

Method & Data for Developing Projections for Water Plans

Presented to
Western States Water Council Workshop
January 16, 2018

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Texas Water Development Board

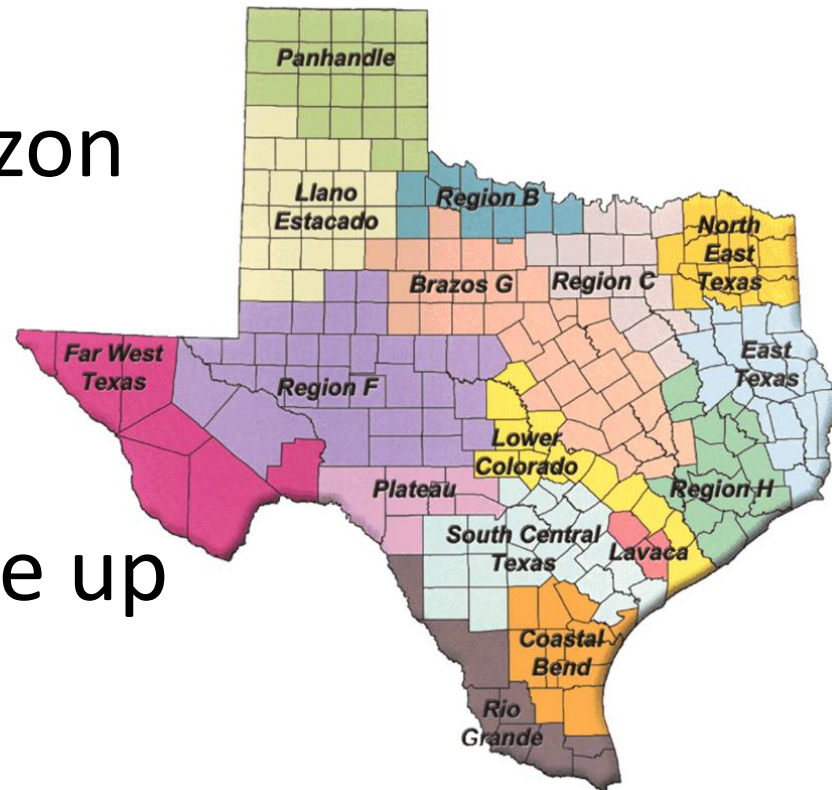
The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

Overview

- Basics of Planning
- Projections & data
 - Timeline
 - Population and municipal projections
 - Non-municipal projections
 - Revision process

Basic Planning Parameters

- Meet **drought of record** water needs
- 50-year planning horizon (2020-2070)
- 5-year planning cycle
- 16 Regional plans make up the state water plan



2,900 WUGs (Water User Groups)

Municipal

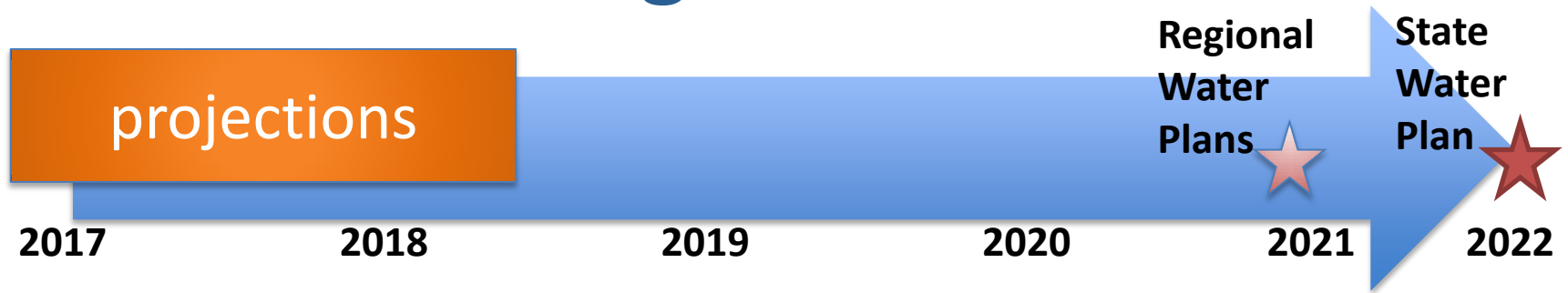
- Utilities: Annual water use > 100 acre-feet
- County-Others: small water systems + rural population

Non-Municipal:

- Irrigation
- Livestock
- Mining
- Manufacturing
- Steam Electric



Timing & Process



Developing Draft Projection

- QC historical data
- Draft projections + supporting data for RWPGs

Revision Process

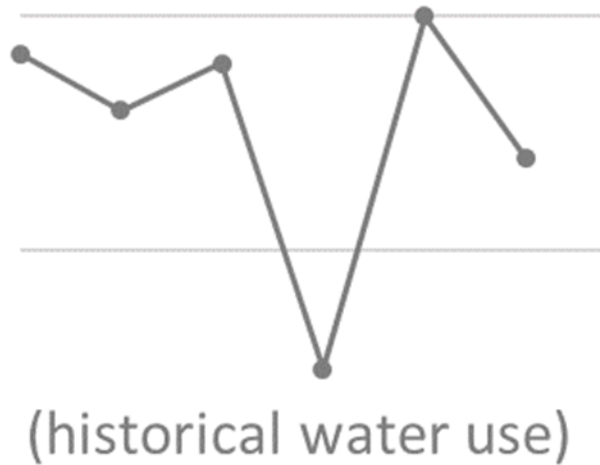
- RWPGs review & request changes
- TWDB staff review and recommendation

Final Projections

- Coordinates with 3 agencies
- TWDB Board adoption

Projection

What do we need?

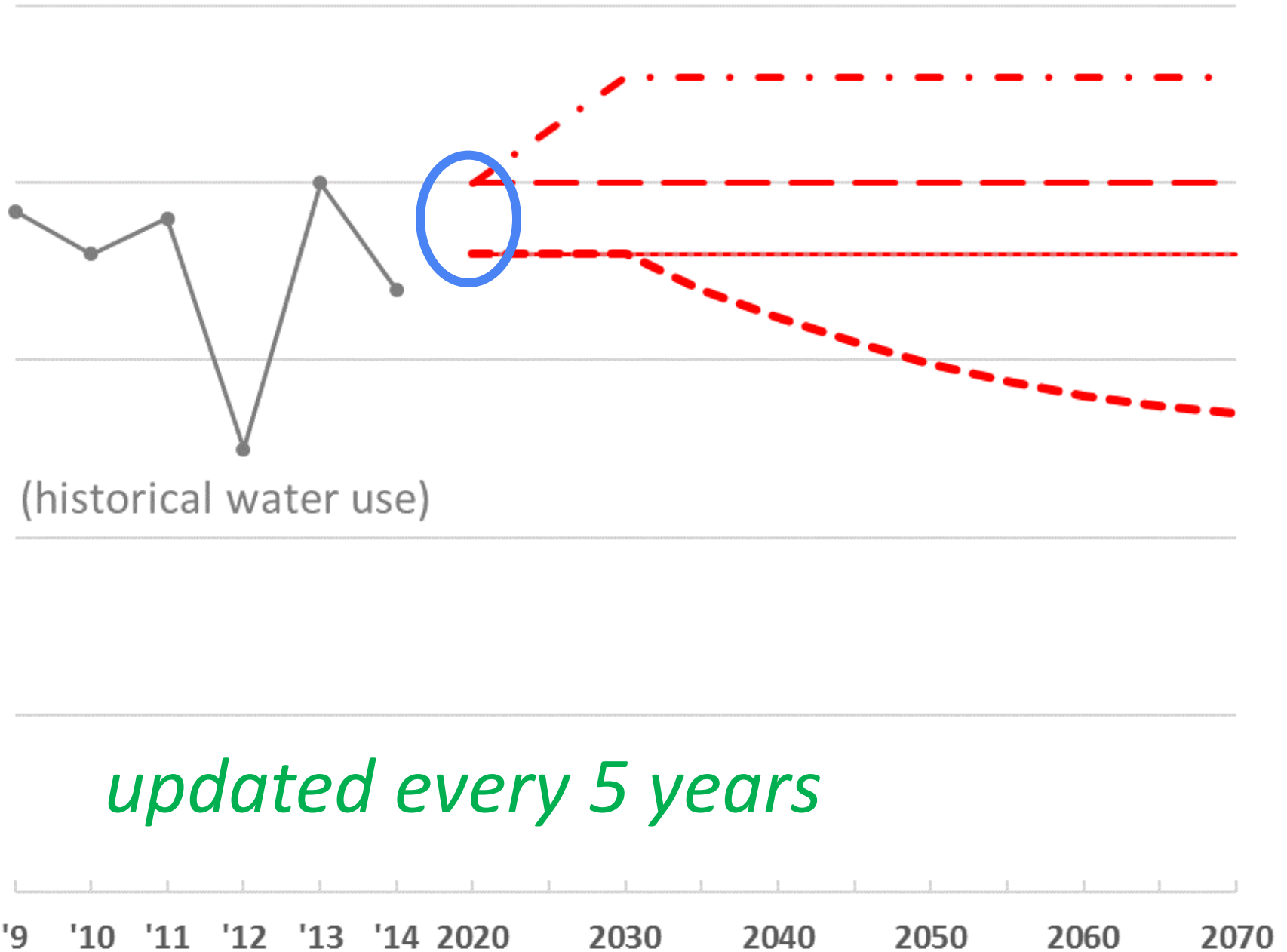


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Baseline

'9 '10 '11 '12 '13 '14 2020 2030 2040 2050 2060 2070

Illustrative Demand Trends



Historical Water Use Data – basis of projections

- **Annual Water Use Survey (WUS):**

- Appx. 4,500 PWSs + 2,000 industrial facilities
- TWDB staff developed annual water use estimates (irrigation, livestock & fracking)
- Most recent 5 years

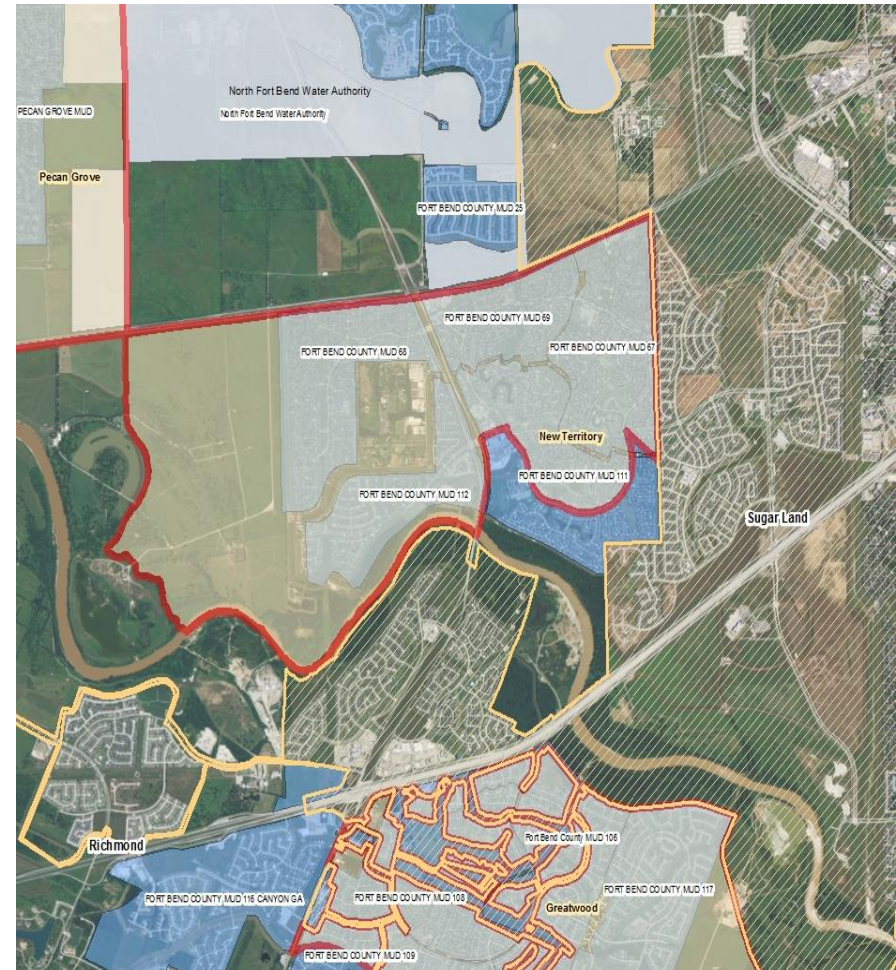
Municipal Projection

- Historical water use by utility:
 - WUS reported use
 - Population est
 - $GPCD = (Net\ Use / Pop / 365)$
- Baseline: dry-year 2011 GPCD
- Trend: projected population growth



Population Estimates

- Population Est:
 - Permanent residents
 - WUS Pop served
 - GIS estimates using utility boundaries
 - # of connection x person per household



Historical Population & GPCD Estimates

Entity Name	County	Historical Population Estimates						Historical Net Use Estimates						Historical GPCD Estimates					
		2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015
AMARILLO	POTTER	109,045	109,742	110,927	112,125	113,246	114,470	22,710	27,416	25,481	23,106	22,300	18,724	186	223	205	184	176	146
AMARILLO	RANDALL	88,540	89,106	90,068	91,041	91,951	92,945	18,439	22,261	20,690	18,762	18,106	15,203	186	223	205	184	176	146
BOOKER	LIPSCOMB	1,497	1,680	1,680	1,680	1,680	1,760	276	445	538	283	283	326	164	237	286	151	151	166
BOOKER	OCHILTREE	19	21	21	21	21	22	3	6	7	4	4	4	164	237	286	151	151	166
BORGER	HUTCHINSON	13,039	12,165	12,165	12,172	12,172	12,172	3,604	3,266	2,218	2,518	2,298	2,559	247	240	163	185	169	188
CACTUS MUNICIPAL WATER SYSTEM	MOORE	3,179	4,157	4,402	4,402	4,402	4,402	741	1,066	962	991	737	666	208	229	195	201	150	135
CANADIAN	HEMPHILL	2,775	2,828	2,679	2,549	2,918	3,020	611	789	744	680	698	559	197	249	248	238	214	165
CANYON	RANDALL	11,860	11,663	11,665	11,665	12,013	12,452	2,381	3,096	2,904	2,783	2,510	2,344	179	237	222	213	187	168
CHILDRESS	CHILDRESS	5,897	5,361	5,361	5,361	5,361	5,361	1,447	1,557	1,465	1,317	1,331	1,389	219	259	244	219	222	231
CLARENDON	DONLEY	1,992	2,128	2,128	2,042	2,051	2,042	314	385	335	278	263	284	141	161	141	122	115	124
CLAUDE MUNICIPAL WATER SYSTEM	ARMSTRONG	1,202	1,088	1,088	1,088	1,088	1,088	276	378	349	309	273	246	205	310	286	254	224	202
DALHART	DALLAM	5,393	5,456	5,583	5,647	5,710	5,774	1,387	1,707	1,642	1,517	1,388	1,441	230	279	262	240	217	223
DALHART	HARTLEY	2,537	2,567	2,627	2,656	2,686	2,716	652	803	772	713	653	678	230	279	262	240	217	223
DARROUZETT	LIPSCOMB	424	423	490	490	490	490	93	127	62	62	62	62	196	268	113	113	113	113
DUMAS	MOORE	14,884	14,891	13,588	13,588	13,588	14,891	2,339	3,279	2,937	2,876	2,663	2,466	140	197	193	189	175	148
FOLLETT	LIPSCOMB	424	424	424	480	494	494	134	134	201	127	160	135	281	281	423	236	289	245
FRITCH	HUTCHINSON	2,861	2,861	5,012	5,012	5,012	5,012	576	576	598	332	1,119	1,119	180	180	107	59	199	199
FRITCH	MOORE	13	13	23	23	23	23	3	3	3	2	5	5	180	180	107	59	199	199
GROOM MUNICIPAL WATER SYSTEM	CARSON	568	568	568	568	568	568	133	187	177	140	137	111	208	294	278	220	215	174
GRUVER	HANSFORD	1,353	1,353	1,001	925	965	965	294	294	415	377	354	324	194	194	370	363	327	300
HAPPY	RANDALL	64	64	64	64	64	64	10	10	10	10	10	10	143	143	143	143	143	143
HARTLEY WSC	HARTLEY	623	697	697	697	705	738	-	236	204	195	192	164	-	303	261	250	243	199
HIGGINS MUNICIPAL WATER SYSTEM	LIPSCOMB	397	397	397	397	397	397	80	121	121	82	86	79	180	271	273	184	193	177
LAKE TANGLEWOOD	RANDALL	1,096	1,089	1,096	1,096	1,096	1,096	226	328	293	285	259	212	184	269	239	232	211	172
MCLEAN MUNICIPAL WATER SUPPLY	GRAY	800	896	896	896	896	896	177	199	186	186	186	186	197	198	186	186	186	186
MEMPHIS	HALL	2,309	2,309	2,299	2,193	2,193	2,193	411	411	368	350	347	308	159	159	143	142	141	125
MIAMI	ROBERTS	600	598	600	600	600	550	129	198	179	168	176	149	193	295	266	250	262	242
PAMPA MUNICIPAL WATER SYSTEM	GRAY	17,874	17,981	17,981	17,874	18,485	18,262	3,316	3,441	3,218	3,232	2,835	2,812	166	171	160	161	137	137
PANHANDLE MUNICIPAL WATER SYSTEM	CARSON	2,470	2,490	2,339	2,339	2,339	2,339	675	603	594	507	470	396	244	216	227	194	179	151
PERRYTON MUNICIPAL WATER SYSTEM	OCHILTREE	8,381	8,381	9,429	9,952	9,221	9,221	1,936	2,615	2,594	2,307	2,229	1,905	206	279	246	207	216	184
RED RIVER AUTHORITY OF TEXAS	CHILDRESS	931	916	919	901	915	913	193	243	201	177	161	168	185	236	196	176	157	164
RED RIVER AUTHORITY OF TEXAS	COLLINGSWORTH	369	363	364	357	363	362	76	96	80	70	64	67	185	236	196	176	157	164
RED RIVER AUTHORITY OF TEXAS	DONLEY	487	479	481	471	479	477	101	127	105	93	84	88	185	236	196	176	157	164
RED RIVER AUTHORITY OF TEXAS	HALL	266	262	263	257	261	261	55	69	58	51	46	48	185	236	196	176	157	164
SHAMROCK MUNICIPAL WATER SYSTEM	WHEELER	1,910	1,882	1,801	1,819	1,910	1,819	649	842	952	728	912	857	303	399	472	357	426	421

Population Projections

County

Based on recent Census (State Demographer's Office)

- Cohort Component Analysis:
age, gender & race /birth, death & migration
- 3 migration scenarios:
0, 0.5, & 1
- Constant population
- Control totals

Population Projections

WUGs (Sub-County)

- 2000-2010 WUG Pop
 - Share of population: % of county's total pop
 - Share of growth: % of county's growth
 - Constant population: military, institutions, build-out

Geography	2020	2030	2040	2050	2060	2070
County	25000	27000	29000	31500	33000	35000
WUG 1						
WUG 2						
WUG 3						
County-Other						

Municipal Water Demand Projections calculation for 2020-2070:



Projected
Population

X



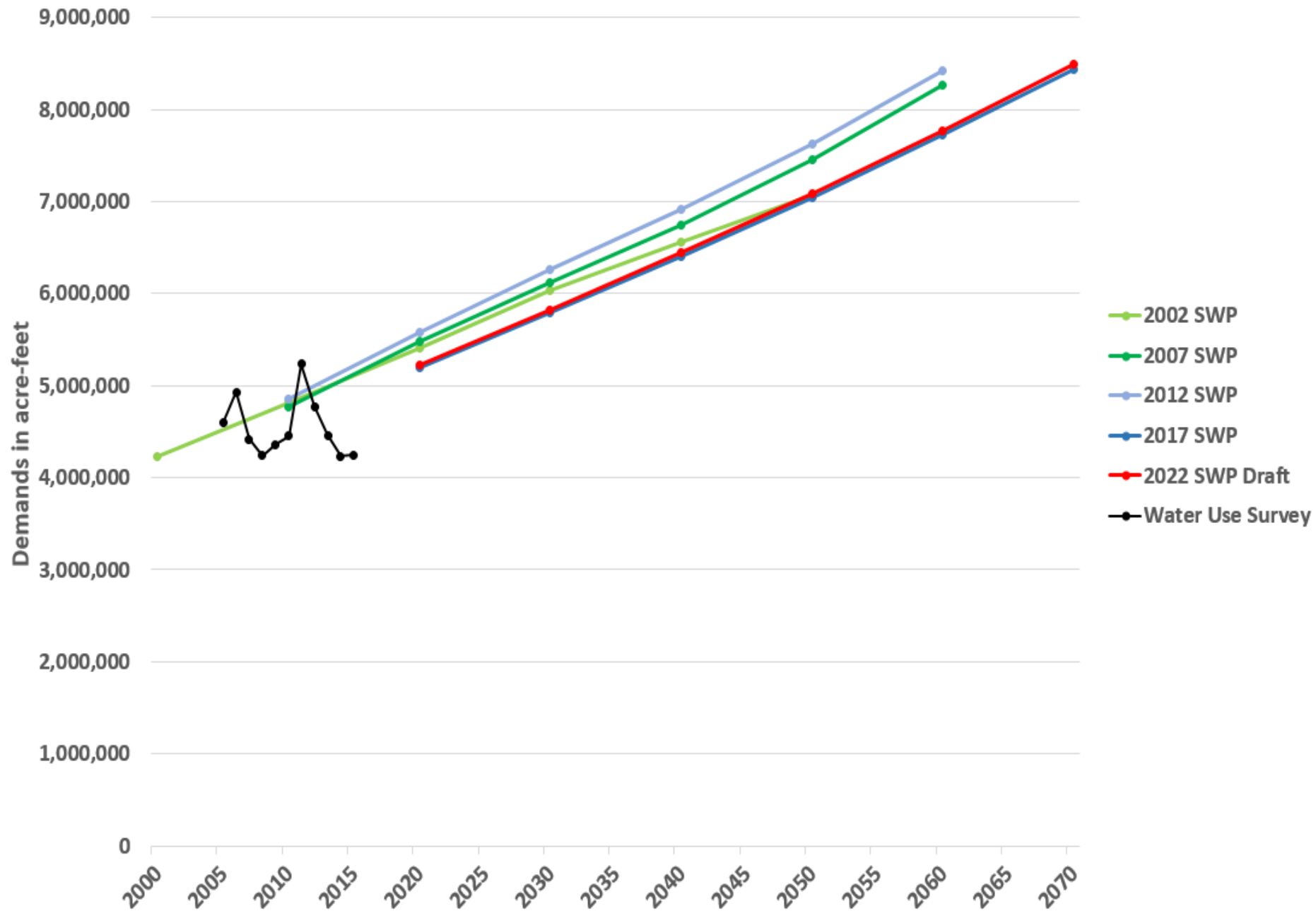
Dry-year
per-person
water use
(GPCD)

MINUS



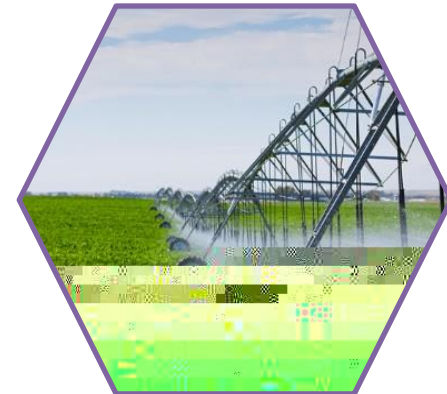
Passive
efficiency
savings

Municipal Water Demand Projections for All Counties in All Regions.

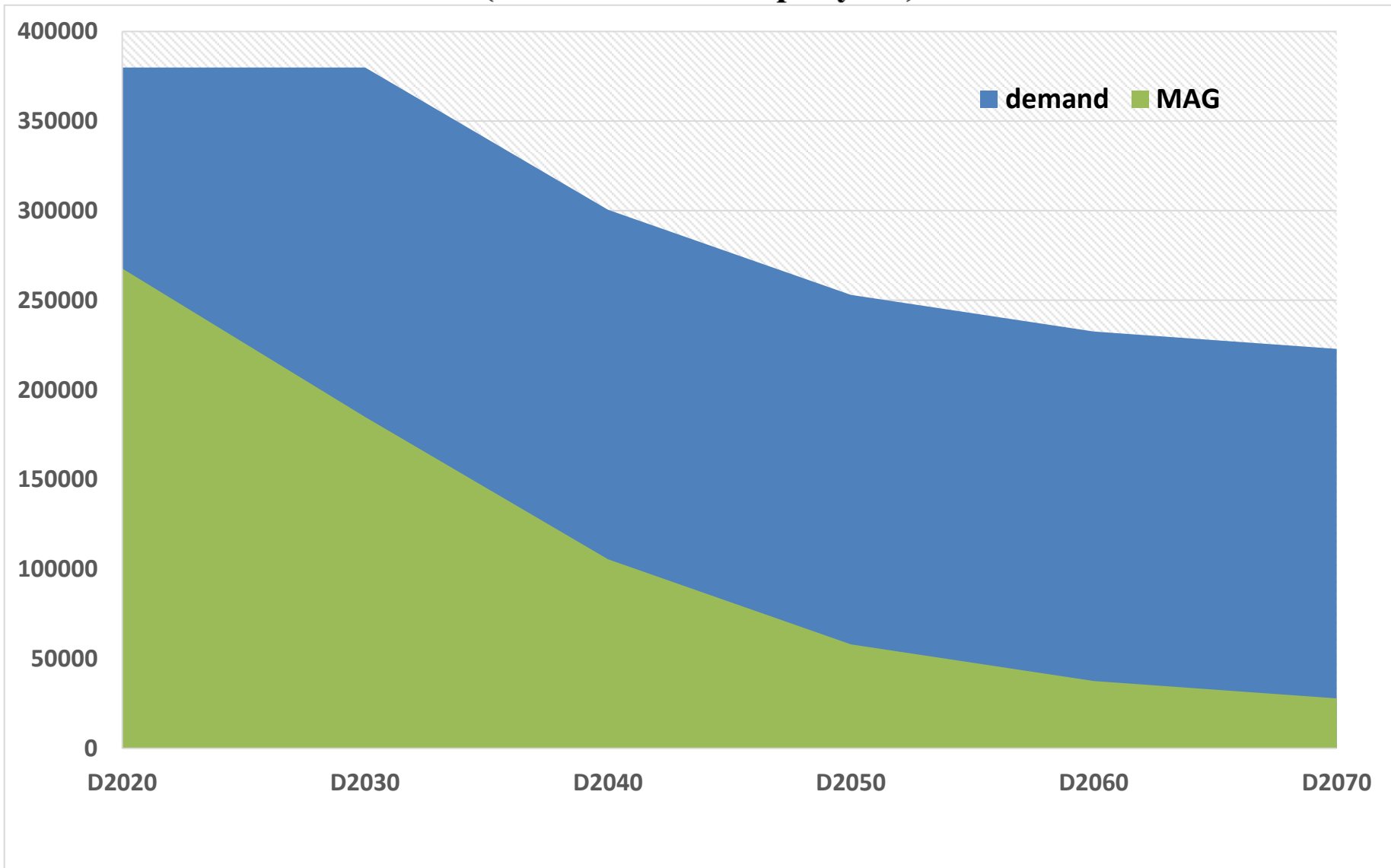


Irrigation

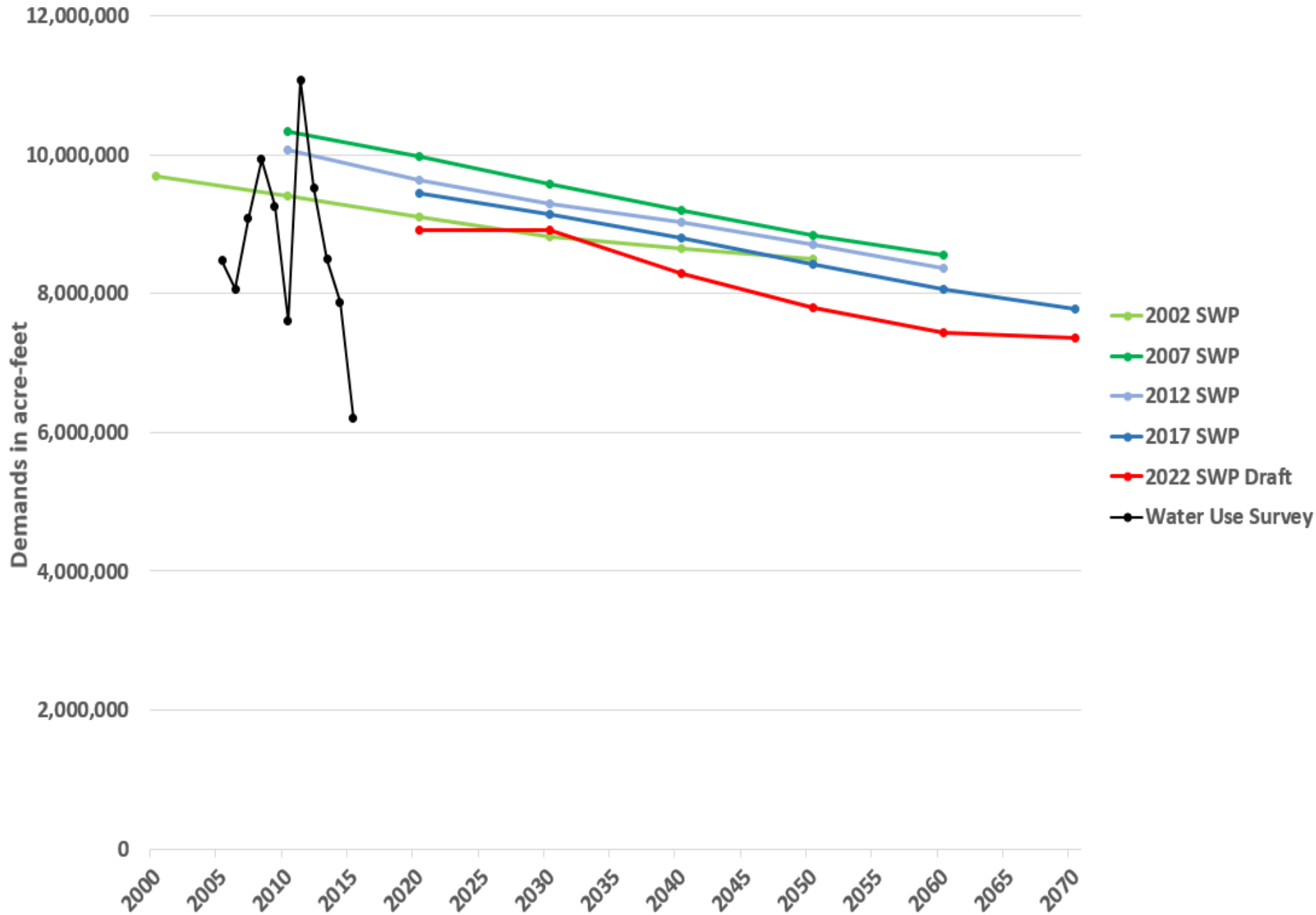
- Historical water use estimates
 - Crop acreage from Farm Service Agency (FSA)
 - Reported GW pumpage & SW diversion
- Baseline: average of 2010-2014 water use
- Trends:
 - I. 2020-2070 projections held constant
 - II. Constrained groundwater option (*i.e., demand > projected GW availability*)



Draft Irrigation Water Demand Projections, Constrained Groundwater Example (acre-feet of water per year)



Irrigation Water Demand Projections for All Counties in All Regions.



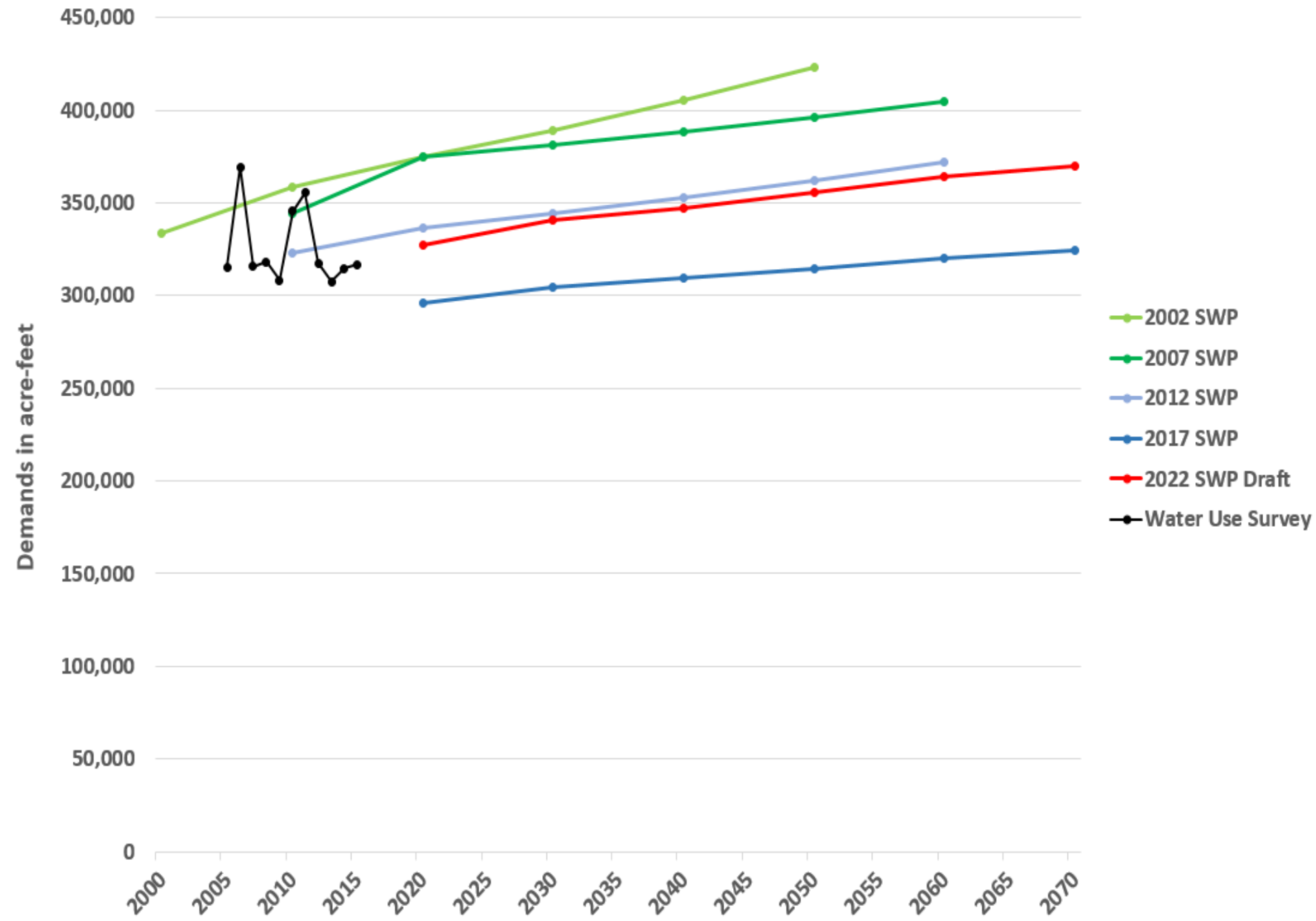
Livestock Projections

Historical water use estimate:

- Livestock population from Texas Agricultural Statistics Service (TASS)
- Per-head water use applied
- Cattle association or and other local sources
- Baseline: average of 2010-2014 water use
- Trend: carried over



Livestock Water Demand Projections for All Counties in All Regions.

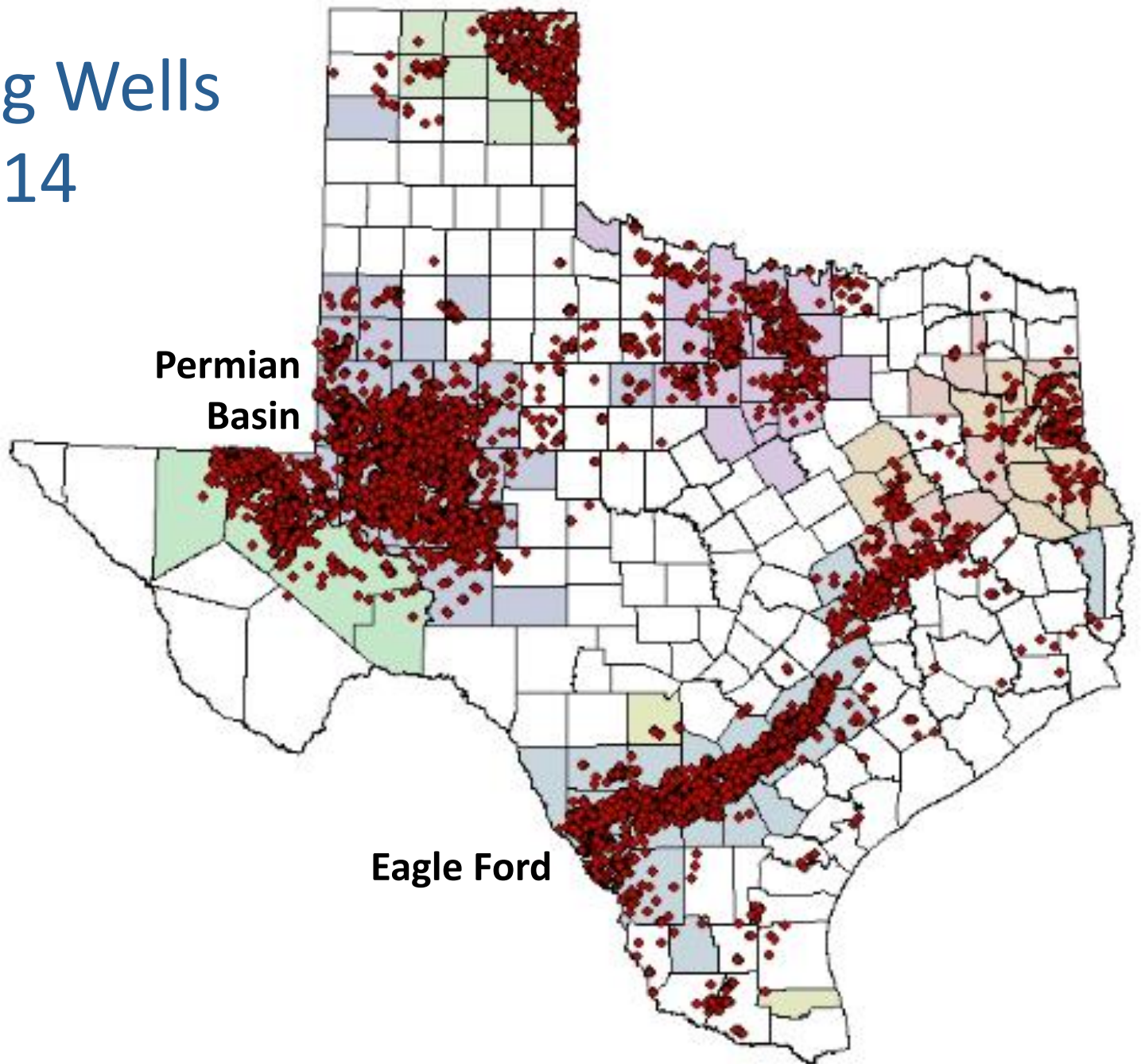


Mining Projections

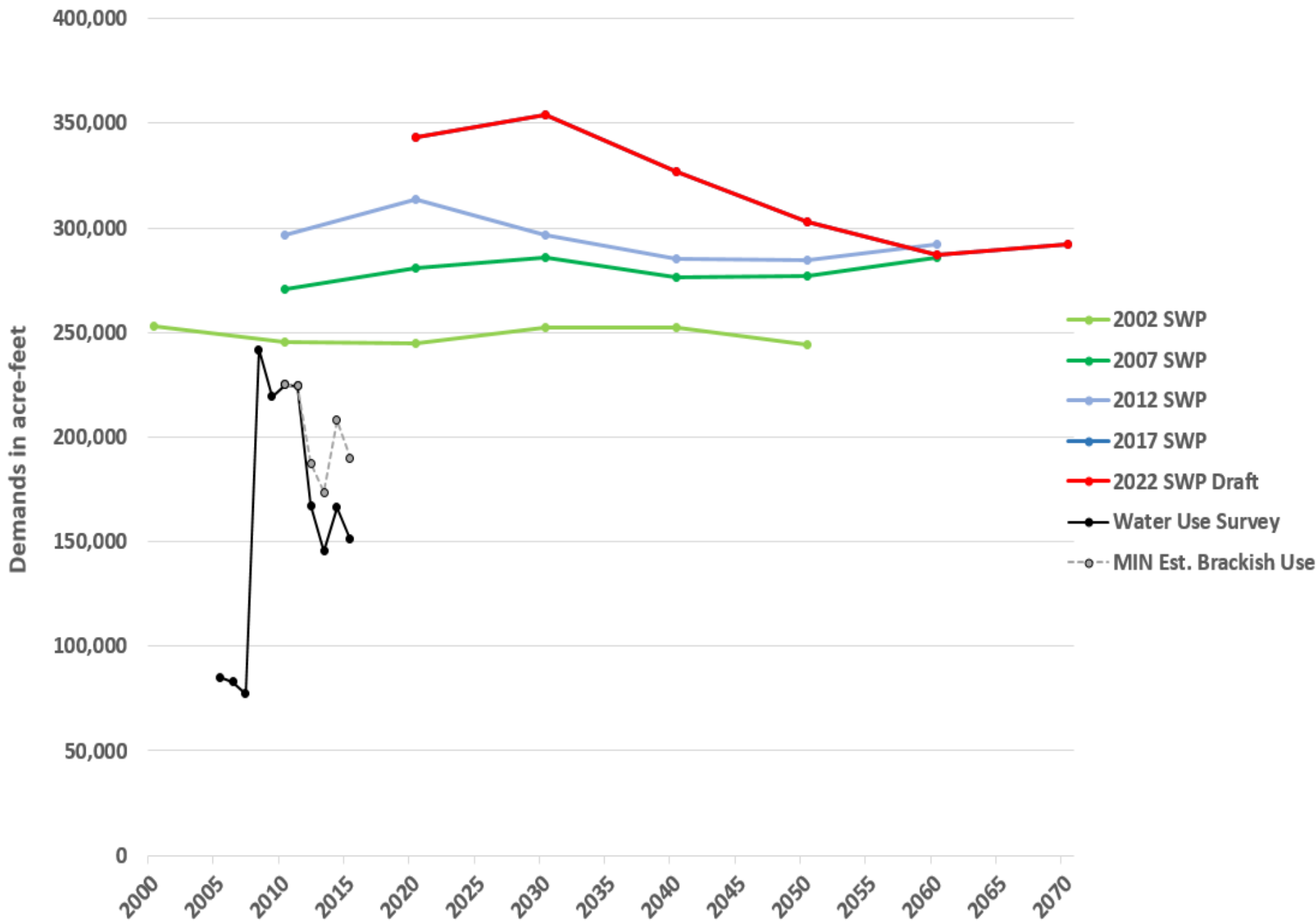
- Annual Water Use Estimates:
 - WUS reported water use
 - Oil & Gas estimates: Frac Focus data
- Baseline: average of 2010-2014 water use
- Trend: 2012 UT Bureau of Economic Geology (BEG) projected oil & gas production



Fracking Wells 2014



Mining Water Demand Projections for All Counties in All Regions.



Manufacturing Projections

- Historical water use estimates:
 - WUS reported use by facility
- Baseline: highest single-year county use 2010-2014
- Trend:
 - 2020-2030 increase per industry sector employment projection (Tx Workforce Commission)
 - 2030-2070 held constant



Why Constant Demands After 2030?

Output $\neq$ Water Use

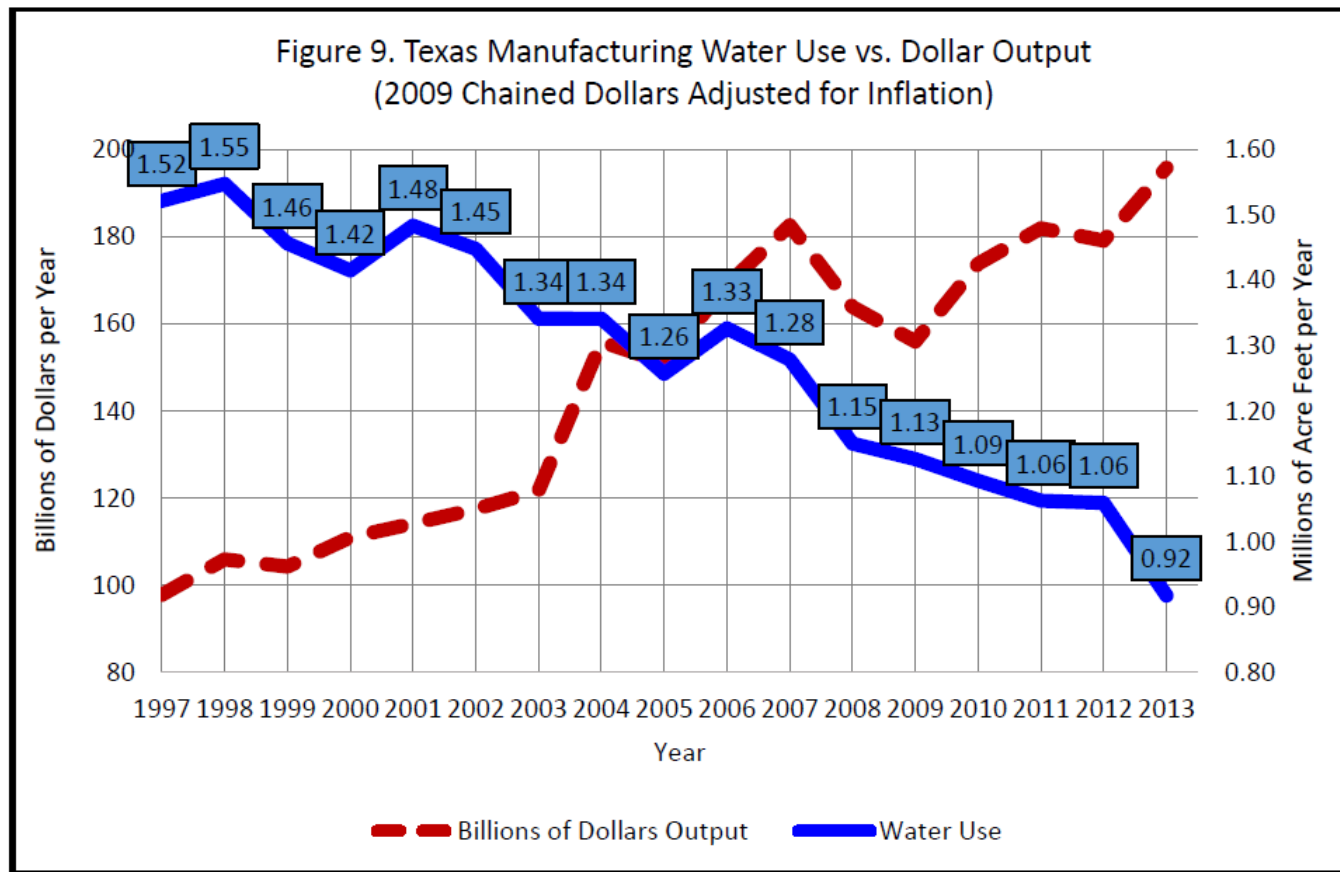
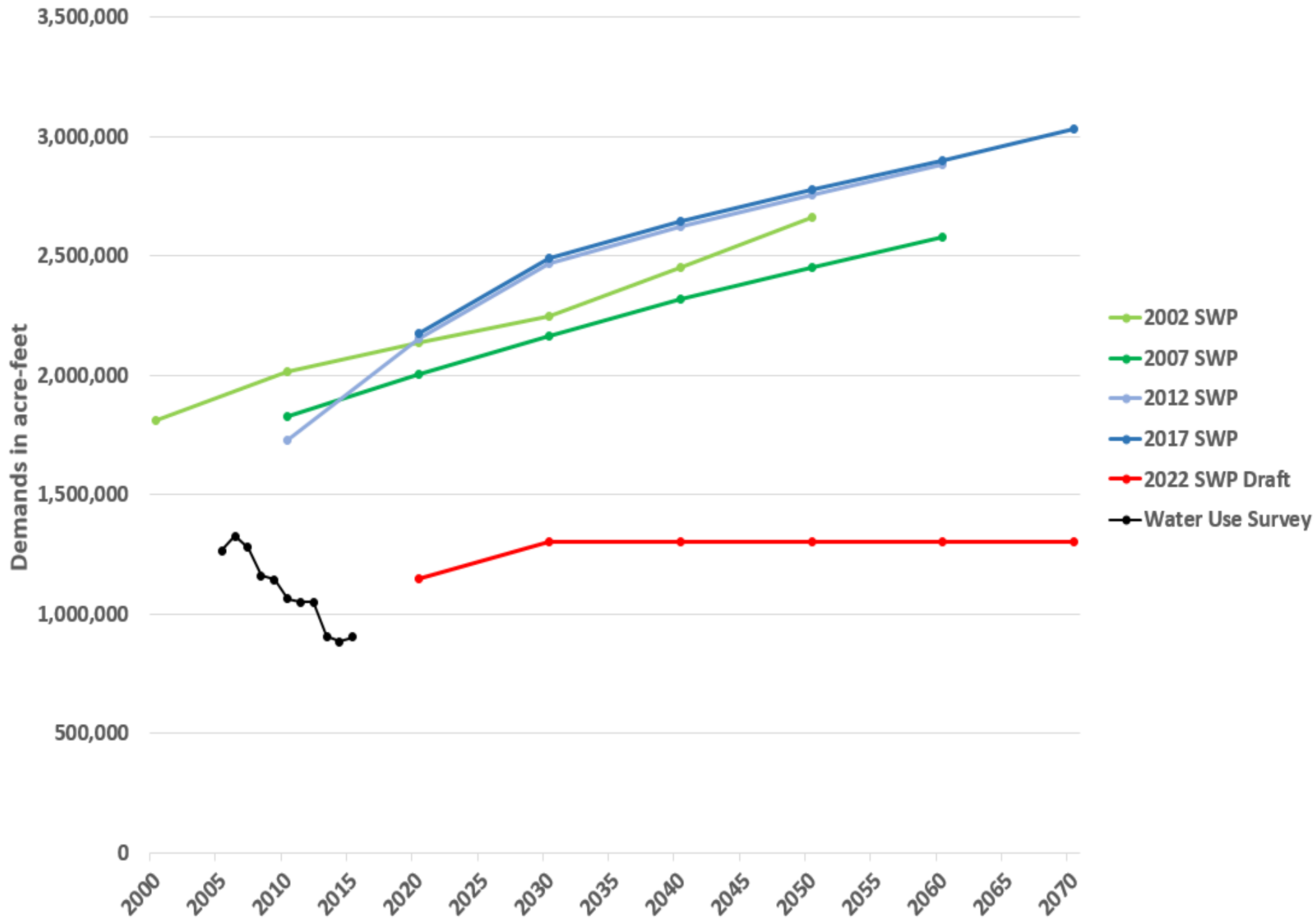


Figure 9. Texas Manufacturing Water Use vs. Dollar Output (2009 Chained Dollars Adjusted for Inflation)

Manufacturing Water Demand Projections for All Counties in All Regions.



Steam Electric

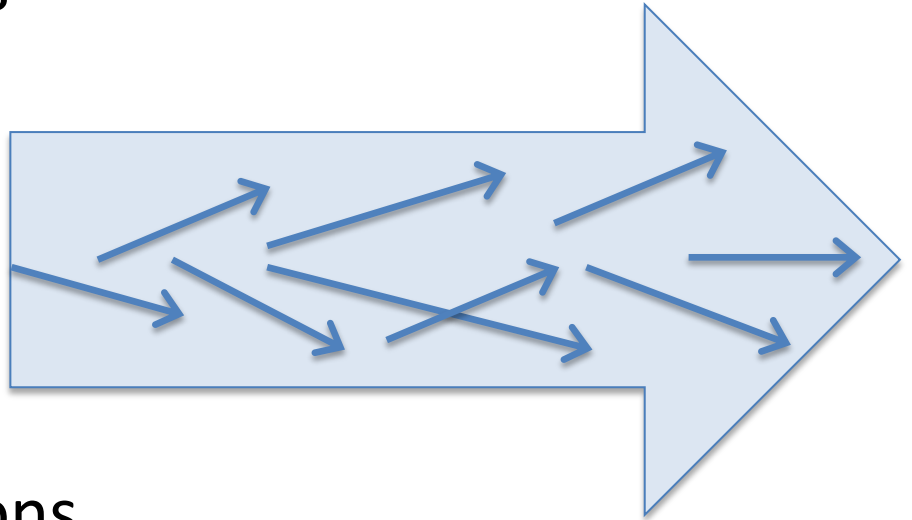
- Historical water use estimates:
 - WUS reported water use estimates
 - Fuel and cooling type
- Baseline: highest single-year county water use (2010-2014)
 - +/- near-term plant inventory changes based on ERCOT, EIA & PUC
- Trend: 2020-2070 projections held constant



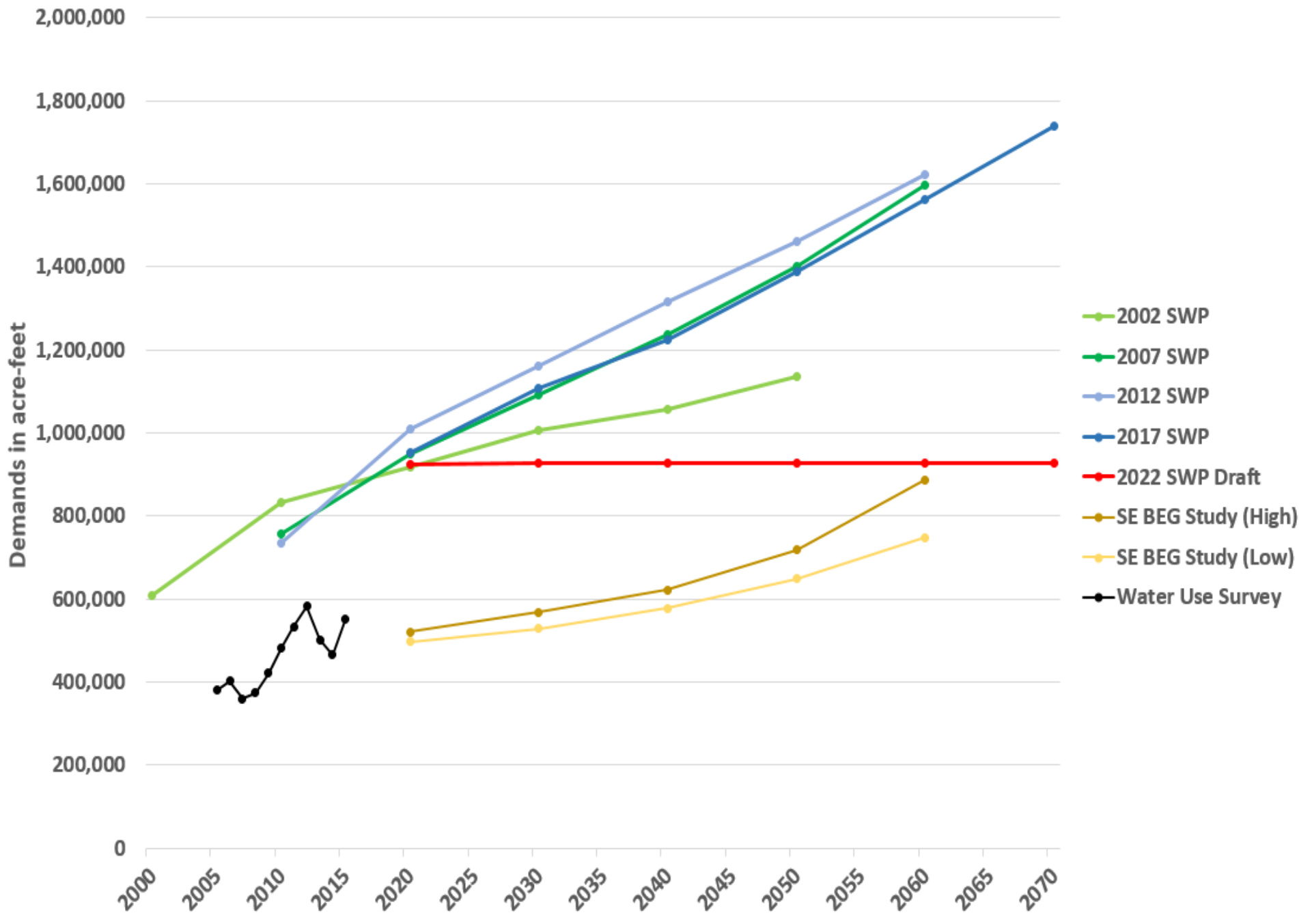
Why Constant Demands After 2020?

Long-term unknowns:

- Electricity demand
- Solar/Wind/Dry-Cooling
- Fuel type
- Cooling type
- Generation type
- Efficiency
- Environmental regulations



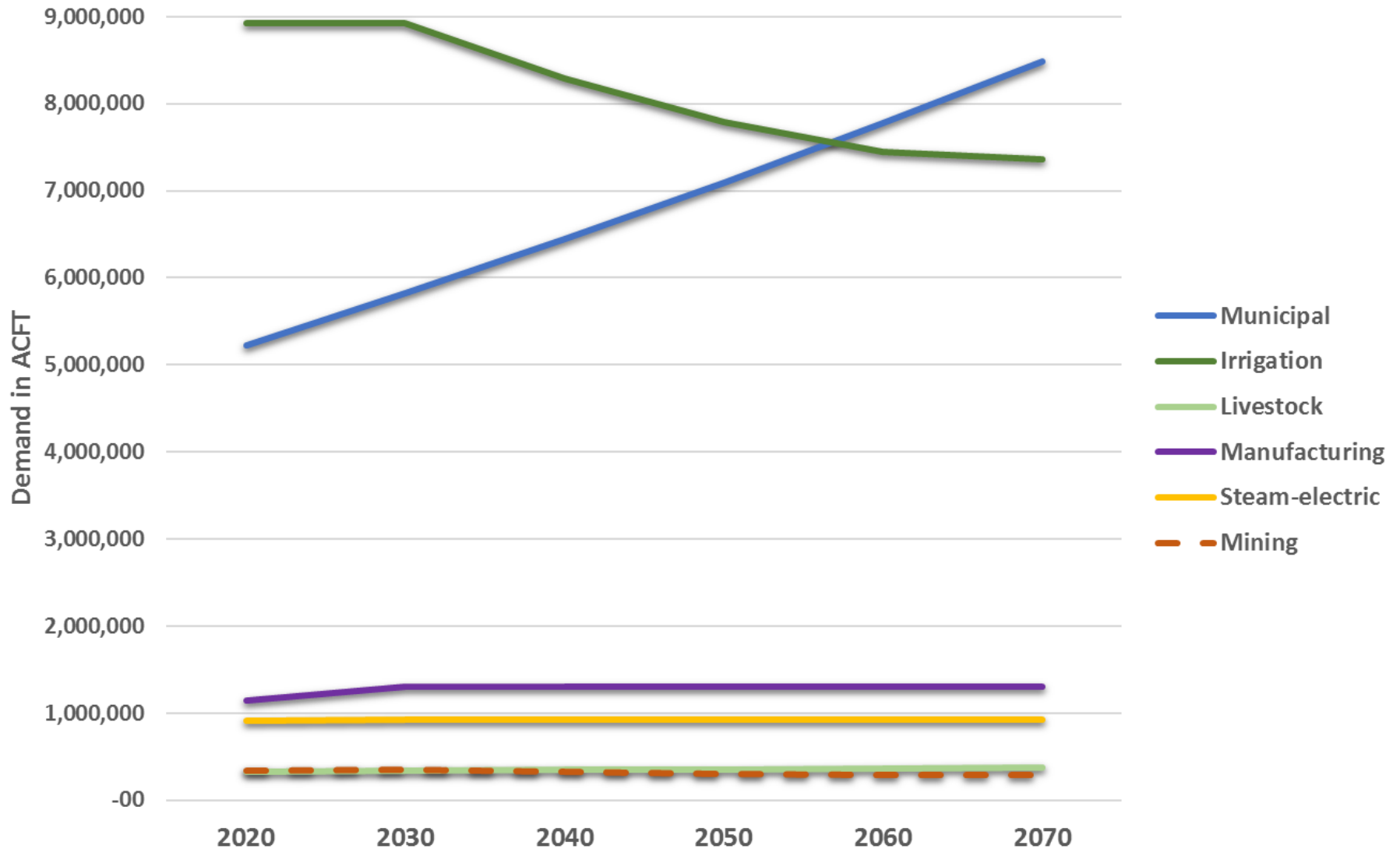
Steam-electric Water Demand Projections for All Counties in All Regions.



Revision Process

- Input from the RWPGs based on the TWDB guideline (criteria & data requirement) & [supporting data](#)
 - Reasonable, Justifiable & Quantifiable
- Robust and intensive process
- 3 agency review
- TWDB Board's consideration for adoption

2021 Draft Water Demand Projections



Questions?

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Texas Water Development Board



PWS Boundaries Viewer & Editor Project

Water Service Boundary Viewer

Layers Base Maps About VICTORIA COUNTY WCID 1 (editing)

User: Taylor Christian Texas Water Development Board

Find address or place

200km 100mi 1: 9244649

Pointer - DMS: 32° 50' 20.39" N 113° 10' 25.43" W | DD: 32.838997 -113.173730

Service Areas 4104

PWS Code	PWS ID	Survey No	Water System Name	Source	Area	Area Diff	Overlap	Status	Last Verified	Last User	Last Update
790455	TX0790455	1102376	FORT BEND COUNTY MUD 57	DISTRICTBND	0.91	0	false	Not Started	5/27/2011, 7:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
1013295	TX1013295	1102377	HARRIS COUNTY MUD 397	DISTRICTBND	0.91	0	false	Not Started	12/5/2010, 6:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
2460161	TX2460161	1102378	ROUND ROCK RANCH PUD UTILITY CO	CCNBND	0.04	0	false	Not Started	11/29/2010, 6:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
1050137	TX1050137	1102379	HAYS COUNTY WCID 1	DISTRICTBND	0.95	0	false	Not Started	12/5/2010, 6:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
140173	TX0140173	1102380	LIBERTY VILLAGE (no polygon)		0	0	false		12/31/1900, 6:00:00 PM		12/31/1900, 6:00:00 PM
710010	TX0710010	1102381	PONDEROSA AND WESTERN VILLAGE WSC (no polygon)		0	0	false		12/31/1900, 6:00:00 PM		12/31/1900, 6:00:00 PM
1290043	TX1290043	1102382	KAUFMAN COUNTY FWSD 1A	DISTRICTBND	4.16	0	false	Not Started	6/29/2011, 7:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
910146	TX0910146	1102383	CITY OF KNOLLWOOD	PWS	0.34	0	false	Not Started	2/8/2011, 6:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM
1050132	TX1050132	1102384	ELLIOTT RANCH WATER SYSTEM	PWS	0.82	0	false	Not Started	2/7/2011, 6:00:00 PM	Aubrey Drescher	12/31/1899, 6:00:00 PM

Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS