CAPITAL FACILITIES PLAN

Timpanogos Special Service District

April 2009

FOR INFORMATION REGARDING
THIS PROJECT CONTACT:

Larry Bowen
756 East 12200 South
Draper, Utah 84020
(801) 495-2224

BOWEN COLLINS & Associates, Inc.
Consulting Engineers

TABLE OF CONTENTS

SECTION **PAGE**

EXECUTIVE SUMMARY ES-1

1 Introduction..... 1-1
1.1 Purpose..... 1-1

2 Past Construction Project Inventory 2-1
2.1 Project Cost, Funding, Outstanding Debt, and Capacity Summary..... .2-1

3 Summary of Historical Conditions 3-1
3.1 Flow 3-1
3.2 Organic Load 3-1
3.3 Service Connections..... 3-1

4 Summary of Future Conditions……4-1
4.1 Population Projection……...4-1
4.2 Flow Projection…….……..…….4-2
4.3 Organic Load Protection……..……4-2

5 Future Planning..... 5-1
5.1 Wastewater Treatment Plant..... 5-1
Hydraulic Loading 5-1
Organic Load 5-3
5.2 Outfall Lines 5-3
5.3 Proposed Projects..... 5-4
5.4 Project Expenditure Distribution 5-6

APPENDIX

Table of Contents
(continued)

LIST OF TABLES

NO.	TITLE	FOLLOWING PAGE
ES-1	Estimated Quarterly Expenditures Anticipated Major Projects	ES-3
2-1	Construction Project Inventory 1977-2007	2-1
3-1	Historical Flows, Organic Loads, and Connections	3-1
4-1	TSSD Service Area Population Growth Projections 2007-2030	4-1
5-1	Estimated Quarterly Expenditures Anticipated Major Projects	5-6

LIST OF FIGURES

FIGURE		FOLLOWING PAGE
3-1	Historical Flow, Organic Load, and Connections	3-1
3-2	TSSD Flow Summary 2008	3-1
4-1	Service Area Population Growth Projections 2007-2030	4-1
4-2	Historic and Projected Flows	4-2
4-3	Organic Load History & Projections 1980-2030	4-2
5-1	Flows and Plant Capacity	5-2
5-2	Treatment Plant Organic Load Capacity Evaluation	5-3
5-3	Outfall Lines Capacity Projection	5-3

EXECUTIVE SUMMARY

BACKGROUND

The Timpanogos Special Service District (TSSD / District) intends to amend and adopt its Capital Facilities Plan (CFP) regarding its wastewater treatment and collection facilities. TSSD provides wastewater treatment and disposal services for the cities of Pleasant Grove, Lehi, American Fork, Alpine, Highland, Cedar Hills, Eagle Mountain, Saratoga Springs, and a small area of Draper. TSSD was petitioned by the Town of Vineyard to provided treatment for most of its incorporated area. The District Board of Directors voted in September, 2006 to provide treatment services for up to 7,666 Equivalent Residential Units (ERU) based on a flow 400 gallons/day/ERU.

Historically, all of the cities have experienced significant growth, although the recent slump in the housing market and down turn in the economy has slowed growth during the past year. The District's CFP is being reviewed and updated to ensure that the changing needs of TSSD's service area population are properly planned for. The CFP will be used by the District to identify future capital projects and provide a document that will be used in developing a responsible financial plan.

PAST CONSTRUCTION PROJECTS INVENTORY

The first construction project completed by TSSD was the original 7.6 MGD treatment plant along with three major sewer outfall lines serving Alpine, Lehi, American Fork, and Pleasant Grove. Since that time, TSSD has completed several treatment plant expansions increasing the capacity to over 18 MGD. TSSD has also constructed several additional outfall lines to better service its member agencies. TSSD has also completed several improvement and rehabilitation projects at the treatment plant. The total construction cost for all of these projects is approximately $64.6 million. The District has used several funding sources to pay for these projects. Funding sources included EPA grants, State Wastewater Loan Program, G.O. bonds, revenue bonds, and reserve TSSD funds.

The District is presently making payments on State Loan No. 2 which has an outstanding balance of approximately $1,437,000. It is scheduled for a payoff in 2015. It is also making payments on the 2007; $30 million fixed rate revenue bond with a projected payoff in 2027.

SUMMARY OF HISTROICAL CONDITONS

The following paragraphs summarize historical flows, organic loading, and service conditions for TSSD. This data is used to identify historical trends and will be used in planning for the future.

Flow

The average daily flow has fluctuated dramatically over the past 25 years. During 1982-1986 the flow peaked at 5.8 MGD and then dropped down to 3.7 MGD during 1988-1990. Since 1990, the flow has increased at an average annual rate of approximately 7.5 percent reaching an annual average of 14.13 MGD in 2008. The peak 30-day average flow of 15.22 MGD occurred in September 2008. The plant must have treatment capacity to effectively handle the peak 30 day average conditions. Despite the dramatic slow down in the housing market the yearly average flow increased by 9.5% and the peak 30 day average increased by 11.3% between 2007 and 2008. As surprising as this significant increase is it demonstrates that housing growth is not always necessary for flow increases. Flows can be impacted by a variety of things including an increase in the groundwater level and industrial users.

Organic Load

Organic load is normally determined by biochemical oxygen demand (BOD) and suspended solids (SS) both measured in mg/L units. BOD and SS are used to measure the level of contamination of the wastewater. Organic loads generally increase in response to population and/or commercial growth. The organic load began to significantly increase in 1990. Since then the average yearly BOD increase has been just under 8 percent and the SS increase has been nearly 6.6 percent.

Service Connections

The number of service connections within the TSSD service area has increased from 11,546 in 1991 to 39,610 in 2007. The population growth rate from 1991 to 2007 has averaged nearly 8.5 percent per year. This is a high growth rate compared to the State average of less that 3 percent.

SUMMARY OF FUTURE CONDITIONS

Historical trends are used in estimating future conditions and requirements of the TSSD service area. The following summarizes the estimated future conditions for TSSD.

Population Projections

Population growth projections for the next 23 years were primarily obtained from Mountainlands Association of Governments (MAG) Population Projections, released May 2005. Average yearly population growth within the TSSD service area is projected to maintain a rate of 5 percent through 2010 and then decrease to 4 percent, 3 percent, and then remain at 2 percent through the years 2015, 2020, 2025, and 2030 respectively. The communities estimating the largest growth (more than 1,000 people per year) are Eagle Mountain, Lehi, Saratoga Springs, and South Valley (Suncrest Development). It is estimated that the total population within the TSSD service area will exceed 184,000 by 2010.

A recent slump in the U.S. housing market has slowed growth beginning mid 2007 and continues today. Some experts are predicting that the housing downturn will begin to ease in the last quarter of 2009. The population projections used in this document was developed by MAG prior to the slump in the housing market. If the slow down is reversed over the next two years the long-term population projects will likely still be valid.

Flow Projections

Based upon historical flow data and future population projections, flows to the TSSD treatment plant could exceed an annual average flow of 18.0 MGD by 2012 and will increase to more than 27.0 MGD by 2030.

The flow projection is based on limited flow from Infiltration and Inflow (I&I) and does not address the average daily flow for the peak 30-day period. Consideration should be given to the average daily flow for the peak 30-day period and high values for I&I when evaluating plant capacity and appropriate timing for plant expansion.

Organic Load Projections

Based on historical TSSD organic loadings and connected population, the per capita loadings are 0.14 lbs BOD and 0.16 lbs SS. The BOD and SS are then projected by multiplying the BOD and SS per capita loading rates by the projected population. BOD and SS loadings could exceed 44,000 lb/day and 49,000 lbs/day by 2030.

FUTURE PLANNING

The TSSD treatment plant and outfall lines were evaluated based upon projected future conditions. The treatment plant evaluation included such variables as population growth, I&I and reserved capacity for industrial users. The outfall line evaluation compared the capacity of existing pipelines versus projected flows. Based upon the capacity analysis coupled with District priorities, nine projects were identified as necessary to meet short term needs. The attached Table ES-1 identifies these projects, the estimated cost, and the estimate quarterly expenditures for each project. The total expenditures through 2013 are estimated to be nearly $107 million. Table ES-1 reflects changes requested by the Board to delay some the projects that were initially identified in an effort to keep costs to a minimum. The postponement of several projects resulted in capital cost reduction of nearly $34,000,000. For further detail and description of the projects reference the Timpanogos Special Service District Capital Facilities Plan dated June 2008.

Table ES-1
Timpanogos Special Service District
Estimated Quarterly Expenditures Anticipated Major Projects (Jan 2008 thru Dec 2013)

(Prepared Dec 16, 2008)

	Est. Distribution			2008				2009				2010				2011				2012				2013				
Project	**Growth**	**O&M**	**Task**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**TOTAL**
WWTP Expansion	80%	20%																										
			Engineering	$180,000	$1,100,000	$663,000	$785,000	$190,000	$180,000	$380,000	$380,000	$382,000	$380,000	$330,000	$320,000	$310,000	$230,000	$210,000	$150,000	$150,000								**$6,320,000**
			Construction								$10,000,000	$9,500,000	$10,000,000	$11,000,000	$12,000,000	$7,000,000	$5,200,000	$4,500,000	$4,000,000	$3,000,000								**$76,200,000**
Lehi Outfall Line Repairs	90%	10%																										
			Engineering					$200,000	$120,000	$60,000																		**$380,000**
			Construction						$1,900,000	$1,000,000																		**$2,900,000**
Boat Harbor Lift Sta Replacement	50%	50%																										
			Engineering		$25,000	$200,000	$110,000	$80,000	$80,000	$80,000	$80,000																	**$655,000**
			Construction					$1,500,000	$1,500,000	$1,000,000	$1,000,000																	**$5,000,000**
Alpine/Highland Line Segment 2	100%																											
			Engineering					$250,000	$100,000	$150,000	$70,000																	**$570,000**
			Construction						$1,000,000	$3,000,000	$800,000																	**$4,800,000**
Alpine/Highland Line Segment 3A&B	100%																											
			Engineering									$280,000	$150,000	$180,000	$102,000													**$712,000**
			Construction										$1,200,000	$3,600,000	$1,100,000													**$5,900,000**
Pleasant Grove/Cedar Hills Outfall	100%																											
(Sta 28+15 to Sta 84+00)			**Engineering**					$15,000	$25,000																			**$40,000**
			Construction					$256,000	$171,000																			**$427,000**
Pleasant Grove/Cedar Hills Outfall	40%	60%																										
(Sta 120+00 to Sta 263+00)			**Engineering**							$280,000	$220,000																	**$500,000**
			Construction																									**$0**
Suncrest Lift Station Upgrade	70%	30%																										
			Engineering					$48,000	$20,000																			**$68,000**
			Construction					$100,000	$150,000	$50,000																		**$300,000**
Land Acquisition	70%	30%																										
			Property Purchase					$1,000,000	$1,000,000																			**$2,000,000**
TOTAL				**$180,000**	**$1,125,000**	**$863,000**	**$895,000**	**$3,639,000**	**$6,246,000**	**$6,000,000**	**$12,550,000**	**$10,162,000**	**$11,730,000**	**$15,110,000**	**$13,522,000**	**$7,310,000**	**$5,430,000**	**$4,710,000**	**$4,150,000**	**$3,150,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$106,772,000**

Based on the Following Information/Assumptions:	**Schedule**
Wastewater Treatment Plant Expansion	
Engineering Design $3.6 M (portion spent in 2007)	Jan 2008 - Jan 2009
Engineering CMS $3.4 M (est)	Sept 2009 - Feb 2012
Construction $76.2 M (est)	Sept 2009 - Feb 2012
Lehi Outfall Line Repairs	
Engineering Design $193,000 (est)	Jan 2009 - April 2009
Engineering CMS $187,000 (est)	May 2009 - Sept 2009
Construction $2.9 M (est)	May 2009 - Sept 2009
Boat Harbor Lift Station Replacement	
Engineering Design $375,000 (est)	Apr 2008 - Dec 2008
Engineering CMS $280,000 (est)	Feb 2009 - Mar 2010
Construction $5.0 M (est)	Mar 2009 - Mar 2010
Alpine/Highland Line Segment 3A&B	
Engineering Design $410,000 (est)	Jan 2010 - Apr 2010
Engineering CMS $302,000 (est)	May 2010 - Oct 2010
Construction $5.9 M (est)	May 2010 - Oct 2010
Alpine/Highland Line Segment 2	
Engineering Design $300,000 (est)	Jan 2009 - Apr 2009
Engineering CMS $270,000 (est)	May 2009 - Oct 2009
Construction $4.8 M (est)	May 2009 - Oct 2009
Suncrest Lift Station Upgrade	
Engineering Design $38,000 (est)	Jan 2009 - Feb 2009
Engineering CMS $30,000 (est)	Mar 2009 - July 2009
Construction $300,000 (est)	Mar 2009 - July 2009
Pleasant Grove /Cedar Hills Outfall (Sta 28+15 to Sta 84+00)	
Engineering Design $15000 (est)	Jan 2009 - Feb 2009
Engineering CMS $25,000 (est)	Jan 2009 - Apr 2009
Construction $427,000 (est)	Jan 2009 - Apr 2009
Land Acquisition ($2.0 M - est)	Jan 2009 - Jun 2009

SECTION 1
INTRODUCTION

The Timpanogos Special Service District (TSSD or District) contracted with Bowen, Collins & Associates (BC&A) to complete an update of its latest Capital Facilities Plan (CFP) dated August 2006. The plan summarizes historical flow information and capital projects completed by the District. The plan also projects future conditions including capital project needs. The historical summary covers the time period from 1979, when TSSD initiated service, to 2008. Future District expenditures will be projected over the next five years through the end of 2013.

The TSSD Wastewater Treatment Plant (WWTP) was constructed in 1979 with an initial treatment capacity of 7.6 million gallons per day (MGD) treating wastewater from the cities of American Fork, Pleasant Grove, Lehi, and Alpine. Since that time additional cities have been annexed into the District – Highland (1996), Cedar Hills (1996), Saratoga Springs, Eagle Mountain (1999), part of the South Valley Sewer District service area (2005) and part of the Town of Vineyard (2006). Expansion projects in 1984 and 1996 increased the overall treatment capacity to 18.34 MGD. The 2008 average daily flow during September (peak month) was 15.22 MGD, 83 percent of plant capacity. A portion of the remaining capacity has been reserved by a major industrial user. The State recommends that a treatment facility begin planning for expansion once a treatment facility reaches 85 percent of design capacity. TSSD also maintains six sewer outfall lines to transport flow from the service area.

1.1 Purpose

The purpose of this CFP is to provide the District with a document that:

- summarizes District projects completed to date identifying cost, funding, outstanding indebtedness and size of each project;
- summarizes historical connections, flows, and organic loading of the treatment plant;
- projects population growth, flows, and organic loading for the service area through 2030;
- identifies future projects, estimated cost, and estimated quarterly expenditures to meet projected needs through 2013.

SECTION 2
PAST CONSTRUCTION PROJECT INVENTORY

Table 2-1 lists major construction projects the District has completed since its inception. It summarizes the construction completion date, project cost, funding, and outstanding debt. Table 2-1 also identifies the projects that increased treatment and/or flow capacity.

2.1 Project Cost, Funding, Outstanding Debt, and Capacity Summary

The first construction project completed by TSSD was the original 7.6 MGD treatment plant and three major sewer outfall lines serving Alpine, Lehi, American Fork, and Pleasant Grove. The total cost for the projects was $14,287,047. Seventy-five percent of the cost was funded by an EPA grant and the other 25 percent was paid for through a G.O. bond. Bond payments were made through user fees. The bond for the original plant construction was retired in June 2002.

The first treatment plant expansion project was completed in 1984 increasing treatment capacity to 10.34 MGD. The expansion included the addition of a third clarifier, return activated sludge (RAS) bypass line, and sludge drying bed. The total loan amount for the project was $1,260,207. Sixty-three percent of the project was funded by the Utah State Wastewater Loan Program. Payments on the loan were made with user fees and was retired in 1993. The remaining 37 percent of the loan was paid with reserve funds from user fees.

Several capital improvement projects that did not increase the overall plant capacity beyond 10.34 MGD were completed from 1990 to 1994. Improvements included compost pad, sludge drying beds, dechlorination ponds, aerobic digester, sludge valve vault, etc. Each project varied in cost and most were paid using reserve funds from user fees. The 1993 Capital Improvement Project has no outstanding debt. The 1994 Capital Improvement Project has an outstanding debt of $1,437,000 scheduled to be retired in 2015.

In 1996, the District initiated the west-side expansion project increasing the treatment plant design capacity to 18.34 MGD. The expansion included the addition of oxidation ditches, clarifiers, sludge beds, headworks, UV disinfection, and a new administration building. In addition to the plant expansion, three sewer outfall lines were constructed during 1995-1998 serving the communities of Alpine, Highland, Lehi, Eagle Mountain, and Saratoga Springs. These projects were funded by three revenue bonds totaling $39,845,000. All three revenue bonds were defeased in 2007.

Projects completed during 1999 to 2005 included Headwork Improvements, Wetland Mitigation, and the East Side Plant Rehabilitation Phase II and III Projects. These projects have been paid using reserve funds from user fees.

The District completed an interim solids dewatering project in May 2008 at a cost of $1,294,833. Project costs were paid using reserve funds from user fees. The project included construction of a metal building with two belt presses to provide mechanical

Table 2-1

Construction Project Inventory 1977-2007

Project Name	Description	Contractor	Construction Completion Date	Construction Cost	Total Loan Amount	Outstanding Debt	Funding Type / Organization	Method of Payment	Pipe Size Dia (in)	Treatment / Flow Capacity (MGD)	Treatment / Flow Capacity (ERU)	Treatment / Flow Presently Used (ERU)	Treatment / Flow Capacity Available (ERU)
1977 Wastewater Treatement Facilities													
Treatment Facility Construction	Original Construction of Water Treatment Facility	Alder Construction	1977	$10,791,731.00						7.60	17,273	25,518	NA
Other	Land, Improvement, Easement Rights			$796,545.00									
1977 Outfall Lines	Construction of Outfall Lines Serving Lehi, Alpine, & Pleasant Grove												
		Engineers											
Alpine 18" Pipe	Schedule I	Construction Co.		$1,800,656.54					18	4.29	5,298	3,867	1,431
21" Pipe									21	7.49	9,252	4,068	5,184
Lehi 24" Pipe	Schedule II	Jay Tuft & Company		$594,000.00	$8,887,047.00	None	75% EPA Grant		24	4.62	5,705	4,068	1,637
42" Pipe					$5,400,000.00	None	25% GEO Bond (Pd 6/1/02)	User Fees	42	19.45	18,528	10,511	8,017
Pleasant Grove 27" Pipe	Schedule II	Jay Tuft & Company							27	8.90	8,020	6,185	1,835
30" Pipe									30	9.55	9,099	6,185	2,914
American Fork 36" Pipe	Schedule II	Jay Tuft & Company							36	43.09	37,144	6,443	30,701
			Total	**$13,982,932.54**	**$14,287,047.00**								
1983 Capital Improvement &	Clarifier, RAS Bypass Line, Sludge Mixer				$800,000.00	None	73% State Health Loan (Pd 1993)						
Energy Reduction Proj.	and Sludge Bed Drive Strips			$952,700.00	$290,000.00		27% Reserve Funds	User Fees					
			Total		**$1,090,000.00**								
1984 Expansion Project	Expand Treatment Plant Capacity to 10.34 MGD			$1,260,206.87	$800,000.00	None	63% Ut St Waste Wtr Loan Prog (Paid 2/15/92)	User Fees		10.34	23,500	25,518	NA
	Added Clarifier, R.A.S. Wet Well, Sludge Bed,	Brown & Foutz	3/27/1985		$460,206.87		37% Reserve Funds			(2.74 MGD Increase)			
	etc.		**Total**	**$1,260,206.87**	**$1,260,206.87**								
1984 Waste Water Facilities Flood	Construct Dike Along Lake-Side of Existing	Savage Brothers											
Relief Grant	Facilities.	Excavating	6/30/1984		$32,600.00	None	Grant / Department of Health	Grant					
1990 Sludge Handling Area	Dike for wetlands, sludge drying beds	K & P Plumbing											
Expansion Project		& Heating	12/31/1990	$226,094.00	None	None	Reserve Funds (Paid 1990)	User Fees					
1991 Capital Improvement Project	Compost pad, sludge drying beds	Allstate Builders	Nov-91	$451,787.00	None	None	Reserve Funds (Paid 1991)	User Fees					
1992 Capital Improvements	Dechlorination Pond Pilot Study	K & P Plumbing								20.00			
	Modified Sludge Beds, Added Dechlorination Ponds	& Heating	11/30/1992	$425,690.00	None	None	Reserve Funds (Paid 1991)	User Fees					
1993 Capital Improvements	Above ground electrical, modify sludge drying beds	American Pacific, Inc.											
	Const collection system maintenance building		12/14/1993	$1,140,286.00	$1,300,000.00	None	State Loan No. 1 (Paid 2007)	User Fees					
1994 Capital Improvements	New Aerobic Digester, new 4" sludge spray line,	American Pacific, Inc.											
	new sludge valve vault, and new surcharge area		3/15/1996	$2,739,244.00	$2,900,000.00	$1,437,000.00	State Loan No. 2	User Fees					
							Projected Payoff 2015						
1996 West Side Plant Expansion	Expand Treatment Capacity to 18.34 MGD,	Ames Construction	9/13/1998	$19,739,955.00									
	100' Dia Clarifier			$3,754,768.00	$4,250,000.00	None	1996A Revenue Bond	Capital	Plant	18.34	53,159	40,869	12,290
	Land, Improvement, Easement Rights			$1,221,261.56			(Defeased 2007)	Facility Fee		(8.0 MGD Increase)			
	Administration Building Renovation			$1,165,702.00									
	West Sludge Beds			$1,146,466.00									
1995 Westside Interceptor	54" & 30" Outfall Lines serving Eagle Mountain,	Johansen Construction	4/18/1997	$2,483,684.55	$240,000.00	None	1996B Revenue Bond	Capital	54	20.87	20,874	3,597	17,277
	Saratoga Springs, & Lehi						(Defeased 2007)	Facility Fee	30	17.87	17,873	5,446	12,427
1996 Lehi 60" Outfall Line	Constructed 60" outfall line South Lehi	Larsen Excavating	10/1/1997	$4,093,486.35	$35,355,000.00	None	1998 Revenue Bond	75% Capital	60	28.15	29,023	9,044	19,979
							(Defeased 2007)	Facility Fee					
1996 Landscaping Project	West side landscaping improvements	Brookline Farms		$220,500.08				25% User Fee					
1997 24" Outfall Line	24" Outfall line serving Alpine & Highland	Larsen Excavating		$1,212,320.88					24	4.13	5,103	4,068	1,035
1998 6800 West 24" Outfall Line	24" Outfall line serving Alpine & Highland	Hadco Construction		$899,291.11					24	5.85	7,217	4,068	3,149
Other	1998 Debt Service Reserve			$3,576,000.00									
			Total	**$39,513,435.53**	**$39,845,000.00**	None							
1999 East Plant Phase I	Improvements for east-side headworks and influent	Absolute	2000	$245,948.00	None	None	Reserve Funds	User Fee					
Headworks Improvements	pump building	Constructors Corp.											
2001 Wetland Mitigation Project	Phase 1												
	Install new WCS (2), modify WCS, fill areas, and	Ducks Unlimited		$168,000.00	None	None	Reserve Funds	User Fee					
	remove existing levees and structures												
Boat Harbor Lift Station Odor Control	Ph I Cover open channels w/ fiberglass covers	Absolute											
	Ph II Install Blower & Odor Scrubber (if required)	Constructors Corp.	3-May-01	Ph I $5256.00	None	None	Reserve Funds	User Fee					
East-Side Plant Rehabilitation Project	East Side Clarifier Improvements												
Phase II	East Side RAS/WAS Building Upgrades	Nelson Brothers	15-Jun-03	$847,350.00	None	None	Reserve Funds	User Fee					
	Generator Building	Construction											
	East Side Oxidation Ditch Structural Improvements												
	Reroofing East Side Buildings												
East-Side Plant Rehabilitation Project	Diagester Blower Building Improvements	Gerber	Sep-06	$1,286,564.00	None	None	Reserve Funds	User Fee					
Phase III	Nonpotable Water Strainer	Construction											
	Diagester Improvements												
Interim Dewatering Project	Belt Presses installed in a temporary dewatering	Ellsworth Construction	May-08	$1,342,050.29			Reserve Funds	User Fees					
	building												
Plant Expansion/Odor Control	Expand Plant Treatment Capacity to 30 mgd	Design in Progress	On Going	$76,200,000.00	$10,000,000.00	None	2007 Variable Rate	User Fees and					
				(Estimated)			(Defeased 2008)	Impact Fees	Plant	30 MGD	86,956	40,869	
										(Rehab/12.0 MGD Increase)			
					$30,000,000.00	$30,000,000.00	2007 Fixed Rate-Revenue Bond						
							Utah Water Finance Agency						
							(Projeced Payoff 2027)						

Note: Additional Bonds will be sold in the future to cover costs outside the available $30,000,000.

dewatering of the waste activated sludge. The belt presses will be moved to the new dewatering building upon completion of the planned expansion that is anticipated to occur in 2009, 2010 and 2011. The belt presses will replace the open sludge drying beds.

The District sold $10,000,000 in variable rate revenue bonds and $ 30,000,000 in fixed rate revenue bonds in 2007. A portion of the proceeds from the bond sales were used to defease the 1996A, 1996B and 1998 Revenue bonds. The $10,000,000 variable rate revenue bonds were defeased in 2008 as a result of the volatility of interest rates in the U.S. financial market. The remaining fixed rate bonds are scheduled for payoff in 2027.

TSSD will need to issue additional bonds to pay for the plant expansion and upgrade that is presently underway as well as other scheduled projects.

SECTION 3
SUMMARY OF HISTORICAL CONDITIONS

Wastewater treatment plants are designed based on flow and organic loading (strength). Reviewing historical flows, organic loading, and service connections provide an opportunity to identify historical trends which will be used in Section 5 of this report entitled "Future Planning". Historical data provided by the District from 1980-2007 are summarized in Table 3-1 and list the city average daily flow, organic load, and service connections to TSSD. The District has not yet received flows from the Town of Vineyard. Overall District totals are summarized at the bottom of Table 3-1. Figure 3-1 is a graphical representation of the information contained in Table 3-1.

3.1 Flow

The average daily flow has fluctuated dramatically over the past 25 years. During 1982-1986 the flow peaked at 5.8 MGD and then dropped down to 3.7 MGD during 1988-1990. Since 1990, the flow has increased at an average annual rate of nearly 7.5 percent per year reaching an annual average of 12.7 MGD in 2007. The average flow for the peak 30 day period in 2007 was 13.66 MGD. In 2008 the average flow for the peak month was 15.22 MGD.

Table 3-2 contains an update of recent flow quantities to the District's Wastewater Treatment Plant. It lists monthly 30 day averages for 2008 and compares the flows for the same period in 2007 along with the percent increase experienced during the past year.

Table 3-2
TSSD Flow Summary 2008

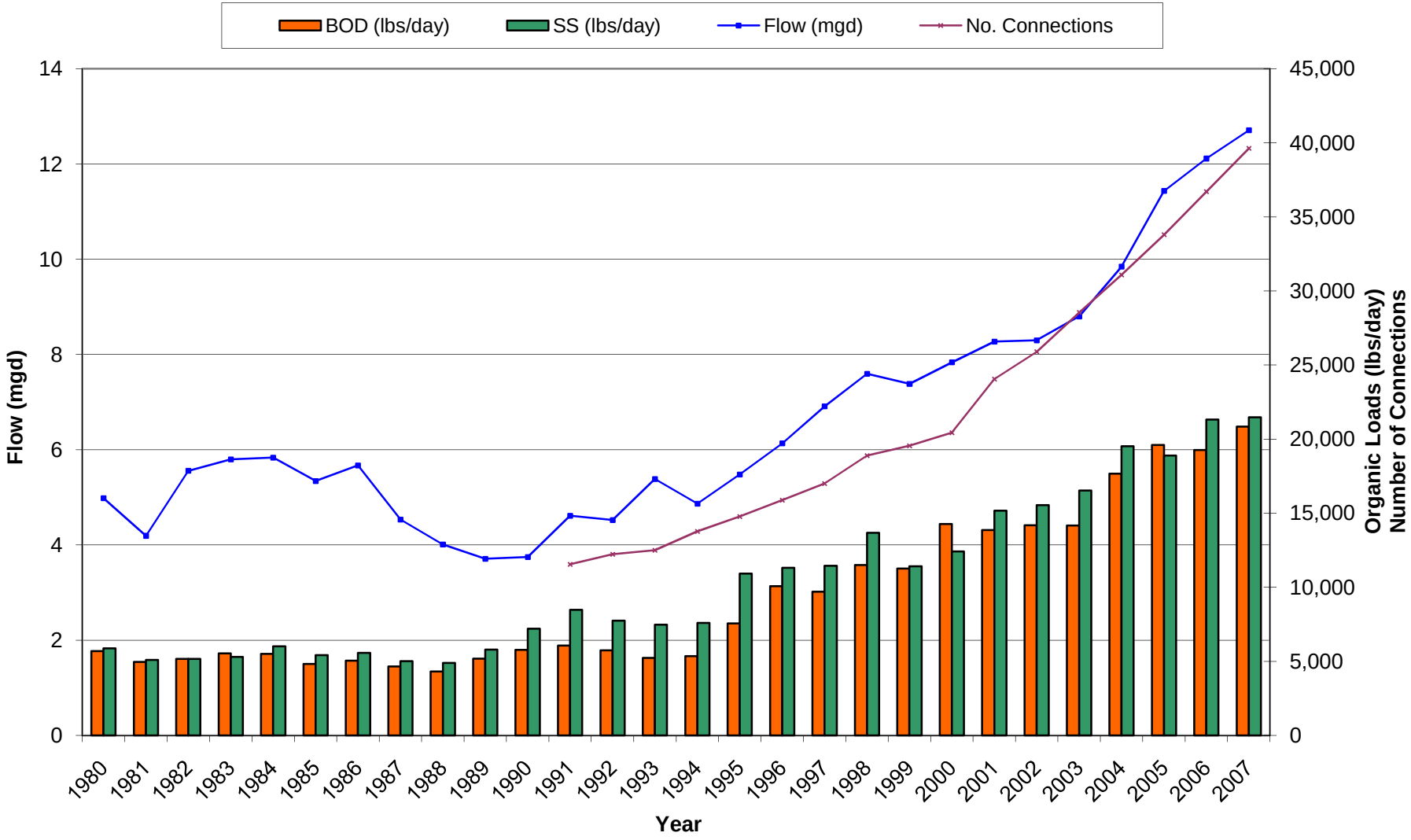
MONTH	FLOW (2008) (MGD)	FLOW (2007) (MGD)	% Increase
January	13.04	12.22	6.71%
February	13.24	12.13	9.15%
March	13.22	12.00	10.17%
April	13.11	11.56	13.41%
May	14.10	13.67	3.15%
June	14.57	13.31	9.47%
July	14.83	13.52	9.69%
August	14.67	13.56	8.19%
September	15.22	13.49	12.82%
October	14.76	13.49	9.41%
November	14.67	12.96	13.19%
December	14.15	12.90	9.69%
Average	**14.13**	**12.90**	**9.54%**
Peak Month	**15.22**	**13.67**	**11.34%**

Table 3-1

Historical Flow, Organic Loads, and Connections

City		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Av. % Increase 1980-2007
American Fork	Flow (mgd)	2.28	1.63	2.55	2.47	2.41	2.13	2.61	1.75	1.61	1.54	1.59	1.87	1.86	2.45	2.00	2.08	2.30	2.69	2.87	2.61	2.51	2.74	2.68	2.60	2.81	3.28	3.46	3.19	1%
	BOD (lbs/day)	2,684	1,859	2,037	2,136	2,224	1,757	2,140	1,881	1,921	2,046	2,342	2,104	2,265	2,291	2,291	2,221	2,902	3,398	3,457	3,639	4,533	4,085	3,928	4,094	4,812	4,635	4,589	4,712	2%
	SS (lbs/day)	2,714	1,895	1,915	1,959	2,650	1,956	2,198	1,790	2,202	2,168	2,896	2,918	3,092	3,172	2,987	2,595	3,038	3,679	3,783	3,488	3,963	4,211	4,034	4,856	5,815	4,270	4,847	4,574	2%
	No. Connections												4,488	4,721	4,993	5,181	5,412	5,642	5,858	6,074	6,307	6,378	6,816	7,000	7,015	7,030	7,045	7,060	7,077	3%
	Connected Pop												16,605	17,467	16,976	17,615	18,400	19,182	19,917	20,651	21,443	21,685	27,263	23,801	23,851	24,892	25,932	25,596	26,000	3%
	People/Connection												3.7	3.7	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	4.0	3.4	3.4	3.5	3.7	3.6	3.7	
Pleasant Grove	Flow (mgd)	1.59	1.50	1.67	1.91	2.01	1.87	1.63	1.41	1.44	1.33	1.31	1.56	1.58	1.66	1.56	1.69	1.87	1.95	2.27	2.11	2.11	2.03	2.13	2.03	2.16	2.48	2.52	2.37	1%
	BOD (lbs/day)	1,843	1,845	1,900	2,026	1,946	1,867	1,616	1,424	1,343	1,757	1,915	1,978	1,907	1,372	1,391	2,153	2,769	2,493	3,545	3,012	4,278	3,908	3,876	3,453	3,555	3,673	3,572	3,705	3%
	SS (lbs/day)	1,982	2,055	1,989	1,994	1,953	2,157	1,891	1,612	1,560	2,081	2,578	2,961	2,611	2,144	2,041	3,568	3,099	2,870	4,159	2,940	3,962	4,526	4,564	3,922	4,180	3,900	4,716	4,121	3%
	No. Connections												3282	3431	3431	3935	4220	4550	4923	5498	5596	5639	5881	6100	6115	6130	6145	6160	6179	4%
	Connected Pop												12734	13312	12107	15267	16373	17654	19101	21332	21712	21879	23523	23666	23849	27,116	28,378	29,640	30,903	6%
	People/Connection												3.9	3.9	3.5	3.9	3.9	3.9	3.9	3.9	3.9	3.9	4.0	3.9	3.9	4.4	4.6	4.8	5.0	
Lehi	Flow (mgd)	1.02	0.95	1.17	1.26	1.23	1.13	1.16	1.13	0.79	0.40	0.69	0.98	0.87	1.01	0.97	1.19	1.39	1.65	1.73	1.86	2.18	2.22	2.09	2.39	2.80	3.25	3.55	3.92	5%
	BOD (lbs/day)	1,067	1,062	979	1,103	1,022	852	843	927	746	1,027	1,143	1,567	1,099	1,127	1,015	1,938	2,980	2,363	2,949	2,793	2,894	3,129	3,340	3,254	5,129	6,406	6,063	6,219	7%
	SS (lbs/day)	1,071	939	989	1,062	1,084	857	955	1,111	835	1,174	1,348	2,124	1,531	1,616	1,765	3,195	3,655	3,362	4,001	3,254	2,295	3,533	3,602	4,006	5,226	5,949	6,458	6,243	7%
	No. Connections												2466	2638	2638	3110	3449	3843	4244	5018	5013	5181	5997	6490	7351	8,361	9,371	10,472	11,572	10%
	Connected Pop												8828	9444	9444	11133	12347	13757	15193	17964	17946	18547	23986	23232	26464	30,568	34,673	36,021	46,000	11%
	People/Connection												3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	4.0	3.6	3.6	3.7	3.7	3.4	4.0	
Alpine	Flow (mgd)	0.08	0.11	0.13	0.14	0.16	0.18	0.21	0.19	0.11	0.12	0.11	0.14	0.15	0.15	0.17	0.29	0.31	0.35	0.38	0.40	0.45	0.46	0.47	0.51	0.51	0.53	0.55	0.55	7%
	BOD (lbs/day)	95	175	221	265	283	329	379	342	195	252	263	282	339	273	353	736	759	844	879	887	1,114	1,119	1,073	1,042	1,127	1,103	1,081	1,119	10%
	SS (lbs/day)	102	196	249	268	292	419	435	417	179	263	272	310	359	330	436	820	799	843	949	811	974	1,154	1,162	1,074	1,168	1,054	1,113	1,021	9%
	No. Connections												765	809	809	870	935	1007	1073	1229	1208	1233	1376	1465	2013	2,089	2,165	2,241	2,319	7%
	Connected Pop												3473	3672	3478	3949	4244	4571	4871	5579	5484	7146	7489	7832	8175	8518	8861	9,204	10,000	7%
	People/Connection												4.5	4.5	4.3	4.5	4.5	4.5	4.5	4.5	4.5	5.8	5.4	5.3	4.1	4.1	4.1	4.1	4.3	
Highland	Flow (mgd)	0.01	0.01	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.02	0.03	0.03	0.04	0.06	0.12	0.16	0.16	0.24	0.25	0.30	0.35	0.42	0.52	0.61	0.73	0.73	0.75	20%
	BOD (lbs/day)	6	16	27	12	27	21	20	22	55	30	39	59	55	64	124	295	427	356	459	576	783	723	858	949	1,181	1,434	1,454	1,408	23%
	SS (lbs/day)	6	16	24	10	36	22	32	21	62	33	42	73	63	87	135	456	444	444	540	549	679	761	937	1,004	1,166	1,447	1,559	1,498	23%
	No. Connections												288	361	361	408	466	519	571	678	678	726	1197	1437	1714	2,119	2,524	2,759	2,993	16%
	Connected Pop												1448	1815	1552	2052	2343	2610	2872	3410	3410	3651	4786	7226	8570	11,100	13,630	14,515	15,400	16%
	People/Connection												5.0	5.0	4.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.2	5.4	5.3	5.1	
Cedar Hills	Flow (mgd)						0.003	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.06	0.10	0.11	0.10	0.11	0.09	0.10	0.18	0.20	0.21	0.28	0.36	0.40	0.43	0.46	26%
	BOD (lbs/day)						5	52	56	54	64	69	75	70	104	182	217	240	242	220	230	436	424	458	511	715	796	830	865	27%
	SS (lbs/day)						3	60	53	62	66	73	86	86	130	230	287	273	260	247	216	325	407	464	522	636	644	746	762	28%
	Connections												257	261	261	268	287	311	327	389	366	680	821	962	1202	1,534	1,866	2,023	2,180	14%
	Connected Pop												1228	1247	965	1281	1371	1486	1563	1859	1749	3094	3284	4600	5770	7,083	8,397	9,072	9,746	14%
	People/Connection												4.8	4.8	3.7	4.8	4.8	4.8	4.8	4.8	4.8	4.6	4.0	4.8	4.8	4.6	4.5	4.5	4.5	
Saratoga Springs	Flow (mgd)																				0.04	0.07	0.18	0.15	0.28	0.37	0.44	0.52	0.97	51%
	BOD (lbs/day)																				108	138	233	276	411	619	863	950	1,775	42%
	SS (lbs/day)																				128	138	332	323	522	663	907	1,102	2,180	43%
	Connections																				296	315	930	1292	1763	2,178	2,593	3,257	3,920	38%
	Connected Pop																				1414	1505	3720	6176	8462	8,250	8,038	9,069	10,100	28%
	People/Connection																				4.8	4.8	4.0	4.8	4.8	3.8	3.1	2.8	2.6	
Eagle Mountain	Flow (mgd)																				0.01	0.04	0.09	0.14	0.19	0.23	0.32	0.34	0.45	61%
	BOD (lbs/day)																				25	90	235	374	450	526	691	695	961	58%
	SS (lbs/day)																				26	81	248	449	614	662	713	763	1,001	58%
	No. Connections																				78	272	1026	1144	1368	1,635	1,902	2,456	3,009	58%
	Connected Pop																				372	1300	4102	5470	6566	7,182	7,798	10,199	12,600	55%
	People/Connection																				4.8	4.8	4.0	4.8	4.8	4.4	4.1	4.2	4.2	
South Valley	Flow (mgd)																										0.005	0.013	0.039	98%
	BOD (lbs/day)																										7	24	79	120%
	SS (lbs/day)																										6	22	78	135%
	No. Connections																										172	267	361	28%
	Connected Pop																										688	1,066	1,444	28%
	People/Connection																										4.0	4.0	4.0	
TSSD Total	**Flow (mgd)**	**4.982**	**4.190**	**5.554**	**5.795**	**5.832**	**5.339**	**5.668**	**4.532**	**4.008**	**3.707**	**3.744**	**4.609**	**4.520**	**5.383**	**4.864**	**5.479**	**6.131**	**6.908**	**7.591**	**7.381**	**7.833**	**8.269**	**8.295**	**8.797**	**9.842**	**11.434**	**12.112**	**12.706**	
	% Increase		-16%	33%	4%	1%	-8%	6%	-20%	-12%	-8%	1%	23%	-2%	19%	-10%	13%	12%	13%	10%	-3%	6%	6%	0%	6%	12%	16%	6%	5%	4%
	BOD (lbs/day)	**5,695**	**4,957**	**5,164**	**5,541**	**5,501**	**4,831**	**5,050**	**4,652**	**4,314**	**5,176**	**5,772**	**6,065**	**5,735**	**5,232**	**5,357**	**7,560**	**10,078**	**9,697**	**11,509**	**11,269**	**14,266**	**13,857**	**14,182**	**14,165**	**17,664**	**19,608**	**19,259**	**20,844**	
	% Increase		-13%	4%	7%	-1%	-12%	5%	-8%	-7%	20%	12%	5%	-5%	-9%	2%	41%	33%	-4%	19%	-2%	27%	-3%	2%	0%	25%	11%	-2%	8%	5%
	SS (lbs/day)	**5,876**	**5,101**	**5,166**	**5,293**	**6,016**	**5,415**	**5,571**	**5,005**	**4,900**	**5,786**	**7,209**	**8,472**	**7,742**	**7,479**	**7,595**	**10,922**	**11,308**	**11,458**	**13,678**	**11,411**	**12,418**	**15,172**	**15,536**	**16,521**	**19,515**	**18,892**	**21,325**	**21,478**	
	% Increase		-13%	1%	2%	14%	-10%	3%	-10%	-2%	18%	25%	18%	-9%	-3%	2%	44%	4%	1%	19%	-17%	9%	22%	2%	6%	18%	-3%	13%	1%	5%
	No. Connections												**11,546**	**12,221**	**12,493**	**13,772**	**14,769**	**15,872**	**16,996**	**18,886**	**19,542**	**20,424**	**24,044**	**25,890**	**28,541**	**31,076**	**33,783**	**36,693**	**39,610**	
	% Increase													6%	2%	10%	7%	7%	7%	11%	3%	5%	18%	8%	10%	9%	9%	9%	8%	9%
	Connected Pop												**44,316**	**46,957**	**44,522**	**51,297**	**55,078**	**59,260**	**63,517**	**70,795**	**73,530**	**78,807**	**98,153**	**102,003**	**111,707**	**124,710**	**136,395**	**144,382**	**162,193**	
	% Increase													6%	-5%	15%	7%	8%	7%	11%	4%	7%	25%	4%	10%	12%	9%	6%	12%	10%
	People/Connection												**0.0**	**-0.7**	**-0.7**	**6.6**	**0.2**	**2.1**	**5.3**	**0.6**	**-0.2**	**0.5**	**0.8**	**3.2**	**3.9**	**4.0**	**4.0**	**3.9**	**4.1**	

Figure 3-1
Historical Flow, Organic Loads, & Connections



It's interesting to note the significant flow increases that occurred in 2008 even with the sharp down turn in the housing market. This indicates that other factors besides housing growth can affect flow volumes at the Treatment Plant. Flows have the potential to increase or decrease dramatically. This is primarily caused by I/I. I/I is storm and/or groundwater that enters the sewer system through cracked or broken pipes, leaky manholes, poor joints, or improperly connected storm drains. Most inflow comes from storm water while the majority of infiltration comes from groundwater. There is typically more I/I in the summer months than winter months. The amount of I/I varies from year to year depending on wet or dry precipitation years and groundwater levels. The scope of this Capital Facility Plan does not include a major I/I evaluation, however, general I/I trends are identified from available data and discussed further in Section 4.2.

3.2 Organic Load

Organic load is normally determined by BOD and SS both measured in mg/L units. BOD and SS are used to measure the level of contamination of the wastewater. Figure 3-1 illustrates the BOD and SS steadily increasing over the past 27 years rather than fluctuating up and down dramatically like the flow. This occurs because the organic load is not significantly impacted by I/I. Organic loads generally increase in response to population and/or commercial growth. The organic load began to significantly increase in 1990. Since then the average yearly BOD increase has been nearly 8 percent and the SS increase has been approximately 6.6 percent.

3.3 Service Connections

Estimated service connections (1991-2007) provided by the District are summarized and illustrated in Table 3-1 and Figure 3-1. The District population growth rate from 1991 to 2007 has averaged close to 8.5 percent per year. This is a high growth rate compared to the State average of less than 3 percent.

SECTION 4
SUMMARY OF FUTURE CONDITIONS

4.1 Population Projection

A major contributor to flow and organic load increases is population growth. The population in northern Utah County has grown significantly the past 15 years due to a variety of reasons such as low interest rates, available land, and a strong economy. Variables such as these can change impacting the growth of the area. This is one reason the CFP should be updated periodically (3-5 years) to reflect accurate population growth projections for estimating capital facility improvements.

Each city/area served by TSSD provided population estimates for the year 2007 as listed in Table 4-1. Population growth projections for the next 23 years were primarily obtained from MAG) Population Projections, released May 2005. These data are graphically shown in Figure 4-1. Average yearly population growth within the TSSD service area is projected to maintain a rate of 5 percent through 2010 and then decrease to 4 percent, 3 percent, and then remain at 2 percent through the years 2015, 2020, 2025, and 2030 respectively. The communities estimating the largest growth (more than 1,000 people per year) are Eagle Mountain, Lehi, Saratoga Springs, and South Valley (Suncrest Development).

Of note is that Eagle Mountain only sends a portion of its wastewater flow to TSSD for treatment. Approximately 1/3 of Eagle Mountain's population is served by a small treatment facility owned by the City. Epic Engineering prepared an engineering report dated October 2005 that analyzed in greater detail the population projection that would be served by TSSD. These population projection values are listed for Eagle Mountain in this report.

The Town of Vineyard will begin sending flow to TSSD in the near future. Only a portion of the Town of Vineyard will direct its wastewater flow to TSSD. The South end of the Town is presently being serviced by Orem City's wastewater treatment plant which will continue. The agreement between the Town of Vineyard and TSSD is for the District to provide treatment services for up to 7,666 Equivalent Residential Units (ERU) based on a flow 400 gallons/day/ERU.

A recent slump in the U.S. housing market has slowed growth beginning mid 2007 and continues today. Some experts are predicting that the housing downturn will begin to ease later in 2009. The population projections used in this document were developed by MAG prior to the slum in the housing market. If the slow down is reversed over the next two years the long term population projects will likely still be valid.

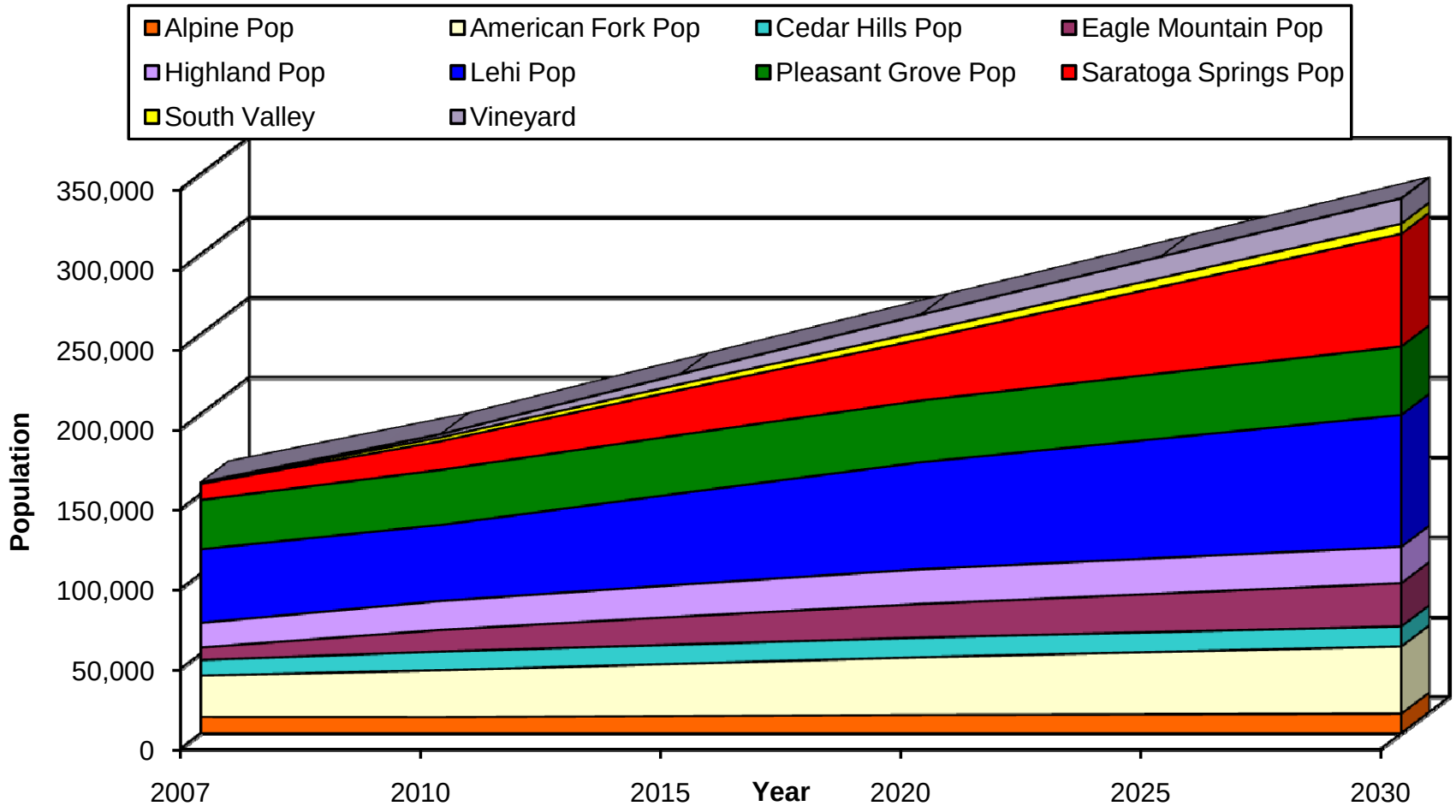
Table 4-1 TSSD Service Area Population Growth Projections 2007-2030

City	2007	2010	2015	2020	2025	2030	2007-2030 Annual Average
Alpine Pop	10,000	9,884	10,612	11,340	11,723	12,105	
Av Annual Pop Increase		-39	146	146	77	77	81
Av Annual Growth Rate (%)		-0.4%	1.4%	1.3%	0.7%	0.6%	0.8%
American Fork Pop	26,000	29,434	32,787	36,139	39,120	42,100	
Av Annual Pop Increase		687	671	671	596	596	644
Av Annual Growth Rate (%)		2.5%	2.2%	2.0%	1.6%	1.5%	1.9%
Cedar Hills Pop	9,746	11,737	12,016	12,295	12,424	12,552	
Av Annual Pop Increase		398	56	56	26	26	112
Av Annual Growth Rate (%)		3.8%	0.5%	0.5%	0.2%	0.2%	1.0%
Eagle Mountain Pop	7,798	13,500	17,500	21,000	24,000	27,000	
Av Annual Pop Increase		1,140	800	700	600	600	768
Av Annual Growth Rate (%)		11.6%	5.3%	3.7%	2.7%	2.4%	5.1%
Highland Pop	15,400	18,107	19,921	21,735	22,255	22,775	
Av Annual Pop Increase		541	363	363	104	104	295
Av Annual Growth Rate (%)		3.3%	1.9%	1.8%	0.5%	0.5%	1.6%
Lehi Pop	46,000	47,555	57,261	66,967	74,727	82,487	
Av Annual Pop Increase		311	1,941	1,941	1,552	1,552	1,459
Av Annual Growth Rate (%)		0.7%	3.8%	3.2%	2.2%	2.0%	2.4%
Pleasant Grove Pop	30,903	34,446	36,512	38,578	40,728	42,877	
Av Annual Pop Increase		709	413	413	430	430	479
Av Annual Growth Rate (%)		2.2%	1.2%	1.1%	1.1%	1.0%	1.3%
Saratoga Springs Pop	10,100	17,936	28,131	38,325	54,356	70,386	
Av Annual Pop Increase		1,567	2,039	2,039	3,206	3,206	2,411
Av Annual Growth Rate (%)		12.2%	9.4%	6.4%	7.2%	5.3%	8.1%
South Valley	774	2,400	3,628	4,856	5,582	6,307	
Av Annual Pop Increase		325	246	246	145	145	221
Av Annual Growth Rate (%)		25.4%	8.6%	6.0%	2.8%	2.5%	8.8%
Vineyard	150	1,955	6,241	10,526	13,179	15,832	
Av Annual Pop Increase		361	857	857	531	531	627
Av Annual Growth Rate (%)		67.1%	26.1%	11.0%	4.6%	3.7%	20.5%
Total	156,721	184,999	218,367	251,235	284,912	318,589	
Av Annual Pop Increase		5,656	6,674	6,574	6,735	6,735	6,475
Av Annual Growth Rate (%)		3.4%	3.4%	2.8%	2.5%	2.3%	2.9%

Notes:

1. 2007 population data obtained from individual cities.
2. 2010 - 2030 population data obtained from Mountainland AOG except Eagle Mountain & South Valley
3. Eagle Mountain projected population data obtained from Epic Engineering Report: "Wastewater Treatement Alternatives for the City of Eagle Mountain", Oct 2005
4. South Valley population data obtained from Suncrest Development

Figure 4-1
Service Area Population Growth Projections 2007-2030



4.2 Flow Projection

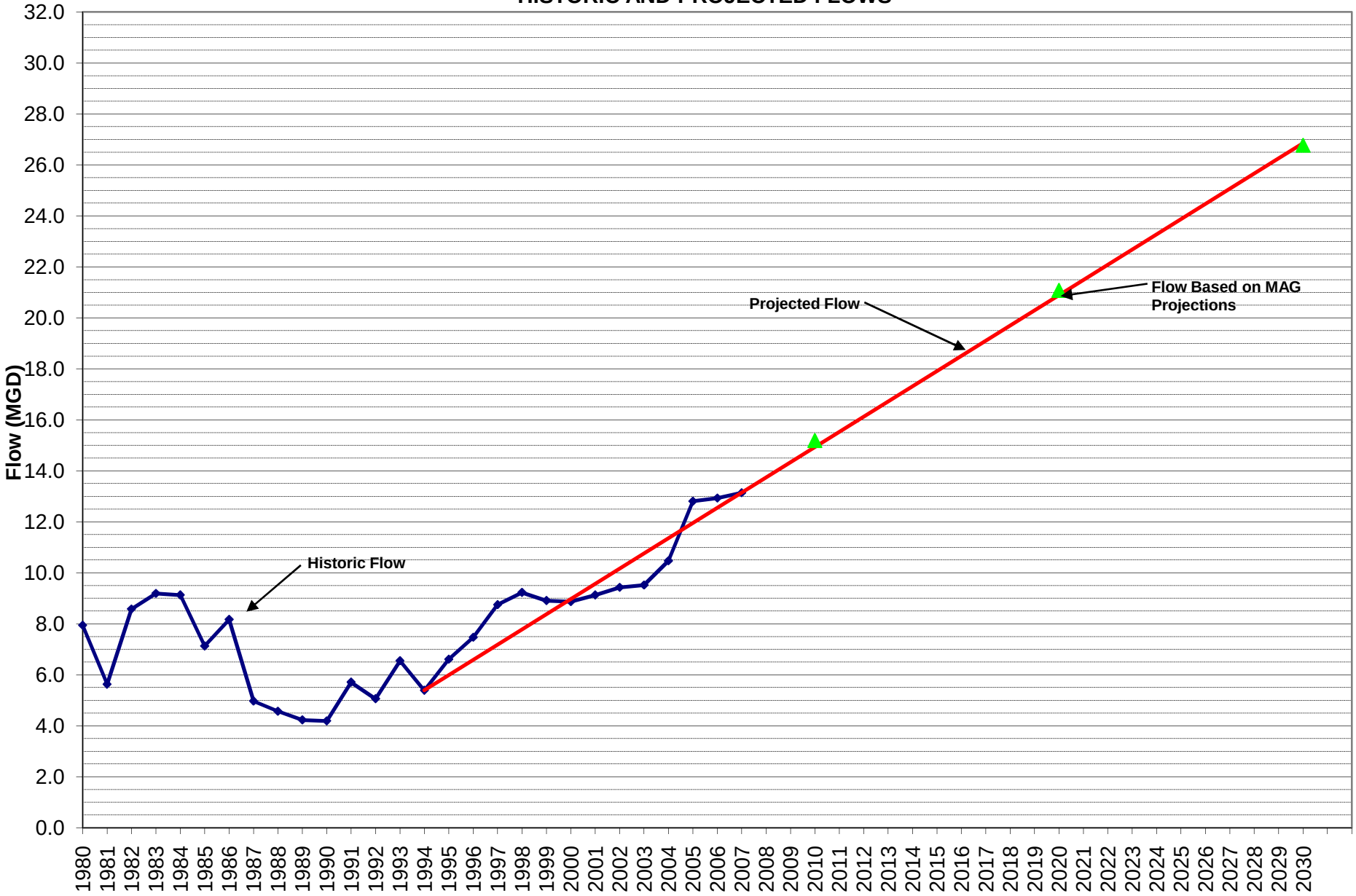
Figure 4-2 is a graph of the historical flows that TSSD has experienced since its inception in 1980. Historic flows are shown as a blue line on the graph. The flow values represent the average peak month flow during the year. Note that during the years of 1980 through 1994 that significant random variations in flow occurred some of which can be explained by wet/dry weather cycles. However, the magnitude of the randomness is difficult to explain. Greater consistency can be observed between the years of 1994 and 2007. Therefore, the historical flow pattern since 1994 was used to project future flows (shown in red).

Also shown on Figure 4-2 are three green triangles. Each triangle represents the anticipated flow that would be generated by the population estimates generated by MAG. The values correspond well with the graphic method of flow projection that was used.

4.3 Organic Load Projection

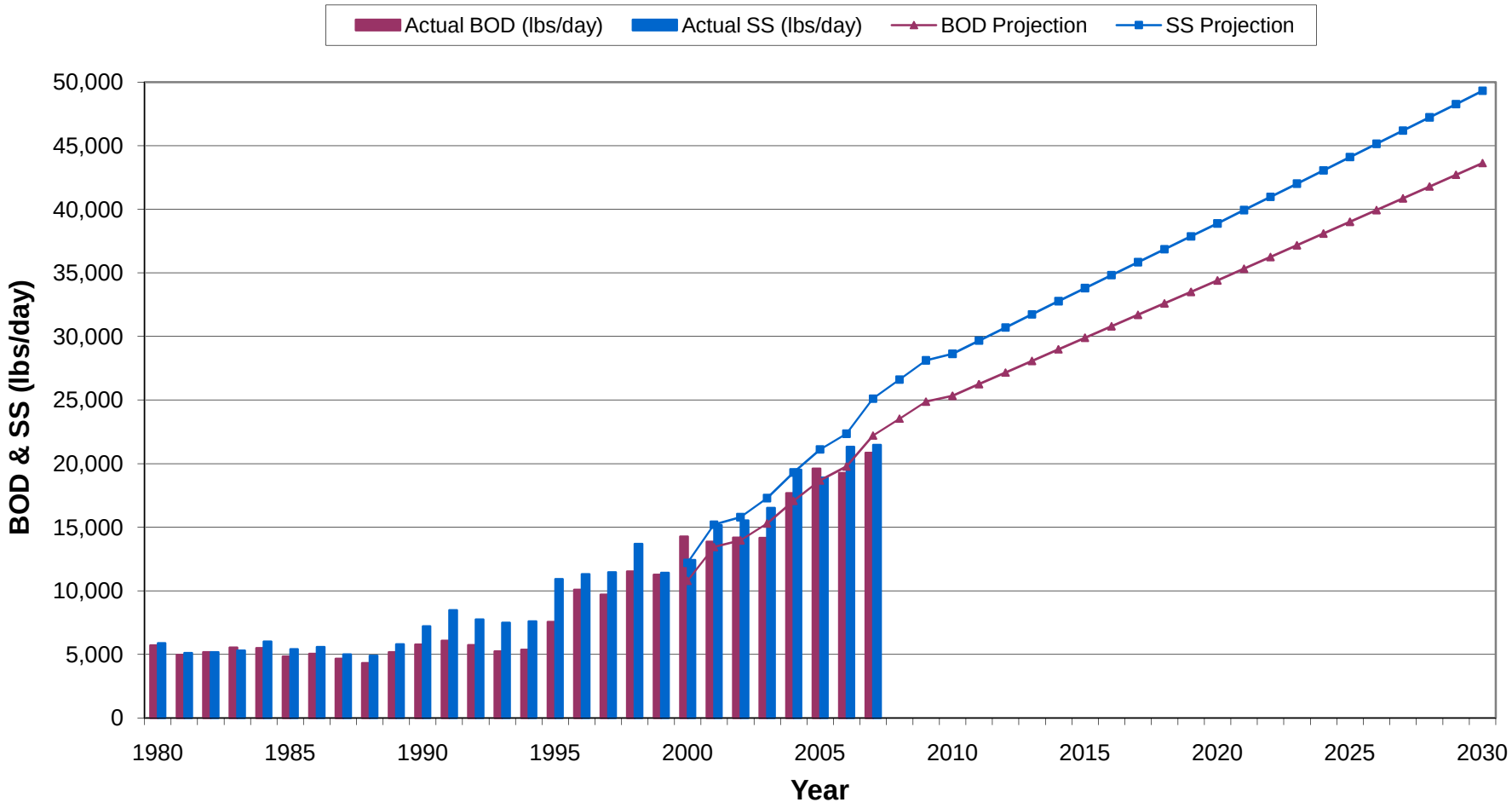
The organic load is simpler to project since it is minimally impacted by I/I. Figure 4-3 illustrates the historical loading in lbs/day of BOD and SS from 1980 to 2007. Based on historical TSSD organic loadings and connected population, the per capita loadings are approximately 0.14 lbs BOD and 0.16 lbs SS. The BOD and SS are then projected to year 2030 by multiplying the BOD and SS per capita loading rates by the projected population.

Figure 4-2
TIMPANOGOS SPECIAL SERVICE DISTRICT
HISTORIC AND PROJECTED FLOWS



Note:
1. Historic flows are based on highest average monthly flow for the year.
2. Projected flows are estimated to increase 0.596 mgd per year (average from 1994-2007).
3. Years shown on the figure represent the end of that year.

Figure 4-3
Organic Load History & Projections 1980-2030



SECTION 5
FUTURE PLANNING

5.1 Wastewater Treatment Plant

Hydraulic Loading

Projecting when the TSSD Wastewater Treatment Plant will reach its treatment capacity is difficult at best. There are several constantly changing variables that must be incorporated in the evaluation. These variables include population growth, I/I and reserve capacity for industrial users. A brief discussion of these variables follows.

Population Growth – Population growth values used in this report were supplied by each member city and MAG. Population numbers directly affect projected flow values. Population growth is affected by many factors including the economy and interest rates. During the past 12 months the U.S. economy has experienced a major slow down in the housing market. If the economy begins its recovery over the next 12 to 24 months it is likely that the MAG and City projects will still be valid. A long-term slow down will necessitate revisions in the population projections. For this report it is assumed that the U.S. economy will not linger in the slow down beyond the early 2010.

Infiltration & Inflow (I/I) – This component of flow can vary significantly from year to year. I/I values at TSSD have ranged from 4.8 MGD to just over 1.0 MGD. Dry weather years will generally experience low levels of I/I while several consecutive years of wet weather will result in high levels of I/I.

Reserve Capacity for Industrial Users – Micron is the industrial user that has the largest potential for discharging significant flows to TSSD. Micron and Intel (I/M Flash Technologies) teamed to produce a new chip for the electronic industry and are anticipating full production in the third quarter of 2008. They expect to discharge approximately 3.2 MGD when in full production. At the present time I/M Flash is discharging approximately 1.7 MGD.

Each of the three variables will have an impact on the volume of flow that reaches the plant. Yet each variable can be hard to predict.

It appears that I/M Flash Technologies will continue to discharge between 1.7 and 2.0 MGD. TSSD will not likely see a reduction in flow from I/M Flash.

The recent growth rate in TSSD's service area has been very rapid but is presently experiencing a significant slow down. The growth rate should be re-examined every two or three years to respond to factors affecting growth.

The most difficult variable to predict and respond to is I/I. As the District has experienced, I/I can vary significantly and change quickly. The District has seen I/I

values that were low and values near 5.0 MGD. This is a wide range of variation and significant changes can occur from one year to the next. It is impossible to predict when a high I/I cycle will occur, but when it does the plant must be capable of accommodating the increased flow.

Figure 5-1 is a graph developed to assist in identifying when the next plant expansion will be needed. The blue line represents a plot of historic flows using the highest monthly average during the year. Significant variations occurred between 1980 and 1994. Some of the variation is due to wet/dry weather patterns but much of the variation cannot be explained. A more consistent flow pattern emerged from 1994 to 2005. The flow data from 1994 to 2007 was used to project future flows (red line). Three green triangles shown on the graph represent the flow volumes expected using population numbers prepared by MAG. Those values correspond well with the projected flow as depicted by the red line. The blue dashed line represents the peak 30 day average flows during high periods of I&I. The horizontal purple solid line represents existing plant capacity of 18.34 MGD while the horizontal dashed purple line is the available capacity with projected future increases in flow from I/M Flash Technologies subtracted . Figure 5-1 graphically shows the timing for expansion of the TSSD WWTP. The State of Utah Department of Environmental Quality (UDEQ) requires that when a treatment facility is within five years of reaching capacity it must begin a study to initiate the next expansion. A rule of thumb is the expansion study should begin once a treatment facility reaches 85 percent of its design capacity.

A treatment plant of TSSD's complexity will require the following schedule (including required review time) to complete an expansion.

Predesign/Design	12 months
State Review/Changes	3 months
Bidding and Award	3 months
Construction	24 months
Startup / Training	3 months
Total	**45 months**

It will require 3-1/2 years to expand the plant and an additional 3 months to complete training and startup.

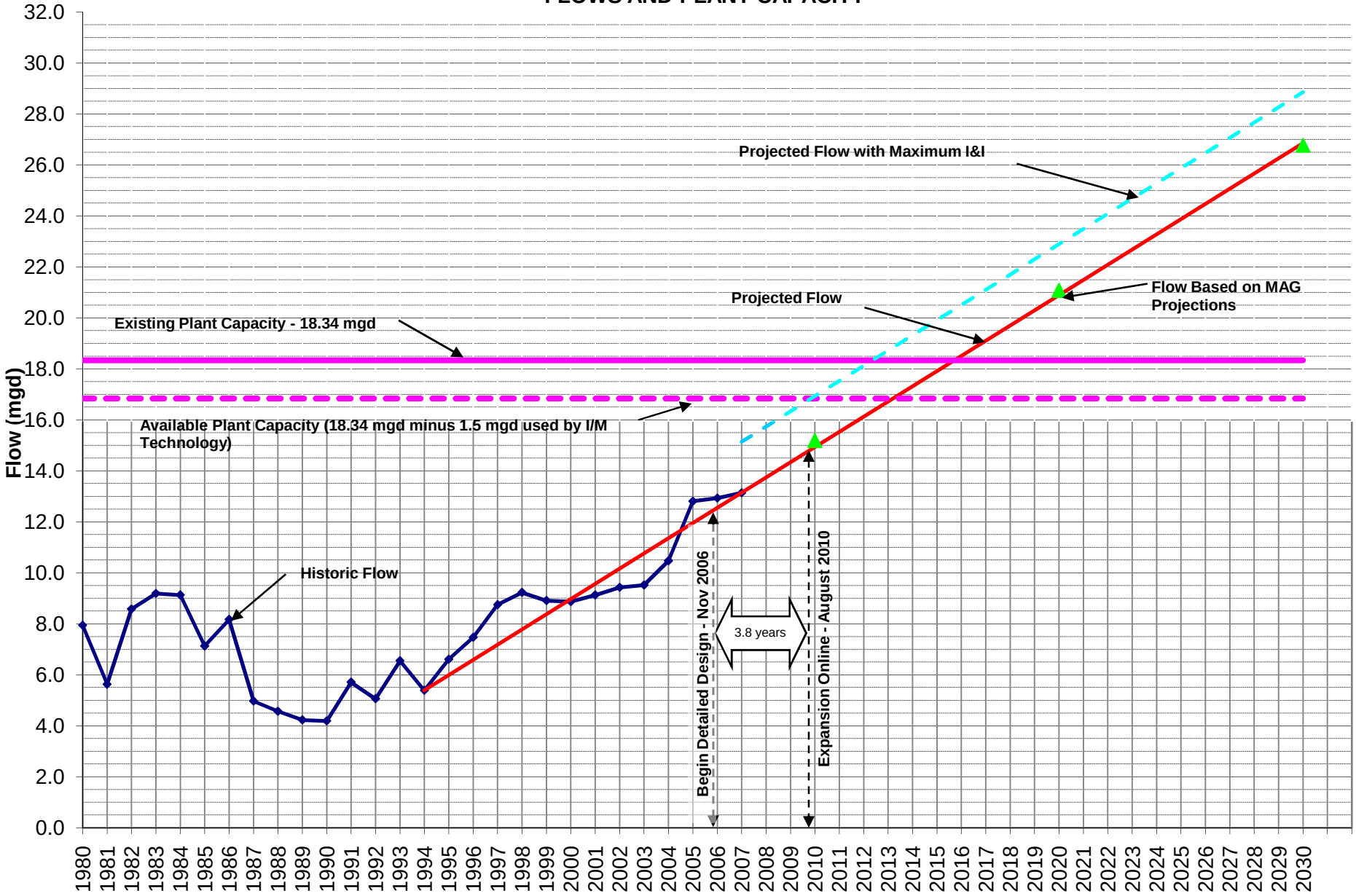
Figure 5-1 shows that TSSD should have began efforts to expand the plant by the middle of 2006 based on the following conditions:

1. Flow projections using historical flow increases from 1994 to 2005 combined with high I&I values (red dashed line in Figure 5-1)

2. I/M Flash Technologies being in full production in October 2008

3. Three and one-half year design, review and approval, bidding, construction period.

Figure 5-1
TIMPANOGOS SPECIAL SERVICE DISTRICT
FLOWS AND PLANT CAPACITY



Note:
1. Historic flows are based on highest average monthly flow for the year.
2. Projected flows are estimated to increase 0.596 mgd per year (average from 1994-2007).
3. Years shown on the figure represent the end of that year.

BC&A was authorized by the TSSD Board to begin design on a plant expansion project to increase its treatment capacity from 18.34 MGD to 30.0 MGD. It is anticipated that construction of the expansion project will be completed by June, 2011.

Organic Loading

The estimated organic capacity of the TSSD treatment plant is 27,813 lbs/day, for BOD and SS. This value is calculated from design information listed in the original 1977 TSSD Treatment Facility and 1996 TSSD Plant Expansion construction drawings. According to the organic load projections illustrated in Figure 5-2, the influent SS load reaches treatment plant capacity in 2010 and the influent BOD load reaches capacity in 2013. Although reaching the SS treatment capacity of the plant is projected to occur in 2010 it is anticipated that effluent water quality standards will be met or exceeded during the expansion period. The organic loading is primarily influenced by the population growth and will not be significantly impacted by I/I and additional flow from I/M Flash Technologies.

5.2 Outfall Lines

The District owns and maintains a number of major sewer outfall lines that are depicted in Figure 5-3. The sewer outfall lines transport wastewater from areas within the District's service area to the treatment plant.

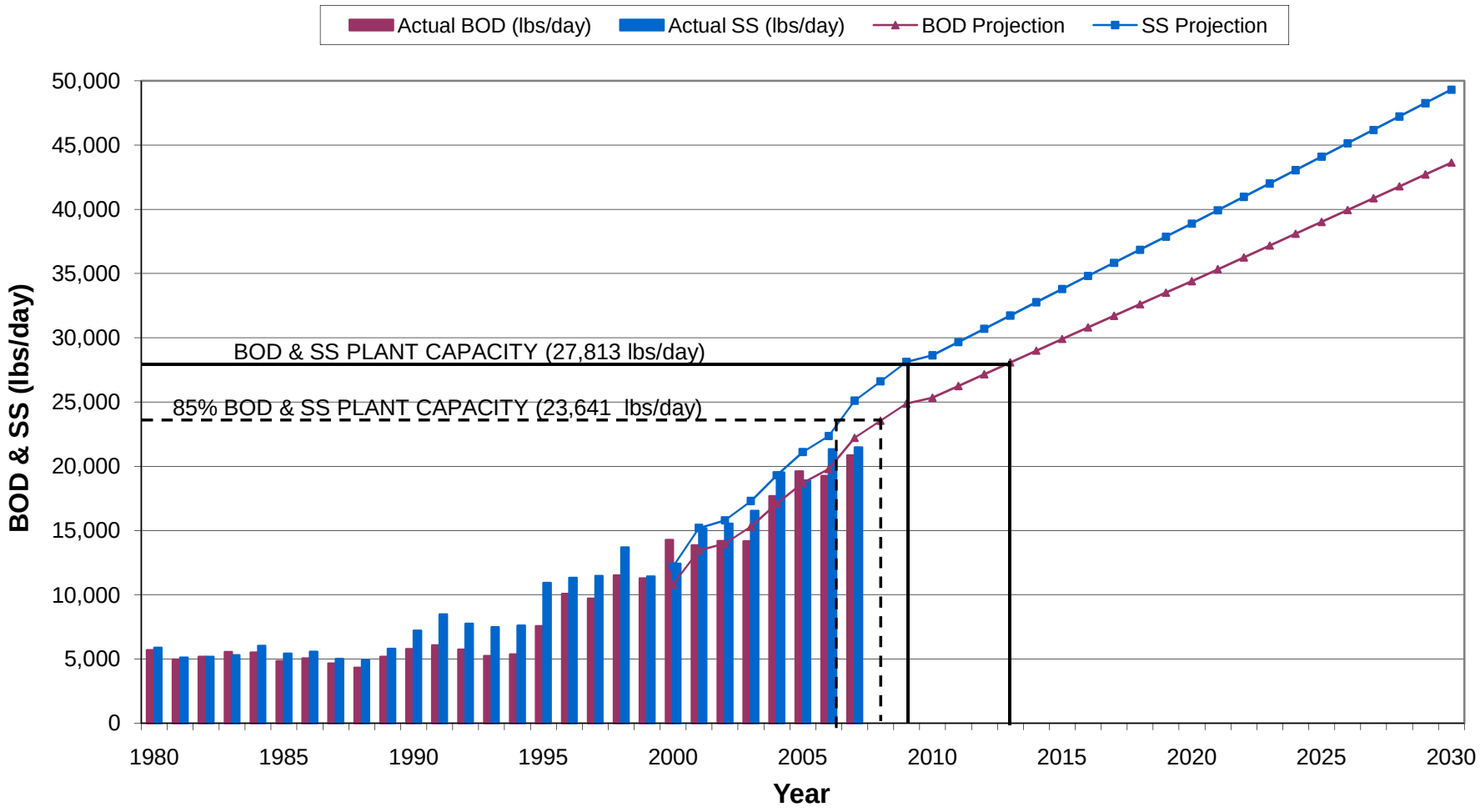
The outfall lines were divided into 16 sections to facilitate a more detailed evaluation. Each section is identified and labeled in Figure 5-3.

Flow projections for each section of the outfall lines, including an I/I estimate from historical flow data, has been conducted. The State requires the use of a 2.5 peaking factor when designing outfall lines (R317-3). Therefore, the outfall line flow projections are calculated by multiplying the 2.5 peaking factor to the dry year (January) flow and then adding the estimated I/I flow. Flow information from the metering stations during 2006 and 2007 was not available for use in this analysis. Once that information becomes available the capacity analysis will be updated. A graph of each outfall line can be found in the Appendix.

Figure 5-3 provides a summary of when each section of the outfall lines reaches capacity and when an expansion project should be initiated. It is recommended that the new outfall line be installed and operating before the full capacity of the existing line is reached. The criteria used to determine when expansion planning/design should begin are based on when the projected flows reach 85 percent capacity or three years before full capacity (whichever is less).

As shown in Figure 5-3, three segments of the Alpine/Highland/Suncrest Outfall Line are recommended to begin expansion planning/design between now and 2012. Additional outfall lines show planning/design to begin in 2015 through 2022.

Figure 5-2
Treatment Plant Organic Load Capacity Evaluation



LEGEND

FACILIITES
- Lift
- Meter

WATERWAYS
- Streams
- Canals

FACILITY CAPACITY PROJECTION

Segment	Interceptor	Year Capacity is Reached	Begin Expansion Planning / Design
2	1977 24" ALPINE/HIGHLAND/SUNCREST	2003	2006
3	1997 24" ALPINE/HIGHLAND/SUNCREST	2008	2007
6	1977 18" ALPINE/HIGHLAND/SUNCREST	2013	2011
* 8	1977 30" PLEASANT GROVE	2018	2015
4	1998 24" ALPINE/HIGHLAND/SUNCREST	2018	2016
7	1977 18" ALPINE/30% HIGHLAND	2020	2018
* 9	1977 30" PLEASANT GROVE	2021	2018
1	1977 42" ALPINE/HIGHLAND/SUNCREST/ AMERICAN FORK/CEDAR HILLS	2022	2020
13	1995 30" 80% LEHI	2025	2022
12	1995 54" SARATOGA/EAGLE MTN/20% LEHI	BEYOND 20 YRS	
11	1996 60" SARATOGA/EAGLE MTN/LEHI	BEYOND 20 YRS	
16	1977 42" ALPINE/HIGHLAND/SUNCREST/ AMERICAN FORK/CEDAR HILLS	BEYOND 20 YRS	
5	1977 21" ALPINE/HIGHLAND/SUNCREST	BEYOND 20 YRS	
14	1977 24" ALTERNATE LEHI LINE	BEYOND 20 YRS	
15	1977 36" AMERICAN FORK/CEDAR HILLS	BEYOND 20 YRS	
10	1977 30" PLEASANT GROVE	BEYOND 20 YRS	

* NOTE: THE 2006 PLEASANT GROVE INTERCEPTOR PROJECT WILL RELIEVE THE 1977 30" PLEASANT GROVE INTERCEPTOR BEFORE CAPACITY IS REACHED.

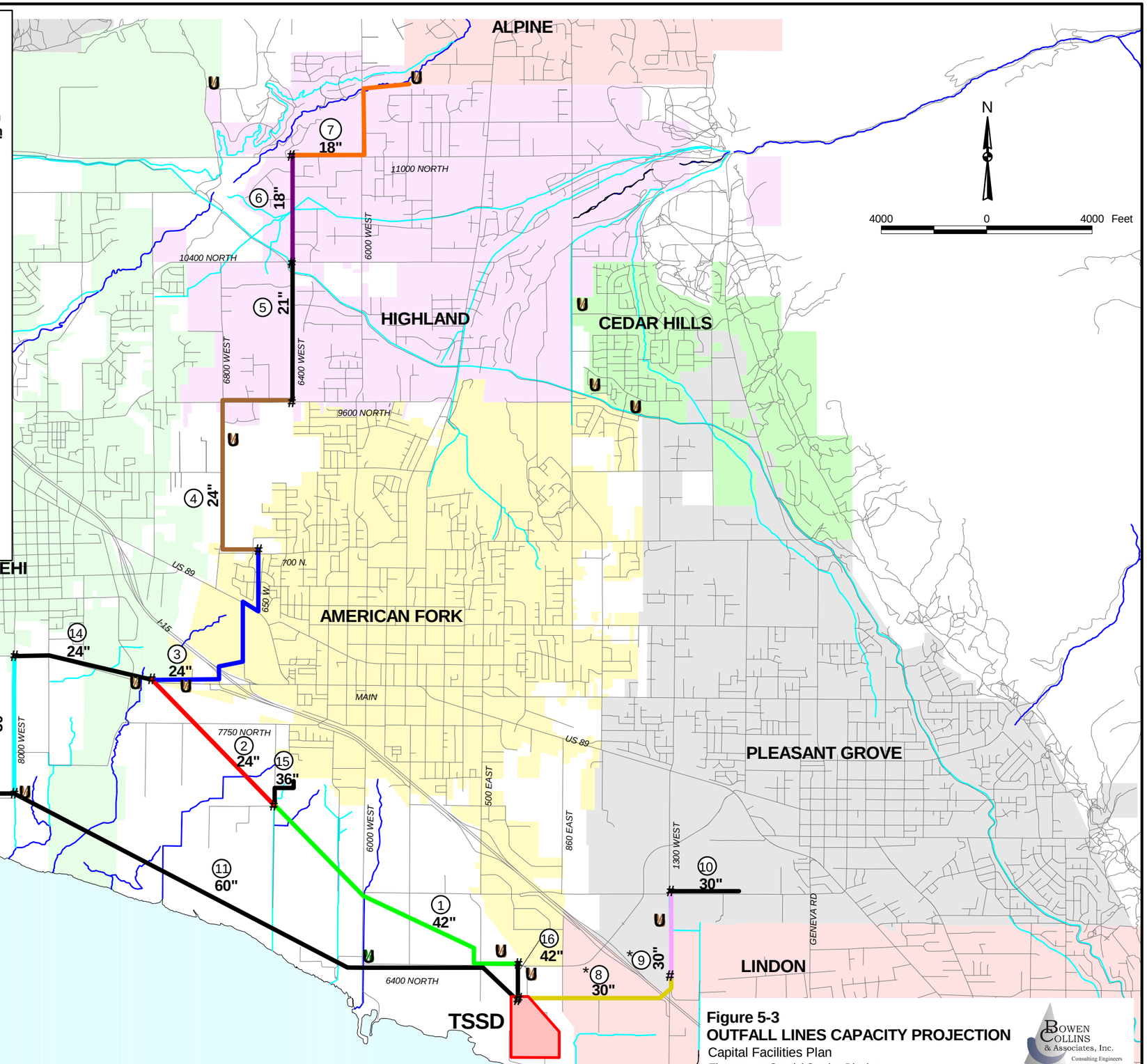


Figure 5-3
OUTFALL LINES CAPACITY PROJECTION
Capital Facilities Plan
Timpanogos Special Service District

BOWEN COLLINS & Associates, Inc. Consulting Engineers

Timpanogos Special Service DistrictGIS\Projects\550201_Capital Facilities.apr Outfall Line Capacity

Flow evaluations are based on peak flows that may occur for a short duration one or two times during the year. Sewer lines that exceed their gravity flow capacity will become surcharged forcing a higher flow through the pipe. This creates a pressure situation in the pipe although the pressures are generally low. The potential problems that can result from surcharging sewer lines include flooding basements, surface discharge of raw sewage, or exfiltration. It is not desirable to surcharge sewer lines in most cases and where surcharging is allowed to take place it should only be a short-term event. It is recommended that the sewer lines, shown to be at capacity in Figure 5-3, be constructed as close to the dates identified as possible.

5.3 Proposed Projects

Following is a brief description of projects that have been identified to be completed between 2008 and the end of 2012.

Pleasant Grove/Cedar Hills Outfall Line. This project includes construction of a new outfall line that will provide capacity to Cedar Hills as well as portions of Highland City, American Fork, and Pleasant Grove. Phase I (sta 0+00 to sta 120+00) includes construction of a 24" line from the treatment plant North to State Highway 89. The project is presently under construction. The total estimated cost of the project is $3,271,000 with an estimated $1,216,000 worth of construction remaining to be completed.

Phase II (sta 120+00 to sta 263+00) of the Pleasant Grove/Cedar Hills outfall line project includes installing a 24" line from State Highway 89 to the North side of the Murdock Canal along 1100 East (American Fork address). Utah County on behalf of UDOT is in the process of planning and securing rights of way for a major widening of that road which is scheduled to occur sometime in the next 1-3 years. It is recommended that the Pleasant Grove/Cedar Hills outfall line be designed beginning early 2009 to ensure that line is ready for construction prior to or in conjunction with the road widening project. The estimated cost of the total project from State Highway 89 to the Murdock Canal is $6.2 million. If the pipeline is not installed prior to or as part of the new road construction the District will need to find a new alignment for the outfall line or wait for a 5 year period or longer after the road is complete before the asphalt can be cut for installation of the pipe.

Replace the Boat Harbor Lift Station. Hydrogen sulfide corrosion has aggressively attacked the concrete at the Boat Harbor Lift Station. There are some design features of the lift station that are adding to the extensive corrosion problem and necessitate replacement of the lift station. Due to the need to replace the lift station as soon as possible it is recommended that a submersible lift station be designed on the existing site. This approach will reduce the time required to obtain Utah County approval through planning and zoning and a public hearing process. The County has indicated that converting to a submersible pump station

on the existing site will be approved as an expansion project and not a new pump station. The estimated to cost to replace the pump station is $5,655,000.

Rehab Corrosion Problem in the 54-inch/ 60-inch Lehi Outfall Line. The (concrete) Lehi outfall line is experiencing corrosion in sections located upstream and downstream of the Boat Harbor Lift Station and near the start of the 54-inch line. A rehabilitation project should be completed to address the corrosion problem. The project is estimated to cost $3,280,000 and should be completed as soon as practical.

Parallel the (1997) 24-inch Alpine/Highland/Suncrest Outfall Line (Segment 3). It is projected that this section of the outfall line will soon reach design capacity. A project should be designed and constructed to parallel this line with a 42-inch line approximately 4,808 feet long. Also included is a boring under State Highway 89 and the railroad. The total estimated cost of the project is $6,612,000. It is scheduled to be completed in 2010.

A section of the existing 24" line will be affected by the new Pioneer Crossing Road that is presently under construction and a new TRAX line that is under design. The District has approached UDOT to request a "betterment" which would include upsizing that section of the 24" line that will be relocated to a 42" line. UDOT is considering the request. The initial indication is the betterment if accepted by UDOT will cost nearly $1,000,000. If UDOT accepts the District's request it will require the District to spend the $1,000,000 earlier than shown in tables 5-1 and ES-1.

Parallel the (1977) 24-inch Alpine/Highland/Suncrest Outfall Line (Segment 2). This project includes paralleling 6,882 feet of the line with a new 42-inch pipe. The project is to be constructed in 2009 at an estimated cost of $5,370,000.

It is critical that this project be completed as soon as practical since the line is at or over capacity at the present time.

Expand TSSD Treatment Facility to 30 MGD. TSSD has authorized the design of a plant expansion. The expansion will increase the plant capacity from 18.34 MGD to 30 MGD. The existing extended aeration process presently employed will be changed. The oxidation ditches will be compartmentalized to facilitate nitrification, de-nitrification and biological phosphorus removal. DEQ has set a voluntary goal for all treatment plants that discharge to Utah Lake to include biological phosphorus removal for all plant upgrades or expansions. It is expected that a future phosphorus standard will be included in discharge permits of plants discharging to Utah Lake.

TSSD's plant expansion will also include replacing the existing turbine mixers with diffused air using fine bubble diffusers and high speed turbo type blowers. In addition to increasing treatment capacity, the expansion project will also

include a new 30 MGD headworks, 30 MGD (equivalent capacity) mechanical dewatering facility, and a 30 MGD low pressure/high intensity UV system. The estimated cost of the project is $83,000,000.

Suncrest Lift Station Upgrade. The Suncrest Lift Station has been mired in problems. Presently only one of the three pumps is operational. Two new pumps need to be purchased and installed as soon as possible. The pump station lacks appropriate ventilation resulting in mold growth in the pump station. The pump station needs to be overhauled or replaced.

The District has been waiting to determine what should be done at the lift station until UDOT determines if the expansion of SR 92 would require relocation of the pump station. It appears that the road expansion will be to the North and will not impact the lift station. If indeed UDOT's plan for widening SR 92 will not impact the lift station it is recommended that work should begin as soon as possible to replace or rehab the lift station. It is estimated that $318,000 will be needed if the District elects to rehab the lift station.

Land Acquisition. It is recommended that TSSD acquire additional property around it's present treatment plant site if it becomes available at a reasonable cost. It is also recommended that property be purchased at an appropriate remote site that can be utilized for solids treatment and/or disposal.

5.4 Project Expenditure Distribution

Table 5-1 presents the project expenditure distribution from 2008 to 2013. The majority of annual expenditures occur in 2008 through 2011. The total expenditures through 2013 are estimated to be nearly $107 million.

Originally Table 5-1 included other projects that resulted in a total estimated cost of nearly $140 million. The District's Board recommended that certain projects be removed or postponed after its review. The Board's actions resulted in lowering of the projected capital expenditures to $107 Million.

Also included in Table 5-1 is a percent cost distribution column. This column identifies the percentage of project costs that are attributed to new capacity or growth and those attributed to all users or O&M.

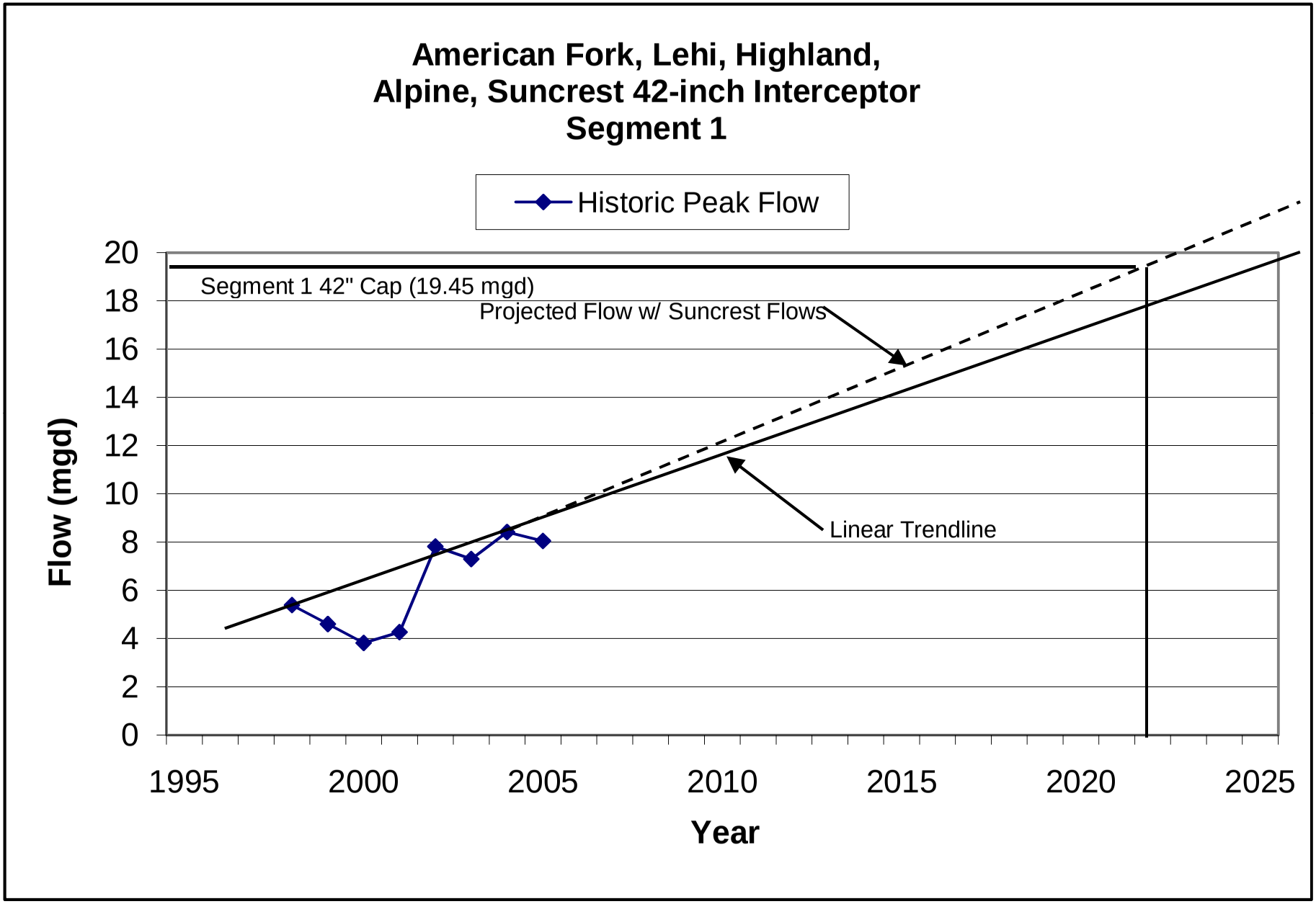
It is important to note that the project implementation schedule with estimated cost is intended to be used as a financial planning tool. The implementation schedule is based on available population projections and I/I data. Over time the actual population growth and I/I data may differ from the projections outlined in this CFP. For this reason, the CFP should be updated every three to five years.

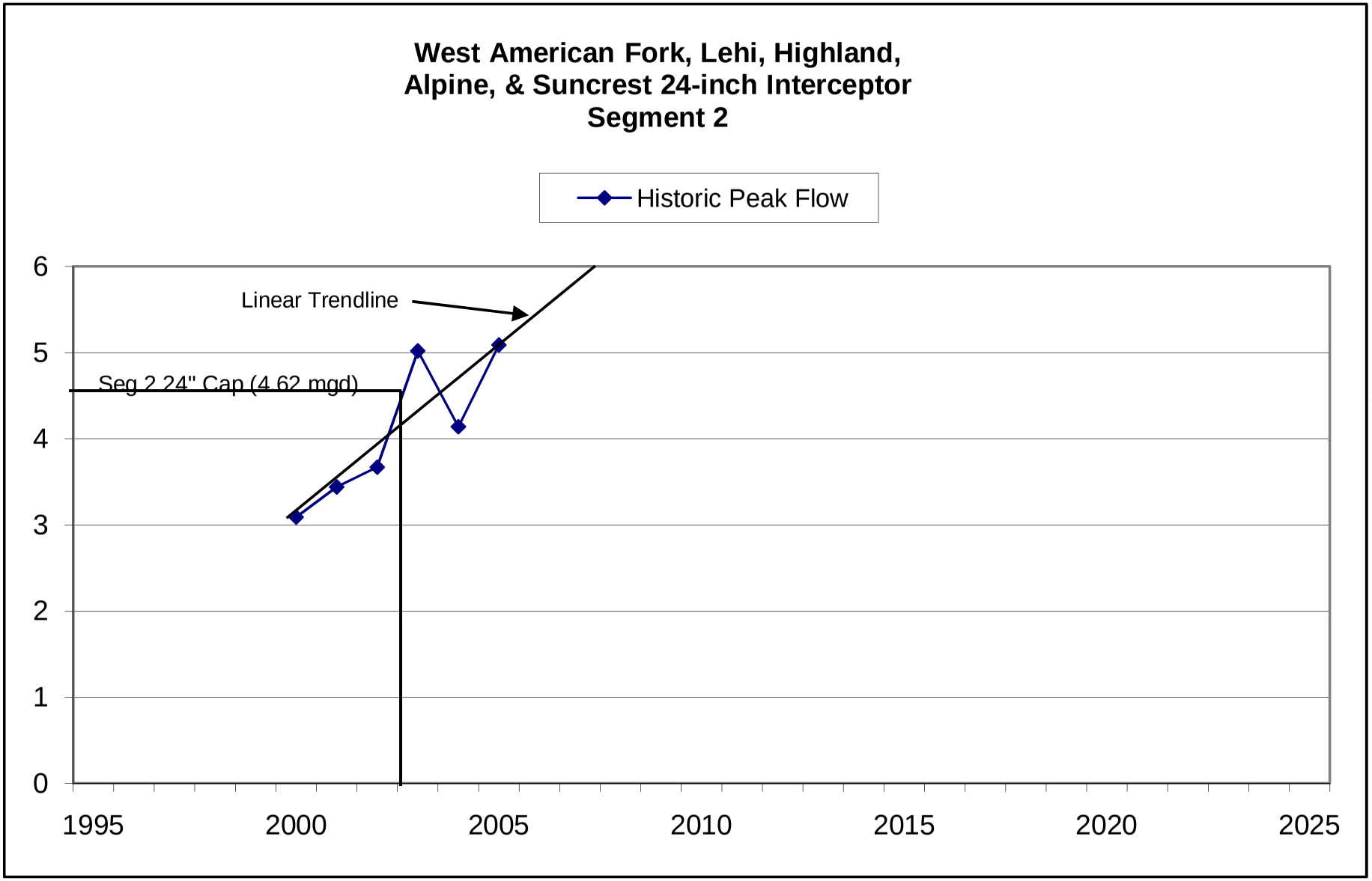
Table 5-1
Timpanogos Special Service District
Estimated Quarterly Expenditures Anticipated Major Projects (Jan 2008 thru Dec 2013)

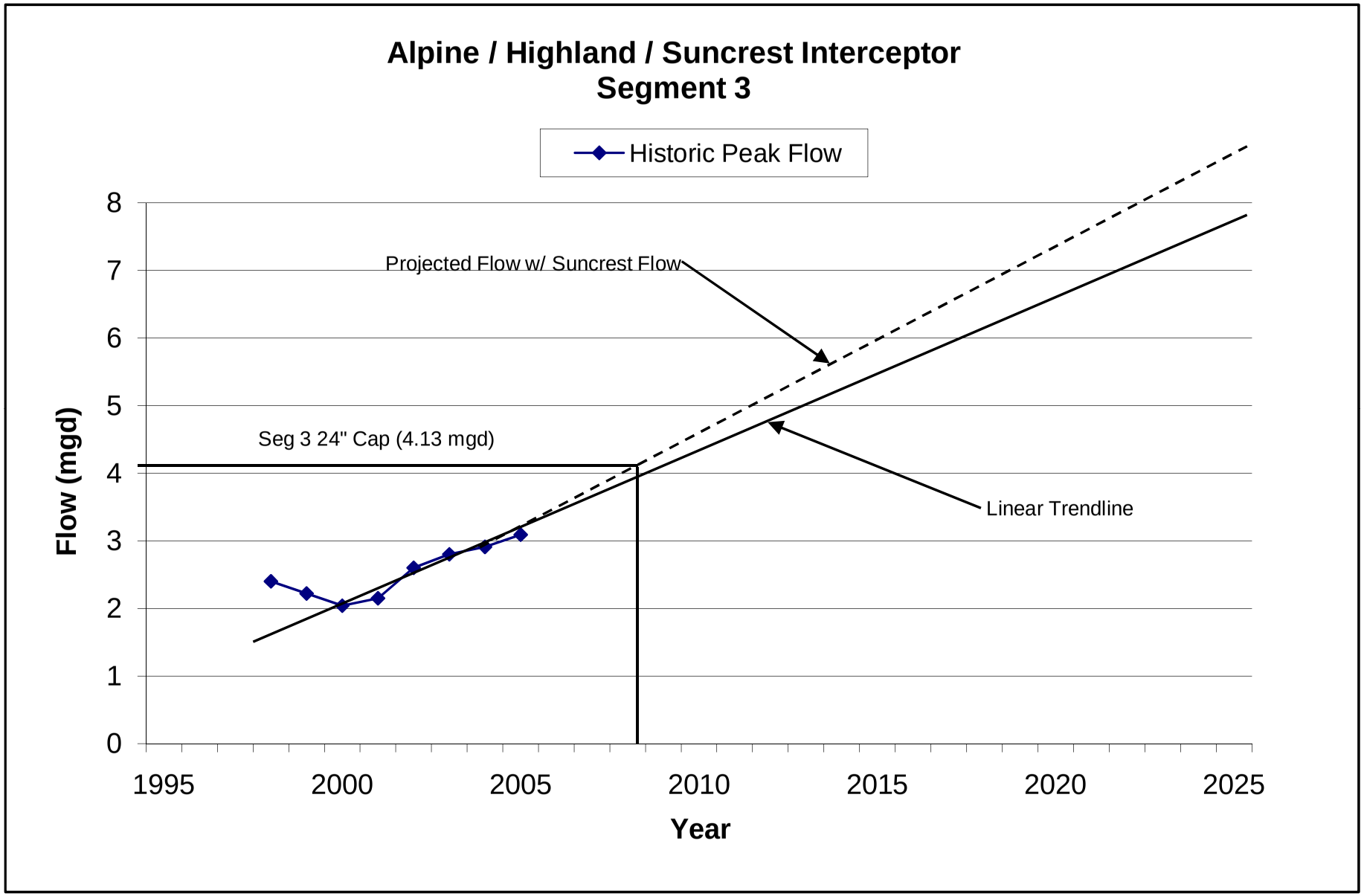
(Prepared Dec 16, 2008)

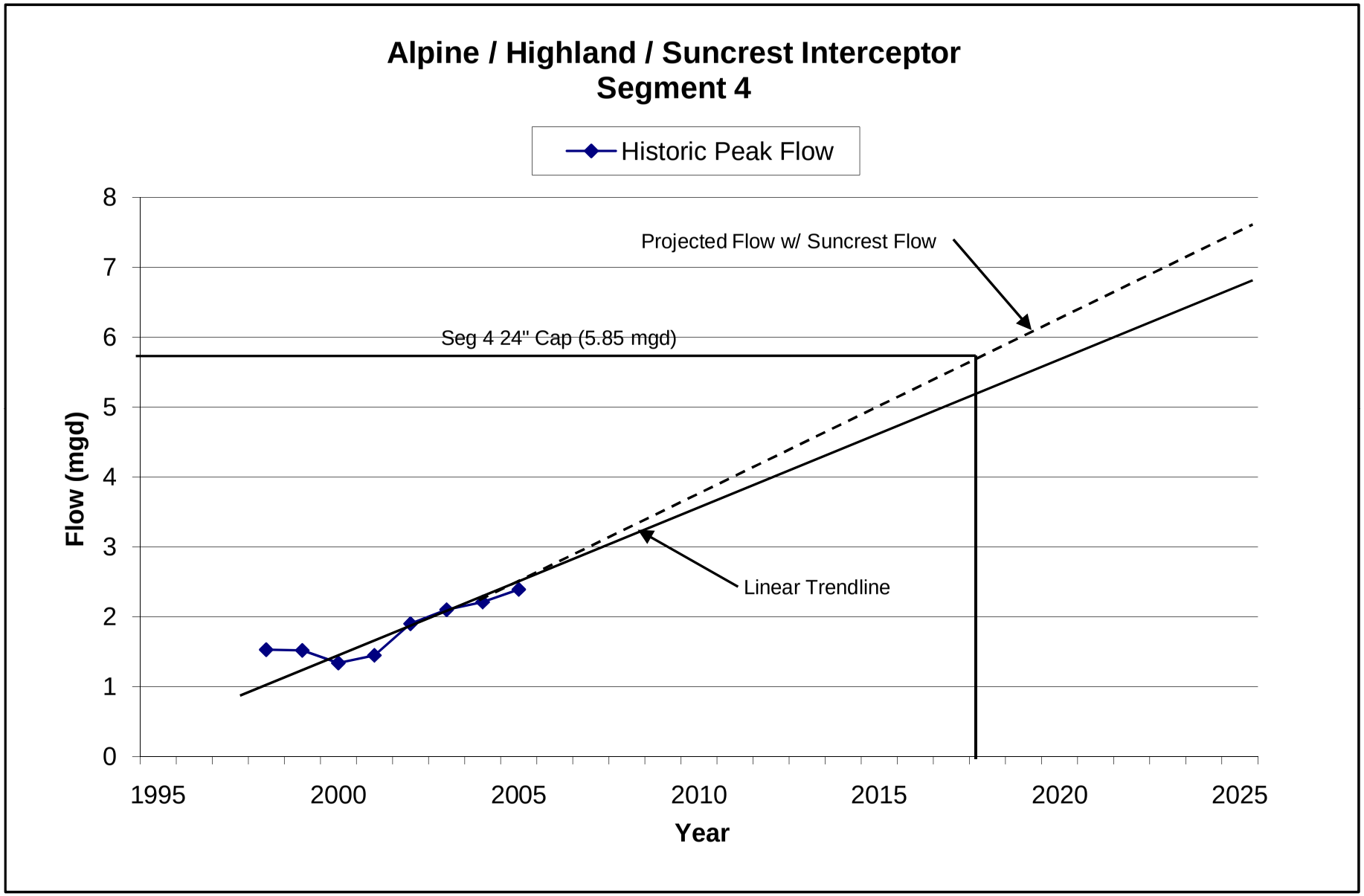
	Est. Distribution			2008				2009				2010				2011				2012				2013				
Project	**Growth**	**O&M**	**Task**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**TOTAL**
WWTP Expansion	80%	20%																										
			Engineering	$180,000	$1,100,000	$663,000	$785,000	$190,000	$180,000	$380,000	$380,000	$382,000	$380,000	$330,000	$320,000	$310,000	$230,000	$210,000	$150,000	$150,000								**$6,320,000**
			Construction								$10,000,000	$9,500,000	$10,000,000	$11,000,000	$12,000,000	$7,000,000	$5,200,000	$4,500,000	$4,000,000	$3,000,000								**$76,200,000**
Lehi Outfall Line Repairs	90%	10%																										
			Engineering					$200,000	$120,000	$60,000																		**$380,000**
			Construction						$1,900,000	$1,000,000																		**$2,900,000**
Boat Harbor Lift Sta Replacement	50%	50%																										
			Engineering		$25,000	$200,000	$110,000	$80,000	$80,000	$80,000	$80,000																	**$655,000**
			Construction					$1,500,000	$1,500,000	$1,000,000	$1,000,000																	**$5,000,000**
Alpine/Highland Line Segment 2	100%																											
			Engineering					$250,000	$100,000	$150,000	$70,000																	**$570,000**
			Construction						$1,000,000	$3,000,000	$800,000																	**$4,800,000**
Alpine/Highland Line Segment 3A&B	100%																											
			Engineering									$280,000	$150,000	$180,000	$102,000													**$712,000**
			Construction										$1,200,000	$3,600,000	$1,100,000													**$5,900,000**
Pleasant Grove/Cedar Hills Outfall	100%																											
(Sta 28+15 to Sta 84+00)			**Engineering**					$15,000	$25,000																			**$40,000**
			Construction					$256,000	$171,000																			**$427,000**
Pleasant Grove/Cedar Hills Outfall	40%	60%																										
(Sta 120+00 to Sta 263+00)			**Engineering**							$280,000	$220,000																	**$500,000**
			Construction																									**$0**
Suncrest Lift Station Upgrade	70%	30%																										
			Engineering					$48,000	$20,000																			**$68,000**
			Construction					$100,000	$150,000	$50,000																		**$300,000**
Land Acquisition	70%	30%																										
			Property Purchase					$1,000,000	$1,000,000																			**$2,000,000**
TOTAL				**$180,000**	**$1,125,000**	**$863,000**	**$895,000**	**$3,639,000**	**$6,246,000**	**$6,000,000**	**$12,550,000**	**$10,162,000**	**$11,730,000**	**$15,110,000**	**$13,522,000**	**$7,310,000**	**$5,430,000**	**$4,710,000**	**$4,150,000**	**$3,150,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$106,772,000**

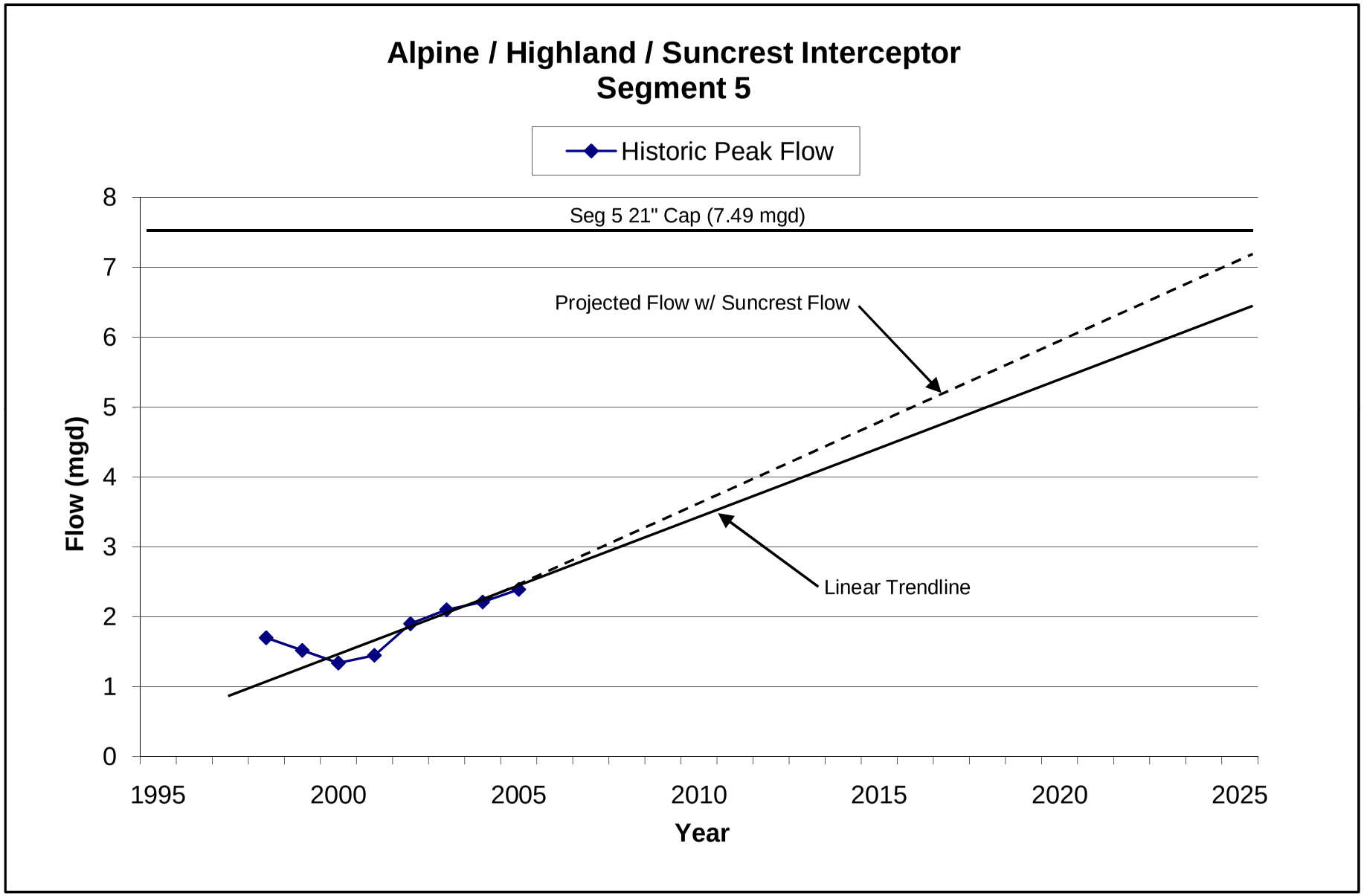
Based on the Following Information/Assumptions:	**Schedule**
Wastewater Treatment Plant Expansion	
Engineering Design $3.6 M (portion spent in 2007)	Jan 2008 - Jan 2009
Engineering CMS $3.4 M (est)	Sept 2009 - Feb 2012
Construction $76.2 M (est)	Sept 2009 - Feb 2012
Lehi Outfall Line Repairs	
Engineering Design $193,000 (est)	Jan 2009 - April 2009
Engineering CMS $187,000 (est)	May 2009 - Sept 2009
Construction $2.9 M (est)	May 2009 - Sept 2009
Boat Harbor Lift Station Replacement	
Engineering Design $375,000 (est)	Apr 2008 - Dec 2008
Engineering CMS $280,000 (est)	Feb 2009 - Mar 2010
Construction $5.0 M (est)	Mar 2009 - Mar 2010
Alpine/Highland Line Segment 3A&B	
Engineering Design $410,000 (est)	Jan 2010 - Apr 2010
Engineering CMS $302,000 (est)	May 2010 - Oct 2010
Construction $5.9 M (est)	May 2010 - Oct 2010
Alpine/Highland Line Segment 2	
Engineering Design $300,000 (est)	Jan 2009 - Apr 2009
Engineering CMS $270,000 (est)	May 2009 - Oct 2009
Construction $4.8 M (est)	May 2009 - Oct 2009
Suncrest Lift Station Upgrade	
Engineering Design $38,000 (est)	Jan 2009 - Feb 2009
Engineering CMS $30,000 (est)	Mar 2009 - July 2009
Construction $300,000 (est)	Mar 2009 - July 2009
Pleasant Grove /Cedar Hills Outfall (Sta 28+15 to Sta 84+00)	
Engineering Design $15000 (est)	Jan 2009 - Feb 2009
Engineering CMS $25,000 (est)	Jan 2009 - Apr 2009
Construction $427,000 (est)	Jan 2009 - Apr 2009
Land Acquisition ($2.0 M - est)	Jan 2009 - Jun 2009

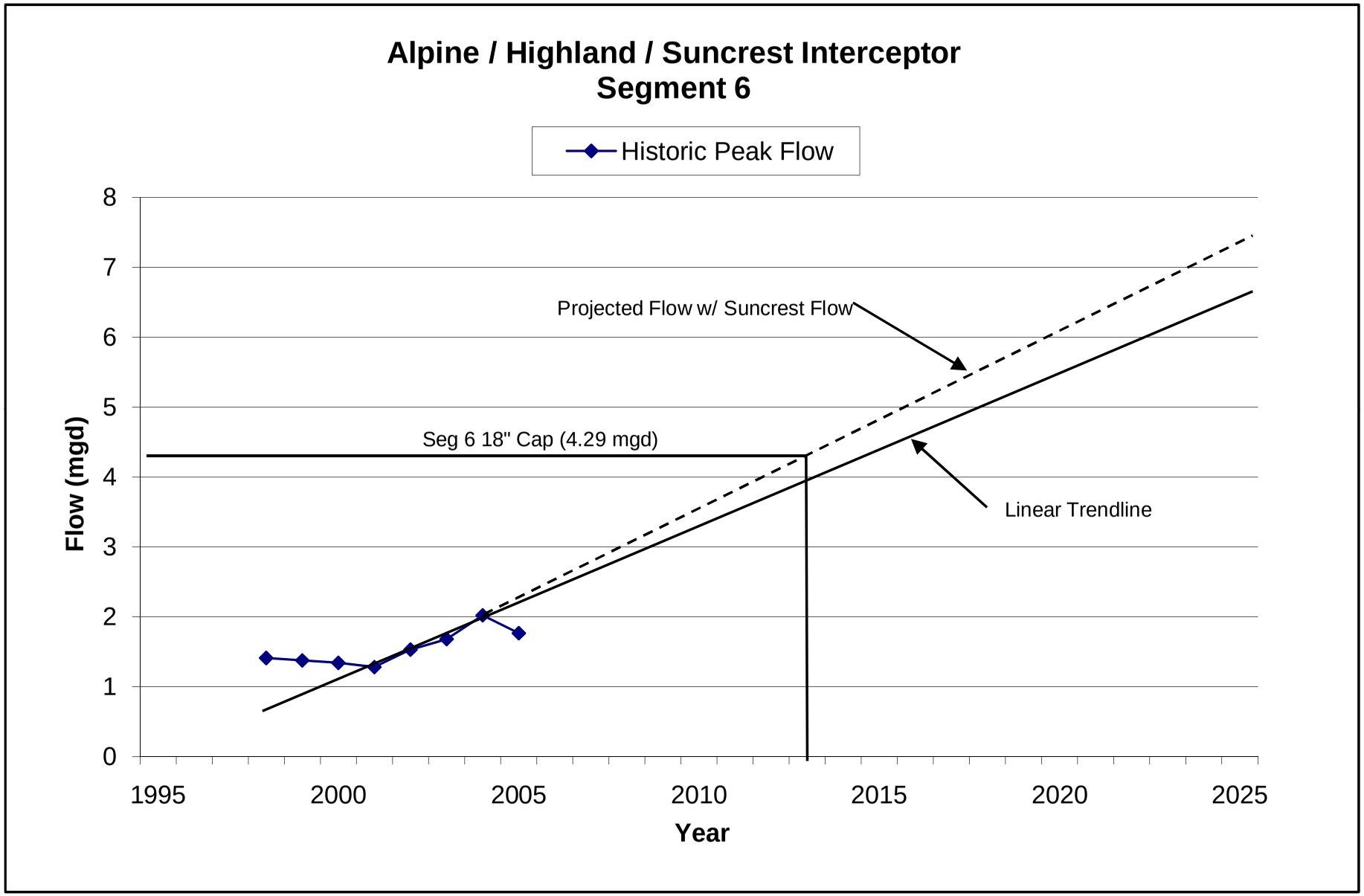

American Fork, Lehi, Highland,
Alpine, Suncrest 42-inch Interceptor
Segment 1
Historic Peak Flow
Segment 1 42" Cap (19.45 mgd)
Projected Flow w/ Suncrest Flows
Linear Trendline
Flow (mgd)
0
2
4
6
8
10
12
14
16
18
20
1995
2000
2005
2010
2015
2020
2025
Year

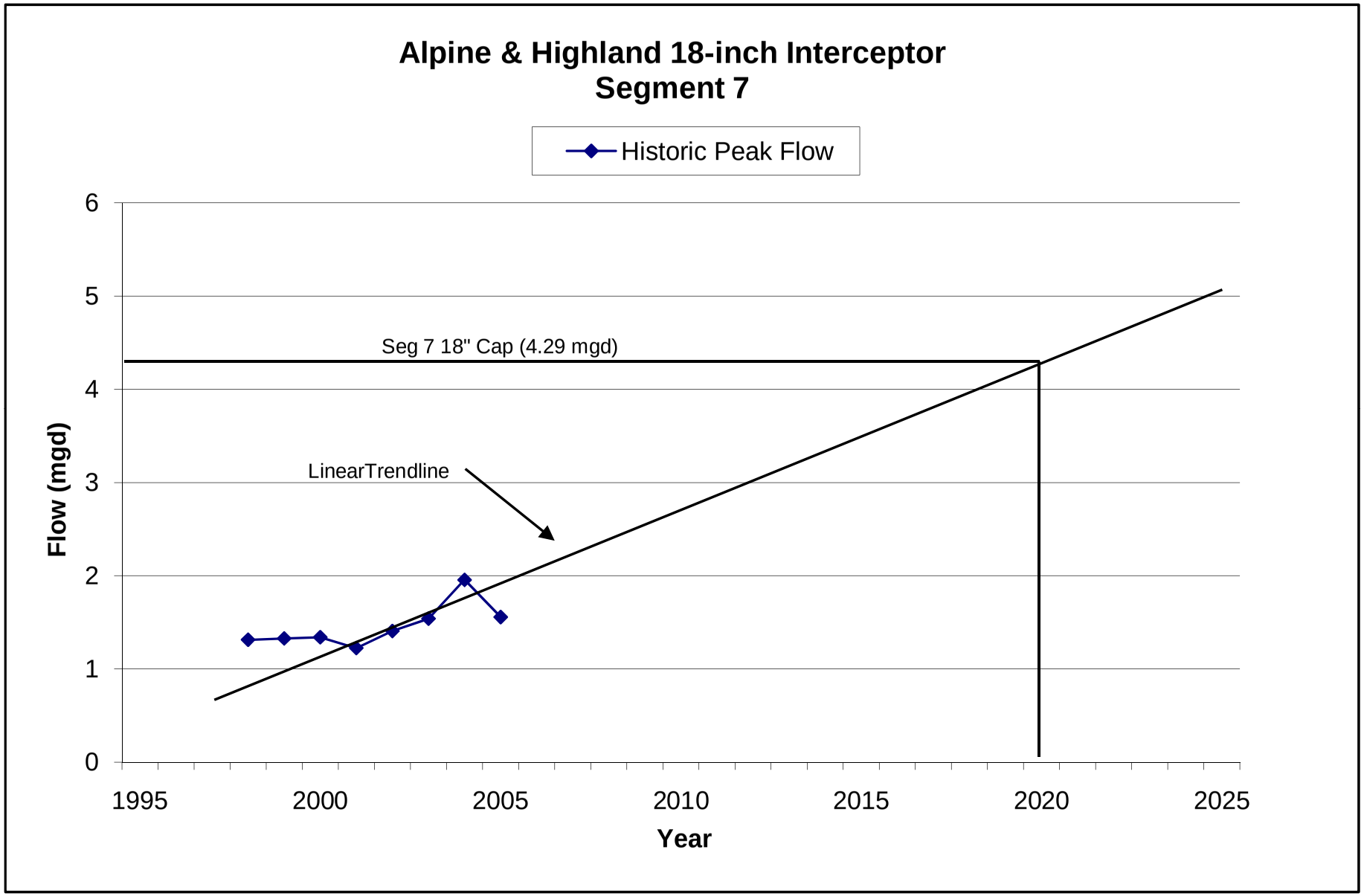

West American Fork, Lehi, Highland,
Alpine, & Suncrest 24-inch Interceptor
Segment 2
Historic Peak Flow
Linear Trendline
Seg 2 24" Cap (4.62 mgd)
6
5
4
3
2
1
0
1995
2000
2005
2010
2015
2020
2025

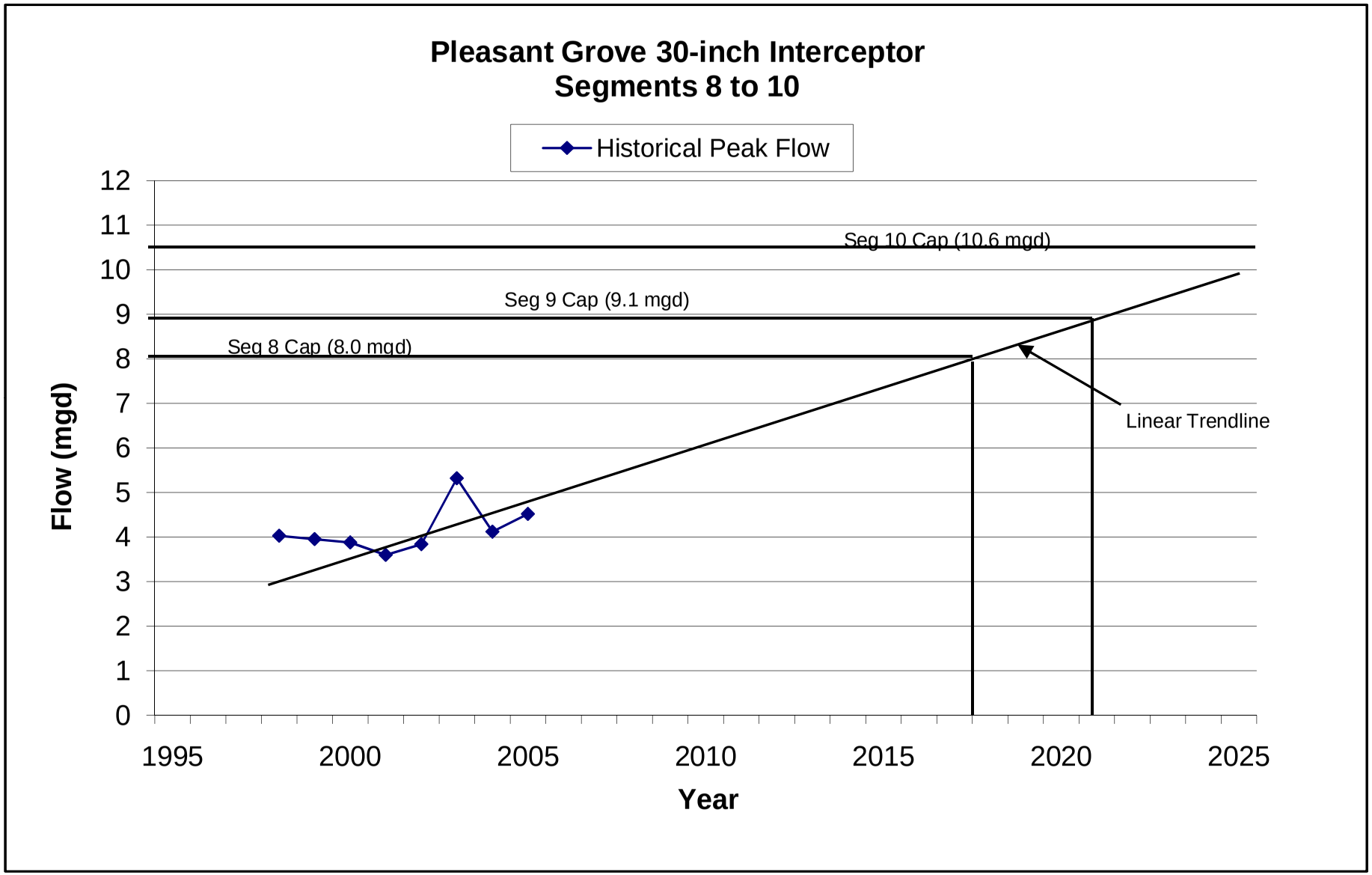

Alpine / Highland / Suncrest Interceptor
Segment 3
Historic Peak Flow
Projected Flow w/ Suncrest Flow
Seg 3 24" Cap (4.13 mgd)
Linear Trendline
Flow (mgd)
0
1
2
3
4
5
6
7
8
1995
2000
2005
2010
2015
2020
2025
Year

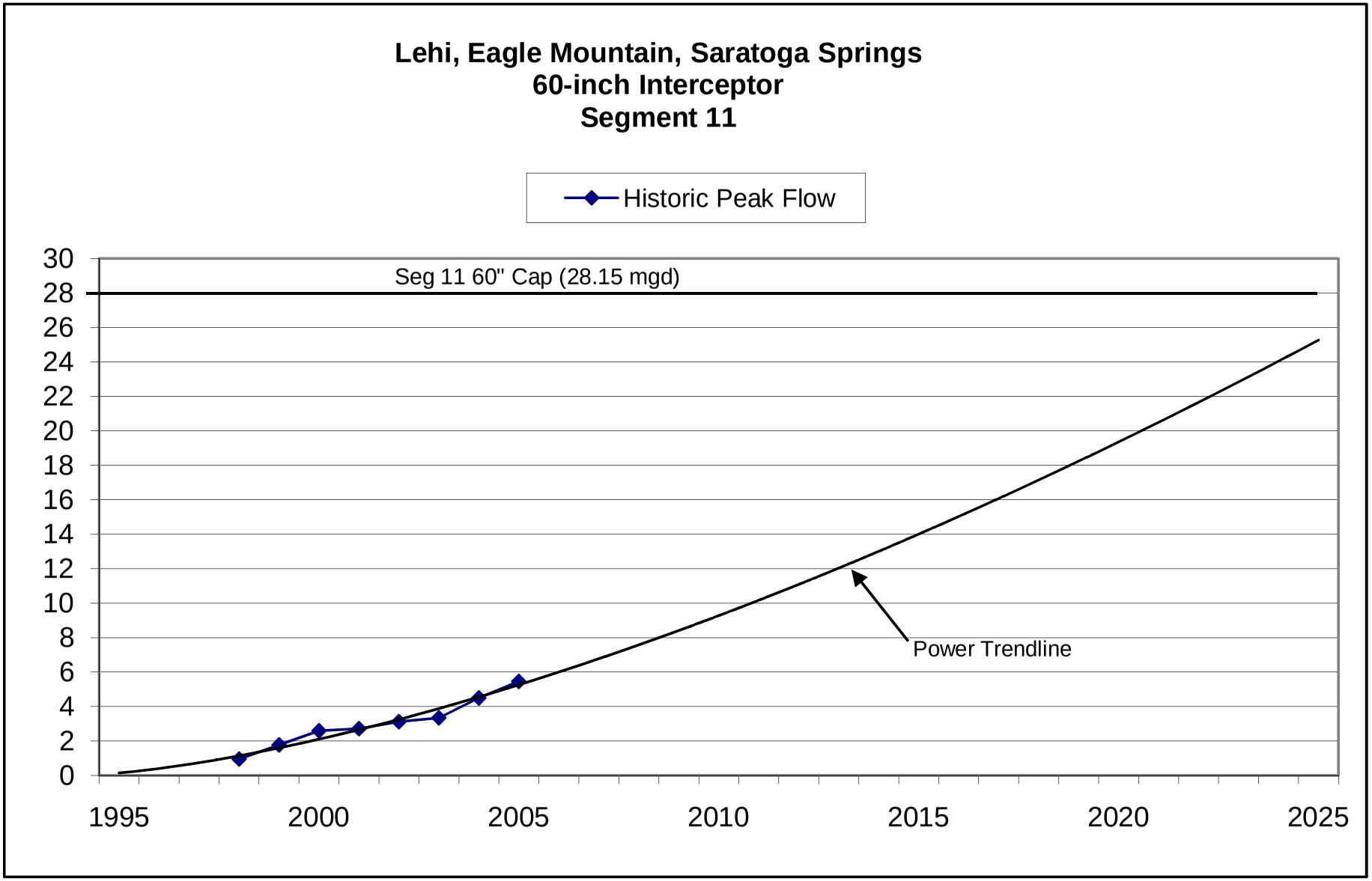

Alpine / Highland / Suncrest Interceptor
Segment 4
Historic Peak Flow
Projected Flow w/ Suncrest Flow
Seg 4 24" Cap (5.85 mgd)
Linear Trendline
Flow (mgd)
0
1
2
3
4
5
6
7
8
1995
2000
2005
2010
2015
2020
2025
Year

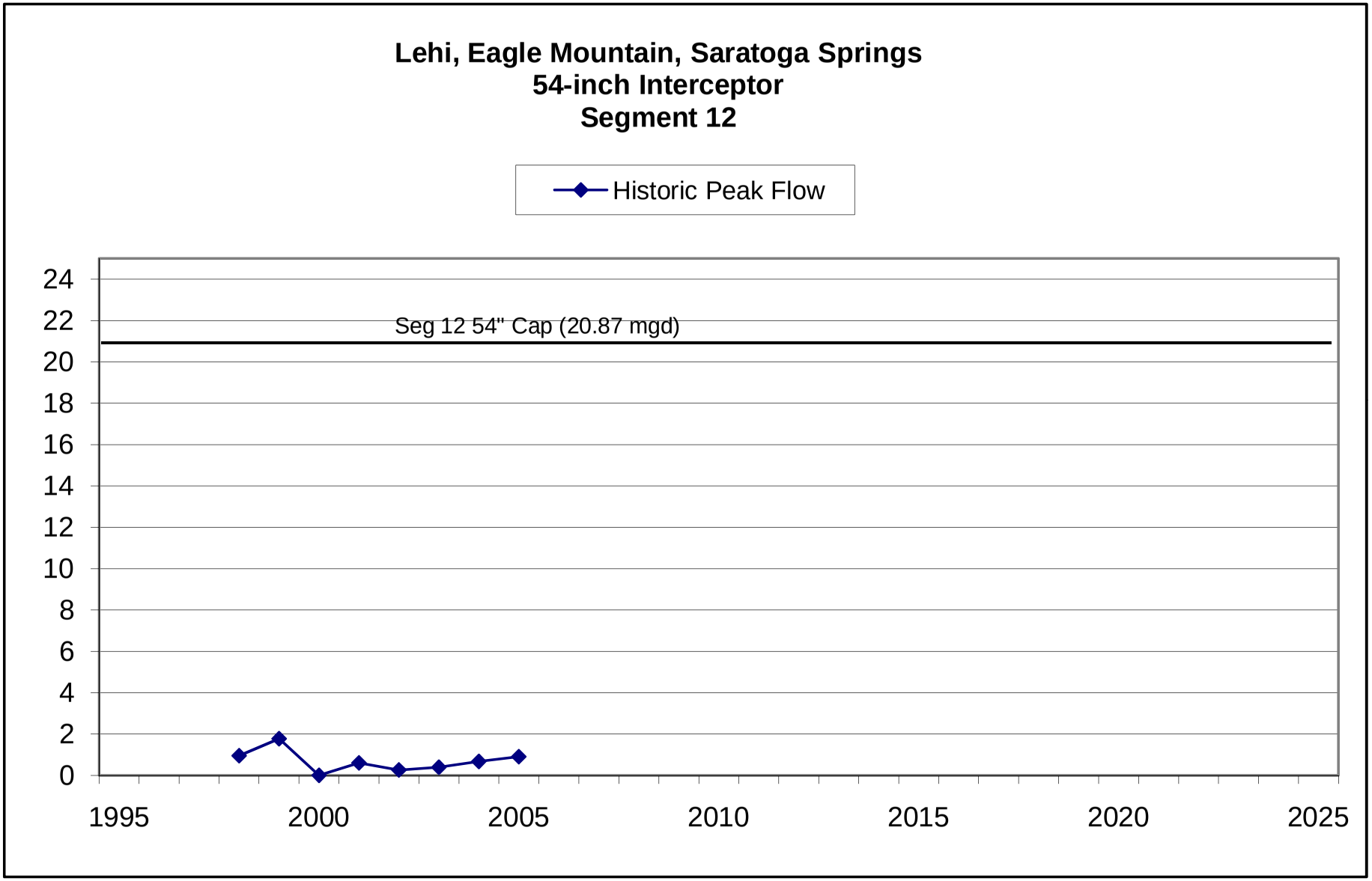

Alpine / Highland / Suncrest Interceptor
Segment 5
Historic Peak Flow
Seg 5 21" Cap (7.49 mgd)
Projected Flow w/ Suncrest Flow
Linear Trendline
Flow (mgd)
0
1
2
3
4
5
6
7
8
1995
2000
2005
2010
2015
2020
2025
Year

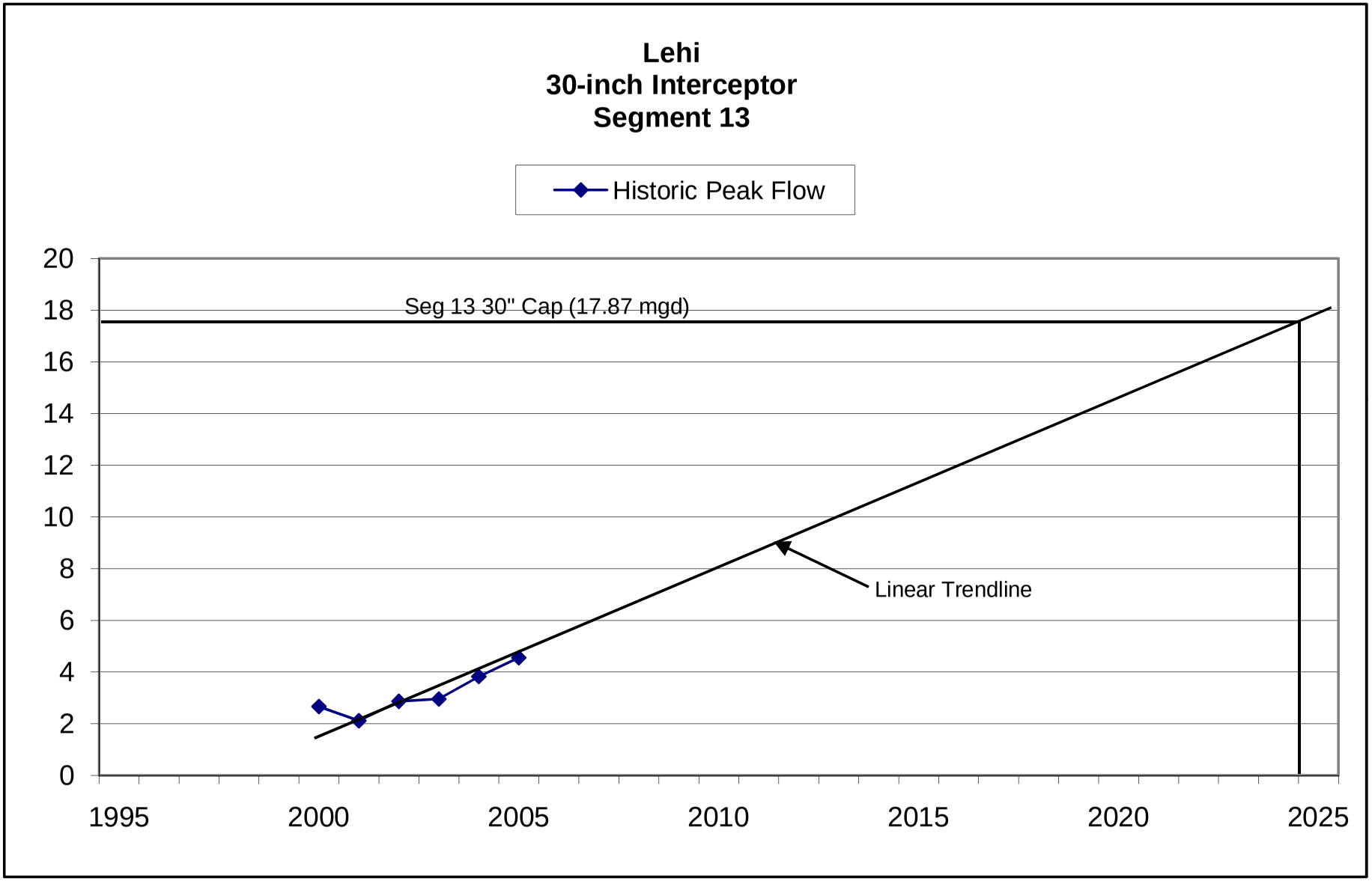

Alpine / Highland / Suncrest Interceptor
Segment 6
Historic Peak Flow
Projected Flow w/ Suncrest Flow
Seg 6 18" Cap (4.29 mgd)
Linear Trendline
Flow (mgd)
0
1
2
3
4
5
6
7
8
1995
2000
2005
2010
2015
2020
2025
Year

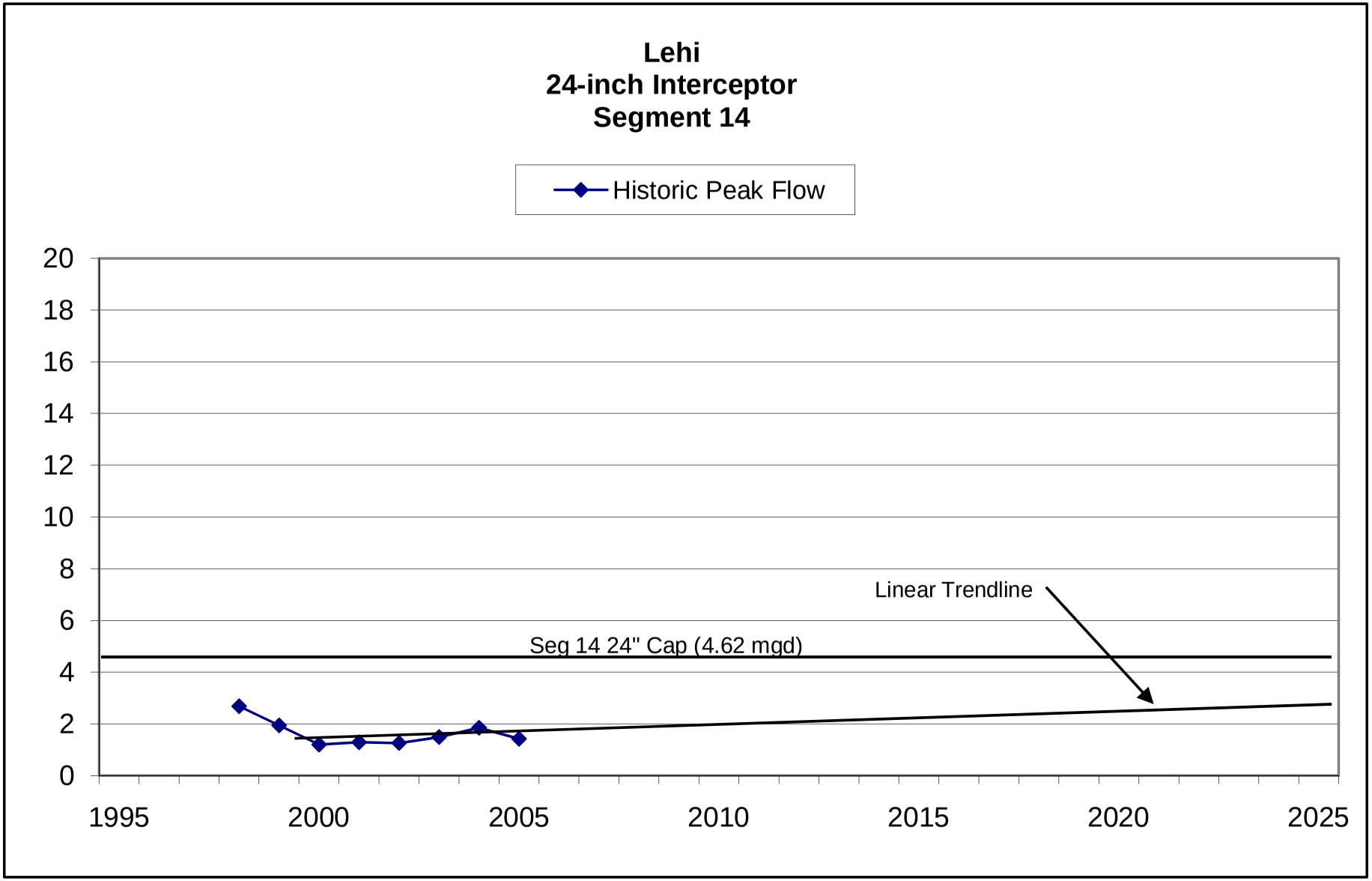

Alpine & Highland 18-inch Interceptor
Segment 7
Historic Peak Flow
Seg 7 18" Cap (4.29 mgd)
LinearTrendline
Flow (mgd)
0
1
2
3
4
5
6
1995
2000
2005
2010
2015
2020
2025
Year

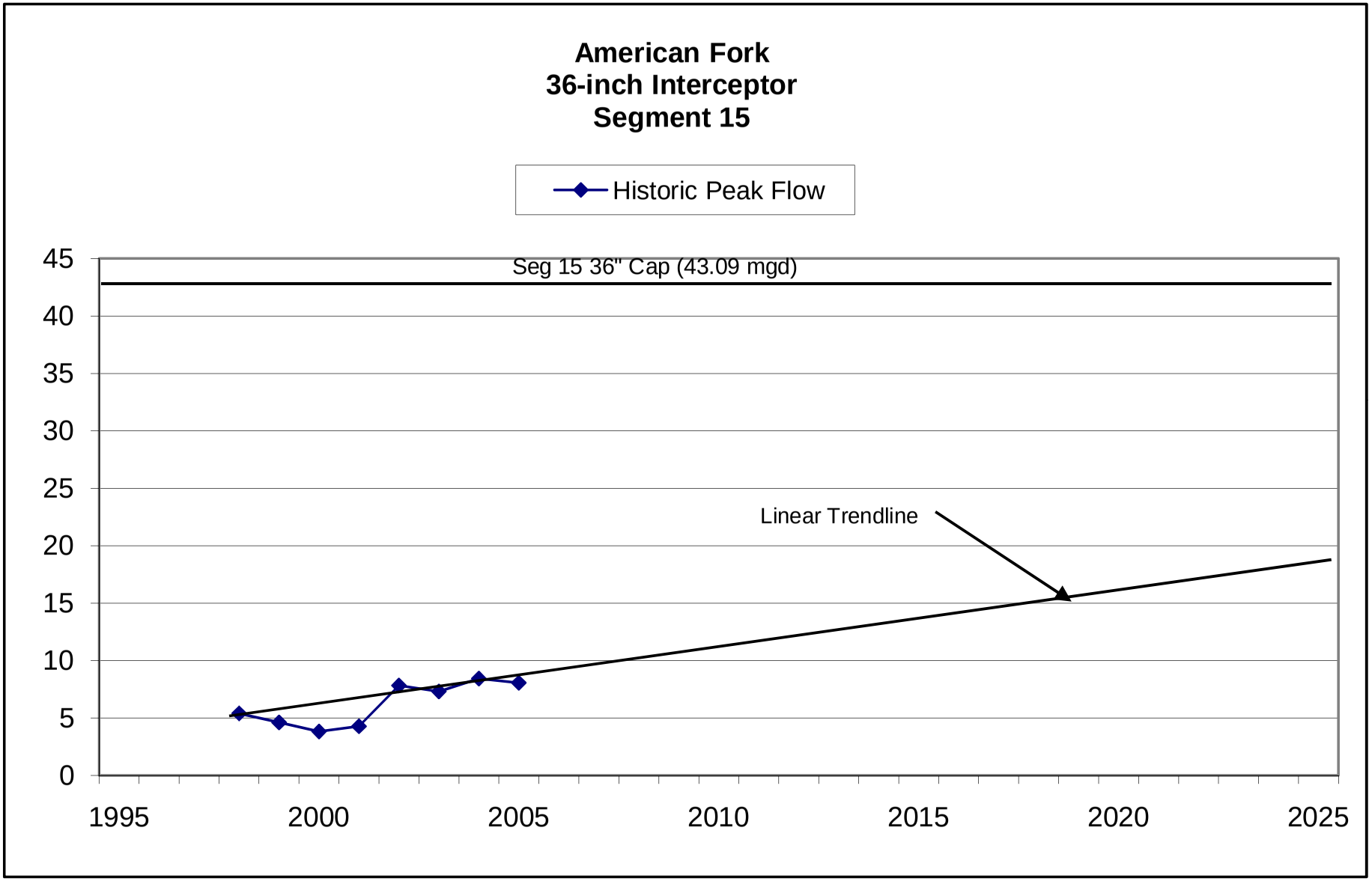

Pleasant Grove 30-inch Interceptor
Segments 8 to 10
Historical Peak Flow
Seg 10 Cap (10.6 mgd)
Seg 9 Cap (9.1 mgd)
Seg 8 Cap (8.0 mgd)
Linear Trendline
Flow (mgd)
0
1
2
3
4
5
6
7
8
9
10
11
12
1995
2000
2005
2010
2015
2020
2025
Year

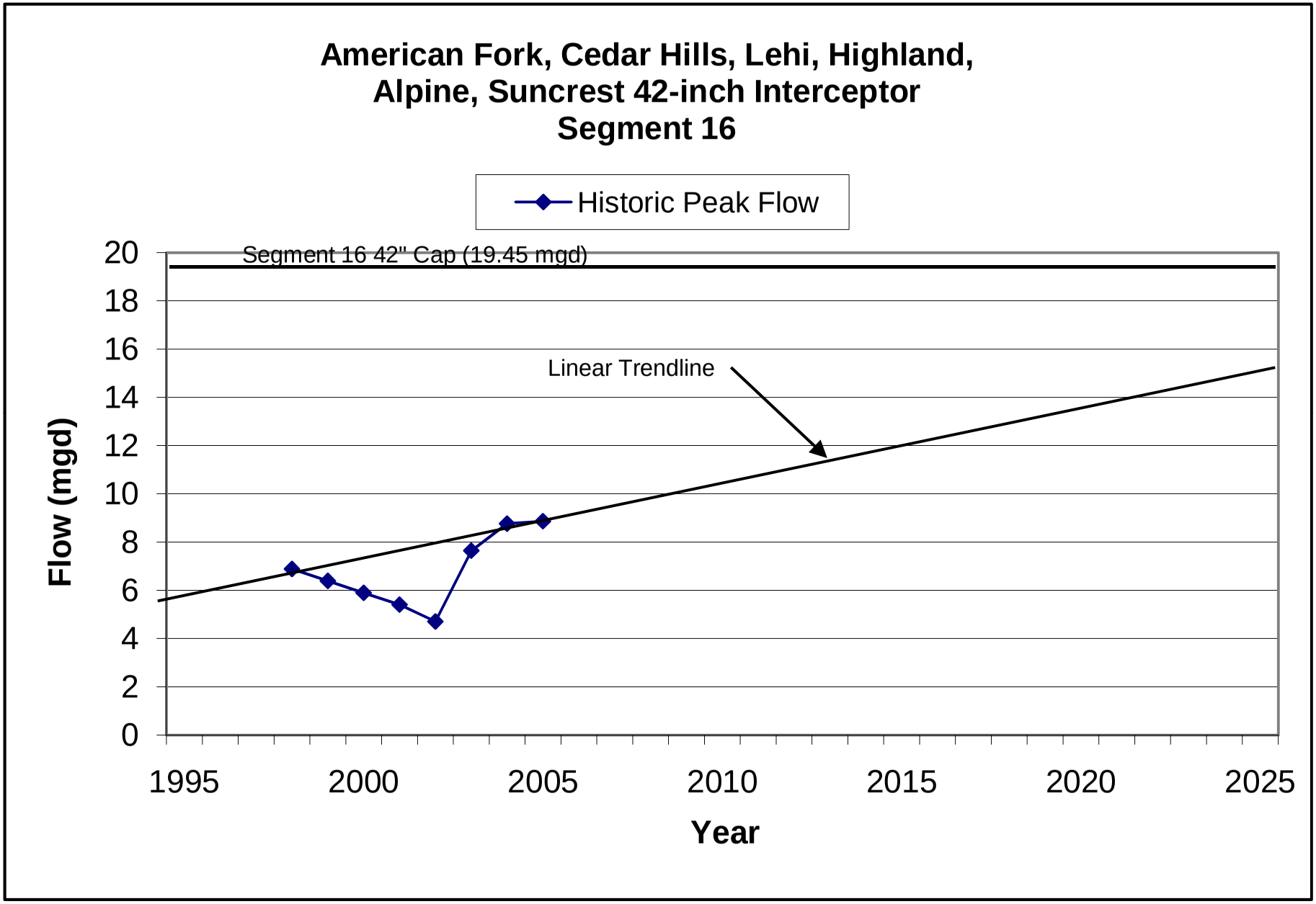

Lehi, Eagle Mountain, Saratoga Springs
60-inch Interceptor
Segment 11
Historic Peak Flow
Seg 11 60" Cap (28.15 mgd)
Power Trendline
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1995
2000
2005
2010
2015
2020
2025


Lehi, Eagle Mountain, Saratoga Springs
54-inch Interceptor
Segment 12
Historic Peak Flow
Seg 12 54" Cap (20.87 mgd)
24
22
20
18
16
14
12
10
8
6
4
2
0
1995
2000
2005
2010
2015
2020
2025


Lehi
30-inch Interceptor
Segment 13
Historic Peak Flow
Seg 13 30" Cap (17.87 mgd)
Linear Trendline
20
18
16
14
12
10
8
6
4
2
0
1995
2000
2005
2010
2015
2020
2025


Lehi
24-inch Interceptor
Segment 14
Historic Peak Flow
20
18
16
14
12
10
8
6
4
2
0
1995
2000
2005
2010
2015
2020
2025
Linear Trendline
Seg 14 24" Cap (4.62 mgd)


American Fork
36-inch Interceptor
Segment 15
Historic Peak Flow
Seg 15 36" Cap (43.09 mgd)
Linear Trendline
45
40
35
30
25
20
15
10
5
0
1995
2000
2005
2010
2015
2020
2025


American Fork, Cedar Hills, Lehi, Highland,
Alpine, Suncrest 42-inch Interceptor
Segment 16
Historic Peak Flow
Segment 16 42" Cap (19.45 mgd)
Linear Trendline
Flow (mgd)
20
18
16
14
12
10
8
6
4
2
0
1995
2000
2005
2010
2015
2020
2025
Year