

***Technical Evaluation of the  
Bottom-Up Program for  
Springflow Protection***

***Changes in Spring Discharge and  
Associated Groundwater and  
Surface Water Supplies***

***Edwards Aquifer  
Recovery Implementation Program  
Funding Work Group***

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***January 17, 2011 (Updated January 18, 2011)***

## ***Objectives***

- 1) Summarize expected changes in discharge from Comal and San Marcos Springs due to implementation of the Bottom-Up Program.**
- 2) Quantify expected changes in groundwater supplies available from the Edwards Aquifer during severe drought.**
- 3) Quantify expected changes in surface water supplies available in the Guadalupe – San Antonio River Basin and Guadalupe Estuary for human and environmental uses during severe drought.**

## ***Topics of Discussion***

- 1) Fundamental assumptions for long-term groundwater and surface water simulations under Baseline (without Bottom-Up Program) and Bottom-Up Program conditions.**
- 2) Comparisons of flows at selected locations.**
- 3) Comparisons of groundwater and surface water supplies.**

## ***Fundamental Assumptions***

- 1) Edwards aquifer model = MODFLOW**
- 2) Edwards permitted pumping at ~572 kacft/yr plus ~13 kacft/yr domestic & livestock plus ~ 7 kacft/yr federal exempt use**
- 3) Edwards critical period management (CPM) per SB3**
- 4) Surface water model = Guadalupe-San Antonio River Basin Water Availability Model (GSA WAM)**
- 5) Full authorized use of surface water rights with treated effluent as reported for 2006 accounting for contracted direct reuse**

## ***Fundamental Assumptions (cont'd)***

### **5) Simulation Periods:**

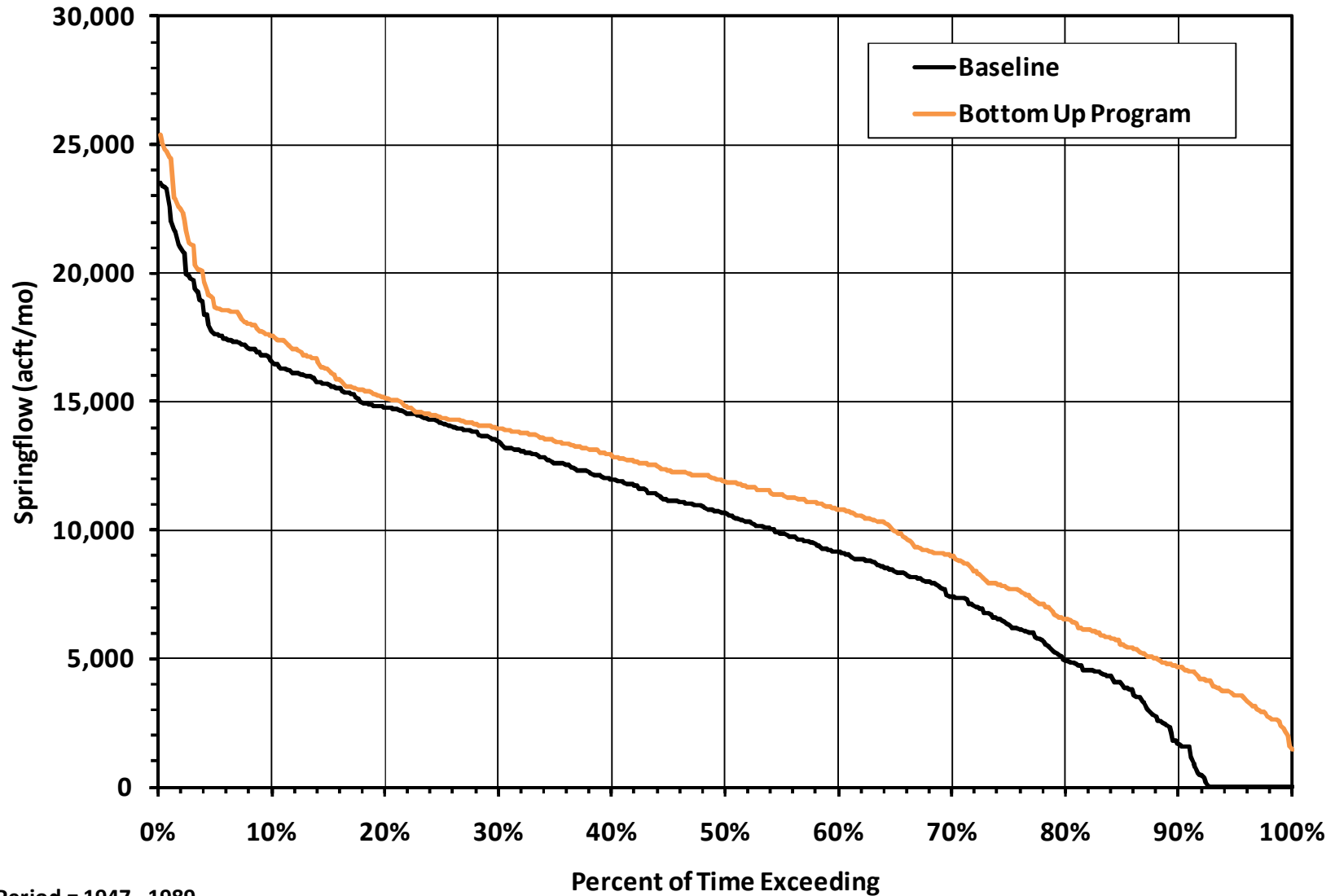
- a) MODFLOW = 1947 – 2000**
- b) GSAWAM = 1934 – 1989**
- c) Graphics in this package = 1947 – 1989**

### **6) Water supplies available to support power plant cooling reservoir operations (Braunig, Calaveras, & Coleta Creek) are reported as determined by TCEQ configuration of the GSA WAM and not in accordance with customary operations.**

# Comal Springs

5,000 acft/mo = ~83 cfs

## Comal Springflow

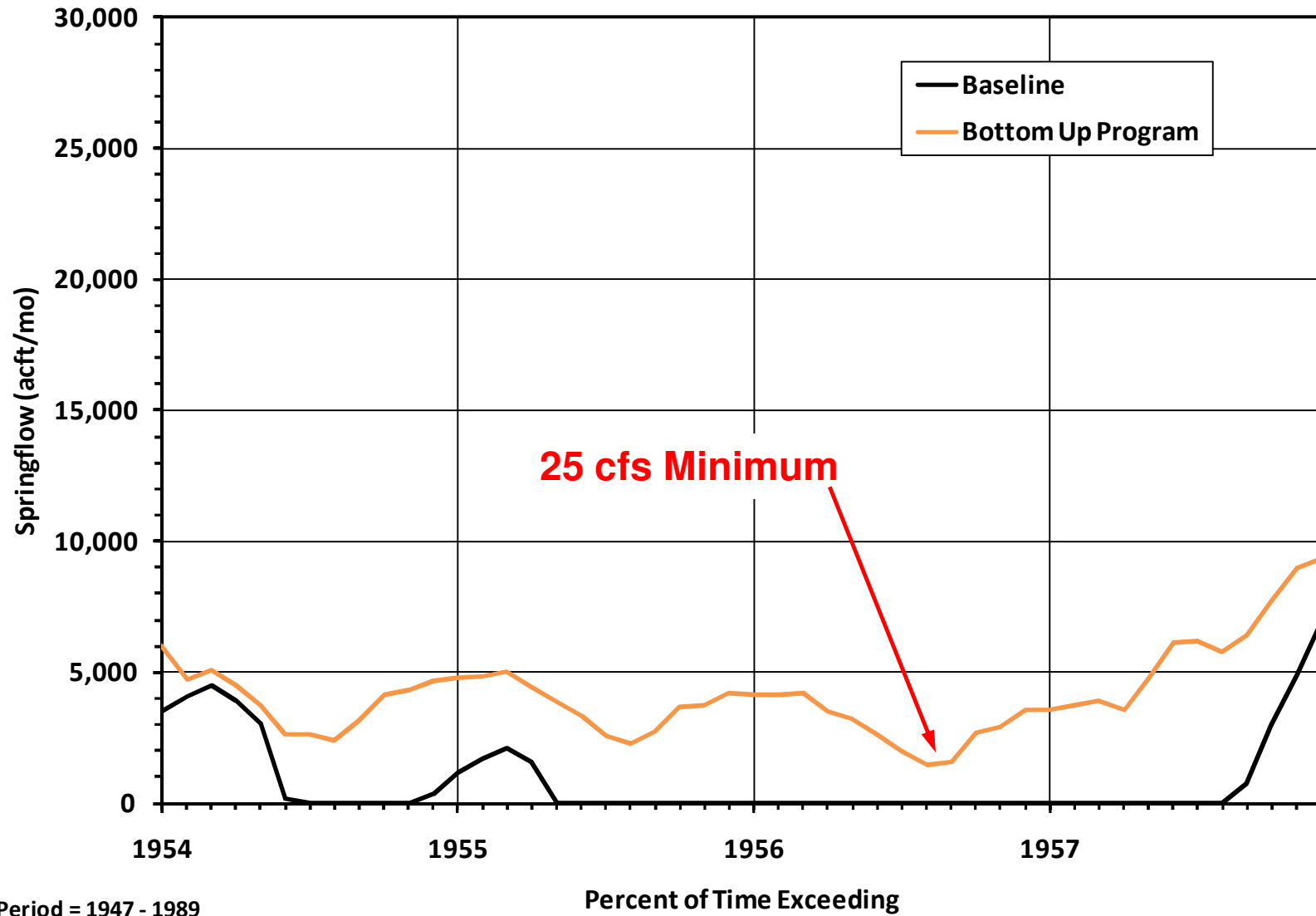


Period = 1947 - 1989

# Comal Springs

5,000 acft/mo = ~83 cfs

## Comal Springflow

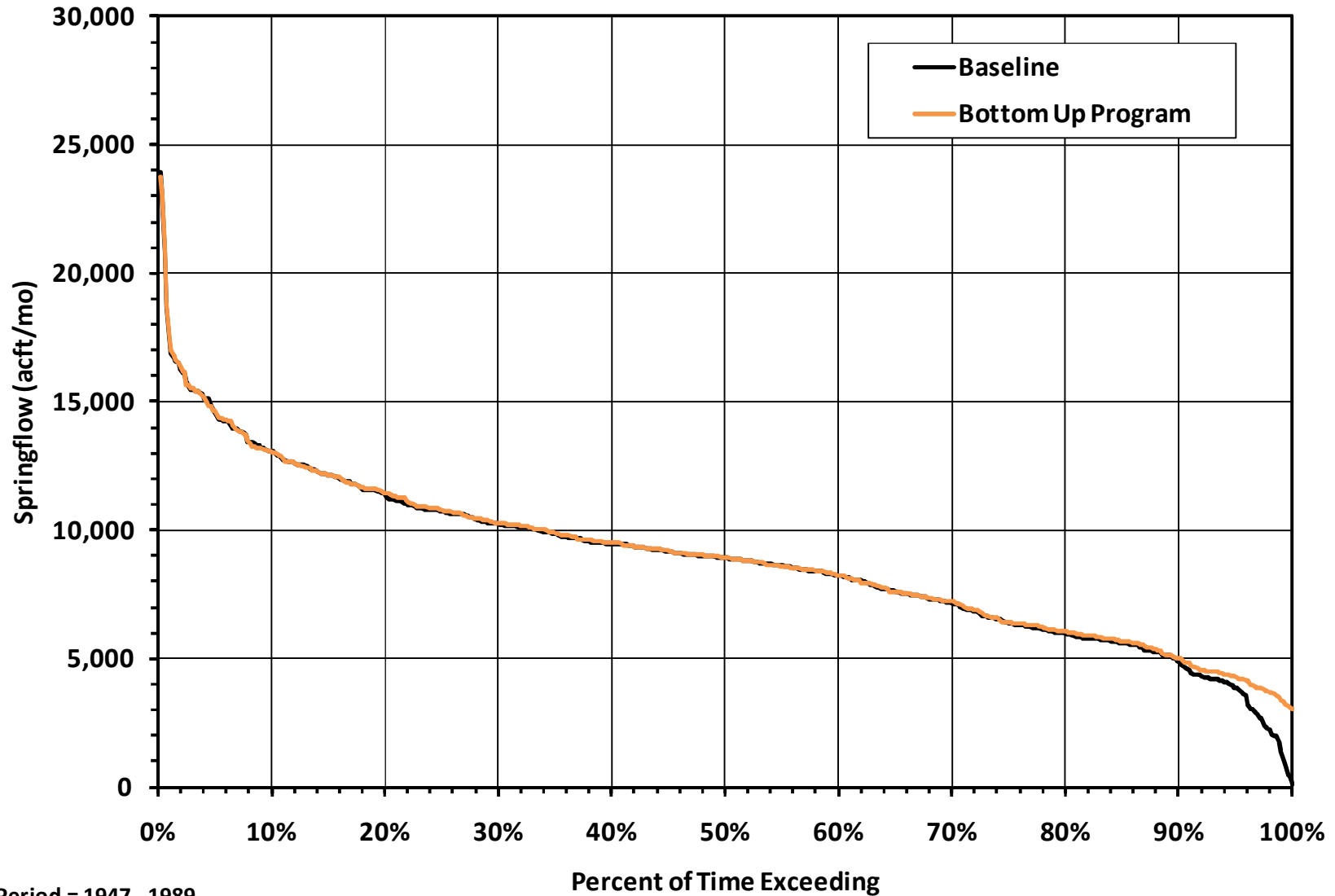


Period = 1947 - 1989

# San Marcos Springs

5,000 acft/mo = ~83 cfs

## San Marcos Springflow



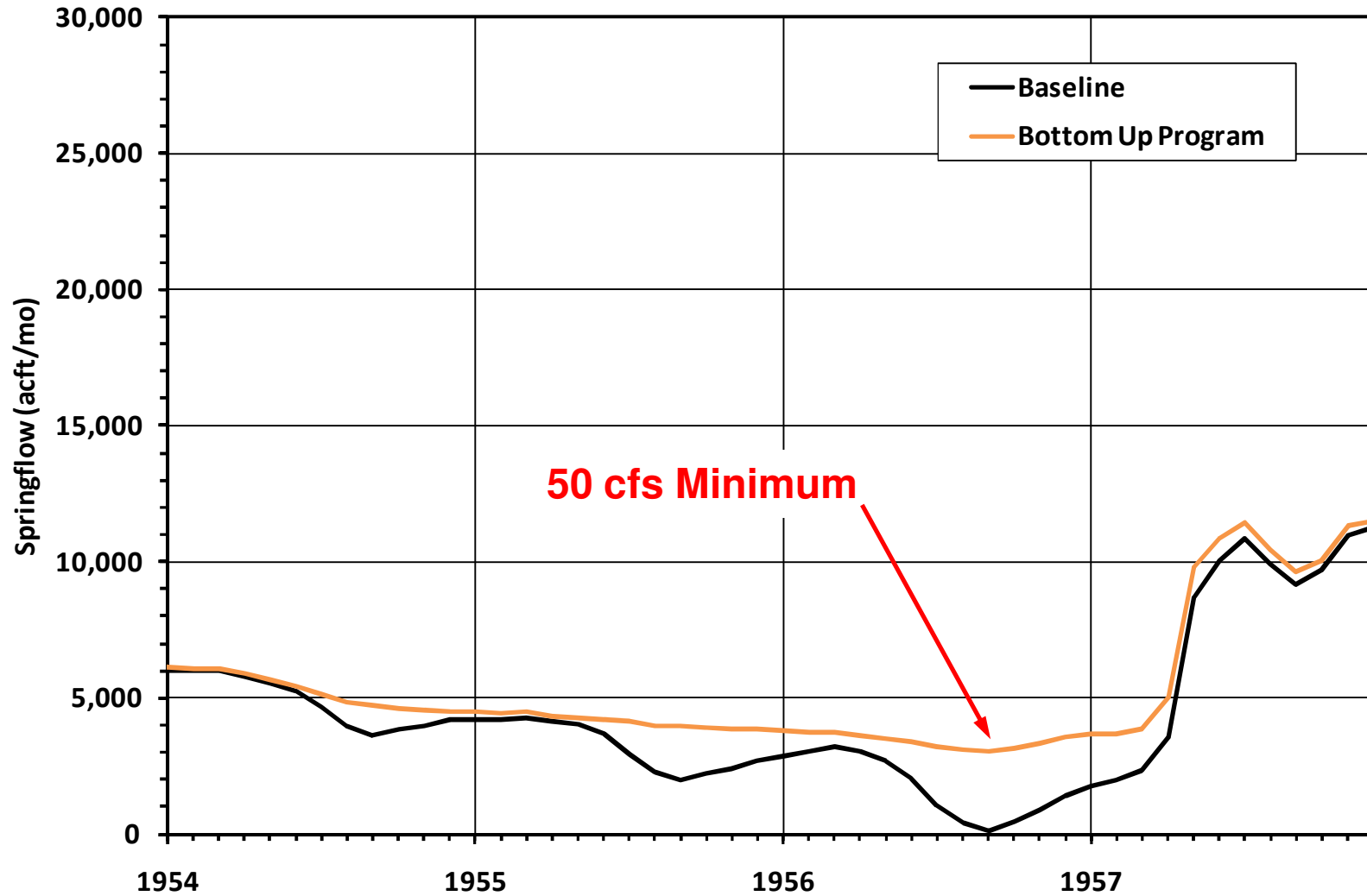
Period = 1947 - 1989



# San Marcos Springs

5,000 acft/mo = ~83 cfs

## San Marcos Springflow



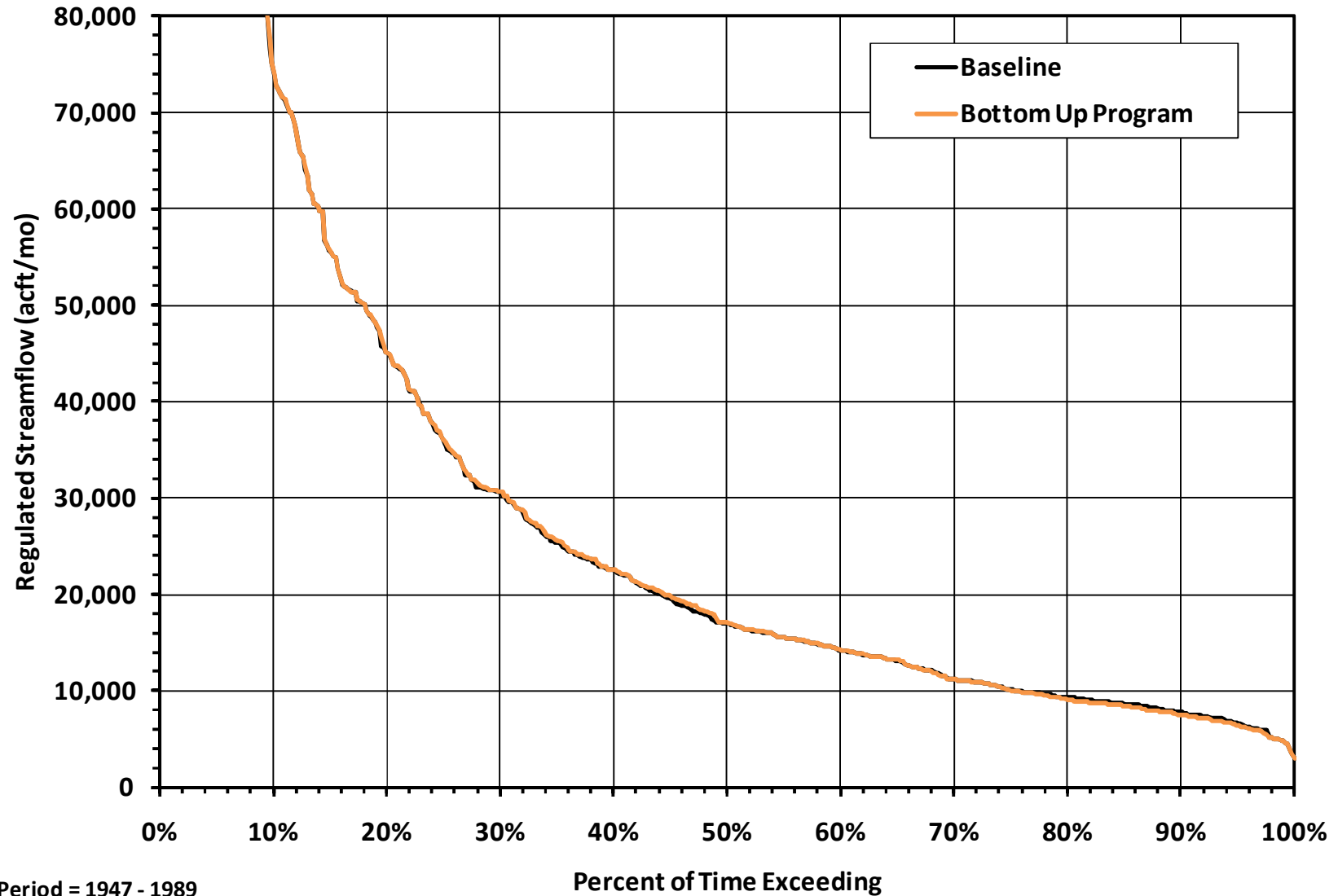
Period = 1947 - 1989

Percent of Time Exceeding

# San Antonio River at Goliad

5,000 acft/mo = ~83 cfs

San Antonio River at Goliad

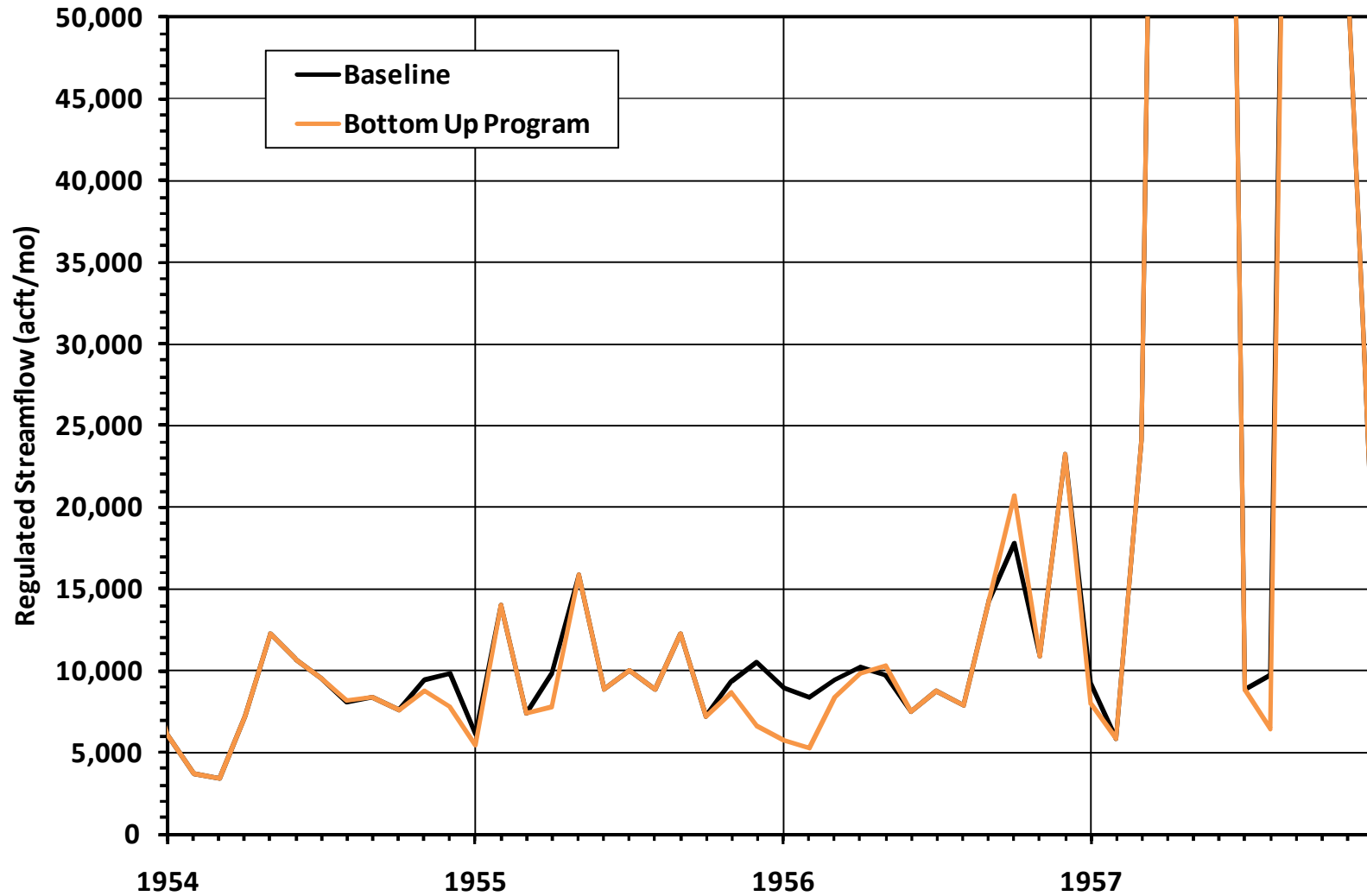


Period = 1947 - 1989

# San Antonio River at Goliad

5,000 acft/mo = ~83 cfs

San Antonio River at Goliad



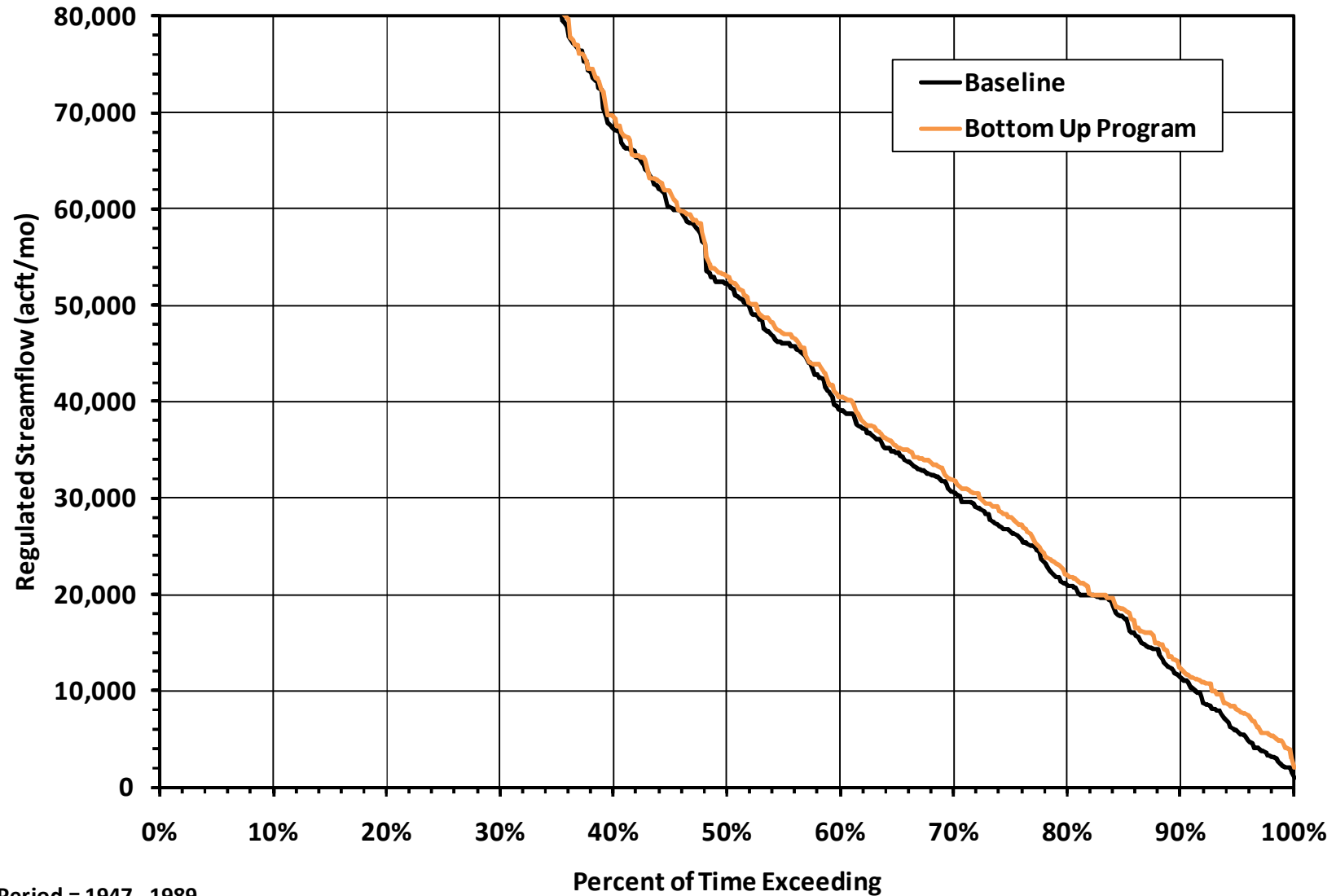
Period = 1947 - 1989

Percent of Time Exceeding

# Guadalupe River at Victoria

5,000 acft/mo = ~83 cfs

## Guadalupe River at Victoria

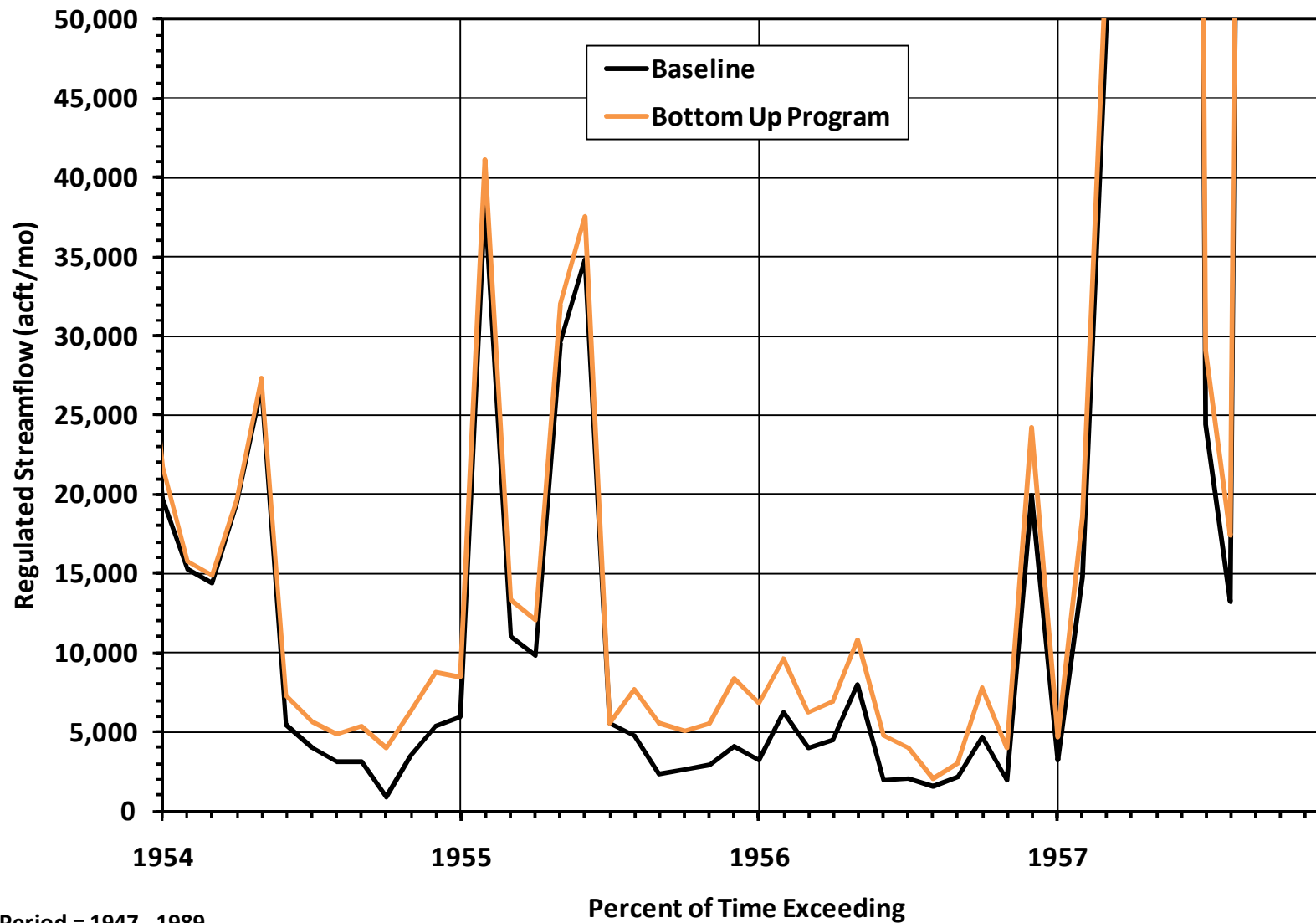


Period = 1947 - 1989

# Guadalupe River at Victoria

5,000 acft/mo = ~83 cfs

## Guadalupe River at Victoria

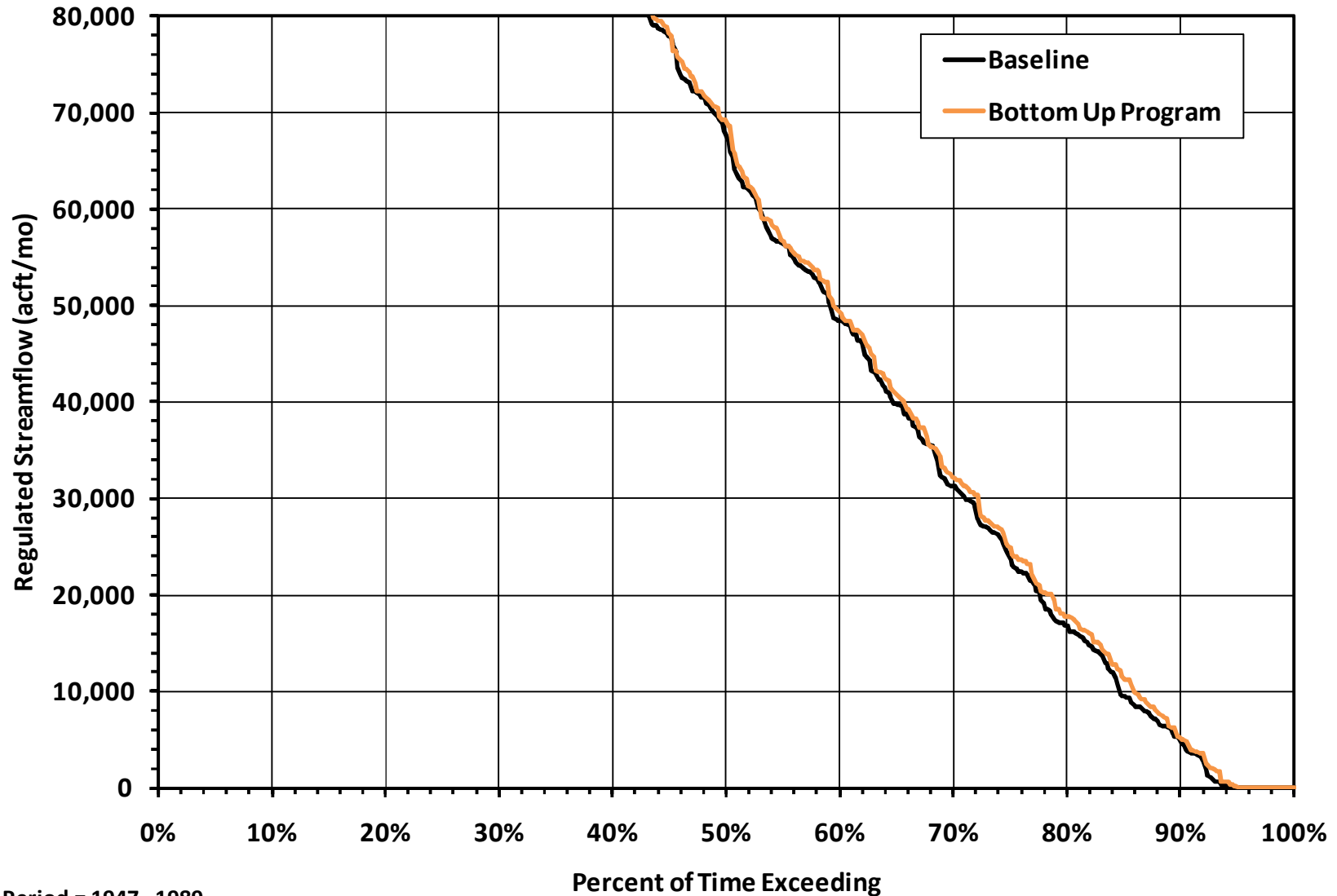


Period = 1947 - 1989

# Freshwater Inflow to the Guadalupe Estuary

5,000 acft/mo = ~83 cfs

## Freshwater Inflow into Guadalupe Estuary

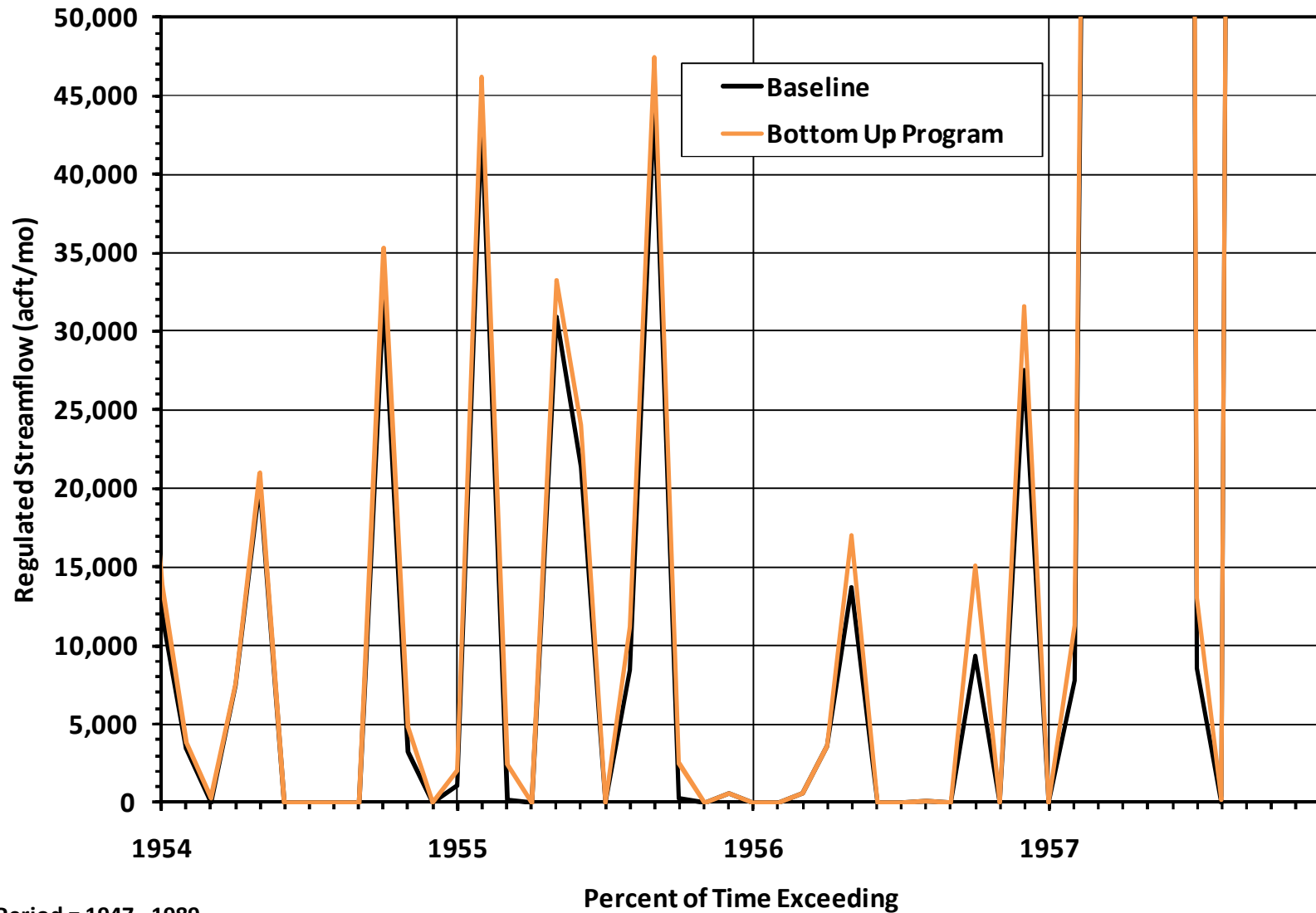


Period = 1947 - 1989

# Freshwater Inflow to the Guadalupe Estuary

5,000 acft/mo = ~83 cfs

## Freshwater Inflow into Guadalupe Estuary



Period = 1947 - 1989

# Benefits of Bottom Up Program

**Water Rights Holder Benefits by Category (Based on Minimum Year)**

	Municipal (acft/yr)	Industrial / Steam-Electric (acft/yr)	Irrigation (acft/yr)	Other (acft/yr)	Hydroelectric (acft/yr)
Surface Water Supplies	+2,677	+15,608	+3,142	+105	Varies *
Groundwater Supplies **	+45,828	+6,047	+23,125	N/A	N/A

\* Individual hydroelectric water supplies on the Comal or Guadalupe River increase by up to about 36,000 acft/yr. Hydroelectric water supplies on the San Marcos River increases by about 19,800 acft/yr.

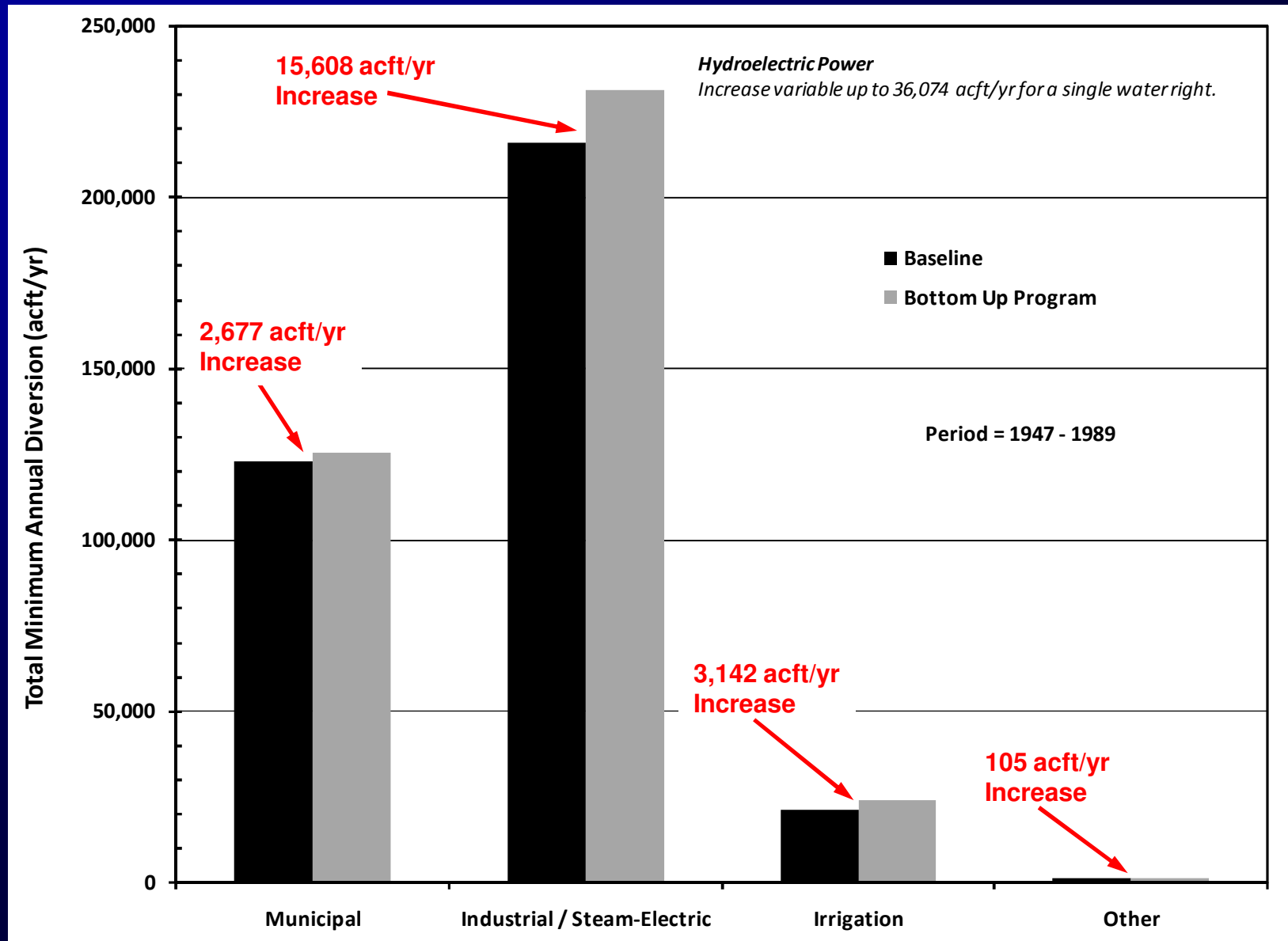
\*\* Edwards groundwater supplies with a minimum monthly discharge from Comal Springs of 25 cfs increase by about 75,000 acft/yr (from about 245,000 acft/yr per Science Subcommittee to 320,000 acft/yr with the Bottom-Up Program).

**Minimum Year (1956) Springflows and Streamflows**

	Comal Springs Discharge (acft/yr)	San Marcos Springs Discharge (acft/yr)	San Marcos River at Luling Streamflow (acft/yr)	Guadalupe River at Victoria Streamflow (acft/yr)	San Antonio River at Goliad Streamflow (acft/yr)	Freshwater Inflow to the Guadalupe Estuary (acft/yr)
Baseline	0	21,311	31,895	60,293	137,060	54,780
Bottom Up Program	36,102	41,130	49,312	90,261	132,898	68,002
Increase	36,102	19,819	17,417	29,968	(4,162)	13,222



# Minimum Annual Diversions (Surface Water)



# Surface Water Rights - Municipal

Owner	Water Right	Authorized Permitted Diversion (acft/yr)	Use Type	Baseline - Minimum Annual Diversion (acft/yr)	Bottom Up Program - Minimum Annual Diversion (acft/yr)	Increase in Minimum Annual Diversion (acft/yr)
GUADALUPE-BLANCO RIVER AUTH	C2074	90,000	Municipal	87,675	89,400	1,725
SEGUIN MUNICIPAL UTILITIES	C3839	7,000	Municipal	6,454	7,000	546
GUADALUPE-BLANCO RIVER AUTH	C3896	1,500	Municipal	99	216	117
GUADALUPE-BLANCO RIVER AUTH	C3896	1,300	Municipal	0	86	86
JOHN F BAUGH	C3888	320	Municipal	112	158	46
STATE BANK & TRUST COMPANY	C3895	580	Municipal	37	78	42
COMAL CO FRESH WSD #1	P4491	120	Municipal	23	60	37
W L LIPSCOMB ET AL	C3860	260	Municipal	145	174	29
CITY OF SAN ANTONIO	C2162	100	Municipal	72	100	28
PRESBYTERIAN MO-RANCH ASSEMBLY	C1932	60	Municipal	40	50	10
TEXAS PARKS & WILDLIFE DEPT	P4106	25	Municipal	3	11	8
CAMP MYSTIC INC	C2445	14	Municipal	11	14	3
GARY A DITTMAR	C3833	5	Municipal	5	5	0.4

**13 Municipal Water Rights had an increase in Minimum Annual Diversion. All are listed.**

# Surface Water Rights – Industrial / Steam-Electric

Owner	Water Right	Authorized Permitted Diversion (acft/yr)	Use Type	Baseline - Minimum Annual Diversion (acft/yr)	Bottom Up Program - Minimum Annual Diversion (acft/yr)	Increase in Minimum Annual Diversion (acft/yr)
CITY OF SAN ANTONIO	C2162	36,900	Steam-Electric	32,739	36,900	4,162
CITY OF SAN ANTONIO	C2161	12,000	Steam-Electric	6,484	10,591	4,106
GBRA - Exelon	C5178	75,000	Steam-Electric	47,642	51,363	3,721
E I DU PONT DE NEMOURS	C3861	33,000	Industrial	26,117	29,365	3,248
MISSION VALLEY TEXTILES, INC	C3829	500	Industrial	289	500	211
SOUTH TEXAS ELECTRIC COOP INC	C3859	1,900	Steam-Electric	456	589	133
STRUCTURAL METALS INC	C3837	34	Industrial	21	34	13
SOUTHWEST TEXAS STATE UNIV	C3866	60	Industrial	22	31	9
CITY OF SAN ANTONIO	C2162	11	Steam-Electric	8	11	3
TOMMIE SMITH BLACKBURN	C1969	15	Industrial	9	11	2
DARRELL G LOCHTE ET AL	C1997	2	Industrial	1	1	0.2

**11 Industrial or Steam-Electric Water Rights had an increase in Minimum Annual Diversion. All are listed.**

# Surface Water Rights - Irrigation

Owner	Water Right	Authorized Permitted Diversion (acft/yr)	Use Type	Baseline - Minimum Annual Diversion (acft/yr)	Bottom Up Program - Minimum Annual Diversion (acft/yr)	Increase in Minimum Annual Diversion (acft/yr)
GBRA - Irrigation	C5178	11,000	Irrigation	5,830	7,771	1,941
WILLIAM K ANDERSON ET UX	P5107	518	Irrigation	23	140	118
KING RANCH INC	C3848	1,800	Irrigation	1,694	1,800	106
SEGUIN MUNICIPAL UTILITIES	C3839	200	Irrigation	121	200	79
KENNETH W WHITEWOOD ET UX	C2006	320	Irrigation	51	109	58
HARRY J WRAY	C2025	155	Irrigation	48	100	51
MIGUEL CALZADA URQUIZA ET UX	C3899	1,180	Irrigation	168	215	47
BOENING ENTERPRISES	P3994	1,056	Irrigation	24	70	45
ERWIN KLEMSTEIN	C2050	136	Irrigation	31	75	43
ZARCO FOWARDING, INC	C2052	232	Irrigation	37	79	42

**151 Irrigation Water Rights had an increase in Minimum Annual Diversion. The Top 10 are listed.**

# Surface Water Rights - Other

Owner	Water Right	Authorized Permitted Diversion (acft/yr)	Use Type	Baseline - Minimum Annual Diversion (acft/yr)	Bottom Up Program - Minimum Annual Diversion (acft/yr)	Increase in Minimum Annual Diversion (acft/yr)
TEXAS PARKS & WILDLIFE DEPT	C3869	500	Fish Hatchery	418	500	82
JIM STORY	STORY	400	?	0	20	20
SHELTON RANCH CORPORATION	C2003	10	Mining	6	8	3
DARRELL G LOCHTE ET AL	C1997	20	Mining	10	10	0.1

**4 Other Water Rights had an increase in Minimum Annual Diversion. All are listed.**

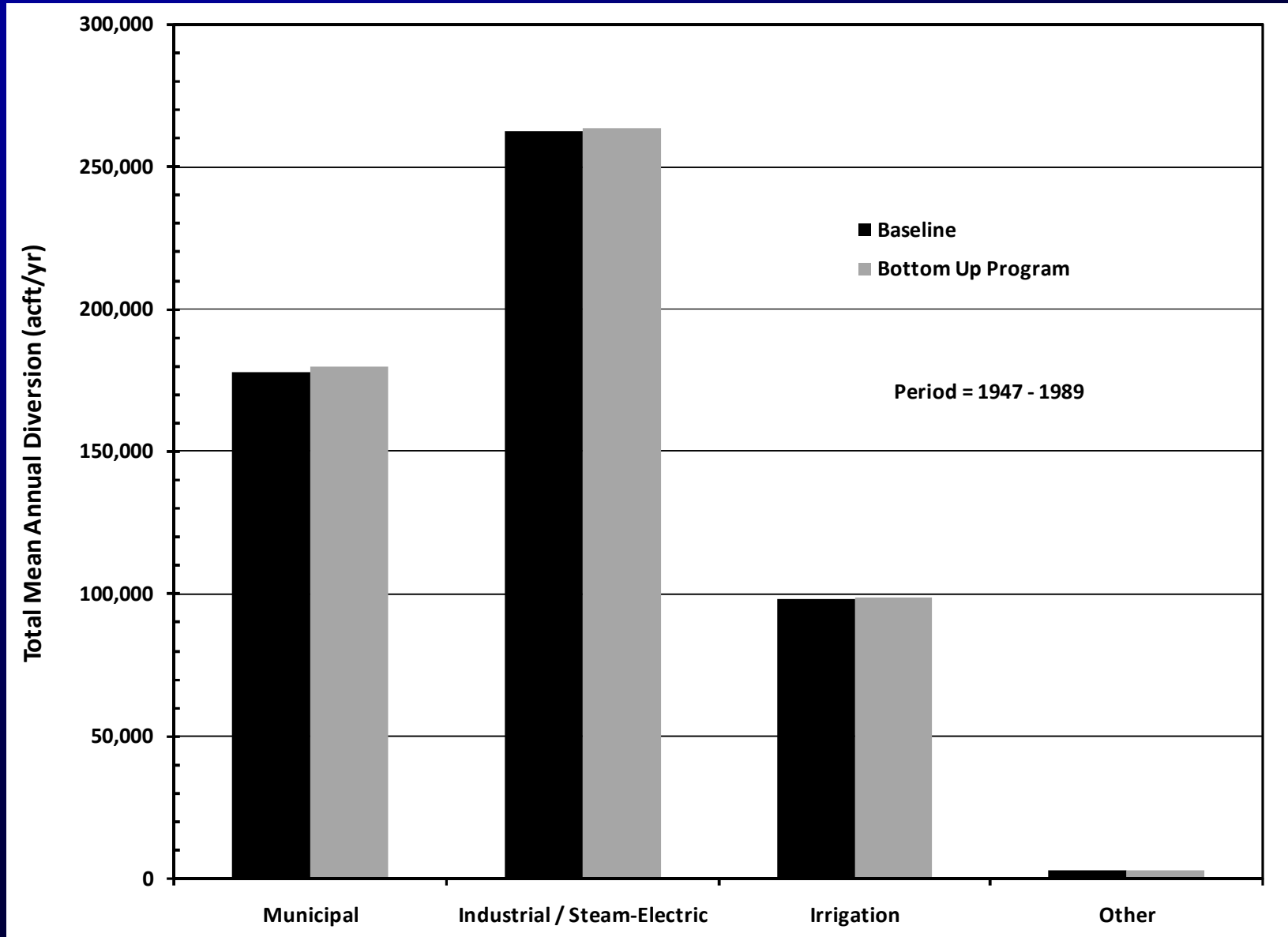
# Surface Water Rights - Hydropower

Owner	Water Right	Authorized Permitted Diversion (acft/yr)	Use Type	Baseline - Minimum Annual Diversion (acft/yr)	Bottom Up Program - Minimum Annual Diversion (acft/yr)	Increase in Minimum Annual Diversion (acft/yr)
NEW BRAUNFELS UTILITIES	C3824	124,870	Hydroelectric	2,511	38,585	36,074
GUADALUPE-BLANCO R A TP-1	C5488	663,892	Hydroelectric	1,321	24,964	23,643
GUADALUPE-BLANCO R A TP-5	C5488	624,781	Hydroelectric	2,333	25,960	23,626
GUADALUPE-BLANCO R A TP-3	C5488	659,995	Hydroelectric	1,310	24,766	23,456
GUADALUPE-BLANCO R A TP-4	C5488	655,323	Hydroelectric	1,305	24,662	23,358
GUADALUPE-BLANCO R A H-4	C5172	585,599	Hydroelectric	4,608	27,358	22,751
GUADALUPE-BLANCO R A H-5	C5172	574,832	Hydroelectric	4,892	27,292	22,400
SOUTHWEST TEXAS STATE UNIV	C3865	64,370	Hydroelectric	22,137	41,991	19,854
CITY OF GONZALES	C3846	796,363	Hydroelectric	0	1,554	1,554
CUERO HYDROELECTRIC, INC.	C3853	538,560	Hydroelectric	0	1,392	1,392

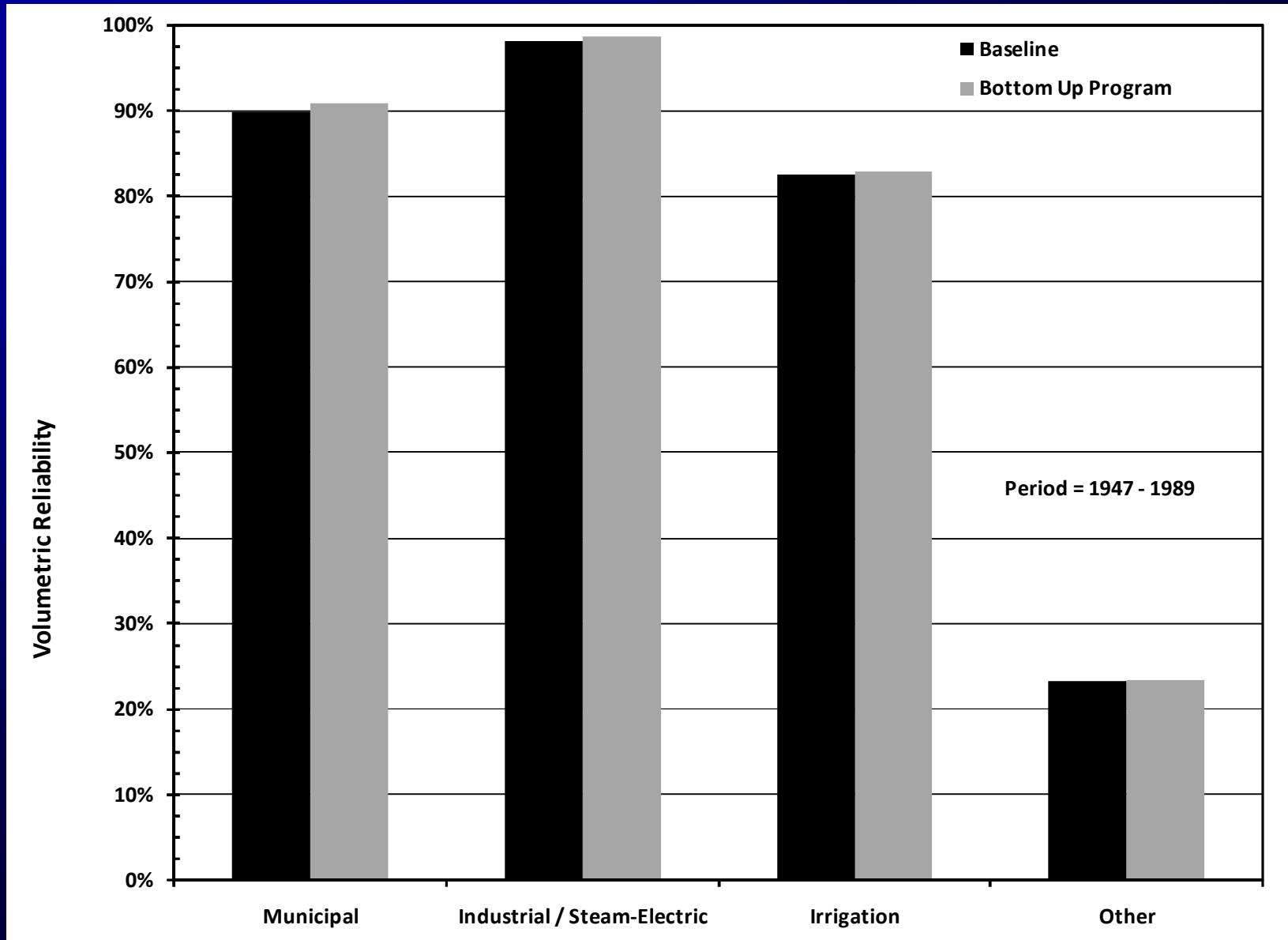
**10 Hydroelectric Water Rights had an increase in Minimum Annual Diversion. All are listed.**

Note: Minimum Annual Diversion values reported in this table are unappropriated streamflows passing through hydropower facilities and do not include concurrent appropriated streamflows passing through hydropower facilities while in delivery to downstream senior water rights.

# Mean Annual Diversions (Surface Water)



# Volumetric Reliability (Surface Water)





## ***Discussion***



***Questions &  
Answers***