

Flathead Indian Reservation Water Rights Negotiations



JULY 30, 2007

TRIBAL/FEDERAL/STATE
LEGAL/TECHNICAL WORK SESSION

CONFIDENTIAL

Technical Elements of Settlement Proposal



- Surface Water Hydrology
- Land Ownership
- Historically Irrigated Lands
- Crop Water Requirements
- Instream Flow Requirements
- Wetland/Riparian Requirements
- Water Availability Modeling
- Water Allocation Scenarios

Surface Water Hydrology



- Complete Reservation-wide for updated (1983-2002) study period
- Utilized available gage record for USGS and CS&KT natural or naturalized streamflow stations
 - ✦ 15 USGS stations
 - ✦ 31 CS&KT stations
- Selected 1983 - 2002 Study Period
 - ✦ 20-year period including a variety of wet, dry, and average years
- Filled-in missing data in gage records through regression with other streamflow gages (MOVE.1 methodology)

Surface Water Hydrology



- Determined natural flow at ungaged model nodes
 - ✦ Utilized regression equations relating natural flow to various basin characteristics
 - ✦ Determined month-by-month, year-by-year natural flow during the 1983 - 2002 study period for each of 100+ model nodes and fishery sites



Settlement Work

Surface Water
Hydrology

Jocko Model Natural
Flow

Model Nodes	Avg. Flow (AF/yr)
510000, Middle Fork Jocko below Tabor Feeder Canal	18,704
510200, Middle Fork Jocko at Black Lake	9,160
510300, Middle Fork Jocko at Lower Jocko Lake	12,355
513000, North Fork Jocko below Tabor Feeder Canal	37,389
514300, Big Knife Creek at Jocko S Canal	7,463
516100, East Fork Finley above Jocko N Canal	7,638
516700, Agency Creek at Jocko S Canal	8,416
516800, McClure Creek at Jocko S Canal	352
517100, Finley Creek at East Finley Creek	15,829
517500, Finley Creek at Jocko E Canal	17,069
517800, Finley Creek at Mouth	19,102
517900, Jocko River below Finley Creek	163,343
518700, Jocko Spring Creek	11,593
519120, Valley Creek below Hewolf Creek	13,127
519200, Valley Creek at Mouth	18,235
519500, Jocko River at Mouth	210,739
587450, Valley Creek near Arlee	9,025
588400, Revais Creek below West Fork Revais Creek	13,114
999501, Falls Creek at Tabor Feeder Canal	4,437
999502, S-14 Creek at Tabor Feeder Canal	719



Settlement Work

Surface Water
Hydrology

Jocko Model Natural
Flow - *cont.*

Model Nodes	Avg. Flow (AF/yr)
999503, Grizzley Creek at Tabor Feeder Canal	1,030
999504, Jocko River above North Fork Jocko at Jocko S Canal	64,164
999505, Cold Creek at Jocko S Canal	1,969
999506, Gold Creek at Jocko S Canal	2,395
999507, Jocko River at Jocko K Canal	131,437
999508, Agency Creek at Jocko E Canal	8,416
999509, Valley Creek below North Valley Creek	18,235
999510, Jocko River at Lower J Canal	217,101
999511, Revais Creek at Revais R Canal	14,197
999514, Jocko R at Confluence with North Fork Jocko River	114,887
999515, Jocko River at Confluence with Valley Creek	217,101
999516, East Fork Finley Creek below Finley Lakes	1,047
999518, North Fork Valley Creek	5,108
999521, Finley Creek below Frog Creek	1,400
999522, Antoine Creek	1,486
999523, Gunderson Creek	451
999529, Hewolf Creek	3,412
999530, Schley Creek at Jocko N Canal	1,006
999531, Unnamed intermittent creek below Jocko E Canal	396

Land Ownership



- Current Ownership by Category
 - ✦ March 2007 Tribal land ownership GIS coverage
- Indian Tracts (Tribal Trust, Tribal Fee, Individual Trust)
 - ✦ Trust Status
 - ✦ Formerly Allotted
 - ✦ Not on Former Allotment
- Non-Indian Tracts (Fee, State, Federal)
 - ✦ Formerly Allotted
 - ✦ Not on Former Allotment
 - ✦ Currently Includes Individual Indian Fee Tracts

Historically Irrigated Lands



- Mapped all Irrigated Lands (both Indian and Non-Indian)
- Complete Reservation-wide for 1990's time period
 - ✦ 1990 stereo aerial photography supplemented by 1977 and 1979 mono photography and 1960s State Water Resources Surveys
 - ✦ Selective field verification checks in late 1990s
 - ✦ Subsequent Spot checks using 1998 stereo aerial photography
- GIS coverage complete for all historically irrigated lands

Historically Irrigated Lands



- Mapped lands according to Irrigation classification
 - ✦ A - Full Service
 - ✦ B - Partial Service
 - ✦ C - Man-induced Incidental Sub-irrigation
 - ✦ E - Recently Idle (systems can be rehabilitated)
 - ✦ F - Discontinued (no functional irrigation system)
- Mapped Irrigation Service Areas
 - ✦ Source of supply for irrigation
 - Ditch Name
 - Project or Private
 - Model Node
 - ✦ Return flow destinations
 - Model Node

Settlement Work

Historically Irrigated Acreage (HIA)

Indian-owned (30,585 acres)

Region	Irrigation Status	Surface Water		Ground Water		Total
		Trust / Former Allotment	Non-Former Allotment	Trust / Former Allotment	Non-Former Allotment	
Camas / Little Bitterroot	Active	1,924	2,239	129	639	4,931
	Idle	664	224	0	186	1,075
	Total	2,589	2,463	129	825	6,006
Jocko	Active	4,150	437	4	0	4,591
	Idle	1,698	88	12	0	1,797
	Total	5,848	525	15	0	6,388
Mission Valley	Active	12,608	829	125	0	13,562
	Idle	3,103	205	9	0	3,317
	Total	15,711	1,034	133	0	16,879
Flathead Lake	Active	185	0	42	0	226
	Idle	2	0	0	0	2
	Total	186	0	42	0	228
Flathead River	Active	568	102	62	0	732
	Idle	99	7	232	15	352
	Total	667	109	294	15	1,084
Grand Total	Active	19,435	3,607	361	639	24,042
	Idle	5,566	524	252	201	6,543
	Total	25,001	4,131	613	840	30,585

Settlement Work

Historically Irrigated Acreage (HIA)

Non-Indian-owned (138,063 acres)

Region	Irrigation Status	Surface Water			Ground Water			Total
		Trust / Former Allotment	Home-stead	Other	Trust / Former Allotment	Home-stead	Other	
Camas / Little Bitterroot	Active	1,420	14,786	165	36	1,849	0	18,256
	Idle	147	1,377	19	0	0	0	1,543
	Total	1,567	16,162	184	36	1,849	0	19,799
Jocko	Active	8,428	1,384	71	0	0	0	9,883
	Idle	545	201	14	0	0	0	760
	Total	8,974	1,585	85	0	0	0	10,643
Mission Valley	Active	53,488	42,811	2,703	1,208	98	167	100,475
	Idle	2,2495	1,364	505	17	0	59	4,440
	Total	55,983	44,175	3,208	1,225	98	226	104,914
Flathead Lake	Active	750	53	143	271	1	0	1,218
	Idle	91	18	14	0	0	0	123
	Total	840	71	158	271	1	0	1,340
Flathead River	Active	313	239	8	44	630	0	1,234
	Idle	89	30	0	13	0	0	133
	Total	402	269	8	58	631	0	1,366
Grand Total	Active	64,399	59,273	3,090	1,559	2,577	167	131,066
	Idle	3,366	2,989	552	30	0	59	6,997
	Total	67,766	62,262	3,642	1,589	2,578	226	138,063

Crop Water Requirements



- **Crops**
 - Historic agricultural crops from annual FIIP crop reports
 - ✦ Alfalfa hay, timothy hay, grass pasture, spring grains, silage corn, seed potatoes, orchards
 - Polson Golf Course (DCMI)
 - ✦ Turf grass
 - Wetlands
 - ✦ Cattails/Bulrushes

Crop Water Requirements



- **Determination of ET and NIR**
 - Complete Reservation-wide for updated (1983-2002) study period
 - Climatic data
 - ✦ Utilizing climatic data from 7 on-Reservation and 2 off-Reservation climate station
 - ✦ 1st order climate stations
 - Missoula and Kalispell
 - ✦ 2nd order climate station (temp. and precip.)
 - Hot Springs, Polson, Polson Kerr Dam, Lonepine, St. Ignatius, St. Ignatius AgriMet, and Round Butte AgriMet
 - Established 5 Climatic Zones

Crop Water Requirements



- Determination of ET and NIR
 - Evapotranspiration (ET) methodology
 - ✦ FAO 56 Penman-Monteith Equation used with Missoula and Kalispell 1st order data (temp, solar radiation, wind, etc. ...)
 - ✦ Used results to calibrate Hargreaves Equation using 2nd order data (temperature only)
 - ✦ Used calibrated Hargreaves Equation and data from the seven 2nd order, on-Reservation stations to determine ET
 - Determined K_c values using FAO 56 guidelines

Crop Water Requirements



- **Determination of ET and NIR**
 - Net Irrigation Requirements (NIR) determined by adjusting for effective precipitation and winter soil moisture carryover
 - ✦ Effective precipitation calculated using National Engineering Handbook methodology (replaced TR-21)
 - Determined month-by-month, year-by-year NIR for historic agricultural and wetland crops within each climatic zone
 - Determined peak day ET for each crop within each climatic zone



Settlement Work

Jocko Region

Net Irrigation
Requirements (NIR)

Unit Demand
(in/mo/acre)

Year	May	Jun	Jul	Aug	Sep	Oct	Annual
1983	0.2	1.8	2.1	4.0	1.7	0.2	10.1
1984	0.3	3.2	5.4	3.8	1.7	0.0	14.4
1985	0.6	4.7	6.2	1.7	0.2	0.3	13.8
1986	0.2	3.0	4.0	4.2	0.3	0.3	12.2
1987	0.7	4.1	2.5	3.2	3.1	1.0	14.6
1988	0.0	4.0	5.1	4.9	2.4	0.6	17.1
1989	0.4	4.2	4.4	2.0	1.3	0.0	12.3
1990	0.0	2.8	4.0	3.3	3.6	0.0	13.8
1991	0.3	1.8	5.1	4.1	2.7	0.5	14.5
1992	1.2	3.7	3.1	3.4	1.5	0.2	13.1
1993	0.7	2.4	1.7	2.5	2.3	0.0	9.6
1994	0.3	3.2	5.4	4.9	3.2	0.0	17.0
1995	0.2	2.1	3.9	3.1	1.9	0.0	11.2
1996	0.0	2.4	5.0	4.5	1.7	0.0	13.5
1997	0.2	2.4	3.4	3.2	2.2	0.0	11.4
1998	0.0	0.7	3.6	4.4	2.8	0.2	11.7
1999	1.1	2.9	4.5	3.8	2.7	0.2	15.2
2000	0.1	4.0	4.4	4.7	1.0	0.00	14.0
2001	1.6	1.4	3.6	5.0	3.2	0.0	14.8
2002	0.0	1.3	4.5	3.6	2.2	0.8	12.5
Avg.	0.4	2.8	4.1	3.7	2.1	0.2	13.3

Instream Flow Requirements (IFR)



- Information currently available from Fisheries Experts for evaluating Scenarios in Jocko Model Area
 - ✦ Interim IFRs (have been in use since 1987)
 - ✦ Extended Interim IFRs
 - ✦ Ecological Maintenance IFRs
 - ✦ Full Natural Flow IFRs

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Wetland/Riparian Requirements



- Streamflows & water tables required to sustain wetlands/riparian areas
- NWI mapping available Reservation-wide
- Tribe has also mapped wetland/riparian areas in the Jocko basin

Water Availability Modeling



- Roughly 155,000 acres of active irrigation
- 17 FIIP storage reservoirs
- 3 major pumping plants
- 1000 miles of canals and laterals
- 3 off-Reservation water supply imports
- 1 on-Reservation transbasin diversion
- Long feeder canals (Tabor, Pablo, Jocko S, Camas A, etc. ...) that intercept/bypass numerous tributaries along mountain front on the east, west and south sides of Reservation
- Significant Reuse of Return Flows
- Requires 100+ model nodes to represent the water distribution complexity

Water Availability Modeling



- Using USBR's Hydrologic River Operation Study System (HYDROSS)

- 3 HYDROSS models
 - ✦ Jocko
 - ✦ Mission
 - ✦ Little Bitterroot

- Jocko Model
 - ✦ Updated to reflect the additional data for the extended study period (1983-2002)
 - ✦ Available to Run Settlement Scenarios

Water Availability Modeling



○ Jocko model elements

- ✖ 42 model nodes
- ✖ 2 reservoirs
- ✖ 33 existing irrigation diversions
- ✖ 9 existing operational diversions
- ✖ 23 potential future irrigation diversions
- ✖ 11 interim instream flow nodes
- ✖ 28 new instream flow nodes
- ✖ 1 import (Placid Canal)
- ✖ 1 export (Tabor Feeder Canal)
- ✖ Stream seepage loss/gain modeled for 4 reaches
- ✖ Natural groundwater inflow (spring)
- ✖ 23 calibration nodes
 - 11 streamflow sites, 2 reservoirs, 10 diversions

Water Availability Modeling



- Shortage criteria for “What If” Scenarios
 - ✦ Historically Irrigated Acreage (HIA)
 - 30% Max. Annual and 100% Max. 10-Year Shortage or no worse than baseline shortage
 - ✦ Instream Flow Requirements
 - Interactive feedback from Fisheries Experts to evaluate impacts of shortage on fishery and habitat

Water Allocation Scenarios



- **Baseline (Current Conditions)**
 - ✦ **Objective:** Illustrate baseline (existing) conditions.
 - ✦ **IFR:** Uses Interim Instream Flow Requirements.

- **Scenario 1a (Litigation Claim)**
 - ✦ **Objective:** Determine the maximum potential Tribal claim, unlimited by competing water demands. This scenario shows that the potential composite Tribal claim is in excess of the available water supply.
 - ✦ **IFR:** Full Natural Flow.

Water Allocation Scenarios



○ Scenario 3a (Settlement Proposal)

✦ Objectives:

- All Project lands, Non-Project Indian lands, and formerly allotted Non-Project Non-Indian lands to be administered under the Tribe's 1855 water right.
- Serve all verified, actively irrigated lands.
- Make additional water available for the Tribe's uses.
 - Establish baseflows and ecological maintenance flows for all streams.
 - Develop as much additional water for future Tribal uses as possible after IFRs are met.
 - Will require significant State and Federal Contributions

Water Allocation Scenarios



- Scenario 3a (Settlement Proposal)- *Cont.*

- ✦ **Methods:** The Tribe will demand minimum instream flows at all times.

- Assigns a minimum monthly requirement to all streams (both those with and those without “interim” IFRs)

- Minimum Instream Flow for Jocko River below Jocko K Canal is increased from interim baseflow of 36 cfs to 62 cfs based on assumption that Safety of Dams’ constraints are lifted from Reservoirs.

Water Allocation Scenarios



○ Scenario 3a (Settlement Proposal) - *Cont.*

- ✦ **Methods:** All actively irrigation lands will be served through improved water distribution management and improved infrastructure after the minimum instream flows are met.
 - Strategically reduce Trans-basin exports to free-up additional water, assuming that similar improvements to infrastructure and management will also occur in the Mission Area.
 - Upper and Lower Jocko Reservoir dams will be repaired so the Safety of Dams' constraints can be removed.
 - Rehabilitation of Dilapidated Irrigation Structures
 - Add Flow Measurement / Gate Automation
 - Line (or partially line) Key Canals (K, Lower S, Lower J)
 - Improve distribution/on-farm irrigation efficiencies
 - Shortages to be shared among all existing irrigators. Achieved through a water management plan rather than strict priority administration.

Water Allocation Scenarios



○ Scenario 3a (Settlement Proposal) - *Cont.*

- ✦ **Methods:** The additional flow made available will be utilized for ecological maintenance.
 - The 20%, 50% and 80% Exceedence, Ecological Flow Requirements are applied by month and year for the 20-year study period as follows:
 - The *four driest months* for each month (Jan, Feb, ... Nov, Dec) within the study period use the 80% Exceedence Demand. (Example: The four driest months of October within the 20-year study period use the 80% Exceedence Demand for October.)
 - The *four wettest months* for each month within the study period use the 20% Exceedence Demand.
 - The *remaining (average) months* use the 50% Exceedence Demand for the appropriate month.
- ✦ **Methods:** Additional Surface Water Demands (Idle Indian HIA / PIA / DCMI) will be developed, to the extent possible, where additional flow is available after other demands are met.

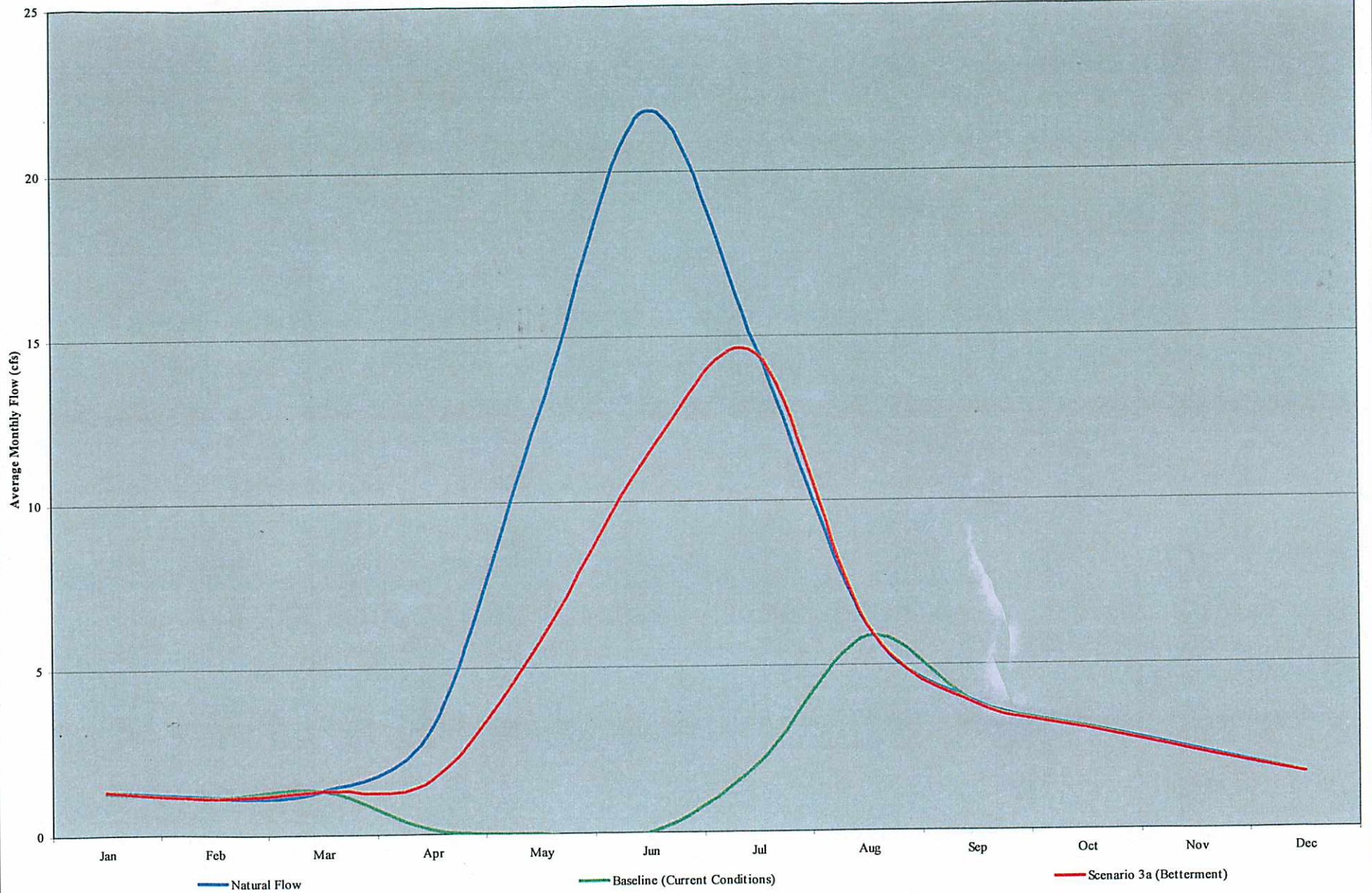
Water Allocation Scenarios



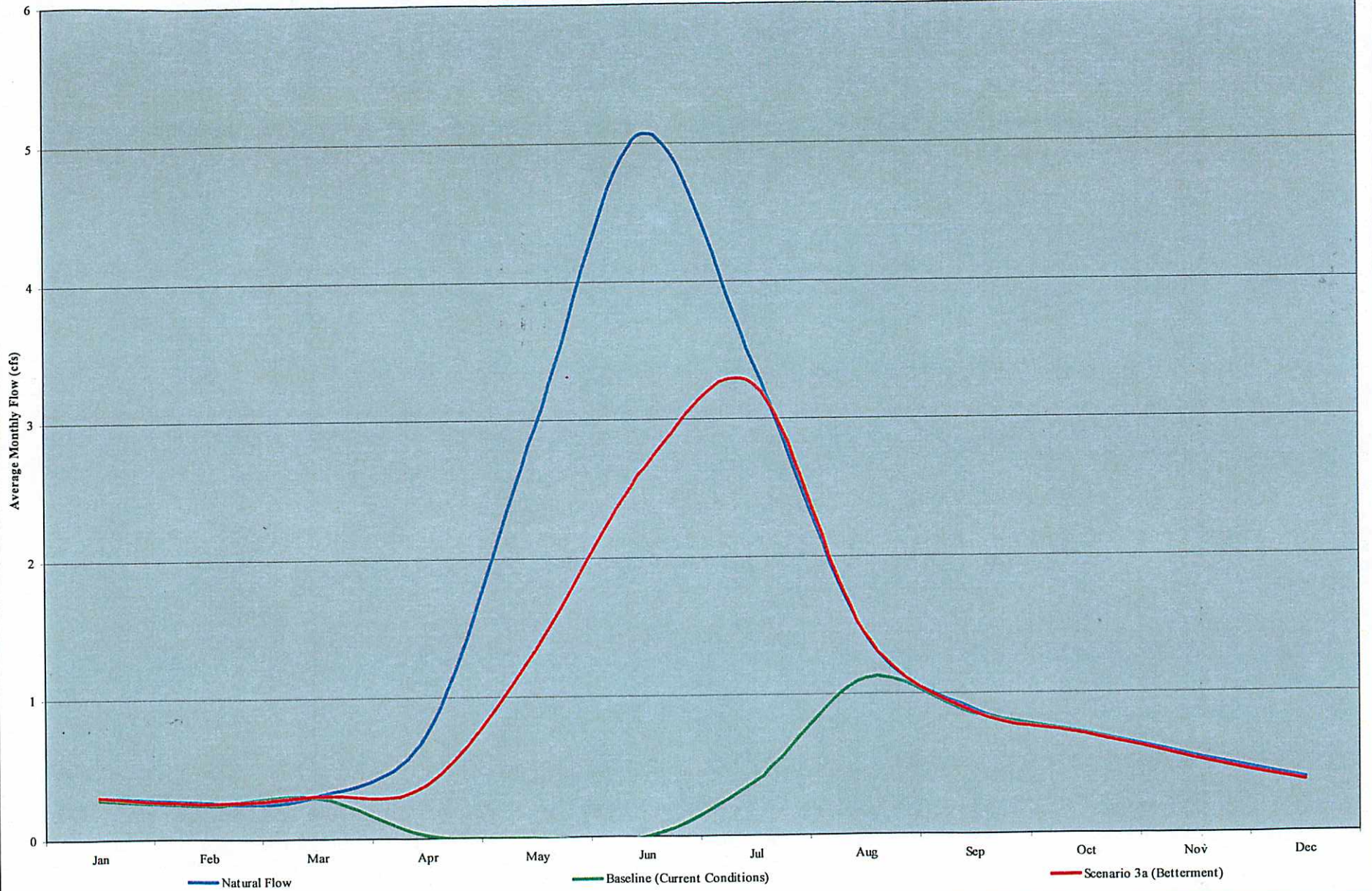
- Scenario 3a (Settlement Proposal) - *Cont.*

SAMPLE RESULTS

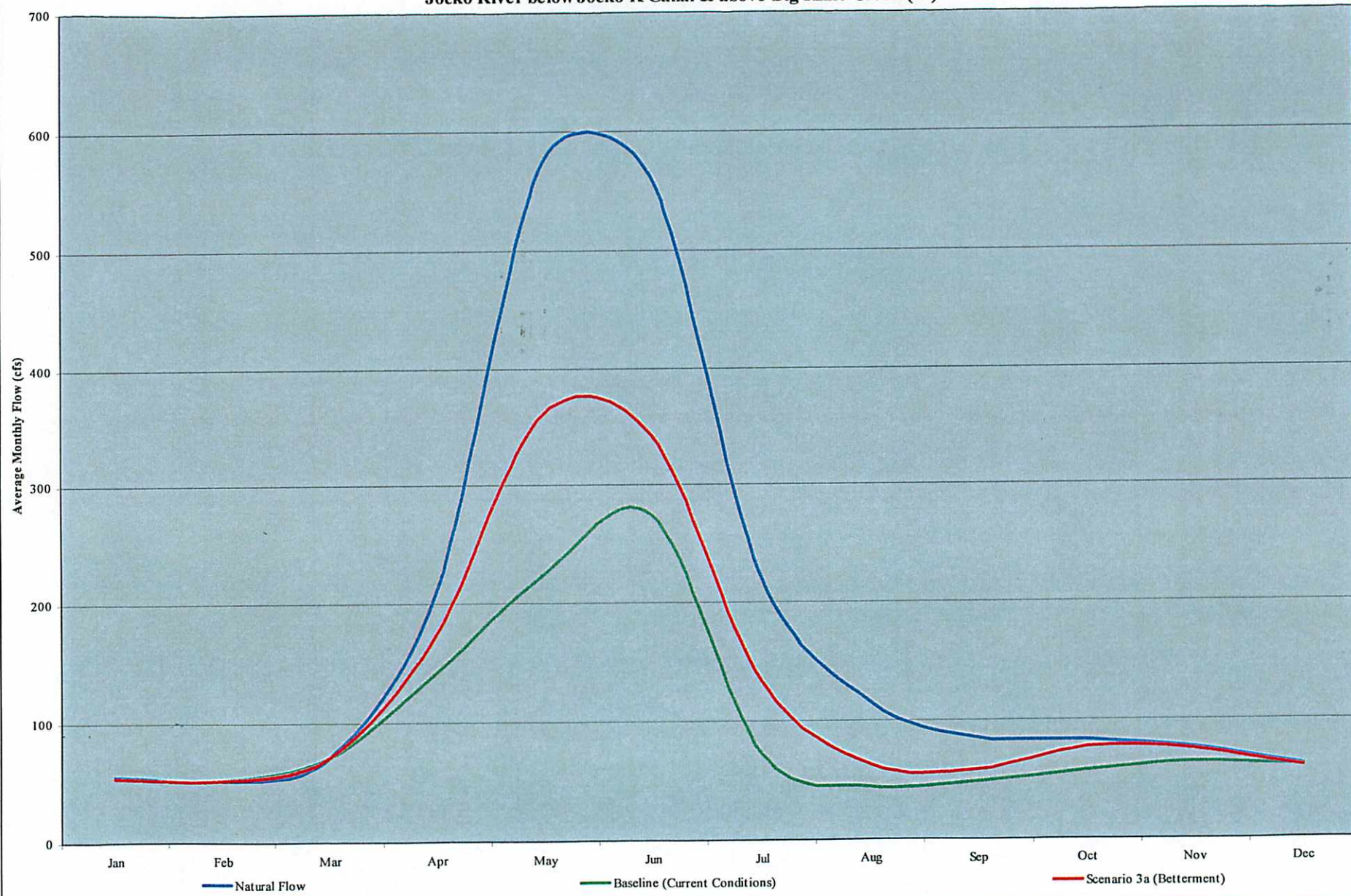
Falls Creek at Mouth (26)



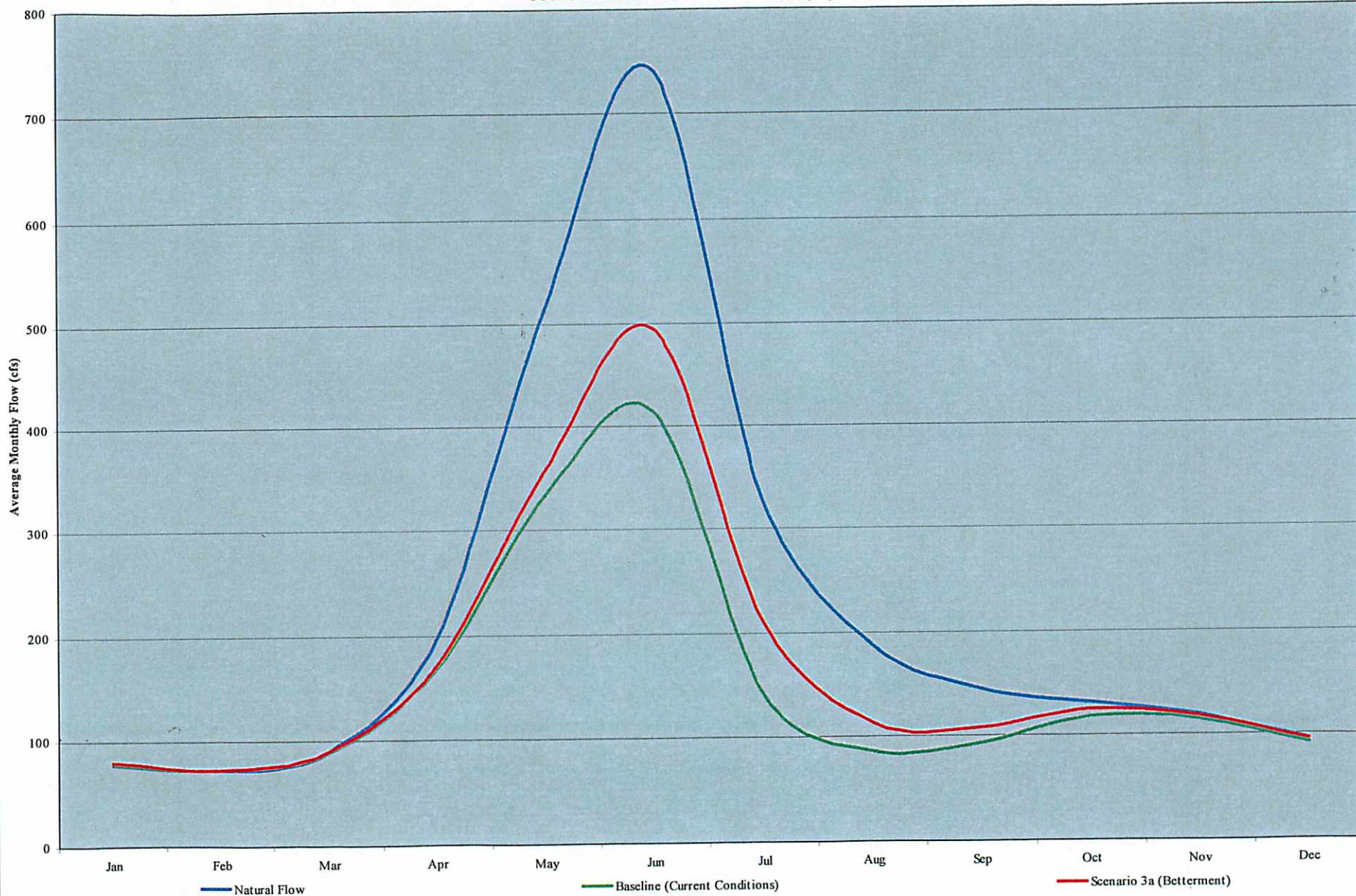
Grizzley Creek below Tabor Feeder Canal (29)



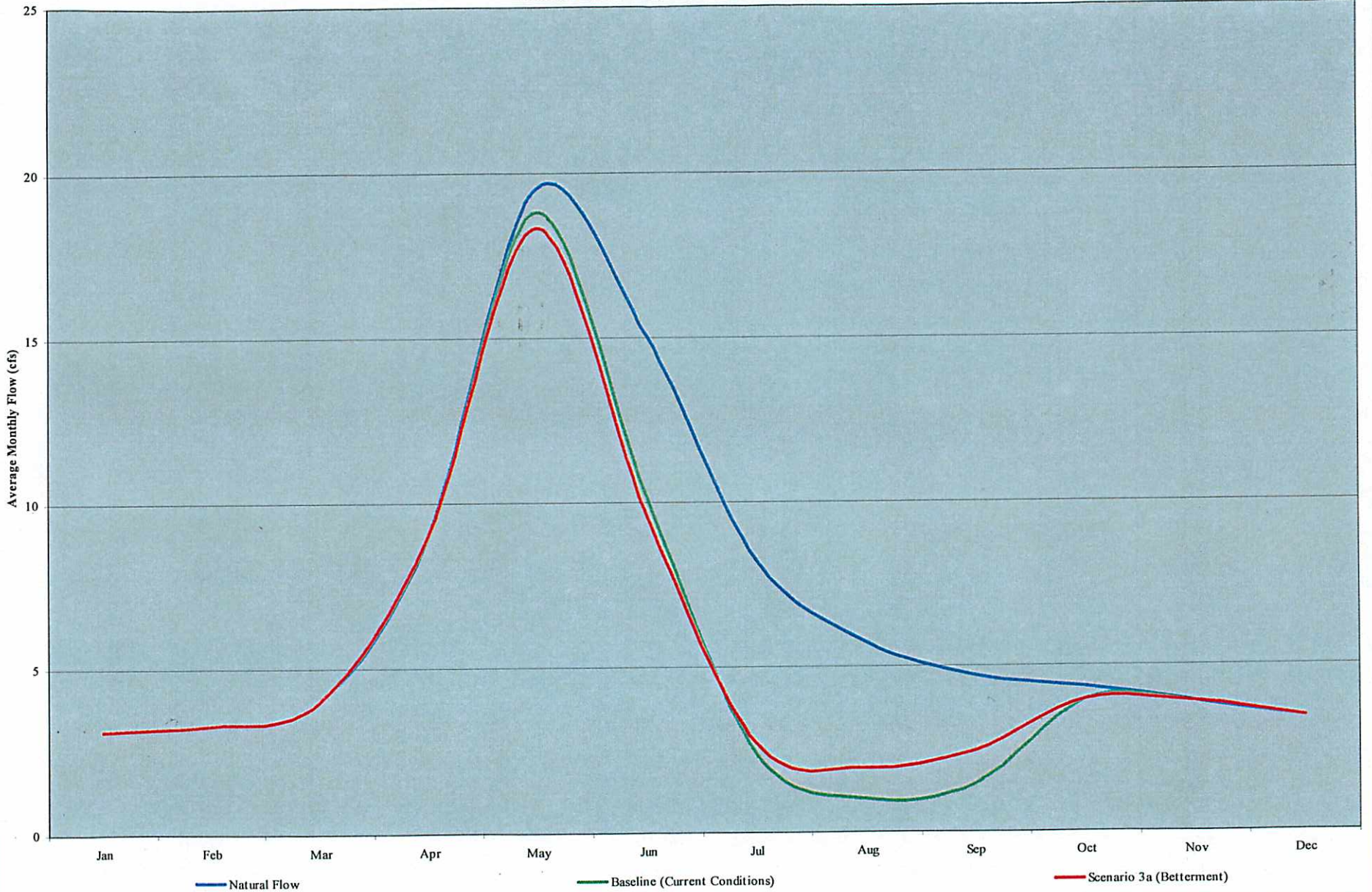
Jocko River below Jocko K Canal & above Big Knife Creek (84)



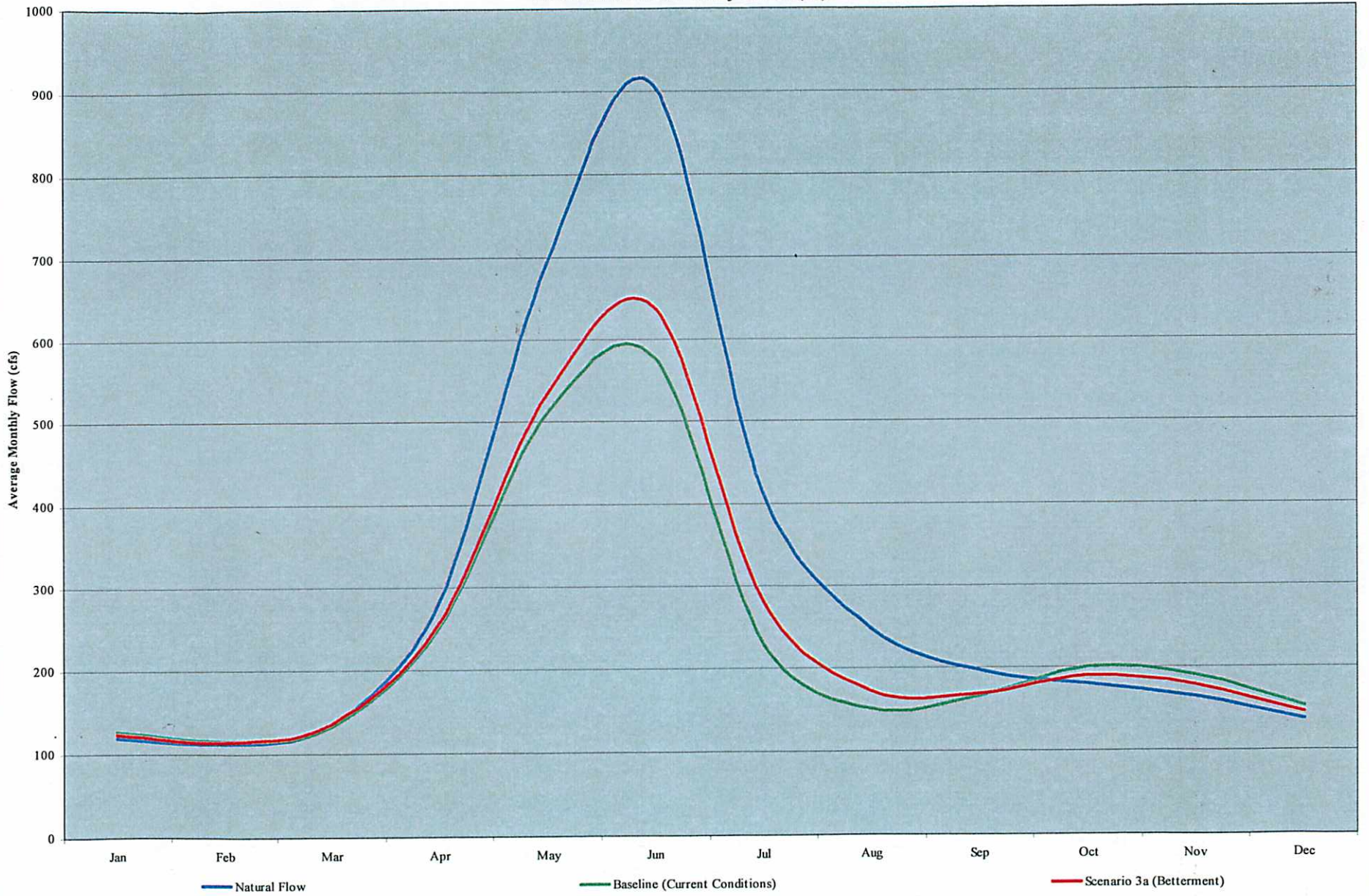
Jocko River below Lower S Canal (81)



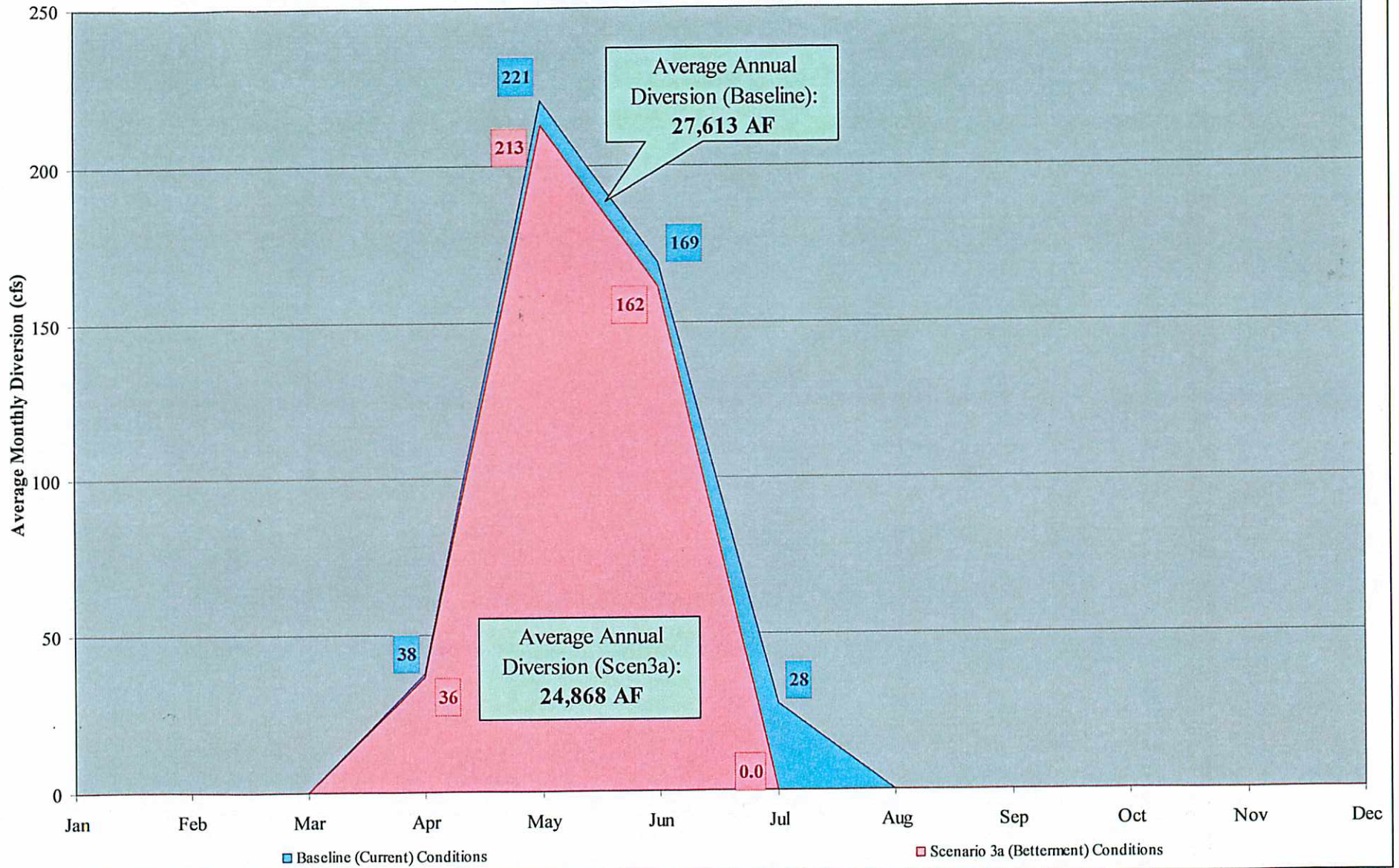
North Fork Valley Creek at Mouth (45)



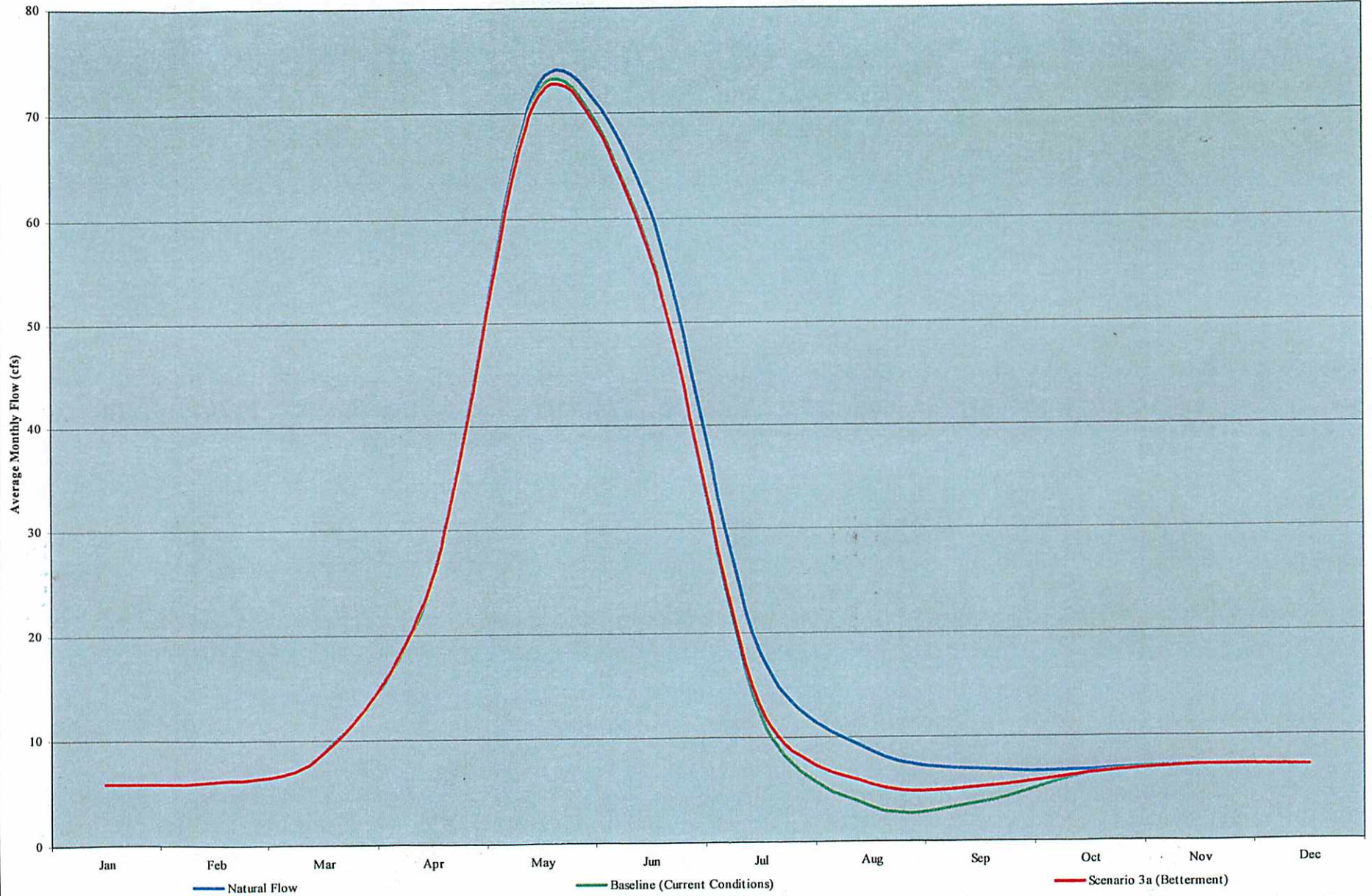
Jocko River below Valley Creek (48)



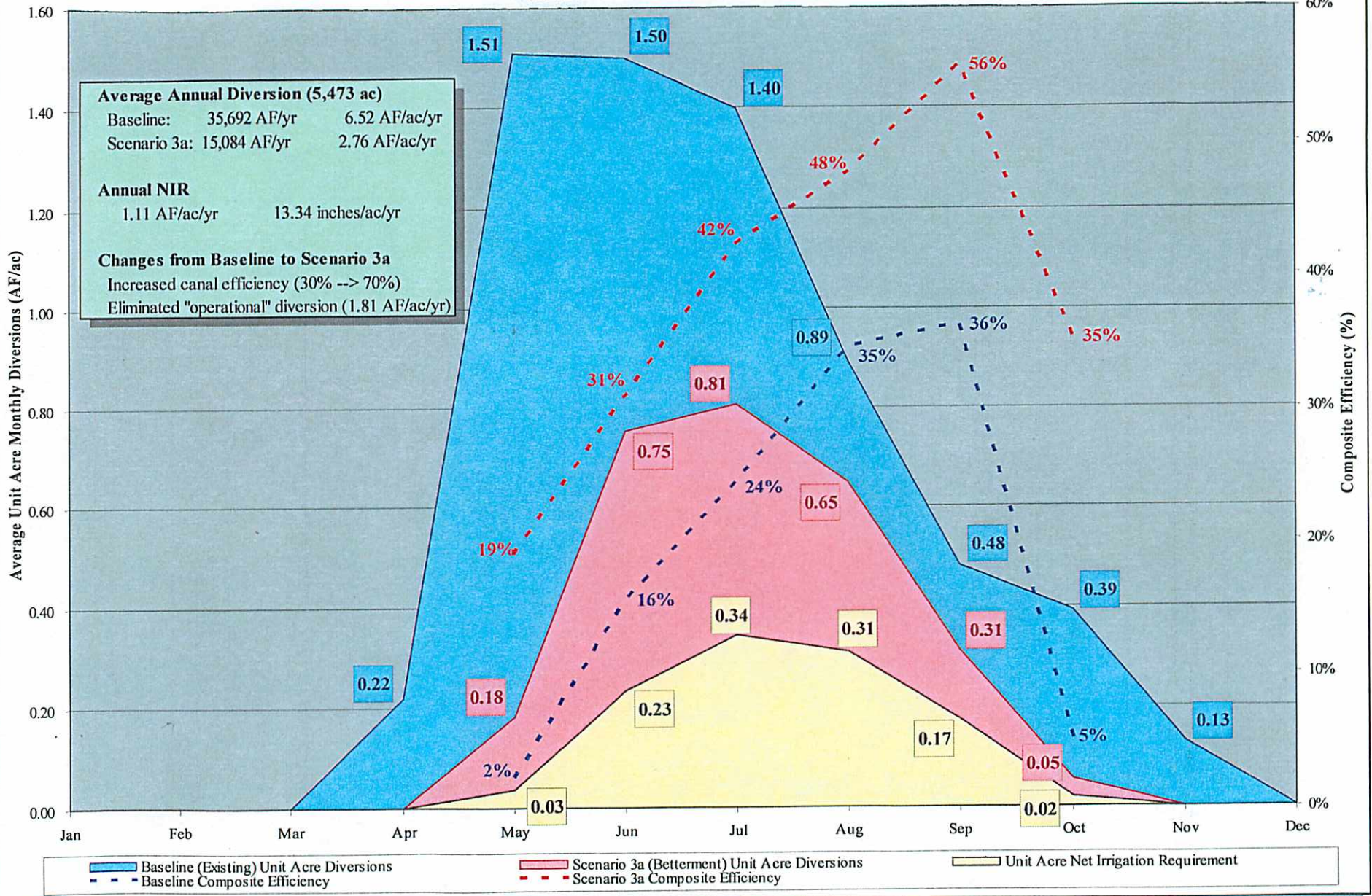
Tabor Feeder Canal Exports



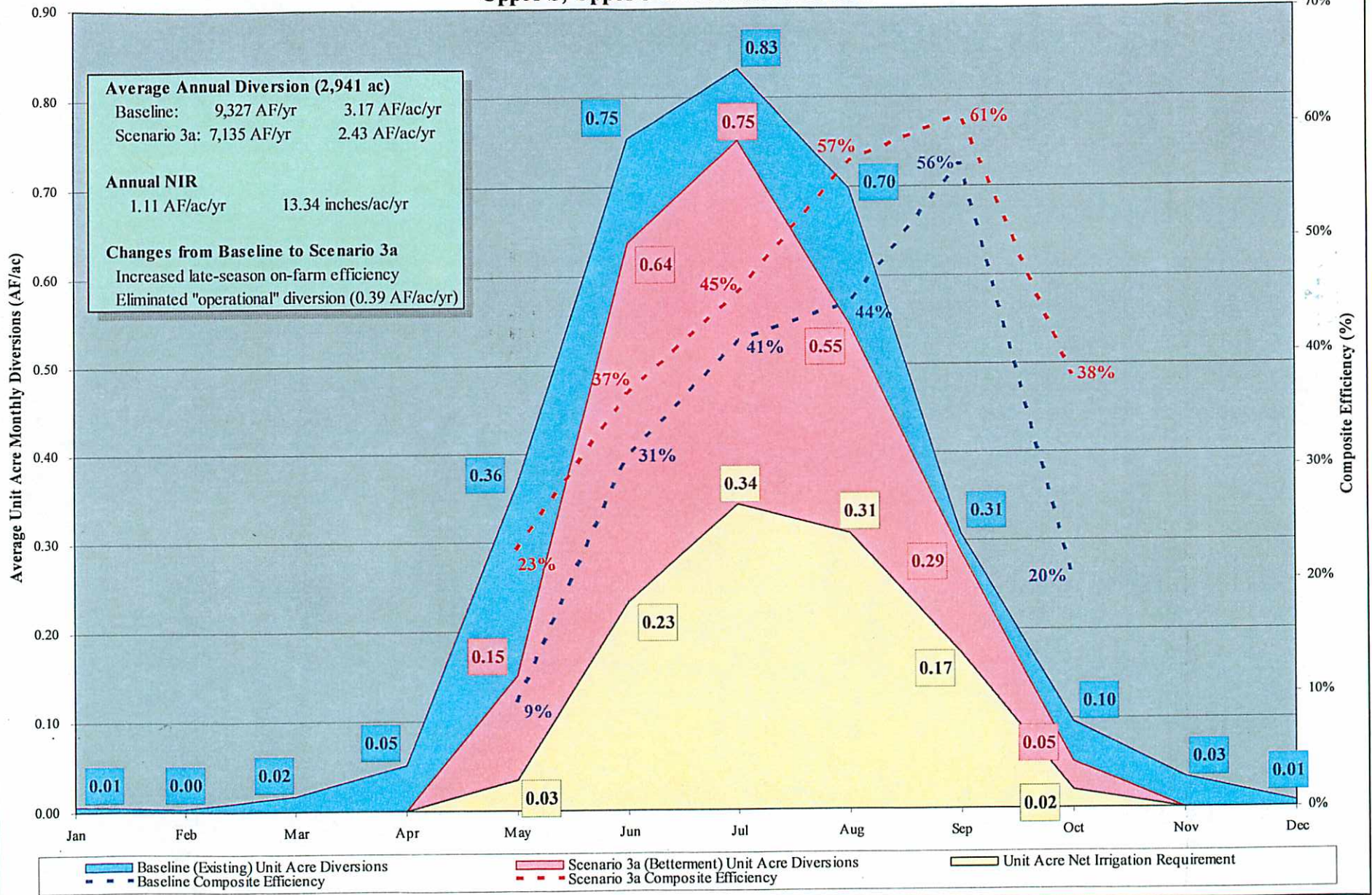
Revais Creek below Revais R Canal (79)



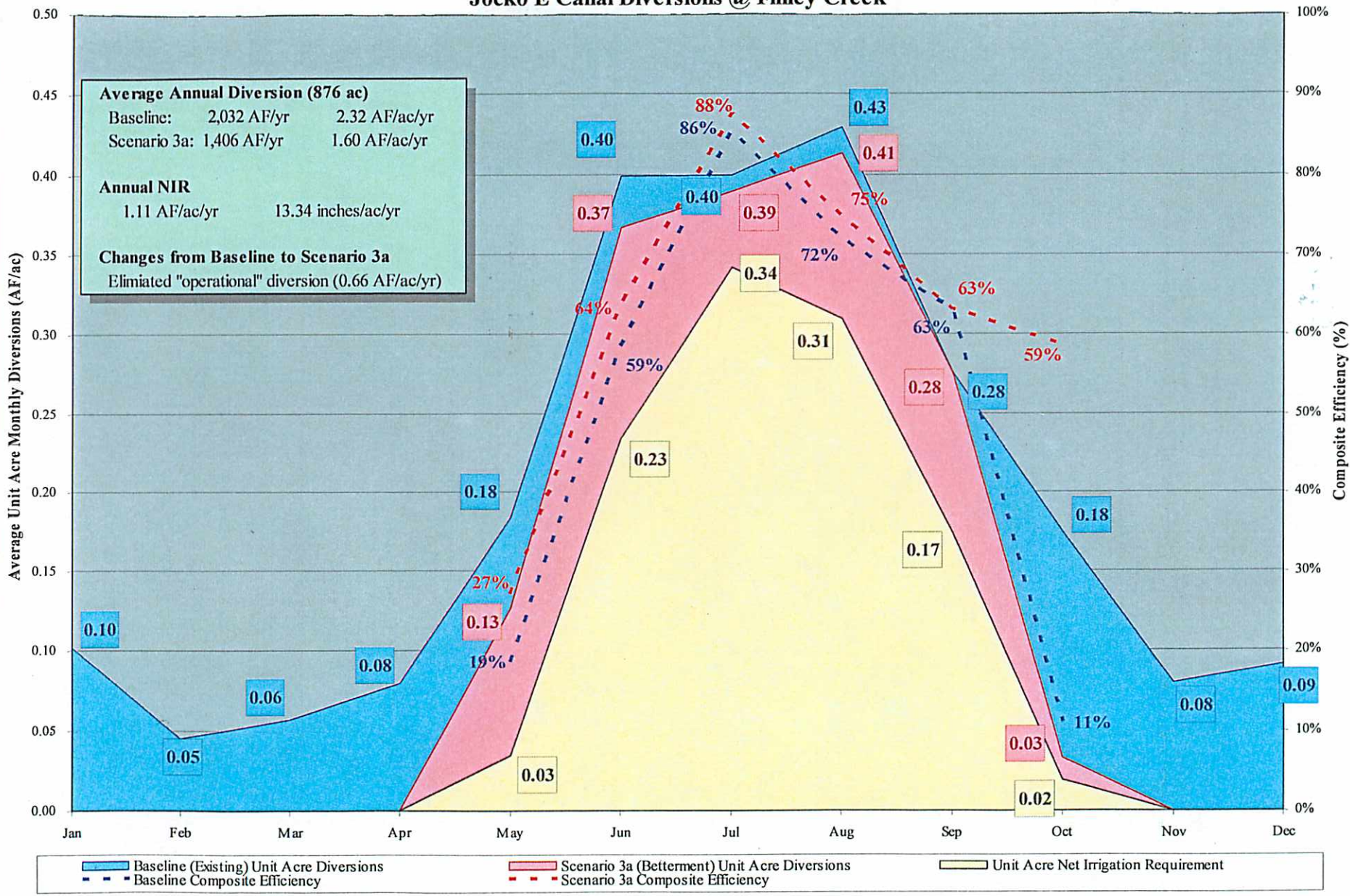
Jocko K & R Canal Diversions



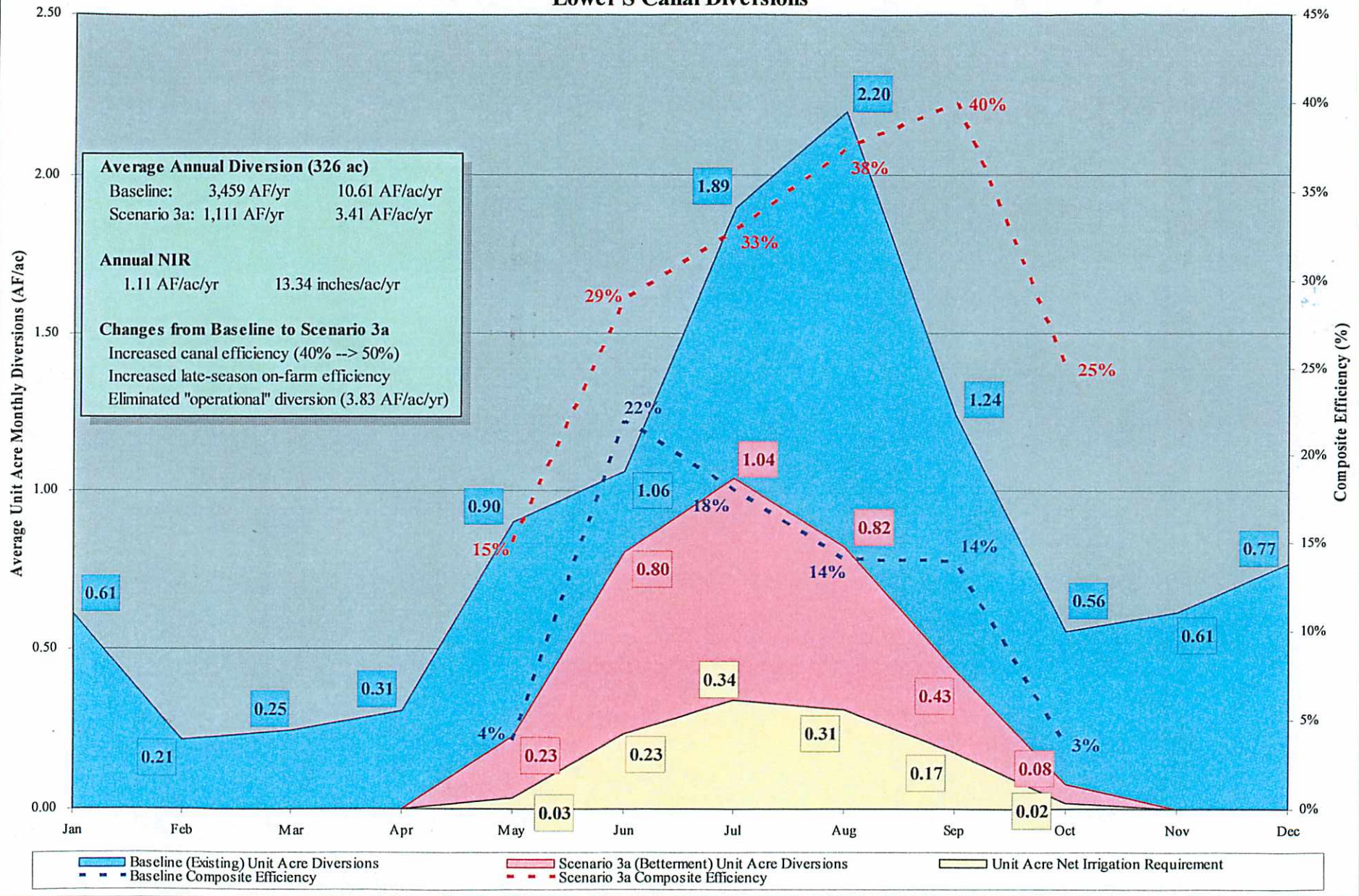
Upper S, Upper J & E Canal Diversions



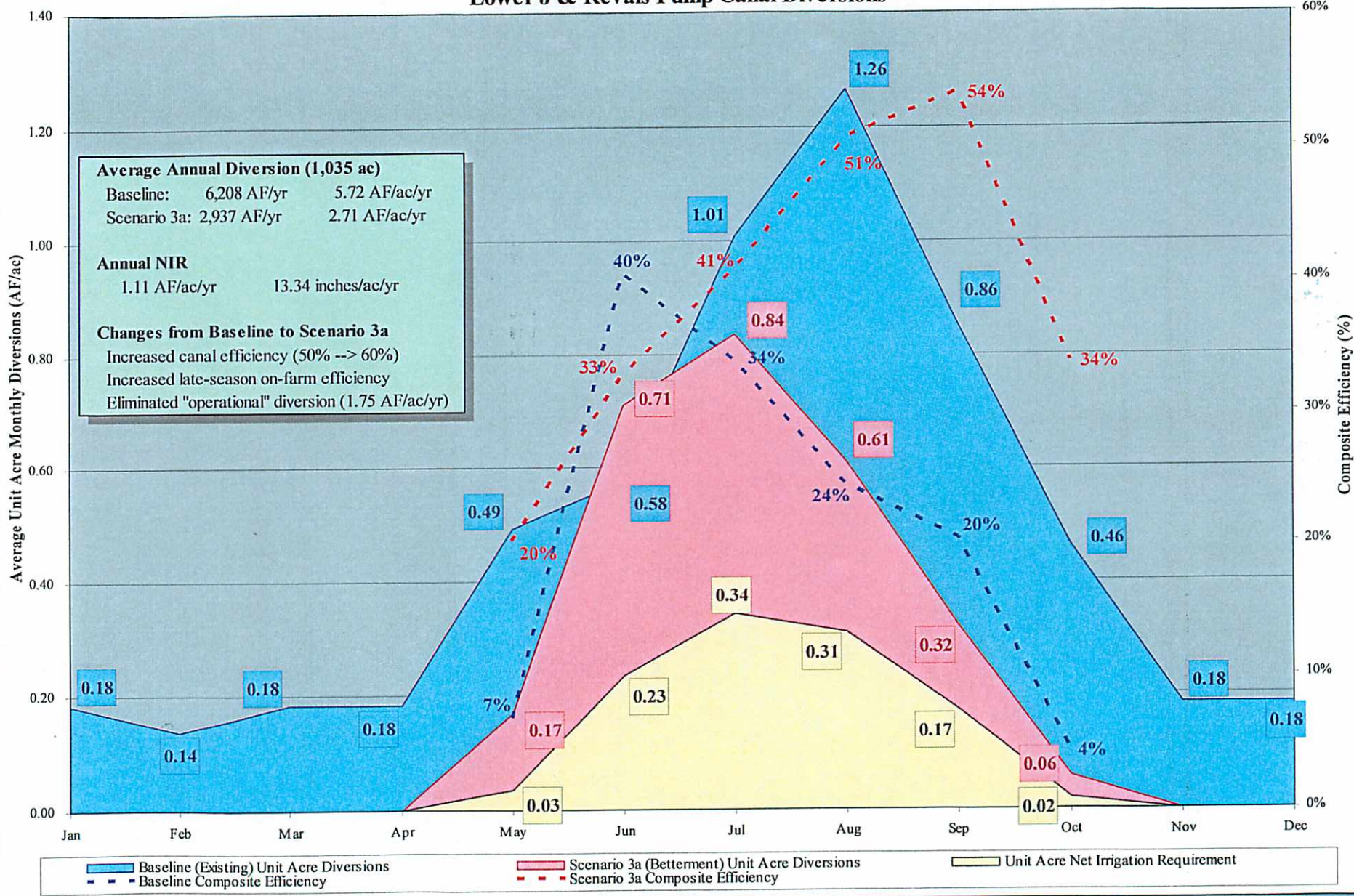
Joeko E Canal Diversions @ Finley Creek



Lower S Canal Diversions



Lower J & Revais Pump Canal Diversions



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