Appendix F – South Metro Water Supply Authority Concept for Discussion

South Platte Basin Implementation Plan

South Platte Basin Roundtable/Metro Basin Roundtable

April 17, 2015

Below is a collaborative conjunctive use multi-purpose project concept based on a potential Flaming Gorge Pipeline project and conjunctive use with the Denver Basin Aquifer System. This is an example that provides something for others to react to, and should be evaluated and built upon through the Basin Roundtables and planning process. Although this "straw-man" is conceptualized around a Flaming Gorge Pipeline project, many of the concepts could extend to other new water supply projects. Section 1 describes the concept and Section 2 provides additional summary information on the Denver Basin Aquifer and the opportunity to use it as a drought reserve.

Section 1: Conjunctive Use Multi-Purpose Project Concept

This description outlines potential elements of a conjunctive use multi-purpose new supply project.[1] This conceptual "straw-man" project is prepared to test and demonstrate the ability of a project to meet stakeholders' concerns including environmental, recreational, and water users concerns. It could be centered around a number of potential projects such as the Green Mountain/Blue River Pumpback, Yampa Pumpback, Blue Mesa Pumpback, or Flaming Gorge Pipeline with conjunctive use of the Denver Basin Aquifer and interruptible supply agreements in the South Platte Basin.

This description is intended to focus discussions related to new supply development and provide a framework for analysis and feedback. It is anticipated that the substance of a specific concept will change and additional details will be developed over time. This description can help inform recent IBCC and roundtable discussions and ultimately be included as part of a roundtable-to-roundtable engagement within Section 4.8 Interbasin Projects and Methods of the South Platte and Metro's Basin Implementation Plan (BIP).

As a starting point, the following elements of a multi-purpose project are described:

- Project Description
  - Water Source
  - Risk Management and Variability
  - Headwater Enhancement
- Overall Benefits of the Project
- Challenges/Issues/Costs of the Project
- Potential Area of Origin Compensation
- Statewide Policy Objectives
- Financing and Governance

[1] Several sources were used to compile this memo including: Prior “Basin of Origin” bills (between 1988 and 2000 the Colorado General Assembly looked at 16 out of basin transfer proposals of which some were compensation/mitigation approaches, some focused on additional requirements before diversion, and two required voter authorization); Reports from the Colorado Water Resources Research Institute on area-of-origin compensation; The South Metro Water Supply Study (February, 2004); SWSI Phase II Section 5 (Addressing the Water Supply Gap); Discussions between the Yampa/White Roundtable and South Platte Roundtable on the proposed Yampa Pumpback Project; SWSI 2010 and the December 15, 2010 IBCC Report; and Basin Roundtable Project Exploration Committee (a.k.a Flaming Gorge Task Force) Phase 1 Report.

These elements are outlined in general terms below. Additional details such as yield (average, firm, and dry), water rights, infrastructure, cost estimates, mitigation, funding, etc. will need to be further developed with additional stakeholder input. In addition, a section at the end further describes the Denver Basin Aquifers as an opportunity for a risk and drought reserve. Including the Denver Basin aquifers as an asset to provide supplies when no project yield is available can be an important element in risk management of Colorado's Compact Entitlement.

The specific elements of projects, mutual commitments, and milestones of progress would be the subject of an exploratory investigation and ultimately negotiation among multiple parties. It is anticipated that should a package of projects emerge as feasible and desirable, commitments would be made in tandem. As potential end users made certain commitments, potential opposers would also make commitments helping to ensure that a new west slope supply project will, in fact, be a fundamental part of "filling the gap" package. This approach needs to provide confidence that Colorado River water supply development will be available for the east slope, thereby providing an alternative to agricultural to urban water transfers.

Elements of a Conjunctive Use Multi-Purpose Project

Project Description:

For discussion purposes, this concept is centered around the Flaming Gorge Pipeline Project. It has been initially screened through a sub-committee, and also been investigated by a variety of agencies over several decades. Much information is already available, reducing the need to gather new data. A group has also begun to coordinate with the US Bureau of Reclamation to review hydrologic analyses and model projections of potential yields and operations. This Conjunctive Use Flaming Gorge Pipeline Multi-Purpose Project contains several major components. The components include:

1. **Flaming Gorge Pipeline**: The source of water for the project would be a contract with the Bureau of Reclamation (BOR) for an annual average yield from Flaming Gorge Reservoir of 150,000 + acre feet. The water would be diverted from the Green River through a pumpstation at Flaming Gorge Reservoir. A 400-mile 7-8 foot diameter pipeline would convey this water to the Front Range. The most likely pipeline route would travel along Interstate 80 through Wyoming to Laramie, and then south along the Colorado Front-Range. The pipeline would convey supplies to municipalities in Wyoming and on the Colorado Front-Range in the South Platte and Arkansas Basin.

   The overall capacity of the pipeline should include consideration of several opportunities beyond that required to convey 150,000 acre feet for several reasons:

   a) Cost/benefit review of moving additional water under certain hydrologic conditions;

   b) Potential as a water management tool, capable of bringing water to the Front Range as an alternative diversion method to depletion in the

headwaters of the Colorado River. That might position the project as a riparian restoration project as well as a new supply project, and;

c) In a fashion similar to the transaction between the Southern Nevada Water Authority and the Arizona Water Banking Authority2, Colorado could perhaps develop underground storage of other Upper Basin state's compact entitlement as a component of risk management and oversize the conveyance system for that type of possibility.

2. **Risk Management and Project Variability Strategies:** In 2010, the IBCC agreed that the development of new water supplies from the Colorado River "should be accompanied by a risk management program that ... is integrated with 'triggers' and utilizes other dry cycle sources to fill the gaps when the new supply water is unavailable." Because populations and economies would be dependent upon this new water supply from Flaming Gorge, mechanisms would need to be in place to deal with periodic supply shortages. The IBCC recommended a two-pronged approach: 1) "to put in place an 'early warning' system that shuts down, curtails, or offsets [the new supply project] in advance of a Compact curtailment. The early warning system would be based on hydrologic triggers;" and 2) "the water supply triggers would be coupled with an emergency water bank or other operational scenario that would meet the critical needs of all of Colorado's post-1922 users if a curtailment cannot be avoided."

a) Triggers and Dry-Period Sources

i. ***Triggers***: Hydrologic triggers could include Lake Powell levels, overall storage in the CRSP system, the 10-year rolling average of upper basin deliveries, or some combination. The IBCC notes, "additional work is needed to define which triggers would be used ... and how they would work."

ii. ***Sources to meet shortages***: Regardless of the triggers, the end users of the project would need supplies that can be used conjunctively with the Flaming Gorge supplies. This is not a new concept for many front-range utilities. For example, the South Metro region recently secured a permanent, but variable, renewable water supply through the WISE Project. In years when no delivery occurs, they will continue to rely on Denver Basin well pumping. Similar strategies could be used to deal with the variability of a Flaming Gorge project and associated triggers.

1) ***Denver Basin Aquifer Conjunctive Use and ASR***: Diversion of water from Flaming Gorge could be tied to levels in Lake Powell or other triggers to avoid compact curtailment. This strategy involves diverting a larger amount of water in wet years for front range groundwater users to store water in Denver Basin aquifers through an ASR (aquifer storage and recovery) program to assure sustained productivity. In dry periods when supplies are not available from

[2]http://www.snwa.com/ws/future_banking_arizona.html

Flaming Gorge, municipalities with access to the Denver Basin Aquifer would meet their water needs from local groundwater supplies. Through ASR and changing the use of the Denver Basin Aquifer from a base supply to a drought supply, the aquifers can be managed to assure long-term reliability. Additional information on this concept is included in the section below "Denver Basin Aquifers - Our Best Opportunity for a Risk and Drought Reserve."

2) ***East Slope Temporary Ag. Transfers***: Interruptible supply agreements with east slope agricultural water rights could also provide a back up water supply during dry-cycles. An alternative agricultural transfer project could build on the FLEX Market concept and include the temporary transfer of agricultural water rights similar to substitute water supply plans (CRS 37-92-308) and interruptible supply contracts (CRS 37-92-309). It could also include supporting the development of additional storage and infrastructure in the Arkansas and South Platte river basins to facilitate the temporary transfer of agricultural water rights to Front Range municipalities.

b) **Emergency West Slope Water Bank for pre-1922 Water Rights:** The triggers and dry-sources above would be coupled with an emergency west slope water bank to help ensure the critical needs of all of Colorado's post-1922 users would be met if a curtailment cannot be avoided. As described by the IBCC, "this water bank would utilize the consumptive uses of Colorado's pre-1922 water rights on a willing buyer/lessee–willing seller/lessor basis. The bank could be combined with or include the use of the capacity of existing reservoirs such as Blue Mesa. The concept of such a bank is the effort of a current study by West Slope and Front Range water users."

3. **Headwater Enhancements:** This multi-purpose project could include non-consumptive environmental and recreational benefits to the headwaters of the Colorado River system. This could involve exchanges with current transbasin diverters for additional flows in Colorado headwaters and could utilize specifics from the Grand County Streamflow Management Plan and the Colorado Roundtable's Nonconsumptive Needs Assessment. This concept would need to be explored with current transbasin diverters.

Potential Area of Origin Compensation

Through the IBCC and Basin Roundtable process, west slope representatives have said that they would need several commitments before being supportive of this type of multi-purpose project. These included:

- Continued viability of the west slope's regional economy
- Certainty – ensure an increment of water is available for development in each west slope basin
- Front-Range commitment to conservation and reuse
- Environmental mitigation and enhancement

These elements could be met through a combination of water related benefits for the west slope sub-basins and/or socio-economic compensation.

Water related benefits for west slope sub-basins

Even though the diversion may not occur directly in each basin, different elements could be included to distribute statewide benefits, ensure continued viability of the west slope's economy, and provide certainty.

- Yampa/White
    - Infrastructure for irrigation of additional acres in Moffat County (20,000-30,000 acres of land could be irrigated)
    - Water for future municipal development particularly in Steamboat and Craig. Upper basin interests have previously secured 60,000 a.f. subordinations to protect future uses and they have indicated they would want a similar subordination or component of the project.
- Colorado
    - Exchanges with current transbasin diverters for additional flows in Colorado headwaters (Grand County Streamflow Management Plan; Blue River Flow enhancement)
    - Maintain Dillon Reservoir Levels
    - Wolcott Reservoir for future west slope water demands and additional yield to the Grand Valley
- Gunnison
    - Agricultural firming projects in the upper basin (Tomichi Creek, etc.) to help with current agricultural shortages
    - Water quality improvements in the Uncompahgre River and Lower Gunnison (selenium)
- Southwest
    - Financial assistance and support developing their identified projects and processes

Socio-Economic Compensation (Development Fund)

Generally, the most useful form of compensation would be unrestricted monetary compensation to be used by the west slope to compensate unprotected parties and for whatever other purposes its citizenry prefers. Rather than committing to specific projects, a development fund could be established. The money from this fund would be available to provide assistance for future water needs (see above) or other economic development on the west slope.

The fund could be financed in a number of ways as further described below. These financing mechanisms could also be accompanied by a charge placed on users of the multi-purpose project water (perhaps indexed to the current price of water in the South Platte Basin). The fund could be held by the state (CWCB) or potentially by west slope

conservation districts or counties. Expenditures would be made against the fund for projects proposed by municipalities, conservancy districts, and other public entities on the west slope. Appropriate expenditures could be solely water related3, or appropriate expenditures could include other economic development projects.

An alternative, predicated on the pipeline becoming a riparian restoration management tool, would be application of funds in two ways: First, for compensatory projects in the Colorado River basin, and; Secondly, to fund the increased cost associated with alternative diversions of transbasin sources. The first compensation is an early milestone in the process, bringing environmental benefits to the headwaters on the way to project permitting. The second form of compensation, where water providers with low cost, gravity delivery systems accept alternative deliveries, may also be necessary to have the required support for the project.

The major Front Range water providers have invested enormous capital in transbasin diversion structures. That investment yields lower cost water supply for their customers. The offset to the increased cost of alternative delivery might take the form of cash or delivery of more water than could have been historically diverted. The combination of a hold harmless economic approach, coupled with compensatory water stored underground, might be sufficient to garner enthusiastic support for the project.

Financing

In addition to the configuration of the project, the other major outstanding questions relate to how the project would be financed, managed and implemented. Four models could be further explored:

1. Federal/State partnership similar to the Central Arizona Project
2. State water project such as the California State Water Project
3. State/Local partnership where the state facilitates the project, but end users finance and manage it
4. Local/Local partnership similar to WISE and Chatfield as water examples and E-470 as a transportation example
5. Public/Private partnership similar to transportation projects (Hwy 36)[4]

Under any funding model it is most appropriate for use rates and tap fees to be the primary base of funding. This connects the customers with what they are paying for. However, the conceptual package of projects described above will likely also include broader public benefits that are more dispersed than those that accrue to the specific end users of the transmountain diversion project. Therefore broader public funding

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[3]New storage projects, repair and rehabilitation of existing water storage and delivery facilities, municipal water systems, improvement of irrigation systems, on-farm improvements resulting in greater efficiency, water based recreation facilities, securing in-stream flows, and other water-related projects.

[4] Western Resource Advocates published a report, “Economic and Financial Impacts of the Proposed Flaming Gorge Pipeline” by Honey Creek Resources, Inc. September 6, 2011. The report compares public and private finance approaches. The report does not consider a public-private partnership.

mechanisms should also be explored. Two funding mechanisms, a "water" mill levy and a Container Fee, are briefly described as examples of how some of the broader public components of this multi-purpose concept could be funded. These funding mechanisms are described in order to demonstrate that broader funding mechanisms could be available if a package of projects is generally agreed to. SMWSA is not advocating for nor necessarily supportive of either method; rather, they are described as possibilities in order to spark further discussion.

Finance - "Water" Mill Levy

A two (2) mill property tax on the nine largest front-range counties will generate about $107 million/year. (Adams $9m; Arapahoe $15.2m; Boulder $11m; Denver $20.2m; Douglas $8.6; El Paso $11.6; Jefferson $14.4; Larimer $7.6m; Weld $9m). As a point of comparison most fire districts collect an 8+ mill. An additional two mills might incentivize linking land-use planning and water supply planning in the “Big 9.”

One (1) mill, or about $54 million/year could help provide water and economic development for the west slope. This could be done through a “Development Fund” as described above or it could be divided between the west slope counties.

The other (1) mill or about $54 million/year could help fund construction and operation and maintenance of the multi-purpose project, including headwaters exchanges.

As a point of comparison, the 2009 General Fund Revenue for the following counties - Gunnison $10.388M; Montrose $10.1M; Logan $4.5M; Garfield $28M; Otero $1M (estimate) - approximate what this fund could generate.

Finance – The Container Fee Ballot Initiative of 2010

In 2010, two citizens filed a Ballot Initiative seeking a fee on beverage containers sold in Colorado. Unofficially captioned “Container Fee to Fund Water Preservation and Protection” by legislative staff for tracking purposes, the initiative was heard by the Ballot Title Setting Board at its hearing April 21, 2010. The minutes of that hearing document that the legislative staff determined such a fee would generate approximately $100 Million per year in revenue.

The Title Board’s opinion setting the initiative title for the ballot was appealed to the Colorado Supreme Court. The basis of the appeal was that by naming the Basin Roundtables specifically (the funds were to be allocated in part based on roundtable approval of grants), the initiative was not a single subject. The Supreme Court granted the appeal. Given the timeline of the Colorado Water Plan, consideration could be given to a similar ballot initiative in November, 2015. The funds generated could go immediately to riparian restoration projects with future use for compensatory offsets. In the long run, the funding stream would support project development, permitting and eventually debt service.

Overall Benefits of the Project

- Front-range municipalities get an increment of high quality reusable water.

- New water supply development minimizes loss of irrigate acres in South Platte and Arkansas Basins. Transfers of east slope agricultural would no longer be the dominant strategy for meeting front-range water needs. East slope agriculture could participate in the project and receive additional yields (either directly or through "second use" of fully consumable return flows).
- Acceptable water quality that does not require advanced water treatment and may be used to blend with lower quality South Platte supplies.
- Allows development of new water supplies and utilization of Colorado's compact entitlements while protecting recreation, environmental flows, and future economic development on the west slope.
- Depending upon the location of the diversion it could diversify the state's M&I water supplies. The CRWAS indicates that climate change impacts are less severe in northern basins such as the Green River. Adding a more northerly water supply, and a basin other than the Colorado mainstem, would diversify the state's M&I water supply and could mitigate potential risks from climate change.

Challenge/Issues/Costs of the Project

- Potential endangered fish and depletion issues downstream of the diversion would need to be analyzed.
- May require enlargement or construction of additional storage in the South Platte or Arkansas basins. This storage could be surface water storage or underground storage.
- Additional cost analysis of the various component of the package of projects will be needed. This will include, but not be limited to, the cost of equipping existing wells for ASR, implementing a regional ASR program, and comparing the costs of ASR with above ground storage.
- Complexities of water right administration in the event of a compact call.
- Although the Colorado Compact recognizes the right of one state to move water through another state, there will likely be a need for an agreement with Wyoming, perhaps Utah and perhaps between all four Upper Basin States.

Statewide Policy Objectives

- Safe reliable drinking water supply for all Colorado citizens
- Conservation – the project can include elements to require or encourage different conservation measures
- Reuse – the project can be configured for maximum utilization of fully consumable water either through M&I reuse or "second use" by east slope agriculture
- Maximum utilization of the state's Colorado River Compact entitlements
- Environmental and recreational preservation and enhancements

Section 2: Denver Basin Aquifers - Our best opportunity for a risk and drought reserve

Existing Groundwater Conditions

Denver Basin Aquifers (Laramie-Fox-Hills, Arapahoe, Denver, and Dawson) comprise a huge groundwater storage reserve immediately beneath much of the central Front Range. The aquifers extend from roughly Greeley on the north to Colorado Springs on the south, the Foothills on the west, and the eastern boundaries of Adams, Arapahoe and Douglas counties on the east, comprising around 6700 square miles. The combined aquifers hold over 450 million acre-feet of water, and over 250 million of that may be economically pumped. Wells have been drilled and can produce up to as much as 1000 gallons per minute (gpm).

Historically, the South Metro area has relied almost exclusively on this non-tributary, nonrenewable groundwater supply. Estimates are that approximately 38MAF of recoverable water exists under the South Metro area. However, recent work reinforces previous observation regarding steady rates of aquifer declines. The 2013 Douglas County Rural Water Supply System Feasibility Study included a comparison of USGS groundwater modeling, measurements in active wells, and CDWR investigation of Denver Basin aquifer levels. The USGS modeling predicts a -1 to -5 feet per year average annual groundwater level decline and the CDWR investigation predicts a -5 to -13 feet per year decline. South Metro water providers continue to experience declines in aquifer levels and the cascading reduction in well yields.

Given the historic, current, and predicted declines in aquifer levels, the volume of Denver Basin Aquifer production will have a future economic limit which is likely to fall short of urban demands. Numerous studies between 2004 and 2013 all suggest that costs associated with continued reliance on non-tributary, nonrenewable groundwater are expected to be comparable or higher than costs for developing a regional renewable water supply system, thereby providing appropriate incentive to import renewable supplies that can be used conjunctively with the Denver Basin Aquifer.

Future Scenarios for Denver Basin Aquifer Groundwater Use

There are two likely scenarios for South Metro entities involving future use of Denver Basin groundwater: the first scenario is the status quo use of non-renewable groundwater supplies at increasing cost due to declining well production capacities. For the reasons discussed above, this scenario is generally unacceptable as it is an expensive and non-sustainable model.

A second – preferable - scenario is a large-scale conjunctive use plan involving development of renewable supplies and implementation of a robust wet-year aquifer recharge program in which reliance on Denver Basin Aquifer groundwater is primarily as a drought supply. While efforts to increase renewable supplies are currently underway, formalization of a significant conjunctive use plan involving a new transbasin diversion is urgently needed.

Such a conjunctive use plan can operate largely through existing and planned infrastructure. Water providers in the southern metro region rely on multiple wells for their water supply, and have constructed infrastructure connecting them with community water distribution systems. There are around 150 municipal supply wells in Douglas County alone. Recently, the WISE project included plans to link these service areas over the majority of the region. This will provide a water link both internally and to sources of renewable water from outside the region. The opportunity to recharge the Denver Basin Aquifers and a large-scale conjunctive use project is here.

Current annual well production in the area exceeds 40,000 afy (acre feet per year), which corresponds to an average rate of 35 mgd. Assuming the majority of wellfields are sized to meet summer demands and typically triple the average rate, there may be over 100 mgd of peaking capacity available in off-peak periods. With proper equipping and treatment capacity, a significant volume of renewable water could be supplied to the Denver Basin in wet periods for use during droughts.

A rough approximation of rates of flow into the aquifers can begin with the assumption that typical provider demands in the summer are sized for triple that year round rate, or 105 mgd in the aggregate. This leaves an average of up to 70 mgd in off-peak months. If off-peak demands are met with imported water making wells available for recharge, this rate could be returned to the aquifers for a total ranging between 25,000 and 45,000 af per year. Specific rates and durations of flows would be examined in detail during the feasibility review process. Generally, the initial projections affirm the potential viability of this concept.

The potential of a conjunctive use approach to integrating local non-tributary groundwater supplies and storage with interruptible surface water supplies from the South Platte and West Slope drainage basins was outlined in the State of Colorado's Metro Water Supply Investigation, Final Report (Colorado Water Conservation Board, 1998). Subsequently, the South Metro Water Supply Study (prepared for the South Metro Water Supply Study Board in February, 2004) carried the concept further through a joint effort between the Douglas County Water Resources Authority, Denver Water, and the Colorado River Conservation District.

Conjunctive Use is characterized as "The coordinated use of surface and groundwater resources and facilities to produce a larger, more reliable and cost effective combined water supply that could be generated from either source alone." (SMWSSB, page 1-12)

Centennial Water and Sanitation District in Douglas County has operated a conjunctive use plan since the early 1980's and an aquifer storage and recovery project with Denver Basin deep wells since 1992. The technology and recharge operation have met no significant impediments after over 20 years of and over 14,000 acre-feet of treated potable water back into the aquifers. South Metro WISE participants are currently evaluating the feasibility of expanding this operation with future WISE deliveries.

To date, many water suppliers along the Front Range who rely on deep bedrock aquifers have not been able to capture wet year supplies. With the addition of WISE Project infrastructure and Parker's Rueter-Hess Reservoir, the South Metro Area will soon have necessary infrastructure for a large-scale conjunctive use program. A large-scale conjunctive use plan could bring renewable surface water into the South Metro Region by utilizing:

- Interruptible raw water deliveries from existing transbasin diversion systems, Flaming Gorge, or another new transbasin project.
- Deliveries only in wet periods of low-risk hydrologic and administrative conditions.
- Distribution to existing deep aquifer wells equipped for recharge.
- Dry period use of reliable, drought-proof deep aquifer production to provide water when surface yields are not available.
- No increase of risk to yields controlled by partner entities.
- Protecting the integrity of the Colorado River Compact under a working cooperative operation.

This concept has been investigated and described for over 15 years (if not longer) by key parties who would potentially be involved and is now worthy of serious consideration by the IBCC and the CWCB through Colorado's Water Plan. This concept is recommended for further investigation and a role as a practical and viable means to manage Colorado's statewide water resources. It should be vigorously pursued in subsequent stages of the Colorado Water Plan.