GEORGETOWN DIVIDE PUBLIC UTILITY DISTRICT

OPTIONS TO INCREASE WATER SUPPLY

April 2009

- DRAFT -

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1.0 EXECUTIVE SUMMARY

A set of options selected to increase water supply has been identified and evaluated based on ability to meet future water supply demands of the Georgetown Divide Public Utility District (District). Supplemental water supply project options were identified during meetings with the District and by review of historical reports. Listing and potential water yield and cost information for each of the options to increase water supply to the District included in the evaluation is presented below in Table 1.

Georgetown Divide Public Utility District Ditch

Table 1 – Summary of Georgetown Divide Public Utility District Options to Increase Water Supply

Option Number	Option Name	Additional Water Yield (acre-feet)	Initial Cost ($mil)	Cost of Water ($/af/yr)
1	Conveyance canal loss reduction	670	11.5	1,200
2	Enlarging Stumpy Meadows Reservoir	250-1,000[1]	-[2]	-[2]
3	Upper Stumpy Meadows Reservoir	3,200	-[2]	-[2]
4	(a) Rubicon River Diversion – with tunnel	3,300-10,300[3]	59.0	470-1,100[3]
	(b) Rubicon River Diversion – without tunnel	3,300-10,300[3]	28.5	290-680[3]
5	North Fork American River Pumping Plant	10,300	14.2	230
6	Canyon Creek Reservoir	6,100	108.3	1,200
7	Mutton Canyon	100	0.140	130
8	Onion Creek	50-300[4]	2.2	500-3,000[4]
9	Modification to allowable demand deficiency	200-1,000[5]	0	0

[1]Range depends on size of dam raise (see Section 4.2).
[2]No known cost information and none developed in this analysis.
[3]Depending on diversion capacity of 15 or 50 cfs (see Section 4.4)
[4]Range depends on type of water right (see Section 4.8).
[5]Range depends on demand deficiency modification (see Section 4.9).

The *Initial Cost* shown in Table 1 represents the cost to bring the option on-line while the *Cost of Water* represents the unit cost of water per year.

2.0 INTRODUCTION AND BACKGROUND

The District is investigating options to increase its available water supply to help meet future increasing water demands. The El Dorado County Water Agency's *Water Resources Development and Management Plan,* December 2007 (Water Plan) reports that about 10,300 acre-feet (about 25% residential-commercial and 75 % agricultural) of additional water could be needed to meet District demands at year 2025 demand levels and up to 21,600 acre-feet per year to meet demands at buildout. In addition to these water needs, the Water Plan suggests that areas located near the District service area could possibly be annexed through service area expansion driving the water need even higher. This report summarizes an investigation of a set of options selected to increase the water supply availability to the District to help meet future water supply demands. The projected water need presented here does not include supplemental water that would be made available under the P.L. 101-514 (Fazio Water) project that is currently being developed by the District, El Dorado County Water Agency, and El Dorado Irrigation District. Water that would be made available under the P.L 101-514 project is included as OPTION 5 - North Fork American River Pumping Plant of this report.

The District provides water in the Georgetown Divide area of El Dorado County including the areas of Cool, Pilot Hill, Greenwood, Georgetown, Garden Valley, and Kelsey. The Stumpy Meadows Project, owned and operated by the District, is the District's primary water supply source. The main feature of the Stumpy Meadows Project is Stumpy Meadows Dam and Reservoir located on Pilot Creek. The reservoir has a total storage capacity of about 20,000 acre-feet and a usable capacity of about 18,800 acre-feet. The average annual inflow to Stumpy Meadows Reservoir is about 23,000 acre-feet (1923-1999 average). Water from Stumpy Meadows Reservoir is released to Pilot Creek and rediverted and conveyed to the District's service area through the El Dorado Conduit and Georgetown Divide Ditch. The *firm* and *safe* water yield of the Stumpy Meadows Project is calculated as 12,251 and 10,541 acre-feet, respectively. The evaluation summarized in this report uses the following definition of *firm* and *safe* yield which is consistent with traditional District definitions.

> *Firm yield* is defined as the maximum annual water supply that is expected to be available with the understanding that lower yields will occur in some dry

years in accordance with the Districts water deficiency policy.
Safe yield is defined as the maximum annual water supply that is expected to be available in all years even during the most critically dry years.

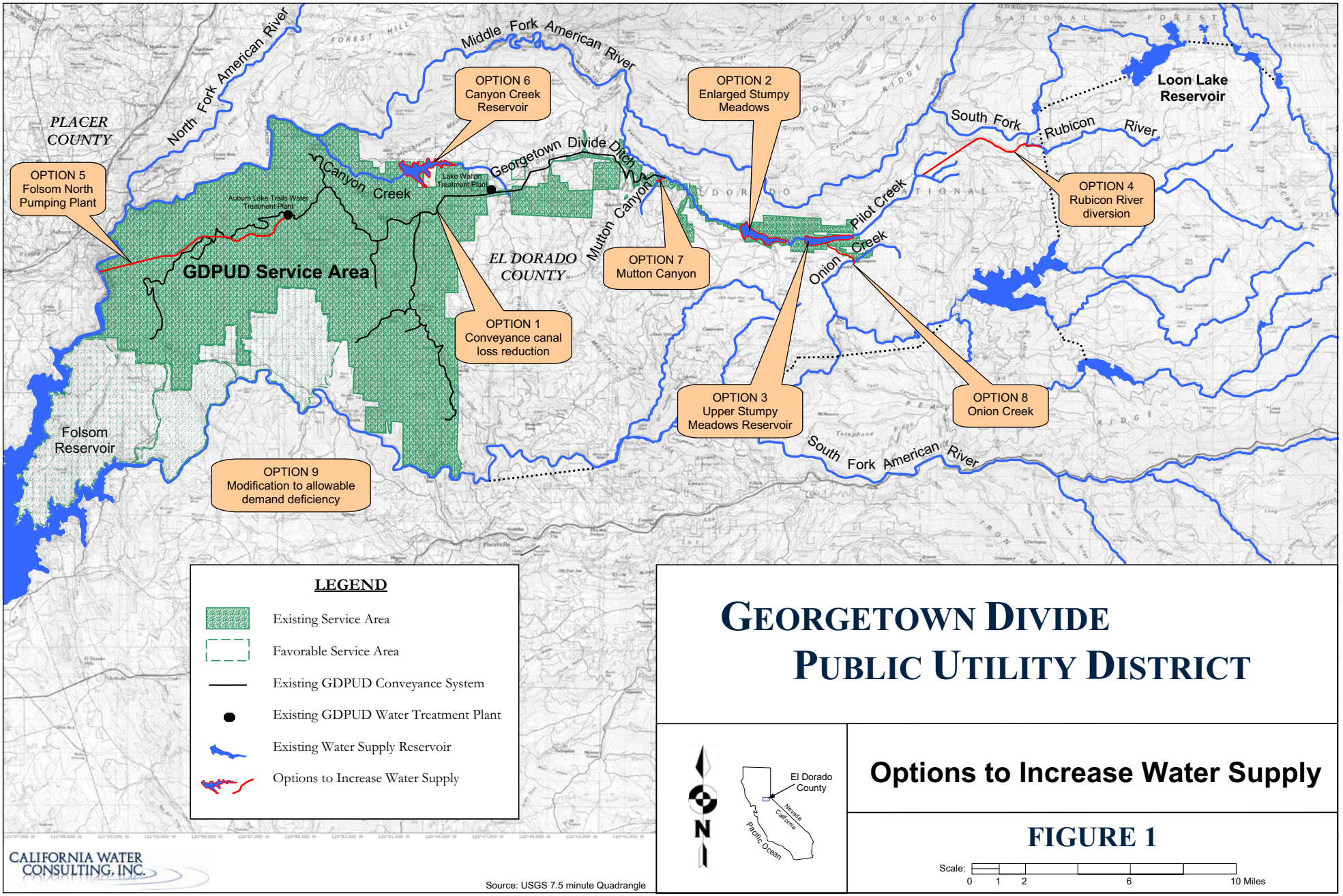
The evaluation presented here is intended to provide a general conceptual-level overview of some options available to the District to increase water supply. Based on this conceptual-level information, results of the evaluation are intended to present a description of each alternative, conceptual-level cost estimates where available, an evaluation of the ability of the option to provide supplemental water, discussion of water rights, and other contributing factors. Information presented in this report is intended to be used to evaluate selected options that best meet the needs of the District for consideration of implementation or further evaluation.

3.0 APPROACH TO EVALUATION

The District has previously investigated a number of options aimed at supplementing its water supply over the years. The investigation summarized in this report considers nine potential options many of which have been evaluated previously at varying levels of detail. These options were identified during meetings with the District and review of historical reports. The evaluation described here primarily relied on research and updating previously developed information. Some options were previously fully developed and some were modified to meet the needs of this study. *OPTION 9 – Modification to allowable demand deficiency* was fully developed as part of this evaluation as no previous studies evaluating this option are known.

4.0 OPTIONS TO INCREASE WATER SUPPLY

This section describes each of the nine options considered in this evaluation to increase water supply to the District. Figure 1 illustrates the location of each of the nine options.



GEORGETOWN DIVIDE PUBLIC UTILITY DISTRICT

Options to Increase Water Supply

FIGURE 1

Scale: 0 1 2 6 10 Miles

4.1 OPTION 1 – Conveyance canal loss reduction

The District's ongoing management practices and conservation programs to reduce demands in its water conveyance system by lining ditches with gunite, replacing ditches with pipelines, and improving procedures to minimize operational water requirements has increased the reliability of its water delivery system as well as minimized water loss do to ditch seepage and leakage. The District estimates that operational water requirements and losses total about 3,600 acre-feet per year. Operational water requirements and loss reduction was evaluated in the Department of Water Resources (DWR) *Georgetown Divide Water Treatment Study*, 1992. That study was used as the basis for considering potential additional reduction of operational water requirements and losses in the Districts conveyance system in this evaluation as well as considering updated information related to system operation received from District personnel.

Even with the District's continuing program of system improvements to manage operational water requirements and reduce water losses, some losses still exists and are evaluated as to the feasibility of further reduction in this option. *OPTION 1 - Conveyance canal loss reduction* investigates the potential to reduce operational water requirements and losses thereby making additional water available to meet increasing water demands.

This option consists mainly of lining portions of unlined open ditch in the conveyance system with gunite. As the District has knowledge of the areas that are more susceptible to seepage and leakage losses, it is assumed that only those portions that experience significant loss would be lined and that continuing to line ditches will eventually reach a diminishing return by lining sections of ditch that currently experience little loss. It should be acknowledged that gunite lined open ditches do not always reduce water losses to zero and over time, losses can increase in lined ditches due to the formation of cracks in the lining requiring additional maintenance to continue to control losses.

Additionally, open ditches do gain water during some times of the year and at some locations due to direct inflow and groundwater intrusion. Additional evaluation of the existing ditch system is required to identify the locations that would most benefit from gunite lining.

Conveyance water requirement is associated with water transmission and delivery. In the treated and untreated water delivery system, this water may include seepage, leakage, and other losses associated with conveyance. The 1992 DWR study projected that conveyance

water requirements could be reduced to the order of about 13 percent by year 2000 by providing system improvements similar to those that the District performed in the past. A reduction to 13% might be a bit ambitious, but does represent a potential target and was used in this evaluation.

Carriage water requirement is the additional water that must be supplied due to the necessity to provide flows for regulation and diversion by users along the ditch system. The 1992 DWR study projected carriage water requirements for year 2000 of 2.3 cfs during the 5-month summer irrigation season and 1.4 cfs during the winter.

Distribution system water requirements result from the distribution of treated water and may include line flushing, fire fighting, casual sales (typically for construction and filling of swimming pools) and unauthorized water diversion. The 1992 DWR study projected distribution system losses could be reduced to 13 percent of the treated water production, or about 410 acre-feet per year. Process water requirement for the purpose of this study, refers to water uses including street cleaning and backwashing the water treatment plants. The District reports process water requirements in 2004 of approximately 150 acre-feet per year. The last major category of operational water requirements is water associated with watering-up of the canal system at the beginning of the irrigation season. The District reports water-up requirements in 2004 of approximately 450 acre-feet per year.

The District reports that the total system operational water requirement and losses were approximately 3,600 acre-feet in 2007. Of that amount, 600 acre-feet per year are accounted for in the process and water up losses described above. The other 3,000 acre-feet per year results from conveyance, carriage, and distribution requirements. As the split of these water requirements is unknown, year 2000 projected conveyance, carriage, and distribution losses from the 1992 DWR study were used to distribute the remaining 3,000 acre-feet of losses among the three categories by weighting the losses according to the weighted distribution from the 1992 study.

Potential measures to reduce operational water requirements and losses were considered based on the distribution of the source. No reduction in carriage, process, and distribution water requirements were considered in this option for the following reasons:

- The District monitors and operates to minimize the amount of carriage water required, and the water requirement is already below the projected 2000 levels indicated the 1992 DWR study.

- Process water requirements are considered to be necessary uses of water, for which reductions would only be minimal compared to the total operational requirements.
- Water-up requirements are necessary for operation of the conveyance system and can not be avoided.
- Although there may be opportunities for some further reductions in operational water requirements, they are minor compared to the overall requirements and, therefore, were not considered in the evaluation.

Excluding the above operational water requirements leaves conveyance and carriage requirements as opportunities for reducing water demands. Based on conversations with the District personnel, approximately 30% of the conveyance system is lined canal, tunnel, or pipeline. The remaining 70% of the District's 75 miles of conveyance is unlined ditch. It was assumed that an effort to line ditches in the areas that are more likely or known to have a higher degree of conveyance losses would result in the most efficient use of resources to achieve the highest degree of water savings. The cost for this savings was determined based on this assumption and an average cost per linear foot of canal lining.

This analysis estimates that a maximum of about 670 acre-feet could be saved through reduction in conveyance losses. To achieve this amount, costs are estimated at about $11.5 million. An advantage of this option is that ditch improvements can be incrementally staged over time as the need for supplemental water arises.

4.2 OPTION 2 – Enlarging Stumpy Meadows Reservoir

Stumpy Meadows Reservoir is located on Pilot Creek and has a capacity of 20,000 acre-feet. The existing Stumpy Meadows Dam has a crest length of 1,230 feet and width of 30 feet. The Pilot Creek drainage area tributary to the reservoir is about 15.6 square miles. *OPTION 2 - Enlarging Stumpy Meadows Reservoir* considers the increase in water supply made available by raising the Stumpy Meadows Dam and impounding additional water.

Stumpy Meadows Reservoir

There is a limit to how high the Stumpy Meadows Dam could be raised based on the physical aspects of the impoundment, dam stability, cost, as well as the reducing water

supply benefit afforded by increasing storage capacity. For this evaluation, Stumpy Meadows Dam raise of up to 9 feet was investigated. Additional information and study is needed to determine whether a simple dam raise of this magnitude would be supported by the existing dam foundation. If a simple dam raise is not feasible, costs would increase significantly.

The operation of an enlarged Stumpy Meadows Reservoir was evaluated using the District's *StumpSIM* computer model. Dam raises up to 9 feet, in one foot increments, were analyzed to determine the increase in project firm yield. Table 4 show the expected increase in water supply yield expected with additional storage capacity at Stumpy Meadows Reservoir made possible by increasing the dam height.

Table 2 – Stumpy Meadows Project Firm Yield With Increased Storage Capacity

Stumpy Meadows Dam Raise (feet)	Stumpy Meadows Reservoir Storage (acre-feet)	Stumpy Meadows Project Yield (acre-feet)	Water Supply Increase (acre-feet)
0	20,000	12,251	-existing project-
1	20,350	12,379	128
2	20,700	12,507	256
3	21,000	12,616	365
5	21,700	12,867	616
7	22,300	13,088	837
9	23,000	13,362	1,111

The evaluation indicates that raising Stumpy Meadows Dam 9 feet would increase the firm yield of the Stumpy Meadows Project by about 1,100 acre-feet. It might be possible to add a couple feet of flash boards to the Stumpy Meadows Project spillway to increase the storage capacity at a relative low cost. A two foot raise would provide an increase in firm yield of about 250 acre-feet. See Appendix 2 for additional information on this evaluation.

An advantage of this option is that the dam is already in place on Pilot Creek. Environmental impacts are relatively less compared to a new dam as fish and wildlife in the stream are already subject to regulated flow regime. Also, the incremental cost of adding

storage is typically much lower than for new dam projects. A disadvantage of this option might be that raising the existing Stumpy Meadows Dam might open the door for new requirements from regulatory agencies such as increase in minimum instream flow release requirements.

Cost information for this option has not been developed as it is unknown if a simple raise is feasible. Additional information and analysis is required to provide an estimate the cost of this option.

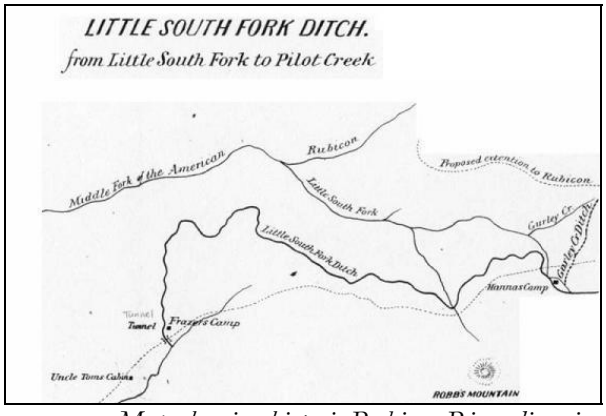
4.3 OPTION 3 – Upper Stumpy Meadows Reservoir

Upper Stumpy Meadows Reservoir is conceptualized to consist of building a new rockfill dam upstream of the existing Stumpy Meadows Dam and Reservoir on Pilot Creek. The dam would be 820 feet long and approximately 145 feet high with the crest elevation at 4,500 feet. The reservoir impounded by the dam would have a surface area of 194 acres with a storage volume of 10,820 acre-feet. The drainage area above the dam would be approximately 10 square miles. Preliminary evaluations estimated a safe yield of 3,200 acre-feet for the project. Upper Stumpy Meadows Reservoir would be operated in conjunction with Stumpy Meadows Reservoir to maximum water supply benefits.

A cost estimate was not prepared for this option. The dam will be similar in cost to *OPTION 6 - Canyon Creek Reservoir* (slightly less due to a smaller structure), but with a water yield of only one-half of that for Canyon Creek Reservoir. These two factors strongly indicate that the cost per acre-foot of water of this alternative will be significantly greater than the Canyon Creek Reservoir option. Due to the anticipated high cost and low water yield, no further evaluations were considered prudent for this option.

4.4 OPTION 4 – Rubicon River diversion

This option consists of constructing a gravity diversion conveyance system from the South Fork of the Rubicon River at or near Robbs Peak Forebay, or from Gerle Creek, to Pilot Creek upstream of the Stumpy Meadows Reservoir. There are two versions of this option being investigated, OPTION 4(a) and OPTION 4(b). OPTION 4(a) includes a pipeline and tunnel. Utilization of a tunnel



Map showing historic Rubicon River diversion

would provide for relatively minimal operation and maintenance costs and a reliable conveyance of water. However, construction of a tunnel does have a relatively high initial cost. OPTION 4(b) considers an all pipeline conveyance without use of a tunnel. Water conveyance would be achieved though a new pipeline following near the original historical flume alignment that once brought water from the Rubicon River to the Georgetown area.

OPTION 4(a) – Rubicon River diversion (with tunnel) consists of constructing a gravity diversion conveyance system from the South Fork of the Rubicon River at or near Robbs Peak Forebay, or from Gerle Creek, to Pilot Creek. Once diverted into Pilot Creek, water would flow down the natural channel for about 6 miles where it would enter Stumpy Meadows Reservoir. The diversion would include approximately 2.6 miles of pipeline along the historical diversion route followed by a new 2.6-mile tunnel to convey water to the headwaters of Pilot Creek. As considered in previous studies, a pipeline and tunnel configuration was investigated to provide a diversion capacity of 50 cfs. There is some concern whether Pilot Creek could support flows at this rate. A diversion capacity of 15 cfs was also investigated to evaluate how a more modest project could increase the District's water supply.

OPTION 4(b) – Rubicon River diversion (without tunnel) would include approximately 7.2 miles of pipeline located along the historical route to convey water to the headwaters of Pilot Creek. Diversion and conveyance capacities of 15 and 50 cfs were investigated. Once the water is diverted to Pilot Creek, it would flow down the natural channel for about 6 miles to Stumpy Meadows Reservoir augmenting its natural inflow.

Remnants of Rubicon River Diversion Flume

Proposed diversions from the South Fork Rubicon River, or Gerle Creek, would occur on an "as-needed" basis, and would increase the yield of the Stumpy Meadows Project by supplementing the natural runoff of Pilot Creek. Diversions from the Rubicon River, or Gerle Creek, would be made in dry years when Stumpy Meadows Reservoir is not expected to fill to capacity. For the 50 cfs diversion capacity scenario, on about April 1st of each year, if the storage in Stumpy

Meadows Reservoir in addition to the forecasted April through October inflow to the reservoir is less than 23,000 acre-feet, then diversions from the South Fork Rubicon would be made into Pilot Creek and Stumpy Meadows Reservoir. These diversions are expected to occur starting in April of the year when the need is identified and continuing at a rate of 50 cfs as long as needed to meet District demands for that year. The ability to make diversions from the South Fork Rubicon River, or Gerle Creek, will allow the District to rely on a greater portion of the water stored in Stumpy Meadows Reservoir than under current operating practice. This would allow for water diversions from the South Fork Rubicon River to only be required during drier water years. During wet years, there would be less need, or no need, to make diversions to meet water supply demands as the natural flow in Pilot Creek would be sufficient.

A maximum diversion rate of about 50 cfs is required to take a sufficient volume of water to meet the identified needs of 10,300 acre-feet. At this rate, about 3,000 acre-feet of water per month can be diverted into Stumpy Meadows Reservoir. Using the diversion criteria described above, the District's *StumpySIM* operational model was used to determine the required diversion volume. The results of the modeling effort are as follows:

Upper Pilot Creek

- Number of years analyzed = 77 (1923-1999)
- Number of years when diversion was required = 32 (42% of years)
- Average annual diversion volume = 2,700 acre-feet
- Maximum annual diversion volume = 18,200 acre-feet (occurred in 1977)
- Water supply yield increase = 10,300 acre-feet

A preliminary analysis was conducted to evaluate the water supply benefit of setting the diversion and conveyance capacity to a rate of 15 cfs. At this diversion rate, about 900 acre-feet of water per month can be diverted into Stumpy Meadows Reservoir which could result in an additional water supply of about 3,300 acre-feet per year. Diversions under this scenario were taken starting on March 1. This analysis is representative of the water supply benefits that could be developed with a 15 cfs diversion capacity. Additional project optimization studies should be conducted when additional information is known on the

diversion sizing criteria, more specific construction and water costs and potential SMUD power foregone costs. The District's operational model was used to estimate how this scenario could operate for representative purposes and results are as follows:

- Number of years analyzed = 77 (1923-1999)
- Number of years when diversion was required = 25 (32% of years)
- Average annual diversion volume = 1,100 acre-feet
- Maximum annual diversion volume = 7,200 acre-feet (occurred in 1977)
- Water supply yield increase = 3,300

Operational information for *OPTION 4 – Rubicon River diversion* is included in Appendix 4.

Development of this option would require additional water rights to allow new diversion and rediversion of water. This option will require the following new rights.

- Right to divert water from Rubicon River and Gerle Creek to storage in Stumpy Meadows Reservoir;
- Right to redivert water stored in Loon Lake at or near Robbs Peak Forebay if this water is desired;
- Right to redivert water from Pilot Creek released from Stumpy Meadows Reservoir storage to the place of use in the District service area.

Review of existing water rights, project facilities, operation, and hydrology of the Rubicon River indicate that unappropriated water is not available to fully meet the diversions required under *OPTION 4 – Rubicon River diversion.* Near the location of potential diversion from the Rubicon River, SMUD holds the rights to divert and store water for power generation and the City of Sacramento and US Bureau of Reclamation (USBR) hold similar consumptive rights. Water diverted under this option could impact SMUD's ability to utilize water under its rights for power production. Water diverted under this alternative could also impact the City of Sacramento and the USBR's ability to take consumptive water under their rights.

Costs associated with obtaining the right to use water for this option is assumed to be $75 per acre-foot which might be consistent with, for example, a transfer. If water were to be obtained for less that this value, then the cost of this option would decrease. For all options in this study, the cost of water is estimated only for the water actually taken. This assumes that the cost associated with water use will only have to be paid for the water actually used.

The cost of *OPTION 4 - Rubicon River diversion* alternative (a) and (b) is estimated at almost $59 million and $29 million, respectively (see Appendix 4). These costs are based on the diversion and conveyance capacity of 50 cfs. There would be some cost reduction to develop the option at a capacity of 15 cfs accounting for a reduction associated with a smaller diversion, pipeline and associated infrastructure. Cost for the 15 cfs diversion scenario is estimated at 85% of the 50 cfs diversion scenario cost.

4.5 OPTION 5 – North Fork American River Pumping Plant

North Fork American River

The North Fork American River Pumping Plant is a joint project with Placer County Water Agency (PCWA) located on the North Fork American River near the undeveloped Auburn Dam site. PCWA has completed a portion of the project and is now able to divert water at this location. The Pumping Plant shares a pump station site, including the intake structure and appurtenances. Two pumps to serve the District would be located on the north bank of the river. A casing has been constructed across the river to allow for a future pipe installation for water to be diverted and pumped to the District's service area. From this location, new conveyance infrastructure would be used to lift water about 800 to 900 feet along the first 3,000 feet of pipeline following a ridge line up to a small regulating reservoir with a total static lift of about 980 feet. Water would then be pumped from a new regulating reservoir and conveyed through a second pipeline to a proposed new treatment plant near the town of Cool or Greenwood Lake.

Based on preliminary estimates in previous studies, total pumping for the two pump stations of up to 4,600 hp would be required. As conceived, a 21 to 24-inch diameter pipeline about 16,000 to 17,000 feet (about 3 miles) in length would be required, with a capacity of about 22 cfs. The static lift from the North Fork American River to a treatment plant site near the town of Cool is approximately 1,080 feet. The project would require a regulating reservoir of approximately 100 acre-feet in size, water treatment plant and related piping to integrate with the existing water distribution system. The required 100 acre-foot regulating reservoir is included in the cost estimate of this options alternative, but not the water treatment plant and related piping.

This option is configured to allow the District to meet its projected water supply need (up to 10,300 acre-feet at year 2025 demand level) using water from the North Fork American River via the pumping plant. For this evaluation, the pumping plant operation was assumed to deliver water to meet demands ramped up starting in year 2009 to the full 10,300 acre-feet per year in 2025. With the North Fork American River Pumping Plant in service, additional water can be taken from the Stumpy Meadows Project minimizing the need to pump water at the North Fork American River Pumping Plant. This is especially the case in earlier years when the District demands have not substantially increased. A Sierra Hydrotech study showed that on average and at full demands, about 84% of the District's increased system water yield was required to be pumped from the North Fork American River Pumping plant with the remaining yield occurring through additional water being utilized from the Stumpy Meadows Project. This study assumes that 84% of the required additional safe yield based on updated water supply demand projections would be required to be pumped at the North Fork American River Pumping Plant. Pumping would occur to the regulating reservoir during off-peak hours to minimize operational energy costs. Water from the regulating reservoir will then be conveyed to the treatment plant as needed. The 100 acre-foot capacity regulating reservoir is sized to meet the storage requirements based on an anticipated delivery schedule.

Water for this option would be made available from the North Fork of the American River and be made up of water secured under a future EDCWA contract with the USBR (P.L. 101-514) and/or water made available under the Supplemental Water Rights Project, currently underway. Because water made available under both a USBR contract as well as the Supplemental Water Rights Project would be required to be taken directly from Folsom Reservoir, downstream of the North Fork American River Pumping Plant location, it is anticipated that water would be exchanged with other PCWA supplies allowing water to be taken directly at the North Fork American River Pumping Plant location. This would require agreement with PCWA and approval from the State Water Resources Control Board.

An advantage of this option is that the North Fork American River Pumping Plant would provide the District with a second major water supply project in addition to the existing Stumpy Meadows Project. Having two major sources of water available to serve the District would increase the dependability of water supply to the end customers. For example, if a catastrophic occurrence should occur on one project, such as conveyance failure, there would be a source of water available from the other project to partially meet demands. Another advantage is that this option locates water near where development is likely to take

place within the District's service area. The cost of the North Fork American River Pumping Plant is estimated at about $14 million (see Appendix 5).

4.6 OPTION 6 – Canyon Creek Reservoir

Canyon Creek Reservoir is a major storage project conceptualized on Canyon Creek below the confluence with Dark Canyon Creek located about 3 miles west of Lake Walton. The proposed dam would have a crest length of 980 feet and a height of 216 feet, providing storage capacity of 17,500 acre-feet. Water would be conveyed from Canyon Creek Reservoir to the existing District water system through 2.6 miles of pipeline and tunnel to a site north of Greenwood.

The Canyon Creek Project would provide gravity supply water to the western and southwestern portions of the District's service area below about 2,000 feet in elevation, while the Stumpy Meadows Project would continue to serve most of the eastern portions. Inflow to the Canyon Creek Reservoir could be augmented with surplus water from the Stumpy Meadows Project by conveying water in the existing District system to the Canyon Creek Reservoir. The Canyon Creek Dam would capture runoff from approximately 12.5 square miles of the Canyon Creek watershed. Operated in conjunction with the Stumpy Meadows Project, past reports have indicated that the safe yield of Canyon Creek Reservoir is about 6,100 acre-feet, with a firm yield of about 6,780 acre-feet.

A small hydroelectric power plant would probably be located at the Canyon Creek Dam to utilize head from the release of surplus water and stream maintenance flow. Releases made through the power plant would decrease over time as District demands continue to increase reducing available flow.

Previous studies of the Canyon Creek Reservoir site considered importing additional water from Otter Creek, thereby increasing the size of the watershed contributing to Canyon Creek Reservoir. The conclusion was that the relatively high cost of the diversion as related to the small increase in yield seemed to make the import from Otter Creek infeasible.

Development of the Canyon Creek Reservoir option would require rights to allow new diversion of water. *OPTION 6 – Canyon Creek Reservoir* would require the following new rights to divert water.

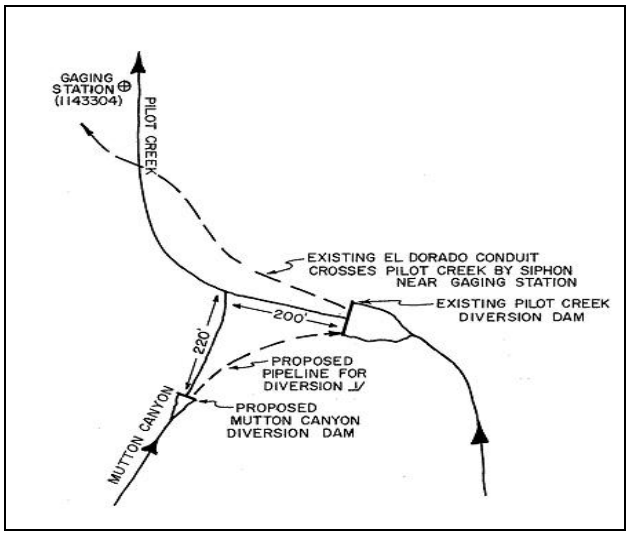
- Right to directly divert water from Canyon Creek, a tributary to the Middle Fork American River, for consumptive use;
- Right to divert water from Canyon Creek to storage in Canyon Creek Reservoir;
- Right to redivert water released from storage to the District's service area; and
- Right to store water from the Stumpy Meadows Project in Canyon Creek Reservoir (if this option were used).

An advantage of this option is that it would provide the District with a second major water supply project in addition to the existing Stumpy Meadows Project. Also, water from the Georgetown Divide Ditch at Walton Lake could be conveyed to Canyon Creek and stored in the reservoir augmenting inflow. A disadvantage is that construction of Canyon Creek Dam and Reservoir would likely have significant environmental opposition making it difficult to obtain project approvals.

The water supply provided by Canyon Creek Reservoir (firm yield of 6,780 acre-feet) is significant but would not meet the full identified 10,300 acre-feet identified as the water need by year 2025. The cost of Canyon Creek Project is estimated at about $108 million (see Appendix 6).

4.7 OPTION 7 – Mutton Canyon

The original vision of the Stumpy Meadows Project included water diverted from Mutton Canyon intended to augment water available from Stumpy Meadows Reservoir. As originally planned, the Pilot Creek Diversion Dam was to be located downstream from the Mutton Canyon confluence, which would have included the flows of Mutton Canyon. However, certain construction problems made it necessary to build the Pilot Creek Diversion Dam above the confluence. Consequently, the flow of Mutton Canyon was never diverted directly to the El Dorado Conduit and Georgetown Divide Ditch.



Mutton Canyon Option

This option would locate a new point of diversion on Mutton Canyon at a location just upstream from the confluence with Pilot Creek. From this new diversion location, water would be conveyed to either the existing Pilot Creek Diversion Dam on just upstream from its confluence with Mutton Canyon or conveyed directly into the El Dorado Conduit. Mutton Canyon diversions would be used to supplement Stumpy Meadows storage by reducing the need to make releases from storage when diversions from Mutton Canyon were available.

This option would include construction of a concrete diversion dam about six feet high and 40 feet long on Mutton Canyon, approximately 220 feet upstream from the confluence with Pilot Creek. The dam would have a crest height approximately 20 feet above the crest elevation of Pilot Creek Diversion Dam. A 15-inch pipeline approximately 400 feet long with a maximum capacity of 15 cfs would be constructed from the Mutton Canyon Diversion Dam and discharge into the pool behind Pilot Creek Diversion Dam or alternatively directly into the El Dorado Conduit.

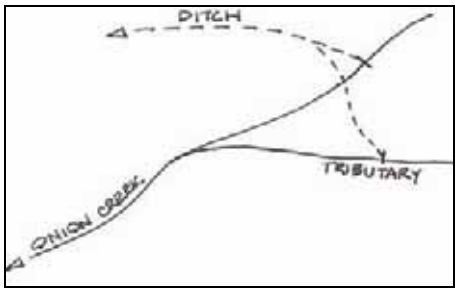
It is anticipated that a maximum diversion of 15 cfs would be made between November 1 and August 1 of each year. For this evaluation, it is assumed that the minimum streamflow release requirement below Mutton Canyon Diversion Dam would be 1 cfs or the natural flow, whichever is less. This stream release would flow down Mutton Canyon and then to Pilot Creek were it would be used to make partial compliance of the 4 cfs minimum release requirement (2 cfs in a dry year) at the compliance point located about 400 feet below the confluence.

When combined flow of Pilot Creek and Mutton Canyon exceeds the demand from the Georgetown Divide Ditch, spill will occur at Pilot Creek Diversion Dam as currently occurs and will occur at Mutton Canyon Diversion Dam when Mutton Canyon diversion capacity of 15 cfs is exceeded. Diversion would be made primarily during the spring runoff period of the drier years, permitting the District to maintain a higher project water yield without as great a degree of storage depletion at Stumpy Meadows Reservoir. It has been estimated that under the most favorable conditions during a moderately dry year, a diversion of 600 to 700 acre-feet could be made to meet District demands. The practical diversion of the flows of Mutton Canyon will likely be on the order of a couple of hundred acre-feet per season. During extremely dry years, it is unlikely that substantial diversion could be made from Mutton Canyon due to a lack of available natural flow. However, diversion that had occurred during previous seasons would assist by providing additional carryover storage at Stumpy Meadows Reservoir. For this evaluation, an increase in yield of 100 acre-feet is used.

The District claims the right to divert water from Mutton Canyon under existing water rights Application 5644A totaling up to about 690 afa at a rate of 15 cfs from Mutton Canyon as part of the Stumpy Meadows Project. Development of *OPTION 7 – Mutton Canyon* could require confirming these water rights will support this option. The Mutton Canyon pipeline would be located on U.S. Forest Service land requiring a special use permit or long-term easement.

The Cost of *OPTION 7 – Mutton Canyon* is estimated at about $190,000 (see Appendix 7).

4.8 OPTION 8 – Onion Creek



Onion Creek Option

The diversion from Onion Creek was originally constructed in the late 1800's as part of the Georgetown Divide Water Company system, diverting about 1.5 square miles of Onion Creek (a tributary to the South Fork American River) into Pilot Creek for enroute use and rediversion to the Georgetown Divide Ditch. The Water Company had pre-1914 water rights to the diversion of this water for mining and domestic purposes on the Georgetown Divide. Water was diverted from Onion Creek into a tributary of Pilot Creek and then rediverted from Pilot Creek to the Georgetown Divide Ditch for conveyance to the Georgetown area. Onion Creek Diversion was acquired by the District and utilized until the early 1970's. Diversion continued from Onion Creek until the early 1980's to serve cabins located along the ditch alignment. It is understood that logging operations in the 1980's destroyed much of the conveyance system from Onion Creek.

This option would include reconstructing the Onion Creek Diversion and conveyance System to allow water to once again be conveyed from Onion Creek to Pilot Creek. This diversion would increase the yield from the Stumpy Meadows project as the diverted water would augment project storage thereby increasing yield.

In order to provide the means of conveying water from Onion Creek to the Pilot Creek watershed, a new pipeline located along the old alignment would probably be the most practical approach. The length of the new pipeline would be about 1.7 miles.

It is not clear how much water could be made available from a restored Onion Creek Diversion as there is some question as to the type of water rights that could be utilized for this option; pre-1914 or permitted water rights. The District's *StumpySIM* computer model

was used to develop estimates of the potential additional Stumpy Meadows Project water supply firm yield that could be developed through diversions from Onion Creek. Project yield was estimated based on, 1) operation under pre-1914 water rights, and 2) operation under permitted water rights. It is assumed that the pre-1914 water rights allow diversion year around and the permitted water rights allow diversion from November 1 through August 1 with a minimum instream release requirement of 0.5 cfs. Results of the water supply yield analysis are shown below in Table 3.

Table 3 – Stumpy Meadows Project Firm Yield With Onion Creek Diversion

Onion Creek Water Right Type	Stumpy Meadows Project Yield (acre-feet)	Water Supply Increase (acre-feet)
-	12,251	-existing project-
Pre-1914 right	12,566	315
Permitted Right	12,305	54

The additional firm yield from *Option 8 – Onion Creek* operating under pre-1914 water rights is over 300 acre-feet. Under permitted rights, the additional firm yield is about 50 acre-feet. A first step in the potential reconstruction of the Onion Creek Diversion should be a water rights assessment to gain a better understanding of diversion constraints and potential water yield.

4.9 OPTION 9 – Modification to allowable demand deficiency

The annual safe yield of the Stumpy Meadows Project is 10,541 acre-feet estimated using the District's *StumpySIM* computer model. The project is operated to provide an estimated firm yield of 12,251 acre-feet per year by imposing dry year demand deficiency requirements. The District operates the Stumpy Meadows Project employing the demand deficiency criteria shown below in Table 4.

Table 4 – Georgetown Divide Public Utility District Maximum Dry Year Demand Deficiency Criteria

	Demand Deficiency	% of years Requiring Deficiency*
Treated water	10%	7%
Untreated water	50%	

*A year with required deficiency is defined as when modeling indicates a deficiency of over 5% is required for either treated or untreated water.

In most years, the District is able to supply the full firm yield of 12,251 acre-feet of water to its customers. In dry years, the District can impose up to 10% and 50% demand deficiency in treated and untreated water deliveries, respectively. Using this criterion, the District should expect to require some level of demand deficiency during about 7% of the years (less than 1 year out of ten) when water demands increase to equal the project firm yield.

OPTION 9 - Modification to allowable demand deficiency considers alternative dry year demand deficiency criteria designed to increase the firm yield of the Stumpy Meadows Project. Increasing the dry year demand deficiency criteria, allows for an increase in project firm yield by reducing the water used in dry years. Several different alternative dry year deficiency criteria have been examined to demonstrate how different criteria affect the Stumpy Meadows Project firm yield.

Table 5 lists the alternative dry year demand deficiency criteria considered in this evaluation along with the estimated Stumpy Meadows Project firm yield. Also shown is the percent of years that would require some level of demand deficiency. As shown in the table, the greater the deficiency criteria the more often demand deficiency would be required.

Table 5 – Stumpy Meadows Project Firm Yield
Alternative Water Demand Deficiency Criteria*

Demand Deficiency		% of years Requiring Deficiency	Stumpy Meadows Project Yield (acre-feet)	Water Supply Increase (acre-feet)
Treated	Untreated			
0%	0%	0%	10,541	-safe yield-
10%	50%	7%	12,251	-existing firm yield-
20%	50%	9%	12,493	242
30%	50%	9%	12,753	502
10%	60%	9%	12,616	365
20%	60%	12%	12,876	625
30%	60%	11%	13,161	910

*See Appendix 9 OPTION 9 - Modification to allowable demand deficiency for additional information on this option.

An increase in water supply firm yield is made available by increasing the demand deficiency criteria. For example, by increasing the treated water demand deficiency from 10% to 30%, a firm yield increase of about 500 acre-feet is realized (an increase of about 4%). By increasing the treated water demand deficiency from 10% to 30% and the untreated deficiency from 50% to 60% a firm yield increase of over 900 acre-feet is realized (an

increase of over 7%). Detailed results of this analysis including an evaluation of additional alternative demand deficiencies are included in Appendix 9.

The advantages of this option include its very low cost (for this analysis it is assumed cost is zero), no infrastructure requirements, and no outside approval requirements. The option could be realized through adoption of a new District dry year deficiency policy, operation of the Stumpy Meadows Project to implement the new policy, managing the associated water supply "cut backs" in dry years, and a perhaps a water rate schedule that encourages conservation, especially in dry years.

The main disadvantage of this option is that it would require more stringent dry year water supply deficiency to customers during dry years. However, the evaluation indicates that the increase in number of years that would require demand deficiencies would probably be minimal.

5.0 SUMMARY OF EVALUATION

Stumpy Meadows Reservoir

The options evaluated here are designed to increase the Districts available water supply yield to help meet future increasing demands. The potential water supply benefit and projected development cost for each evaluated option are summarized in Table 6 – Georgetown Divide Public Utility District Options to Increase Water Supply Summary of Findings. The water supply yield developed by each option ranges from under 100 acre-feet per year (Onion Creek) to 10,300 acre-feet (100% of projected future need) for several of the options. Initial costs range greatly from near zero for *OPTION 9 – Modification to Allowable Demand Deficiency* to $108 million to develop *OPTION 6 - Canyon Creek Reservoir*. Annual operating costs for the options range from near zero for *OPTION 9 – Modification to Allowable Demand Deficiency* to $1.4 million per year for the *OPTION 6 – North Fork American River Pumping Plant*. Unit cost of water per acre-foot per year ranges from near zero to over $1,000 for some options.

The information presented here is intended to provide a general conceptual-level overview of a series of options that could be available to the District to increase water supply. The intent of this study is to provide the District with information that can be used to help decide which options are most promising. The most promising options should be considered for detailed study to better understand their feasibility and ability to meet the Districts future water supply needs.

Table 6 - Georgetown Divide Public Utility District
Options to Increase Water Supply Summary of Findings

OPTION	Option Name	Initial Costs ($ mil) (Option 7, 8 and 9 in $1,000)						Annual Costs ($1,000/yr)					Total Cost ($ mil) (Option 7, 8 and 9 in $1,000)		Water Supply Safe yield (acre-feet)	Cost of Water ($/af/yr)
		Construction	Engineering[1]	Financing[2]	Land	Approvals	Total	Power Foregone[3]	Pumping Cost	Cost of Water[4]	O&M	Total	Present	Annual[5]		
1	Conveyance canal loss reduction	9.4	1.4	0.3	0	0.4	11.5	0	0	0	0	0	11.5	0.8	670	1,200
2	Enlarging Stumpy Meadows Reservoir	*Cost analysis not performed*						-	-	-	-	-	-	-	250 - 1,000	-
3	Upper Stumpy Meadows Reservoir	*Cost analysis not performed*						-	-	-	-	-	-	-	3,200	-
4	(a) Rubicon River Diversion-50 cfs (with tunnel)	48.6	7.3	1.5	0.5	1.2	59.0	540	0	203	25	768	70.3	4.8	10,300	470
	Rubicon River Diversion-15 cfs (with tunnel)	41.3	6.2	1.2	0.5	1.2	50.4	220	0	83	25	328	55.2	3.8	3,300	1,100
4	(b) Rubicon River Diversion-50 cfs (without tunnel)	22.9	3.4	0.7	0[6]	1.5	28.5	540	0	203	250	993	43.0	2.9	10,300	290
	Rubicon River Diversion-15 cfs (without tunnel)	19.5	2.9	0.6	0[6]	1.5	24.5	220	0	83	250	553	32.5	2.2	3,300	680
5	North Fork American River Pumping Plant	9.9	1.5	0.3	1.0	1.5	14.2	0	1,100	216	100	1,400	34.6	2.4	10,300	230
6	Canyon Creek Reservoir	85.0	12.8	2.6	3.0	5.0	108.3	0	0	0	200	200	111.2	7.6	6,100	1,200
7	Mutton Canyon	140	21	4	0	25	190	0	0	0	15	15	190	13	100	130
8	Onion Creek	1,800	270	54	0	50	2,200	0	0	0	20	20	2,200	150	50 - 300	500 - 3,000
9	Modification to allowable demand deficiency	0	0	0	0	0	0	0	0	0	0	0	0	0	200 - 1,000	0

[1] Engineering costs estimated at 15% of construction costs.
[2] Financing costs estimated at 3% of construction costs.
[3] Based on an estimated cost of $200/acre-foot.
[4] Cost of water assumes full water demand for all years
[5] Annual costs determined using a discount rate of 3.2% and a project life of 20 years.
[6] Assumes land is available under the original land patent

6.0 REFERENCES

The following references were reviewed in carrying out the evaluation described in this report. Information from these references is incorporated throughout the report.

State of California, Department of Water Resources, Central District, *Georgetown Divide Water Management Study*, June 1992.

Sierra Hydrotech, Memorandum to Marie Davis, Subject: Preliminary Report – Folsom North Pumping Project, September 2, 1997.

Sierra Hydrotech, *Georgetown Divide Public Utility District's Water Rights and Water Supply and Sacramento Municipal Utility District's Relicensing Issues*, December 12, 2003.

Placer County Water Agency, US Army Corps of Engineers, *East Loomis Basin Canal Efficiency Study*, June 2008.

El Dorado County Water Agency, *Water Resources Development and Management Plan*, April 2007.

Mead & Hunt, Inc., Joint Benefit Investigation Plan, *Technical Analysis of Preliminary Alternatives*, July 2004.

Mead & Hunt, Inc., *Georgetown Divide Public Utility District Supplemental Water Supply Options Study, Technical Analysis of Preliminary Alternatives*, November 2004.

Website: (http://www.gerlecreek.com/documents/georgetowndividemaps.htm)

Brown & Caldwell, Georgetown Divide Public Utility District Drought Plan, October 2007.

APPENDIX 1

Conveyance canal loss reduction

OPTION 1 - Conveyance canal loss reduction

Losses estimated from 1992 DWR Georgetown Divide Water Management Study

Source	Projected 2000 Loss AF/yr	Losses Pro-Rated to 2009[2]	Percent of Total Water 10,300 AF
Process Water (wash streets, back flush treatment plant, etc) [1]	-	150	1%
System Water-up (annual) [1]	-	450	4%
Treated Water Distribution System Process Water (Casual sales, fire department, water theft, etc)	410	406	4%
Carriage Water (additional flow necessary for regulation and diversion by users) [1]	1,280	1,270	12%
Conveyance Losses (seepage, leakage and other losses associated with conveyance)	1,340	1,330	13%
	Total Process Water and Losses =	3,600	
	Total as Percent of Water Delivered =	35%	

Carriage Losses: (Assuming 10,300 acre-feet of delivery)

Season	Duration Months[1]	Rate cfs[1]	Total Loss (AF)
Summer	5	2.3	690
Winter	7	1.4	590
			1,280

Additional Water from Stumpy Meadows from Conservation:

Assumptions:
1. Carriage water requirements are already reduced to the projected 2000 levels from the 1992 DWR study.
2. A reduction in conveyance water requirements is considered for ditch lining only. Assume that by lining a percentage of the remaining unlined ditches at areas most susceptible to leakage and seepage, a 50% reduction in conveyance water requirement can be realized.
3. Water-up and process water requirements are necessary and can not be reduced.
4. Distribution system water requirement reductions are minor and not considered for reduction.

Conveyance:

Total Conveyance Length:		75	miles
Percent lined, tunnel, or pipeline: [1]		30%	
Percent of unlined canal to be lined:		40%	
Length of canal for lining:		21	miles
Cost per foot of ling:	$	85.00	per linear foot
Total cost for lining:	$	9,420,000	
Additional water:		670	AF/year

Total Cost (year 2009)	$	9,420,000			
Additional Water 2010 - 2029:		13,400	AF	Cost/AF	$ 700

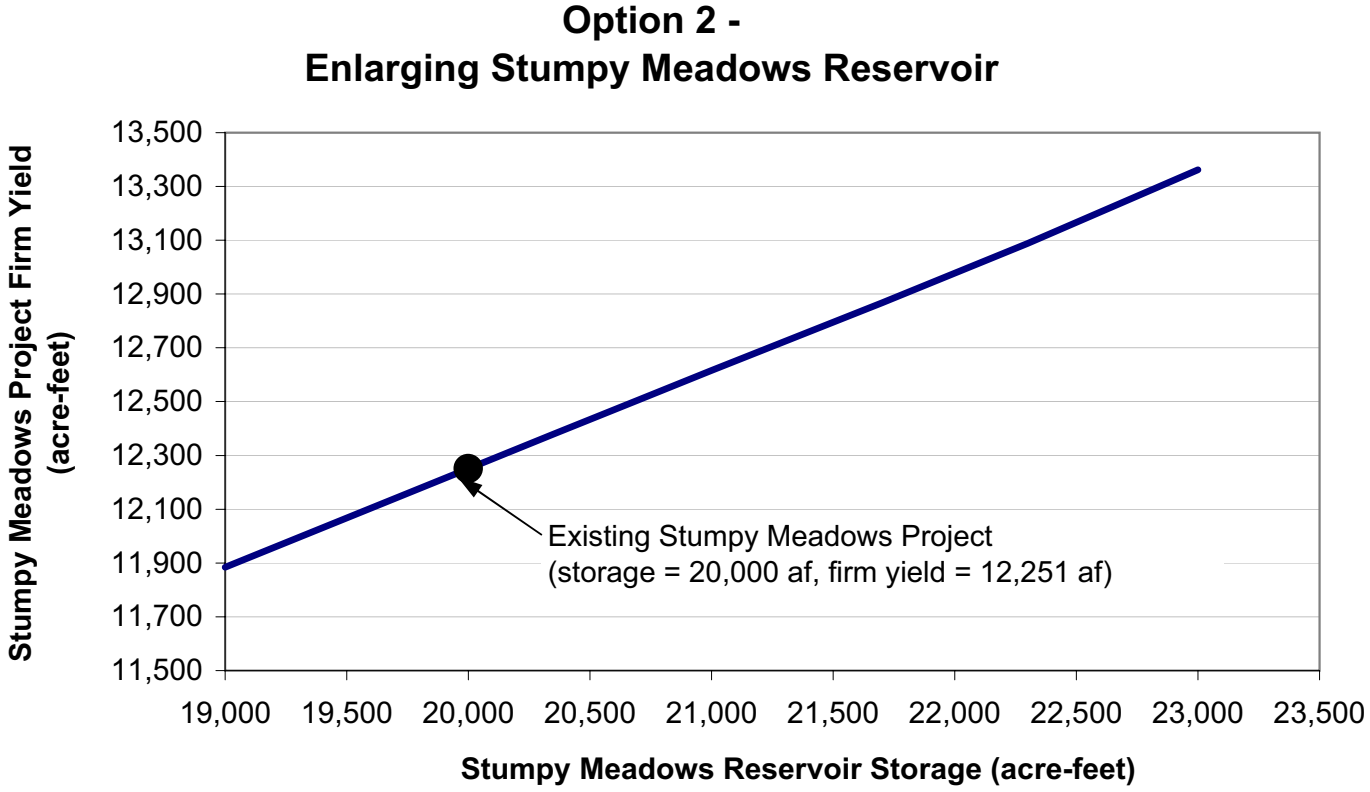
[1] *Estimates provided by GDPUD personnel.*

[2] *GDPUD reports total system losses of 3,600 acre-feet/year. Projected year 2000 losses from the 1992 study were pro-rated to match the remaining 3,000 acre-feet of losses reported by GDPUD after removing process and system water up demands.*

APPENDIX 2

Enlarging Stumpy Meadows Reservoir

Stumpy Storage (af)	Additional Storage (af)	Dam Height (feet)	Dam Raise (feet)	Project Yield	Delta from Existing Yield
19,000	-1,000	159	-3	11,884	-367
20,000	0	162	0	12,251	0
20,350	350	163	1	12,379	128
20,700	700	164	2	12,507	256
21,000	1,000	165	3	12,616	365
21,700	1,700	167	5	12,867	616
22,300	2,300	169	7	13,088	837
23,000	3,000	171	9	13,362	1,111



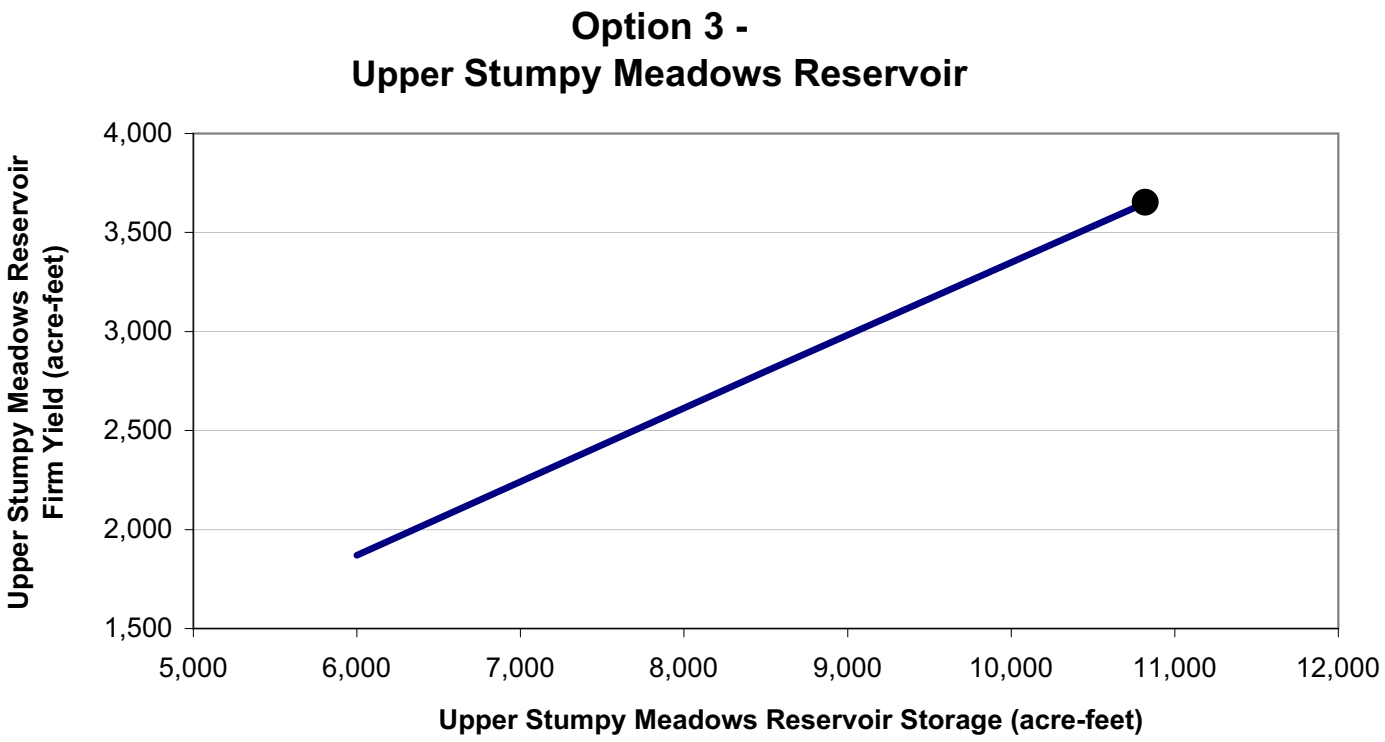
APPENDIX 3

Upper Stumpy Meadows Reservoir

Upper Stumpy Storage (af)	Usable Capacity (af)	Dam Height (feet)	Project Firm Yield w/Stumpy (af)	Upper Stumpy Project Firm Yield (af)
6,000	5,000	≈100	14,121	1,870
8,500	7,500	≈130	15,048	2,800
10,820	9,820	145	15,903	3,650

Upper Stumpy Meadows Dam and Reservoir
configuration used for cost development

Upper Stumpy Meadows Dam height = 142 feet
Dam crest elevation = 4,500 feet
Reservoir surface area = 194 acres
Storage capacity = 10,820 acre-feet
Assume dead pool = 1,000 acre-feet
Usable storage capacity = 9,820 acre-feet
Reservoir drainage area = 10 square miles



OPTION 3 - Upper Stumpy Meadows Reservoir

Project: Upper Stumpy Meadows Reservoir
Location: Pilot Creek, Upstream of existing Stumpy Meadows Reservoir

Comparison with Canyon Creek Dam:

	Upper Stumpy Meadows		Canyon Creek	
Dam:	Rockfill		Earthfill	
Top of Dam:	4500	feet	2256	feet
Base of Dam	4355	feet	2040	feet
Height:	145	feet	216	feet
Length:	850	feet	980	feet
Topwidth:	20	feet		feet
Reservoir Area:	194	acres	280	acres
Reservoir Volume	10820	acre-feet	17500	acre-feet
Safe Yield:	3200	acre-feet	6100	acre-feet
Drainage Basin:	10	square miles	12.5	square miles

Cost Estimate: Not performed due to comparison with Canyon Creek. Project will cost more and provide less benefits.

APPENDIX 4

Rubicon River diversion

Georgetown Divide Public Utility District
Options to Increase Water Supply

OPTION 4 - Rubicon River Diversion (50 cfs)

Water Year	Water Demand ac-ft	Stumpy Safe Yield ac-ft	GDPUD Defficiency ac-ft	Water Req'd to meet Deff.[1] ac-ft	Power Foregone Cost[2]	2009 Power Foregone	Option 4(a) With Tunnel O&M	Option 4(a) With Tunnel 2009 Discounted O&M	Option 4(b) Without Tunnel O&M	Option 4(b) Without Tunnel 2009 Discounted O&M	Cost of Water	2009 Discounted Cost of Water
2005	11,257	10,500	757	0	Year Not Used in Analysis							
2006	11,734	10,500	1,234	135	Year Not Used in Analysis							
2007	12,211	10,500	1,711	270	Year Not Used in Analysis							
2008	12,688	10,500	2,188	405	Year Not Used in Analysis							
2009	13,166	10,500	2,666	540	Year Not Used in Analysis							
2010	13,643	10,500	3,143	675	Year Not Used in Analysis							
2011	14,120	10,500	3,620	810	$ 162,000	$ 147,393	$25,000	$ 22,746	$250,000	$ 227,458	$ 60,750	$ 55,272
2012	14,597	10,500	4,097	945	$ 189,000	$ 166,626	$25,000	$ 22,040	$250,000	$ 220,405	$ 70,875	$ 62,485
2013	15,074	10,500	4,574	1,080	$ 216,000	$ 184,525	$25,000	$ 21,357	$250,000	$ 213,571	$ 81,000	$ 69,197
2014	15,551	10,500	5,051	1,215	$ 243,000	$ 201,154	$25,000	$ 20,695	$250,000	$ 206,948	$ 91,125	$ 75,433
2015	16,028	10,500	5,528	1,350	$ 270,000	$ 216,574	$25,000	$ 20,053	$250,000	$ 200,531	$101,250	$ 81,215
2016	16,506	10,500	6,006	1,485	$ 297,000	$ 230,844	$25,000	$ 19,431	$250,000	$ 194,313	$111,375	$ 86,567
2017	16,983	10,500	6,483	1,620	$ 324,000	$ 244,021	$25,000	$ 18,829	$250,000	$ 188,288	$121,500	$ 91,508
2018	17,460	10,500	6,960	1,755	$ 351,000	$ 256,159	$25,000	$ 18,245	$250,000	$ 182,450	$131,625	$ 96,060
2019	17,937	10,500	7,437	1,890	$ 378,000	$ 267,310	$25,000	$ 17,679	$250,000	$ 176,792	$141,750	$ 100,241
2020	18,414	10,500	7,914	2,025	$ 405,000	$ 277,523	$25,000	$ 17,131	$250,000	$ 171,310	$151,875	$ 104,071
2021	18,891	10,500	8,391	2,160	$ 432,000	$ 286,845	$25,000	$ 16,600	$250,000	$ 165,998	$162,000	$ 107,567
2022	19,369	10,500	8,869	2,295	$ 459,000	$ 295,323	$25,000	$ 16,085	$250,000	$ 160,851	$172,125	$ 110,746
2023	19,846	10,500	9,346	2,430	$ 486,000	$ 302,999	$25,000	$ 15,586	$250,000	$ 155,864	$182,250	$ 113,625
2024	20,323	10,500	9,823	2,565	$ 513,000	$ 309,915	$25,000	$ 15,103	$250,000	$ 151,031	$192,375	$ 116,218
2025	20,800	10,500	10,300	2,700	$ 540,000	$ 316,110	$25,000	$ 14,635	$250,000	$ 146,347	$202,500	$ 118,541
2026	20,800	10,500	10,300	2,700	$ 540,000	$ 306,309	$25,000	$ 14,181	$250,000	$ 141,810	$202,500	$ 114,866
2027	20,800	10,500	10,300	2,700	$ 540,000	$ 296,811	$25,000	$ 13,741	$250,000	$ 137,412	$202,500	$ 111,304
2028	20,800	10,500	10,300	2,700	$ 540,000	$ 287,607	$25,000	$ 13,315	$250,000	$ 133,151	$202,500	$ 107,853
2029	20,800	10,500	10,300	2,700	$ 540,000	$ 278,689	$25,000	$ 12,902	$250,000	$ 129,023	$202,500	$ 104,508
2030	20,800	10,500	10,300	2,700	$ 540,000	$ 270,048	$25,000	$ 12,502	$250,000	$ 125,022	$202,500	$ 101,268
2031	20,800	10,500	10,300	2,700	$ 540,000	$ 261,674	$25,000	$ 12,115	$250,000	$ 121,145	$202,500	$ 98,128
2032	20,800	10,500	10,300	2,700	$ 540,000	$ 253,560	$25,000	$ 11,739	$250,000	$ 117,389	$202,500	$ 95,085
2033	20,800	10,500	10,300	2,700	$ 540,000	$ 245,698	$25,000	$ 11,375	$250,000	$ 113,749	$202,500	$ 92,137
2034	20,800	10,500	10,300	2,700	$ 540,000	$ 238,079	$25,000	$ 11,022	$250,000	$ 110,222	$202,500	$ 89,280
2035	20,800	10,500	10,300	2,700	$ 540,000	$ 230,697	$25,000	$ 10,680	$250,000	$ 106,804	$202,500	$ 86,511
2036	20,800	10,500	10,300	2,700	$ 540,000	$ 223,544	$25,000	$ 10,349	$250,000	$ 103,492	$202,500	$ 83,829
2037	20,800	10,500	10,300	2,700	$ 540,000	$ 216,612	$25,000	$ 10,028	$250,000	$ 100,283	$202,500	$ 81,230
2038	20,800	10,500	10,300	2,700	$ 540,000	$ 209,895	$25,000	$ 9,717	$250,000	$ 97,174	$202,500	$ 78,711
Total (2011 - 2025)			100,000			$ 3,700,000		$ 300,000		$ 2,800,000		$ 1,388,745

[1] Estimated amount of water needed to supplement Stumpy Meadows Project.

[2] UARP Power Forgone estimated at $200/acre-foot

OPTION 4(a) - Rubicon River Diversion (50 cfs) with tunnel

Item	Qty	Unit	Unit Price	Total Price
1 Clearing				
Clearing for Pipeline	14	AC	$ 4,000	$ 56,000
Clearing for Intake	3	AC	$ 3,000	$ 9,000
Clearing for Tunnel Entrance Portal	4	AC	$ 3,000	$ 12,000
Clearing for Tunnel Exit Portal	3	AC	$ 3,000	$ 9,000
TOTAL CLEARING				**$ 86,000**
2 Diversion at/near Robbs Peak Forebay				
Cofferdam	1	LS	$ 300,000	$ 300,000
Bypass Piping	250	LF	$ 500	$ 125,000
Diversion Intake Structure	1	LS	$ 2,500,000	$ 2,500,000
Demolition, Temp. structure removal	1	LS	$ 50,000	$ 50,000
TOTAL DIVERSION				**$ 2,975,000**
3 Pipeline				
≈30" Pipeline with excavation and backfill	13,700	LF	$ 550	$ 7,535,000
structures/supports at above ground location (assumed 15% of length)	2,100	EA	$ 1,500	$ 3,150,000
TOTAL PIPELINE				**$ 10,685,000**
4 Tunnel with pipe lining				
Entrance Portal	1	LS	$ 750,000	$ 750,000
Tunnel 8' dia.	13,700	LF	$ 1,100	$ 15,070,000
Tunnel Lining & Grouting (8' dia.)	13,700	LF	$ 650	$ 8,905,000
Exit Portal	1	LS	$ 450,000	$ 450,000
TOTAL TUNNEL AND PIPE LINING				**$ 25,175,000**
			Subtotal (Direct Construction Costs)	$ 38,900,000
			Contingency @ 25%	$ 9,700,000
			OPTION 5(a) Total Estimated Construction Cost =	**$ 48,600,000**

OPTION 4(b) - Rubicon River Diversion (50 cfs) without tunnel

Item	Qty	Unit	Unit Price	Total Price
1 Clearing				
Clearing for Pipeline	38.4	AC	$ 4,000	$ 154,000
Clearing for Intake	3	AC	$ 3,000	$ 9,000
TOTAL CLEARING				**$ 163,000**
2 Diversion at/near Robbs Peak Forebay				
Cofferdam	1	LS	$ 300,000	$ 300,000
Bypass Piping	250	LF	$ 500	$ 125,000
Diversion Intake Structure	1	LS	$ 2,500,000	$ 2,500,000
Demolition, Temp. structure removal	1	LS	$ 50,000	$ 50,000
TOTAL DIVERSION				**$ 2,975,000**
3 Pipeline				
≈30" Above ground pipeline with structures and supports	38,000	LF	$ 400	$ 15,200,000
TOTAL PIPELINE				**$ 15,200,000**
			Subtotal (Direct Construction Costs)	$ 18,300,000
			Contingency @ 25%	$ 4,600,000
			OPTION 5(b) Total Estimated Construction Cost =	**$ 22,900,000**

Georgetown Divide Public Utility District
Options to Increase Water Supply

OPTION 4 - Rubicon River Diversion (50 cfs)

Monthly diversion from Robbs Peak Res. based on a target of 23,000 acre-feet for sum of April 1 storage and remaining April-Oct inflow. Volumes are listed as thousands of acre-feet.

Calendar Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	2.975	2.975	2.975	2.975	0.34	0	0	0	0	12.24
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	2.975	1.895	0	0	0	0	0	0	0	4.87
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	2.975	2.975	2.581	0	0	0	0	0	0	8.531
1930	0	0	0	2.975	2.65	0	0	0	0	0	0	0	5.625
1931	0	0	0	2.975	2.975	2.975	2.975	1.446	0	0	0	0	13.346
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	2.975	1.675	0	0	0	0	0	0	0	4.65
1934	0	0	0	2.975	2.975	2.975	1.117	0	0	0	0	0	10.042
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	2.5	0	0	0	0	0	0	0	0	2.5
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	2.975	0.725	0	0	0	0	0	0	0	3.7
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	2.975	0.71	0	0	0	0	0	0	0	3.685
1948	0	0	0	0.3	0	0	0	0	0	0	0	0	0.3
1949	0	0	0	0.7	0	0	0	0	0	0	0	0	0.7
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	2.975	1.195	0	0	0	0	0	0	0	4.17
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	2.975	1.11	0	0	0	0	0	0	0	4.085
1960	0	0	0	2.975	1.175	0	0	0	0	0	0	0	4.15
1961	0	0	0	2.975	2.975	2.975	2.975	0.765	0	0	0	0	12.665
1962	0	0	0	2.975	0.4	0	0	0	0	0	0	0	3.375
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	1.9	0	0	0	0	0	0	0	0	1.9
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	2.975	0.68	0	0	0	0	0	0	0	3.655
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	1.4	0	0	0	0	0	0	0	0	1.4
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	2.975	2.975	2.975	0.85	0	0	0	0	0	9.775
1977	0	0	0	2.975	2.975	2.975	2.975	2.975	2.975	0.3	0	0	18.15
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0.8	0	0	0	0	0	0	0	0	0.8
1980	0	0	0	0	0	0	0	0	0	0	0	0	0

Georgetown Divide Public Utility District
Options to Increase Water Supply

OPTION 4 - Rubicon River Diversion (50 cfs)

Monthly diversion from Robbs Peak Res. based on a target of 23,000 acre-feet for sum of April 1 storage and remaining April-Oct inflow. Volumes are listed as thousands of acre-feet.

Calendar Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1981	0	0	0	2.975	2.975	0.19	0	0	0	0	0	0	6.14
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	2.8	0	0	0	0	0	0	0	0	2.8
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	2.975	2.975	2.975	0.209	0	0	0	0	0	9.134
1988	0	0	0	2.975	2.975	2.975	2.975	2.775	0	0	0	0	14.675
1989	0	0	0	2.826	0	0	0	0	0	0	0	0	2.826
1990	0	0	0	2.975	2.975	2.975	0.867	0	0	0	0	0	9.792
1991	0	0	0	2.975	2.975	2.975	0.885	0	0	0	0	0	9.81
1992	0	0	0	2.975	2.975	2.975	2.188	0	0	0	0	0	11.113
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	2.975	2.975	0.65	0	0	0	0	0	0	6.6
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0

Avg=	0	0	0	1.099	0.700	0.469	0.273	0.108	0.039	0.004	0	0	2.691
Min=	0	0	0	0	0	0	0	0	0	0	0	0	0
Max=	0	0	0	2.975	2.975	2.975	2.975	2.975	2.975	0.3	0	0	18.15

APPENDIX 5

North Fork American River Pumping Plant

Georgetown Divide Public Utility District
Options to Increase Water Supply

OPTION 5 - North Fork American River Pumping Plant

Water Year	Water Demand ac-ft	Stumpy Safe Yield ac-ft	GDPUD Defficiency ac-ft	Water Req'd to meet Deff. ac-ft	Pumping Hours Per Year	Annual Pumping Cost	2008 Discounted Cost	Cost of Water[1]	2008 Discounted Cost of Water	O&M Cost	2008 Discounted O&M
2005	11,257	10,500	757	0	Year Not Used in Analysis						
2006	11,734	10,500	1,234	433	Year Not Used in Analysis						
2007	12,211	10,500	1,711	865	Year Not Used in Analysis						
2008	12,688	10,500	2,188	1,298	Year Not Used in Analysis						
2009	13,166	10,500	2,666	1,730	Year Not Used in Analysis						
2010	13,643	10,500	3,143	2,163	Year Not Used in Analysis						
2011	14,120	10,500	3,620	2,596	1,472	$ 321,973	$ 292,941	$ 64,890	$ 59,039	$ 200,000	$ 181,966
2012	14,597	10,500	4,097	3,028	1,717	$ 375,636	$ 331,168	$ 75,705	$ 66,743	$ 200,000	$ 176,324
2013	15,074	10,500	4,574	3,461	1,962	$ 429,298	$ 366,742	$ 86,520	$ 73,913	$ 200,000	$ 170,857
2014	15,551	10,500	5,051	3,893	2,208	$ 482,960	$ 399,791	$ 97,335	$ 80,573	$ 200,000	$ 165,559
2015	16,029	10,500	5,529	4,326	2,453	$ 536,622	$ 430,438	$ 108,150	$ 86,750	$ 200,000	$ 160,425
2016	16,506	10,500	6,006	4,759	2,698	$ 590,284	$ 458,800	$ 118,965	$ 92,466	$ 200,000	$ 155,451
2017	16,983	10,500	6,483	5,191	2,943	$ 643,947	$ 484,990	$ 129,780	$ 97,744	$ 200,000	$ 150,630
2018	17,460	10,500	6,960	5,624	3,189	$ 697,609	$ 509,114	$ 140,595	$ 102,606	$ 200,000	$ 145,960
2019	17,937	10,500	7,437	6,056	3,434	$ 751,271	$ 531,276	$ 151,410	$ 107,072	$ 200,000	$ 141,434
2020	18,414	10,500	7,914	6,489	3,679	$ 804,933	$ 551,574	$ 162,225	$ 111,163	$ 200,000	$ 137,048
2021	18,891	10,500	8,391	6,922	3,924	$ 858,596	$ 570,102	$ 173,040	$ 114,897	$ 200,000	$ 132,799
2022	19,369	10,500	8,869	7,354	4,170	$ 912,258	$ 586,951	$ 183,855	$ 118,293	$ 200,000	$ 128,681
2023	19,846	10,500	9,346	7,787	4,415	$ 965,920	$ 602,207	$ 194,670	$ 121,368	$ 200,000	$ 124,691
2024	20,323	10,500	9,823	8,219	4,660	$ 1,019,582	$ 615,952	$ 205,485	$ 124,138	$ 200,000	$ 120,824
2025	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 628,266	$ 216,300	$ 126,620	$ 200,000	$ 117,078
2026	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 608,785	$ 216,300	$ 122,694	$ 200,000	$ 113,448
2027	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 589,908	$ 216,300	$ 118,889	$ 200,000	$ 109,930
2028	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 571,616	$ 216,300	$ 115,203	$ 200,000	$ 106,521
2029	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 553,892	$ 216,300	$ 111,631	$ 200,000	$ 103,218
2030	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 536,717	$ 216,300	$ 108,169	$ 200,000	$ 100,018
2031	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 520,075	$ 216,300	$ 104,815	$ 200,000	$ 96,916
2032	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 503,948	$ 216,300	$ 101,565	$ 200,000	$ 93,911
2033	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 488,322	$ 216,300	$ 98,416	$ 200,000	$ 90,999
2034	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 473,180	$ 216,300	$ 95,364	$ 200,000	$ 88,178
2035	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 458,508	$ 216,300	$ 92,407	$ 200,000	$ 85,443
2036	20,800	10,500	10,300	8,652	4,906	$ 1,073,244	$ 444,291	$ 216,300	$ 89,542	$ 200,000	$ 82,794
	Total (2011-2025)		104,399				$ 7,400,000		$ 1,500,000		$ 2,200,000

Information based on 1997 Sierra Hydrotech Memo

Pumping					
	Static Head:	1,080	ft		
	Length Of Pipe:	17,000	ft		
	Pipe Diameter:	2	ft		
	Discharge:	21.3	cfs		
	Headloss:	132	ft		
	Velocity:	6.8	fps		
	PS Efficiency:	65%			
	Pumping Power:	3,366	kW	or 4,514	hp
	Power Cost:	$ 0.065	/kW-hr		

Pumping Cost Per Acre-foot			
	Flowrate:	21.3	cfs
	Time:	1	hour
	Volume:	1.76	Acre-Feet
Average	Power Cost:	$ 0.065	/kW-hr
	Unit Cost:	*$ 124.05*	*/acre-foot*
High:	. Power Cost:	$ 0.085	/kW-hr
	Unit Cost:	*$ 162.21*	*/acre-foot*
Low:	. Power Cost:	$ 0.045	/kW-hr
	Unit Cost:	*$ 85.88*	*/acre-foot*

[1]Assume $25 per acre-foot to secure right to water typical of what might be charged for PL 101-514 water.

OPTION 5 - North Fork American River Pumping Plant

Project cost estimation as of 1997 from Sierra Hydrotech study.

1997 S.H. Study		
Estimated Cost:	$ 8,440,000	
Remove Treatment Plant	$ (3,000,000)	(remove treatment plant cost for consistancy with other options)
1997 Project Cost for Evaluation	$ 5,440,000	
Escalation factor 1997 to 2009	1.46	3.2% annual escalation rate
Updated Construction Cost		
Updated Project Cost:	$ 7,900,000	
Contingencies @ 25%	$ 2,000,000	
Total 2009 Cost	$ 9,900,000	(Cost does not include new or expanded water treatment plant)

Initial Costs		
Construction Cost	$ 9,900,000	
Engineering	$ 1,500,000	(15% of Construction Cost)
Financing	$ 300,000	(3% of Construction Cost)
Land	$ 1,000,000	(Assumed $1.0 million)
Approvals	$ 1,500,000	(Assumed $1.5 million)
Total Initial Cost Estimate =	$ 14,200,000	
Annual Costs		
Pumping Cost:	$ 1,100,000	
Cost of Water:	$ 220,000	(Cost of water asumes full water demand for all years)
O&M	$ 100,000	(Assumed at $100,000)
Total Annual Cost Estimamte =	$ 1,400,000	

Total Costs		
Project Life =	20	years
Discount Rate =	3.2	%
Present =	$ 34,900,000	
Annual =	$ 2,400,000	

Water Supply Safe Yield =	10,300	(acre-feet)
Cost of Water =	**$ 230**	**($/acre-foot/year)**

APPENDIX 6

Canyon Creek Reservoir

Georgetown Divide Public Utility District
Options to Increase Water Supply

OPTION 6 - Canyon Creek Reservoir

Project cost estimated as of July 1986 taken from DWR study.

1986 DWR Study			
Estimated Cost:	$	34,000,000	(Cost does not include conveyance system to existing distribution system.)
Year		1986	
Set Inflation Rate		3.2%	
Updated Construction Cost			
Updated Project Cost:	$	68,000,000	
Contingency @ 25%	$	17,000,000	(Represents increases in project cost in addition to inflation)
Total 2009 Cost	$	85,000,000	
Initial Costs			
Construction Cost	$	85,000,000	
Engineering	$	12,800,000	(15% of Construction Cost)
Financing	$	2,600,000	(3% of Construction Cost)
Land	$	3,000,000	(Assumed $3.0 million)
Approvals	$	5,000,000	(Assumed $5.0 million)
Total Initial Cost Estimate =	$	108,400,000	
Annual Costs			
O&M	$	200,000	(Assumed at $200,000)
Total Costs			
Project Life =		20	years
Discount Rate =		3.2	%
Present =	$	111,300,000	
Annual =	$	7,600,000	
Water Supply Safe Yield =		6,100	(acre-feet)
Cost of Water =	**$**	**1,200**	**($/acre-foot/year)**

APPENDIX 7

Mutton Canyon

OPTION 7 - Mutton Canyon

Item	Qty	Unit	Unit Price	Total Price
1 Clearing				
Clearing for Pipeline	0.5	AC	$ 4,000	$ 2,000
Clearing for Intake	0.1	AC	$ 3,000	$ 300
TOTAL CLEARING				**$ 2,300**
2 Diversion at Mutton Canyon				
Cofferdam	1	LS	$ 6,000	$ 6,000
Bypass Piping	50	LF	$ 175	$ 8,750
Diversion Intake Structure	1	LS	$ 30,000	$ 30,000
Demolition, Temp. structure removal	1	LS	$ 5,000	$ 5,000
TOTAL DIVERSION				**$ 50,000**
3 Pipeline				
≈15" Above ground pipeline with structures and supports	400	LF	$ 150	$ 60,000
TOTAL PIPELINE				**$ 60,000**
			Subtotal (Direct Construction Costs)	$ 112,300
			Contingency @ 25%	$ 28,100
			OPTION 7 Total Estimated Construction Cost =	**$ 140,000**

APPENDIX 8

Onion Creek

Georgetown Divide Public Utility District
Options to Increase Water Supply

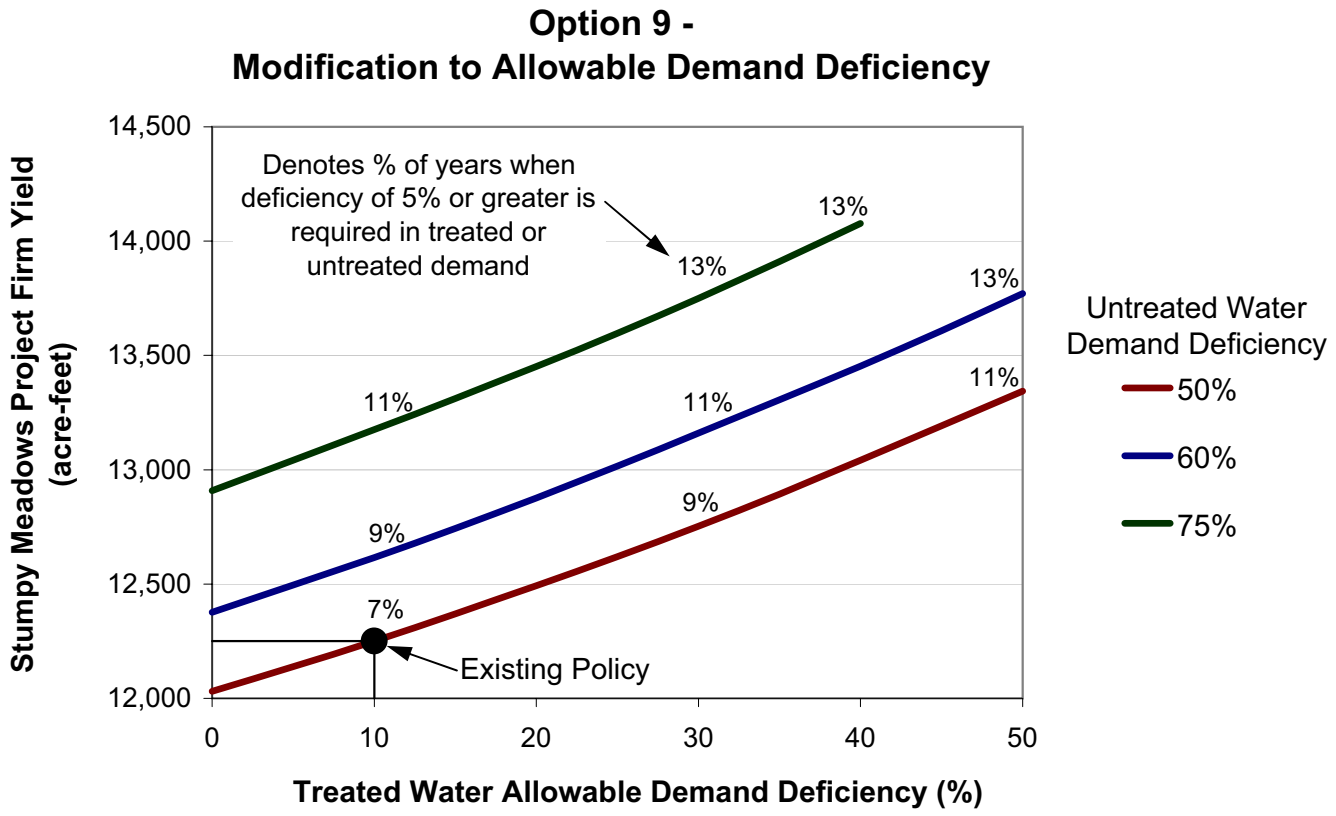
OPTION 8 - Onion Creek

Item	Qty	Unit	Unit Price	Total Price
1 Clearing				
Clearing for Pipeline	9.1	AC	$ 4,000	$ 36,000
Clearing for Intake	0.1	AC	$ 3,000	$ 300
TOTAL CLEARING				**$ 36,300**
2 Diversion at Onion Creek				
Cofferdam	2	LS	$ 6,000	$ 12,000
Bypass Piping	100	LF	$ 175	$ 17,500
Diversion Intake Structure	2	LS	$ 25,000	$ 50,000
Demolition, Temp. structure removal	2	LS	$ 5,000	$ 10,000
TOTAL DIVERSION				**$ 90,000**
3 Pipeline				
≈15" pipeline	9,000	LF	$ 150	$ 1,350,000
TOTAL PIPELINE				**$ 1,350,000**
			Subtotal (Direct Construction Costs)	$ 1,476,000
			Contingency @ 25%	$ 369,000
			OPTION 8 Total Estimated Construction Cost =	**$ 1,800,000**

APPENDIX 9

Modification to allowable demand deficiency

Deficiency Treated (%)	Deficiency Untreated (%)	Project Yield	Delta from Existing Yield	Deficiency Treated (%)	Deficiency Untreated (%)	Project Yield	Delta from Existing Yield	Deficiency Treated (%)	Deficiency Untreated (%)	Project Yield	Delta from Existing Yield
0	50	12,031	-220	0	60	12,377	-239	0	75	12,909	-267
5	50	12,138	-113	5	60	12,495	-121	5	75	13,041	-135
10	50	12,251	0	10	60	12,616	0	10	75	13,176	0
15	50	12,369	118	15	60	12,743	127	15	75	13,312	136
20	50	12,493	242	20	60	12,876	260	20	75	13,451	275
25	50	12,620	369	25	60	13,016	400	25	75	13,597	421
30	50	12,753	502	30	60	13,161	545	30	75	13,750	574
35	50	12,893	642	35	60	13,306	690	35	75	13,911	735
40	50	13,041	790	40	60	13,453	837	40	75	14,077	901
45	50	13,193	942	45	60	13,608	992				
50	50	13,344	1,093	50	60	13,771	1,155				



Demand Deficiency Criteria (%)

Treated	10	50	30	40	30	10	10	30	50	20	40	20	40	20
Untreated	50	50	50	75	75	75	60	60	60	50	50	60	60	75

Water Delivery (% of demand)

Year	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
1923	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1924	0.82	0.99	0.77	0.89	0.80	0.96	0.63	0.90	0.65	0.93	0.68	0.98	0.77	0.99	0.74	0.95	0.71	0.88	0.81	0.98	0.78	0.93	0.75	0.97	0.72	0.91	0.67	0.96
1925	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1926	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1927	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1928	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1929	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1930	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1931	0.85	1.00	0.75	0.87	0.81	0.97	0.56	0.84	0.60	0.90	0.68	0.98	0.80	1.00	0.73	0.94	0.67	0.82	0.83	0.99	0.78	0.93	0.77	0.98	0.70	0.89	0.64	0.95
1932	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1933	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1934	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1935	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1936	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1937	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1938	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1939	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1940	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1941	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1942	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1943	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1944	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1945	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1946	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1947	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1948	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1949	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1950	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1951	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1952	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1953	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1954	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1955	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1956	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1957	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1958	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1959	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1960	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1961	0.97	1.00	0.90	1.00	0.94	1.00	0.80	1.00	0.83	1.00	0.88	1.00	0.94	1.00	0.90	1.00	0.85	1.00	0.95	1.00	0.92	1.00	0.92	1.00	0.87	1.00	0.85	1.00
1962	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1963	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1964	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1965	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1966	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1967	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1968	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1969	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1972	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1973	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1974	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Demand Deficiency Criteria (%)

Treated	10	50	30	40	30	10	10	30	50	20	40	20	40	20
Untreated	50	50	50	75	75	75	60	60	60	50	50	60	60	75

Deficeincy over 5% required? (1 = Yes, 0 = No)

Year														
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1932	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1933	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	1	1	1	1	1	1	1	1	0	0	1	1	1
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Demand Deficiency Criteria (%)																														
Treated	10		50		30		40		30		10		10		30		50		20		40		20		40		20	
Untreated	50		50		50		75		75		75		60		60		60		50		50		60		60		75	
	Water Delivery (% of demand)																													
Year	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
1975	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1976	0.95	1.00	0.88	1.00	0.92	1.00	0.78	1.00	0.81	1.00	0.86	1.00	0.92	1.00	0.88	1.00	0.83	1.00	0.94	1.00	0.90	1.00	0.90	1.00	0.86	1.00	0.84	1.00		
1977	0.50	0.90	0.50	0.50	0.50	0.70	0.25	0.60	0.25	0.70	0.25	0.90	0.40	0.90	0.40	0.70	0.40	0.50	0.50	0.80	0.50	0.60	0.40	0.80	0.40	0.60	0.25	0.80		
1978	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1979	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1982	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1983	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1984	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1985	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1986	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1987	1.00	1.00	0.98	1.00	1.00	1.00	0.91	1.00	0.94	1.00	0.99	1.00	1.00	1.00	0.99	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	0.97	1.00		
1988	0.77	0.98	0.70	0.79	0.73	0.90	0.53	0.82	0.55	0.87	0.58	0.96	0.69	0.97	0.65	0.88	0.63	0.78	0.75	0.94	0.71	0.85	0.67	0.93	0.64	0.83	0.56	0.92		
1989	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1990	1.00	1.00	0.95	1.00	1.00	1.00	0.85	1.00	0.89	1.00	0.97	1.00	1.00	1.00	0.97	1.00	0.90	1.00	1.00	1.00	0.98	1.00	1.00	1.00	0.94	1.00	0.93	1.00		
1991	1.00	1.00	0.88	1.00	0.95	1.00	0.76	1.00	0.80	1.00	0.88	1.00	0.97	1.00	0.89	1.00	0.82	1.00	0.99	1.00	0.92	1.00	0.93	1.00	0.86	1.00	0.84	1.00		
1992	0.86	1.00	0.74	0.85	0.79	0.95	0.58	0.86	0.61	0.91	0.66	0.98	0.78	0.99	0.72	0.93	0.67	0.82	0.82	0.99	0.76	0.91	0.74	0.97	0.69	0.88	0.63	0.95		
1993	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1994	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1995	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1996	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1997	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
1998	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		

Demand Deficiency Criteria (%)														
Treated	10	50	30	40	30	10	10	30	50	20	40	20	40	20
Untreated	50	50	50	75	75	75	60	60	60	50	50	60	60	75
	Deficeincy over 5% required? (1 = Yes, 0 = No)													
Year														
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	1	1	1	1	1	1	1	1	1	1	1	1	1
1977	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	1	1	0	0	0	1	0	0	0	0	0
1988	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	1	1	0	0	0	1	0	0	0	0	0
1991	0	1	0	1	1	1	0	1	1	0	0	1	1	1
1992	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of year out of 76 years of record ------->	Sum =	5	8	7	10	10	8	7	8	10	7	7	9	9	9
% of years with a deficiency of greater than 5% ---------->		***7%***	***11%***	***9%***	***13%***	***13%***	***11%***	***9%***	***11%***	***13%***	***9%***	***9%***	***12%***	***12%***	***12%***