Water Supplies and Demands for Participants in the Northern Integrated Supply Project

Harvey Economics

Final Report

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Water Supplies and Demands for Participants in the Northern Integrated Supply Project

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SECTION ONE
Introduction

This introduction describes a research effort and report prepared by Harvey Economics (HE) for the Northern Colorado Water Conservancy District (Northern District), acting on behalf of the Northern Integrated Supply Project Water Activity Enterprise (NISP). The report's purpose, approach, organization and caveats are described below.

Research Objective, Purpose and Background

HE was commissioned by the Northern District in June 2004 to evaluate and prepare water demand forecasts for the NISP Participants (Participants), along with a discussion of conservation practices employed by these Participants. Separately, the Northern District staff prepared an evaluation of water supplies for the Participants. These two work elements were then combined to assess potential future water shortages for the Participants. This study will be provided to the U.S. Army Corps of Engineers for its use in considering NISP purpose and need and in preparing Chapter One of the NISP Environmental Impact Statement (EIS).

A review of NISP purpose and need was a component of the *NISP Phase Two Alternative Evaluation* prepared by Montgomery Watson-Harza (MWH) for the Northern District, published in June 2004. The overall purpose of the MWH alternative evaluation report was to identify a preferred project that would provide 34,400 acre-feet of new firm yield and 17,000 acre-feet of firming storage to the Participants at that time. Although not the primary focus of the alternative study, project need was examined on a Participant basis, comparing projected demand to firm supply. The differences between the MWH study and the HE study are substantial: a different list of Participants; a NISP project that will produce up to 40,000 acre-feet of permitted yield; a NISP project without marketable firm storage; and HE's independent evaluation of water supply and demand projections offered by individual Participants. HE water demand projections for the 13 Participants are roughly one quarter less than the demand projections in the MWH report for the year 2050.

The Northern District has sponsored two other previous water demand studies in the past 15 years. In the year 2000, the Northern District completed a land use based projection of water needs. Unlike the present HE study, that previous effort was focused on demands at buildout capacity. In 1991, the Northern District published the *Regional Water Supply Study,* which examined water requirements for a number of providers, including some of the current Participants. Economic and demographic conditions and prospects have changed considerably for Northern Colorado since that time.

Research Approach

The HE study team (study team) consisted of Ed Harvey, Andy Fritsch, Chris Goemans, Susan Walker and Melinda Ogle, who together conducted the research and analyses related to water demands and conservation. The study team also included Val Flory, from the Northern District, who provided historical information and previous data collected from the

Participants. In addition, Ms. Flory also gathered, compiled and provided to the rest of the study team supply-related information for each Participant.

The research approach entailed extensive data collection, evaluation and analysis of the information provided, plus conclusions about future water demands and need for NISP. The study team gathered and reviewed supply and demand related information collected by the Northern District and others, as reported in the *NISP Phase Two Alternative Evaluation.* The study team established data collection goals for each Participant and then compared those goals with the information collected in the previous MWH effort. Personal interviews were conducted with each of the Participants to gather any remaining necessary information, and several follow-up contacts with most Participants were necessary to gather all final information available from each Participant.

The data collection effort, growth projections and water demand projections for each Participant were accomplished as an iterative effort. Initially, the study team provided each of the Participants with a list of information and subject categories that would become part of the purpose and need study. Each of the Participants provided published reports prepared by themselves or by consultants, along with internal operating data related to past and future growth, water use, conservation and water supply. The study team reviewed this information and developed interview questions for each of the Participants to complete the data collection effort. During the personal interviews, Participants were informed of the scope of the purpose and need inquiry, additional information was collected, and data sources were reconciled. In addition to information collected from Participants, the study team gathered published studies and other data from local, state and Federal government sources related to growth, water use and conservation relevant to Northern Colorado.

With the data collection phase completed, the study team evaluated projections of growth, water demand and supply as provided by the Participants for acceptance, rejection or modification. The bulk of Participant growth projections were based on recent growth trends and percentage growth rate assumptions, informed by developer projections. The water demand projections were mostly based on water use per capita or per tap assumptions. The study team evaluation was based upon historical evidence, capacity for growth, developer plans, land use plans, local government policies and an overall understanding of growth in the region. Judgment and reasonableness based upon past experience were applied in determining whether to accept or reject Participant projections. In general, growth over the long-term was typically adjusted downward to recognize that the rapid increases in population experienced during the past 15 years would not be likely to continue indefinitely.

Besides growth projections, the study team scrutinized historical water use patterns, beginning with sales to end users, separately examining individual agricultural or industrial, water intensive customers. Potable and non-potable demands were considered separately. Water use projections included losses within the distribution system, at the treatment plant or through conveyance or storage. On the basis of the sum of all these evaluations, the study team either accepted the Participant's growth and water demand forecasts or independently developed demographic and water demand projections for that Participant.

The study team then prepared draft working papers describing historical information, current status, water demand projections and conservation initiatives, shown as appendices to this report, which were reviewed by each of the Participants for accuracy. Participants had the opportunity to disagree with assumptions, and further discussions with the study team ensued, leading to a mutual agreement among each of the Participants and the study team that the information and projections in the appendices in this report were as accurate as possible, given available data and the inherent uncertainty of forecasts, generally. Final versions of the Participant water demand evaluations are set forth in Appendices A through M. Specific water sources and firm yield estimates for each Participant are compiled in Appendix N.

Table I-1 lists Participants that were included in this study and the NSIP firm yield request of each.

Table I-1.
NISP Participants and New Permitted Firm Yield from NISP, December 2005

Participant	Permitted Yield Requested (AF)
Town of Berthoud	1,300
Central Weld County Water District (CWCWD), including Firestone, Frederick and Dacono	7,100
Town of Eaton	1,300
Town of Erie	6,500
City of Evans	1,600
Fort Collins – Loveland Water District (FCLWD)	3,000
City of Fort Lupton	3,000
City of Fort Morgan	3,600
City of Lafayette	1,800
Left Hand Water District (LHWD)	4,900
Morgan County Quality Water District (MCQWD)	1,300
Town of Severance	1,300
Town of Windsor	3,300

Source: Northern Colorado Water Conservancy District, 2006 Phase III Participation and Budget.

Report Organization

Following this introduction, this report proceeds with an overview of Participants' water demands. This overview describes historical demographic and water use changes and projections of future demographic conditions and water demands. Section Three provides an identification and evaluation of conservation practices and water use patterns expressed as gallons per capita per day. Participants' water conservation programs are identified in individual Participant water demand evaluations in Appendices A through M.

Section Four focuses on net future water needs by comparing firm annual yields in 2004 with projected water demands. Finally, the report concludes with an identification of each Participant's need for NISP.

Caveats

Standard data sets across all Participants were unavailable. The recordkeeping and data retrieval system for each of the Participants is unique to that Participant. Because of the location and nature of each customer base, water providers, even in close proximity to one another, record, report and utilize different measures as they conduct water resource planning. For example, rural water districts do not normally report population estimates on a consistent basis; rather, they keep track of their customer base by the number of taps, sometimes by type of tap or type of customer. Depending on the rate schedule, Participants may or may not keep track of water use by type of customer. Hence, historical recordkeeping practices are not the same from Participant to Participant, although individual practices may serve each Participant's water planning purposes well. To address this issue, the study team worked with the water use and supply records available for each water provider. From those data, the study team developed historical trends and water use patterns that maximized the completeness of foundational information for each Participant.

Just as the historical demand data were not standardized among Participants, existing projections of water demand also were not standardized. Methodologies for projecting future water demand differ substantially from Participant to Participant, and these methodologies are often determined by the historical foundation of information, by different consultants employed by each Participant, the size and technical capabilities available to a Participant, and the nature of the Participant's service area. Further, Participants adopt projections of demographic change from different sources and focus on different measures, such as population, housing units, number of taps or land uses. The study team adopted the view that no single forecasting methodology was necessarily more acceptable than others, and, similarly, data sources and information driving those projections might come from different sources but still be the most reliable data sources as they pertain to that Participant. For instance, one Participant might rely on its own population or housing unit projections that are up-to-date with specific developer information, as compared with the Colorado state demographer's projections that naturally lack this kind of local data. Under conditions of rapid change, local information is preferred.

An important caveat for this study and for all studies of this kind lies with the inherent uncertainty of forecasting in general, and of demographic forecasting in particular. Long-term projections always rely upon underlying assumptions, some of which are assumed to continue on into the future, and some of which are assumed to change. For example, this report assumes that migration will continue, as it has in the past, to be the predominant influence on population and housing unit growth in Northern Colorado, whereas natural population changes driven by birth rates and mortality rates will not be a major influence on these projections. Technology related to water use patterns is not assumed to change fundamentally over the long-term. Over the short-term, assumptions such as these are relatively safe, but over the long-term the error risk associated with such assumptions increases.

Other explicit forecasting assumptions such as growth rates, land-use policies and even service area boundaries for individual Participants will vary over the long-term as compared

with the more static assumptions embodied in the study team projections provided in this report. For these reasons, long-term projections such as the demographic and related water demand projections provided in this report can be counted upon to be inaccurate on either the low side or the high side as the year 2050 approaches.

One important source of uncertainty in these water demand forecasts is the rapidly escalating growth rates that have occurred among the Participants since 1990. Although there are strong indications that rapid growth will continue into the foreseeable future at some level, the volatile nature of growth itself significantly adds to the uncertainty of these forecasts.

Further, estimates of firm annual yield for Participant water supplies represent only those supplies that existed in 2005. Water supplies can be reduced by water quality concerns, species or habitat preservation issues, or water right conflicts with competing users. Over the long-term, uncertainty of supply, mostly its diminution, as well as demand creates an uncertainty in the evaluation of the need for NISP presented in this report.

This report recognizes these many dimensions of uncertainty. Key assumptions are carefully scrutinized, and assumptions based upon the best available information are adopted where possible. The study team assiduously attempted to bring no bias into the assumptions underlying the projections offered in this report, but the study team recognizes that there is an equal chance that the assumptions could be wrong in either direction. Since no probabilities could be assigned to a different set of assumptions, the study team relied upon only a single set of projections with the presumption of uncertainty described here. In order to explore a possible range of impacts of project alternatives, the study team prepared high and low scenarios in a separate technical memo.

In summary, the study team evaluated demographic and water demand projections provided by each Participant on the basis of that Participant's individual circumstances. Comparisons with independently derived county or other projections were performed when relevant. The study team drew a conclusion about the water demand forecasting methodology and data sources for each Participant. If clearly better data or a superior demand forecasting methodology was available, the study team identified and then carried out those independent water demand projections. For example, if new lands were annexed to a water provider and not included in the water demand projections, the study team made the necessary adjustments. If assumptions behind the demand projections could not be substantiated with historical information, the study team developed new forecasting assumptions so that the results would be more reliable. The study team attempted to use the most appropriate information available for each provider and to present, in this report, the most defensible water demand projections for the NISP EIS.

SECTION TWO
Overview of NISP Participant Demands

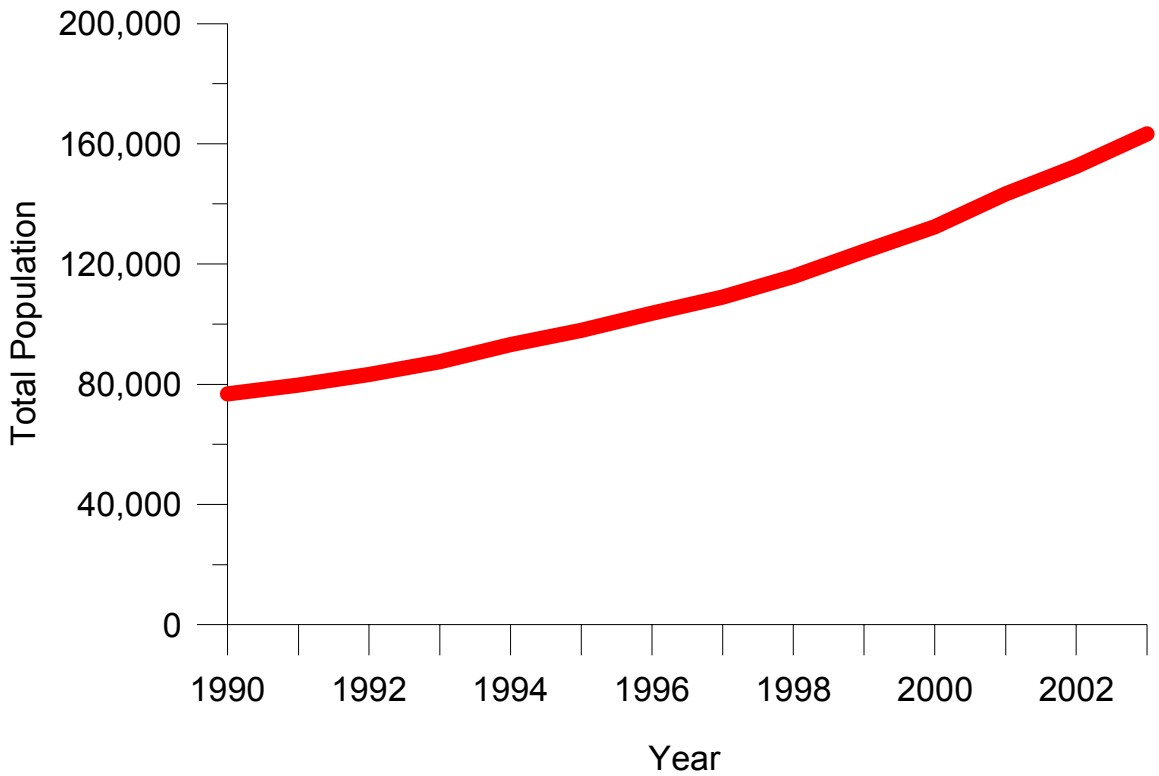
This report section provides the historical foundation for the demographic and water use changes experienced by Participants. Water demand projections combined for all Participants are also identified. Individual historical information and projections for each Participant can be found in Appendices A through M.

Historical Demographic Change

The study team attempted to gather historical population figures, numbers of water taps and housing units for the Participants. Whereas each Participant was able to provide the study team with one or more of these data sets, only population data were available for all 13 Participants.

Figure II-1 depicts historical population trends for all the Participants combined from 1990 through 2003.

Figure II-1.
Population Growth for NISP Participants in Total, 1990 through 2003

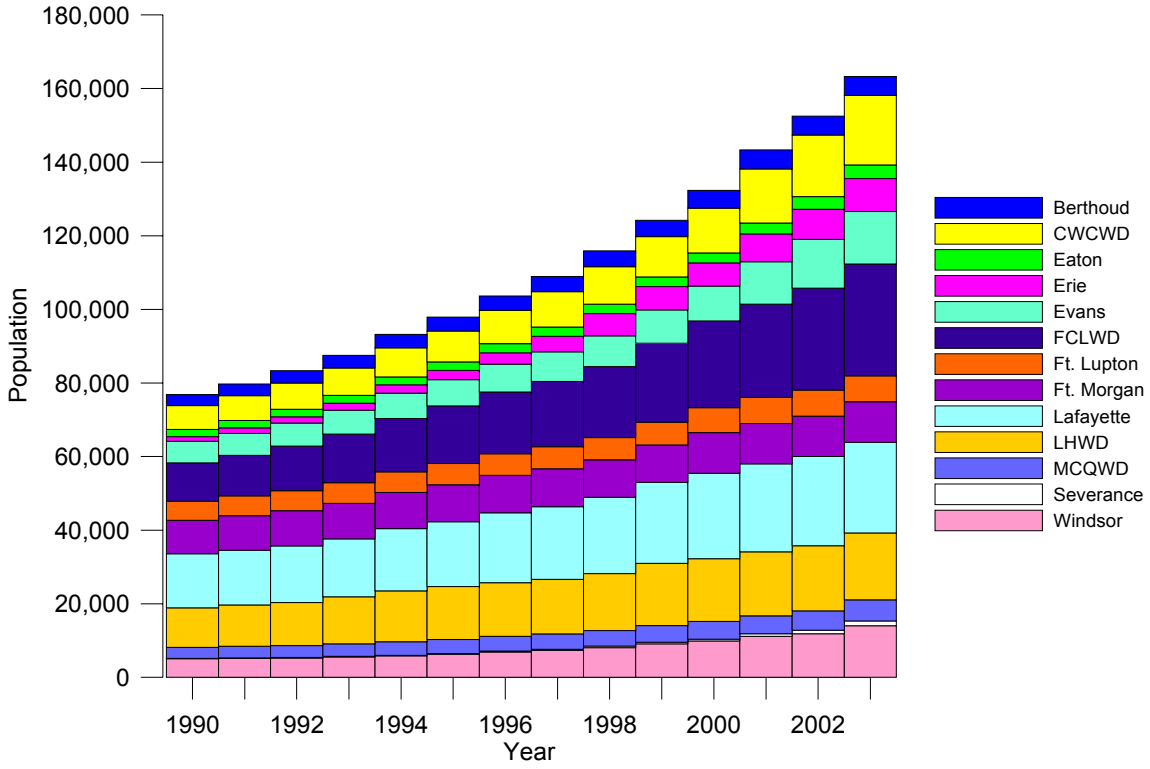


Note: The study team sought the total number of residents in the service area of each Participant from 1990 to 2003. Estimates for missing years were made on the basis of housing units or water taps for a small number of Participants.

Together, the 13 Participants served water to 77,000 persons in 1990, increasing to 163,000 persons by 2003. This expansion represents more than a doubling of the population during this period, or an average annual growth rate of 6 percent. This unusually rapid growth indicates the considerable in-migration that occurred in northern Colorado between 1990 and 2003, likely attributable to a substantial increase in job opportunities in the northern Front Range during this time.

Figure II-2 illustrates population growth by each Participant from 1990 through 2003.

Figure II-2.
Population Growth for Each NISP Participant, 1990 through 2003



Population growth is widespread among all the Participants. The Town of Erie and the Town of Severance grew faster than the other Participants; Severance increased almost tenfold in population to 1,300 people by the year 2003. The Town of Erie grew sevenfold from 1990 through 2003. The most heavily populated water suppliers in 2003 were the Fort Collins-Loveland Water District with 30,400 residents followed by the City of Lafayette with 24,600 residents. Together, these two water providers accounted for about one third of the total population of all the Participants in 2003.

Historical Water Use

The 13 Participants serve residential, commercial, industrial, public and other water uses in their service areas. These service areas include communities and the surrounding vicinity in some instances and primarily rural areas with small population centers in others. The study

team gathered data for total water use by customer type delivered at the tap, where possible. In many instances, a full breakdown of water use by type of user was not available; however, the study team did distinguish each water provider's large industrial or other single large water users. Historical water uses by customer type, where available, are described for each Participant in Appendices A through M.

Potable water deliveries to end users are segregated from non-potable water deliveries since eight out of the 13 water providers deliver non-potable supplies for irrigation of golf courses, parks, schools and large residential or commercial developments. Whereas these eight water providers are responsible for the non-potable supplies, the Town of Windsor has a dual water system for some land development for which it has no supply obligation.

Table II-1 shows potable and non-potable water deliveries by Participant for 2003.

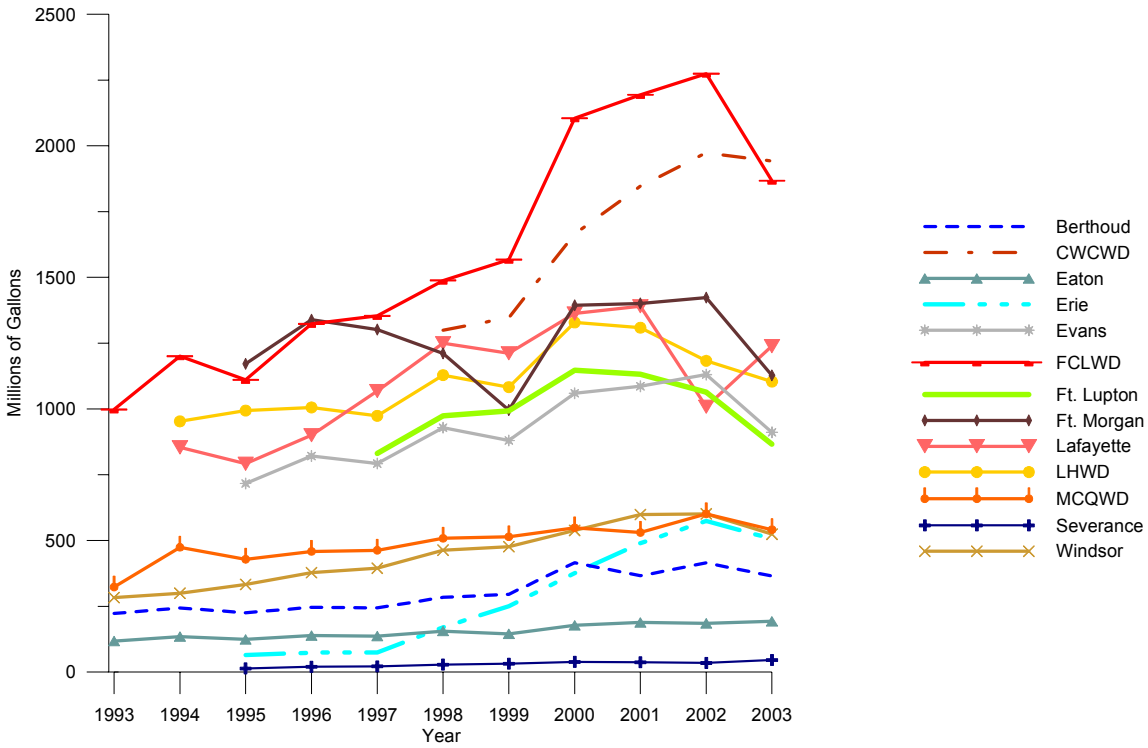
Table II-1.
Potable and Non-Potable Water Deliveries by NISP Participants, Millions of Gallons, 2003

NISP Participant	Potable Deliveries	Non-Potable Deliveries	Total Deliveries
Berthoud	365	0	365
CWCWD	1,942	0	1,942
Eaton	188	5	193
Erie	480	26	506
Evans	512	399	911
FCLWD	1,867	0	1,867
Ft. Lupton	282	585	866
Ft. Morgan	853	274	1,127
Lafayette	1,133	106	1,239
LHWD	1,104	0	1,104
MCQWD	541	0	541
Severance	42	5	46
Windsor	524	0	524
Total	**9,834**	**1,399**	**11,233**

Together, potable and non-potable water deliveries amount to total water deliveries to NISP end users; these total deliveries were a combined 11,200million gallons (MG) in the year 2003. This amount was down from a peak of 12,600MG in the year 2001; the decrease was attributable to drought and related restrictions. From 1998 to 2001, total water deliveries to Participant end users increased by about 27 percent.

Figure II-3 indicates total water deliveries to end users for each Participant between 1993 and 2003.

Figure II-3.
Total Water Deliveries to NISP Participants' End Users, 1993 through 2003, Millions of Gallons



Certain water suppliers do not have a complete data set for this time period, as indicated in the chart. Nevertheless, the trends, by and large, show increases in end user deliveries that accelerated through the year 2000 before flattening and then declining, as a result of drought and related restrictions. Water customers among the Participants were very responsive to drought related restrictions in recent years.

Demographic Projections

The 13 Participants utilize a host of different demographic projections to develop their water demand projections. Eight Participants prepared population projections, whereas 11 Participants utilize water tap or housing unit projections. Three Participants employ land use or other sector by sector demand projection techniques. Some Participants utilize more than one method in developing projections. The study team evaluated these projections and their application techniques and modified, updated or replaced them where necessary. Details of demographic and other variable projections are provided for each Participant in Appendices A through M.

Water Demand Projections

Many Participants provided the study team with their own existing water demand projections. The study team either utilized the Participant's water demand forecasts or independently projected potable water deliveries and non-potable water deliveries and summed both to

arrive at total water delivery estimates for each Participant. Most existing water delivery projections were derived from demographic projections applied to a water use factor such as gallons per capita per day (gpcd) or gallons per tap per day (gptd). The study team scrutinized each potable water demand forecasting technique and either accepted it, if appropriate, or applied a different technique relevant to that water supplier and used existing projections as a check on those new water demand projections.

Total water deliveries, the sum of potable and non-potable deliveries, are projected to increase by almost threefold from the peak year of 2001, when total deliveries reached 12,600 MG. By 2050, total water deliveries for all Participants are projected to reach 36,200 MG. Increases are expected from all Participants. Potable water deliveries for all Participants are projected to increase from 9,800 MG in 2003 to 31,600 MG in 2050. Non-potable deliveries were projected for eight Participants who intend to rely on non-potable resources in the future. Non-potable deliveries are expected to increase from a peak of 1,500 MG in 2001 to 4,600 MG in 2050. Table II-2 provides the potable, non-potable and total delivery projections for the Participants through 2050.

Table II-2.
Projected 2025 and 2050 NISP Participant Deliveries of Potable and Non-Potable Water, Millions of Gallons

NISP	2025 Deliveries			2050 Deliveries		
Participant	Potable	Non-Potable	Total	Potable	Non-Potable	Total
Berthoud	850	0	850	1,857	0	1,857
CWCWD	4,603	1,150	5,753	6,689	1,490	8,179
Eaton	330	100	430	500	210	710
Erie	2,400	100	2,500	2,400	100	2,500
Evans	1,600	890	2,490	2,300	1,200	3,500
FCLWD	4,700	0	4,700	4,700	0	4,700
Ft. Lupton	620	850	1,470	1,140	850	1,990
Ft. Morgan	1,900	350	2,250	2,400	490	2,890
Lafayette	2,400	210	2,610	2,400	220	2,620
LHWD	2,100	0	2,100	2,700	0	2,700
MCQWD	920	0	920	1,200	0	1,200
Severance	400	23	423	900	23	923
Windsor	1,300	0	1,300	2,400	0	2,400
Total	**24,100**	**3,700**	**27,800**	**31,600**	**4,600**	**36,200**

Total water requirements are equal to total water deliveries plus an accounting for losses. Whereas total deliveries are expressed in millions of gallons consistent with Participants' end use sales records, total requirements are expressed in acre-feet, reflective of raw water resource planning units.

Losses are calculated for each Participant from the end user, or point of delivery, to the treatment plant or master meter, and then back to the point of diversion. The study team obtained these distribution, treatment plant and conveyance loss figures during interviews with each Participant, based upon their own estimates or calculations. Distribution system losses typically range from 5 to 10 percent for the Participants, whereas treatment plant and

conveyance losses range from an additional 10 to 15 percent. Assumptions about future losses are based on existing estimated losses and indications from Participants about future losses. Total water requirements projections assume the following combined distribution, treatment plant and conveyance losses set forth in Table II-3.

Table II-3.
Estimated Future Water Losses for NISP Participants

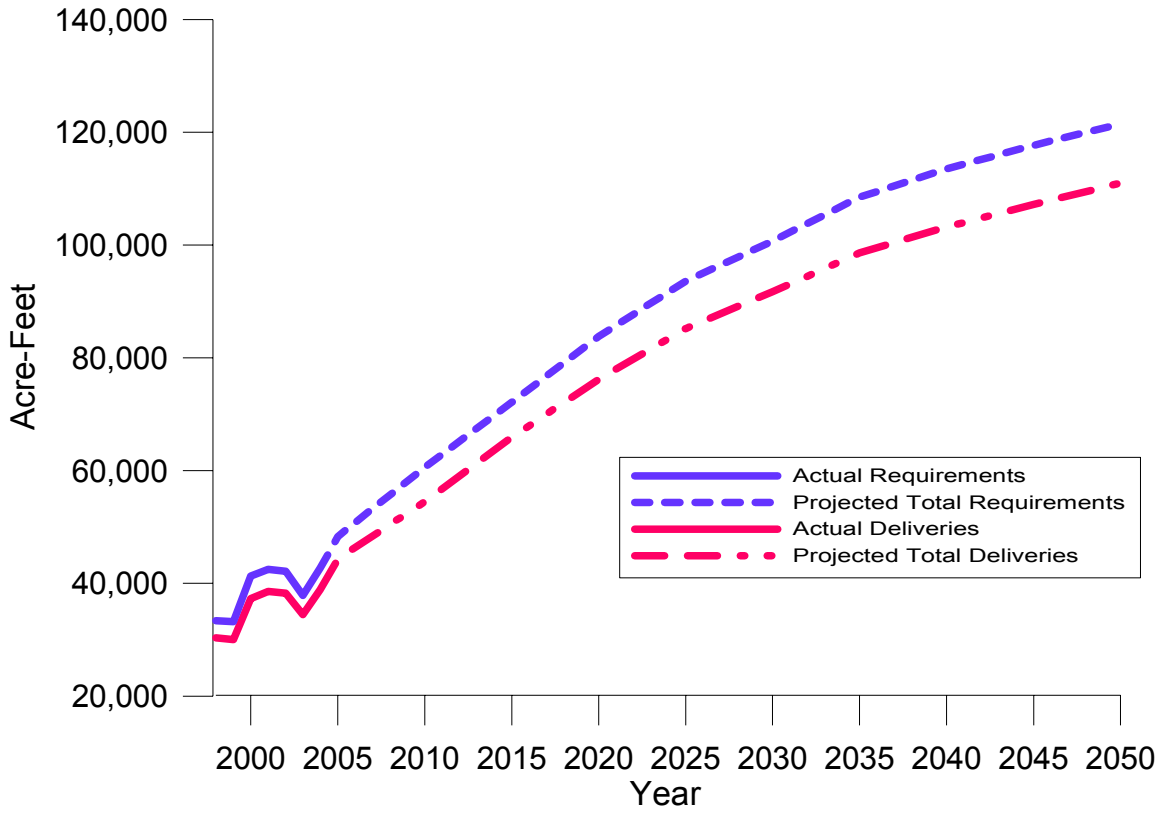
Participant	Total Losses as a Percent of Total Water Requirements*
Berthoud	10%
CWCWD	5%
Eaton	10%
Erie	13%
Evans	8%
Firestone	0%
FCLWD	10%
Ft. Lupton	10%
Ft. Morgan	7%
Frederick	5%
Lafayette	8%
LHWD	16%
MCQWD	5%
Severance	5%
Windsor	5%

* Not including loss charges from wholesale water providers.

A number of Participants acquire their water in a treated form from other water providers who charge 10 to 30 percent water surcharges as a water resource fee.

Figure II-4 provides historical and projected total water requirements and total water deliveries for all Participants from 1998 through 2050. Complete data sets were not available for all Participants prior to 1998.

Figure II-4.
Historical and Projected Water Deliveries and Total Water Requirements for NISP Participants, 1998 through 2050, Acre-Feet

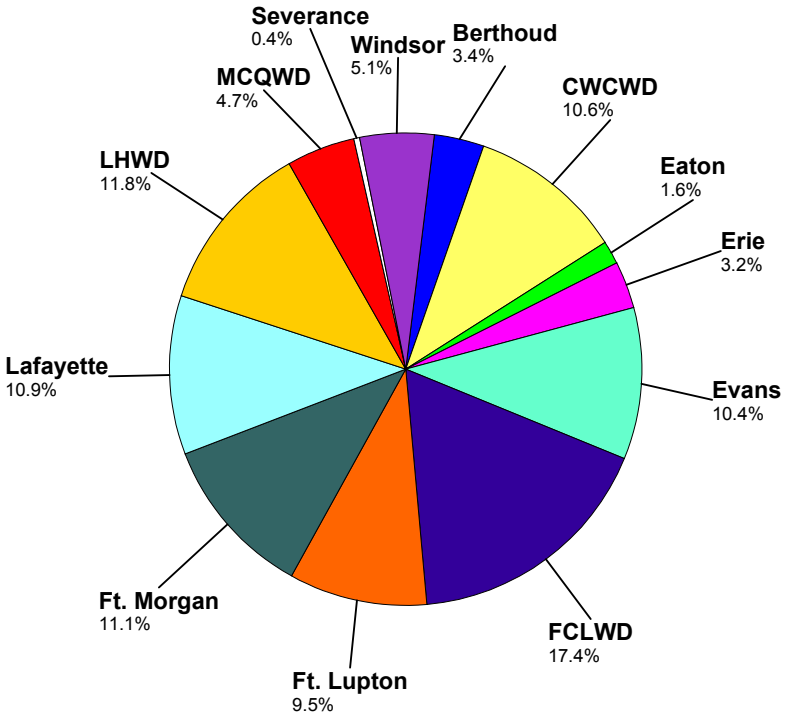


Total water requirements, which include all forms of losses and wholesale water resource fees, are projected to increase from 42,500, acre-feet (AF) in 2001 to 121,500 AF by the year 2050. This nearly threefold increase would indicate that the Participants together will experience an increase in total water requirements of more than 79,000 AF by 2050.

Figure II-5 presents two pie charts, one of total water requirements by Participant in the year 2000, and the other of total water requirements by Participant in 2050.

Figure II-5.
Proportionate Total Water Requirements among NISP Participants, 2000 and 2050

Year 2000

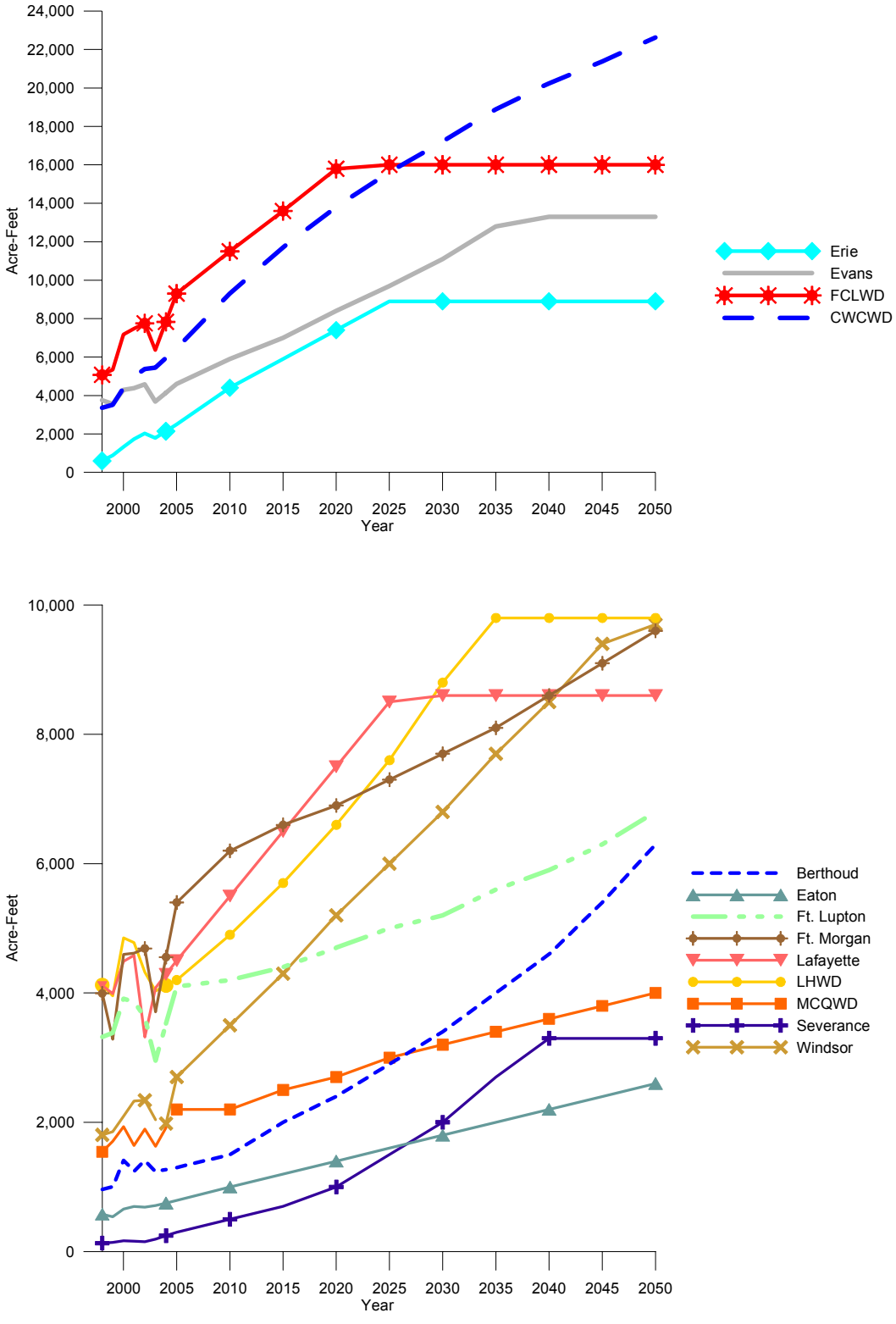


Year 2050

FCLWD, LHWD, Ft. Morgan, Lafayette, and CWCWD had the largest water demands in 2000. CWCWD, FCLWD, Evans LHWD and Windsor will be the largest water providers in 2050.

Figure II-6 graphs projected total water requirements by Participant through the year 2050. To assist the reader, the first graph includes Erie, Evans, FCLWD and CWCWD. The remaining water users are shown in the second graph.

Figure II-6.
Total Water Requirements by NISP Participant, 1998 to 2050, Acre-Feet



This figure illustrates that a number of water providers will reach buildout during the forecasting horizon, beginning in 2025 to 2030. The most rapidly increasing water demands will occur in Severance, LHWD, Windsor, Erie, Eaton and Evans.

In sum, these water demand projections point to very substantial increases within the next 50 years for the Participants. The study team water demand projections imply an average annual growth rate of 2.0 percent from 2005 through 2050, which compares with an average annual growth rate of 5.4 percent from 1998 through 2005, measured on the same basis. These projections do indicate that future total water requirements will continue to increase but at a decreasing rate over time. While extraordinary, the study team believes that these water demand projections represent the most reliable, justifiable projections available for these Participants.

SECTION THREE
Summary of NISP Participant Conservation Efforts

This section provides an evaluation of ongoing water conservation efforts among the Participants and their customers. The extent of current conservation helps determine the potential for additional water conservation savings that might be available to Participants in considering their need to participate in NISP.

It is important to distinguish ongoing water conservation programs from drought related measures. Water conservation measures are those programs that are consistently applied every year to reduce water demands or to increase supplies. These measures are distinguished from drought restrictions that are special, more severe measures that are implemented temporarily to avoid a true water shortage. Drought restrictions are normally reserved by water resource managers for unusually adverse hydrologic conditions or for unexpected circumstances that threaten the ability of the water provider to meet its customers' requirements.

This section provides a brief summary description of the conservation programs currently in place among the NISP Participants, followed by an evaluation of water use patterns. These water use patterns, measured in potable gallons per capita per day, provide an indication of the effectiveness of the conservation efforts currently being practiced among the customers of the Participants.

Conservation Program Overview

The study team gathered information about the different conservation programs practiced by each Participant during personal interviews and in reviews of past studies for each Participant. The water conservation programs for each Participant are described in detail in Appendices A through M.

It is important to recognize that each Participant applies a unique mix of conservation measures suitable to the particular conditions in its community and to the operation of their water system. A brief overview of Participant conservation measures is provided below.

- *Berthoud* – The Town of Berthoud conservation program focuses on water rates and public information. Berthoud has an increasing block rate structure with a surcharge for water use above an established monthly allotment. Berthoud sends water conservation reminders out in water bills and advertises in the local newspaper about the need to conserve water. The Berthoud Water Department contacts customers when their water usage spikes. The town has a prohibition against outdoor watering from 10 am through 6 pm in the summer.

- *Central Weld County Water District (CWCWD)* – CWCWD implemented its water conservation plan in 2003, emphasizing among other elements a diverse public education effort. CWCWD encourages its dairies and other agricultural businesses to use non-treated water when possible. CWCWD utilizes an especially aggressive and advanced computer leak detection system, which monitors inflows and outflows every 2.5 minutes, facilitating rapid system repair. Its conservation plans call for a future review of its rate structure, including an incentive/reward mechanism and potential surcharges for excessive use.

- *Town of Eaton* – Eaton also has an increasing block rate structure and a public information program, including website information for its customers. Eaton requires new developments to construct a dual use irrigation system which will cut down substantially on summer water use, as reflected in the demand projections in this report.

- *Town of Erie* – Erie also has a diverse public education program that includes a six-part series on the local television station related to water conservation. Erie's conservation program emphasizes low water use landscaping for open space and parks, which Erie believes may eventually save as much as 1,100 acre-feet per year. Other components of the Erie conservation plan include leak detection on a continuous basis, an irrigation audit program and an increasing block rate structure. Reusable effluent is used for golf course and landscape irrigation.

- *City of Evans* – The City of Evans conservation program emphasizes ongoing, outdoor watering restrictions. In addition, Evans recently implemented an increasing block rate structure, billed monthly instead of quarterly. Evans promotes non-potable water use for residential irrigation and has an active leak detection program. In the future, Evans intends to upgrade its public education effort regarding water conservation through a host of mechanisms. Non-potable water sources are used for irrigation of rural property, city parks, schools, open space and residential landscaping.

- *Fort Collins – Loveland Water District (FCLWD)* – FCLWD has an increasing block rate structure and a surcharge, which it applies to users who exceed the established monthly allocation. The district's public information program includes a website with conservation measures and offers to support customers in their various conservation efforts. FCLWD also has a leak detection program.

- *City of Fort Lupton* – As part of its 2003 Drought Response Plan, the City of Fort Lupton set a long-term conservation goal of 15 percent reduction in water usage. To achieve this goal, Fort Lupton is committed to a diverse public education program, which includes monthly monitoring of water savings and a public display of the results. Fort Lupton applies specific water conservation measures to golf courses, restaurants and car washing, along with outdoor watering restrictions, all enforced by police and code enforcement employees. In June 2004, Fort Lupton instituted a large rate increase, including a surcharge for water use above a set supply allotment, by user.

- *City of Fort Morgan* – Fort Morgan recently completed its universal water metering program and offers a proactive and diverse public education program, including pamphlets, newspaper advertisements, an irrigation efficiency program and a published annual report concerning the effectiveness of conservation measures. Fort Morgan assists with water audits for the top 30 or 40 users in its city and has an ordinance banning waste.

- *City of Lafayette* – Lafayette's conservation program emphasizes an increasing block rate structure and substantial present and future rate increases. Lafayette's conservation program also focuses on reducing system losses through an extensive refurbishment program that has yielded a 15 percent reduction in system losses. Lafayette has a diverse public education program that includes access to free material, newsletters, Xeriscape seminars and irrigation audits. In the future, the City is considering adding a fifth tier to its rate structure and permanently banning outside watering during portions of the day. Effluent exchanges allow for reuse of part of their water supply, and the City is considering implementation of a reclaimed water system for irrigation or exchanges.

- *Lefthand Water District (LHWD)* – LHWD has an aggressive leak detection and repair program that has resulted in a 50 percent reduction of water distribution losses. The District emphasizes modification to low water use landscaping through demonstrations, classes and requirements for new development through Boulder County. LHWD has an increasing block rate structure. The District reviews high and low water consumption patterns among its customers and replaces meters regularly.

- *Morgan County Quality Water District (MCQWD)* – MCQWD has an increasing block rate structure that it considers effective with its agriculturally oriented customers facing low financial margins.

- *Town of Severance* – Severance has an increasing block rate structure and a public education program to promote conservation. The Town maintains permanent watering restrictions regarding days of the week and times of the day that customers can irrigate.

- *Town of Windsor* – Windsor has an increasing block rate structure and a surcharge for excessive water use. The Town has plumbing codes requiring low-flow water appliances, and new developments are required to develop dual water systems, where possible, using ditch water. New developments face landscaping restrictions, and all customers face lawn watering restrictions between 10 am and 6 pm during the summer. The Town also has a leak detection system, car washing guidelines and a diversified public information system promoting conservation.

All 13 Participants have active conservation programs in place. Almost all of the Participants have an educational component to their water conservation programs, which ranges from stuffing bills with water conservation reminders to websites, newspaper and television ads,

and school programs. All of the Participants also practice universal metering to keep track of water use patterns and to charge customers for the water they consume. The water price signal to customers is accentuated by the increasing block rate structure that is in place for almost all of the Participants. In addition, five of the 13 Participants have an excess water use surcharge. The Participants exhibit considerable emphasis on a strong price signal to customers to conserve water. Leak detection and the repair or replacement of inefficient water mains, pipes and meters are also commonly used by many Participants.

In terms of outdoor water use, a number of Participants have landscape ordinances and permanent outdoor watering restrictions in place. Water audits and the promotion of water efficient appliances are also practiced by a number of Participants. Certain Participants have non-potable irrigation systems or a water re-use system in which wastewater is used for irrigation. In sum, the Participants' ongoing water conservation programs are typical among water providers, with, perhaps, a stronger emphasis on price signals to promote efficient use.

Historical Water Use Patterns

For this study, water use patterns refer to the magnitude of gallons per capita per day (gpcd) of potable water use among end users. The study team assessed the overall Participants' water use patterns and the water use patterns of each Participant individually based on a comparison of individual gpcd figures.

Table III-1 compares the average gpcd for all Participants' customers to the average potable gpcd for Denver Water's customers.[1]

Table III-1.
A Comparison of Gallons per Capita per Day of Combined NISP Participants with Denver Water

Year	NISP		Denver Water
	Simple Average	Weighted Average	
1998	185	191	213
1999	174	177	204
2000	201	207	220
2001	187	199	211
2002	174	184	192
2003	144	153	166
Average, 1998 to 2003	177	185	201

This table shows a simple average of gpcd for all 13 Participants from 1998 through 2003, and then an average gpcd weighted by the population of each Participant. Such a weighting reduces the influence of very small water providers, such as the Town of Severance or the Town of Eaton, in the calculations. Regardless of methodology used, the annual combined figures for the Participants indicate a gpcd that fluctuates up and down largely with weather and water use restrictions during the 1998 to 2003 timeframe. For that same period, the

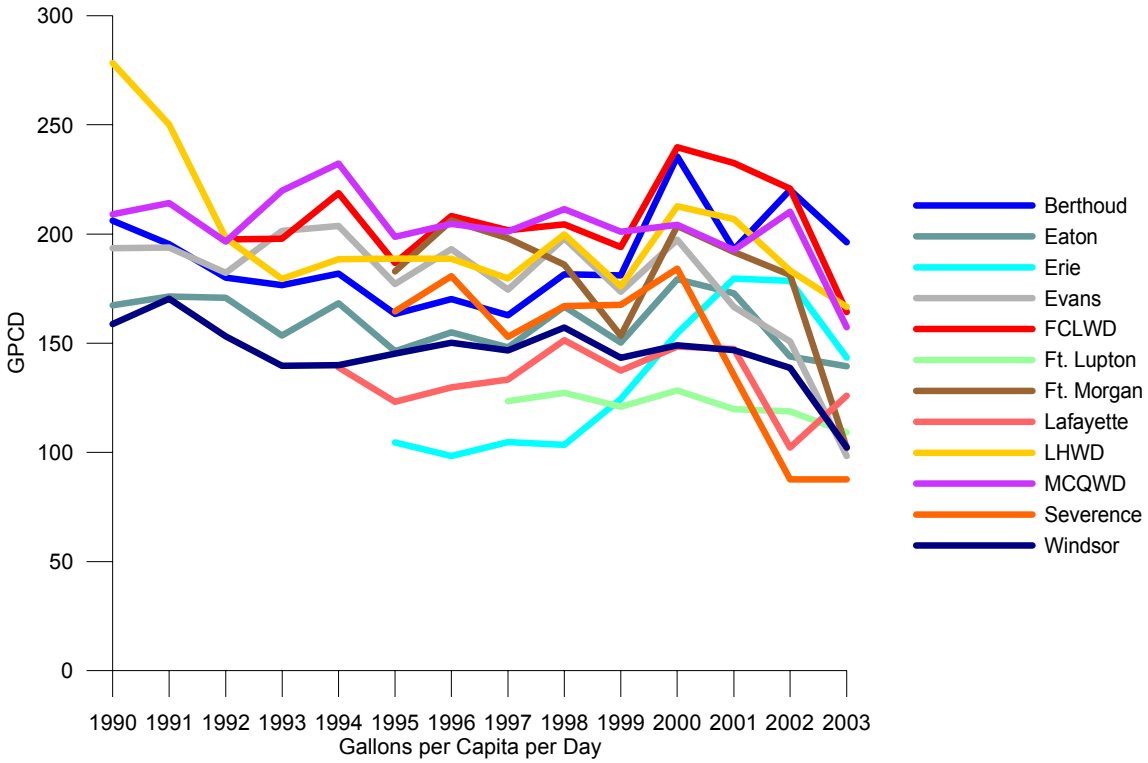
[1] Denver Water, data files obtained from John Loughry, November 2004.

simple average for all 13 Participants was 177 gpcd, and the weighted average gpcd was 185. By comparison, Denver Water's average gpcd during this same period was 201.

Participants' water use patterns related to the water use patterns of a major regional water provider in Colorado offers something of a benchmark comparison, although the characteristics of water consumers in the Denver metropolitan area are different in many respects from those among the Participants, as discussed later in this section. Denver Water's potable gpcd is fairly close but typically somewhat higher than the weighted average Participants' gpcd. It should be recognized that these presumptions of comparability are uncertain at best, and so only general insights can be drawn from this type of comparison.

Figure III-1 illustrates the water use patterns for individual Participants from 1998 through 2003. CWCWD is not included in this figure but is discussed following Table III-2.

Figure III-1.
Water Use Patterns for NISP Participants, Gallons per Capita per Day, 1990 through 2003



From 1990 to 2003, most of the Participants experienced potable gpcd that fluctuated between a fairly narrow range, depending upon weather, and almost all experienced a substantial decline in 2003 due to drought restrictions. It is also evident from the figure that each Participant's water use patterns are unique from the others, even in the same region. The mix of customer types distinguishes the water use patterns of the Participants: the presence of large water users such as dairies or industry; new large lot homes versus older in-town lots; and the presence of commercial activity can all help determine the water use patterns of a

single Participant and why they are different from another Participant. A complete data set of water use and population information was not available from all Participants for the period of 1990 through 2003.

Table III-2 provides annual total potable gpcd for each Participant from 1998 through 2003, along with averages during this period.

Table III-2.
Total Potable Gallons per Capita per Day Use for Each NISP Participant, 1998 through 2003

Year	1998	1999	2000	2001	2002	2003	Average 1998-2003
Berthoud	182	181	235	193	220	196	201
CWCWD	351	338	374	345	324	281	335
Eaton	167	150	179	173	144	139	159
Erie	104	125	155	180	179	143	147
Evans	198	174	197	167	151	98	164
FCLWD	204	194	240	233	221	164	209
Ft. Lupton	127	121	128	120	119	109	121
Ft. Morgan	186	153	204	192	181	102	170
Lafayette	151	137	148	147	102	126	135
Lefthand WD	200	176	213	207	183	167	191
MCQWD	211	201	204	193	210	157	196
Severance	167	168	184	135	88	88	138
Windsor	157	143	149	147	139	102	140
Total NISP Average	185	174	201	187	174	144	177

The water providers with lower gpcd, including Fort Lupton, Erie and Lafayette are largely bedroom communities with a higher number of persons per tap than other water providers, which tends to lower potable gpcd. The water provider with the highest gpcd was CWCWD. CWCWD provides water to various agricultural and dairy users, such as Aurora Dairy. Since the CWCWD historical data could not distinguish dairies and other large agricultural water users within their commercial consumption data records, CWCWD was excluded from Figure III-1 above. Residential use per capita per day for CWCWD, on the other hand, was less than 172 gpcd from 1999 through 2003, which is comparable with other Participants.

As a further evaluation of the water use patterns of each Participant, Table III-3 indicates each Participant's gpcd when compared with Denver Water's gpcd as a percentage of Denver Water's gpcd in the years from 1998 through 2003.

Table III-3.
NISP Participant Gallons per Capita per Day as a Percentage of Denver Water's Gallons per Capita per Day

Year	1998	1999	2000	2001	2002	2003
Berthoud	85.3%	88.8%	107.0%	91.4%	114.7%	118.2%
CWCWD	164.6%	165.5%	170.0%	163.5%	168.8%	169.1%
Eaton	78.3%	73.7%	81.5%	81.9%	75.0%	84.0%
Erie	48.6%	61.0%	70.3%	85.1%	93.0%	86.4%
Evans	93.0%	85.1%	89.8%	79.0%	78.6%	59.2%
FCLWD	96.0%	95.1%	109.0%	110.2%	115.0%	99.0%
Ft. Lupton	59.7%	59.3%	58.3%	56.8%	61.9%	65.7%
Ft. Morgan	87.3%	75.2%	92.6%	90.9%	94.4%	61.4%
Lafayette	71.1%	67.4%	67.5%	69.8%	53.2%	75.9%
Lefthand WD	93.8%	86.3%	96.7%	98.0%	95.4%	100.3%
MCQWD	99.3%	98.5%	92.8%	91.3%	109.5%	94.8%
Severance	78.4%	82.2%	83.7%	64.1%	45.6%	52.8%
Windsor	73.8%	70.3%	67.7%	69.6%	72.3%	61.6%

Participants have rarely exceeded Denver Water's potable gpcd since 1998. Only one district, CWCWD experienced water use patterns substantially greater than Denver Water's water use patterns as measured by gpcd.

Evaluation of Water Use Patterns

The evaluation of Participant water use patterns is intended to answer this question: Are Participants' levels of water use and associated water conservation efforts reasonable, or should additional conservation efforts be assumed when considering need for NISP? This evaluation begins with an historical look at water use patterns in Northern Colorado to identify what progress has been made in the area of water conservation. Next, this evaluation focuses on establishing a benchmark for reasonable conservation water usage for comparison with the Participants current water use patterns. This evaluation then focuses on Participants whose water use patterns exceed the benchmark.

Historical water use patterns in Northern Colorado. Two sources of information offer a comparison of historical water use with current water use patterns in Northern Colorado: the original Windy Gap EIS, which was prepared in the late 1970s and early 1980s, and the Northern District's *Regional Water Supply Study,* prepared in 1991.

The Windy Gap EIS focused on water use patterns of the original participants of that project: Boulder, Estes Park, Greeley, Longmont, Loveland and the Platte River Power Authority. Although none of these water providers are Participants in NISP, geographically they are representative of the Participants. In Table 1-1 of that EIS, the average water use of the Windy Gap participants, excluding Platter River Power Authority, amounted to 250 gpcd, which compares with an average gpcd for the Participants in NISP from 1998 through 2003 of 177.

The Northern District's 1991 *Regional Water Supply Study* included estimates of water use patterns for water providers in Northern Colorado and projections of future water use for municipal and industrial water providers from the Northern Denver Metropolitan area through Boulder, Larimer and Weld Counties, including many of the Participants. The water use patterns of the Participants expressed in gpcd, according to the 1991 Regional Study, are presented in Table III-4:

Table III-4.
1988 Water Use Pattern for Selected NISP Participants

NISP Participant	1988 GPCD
Berthoud	209
CWCWD	395
Eaton	183
Erie	389
Evans	216
FCLWD	199
Ft. Lupton	326
Ft. Morgan	280
LHWD	177
MCQWD	245
Windsor	140
Average	**251**

Source: Northern Colorado Water Conservancy District and Municipal Subdistrict, *Regional Water Supply Study*, 1991

The average gpcd for these Participants for 1998 through 2003 is almost one third less than the average which those Participants exhibited in 1988. This significant reduction in water use provides an indication that the conservation efforts already undertaken by Participants have been effective. It would also suggest that additional savings will be more difficult and costly to achieve.

Normally, water providers and their customers are motivated to take the first steps in a conservation program which achieve the largest savings at the least incremental cost...The Participants have reduced use by implementing relatively inexpensive water saving measures such as public education, watering restrictions and low-flow fixture requirements and landscaping regulation for new construction. In the case of an individual family, this might mean turning off the water while brushing one's teeth, using a hose nozzle when washing the car and limiting outdoor watering. For that same family to achieve greater savings, it might be necessary for them to purchase more efficient appliances or re-landscape using native plants. These reductions would come at a significant cost to the family or to a utility offering rebates. Thus, once waste is reduced, other savings are likely to involve structural changes that are more costly. Subsequent conservation measures produce incrementally less savings at greater cost.

Water use benchmark for NISP Participants. A water use benchmark applicable to the Participants may be useful in a comparison to those Participants' existing water use

patterns to determine if additional water conservation is a reasonable expectation; however the establishment of such a benchmark is a challenge for a number of reasons.

(1) Numerous jurisdictions, including the States of Texas, California and Utah, have attempted to establish water conservation benchmarks, but each developed that benchmark in a unique manner suitable to its own purpose. No single, commonly accepted means for establishing such a benchmark is known to exist as of 2005.

(2) Many measures of water use exist, and the calculation of water use is performed differently by agencies and jurisdictions. For example, water use can be measured by gpcd, gallons per tap per day, gallons per household per day, residential water use per capita per day, and so on. Further, the point of measurement, i.e. public water supplies versus all water supplies, or population within the city limits versus service area population, is also not uniform.

(3) Benchmarks are best established by following comparability criteria as outlined by the EPA in its water conservation guidelines.[2]

In sum, establishing a benchmark for the purposes of this report requires judgment based upon comparable areas and an understanding of the site-specific circumstances of the Participants.

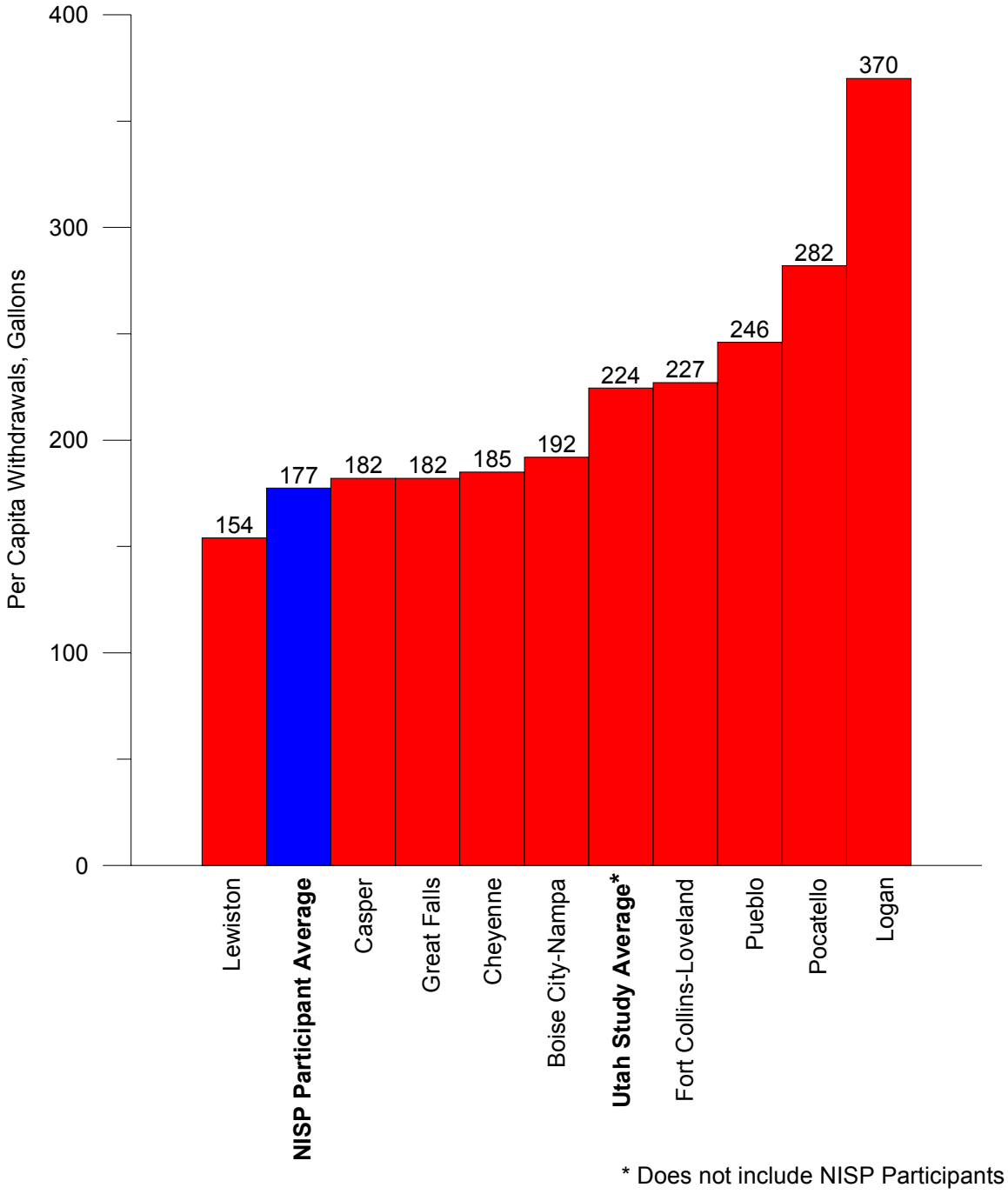
Regional average gpcd's provide a starting point for establishing a NISP water use benchmark. The Statewide Water Initiative (SWSI) found that Colorado statewide gpcd averaged between 206 and 332, with the South Platte Basin as the lowest average in the state at 206 gpcd.[3] The EPA reports an average water use of 242 gpcd for the entire upper Colorado River Basin.[4] This same EPA report assigns a 194 gpcd to the Platte River Basin. A Western Resource Advocates report indicates an average gpcd for 13 large western U.S. cities of about 229 in 2001.[5] Yet another benchmark can be extracted from U.S. Geological Survey water use data produced in the year 2000. This Federal agency gathers water supply, demand and population data for counties throughout the U.S. every five years. In the year 2000, average gpcd for Colorado's portion of the South Platte Basin amounted to about 200.[6]

One of the more useful sources of information for establishing a conservation water use benchmark comes from a study entitled, *Water Use and Residential Rate Structures in the Intermountain West*[7]. In that study, the authors provide water use information for 25 cities in the western U.S. of various sizes and locations. The average gpcd for these 25 cities was 243. However, this study also provides information about the size of each of the communities and their average precipitation and temperature. In isolating cities of less than 301,000 in population and cities with precipitation and average temperature within plus or minus 25 percent of the Fort Collins – Loveland area, a total of nine cities are identified including the

[2] Environmental Protection Agency, accessed at http://www.epa.gov/owm/water-efficiency/wave0319/inform3.htm.
[3] CDM, Statewide Water Supply Initiative, Executive Summary, Page ES-9.
[4] Environmental Protection Agency, accessed at EPA.gov/watrhome/use/cap1.html.
[5] Western Resource Advocate, Smart Water, Page 66, 2003.
[6] US Geological Survey, Water Supply and Use, year 2000, Colorado.
[7] *Water Use and Residential Rate Structures in the Intermountain West*, Utah Economic and Business Review. Volume 65, March/April 2005.

Fort Collins – Loveland area. The average gpcd for these communities was 224, as shown in Figure III-2 below.

Figure III-2.
Average GPCD for Selected Cities



As a final data point in considering the NISP benchmark, Denver Water exhibited an average potable gpcd usage of 201 gpcd between 1998 and 2003. Denver is considered to have a well developed water conservation program and is considered by many to be an example of strong conservation along Colorado's Front Range. Denver Water' comparability is somewhat limited in this instance, since it is a much larger metropolitan area with different financial resources than the Participants. Denver Water data also include parks and other outdoor irrigation requirements, whereas potable water use per day within the Participants includes only potable supplies, excluding a modest portion of non-potable use for irrigation. Based upon the foregoing data points, and using its professional judgment, the study team established the water use benchmark of 215 gpcd for Participants potable water use.

Comparison of Benchmark to NISP Participant Usage. The study team compared the benchmark of 215 gpcd to the average gpcd from 1998 to 2003 for each Participant. One Participant was found to be over that average, CWCWD. The study team examined the water use characteristics of CWCWD to attempt to understand why it exceeded the NISP water use benchmark.

As discussed earlier in this section, CWCWD provides water to various agricultural and dairy users, such as Aurora Dairy. The residential gpcd for CWCWD reflects water use patterns that typically average below 172 gpcd. CWCWD encourages dairy and other agricultural businesses to use non-treated water when possible.

Summary observations about conservation. All Participants have active conservation programs in place and each include a host of measures. Programs emphasizing price signals appear to be emphasized by Participants. From the limited years for which data were available, there does not appear to be a trend in water use patterns for Participants, exclusive of weather effects or drought restrictions. To the extent there is a NISP water use benchmark, water use patterns of the Participants are not considered excessive. The relatively higher water using Participants are rural water districts that serve large agribusinesses whose effects on water use patterns are magnified by a relatively small population base. This finding suggests that a reasonable level of efficient water use is being practiced by most Participants' customers.

SECTION FOUR
Additional Water Needs of the NISP Participants

Additional water needs of the Participants are determined by the difference between their projected future water demands and their firm annual water supplies or yields that were owned or controlled by the Participants in 2004. That is, as future water demands in a normalized weather condition year exceed firm annual yield, this excess amounts to future water resource needs for a Participant. Thus, unmet future needs refer to a Participant's inability to meet normal demands during water supply circumstances similar to a defined drought period. This approach is consistent with industry standards.

In anticipation of future demands exceeding firm yield, it would be prudent for a water provider to seek additional water supplies. In fact, a water provider can operate assuming average year supplies, which temporarily forestalls the need for additional water resources, but water customers would be faced with drought restrictions more frequently, and the uncertainty or risk of insufficient supplies would be elevated to a level that is not consistent with good water resource management. Therefore, this evaluation focuses on the difference between total future water requirements and present firm annual yields to assess the need for NISP. It is important to note that projected water requirements assume that future water supplies are available to meet demands. Tables IV-1 and IV-2 summarize total future water requirements and shortages beyond firm yields, respectively, by Participant from 2005 through 2050.

Table IV-1
Projected Water Requirements for NISP Participants in Acre Feet, 2005 to 2050

NISP Participant	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Berthoud	1,300	1,500	2,000	2,400	2,900	3,400	4,000	4,600	5,400	6,300
CWCWD	6,500	9,300	11,700	13,800	15,600	17,200	18,900	20,200	21,400	22,600
Eaton	790	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600
Erie	2,500	4,400	5,900	7,400	8,900	8,900	8,900	8,900	8,900	8,900
Evans	4,600	5,900	7,000	8,400	9,700	11,100	12,800	13,300	13,300	13,300
FCLWD	9,300	11,500	13,600	15,800	16,000	16,000	16,000	16,000	16,000	16,000
Ft. Lupton	4,100	4,200	4,400	4,700	5,000	5,200	5,600	5,900	6,300	6,800
Ft. Morgan	5,400	6,200	6,600	6,900	7,300	7,700	8,100	8,600	9,100	9,600
Lafayette	4,500	5,500	6,500	7,500	8,500	8,600	8,600	8,600	8,600	8,600
LHWD	4,200	4,900	5,700	6,600	7,600	8,800	9,800	9,800	9,800	9,800
MCQWD	2,200	2,200	2,500	2,700	3,000	3,200	3,400	3,600	3,800	4,000
Severance	300	500	700	1,000	1,500	2,000	2,700	3,300	3,300	3,300
Windsor	2,700	3,500	4,300	5,200	6,000	6,800	7,700	8,500	9,400	9,700
Total	**48,390**	**60,600**	**72,100**	**83,800**	**93,600**	**100,700**	**108,500**	**113,500**	**117,700**	**121,500**

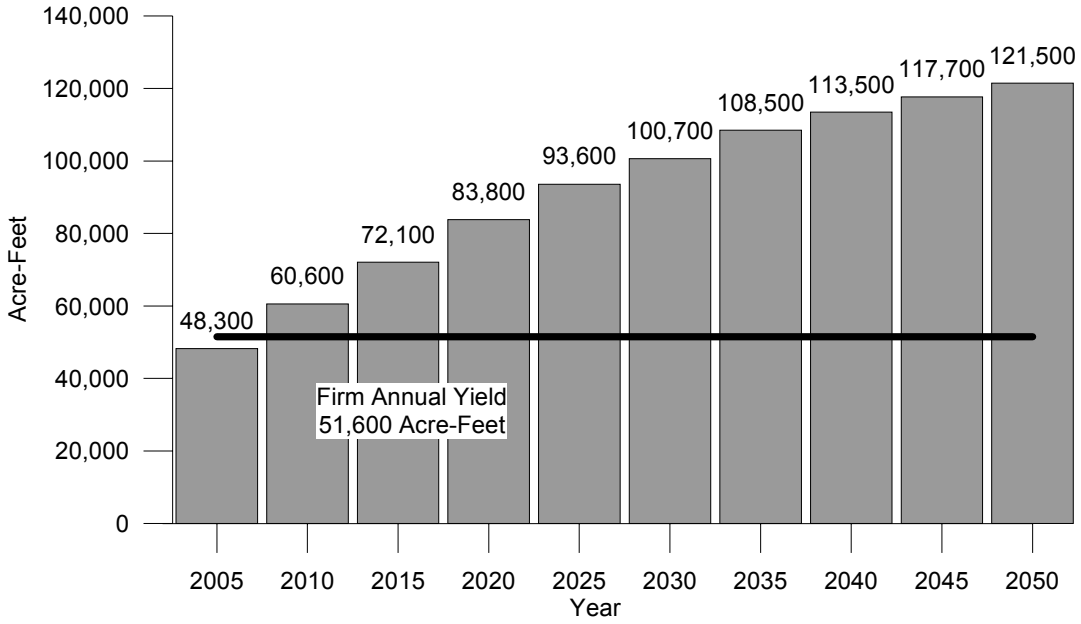
Table IV-2
Projected Water Shortages beyond Firm Annual Yields for NISP Participants in Acre Feet, 2005 to 2050

NISP Participant	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Berthoud	(920)	(720)	(220)	180	700	1,200	1,800	2,400	3,200	4,100
CWCWD	(2,000)	840	3,200	5,300	7,100	8,700	10,400	11,700	12,900	14,120
Eaton	(180)	30	230	430	630	830	1,000	1,200	1,400	1,600
Erie	360	2,300	3,800	5,300	6,800	6,800	6,800	6,800	6,800	6,800
Evans	(2,300)	(1,000)	100	1,500	2,800	4,200	5,900	6,400	6,400	6,400
FCLWD	1,100	3,300	5,400	7,600	7,800	7,800	7,800	7,800	7,800	7,800
Ft. Lupton	560	660	860	1,160	1,500	1,700	2,100	2,400	2,800	3,300
Ft. Morgan	900	1,700	2,100	2,400	2,800	3,200	3,600	4,100	4,600	5,100
Lafayette	(30)	1,000	2,000	3,000	4,000	4,100	4,100	4,100	4,100	4,100
LHWD	(510)	190	990	1,900	2,900	4,100	5,100	5,100	5,100	5,100
MCQWD	(310)	(310)	(10)	190	490	690	900	1,100	1,300	1,500
Severance	(120)	80	280	580	1,100	1,600	2,300	2,900	2,900	2,900
Windsor	210	1,000	1,800	2,700	3,500	4,300	5,200	6,000	6,900	7,200
Total	**(3,240)**	**9,070**	**20,530**	**32,240**	**42,120**	**49,220**	**57,000**	**62,000**	**66,200**	**70,020**

Combined Water Needs of the NISP Participants

The water needs of the Participants, viewed as a group, are considerable, as illustrated in Figure IV-1.

Figure IV-1.
Comparison of Future Water Requirements with 2004 Firm Annual Yields for 13 NISP Participants, Combined, in Acre-Feet, 2005 through 2050



Between 2005 and 2010, total future demands of all Participants combined will exceed their combined firm annual yield. By the year 2025, the excess of combined demands over current supplies will reach 42,000 AF. Table IV-3 estimates the projected margins of future demands compared with 2004 firm annual yield of a combined 51,600 AF.

Table IV-3.
Cumulative New Water Requirements beyond 2004 Firm Annual Yield, in Acre-Feet, 2005 through 2050

Note: Firm annual yield for 2004 was estimated to be 51,600 acre-feet for the 13 Participants combined.

Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(3,300)
2010	9,100
2015	20,500
2020	32,200
2025	42,100
2030	49,200
2035	57,000
2040	62,000
2045	66,200
2050	70,000

The Participants are seeking a permitted yield from NISP totaling 40,000 AF in new firm yield.[8] From a combined standpoint, the Participants will need the yield from NISP no later than 2010, and these Participants will need additional supplies from 2025 forward. Of course, individual Participants are most likely pursuing multiple strategies for water resource acquisition.

It should be noted that the Participants' future investment in NISP and other water supplies will very likely increase their overall costs per acre-foot of water supplies. If these costs were recovered through volumetric water rates, it is possible that water price elasticity effects would result in reduced consumption, thereby reducing water needs. However, municipalities and most water providers in Northern Colorado have policies that growth must pay its own way. It is quite likely that large portions of the incremental costs of NISP and other new water supplies will be collected in the form of tap fee increases, instead of in water rate increases. Since almost all water costs along the Front Range of Colorado are increasing, it is unlikely that growth or water use will be affected significantly by increases in the cost of water for the Participants.

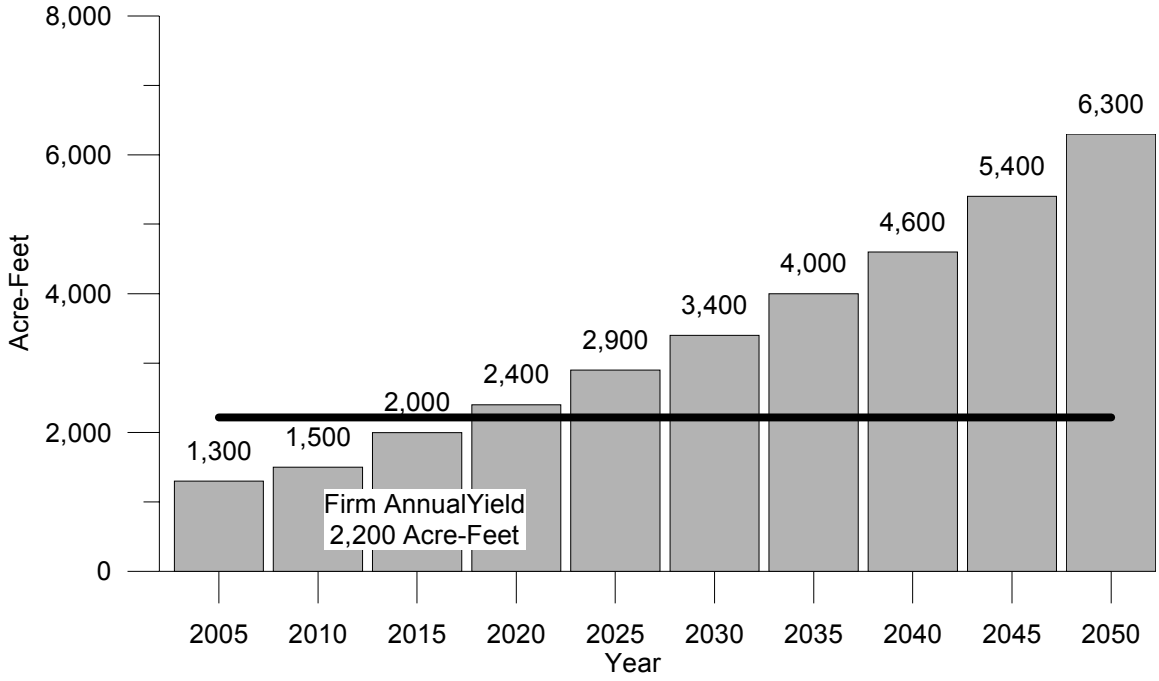
Future Water Needs of Individual NISP Participants

Figures IV-2 through IV-14 present the new water requirements for each Participant beyond their own firm annual yields in 2004. For each Participant, a bar chart comparing future water requirements with 2004 firm annual yield is followed by a table that quantifies the excess supplies or unmet demands for each Participant.

[8] Document obtained from Northern Colorado Water Conservancy District, December 2005.

Berthoud. The Town of Berthoud's firm annual yield in 2004 is estimated to be almost 2,200 AF, excluding Handy Ditch Company water, which is assumed to fully meet future non-potable water demands that are excluded from the demand projections. Compared with demand projections assuming average weather conditions, this firm annual yield will be adequate until the year 2015. The Town of Berthoud is seeking 1,300 AF of new permitted firm yield from NISP, which will carry them to a time between 2030 and 2035, when additional water supplies must be secured.

Figure IV-2.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Town of Berthoud, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(920)
2010	(720)
2015	(220)
2020	180
2025	700
2030	1,200
2035	1,800
2040	2,400
2045	3,200
2050	4,100

Central Weld County Water District (CWCWD). With 2004 firm annual yield of almost 8,465 AF, CWCWD is in rough balance with average year demands expected in the year 2005. Projected water demands under normal weather conditions will exceed 2004 firm annual yield by 840 AF by 2010 and about 14,100 AF by 2050. CWCWD is seeking 7,100 AF of new permitted firm yield from NISP.

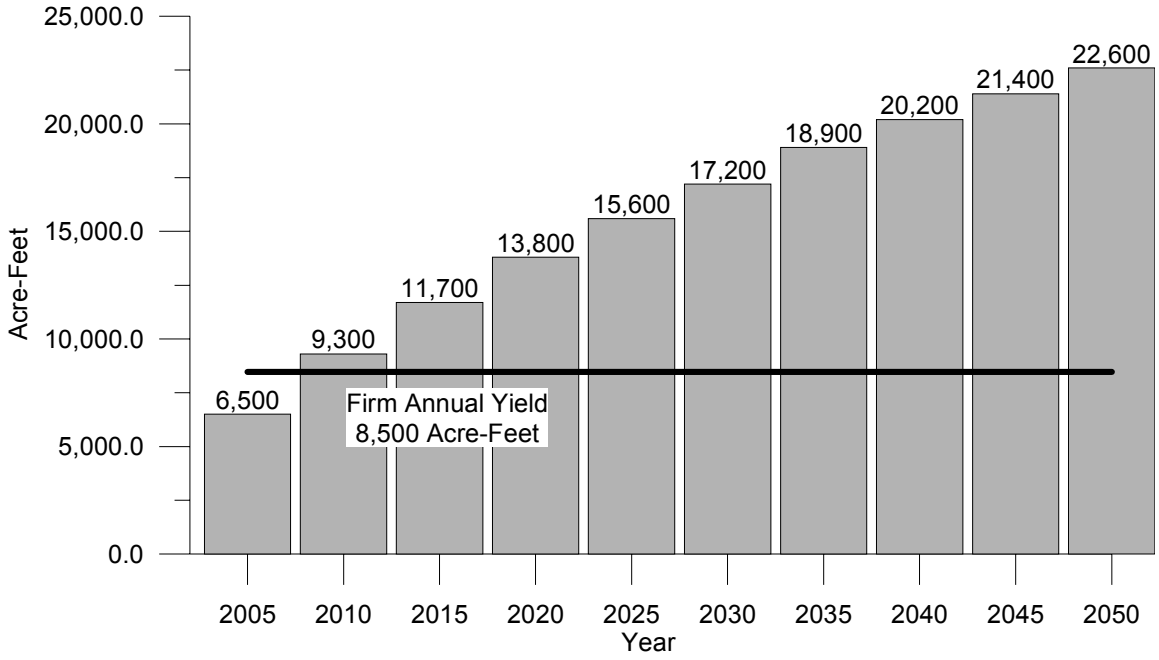
CWCWD serves nine small communities within its district that in the past have been required to obtain their own water supplies. In 2001, CWCWD treated and delivered 1,246 MG or 3,820 AF, of potable water to the communities of Dacono, Frederick, Firestone, Gilcrest, Kersey, LaSalle, Milliken, Platteville, and Aristocrat. These deliveries increased by 62 percent, or at an average annual rate of 8 percent, between 1995 and 2001. In 2004, these communities accounted for more than 56 percent of the total water consumed within the District.[9]

In the future, CWCWD will work with the Towns of Frederick, Firestone and Dacono to provide their future water supplies. Hence, this report includes projected water needs for these three communities as part of CWCWD's future water requirements.

Since CWCWD is not currently responsible for securing the raw water necessary to meet the current or future demands of the remaining six towns, water demand projections for them were not completed. Water demand projections contained in the District's 2003 *Water System Master Plan* suggest that deliveries to these communities are expected to increase substantially between 2005 and 2030. Consultation with the District suggested that, absent significant changes to current infrastructure, these communities have few supply options available to meet these demands.[10] While the District has yet to discuss its future role with these communities, it is likely that the District will play some part in helping these communities secure the raw water needed to support the projected growth. The District's participation in NISP is, in part, attributable to the future water needs of these communities.

[9] CWCWD document, "Consumption Comparison Report," Obtained August 2004.
[10] Conversation with John Zadel, CWCWD, December 2004.

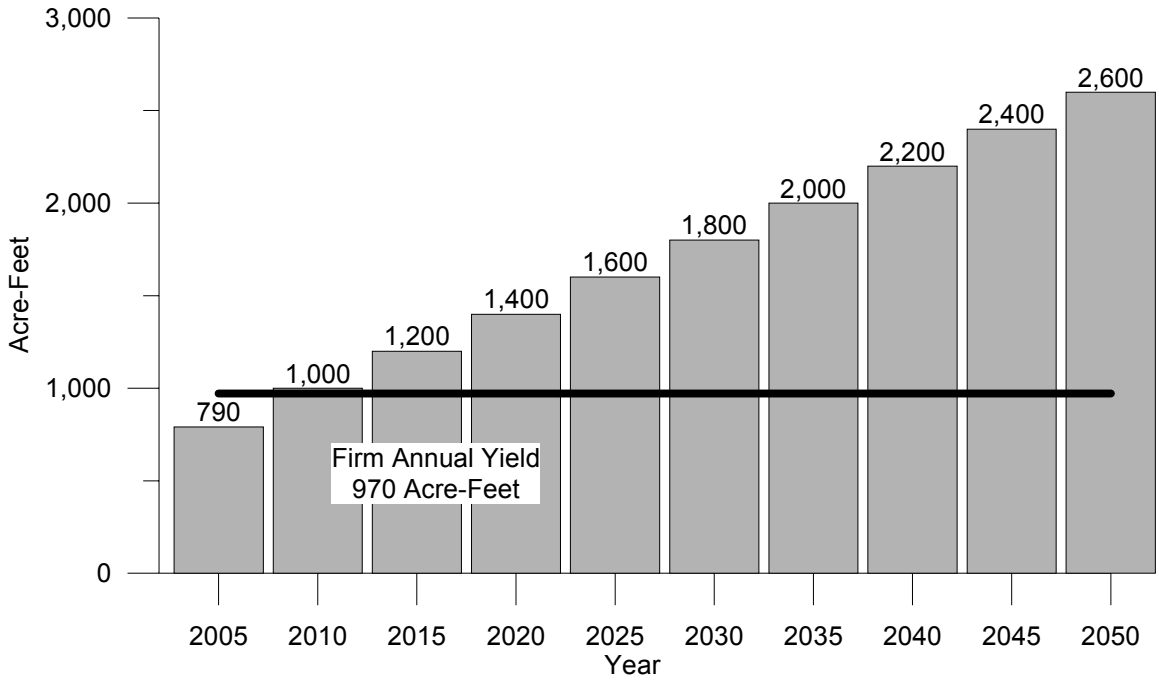
Figure IV-3.
Comparison of Future Water Demands with 2004 Firm Annual Yield, CWCWD, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(2,000)
2010	840
2015	3,200
2020	5,300
2025	7,100
2030	8,700
2035	10,400
2040	11,700
2045	12,900
2050	14,100

Town of Eaton. The Town of Eaton's future water demands will be in rough balance with its 2004 firm annual yield of 970 AF until about 2010. By the year 2015, the Town of Eaton is projected to need about 230 AF in new, firm annual yield. By 2030, that figures rises to 830 AF. Eaton is seeking 1,300 AF of new permitted firm yield from NISP.

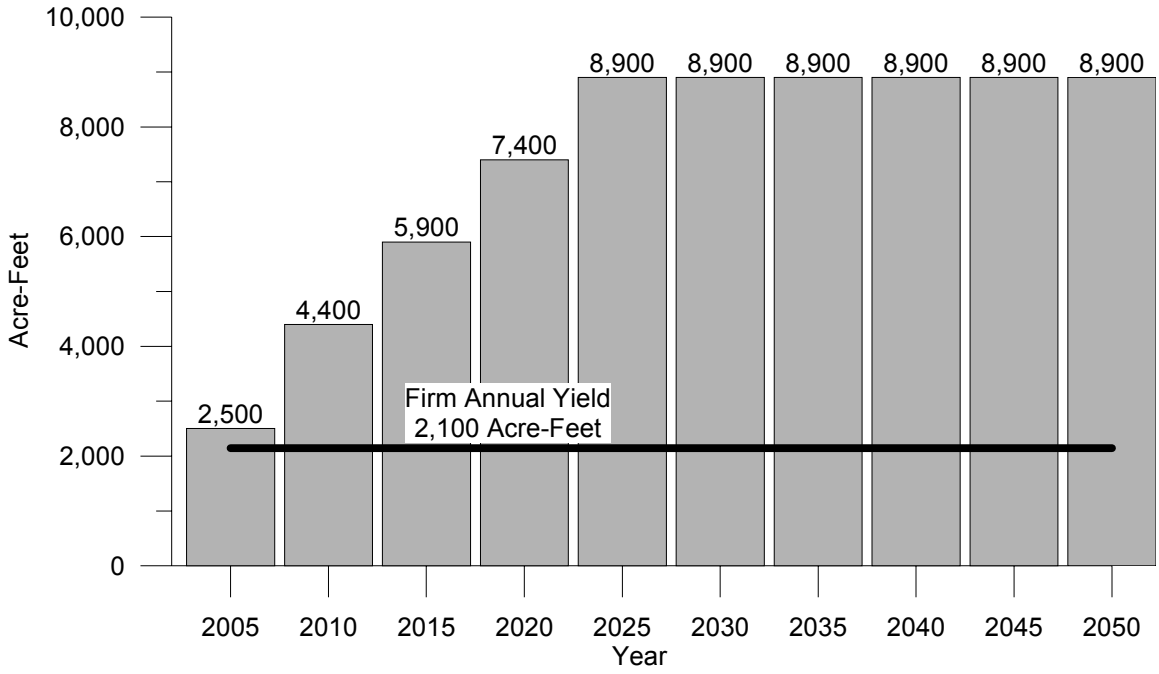
Figure IV-4.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Town of Eaton, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(180)
2010	30
2015	230
2020	430
2025	630
2030	830
2035	1,000
2040	1,200
2045	1,400
2050	1,600

Town of Erie. The Town of Erie has a 2004 firm annual yield of about 2,100 AF, but for its own planning purposes, the Town of Erie assumes a higher firm annual yield for its Colorado-Big Thompson units. Applying Erie's own view of its water supplies, it is in rough balance with water demands expected for the year 2005. By any measure, the Town of Erie will need additional firm annual yield shortly thereafter, and this excess of demands over 2004 water supplies will increase rapidly until the Town of Erie reaches buildout between the year 2020 and 2025. Erie is seeking 6,500 AF of new permitted firm yield from NISP, which will meet the majority of its future buildout demands.

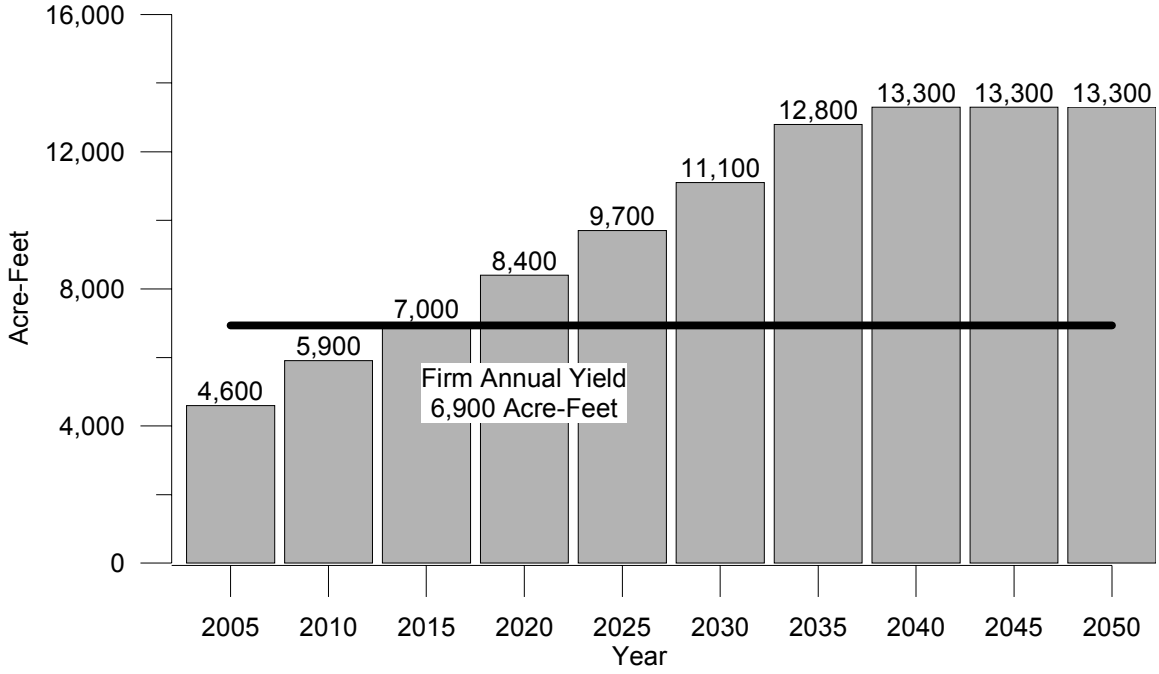
Figure IV-5.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Town of Erie, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	360
2010	2,300
2015	3,800
2020	5,300
2025	6,800
2030	6,800
2035	6,800
2040	6,800
2045	6,800
2050	6,800

City of Evans. The City of Evans obtains treated water from the City of Greeley but must provide Greeley with the underlying water resources to meet that need. Evans' firm annual yield in 2004 was estimated at about 6,900 AF, including non-potable supplies that were available only for non-potable deliveries. The City of Evans faces an excess of demands over its supplies in coming years, reaching a deficit of 2,800 AF by the year 2025. The City of Evans is seeking 1,600 AF of new permitted firm yield from NISP.

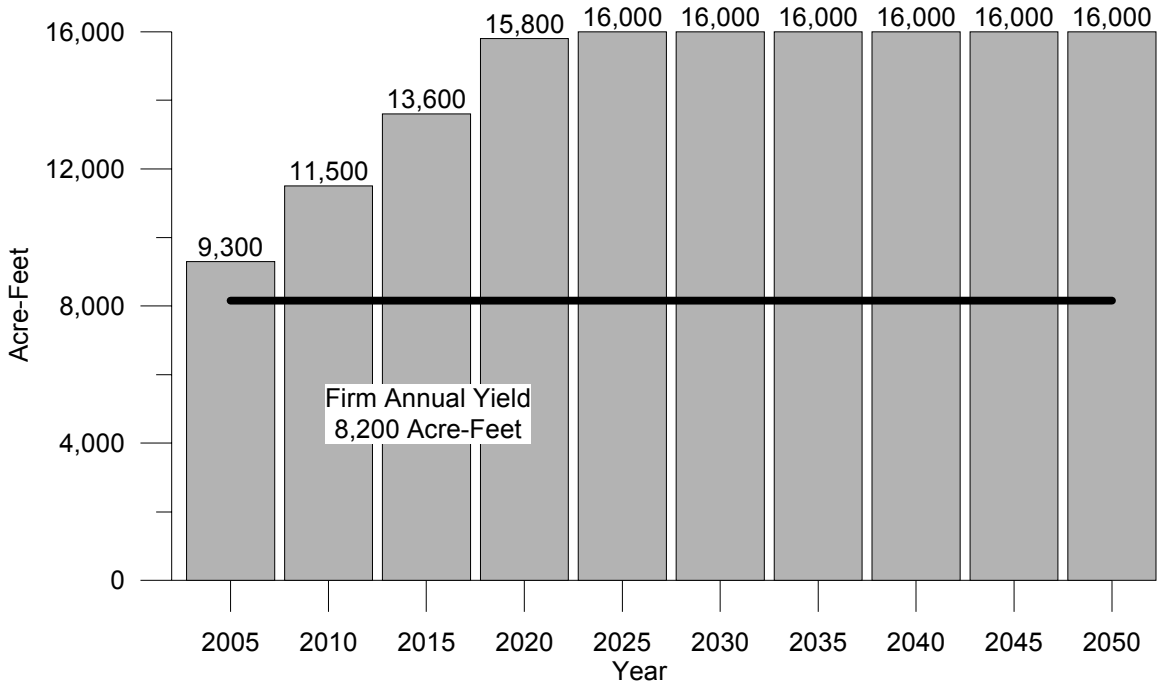
Figure IV-6.
Comparison of Future Water Demands with 2004 Firm Annual Yield, City of Evans, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(2,300)
2010	(1,000)
2015	100
2020	1,500
2025	2,800
2030	4,200
2035	5,900
2040	6,400
2045	6,400
2050	6,400

Fort Collins-Loveland Water District (FCLWD). With a 2004 firm annual yield of about 8,200 AF, FCLWD would need to rely on drought restrictions to meet normalized 2005 water demands under very dry hydrologic circumstances. The excess of FCLWD water demands compared with 2004 firm annual yield will grow to 7,800 AF by 2025, when buildout is achieved. FCLWD is seeking 3,000 AF of new permitted firm yield from NISP.

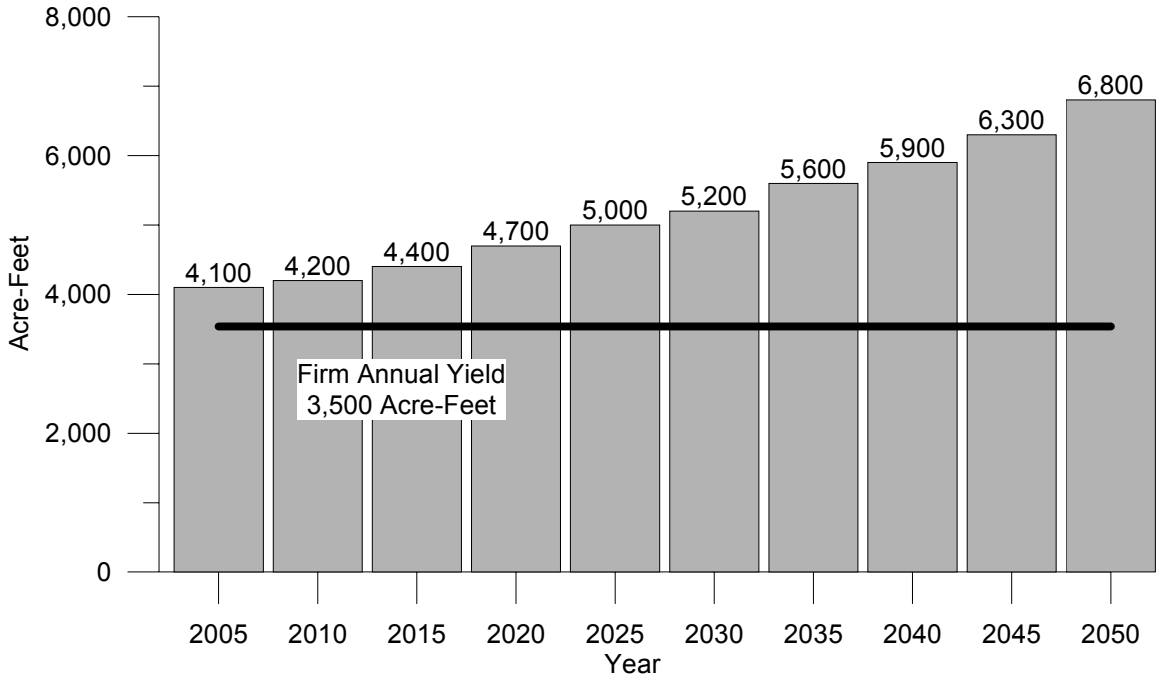
Figure IV-7.
Comparison of Future Water Demands with 2004 Firm Annual Yield, FCLWD, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	1,100
2010	3,300
2015	5,400
2020	7,600
2025	7,800
2030	7,800
2035	7,800
2040	7,800
2045	7,800
2050	7,800

The City of Fort Lupton. The City of Fort Lupton had a 2004 firm annual yield of almost 3,500 AF, which was in rough balance with the average year water demands projected in 2005. The excess of Fort Lupton's future water demands compared with its 2004 firm annual yield will rise slowly but steadily to reach 1,500 AF by the year 2025 and more than 3,000 AF by the year 2050. The City of Fort Lupton is seeking 3,000 AF of new permitted firm yield from NISP.

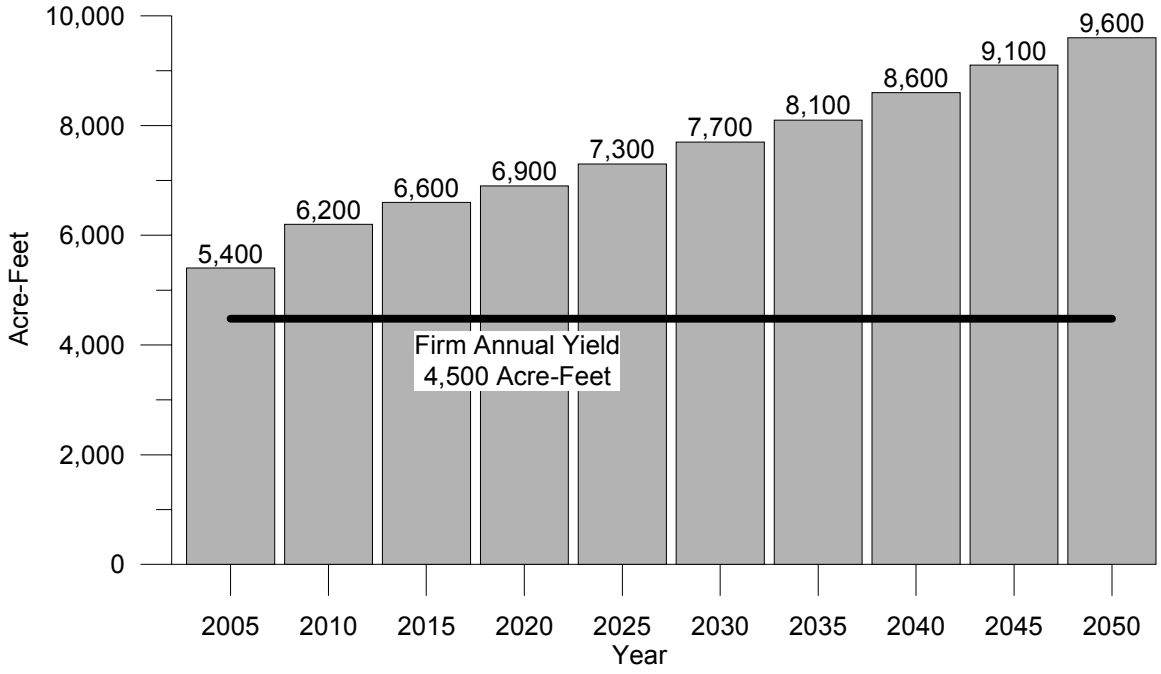
Figure IV-8.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Town of Fort Lupton, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	560
2010	660
2015	860
2020	1,200
2025	1,500
2030	1,700
2035	2,100
2040	2,400
2045	2,800
2050	3,300

City of Fort Morgan. With almost 4,500 AF of 2004 firm annual yield, the City of Fort Morgan could experience shortages in the immediate future. Fort Morgan's need for new water supplies will grow steadily, reaching almost 2,800 AF in the year 2025 and 5,100 AF in 2050. Fort Morgan is seeking 3,600 AF of new permitted firm yield from NISP.

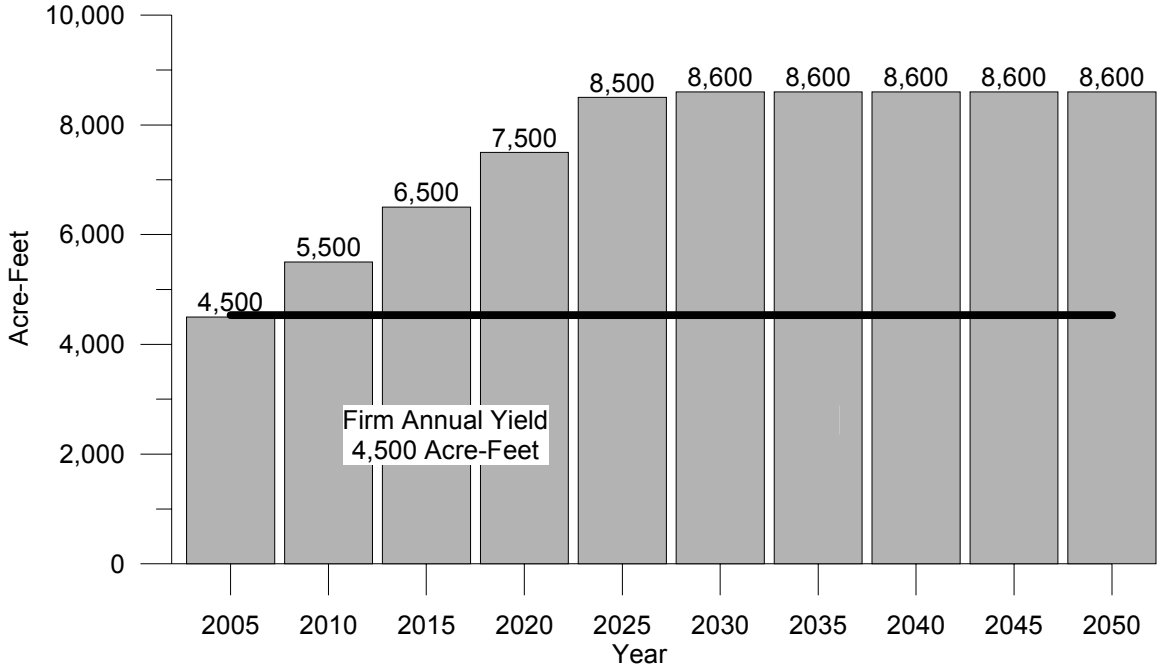
Figure IV-9.
Comparison of Future Water Demands with 2004 Firm Annual Yield, City of Fort Morgan, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	900
2010	1,700
2015	2,100
2020	2,400
2025	2,800
2030	3,200
2035	3,600
2040	4,100
2045	4,600
2050	5,100

City of Lafayette. The City of Lafayette's projected water demands in 2005 were likely to be in balance with its 2004 firm annual yield of about 4,500 AF. From there, the excess of projected demands over 2004 supplies will increase by about 1,000 AF every five years, reaching more than 4,100 AF by the year 2030, when buildout is achieved. The City of Lafayette is seeking 1,800 AF of new permitted firm yield from NISP.

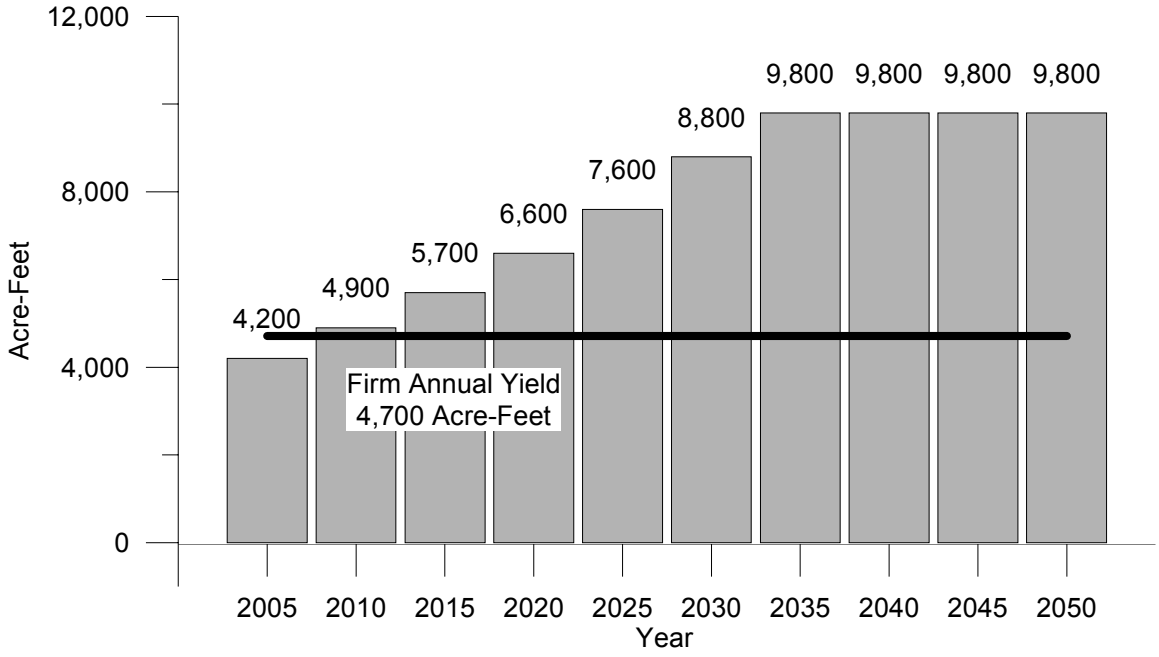
Figure IV-10.
Comparison of Future Water Demands with 2004 Firm Annual Yield, City of Lafayette, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(30)
2010	1,000
2015	2,000
2020	3,000
2025	4,000
2030	4,100
2035	4,100
2040	4,100
2045	4,100
2050	4,100

Left Hand Water District (LHWD). LHWD's 2004 firm annual yield of about 4,700 AF will meet average year water demands projected through the year 2010. The need for new firm annual yield will grow after that, reaching 5,100 AF at buildout, by the year 2035. LHWD is seeking 4,900 AF of new permitted firm yield from NISP.

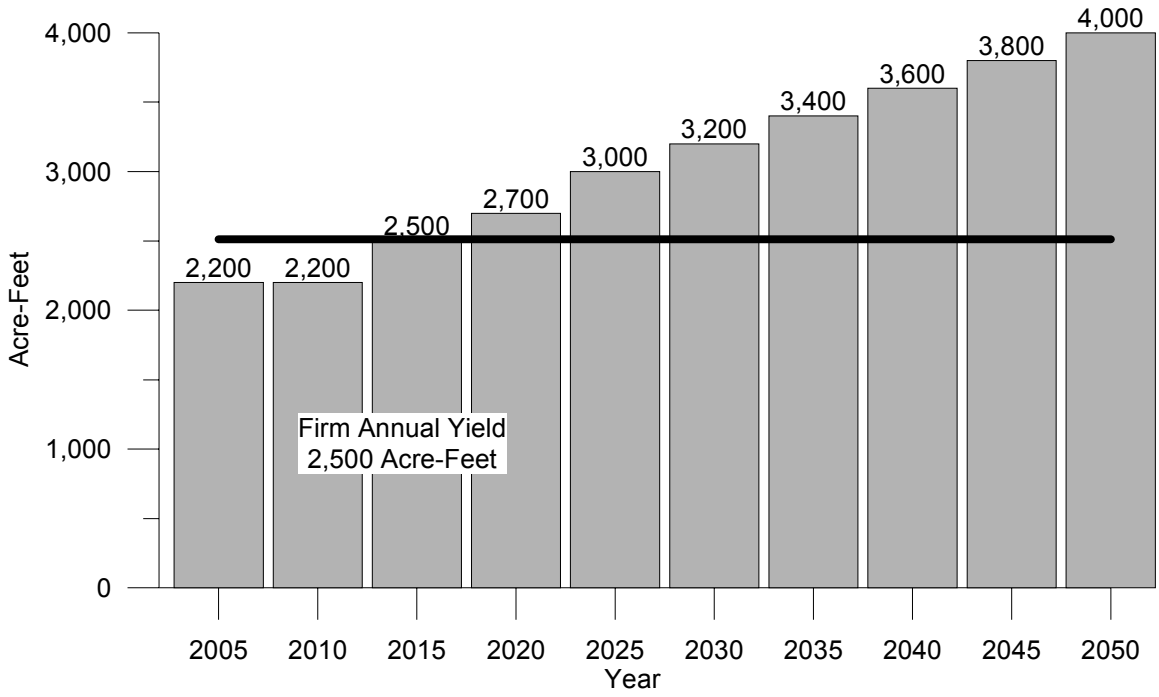
Figure IV-11.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Left Hand Water District, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(510)
2010	190
2015	990
2020	1,900
2025	2,900
2030	4,100
2035	5,100
2040	5,100
2045	5,100
2050	5,100

Morgan County Quality Water District (MCQWD). This water district, with almost 2,500 AF in 2004 firm annual yield, will be able to meet projected demands through the year 2010. After that, the need for new water resources will gradually increase, reaching 1,500 AF by the year 2050. MCQWD is seeking 1,300 AF of new permitted firm yield from NISP.

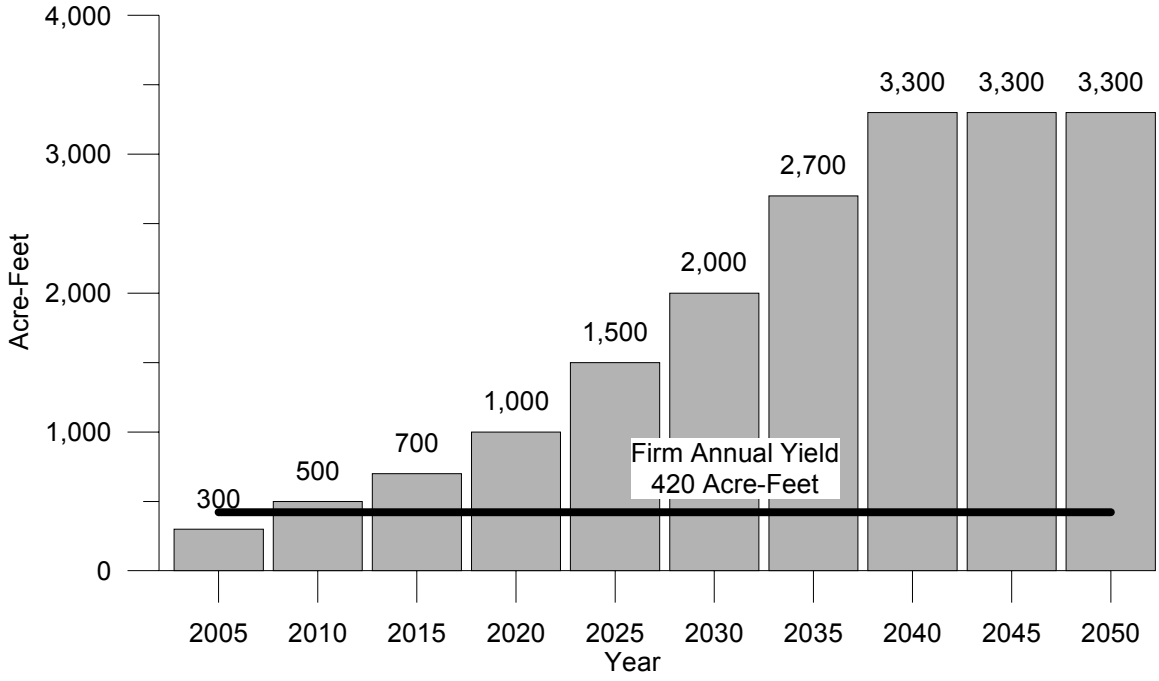
Figure IV-12.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Morgan County Quality Water District, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(310)
2010	(310)
2015	(10)
2020	190
2025	490
2030	690
2035	900
2040	1,100
2045	1,300
2050	1,500

The Town of Severance. The Town of Severance's 2004 firm annual yield of 420 AF will be adequate to meet average year demand projected to about 2009. New water resource needs for the Town of Severance will grow relatively rapidly thereafter, reaching 2,900 AF between 2035 and 2040, when buildout is achieved. The Town of Severance is seeking 1,300 AF of new permitted firm yield from NISP.

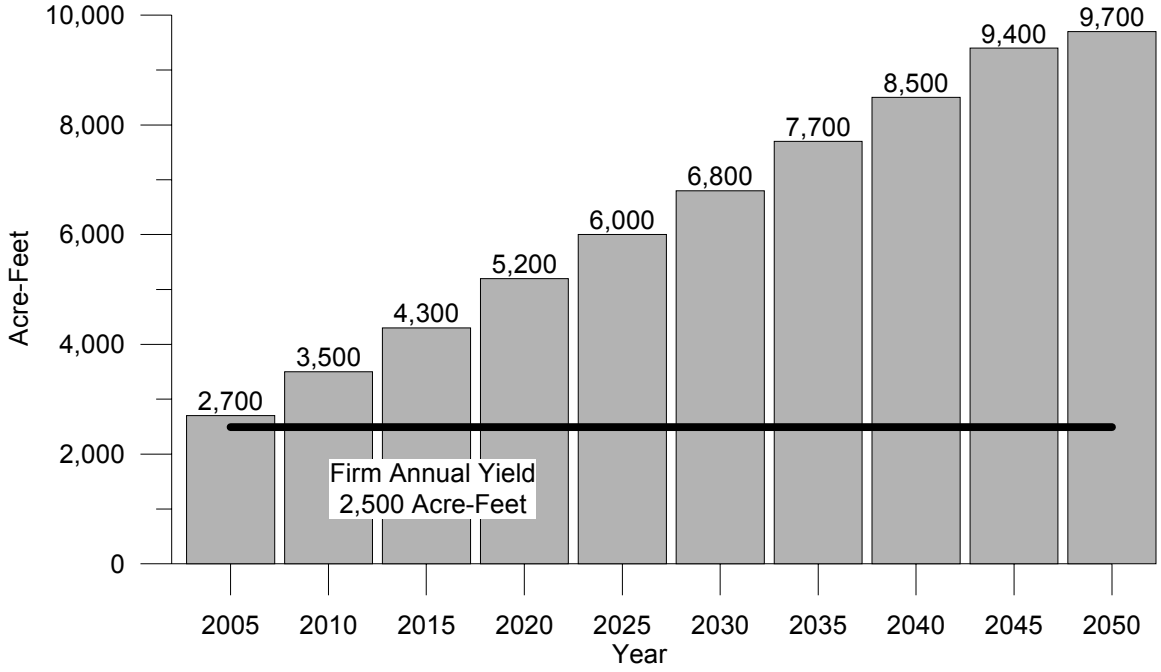
Figure IV-13.
Comparison of Future Water Demands with 2004 Firm Annual Yield, Town of Severance, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	(120)
2010	80
2015	280
2020	580
2025	1,100
2030	1,600
2035	2,300
2040	2,900
2045	2,900
2050	2,900

Town of Windsor. With 2004 firm annual yield of almost 2,500 AF, the Town of Windsor's water demands projected for the year 2005 are in rough balance with its supply, but new water supplies will be required in the near future. Windsor's need to secure new water resources will grow, reaching 3,500AF by the year 2025. The Town of Windsor is seeking 3,300 AF of new permitted firm yield from NISP.

Figure IV-14.
Comparison of Future Water Demands with 2004 Firm Annual Yields, Town of Windsor, in Acre-Feet, 2005 through 2050



Year	Cumulative Water Requirements beyond 2004 Firm Annual Yield (acre-feet)
2005	210
2010	1,000
2015	1,800
2020	2,700
2025	3,500
2030	4,300
2035	5,200
2040	6,000
2045	6,900
2050	7,200

Conclusions about the Need for NISP

The study team performed a careful analysis of existing supplies and projected water demands for each of the 13 Participants in NISP. In each instance, the Participants have projected new water resource needs that justify their participation in this project. For many Participants, additional water resources should also be identified in the near future.

Between 2005 and 2010, the total future demand of all Participants combined will exceed their combined firm annual yield. By the year 2025, the excess of combined demands over current supplies will approximate 42,000 AF. The Participants are seeking from NISP a combined 40,000 AF in new permitted firm yield.[11] Between 2025 and 2030, these Participants will need additional supplies. Of course, individual Participants are most likely pursuing multiple strategies for water resource acquisition.

[11] Northern Colorado Water Conservancy District, 2006 Phase III Participation and Budget, December 2005.