Part Three of the South Platte Basin Roundtable Consumptive Needs Assessment

This memo sets forth part three of the consumptive needs assessment of the South Platte Basin Roundtable. The first part was done in 2006 when the South Platte Basin Roundtable adopted the findings of the Statewide Water Supply Initiative (SWSI) Phase 1 as the first step toward completing its consumptive needs assessment.

Part Two of the consumptive needs assessment was adopted during the spring of 2009 and focused on the following tasks:

- Develop projections of competing water supply
- Identify any unappropriated water
- Describe current vs. historic river administration
- Quantify and project consumable effluent reuse
- Summary of water conservation plans

Part Three extends the 2030 South Platte Municipal and Industrial (M&I) water needs or "gap" analysis to 2050 and discusses future agricultural water shortages.

South Platte Basin 2050 M&I Water Needs "Gap" Analysis

For this analysis, the South Platte Basin Roundtable is broken into four regions as shown in Figure 1. For the purpose of this analysis, the Denver Metro and the South Metro areas from Figure 1 were excluded. For each region, the 2050 population projections and associated water demands based on Colorado Water Conservation Board's (CWCB) "State of Colorado 2050 Municipal and Industrial Water Use Projections" (2009) are summarized in Table 1. As discussed in the CWCB report, 2050 population projections and associated demand projections were developed on a low, medium, and high basis based on the uncertainty of predicting population projects 40 years into the future. Table 1 shows the 2050 low, medium, and high population projections and associated M&I plus self-supplied industrial (SSI) demands. Total M&I demand plus SSI demand in 2050 is expected to range between 484,700 to 557,500 acre-feet per year (AFY).

The methodology for these 2050 demand projections does not "embed" conservation into the analysis. If conservation was embedded into the demand projections, the 2050 M&I water demand projections would take into account conservation measures that would be implemented over the next 40 years. This would result in a lower 2050 projected M&I water demand. The CWCB determined that analyzing conservation measures and their potential savings statewide should not be embedded into the M&I demand projections to provide a better understanding of the increments of water that

conservation could supply to Colorado's future water needs. The CWCB will continue to provide more detail on this conservation strategy in the coming months.

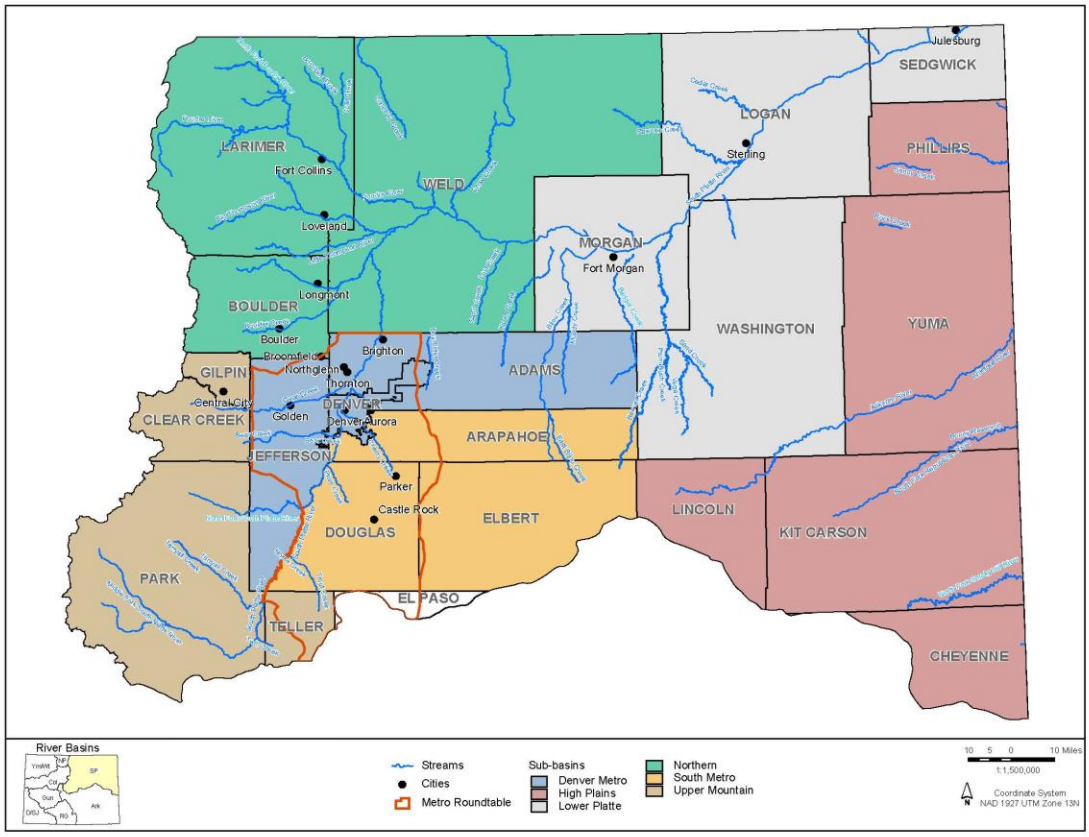

Figure 1. South Platte Basin Location Map

Table 1. South Platte Basin Population and Water Demand Projections for 2050

Region	2050 Population Projection (low)	2050 Population Projection (medium)	2050 Population Projection (high)	2050 M&I plus SSI Demand (low)	2050 M&I plus SSI Demand (medium)	2050 M&I plus SSI Demand (high)
Upper Mountain	93,600	103,600	113,900	25,200	27,600	30,100
High Plains	37,400	40,300	44,500	13,100	14,100	15,500
Northern	1,550,600	1,654,000	1,807,200	397,100	421,600	457,700
Lower Platte	97,500	103,600	113,500	49,300	51,200	54,200
Total	**1,779,100**	**1,901,500**	**2,079,100**	**484,700**	**514,500**	**557,500**

As a reminder, the 2030 demands from SWSI for the South Platte Basin minus the Denver Metro and South Metro region was 480, 500. The low demand projections are approximately equal to the 2030 demand projections because the water use rates used for the recent 2050 analysis were updated to be reflective of 2008 water use. Water use rates in the South Platte Basin are about 15 percent less in 2008 than they were in 2000 (CWCB 2009).

To project the 2030 water needs or "gap" during SWSI, CWCB developed a list of Identified Projects and Process (IPPs) that identified the amounts of water that will be

produced by projects or processes that are expected to move forward with a reasonable degree of success by 2030. Table 2 shows by South Platte region the amount of water the IPPs are expected to yield by 2030. This table is the same as Table 8-2 in the Interim Water Supply and Needs Report for the South Platte Basin and Denver/South Metro Counties, November, 2004, (Interim Report).

Table 2. Major Identified Projects and Processes in South Platte Basin Excluding the Denver/South Metro Counties

Subbasins (Counties)	Estimated Demand met by Identified Projects and Processes and Additional Conservation (AFY)	Identified Projects and Processes
Upper Mountain (Clear Creek, Gilpin, Park, Teller)	16,500	■ Drilling of exempt wells ■ Cooperative agreements with existing major water providers ■ Development of tributary groundwater supplies and plans for augmentation with agricultural transfers and new storage
High Plains (Cheyenne, Kit Carson, Lincoln, Phillips, Washington, Yuma)	800	■ Additional non-tributary groundwater
Northern (Boulder, Larimer, Weld)	146,500	■ Active Conservation ■ Windy Gap Firming ■ Northern Integrated Supply Plan ■ Halligan and Seaman Reservoirs enlargement ■ New storage including gravel lakes ■ Agricultural transfers ■ CBT acquisition ■ Reuse for non-potable irrigation of parks and golf courses and other landscaping ■ Exchanges ■ Annexation policies ■ Treating lower quality water sources ■ Use of local ditch rights for landscape irrigation
Lower Platte (Logan, Morgan, Sedgwick)	8,900	■ Augmentation of tributary groundwater with agricultural transfers ■ CBT acquisition
TOTAL	**172,700**	

The South Platte Basin's water needs or "gap" for 2050 were estimated based on subtracting current water use (2008) and the IPPs from the 2050 low, medium, and high demands. Figure 2 shows the 2050 "gap" by region if 100 percent of the IPPs are implemented by 2030. For the low and medium demand scenarios, the Upper Mountain will not have a "gap" in 2050 if 100 percent of the IPPs are implemented. For the medium demand scenario, High Plains, Northern, and Lower Platte will have a "gap" in 2050 of 2,600, 55,300, and 17,000 AFY, respectively if 100 percent of the IPPs are successful. All regions will have a "gap" based on the high demand scenario.

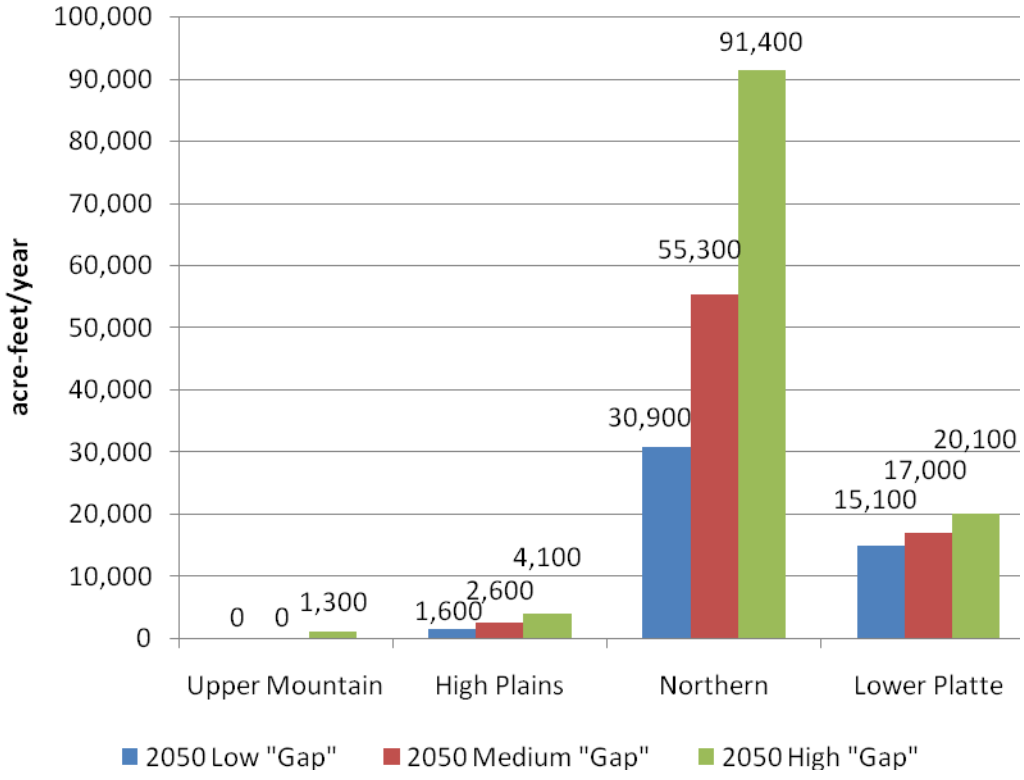

Figure 2. Water Supply Gaps in the South Platte Basin at 100 Percent IPP Success Rate by Region

Several of the IPPs in the South Platte Basin are in the National Environmental Policy Act process and it is uncertain whether they will be fully implemented by 2030. These projects are the Northern Integrated Supply Project, Windy Gap Firming, and Halligan- Seaman Water Management Project. Together, these IPPs total 105,700 AFY. To account for this uncertainty the gap analysis for the South Platte Basin was considered at 25, 50, and 75 percent success rate of the IPPs. Figure 3 summarizes the results of this analysis.

As shown in Figure 3, the IPP success rate in the South Platte regions has varying effects on the gap. The gaps in the Northern and Upper Mountain regions are more sensitive to the IPP success rate due to IPPs in their respective regions. The gap in the Northern region is reduced from 165,200 AFY at a 25 percent IPP success rate to 91,900 AFY at a 75 percent IPP success rate at the medium demand projection. The Lower Platte and High Plains are less sensitive to the IPP success rate.

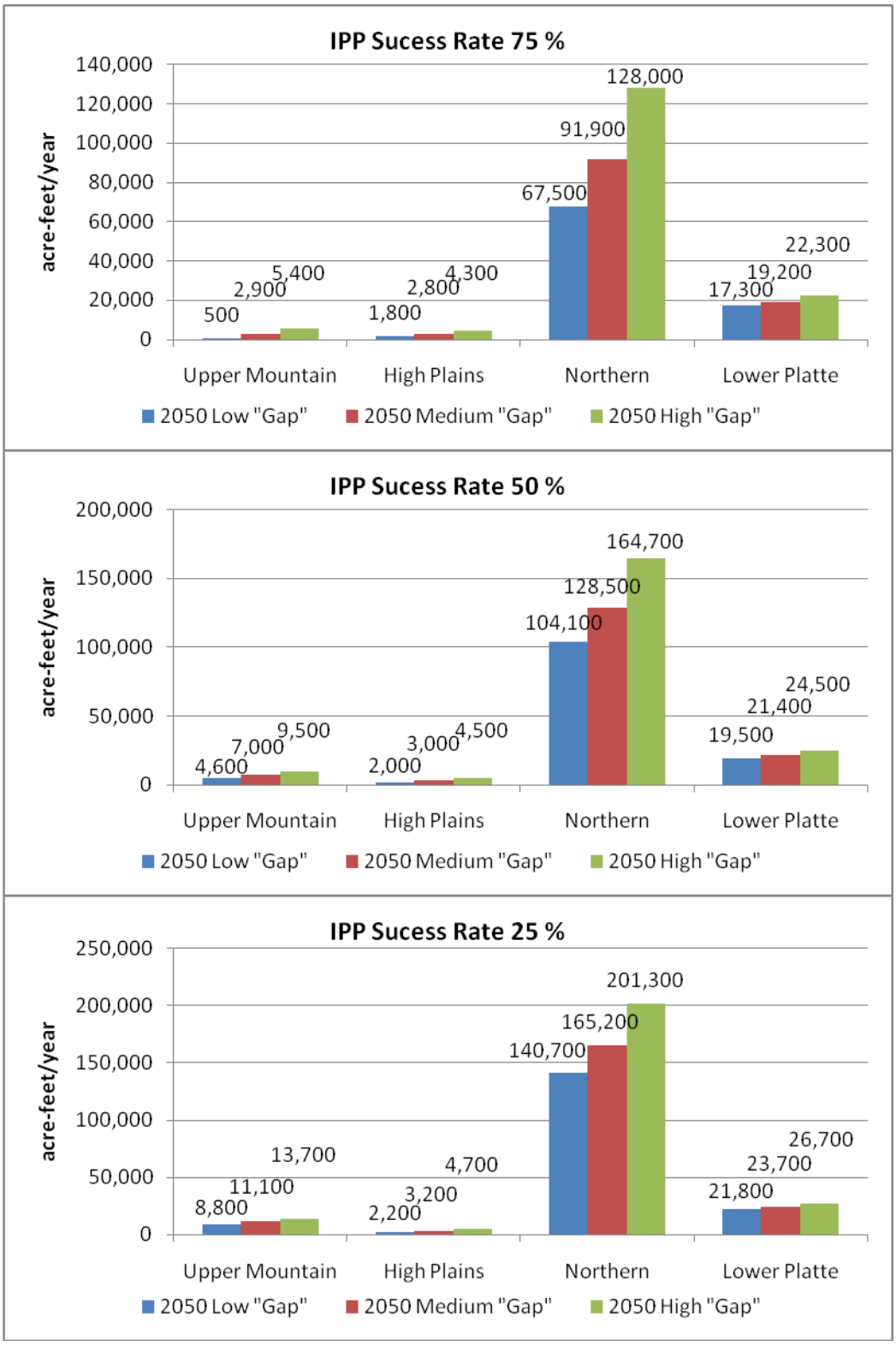

Figure 3. South Platte Basin Gaps by Region at IPPs Success Rate of 25, 50 and 75 Percent

Agricultural Water Needs[1]

Current agricultural water needs and shortages can be estimated using information from Part Two of the South Platte Basin Roundtable Consumptive Needs Assessment (Part Two) on current irrigated areas in the South Platte Basin and information from SWSI 2 (November 2007) and the Interim Water Supply and Needs Report for the South Platte Basin and Denver/South Metro Counties, November 2004, (Interim Report).

The 2005 Colorado Decision Support System (CDSS) irrigated areas in the South Platte Basin are shown as 840,000 acres and this value is also stated in Part Two on page 2. This value can be used to compute the current Irrigation Water Requirement (IWR) and Water Supply Limited (WSL) consumptive use.

The Interim Report in Table 5-5 shows an estimated decrease in irrigated area to 2030 with a range of 113,000 to 226,000 acres. This report was based on 2001 data for irrigated area from 2001 draft GIS coverage used in SWSI 1, which has been found to overstate the irrigated area. The 2001 CDSS coverage states that the irrigated area is 910,000 acres. If the 2001 CDSS data is used with the range of decline in irrigated area to 2030, the irrigated area would be 684,000 to 797,000 acres in 2030. The 2005 CDSS coverage indicates that the irrigated area is 840,000 acres so a portion of the decline in irrigated area projected in Interim Report has in fact already occurred. The change from 2001 to 2005 in CDSS in irrigated area is a decline of 70,000 acres. If this change is considered in the decline projected in Table 5-5 from 2001, the remaining range of decline is 43,000 to 156,000 from the current value, 840,000 acres, and the range of irrigated area in 2030 is 684,000 to 797,000 acres. The 2050 irrigated area is difficult to project since it has not been done nor has it been discussed with the South Platte Roundtable. It clearly will be influenced by IPPs not successfully completed or lack of water imported from other basins to meet future M&I needs. Thus, the decline in irrigated areas could be more than that projected for 2030. It is recommended that for this Part Three Report that the 2030 values be used to compute agricultural water needs and shortages for the South Platte Basin. Table 3 shows the IWR, WSL, and shortages for the various years.

Table 3. Agricultural Demand Projections for the South Platte Basin

Year	Irrigated Acres	IWR AFY	WSL AFY	Shortage AFY
2005	840,000	1,470,000	1,260,000	210,000
2030 low	684,000	1,197,000	1,026,000	171,000
2030 high	797,000	1,394,000	1,196,000	198,000

The above IWR, WSL, and Shortage values are in AFY of consumptive use and are from the CDSS computations. The diversion shortage can be estimated by dividing by on-farm efficiency and applying a canal loss for those systems having surface water. Clearly some of the shortage is related to water from wells and there would be no canal loss to consider. It is also assumed that the irrigation water requirements for

[1] The agricultural demands in this section do not include the Republican River Basin.

those wells in the Central Colorado Water Conservancy District's two ground water augmentation districts are included in the above table. If it is determined that they are not, then according to Tom Cech, Manager of the District, the two districts need about 100,000 AFY of augmentation water to allow pumping without restrictions.

The amounts of water from the river or alluvium needed to provide for the above shortages are estimated by using a weighted on-farm efficiency of 65 percent, which takes into consideration both flood and sprinkler irrigation. Likewise, the weighted canal loss is recommended to be 10 percent, which assumes that groundwater irrigated areas are 50 percent of the total areas and canal irrigated areas are the other 50 percent (20 percent loss). The total weighted system efficiency of 55 percent is used to compute a shortage water diversion requirement of 382,000 AFY for 2005, 311,000 AFY for 2030 (low), and 360,000 AFY for 2030 (high).

These amounts of water from the river would need to be added to estimates of M&I gaps for 2050 to obtain a total water supply gap for 2050 for the South Platte Basin.

Summary

Through this analysis it has been identified that there is a water supply gap in the South Platte Basin. In this analysis, M&I demands were extended to 2050 and agricultural water needs and shortages in the South Platte Basin were quantified. The total gap in 2050 due to M&I demands and agricultural shortages in the South Platte Basin may range from 355,000 to 476,800 AFY. This projected gap is dependent on the success rates of IPPs and agricultural demands in the basin.