

**Appendix A: Preliminary Impact Fee Analysis**  
**Estimate of the Cost to Denver Water Customers**  
**Due to Potential Impact Fees on Trans-Mountain Diversions**  
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This report evaluates the annual cost to Denver Water customers if an impact fee is applied to trans-mountain diversions used in its water supply. As upper west slope streams have already been severely impacted by trans-mountain diversions to the east slope cities, including Denver, the impact fee would provide money for stream restoration projects in the upper west slope streams, upgrades to waste water treatment plants to facilitate compliance with discharge standards, and additional monitoring in the basins to evaluate the health of the streams.

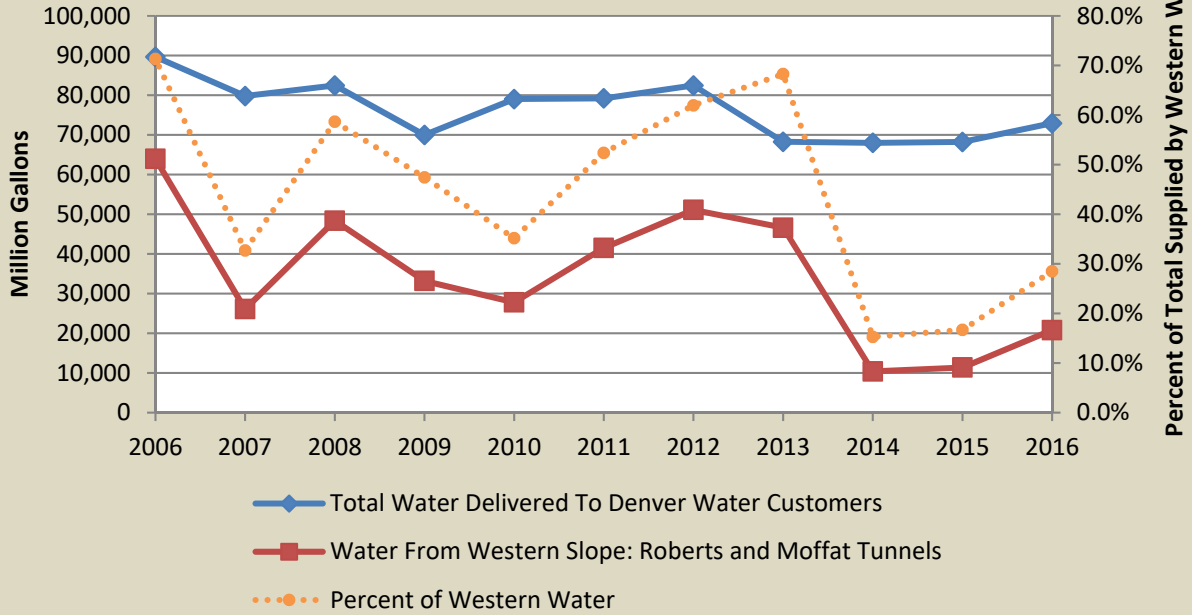
Denver Water Fresh Water Use

Trans-mountain diversions through the Roberts and Moffat Tunnels contribute to the water supply for Denver Water. Denver Water serves water customers in its Combined Service Area (CSA) which includes “Inside the City” and County of Denver as well as entities “Outside the City but within the CSA”. Via contracts, Denver Water also supplies water to several entities which are both “Outside the City and the CSA”. Water use data was obtained from annual Comprehensive Financial Reports published by Denver Water which are available online for 2006 to 2016. A map of the CSA is shown on page III-13 of the DW 2015 annual report (attached). The reports distinguish between treated or potable and raw or non-potable water use in each area. Also included is the annual number of water taps within the CSA that were supplied with treated water. Raw water customers are noted individually – for instance, those located Outside the CSA - or grouped together – such as those located Outside the City but within the CSA. Non-potable water deliveries include effluent and reuse sales: these categories are not included in this analysis because they do not require additional fresh water supply.

Moffat and Roberts Tunnels Diversions

Diversion records for Roberts and Moffat Tunnels are available from the online Colorado Decision Support System (CDSS). The percentage of trans-mountain water of the total water use by Denver Water varies from year to year as shown in Figure 1. Of the trans-mountain diversions, the percent delivered by the Moffat Tunnel also varies from year to year as shown in Figure 2. It is anticipated that the impact fee revenue would be provided to the basin of origin in proportion to the amount of water diverted out of the basin. The 2006 to 2016 timeframe was chosen based on online availability to financial records. The 2006 to 2016 time period reflected the variability of tunnel flows over the 1975 to 2017 period of record (Table 1). Revenue generated by various levels of impact fee, from 1 cent per gallon to 1/20 cent per gallon, is shown in Figure 3.

**Figure 1: Total Water Supplied to Denver Water's Customers and Water From Western Slope 2006 to 2016**



**Figure 2: Combined, Roberts, and Moffat Tunnel Diversions: 2006 to 2016**

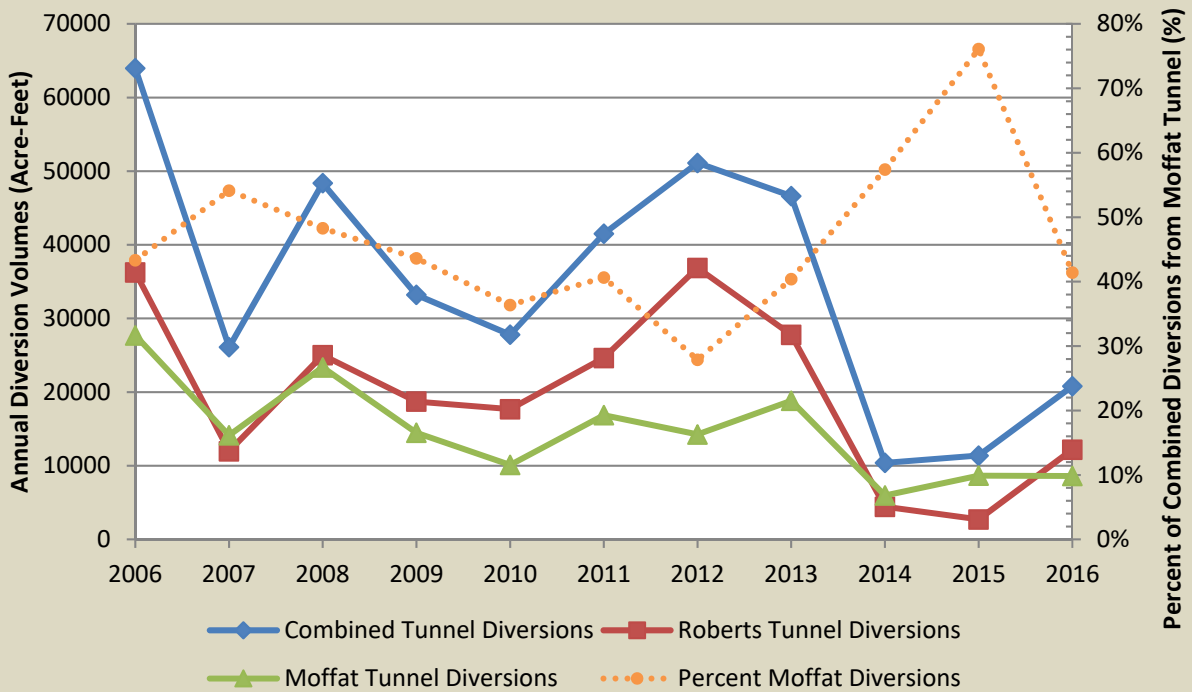


Table 1: Comparison of Average Annual Diversions Between 2006 to 2016 and 1975 to 2017 Time Periods								
Average Moffat Diversions (millions gallons)			Average Roberts Diversions (millions gallons)			Average Combined Diversions (millions gallons)		
2006 to 2016	1975 to 2017	Diff.	2006 to 2016	1975 to 2017	Diff.	2006 to 2016	1975 to 2017	Diff.
14,816	17,253	-2,437	19,845	18818	1,027	34,661	35746	-1,085

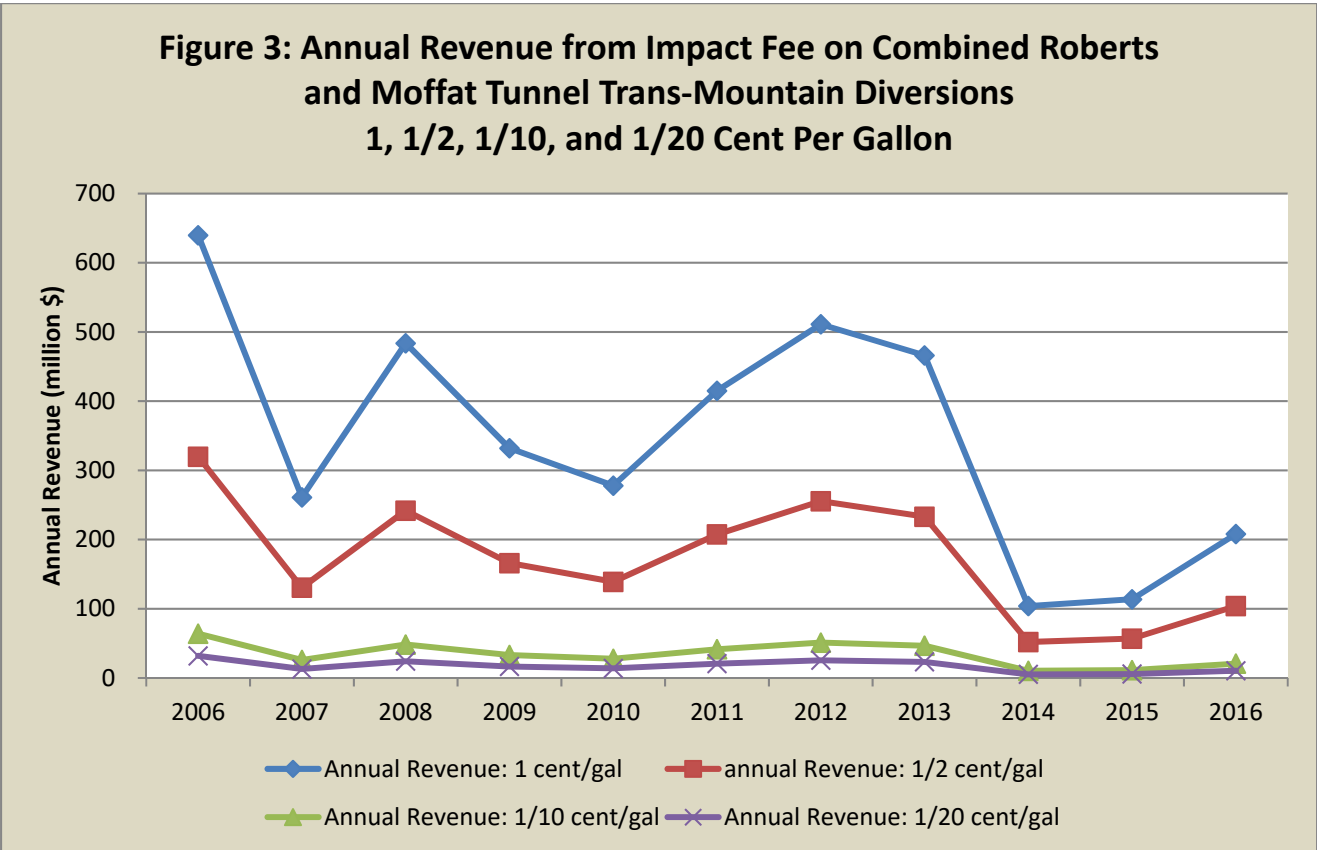


Table 2: Annual Revenue in Millions of Dollars From Impact Fee -2006 to 2016				
Impact Fee	1 cent/gallon	½ cent/gallon	1/10 cent/gallon	1/20 cent/gallon
Average Revenue	347	173	34.7	17.3
Median Revenue	332	166	33.2	16.6
Maximum Revenue	640	320	64.0	32.0
Minimum Revenue	104	52	10.4	5.2

### Cost of Impact Fee Revenues for Denver Water Customers

As shown in Figure 1, the percentage of trans-basin water in water supplies (average of 34,661 million gallons) provided to Denver Water customers (average of 76,374 million gallons) ranges from 15 to 70 percent (averaging 44 percent) in the 2006 to 2016 time period. Therefore, the cost per gallon for Denver Water customers will be less than the impact fee applied to gallons of trans-basin diversions. The charge per gallon for water customers required to meet the impact fee was calculated for each year and for each level of impact fee between 1 cent/gallon and 1/20 cent/gallon. The average, maximum, and minimum cost per gallon for customers from 2006 to 2016 is shown in Table 3.

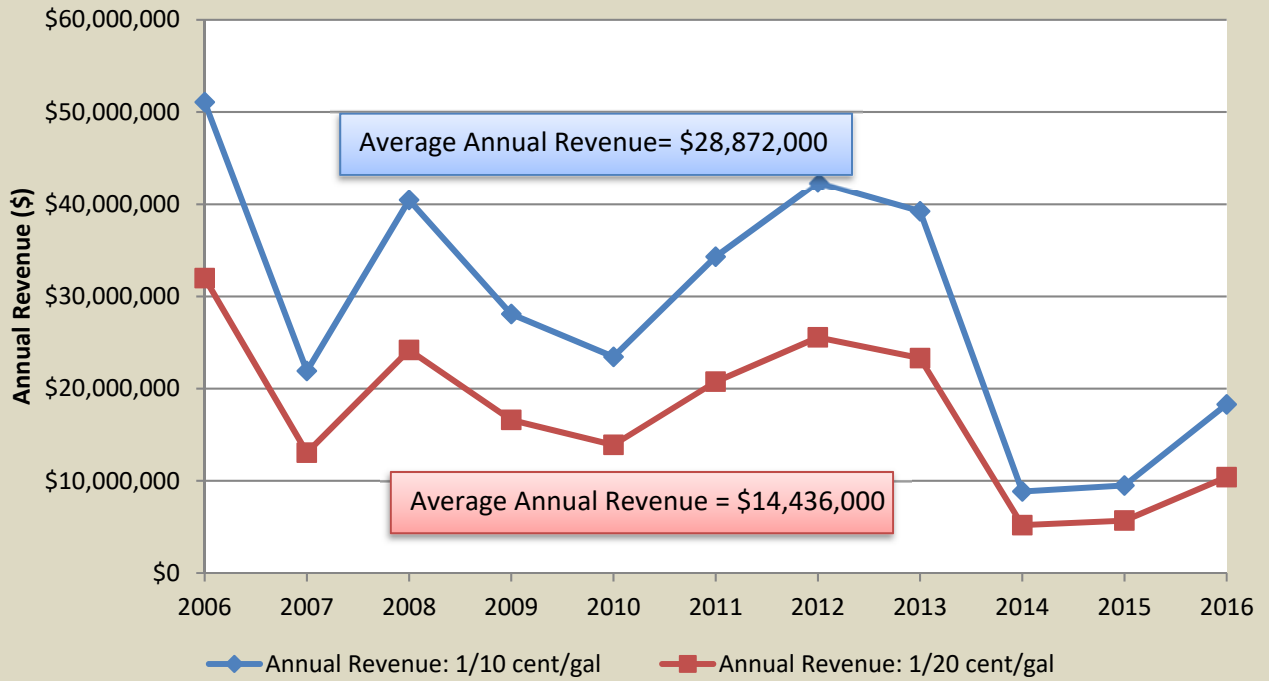
<b>Table 3: Cost/Gallon to Customers From Impact Fee -2006 to 2016</b>				
Impact Fee	1 cent/gallon	½ cent/gallon	1/10 cent/gallon	1/20 cent/gallon
Average Cost	\$0.0044	\$0.0022	\$0.00044	\$0.00022
Maximum Cost	\$0.0071	\$0.0036	\$0.00071	\$0.00036
Minimum Cost	\$0.0015	\$0.0008	\$0.00015	\$0.00008

The total water delivered to Denver Water customers was divided into the various categories of water use:

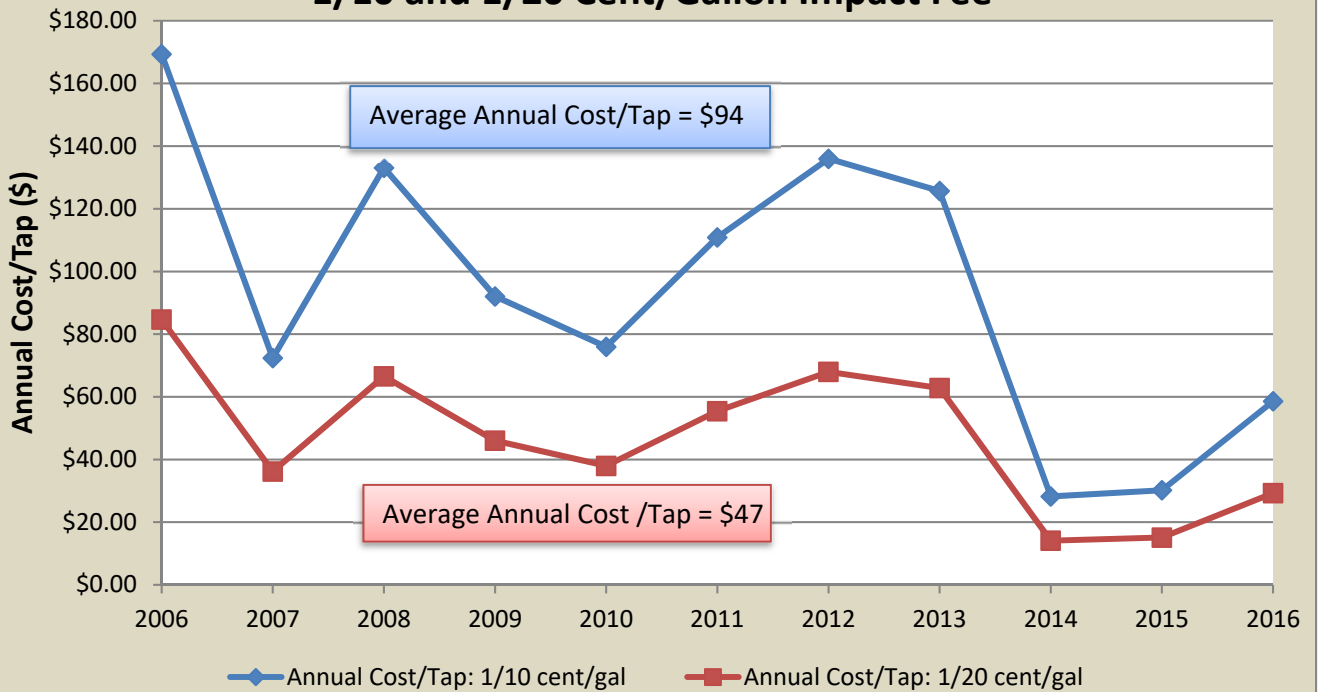
- Treated Water to Customers in the CSA for which the number of taps is known,
- Treated Water to Customers Outside of the CSA.
- Raw Water to Customers In and Outside of the CSA
- Other Raw Water Customers

Treated water Inside the CSA was supplied to between 301,620 and 314,598 customers (average of 308,750). Outside the CSA, the main water customers for treated water under fixed water supply contracts were Broomfield, South Adams County Special District, Suncor Energy, and East Cherry Creek. In 2006 and 2007, treated water was also supplied to Thornton and Aurora. The main customers provided raw water Inside and Outside of the CSA were Arvada, North Table Mountain, Centennial, and the group of customers located Inside the CSA but Outside the City. These raw water customers used, on average, 68 percent of the total raw water supplied by Denver Water and would be the most impacted by generating revenue to meet the Impact Fee on Trans-basin diversions. Last, the financial statements noted an “Other Raw Water” category including City Ditch at Washington Park and the City of Englewood. The annual cost for each customer category, and the individual water users in those categories, was calculated using their annual water use the customer cost per gallon need to meet the total annual impact fee on trans-mountain diversions. Results are presented for the 1/10 and 1/20 cent per gallon impact fee. Annual revenue and costs per tap for treated water customers Inside the CSA are shown in Figures 4 and 5. Annual costs for treated water customers Outside the CSA are shown in Figures 6 and 7 for Impact Fees of 1/10 and 1/20 cent/gallon, respectively.

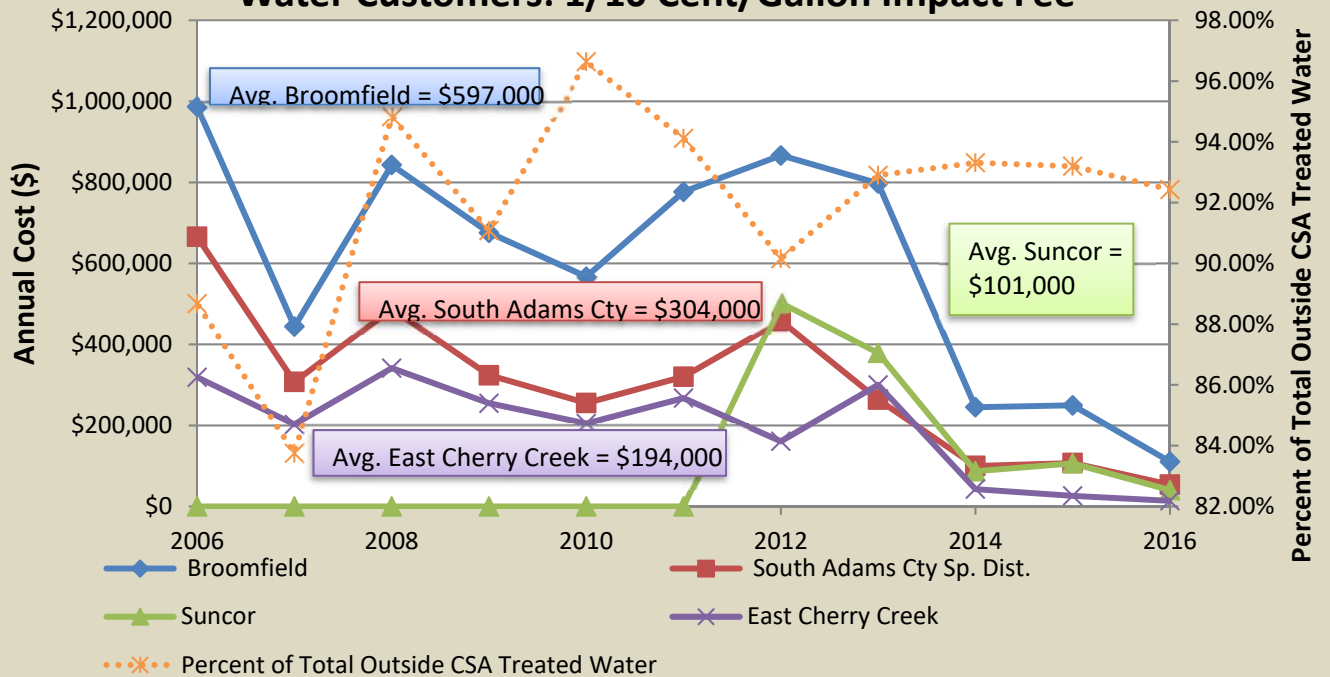
**Figure 4: Inside CSA Treated Water: Annual Revenue  
1/10 and 1/20 Cent/Gallon Impact Fee**



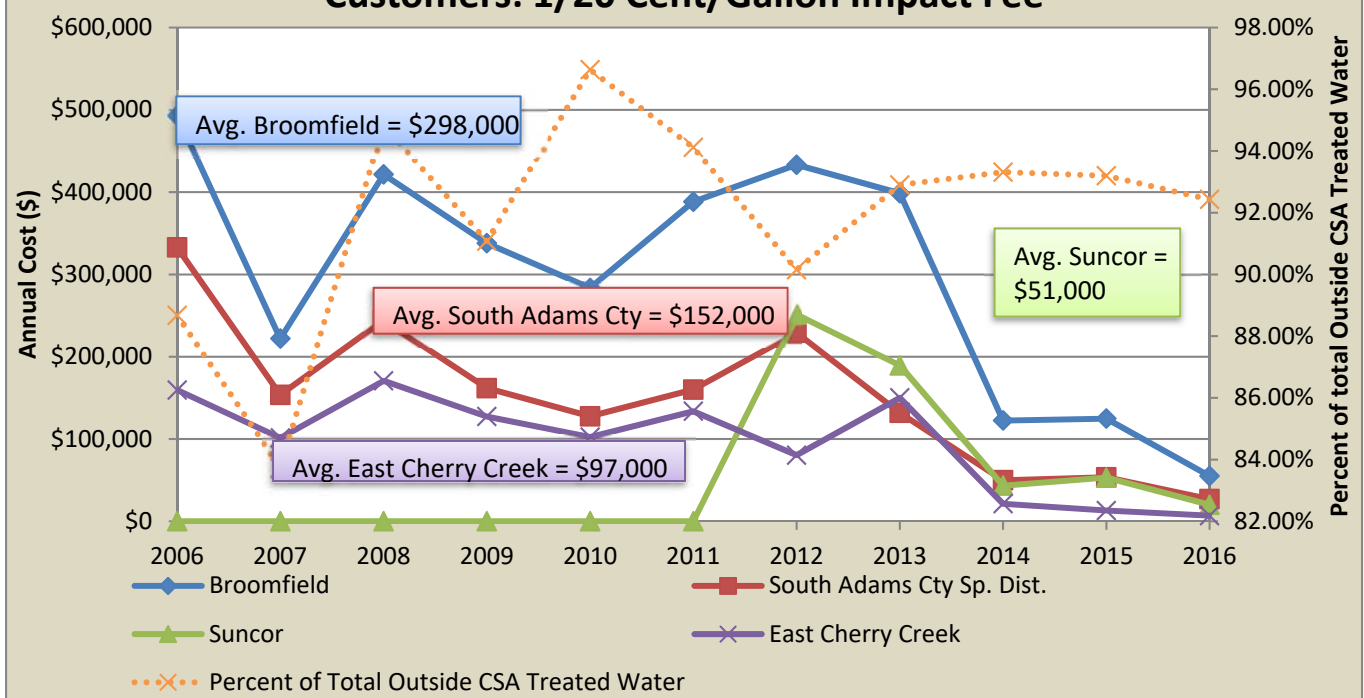
**Figure 5: Inside CSA Treated Water: Annual Cost/Tap  
1/10 and 1/20 Cent/Gallon Impact Fee**



**Figure 6: Annual Cost To Four Main Outside CSA Treated Water Customers: 1/10 Cent/Gallon Impact Fee**

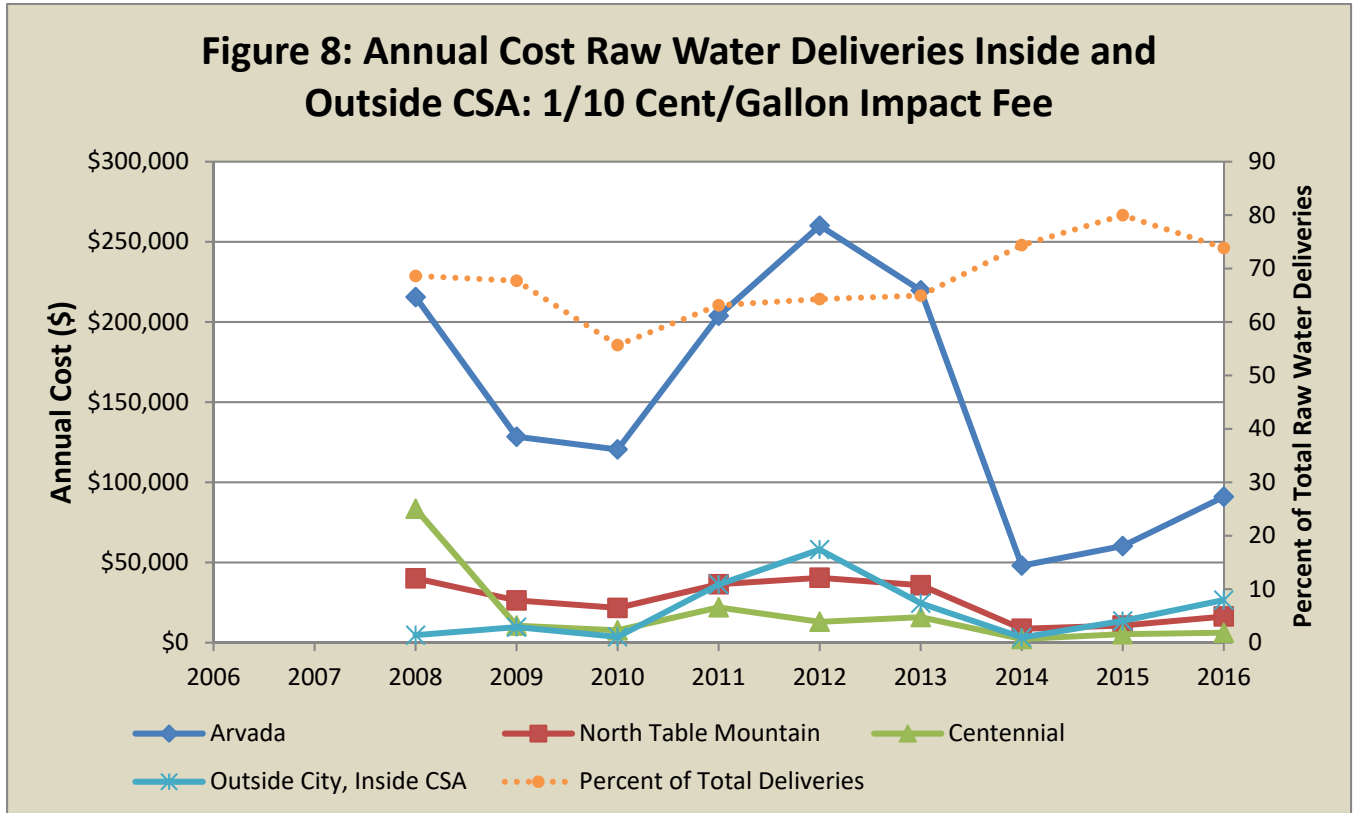


**Figure 7: Annual Cost for Outside CSA Treated Water Customers: 1/20 Cent/Gallon Impact Fee**

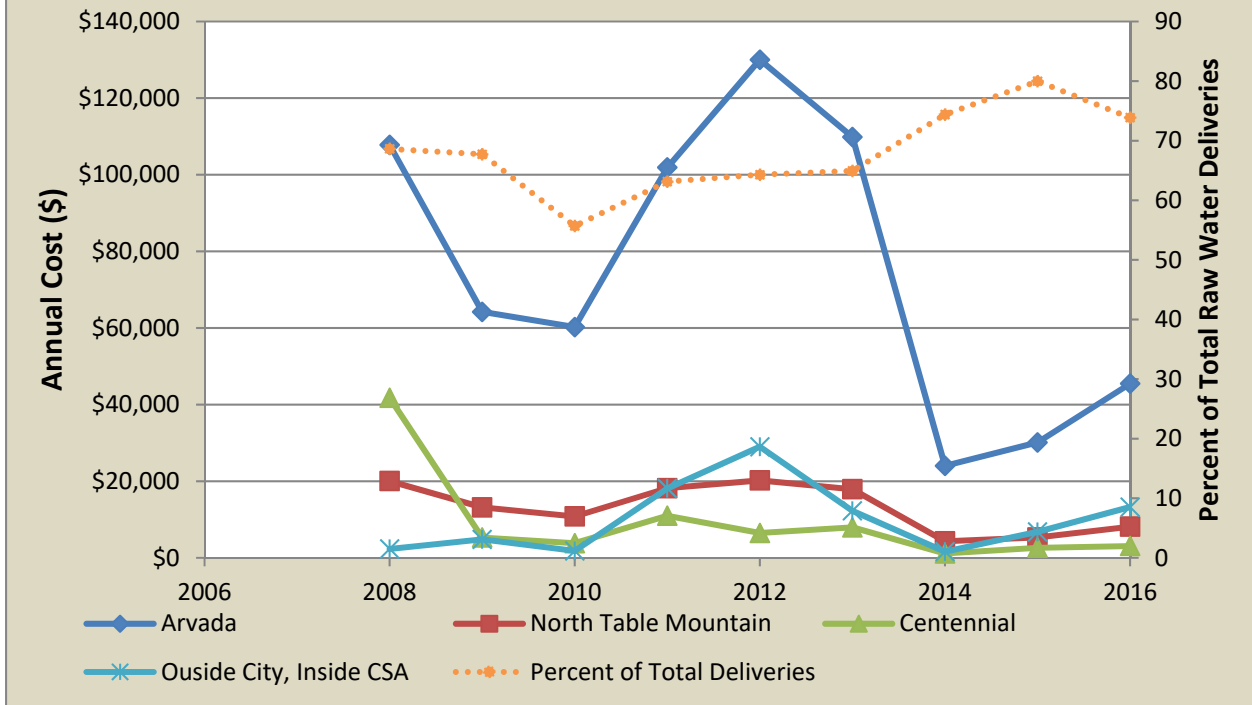


Annual costs for the main raw water customers located Inside and Outside the CSA are shown in Figures 8 and 9 for Impact Fees of 1/10 and 1/20 cent/gallon Impact Fee on trans-basin diversions, respectively. Average annual costs for these entities and impact fees, respectively, are:

- Arvada; \$150,000 and \$75,000,
- North Table Mountain; \$26,000 and 13,000,
- Centennial; \$18,500 and \$9,300,
- Outside the City, Inside the CSA; \$20,000 and \$10,000.



**Figure 9: Annual Cost Raw Water Deliveries Inside and Outside CSA: 1/20 Cent/Gallon Impact Fee**

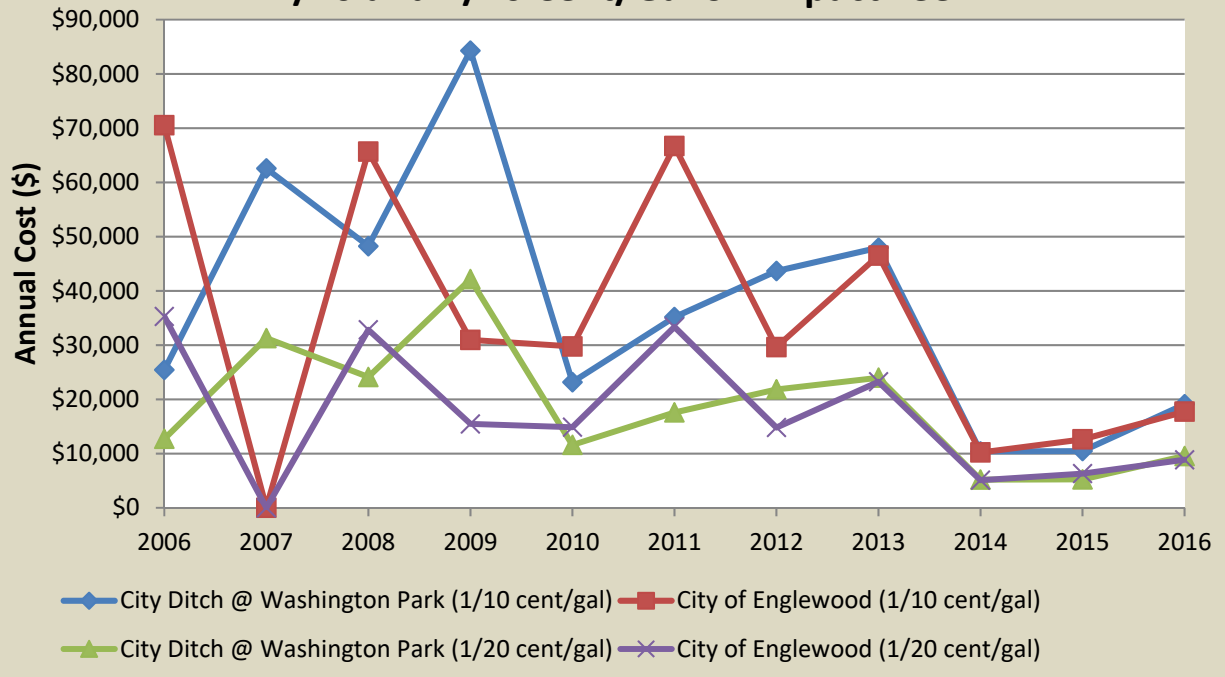


Annual costs for the City Ditch at Washington Park and City of Englewood are shown in Figure 10. Average annual costs for these entities at 1/10 and 1/20 cent/gallon impact fee are:

- City Ditch at Washington Park; \$37,300 and \$18,700,
- City of Englewood; \$34,600 and \$17,300.



**Figure 10: Annual Cost Other Raw Water Deliveries:  
1/10 and 1/20 Cent/Gallon Impact Fee**



## Appendix B: Calculations for Combined Roberts and Moffat Tunnels

cdss website only had data to 1975 though the tunnel was completed in 1962. therefore the combined analysis went from 1975 to 2017

Water year data include diversions from October to December of the previous year and Jan to Sept in the current year.

	Rob+Moff		million gallons	1 cent/gal		0.01		1/2 cent/gal		1/10 cent/gal		1/20 cent/gal	
	(AF)	gallons		<u>\$0.01</u>	<u>millions</u>	<u>0.005</u>	<u>millions</u>	<u>\$0.001</u>	<u>millions</u>	<u>\$0.0005</u>	<u>millions</u>		
1975	105163	3.43E+10	34268	342,675,754	343	171,337,877	171	34,267,575	34.3	17133788	17.1		
1976	118479	3.86E+10	38607	386,065,949	386	193,032,975	193	38,606,595	38.6	19303297	19.3		
1977	142861	4.66E+10	46551	465,512,910	466	232,756,455	233	46,551,291	46.6	23275646	23.3		
1978	190738	6.22E+10	62152	621,521,936	622	310,760,968	311	62,152,194	62.2	31076097	31.1		
1979	125284	4.08E+10	40824	408,237,838	408	204,118,919	204	40,823,784	40.8	20411892	20.4		
1980	90206	2.94E+10	29394	293,937,405	294	146,968,702	147	29,393,740	29.4	14696870	14.7		
1981	164947	5.37E+10	53748	537,481,710	537	268,740,855	269	53,748,171	53.7	26874086	26.9		
1982	155389	5.06E+10	50634	506,335,591	506	253,167,795	253	50,633,559	50.6	25316780	25.3		
1983	44392	1.45E+10	14465	144,651,721	145	72,325,861	72	14,465,172	14.5	7232586	7.2		
1984	50831	1.66E+10	16563	165,632,089	166	82,816,045	83	16,563,209	16.6	8281604	8.3		
1985	77820	2.54E+10	25358	253,575,647	254	126,787,824	127	25,357,565	25.4	12678782	12.7		
1986	80394	2.62E+10	26196	261,964,861	262	130,982,431	131	26,196,486	26.2	13098243	13.1		
1987	65475	2.13E+10	21335	213,352,247	213	106,676,123	107	21,335,225	21.3	10667612	10.7		
1988	128224	4.18E+10	41782	417,820,637	418	208,910,318	209	41,782,064	41.8	20891032	20.9		
1989													
1990													
1991													
1992	103750	3.38E+10	33807	338,070,472	338	169,035,236	169	33,807,047	33.8	16903524	16.9		
1993	144031	4.69E+10	46932	469,324,874	469	234,662,437	235	46,932,487	46.9	23466244	23.5		
1994	113303	3.69E+10	36920	369,199,083	369	184,599,541	185	36,919,908	36.9	18459954	18.5		
1995	74414	2.42E+10	24248	242,480,125	242	121,240,063	121	24,248,013	24.2	12124006	12.1		
1996	87449	2.85E+10	28495	284,952,118	285	142,476,059	142	28,495,212	28.5	14247606	14.2		
1997	105222	3.43E+10	34287	342,866,858	343	171,433,429	171	34,286,686	34.3	17143343	17.1		
1998	62913	2.05E+10	20500	205,001,818	205	102,500,909	103	20,500,182	20.5	10250091	10.3		
1999	58207	1.90E+10	18967	189,667,681	190	94,833,841	95	18,966,768	19.0	9483384	9.5		
2000	139804	4.56E+10	45555	455,553,520	456	227,776,760	228	45,555,352	45.6	22777676	22.8		
2001	148932	4.85E+10	48530	485,296,704	485	242,648,352	243	48,529,670	48.5	24264835	24.3		
2002	133313	4.34E+10	43440	434,402,769	434	217,201,385	217	43,440,277	43.4	21720138	21.7		
2003	134063	4.37E+10	43684	436,844,707	437	218,422,353	218	43,684,471	43.7	21842235	21.8		

2004	124166	4.05E+10	40460	404,597,500	405	202,298,750	202	40,459,750	40.5	20229875	20.2
2005	113048	3.68E+10	36837	368,369,225	368	184,184,613	184	36,836,923	36.8	18418461	18.4
2006	196315	6.40E+10	63969	639,694,013	640	319,847,006	320	63,969,401	64.0	31984701	32.0
2007	80112	2.61E+10	26105	261,046,861	261	130,523,430	131	26,104,686	26.1	13052343	13.1
2008	148462	4.84E+10	48377	483,766,054	484	241,883,027	242	48,376,605	48.4	24188303	24.2
2009	101897	3.32E+10	33203	332,032,730	332	166,016,365	166	33,203,273	33.2	16601637	16.6
2010	85314	2.78E+10	27800	277,996,056	278	138,998,028	139	27,799,606	27.8	13899803	13.9
2011	127376	4.15E+10	41505	415,054,670	415	207,527,335	208	41,505,467	41.5	20752734	20.8
2012	156871	5.11E+10	51116	511,164,371	511	255,582,185	256	51,116,437	51.1	25558219	25.6
2013	143068	4.66E+10	46619	466,187,551	466	233,093,775	233	46,618,755	46.6	23309378	23.3
2014	31899	1.04E+10	10394	103,942,031	104	51,971,016	52	10,394,203	10.4	5197102	5.2
2015	34923	1.14E+10	11380	113,797,768	114	56,898,884	57	11,379,777	11.4	5689888	5.7
2016	63830	2.08E+10	20799	207,990,456	208	103,995,228	104	20,799,046	20.8	10399523	10.4
2017	135080	4.40E+10	44016	440,157,986	440	220,078,993	220	44,015,799	44.0	22007899	22.0

	1 cent/ gal	0.01 cent/ gal	1/2 cent/ gal	1/10 cent/ gal	1/20 cent/ gal
Totals for 1975 to 2016 (millions \$)	13,858		6,929	1,386	693
Average Annual Impact Fees (millions \$) 1975-2017	357		179	35.7	17.9
Median Annual Impact Fee (millions \$) 1975-2017	369		184	36.9	18.4
Maximum	640		320	64.0	32.0
Minimum	104		52	10.4	5.2

	1 cent/ gal	0.01 cent/ gal	1/2 cent/ gal	1/10 cent/ gal	1/20 cent/ gal
Average Annual Impact Fees (millions \$) 2006-2016	347		173	34.7	17.3
Median Annual Impact Fee (millions \$) 2006-2016	332		166	33.2	16.6
Maximum	640		320	64.0	32.0
Minimum	104		52	10.4	5.2

percent of combined diversions that are from Moffat Tunnel  
millions of gallons  
combined    Moffat    % of combined

2006	63969	27706	43%
2007	26105	14129	54%
2008	48377	23357	48%
2009	33203	14485	44%
2010	27800	10112	36%
2011	41505	16872	41%
2012	51116	14249	28%
2013	46619	18828	40%
2014	10394	5965	57%
2015	11380	8659	76%
2016	20799	8612	41%

average

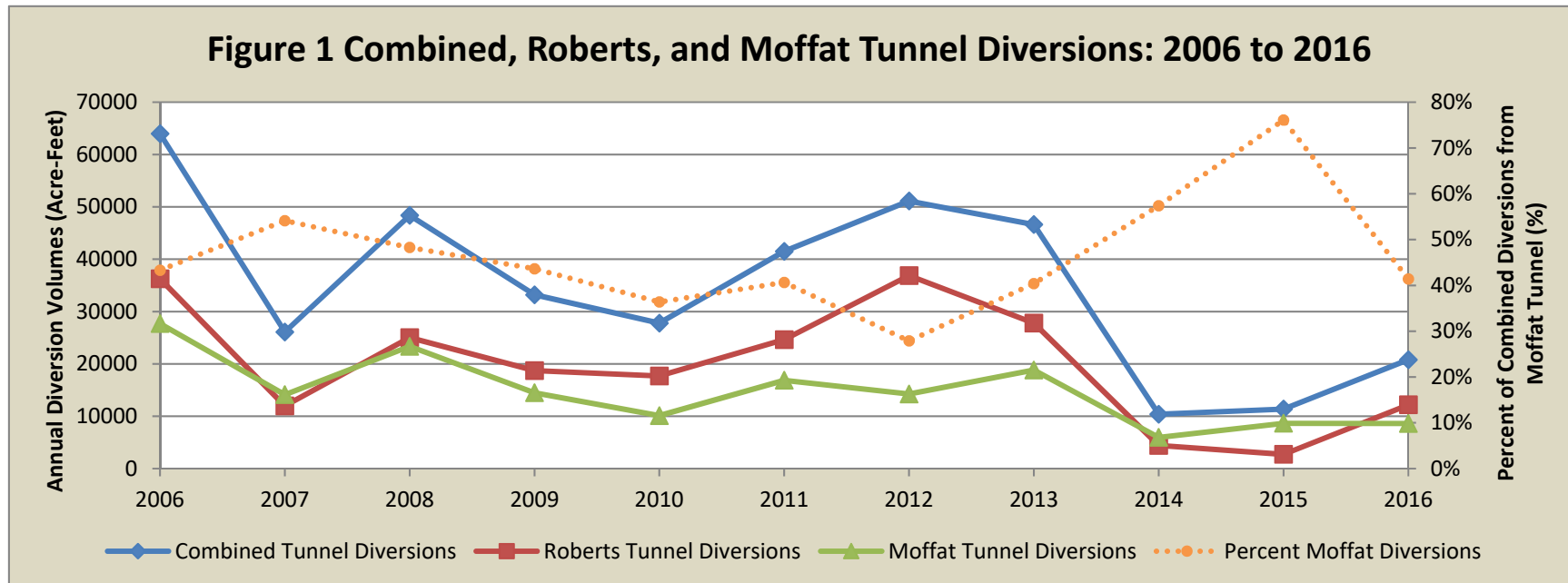
14816

average combined flows (millions gallons)

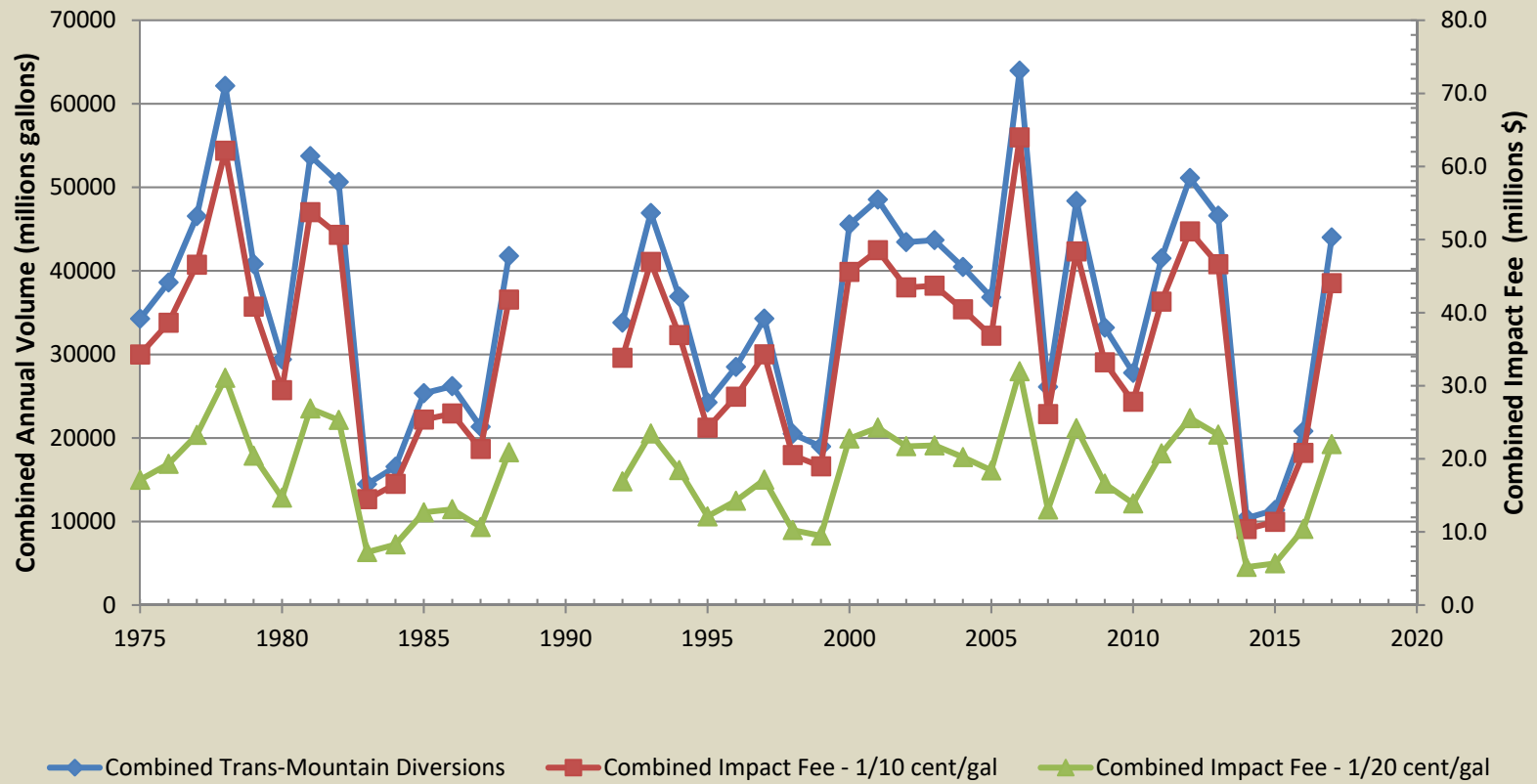
34,661 2006 to 2016

average of combined flows (million gallons)

35746 1975 to 2017



**Combined Roberts and Moffat Tunnel Annual Diversions,  
Annual Impact Fee at 1/10th and 1/20th cent/gallon: 1975 to 2017**



**Figure 3: Annual Revenue from Impact Fee on Combined Roberts and Moffat Tunnel Trans-Mountain Diversions  
1, 1/2, 1/10, and 1/20 Cent Per Gallon**

