3,754.18	11,947.85
LATERAL-STRUCTURES-GROUTING	660.78	249.47
LATERAL-STRUCTURES-REPAIRING	20,455.46	25,621.05
TOTAL LATERAL STRUCTURES	24,870.42	37,818.37
LATERAL-FLOWMETERS-CONSTRUCTING	14.08	271.42
LATERAL-FLOWMETERS-REPAIRING	8,634.57	13,124.40
TOTAL FLOWMETERS	8,648.65	13,395.82
LATERAL-ROADS-CONSTRUCT	187.86	106.46
LATERAL-ROADS-BRIDGES & CATTLEGUARDS	3,737.54	76.16
LATERAL-ROADS-REPAIRING	17,945.48	26,942.16
TOTAL LATERAL ROADS	21,870.88	27,124.78
LATERAL-WASTEWAYS-BURNING	143.88	199.08
LATERAL-WASTEWAYS-CLEAN		
LATERAL-WASTEWAYS-CONST		
LATERAL-WASTEWAYS-REPAIR	110.72	891.91
TOTAL LATERAL WASTEWAYS	254.60	1,090.99
TOTAL LATERALS	298,651.43	355,182.38
DRAINS-OPEN,TOE-BURN		
DRAINS-OPEN,TOE-CLEANING		
DRAINS-OPEN,TOE-CONSTRUCT		2,414.71
DRAINS-OPEN,TOE-REPAIRING	84.88	498.38
DRAINS-OPEN,TOE-SPRAYING		
DRAINS-OPEN,TOE-PULLING		
DRAINS-OPEN,TOE-MOWING	39.20	
TOTAL DRAINS-OPEN,TOE	124.08	2,913.09
DRAINS-OPEN,OUTLET-BURN	1,399.76	236.68
DRAINS-OPEN,OUTLET-CLEAN	18,628.55	23,038.15
DRAINS-OPEN,OUTLET-CONST		457.64
DRAINS-OPEN,OUTLET-REPAIR	12.50	55.36
DRAINS-OPEN,OUTLET-SPRAY		730.35
DRAINS-OPEN,OUTLET-PULL		
DRAINS-OPEN,OUTLET-MOWING	31.15	
TOTAL DRAINS OPEN,OUTLET	20,071.96	24,518.18
DRAINS-OPEN,PICKUP-BURN	800.22	1,174.60
DRAINS-OPEN,PICKUP-CLEAN	9,657.12	3,300.72
DRAINS-OPEN,PICKUP-CONST		
DRAINS-OPEN,PICKUP-REPAIR		106.32
DRAINS-OPEN,PICKUP-SPRAY		810.99

	YTD BALANCE	LYT BALANC
DRAINS-OPEN,PICKUP-PULL		29.25
DRAINS-OPEN,PICKUP-MOWING	553.60	
TOTAL DRAINS OPEN,PICKUP	11,010.94	5,421.88
DRAINS-OPEN,JOINT-BURNING		
DRAINS-OPEN,JOINT-CLEAN		
DRAINS-OPEN,JOINT-CONST		
DRAINS-OPEN,JOINT-REPAIR		
DRAINS-OPEN,JOINT-SPRAY	1,122.87	1,277.12
DRAINS-OPEN,JOINT-PULLING		
DRAINS-OPEN,JOINT-MOWING		
TOTAL DRAINS OPEN,JOINT	1,122.87	1,277.12
ROZA MAINTAINED-DID #11- BURNING		22.44
ROZA MAINTAINED-DID #11- CLEANING	214.24	5,294.67
ROZA MAINTAINED-DID #11- CONSTRUCTING		
ROZA MAINTAINED-DID #11- REPAIRING	852.76	
ROZA MAINTAINED-DID #11- SPRAYING		
ROZA MAINTAINED-DID #11- PULLING		
ROZA MAINTAINED-DID #11- MOW & CUT	23.04	632.60
JOINT DRAINS-SVID	126,629.50	104,875.00
DRAINS-DID #11	25,931.79	26,630.57
TOTAL JOINT DRAINS & DID #11	153,651.33	137,455.28
DRAINS-PIPED,TOE-CONST		23,060.09
DRAINS-PIPED,TOE-REPAIR	4,151.59	20,917.81
TOTAL DRAINS PIPED, TOE	4,151.59	43,977.90
DRAINS-PIPED,OUTLET- CONSTRUCTING		
DRAINS-PIPED,OUTLET- REPAIRING	104.81	633.51
TOTAL DRAINS PIPED,OUTLET	104.81	633.51
DRAINS-PIPED,PICKUP- CONSTRUCTING		29.78
DRAINS-PIPED,PICKU- REPAIRING	555.42	2,187.59
TOTAL DRAINS PIPED,PICKUP	555.42	2,217.37
DRAINS-PIPED,JOINT-CONST		
DRAINS-PIPED,JOINT-REPAIR	56.66	
TOTAL DRAINS-PIPED,JOINT	56.66	

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	YTD BALANCE	LYTD BALANCE
DRAINS-PUMPS,SVID WT TRAN	49,110.57	
TOTAL DRAINS PUMPS SVID	49,110.57	
TOTAL DRAINS	239,960.23	218,414.33
PUMPING PLANTS-PUMPS	56,737.80	66,165.69
PUMPING PLANTS-MOTORS	1,910.75	261.07
PUMPING PLANTS-CONTROLS	16,287.16	11,664.10
PUMPING PLANTS-STRUCTURE	4,290.55	649.46
PUMPING PLANTS- PIPES & VALVES	2,988.02	1,596.62
PUMP MAINTENANCE SHOP	1,338.67	710.14
PUMPS-SILT REMOVAL	4,219.47	3,991.08
TOTAL PUMPING PLANTS & PUMPS	87,772.42	85,038.16
SAFETY	2,316.11	2,081.45
TOTAL SAFETY	2,316.11	2,081.45
TOTAL PUMPS & SAFETY	90,088.53	87,119.61
WW5-REREG CANAL AUTO	1,643.26	14,083.77
COMPREHENSIVE PLAN		
91/92 PRESSURE PROJECT		
92-93 PRESSURE PROJECT	609,020.30	397,551.42
PUMP 9 CHECK	197,988.27	25,299.78
89-90 PRESS PROJ/LINING	42,814.86	6,477.54
90-91 PRESSURE PROJECT		
TOTAL PRESSURE PROJECTS	851,466.69	443,412.51
REIMBURSABLE-CHANDLER CAN	35,017.62	28,293.93
REIMBURSABLE-ROZA CANAL	88,731.57	82,415.72
REIMBURSABLE-STORAGE DIV	112,905.04	148,550.27
REIMBURSABLE-PRIVATE IND.	79,075.97	69,813.42
REIMBURSABLE-PHONES		
REIMBURSABLE-HUBBARD DITC		
REIMBURSABLE-FISH FACILIT	126,181.31	100,434.16
REIMBURSABLE-CONSOL STUDY		
TOTAL REIMBURSABLES	441,911.51	429,507.50
EQUIPMENT EXPENSES	26,104.61-	5,879.21-
EQUIPMENT-MISC.	23,686.51	30,815.12
EQUIPMENT-TOOLS	10,868.92	8,246.12
TOTAL EQUIPMENT EXPENSES	8,450.82	33,182.03
STOREHOUSE EXPENSES	12,861.82	14,569.38
TOTAL STOREHOUSE EXPENSE	12,861.82	14,569.38
SHOP EXPENSE	10,358.83-	12,106.01
TOTAL SHOP EXPENSE	10,358.83-	12,106.01
YARD BUILDINGS	2,340.64	6,056.08

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	YTD BALANCE	LYT BALANC
OFFICE BUILDING	2,722.79	844.06
TOTAL BUILDINGS	5,063.43	6,900.14
GROUNDS EXPENSES	6,506.18	7,932.92
TOTAL GROUNDS EXPENSES	6,506.18	7,932.92
DISTRICT HOUSES-MISC		351.44
DISTRICT HOUSE-WW 2	577.39	954.27
DISTRICT HOUSE-PUMP 3		
DISTRICT HOUSE-WW 3	2,130.65	1,104.84
DISTRICT HOUSE-PUMP 8	135.54	70.95
DISTRICT HOUSE-PUMP 9	458.34	40.17
DISTRICT HOUSE-PUMP 9A		
DISTRICT HOUSE-WW 5	333.96	676.64
DISTRICT HOUSE-P 13 E	291.56	177.99
DISTRICT HOUSE-P 13 W	282.83	6,475.65
DISTRICT HOUSE-P 14 E	231.59	483.04
DISTRICT HOUSE-P 14 W	82.55	299.90
DISTRICT HOUSE-P 15	343.87	2,034.33
DISTRICT HOUSE-WW 6		
DISTRICT HOUSE-P 16	18.18	629.64
DISTRICT HOUSE-P 17	140.00	65.06
TOTAL DISTRICT HOUSES	5,026.46	13,363.92
COMPENSATION-A/L-O&M	98,517.59	88,152.79
COMPENSATION-S/L-O&M	42,015.29	59,362.39
COMPENSATION-HOLIDAY-O&M	42,755.12	48,380.40
JURY DUTY-O&M	200.88	337.58
TAXES-SOCIAL SECURITY-O&M	110,018.97	106,649.98
TAXES-STATE & FEDERAL UNEMPLOYMENT-O&M	3,514.84	11,277.91
IND INS & MED AID-FIELD	33,661.31	31,173.73
GROUP INSURANCE-UNION	131,239.96	87,851.21
STATE RETIREMENT-O&M	138,284.07	102,210.48
MILEAGE & TRAVEL-O&M		
RODENT CONTROL		
WATER MANAGEMENT& CONTROL	212,449.98	235,813.87
SHOW UP TIME		53.16
RADIO	8,518.86	6,905.07
UTILITIES-STOREHOUSE	2,400.41	2,546.75
UTILITIES-GATES&WASTEWAYS	671.36	656.47
TOTAL BENEFITS, WATER-MANAGEMENT & MISC.	824,248.64	781,371.79
WASTEWAY 7 REREG-O&M		
WASTEWAY 7 REREG/CONST		45,668.50
WASTEWAY 6 REREG-O&M	7,598.49	6,394.88
TOTAL REREG	7,598.49	52,063.38
CONTRACT/USBR-STORAGE	306,200.79	234,295.12
CONTRACT/USBR-RESERVE WKS	68,530.38	70,919.79
CONTRACT/USBR-WATER QUAL		

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	YTD BALANCE	LYTD BALANCE
ONTRACT/USBR-GEN SUPERVI		
ONTRACT/USBR-REMOTE CONT		
ONTRACT/USBR-POWER	211,607.00	315,726.00
ONTRACT/USBR-MISC.		
TOTAL CONTRACTS USBR	586,338.17	620,940.91
USBR Power	211,607.00	315,726.00
USBR other	374,731.17	305,214.91
DMIN & GENERAL SALARIES		
OMPENSATION-A/L-ADMIN		
OMPENSATION-S/L-ADMIN		
OMPENSATION-HOLIDAY-ADM		
URY DUTY-ADMIN & GENERAL		
AXES-SOCIAL SEC-ADMIN		
AXES-STATE & FEDERAL		
UNEMPLOYMENT-ADMIN		
ND INS & MED AID - NON-UNION		
ROUP INS-ADMIN & GENERAL		
T RETIRE/NON-UNION		
TOTAL ADMIN. & GENERAL EXPENSES		
IRECTOR'S FEES		
RAVEL & MILEAGE- ADMIN & SUPER		
RAVEL & MILEAGE-DIRECTOR	15,429.13	9,564.48
ISC TAXES	360.13	412.04
CCOUNT & AUDIT-SERVICE		87.80
EGAL SERVICES	4,286.76	21,534.12
EGAL SERVICE-WT RIGHTS	93,224.65	43,793.77
EGAL SERVICE-JT DRAINS	3,993.02	9,522.84
EGAL SERVICE-POWER RITES		
NGINEERING	450.00	1,260.00
NGINEER/REREG & AUTO		
NGINEER/WW6 REREG		
ASTEWATER RECOVERY		250.00
OMPUTER PROGRAMS-SERVICE	767.59	299.52
OMPUTER EXPENSE	3,167.27	2,443.05
ROF REPORTS		
NSURANCE-PROPERTY	14,664.88	15,194.81
NSURANCE-INJURY&DAMAG	55,138.37	44,982.62
NSURANCE-DIRECTORS & OFFICERS	7,973.33	1,893.44
NSURANCE-OTHERS	2,845.58	1,442.51
ELEPHONE-837 5141	8,723.63	5,756.54
ELEPHONE-837 4157	873.19	862.46
ELEPHONE-837 2223	1,143.49	1,358.90
ELEPHONE-877 2122 & 453 6066	2,396.10	2,483.15
ELEPHONE-973 2441	1,545.84	1,479.47
ELEPHONE-SUPERVISORS	2,197.46	2,227.82
HONE SYSTEMS REPAIRS	2.35	359.97
ELLULAR PHONES		

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	YTD BALANCE	LYTD BALANCE
UTILITIES-OFFICE	3,919.16	3,965.43
INVESTMENT EXPENSES		
LID EXPENSES	15,903.39	70.00
OFFICE EQUIPMENT	3,674.75	6,126.26
OFFICE SUPPLIES	1,690.30	2,093.80
OFFICE EXPENSES	15,395.79	14,568.45
REFERENCE MATERIALS	4,345.07	3,208.52
PUBLISHING	399.19-	785.22
DUES & SUBSCRIPTIONS	16,721.27	12,659.00
ASSESSMENT REFUNDS		
TOTAL MISC.	342,000.86	265,111.94
FISHERIES BIOLOGIST		17,446.18
TOTAL FISHERIES BIOLOGIST		17,446.18
DEPRECIATION-EQUIPMENT	65,766.88	
DEPRECIATION-BUILD&OFFICE	2,267.23	2,267.23
DEPRECIATION-MISC EQUIP	8,877.42	8,877.42
DEPRECIATION-OFF EQUIP	5,585.74	11,587.73
DEPRECIATION-WW6 REREG	33,628.37	33,628.37
DEPRECIATION-STORAGE TANK	4,970.00	4,970.00
DEPRECIATION-SOFT WARE	8,889.15	8,889.18
DEPRECIATION-WW7 REREG	23,682.64	
TOTAL DEPRECIATION	153,667.43	70,219.93
TOTAL EXPENSES	4,634,566.94	4,259,047.70
NET INCOME <LOSS>	525,857.47	22,050.21-

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	YTD BALANCE	LYTD BALANCE
ASSESSMENT INCOME O&M	4,537,792.19	3,924,234.30
ASSESSMENT INCOME-CONST.	2,327.13	2,303.76
ASSESSMENT INCOME-LID		
TOTAL ASSESSMENT INCOME	4,540,119.32	3,926,538.06
INCOME DELINQ-FEES & CHAR		
TOTAL DELINQ INCOME		
INCOME USBR-CHANDLER	34,966.77	47,994.47
INCOME USBR-STORAGE	98,046.27	166,755.19
INCOME USBR-RESERVE WORKS	79,115.68	130,669.58
INCOME USBR-HUBBARD DITCH		
INCOME USBR-FISH FACILITS	192,159.98	191,298.65
INCOME USBR-CONSOL STUDY		
TOTAL INCOME USBR	404,288.70	536,717.89
INT INCOME/INV-O&M	78,891.89	30,410.88
INT INCOME/INV-CONST	9,811.25	5,872.95
INT INCOME/INV-LID		67.03
INT INCOME/INV-SF CONST	3,151.03	3,032.40
INT INCOME/INV-RES USBR	18,605.40	17,565.83
INT INCOME/INV-RES OP	7,320.16	6,911.15
INT INCOME/INV-AD WATER	1,525.03	1,439.82
INT INCOME/INV-DEL ASSMT	2,039.91	4,336.83
INT INCOME/INV-OTHERS	48,306.44	32,816.34
TOTAL INTEREST INCOME	169,651.11	102,453.23
INCOME-RENTAL HOUSES	24,209.68	24,541.41
TOTAL RENTAL INCOME	24,209.68	24,541.41
INCOME-MISCELLANEOUS	166,096.55	156,177.93
INCOME-EXTRA WATER	325,072.93	
INCOME-CO OP PIPE		
INCOME-TOE DRAIN CONST.		
INCOME-SULPHUR CREEK		
INCOME-JURY DUTY		
INCOME-FISH BIO		
INCOME 90/91 P-P CCW		
INCOME WW5 AUTO/CENT		965.32
INCOME WW5 AUTO		482.66
INCOME 94 LID GRANT		24,672.90
INCOME-91/92 P/P REF 38		
INCOME-PRIOR PERIOD ADJ.	31,308.00	
INCOME-92/93 P/P REF 38	291,653.87	256,939.15
INCOME-WW7 REREG/CCW		71,423.19
INCOME-WW7 REREG/REF 38	25,083.58	59,512.67
INCOME-92/93 P/P CCW		
TOTAL MISC. INCOME	839,214.93	570,173.82
TOTAL INCOME	5,977,483.74	5,160,424.41

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	YTD BALANCE	LYT BALANC
MAIN CANAL-LINED-BURNING	183.75	2,202.57
MAIN CANAL-LINED-CLEAN	694.16	1,293.14
MAIN-CANAL-LINED-CONST.	48.00	17.60
MAIN CANAL-LINED-GROUTING	6,292.78	2,232.36
MAIN CANAL-LINED-REPAIR	25,076.32	41,931.68
MAIN CANAL-LINED-SEALING		8,927.66
MAIN CANAL-LINED-DRAINAGE	2,717.39	4,196.65
MAIN CANAL-LINED-REHAB COUNTRY CLUB		
TOTAL MAIN CANAL LINED	35,012.40	60,801.66
MAIN CANAL-UNLINED-BERM	3,424.10	245.12
MAIN CANAL-UNLINED-BURN	9,337.94	3,441.17
MAIN CANAL-UNLINED-CLEAN	9,060.26	9,240.98
MAIN CANAL-UNLINED-CORING	7,438.63	498.91
MAIN CANAL-UNLINED-REPAIR	25,989.25	3,631.36
TOTAL MAIN CANAL UNLINED	55,250.18	17,057.54
MAIN CANAL-GROUND WEEDS-SPRAYING	43,280.87	38,051.67
MAIN CANAL-GROUND WEEDS-PULLING	61.68	756.54
MAIN CANAL-GROUND WEEDS-MOWING	25,494.35	24,198.16
TOTAL MAIN CANAL GROUND WEEDS	68,836.90	63,006.37
MAIN CANAL-AQUATIC WEEDS	92,340.64	54,825.05
TOTAL MAIN CANAL-AQUATIC WEEDS	92,340.64	54,825.05
MAIN CANAL-STRUCTURES-CONSTRUCTING	1,832.30	4,102.42
MAIN CANAL-STRUCTURES-GROUTING	232.95	88.90
MAIN CANAL-STRUCTURES-REPAIRING	16,573.19	7,250.94
MAIN CANAL-AUTO STRUCTURE REPAIRING	976.27	
TOTAL MAIN CANAL STRUCTURES	19,614.71	11,442.26
MAIN CANAL-ROADS-CONST	1,582.07	
MAIN CANAL-ROADS-BRIDGES/CATTLEGUARDS		3,559.17
MAIN CANAL-ROADS-REPAIR	4,739.01	2,454.71
TOTAL MAIN CANAL ROADS	6,321.08	6,013.88
MAIN CANAL-WASTEWAYS-BURN	20.30	3.20
MAIN CANAL-WASTEWAYS-CLEANING	88.87	201.84
MAIN CANAL-WASTEWAYS-	2,169.57	

	YTD BALANCE	LYTD BALANCE
GROUTING		
MAIN CANAL-WASTEWAYS-REPAIRING	727.44	968.63
MAIN CANAL-WASTEWAYS-SEALING		
MAIN CANAL-WASTEWAYS-SPRAYING		
TOTAL MAIN CANAL-WASTEWAYS	3,006.18	1,173.67
MAIN CANAL- SI & TUNNELS-CLEANING		1,062.08
MAIN CANAL-SI & TUNNELS-GROUTING		
MAIN CANAL-SI & TUNNELS-REPAIRING	267.41	1,298.57
MAIN CANAL-SI & TUNNELS-SEALING		
TOTAL MAIN CANAL-SI & TUNNELS	267.41	2,360.65
WW2-UNION GAP FLUME-REPAIRS		
TOTAL UNION GAP FLUME		
TOTAL MAIN CANAL	280,649.50	216,681.08
EN CONDUIT SYS-REPAIRING	10,558.91	6,157.75
EN CONDUIT SYS-LOCATING	260.12	653.27
TOTAL EN CONDUIT SYSTEMS	10,819.03	6,811.02
LATERAL-PIPED-CONSTRUCT	3,631.42	5,532.66
LATERAL-PIPED-REPAIRING	43,595.14	46,564.11
LATERAL-PIPED-LOCATING	1,920.83	3,341.32
TOTAL LATERAL PIPED	49,147.39	55,438.09
LATERAL-OPEN-BURNING	32,493.03	31,957.36
LATERAL-OPEN-CLEANING	51,123.83	68,993.92
LATERAL-OPEN-CORING	14,389.11	4,812.93
LATERAL-OPEN-REPAIRING	18,319.57	8,249.94
TOTAL LATERAL OPEN	116,325.54	114,014.15
LATERAL GROUND WEEDS-SPRAYING	16,659.58	21,358.27
LATERAL-GROUND WEEDS-PULLING	2,870.30	854.96
LATERAL-GROUND WEEDS-MOWING	33,725.97	29,296.76
TOTAL LATERAL GROUND WEED	53,255.85	51,509.99
LATERAL-AQUATIC WEEDS	16,497.21	15,233.63
TOTAL LATERAL AQUAT WEEDS	16,497.21	15,233.63

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	YTD BALANCE	LYTD BALANCE
LATERAL-STRUCTURES-CONSTRUCTING	3,992.98	3,754.18
LATERAL-STRUCTURES-GROUTING	913.03	660.78
LATERAL-STRUCTURES-REPAIRING	22,847.69	20,455.46
TOTAL LATERAL STRUCTURES	27,753.70	24,870.42
LATERAL-FLOWMETERS-CONSTRUCTING	114.93	14.08
LATERAL-FLOWMETERS-REPAIRING	12,537.38	8,634.57
TOTAL FLOWMETERS	12,652.31	8,648.65
LATERAL-ROADS-CONSTRUCT	103.60	187.86
LATERAL-ROADS-BRIDGES & CATTLEGUARDS		3,737.54
LATERAL-ROADS-REPAIRING	8,998.14	17,945.48
TOTAL LATERAL ROADS	9,101.74	21,870.88
LATERAL-WASTEWAYS-BURNING	151.68	143.88
LATERAL-WASTEWAYS-CLEAN		
LATERAL-WASTEWAYS-CONST		
LATERAL-WASTEWAYS-REPAIR		110.72
TOTAL LATERAL WASTEWAYS	151.68	254.60
TOTAL LATERALS	295,704.45	298,651.43
DRAINS-OPEN,TOE-BURN		
DRAINS-OPEN,TOE-CLEANING	131.82	
DRAINS-OPEN,TOE-CONSTRUCT	2,131.06	
DRAINS-OPEN,TOE-REPAIRING	1,088.91	84.88
DRAINS-OPEN,TOE-SPRAYING		
DRAINS-OPEN,TOE-PULLING		
DRAINS-OPEN,TOE-MOWING	45.12	39.20
TOTAL DRAINS-OPEN,TOE	3,396.91	124.08
DRAINS-OPEN,OUTLET-BURN	177.33	1,399.76
DRAINS-OPEN,OUTLET-CLEAN	28,583.09	18,628.55
DRAINS-OPEN,OUTLET-CONST	1,088.04	
DRAINS-OPEN,OUTLET-REPAIR	961.98	12.50
DRAINS-OPEN,OUTLET-SPRAY	319.57	
DRAINS-OPEN,OUTLET-PULL		
DRAINS-OPEN,OUTLET-MOWING		31.15
TOTAL DRAINS OPEN,OUTLET	31,130.01	20,071.96
DRAINS-OPEN,PICKUP-BURN	3,867.19	800.22
DRAINS-OPEN,PICKUP-CLEAN	9,233.63	9,657.12
DRAINS-OPEN,PICKUP-CONST	222.79	
DRAINS-OPEN,PICKUP-REPAIR	1,341.29	
DRAINS-OPEN,PICKUP-SPRAY	146.72	

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	YTD BALANCE	LYTD BALANCE
DRAINS-OPEN, PICKUP-PULL	382.10	
DRAINS-OPEN, PICKUP-MOWING	331.80	553.60
TOTAL DRAINS OPEN, PICKUP	15,525.52	11,010.94
DRAINS-OPEN, JOINT-BURNING		
DRAINS-OPEN, JOINT-CLEAN		
DRAINS-OPEN, JOINT-CONST		
DRAINS-OPEN, JOINT-REPAIR	69.30	
DRAINS-OPEN, JOINT-SPRAY	1,150.94	1,122.87
DRAINS-OPEN, JOINT-PULLING		
DRAINS-OPEN, JOINT-MOWING		
TOTAL DRAINS OPEN, JOINT	1,220.24	1,122.87
ROZA MAINTAINED-DID #11-BURNING		
ROZA MAINTAINED-DID #11-CLEANING	69.76	214.24
ROZA MAINTAINED-DID #11-CONSTRUCTING		
ROZA MAINTAINED-DID #11-REPAIRING	563.78	852.76
ROZA MAINTAINED-DID #11-SPRAYING		
ROZA MAINTAINED-DID #11-PULLING		
ROZA MAINTAINED-DID #11-MOW & CUT		23.04
JOINT DRAINS-SVID	176,712.39	126,629.50
DRAINS-DID #11	19,449.03	25,931.79
TOTAL JOINT DRAINS & DID #11	196,794.96	153,651.33
DRAINS-PIPED, TOE-CONST	13,956.59	
DRAINS-PIPED, TOE-REPAIR	10,320.17	4,151.59
TOTAL DRAINS PIPED, TOE	24,276.76	4,151.59
DRAINS-PIPED, OUTLET-CONSTRUCTING		
DRAINS-PIPED, OUTLET-REPAIRING	1,719.88	104.81
TOTAL DRAINS PIPED, OUTLET	1,719.88	104.81
DRAINS-PIPED, PICKUP-CONSTRUCTING	289.30	
DRAINS-PIPED, PICKU-REPAIRING	1,747.11	555.42
TOTAL DRAINS PIPED, PICKUP	2,036.41	555.42
DRAINS-PIPED, JOINT-CONST		
DRAINS-PIPED, JOINT-REPAIR		56.66
TOTAL DRAINS-PIPED, JOINT		56.66

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	YTD BALANCE	LYTD BALANCE
DRAINS-PUMPS,SVID WT TRAN		49,110.57
TOTAL DRAINS PUMPS SVID		49,110.57
TOTAL DRAINS	276,100.69	239,960.23
PUMPING PLANTS-PUMPS	63,688.46	56,737.80
PUMPING PLANTS-MOTORS	3,416.01	1,910.75
PUMPING PLANTS-CONTROLS	11,869.19	16,287.16
PUMPING PLANTS-STRUCTURE	32.26	4,290.55
PUMPING PLANTS- PIPES & VALVES	977.47	2,988.02
PUMP MAINTENANCE SHOP	727.03	1,338.67
PUMPS-SILT REMOVAL	3,564.60	4,219.47
TOTAL PUMPING PLANTS & PUMPS	84,270.02	87,772.42
SAFETY	4,338.36	2,316.11
TOTAL SAFETY	4,338.36	2,316.11
TOTAL PUMPS & SAFETY	88,608.38	90,088.53
WW5-REREG CANAL AUTO		1,643.26
COMPREHENSIVE PLAN		
91/92 PRESSURE PROJECT		
92-93 PRESSURE PROJECT	659,766.33	609,020.30
PUMP 9 CHECK	164,828.17	197,988.27
89-90 PRESS PROJ/LINING	65,800.10	42,814.86
PUMP 7 CHECK	84,072.76	
TOTAL PRESSURE PROJECTS	974,467.36	851,466.69
REIMBURSABLE-CHANDLER CAN	26,033.34	35,017.62
REIMBURSABLE-ROZA CANAL	54,372.11	88,731.57
REIMBURSABLE-STORAGE DIV	62,555.74	112,905.04
REIMBURSABLE-PRIVATE IND.	54,743.59	79,075.97
REIMBURSABLE-PHONES		
REIMBURSABLE-HUBBARD DITC		
REIMBURSABLE-FISH FACILIT	119,513.23	126,181.31
REIMBURSABLE-CONSOL STUDY		
TOTAL REIMBURSABLES	317,218.01	441,911.51
EQUIPMENT EXPENSES	41,214.83-	26,104.61-
EQUIPMENT-MISC.	42,534.90	23,686.51
EQUIPMENT-TOOLS	13,765.91	10,868.92
TOTAL EQUIPMENT EXPENSES	15,085.98	8,450.82
STOREHOUSE EXPENSES	12,573.65	12,861.82
TOTAL STOREHOUSE EXPENSE	12,573.65	12,861.82
SHOP EXPENSE	3,891.82-	10,358.83-
TOTAL SHOP EXPENSE	3,891.82-	10,358.83-
YARD BUILDINGS	6,799.58	2,340.64

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	YTD BALANCE	LYT BALANCE
OFFICE BUILDING	6,218.92	2,722.79
TOTAL BUILDINGS	13,018.50	5,063.43
GROUNDS EXPENSES	13,804.07	6,506.18
TOTAL GROUNDS EXPENSES	13,804.07	6,506.18
DISTRICT HOUSES-MISC		
DISTRICT HOUSE-WW 2	127.17	577.39
DISTRICT HOUSE-PUMP 3		
DISTRICT HOUSE-WW 3	3,074.91	2,130.65
DISTRICT HOUSE-PUMP 8	457.71	135.54
DISTRICT HOUSE-PUMP 9	782.90	458.34
DISTRICT HOUSE-PUMP 9A		
DISTRICT HOUSE-WW 5	409.89	333.96
DISTRICT HOUSE-P 13 E	208.88	291.56
DISTRICT HOUSE-P 13 W		282.83
DISTRICT HOUSE-P 14 E	774.77	231.59
DISTRICT HOUSE-P 14 W	2,070.51	82.55
DISTRICT HOUSE-P 15	245.70	343.87
DISTRICT HOUSE-WW 6		
DISTRICT HOUSE-P 16	2,411.79	18.18
DISTRICT HOUSE-P 17		140.00
TOTAL DISTRICT HOUSES	10,559.23	5,026.46
COMPENSATION-A/L-O&M	101,296.61	98,517.59
COMPENSATION-S/L-O&M	54,009.66	42,015.29
COMPENSATION-HOLIDAY-O&M	50,394.87	42,755.12
JURY DUTY-O&M	74.72	200.88
TAXES-SOCIAL SECURITY-O&M	108,147.81	110,018.97
TAXES-STATE & FEDERAL UNEMPLOYMENT-O&M	53.58	3,514.84
IND INS & MED AID-FIELD	27,443.81	33,661.31
GROUP INSURANCE-UNION	136,416.82	131,239.96
STATE RETIREMENT-O&M	125,366.90	138,284.07
MILEAGE & TRAVEL-O&M		
RODENT CONTROL		
WATER MANAGEMENT& CONTROL	292,354.94	212,449.98
SHOW UP TIME	937.88	
RADIO	9,720.45	8,518.86
UTILITIES-STOREHOUSE	2,610.71	2,400.41
UTILITIES-GATES&WASTEWAYS	671.35	671.36
TOTAL BENEFITS, WATER-MANAGEMENT & MISC.	909,500.11	824,248.64
WASTEWAY 7 REREG-O&M	8,342.18	
WASTEWAY 7 REREG/CONST		
WASTEWAY 6 REREG-O&M	8,682.88	7,598.49
TOTAL REREG	17,025.06	7,598.49
CONTRACT/USBR-STORAGE	427,696.93	306,200.79
CONTRACT/USBR-RESERVE WKS	69,403.59	68,530.38
CONTRACT/USBR-WATER QUAL		

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	YTD BALANCE	LYT BALANC
CONTRACT/USBR-GEN SUPERVI		
CONTRACT/USBR-REMOTE CONT		
CONTRACT/USBR-POWER	367,987.00	211,607.00
CONTRACT/USBR-MISC.		
TOTAL CONTRACTS USBR	865,087.52	586,338.17
ADMIN & GENERAL SALARIES	358,813.56	293,060.63
COMPENSATION-A/L-ADMIN	52,891.33	48,036.61
COMPENSATION-S/L-ADMIN	29,347.94	19,484.83
COMPENSATION-HOLIDAY-ADM	27,965.44	19,041.52
JURY DUTY-ADMIN & GENERAL	178.00	
TAXES-SOCIAL SEC-ADMIN	46,666.18	43,760.17
TAXES-STATE & FEDERAL UNEMPLOYMENT-ADMIN		149.79
IND INS & MED AID - NON-UNION	6,240.27	6,644.70
GROUP INS-ADMIN & GENERAL	54,891.17	51,609.88
ST RETIRE/NON UNION	46,149.98	72,615.87
TOTAL ADMIN. & GENERAL EXPENSES	618,143.87	554,404.00
DIRECTOR'S FEES	8,800.00	12,046.24
TRAVEL & MILEAGE-ADMIN & SUPER	58,369.16	49,521.31
TRAVEL & MILEAGE-DIRECTOR	18,118.39	15,429.13
MISC TAXES	255.99	360.13
ACCOUNT & AUDIT-SERVICE	15,863.09	
LEGAL SERVICES	5,521.27	4,286.76
LEGAL SERVICE-WT RIGHTS	90,885.54	93,224.65
LEGAL SERVICE-JT DRAINS	17,774.36	3,993.02
LEGAL SERVICE-POWER RITES		
ENGINEERING	5,014.16	450.00
ENGINEER/REREG & AUTO		
ENGINEER/WW6 REREG		
WASTEWATER RECOVERY		
COMPUTER PROGRAMS-SERVICE	505.00	767.59
COMPUTER EXPENSE	1,973.35	3,167.27
CROP REPORTS	458.88	
INSURANCE-PROPERTY	7,944.04	14,664.88
INSURANCE-INJURY&DAMAG	57,231.32	55,138.37
INSURANCE-DIRECTORS & OFFICERS	4,615.45	7,973.33
INSURANCE-OTHERS	1,150.00	2,845.58
TELEPHONE-837 5141	7,500.88	8,723.63
TELEPHONE-837 4157	923.73	873.19
TELEPHONE-837 2223	1,151.79	1,143.49
TELEPHONE-877 2122 & 453 6066	2,707.02	2,396.10
TELEPHONE-973 2441	1,538.02	1,545.84
TELEPHONE-SUPERVISORS	2,654.06	2,197.46
PHONE SYSTEMS REPAIRS		2.35
CELLULAR PHONES	2,472.70	

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	YTD BALANCE	LYTD BALANCE
UTILITIES-OFFICE	3,845.96	3,919.16
INVESTMENT EXPENSES		
LID EXPENSES	920.53	15,903.39
OFFICE EQUIPMENT	5,378.28	3,674.75
OFFICE SUPPLIES	1,361.16	1,690.30
OFFICE EXPENSES	19,919.89	15,395.79
REFERENCE MATERIALS	4,612.07	4,345.07
PUBLISHING	1,821.78	399.19-
DUES & SUBSCRIPTIONS	17,145.08	16,721.27
ASSESSMENT REFUNDS		
PRIOR PERIOD ADJ.		
TOTAL MISC.	368,432.95	342,000.86
FISHERIES BIOLOGIST		
TOTAL FISHERIES BIOLOGIST		
DEPRECIATION-EQUIPMENT	63,584.20	65,766.88
DEPRECIATION-BUILD&OFFICE	2,267.23	2,267.23
DEPRECIATION-MISC EQUIP	8,877.44	8,877.42
DEPRECIATION-OFF EQUIP	9,208.65	5,585.74
DEPRECIATION-WW6 REREG	33,628.37	33,628.37
DEPRECIATION-STORAGE TANK	4,970.00	4,970.00
DEPRECIATION-SOFT WARE	7,348.18	8,889.15
DEPRECIATION-WW7 REREG	26,090.50	23,682.64
TOTAL DEPRECIATION	155,974.57	153,667.43
TOTAL EXPENSES	5,228,062.08	4,634,566.94
NET INCOME <LOSS>	749,421.66	525,857.47

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	YTD BALANCE	LYTD BALANCE
ASSESSMENT INCOME O&M	4,540,868.00	4,537,792.19
ASSESSMENT INCOME-CONST.	4,086.62	2,327.13
ASSESSMENT INCOME-LID		
TOTAL ASSESSMENT INCOME	4,544,954.62	4,540,119.32
INCOME DELINQ-FEES & CHAR		
TOTAL DELINQ INCOME		
INCOME USBR-CHANDLER	38,028.83	34,966.77
INCOME USBR-STORAGE	141,891.65	98,046.27
INCOME USBR-RESERVE WORKS	92,981.82	79,115.68
INCOME USBR-HUBBARD DITCH		
INCOME USBR-FISH FACILITS	181,043.27	192,159.98
INCOME USBR-CONSOL STUDY		
TOTAL INCOME USBR	453,945.57	404,288.70
INT INCOME/INV-O&M	73,290.79	78,891.89
INT INCOME/INV-CONST		9,811.25
INT INCOME/INV-LID		
INT INCOME/INV-SP CONST	3,239.67	3,151.03
INT INCOME/INV-RES USBR	19,762.02	18,605.40
INT INCOME/INV-RES OP	7,775.22	7,320.16
INT INCOME/INV-AD WATER	1,619.84	1,525.03
INT INCOME/INV-DEL ASSMT	1,905.08	2,039.91
INT INCOME/INV-OTHERS	81,184.48	48,306.44
TOTAL INTEREST INCOME	188,777.10	169,651.11
INCOME-RENTAL HOUSES	24,129.68	24,209.68
TOTAL RENTAL INCOME	24,129.68	24,209.68
INCOME-MISCELLANEOUS	165,929.24	166,096.55
INCOME-EXTRA WATER	407,038.00	325,072.93
INCOME-CO OP PIPE		
INCOME-TOE DRAIN CONST.		
INCOME-SULPHUR CREEK		
HEALTH/SAFETY INCOME		
INCOME 90/91 P-P CCW		
INCOME WW5 AUTO/CENT		
INCOME WW5 AUTO		
INCOME 94 LID GRANT		
INCOME 96-97 PRESS.PROJ.	167,513.11	
INCOME-PRIOR PERIOD ADJ.		31,308.00
INCOME-92/93 P/P REF 38	130,551.90	291,653.87
INCOME-WW7 REREG/CCW		
INCOME-WW7 REREG/REF 38		25,083.58
INCOME-92/93 P/P CCW		
TOTAL MISC. INCOME	871,032.25	839,214.93
TOTAL INCOME	6,082,839.22	5,977,483.74

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	YTD BALANCE	LYTD BALANCE
MAIN CANAL-LINED-BURNING	307.50	183.75
MAIN CANAL-LINED-CLEAN	1,856.80	694.16
MAIN-CANAL-LINED-CONST.		48.00
MAIN CANAL-LINED-GROUTING	8,406.38	6,292.78
MAIN CANAL-LINED-REPAIR	15,200.12	25,076.32
MAIN CANAL-LINED-SEALING	369.74	
MAIN CANAL-LINED-DRAINAGE	2,497.00	2,717.39
MAIN CANAL-LINED-REHAB COUNTRY CLUB		
TOTAL MAIN CANAL LINED	28,637.54	35,012.40
MAIN CANAL-UNLINED-BERM	4,704.84	3,424.10
MAIN CANAL-UNLINED-BURN	6,024.90	9,337.94
MAIN CANAL-UNLINED-CLEAN	8,424.32	9,060.26
MAIN CANAL-UNLINED-CORING	1,608.34	7,438.63
MAIN CANAL-UNLINED-REPAIR	4,505.63	25,989.25
TOTAL MAIN CANAL UNLINED	25,268.03	55,250.18
MAIN CANAL-GROUND WEEDS-SPRAYING	44,847.87	43,280.87
MAIN CANAL-GROUND WEEDS-PULLING	1,494.48	61.68
MAIN CANAL-GROUND WEEDS-MOWING	35,919.98	25,494.35
TOTAL MAIN CANAL GROUND WEEDS	82,262.33	68,836.90
MAIN CANAL-AQUATIC WEEDS	113,201.70	92,340.64
TOTAL MAIN CANAL-AQUATIC WEEDS	113,201.70	92,340.64
MAIN CANAL-STRUCTURES-CONSTRUCTING	1,920.95	1,832.30
MAIN CANAL-STRUCTURES-GROUTING	518.47	232.95
MAIN CANAL-STRUCTURES-REPAIRING	9,994.65	16,573.19
MAIN CANAL-AUTO STRUCTURE REPAIRING	10,577.86	976.27
TOTAL MAIN CANAL STRUCTURES	23,011.93	19,614.71
MAIN CANAL-ROADS-CONST		1,582.07
MAIN CANAL-ROADS-BRIDGES/CATTLEGUARDS	30.10	
MAIN CANAL-ROADS-REPAIR	2,217.95	4,739.01
TOTAL MAIN CANAL ROADS	2,248.05	6,321.08
MAIN CANAL-WASTEWAYS-BURN	26.32	20.30
MAIN CANAL-WASTEWAYS-CLEANING	1,319.06	88.87
MAIN CANAL-WASTEWAYS-		2,169.57

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	YTD BALANCE	LYT BALANC
GROUTING		
MAIN CANAL-WASTEWAYS-REPAIRING	5,528.40	727.44
MAIN CANAL-WASTEWAYS-SEALING		
MAIN CANAL-WASTEWAYS-SPRAYING	1,320.19	
TOTAL MAIN CANAL-WASTEWAYS	8,193.97	3,006.18
MAIN CANAL- SI & TUNNELS-CLEANING	659.40	
MAIN CANAL-SI & TUNNELS-GROUTING		
MAIN CANAL-SI & TUNNELS-REPAIRING	626.86	267.41
MAIN CANAL-SI & TUNNELS-SEALING		
TOTAL MAIN CANAL-SI & TUNNELS	1,286.26	267.41
WW2-UNION GAP FLUME-REPAIRS		
TOTAL UNION GAP FLUME		
TOTAL MAIN CANAL	284,109.81	280,649.50
EN CONDUIT SYS-REPAIRING	20,150.45	10,558.91
EN CONDUIT SYS-LOCATING	713.44	260.12
TOTAL EN CONDUIT SYSTEMS	20,863.89	10,819.03
LATERAL-PIPED-CONSTRUCT	10,103.84	3,631.42
LATERAL-PIPED-REPAIRING	66,165.09	43,595.14
LATERAL-PIPED-LOCATING	2,615.48	1,920.83
TOTAL LATERAL PIPED	78,884.41	49,147.39
LATERAL-OPEN-BURNING	38,137.69	32,493.03
LATERAL-OPEN-CLEANING	35,370.62	51,123.83
LATERAL-OPEN-CORING	9,651.48	14,389.11
LATERAL-OPEN-REPAIRING	7,275.90	18,319.57
TOTAL LATERAL OPEN	90,435.69	116,325.54
LATERAL GROUND WEEDS-SPRAYING	21,901.[illegible]1	16,659.58
LATERAL-GROUND WEEDS-PULLING	9,200.27	2,870.30
LATERAL-GROUND WEEDS-MOWING	22,455.99	33,725.97
TOTAL LATERAL GROUND WEED	53,557.77	53,255.85
LATERAL-AQUATIC WEEDS	37,530.30	16,497.21
TOTAL LATERAL AQUAT WEEDS	37,530.30	16,497.21

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	YTD BALANCE	LYTD BALANCE
LATERAL-STRUCTURES-CONSTRUCTING	4,459.83	3,992.98
LATERAL-STRUCTURES-GROUTING	570.93	913.03
LATERAL-STRUCTURES-REPAIRING	18,909.73	22,847.69
TOTAL LATERAL STRUCTURES	23,940.49	27,753.70
LATERAL-FLOWMETERS-CONSTRUCTING	1,537.97	114.93
LATERAL-FLOWMETERS-REPAIRING	14,043.41	12,537.38
TOTAL FLOWMETERS	15,581.38	12,652.31
LATERAL-ROADS-CONSTRUCT	2,328.47	103.60
LATERAL-ROADS-BRIDGES & CATTLEGUARDS	446.81	
LATERAL-ROADS-REPAIRING	7,989.81	8,998.14
TOTAL LATERAL ROADS	10,765.09	9,101.74
LATERAL-WASTEWAYS-BURNING		151.68
LATERAL-WASTEWAYS-CLEAN	120.00	
LATERAL-WASTEWAYS-CONST		
LATERAL-WASTEWAYS-REPAIR	54.00	
TOTAL LATERAL WASTEWAYS	174.00	151.68
TOTAL LATERALS	331,733.02	295,704.45
DRAINS-OPEN,TOE-BURN	22.56	
DRAINS-OPEN,TOE-CLEANING	380.55	131.82
DRAINS-OPEN,TOE-CONSTRUCT		2,131.06
DRAINS-OPEN,TOE-REPAIRING	2,703.29	1,088.91
DRAINS-OPEN,TOE-SPRAYING		
DRAINS-OPEN,TOE-PULLING		
DRAINS-OPEN,TOE-MOWING		45.12
TOTAL DRAINS-OPEN,TOE	3,106.40	3,396.91
DRAINS-OPEN,OUTLET-BURN	165.52	177.33
DRAINS-OPEN,OUTLET-CLEAN	21,301.55	28,583.09
DRAINS-OPEN,OUTLET-CONST	164.18	1,088.04
DRAINS-OPEN,OUTLET-REPAIR	1,099.10	961.98
DRAINS-OPEN,OUTLET-SPRAY		319.57
DRAINS-OPEN,OUTLET-PULL		
DRAINS-OPEN,OUTLET-MOWING	129.04	
TOTAL DRAINS OPEN,OUTLET	22,859.39	31,130.01
DRAINS-OPEN,PICKUP-BURN	272.00	3,867.19
DRAINS-OPEN,PICKUP-CLEAN	7,730.70	9,233.63
DRAINS-OPEN,PICKUP-CONST	150.84	222.79
DRAINS-OPEN,PICKUP-REPAIR	3,192.46	1,341.29
DRAINS-OPEN,PICKUP-SPRAY		146.72

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	YTD BALANCE	LY BALAN
DRAINS-OPEN,PICKUP-PULL	670.77	382.10
DRAINS-OPEN,PICKUP-MOWING	86.10	331.80
TOTAL DRAINS OPEN,PICKUP	12,052.87	15,525.52
DRAINS-OPEN,JOINT-BURNING		
DRAINS-OPEN,JOINT-CLEAN		
DRAINS-OPEN,JOINT-CONST		
DRAINS-OPEN,JOINT-REPAIR	735.74	69.30
DRAINS-OPEN,JOINT-SPRAY		1,150.94
DRAINS-OPEN,JOINT-PULLING		
DRAINS-OPEN,JOINT-MOWING		
TOTAL DRAINS OPEN,JOINT	735.74	1,270.24
ROZA MAINTAINED-DID #11- BURNING		
ROZA MAINTAINED-DID #11- CLEANING	10,946.21	69.76
ROZA MAINTAINED-DID #11- CONSTRUCTING		
ROZA MAINTAINED-DID #11- REPAIRING	109.16	563.78
ROZA MAINTAINED-DID #11- SPRAYING		
ROZA MAINTAINED-DID #11- PULLING		
ROZA MAINTAINED-DID #11- MOW & CUT		
JOINT DRAINS-SVID	111,775.38	176,712.39
DRAINS-DID #11	31,748.20	19,449.03
TOTAL JOINT DRAINS & DID #11	154,578.95	196,794.96
DRAINS-PIPED,TOE-CONST	114.22	13,956.59
DRAINS-PIPED,TOE-REPAIR	9,065.38	10,320.17
TOTAL DRAINS PIPED, TOE	9,179.60	24,276.76
DRAINS-PIPED,OUTLET- CONSTRUCTING	193.39	
DRAINS-PIPED,OUTLET- REPAIRING	586.37	1,719.88
TOTAL DRAINS PIPED,OUTLET	779.76	1,719.88
DRAINS-PIPED,PICKUP- CONSTRUCTING		289.30
DRAINS-PIPED,PICKU- REPAIRING	540.26	1,747.11
TOTAL DRAINS PIPED,PICKUP	540.26	2,036.41
DRAINS-PIPED,JOINT-CONST		
DRAINS-PIPED,JOINT-REPAIR		
TOTAL DRAINS-PIPED,JOINT		

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	YTD BALANCE	LYTD BALANCE
DRAINS-PUMPS,SVID WT TRAN		
TOTAL DRAINS PUMPS SVID		
TOTAL DRAINS	203,832.97	276,100.69
PUMPING PLANTS-PUMPS	85,736.54	63,688.46
PUMPING PLANTS-MOTORS	1,082.93	3,416.01
PUMPING PLANTS-CONTROLS	17,127.38	11,869.19
PUMPING PLANTS-STRUCTURE	3,317.33	32.26
PUMPING PLANTS- PIPES & VALVES	2,485.17	977.47
PUMP MAINTENANCE SHOP	440.83	727.03
PUMPS-SILT REMOVAL	4,943.51	3,564.60
TOTAL PUMPING PLANTS & PUMPS	115,133.69	84,270.02
SAFETY	6,932.44	4,338.36
TOTAL SAFETY	6,932.44	4,338.36
DRUG TESTING	2,256.92	
TOTAL DRUG TESTING	2,256.92	
TOTAL PUMP,SAFETY & TEST	124,323.05	88,608.38
WWS-REREG CANAL AUTO		
COMPREHENSIVE PLAN		
96-97 PRESS. PROJ.	530,999.39	
P8 CHECK STRUCTURE	69,991.68	
92-93 PRESSURE PROJECT	213,399.12	659,766.33
PUMP 9 CHECK		164,828.17
89-90 PRESS PROJ/LINING	21,521.71	65,800.10
PUMP 7 CHECK	156,144.99	84,072.76
TOTAL PRESSURE PROJECTS	992,056.89	974,467.36
REIMBURSABLE-CHANDLER CAN	27,812.23	26,033.34
REIMBURSABLE-ROZA CANAL	64,904.70	54,372.11
REIMBURSABLE-STORAGE DIV	93,188.44	62,555.74
REIMBURSABLE-PRIVATE IND.	67,739.27	54,743.59
REIMBURSABLE-PHONES		
REIMBURSABLE-HUBBARD DITC		
REIMBURSABLE-FISH FACILIT	117,057.93	119,513.23
REIMBURSABLE-CONSOL STUDY		
TOTAL REIMBURSABLES	370,702.57	317,218.01
EQUIPMENT EXPENSES	10,127.07	41,214.83-
EQUIPMENT-MISC.	41,561.33	42,534.90
EQUIPMENT-TOOLS	24,147.49	13,765.91
TOTAL EQUIPMENT EXPENSES	75,835.89	15,085.98
STOREHOUSE EXPENSES	12,345.66	12,573.65
TOTAL STOREHOUSE EXPENSE	12,345.66	12,573.65

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	YTD BALANCE	LY BALAN
TELEPHONE-SUPERVISORS	2,161.40	2,654.06
PHONE SYSTEMS REPAIRS		
CELLULAR PHONES	2,071.23	2,472.70
UTILITIES-OFFICE	4,090.35	3,845.96
ROZA-SVID BOARD OF J.C.		
LID EXPENSES		920.53
OFFICE EQUIPMENT	5,362.21	5,378.28
OFFICE SUPPLIES		1,361.16
OFFICE EXPENSES	19,250.55	19,919.89
REFERENCE MATERIALS	3,964.40	4,612.07
PUBLISHING	3,484.16	1,821.78
DUES & SUBSCRIPTIONS	21,174.65	17,145.08
ASSESSMENT REFUNDS		
PRIOR PERIOD ADJ.		
TOTAL MISC.	297,110.35	368,432.95
COMMUNICATIONS DIRECTOR	292.05	
HEALTH/SAFETY COORDINATOR		
WATER QUALITY SPECIALIST		
TOTAL COMM/SAFETY/WATER	292.05	
DEPRECIATION-EQUIPMENT	86,950.54	63,584.20
DEPRECIATION-BLDG.&OFFICE	2,267.23	2,267.23
DEPRECIATION-MISC.EQUIP.	4,704.73	8,877.44
DEPRECIATION-OFFICE EQUIP	5,567.71	9,208.65
DEPRECIATION-WW6 RE-REG.	33,628.37	33,628.37
DEPRECIATION-STORAGE TANK	4,970.00	4,970.00
DEPRECIATION-SOFTWARE	6,673.14	7,348.18
DEPRECIATION-WW7 RE-REG.	26,090.50	26,090.50
TOTAL DEPRECIATION	170,852.22	155,974.57
TOTAL EXPENSES	5,596,369.34	5,228,062.08
NET INCOME <LOSS>	486,469.88	749,421.66

PGMGL6400
GENERAL LEDGER
FINANCIAL STATEMENT

ROZA IRRIGATION DISTRICT
STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1996 FUNCTION REPORT

	YTD BALANCE	LYTD BALANCE
CONTRACT/USBR-RESERVE WKS	51,921.45	69,403.59
CONTRACT/USBR-WATER QUAL		
CONTRACT/USBR-GEN SUPERVI		
CONTRACT/USBR-REMOTE CONT		
CONTRACT/USBR-POWER	550,931.00	367,987.00
CONTRACT/USBR-MISC.		
TOTAL CONTRACTS USBR	1,116,377.38	865,087.52
ADMIN & GENERAL SALARIES	385,214.01	358,813.56
COMPENSATION-A/L-ADMIN	49,916.43	52,891.33
COMPENSATION-S/L-ADMIN	24,890.04	29,347.94
COMPENSATION-HOLIDAY-ADM	27,416.80	27,965.44
JURY DUTY-ADMIN & GENERAL	23.00	178.00
TAXES-SOCIAL SEC-ADMIN	45,412.07	46,666.18
TAXES-STATE & FEDERAL UNEMPLOYMENT-ADMIN	1,248.50	
IND INS & MED AID - NON-UNION	4,851.38	6,240.27
GROUP INS-ADMIN & GENERAL	51,660.33	54,891.17
ST RETIRE/NON-UNION	59,194.16	46,149.98
TOTAL ADMIN. & GENERAL EXPENSES	644,826.72	618,143.87
DIRECTOR'S FEES	11,073.27	8,800.00
TRAVEL & MILEAGE- ADMIN & SUPER	62,119.80	58,369.16
TRAVEL & MILEAGE-DIRECTOR	12,631.87	18,118.39
MISC TAXES	2,131.67	255.99
ACCOUNT & AUDIT-SERVICE	8,551.00	15,863.09
LEGAL SERVICES	10,815.82	5,521.27
LEGAL SVID JBOC	1,327.00	
LEGAL SERVICE-WT RIGHTS	38,389.00	90,885.54
LEGAL SERVICE-JT DRAINS	71.25	17,774.36
LEGAL SERVICE-POWER RITES		
ENGINEERING	13,080.00	5,014.16
ENGINEER/REREG & AUTO	45.00	
ENGINEER/WW6 REREG		
WASTEWATER RECOVERY		
COMPUTER PROGRAMS-SERVICE	762.16	505.00
COMPUTER EXPENSE	582.82	1,973.35
CROP REPORTS	587.70	458.88
INSURANCE-PROPERTY	6,796.56	7,944.04
INSURANCE-INJURY&DAMAG	47,899.15	57,231.32
INSURANCE-DIRECTORS & OFFICERS	5,140.09	4,615.45
INSURANCE-OTHERS	1,471.25	1,150.00
TELEPHONE-837 5141	6,043.27	7,500.88
TELEPHONE-837 4157	716.94	923.73
TELEPHONE-837 2223	1,158.41	1,151.79
TELEPHONE-877 2122 & 453 6066	2,740.30	2,707.02
TELEPHONE-973 2441	1,422.12	1,538.02

PGMGL6400
GENERAL LEDGER
FINANCIAL STATEMENT

ROZA IRRIGATION DISTRICT
STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1996 FUNCTION REPORT

	YTD BALANCE	LYT BALANC
TELEPHONE-SUPERVISORS	2,161.40	2,654.06
PHONE SYSTEMS REPAIRS		
CELLULAR PHONES	2,071.23	2,472.70
UTILITIES-OFFICE	4,090.35	3,845.96
ROZA-SVID BOARD OF J.C.		
LID EXPENSES		920.53
OFFICE EQUIPMENT	5,362.21	5,378.28
OFFICE SUPPLIES		1,361.16
OFFICE EXPENSES	19,250.55	19,919.89
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DEPRECIATION-MISC.EQUIP.	4,704.73	8,877.44
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NET INCOME <LOSS>	486,469.88	749,421.66

FGMGL6400
GENERAL LEDGER
FINANCIAL STATEMENT

ROZA IRRIGATION DISTRICT
STATEMENT OF INCOME & EXPENSE
DECEMBER 31, 1996 FUNCTION REPORT

	YTD BALANCE	LYTD BALANCE
SHOP EXPENSE	18,147.89-	3,891.82-
TOTAL SHOP EXPENSE	18,147.89-	3,891.82-
YARD BUILDINGS	1,633.93	6,799.58
OFFICE BUILDING	10,028.34	6,218.92
TOTAL BUILDINGS	11,662.27	13,018.50
GROUNDS EXPENSES	4,235.74	13,804.07
TOTAL GROUNDS EXPENSES	4,235.74	13,804.07
DISTRICT HOUSES-MISC		
DISTRICT HOUSE-WW 2	908.84	127.17
DISTRICT HOUSE-PUMP 3	53.46	
DISTRICT HOUSE-WW 3	218.02	3,074.91
DISTRICT HOUSE-PUMP 8		457.71
DISTRICT HOUSE-PUMP 9	2,002.74	782.90
DISTRICT HOUSE-WW 5	445.66	409.89
DISTRICT HOUSE-P 13 E	641.10	208.88
DISTRICT HOUSE-P 13 W	62.41	
DISTRICT HOUSE-P 14 E	5,171.80	774.77
DISTRICT HOUSE-P 14 W	588.92	2,070.51
DISTRICT HOUSE-P 15	167.95	245.70
DISTRICT HOUSE-P 16	322.21	2,411.79
DISTRICT HOUSE-P 17		
TOTAL DISTRICT HOUSES	10,563.11	10,559.23
COMPENSATION-A/L-O&M	104,727.04	101,296.61
COMPENSATION-S/L-O&M	48,734.72	54,009.66
COMPENSATION-HOLIDAY-O&M	53,141.52	50,394.87
JURY DUTY-O&M	810.48	74.72
TAXES-SOCIAL SECURITY-O&M	117,165.46	108,147.81
TAXES-STATE & FEDERAL	3,890.88	53.58
UNEMPLOYMENT-O&M		
IND INS & MED AID-FIELD	23,942.50	27,443.81
GROUP INSURANCE-UNION	144,332.43	136,416.82
STATE RETIREMENT-O&M	130,950.40	125,366.90
MILEAGE & TRAVEL-O&M		
RODENT CONTROL		
WATER MANAGEMENT& CONTROL	303,512.65	292,354.94
SHOW UP TIME	1,134.30	937.88
RADIO	9,358.91	9,720.45
UTILITIES-STOREHOUSE	3,151.63	2,610.71
UTILITIES-GATES&WASTEWAYS	595.94	671.35
TOTAL BENEFITS, WATER-MANAGEMENT & MISC.	945,448.86	909,500.11
WASTEWAY 7 REREG-O&M	4,211.14	8,342.18
WASTEWAY 7 REREG/CONST		
WASTEWAY 6 REREG-O&M	13,997.53	8,682.88
TOTAL REREG	18,208.67	17,025.06
CONTRACT/USBR-STORAGE	513,524.93	427,696.93

APPENDIX III
AUDIT REPORT

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

Washington State Auditor's Office

Audit Report

Audit Services

Report No. 57885

ROZA IRRIGATION DISTRICT

Yakima County, Washington

January 1, 1995 Through December 31, 1995

Issue Date: December 13, 1996

THE SEAL OF THE STATE OF WASHINGTON 1889

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Notice of Filing and Transmittal
December 13, 1996

Notice is hereby given that the attached document is the official post audit report of the Roza Irrigation District, Yakima County, Washington, for the period January 1, 1995, through December 31, 1995.

The report was prepared and transmitted for filing by the State Auditor's Office pursuant to Chapter 43.09 RCW.

Brian Sonntag
State Auditor

Copies transmitted to:

Ron Van Gundy, Manager/Secretary/Treasurer
Doug Cochran, County Auditor
Jeffrey C. Sullivan, County Prosecuting Attorney
Mary Riveland, Director, Department of Ecology
Laurie Fortier, State Publication Distribution, State Library
The Honorable Christine O. Gregoire, Attorney General, Office of the Attorney General
Office of the State Auditor

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ROZA IRRIGATION DISTRICT
Yakima County, Washington
January 1, 1995 Through December 31, 1995

Independent Auditor's Report On Compliance With State Laws And Regulations

Board of Directors
Roza Irrigation District
Sunnyside, Washington

We have audited the general-purpose financial statements, as listed in the table of contents, of the Roza Irrigation District, Yakima County, Washington, as of and for the fiscal year ended December 31, 1995, and have issued our report thereon dated September 30, 1996.

We also performed tests of compliance with state laws and regulations as required by *Revised Code of Washington* (RCW) 43.09.260. This statute requires the State Auditor to inquire as to whether the district complied with the laws and the *Constitution of the State of Washington*, its own ordinances and orders, and the requirements of the State Auditor's Office.

Compliance with these requirements is the responsibility of the district's management. Our responsibility is to make a reasonable effort to identify any instances of misfeasance, malfeasance, or nonfeasance in office on the part of any public officer or employee and to report any such instance to the management of the district and to the Attorney General. However, the objective of our audit of the financial statements was not to provide an overall opinion on compliance with these requirements. Accordingly, we do not express such an opinion.

The results of our tests indicated that, with respect to the items tested, the district complied, in all material respects, with the applicable laws and regulations referred to in the preceding paragraphs. With respect to items not tested, nothing came to our attention that caused us to believe that the district had not complied, in all material respects, with those provisions.

This report is intended for the information of management and the board of directors and to meet our statutory reporting obligations. This report is a matter of public record and its distribution is not limited. It also serves to disseminate information to the public as a reporting tool to help citizens assess government operations.

Brian Sonntag
State Auditor

September 30, 1996

Status Of Prior Findings

The finding contained in the prior audit report was resolved as follows:

1. District Policies Should Address The Manner In Which Employees Report Annual And Sick Leave Time Taken

   Resolution: The district revised their employee policies and procedures manual to address how employees are to report leave time taken.

Roza Irrigation District
Yakima County, Washington
January 1, 1995 Through December 31, 1995

Independent Auditor's Report On Financial Statements And Additional Information

Board of Directors
Roza Irrigation District
Sunnyside, Washington

We have audited the accompanying general-purpose financial statements of the Roza Irrigation District, Yakima County, Washington, as of and for the fiscal year ended December 31, 1995, as listed in the table of contents. These financial statements are the responsibility of the district's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Roza Irrigation District, at December 31, 1995, and the results of its operations and cash flows of its proprietary fund types for the fiscal year then ended, in conformity with generally accepted accounting principles.

Our audit was made for the purpose of forming an opinion on the financial statements taken as a whole. The accompanying Schedule of State Financial Assistance listed in the table of contents is presented for purposes of additional analysis and is not a required part of the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the financial statements and, in our opinion, is fairly presented in all material respects in relation to the financial statements taken as a whole.

Brian Sonntag
State Auditor

September 30, 1996

ROZA IRRIGATION DISTRICT
Comparative Balance Sheet
As Of December 31, 1995 And 1994

ASSETS	1995	1994
Current Assets:		
Cash	$ 539,419.62	$ 753,720.21
Receivables:		
Assessments Receivable	37,979.73	19,891.36
Accounts Receivable	84,891.73	75,248.56
Due from Other Governmental Units	133,294.81	94,030.44
Accrued Interest	12,733.28	40,383.40
Inventory, at Lifo	63,829.20	64,197.04
Prepaid Expenses	575,833.12	734,838.89
TOTAL CURRENT ASSETS	1,447,981.49	1,782,309.90
Restricted Assets:		
Investments, at Costs	1,529,171.55	475,000.00
LID Receivable	- 0 -	106,620.90
Contract Receivable	6,420,330.35	6,690,839.33
TOTAL RESTRICTED ASSETS	7,949,501.90	7,272,460.23
Property and Equipment:		
Land	185,130.03	185,130.03
Buildings	90,689.05	90,689.05
Rereg Facilities	597,185.35	573,106.73
Const. & Maint. Equipment	1,656,296.44	1,611,430.96
Miscellaneous Equipment	61,475.34	61,475.34
Office Equip. & Comp. Soft.	189,767.98	166,180.66
Storage Tanks	49,700.00	49,700.00
	2,830,244.19	2,737,712.77
Less Accumulated Depreciation	1,807,360.75	1,702,789.30
NET PROPERTY AND EQUIPMENT	1,022,883.44	1,034,923.47
Deferred Compensation	152,614.89	111,199.12
TOTAL ASSETS	$10,572,981.72	$10,200,892.72

The Accompanying Notes Are An Integral Part Of This Statement.

ROZA IRRIGATION DISTRICT
Comparative Balance Sheet
As Of December 31, 1995 And 1994

LIABILITIES	1995	1994
Current Liabilities		
(Payable from Current Assets):		
Vouchers Payable	65,937.13	69,002.72
Accrued Expenses	514,433.24	486,844.74
TOTAL CURRENT LIABILITIES (Payable from Current Assets)	580,370.37	555,847.46
Current Liabilities		
(Payable from Restricted Assets):		
Deposits	305,379.72	330,582.60
Contract Payable-USBR	270,508.95	270,731.19
Contract Payable-LID	- 0 -	116,029.24
TOTAL CURRENT LIABILITIES (Payable from Restricted Assets	575,888.67	717,343.03
TOTAL CURRENT LIABILITIES	1,156,259.04	1,273,190.49
Long-Term Liabilities:		
Contract Payable-USBR	6,149,821.37	6,420,330.35
Deferred Compensation	152,614.89	111,199.12
TOTAL LONG-TERM LIABILITIES	6,302,436.26	6,531,529.47
TOTAL LIABILITIES	7,458,695.30	7,804,719.96
EQUITY		
Contributed Capital, Net of Amortization	- 0 -	31,308.00
Retained Earnings:		
Reserve for USBR Contract	288,000.00	288,000.00
Reserve for Operations	116,265.35	116,265.35
Reserve for Advance Water	25,391.84	25,391.84
Reserve for Special Construction	47,875.84	47,875.84
Unreserved	2,636,753.39	1,887,331.73
TOTAL EQUITY	3,114,286.42	2,396,172.76
TOTAL LIABILITIES AND EQUITY	$10,572,981.72	$10,200,892.72

The Accompanying Notes Are An Integral Part Of This Statement.

ROZA IRRIGATION DISTRICT

Comparative Statement Of Revenues, Expenses, And Changes In Equity
For The Fiscal Years Ended December 31, 1995 And 1994

	1995	1994
Operating Revenues-Charges for Services, etc:	$5,426,305.50	$4,619,433.88
Operating Expenses:		
O & M	3,768,548.67	3,142,943.27
General	986,320.83	896,044.73
Amortization and Depreciation	155,974.57	153,667.43
Contract Work	317,218.01	441,911.51
TOTAL OPERATING EXPENSES:	5,228,062.08	4,634,566.94
TOTAL INCOME/LOSS:	198,243.42	<15,133.06>
Non-Operating Revenues:		
Interest	169,651.11	102,453.23
Gain on Sale of Assets	9,272.00	- 0 -
Property Rental	24,209.68	24,541.41
Non-Operating Grants	316,737.45	413,995.89
Prior Period Adjustment	31,308.00	- 0 -
TOTAL NON-OPERATING REVENUES:	551,178.24	540,990.53
NET INCOME/LOSS:	749,421.66	525,857.47
Equity January 1	2,396,172.76	1,888,683.29
Prior Period Adjustment	<31,308.00>	<18,368.00>
EQUITY DECEMBER 31:	$3,114,286.42	$2,396,172.76

The Accompanying Notes Are An Integral Part Of This Statement.

ROZA IRRIGATION DISTRICT
Comparative Statement Of Cash Flows
For The Fiscal Years Ended December 31, 1995 And 1994

	1995	1994
Cash flows from operating activities		
Cash received from customers	$ 5,386,959	$ 4,625,936
Cash paid to suppliers\employees	(4,913,393)	(4,677,914)
Other operating cash received	0	0
Net cash provided by operating activities	$ 473,566	$ (51,978)
Cash flows from noncapital financing activities		
Property Rental	24,209	24,541
Non-Operating Grants	316,737	389,323
Non-Operating Drought Grants	0	34,081
Net cash provided by noncapital financing activit	$ 340,946	$ 447,945
Cash flows from capital financing activities		
Acquisition of capital assets	(143,934)	(256,425)
Grants Received	0	0
Contract Payments	377,130	431,555
Principal paid on LT Debt	(386,760)	(429,029)
Proceeds from Sale of Prop & Equip	9,272	0
Net cash used for capital financing activities	$ (144,292)	$ (253,899)
Cash flows from investing activities		
Interest on investments	$ 169,651	$ 75,537
Net cash provided by investing activities		
Net increase in cash and cash equivalents	$ 839,871	$ 217,605
Cash and cash equivalents January 1	$ 1,228,720	$ 536,114
Cash and cash equivalents December 31	$ 2,068,591	$ 753,719

The Accompanying Notes Are An Integral Part Of This Statement.

ROZA IRRIGATION DISTRICT
Comparative Statement Of Cash Flows
For The Fiscal Years Ended December 31, 1995 And 1994

Reconciliation of operating income to net cash provided by operating activities:

	1995	1994
Net operating income	$ 198,244	$ (15,133)
Adjustment to reconcile operating income to net cash provided by operating activities:		
Depreciation	$ 155,975	$ 153,667
Change in assets and liabilities		
Increase in Accounts receivable	(39,346)	12,365
Decrease in Inventory	368	8,160
Decrease in Accounts payable	(3,066)	21,761
Decrease in Prepaid	159,006	(182,507)
Increase in Accrued Liabilities	27,589	(10,114)
Decrease in Deposits	(25,203)	(18,698)
Total adjustments	275,322	(15,366)
Net Cash Provided by Operating Activities	$ 473,566	$ (30,499)

The Accompanying Notes Are An Integral Part Of This Statement.

The following notes are an integral part of the accompanying financial statements.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The accounting policies of the Roza Irrigation District conform to generally accepted accounting principles as applicable to proprietary funds of governmental units in most respects. The following is a summary of the more significant policies.

a. Reporting Entity

Roza Irrigation District is a municipal corporation governed by an elected 5 member board. As required by generally accepted accounting principles, management has considered all potential component units in defining the reporting entity. The Roza Irrigation District has no component units.

b. Basis of Accounting And Presentation

The Accounting records of the district are maintained in accordance with methods prescribed by the State Auditor under the authority of Chapter 43.09 RCW. The district uses the Uniform System of Accounts for Irrigation Districts.

The district uses the full-accrual basis of accounting where revenues are recognized when earned and expenses are recognized when incurred. Fixed asset purchases are capitalized and long-term liabilities are accounted for in the appropriate funds.

c. Cash and Cash Equivalents

For purposes of the statement of cash flows, the district considers all highly liquid investments (including restricted assets) with a maturity of three months or less when purchased to be cash equivalents.

d. Utility Plant And Depreciation

Utility Plant in service and other fixed assets are recorded at cost. Donations by customers are recorded at contract cost.

The original cost of significant operating equipment when sold is removed from the utility plant accounts, accumulated depreciation is charged with the accumulated depreciation related to the property sold, and the net gain or loss on disposition is credited or charged to income.

Depreciation is computed on the straight-line method with useful lives of 40 years for buildings. Initial depreciation of the utility plant is recorded in the year subsequent to purchase. Depreciation is computed based on units of usage methods using either hours or miles for equipment.

e. Restricted Funds

These accounts contain resources for construction, operations, and debt service including current and delinquent receivables in the irrigation district. The current portion of related liabilities are shown as payables from restricted funds.

The restricted funds of the district are composed of the following:

Special Funds:	
O & M Construction	$1,054,172
USBR Contract	288,000
Operations	116,306
Special Construction	45,302
Advance Water	25,392
Debt Service Fund:	
Contract Receivable for USBR Contract Payable	6,420,330
Total	$7,949,502

The contract receivable represents the amount due from the land owners of the district to service the USBR contract payable. Assets and liabilities shown as current in the accompanying balance sheet exclude current maturities on revenue bonds and accrued interest thereon because debt service funds are provided for their payment.

f. Receivables

Accounts receivable primarily represents uncollected assessments from prior years. There is no provision for uncollectible accounts receivable because assessments represent liens against the property and the direct write-off method is used for other accounts receivable.

g. Inventories

Inventories consisting mainly of canal repair parts, chemicals and fuel are valued at the lower of cost or market value. Inventories are valued at $63,829.20.

h. Investments

See Note 2.

i. Amortization of Contributed Capital

In Accordance with the prescribed system of accounts, the district amortizes contributed capital by amounts that equal the annual depreciation on assets acquired with that capital.

j. Compensated Absences

Compensated absences are absences for which employees will be paid, such as vacation and sick leave. The district records unpaid leave for compensated absences as an expense and liability when incurred.

Vacation pay, which may be accumulated up to 9 hours per pay period, is payable upon resignation, retirement or death. Sick leave may accumulate at 1 1/2% per employee for each year of service as earned.

k. Direct Charge (Or Credit) To Retained Earnings

In accordance with its prescribed system of accounts, the district has (charged or credited) $31,308.00 directly to retained earnings. This is a departure from generally accepted accounting principles, which require such (charges or credits) be included in net income of the period. See Note 6.

l. Construction Financing

See Note 3.

NOTE 2 - DEPOSITS AND INVESTMENTS

As required by state law, all deposits and investments of the district's funds (except as noted below) are obligations of the U. S. Government, (the State Treasurer's Investment Pool,) (banker's acceptances,) deposits with Washington State banks and saving and loan institutions, or other investments allowed by Chapter 39.59 RCW.

The district's deposits and certificates of deposit are entirely covered by federal depository insurance (FDIC and FSLIC) or by collateral held in a multiple financial institution collateral pool administered by the Washington Public Deposit Protection Commission (PDPC).

The district's investments are categorized to give an indication of the risk assumed at year end. Category 1 includes investments that are held by the district of its agent in the district's name. Category 2 includes uninsured and unregistered investments which are held by the counterparty's trust department or agent in the district's name.

	Category 1	Category 2	Carrying Value	Market Value
Certificates of Deposit	$1,529,171.55	$ 0.00	$1,529,171.55	$1,529,171.55
Total	$1,529,171.55			
Total Deposits and Investments			$1,529,171.55	$1,529,171.55

All temporary investments are stated at cost plus accrued interest which approximates market.

NOTE 3 - LONG-TERM DEBT

Schedule 09 which accompanies this report contains amounts due to the USBR by the district on the original construction of the irrigation system. The annual requirements to amortize all debts outstanding as of December 31, 1995, including interest, are as follows:

1996	270,509.01
1997	270,509.01
1998	270,509.01
1999	270,509.01
2000	270,509.01
2001-2023	5,067,785.27
TOTAL	$6,420,330.32

The various long-term contracts contain commitments and restrictions regarding cash reserve balances and debt service requirements. The district is in compliance with all significant limitations and restrictions.

NOTE 4 - PENSION PLAN

Substantially all of Roza Irrigation District's full-time and qualifying part-time employees participate in the Public Employees' Retirement System (PERS). This is a statewide local government retirement system administered by the Department of Retirement Systems, under a cost-sharing multiple-employer public employee retirement plan.

a. Funding Status And Progress

	Summary Of System's Actuarial Data (In Millions of Dollars) As Of December 31, 1994
Total Pension Benefit Obligation	$ 11,549
Less Net Assets Available For Benefits	9,800
Unfunded (Surplus) Actuarial Present Value Of Accumulated Plan Benefits	$ 1,749

The amount shown as total pension benefit obligation is the actuarial present value of credited projected benefits, adjusted for the effects of projected salary increases estimated to be payable in the future as a result of employee service to date. Use of the standardized measure enables readers of Washington's financial statements to: (a) assess on an ongoing basis the funding status of the system; (b) assess progress made in accumulating sufficient assets to pay benefits when due; and (c) make comparisons among other states or other retirement systems. The standardized disclosure method is independent of the actuarial funding method used to determine contributions to the retirement system.

Historical trend information showing the system's progress in accumulating sufficient assets to pay benefits when due is presented in the State of Washington's June 30, 1993 comprehensive annual financial report. Please refer to said plan for detailed trend information.

b. Description Of Plan

The state legislature established PERS in 1947 under Chapter 41.40 RCW. PERS is a cost sharing multiple-employer system. Membership in the system includes: elected officials; state employees; employees of the Supreme, Appeals, and Superior courts (other than judges); employees of legislative committees; college and university employees not in national higher education retirement programs; judges of district and municipal courts; noncertificated employees of school districts; and employees of local government. Approximately 47 percent of PERS members are state employees.

PERS contains 2 plans. Participants who joined the system by September 30, 1977 are Plan I members. Those joining thereafter are enrolled in Plan II. Retirement benefits are financed from employee and employer contributions and investment earnings. Retirement benefits for both plans are vested after completion of 5 years of eligible service.

Plan I members are eligible for retirement after 30 years of service, or at the age of 60 with 5 years of service, or at the age of 55 with 25 years of service. The annual pension is 2 percent of the final average salary per year of service, capped at 60 percent.

Plan II members may retire at the age of 65 with 5 years service, or at 55 with 20 years of service, with an allowance of 2 percent per year of service of the final average salary. Plan II retirement prior to 65 are actuarially reduced. There is no cap on years of service credit and a cost-of-living allowance is granted, capped at 3 percent annually.

During the 1995 Washington Legislative Session, the Washington State Legislature did approve a change in retirement law that will not become effective until after the close of fiscal year 1995. The existing Cost of Living Allowance (COLA) benefits based on the loss of purchasing power in PERS 1 and TRS 1 were repealed and replaced with a COLA based on years of service. The COLA will increase employer contribution rates .16 percent and .09 percent in PERS and TRS, respectively. The material changes made during the 1994 Legislative Session that became effective during the 1995 fiscal year were disclosed in last year's annual report.

None of the other bills that passed affected contribution rates.

The district's covered payroll for year ending December 31, 1995 was $1,974,623.25. The district's total current-year payroll for all employees was $2,026,588.12.

Each biennium the legislature establishes Plan I employer contribution rates and Plan II employer and employee contribution rates. Employee contribution rates for Plan I are established by legislative statute and do not vary from year to year. Employer rates for Plan I are not necessarily adequate to fully fund the system. The employer and employee contribution rates for Plan II are developed by the Office of State Actuary to fully fund the system. All employers are required to contribute at the level established by the legislature. The methods used to determine the contribution requirements were established under state statute.

c. Contributions Required and Made

The district's contribution rates expressed as a percentage of covered payroll as of December 31, 1995 were:

	PERS Plan I		PERS Plan II	
	Required	Actual	Required	Actual
Employer	7.48%	7.42%	7.48%	7.42%
Employee	6.00%	6.00%	5.06%	5.08%
Total	13.48%	13.42%	12.54%	12.50%

The Roza Irrigation District actuarially determined contribution requirement and actual contribution for the year ending December 31, 1995 were:

	PERS Plan I		PERS Plan II	
	Required	Actual	Required	Actual
Employer	$ 54,782.43	$ 54,343.00	$ 92,919.39	$ 92,174.04
Employee	43,943.13	43,943.13	62,857.23	63,105.68
Total	$ 98,725.56	$ 98,286.13	$155,776.62	$155,279.72

The Roza Irrigation District's actuarially determined employer contribution requirement represents approximately .03 percent of the total for all employers covered by PERS.

NOTE 5 - DEFERRED COMPENSATION PLAN

The district offers its employees a deferred compensation plan created in accordance with Internal Revenue Code Section 457. The plan is with the State of Washington, Committee for Deferred Compensation and is available to eligible employees. This plan permits employees to defer a portion of their salary until future years. The deferred compensation is not available to employees until termination, retirement, death, or unforeseeable emergency.

Compensation deferred under the plan and all income attributable to the plan are solely the property of the district. The district's rights to this property are subject only to the claims of the district's general creditors until paid to the employee or other beneficiary and are not restricted to the benefit provisions under the plan.

The district has no liability for losses under the plan but does have the duty of due care that would be required of an ordinary prudent investor. The district believes that it is highly unlikely that it will use the assets to satisfy the claims of general creditors in the future.

Of the $657,095,378.34 in the plan at December 31, 1995, $152,614.89 was applicable to the district while the remaining $656,942,763.45 represents the assets of other jurisdictions participating in the plan. Deferred compensation plan investments are recorded at market value, along with the corresponding liability.

NOTE 6 - PRIOR PERIOD ADJUSTMENT

The contributed capital account consists of money received ($31,308.00) from the sale of a house donated from USBR prior to 1990. The transaction was not properly recorded.

The contributed capital account was eliminated and recorded to the unreserved account by prior period adjustment.

NOTE 7 - RISK MANAGEMENT

The Roza Irrigation District maintains insurance against most normal hazards through a local broker, R. F. Strain Insurance, coverage in place for 10/15/95 to 10/15/96 is as follows:

TYPE OF COVERAGE	DEDUCTIBLE	CARRIER
PROPERTY	$1,000	PENCO
EQUIPMENT	250	PENCO
AUTOMOBILE		
SPECIFIED PERILS	0	PENCO
COLLISION	1,000	PENCO
LIABILITY		
PROPERTY DAMAGE	1,000	PENCO
PUBLIC OFFICIALS	7,500	PENCO

In addition, Roza Irrigation District maintains Environmental Impairment Liability insurance through R. F. Strain Insurance, coverage in place for 4/20/95 to 4/20/96 is as follows:

TYPE OF COVERAGE	DEDUCTIBLE	CARRIER
LIABILITY ENVIRONMENTAL	10,000	SCOTTSDALE INS. CO.

ROZA IRRIGATION DISTRICT

Schedule Of State Financial Assistance
Governmental Assistance Received From State Agencies Or Local Government
For The Fiscal Year Ended December 31, 1995

Grantor/Pass Through Agency	Program Name	CFDA No.	Other Identification Number	Expenditures
Washington State Department of Ecology - Direct				
DOE	WW7 REREG	N/A	WFG 91032	$25,084
DOE	Enclosed Conduit	N/A	G9200039	291,654
Total Deptartment of Ecology				$316,737

Additional Information

The Accompanying Notes To Schedule Of State Financial Assistance Are An Integral Part Of This Statement.

NOTE 1 - BASIS OF ACCOUNTING

The schedule of Financial Assistance is prepared on the same basis of accounting as the District's financial statements. The District uses the method of accounting prescribed by the State Auditor under the authority of Washington State Law, Chapter 43.09 RCW.

NOTE 2 - PROGRAM COSTS

The amounts shown as current year expenditures represent only the state portion of the program costs. Actual program costs, including the District's portion, may be more than shown.

Roza Irrigation District
Yakima County, Washington
January 1, 1995 Through December 31, 1995

Directory Of Officials

Elected

		Term	Expiration
Board of Directors:			
President	Ric Valicoff	3	January 1998
Vice President	Jim Willard	3	January 1998
	Paul Allison	3	January 1996
	Kenneth Lisk	3	January 1999
	Jan Don	3	January 1997
	Gene D. McIntire	3	January 1996
	Mike Miller	3	January 1999

Appointed

Manager/Secretary/Treasurer	Ron Van Gundy
Assistant Manager/Secretary/Treasurer	Tom Monroe
Assistant Secretary/Treasurer	Mary Morales
Attorney	Tom Cowan

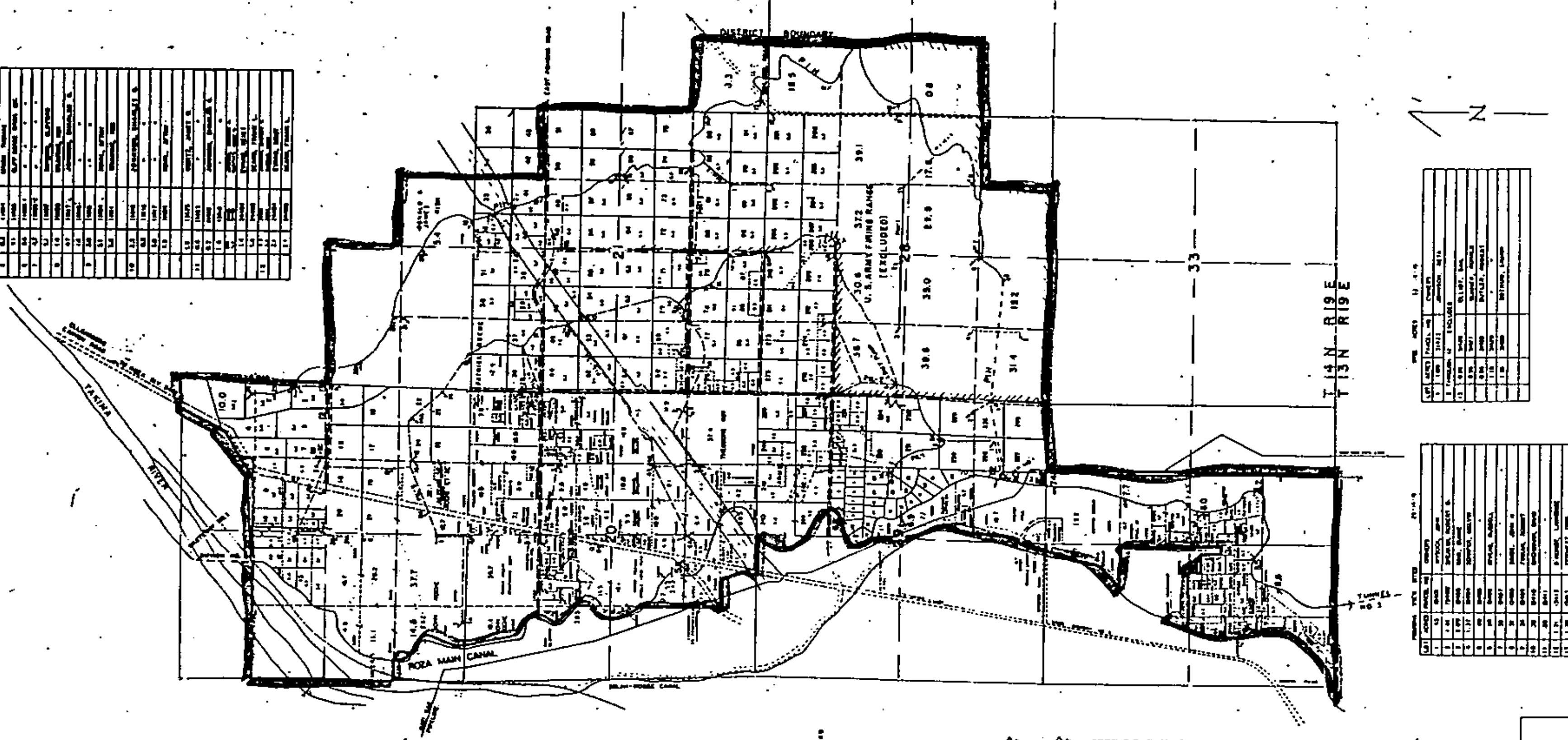
Mailing Address

District	PO Box 810 Sunnyside WA 98944
Attorney	Suite A 503 Knight Street PO Box 927 Richland WA 99352

APPENDIX IV
OPERATIONS MAP

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

POMONA HEIGHTS TRACTS



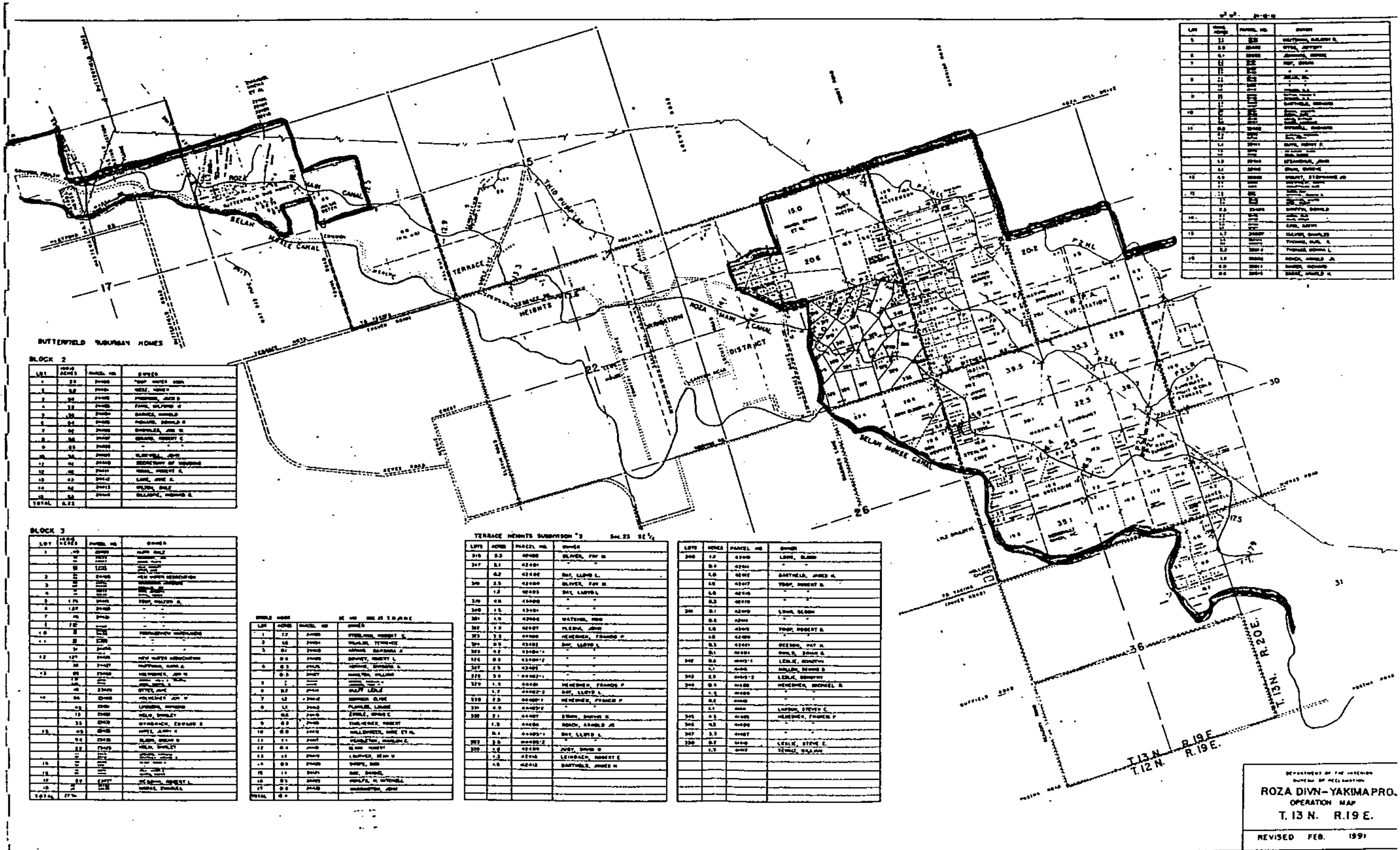
ROZA DIVN-YAKIMA PROJ.

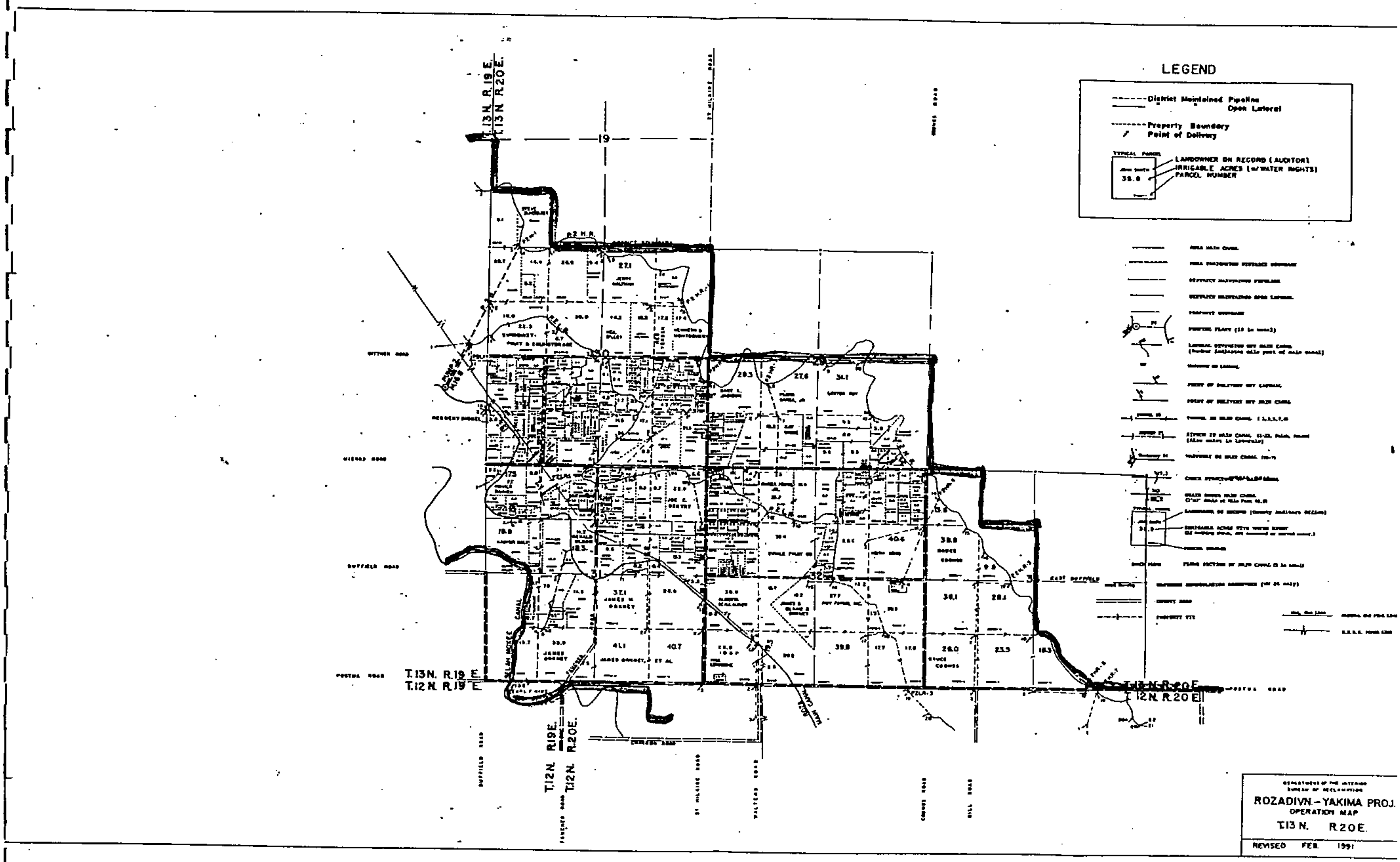
OPERATION MAP

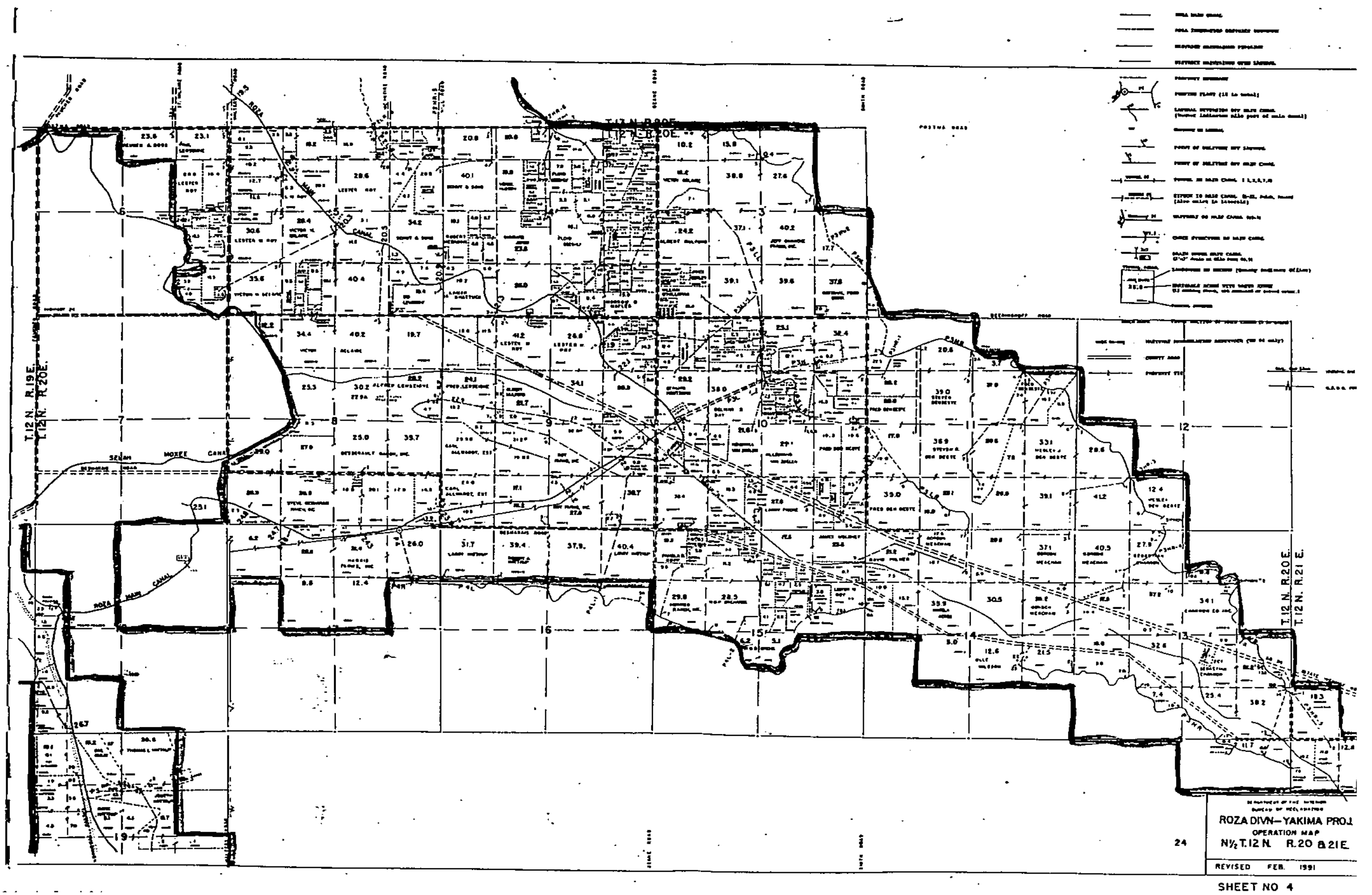
T14N. R.19E.

REVISED FEB 1991

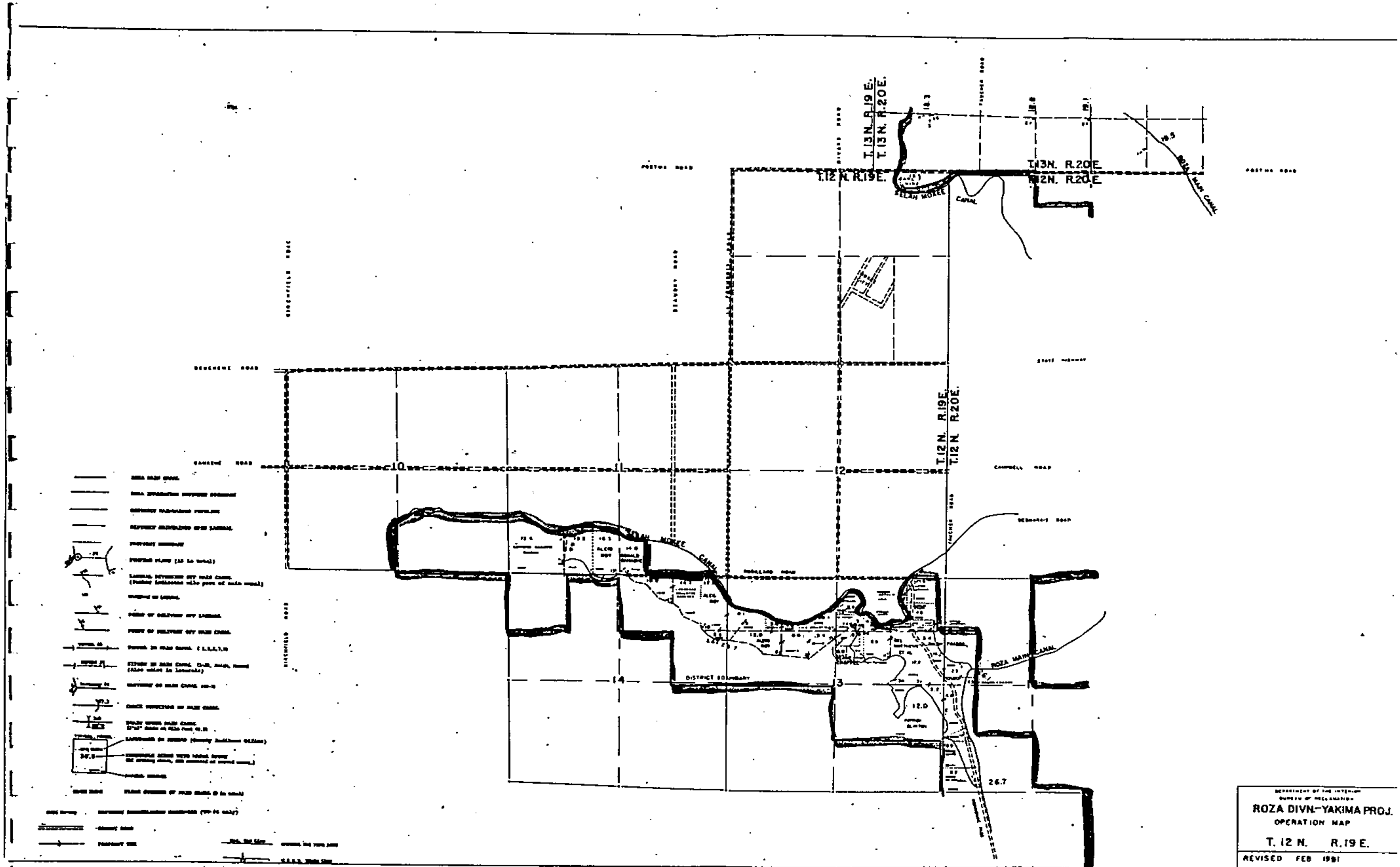
SHEET NO. 1


DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN-YAKIMA PROJ.
OPERATION MAP
T. 13 N. R. 19 E.
REVISED FEB. 1991
SHEET NO 2
BUTTERFIELD SUBURBAN HOMES
BLOCK 2
BLOCK 3
TERRACE HEIGHTS SUBDIVISION #3
ROZA MAIN CANAL
SELAH MOXEE CANAL
TERRACE HEIGHTS
IRRIGATION DISTRICT
THIO PUMP LAT.
T. 13 N. R. 20 E.
T. 13 N. R. 19 E.
T. 12 N. R. 19 E.
17
22
25
26
30
31
36

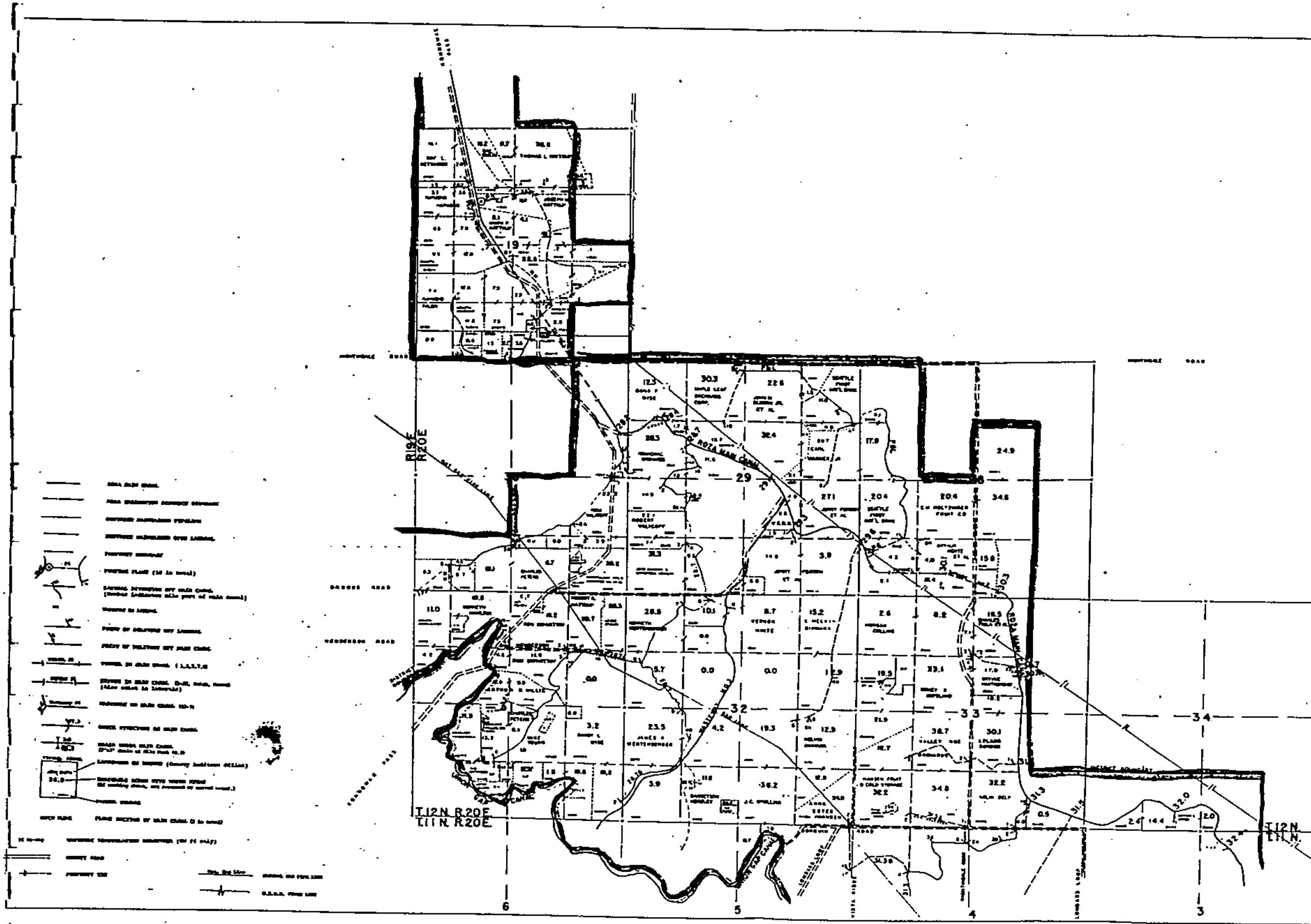

LEGEND
District Maintained Pipeline
Open Lateral
Property Boundary
Point of Delivery
LANDOWNER ON RECORD (AUDITOR)
IRRIGABLE ACRES (w/WATER RIGHTS)
PARCEL NUMBER
T.13N. R.19E.
T.13N. R.20E.
T.12N. R.19E.
T.12N. R.20E.
T.13N. R.20E.
T.12N. R.20E.
19
ROZADIVN.-YAKIMA PROJ.
OPERATION MAP
T.13N. R.20E.
REVISED FEB. 1991
SHEET NO 3



T.12 N. R.20E.
T.12 N. R.19E.
T.12 N. R.20 E.
T.12 N. R.21 E.
SELAH MOXEE CANAL
ROZA MAIN CANAL
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN—YAKIMA PROJ.
OPERATION MAP
N½ T.12 N. R.20 & 21E.
24
REVISED FEB. 1991
SHEET NO 4



DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN.-YAKIMA PROJ.
OPERATION MAP
T. 12 N. R. 19 E.
REVISED FEB 1981
SHEET NO. 5

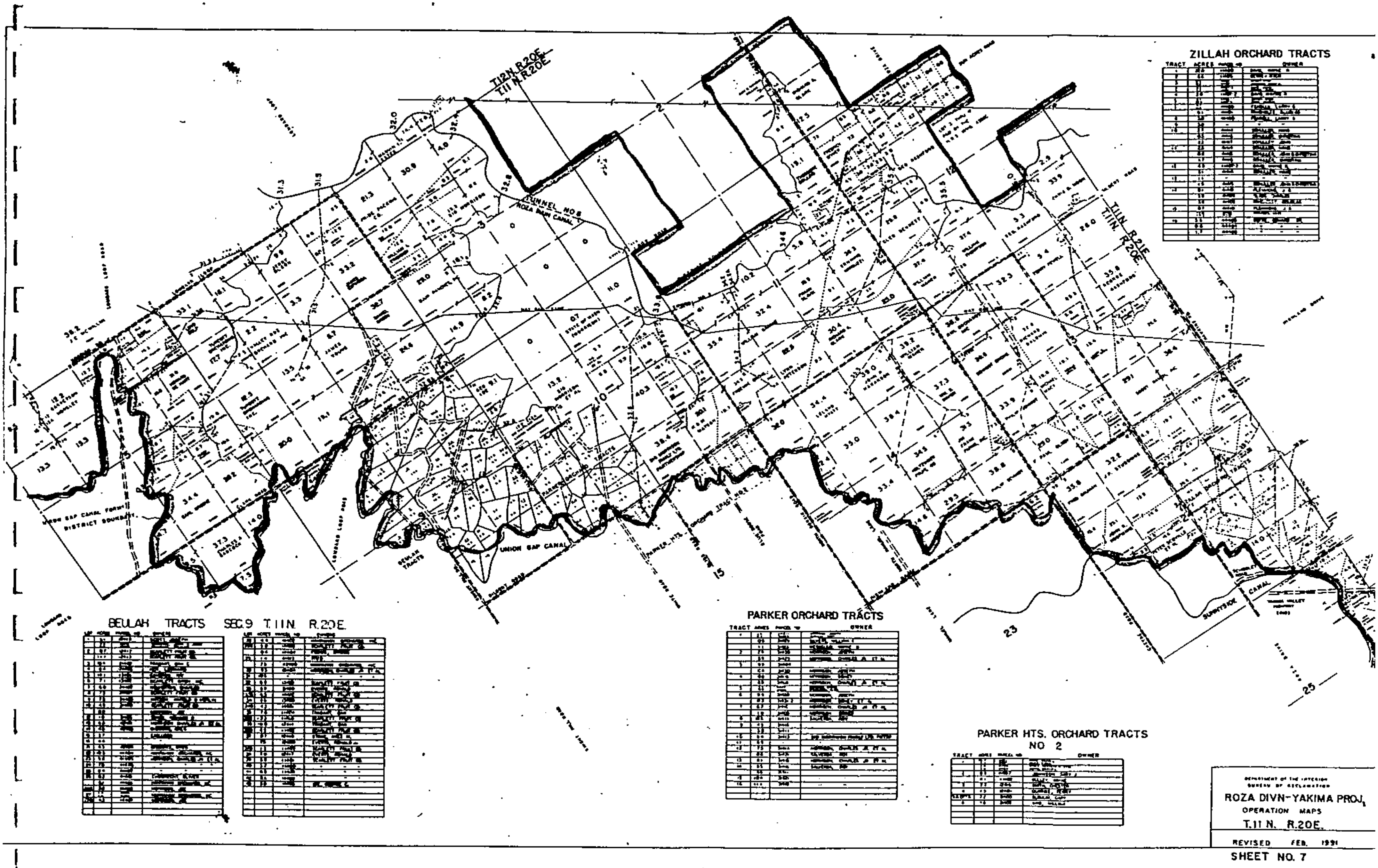


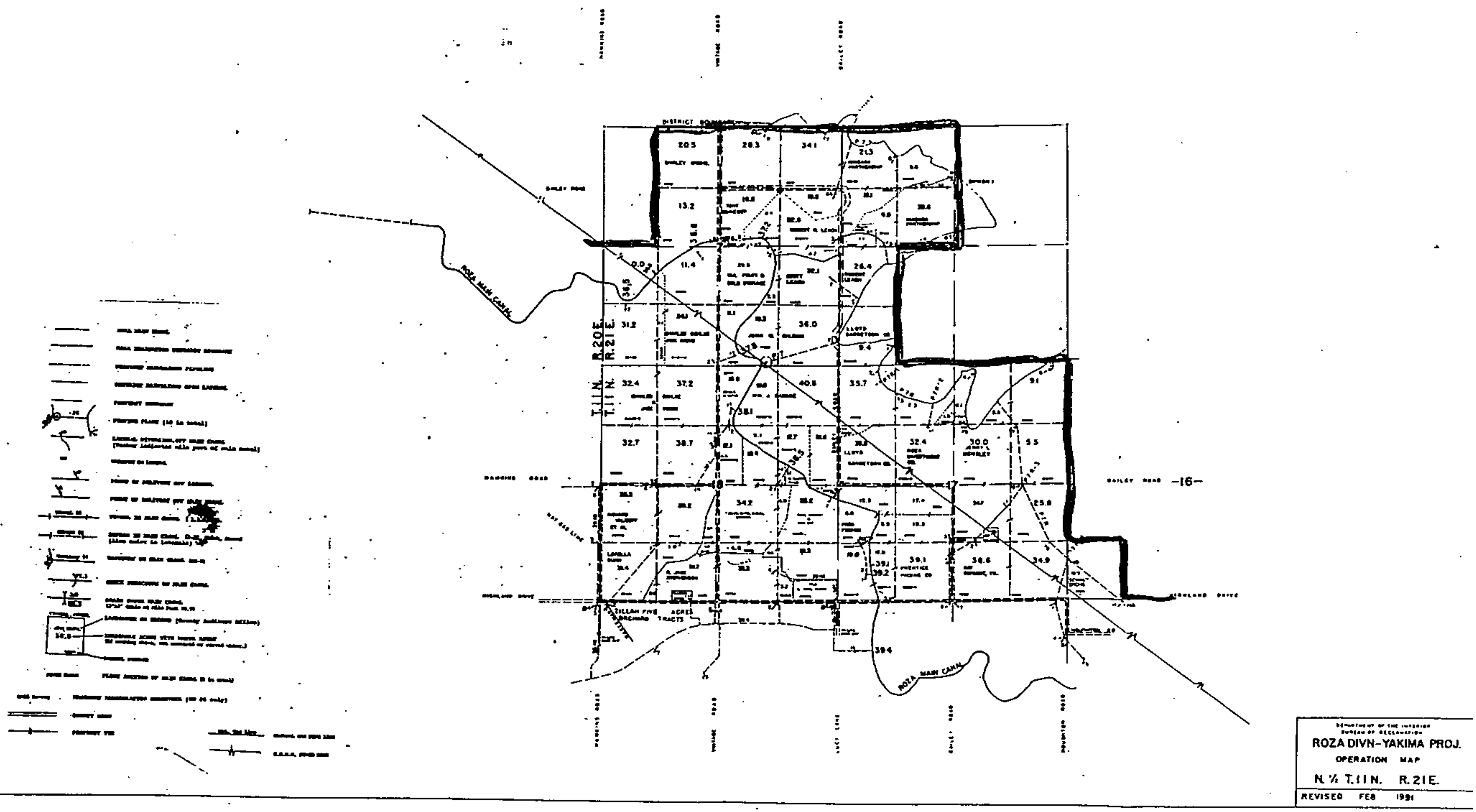
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

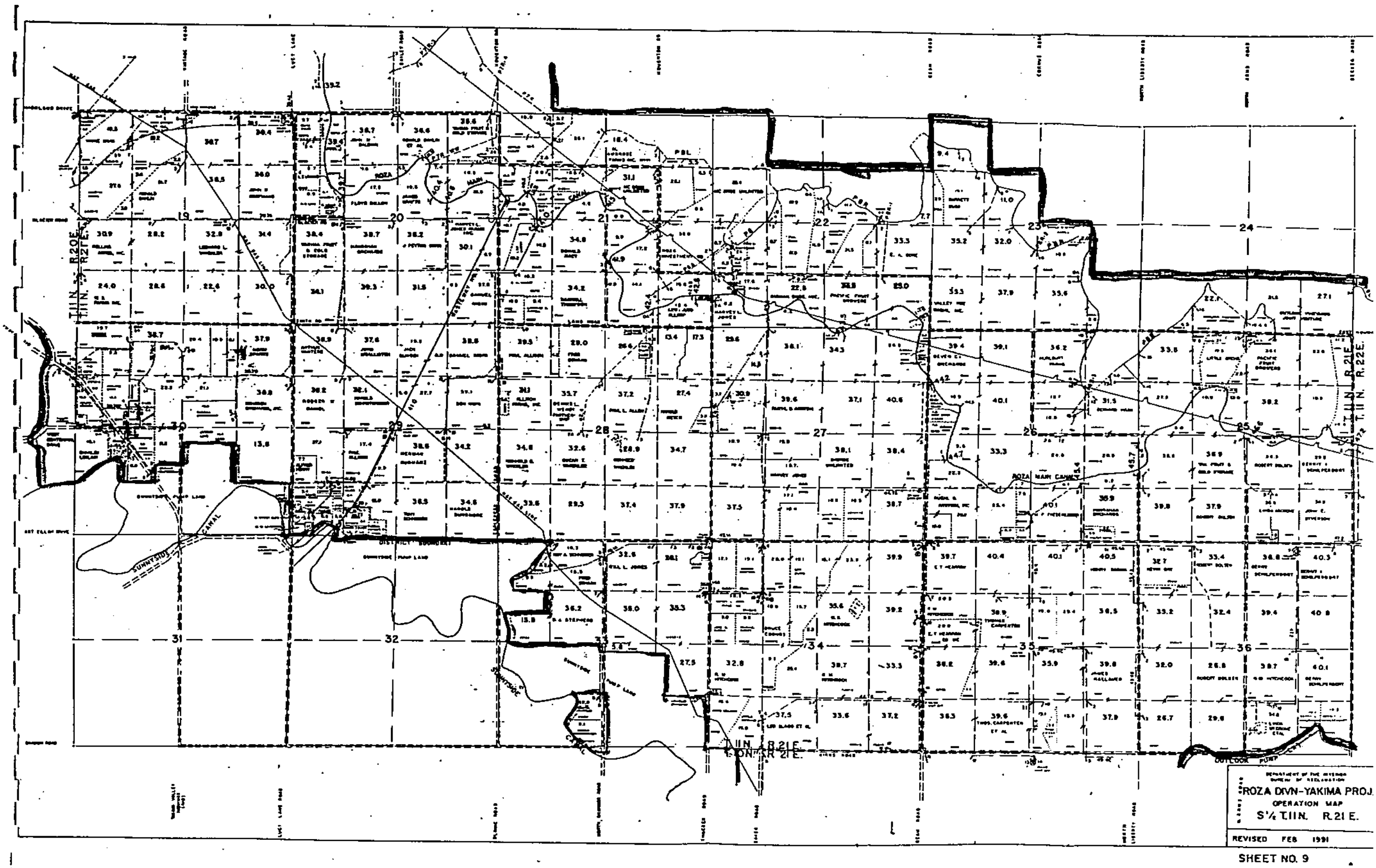
ROZA DIVN- YAKIMA PROJ.
OPERATION MAP
S.½ T.12N. R.20E.

REVISED FEB 1991

SHEET NO. 6


ZILLAH ORCHARD TRACTS
TRACT ACRES PARCEL NO. OWNER
T.12N. R.20E.
T.11N. R.20E.
T.11N. R.21E.
T.11N. R.20E.
TUNNEL NO. 8
ROZA MAIN CANAL
UNION GAP CANAL
UNION GAP CANAL FORMS DISTRICT BOUNDARY
BEULAH TRACTS
SUNNYSIDE CANAL
BEULAH TRACTS SEC.9 T.11N. R.20E.
PARKER ORCHARD TRACTS
TRACT ACRES PARCEL NO. OWNER
PARKER HTS. ORCHARD TRACTS NO 2
TRACT ACRES PARCEL NO. OWNER
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN-YAKIMA PROJ.
OPERATION MAPS
T.11 N. R.20E.
REVISED FEB. 1991
SHEET NO. 7


DISTRICT BOUNDARY
ROZA MAIN CANAL
ROZA MAIN CANAL
T.11N. R.20E.
T.11N. R.21E.
-16-
TILLAH FIVE ACRES ORCHARD TRACTS
20.5
28.3
34.1
21.3
13.2
11.4
26.4
31.2
36.0
32.4
37.2
40.8
35.7
32.7
38.7
32.4
30.0
5.5
34.2
25.8
39.1
38.6
34.9
39.4
38.1
9.1
9.4
36.5
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN-YAKIMA PROJ.
OPERATION MAP
N. ½ T.11N. R.21E.
REVISED FEB 1991
SHEET NO. 8


DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DIVN-YAKIMA PROJ.
OPERATION MAP
S½ T.11N. R.21 E.
REVISED FEB 1991
SHEET NO. 9
T.11N. R.20E.
T.11N. R.21E.
T.11N. R.22E.
ROZA MAIN CANAL
DISTRICT BOUNDARY
SUNNYSIDE PUMP LAND
SUNNYSIDE CANAL
OUTLOOK PUMP
19
20
21
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26
27
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29
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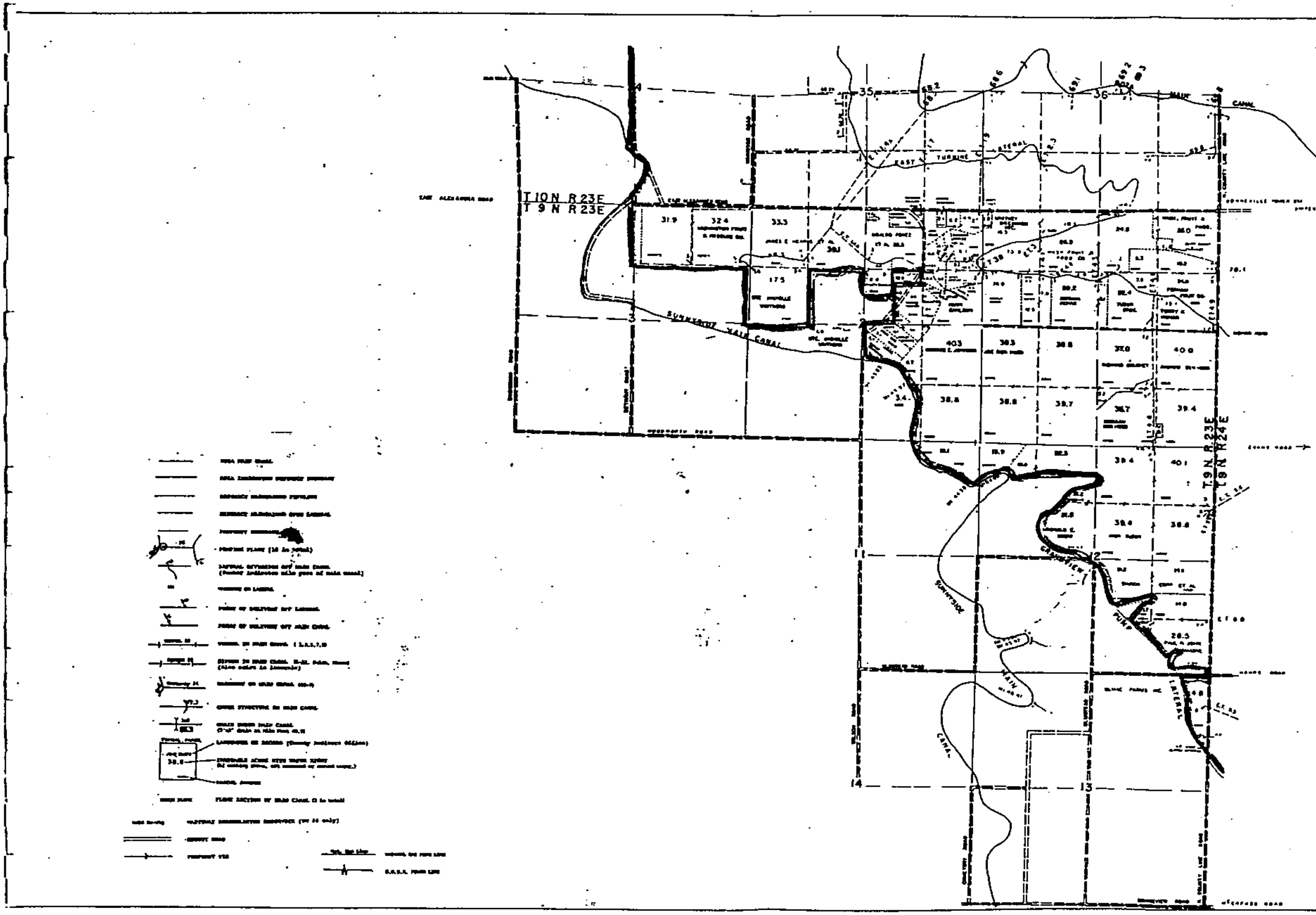
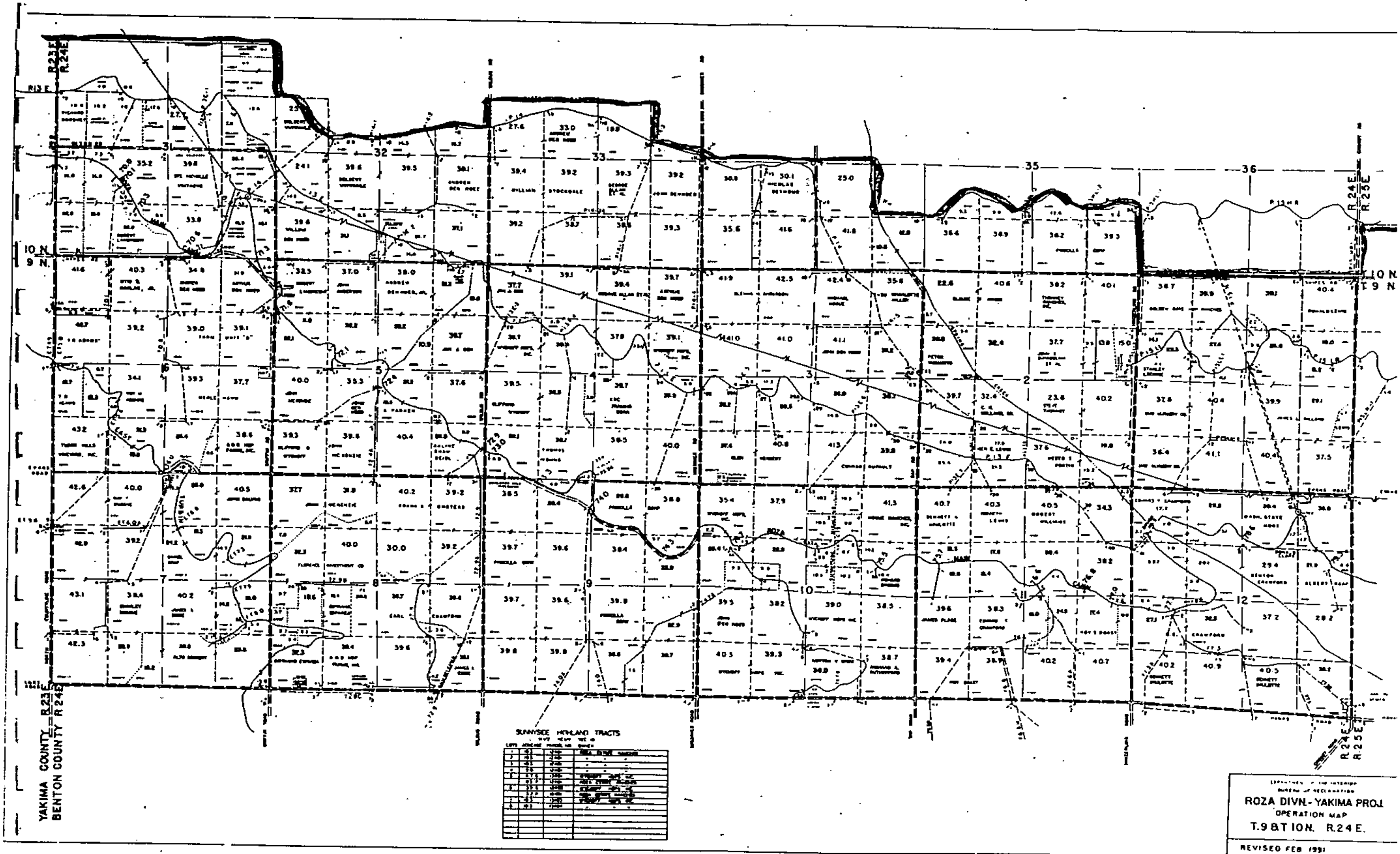
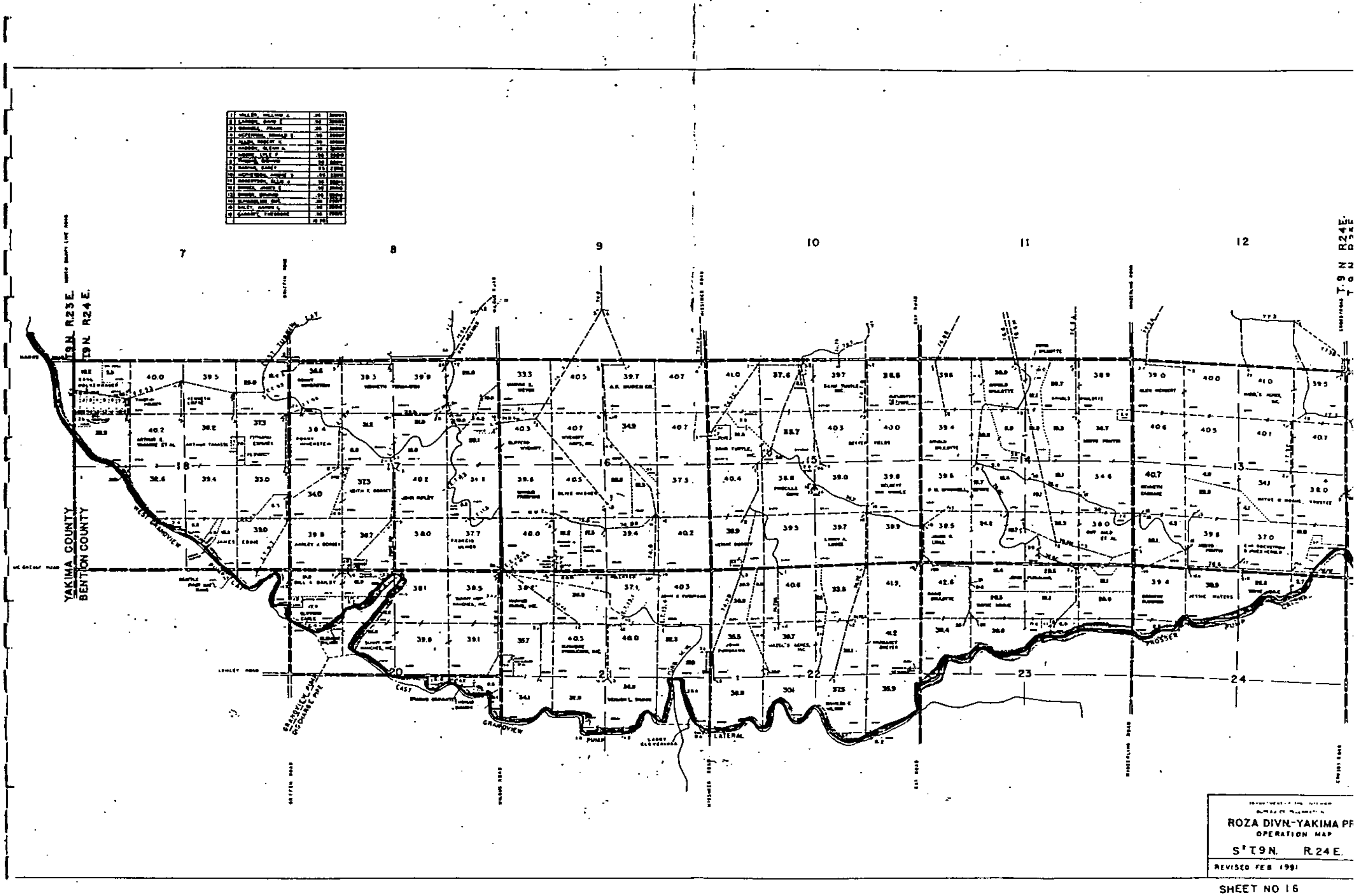


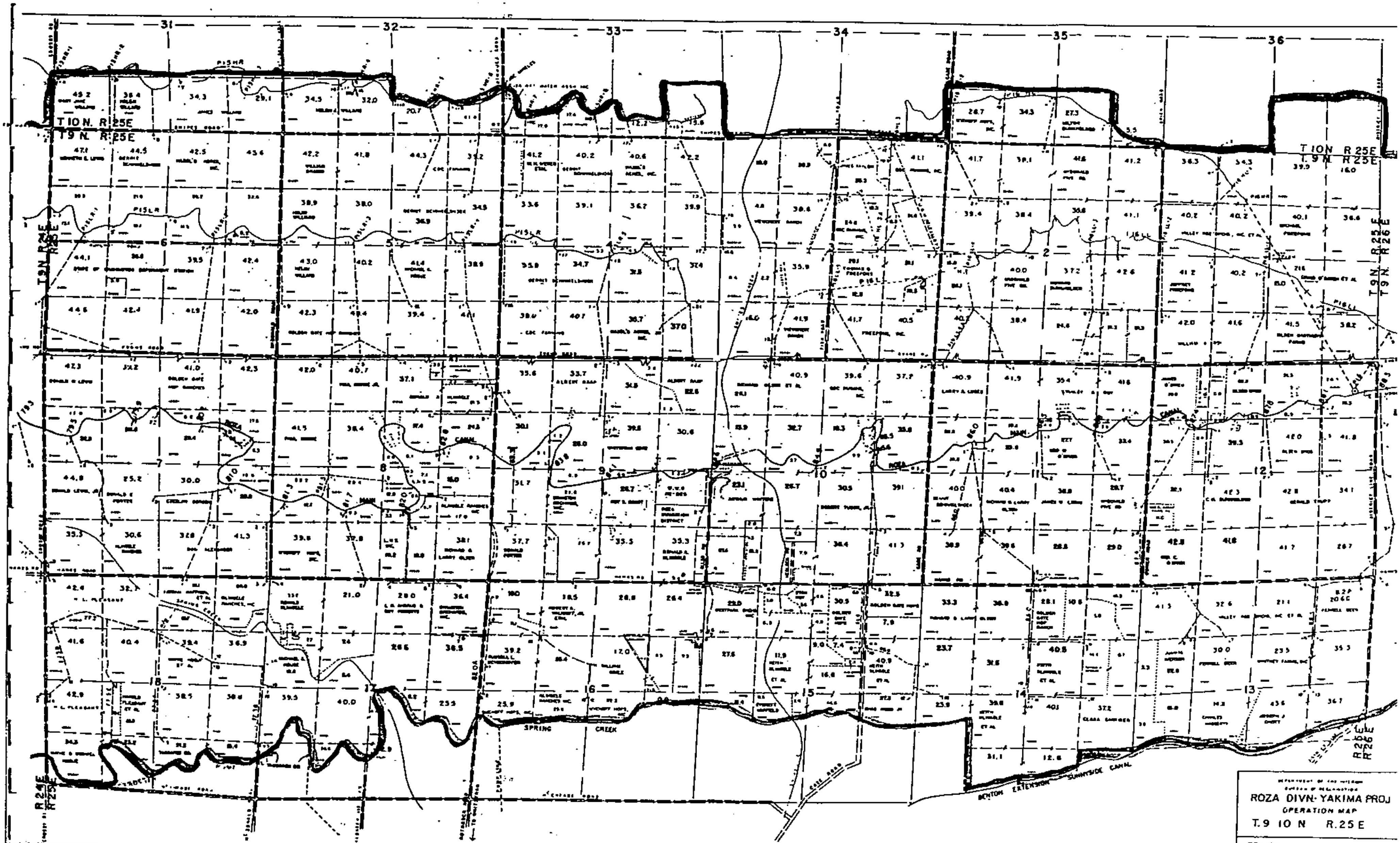
ROZA DIVN - YAKIMA PROJ
OPERATION MAP
T 9 N R 23 E
REVISED FEB 1991
SHEET NO 14

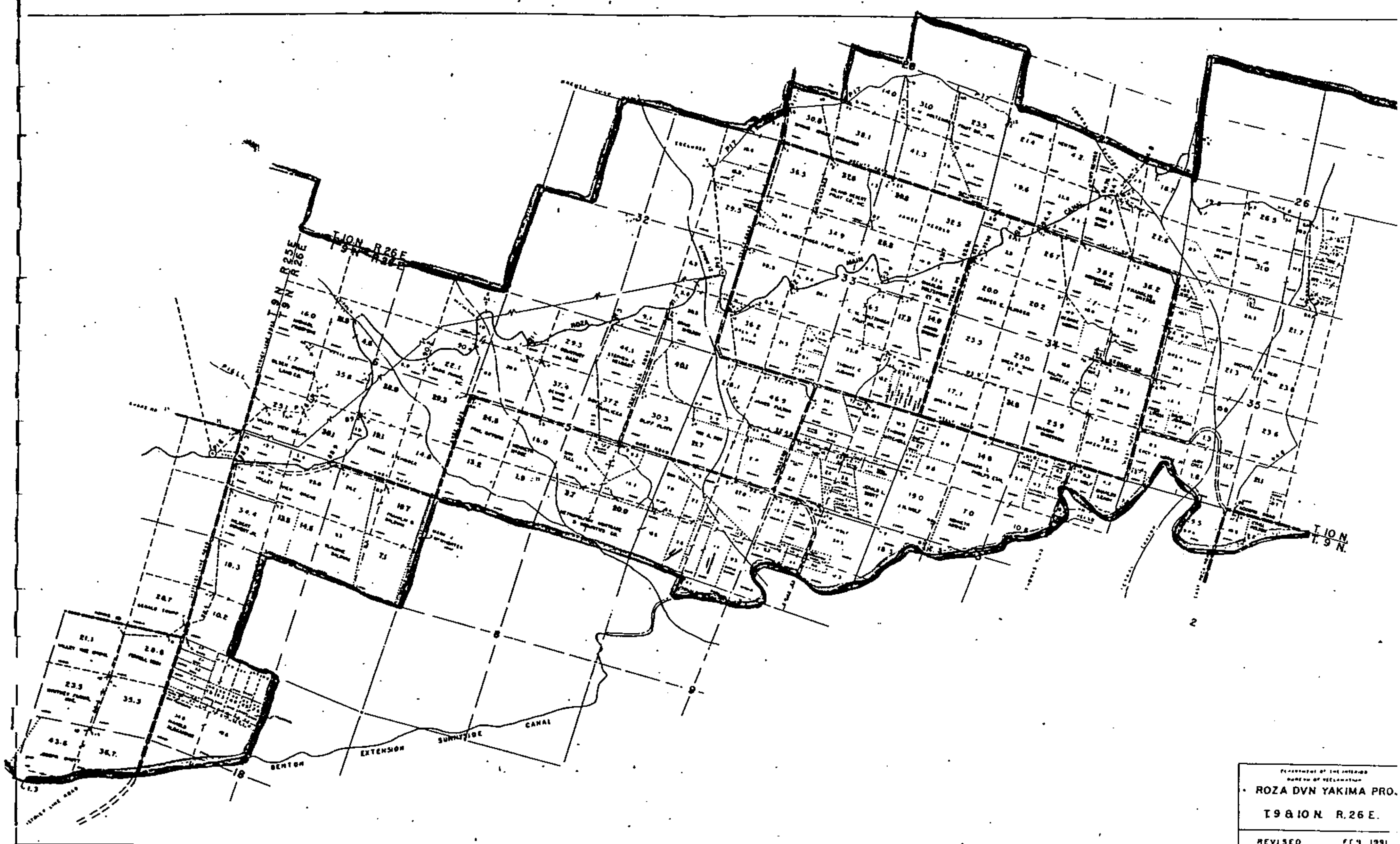

ROZA DIVN.- YAKIMA PROJ.
OPERATION MAP
T. 9 & T 10N. R. 24 E.
REVISED FEB 1991
YAKIMA COUNTY R.23E
BENTON COUNTY R.24E
SUNNYSIDE HIGHLAND TRACTS
R.24E
R.25E
10 N.
9 N.
31
32
33
35
36
1
2
3
4
5
6
7
8
9
10
11
12
ROZA
FISHER

SHEET NO 15



ROZA DIVN-YAKIMA PR
OPERATION MAP
S ½ T9N. R24E.
REVISED FEB 1991
SHEET NO 16
YAKIMA COUNTY
BENTON COUNTY
T9N. R23E.
T9N. R24E.
PROSSER
GRANDVIEW
WEST GRANDVIEW
LATERAL


ROZA DIVN·YAKIMA PROJ
OPERATION MAP
T.9 10 N R.25 E
REVISED FEB 1991
SHEET NO 17
T10N R25E
T9N R25E
SPRING CREEK



DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ROZA DVN YAKIMA PRO.
T 9 & 10 N. R. 26 E.

REVISED FEB 1991

SHEET NO 18

APPENDIX V
EXCERPT FROM USBR STORAGE CONTRACT

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

District electric energy required to operate the pumping plants of the Division. The Secretary shall, by written notice, advise the District of the time and amount of the payments to be made for the furnishing of such power.

(d) Unless and until legislation is enacted authorizing the transfer of the Roza powerplant to the District and the completion of arrangements in accordance with such legislation, title to the Roza powerplant, a plant to be constructed as incidental to the irrigation works to serve the Division, shall be and remain in the exclusive control, possession, and ownership of the United States.

STORAGE AND DELIVERY OF WATER BY THE UNITED STATES

14. (a) The United States will impound and store water for the irrigation of irrigable lands within the District, and will deliver said water from the project supply, subject to the conditions of this contract, and in amounts hereinafter specified at the headworks of the Roza canal.

(b) The total annual supply of water that will be delivered by the United States hereunder shall not exceed 375,000 acre-feet measured at the headworks at the diversion dam in the Yakima River except as that quantity may be reduced as otherwise provided in this contract.

(c) The annual supply to be provided hereunder shall be furnished by months, and not to exceed the quantity shown in the following schedule:

During April	10%	37,500 A/A	625 [illegible]
During May	15%	56,250	937
During June	19%	71,250	1187
During July	19%	71,250	1187
During August	19%	71,250	1187
During September	12%	45,000	750
During October	6%	22,500	375

Nothing herein contained shall, however, prevent the United States from delivering on a different schedule at the request of the District if a revision of the schedule is not in conflict with other vested water rights and the interests of the United States and the various water users having rights in the project supply will not be injured thereby.

(d) The District's original construction cost obligation for its share of the project water supply, set tentatively at two million five hundred thousand dollars ($2,500,000), shall be determined when costs of the pooled storage of the project's storage division are finally established, in accordance with the provisions of the contract of July 8, 1921, as amended by the contract of April 15, 1935, Symbol and No. Ilr-463.

(e) The supply of water to operate the Roza powerplant will be diverted by the United States at the diversion works and carried through the first 10.9 miles of the Roza canal to Wasteway No. 2. No part of said water supply for the Roza powerplant shall be deducted from the water supply to be made available to the District hereunder.

PRORATION AMONG CONTRACTING PARTIES

15. (a) The United States, to the extent permitted by law, will treat on an equal footing with respect to priority all authorized divisions of the project and all lands of irrigation districts, water users

APPENDIX VI
WATER USE RECORD 1942-1995

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

Roza Irrigation District
P. O. Box 310
Sunnyside, Wash. 98944

EXPLANATION FOR "SUMMARY OF DIVERSION AND USE 1942 THROUGH 1990"

TOTAL DIVERSION - Total water diverted for use within the Roza Irrigation District (RID). Years marked with an asterisk (*) (1942-1962) includes water diverted for Terrace Heights Irrigation District (THID). Generally 3,200 acre feet are diverted for use by THID annually. March water is used for canal Priming with incidental water being used for irrigation in most years. Total Diversion does not include the water diverted for use at the hydroelectric station at Main Canal mile 11.

DELIVERED TO FARMS - Total water delivered to the farmer at his point of delivery, although the years marked with an asterisk (*) (1942-62) includes water delivered to THID. Generally 2,900 acre feet is delivered to THID farms annually. Water is not measured at the farm delivery until April First so no data exists for March.

ASSESSED ACRES - This figure includes acres assessed by RID only.

APPENDIX IV

Summary of Diversion and Use
1942 Through 1995

Year 1942 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	1,360			
APRIL	5,504	1,478		
MAY	8,341	3,667		
JUNE	7,278	4,183		
JULY	6,244	3,719		
AUGUST	5,658	3,778		
SEPTEMBER	4,588	2,405		
OCTOBER	1,429	631		
TOTAL	40,402	19,861	5,687.00	3.49

Year 1943 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	2,600			
APRIL	5,449	628		
MAY	8,509	4,466		
JUNE	9,791	6,609		
JULY	10,973	7,179		
AUGUST	10,445	6,867		
SEPTEMBER	9,324	5,633		
OCTOBER	3,284	1,580		
TOTAL	60,375	32,962	9,251.00	3.56

Year 1944 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	1,960			
APRIL	5,110	1,315		
MAY	11,474	6,955		
JUNE	14,027	8,340		
JULY	14,372	9,466		
AUGUST	14,214	9,208		
SEPTEMBER	10,733	6,130		
OCTOBER	4,609	1,741		
TOTAL	76,499	43,155	12,691.00	3.40

Year 1945 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	4,190			
APRIL	9,003	1,719		
MAY	20,386	10,005		
JUNE	22,943	12,489		
JULY	27,755	16,368		
AUGUST	23,984	14,552		
SEPTEMBER	18,306	9,004		
OCTOBER	8,475	2,882		
TOTAL	135,042	67,019	18,555.00	3.61

Year 1946 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	4,770			
APRIL	16,261	4,098		
MAY	28,804	18,400		
JUNE	29,608	18,996		
JULY	30,881	18,291		
AUGUST	30,276	18,338		
SEPTEMBER	21,055	10,076		
OCTOBER	8,470	3,538		
TOTAL	170,125	91,737	27,138.00	3.38

Year 1947 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	8,010			
APRIL	26,726	11,877		
MAY	35,524	22,236		
JUNE	35,177	21,906		
JULY	35,832	24,275		
AUGUST	32,260	21,572		
SEPTEMBER	22,181	12,402		
OCTOBER	8,156	3,596		
TOTAL	203,866	117,864	31,053.00	3.80

Year 1954 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,990			
APRIL	36,147	16,660		
MAY	57,199	40,380		
JUNE	53,879	37,306		
JULY	61,319	45,750		
AUGUST	57,310	40,841		
SEPTEMBER	37,265	22,328		
OCTOBER	19,684	8,612		
TOTAL	333,793	211,877	71,469.20	2.96

Year 1955 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,530			
APRIL	36,230	19,471		
MAY	48,902	32,340		
JUNE	61,339	45,513		
JULY	62,166	45,626		
AUGUST	60,174	40,039		
SEPTEMBER	42,645	27,961		
OCTOBER	20,404	5,964		
TOTAL	342,390	216,914	72,507.80	2.99

Year 1956 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	15,897			
APRIL	35,857	11,856		
MAY	55,799	37,330		
JUNE	52,477	35,149		
JULY	66,262	49,799		
AUGUST	60,851	44,156		
SEPTEMBER	39,947	23,774		
OCTOBER	23,887	9,300		
TOTAL	350,977	211,364	72,508.20	2.92

Year 1957 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	3,126			
APRIL	31,706	5,543		
MAY	62,511	32,780		
JUNE	64,671	44,221		
JULY	68,281	49,894		
AUGUST	63,279	43,848		
SEPTEMBER	45,380	25,562		
OCTOBER	16,248	3,462		
TOTAL	355,202	205,310	72,508.00	2.83

Year 1958 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	12,140			
APRIL	29,659	3,876		
MAY	58,348	34,647		
JUNE	66,228	49,281		
JULY	68,750	50,060		
AUGUST	67,803	45,249		
SEPTEMBER	43,900	24,483		
OCTOBER	17,913	7,940		
TOTAL	364,741	215,536	72,505.50	2.97

Year 1959 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	7,180			
APRIL	43,159	15,137		
MAY	60,626	36,952		
JUNE	63,170	40,276		
JULY	72,524	50,348		
AUGUST	69,379	45,937		
SEPTEMBER	45,921	23,195		
OCTOBER	16,417	4,647		
TOTAL	378,376	216,492	72,575.90	2.98

Year 1960 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,110			
APRIL	40,077	14,039		
MAY	60,320	32,282		
JUNE	68,166	44,965		
JULY	72,340	53,418		
AUGUST	69,346	46,695		
SEPTEMBER	51,117	26,095		
OCTOBER	21,251	7,997		
TOTAL	392,727	225,491	72,567.30	3.11

Year 1961 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	12,630			
APRIL	34,790	8,077		
MAY	47,816	25,837		
JUNE	68,728	45,491		
JULY	74,826	55,557		
AUGUST	71,610	53,129		
SEPTEMBER	48,133	32,699		
OCTOBER	17,680	10,606		
TOTAL	376,213	231,396	72,585.90	3.19

Year 1962 *

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	9,220			
APRIL	37,590	17,227		
MAY	49,853	27,340		
JUNE	63,383	40,857		
JULY	74,060	54,224		
AUGUST	66,508	49,203		
SEPTEMBER	47,971	33,066		
OCTOBER	14,476	8,168		
TOTAL	363,061	230,085	72,585.90	3.17

Year 1963

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,300			
APRIL	23,587	1,766		
MAY	46,571	25,384		
JUNE	68,253	51,126		
JULY	63,981	47,820		
AUGUST	69,201	53,236		
SEPTEMBER	51,078	35,712		
OCTOBER	17,850	11,867		
TOTAL	350,821	226,911	72,585.90	3.13

Year 1964

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	13,310			
APRIL	44,540	25,641		
MAY	54,655	38,623		
JUNE	53,997	36,476		
JULY	70,485	54,581		
AUGUST	63,452	48,245		
SEPTEMBER	45,096	33,193		
OCTOBER	17,248	11,669		
TOTAL	362,783	248,428	72,581.30	3.42

Year 1965

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	12,860			
APRIL	35,940	17,473		
MAY	55,913	37,881		
JUNE	62,471	45,504		
JULY	69,843	53,597		
AUGUST	65,748	51,799		
SEPTEMBER	42,942	30,354		
OCTOBER	19,837	11,277		
TOTAL	365,554	247,885	72,577.70	3.42

Year 1966

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	12,064			
APRIL	42,649	23,125		
MAY	64,246	46,168		
JUNE	64,143	45,834		
JULY	65,998	48,463		
AUGUST	70,935	56,294		
SEPTEMBER	44,875	32,417		
OCTOBER	20,425	11,946		
TOTAL	385,335	264,247	72,576.60	3.64

Year 1967

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	13,765			
APRIL	33,890	18,968		
MAY	51,669	33,842		
JUNE	66,297	50,586		
JULY	72,475	58,585		
AUGUST	70,152	56,852		
SEPTEMBER	50,647	36,041		
OCTOBER	23,851	13,099		
TOTAL	382,746	267,973	72,576.60	3.69

Year 1968

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	15,220			
APRIL	40,404	22,410		
MAY	62,063	44,370		
JUNE	65,442	49,791		
JULY	72,652	56,590		
AUGUST	65,058	47,070		
SEPTEMBER	39,332	22,352		
OCTOBER	23,289	10,138		
TOTAL	383,460	252,721	72,576.60	3.48

Year 1969

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	4,600			
APRIL	28,587	8,914		
MAY	56,960	35,962		
JUNE	68,617	51,098		
JULY	72,854	55,153		
AUGUST	69,007	51,035		
SEPTEMBER	42,973	25,685		
OCTOBER	18,029	6,747		
TOTAL	361,627	234,594	72,584.50	3.23

Year 1970

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	11,633			
APRIL	32,645	15,183		
MAY	60,149	38,759		
JUNE	68,516	49,486		
JULY	73,280	55,251		
AUGUST	68,767	50,552		
SEPTEMBER	44,640	25,032		
OCTOBER	20,348	7,409		
TOTAL	379,978	241,672	72,584.50	3.33

Year 1971

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	12,592			
APRIL	31,814	10,180		
MAY	63,491	40,019		
JUNE	60,746	40,707		
JULY	71,471	53,237		
AUGUST	73,179	52,406		
SEPTEMBER	37,866	18,113		
OCTOBER	21,783	7,380		
TOTAL	372,942	222,042	72,582.20	3.06

Year 1972

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	14,005			
APRIL	34,782	14,282		
MAY	57,365	31,506		
JUNE	63,450	40,635		
JULY	71,960	52,347		
AUGUST	68,949	49,137		
SEPTEMBER	49,459	28,195		
OCTOBER	19,972	8,176		
TOTAL	379,942	224,278	72,574.20	3.09

Year 1973

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,535			
APRIL	44,421	22,145		
MAY	63,705	44,057		
JUNE	62,906	44,484		
JULY	67,339	50,850		
AUGUST	62,993	49,390		
SEPTEMBER	27,378	18,212		
OCTOBER				
TOTAL	339,277	229,138	72,574.20	3.16

Year 1974

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	8,971			
APRIL	28,581	6,459		
MAY	51,910	31,784		
JUNE	71,833	51,724		
JULY	72,188	49,724		
AUGUST	69,293	50,761		
SEPTEMBER	57,054	35,644		
OCTOBER	27,259	11,778		
TOTAL	387,089	237,874	72,561.10	3.28

Year 1975

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,537			
APRIL	29,798	8,423		
MAY	56,156	35,390		
JUNE	71,495	49,889		
JULY	74,996	54,428		
AUGUST	67,303	44,681		
SEPTEMBER	48,573	28,701		
OCTOBER	23,132	9,670		
TOTAL	381,990	231,182	72,555.30	3.19

Year 1976

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	13,056			
APRIL	35,816	15,388		
MAY	63,459	42,858		
JUNE	65,747	47,476		
JULY	71,509	52,336		
AUGUST	64,783	45,354		
SEPTEMBER	48,227	29,495		
OCTOBER	24,270	11,873		
TOTAL	386,867	244,780	72,506.00	3.38

Year 1977

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	0			
APRIL	21,641	12,432		
MAY	31,113	18,209		
JUNE	43,308	27,588		
JULY	56,558	38,215		
AUGUST	60,641	43,218		
SEPTEMBER	44,809	29,316		
OCTOBER				
TOTAL	258,070	168,978	72,506.81	2.33

Year 1978

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	9,195			
APRIL	32,509	8,972		
MAY	51,664	28,373		
JUNE	67,331	46,843		
JULY	69,916	47,538		
AUGUST	65,779	47,134		
SEPTEMBER	41,947	22,515		
OCTOBER	22,218	10,753		
TOTAL	360,559	212,128	72,521.51	2.93

Year 1979

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	8,050			
APRIL	36,588	12,637		
MAY	65,540	42,009		
JUNE	67,588	48,852		
JULY	65,847	48,378		
AUGUST	31,156	20,352		
SEPTEMBER	0	0		
OCTOBER	10,411	3,375		
NOVEMBER	4,489	2,479		
TOTAL	289,669	178,082	72,521.51	2.46

Year 1980

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	5,660			
APRIL	30,467	7,754		
MAY	57,247	30,717		
JUNE	56,043	32,555		
JULY	72,290	49,438		
AUGUST	71,109	48,988		
SEPTEMBER	44,279	23,947		
OCTOBER	23,299	10,973		
TOTAL	360,394	204,372	72,521.51	2.82

Year 1981

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	6,220			
APRIL	31,540	13,304		
MAY	50,797	32,065		
JUNE	55,949	35,012		
JULY	67,425	46,142		
AUGUST	67,398	48,026		
SEPTEMBER	49,148	30,359		
OCTOBER	18,449	7,283		
TOTAL	346,926	212,191	72,521.51	2.93

Proratable Supplies Reduced Below Demand

Year 1982

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	6,910			
APRIL	28,918	7,307		
MAY	57,010	33,175		
JUNE	66,287	45,181		
JULY	66,186	42,564		
AUGUST	64,555	45,054		
SEPTEMBER	43,646	23,448		
OCTOBER	19,457	6,601		
TOTAL	352,969	203,330	72,520.71	2.80

Year 1983

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	7,240			
APRIL	28,763	6,771		
MAY	51,617	30,948		
JUNE	60,957	44,581		
JULY	58,651	39,978		
AUGUST	64,351	44,947		
SEPTEMBER	40,302	21,535		
OCTOBER	22,617	11,378		
TOTAL	334,498	200,138	72,521.01	2.76

Summary of Diversion and Use
1942 Through 1995

Year 1984

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	8,117			
APRIL	31,620	6,889		
MAY	50,820	25,265		
JUNE	62,562	37,452		
JULY	72,589	51,791		
AUGUST	72,478	49,618		
SEPTEMBER	48,330	26,566		
OCTOBER	20,762	8,100		
TOTAL	367,278	205,681	72,521.31	2.84

Year 1985

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	8,299			
APRIL	39,902	14,334		
MAY	63,307	39,276		
JUNE	65,435	42,609		
JULY	72,907	54,622		
AUGUST	68,940	45,868		
SEPTEMBER	42,077	21,695		
OCTOBER				
TOTAL	360,867	218,404	72,521.21	3.01

Year 1986

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	9,913			
APRIL	36,434	17,717		
MAY	50,640	27,819		
JUNE	63,248	43,745		
JULY	68,407	45,512		
AUGUST	67,779	47,514		
SEPTEMBER	39,673	19,552		
OCTOBER				
TOTAL	336,094	201,859	72,515.91	2.78

Year 1987

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	Proratable Supplies Reduced Below Demand ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	9,669			
APRIL	37,360	18,031		
MAY	63,555	38,102		
JUNE	61,380	42,132		
JULY	63,481	45,945		
AUGUST	50,504	37,601		
SEPTEMBER	20,380	14,904		
OCTOBER				
TOTAL	306,329	196,715	72,665.01	2.71

Year 1988

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	Proratable Supplies Reduced Below Demand ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	31,630			
APRIL	40,400	18,173		
MAY	51,848	28,711		
JUNE	45,407	27,589		
JULY	56,645	38,904		
AUGUST	60,870	43,349		
SEPTEMBER	46,133	28,845		
OCTOBER	22,174	12,615		
TOTAL	355,107	198,186	72,665.01	2.73

Year 1989

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	3,014			
APRIL	34,085	11,578		
MAY	53,127	32,628		
JUNE	66,272	45,276		
JULY	69,888	49,464		
AUGUST	63,049	42,444		
SEPTEMBER	43,743	25,103		
OCTOBER	22,594	12,503		
TOTAL	355,772	218,996	72,632.41	3.02

Year 1990

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	13,462			
APRIL	48,401	26,268		
MAY	52,594	30,164		
JUNE	55,830	35,699		
JULY	70,853	50,235		
AUGUST	63,935	40,828		
SEPTEMBER	42,778	25,423		
OCTOBER	21,026	11,726		
TOTAL	368,879	220,343	72,665.01	3.03

Year 1991

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	10,680			
APRIL	43,274	19,601		
MAY	58,671	31,430		
JUNE	57,372	30,445		
JULY	70,776	48,235		
AUGUST	70,797	48,891		
SEPTEMBER	49,382	30,875		
OCTOBER	27,968	16,159		
TOTAL	388,920	225,636	72,143.41	3.13

Year 1992

Proratable Supplies Reduced Below Demand

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	13,713			
APRIL	37,739	19,994		
MAY	52,819	32,682		
JUNE	44,318	30,810		
JULY	45,675	32,297		
AUGUST	45,092	31,901		
SEPTEMBER	20,255	15,009		
OCTOBER	0			
TOTAL	259,611	162,693	72,488.21	2.24

Year 1993

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
			Proratable Supplies Reduced Below Demand	
MARCH				
APRIL	24,043	8,091		
MAY	46,117	29,621		
JUNE	38,602	24,905		
JULY	44,742	30,937		
AUGUST	48,259	33,236		
SEPTEMBER	42,287	28,432		
OCTOBER	4,050	3,069		
TOTAL	248,100	158,291	72,490.71	2.18

Year 1994

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
			Proratable Supplies Reduced Below Demand	
MARCH	9,304			
APRIL	39,330	23,270		
MAY	18,772	13,224		
JUNE	26,468	13,949		
JULY	33,350	20,481		
AUGUST	34,104	19,923		
SEPTEMBER	8,593	5,678		
OCTOBER	0			
TOTAL	169,921	96,525	72,490.61	1.33

Year 1995

	TOTAL DIVERSION (AF)	DELIVERED TO FARMS (AF)	ASSESSED ACRES	TOTAL DELIVERED TO FARMS DIVIDED BY ASSESSED ACRES
MARCH	9,187			
APRIL	32,128	13,184		
MAY	44,775	20,296		
JUNE	56,792	35,294		
JULY	66,871	46,648		
AUGUST	64,906	46,321		
SEPTEMBER	42,969	25,365		
OCTOBER	15,101	7,910		
TOTAL	332,729	195,018	72,489.81	2.69

APPENDIX VII
WASHINGTON STATE WATER QUALITY STANDARDS

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

Chapter 173-201 WAC
WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON

WAC
173-201-010 Introduction.
173-201-025 Definitions.
173-201-035 General considerations.
173-201-045 General water use and criteria classes.
173-201-047 Toxic substances.
173-201-070 General classifications.
173-201-080 Specific classifications—Freshwater.
173-201-085 Specific classifications—Marine water.
173-201-090 Achievement considerations.
173-201-100 Implementation.
173-201-110 Surveillance.
173-201-120 Enforcement.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

173-201-020 Water use and quality criteria. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-020, filed 1/17/78; Order 73-4, § 173-201-020, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035.

173-201-030 Water use and quality criteria—General water use and criteria classes. [Order 73-4, § 173-201-030, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035.

173-201-040 Water use and quality criteria—General considerations. [Order 73-4, § 173-201-040, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035.

173-201-050 Characteristic uses to be protected. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-050, filed 1/17/78; Order 73-4, § 173-201-050, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035.

173-201-060 Water course classification. [Order 73-4, § 173-201-060, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035.

173-201-130 Definitions. [Order 73-4, § 173-201-130, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035.

173-201-140 Miscellaneous. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-140, filed 1/17/78; Order 73-4, § 173-201-140, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035.

WAC 173-201-010 Introduction. (1) The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment thereof, and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW and the policies and purposes thereof.

(2) This chapter shall be reviewed periodically by the department and appropriate revisions shall be undertaken.

(3) The water use and quality criteria set forth in WAC 173-201-035 through 173-201-085 are established in conformance with present and potential water uses of the surface waters of the state of Washington and in consideration of the natural water quality potential and limitations of the same. These shall be the sole criteria for said waters. [Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-010, filed 1/6/88. Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-010, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-010, filed 1/17/78; Order 73-4, § 173-201-010, filed 7/6/73.]

WAC 173-201-025 Definitions. (1) Background conditions: The biological, chemical, and physical conditions of a water body, upstream from the point or nonpoint source of any discharge under consideration. Background sampling location in an enforcement action would be upstream from the point of discharge, but not upstream from other inflows. If several discharges to any water body exist, and enforcement action is being taken for possible violations to the standards, background sampling would be undertaken immediately upstream from each discharge.

(2) Department: State of Washington department of ecology.

(3) Director: Director of the state of Washington department of ecology.

(4) Hardness: A measure of the calcium and magnesium salts present in water. For purposes of this chapter, hardness is measured in milligrams per liter as calcium carbonate (C_aCO_3).

(5) Fecal coliform: That portion of the coliform group which is present in the intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 plus or minus 0.2 degrees Celsius.

(6) Geometric mean: The nth root of a product of n factors.

(7) Mean detention time: The time obtained by dividing a reservoir's mean annual minimum total storage by the 30-day ten-year low-flow from the reservoir.

(8) Permit: A document issued pursuant to RCW 90-.48.160 et seq. or 90.48.260 or both, specifying the waste treatment and control requirements and waste discharge conditions.

(9) pH: The negative logarithm of the hydrogen ion concentration.

(10) Primary contact recreation: Activities where a person would have direct contact with water to the point

(a) Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses will be allowed.

(b) No degradation will be allowed of waters lying in national parks, national recreation areas, national wildlife refuges, national scenic rivers, and other areas of national ecological importance.

(c) Whenever waters are of a higher quality than the criteria assigned for said waters, the existing water quality shall be protected and waste and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof, except, in those instances where:

(i) It is clear that overriding considerations of the public interest will be served, and

(ii) All wastes and other materials and substances proposed for discharge into the said waters shall be provided with all known, available, and reasonable methods of treatment before discharge.

(d) Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

(e) The criteria and special conditions established in WAC 173-201-045 through 173-201-085 may be modified for a specific water body on a short term basis when necessary to accommodate essential activities, respond to emergencies, or to otherwise protect the public interest. Such modification shall be issued in writing by the director or his/her designee subject to such terms and conditions as he/she may prescribe. The aquatic application of herbicides which result in water use restrictions shall be considered an activity for which a short term modification generally may be issued subject to the following conditions:

(i) A request for a short-term modification shall be made to the department on forms supplied by the department. Such request generally shall be made at least thirty days prior to herbicide application.

(ii) Such herbicide application shall be in accordance with state of Washington department of agriculture regulations.

(iii) Such herbicide application shall be in accordance with label provisions promulgated by USEPA under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended. (7 U.S.C. 136, et seq.)

(iv) Notice, including identification of the herbicide, applicator, location where the herbicide will be applied, proposed timing and method of application, and water use restrictions shall be given according to the following requirements:

(A) Appropriate public notice as determined and prescribed by the director or his/her designee shall be given of any water use restrictions specified in USEPA label provisions.

(B) The appropriate regional offices of the departments of fisheries and game shall be notified twenty four hours prior to herbicide application.

(C) In the event of any fish kills, the departments of ecology, fisheries, and game shall be notified immediately.

(v) The herbicide application shall be made at times so as to:

(A) Minimize public water use restrictions during weekends.

(B) Completely avoid public water use restrictions during the opening week of fishing season, Memorial Day weekend, July 4 weekend, and Labor Day weekend.

(vi) Any additional conditions as may be prescribed by the director or his/her designee.

(f) In no case, will any degradation of water quality be allowed if this degradation interferes with or becomes injurious to existing water uses and causes long term harm to the environment.

(g) No waste discharge permit will be issued which violates established water quality criteria, except, as provided for under WAC 173-201-035 (8)(e).

(9) Due consideration will be given to the precision and accuracy of the sampling and analytical methods used as well as existing conditions at the time, in the application of the criteria.

(10) The analytical testing methods for these criteria shall be in accordance with the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* (40 C.F.R. Part 136) and other or superseding methods published and/or approved by the department following consultation with adjacent states and concurrence of the USEPA.

(11) Deleterious concentrations of radioactive materials for all classes shall be as determined by the lowest practicable concentration attainable and in no case shall exceed:

(a) 1/100 of the values listed in WAC 402-24-220 (Column 2, Table II, Appendix A, rules and regulations for radiation protection); or,

(b) USEPA Drinking Water Regulations for radionuclides, as published in the Federal Register of July 9, 1976, or subsequent revisions thereto.

(12) Nothing in this chapter shall be interpreted to be applicable to those aspects of governmental regulation of radioactive wastes which have been preempted from state regulation by the Atomic Energy Act of 1954, as amended, as interpreted by the United States Supreme Court in the cases of *Northern States Power Co. v. Minnesota 405 U.S. 1035 (1972) and Train v. Colorado Public Interest Research Group,* 426 U.S. 1 (1976).

(13) Nothing in this chapter shall be interpreted to prohibit the establishment of effluent limitations for the control of the thermal component of any discharge in accordance with Section 316 of the Federal Clean Water Act (33 U.S.C. 1251 et seq.). [Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-035, filed 1/6/88. Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-035, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-035, filed 1/17/78.]

(iv) Temperature shall not exceed 18.0°C (freshwater) or 16.0°C (marine water) due to human activities. Temperature increases shall not, at any time, exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine water).

When natural conditions exceed 18.0°C (freshwater) and 16.0°C (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a dilution zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8°C, and the maximum water temperature shall not exceed 18.3°C (freshwater).

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a man caused variation within a range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health (see WAC 173-201-047).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) **Class B (good).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial and agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing and spawning.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria.

(i) Fecal coliform organisms.

(A) Freshwater - fecal coliform organisms shall not exceed a geometric mean value of 200 organisms/100 mL, with not more than 10 percent of samples exceeding 400 organisms/100 mL.

(B) Marine water - fecal coliform organisms shall not exceed a geometric mean value of 100 organisms/100 mL, with not more than 10 percent of samples exceeding 200 organisms/100 mL.

(ii) Dissolved oxygen.

(A) Freshwater - dissolved oxygen shall exceed 6.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 5.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 5.0 mg/L, natural dissolved oxygen levels can be degraded by up to 0.2 mg/L by man-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 21.0°C (freshwater) or 19.0°C (marine water) due to human activities. Temperature increases shall not, at any time, exceed t=34/(T+9) (freshwater) or t=16/T (marine water).

When natural conditions exceed 21.0°C (freshwater) and 19.0°C (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a dilution zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8°C, and the maximum water temperature shall not exceed 21.3°C (freshwater).

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) and 7.0 to 8.5 (marine water) with a man-caused variation within a range of less than 0.5 units.

(vi) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health (see WAC 173-201-047).

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.

(4) **Class C (fair).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial).

(ii) Fish (salmonid and other fish migration).

(iii) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(iv) Commerce and navigation.

(c) Water quality criteria - marine water.

b. $\leq 0.52/FT/FPH/2$

Where $FT = 10^{0.03(20-TCAP)}$; $TCAP \leq T \leq 30$

$10^{0.03(20-T)}$; $0 \leq T \leq TCAP$

$FPH = 1$; $8 \leq pH \leq 9$

$$FPH = \frac{1 + 10^{7.4-pH}}{1.25};\ 6.5 \leq pH \leq 8$$

TCAP = 20°C: Salmonids present

TCAP = 25°C: Salmonids absent

c. $\leq 0.80/FT/FPH/RATIO$

The RATIO = 16 if: $7.7 \leq pH \leq 9$

The RATIO = $24 \times \frac{10^{7.7-pH}}{1 + 10^{7.4-pH}}$ if: $6.5 \leq pH \leq 7.7$

Where FT and FPH are as above except:
TCAP = 15°C: Salmonids present
TCAP = 20°C: Salmonids absent

d. $\leq e^{(1.128[\ln(hardness)] - 3.828)}$

e. $\leq e^{(0.7852[\ln(hardness)] - 3.490)}$

f. $\leq e^{(0.8190[\ln(hardness)] + 3.688)}$

g. $\leq e^{(0.8190[\ln(hardness)] + 1.561)}$

h. $\leq e^{(0.9422[\ln(hardness)] - 1.464)}$

i. $\leq e^{(0.8545[\ln(hardness)] - 1.465)}$

j. $\leq e^{(1.273[\ln(hardness)] - 1.460)}$

k. $\leq e^{(1.273[\ln(hardness)] - 4.705)}$

l. $\leq e^{(0.8460[\ln(hardness)] + 3.3612)}$

m. $\leq e^{(0.8460[\ln(hardness)] + 1.1645)}$

n. $\leq e^{(1.72[\ln(hardness)] - 6.52)}$

o. $\leq e^{(0.8473[\ln(hardness)] + 0.8604)}$

p. $e^{(0.8473[\ln(hardness)] + 0.7614)}$

q. $e^{[1.005(pH) - 4.830]}$

r. $e^{[1.005(pH) - 5.290]}$

w. An instantaneous concentration not to be exceeded at any time.

x. A 24 hour average not to be exceeded.

y. A 1 hour average concentration not to be exceeded more than once every three years.

z. A 4-day average concentration not to be exceeded more than once every three years.

(2) *USEPA Quality Criteria for Water, 1986* shall be used in the use and interpretation of the values listed in subsection (1) of this section.

(3) Concentrations of toxic, and other substances with toxic propensities not listed in subsection (1) of this section shall be determined in consideration of *USEPA's Quality Criteria for Water*, 1986, and as revised, and other relevant information as appropriate.

(4) Toxic substances shall not be introduced above natural background levels in waters of the state which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health, as determined by the department. [Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-047, filed 1/6/88.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-201-070 General classifications. General classifications applying to various surface water bodies not specifically classified under WAC 173-201-080 or 173-201-085 are as follows:

(1) All surface waters lying within national parks, national forests, and/or wilderness areas are classified Class AA or lake class.

(2) All lakes and their feeder streams within the state are classified lake class and Class AA respectively, except for those feeder streams specifically classified otherwise.

(3) All reservoirs with a mean detention time of greater than 15 days are classified lake class.

(4) All reservoirs with a mean detention time of 15 days or less are classified the same as the river section in which they are located.

(5) All reservoirs established on preexisting lakes are classified as lake class.

(6) All unclassified surface waters that are tributaries to Class AA waters are classified Class AA. All other unclassified surface waters within the state are hereby classified Class A. [Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-070, filed 1/6/88. Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-070, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-070, filed 1/17/78; Order 73-4, § 173-201-070, filed 7/6/73.]

WAC 173-201-080 Specific classifications—Freshwater. Specific fresh surface waters of the state of Washington are classified as follows:

(1) American River. Class AA
(2) Big Quilcene River and tributaries. Class AA
(3) Bumping River. Class AA
(4) Burnt Bridge Creek. Class A
(5) Cedar River from Lake Washington to Landsburg Dam (river mile 21.6). Class A
(6) Cedar River and tributaries from Landsburg Dam (river mile 21.6) to headwaters. Special condition – no waste discharge will be permitted. Class AA
(7) Chehalis River from upper boundary of Grays Harbor at Cosmopolis (river mile 3.1, longitude 123°45'45" W) to Scammon Creek (river mile 65.8). Class A

(48) Hanaford Creek from east boundary of Sec. 25 T15N R2W (river mile 4.1) to headwaters. Class A
(49) Hoh River and tributaries. Class AA
(50) Hoquiam River (continues as west fork above east fork) from mouth to river mile 9.3 (Dekay Road bridge) (upper limit of tidal influence). Class B
(51) Humptulips River and tributaries from mouth to Olympic National Forest boundary on east fork (river mile 12.8) and west fork (river mile 40.4) (main stem continues as west fork). Class A
(52) Humptulips River, east fork from Olympic National Forest boundary (river mile 12.8) to headwaters. Class AA
(53) Humptulips River, west fork from Olympic National Forest boundary (river mile 40.4) to headwaters. Class AA
(54) Issaquah Creek. Class A
(55) Kalama River from lower Kalama River Falls (river mile 10.4) to headwaters. Class AA
(56) Klickitat River from Little Klickitat River (river mile 19.8) to headwaters. Class AA
(57) Lake Washington Ship Canal from Government Locks (river mile 1.0) to Lake Washington (river mile 8.6). Special condition salinity shall not exceed one part per thousand (1.0 ppt) at any point or depth along a line that transects the ship canal at the University Bridge (river mile 6.1). Lake Class
(58) Lewis River, east fork, from Multon Falls (river mile 24.6) to headwaters. Class AA
(59) Little Wenatchee River. Class AA
(60) Methow River from mouth to Chewack River (river mile 50.1). Class A
(61) Methow River from Chewack River (river mile 50.1) to headwaters. Class AA
(62) Mill Creek from mouth to 13th street bridge in Walla Walla (river mile 6.4). Special condition dissolved oxygen concentration shall exceed 5.0 mg/L. Class B
(63) Mill Creek from 13th Street bridge in Walla Walla (river mile 6.4) to Walla Walla Waterworks Dam (river mile 25.2). Class A
(64) Mill Creek and tributaries from city of Walla Walla Waterworks Dam (river mile 25.2) to headwaters. Special condition no waste discharge will be permitted. Class AA
(65) Naches River from Snoqualmie National Forest boundary (river mile 35.7) to headwaters. Class AA
(66) Naselle River from Naselle "Falls" (cascade at river mile 18.6) to headwaters. Class AA
(67) Newaukum River. Class A
(68) Nisqually River from mouth to Alder Dam (river mile 44.2). Class A
(69) Nisqually River from Alder Dam (river mile 44.2) to headwaters. Class AA
(70) Nooksack River from mouth to Maple Creek (river mile 49.7). Class A
(71) Nooksack River from Maple Creek (river mile 49.7) to headwaters. Class AA
(72) Nooksack River, south fork, from mouth to Skookum Creek (river mile 14.3). Class A
(73) Nooksack River, south fork, from Skookum Creek (river mile 14.3) to headwaters. Class AA
(74) Nooksack River, middle fork. Class AA
(75) Okanogan River. Class A
(76) Palouse River from mouth to south fork (Colfax, river mile 89.6). Class B
(77) Palouse River from south fork (Colfax, river mile 89.6) to Idaho border (river mile 123.4). Special condition – temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$. Class A
(78) Pend Oreille River from Canadian border (river mile 16.0) to Idaho border (river mile 87.7). Special condition – temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$. Class A
(79) Pilchuck River from city of Snohomish Waterworks Dam (river mile 26.8) to headwaters. Class AA
(80) Puyallup River from mouth to river mile 1.0. Class B
(81) Puyallup River from river mile 1.0 to Kings Creek (river mile 31.6). Class A
(82) Puyallup River from Kings Creek (river mile 31.6) to headwaters. Class AA
(83) Queets River and tributaries. Class AA
(84) Quillayute River. Class AA
(85) Quinault River and tributaries. Class AA
(86) Salmon Creek (Clark County). Class A
(87) Satsop River from mouth to west fork (river mile 6.4) Class A
(88) Satsop River, east fork. Class AA
(89) Satsop River, middle fork. Class AA
(90) Satsop River, west fork. Class AA
(91) Skagit River from mouth to Skiyou Slough lower end (river mile 25.6). Class A
(92) Skagit River and tributaries (includes Baker, Suak Suiattle, and Cascade rivers) from Skiyou Slough lower end, (river mile 25.6) to Canadian border (river mile 127.0). Class AA
(93) Skokomish River and tributaries. Class AA
(94) Skookumchuck River from Bloody Run Creek (river mile 21.4) to headwaters. Class AA

(122) Toutle River, north fork, from Green River to headwaters. Class AA

(123) Toutle River, south fork. Class AA

(124) Tucannon River from Umatilla National Forest boundary (river mile 38.1) to headwaters. Class AA

(125) Twisp River. Class AA

(126) Union River and tributaries from Bremerton Waterworks Dam (river mile 6.9) to headwaters. Special condition no waste discharge will be permitted. Class AA

(127) Walla Walla River from mouth to Lowden (Dry Creek at river mile 27.2). Class B

(128) Walla Walla River from Lowden (Dry Creek at river mile 27.2) to Oregon border (river mile 40). Special condition temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9). Class A

(129) Wenatchee River from Wenatchee National Forest boundary (river mile 27.1) to headwaters. Class AA

(130) White River (Pierce King counties) from Mud Mountain Dam (river mile 29.6) to headwaters. Class AA

(131) White River (Chelan County). Class AA

(132) Wildcat Creek. Class A

(133) Willapa River upstream of a line bearing 70°true through Mailboat Slough light (river mile 1.8). Class A

(134) Wishkah River from mouth to river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21 T18N R9W). Class B

(135) Wishkah River from river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21 T18N R9W) to west fork (river mile 17.7). Class A

(136) Wishkah River from west fork of Wishkah River (river mile 17.7) to south boundary of Sec. 33 T21N R8W (river mile 32.0). Class AA

(137) Wishkah River and tributaries from south boundary of Sec. 33 T21N R8W (river mile 32.0) to headwaters. Special condition no waste discharge will be permitted. Class AA

(138) Wynoochee River from mouth to Olympic National Forest boundary (river mile 45.9). Class A

(139) Wynoochee River from Olympic National Forest boundary (river mile 45.9) to headwaters. Class AA

(140) Yakima River from mouth to Cle Elum River (river mile 185.6). Special condition temperature shall not exceed 21.0°C due to human activities. When natural conditions exceed 21.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9). Class A

(141) Yakima River from Cle Elum River (river mile 185.6) to headwaters. Class AA

[Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-080, filed 1/6/88. Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-080, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-080, filed 1/17/78; Order DE 73-22, § 173-201-080, filed 11/16/73; Order 73-4, § 173-201-080, filed 7/6/73.]

WAC 173-201-085 Specific classifications—Marine water. Specific marine surface waters of the state of Washington are classified as follows:

(1) Budd Inlet south of latitude 47°04'N (south of Priest Point Park). Class B

(2) Coastal waters: Pacific Ocean from Ilwaco to Cape Flattery. Class AA

(3) Commencement Bay south and east of a line bearing 258° true from "Brown's point" and north and west of line bearing 225° true through the Hylebos waterway light. Class A

(4) Commencement Bay, inner, south and east of a line bearing 225° true through Hylebos Waterway light except the city waterway south and east of south 11th Street. Class B

(5) Commencement Bay, city waterway south and east of south 11th Street. Class C

(6) Drayton Harbor, south of entrance. Class A

(7) Dyes and Sinclair Inlets west of longitude 122°37'W. Class A

(8) Elliott Bay east of a line between Pier 91 and Duwamish head. Class A

(9) Everett Harbor, inner, north and east of a line bearing 121° true from light "4" (Snohomish River mouth). Class B

(10) Grays Harbor west of longitude 123°59'W. Class A

(11) Grays Harbor east of longitude 123°59'W to longitude 123°45'45"W (Cosmopolis Chehalis River, river mile 3.1). Special condition dissolved oxygen shall exceed 5.0 mg/L. Class B

(12) Guemes Channel, Padilla, Samish and Bellingham Bays east of longitude 122°39'W and north of latitude 48°27'20"N. Class A

(13) Hood Canal. Class AA

(14) Mukilteo and all North Puget Sound west of longitude 122°39' W (Whidbey, Fidalgo, Guemes and Lummi islands and state highway 20 bridge at Deception Pass), except as otherwise noted. Class AA

(15) Oakland Bay west of longitude 123°05'W (inner Shelton harbor). Class B

(16) Port Angeles south and west of a line bearing 152° true from buoy "2" at the tip of Ediz Hook. Class A

(3) Levying of civil penalties as provided for in RCW 90.48.144. Under this section, the director may levy a civil penalty up to five thousand dollars per day against a person who violates the terms of a waste discharge permit, or who discharges without such a permit when the same is required, or violates the provisions of RCW 90.48.080. If the amount of the penalty, which is subject to mitigation or remission by the department, is not paid within thirty days after receipt of said notice, the attorney general, upon request of the director, shall bring an action in superior court to recover the same.

(4) Initiation of a criminal proceeding by the appropriate county prosecutor, as provided for in RCW 90.48.140.

(5) Issuance of regulatory orders or directives as provided for in RCW 90.48.240. [Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-120, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-120, filed 1/17/78; Order 73-4, § 173-201-120, filed 7/6/73.]

APPENDIX VIII
1990 STATEWIDE WATER QUALITY ASSESSMENT 305(B) REPORT

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

1990 STATEWIDE WATER QUALITY ASSESSMENT
305(B) REPORT

STATE OF WASHINGTON
BOOTH GARDNER
GOVERNER

DEPARTMENT OF ECOLOGY
CHRISTINE O. GREGOIRE
DIRECTOR

WATER QUALITY PROGRAM

JUNE 1990

This Assessment has been prepared to fulfill the State of Washington's obligation under Section 305(b) of the federal Clean Water Act.

Roza Irrigation District
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CHAPTER 2: WATER QUALITY SUMMARY

For the purposes of this report, water quality information is summarized primarily in terms of designated use support status and CWA goal attainment. These two indicators may be thought of as the "bottom line" in judging problems and progress under both state and federal water quality programs. It should be noted, however, that this report may present a worst-case scenario as opposed to a balanced or realistic assessment of the State's water quality. This is due to a substantial portion of the data used being collected in response to identified problems (ie., healthy environments are less likely to be targeted than troubled ones).

Designated Use Support

ATTACHMENT 6.2.2.

Designated use support status has been determined by comparing available water quality information to the state's water quality criteria (Appendix 1). These determinations considered both numeric and narrative criteria which have been established to provide a level of water quality that supports designated uses. Variations from specific numeric criteria due to natural conditions, such as high turbidity due to glacial runoff, are not considered violations. Most conventional parameters for which monitoring data is available have numeric criteria corresponding to minimum conditions necessary for support of designated uses. The narrative criteria are most often applied to toxics data and evidence of biological effects. Designated use support status is determined for entire waterbodies or portions of waterbodies based on the areal extent represented by monitoring data or other evaluation criteria. In many cases, different portions of a waterbody have a different use support status. In certain cases where information is not available to determine the limits of impaired areas, the entire waterbody is considered impaired.

The multiple-use classifications established in the state's Water Quality Standards are considered to be fully supported if all designated uses within that classification are supported. Designated uses are considered to be fully supported but threatened if ambient pollutant levels are approaching the applicable criteria, and sources are present which could further degrade water quality.

Waterbodies considered impaired if uses designated in the State Water Quality Standards are partially supported or not supported. Designated uses are considered partially supported where water quality conditions are not supporting or only partially supporting one of these uses, but are fully supporting the other designated uses. Designated uses are considered not supported for portions of waterbodies where two or more classified uses are not fully supported.

This method of determining the use support status for impaired waters is most appropriate for Washington's multiple-use classification system. It allows surface waters with more severe water quality problems (i.e. those where two or more uses are impaired) to be differentiated from those where a single use is impaired. Utilizing such an approach to classifying impaired waters improves the resolution of the data base, and may facilitate future trends evaluation of designated use support. This includes trends within individual waterbodies, as well as in the overall status of assessed waters.

Designated use support status is summarized in Table III.1, by total size among waterbody types. For individual waterbodies, use support status is provided in Appendix VI.

Water Quality-Limited Status

For waterbodies found to be not meeting applicable state water quality standards, the water quality-limited status has been determined. A list of waterbodies, all or a portion of which are water quality-limited, is attached as Appendix IV of this report. This list is divided into two parts. The first part contains the waterdies for which there is enough information for them to be assessed on a "monitored" basis. The water bodies in the second part are assessed on an evaluated basis. The information available on these waterbodies suggessts that they may be water quality-limited, however the information is not sufficient for actual listing as water quality limited. This listing meets the requirements of Section 303(d) of the CWA. Priority waterbodies are identified from this list on an annual basis as part of the State-EPA Agreement and Ecology's Program Planning Process. The specific information on the use support status of these waterbodies is contained in Appendix VI of this report and the Waterbody System data base.

The water quality-limited status and designated use support status are separate determinations. For example, a Class AA waterbody could be fully supporting designated uses (which are the same for Lake Class and Class A and AA) but not meeting the more stringent criteria the state has set for Class AA waters. This would be the case in a Class AA stream where ambient fecal coliform levels fall between the Class AA and Class A criteria due to agricultural runoff. The stream would be fully supporting its designated uses, yet it would be water quality-limited for fecal coliform. In general, however, waters which are water quality-limited are those which are not fully supporting designated uses.

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APPENDIX VI: Waterbody Specific Information ←

Note: The use support status is the degree to which the water quality of a waterbody supports the designated uses described in the State Water Quality Standards. The coding for the use support status columns in this appendix are explained below.

FULL - This area of the waterbody fully supports all of it's designated uses.
PART - This area of the waterbody does not support one of it's designated uses.
THREAT - This area of the waterbody fully supports all of it's designated uses, although this support is threatened by current trends.
NOT - This area of the waterbody does not support two or more of it's designated uses.
NOT ASS. - This area of the waterbody has not been assessed for it's use support status.

ALL - The entire water body has this use support status
REST - The remainder of the waterbody not included under other use support status designations has this use support status.

I.D. NUMBER	WATERBODY NAME	WATERBODY SIZE	COUNTY	USE SUPPORT STATUS FULL	PART	THREAT	NOT	NOT ASS.
WA-36-1010	ESQUATZEL COULEE	30.00 Miles	Franklin Co					0.00
WA-36-9060	KAHLOTUS LAKE	380.00 Acres	Franklin Co	0.00	0.00	0.00	0.00	- ALL
WA-37-1010	YAKIMA R.	80.40 Miles	Benton Co	0.00	- ALL	0.00	0.00	0.00
WA-37-1012	SNIPES CREEK	10.03 Miles	Benton Co	0.00	0.00	0.00	- ALL	0.00
WA-37-1020	YAKIMA R.	23.40 Miles	Yakima Co	0.00	- ALL	0.00	0.00	0.00
WA-37-1024	GRANGER DRAIN	5.00 Miles	Yakima Co	0.00	0.00	0.00	0.00	- ALL
WA-37-1030	SULPHUR CREEK WASTEWAY	9.00 Miles	Yakima Co	0.0	0.0	0.0	9.0	0.
WA-37-1040	YAKIMA R.	12.50 Miles	Yakima Co	0.00	0.00	0.00	- ALL	0.
WA-37-1047	WIDE HOLLOW CREEK	28.00 Miles	Yakima Co	0.00	0.00	0.00	0.00	- A
WA-37-1048	MOXEE DRAIN (BIRCHFIELD DRAIN)	12.60 Miles	Yakima Co	0.00	0.00	0.00	0.00	- A
WA-37-1050	TOPPENISH CREEK	35.00 Miles	Yakima Co	0.00	0.00	0.00	0.00	- A
WA-38-1010	NACHES R.	17.50 Miles	Yakima Co	- ALL	0.00	0.00	0.00	0.
WA-38-1020	TIETON R.	21.30 Miles	Yakima Co					0.
WA-38-1030	NACHES R.	18.20 Miles	Yakima Co					0.
WA-38-1040	NACHES R.	8.90 Miles	Kittitas; Yakima Co					0.0
WA-38-1050	BUMPING R.	3.50 Miles	Yakima Co					0.0
WA-38-1060	AMERICAN R.	24.50 Miles	Yakima Co					0.0
WA-38-1070	BUMPING R.	13.50 Miles	Yakima Co					0.0
WA-38-1080	LITTLE NACHES R.	13.20 Miles	Kittitas; Yakima Co					0.0
WA-38-1200	WIDE HOLLOW CREEK	21.70 Miles	Yakima Co	0.00	0.00	0.00	- ALL	0.0
WA-38-9005	AMERICAN LAKE	4.90 Acres						0.0
WA-38-9013	DEER LAKE	11.60 Acres						0.0
WA-38-9016	PEAR LAKE	21.00 Acres						0.00
WA-38-9030	SHELLROCK LAKE	14.30 Acres						0.00
WA-38-9040	SUPRISE LAKE	7.70 Acres						0.00
WA-38-9050	LEECH LAKE	41.00 Acres	Yakima Co	0.00	0.00	0.00	- ALL	0.00
WA-38-9066	BIG TWIN SISTER LAKE	104.00 Acres	Yakima Co	- ALL	0.00	0.00	0.00	0.00
WA-38-9070	LITTLE TWIN SISTER LAKE	31.10 Acres	Yakima Co	- ALL	0.00	0.00	0.00	0.00
WA-39-1010	YAKIMA R.	30.70 Miles	Yakima Co	0.00	0.00	0.00	0.00	- ALL
WA-39-1011	GOLF CLUB CREEK	34.00 Miles	Yakima Co	0.00	11.00	0.00	0.00	23.00
WA-39-1020	WILSON CR.	30.60 Miles	Kittitas Co	0.0	0.0	0.0	30.6	0.00
WA-39-1030	YAKIMA R.	38.60 Miles	Kittitas Co	38.6	0.0	0.0	0.0	0.00
WA-39-1032	CHERRY CREEK	3.00 Miles	Kittitas Co	0.00	0.00	0.00	0.00	- ALL
WA-39-1037	CRYSTAL CREEK	3.00 Miles	Kittitas Co	0.0	3.0	0.0	0.0	0.00
WA-39-1040	CLE ELUM R.	8.20 Miles	Kittitas Co					0.00
WA-39-1050	CLE ELUM R.	18.30 Miles	Kittitas Co					0.00
WA-39-1060	YAKIMA R.	16.90 Miles	Kittitas Co					0.00
WA-39-1070	YAKIMA R.	12.00 Miles	Kittitas Co					0.00
WA-39-1110	SELAH DITCH	0.98 Miles	Kittitas Co	0.00	0.00	0.00	- ALL	0.00
WA-39-1210	CABIN CREEK	9.00 Miles	Kittitas Co	0.00	0.00	0.00	0.00	- ALL
WA-39-9002	BAKER LAKE	4.90 Acres						0.00
WA-39-9004	BONNIE LAKE	8.40 Acres						0.00
WA-39-9006	CAMP LAKE	5.20 Acres						0.00
WA-39-9008	CIRCLE LAKE	44.00 Acres						0.00
WA-39-9010	CLE ELUM LAKE	4800.00 Acres	Kittitas Co	- ALL	0.00	0.00	0.00	0.00

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The "208" plans have relied heavily on voluntary programs based on information and education, technical assistance, and incentives promoting good land management. The forest practices, dairy waste, and irrigated and dryland agriculture plans also contain a regulatory component. Since adoption of the plans, neither the voluntary nor regulatory elements have been fully implemented due to inadequate funding. However, recent funding increases have allowed an increase in complaint response and regulatory efforts by Ecology. Agricultural water quality complaint response activities are guided by the Agricultural Compliance Memorandum of Agreement.

Agricultural Compliance Memorandum of Agreement

In September 1988, Ecology and the Washington Conservation Commission executed the Agricultural Compliance Memorandum of Agreement. The purpose of the agreement is to recognize the working relationship between conservation districts, the Conservation Commission, and Ecology in protecting water quality of the state, and to outline a process by which complaints on water quality violations will be handled at the district level. Since September of 1988, virtually all of the state's 48 conservation districts have each selected a specific level for their involvement in administering their responsibilities under the agreement.

The Agreement reaffirms the original complaint response process specified in the "208" Plans. That is, if a water quality problem is verified by Ecology, the landowner is provided an opportunity for voluntary compliance rather than achieving the same through formal enforcement action. The agreement provides that in critical situations, immediate corrective action may be required by Ecology. Normally, however, compliance is achieved through the landowner adopting a water quality management plan within six months and implementing it within eighteen additional months. When developing and implementing the management plan, technical assistance is provided to the landowner through the local conservation district. If voluntary compliance is not forthcoming, Ecology will initiate formal enforcement action.

Since the Agreement was executed, Ecology has assigned staff in headquarters and regional offices to implement the Agreement. This is significant since staff have never been specifically dedicated to agricultural complaint response activities.

Timber, Fish and Wildlife (TFW) Agreement

In an unprecedented negotiation process, state agencies, tribes, environmentalists, and forest industry representatives agreed on a major shift in the way natural resources in forested areas are managed in Washington. The culmination of nearly six months of intense meetings, In early 1989, the Spokane River Waste Management Plan was finalized and signed by all dischargers to the river. This plan set out a schedule for active phosphorous removal at each of the municipal treatment plants to maintain phosphorous levels below the TMDL. Coeur d'Alene, the next scheduled facility, could not begin removal until the 1991 growing season, due to design and construction considerations.

During the Summer of 1989 numerous nuisance algal blooms occurred in Long Lake. Ecology determined through the use of a computer model that the TMDL was exceeded in Long Lake during June, July, August and September. Ecology addressed this problem to the technical advisory committee established as part of the plan. Solutions for the 1990 growing season needed to be developed.

The committee discussed this matter at length and recommended that a phosphate detergent ban was the best alternative for meeting the TMDL during the 1990 growing season.

Ecology agrees with the committee's recommendation and encourages the city, along with other governmental bodies in the area, to implement a phosphate detergent ban. All information received to date indicates that with a ban in place prior to the 1990 growing season, the TMDL will not be exceeded and improved water quality should occur. This ban in conjunction with physical removal at treatment plants, should protect the Spokane River into the future.

Yakima River

The U.S. Geological Survey initiated the pilot phase of the National Water Quality Assessment (NAWQA) program in 1986 with a preliminary study of the Yakima River basin. This national program proposes to investigate about 120 river basins and aquifers to (1) provide a nationally consistent description of the current status of water quality, (2) define water quality trends that have occurred over recent decades, and (3) relate past and present water quality conditions to relevant natural features, the history of the land and water use, and land and waste management practices. Aggregation of acquired information from each study site will be used to answer national-scale questions about current conditions, trends and factors that affect water quality. Results could be used by federal, state and local agencies to understand and manage resources in each study area.

The Yakima River basin drains an area of 6,155 square miles and contains about 1900 river miles of perennial streams. Major land-use activities include growing and harvesting timber, dryland pasture grazing, intense farming and irrigated agriculture, and urbanization. Potential water quality problems resulting from these uses may include large concentrations of suspended sediments, bacteria, nutrients, and

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pesticides. Also, a presence of trace elements may affect water used for human consumption, fish propagation and passage, contact recreation, livestock watering and irrigation.

Data collection for each study site revolves around a 9 year cycle. The preliminary 3 years is a period of concentrated data acquisition and interpretation. The remaining 6 years involves less intensive data collection and the focus lies in detecting conspicuous changes in water quality. The 9 year cycle is then repeated.

Three sampling techniques are used for data acquisition: fixed-location station sampling, synoptic sampling and intensive-reach studies. Fixed location station data determine mass loadings and seasonal variations of constituent concentrations. Synoptic sampling data provide a "snapshot" of water-quality conditions over a broad geographical area. Data are collected at numerous sites during a brief time interval. Synoptic studies in the Yakima River basin include sampling for dissolved oxygen, indicator bacteria, trace elements, nutrients, suspended sediments, pesticides, and in-stream biology. Intensive-reach studies are concerned with determining the origin, movement, and fate of particular contaminents, and their effects on biota. These studies will occur only if synoptic data results indicate a need to further examine a particular reach for specific contaminants. If utilized, intensive reach studies are expected to cover two field seasons and may incorporate mathematical modeling and simulation.

APPENDIX IX
RESULTS OF 1990 WATER QUALITY INDEX ANALYSIS

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

USTINE O. GREGOIRE
Director

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
7171 Cleanwater Lane, Building 8, LH-14 • Olympia, Washington 98504

July 18, 1990

TO: Dick Cunningham

FROM: David Hallock

SUBJECT: Results of the 1990 Water Quality Index Analysis

This memo describes the Water Quality Index (WQI), records the procedures used to produce the 1990 WQI, and presents the results of the analysis.

Introduction

The WQI is a unitless number, ranging from 0 to 100, which is derived primarily from data collected by the Ambient Monitoring Section (AMS) of Environmental Investigations and Laboratory Services (EILS); however, data collected by USGS, METRO, and USBR were also used in the 1990 analysis. Scores are determined by comparing measured values to specified criteria. Criteria were developed by a national study group and modified to better evaluate Washington's water quality. In general, the criteria are based on Washington State Water Quality Standards for Class A waters. The following variables were included in the 1990 WQI:

1. Temperature
2. Oxygen
3. Bacteria
4. pH
5. Turbidity
6. Nutrients (N and P)
7. Suspended Sediment
8. Ammonia Toxicity

For marine stations, only the first five variables were included.

The higher the WQI, the worse the water quality. For the first four variables above, an index below 20 implies compliance with state Class A standards. For the other variables, state standards do not exist or are not compatible with the WQI analysis. In general, scores between 0 and 20 meet the goals of the Federal Water Pollution Control Act, scores between 20 and 60 are considered marginal, and scores over 60 are unacceptable.

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The WQI is produced for each variable by a computer program developed by Ray Peterson, EPA, Region X. WQIs are determined by converting raw data to an index score based on the criteria curve for that variable. The computer program then calculates a monthly WQI by averaging the data for each month in the period selected. For example, for a three-year period the January WQI would be an average of three Januarys. A monthly overall WQI is calculated by averaging the monthly WQI for each variable with a penalty applied for values over 20, excluding turbidity. The final WQI for a given variable is the average of the WQI's for the highest three consecutive months. The final overall WQI is the average of the highest three consecutive months of the monthly overall WQI.

Procedures Used in the 1990 WQI Analysis

The analyst can determine the variables to be evaluated, the number of years to include in the index, the criteria curve for each variable, and the weight of each variable in the overall WQI. The analyst can also use different criteria curves for different seasons.

For the 1990 analysis, "current" stations had at least one sample per quarter for four consecutive quarters (three consecutive quarters for marine stations) collected any time in the three water years (WY) prior to the analysis (WY 1990). This three-year average masks anomalies in the data set and the effects of low- or high-water years but may also mask actual changes in water quality. The 1988 WQI analysis used five years for current stations but I felt that three years would provide a more accurate assessment of current conditions. "Historic" stations were those with sufficient data in the five years preceding the current period (WY 1982 through 1986). Those stations where no data has been collected since WY 1981 are not included in the 1990 WQI. Historic station WQI's should be used with caution because of possible changes since those stations were sampled last. Monitoring data from USGS, USBR, and METRO were used where available. If data from both Ecology and another agency were available, the data was aggregated from both data sets prior to running the analysis.

I used the same criteria curve for a given variable as was used in the 1988 analysis. The actual curves used are available on request. Most variables have several criteria curves (for example, one for cold water, one for warm water, one for spawning and rearing, etc.) In general, only the cold water curve corresponds to state standards.

All variables were weighted equally in determining the overall WQI. That is, temperature, for example, was not considered more important than turbidity. Nutrients and suspended sediment were compared to more stringent standards from June through October and less stringent standards from November through May. Some streams were

Table 1. 1990 Water Segment Analysis Using the Water Quality Index. Sorted by Water Body Tracking Sytems (WBTS) number.
**** indicates insufficient data, 'C' and 'H' by station number indicate data is current (last three years) or historical (last eight years), respectively.

Station Number	WBTS Number	Station Name	Seg. Class	Seg. Size (mi)	Yrs in Anal	Temp	Oxy	pH	Bact	Nutr	Turb	Susp Sed	Ammo Tox	Over all	WQL in 1988	Comments and Possible Sources of WQIs Greater Than 20
34B110 C	WA-34-1020	SF Palouse R @ Pullman	A	23.3	3	19	7	19	76	100	25	21	23	100	Y	Dryland agr. Misc STP's. Moscow, ID STP. Agr. runoff. Little bank veg.
35B060 C	WA-35-2010	Tucannon R @ Powers	A	32.7	3	15	10	7	25	22	21	28	4	22	Y	Agr. runoff. Cattle (open range).
37A090 C	WA-37-1010	Yakima R @ Kiona	A	80.4	3	38	10	17	18	37	9	21	18	46	Y	Irrigation returns. Misc STP's. Silviculture.
37A190 C	WA-37-1040	Yakima R @ Parker	A	12.5	3	13	8	6	20	22	4	17	7	12	Y	Agr. runoff/irrigation returns. Feedlots. Yakima STP. Silviculture,
37A200 C	WA-37-1040	Yakima R abv Ahtanum Cr (USGS)	A	12.5	3	17	11	10	24	25	15	21	14	33	Y	Agr. runoff/irrigation returns. Feedlots. Yakima STP. Silviculture.
38A061 H	WA-38-1010	Naches River @ Nelson Bridge	A		?	10	11	4	***	9	5	8	5	13	N	
39A051 H	WA-39-1010	Yakima River @ Umtanum	A		5	12	11	3	***	14	8	14	4	17	Y	
39A041 H	WA-39-1010	Yakima River below Roza Dam	A		1	18	11	5	***	20	17	43	3	43	Y	
39E071 C	WA-39-1110	Cabin Creek nr Easton	AA		3	8	9	6	***	7	6	13	1	14	N	
41A070 C	WA-41-1010	Crab Cr nr Beverly	B	45.8	3	34	9	25	21	34	15	40	20	61	N	Agr. runoff/irrigation return.
41A101 C	WA-41-1010	Crab Creek @ McMannon Road	B		3	31	13	14	15	19	5	11	21	31	N	Agr. runoff/irrigation return.
41A110 H	WA-41-1030	Crab Cr nr Moses Lake	B	17.9	2	24	5	16	28	14	25	12	20	22	N	Agr runoff/irrigation return.
41B071 C	WA-41-1110	Winchester Wasteway @ Gage	A		3	37	13	9	17	17	5	10	21	37	N	Agr. runoff/irrigation return.
41C071 C	WA-41-1120	Frenchman Hills Wasteway @ Gag	A		3	26	9	12	23	45	6	25	22	45	N	Agr. runoff/irrigation return.
45A070 C	WA-45-1010	Wenatchee R @ Wenatchee	A	27.1	3	19	6	27	8	7	4	8	16	19	N	Irrigation returns. Silviculture.
45A110 C	WA-45-1020	Wenatchee R nr Leavenworth	AA	27.1	3	11	9	12	3	4	1	3	1	4	N	
46A070 C	WA-46-1010	Entiat R nr Entiat	A	20.5	3	17	8	20	5	6	2	11	13	12	N	
47A070 C	WA-47-9020	Chelan R @ Chelan	L	33104	3	31	10	10	3	4	1	1	7	16	N	Elevated surface temp in lake. WQL due to hist. pesticides.
48A070 C	WA-48-1010	Methow R nr Pateros	A	35.2	3	16	8	17	9	8	4	8	9	8	N	
48A130 C	WA-48-1020	Methow R nr Twisp	A	5.0	3	7	7	16	7	4	1	6	7	7	N	
48C070 C	WA-48-1058	Andrews Cr nr Mazama (USGS)	AA	0.0	3	0	8	3	1	7	0	3	1	3	N	
49A070 C	WA-49-1010	Okanogan R @ Malott	A	25.7	3	27	19	14	15	7	13	15	11	19	Y	Little bank vegetation, wide shallow channel.
49A090 C	WA-49-1020	Okanogan R @ Okanogan	A	48.4	2	30	18	14	15	4	2	15	9	19	Y	Little bank vegetation, wide shallow channel.
49B070 C	WA-49-1030	Similkameen R @ Oroville	A	27.1	3	22	12	21	10	3	5	12	9	12	N	Little bank vegetation, wide shallow channel. Upstream mining activity.
49A190 C	WA-49-1040	Okanogan R @ Oroville	A	4.9	3	31	16	24	8	6	2	12	18	26	Y	Little bank vegetation, wide shallow channel. Influenced by Lake Osoyoos temperature.
51A070 C	WA-51-1010	Nespelem R @ Nespelem	A	18.0	3	6	8	10	20	12	1	3	4	9	N	

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Table 3. The ten stations receiving the highest Water Quality Index (indicating low water quality) for each category.

Station Number	Current	Station Name	Ecology Region	Eco-Class	Region	WQI
Temperature						
*32A070	C	Walla Walla R nr Touchet	E	A	7	45
*32B070	C	Touchet R @ Touchet	E	A	7	42
*37A090	C	Yakima R @ Kiona	C	A	7	38
41B071	C	Winchester Wasteway @ Gage	E	A	7	37
41A070	C	Crab Cr nr Beverly	E	B	7	34
33A050	C	Snake R @ Burbank	E	A	7	32
41A101	C	Crab Creek @ McMannon Road	E	B	7	31
*57A190	C	Spokane R nr Post Falls	E	A	7	31
*56A070	C	Hangman Cr @ Mouth	E	A	7	31
*49A190	C	Okanogan R @ Oroville	C	A	7	31
Oxygen						
09E070	C	Mill Creek @ Orillia	N	A	2	86
09G071	C	Springbrook Cr. @ N. end Longacres	N	A	2	70
*HCB004	C	Hood Canal at Sisters Point	S	AA	A	64
09E090	C	Mill Creek - Kent on W Valley Hwy	N	A	2	61
PSS008	C	Pt Gardner Bay at Pier 3	N	B	A	54
*HCB003	C	Hood Canal at Eldon	S	AA	B	54
*HCB002	C	Hood Canal at Pulali Point	N	AA	A	54
SUZ001	C	Port Susan at Kayak Point	N	A	A	46
PSS015	C	Snohomish R at Highway 99 Brdg	N	A	A	46
PSS020	C	Ebey Slough near Marysville	N	A	A	43
pH						
PSS015	C	Snohomish R at Highway 99 Brdg	N	A	A	34
PSS020	C	Ebey Slough near Marysville	N	A	A	31
*32B070	C	Touchet R @ Touchet	E	A	7	29
*32A070	C	Walla Walla R nr Touchet	E	A	7	29
*56A070	C	Hangman Cr @ Mouth	E	A	7	27
45A070	C	Wenatchee R @ Wenatchee	C	A	7	27
*34A070	C	Palouse R @ Hooper	E	B	7	26
41A070	C	Crab Cr nr Beverly	E	B	7	25
49A190	C	Okanogan R @ Oroville	C	A	7	24
08B110	C	Sammamish R @ Redmond	N	AA	2	23

* Indicates stations that were in the top ten in the same category in the 1988 WQI.
Ecoregion is based on Omernik and Gallant (1986).

Table 3. Continued.

Station Number	Current	Station Name	Ecology Region	Eco-Class	Region	WQI
Bacteria						
*34B110	C	SF Palouse R @ Pullman	E	A	7	76
09E090	C	Mill Creek - Kent on W Valley Hwy	N	A	2	60
24B130	C	Willapa R @ Lebam	S	A	1	59
*GYS006	H	Grays Hbr at E End Rennie Is.	S	B	A	57
09E070	C	Mill Creek @ Orillia	N	A	2	55
01D070	C	Sumas R nr Huntingdon BC	N	A	2	50
08B070	C	Sammamish R @ Bothell	N	AA	2	46
*PSS008	C	Pt Gardner Bay at Pier 3	N	B	A	42
09A060	C	Duwamish R @ Allentown Br	N	B	2	37
*ELB010	C	Duwamish Waterway @ 16th St Br	N	B	A	35
Nutrients						
*34B110	C	SF Palouse R @ Pullman	E	A	7	100
09E070	C	Mill Creek @ Orillia	N	A	2	50
*34A070	C	Palouse R @ Hooper	E	B	7	45
41C071	C	Frenchman Hills Wasteway @ Gage	E	A	7	45
09E090	C	Mill Creek - Kent on W Valley Hwy	N	A	2	45
09G071	C	Springbrook Cr. @ N. end Longacres	N	A	2	43
*01D070	C	Sumas R nr Huntingdon BC	N	A	2	39
X *37A090	C	Yakima R @ Kiona	C	A	7	37
*41A070	C	Crab Cr nr Beverly	E	B	7	34
*32A070	C	Walla Walla R nr Touchet	E	A	7	34
Turbidity						
*34A070	C	Palouse R @ Hooper	E	B	7	46
*56A070	C	Hangman Cr @ Mouth	E	A	7	40
*32B070	C	Touchet R @ Touchet	E	A	7	28
41A110	H	Crab Cr nr Moses Lake	E	B	7	25
*34B110	C	SF Palouse R @ Pullman	E	A	7	25
26D070	C	Toutle R nr Castle Rock	S	A	2	25
10A110	C	Puyallup R @ Orting	S	A	2	25
10A070	C	Puyallup R @ Meridian St	S	A	2	25
09G071	C	Springbrook Cr. @ N. end Longacres	N	A	2	22
09E070	C	Mill Creek @ Orillia	N	A	2	22

APPENDIX X
SALMON AND STEELHEAD PROTECTION PLAN

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

Roza Irrigation District
P. O. Box 810
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Columbia Basin System Planning

SALMON and STEELHEAD PRODUCTION PLAN

YAKIMA RIVER SUBBASIN

September 1, 1990

YAKIMA RIVER SUBBASIN
Salmon and Steelhead Production Plan

September 1, 1990

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Columbia Basin System Planning

Funds Provided by
the Northwest Power Planning Council,
and the Agencies and Indian Tribes of the
Columbia Basin Fish and Wildlife Authority

Vegetation in the subbasin is a complex blend of forest, range and cropland. Over one-third of the land in the Yakima Subbasin is forested. Rangeland lies between cultivated areas, located in the fertile lower valleys, and the higher-elevation forests. Cropland accounts for about 16 percent of the total subbasin area of which 77 percent is irrigated.

The climate of the Yakima Subbasin ranges from cool and moist in the mountains to warm and dry in the valleys. Annual precipitation near the Cascade crest ranges from 80 inches to 140 inches, whereas the lower elevations in the eastern part of the subbasin receive 10 inches or less. Summer temperatures average 55 degrees Fahrenheit in the mountains, and 82 F in the valleys. Average maximum winter temperatures range from 25 degrees to 40 degrees Fahrenheit, while average minimum winter temperatures range from 15 degrees to 25 degrees Fahrenheit. Minimum temperatures of minus 20 F to minus 25 F have been recorded in most areas.

Irrigated agriculture is the economic base of the Yakima Subbasin. In 1982, about 400,000 irrigated acres produced an estimated gross crop value of $500 million. Major crops include apples, cherries, peaches, pears, prunes, sugar beets, grapes, mint, grain, corn, hops and alfalfa. Livestock production and forestry are also important contributors to the economic base. The major industries in the subbasin are related primarily to the processing of agricultural and forest products.

Riparian conditions are extremely varied, ranging from severely degraded to nearly pristine. Good riparian habitat generally is found along forested, headwater reaches, whereas degraded riparian habitat is concentrated in the valleys, frequently associated with agricultural activity, especially grazing.

Water Resources

Water is central to the productivity of the agricultural economy and the fisheries of the Yakima Subbasin. While the water resources of the subbasin are subject to problems of both quantity and quality, quantitative concerns are more important. Water quality in the Yakima Subbasin is good to excellent in the upper reaches, but only fair to poor in the lower valley. As the Yakima River passes through the Kittitas Valley (headwaters to Roza Dam), it receives pollutants from irrigated pasture lands and municipalities. Although almost all water quality indices suffer a progressive deterioration through this section, overall water quality would still be considered good as the river passes Roza Dam.

Through its middle reaches (Roza to Sunnyside Dam), the Yakima River receives treated wastes from Yakima, Selah, Union Gap, and Terrace Heights as well as irrigation returns from the Ahtanum Creek and the Moxee area. Normally, however, water quality is only slightly degraded because pollutants are diluted with large volumes of high quality water from the Naches River. Water quality can therefore still be considered good as far as Union Gap.

Water quality degrades rapidly in the lower subbasin (Sunnyside Dam to Columbia River). Most of the summer flow is diverted at Wapato and Sunnyside dams, and large volumes of warm, turbid irrigation water with a high content of nutrients, suspended sediments and fecal bacteria are added a short distance downstream. While irrigation return flows comprise about 5 percent of the yearly Yakima River flows in the reach from Sunnyside Dam to Wilson Creek, below Sunnyside Dam this percent increases to more than 30 percent on an annual basis, and to more than 80 percent in the summer months (Anonymous 1974). The summertime concentrations of (nitrate + nitrite) orthophosphate, chlorophyll A, specific conductance and turbidity all reflect the virtual transformation of the Yakima River below Granger (RM 83) to a seasonal irrigation return; in all cases, concentrations rise to levels approaching those observed in irrigation drains (Mongillo and Falconer 1980). However, those levels are not acutely toxic to fish.

Water temperatures and substrate quality present problems in the lower Yakima. Mean July temperatures at Kiona range from 70 F to 78 F, with maximum July temperatures occasionally reaching 80 F. Although a survey of particle size distribution of substrate materials in the lower river has never been conducted, the deposition of fine materials is undoubtedly a problem, especially between Union Gap and Kiona. Eleven major irrigation drains enter the Yakima River in this reach, discharging between 122,000 and 127,000 tons of suspended sediments yearly (USGS Open-File Report 78-946). It is possible that much of this material settles out before reaching Kiona as summertime turbidity begins rising at Union Gap, peaks in the vicinity of Granger, and falls at Kiona to levels not substantially greater than those observed at Union Gap (Mongillo and Falconer 1980).

Pesticide contamination is also a potential problem to fish in the lower Yakima. In 1985 the Washington Department of Ecology's Water Quality Investigations section conducted an evaluation of the hazards to human health and aquatic life presented by toxic chemicals (DDT and metabolites, 15 additional organochlorine pesticides, PCBs and mercury) in water, sediments and fish tissues. Major organochlorine compounds detected in fish were DDT, DDE, dieldrin and PCB-1260. Fish in the lower river had higher concentrations than fish in the upper river, and resident fish had higher concentrations than juvenile anadromous salmonids. Concentrations of all substances were, however, well below FDA "action levels." The concentrations of all substances in fish tissues were not high enough to suggest the possibility of impaired reproduction. DDT, DDE, DDD, dieldrin and endosulfan, evidently of historic origin, were detected in water samples taken from irrigation drains (Sulphur Creek, Birchfield Drain, Granger Drain, and Snipes/Spring Creek) and in one instance from the Yakima River at Kiona. All were present in concentrations below those known to be acutely toxic to aquatic life. However, concentrations in a number of tributaries (Birchfield Drain, Sulphur Creek, Granger Drain and Snipes/Spring Creek) were above levels considered safe to aquatic animals subjected to chronic exposure. The implications of the water quality violations observed in these drains were as follows.

✓1) Sensitive species living in or in the immediate vicinity of affected drains might be adversely affected either through direct, possibly synergistic, toxicity; or through impaired reproduction.

✓2) Birds feeding on fish from affected drains might have lower than normal reproductive rates.

✓3) Fish in affected drains might not meet FDA standards for human consumption (Johnson et al. 1986).

<u>Water Supply</u>

Water supplies in the Yakima Subbasin are severely overtaxed by the competing demands of irrigation and instream flows for fish production. Moreover, except for a minimum flow below Prosser Dam and a court-ordered minimum flow for egg incubation in the Yakima from Easton Dam to the Teanaway, there are no binding minimum instream flows for fish (the Washington Department of Energy is prevented by state law from requiring existing water rights to meet new instream flow requirements). Subject only to the above exceptions, current instream flows represent the difference between available water (storage plus runoff) and irrigation and other demands. As available water and demand are rather precariously balanced, instream flows are rarely optimal anywhere in the subbasin, and may be catastrophically low for fish production in drought years.

In an average year, the total available water supply in the subbasin is barely adequate for irrigation and never adequate for optimal fish production. To satisfy irrigation needs, a great volume of water is released during the irrigation season, resulting in flows in many reaches of the mainstem Yakima that are much greater than optimal. The lack of water in the subbasin for fish production is felt in the main river primarily after the

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the entire year. An IFIM-based (instream flow incremental method) analysis (Stemple 1985) indicated total anadromous spawning runs would reach equilibrium at 17,600 adults under current conditions. Mean run size to the Yakima Subbasin for all anadromous fish from 1983 through 1987 (years in which runs have been increasing) has been 7,018 fish.

A summary of specific adverse impacts on the subbasin's fisheries attributable to a problematic water supply would include:

1) Passage problems associated with diversions. Problem diversions include both those that physically impede spawning adults and unscreened diversions that entrain juveniles. Currently, these are found primarily in tributaries.

   Researchers have not conducted a thorough stream inventory in over a decade, and a new effort is urgently needed. Fortunately, a new effort is under way -- the Bureau of Reclamation has contracted with the Northwest Power Planning Council to conduct a water supply availability analysis for the purpose of locating and devising solutions to problems of instream flow, and evaluating instream and riparian habitat. This study was required as a part of the pre-planning process for the Yakima/Klickitat Hatchery and should provide the information necessary to prioritize currently underutilized tributaries as potential production areas and candidates for outplanting.

2) Passage and rearing habitat restrictions resulting from low flows. Problems occur both in tributaries and the mainstem. Most of the tributaries in the subbasin suffer from severe low flow problems in the summer and early fall, and most are attributable to irrigation diversions in their lower reaches (an important exception is the low flow problems in the Satus system, which are attributable to the combination of a low water table, permeable soils and low precipitation). Mainstem reaches also suffer periodic episodes of critically low flow, the most significant of which occur in the Yakima from Keechelus Dam to Easton Dam, in the Yakima from Easton Dam to the Cle Elum River, in the Yakima from Sunnyside Dam to the Chandler power plant outlet, and in the Naches from Wapatox diversion to the Yakima confluence. The Keechelus/Easton and Easton/Cle Elum situations are attributable to the absence of releases from Keechelus Reservoir during refilling and maintenance periods, and the others are attributable to diversions.

3) Adverse impacts to spawning and rearing habitat associated with rapid daily flow fluctuations below storage reservoirs and diversion dams. Areas having such problems include both tributaries and mainstem reaches, and are usually confined to areas immediately below reservoirs. The Yakima above Easton Dam, the Cle Elum River, the Kachess River, the Yakima from Roza Dam to the Naches confluence, the Tieton River and the Bumping River all suffer episodes of severe flow fluctuation (more than 300 percent in 24 hours) several times a year (Mongillo and Falconer 1980).

4) Deposition of fine sediments on fall chinook spawning beds in the lower river. This problem is exacerbated by the low instream flows in the Yakima from Union Gap to Kiona during the irrigation season.

5) False attraction flows associated with irrigation returns and wasteways. This problem is also more severe in the lower river from Union Gap to Kiona, as low instream flows increase the attractiveness of returns.

6) Impaired upstream and downstream migration and degraded spawning and rearing habitat caused by annual river channel berming at small diversions without permanent headwork structures.

7) Degraded rearing habitat caused by prolonged, excessively high flows. Such problems occur in the Yakima from the Cle Elum River to Roza Dam during irrigation season, and in the Bumping and Tieton rivers during the "flip flop" portion of the irrigation season and sometimes during spring runoff.

8) High temperatures in the lower river in July and August. These temperatures reduce rearing habitat quality to marginal, and when above 75 degrees Fahrenheit, would constitute at least a partial thermal block to stocks with late summer spawning runs, such as summer chinook and sockeye.

9) Pesticide concentrations above levels considered safe for chronic exposure to fish in irrigation returns. This situation could conceivably contribute to the very low egg-to-smolt survival rates of fall chinook spawning above Prosser Dam, especially those spawning in and just downstream from Marion Drain and downstream of Prosser Dam.

plant associations in the Yakima Subbasin are the big sagebrush-bluebunch wheatgrass association (40 percent of existing rangeland), the three-tip sagebrush-Idaho fescue association (5 percent existing rangeland), the bitterbrush-bluebunch wheatgrass association (35 percent existing rangeland) and the Sandberg bluegrass-stiff sagebrush association (20 percent existing rangeland). Except for the small three-tip sagebrush-Idaho fescue association, over 50 percent of all grazing associations are in fair to poor condition today. The increased runoff and erosion from these areas may have a significant impact on water quality.

Riparian conditions are highly variable, with good to excellent conditions occurring mainly along the upper reaches of subbasin streams, and fair to poor conditions along reaches in the valley bottom. Riparian degradation is primarily the result of agricultural practices, especially grazing and streamside tillage or mowing, but recreational development is having an increasing impact, especially along the Yakima River in the critical reach from the city of Cle Elum to Easton Dam.

Stream Characteristics

As the data summarized in Table 1 illustrates, the instream flow problem in the Yakima River is not so much that flows are consistently suboptimal or critical. Rather, fluctuations in flow cause periodic suboptimal or critical situations and, somewhat surprisingly, many reaches suffer from a decided excess of flow during the irrigation season (note that "critical" is used here as defined by the "Montana Method" of instream flow assessment: discharge one-tenth or less of the mean annual discharge). A more pertinent measure of lack of instream flow is the mean number of days per month discharge was less than optimal or less than critical. The latter statistic has been computed for some of the reaches in Table 1. In descending order of severity, the worst major reaches in the Yakima system in the period 1982 through 1987 have been the Yakima from Keechelus Dam to Easton Dam (397 days), the Naches below Wapatox diversion (91 days), the Yakima below Sunnyside Dam (Parker gauge, 81 days), the Yakima below Prosser Dam (71 days) and the Yakima below Easton Dam (10 days). Note that episodes of critically low flow in the reach of the Yakima from Easton Dam to the Cle Elum confluence can be especially damaging when they occur in the late spring and early summer (May through early July). This reach includes the most heavily used spring chinook spawning area in the entire subbasin, and contains numerous braids and side channels. Newly emergent fry are attracted to side channels and braids. When discharge falls to critical levels in the late spring, it is probable that large numbers of spring chinook fry are trapped in isolated side channels where they are killed either directly, from physical stranding, or indirectly, from predation.

Mongillo and Falconer (1980) assessed the frequency of critically low flows in the Yakima system for the very dry years of 1973 and 1977 and found a similar but more severe situation. In descending order, the most frequently critical reaches in these five years were Keechelus to Easton (143 days), Parker (142 days), Prosser (96 days), the Naches below Wapatox, and the Yakima at Pomona (both 48 days), and the Yakima at Easton (20 days). (It should be noted that the period Mongillo and Falconer investigated preceded flip-flop operations. Therefore, the precise ordinal pattern they observed should not be expected to reflect the current situation exactly.)

Another important measure of the quality of instream flow is the lack of rapid, large-scale fluctuations. Mongillo and Falconer (1980) proposed that fluctuations equal to or greater than 300 percent in 24 hours be considered unacceptable. By this criterion, the worst major reaches in the Yakima system from 1982 through 1987 have been the Yakima from Keechelus Dam to Easton Dam (30 days); the Naches below Wapatox (19 days); the Yakima at Parker (16 days); the Yakima at Cle Elum and the Yakima at Easton (both nine days); the Yakima at Ellensburg (eight days); and the Yakima at Umptanum, the Yakima at Yakima and the Naches above Wapatox (all four days). Mongillo and Falconer determined that the order of the most severely fluctuating reaches in 1973 through 1979 was the Yakima from Keechelus Dam to Easton Dam (six days); the Yakima at Pomona (three days); the Yakima at Parker and Prosser (both two days); and the Yakima at Easton and the Naches below Wapatox (both one day). Compared to the period 1973 through 1977, severe fluctuations over the last six years have become more frequent and occur in different reaches. These changes may be attributable to flip-flop system operation.

It should be noted that the preceding analysis of instream flows has been limited to major reaches of the mainstem Yakima and Naches rivers. The situation in the lower reaches of many tributaries is considerably worse, especially in the lower reaches of the Teanaway River, and Big, Taneum, Manastash, Swauk, Wenas and Ahtanum creeks.

In the mainstem Yakima above Sunnyside Dam, and in all of the Naches system, temperatures rarely exceed 70 degrees Fahrenheit (21 degrees Celsius) (Tables 3 and 4). However, summer temperatures at Prosser and Kiona frequently exceed 75 F and occasionally reach 80 F in July and August. These high temperatures preclude summer rearing of salmonids in the lower river. The precise downstream boundary for rearing habitat in the summer probably varies from year to year, sometimes being as high as Sunnyside Dam (RM 103.8), and sometimes as low as Marion Drain (RM 82.6). In a survey in the summer of 1988, temperatures in all tributaries except the lower portions of the Satus Creek and Toppenish Creek drainages were observed to be well within the

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acceptable range for summer rearing of salmonids. The 1988 survey was the initial phase of a Bureau of Reclamation water supply analysis study of all Yakima tributaries. When completed in 1990, it will supply needed temperature data, as well as many other kinds of hydrologic data, necessary for the selection of outplanting sites for smolts produced by the Yakima/Klickitat Hatchery (see Part IV, Alternative Strategies).

In general, stream gradients in the subbasin vary from 0.1 percent or less in the lower mainstem Yakima to 1 percent to 2 percent in the tributaries. Gradients reach or exceed 3 percent only in the steepest drainages, such as the North and South Forks of Simcoe Creek and the North Fork of Toppenish Creek. Production potential is almost never limited by gradient in the Yakima Subbasin except at the extreme headwaters of some streams.

Particle size distribution of streambed material has been quantified only in a few reaches of the upper Yakima and the Little Naches (Wasserman et al. 1984, Fast et al. 1986), but field biologists have qualitatively observed that substrate quality, especially as regards deposition of fine materials, generally falls off along a downstream gradient. In the mainstem Yakima, substrate quality is worst in the reach from Sunnyside Dam to Kiona, and improves somewhat from Kiona to the Columbia confluence as fine materials settle out and/or are resuspended by river flows augmented with irrigation returns. Except for fall chinook, which spawn entirely below Sunnyside Dam, planners do not feel spawning habitat is limiting in the subbasin.

Cover for summer rearing, in the form of large substrate or large organic debris (LOD), is lacking in most tributaries in agricultural areas, and in the lower Little Naches, the lower mainstem Naches, the North Fork of the Teanaway and the Yakima River between Ellensburg and Roza Dam. However, lack of streamside cover for overwintering, particularly when flows are low, may represent a more serious limitation. Spring chinook and steelhead juveniles are known to move from the upper Yakima and Naches in the winter, many moving as far downstream as Prosser. Biologists have interpreted this movement as a search for winter cover. At normal flows, the margins of the Yakima River near the Naches confluence include LOD, undercut banks and rubbly areas, and may afford abundant overwinter cover. Since 1983, the mean depth of this reach through the winter months (October to February) has varied by as much as two feet. The associated variation in the availability of overwinter cover may have strongly influenced egg-to-smolt survival.

....

forest practices on state and private lands will be changed to reflect new scientific data gathered by Timber, Fish and Wildlife investigators. Forest practices on national forest lands would probably follow suit, as it is the policy of the Forest Service always to employ Best Management Practices.

Agriculture

Planners propose five general objectives for agricultural practices in the subbasin:

1. Endorse new state legislation to regulate agricultural practices much as the existing Forest Practices Act regulates forestry. Such legislation should, in addition to promoting productive and profitable agricultural activity, ensure that agricultural practices are environmentally sound. It should, in particular, address the maintenance of high water quality (sediment discharge, temperature, pesticide and herbicide pollution), the problem of non-point source pollution, and the preservation of riparian habitat.

2. Reduce discharge of suspended sediments into the Yakima River from irrigation returns and wasteways, if possible, to a level consistent with its designation as a "Class A" water (turbidity less than or equal to 5 NTU). Sediment loading can be reduced by the following four measures.

   First, ongoing programs to implement Best Management Practices (BMPs) for on-farm erosion control and water conservation (such as installation of closed-conduit delivery systems that facilitate conversion to sprinkler irrigation) should be accelerated, and definitely should not be put on hold pending further studies. Unfortunately, this situation is occurring in the subbasin. Project monies appropriated under Referendum 39 have been transferred to the Centennial Clean Water Commission and reallocated for new studies. Consequently, successful BMP implementation programs, such as the one administered by the Roza Irrigation District, have been deferred. Yakima planners submit that this policy is counterproductive. It is suggested that Yakima River Basin Water Enhancement Project, Washington Department of Energy and the Soil Conservation Service intercede, and attempt to persuade the Centennial Clean Water Commission to reverse itself in this matter.

   Second, whenever feasible from a financial and operational standpoint, riparian corridors on natural waterways should not be cultivated, but instead left fallow or planted in grasses to generate "vegetative filter strips" to "strain out" suspended solids in runoff. The Soil Conservation Service, as well as all fisheries and wildlife managers,

4. The stocking densities on rangeland currently in good condition should be maintained, and the grazing pressure on deteriorating range should be reduced.

The conservation and enhancement of rangeland in <u>upland</u> areas is necessary if grazing pressure is to be diverted from riparian areas. Range conditions in the Yakima Subbasin could be improved by institution of site-specific programs of intensive management. On the Yakima Indian Reservation, it is suggested that the Tribal Range and Wildlife departments collaborate in the drafting of a new, integrated grazing strategy and a revision of grazing regulations, and that the BPA-funded fencing program be an integral part of the strategy (see strategies for spring chinook and steelhead for details). Off the reservation, this measure would be best promoted by enlisting the Washington Department of Ecology, the Washington Department of Agriculture and the Soil Conservation Service in a campaign to persuade the Washington Department of Natural Resources, the Wenatchee National Forest, the Bureau of Land Management, and the Department of Defense (Yakima Firing Center) to develop and implement similar programs of intensive management.

It should be noted that the restoration and enhancement of reservation uplands and riparian corridors for the benefit of fish, wildlife and cattle production ultimately will require that the density of wild horses be controlled in some manner. It is suggested that the Tribal Wildlife Department, in consultation with the Tribal Fish and Wildlife Committee and Tribal Council, develop a strategy for this key element, range and riparian management.

5. The concentration of organochloride pesticides and dieldrin in Sulphur Creek, Birchfield Drain, Granger Drain and Spring/Snipes Creek should be reduced to levels not hazardous to aquatic organisms subjected to long-term exposure.

The reduction of pesticide pollution in irrigation returns, entails two measures. Where plans do not yet exist, the Department of Ecology, Soil Conservation Service, Yakima River Basin Water Enhancement Project, soil conservation districts, and irrigation districts should work with individual farmers to design, fund and implement on-farm plans to reduce erosion in the targeted waterways. Where existing projects have been deferred pending further research, they should be restarted immediately. It should be noted that, although pesticides are generally very insoluble in water, they do adhere to soil particles. Thus, pesticide pollution of water courses is usually the result of erosion from agricultural lands. The Washington

YAKIMA RIVER SUBBASIN
Salmon and Steelhead Production Plan

September 1, 1990

SUPPLEMENT 1
Appendices 1 - 7

Columbia Basin System Planning

Funds Provided by
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(13 of 15)

Kiona to Prosser Dam (16 miles)

This is a fall chinook spawning area used by other anadromous salmonids only for overwintering because of high summer temperatures. The river flows through a narrow valley, has a fairly swift current and few gravel beds. As judged by suspended sediment, sedimentation is probably worse than in mouth to Kiona reach. This reach may have the worst overall water quality in system; dissolved oxygen may be a problem in deeper areas in summer, ammonia concentrations may reach toxic concentrations for 10 miles below Prosser sewage treatment plant during low flows, and pesticide concentrations highest in drainage. Riparian corridor is poor to fair. Many smolts may be lost to predators at below the Chandler bypass outfall and in Chandler Canal in front of the screens.

	PROBLEMS						
HAS ANAD FISH?	SED.	FLOWS	WATER QUAL.	BARRIERS	RIP ZONE	SUBSTRATE	OTHER
yes	P	P	P...lacks dilution.	Low flow	F... grazing.	P: muck, bedrock.	NH3, pesti- cides.

Prosser Dam to Yakima (60 miles)

The reach around Granger (approximately RM 80) is a secondary fall chinook spawning area, and the upper 37 miles (Ahtanum Creek to Satus Creek) probably supports some steelhead spawning and rearing. The lower 23 miles of this reach is used by anadromous salmonids mainly for overwintering because of high summer temperatures.

The lower 36 miles of this reach (below Granger Drain, RM 83) has a "slough-like" character, being deep and slow moving, with a silt/algae bottom and very few riffles. The upper 24 miles is more riverine, with a fair number of riffles and much less fine organic material in the substrate.

Relative to unregulated flows, this is the most dewatered reach in the Yakima mainstem. Low natural flow in summer combined with proximity to major irrigation returns also make this the reach most severely impacted by sedimentation, although the sedimentation improves significantly above Granger. Although instream cover is scarce, the riparian corridor is either quite brushy (below Granger), or has reasonably dense stands of trees (above Granger) and would have to be classed as fair to good. The reach from Sunnyside to Prosser is associated with large smolt mortalities when flows are low.

HAS ANAD FISH?	PROBLEMS SED.	FLOWS	WATER QUAL.	BARRIERS	RIP ZONE	SUBSTRATE	OTHER
yes	P	P	P	Flows impede adults.	F-G	P-F:muck, algae in lower 36 miles.	smolt losses.

Yakima to Ellensburg (40 miles)

Most of this reach lies in the deep, narrow Yakima Canyon. This is a fast-flowing reach with few gravel bars and little spawning above Pomona. It is, however, the primary rearing area for spring chinook parr from upper Yakima spawning grounds, and in the reach from Roza Dam to Selah, a secondary spawning area as well. Water quality in this reach is good to excellent, with two exceptions. First, Roza Dam acts as a settling pond and, when Roza pool is drained, large volumes of sediment are deposited on the redds below the dam. Second, wakes from power boats in the pools above Roza are causing some bank erosion and thus turbidity and sedimentation problems. The riparian corridor in the lower reaches of this section, roughly from Yakima (RM 114) to the Harrison Bridge (RM 122), has suffered from overgrazing and riprapping associated with the construction of Interstate Highway 82. A relatively small (50-150) number of spring chinook redds are deposited late in the season in the reach below Roza Dam and above the Naches confluence. Discharge in the canyon is usually too great for optimal rearing during irrigation season, and sometimes may be too little during winter. The canyon area probably would benefit from more instream cover (boulders, large organic debris).

The area near the Naches confluence is probably important overwintering habitat, as is the Yakima Canyon. Both reaches occasionally experience winter flows low enough to impact production adversely.

APPENDIX XI
EXECUTIVE SUMMARY FOR OFR 91-453 (NAWQA)

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

SURFACE-WATER-QUALITY ASSESSMENT OF THE YAKIMA RIVER BASIN, WASHINGTON: ANALYSIS OF AVAILABLE WATER-QUALITY DATA THROUGH 1985 WATER YEAR

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By J.F. Rinella, S.W. McKenzie, and G.J. Fuhrer

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EXECUTIVE SUMMARY

In 1986, the U.S. Geological Survey (USGS) began testing and refining concepts for the National Water-Quality Assessment (NAWQA) Program. The long-term goals of the program are to (1) provide a nationally consistent description of current water-quality conditions for a large part of the Nation's water resources; (2) define long-term trends in water quality; and (3) identify, describe, and explain, as possible, the major factors that affect water-quality conditions and trends.

At present (1990), the assessment program is in a pilot phase in seven project areas (four surface-water and three ground-water project areas) throughout the country that represent diverse hydrologic environments and water-quality conditions. One of the surface-water project areas is the Yakima River basin in Washington.

The first major activity undertaken in the Yakima pilot project was to compile, screen, and interpret available water-quality data. **The purpose of this report is to describe: (1) historical water-quality conditions in the basin, (2) long-term trends in water quality, and (3) relations of historical conditions and trends with natural and human factors.**

The Yakima River Basin

The Yakima River basin drains 6,155 square miles in south-central Washington and contains a diversity of landforms, including high peaks and deep valleys of the Cascade Range, broad river valleys, and lowlands of the Columbia Plateau. Even though areas covered with irrigated agriculture (approximately 1,000 square miles) and urbanization (50 square miles) are smaller than those areas covered with timber harvesting (2,200 square miles) or grazing (2,900 square miles), the intensity of the activities makes agriculture and urbanization of primary importance with respect to effects on water quality.

The Yakima River basin is one of the most intensively irrigated areas in the United States. The basin has 6 large storage reservoirs, 14 major diversions on the main stem, more than 1,900 miles of canals and laterals, 3 hydroelectric plants, 6 major irrigation projects, and numerous small irrigation systems. Surface-water diversions for irrigation are large and equivalent to about 60 percent of the water use and 81 percent of the annual streamflow from the basin. **The quality of the agricultural-return flow determines the quality of water in the lower Yakima River (downstream from the City of Yakima), because return flows account for as much as 80 percent of the lower main-stem flow during irrigation season.**

Surface-water-quality Conditions

Surface-water quality in the Yakima River basin is suitable for many designated uses. **Water quality in headwater streams is classified by the State of Washington (Washington State Administrative Code, 1988) as extraordinary (class AA--should exceed requirements for all beneficial uses)** and is controlled by the chemical properties of the precipitation, the mineralogy of the soils and geology, residence time in the ground-water system and storage reservoirs, forest management practices, and the nature and intensity of storm events. More than 70 percent of the irrigated land, 90 percent of the point-source nutrient loads, and more than 80 percent of the population are located in the lower basin downstream from Kittitas Valley. These point and nonpoint sources of contaminants affect water quality with measurable changes generally occurring downstream from Wilson Creek (Yakima RM [river mile] 147), which receives agricultural-return flow from Kittitas Valley. **Water quality downstream from the headwater reaches is classified by the State of Washington (Washington State Administrative Code, 1988) as good (class B for Sulphur Creek--should meet or exceed requirements for most beneficial uses) or excellent (class A--should meet or exceed requirements for all beneficial uses).**

To describe water-quality conditions in the Yakima River basin, and to facilitate intersite comparison, selected monthly data collected from 1974-81 and in 1975 water year are summarized in tables A and B, respectively. **Most water-quality constituent concentrations in the main stem increased in a downstream direction and were largest in tributaries that contained agricultural-return flow and point-source discharges.** These values indicate that current (1990) State standards were not met for stream temperature, pH, fecal-coliform bacteria, and dissolved oxygen. In addition, turbidity and phosphorus concentrations were detected at levels of concern relative to effects on aquatic life and eutrophication, respectively.

Observed trends in constituent concentrations at 43 locations in the Yakima River basin from 1974-81 water year indicate changes in stream quality (table C). **Increases in stream temperature, specific conductance, and concentrations of orthophosphate (soluble-reactive phosphorus), ammonia, and nitrite plus nitrate were widespread in the basin from 1974-81 water years.** Flow-adjusted-trend results indicate that about 50 percent of the increasing specific conductance trends probably were associated with the decreasing streamflows. **General increases in ammonia, nitrite-plus-nitrate, and orthophosphate concentrations may be due to the increasing use of nitrogen and phosphorus fertilizers in the basin and to increasing populations of livestock. General decreases in turbidity levels, and concentrations of suspended sediment and suspended phosphorus may be due to changes in crop types from row crops to less erosive permanent crops (for example, orchards) and to efforts to control erosion (for example, sediment-detention ponds, and sprinkler- and drip-irrigation methods).**

pH and Major Cations and Anions

Most (98 percent) of the pH measurements and alkalinity concentrations in the streams range from 6.4 to 8.6 pH units and 14 to 182 mg/L [milligrams per liter] (as calcium carbonate), respectively. **In general, these concentrations are typical of natural river water not influenced by contamination** (natural river water ranges from 6.5 to 8.5 pH units with alkalinities less than 165 mg/L; Hem, 1985). Alkalinity and pH values

Table A.--Summary of monthly streamflow and physical-property measurements and nutrient concentrations at selected sites in the Yakima River basin, Washington, 1974-81 water years

[90-percentile value indicates that 90 percent of the values were less than or equal to the listed value; 50-percentile value indicates that 50 percent of the values were less than or equal to the listed value; 10-percentile value indicates that 10 percent of the values were less than or equal to the listed value; concentrations are expressed in milligrams per liter except as follows: streamflow (cubic feet per second), temperature (degrees Celsius), turbidity (NTU--nephelometric turbidity units), specific conductance (microsiemens per centimeter at 25 degrees Celsius), pH (standard units), "--" = no data or no Washington State standard; all sites listed are Washington State class A streams, except Sulphur Creek, which is class B; 1/ = Not to exceed 5 NTU above background levels; 2/ = Washington State standard varies with temperature and pH (U.S. Environmental Protection Agency, 1986; Washington State Administrative Code, 1988)]

Property or constituents	Yakima River at (river mile in parenthesis): Cle Elum (183.1)	Ellensburg (148.0)	Umtanum (140.4)	Terrace Heights Bridge (113.2)	Granger (82.7)	Mabton (59.8)	Kiona (29.9)	Selected agricultural drain: Wilson Creek at Thrall Road	Sulphur Creek at McGee Road	Washington State standard--class A streams
90-percentile values										
Streamflow	3,560	3,910	4,430	5,790	6,710	6,140	8,470	197	360	--
Stream temperature	16.0	15.5	15.5	16.0	18.9	21.0	22.0	15.5	19.0	21.0
Turbidity	8	13	14	16	16	17	22	12	54	1/ plus 5
Suspended sediment	16	20	32	32	60	59	113	38	285	--
Specific conductance	87	114	155	156	318	323	350	248	712	--
Dissolved oxygen	12.6	12.4	13.3	13.1	12.2	11.8	13.4	13.4	11.0	8.0
Chemical oxygen demand	9	16	14	14	16	16	--	21	32	--
pH	7.7	7.7	7.8	7.8	7.9	8.0	8.6	7.9	8.1	6.5-8.5
Ammonia, total as N	.02	.06	.05	.04	.18	.11	.17	.07	.47	2/
Nitrite + nitrate as N	.07	.18	.36	.26	1.3	1.4	1.5	.48	6.1	10
Phosphorus, total as P	.06	.12	.13	.12	.24	.22	.21	.24	.68	--
Orthophosphate, dissolved as P	.01	.03	.05	.03	.13	.10	.11	.10	.25	--
50-percentile values										
Streamflow	1,200	1,830	2,260	2,850	1,550	2,200	2,405	85.0	182	--
Stream temperature	8.8	8.7	8.2	9.0	11.0	12.8	11.6	9.8	12.7	21.0
Turbidity	1	1	2	3	6	6	7	4	13	1/ plus 5
Suspended sediment	4	6	8	10	22	23	26	12	45	--
Specific conductance	62	89	114	100	182	244	265	210	377	--
Dissolved oxygen	10.9	10.7	11.1	10.7	9.7	9.5	10.8	11.4	9.3	8.0
Chemical oxygen demand	4	6	7	7	10	10	--	13	16	--
pH	7.5	7.5	7.6	7.5	7.6	7.7	7.9	7.7	7.8	6.5-8.5
Ammonia, total as N	.01	.02	.01	.01	.05	.04	.07	.02	.16	2/
Nitrite + nitrate as N	.03	.06	.13	.06	.54	1.0	.89	.25	2.7	10
Phosphorus, total as P	.02	.03	.04	.04	.11	.12	.13	.12	.29	--
Orthophosphate, dissolved as P	<.01	.01	.01	.01	.05	.06	.08	.06	.16	--
10-percentile values										
Streamflow	235	424	709	1,050	415	840	1,040	40.0	57.7	--
Stream temperature	3.6	2.5	1.7	2.1	3.0	4.0	3.4	3.0	7.0	21.0
Turbidity	1	1	1	1	2	2	3	1	3	1/ plus 5
Suspended sediment	1	1	2	3	8	6	7	5	14	--
Specific conductance	42	65	86	75	107	142	149	155	262	--
Dissolved oxygen	9.1	9.1	9.2	8.7	7.5	8.1	8.7	9.3	7.7	8.0
Chemical oxygen demand	2	3	3	4	6	6	--	8.0	11	--
pH	7.2	7.3	7.4	7.3	7.4	7.5	7.6	7.5	7.6	6.5-8.5
Ammonia, total as N	<.01	<.01	<.01	<.01	.01	.01	<.01	<.01	.03	2/
Nitrite + nitrate as N	.01	.02	.02	.02	.14	.33	.37	.08	1.4	10
Phosphorus, total as P	.01	.01	.02	.02	.07	.08	.08	.07	.17	--
Orthophosphate, dissolved as P	<.01	<.01	<.01	<.01	.02	.03	.04	.03	.09	--

Table B.--Summary of monthly bacteria and major-ion concentrations in the Yakima River, Washington, 1975 water year

[90-percentile value indicates that 90 percent of the values were less than or equal to the listed value; 50-percentile value indicates that 50 percent of the values were less than or equal to the listed value; 10-percentile value indicates that 10 percent of the values were less than or equal to the listed value; concentrations are expressed in milligrams per liter except fecal-coliform bacteria (colonies per 100 milliliters); "--" = no data or no standard; all sites listed are Washington State class A streams, except Yakima River mile 191 which is class AA; 1/ = Geometric mean shall not exceed 100 organisms per 100 milliliters; 2/ = Shall not be less than 20 nor greater than 300 milligrams per liter, except under natural conditions]

Constituents	Yakima River (river mile in parenthesis) Near Cle Elum (191.1)	Thorp Highway Bridge (165.4)	Terrace Heights Bridge (113.2)	Near Toppenish (93.0)	Mabton (59.8)	Kiona (29.9)	Washington State standard--class A streams
			90-percentile values				
Fecal-coliform bacteria	11	17	132	330	804	400	1/ 100
Calcium	12	12	18	20	29	32	--
Magnesium	2.0	3.9	5.8	6.8	11	11	--
Sodium	4.2	3.4	8.0	10	18	20	--
Potassium	1.6	.6	5.0	2.6	3.4	3.7	--
Chloride	4.6	2.7	3.3	4.4	6.7	7.8	250
Sulfate	3.4	2.2	5.6	6.9	17	20	250
Alkalinity as calcium carbonate	30	43	67	78	117	137	2/ 20-300
			50-percentile values				
Fecal-coliform bacteria	2	2	17	22	230	135	1/ 100
Calcium	8.2	7.6	11	12	22	21	--
Magnesium	1.4	2.5	3.4	4.4	7.7	7.7	--
Sodium	2.6	2.2	4.8	6.6	12	12	--
Potassium	.7	.4	1.2	1.4	2.8	2.4	--
Chloride	2.8	1.6	2.2	3.0	4.6	5.1	250
Sulfate	2.2	1.4	3.1	4.4	12	10	250
Alkalinity as calcium carbonate	24	31	43	53	88	88	2/ 20-300
			10-percentile values				
Fecal-coliform bacteria	1	1	<1	1	80	62	1/ 100
Calcium	6.4	4.6	8.8	9.2	12	12	--
Magnesium	.6	1.6	2.6	2.6	3.4	4.1	--
Sodium	2.2	1.4	3.1	3.5	6.8	6.7	--
Potassium	.4	.2	.6	.8	1.4	1.5	--
Chloride	1.3	.8	.8	1.4	2.1	2.2	250
Sulfate	1.2	1.0	1.8	2.3	4.3	5.6	250
Alkalinity as calcium carbonate	16	20	32	36	51	53	2/ 20-300

throughout most of the basin are indicative of water from noncalcareous (lacking calcium carbonate) igneous terrane along the eastern slopes of the Cascade Range. Increases in alkalinity and pH values down the main stem of the Yakima River probably result from agricultural-return flow and point-source effluent effects (including evapotranspiration and nutrient enrichment that causes eutrophication). **Most of the pH and alkalinity values meet State standards for the protection of freshwater aquatic life.** Many of the pH values that do not meet standards occurred during the summer months and probably were the result of increased photosynthetic activity from aquatic plants. Exceedance of the alkalinity guidelines for food canning (less than 1 percent of the values exceeded 300 mg/L as calcium carbonate) only occurred at two locations, both of which receive agricultural-return flow: South Drain near Satus and Yakima River at Kiona.

Table C.--Summary of temporal trends for streamflow and selected water-quality properties and constituents at sites having 4 to 8 years of monthly data, Yakima River basin, Washington, 1974-81 water years

["NA" indicates not applicable]

Property or constituent	Number of sites with 4 to 8 years of data	Non-flow-adjusted trends: Number of sites with upward trends	Non-flow-adjusted trends: Number of sites with downward trends	Flow-adjusted trends: Number of sites with upward trends	Flow-adjusted trends: Number of sites with downward trends
Streamflow	43	0	19	NA	NA
Stream temperature	43	12	0	8	2
Specific conductance	43	14	3	8	7
Total phosphorus	43	2	9	4	10
Dissolved orthophosphate	43	13	2	10	4
Suspended phosphorus	43	0	13	0	12
Total ammonia nitrogen	43	24	3	18	4
Dissolved nitrite plus nitrate	43	23	0	16	2
Turbidity	43	0	18	1	15
Suspended sediment	43	3	8	9	6

Headwater streams in the basin are poorly buffered and are susceptible to precipitation-induced acidification. **The pH and strong-acid-ion concentrations (sulfate and nitrate) of precipitation in the headwater streams in the Yakima River basin are similar to mean background levels in remote areas of the world; this similarity indicates that man's influences on the quality of precipitation in the upper basin might be small, when compared with levels in large population centers in the United States.**

Median major-ion concentrations of calcium, magnesium, sodium, potassium, chloride, sulfate, and total dissolved solids (13, 4.9, 7.1, 1.6, 2.5, 4.4, and 120 mg/L, respectively) **in the Yakima River basin are similar to or smaller than the mean concentrations observed in river water of the world** (14, 3.7, 5.7, 1.8, 6.8, 9.6, and 81 mg/L, respectively; Hem, 1985). The predominant major ions in surface water in the Yakima River basin are calcium and bicarbonate. The water generally has high calcium:sodium ratios and small fluoride concentrations (most less than 0.3 mg/L), which are typical of water from the basalt terrane located throughout much of the basin (White and others, 1963). Major-ion concentrations and specific conductance increase down the main stem of the Yakima River, but their relative ion composition is remarkably similar. Two mechanisms that could account for the observed increases in concentration are (1) evapotranspiration that equally concentrates all ions, and (2) uniform dissolution of ions from geologically similar rock and soil types. **Generally, major-ion concentrations do not pose a major alkali or salinity hazard nor should they affect soil properties through ion-exchange effects.** Few sulfate (less than 1 percent) and total-dissolved-solids concentrations (3 percent) exceeded State standards and U.S. Environmental Protection Agency guidelines for domestic water supplies and irrigation, respectively.

Suspended Sediment and Turbidity

Background levels of suspended sediment and turbidity in the Yakima River upstream from the Yakima River at Terrace Heights Bridge (Yakima RM 113.2) were small with median values less than 10 mg/L and 3 NTU, respectively. **These levels approximately doubled downstream from the Terrace Heights Bridge, primarily because of sediment contributed by turbid agricultural-return flows during irrigation season. The largest suspended-sediment concentrations in the Yakima River basin occurred in the Sunnyside subbasin, which has steep slopes that contribute to increased erosion.** In the main stem, the largest suspended-sediment concentrations generally occurred from April to June during high flows due to snowmelt; in the agricultural-return flows, large concentrations generally occurred during storm runoff, periods of peak irrigation, and at the start of irrigation season when soils were freshly tilled and irrigation ditches were layered with sediment from recent mechanical cleaning and windblown sources. **During the 1980 water year (a median flow year), the major loadings of suspended sediment in the Yakima River basin were from nonpoint sources.**

Nutrients

The Yakima River has small background concentrations of total phosphorus, dissolved orthophosphate, total ammonia, and dissolved nitrite plus nitrate (median values less than or equal to 0.04, 0.01, 0.02, and 0.13 mg/L, respectively) **from Cle Elum (RM 183.1) downstream to Terrace Heights Bridge (RM 113.2).** Total-phosphorus and nitrite-plus-nitrate concentrations upstream from Terrace Heights Bridge are about one-half of the median values for many rivers in the United States (Smith and others, 1987). The diluting effect of the Naches River at RM 116.3 reduces nutrient concentrations in the main stem. Farther downstream **in the vicinity of Parker (RM 104.6), however, median concentrations increase by about a factor of two or more,** and except for ammonia, which decreases downstream from Parker, **the nutrient concentrations continue to increase downstream to Kiona** (RM 29.9) [table A]. **These median nutrient concentrations downstream from Parker are equal to or greater than those for many rivers in the United States (Smith and others, 1987).** The increased concentrations at Parker might be attributed to nutrient loadings from a sewage treatment plant at RM 111.0, Wide Hollow Creek at RM 107.4, Moxee Drain at RM 107.3, and Ahtanum Creek at RM 106.9.

Downstream from two large canal diversions (Wapato and Sunnyside Canals) near Parker, the streamflow in the Yakima River is low during most of the irrigation season (April through October). Consequently, **point and nonpoint discharges (including agricultural-return flows) downstream from Parker cause substantial increases in median nutrient concentrations.**

Nutrient enrichment during the warm summer months results in some scattered patches of dense attached and rooted plant growth in the sluggish-moving reaches of Yakima River downstream from its confluence with Satus Creek (RM 69.6). However, the temporal and spatial coverages of historical nutrient data are insufficient to define whether causes of eutrophication are from point or nonpoint sources.

Increased stream turbidity in the lower Yakima River might be limiting aquatic plant growth and other effects of eutrophication by decreasing sunlight penetration that is needed for photosynthesis. Major increases in turbidity in streams in the lower basin result from soil erosion in irrigated agricultural areas; if soil erosion was reduced without also reducing dissolved nutrient concentrations in the Yakima River, conditions could become more eutrophic.

On the basis of the evaluation of 6,475 and 7,900 determinations of total ammonia and dissolved nitrite plus nitrate, respectively, **about 2 percent of the ammonia determinations (mostly in agricultural-return flows and downstream from sewage treatment plants) exceeded the EPA (U.S. Environmental Protection Agency, 1989) chronic-toxicity criteria for the protection of salmonids or other sensitive coldwater fish species,** and one site (Satus Drain 302) had nitrite-plus-nitrate concentrations larger than EPA's National Primary Drinking-Water Regulation (10 mg/L as N). Streams having the largest nitrite-plus-nitrate concentrations generally were in the Sunnyside subbasin, where a large number of dairies might be contributing to the enrichment.

Largest total-phosphorus concentrations occurred during snowmelt and irrigation seasons when suspended-sediment concentrations also were large. Largest nitrite-plus-nitrate, ammonia, and orthophosphate concentrations occurred from October through March when much of the nutrient loading could be attributed to ground-water and point-source contributions. In addition, reduced primary productivity (consumption of nutrients by stream biota) during the cold fall and winter seasons, also would contribute to the increased nutrient concentrations.

Estimates of major point-source loads of total phosphorus and total nitrogen in the Yakima River basin for 1980 indicate that: (1) the annual, total phosphorus, point-source, load was larger than the annual, total-phosphorus load in the Yakima River at Kiona near the terminus of the basin, and (2) the annual, total-nitrogen, point-source, load was about 13 percent of the annual, total-nitrogen, load at Kiona. **Even though the point-source phosphorus load appears large, it is about 25 percent of the estimated annual amount of phosphorus fertilizer applied in the basin; the point-source, total-nitrogen, load is about than 5 percent of the annual amount of nitrogen fertilizer applied.**

Stream Temperature

The upper Yakima River originates from precipitation, snowmelt, and ground-water seepage from the high Cascade Mountains. Consequently, the initial river temperature is cold, and the water becomes warmer as it flows to the lower basin.

Analysis of 12,500 instantaneous stream-temperature measurements from about 400 sites from 1959-85 water years indicates that **7 percent of the temperature measurements at the class AA streams in the basin** (headwater sites in the national forest) **were above the 16 °C** (degrees Celsius) **State standard, 5 percent at the class A streams** (sites downstream from the national forest) **were above the 21 °C standard, and 2 percent at the class B stream** (Sulphur Creek Wasteway) **were above the 21 °C standard.** As expected, most of the exceedances occurred during the warm July-August period.

Increased stream temperatures in the main stem during the summer result from the dominant influence of air temperature in the lower basin in conjunction with: (1) low flows downstream from the Wapato and Sunnyside Canal diversions (Yakima RM 106.7 and 103.8, respectively), (2) slow velocities due to a small stream gradient between Yakima RM 69.6 and 47.1, and (3) low flows between Prosser Dam (Yakima RM 47.1) and Chandler Pumping Plant (Yakima RM 35.8).

A calibrated model was used to estimate water temperatures for natural conditions in the main stem for August 1981, based on the assumptions of no reservoir storage and no diversions. The model simulation indicated that the mean stream temperatures would exceed the class A temperature standard of 21 °C from Umtanum (Yakima RM 140.4) to Kiona (Yakima RM 29.9) by as much as 1 °C.

Dissolved Oxygen

On the basis of 6,165 measurements of DO (dissolved oxygen) from 185 sites in the Yakima River basin, **DO concentrations in the basin are similar to those in many rivers in the United States** (Smith and others, 1987; median DO for rivers in the United States is 9.8 mg/L compared to the median DO of 10.2 mg/L for the Yakima River basin). Most of the data from the Yakima River basin were collected during daylight periods; the concentrations should be near maximum, if the controlling effect on daytime concentrations was photosynthesis. In streams containing abundant aquatic plant and animal (bacteria, invertebrates, and fish) growth, nighttime DO concentrations would be smaller as a result of respiration and the absence of photosynthesis.

More than 50 percent of sites had one or more DO concentrations that did not meet State standards. Twenty-five percent of the DO concentrations at class AA streams were less than the 9.5 mg/L standard. The class AA standard might be naturally unattainable for some headwater streams during the summer months because of altitude and temperature effects on DO saturation. **Ten and 1 percent of the DO concentrations at the class A and B streams were less than the State standards of 8.0 and 6.5 mg/L, respectively.** Many of the smaller DO concentrations occurred during the warm summer months at streams that receive relatively large nutrient and organic-carbon loads from point and nonpoint sources. Potential causes for the smaller concentrations include increased water temperatures that decrease DO concentrations at saturation, and increased rates of respiration (plants and animals) and biochemical oxygen demand.

Organic Carbon and Related Measures

On the basis of 193 samples from 26 sites in the basin, **total organic carbon concentrations range from 0.1 to 17 mg/L with a median concentration of 4.4. These concentrations are similar to average concentrations in (1) many rivers in the United States, (2) snow in North America** (dissolved organic carbon ranging from 0.1 to 6 mg/L), **and (3) tree-canopy drip** (dissolved organic carbon ranging from 5 to 10 mg/L; tree-canopy drip is precipitation that contacts tree branches and leaves as it falls to the ground; Thurman, 1985). Main-stem data from the Yakima River basin indicate that (1) dissolved organic carbon constitutes more than 80 percent of the total organic carbon, which is typical of many rivers in the United States (Thurman, 1985), and (2) median monthly concentrations of total organic carbon are relatively constant throughout the year.

COD (chemical oxygen demand) concentrations increase downstream in the main stem, from a median of 4 mg/L at Cle Elum (RM 183.1) to a median of 10 mg/L at Mabton (RM 59.8), as a result of increasing organic contributions from domestic, industrial, and agricultural sources. Sites in the basin having the largest COD concentrations are agricultural-return flows that also receive point-source discharges and runoff from dairies and livestock. **Many of the agricultural-return flows have the largest COD concentrations and the smallest DO concentrations in the Yakima River basin, reflecting the bacterial consumption of dissolved oxygen and organic matter as a food source.**

Major Metals and Trace Elements

In the Yakima River basin, concentrations of suspended and dissolved elements in streams depend on (1) man's influences, including transportation, urbanization, industrialization, and pesticide application; (2) the natural weathering and erosion of rocks and soils; and (3) ash fallout from the volcanic eruption of Mount St. Helens. Estimates of iron and selected trace-element (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) sources indicate that point sources (mostly sewage treatment plants) are contributing less than 10 percent of the annual element loads to surface water in the basin. However, most trace element data in the basin are spatially and temporally limited, and are inadequate for accurately defining water-quality conditions and source loads.

Generally, concentrations of major metals and trace elements in water and sediment samples from the Yakima River basin are not enriched above natural concentrations. The range of dissolved concentrations in the basin is similar to the range of concentrations observed in other rivers in the United States, and the median dissolved concentrations are similar to background concentrations that have been minimally affected by man's activities. For example, median dissolved concentrations of arsenic, cadmium, copper, lead, mercury, and zinc in the Yakima River basin are <5, <1, 3, 4, <0.1, and 11 mg/L compared with 2, 0.07, 1.8, 0.2, 0.01, and 10 mg/L, respectively, for inland water that is minimally affected by man's activities (Forstner and Wittman, 1979). Median concentrations of these elements in bed-sediment samples from the upstream mountainous regions of the basin fall within the expected 95-percentile confidence range for uncontaminated soils in the Western

United States (R.C. Severson, U.S. Geological Survey, written commun., 1987, based on data in Shacklette and Boerngen, 1984). Because few water samples were collected from these mountainous regions, dissolved- or suspended-element concentrations could not be related directly to element concentrations in the bed sediment. **Except for arsenic, lead, and zinc, trace-element concentrations in 6-12 whole-fish samples from the Yakima River were similar to national baseline concentrations collected in U.S. Fish and Wildlife Service's National Contaminant Biomonitoring Program.** Eighty-fifth-percentile concentrations of arsenic, lead, and zinc in whole-fish samples from the Yakima River basin are 460, 1,260, and 77,900 compared with 230, 320, and 46,300 micrograms per kilogram (wet weight) for 85-percentile concentrations in whole-fish samples collected in the National Contaminant Biomonitoring Program (1978-79). A potential source of arsenic may be acid-lead-arsenate sprays used for controlling codling moths in apple orchards prior to 1947. High application rates of phosphate fertilizer increase the dissolution of arsenic from the soils and result in arsenic contamination in the shallow aquifers that feed drains in agricultural areas. A source of lead might be automotive exhaust from the combustion of leaded gasoline.

From 1953-85 water years, the dissolved elements that most often exceeded U.S. Environmental Protection Agency National Primary or Secondary Drinking-Water Regulations were iron (7 percent of the iron determinations), manganese (2 percent) and lead (2 percent). **Similarly, dissolved elements that most often exceeded State chronic-toxicity standards for aquatic life were lead (56 percent), mercury (43 percent), copper (23 percent), cadmium (12 percent), and zinc (3 percent).** The order of exceedances for total recoverable elements was similar to the order of exceedances for the dissolved elements, listed above, except that the frequencies of exceedances were larger.

In the Yakima River at Kiona (RM 29.9) near the terminus of the basin, dissolved lead and copper exhibited decreasing concentrations from the 1960s to 1985. Possible explanations for these decreases include the large decline in leaded-gasoline combustion during the 1970s, and a decreasing use of copper sulfate for eradicating nuisance aquatic plant growths in canals.

Radionuclides

The absence of baseline data prohibits any evaluation of radionuclides relative to spatial and temporal variability and to water-quality standards. The basin is near the Hanford Nuclear Facility (operated by the U.S. Department of Energy), and the collection of baseline radionuclide data would identify any need for concern.

Pesticides and Other Trace Organic Compounds

Even though the application of synthetic organic compounds is extensive on agricultural land in the Yakima River basin, relatively few samples have been collected to determine the spatial and seasonal distributions of these compounds in the aquatic environment. Data have been collected from about 30 sites in the basin, and about 50 percent of the samples have been collected from the Yakima River at Kiona near the terminus of the basin. **About 85 percent of the trace-organic-compound**

concentrations from 1968-83 water years were reported below the minimum analytical reporting levels (note that historical reporting levels are generally 1 to 2 orders of magnitude larger than those that are currently--1990--available.)

Concentrations of several trace organic compounds in water exceeded State water standards for chronic toxicity of freshwater aquatic life, including aldrin/dieldrin, endosulfan, dichlorodiphenyltrichloroethane (DDT) and its metabolites, endrin, parathion, and polychlorinated biphenyls (PCB). None of these concentrations exceeded standards for acute toxicity. Most of the exceedances occurred in the Yakima River at Kiona, partly because of the relatively large number of samples collected from the site.

The largest concentrations of the hydrophobic organic compounds (DDT and its metabolites, dieldrin, and others) in water occurred during irrigation season in agricultural-return flows that also contained the largest suspended-sediment concentrations. This pesticide-sediment relation indicates that concentrations of **hydrophobic contaminants could be reduced in streams by controlling sediment erosion of contaminated soils.** From 1968-82, **decreases in concentrations of DDT and its metabolites, and dieldrin in water and whole-fish tissues coincide with EPA's decision in December 1972 to ban further use of DDT due to health and environmental-hazard considerations and in 1974 to prohibit the manufacture of dieldrin in the United States.**

Routine fish monitoring by WDOE (Washington State Department of Ecology) from 1979 to 1984 showed that the largest concentrations of DDT plus metabolites in Washington State occurred in fish from the Yakima River basin. In 1985, concentrations of DDT plus metabolites in edible resident fish were below the Food and Drug Administration action level (5,000 μg/kg--micrograms per kilogram, wet weight), but they exceeded the maximum recommended concentration of 1,000 μg/kg (wet weight) established by the National Academy of Science for the protection of fish predators (such as fish-eating birds; Johnson and others, 1986).

Assuming an average fish consumption of 6.5 grams per day, the average lifetime (70 years) cancer risks (U.S. Environmental Protection Agency health assessment methodology; Johnson and others, 1986) for consumption of fish by humans from the lower Yakima River are $3x10^{-5}$, $8x10^{-5}$, $9x10^{-7}$, $2x10^{-6}$, and $1x10^{-5}$ for PCB, dieldrin, DDD, DDT, and DDE, respectively (a risk of $3x10^{-5}$ is 1 person per 300,000 people).

Fecal-coliform Bacteria

The presence of fecal-coliform bacteria indicates a potential health hazard from the transmission of pathogenic microorganisms in water from fecal contamination. Fecal-coliform-bacteria data are limited in both spatial and temporal coverage, so that the occurrence, temporal trends, and sources could not be quantitatively defined throughout the basin. **An evaluation of 2,235 fecal-coliform bacteria determinations at 200 sites from 1968-85 water years indicates that 49 percent of the determinations at 128 sites exceeded State standards.** About 32 percent of the determinations were made on main-stem samples and about 40 percent of these determinations exceeded standards. Most of the exceedances in the main stem occurred downstream from Granger (Yakima RM 82.7). **The largest percentage of exceedances occurred at the class B sites [Sulphur Creek] (93 percent of the class B determinations) and at the class A sites (54 percent)**, whereas the class AA sites had 14 percent. Class AA sites are affected minimally by man's activities and exhibited the smallest bacteria concentrations. Prior to the 1970's, a source of fecal-coliform bacteria in the Yakima River basin was untreated and (or) improperly treated effluent from STPs (sewage treatment plants; Sylvester and others, 1951); since then, most of the STP discharges in the basin have been treated with chlorine, substantially reducing the bacteria concentrations in the effluent (Jim Milton, Washington Department of Ecology, oral commun., August 24, 1989). **Data collected since 1970 indicate that nonpoint sources are controlling the bacterial quality of streams.** Areas with concentrations greater than 200 colonies per 100 mL (milliliters) of water (class A standard is 100 colonies per 100 mL, and class B standard is 200 colonies per 100 mL) include sites at most agricultural-return flows, on the main stem downstream from major agricultural-return flows, and in subbasins with large densities of dairies and livestock, such as Granger, Sunnyside, and Kittitas subbasins.

Fecal-coliform concentrations were increasing from 1977-85 water years in the Yakima River at Parker (RM 104.6) and Kiona (RM 29.9) by about 6 and 14 percent per year, respectively. These increasing concentrations were not associated with increasing streamflows and could be attributed to increases in the number of livestock in the basin.

Fish and Other Aquatic Biological Communities

Because of the commercial and recreational value of anadromous fish in the Yakima River basin, the emphasis of biological investigations has been on the description, quantification, protection, and enhancement of salmon and trout populations. Prior to 1880, anadromous fish runs were estimated to be more than one-half million fish (Davidson, 1965). By 1900, all summer streamflow in the Yakima River basin had been appropriated and diverted by private interests for irrigation. A serious water shortage had developed, leaving the lower Yakima River with increasing temperatures in stagnant pools. By 1905, the construction of large storage reservoirs and other water-resource developments for irrigation had seriously affected fish migrations in the Yakima River; the number of anadromous fish annually returning to the Yakima system declined to about 60,000 (Davidson, 1965). By 1920, anadromous fish runs further declined to 12,000 and have remained at approximately this level for 70 years.

Major habitat and water-sediment factors that currently (1990) are suspected of affecting fishery in the Yakima River basin are (Confederated Tribes and Bands of the Yakima Indian Nation and others, 1990): (1) fish passage problems associated with irrigation diversions in the tributaries, (2) passage and rearing habitat restrictions resulting from low streamflows in both the main stem and the tributaries, (3) adverse effects to spawning and rearing habitat associated with rapid daily-flow fluctuations downstream from large storage reservoirs, (4) erosion of agricultural soils and subsequent deposition of fine-grained sediment on fall chinook spawning beds in the lower river, (5) false-attraction flows associated with agricultural-return flows, (6) degraded rearing habitat, including the lack of large organic debris, caused by prolonged, excessively high-flow augmentation for irrigation, (7) stream temperatures higher than 24 °C in the lower river, which constitute a partial thermal block for fish passage and decrease available habitat for native, cold-water species, (8) pesticide concentrations above safe, chronic-exposure levels for fish in the main stem and in the agricultural-return flows, and (9) degradation of riparian cover caused by grazing and agricultural activities. The relative importance of each of these factors has not been quantified.

The fewest resident fish are found in the Yakima River from Prosser (RM 47.4) to Mabton (RM 59.8). Within this reach, the current is slow, the water is warm and turbid from agricultural-return flow, and the streambed is composed of silt and clay.

A limited number (both temporally and spatially) of benthic invertebrate and phytoplankton samples indicate changes in habitat and water-quality conditions along the main stem of Yakima River. Benthic invertebrate communities reflect downstream increases in fine-grained-sediment deposition, stream turbidity, temperature, and organic-carbon concentrations from point and nonpoint sources. Phytoplankton samples indicate that algal blooms occurred annually in the Yakima River at Kiona from 1975-81 water years. The codominant algal genera are tolerant of pollution, commonly being associated with nutrient-enriched water.

Needs for Future Data Collection and Analysis

Future data-collection activities in the basin require close scrutiny of sampling, preservation, and analytical techniques to ensure that the data are representative of actual stream conditions. In addition, analytical procedures need to provide constituent reporting levels that are less than water-quality criteria and standards.

Water-quality issues that need to be addressed in future data-collection programs include: eutrophication (nutrients), erosion and deposition (suspended sediment and turbidity), sanitary quality (fecal indicator bacteria), toxic compounds (trace-organic compounds, trace elements, and radionuclides), habitat and contaminant effects on biological communities, high-water temperatures, and small dissolved-oxygen concentrations. Additional data are needed to describe spatial and temporal distributions as well as the sources of these contaminants in the aquatic environment.

INTRODUCTION

Background

Beginning in 1986, Congress appropriated funds for the U.S. Geological Survey (USGS) to test and refine concepts for the National Water-Quality Assessment (NAWQA) Program. The NAWQA Program is designed

APPENDIX XII
CANAL LATERAL LOSS, WASTE AND DELIVERY

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL	LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
5.5		86.76	0	0	86.76
5.6		0	0	0	0
6.5		1.47	0	0	1.47
6.9		25.98	0.91	0	25.07
7.2		50.81	7.37	0	43.44
7.3	P1-H	1966.37	598.42	250.34	1117.61
7.3	P1-L	3334.12	840.23	343.18	2150.71
7.4		59.52	8.14	0	51.38
7.7		26	0	0	26
8.0		47.08	3.78	0	43.3
8.5		62.49	3.17	0	59.32
8.8		14.79	5.49	0	9.3
11.7	Share with THID	50.42	0	0	11.54
11.9		0	0	0	0
12.0		0	0	0	0
12.1	Share with THID	78.09	0	0	31.81
12.5	Share with THID	190.41	0	0	26.57
12.9	THID	107.32	0	0	0
13.0	THPL	1633.78	0	0	0
13.3	THL	235.9	0	0	0
13.6	THL	129.4	0	0	0
14.1	THL	294.15	0	0	0
14.6	THL	167.09	0	0	0
14.9		36.42	0	0	36.42
15.0		71.44	5.84	0	65.6
15.7		82.23	1.59	0	80.64
15.9		179.44	13.34	0	166.1
16.4		69.74	5.11	0	64.63
16.5		333.83	9.35	0	324.48
16.9	P2-L	367.92	125.54	0	242.38
16.9	P2-LL	1277.94	472.24	156.62	649.08
16.9	P2-LR	3101.55	989.91	250.45	1861.19
16.9	P2-H	698.98	0	0	698.98
16.9	P2-HL	1118.78	508.24	161.68	448.86
16.9	P2-HR	5812.96	1676.35	492.81	3643.8
17.1		174.29	18.77	0	155.52
17.5		0	0	0	0
17.9		96.16	0	0	96.16
18.3		304.32	55.91	0	248.41
18.8		175.37	0	0	175.37
19.1		227.5	-3.14	0	230.64
19.5		206.32	109.96	0	96.36
19.9		120.59	0	0	120.59
20.3		163.91	2.16	0	161.75
20.5		140.57	-20.06	0	160.63
20.9		0	0	0	0
21.3		145.16	6.25	0	138.91
22.1		110.64	0	0	110.64

MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL	LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
22.6	P3-L	256.21	0	0	256.21
22.6	P3-LL	1340.52	598.35	169.84	572.33
22.6	P3-LR	1259.58	502.23	124.49	632.86
22.6	P3-H	139.25	0	0	139.25
22.6	P3-HL	1375.12	85.01	22.47	1267.64
22.6	P3-HR	5724.52	2082.36	551.99	3090.17
22.9		453.65	3.17	0	450.48
23.2		89.92	0	0	89.92
23.9		129.17	0	0	129.17
24.1	P4	0	0	0	0
24.1	P4-L	2435.65	531.51	185.41	1718.73
24.1	P4-R	436.02	40.61	0	395.41
24.3		267.13	2.69	0	264.44
24.6		0	0	0	0
24.7		76	3.06	0	72.94
24.8		180.98	8.36	0	172.62
25.1		39.19	0	0	39.19
26.1		98.97	36.99	0	61.98
26.7		996.19	284.94	143.96	567.29
27.1	P5	1389.38	141.84	171.04	1076.5
28.2		532.83	119.95	47.5	365.38
28.4		137.95	0	0	137.95
28.7		2870.22	632.96	203.7	2033.56
29.1		296.75	0	0	296.75
29.3		148.22	0	0	148.22
29.6		538.62	0	0	538.62
29.7	P6-L	757.25	74.63	61.21	621.41
29.7	P6-R	422.09	43.16	0	378.93
30.1		0	0	0	0
30.3		0	-46.65	0	46.65
30.7		733.65	-3.02	0	736.67
31.1		127.1	0	0	127.1
31.3		2508.14	288.56	98.63	2120.95
31.5		715.99	0	0	715.99
32.0		213.92	0	0	213.92
32.4		293.77	0	0	293.77
32.8		3149.59	816.83	174.8	2157.96
33.8		987.34	71.67	46.65	869.02
34.2		837.01	115.17	0	721.84
34.6		117.2	-46.08	0	163.28
34.7		433.37	119.4	0	313.97
35.2		687.45	41.9	0	645.55
35.5		3689.51	472.09	179.36	3038.06
36.0		520.54	-9.28	0	529.82
36.5		0	0	0	0
36.6		212.68	0	0	212.68
36.8		149.44	0	0	149.44
37.2		0	0	0	0
37.8		139.31	0	0	139.31

MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL		LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
37.9	P7	190.29		0	0	190.29
37.9	P7-L	1244.34		136	45.64	1062.7
37.9	P7-R	2710		307.6	237.61	2164.79
38.1		862.41		26.14	43.54	792.73
38.5		149.27		0	0	149.27
38.7		151.92		0	0	151.92
39.1		443.54		0	0	443.54
39.2		18.61		0	0	18.61
39.4		2016.74		0	0	2016.74
39.7		3344.4		0	0	3344.4
40.4		14.25		0	0	14.25
40.5		397.58		0	0	397.58
40.7		0		0	0	0
40.8		161.65		0	0	161.65
41.0		1687.93		0	0	1687.93
41.9		393.79		0	0	393.79
42.1		0		0	0	0
42.4		488.18		27.8	0	460.38
42.6		833.87		10.83	0	823.04
42.9	P8	6789.91		694.09	506.23	5589.59
42.9	P8A	465.18		61.84	0	403.34
42.9	P8-L	0		0	0	0
42.9	P8-R	0		0	0	0
43.1		2417.69		0	0	2417.69
43.5		371.31		0	0	371.31
44.2		529.44		-2	0	531.44
44.5		0		0	0	0
44.7		3380.05	45.2	181.73	0	3198.32
45.4		3759.06		284.64	0	3474.42
45.7		533.72		11.54	0	522.18
46.6		154.21		18.11	0	136.1
47.2		2196.81		211.62	0	1985.19
47.6		79.25		0	0	79.25
48.1		890.31		47.94	0	842.37
48.5		65.45		0	0	65.45
48.5	P9	662.71		0	0	662.71
48.5	P9L	3680.14		361.79	0	3318.35
48.5	P9R	4780.56		425.78	76.98	4277.8
48.6		1241.16		183.41	0	1057.75
48.9		223.85		0	0	223.85
49.2		1732.79		0	0	1732.79
49.3		86.6		0	0	86.6
49.7		1006.59		0	0	1006.59
50.0		92.11		-1.25	0	93.36
50.3		5.44		0	0	5.44
50.4		964.77		0	0	964.77
50.8		0		0	0	0
51.3		284.63		41.16	0	243.47
51.4		69.44		0	0	69.44
51.5		144.81		0	0	144.81
52.1		115.89		12.78	0	103.11

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MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL	LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
52.5	P9A	442.77	0	0	442.77
52.5	P9A-L	1103.44	183.88	0	919.56
52.5	P9A-R	6946.52	774.22	0	6172.3
52.8		1322.82	36.54	0	1286.28
53.4		741.84	26.52	0	715.32
53.8		1243.15	245.18	0	997.97
54.2		1217.49	70.9	0	1146.59
54.4		0	0	0	0
54.7		294.44	0	0	294.44
54.9		254.65	0	0	254.65
55.0		1500.6	59.34	0	1441.26
55.5		357.94	0	0	357.94
56.1	P10	3148.19	659.05	0	2489.14
56.4		658.87	0	0	658.87
56.7		174.12	0	0	174.12
57.0		441.47	0	0	441.47
57.2		788.61	51.02	0	737.59
57.7		254.42	0	0	254.42
57.9		465.87	13.95	0	451.92
58.3		642.28	0	0	642.28
58.4		54.33	0	0	54.33
59.0		2737.73	0	0	2737.73
59.1		2092.58	0	0	2092.58
59.3		120.29	0	0	120.29
59.5		868.19	0	0	868.19
59.9		184.85	0	0	184.85
60.3		1128.1	0	0	1128.1
60.8		188.24	0	0	188.24
61.4		597.52	10.31	1.79	585.42
61.9	P12	163.66	10.1	0	153.56
61.9	P12-L	850.79	81.11	0	769.68
61.9	P12-R	1058.27	10.09	15.73	1032.45
62.2		314.03	2.71	0	311.32
62.5		0	0	0	0
62.7		403.62	20.83	0	382.79
63.2		1217.82	37.3	0	1180.52
63.5		127.21	0	0	127.21
63.6		2612.35	41.87	0	2570.48
64.0		157.45	0.05	0	157.4
64.2		185.47	0	0	185.47
64.5		0	0	0	0
65.4		54.21	0	0	54.21
66.0		622.24	10.71	2.64	608.89
66.2		438.72	6.5	0	432.22
66.6		216.82	2.78	0	214.04
67.1		144.89	0	0	144.89
67.2	EAST TURBINE	9975.19	1212.3	1134.81	7628.08
67.2	P13	11967.81	2285.3	971.76	8710.75
67.2	P13-E	0	0	0	0
67.2	P13-W	0	0	0	0
67.2	WEST TURBINE	3934.91	523.05	212.06	3199.8

MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL	LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
67.3		21.47	0	0	21.47
67.5		98.11	-1.78	0	99.89
67.9		553.46	0	0	553.46
68.2		1711.9	0	0	1711.9
68.3		626.32	5.09	0	621.23
68.6		129.66	0	0	129.66
69.1		205.94	0	0	205.94
69.2		24.11	1.4	0	22.71
69.3		17.57	0	0	17.57
69.8		270.94	30.75	0	240.19
70.0		192.62	0	0	192.62
70.1		603.26	58.53	0	544.73
70.3		85.58	0	0	85.58
70.6		540.5	75.12	0	465.38
70.9		0	0	0	0
71.1	P14	7081.67	1654.9	575.89	4850.88
71.3		262.03	0	0	262.03
71.6		450.41	28.68	0	421.73
72.1		87.31	-69.92	0	157.23
72.4		1220.57	22.66	0	1197.91
72.9		2438.24	356.02	330.87	1751.35
73.0		47.29	0	0	47.29
73.3		509.03	10.13	0	498.9
73.9		0	0	0	0
74.0		2678.53	57.39	97.21	2523.93
74.3		340.65	4.94	0	335.71
74.7		6663.39	744.65	184.77	5733.97
75.1		219.04	25.34	0	193.7
75.5		282.97	0	0	282.97
75.7		123.79	0	0	123.79
76.6		3539.91	200.47	81.54	3257.9
76.8		187.2	0	0	187.2
77.0		21.25	0	0	21.25
77.3		4282.33	206.31	192.54	3883.48
78.6		110.75	0	0	110.75
79.0	P15-LL	1142.91	44.42	4.89	1093.6
79.0	P15-LR	6130.2	636.93	229.8	5263.47
79.0	P15-H	44.61	0	0	44.61
79.0	P15-HL	2255.47	320.89	76.97	1857.61
79.0	P15-HR	5390.67	941.53	271.55	4177.59
79.3		99.78	0	0	99.78
79.5		208.97	0	0	208.97
79.9		57.86	14.33	0	43.53
81.0		379.77	19.03	0	360.74
81.3		241.01	6.78	0	234.23
81.5	SERVERNS PUMP	376.17	8.75	0	367.42
81.7		116.31	0	0	116.31
82.0		1801.47	0	0	1801.47
82.8		243.14	0	0	243.14
83.3		137.24	1.79	0	135.45

MILE POST	NAME (DESCRIPTION)	DELIVERED TO LATERAL	LATERAL LOSSES	LATERAL WASTE	DELIVERED TO FARM
83.8		121.48	1.79	0	119.69
84.1		368.92	0.95	0	367.97
84.3		66.17	0	0	66.17
84.6		873.96	0	0	873.96
84.7		0	0	0	0
84.9		143.02	0	0	143.02
85.5		14.74	0	0	14.74
85.6		1719.23	66.36	40.12	1612.75
86.0		2094.92	65.72	40.34	1988.86
86.5		217.73	1.68	0	216.05
86.8		46.01	0	0	46.01
87.4		1560.81	110.41	0	1450.4
87.8		384.77	20.47	0	364.3
88.1		530.05	-9.91	0	539.96
88.3	P16-LL	4037.2	552.61	409.54	3075.05
88.3	P16-LR	631.79	17.46	0	614.33
88.3	P16-H	335.02	0	0	335.02
88.3	P16-HL	3635.4	470.21	163.48	3001.71
88.3	P16-HR	227.35	18.11	0	209.24
88.5		1533.93	6.96	0	1526.97
88.9		0	0	0	0
89.2		179.87	12.69	0	167.18
90.2		265.02	0	0	265.02
90.4		233.66	1.54	0	232.12
91.1		227.28	-11.14	0	238.42
91.5		198.8	6.75	0	192.05
91.7		328.69	13.73	0	314.96
92.1	P17	3146.52	386.75	0	2759.77
92.4		1611.08	436.25	0	1174.83
92.7		82.39	0	0	82.39
93.4		610.93	34	0	576.93
93.7		45.99	0	0	45.99
93.9		659.61	1.22	0	658.39
94.2		284.35	5.8	0	278.55
94.4		778.76	246.31	0	532.45
94.7		1000.96	38.47	0	962.49
94.8		1859.41	405.31	266.62	1187.48
		262044	30180.07	10051.05	218996.3

APPENDIX XIII
SEPA REPORT FOR MODERNIZATION FACILITIES

ROZA IRRIGATION DISTRICT CONSERVATION PLAN

ENVIRONMENTAL REPORT

FOR

ROZA IRRIGATION DISTRICT'S

PREFERRED REHABILITATION PROJECT

FOR THE COMPREHENSIVE WATER CONSERVATION PLAN

ROZA IRRIGATION DISTRICT

SUNNYSIDE, WA

NOVEMBER 1991

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I. PROPOSAL AND BACKGROUND

A. Introduction Roza Irrigation District is undergoing long term rehabilitation of all the District facilities. The rehabilitation project provides many benefits to the District, the landowners and the Yakima Basin as a whole. The District has been working on the project for 8 years and it is projected to be another 30 years until the projects are completed, if the District continues at the present pace.

B. Need for the Project

When the Roza Irrigation District was first built, the Yakima Basin experienced over 20 years of plentiful water supply. Construction of the District was completed in 1950 and the Yakima Basin experienced no recorded shortages from 1946-1972. Since 1973 the Yakima Basin has experienced five recorded years of water shortage three of which required water users in the Basin to be prorated by more than 30% of their entitlement. (USBR, Yakima Project Office)

The average total yield of the Yakima Basin is in the range of 3.5 million acre feet. The average annual irrigation use, is approximately 2.1 million acre feet. Total storage in the basin is 1 million acre feet. The total yield of the basin is a complex relationship between snow pack, snow melt and precipitation. The quantities stated above allude to the fact that the Yakima Basin is does not have the storage capacity to carry over water supply from one year to the next unless it is a very good water year. Since 1981 the USBR has managed the Yakima River Basin to account for the anadromous fish populations which puts an added demand on the water in the basin. The present storage capabilities when managed well, weather permitting, allow irrigation for the Districts within the basin to operate as long as possible in the growing season as well as providing instream flows. If things do not work out well, water shortages cause problems in the Basin.

Roza Irrigation District has a junior water right so from the preceding discussion the following hypothesis have been made:

1) Within the next 15 years there is a high probability that Roza Irrigation District will receive 70% or less of entitlement in at least 1 year.

2) With in the next 15 years it is possible Roza Irrigation District could receive less than 50% of entitlement.

3) If snowpack is moderate or runoff is early there will be insufficient basin storage to meet the irrigation needs of the basin.

4) With the increased demand for instream flows to provide better

fish habitat, these shortages will be even more frequent and in greater magnitude.
Therefore, it follows, additional storage and improved system efficiency are required to assure adequate water supply in all years. The rehabilitation projects that Roza Irrigation District is presently carrying out are designed to reduce the water requirements throughout the entire irrigation season. This will reduce the impact of water short years and allow a greater amount of water to be carried to the end of the season, which will enhance supplies for both irrigators and instream flows.

Roza Irrigation District, through these rehabilitation projects, is improving water use efficiency and improving water quality in the basin. The third phase of the Yakima Enhancement Plan is intended to address the need for additional storage which will be the item that will have the biggest and most positive effect on the Yakima Basins ability to manage water for all uses.

C. Location The Roza Irrigation District diverts from the Yakima River at RM 127. The first 11 miles of the Roza Main Canal is also used for the power plant located just above 11 mile. The Roza Main Canal is 96.4 miles long and runs from the diversion at Yakima River Mile 127 through Pamona, East Selah, east Moxee Valley and then through Konowac Pass down the lower Yakima Valley. The end of the canal spills into the Corral Creek in Benton County. The Roza Canal and the District is the highest in elevation of all the irrigation districts that lye in the Yakima Valley. There are just under 100,000 acres within the District Boundaries and just over 72,000 of those are irrigated.

II. ALTERNATIVES CONSIDERED

A. No Action The option of no action is not a consideration for this project. The Roza Irrigation District already exists and delivers water to many landowners and farmers within district boundaries. To run such a large water delivery system inefficiently causes many problems for the District, the landowners and the water quality and quantity of the Yakima Basin as a whole. The Board of Directors for Roza Irrigation District is committed to the Rehabilitation Project.

Washington State is also supportive of measures to improve water delivery systems. Referendum 38 passed legislature and was approved by Washington State voters November 6, 1980. The goal of the Agriculture Water Supply Facilities, Referendum 38, was to provide financial assistance to public bodies engaged in furnishing an adequate and efficient irrigation water supply. Referendum 38 authorized the State Finance Committee to issue State General Obligation Bonds in the sum of $125,000,000 for these water supply facilities.

B. Proposed Action

Roza Irrigation District's preferred plan for rehabilitation is made up of the following components:

1. Enclosed Conduit Systems on gravity laterals
2. Reregulation Reservoirs
3. Automation of the Main Canal
4. Lining 1/2-1 Mile of Main Canal per Year
5. Enclosing the Pump Laterals

All these components are part of the goal to create a water delivery system that is as close a possible to full demand system.

1. Enclosed Conduit Systems for Gravity Laterals.

The enclosed Conduit System replaces old concrete delivery boxes, weir blades, and open ditches or low head concrete pipe with PVC pipe and flowmeters.

Roza Irrigation District has been enclosing approximately 2000 acres (10 miles of pipe) a year since 1982-83. 18,350 acres are presently installed of the 45,000 acres under gravity water delivery in the District. Roza Irrigation District has developed an effective system for all phases of the enclosed conduit systems, as all the work has been done in house.

The benefits derived from the enclosed conduit systems are a reduction of lateral losses to virtually zero, the operational spills on laterals are reduced to zero. Reducing lateral spills will reduce water in some drains. The flow meter is a much more precise measurement of both flow rate and total volume of water used, so that District farmers can better control water. The Enclosed Conduit system provides the farmer more flexibility in operation. Reduced maintenance costs for the District and a reduction in liability for both the open laterals and the seepage, operational spills and drains.

2. Reregulation Reservoirs. These are reservoirs located fairly close to the main canal that are used to dampen the fluctuations in the main canal flows. As more enclosed conduit systems are installed, more landowners have the ability to shut off their irrigation water when they desire. Presently, if the level in the main canal rises the extra water will spill into the wasteways and back to the Yakima River. The reregulation reservoirs will momentarily store the unneeded water. Then when the canal level drops due to farmers demands increasing then the water is pumped out of the reregulation reservoir back into the canal. The reregulation reservoirs are situated at the lower end of the main canal as this area is where more fluctuations happen and the fluctuations are more critical as the canal is smaller.

Roza Irrigation District presently has a reregulation reservoir just upstream of wasteway 6. One upstream of wasteway 7 has been funded. A large reregulation reservoir is planned for upstream of wasteway 5.

The reregulation reservoirs provide several benefits to the operation of the Roza Irrigation District. They theoretically reduce the main canal waste to zero. As the main canal waste is stored and used to match supply and demand this will result in less water required at the head gate. This is a benefit for the District as during the water short years. Roza Irrigation District holds a junior water right. This means in water short years the District can be quite harshly prorated. This is especially true at the end of the water season. If Roza Irrigation District can divert less water from the Yakima River once the Basin is on storage control then this will leave a more water for the farmers later in the summer. Otherwise the typical scenario is that Roza Irrigation District must shut down earlier in the season. Reregulation reservoirs also make use of the diurnal effect present in canal operation. Without reregulation reservoirs the increase in flow during the night is lost down the wasteways. The reregulation reservoirs will store the water at night and then put it back into the canal during the daytime operation.

The reregulation reservoirs are important as they absorb the fluctuations in demand that become more prevalent as more enclosed conduit systems are installed. Without the reregulation reservoirs these fluctuations will end up as spill to a wasteway.

3. **Automation of the Main Canal.** Canal automation involves automating check structures along the main canal so that a constant elevation can be maintained to the deliveries. Check structures presently exist in the main canal but are changed manually. Automation becomes a necessity as the farmer are given more flexibility and control of the water. The way the District has been run in the past, has been the easiest for the operation but with improving service to the farmer the new delivery system will be more flexible for the farmer and require more from the District as far and changes made to check structures.

Presently Roza Irrigation District is modeling the main canal to aid in the decision of where to best locate the automated structures. One demonstration gate has been constructed and the use of the gate in Roza Irrigation District operations is also being studies as part of the Canal Automation Study. It is Roza Irrigation District's intention to construct or retrofit two check structures a year, beginning in winter of 1993.

The benefits of automating the main canal are that fluctuations in flow in the main canal will prevent changes in the pool elevations of the main canal. The system of manually changing the check structures will become insufficient as more control of the water supply timing is given to the farmer. If several farmers shut off then the flow in the main canal will increase. In order to provide the farmers with a constant supply of water so they can operate more efficiently, it is important to keep the water elevations constant. The automated check structures will do this job on a continuous basis. The changes in flow are compensated for by the reregulation reservoirs. The automated check structures will allow the system to operate at a lower flow rate. The water level of the canal must be kept at a certain level above the turnouts in order for water to fill the laterals properly. Using the automated check structures to hold the minimum acceptable water level allows the pool levels to remain at the necessary height with lower flow in the canal. This is very important in water short years and early and late in the season when demands are not as large.

4. **Lining of the Main Canal.** This involves digging out the main canal and placing a layer of 20mil PVC plastic 1.5 feet under the canal original cross section. The top soil and rip rap are placed on top of the liner.

Roza Irrigation District is presently installing 1/2 to 1 mile of the liner per year. This is being placed in area which normal maintenance procedures have not effectively corrected the most sever seepage problems. From cost estimates of embarking on a continuing project to line the entire main canal are not reasonable. The cost per acre foot of water saved is not as cost effective as other rehabilitation projects Roza Irrigation District is considering. The lining will only be done in areas where the structural soundness of the system becomes questionable.

The benefits of the main canal lining are that this practice solves for the long term some of the districts worse seepage problems. As a capital expenditure it reduces the maintenance bill and rids Roza Irrigation District of possible liability due to loss of use of farm land.

5. **Enclosed Conduit Systems on the Pump Laterals.** Once Roza Irrigation District has enclosed all of the gravity laterals (lying below the Main Canal) the pump laterals will be enclosed. It will be another 15 years before Roza Irrigation District begins to enclose these laterals.

It is important to understand that each component of the rehabilitation project is dependent on the other components to create an overall irrigation delivery system that will operate optimally and increase the overall efficiency of water use in the Yakima Basin.

C. Other Alternatives Considered

When developing water delivery systems there are two main choices.

The system can be either opened or closed. Open water delivery systems can be ditches or canals that are earthen lined or lined with another material such as concrete or PVC. Closed systems can be wither low head pipe or pressurized pipe. The method of delivering water that will eliminate losses is closed pressurized PVC pipe (**Figure I**). This also has the added advantage of supplying operating pressure for some of the landowners on the Roza Irrigation District. This method is only economical however to deliver flow up to 50 cfs. Flows above 50 cfs are normally delivered in an open system. Seepage losses in open systems can be controlled by lining the canals or ditches with the appropriate material. There is a need to develop methods to handle the waste in the system due to the inability of an open system to match supply and demand. Reregulation reservoirs and canal automation allow the system to be managed more efficiently. There are not a large array of options available to achieve a more efficient water delivery system that is cost effective and for which technology presently exists.

The four components Roza Irrigation District is proposing will convert the District into a very advanced and efficient system. As stated previously, Roza Irrigation District has been carrying out the rehabilitation project for eight years. Each time a new component has been added; enclosing gravity lateral, reregulation reservoirs, automation of gates, the District has performed more in depth feasibility studies and engineering reports before the project is carried out. These cover the different options available for hardware and construction of the system. These are available at Roza Irrigation District Office.

III.. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A. Natural Environment

1. **Earth.** The Roza Irrigation District is the youngest irrigation district in the Yakima Basin so in comparison, it is positioned higher in elevation than other irrigation district in the Yakima River Basin. Because the district sits higher up off the valley floor the slopes of the land are steeper than other districts in the valley. Slopes average from 3-6% with localized slopes exceeding 20% in some areas. The topography is rolling to hilly with some areas of steep slopes.

The soils found in Roza Irrigation District are mostly well drained soils of medium texture, over basalt. Caliche layers existing in some places. Roza Irrigation District is 98,000 acres of which 14,000 are class six land. Class six lands were determined non farmable when the district was first formed. They were felt to be non farmable due to extreme slopes, poor ground due to rocks or gravelly ground.

The rehabilitation projects will include removal of old concrete

EXPLANATION OF REHABILITATION OPTIONS FOR IRRIGATION WATER DELIVERY SYSTEMS

The following table lists options for rehabilitation of systems designed for irrigation water delivery. A classification has been given as to the amounts of operational loss and waste that are inherent in each option.

	OPTION	OPERATIONAL LOSS	OPERATIONAL WASTE
Closed Systems	1. Pipes with Weir Blades	Moderate	High
	2. Pipes with Flowmeters (Enclosed Conduit System)	Very Low	Very Low
Open Systems	3. Open Lateral with Flowmeters		
	a) unlined laterals	High	Unmanageable without automation
	b) lined laterals	Moderate	Unmanageable without automation
	4. Laterals with Weir Blades		
	a) unlined laterals	High	High
	b) lined laterals	Moderate	High
	5. Main Canal		
	a) unlined	Moderate	High
	b) lined	Low	High
	6. Reregulation	Little Change	Helps Reduce Waste
	7. Automation as related to 1,3,4,5,6	Little Change	Helps Reduce Waste

FIGURE I

delivery boxes and elimination of open laterals by piping. Backfill for pipelines will be required but often silt from silt basins along the main canal is used. The reregulation reservoirs will require more earth moving and fill materials. Roza Irrigation District uses as much material from the project site or sites on the District as possible. Sometimes fill and aggregate must be bought in as a higher quality or quantity is needed. After construction only 1% of the site area will be covered by impervious structures ie flowmeter structures, lining of the main canal and lining of reregulation reservoirs.

Erosion could occur during construction of the reregulation reservoirs. After construction erosion will be controlled by seeding and compacting exposed, mined or worked areas.

The enclosed conduit systems will decrease erosion as laterals will be enclosed. They will also provide the farmer with more control of the water which has been proven to reduce erosion. The soil erosion will be decreased with the installation of the projects as it provides the farmer with a more effective means to manage the irrigation and often provides operating pressure.

2. **Air.** AIR QUALITY: Air quality in the Yakima River Basin ranges from good to excellent. The air quality in the Yakima Valley is usually in compliance with the National Ambient Air Quality Standards and Washington State standards. Occasionally, standards are exceeded for short periods. Carbon monoxide and suspended particulates exists in the area of Yakima City. The lower valley has areas of high levels of natural windborne particulates originating from fallow croplands during windy periods. Burning crop and forest residues and vehicle travel on gravel roads are often sources of particulates during the summer and fall. The east Moxee area is similar to the urban Yakima area which is surrounded by hills and ridges. This area can experience poor atmospheric dispersal of pollutants from automobiles and industry during winter inversions.

The preferred rehabilitation project will not effect long term air quality in the lower Yakima Basin. During construction the heavy equipment will emit exhaust and dust but the proper measures will be taken to reduce these as much as possible. Once laterals are enclosed the need for burning weed along them and in them every spring so this will help to improve air quality in the area.

CLIMATE: Summer temperatures average 82 degrees Fahrenheit in the Yakima Valley. Winter temperatures are from 15-25 with minimum temperatures of -20 to -25 recorded in most areas. The rainfall is about 6-10 inches annually. The Yakima is arid in climate with irrigation providing humidity normally not present.

The preferred rehabilitation projects will not have an effect on the climate of the Yakima Valley.

3. **Water.** SURFACE WATER: Surface water quality in the Yakima Basin becomes progressively worse as the water moves downstream. Water quality in the upper tributary reaches is excellent but only fair to good in the lower Yakima Valley. River water upstream of the Roza Dam are considered good, but as the River flows through the middle basin Roza Dam to Sunnyside Dam treated wastes form the communities of Yakima, Selah, Union Gap and Terrace Heights plus irrigation return flows for the Ahtanum and Moxee Valleys are added. But under average flow conditions, quality is degraded only slightly as the Naches River has good quality and is added to the Yakima River in this reach. In the lower basin, below Sunnyside Dam, the water quality degrades rapidly. During the summer most of the flow is diverted at Sunnyside and Wapato Dams. Also downstream turbid, nutrient, and bacterial rich return flows make up a large portion of the river's flow. Return flows from Agriculture are the major source of turbidity, nitrogen, phosphorus, and dissolved solids in the reach. The high temperatures prevent andromous fish utilization during the summer months. Also refer to John Easterbrooks letter in **Appendix** I for comments on this subject.

Water quantity in the Yakima Basin has been discussed briefly in the introduction. The Yakima River Basin drains 6,155 square miles. The average annual discharge of the basin is 2.9 million acre-feet. There is only storage for 1 million acre feet so demands on the water must be fulfilled by the timing of natural run off as much as possible.

There are various drains and wasteways within the Roza District that drain the irrigated farmlands. A small part of the drain waters are from Roza's operations, but the majority of the impact on these drains is the result of on farm practices. None of these drains will be covered as a result of the project. Normal amount of maintenance on theses drains will continue. This means possibly every 3-7 years the drains will be cleaned, not all within any given year.

The wasteway 5 reregulation reservoir is sited in the upland area of Sulphur Creek across the natural drainage. This dam will be designed for maximum probable flood event so as to minimize the flood effects down stream of the structure.

The rehabilitation projects will fill in open laterals as the enclosed conduit systems are built. These surface waters it is felt will be compensated for by the increase in farmer ponds on the district. These are becoming more useful to farmers as things such as frost control and cooling of apples. Water from the Roza main canal will be used to puddle backfill the pipelines but the projects will not require any more surface water diversions. The overall purpose of the rehabilitation projects is to be able to reduce Roza Irrigation District head gate diversions from the

Yakima River.

GROUND WATER: The source of shallow water in the Yakima basin is the infiltration of rain or surface waters through the soils. The porous nature of the surface soils in the Yakima basin allows for fairly high infiltration rates. So shallow ground water has the potential of being more susceptible to pollution from agricultural practices.

The shallow ground water is found near rivers and streams in the basin. Normally shallow ground water seeps into the surface waters. The primary source of deep ground water is from recharge in the high mountains.

None of the projects in the proposed rehabilitation plan involve the use of groundwater. The enclosed conduit projects will however decrease the amount of water returned to the Yakima River via drains from operational wastes and losses. The reregulation reservoirs may provide some seepage to the shallow ground water if it is decided they are not to be lined.

RUNOFF: Runoff on Roza Irrigation District above the main canal is water that returns to the main canal through overshot drains. Most of the natural drainages have undershot drains under the Roza main canal. Sources of runoff include snow melt and rain waters derived from upland peripheral lands and Roza Irrigation District operational losses and waste. The majority of the run off on the Roza Irrigation District is from on farm use of the water. The proposed rehabilitation project will reduce. Runoff will be reduced as the rehabilitation projects provide more flexibility and control of water for the farmer. In turn, farmers make better use of their water. The enclosed conduit systems encourage farmers to change from rill irrigation to more efficient methods such as sprinkler, because for many of them pressure is provided by the system.

4. **Plants and Animals.** PLANTS: The Roza Irrigation District has many types of plants found within the boundaries of the district. The most obvious are the agricultural crops such as orchard, grapes, hops, mint, grains, row crops and others. Pasture, grass, shrubs, cattails, cottonwood trees, other deciduous trees and evergreen trees.

The rehabilitation projects will eliminate any plants growing along the open laterals. These plants are destroyed annually with the ditching and burning done as maintenance to the laterals. The area where the laterals did exist will be returned to its original slope and the landowner will be able to make use of the land as laid out in Roza Irrigation District policies. The laterals and main canal are not considered regulated wetlands according to Department of Ecology so that plant life along the immediate water surface is not considered prime habitat loss associated with this proposal.

The construction of reregulation reservoirs will disturb pretty large areas of land but these sites are either farmland or waste land that does not have any specialty plant life.

ANIMALS: There are no fish on the Roza Irrigation District that are directly involved with the operation of the district. **Appendix I** is a letter in which John Easterbrooks describes how fish maybe affected by the rehabilitation projects. Individual farmers may have ponds that they stock. There are upland birds and mammals in the District which may make their homes in areas which a specific project will be constructed. See attached list of animals and birds commonly found in the Yakima River Basin in **Appendix II.** There are no endangered species found on the Roza Irrigation District.

The reregulation reservoirs will enhance wildlife since it should increase the faunal and floral diversity of the impacted area yet maintain the integrity, if not improve it, of the indigenous faunal and floral community peripheral to the impacted areas.

5. **Energy**. Presently the energy used by Roza Irrigation District to operate and maintain the water delivery facilities includes electrical power at each of the pumping plants, the reregulation reservoir at wasteway 6, and several pumpbacks along the main canal. Pumpbacks are used to return water from the exit end of a lining drain back to the main canal.

During the construction phase of the projects fossil fuels will be used by heavy equipment. For operation of the completed projects electricity will be used by the water pumping plants. Where possible solar power will be used to operate automated gates at check structures. Possibly a new power substation will be required at the wasteway 5 reregulation reservoir. The use of variable speed drives with existing pumping plant facilities will help to reduce the use of electricity. It maybe necessary to boost the pumping capabilities at existing pumping plants, depending on the design. The enclosed conduit systems reduce the farmers need to pump as the natural fall in elevation provides some operating pressure for approximately half of the farmers on each lateral.

It is felt that the overall result of the rehabilitation projects may actually be an increase in demand on electricity from the District's perspective. When considering the farmers decrease in demand for pumping power then electricity demand could decrease.

B. Built Environment

1. **Wetlands**. Wetlands on Roza Irrigation District have been artificially created since the irrigation project began delivering water to farmers. The area which is now the Roza Irrigation

District was at one time desert and sage brush with possibly some growth in the natural drains that supported the large drainages. The wetlands there today are created from water coming from a number of sources. The majority of this water is runoff from irrigated farm land and subsurface drainage from shallow ground water that has been applied for leaching purposes on the agricultural lands and then moves along a basalt layer or caliche layer to a natural drain. Roza Irrigation District operational wastes and losses also provide a source of water as well as runoff from winter snow pack in the hills above and rain water during rain storms.

The land on which these wetlands exists is farmers land. Roza Irrigation District is responsible to the farmers to maintain the delivery system so it does not damage farmers crops or prevent farmers from using the land for production. The drains must be cleaned occasionally so that they do not silt in and begin encroaching on farmland. District policy states that "The District may, at the request of the landowner, clean existing drains provided it is in the best interests of the District as a whole, time and funds are available, adequate right-of-way is provided and two or more Roza landowners are contributing surface flow to the drain."

The enclosed conduit systems will decrease the amount of flow into the drains as the operational spill at the end of laterals will be removed and seepage areas along laterals will be removed. The reregulation reservoir and automated check structures will not have a direct impact on these wetlands. They are however components of the rehabilitation project which will in totality improve water quality in the Basin. Lining of the main canal will remove any seepage from the main canal that is draining into these draws. Lining drains that will be placed under the lined section may discharge drain water. If a high water table exists, due to the irrigation above the main canal, a point source discharge will still go to the natural drain.

Roza Irrigation District does realize that the rehabilitation projects will decrease the amount of flow in the natural draws. These rehabilitation projects will not however dry up these artificially created wetland areas. **Figure II** on the page demonstrates all the sources which feed the natural drainages. If Roza Irrigation District was able to run its entire system "water tight" only half the water that is presently in the natural draws and eventually returns to the Yakima River is contributed by Roza Irrigation District operational waste and losses. It is unrealistic to think that Roza Irrigation District could operate 100% water tight.

The landowners management along these draws have a large impact on these wetlands. This can be demonstrated by looking down along one of these natural draws and observing the degree to which the

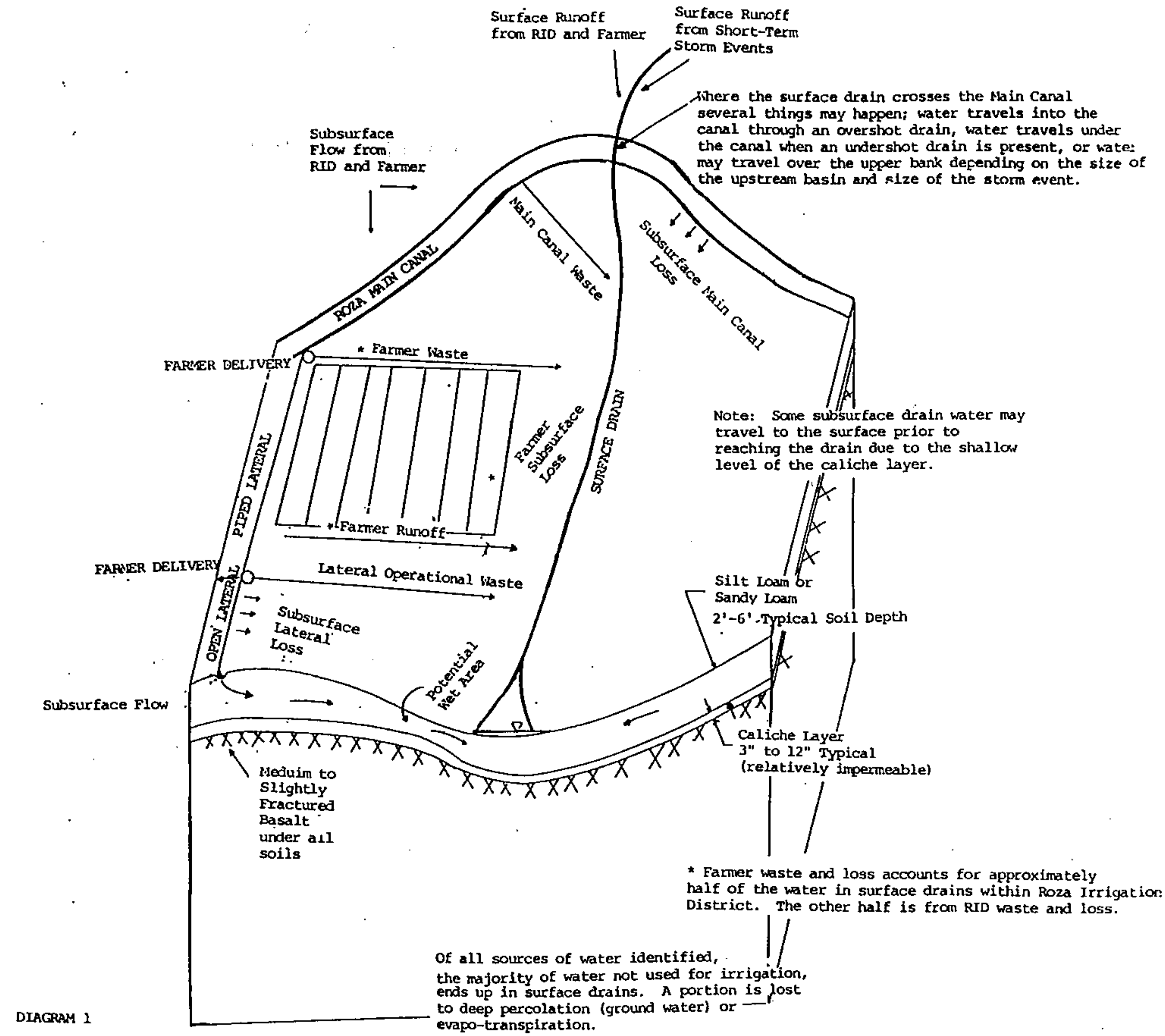
Surface Runoff from RID and Farmer
Surface Runoff from Short-Term Storm Events
Where the surface drain crosses the Main Canal several things may happen; water travels into the canal through an overshot drain, water travels under the canal when an undershot drain is present, or wate: may travel over the upper bank depending on the size of the upstream basin and size of the storm event.
Subsurface Flow from RID and Farmer
ROZA MAIN CANAL
Main Canal Waste
Subsurface Main Canal Loss
FARMER DELIVERY
* Farmer Waste
Farmer Subsurface Loss
SURFACE DRAIN
PIPED LATERAL
*Farmer Runoff
FARMER DELIVERY
Lateral Operational Waste
OPEN LATERAL
Subsurface Lateral Loss
Potential Wet Area
Subsurface Flow
Note: Some subsurface drain water may travel to the surface prior to reaching the drain due to the shallow level of the caliche layer.
Silt Loam or Sandy Loam
2'-6' Typical Soil Depth
Caliche Layer
3" to 12" Typical
(relatively impermeable)
Meduim to Slightly Fractured Basalt under all soils
* Farmer waste and loss accounts for approximately half of the water in surface drains within Roza Irrigation District. The other half is from RID waste and loss.
Of all sources of water identified, the majority of water not used for irrigation, ends up in surface drains. A portion is lost to deep percolation (ground water) or evapo-transpiration.
DIAGRAM 1

FIGURE II

farmers have an impact on these wetlands. Some areas look like a low spot in the land and the drain is kept as a drain ditch. Other spots the farmer have let the drain go and cottonwood trees, willows and cattails are growing there.

2. **Surface Water Drains.** There are also man made drains on the Roza Irrigation District. These are built to transport water to natural draws. Some of the characteristics of the drains are similar to the wetlands described above.

3. **Environmental Health.** The rehabilitation projects do not involve any sort of environmental health hazards such as exposure to toxic chemicals or risk of fire and explosion.

There is no noise in the areas that will effect Roza Irrigation District's rehabilitation projects but some short and long term noise will be created by the projects. The short term noise will involve construction equipment. All work will be done from 8am until 4:30pm Monday through Friday. The projects often require overtime to meet the deadline of water being turned on. the overtime is done on weekends. The roller compacted concrete dam at wasteway 5 will be constructed 24 hours a day once the concrete is being laid. Long term noise will consist of the same amount of noise related to current operations and maintenance of the water distribution system which consists of pumping plants and the presence of vehicles on the project for operations and maintenance.

To control the noise as much as possible new pumping facilities may be placed below ground level and enclosed in a building to minimize noise. During construction the contractor or our crew, will be required to comply with applicable Federal, State and local laws and regulations concerning other prevention, control and abatement of excessive noise.

4. **Land Use** The current use of land within the Roza Irrigation District is irrigated agriculture with some non-irrigated agriculture and waste land. The agricultural crops grown include orchard, grapes, hops, mint pasture and row crops. Structures on the site include single family dwellings, farm buildings, farm structures and irrigation facilities. The current zoning classification of all the projects sites is agriculture. The current comprehensive plans for Yakima and Benton Counties designate the District as either agriculture or exclusively agriculture. There are no area in the district that are classified as "environmentally sensitive" areas.

The rehabilitation projects, specifically the enclosed conduit systems will eliminate the old concrete delivery boxes. There will be no changes in the number of people residing or working in the project areas. The projects would not displace any current residents.

5. **Transportation** There is no public transportation system on the Roza Irrgation District. Benton and Yakima County provide the county roads that are used through out the District.

The proposed rehabilitation projects will have no effect on existing transportation infrastructure.

6. **Public Services and Utilities** The proposed rehabilitation projects will not result in an increased need for public services in general. In fact the enclosed conduit systems will result in a decrease in demand for on-farm pumping.

Utilities presently available to Roza Irrigation District are electricity and telephone. Electricity presently exists at all pump backs on the main canal, all existing pumping plants, wasteway 6 reregulation reservoir and the gate actuator at the entrance to siphon 9. Telephone service to wasteway 6 reregulation reservoir exists as a modem is used for remote sensing.

Utilities proposed for the projects are possibly a new power substation for the reregulation reservoir at wasteway 5. Power transmission lines to the wasteway 7 reregulation reservoir. Possible power to some automated gates if solar power is not practical.

IV. PERMIT REQUIREMENTS

This section will discuss how the proposed Rehabilitation Projects will comply with some important Federal, State, local laws, regulations, authorities, and permit requirements.

A. Federal

1. National Environmental Policy Act (NEPA) This Act requires that federally sponsored actions or projects be evaluated from an environmental perspective to adequately determine impacts on the quality of the human environment. Presently the State is the only outside source of funding and no federal permits are necessary for these projects. Therefore, NEPA would not be necessary. (See under state regulations SEPA.)

2. Endangered Species Act This Act requires full protection of plant and animal species that are currently in danger of extinction (endangered) or those that may be so in the foreseeable future (threatened). Section 7 of this Act requires consultation with the Service to determine potential project impacts on threatened and endangered species. Roza Irrigation District has no Federally listed endangered or threatened animal species within the District. There are no federally listed endangered or threatened plants in Washington.

3. Fish and Wildlife Coordination Act Under this authority, fish and wildlife must receive consideration equal to other water project features. As required by the Act, impacts to fish and wildlife will be evaluated in consultation with the U.S. Fish and Wildlife Service and the Washington State Department of Wildlife. These projects have no direct impact on fish. The wildlife will be considered at a State level.

4. Executive Order 11990, Protection of Wetlands Under this directive and in carrying out resource management programs, all Federal agencies are to take actions which will minimize the destruction, loss or degradation of wetlands areas. The rehabilitation projects described above will not destroy or degradate wetlands in the project area. The rehabilitation projects will improve the quality of the water in the wetlands by reducing the erosion and sediment loading in the drains.

5. Executive Order 11988, Floodplain Management This executive order requires that Federal agency programs management reduce the risk of flood plain losses; minimize the impact of floods on human safety, health, and welfare; and restore the preserve the natural and beneficial values served by flood plains. The Corps of Engineers has completed floodplain and floodway mapping in the Yakima Basin. In some areas, 100-year flood elevations have been mapped (based on National Geodetic Vertical Datum of 1929). Areas not included in this mapping only the horizontal extent of the 100 year flood plain is shown. Additional information will be needed for final design to determine the full extent of the 100 year flood plain at each project site.

6. Clean Water Act The goal of the clean water act is to"restore and maintain the chemical, physical, and biological integrity of the Nation's water." Under Section 401 of the Clean Water Act, Reclamation would concurrently acquire water quality certification or modification approval from the Washington Department of Ecology to assure compliance with the states water quality standards. Roza Irrigation District would not fall under the 401 regulation.

7. Clean Air Act This Act was passed in 1963 and amended many times. It establishes air quality criteria, national ambient air quality standards and a mechanism for State implementation of air quality standards. None of the construction projects have any stationary emissions source, nor are any of the sites in a DOE's non-attainment area. Therefore, the rehabilitation projects are not regulated by the Clean Air Act.

8. National Historic Preservation Act, Archeological Resources Protection Act, American Indian Religious Freedom Act, National Landmarks Program and the World Heritage List All these Acts safeguard our heritage from Federally sponsored or permitted projects.

B. State

1. State Environmental Policy Act (SEPA) This act was implemented to insure that Washington State decision makers would consider the environmental impacts of proposed projects. This environmental report and the check list is being prepared under the normal SEPA process. Responses and comments received at this stage in the project planning will be taken into consideration when the individual construction projects are in design phase and once again go through the SEPA process.

C. Local

1. Compliance with Yakima and Benton County Comprehensive Land Use Plans and Zoning Requirements. Roza Irrigation District is working the both counties as they prepare their updated comprehensive land use plans in accordance with the Growth Management Act.

D. Government Approvals or Permits Required

1. Yakima and Benton County Road Crossing Permits any time a project crosses a county road.

2. WDOE Dam Safety Approval Permit for the dams at the reregulation reservoirs.

3. Labor and Industry Electrical Section, Electrical Work Permit for any wiring done on automation controls or power for pumping plants.

4. FCC Permit if Roza Irrigation District uses radio communication for remote sensing or control.

5. Benton and Yakima County Special Property Use Permit for the reservoirs.

6. Special permit from Benton County to carry heavy loads before frost comes out of the ground.

V. RECOMMENDATIONS

The environmental assessment points out how the different projects that are a part of Roza Irrigation District's rehabilitation plan will impact the environment. It appears that there are not going to be any major negative effects on the environment. Each construction project will be explored more in depth when the project is in the preliminary design phase. At this point it seems there is no reason to prevent the Roza Irrigation District from proceeding with the preferred rehabilitation plan for the improved conservation and improved water quality in the Yakima River Basin.

VI. CONSULTATION AND COORDINATION

Below is a list of agencies and individuals who were contacted by Roza Irrigation District in the preparation of this draft environmental assessment.

Yakima County Conference of Governments, Elaine Taylor
Benton-Franklin Governmental Conference
Washington Department of Wildlife, Brent Renfrow
Yakima Indian Nation, Carroll Palmer
Washington Department of Fisheries, John Easterbrooks
Soil Conservation Service, Jerry Jacoby
U.S. Fish and Wildlife Service, Mike Tehan
Bureau of Reclamation, Ray Nelson
Department of Ecology, Ray Newkirk
Yakima County Planning Department, Rich Nourse
Benton County Planning Department, Phil Mees

VII. REFERENCES

Bonneville Power Administration, 1990. Environmental Assessment of Yakima-Klickitat Production Project.

Bureau of Reclamation, 1990. Draft Environmental Assessment of Fish Passage and Protective Facilities, Phase II for the Yakima River Basin, Washington.

Department of Ecology, 1984. State Environmental Policy Act Rules, Chapter 197-11 WAC.

Environment 2010. The Stat of the Environment Report. November 1989.

APPENDIX I

JOSEPH R. BLUM
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600
Yakima Screen Shop, P.O. Box 9155, Yakima, WA 98909 (509)-575-2733

November 20, 1991

Roza Irrigation District
Attn: Rhoda Benson
P.O. Box 810
Sunnyside, WA 98944

SUBJECT: Review of Draft Environmental Assessment, Preferred Rehabilitation Project, Comprehensive Water Conservation Plan

Dear Ms. Benson:

Per your request of November 1, 1991, the Washington Department of Fisheries (WDF) has reviewed the above referenced document and the SEPA Environmental Checklist.

Roza Irrigation District (RID) deserves recognition for planning and implementing a comprehensive water conservation program beginning in 1982. Over 36 percent of the gravity open laterals have been replaced with enclosed conduit systems (ECS) and one reregulation reservoir has been constructed adjacent to Wasteway No. 6. These improvements are already benefiting district waterusers and are contributing to increased water quality and quantity for instream resources (e.g. anadromous fish) in the Yakima River. WDF commends RID's proactive and positive approach to dealing with the uncertainty caused by the Yakima Basin general water rights adjudication. We wish the other major irrigation districts would adopt the same approach and begin developing comparable conservation programs instead of waiting for the adjudication to be completed.

We concur with the components in your preferred rehabilitation plan. Referendum 38 funds would be well spent in assisting RID:

1) complete the conversion from gravity open laterals to ECS;

2) construct reregulation reservoirs at Wasteways No. 5 and 7;

3) construct automated check structures in the main canal.

These three components, implemented as a package in recognition of their interdependence, will significantly reduce operational spills, thereby reducing river diversions. Water quality in Sulfur, Snipes and Corral Creeks should also improve as operational spills decrease. Lining sections of the main canal and enclosing pumped laterals should be studied further to evaluate benefits vs. costs.

Affected Environment and Environmental Consequences

Surface Water

We agree that the overall effect of the conservation program should be to improve water quality in the lower Yakima River. If the Bureau of Reclamation (BOR) increases the summer target flow downstream of Sunnyside Dam to compensate for reduced RID return flow, water quality will improve. However, BOR may reduce power production at Chandler powerhouse to offset lower return flow and still meet their obligation to deliver irrigation water to Kennewick I.D. If this occurred, total flow arriving at Prosser Dam could actually decrease and water quality could worsen.

Conversely, river water quality may improve without increasing flow at Sunnyside Dam simply because the conservation program reduces the amount of poor quality return flow in Sulfur Creek, Snipes Creek and Corral Creek. The river will benefit from reduced sediment loading with the associated agricultural chemicals and thermal pollution. If on-farm irrigation practices change as a result of converting to ECS (e.g. rill to sprinkler irrigation), then the quality of water in drains which flow into these creeks should improve (and quantity should decrease). RID should consider using a water quality model to determine if lower Yakima River water quality improves or declines as return flows decrease.

Animals

Anadromous and resident fish are directly affected by the operation of the RID. These fish may not be in the main canal and laterals, but they are found in Sulfur, Snipes/Spring and Corral Creek which are heavily impacted by RID return flows and main canal operational spills. False attraction of adult spring chinook salmon into Snipes and Sulfur Creek during their spring upstream migration is a serious problem. The fish are attracted by the origin of the water (Yakima River canyon) and the amount of flow. Salmon swim upstream as far as they can go and jump at the wasteway chutes. Injury, delay and mortality occur. Poaching activity at Wasteway 5 and 6 has been documented. WDF is anxious to reduce operational spills and return flows during the spring migration period (April - June) to reduce false attraction.

Thank you for the opportunity to comment on the draft EA.

Sincerely,

John A. Easterbrooks
Fish Biologist

cc: Dale Bambrick, YIN
Walt Larrick, RID

APPENDIX II

Derived From
Mammals of Washington Department of Wildlife Region Three

Common Name	Scientific Name
Order Insectivora (Shrews and Moles)	
Family Soricidae (Shrews)	
Masked Shrew	Sorex cinereus
Vagrant Shrew	Sorex vagrans
Dusky Shrew	Sorex obscurus
Water Shrew	Sorex palustris
Merriam's Shrew	Sorex merriami
Family Talpidae (Moles)	
Coast Mole	Scapanus orarius
Order Chiroptera (Bats)	
Family Vespertilionidae (Plainnose Bats)	
Little Brown Myotis	Myotis lucifugus
Yuma Myotis	Myotis yumanensis
Keen's Myotis	Myotis keenii
Long-eared Myotis	Myotis evotis
Fringed Myotis	Myotis thysanodes
Long-legged Myotis	Myotis volans
California Myotis	Myotis californicus
Small-footed Myotis	Myotis leibii
Silver-haired Bat	Lasionycteris noctivagans
Western Pipistrelle	Pipistrellus hesperus
Big Brown Bat	Eptesicus fuscus
Red Bat	Lasiurus borealis
Townsend's Big-eared Bat	Plecotus townsendii
Pallid Bat	Antrozous pallidus
Order Logomorpha (Pikas, Hares, and Rabbits)	
Family Leporidae (Hares and Rabbits)	
Pygmy Rabbit	Brachylagus idahoensis
Eastern Cottontail	Silvilagus floridanus
Nuttall's Cottontail	Sylvilagus nuttallii
European Rabbit	Oryctolagus cunicalus
White-tailed Jack Rabbit	Lepus townsendii
Black-tailed Jack Rabbit	Lepus californicus
Order Rodentia (Gnawing Mammals)	
Family Sciuridae (Squirrels)	
Least Chipmunk	Tamias minimus
Yellow-pine Chipmunk	Tamias amoenus
Yellow-bellied Marmot	Marmota flaviventris
Townsend's Ground Squirrel	Spermophilus townsendii
Washington Ground Squirrel	Spermophilus washingtoni
California Ground Squirrel	Spermophilus beecheyi
Golden-mantled Ground Squirrel	Spermophilus lateralis
Cascade Golden mantled Ground Squirrel	Spermophilus saturatus
Eastern Gray Squirrel	Sciurus carolinensis

Common Name	Scientific Name
Family Geomyidae (Pocket Gophers)	
Northern Pocket Gopher	Thomomys talpoides
Family Heteromyidae (Pocket Mice, Kangaroo Mice, and Kangaroo Rats)	
Great Basin Pocket Mouse	Perognathus parvus
Ord's Kangaroo Rat	Dipodomys ordii
Family Castoridae (Beaver)	
Beaver	Castor canadensis
Family Cricetidae (Mice, Rats, Lemmings, and Voles)	
Western Harvest Mouse	Reithrodontomys megalotis
Deer Mouse	Peromyscus megalotis
Northern Grashopper Mouse	Onychomys leucogaster
Bushy-tailed Woodrat	Neotoma cinerea
Meadow Vole	Microtus pennsylvanicus
Montane Vole	Microtus montanus
Gray-tailed Vole	Microtus canicaudus
Long-tailed Vole	Microtus longicaudus
Creeping Vole	Microtus oregoni
Water Vole	Microtus richardsoni
Sagebrush Vole	Lagurus curtatus
Muskrat	Ondatra zibethicus
Norway Rat	Rattus norvegicus
House Mouse	Mus musculus
Western Jumping Mouse	Zapus princeps
Family Erethizontidae (Porcupine)	
Porcupine	Erethizon dorsatum
Family Capromyidae (Nutria)	
Nutria	Myocastor coypus
Order Carnivora (Flesh Eaters)	
Family Canidae (Dogs, Wolves, Foxes)	
Coyote	Canis latrans
Red Fox	Vulpes vulpes
Family Procyonidae (Racoons and Coatis)	
Racoon	Procyon lotor
Family Mustelidae (Weasels, Skunks, ect.)	
Ermine	Mustela erminea
Long-tailed Weasel	Mustela frenata
Mink	Mustela vison
Badger	Taxidae taxus
Spotted Skunk	Spilogale gracilis
Stripped Skunk	Mephitis mephitis
River Otter	Lutra canadensis

Common Name	Scientific Name
Family Felidae (Cats)	
Bobcat	Lynx rufus
Order Artiodactyla (Even-toed Hoofed Mammals)	
Family Cervidae (Deer)	
Rocky Mountain Elk	Cervus elaphus nelsoni
Mule Deer	Odocoileus hemionus hemionus
White-tailed Deer	Odocoileus virginianus

Derived From
Status of Birds of Washington Department of Wildlife Region Three

Family	Common Name	Genus Species
Gaviidae		
	Pacific Loon	Gavia pacifica
	Common Loon	Gavia immer
Podicipedidae		
	Pied-billed Grebe	Podilymbus podiceps
	Horned Grebe	Podiceps auritus
	Eared Grebe	Podiceps nigricollis
	Western Grebe	Aechmorphorus occidentalis
	Clark's Grebe	Aechmorphorus clarkii
Pelicanidae		
	American White Pelican	Pelecanus erythrorynchos
Phalacrocoracidae		
	Double-crested Cormorant	Phalacrocorax auritus
Ardeidae		
	American Bittern	Botaurus lentiginosus
	Great Blue Heron	Ardea herodias
	Snowy Egret	Egretta thula
	Great Egret	Casmerodius albus
	Black-crowned Night-Heron	Nycticorax nycticorax
Anatidae		
	Tundra Swan	Cygnus columbiaus
	Trumpeter Swan	Cygnus buccinator
	Greater White-fronted Goose	Anser albifrons
	Snow Goose	Chen caerulescens
	Canada Goose	Branta canadensis
	Green-winged Teal	Anas crecca
	Mallard	Anas platyrynchos
	Northern Pintail	Anas acuta

Family	Common Name	Genus Species
Anatidae (Continued)		
	Blue-winged Teal	Anas discors
	Cinnamon Teal	Anas cyanoptera
	Northern Shoveler	Anas clypeata
	Gadwall	Anas strepera
	Eurasian Wigeon	Anas penelope
	American Widgeon	Anas americana
	Wood Duck	Aix sponsa
	Redhead	Aythya americana
	Canvasback	Aythya valisineria
	Ring-necked Duck	Aythya collaris
	Greater Scaup	Aythya marila
	Lesser Scaup	Aythya affinis
	Old Squaw	Clangula hyemalis
	Common Goldeneye	Bucephala clangula
	Barrow's Goldeneye	Bucephala islandica
	Bufflehead	Bucephala albeola
	Hooded Merganser	Lophodytes cucullatus
	Common Merganser	Mergus merganser
	Red-breasted Merganser	Mergus serrator
	Ruddy Duck	Oxyura jamaicensis
Cathartidae		
	Turkey Vulture	Cathartes aura
Accipitridae		
	Osprey	Pandion haliaetus
	Bald Eagle	Haliseetus leucocephalus
	Northern Harrier	Circus cyaneus
	Sharp-shinned Hawk	Accipiter striatus
	Cooper's Hawk	Accipiter cooperii
	Norther Goshawk	Accipiter gentilis
	Swainson's Hawk	Buteo swainsoni
	Red-tailed Hawk	Buteo jamaicensis
	Ferruginous Hawk	Buteo regalis
	Rough-legged Hawk	Buteo lagopus
	Golden Eagle	Aquila chrysaetos
Falconidae		
	American Kestrei	Falco sparverius
	Merlin	Falco columbarius
	Peregrine Falcon	Falco peregrinus
	Gyrfalcon	Falco rusticolus
	Prairie Falcon	Falco mexicanus
Phasianidae		
	Gray Partridge	Perdix perdix
	Chukar	Alectoris chukar
	Ring-necked Pheasant	Phasianus colchicus
	Ruffed Grouse	Bonasa umbellus
	Sage Grouse	Centrocercus europhasianus
	Wild Turkey	Meleagris gallopavo
	Northern Bobwhite	Colinus virginianus
	California Quail	Callipepla californica

Family	Common Name	Genus Species
Rallidae		
	Virginia Rail	Rallus limicola
	Sora	Porzana carolina
	American Coot	Fulica americana
Gruidae		
	Sandhill Crane	Grus canadensis
Charadriidae		
	Black-bellied Plover	Pluvialis dominica
	Killdeer	Charadrius vocifrus
Recurvirostridae		
	American Avocet	Recurvirostra americana
Scolopacidae		
	Greater Yellowlegs	Tringa melanoleuca
	Lesser Yellowlegs	Tringa flavipes
	Solitary Sandpiper	Tringa solitaria
	Spotted Sandpiper	Actitis macularia
	Long-billed Curlew	Numenius americanus
	Sanderling	Calidris alba
	Semipalmated Sandpiper	Charadrius semipalmatus
	Western Sandpiper	Calidris mauri
	Least Sandpiper	Calidris minutilla
	Baird's Sandpiper	Calidris bairdii
	Pectoral Sandpiper	Calidris melanotos
	Dunlin	Calidris alpina
	Long-billed Dowitcher	Limnodromus griseus
	Common Snipe	Gallinago gallinago
	Wilson's Phalarope	Phalaropus tricolor
	Red-necked Phalarope	Phalaropus fulicarius
Laridae		
	Franklin's Gull	Larus pipixcan
	Bonaparte's Gull	Larus philidelphia
	Ring-billed Gull	Larus delawarensis
	California Gull	Larus californicus
	Herring Gull	Larus argentatus
	Glaucous-winged Gull	Larus glaucescens
	Sabine's Gull	Xema sabini
	Caspian Tern	Sterna caspia
	Common Tern	Sterna hirundo
	Forster's Tern	Sterna forsteri
	Black Tern	Childonias niger
Columbidae		
	Rock Dove	Columba livia
	Mourning Dove	Zenaida macroura

ROZA IRRIGATION DISTRICT

SOCIOECONOMIC IMPACT STUDY

November 25, 1992

Prepared By

ECONOMIC AND ENGINEERING SERVICES, INC.
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Olympia, WA 98507

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(206) 352-5090 • FAX (206) 357-6573

November 30, 1992

File #43010

Mr. Ron Van Gundy
Manager
Roza Irrigation District
PO Box 810
Sunnyside, WA 98944

Subject: Socioeconomic Study Related to Comprehensive Water Conversation Plan

Dear Ron:

We are please to submit our final report on the socioeconomic impact analysis related to your Comprehensive Water Conservation Plan. Based upon my recent discussion with Rhoda Benson, we are enclosing one bound copy and one loose-leaf as a "master" copy.

The assistance provided by Rhoda in conducting this study and preparing the analysis has been welcomed and appreciated. I hope the report will complement your other work on the Plan and be of assistance to the District.

We have enjoyed working with you and your staff on this project. Please call if you have any further questions about the enclosed analysis or if we can be of assistance to you on other studies.

Sincerely,

Glen Fiedler

Glen Fiedler, P.E.
Associate

GHF:llr:w:vangundy

cc: Boris Prokop, with enclosures

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ROZA IRRIGATION DISTRICT

SOCIOECONOMIC IMPACT STUDY

1. INTRODUCTION

The objectives of this Socioeconomic Impact Study are to discuss and quantify the economic and employment impacts that would occur from implementing the improvements contained in the Comprehensive Water Conservation Plan (Plan) for the Roza Irrigation District (RID). This study will entail two elements: 1) an economic analysis and 2) an employment impact study. The economic analysis will be presented from two perspectives: an irrigator perspective and a societal perspective. This analysis will compare the cost of the system improvements to the cost of water to society. Benefits to irrigators will be quantified where possible. The employment impact study will predict the income and employment effects of the Plan in the study area. These two study elements respond to the requirements of Chapter III-F of the Department of Ecology Supplemental Guidelines to Chapter 173-170 WAC.

2. CURRENT WATER ENTITLEMENT

This study has been conducted in the context of RID's current water entitlement under the 1945 Consent Decree. The RID has trouble in water-short years when the entitlement is prorated. When prorated, the entitlement is reduced from the storage control date onwards. RID is allowed to move some of its water in later months to the present operating month. This water is "moved" to an earlier month to aid the farmer through to the harvest stage of crop. The amount that is moved, however, is normally small for concern that a harsher proration will be necessary in later months and RID will have already over used its prorated amount for that month. The end result in years of heavy proration is that RID water is cut off early. In years of lighter proration, water is not moved forward and the irrigation season will last until mid October.

For the historical period of full operation (1950-present), RID has experienced four years of harsh proration (1973, 1977, 1979, 1987) and four additional years of moderate proration (1981, 1985, 1986, 1988). RID received 66%, 74%, and 78% of entitlement in 1977, 1979, and 1987, respectively. Early predictions for water supply in 1977 and 1988 were in the range of 6% and 50%, respectively. Above average water supply in the spring and early summer improved water supply in 1977 and 1988.

The average total yield of the Yakima Basin is in the range of 3.5 million acre-feet. The average total irrigation requirement is approximately 2.1 million acre-feet. Total storage in the Basin is about 1 million acre-feet. Because of the complex relationship between snow pack, snow melt, precipitation and storage, it is difficult to predict total available water supply.

From the above discussion, the following generalizations may be made:

(1) Within the next fifteen years, there is a high probability that RID will receive 70%, or less, of entitlement in at least one year.

(2) Within the next fifteen years, there is a moderate probability that RID could receive less than 50% of entitlement in a single year.

(3) If snowpack is moderate, or runoff is early, there is insufficient Basin storage to meet irrigation demands.

(4) With the increased demand for instream flows since 1981 to provide fish habitat, these shortages will be even more frequent and greater in magnitude.

Therefore, it follows, additional storage and improved system efficiency are required to assure adequate supplies in all years. The Comprehensive Water Conservation Plan that RID is presently carrying out is designed to reduce the water requirements throughout the entire irrigation season. This will reduce the impact of water short years which will enhance supplies for both irrigators and instream flows. During years where proration exists, the severity of the proration will be mitigated by the Plan. During average years, the Plan will enhance water available for instream flows.

3. ECONOMIC ANALYSIS OVERVIEW

The economic analysis consists of three elements:

(1) the cost of the Plan;

(2) the value of the Plan to society; and,

(3) the value of the Plan to irrigators.

The cost of the Plan is developed so it can be compared to the value of the Plan to society. The value of the Plan to the irrigators will be quantified where possible.

The cost of these elements will be examined in three ways: 1) a nominal and real dollar cost per acre-foot (AF) per year of operation for capital and operating costs; 2) a net present value of capital and operating costs; and, 3) a levelized cost of the Plan.

To determine nominal dollar costs for the Plan, projected nominal capital and operation and maintenance costs are utilized to determine annual total costs for the life of the Plan. Nominal costs or nominal dollars represent the dollar value in that year including inflation. Inflation is the price escalation in the economy. If a particular component costs $100 in 1992 and inflation is expected to be 4% for the study period, then the nominal cost in 1993 is $104. In 1994, the nominal cost would be $108.16.

Real dollars reflect no inflation and are stated in a base year. The cost in 1992 real dollars of the component in the above example is $100 across 1993 and 1994 because the cost increased at the same level of inflation. Nominal dollars are utilized to plan for project cash flow. Real dollars are utilized to compare different resources across different years. In this study real dollars will be stated in a base 1992 year.

It is important to recognize both fixed and variable costs in an economic analysis. To capture the length of time capital assets last and the differences in variable cost over time, an analysis which recognizes the time value of money is required. A discount rate which reflects the time value of money is employed in a present value analysis and a levelized cost analysis.

A present value analysis computes the value of the stream of nominal or real costs of a project given the time value of money. Usually the time value of money for public agencies such as the RID represents their borrowing cost. For public agencies, tax-exempt borrowing is presently on the order of 7.5% per year. While RID will not borrow for this Plan, the 7.5% annual *nominal* discount rate represents the time value of money. In the above example, the real present value of a nominal $104 spent in 1993 is $104 divided by 1.075 or $96.75 in present value real 1992 dollars.

A distinction is made between real and nominal discount rates. A nominal discount rate is utilized with nominal dollars or where inflated dollars occur. A real discount rate is meant to be utilized with real dollars. The 7.5% nominal discount rate can be separated into an inflation component and a real discount component. Inflation is assumed to be approximately 4%. The real discount rate is therefore assumed to be about 3.5%. The nominal discount rate is the sum of the two.

The present value analysis discounts the stream of nominal or real costs (total and nominal dollars per acre) utilizing an appropriate interest rate and sums the discounted costs. This sum of the discounted cost represents the total value of the resources expended for the Plan, discounted for the time value of money. The present value of a project is useful when comparing different scenarios or valuations of the same project. The present value of the cost of the Plan compared to the present value of the benefit of a project is termed a cost benefit analysis.

It is advantageous to have a convenient shorthand method of comparing different projects in a manner that recognizes different project useful lives, different cost streams, and different capacities. Levelized cost is a convenient method which represents a project's stream of costs over time as a single cost per acre-foot. The levelized cost for a project is calculated as follows. The present value sum of the nominal cost stream per acre-foot is computed. The present value sum is then amortized over the life of the project at the real discount rate. The levelized cost provides a convenient single figure, by project, to compare various projects and alternatives. Intuitively, it represents an average cost per acre-foot recognizing the time value of money.

This study will compute the nominal and real annual cost stream for the Plan on a dollar per acre-foot basis for the life of the Plan. Real dollars will be stated in 1992 dollars. A real present value and real levelized cost will be computed for the Plan.

An alternative value for the water will be analyzed from society's perspective. Recent proposed project's in the Yakima basin will be examined as to their societal value. These projects represent alternative costs for developing water resources. Real levelized costs for these societal surrogate projects will be calculated and compared to the Plan's levelized cost. If the Plan has a lower levelized cost than the cost of projects representing society's cost, than the Plan is beneficial to society. If the Plan's cost of water is higher on a levelized cost basis than society's value, the Plan is not beneficial.

In addition, where possible, an analysis of irrigator benefits will be performed. However, while there is benefit to the irrigator, the quantification of this benefit is difficult and problematic. Therefore, no full comparison of cost and benefits is possible from the irrigator perspective.

4. PLAN COST ANALYSIS

Two components of Plan costs were collected: capital and operation and maintenance costs. Capital costs are those for physical facilities that have a useful life greater than one year, such as reservoirs, conduit system, etc. Operation and maintenance (O&M) costs are for maintaining the Plan, such as power costs, labor costs to repair and maintain facilities etc. (O&M represent variable costs the Plan incurs). A present value and levelized cost analysis will be prepared in this section based on the project costs provided by RID.

The total project capital cost is $62,538,000 in 1992 dollars. The schedule for construction of capital items appears in page 1 of Table 1. This schedule is in 1992 dollars. The schedule was obtained from RID and is more current than the study titled "Comprehensive Water Conservation Plan Revision Draft of Phase Two" January 1992. However, the January 1992 document can be utilized for general reference for the project. The schedule was provided in 1992 dollars to EES. The capital costs in 1992 dollars is summarized as follows:

Enclosed Conduit System Gravity	$15,868,000
Enclosed Conduit System Pump	25,320,000
Main Canal Automation	4,800,000
Lining	3,150,000
Reregulation Reservoirs	13,400,000
Total	$62,538,000

It is assumed that the useful life of the facilities is approximately fifty years. The project starts in 1992 and different components are completed through 2027. A simplifying assumption, which was used, is to assume that the useful life of the project starts in 1992 and ends in 2041 as opposed to staggered component life. No bonding for costs would occur for the project.

The project's operation and maintenance costs are summarized in page 2 of Table 1. Again, the costs were provided and are presented in 1992 dollars. Costs are separated between power costs and regular operation and maintenance costs. The Plan will have a net increase in electrical power requirements for canal automation and reregulation reservoirs. Overall operation and maintenance costs are assumed to be approximately the same, with savings from reduced employee numbers being offset by higher costs for retraining or hiring skilled employees capable of managing the more sophisticated aspects of the project.

Conduit maintenance costs make up the majority of these variable costs. Conduit maintenance and operation costs are assumed to decline through time, based on RID studies, at about 2% per year in real terms. Other costs ramp up to a maximum level, and maintain that level for the useful life of the project. Annual variable costs in 1992 dollars range from about $370,000 to $580,000. Total variable cost over the fifty years of project life totaled $17,708,054 in 1992 dollars.

The current schedule for water savings of the project was provided to EES and supersede the January 1992 report. Cumulative water savings for the project are assumed to be just over 60,688 acre-feet. The schedule for these savings appears in page 3 of Table 1, and follows the construction schedule.

5. PLAN ECONOMIC ANALYSIS

This section will present the results of the economic analysis for the RID Plan. Annual total costs, real, and nominal cost per acre-foot were calculated. A present value and levelized costs analysis was then performed. Page 3 of Table 1 presents this analysis.

In 1992, total annual costs for capital and variable expenditures were projected to be $1,796,290 in 1992 dollars. Over the fifty year study period, the sum of the annual costs was projected to be slightly over $80,000,000 in 1992 dollars. The present value of the Plan's cost is $53,388,509 in 1992 dollars.

Annual costs per acre-feet were calculated in both nominal and real 1992 dollars. Since the analysis started with real dollars, the real cost per acre-foot was calculated first. The nominal cost per acre-foot was calculated utilizing an assumed inflation rate of 4%. Below is a brief summary at ten-year increments

	Nominal Cost Per A.F.	Real Cost Per A.F.
1992	$1,470	$1,470
2002	180	266
2012	57	131
2022	34	112
2032	7	33

As demonstrated by the summary and Table 1, the cost per acre-foot changes substantially through time. To summarize the information, given the time value of money, the real levelized cost per acre-foot was calculated. The levelized cost was calculated to be $182 per acre-foot in 1992 dollars. On a per hundred cubic-foot basis, ccf, the cost is 42 cents. This cost level of the Plan is reasonable given other conservation and supply costs. A more stringent comparison will be made later in the societal cost arena.

6. SOCIETY PERSPECTIVE PLAN VALUE

As discussed above, water proration occurs in drought years. Additional flows produced by the Plan will be used to mitigate proration. However, additional flows will be available only in average and above average years for instream flows. There is a benefit to society of these additional instream flows. How should this water be valued?. The approach in this study is to examine the avoided cost of alternative water supply as society's value for the water.

There are a variety of alternative water supply options in the Yakima Basin. The January 1986 report titled "Plan Formulation Summary: A Report to the Regional Director of the Bureau of Reclamation Pacific, Northwest Region and Director State of Washington, Department of Ecology" proposes a number of water supply projects. Three of these projects were considered for comparison: Cle Elum Lake Raise, Bumping Lake Enlargement and Wymer Dam and Reservoir. Of the three proposed projects, only Wymer Dam and Reservoir is considered a reasonable comparison to the Plan by size and reliability. The Cle Elum Raise involves enlarging an existing reservoir (storage capacity of 436,900 acre-feet) by structural modification of the spillway gates. An additional 14,600 acre-feet would be provided. The Bumping Lake Enlargement is a proposed replacement of a smaller, existing dam. Total storage capacity would be 458,000 acre-feet, which exceeds the annual average yield of the tributary watershed. Storage and use would be on a "cyclic" basis.

Wymer Dam is a proposed off-stream storage project. The reservoir would be filled by pumping surplus flows from the Yakima River. The annual volume of water pumped would range from 24,500 to 133,000 acre-feet, with an average of 58,000 acre-feet. This size compares more favorably to the RID Plan annual water yield of 60,000 acre-feet. Table 2 summarizes capital and operating costs escalated to 1992 dollars from the 1986 report. Power costs are assumed to be at an unsubsidized rate. A levelized cost of $216 per acre-foot and a present value of $294,660,000 in 1992 dollars is projected based on average conditions. This compares to the RID Plan of $182 per acre-foot and $53,000,000 in levelized cost and present value. A levelized cost based on firm capacity for Wymer dam was also calculated. The result was $512 per acre-foot in 1992 dollars. Given the Wymer figures, the RID Plan is beneficial from a society perspective.

In the interest of looking more broadly at the cost of new water supply, a review was made of the recently issued (August 1992) Seattle Water Department (SWD) Draft Comprehensive Regional Water Supply Plan. The plan represents an extensive and thorough effort by the SWD to analyze and compare supply alternatives available to meet future public water supply requirements. Three projects for which levelized cost information was developed are as follows:

Project	Yield in Average Day MGD	Levelized Cost per Acre-foot
1. Cedar High Dam - Replace existing control structure at the outlet of Chester Morse Lake with an earth dam approximately 58 feet high storing 109,000 acre-feet.	65	$365
2. Morse Lake Permanent Pumping - Install pumping facilities to access water stored below the natural outlet.	44	$374

3. North Fork Tolt River Diversion - Construct diversion intake on the North Fork Tolt River and a transmission pipeline to the Tolt Regulating Basin.	52	$287

Again, in comparing the RID Plan levelized cost of $182 per acre-foot to the SWD project costs, the RID Plan is considered to be beneficial from a societal perspective.

7. IRRIGATOR PERSPECTIVE PLAN VALUE

The irrigator's perspective is how the improvements in the system will affect the operation of his farm, the operating cost, and the water supply available. Three benefits are possible: 1) additional water may be available for a different crop mix, 2) improved quality of water service may reduce operating costs, and 3) a larger water supply may be available in years when use of water is prorated. Because of the nature of current allocation of water within the District and the present farm economics, no change in crop mix is anticipated. However, there are benefits associated with the level of service and available supply.

Under the proposed conservation plan, water will be delivered at a higher pressure to farms than before. Approximately one-third of currently supplied acreage will no longer require pumping from laterals to be served. Pumping costs for one-third of the land will be cut in half. The remaining one-third will have no benefit. Based on the data contained in Table 3, annual savings to the irrigators will amount to $444,000 annually in levelized 1992 dollars.

As described above, the RID and its water users are adversely impacted in water short years when the entitlement is prorated. Severe to moderate reductions have taken place in nine years since the District has been in operation (1950 to present). The most severe condition was experienced in 1992 when only 58% of the entitlement was received. Through implementation of the water conservation measures, there will be a reduced demand under a constant entitlement and a longer irrigation session will be available.

Other possible quality of water benefits are not quantifiable. For example, additional frost protection might be possible under the improved system. However, no reasonable estimate was possible of the value of crops saved by this protection.

8. EMPLOYMENT IMPACT ANALYSIS

The construction of the project will have employment impacts in Yakima County. Construction jobs will be directly generated by the project. Also, some materials for construction will be directly purchased in the region. Additional income and jobs will be generated by the "multiplier" effect of construction workers spending their salary on services and goods in the Region.

Yakima County is defined as the region of interest in the study. Table 4 contains employment by industry for Yakima County as reference. An input/output model for the State of Washington developed by the University of Washington is the basis for the analysis. A total of 1,784 man-years of labor will be generated by the project over its thirty-five-year construction period. Annual employment numbers are shown in Table 5 and summarized below.

Year	#/Jobs
1995	12
2000	46
2010	52
2020	61

Average additional income generated by the project will be $3.8 million dollars annually in 1992 dollars.

Roza Irrigation District Modernization Project

Water System Capital Costs (1992 Dollars)

Year	Enclosed Conduit System Gravity (1992 Dollars)	Enclosed Conduit System Pump (1992 Dollars)	Main Canal Automation (1992 Dollars)	Lining (1992 Dollars)	Reregulation Reservoirs (1992 Dollars)	Total Capital Costs (1992 Dollars)
1992	$888,000	$0	$240,000	$90,000	$0	$1,218,000
1993	$1,070,000	$0	$240,000	$90,000	$300,000	$1,700,000
1994	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
1995	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
1996	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
1997	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
1998	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
1999	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2000	$1,070,000	$0	$240,000	$90,000	$13,100,000	$14,500,000
2001	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2002	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2003	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2004	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2005	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2006	$1,070,000	$0	$240,000	$90,000	$0	$1,400,000
2007		$1,070,000	$240,000	$90,000	$0	$1,400,000
2008		$1,070,000	$240,000	$90,000	$0	$1,400,000
2009		$1,070,000	$240,000	$90,000	$0	$1,400,000
2010		$1,070,000	$240,000	$90,000	$0	$1,400,000
2011		$1,070,000	$240,000	$90,000	$0	$1,400,000
2012		$1,070,000		$90,000	$0	$1,160,000
2013		$1,350,000		$90,000	$0	$1,440,000
2014		$1,350,000		$90,000	$0	$1,440,000
2015		$1,350,000		$90,000	$0	$1,440,000
2016		$1,350,000		$90,000	$0	$1,440,000
2017		$1,350,000		$90,000	$0	$1,440,000
2018		$1,350,000		$90,000	$0	$1,440,000
2019		$1,350,000		$90,000	$0	$1,440,000
2020		$1,350,000		$90,000	$0	$1,440,000
2021		$1,350,000		$90,000	$0	$1,440,000
2022		$1,350,000		$90,000	$0	$1,440,000
2023		$1,350,000		$90,000	$0	$1,440,000
2024		$1,350,000		$90,000	$0	$1,440,000
2025		$1,350,000		$90,000	$0	$1,440,000
2026		$1,350,000		$90,000	$0	$1,440,000
2027	0	0		0	$0	0
2028	0	0		0	$0	0
2029	0	0		0	$0	0
2030	0	0		0	$0	0
2031	0	0		0	$0	0
2032	0	0		0	$0	0
2033	0	0		0	$0	0
2034	0	0		0	$0	0
2035	0	0		0	$0	0
2036	0	0		0	$0	0
2037	0	0		0	$0	0
2038	0	0		0	$0	0
2039	0	0		0	$0	0
2040	0	0		0	$0	0
2041	0	0		0	$0	0
Sum	$15,868,000	$25,320,000	$4,800,000	$3,150,000	$13,400,000	$62,538,000
NPV	$12,596,892	$11,917,950	$3,570,594	$1,933,850	$10,322,838	$40,342,123
Levelized Cost (1992 $)						

Table 1, Continued

Roza Irrigation District Modernization Project

Operation and Maintenance Costs

Year	Conduit System (1992 Dollars)	Reregulation Reservoirs WW5 (1992 Dollars)	Reregulation Reservoirs WW6 (1992 Dollars)	Reregulation Reservoirs WW7 (1992 Dollars)	Main Canal Automation (1992 Dollars)	Power Costs WW5 (1992 Dollars)	Power Costs WW6 (1992 Dollars)	Power Costs WW7 (1992 Dollars)	Telemetry (1992 Dollars)	Total O&M Annual Costs (1992 Dollars)
1992	$554,540		$7,500	$750	$10,000		$3,500	$2,000		$578,290
1993	$544,300		$7,500	$750	$10,646		$3,500	$2,000		$568,696
1994	$534,060		$7,500	$750	$11,333		$3,500	$2,000	$200	$559,343
1995	$523,820		$7,500	$750	$12,065		$3,500	$2,000	$200	$549,835
1996	$513,580		$7,500	$750	$12,845		$3,500	$2,000	$400	$540,575
1997	$503,340		$7,500	$750	$13,674		$3,500	$1,750	$400	$530,914
1998	$493,100		$7,500	$750	$14,558		$3,500	$1,750	$600	$521,758
1999	$485,420	$50,000	$7,500	$750	$15,498	$10,000	$3,500	$1,750	$600	$575,018
2000	$480,300	$50,000	$7,500	$750	$16,499	$10,000	$3,500	$1,750	$800	$571,099
2001	$475,180	$50,000	$7,500	$750	$17,564	$10,000	$3,500	$1,750	$800	$567,044
2002	$464,940	$50,000	$7,500	$750	$18,699	$10,000	$3,500	$1,750	$800	$557,939
2003	$454,700	$50,000	$7,500	$750	$19,907	$10,000	$3,500	$1,750	$800	$548,907
2004	$444,460	$50,000	$7,500	$750	$21,192	$10,000	$3,500	$1,750	$1,000	$540,152
2005	$435,571	$50,000	$7,500	$750	$22,561	$10,000	$3,500	$1,750	$1,000	$532,632
2006	$426,859	$50,000	$7,500	$750	$24,018	$10,000	$3,500	$1,750	$1,000	$525,378
2007	$418,322	$50,000	$7,500	$750	$25,570	$10,000	$3,500	$1,750	$1,000	$518,392
2008	$409,956	$50,000	$7,500	$750	$27,221	$10,000	$3,500	$1,750	$1,200	$511,877
2009	$401,757	$50,000	$7,500	$750	$28,979	$10,000	$3,500	$1,750	$1,200	$505,436
2010	$393,722	$50,000	$7,500	$750	$30,851	$10,000	$3,500	$1,750	$1,400	$499,472
2011	$385,847	$50,000	$7,500	$750	$32,844	$10,000	$3,500	$1,750	$1,400	$493,591
2012	$378,130	$50,000	$7,500	$750	$34,965	$10,000	$3,500	$1,750	$1,400	$487,995
2013	$370,568	$50,000	$7,500	$750	$37,223	$10,000	$3,500	$1,750	$1,400	$482,691
2014	$363,156	$50,000	$7,500	$750	$39,627	$10,000	$3,500	$1,750	$1,600	$477,883
2015	$355,893	$50,000	$7,500	$750	$42,187	$10,000	$3,500	$1,750	$1,600	$473,180
2016	$348,775	$50,000	$7,500	$750	$44,912	$10,000	$3,500	$1,750	$1,600	$468,787
2017	$341,800	$50,000	$7,500	$750	$47,812	$10,000	$3,500	$1,750	$1,600	$464,712
2018	$334,964	$50,000	$7,500	$750	$50,900	$10,000	$3,500	$1,750	$1,600	$460,964
2019	$328,264	$50,000	$7,500	$750	$54,188	$10,000	$3,500	$1,750	$1,600	$457,552
2020	$321,699	$50,000	$7,500	$750	$57,688	$10,000	$3,500	$1,750	$1,600	$454,487
2021	$315,265	$50,000	$7,500	$750	$61,414	$10,000	$3,500	$1,750	$1,600	$451,779
2022	$308,960	$50,000	$7,500	$750	$65,380	$10,000	$3,500	$1,750	$1,600	$449,440
2023	$302,781	$50,000	$7,500	$750	$69,603	$10,000	$3,500	$1,750	$1,600	$447,484
2024	$296,725	$50,000	$7,500	$750	$74,099	$10,000	$3,500	$1,750	$1,600	$445,924
2025	$290,791	$50,000	$7,500	$750	$78,885	$10,000	$3,500	$1,750	$1,600	$444,775
2026	$284,975	$50,000	$7,500	$750	$83,979	$10,000	$3,500	$1,750	$1,600	$444,054
2027	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2028	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2029	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2030	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2031	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2032	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2033	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2034	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2035	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2036	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2037	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2038	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2039	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2040	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
2041	$284,975	$50,000	$7,500	$750	$90,000	$10,000	$3,500	$1,750	$1,600	$450,075
Sum	$14,286,518	$1,400,000	$262,500	$26,250	$1,229,386	$280,000	$122,500	$62,500	$38,400	$17,708,054
NPV	$10,489,496	$974,974	-$192,973	$19,297	$1,011,311	$194,995	$90,054	$46,172	$27,113	$13,046,386
Levelizec										

Table 1, Continued

Roza Irrigation District Modernization Project

Water Saved and Cost of Water Conserved

Year	Total O&M & Capital Costs (1992 Dollars)	ECS (Acre Feet)	Canal Automation (Acre Feet)	WW5 (Acre Feet)	WW6 (Acre Feet)	WW7 (Acre Feet)	Net Water Savings (Acre Feet)	Cumulative Net Water Savings (Acre Feet)	Percent Acreage Covered	Real Cost Per Acre Foot (1992 $s)	Real Cost Per CCF (1992 $s)	Nominal Cost Per Acre Foot (Nominal $s)
1992	$1,796,290	664	0	0	558		1,222	1,222	2.01%	$1,470	$3.375	$1,470
1993	$2,268,696	664	0	0	558	255	1,477	2,699	4.45%	$841	$1.930	$874
1994	$1,959,343	664	0	0	558	255	1,477	4,176	6.88%	$469	$1.077	$507
1995	$1,949,835	664	0	0	558	255	1,477	5,653	9.31%	$345	$0.792	$388
1996	$1,940,575	664	0	0	558	255	1,477	7,130	11.75%	$272	$0.625	$318
1997	$1,930,914	664	0	0	47	255	966	8,096	13.34%	$239	$0.548	$290
1998	$1,921,758	664	0	0	47	12	723	8,819	14.53%	$218	$0.500	$276
1999	$1,975,018	498	0	0	47	12	557	9,376	15.45%	$211	$0.484	$277
2000	$15,071,099	332	0	0	47	12	391	9,767	16.09%	$1,543	$3.542	$2,112
2001	$1,967,044	332	0	0	47	12	391	10,158	16.74%	$194	$0.445	$276
2002	$1,957,939	664	0	0	47	12	723	10,881	17.93%	$180	$0.413	$266
2003	$1,948,907	664	25	1,964	47	12	2,712	13,593	22.40%	$143	$0.329	$221
2004	$1,940,152	664	51	1,964	47	12	2,738	16,331	26.91%	$119	$0.273	$190
2005	$1,932,632	664	78	1,964	47	12	2,765	19,096	31.47%	$101	$0.232	$169
2006	$1,925,378	664	108	1,964	47	12	2,795	21,891	36.07%	$88	$0.202	$152
2007	$1,918,392	762	138	1,964	47	12	2,923	24,814	40.89%	$77	$0.177	$139
2008	$1,911,877	762	171	286	47	12	1,278	26,092	42.99%	$73	$0.168	$137
2009	$1,905,436	762	207	286	47	12	1,314	27,406	45.16%	$70	$0.160	$135
2010	$1,899,472	762	245	286	47	12	1,352	28,758	47.39%	$66	$0.152	$134
2011	$1,893,591	762	286	286	47	12	1,393	30,151	49.68%	$63	$0.144	$132
2012	$1,647,995	762	331	286	47	12	1,438	31,589	52.05%	$52	$0.120	$114
2013	$1,922,691	1,143	381	286	47	12	1,869	33,458	55.13%	$57	$0.132	$131
2014	$1,917,883	1,143	436	286	47	12	1,924	35,382	58.30%	$54	$0.124	$128
2015	$1,913,180	1,143	498	286	47	12	1,986	37,368	61.57%	$51	$0.118	$126
2016	$1,908,787	1,143	569	286	47	12	2,057	39,425	64.96%	$48	$0.111	$124
2017	$1,904,712	1,143	651	286	47	12	2,139	41,564	68.49%	$46	$0.105	$122
2018	$1,900,964	1,143	750	286	47	12	2,238	43,802	72.18%	$43	$0.100	$120
2019	$1,897,552	1,143	874	286	47	12	2,362	46,164	76.07%	$41	$0.094	$119
2020	$1,894,487	1,143	1,039	286	47	12	2,527	48,691	80.23%	$39	$0.089	$117
2021	$1,891,779	1,143	1,287	286	47	12	2,775	51,466	84.80%	$37	$0.084	$115
2022	$1,889,440	1,143	1,782	286	47	12	3,270	54,736	90.19%	$35	$0.079	$112
2023	$1,887,484	1,143		286	47	12	1,488	56,224	92.64%	$34	$0.077	$113
2024	$1,885,924	1,143		286	47	12	1,488	57,712	95.10%	$33	$0.075	$115
2025	$1,884,775	1,143		286	47	12	1,488	59,200	97.55%	$32	$0.073	$116
2026	$1,884,054	1,143		286	47	12	1,488	60,688	100.00%	$31	$0.071	$118
2027	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$29
2028	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$30
2029	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$32
2030	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$33
2031	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$34
2032	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$36
2033	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$37
2034	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$39
2035	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$40
2036	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$42
2037	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$43
2038	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$45
2039	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$47
2040	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$49
2041	$450,075	0	0	0	0	0	0	60,688	100.00%	$7	$0.017	$51
Sum	$80,246,054	29,704	9,907	15,254	4,200	1,623	60,688					
NPV	$53,388,509											
Levelizec	$0											

Present Value	**$4,672**	**$11**
Levelized Cost	**182**	**$0.417**

Table 2

Roza Irrigation District, Wymer Dam & Reservoir

Assumptions

Capital Cost	$182,547,828	1992 $
Sales Tax	7.5%	
Contingency	10.0%	
Bonding Cost	3.0%	
Bonding Rate	7.5%	
Term of Bond	30	years
Average Capacity	58,000	acre feet
Firm Capacity	24,500	acre feet
Annual O & M	3,154,585	per year (1992 $)
Project Life	50	year

Table 2

Roza Irrigation District, Wymer Dam & Reservoir

Year	Capital Cost *(Dollars)*	O & M Cost *(Nominal Dollars)*	Total *(Nominal Dollars)*	Average Capacity Cost Per A.F. *(Nominal Dollars)*	Firm Capacity Cost per CCF *(Nominal Dollars)*
1992	$18,775,844	$3,154,585	$21,930,429	$378.11	$895.12
1993	$18,775,844	$3,280,769	$22,056,613	$380.29	$900.27
1994	$18,775,844	$3,411,999	$22,187,844	$382.55	$905.63
1995	$18,775,844	$3,548,479	$22,324,324	$384.90	$911.20
1996	$18,775,844	$3,690,418	$22,466,263	$387.35	$916.99
1997	$18,775,844	$3,838,035	$22,613,880	$389.89	$923.02
1998	$18,775,844	$3,991,557	$22,767,401	$392.54	$929.28
1999	$18,775,844	$4,151,219	$22,927,063	$395.29	$935.80
2000	$18,775,844	$4,317,268	$23,093,112	$398.16	$942.58
2001	$18,775,844	$4,489,958	$23,265,803	$401.13	$949.62

Table 2, Continued

Roza Irrigation District. Wymer Dam & Reservoir

Year	Capital Cost (Dollars)	O & M Cost (Nominal Dollars)	Total (Nominal Dollars)	Average Capacity Cost Per A.F. (Nominal Dollars)	Firm Capacity Cost per CCF (Nominal Dollars)
2002	$18,775,844	$4,669,557	$23,445,401	$404.23	$956.96
2003	$18,775,844	$4,856,339	$23,632,183	$407.45	$964.58
2004	$18,775,844	$5,050,592	$23,826,437	$410.80	$972.51
2005	$18,775,844	$5,252,616	$24,028,460	$414.28	$980.75
2006	$18,775,844	$5,462,721	$24,238,565	$417.91	$989.33
2007	$18,775,844	$5,681,230	$24,457,074	$421.67	$998.25
2008	$18,775,844	$5,908,479	$24,684,323	$425.59	$1,007.52
2009	$18,775,844	$6,144,818	$24,920,662	$429.67	$1,017.17
2010	$18,775,844	$6,390,611	$25,166,455	$433.90	$1,027.20
2011	$18,775,844	$6,646,235	$25,422,079	$438.31	$1,037.64
2012	$18,775,844	$6,912,085	$25,687,929	$442.90	$1,048.49
2013	$18,775,844	$7,188,568	$25,964,412	$447.66	$1,059.77
2014	$18,775,844	$7,476,111	$26,251,955	$452.62	$1,071.51
2015	$18,775,844	$7,775,155	$26,550,999	$457.78	$1,083.71
2016	$18,775,844	$8,086,161	$26,862,006	$463.14	$1,096.41
2017	$18,775,844	$8,409,608	$27,185,452	$468.71	$1,109.61
2018	$18,775,844	$8,745,992	$27,521,836	$474.51	$1,123.34
2019	$18,775,844	$9,095,832	$27,871,676	$480.55	$1,137.62
2020	$18,775,844	$9,459,665	$28,235,509	$486.82	$1,152.47
2021	$18,775,844	$9,838,052	$28,613,896	$493.34	$1,167.91
2022		$10,231,574	$10,231,574	$176.41	$417.62
2023		$10,640,837	$10,640,837	$183.46	$434.32
2024		$11,066,470	$11,066,470	$190.80	$451.69
2025		$11,509,129	$11,509,129	$198.43	$469.76
2026		$11,969,494	$11,969,494	$206.37	$488.55
2027		$12,448,274	$12,448,274	$214.63	$508.09
2028		$12,946,205	$12,946,205	$223.21	$528.42
2029		$13,464,053	$13,464,053	$232.14	$549.55
2030		$14,002,615	$14,002,615	$241.42	$571.54
2031		$14,562,720	$14,562,720	$251.08	$594.40
2032		$15,145,228	$15,145,228	$261.12	$618.17
2033		$15,751,037	$15,751,037	$271.57	$642.90
2034		$16,381,079	$16,381,079	$282.43	$668.62
2035		$17,036,322	$17,036,322	$293.73	$695.36
2036		$17,717,775	$17,717,775	$305.48	$723.17
2037		$18,426,486	$18,426,486	$317.70	$752.10
2038		$19,163,545	$19,163,545	$330.41	$782.19
2039		$19,930,087	$19,930,087	$343.62	$813.47
2040		$20,727,291	$20,727,291	$357.37	$846.01
2041		$21,556,382	$21,556,382	$371.66	$879.85
NPV (1992 $)			$294,657,615	$5,080.30	$12,026.84
Levelized Cost (1992 $)			$12,562,347	$216.59	$512.75

Table 3

Roza Irrigation District, Annual Energy Savings With Modernization

Assumptions

No Longer Using Pumps	24,000 Acres
Using 1/2 Power	24,000 Acres
Total Affected	48,000 Acres
Energy Savings Value	45 mills/kWh
Pump Energy Consumption	1,600 kWh per Acre

Year	Percent of Measures Completed	Annual kWh Savings	Annual 1992$ Savings
1992	2.01%	1,159,821	$52,192
1993	4.45%	2,561,666	115,275
1994	6.88%	3,963,512	178,358
1995	9.31%	5,365,357	241,441
1996	11.75%	6,767,203	304,524
1997	13.34%	7,684,050	345,782
1998	14.53%	8,370,261	376,662
1999	15.45%	8,898,919	400,451
2000	16.09%	9,270,024	417,151
2001	16.74%	9,641,128	433,851
2002	17.93%	10,327,340	464,730
2003	22.40%	12,901,345	580,561
2004	26.91%	15,500,026	697,501
2005	31.47%	18,124,334	815,595
2006	36.07%	20,777,116	934,970
2007	40.89%	23,551,384	1,059,812
2008	42.99%	24,764,355	1,114,396
2009	45.16%	26,011,495	1,170,517
2010	47.39%	27,294,701	1,228,262
2011	49.68%	28,616,820	1,287,757
2012	52.05%	29,981,650	1,349,174
2013	55.13%	31,755,550	1,429,000
2014	58.30%	33,581,650	1,511,174
2015	61.57%	35,466,596	1,595,997
2016	64.96%	37,418,930	1,683,852
2017	68.49%	39,449,090	1,775,209
2018	72.18%	41,573,214	1,870,795
2019	76.07%	43,815,028	1,971,676
2020	80.23%	46,213,446	2,079,605
2021	84.80%	48,847,245	2,198,126
2022	90.19%	51,950,857	2,337,789
2023	92.64%	53,363,143	2,401,341
2024	95.10%	54,775,428	2,464,894
2025	97.55%	56,187,714	2,528,447
2026	100.00%	57,600,000	2,592,000
2027	100.00%	57,600,000	2,592,000
2028	100.00%	57,600,000	2,592,000
2029	100.00%	57,600,000	2,592,000
2030	100.00%	57,600,000	2,592,000
2031	100.00%	57,600,000	2,592,000
2032	100.00%	57,600,000	2,592,000
2033	100.00%	57,600,000	2,592,000
2034	100.00%	57,600,000	2,592,000
2035	100.00%	57,600,000	2,592,000
2036	100.00%	57,600,000	2,592,000
2037	100.00%	57,600,000	2,592,000
2038	100.00%	57,600,000	2,592,000
2039	100.00%	57,600,000	2,592,000
2040	100.00%	57,600,000	2,592,000
2041	100.00%	57,600,000	2,592,000
Sum		1,797,530,398	$80,888,868
NPV		231,261,193	$10,406,754
Levelized (1992 $)			$443,679

Table 4

Covered Employment and Wages, Classified by Industry 1992

SIC Code	Industry	Wages Paid 1989*	Wages Paid 1992
	Total	**$1,141,805,322**	**1,265,939,970**
	Agriculture, Forestry, & Fishing	143,156,889	158,720,602
1	Agricultural Production - Crops	124,896,206	138,474,656
2	Agricultural Production - Livestock	6,726,306	7,457,576
7	Agricultural Services	11,363,027	12,598,391
8	Forestry	171,350	189,979
	Mining	826,589	916,454
13	Oil and Gas Extraction		
14	Nonmetallic Minerals, Except Fuels		
	Other Industries	826,589	916,454
	Construction	44,401,556	49,228,799
15	General Building Contractors	16,653,273	18,463,781
16	Heavy Construction Contractors	6,780,339	7,517,483
17	Special Trade Contractors	20,967,944	23,247,534
	Manufacturing	181,356,071	201,072,718
20	Food and Kindred Products	62,417,677	69,203,594
23	Apparel and Other Textile Products	375,283	416,083
24	Lumber and Wood Products, Exc. Furniture	31,625,590	35,063,857
25	Furniture and Fixtures	3,133,123	3,473,749
26	Paper and Allied Products	19,477,137	21,594,650
27	Printing and Publishing	7,915,912	8,776,513
28	Chemicals and Allied Products		
29	Petroleum Refining & Related Industries		
30	Rubber and Misc. Plastics Products	9,201,899	10,202,310
32	Stone, Clay, Glass, & Concrete Products	3,146,028	3,488,057
33	Primary Metal Industries		
34	Fabricated Metal Products	6,025,829	6,680,944
35	Industrial Machinery & Computer Equipment	10,263,475	11,379,298
36	Electronic Equipment, Except Computer		
37	Transportation Equipment	18,033,056	19,993,572
38	Instruments & Related Products	1,057,348	1,172,301
39	Miscellaneous Manufacturing Industries	7,576,758	8,400,487
	Other Industries	1,106,956	1,227,302
	Transportation and Public Utilities	59,469,616	65,935,026
41	Local and Interurban Passenger Transit		
42	Trucking and Warehousing	26,671,455	29,571,119
44	Water Transportation		
45	Transportation By Air	1,196,691	1,326,793
47	Transportation Services	2,528,526	2,803,422
48	Communications	17,827,199	19,765,334
49	Electric, Gas, and Sanitary Services	10,129,818	11,231,110
	Other Industries	1,115,927	1,237,248

Table 4

Covered Employment and Wages, Classified by Industry 1992

Sic Code	Industry	Wages Paid 1989*	Wages Paid 1992
	Wholesale Trade	110,553,379	122,572,507
50	Wholesale Trade - Durable Goods	24,952,160	27,664,906
51	Wholesale Trade - Nondurable Goods	85,601,219	94,907,602
	Retail Trade	133,875,849	148,430,547
52	Building Material and Garden Supplies	7,421,998	8,228,902
53	General Merchandise Stores	16,531,448	18,328,712
54	Food Stores	28,950,512	32,097,950
55	Automotive Dealers and Service Stations	29,922,498	33,175,608
56	Apparel and Accessory Stores	5,511,139	6,110,298
57	Furniture and Home Furnishings Stores	5,746,891	6,371,681
58	Eating and Drinking Places	24,611,057	27,286,719
59	Miscellaneous Retail	15,180,306	16,830,677
	Finance, Insurance, and Real Estate	36,006,942	39,921,540
60	Depository Institutions	16,619,520	18,426,359
61	Nondepository Credit Institutions	1,380,896	1,531,024
62	Security, Commidity Brokers, and Services	4,243,105	4,704,406
63	Insurance Carriers	3,803,986	4,217,547
64	Insurance Agents, Brokers, and Service	5,624,960	6,236,494
65	Real Estate	4,178,601	4,632,890
67	Holding and Other Investment Offices	155,874	172,820
	Services	196,068,013	217,384,111
70	Hotels and Other Lodging Places	6,898,893	7,648,926
72	Personal Services	6,935,372	7,689,371
73	Business Services	11,069,680	12,273,152
75	Automotive Repair, Services, and Parking	8,166,739	9,054,610
76	Miscellaneous Repair Services	3,028,889	3,358,183
78	Motion Pictures		
79	Amusement and Recreation Services	5,487,019	6,083,556
80	Health Services	95,570,082	105,960,258
81	Legal Services	6,591,906	7,308,564
82	Educational Services	6,387,685	7,082,141
83	Social Services	15,315,363	16,980,417
84	Museums, Botanical, Zoological Gardens		
86	Membership Organizations	14,698,199	16,296,156
87	Engineering, Accounting, & Management	12,633,887	14,007,416
88	Private Households	2,249,866	2,494,467
	Other Industries	1,034,433	1,146,894
	Government	236,090,418	261,757,667
	Federal Government	36,294,604	40,240,476
	State Government	47,760,686	52,953,126
	Local Government	152,035,128	168,564,064

* Source: EmpEmployment and Payrolls in Washington State by County and Industry No. 177, December 1990, Page II-77

Table 5

Employment Impact Analysis

Totals

Year	Materials	Labor	Total New Dollars (1.9)	Total Annual Jobs (2.5)
1992	$318,393	$287,175	$1,150,578	14
1993	$318,393	287,175	1,150,578	14
1994	$318,393	287,175	1,150,578	13
1995	$318,393	287,175	1,150,578	12
1996	$318,393	287,175	1,150,578	12
1997	$1,574,790	1,369,028	5,593,254	54
1998	$1,574,790	1,369,028	5,593,254	51
1999	$1,574,790	1,369,028	5,593,254	49
2000	$1,574,790	1,369,028	5,593,254	46
2001	$1,574,790	1,369,028	5,593,254	44
2002	$2,102,452	1,853,231	7,515,798	57
2003	$2,102,452	1,853,231	7,515,798	54
2004	$2,102,452	1,853,231	7,515,798	52
2005	$2,102,452	1,853,231	7,515,798	49
2006	$2,102,452	1,853,231	7,515,798	47
2007	$2,902,986	2,495,232	10,256,614	60
2008	$2,902,986	2,495,232	10,256,614	57
2009	$2,902,986	2,495,232	10,256,614	54
2010	$2,902,986	2,495,232	10,256,614	52
2011	$2,902,986	2,495,232	10,256,614	49
2012	$4,241,073	3,478,479	14,667,148	66
2013	$4,241,073	3,478,479	14,667,148	62
2014	$4,241,073	3,478,479	14,667,148	59
2015	$4,241,073	3,478,479	14,667,148	57
2016	$4,241,073	3,478,479	14,667,148	54
2017	$6,049,794	4,785,667	20,587,376	71
2018	$6,049,794	4,785,667	20,587,376	67
2019	$6,049,794	4,785,667	20,587,376	64
2020	$6,049,794	4,785,667	20,587,376	61
2021	$6,049,794	4,785,667	20,587,376	58
2022	$8,039,839	6,166,832	26,992,676	71
2023	$8,039,839	6,166,832	26,992,676	68
2024	$8,039,839	6,166,832	26,992,676	65
2025	$8,039,839	6,166,832	26,992,676	62
2026	$8,039,839	6,166,832	26,992,676	59
NPV (1992 $)	$23,442,890	$19,651,545	$81,879,425	
Lev. Cost (1992 $)	$1,091,015	$914,569	$3,810,610	

Table 5

Employment Impact Analysis

Enclosed Conduit System

Year	Total Expenditures	Materials In County	Materials Out of County	Labor
1992	$541,473	$259,907	$64,977	$216,589
1993	541,473	259,907	64,977	216,589
1994	541,473	259,907	64,977	216,589
1995	541,473	259,907	64,977	216,589
1996	541,473	259,907	64,977	216,589
1997	1,258,687	604,170	151,042	503,475
1998	1,258,687	604,170	151,042	503,475
1999	1,258,687	604,170	151,042	503,475
2000	1,258,687	604,170	151,042	503,475
2001	1,258,687	604,170	151,042	503,475
2002	2,174,053	1,043,546	260,886	869,621
2003	2,174,053	1,043,546	260,886	869,621
2004	2,174,053	1,043,546	260,886	869,621
2005	2,174,053	1,043,546	260,886	869,621
2006	2,174,053	1,043,546	260,886	869,621
2007	2,174,053	1,043,546	260,886	869,621
2008	2,174,053	1,043,546	260,886	869,621
2009	2,174,053	1,043,546	260,886	869,621
2010	2,174,053	1,043,546	260,886	869,621
2011	2,174,053	1,043,546	260,886	869,621
2012	2,174,053	1,043,546	260,886	869,621
2013	2,174,053	1,043,546	260,886	869,621
2014	2,174,053	1,043,546	260,886	869,621
2015	2,174,053	1,043,546	260,886	869,621
2016	2,174,053	1,043,546	260,886	869,621
2017	2,174,053	1,043,546	260,886	869,621
2018	2,174,053	1,043,546	260,886	869,621
2019	2,174,053	1,043,546	260,886	869,621
2020	2,174,053	1,043,546	260,886	869,621
2021	2,174,053	1,043,546	260,886	869,621
2022	1,632,580	783,638	195,910	653,032
2023	1,632,580	783,638	195,910	653,032
2024	1,632,580	783,638	195,910	653,032
2025	1,632,580	783,638	195,910	653,032
2026	1,632,580	783,638	195,910	653,032
NPV (1992 $)	$16,116,995	$7,736,157	$1,934,039	$6,446,798
Lev. Cost (1992 $)	$750,074	$360,035	$90,009	$300,029

Table 5

Employment Impact Analysis

Enclosed Conduit System Pump

Year	Total Expenditures	Materials In County	Materials Out of County	Labor
1992	$0	$0	$0	$0
1993	0	$0	$0	$0
1994	0	$0	$0	$0
1995	0	$0	$0	$0
1996	0	$0	$0	$0
1997	0	$0	$0	$0
1998	0	$0	$0	$0
1999	0	$0	$0	$0
2000	0	$0	$0	$0
2001	0	$0	$0	$0
2002	0	$0	$0	$0
2003	0	$0	$0	$0
2004	0	$0	$0	$0
2005	0	$0	$0	$0
2006	0	$0	$0	$0
2007	1,637,755	$687,857	$458,571	$491,327
2008	1,637,755	$687,857	$458,571	$491,327
2009	1,637,755	$687,857	$458,571	$491,327
2010	1,637,755	$687,857	$458,571	$491,327
2011	1,637,755	$687,857	$458,571	$491,327
2012	4,564,087	$1,916,917	$1,277,944	$1,369,226
2013	4,564,087	$1,916,917	$1,277,944	$1,369,226
2014	4,564,087	$1,916,917	$1,277,944	$1,369,226
2015	4,564,087	$1,916,917	$1,277,944	$1,369,226
2016	4,564,087	$1,916,917	$1,277,944	$1,369,226
2017	8,565,683	$3,597,587	$2,398,391	$2,569,705
2018	8,565,683	$3,597,587	$2,398,391	$2,569,705
2019	8,565,683	$3,597,587	$2,398,391	$2,569,705
2020	8,565,683	$3,597,587	$2,398,391	$2,569,705
2021	8,565,683	$3,597,587	$2,398,391	$2,569,705
2022	13,672,847	$5,742,596	$3,828,397	$4,101,854
2023	13,672,847	$5,742,596	$3,828,397	$4,101,854
2024	13,672,847	$5,742,596	$3,828,397	$4,101,854
2025	13,672,847	$5,742,596	$3,828,397	$4,101,854
2026	13,672,847	$5,742,596	$3,828,397	$4,101,854
NPV (1992 $)	$16,390,153	$6,883,864	$4,589,243	$4,917,046
Lev. Cost (1992 $)	$762,786	$320,370	$213,580	$228,836

Table 5

Employment Impact Analysis

Main Canal Automation

Year	Total Expenditures	Materials In County	Materials Out of County	Labor
1992	$163,860	$13,109	$117,979	$32,772
1993	163,860	$13,109	$117,979	$32,772
1994	163,860	$13,109	$117,979	$32,772
1995	163,860	$13,109	$117,979	$32,772
1996	163,860	$13,109	$117,979	$32,772
1997	425,274	$34,022	$306,197	$85,055
1998	425,274	$34,022	$306,197	$85,055
1999	425,274	$34,022	$306,197	$85,055
2000	425,274	$34,022	$306,197	$85,055
2001	425,274	$34,022	$306,197	$85,055
2002	758,913	$60,713	$546,417	$151,783
2003	758,913	$60,713	$546,417	$151,783
2004	758,913	$60,713	$546,417	$151,783
2005	758,913	$60,713	$546,417	$151,783
2006	758,913	$60,713	$546,417	$151,783
2007	1,184,729	$94,778	$853,005	$236,946
2008	1,184,729	$94,778	$853,005	$236,946
2009	1,184,729	$94,778	$853,005	$236,946
2010	1,184,729	$94,778	$853,005	$236,946
2011	1,184,729	$94,778	$853,005	$236,946
2012	1,293,421	$103,474	$931,263	$258,684
2013	1,293,421	$103,474	$931,263	$258,684
2014	1,293,421	$103,474	$931,263	$258,684
2015	1,293,421	$103,474	$931,263	$258,684
2016	1,293,421	$103,474	$931,263	$258,684
2017	1,293,421	$103,474	$931,263	$258,684
2018	1,293,421	$103,474	$931,263	$258,684
2019	1,293,421	$103,474	$931,263	$258,684
2020	1,293,421	$103,474	$931,263	$258,684
2021	1,293,421	$103,474	$931,263	$258,684
2022	1,129,561	$90,365	$813,284	$225,912
2023	1,129,561	$90,365	$813,284	$225,912
2024	1,129,561	$90,365	$813,284	$225,912
2025	1,129,561	$90,365	$813,284	$225,912
2026	1,129,561	$90,365	$813,284	$225,912
NPV (1992 $)	$7,014,834	$561,187	$5,050,681	$1,402,967
Lev. Cost (1992 $)	$326,465	$26,117	$235,055	$65,293

Table 5

Employment Impact Analysis

Lining

Year	Total Expenditures	Materials In County	Materials Out of County	Labor
1992	$63,023	$30,251	$7,563	$25,209
1993	63,023	$30,251	$7,563	$25,209
1994	63,023	$30,251	$7,563	$25,209
1995	63,023	$30,251	$7,563	$25,209
1996	63,023	$30,251	$7,563	$25,209
1997	163,567	$78,512	$19,628	$65,427
1998	163,567	$78,512	$19,628	$65,427
1999	163,567	$78,512	$19,628	$65,427
2000	163,567	$78,512	$19,628	$65,427
2001	163,567	$78,512	$19,628	$65,427
2002	291,889	$140,107	$35,027	$116,756
2003	291,889	$140,107	$35,027	$116,756
2004	291,889	$140,107	$35,027	$116,756
2005	291,889	$140,107	$35,027	$116,756
2006	291,889	$140,107	$35,027	$116,756
2007	455,665	$218,719	$54,680	$182,266
2008	455,665	$218,719	$54,680	$182,266
2009	455,665	$218,719	$54,680	$182,266
2010	455,665	$218,719	$54,680	$182,266
2011	455,665	$218,719	$54,680	$182,266
2012	664,689	$319,051	$79,763	$265,875
2013	664,689	$319,051	$79,763	$265,875
2014	664,689	$319,051	$79,763	$265,875
2015	664,689	$319,051	$79,763	$265,875
2016	664,689	$319,051	$79,763	$265,875
2017	931,462	$447,102	$111,775	$372,585
2018	931,462	$447,102	$111,775	$372,585
2019	931,462	$447,102	$111,775	$372,585
2020	931,462	$447,102	$111,775	$372,585
2021	931,462	$447,102	$111,775	$372,585
2022	1,208,916	$580,280	$145,070	$483,566
2023	1,208,916	$580,280	$145,070	$483,566
2024	1,208,916	$580,280	$145,070	$483,566
2025	1,208,916	$580,280	$145,070	$483,566
2026	1,208,916	$580,280	$145,070	$483,566
NPV (1992 $)	$3,401,576	$1,632,756	$408,189	$1,360,630
Lev. Cost (1992 $)	$158,307	$75,987	$18,997	$63,323

Table 5

Employment Impact Analysis

Reregulation Reservoirs

Year	Total Expenditures	Materials In County	Materials Out of County	Labor
1992	$31,512	$15,126	$3,781	$12,605
1993	31,512	$15,126	$3,781	$12,605
1994	31,512	$15,126	$3,781	$12,605
1995	31,512	$15,126	$3,781	$12,605
1996	31,512	$15,126	$3,781	$12,605
1997	1,787,680	$858,086	$214,522	$715,072
1998	1,787,680	$858,086	$214,522	$715,072
1999	1,787,680	$858,086	$214,522	$715,072
2000	1,787,680	$858,086	$214,522	$715,072
2001	1,787,680	$858,086	$214,522	$715,072
2002	1,787,680	$858,086	$214,522	$715,072
2003	1,787,680	$858,086	$214,522	$715,072
2004	1,787,680	$858,086	$214,522	$715,072
2005	1,787,680	$858,086	$214,522	$715,072
2006	1,787,680	$858,086	$214,522	$715,072
2007	1,787,680	$858,086	$214,522	$715,072
2008	1,787,680	$858,086	$214,522	$715,072
2009	1,787,680	$858,086	$214,522	$715,072
2010	1,787,680	$858,086	$214,522	$715,072
2011	1,787,680	$858,086	$214,522	$715,072
2012	1,787,680	$858,086	$214,522	$715,072
2013	1,787,680	$858,086	$214,522	$715,072
2014	1,787,680	$858,086	$214,522	$715,072
2015	1,787,680	$858,086	$214,522	$715,072
2016	1,787,680	$858,086	$214,522	$715,072
2017	1,787,680	$858,086	$214,522	$715,072
2018	1,787,680	$858,086	$214,522	$715,072
2019	1,787,680	$858,086	$214,522	$715,072
2020	1,787,680	$858,086	$214,522	$715,072
2021	1,787,680	$858,086	$214,522	$715,072
2022	1,756,168	$842,961	$210,740	$702,467
2023	1,756,168	$842,961	$210,740	$702,467
2024	1,756,168	$842,961	$210,740	$702,467
2025	1,756,168	$842,961	$210,740	$702,467
2026	1,756,168	$842,961	$210,740	$702,467
NPV (1992 $)	$13,810,260	$6,628,925	$1,657,231	$5,524,104
Lev. Cost (1992 $)	$642,720	$308,505	$77,126	$257,088