SPECIAL PUBLICATION SJ2010-SP4

COST ESTIMATING AND ECONOMIC CRITERIA FOR 2010 DISTRICT WATER SUPPLY PLAN

Water Supply Solutions, Inc.

Technical Memorandum

To: James T. Gross, P.G.
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From: Ronald L. Wycoff, P.E., D.WRE

Date: September 21, 2009

Re: Cost Estimating and Economic Criteria for 2010 District Water Supply Plan

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Background and Purpose

This technical memorandum (TM) provides cost definitions and cost estimating and economic criteria to be used in the development of regional planning level water supply facilities cost estimates for the 2010 District Water Supply Plan (DWSP). The definitions and criteria are consistent with those employed in 2005 and previous DWSPs but incorporate certain modifications and updates as appropriate for application to the 2010 DWSP.

This TM provides a consistent set of definitions and criteria for the development of comparable planning level life cycle cost estimates for all water supply alternatives. They will be applied to all cost estimates and economic comparisons developed as part of the 2010 DWSP to ensure that all cost estimates are directly comparable.

Definitions

The following definitions will be used in the 2010 DWSP project and should be adhered to when applicable.

Construction Cost

Construction cost is the total amount expected to be paid to a qualified contractor to build the required facilities at peak design capacity.

Non-construction Capital Cost
Non-construction capital cost is an allowance for the following elements associated with the constructed facilities:

- Facilities planning
- Engineering design
- Permitting
- Services during construction
- Administration

Land Cost
The market value of the land required to implement the water supply alternative.

Land Acquisition Cost
The estimated cost of acquiring the required land, exclusive of the land cost.

Total Capital Cost
Total capital cost is the sum of construction cost, non-construction capital cost, land cost, and land acquisition cost.

Operation and Maintenance Cost
The estimated annual cost of operating and maintaining the water supply facility when operated at average day capacity.

Equivalent Annual Cost
Total annual life cycle cost of the water supply alternative based on service life and time value of money criteria established herein. Equivalent Annual Cost accounts for:

- Total Capital Cost
- Operations and Maintenance (O&M) costs (with the facility operating at average day capacity)
- Time value of money (annual interest rate)
- Facilities service life

Unit Production Cost
Equivalent Annual Cost divided by total annual water production. The Unit Production Cost will be expressed in terms of dollars per 1,000 gallons.

Criteria

Cost estimating and economic criteria are guidelines for estimating costs associated with water supply options.

Peak Flow Ratio

Construction and capital cost of water supply facilities will be based on maximum installed capacity designed to accommodate peak or maximum daily flow (MDF) requirements. O&M costs and total annual water production are based on the average daily flow (ADF) produced. The peak flow ratio (MDF/ADF) for an individual water supply system depends on the demand characteristics of the service area.

For public supply systems the required peak flow ratio is generally at least 1.25 for large systems and can be greater than 2.0 for small systems. However, the total system peaking requirement may or may not apply to individual components of an integrated water supply system.

In DWSP applications it is anticipated that some alternative water supply options, including brackish surface water or seawater, may be designed to provide a relatively steady state base flow, to one or more demand centers, with peak demand (MDF) satisfied by the traditional in-place fresh groundwater water supply facilities. In this case, the design peak ratio for the alternative water supply facilities may approach 1.0. Therefore, it is important to understand and establish the role of a particular alternative water supply option prior to determining the required peak flow ratio.

For water supply options where the service area peak flow ratio is known and satisfaction of peak demands is required, the known value should be used. In cases where satisfaction of peak demands is required and a service area specific value is unknown, a peak ratio of 1.5 should be used. This default peak flow ratio (1.5) is the default value applied in previous DWSPs.

For base load (steady state) water supply options a peaking factor of 1.05 should be applied. In the steady state application, the design peak capacity of the facility is only nominally (i. e. 5%) larger than the steady state demand.

It is noted that the *facilities utilization factor*, a parameter sometimes reported in water supply facilities planning and design applications, is equal to the inverse of the peak flow ratio. The utilization factor represents the ratio of average production to total installed capacity. For example, a utilization factor of 0.67 is equivalent to a peak flow ratio of 1.5 and indicates that the facility is normally operated at 67% of maximum day capacity.

Cost Index

Engineering News Record (ENR) publishes a Construction Cost Index (CCI) that can be used to adjust the cost basis of a given construction project for past and future times. The ENRCCI is based on the following construction items:

- 200 hours of common labor at the 20-city average of common labor rates
- 2,500 pounds of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996

- 1.128 tons of Portland cement at the 20-city price
- 1,088 board-ft of 2 x 4 lumber at the 20-city price

Cost estimates, for the 2010 DWSP, will be expressed in estimated mid-year 2010 dollars. Because much of the 2010 DWSP cost estimating work will be completed prior to or early in 2010, projection of the current ENRCCI (July 2009 ENRCCI = 8566) to mid-year 2010 ENRCCI is required.

Figure 1 shows the recent monthly historic ENRCCI data, as well as monthly projections through June 2010. The projected ENRCCI for June 2010 is approximately 8834. This projection is based on the observed mean monthly growth rate (0.280% per month) for the 30-month period from February 2007 through July 2009.

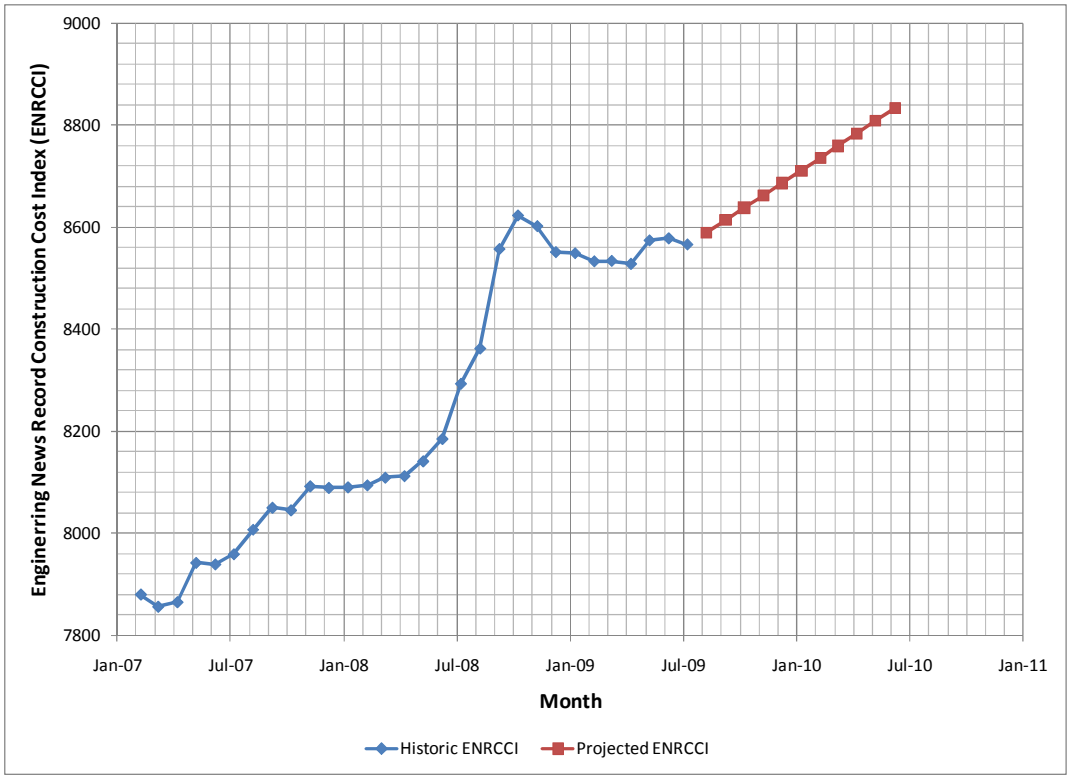

Figure 1 ENRCCI Projection to mid-year 2010.

The cost basis for the 2005 DWSP was mid-year 2005 with a corresponding ENRCCI value of 7420. The projected mid-year 2010 ENRCCI value of 8834 represents an increase in the cost basis of about 19 percent.

Construction and Operation and Maintenance Cost

SJRWMD sponsored development of a comprehensive collection of water supply and reuse system component costing information for application in development of opinion of probable cost (OPC) for water supply project options, including those developed for the DWSP. The work addressed planning level construction and operation and maintenance (O&M) costs and was conducted by Black and Veatch, Inc. The final report is available for download on the SJRWMD web site as Special Publication SJ2008-SP10.

> Black and Veatch, Inc. 2008. *Engineering Assistance in Updating Information on Water Supply and Reuse System Component Costs* Prepared for St. Johns River Water Management District, Palatka FL. Special Publication SJ2008-SP10.

The cost basis for the water supply systems included in the Black and Veatch report is third quarter 2007. At that time, the Engineering News Record Construction Cost Index (ENRCCI) was 8005.

Cost data for individual water supply system components, extracted from the Black and Veatch final report, were used to develop construction and O&M cost equations and unit costs for application in the SJRWMD water supply planning process. All complete water supply system components, such as water treatment plants and booster pumping stations, include provisions for industry standard system redundancy.

The construction cost equations also include mark-ups for construction contingencies, overhead and profit and mobilization/demobilization, as recommended in the Black and Veatch final report and therefore represent total construction OPC.

The cost equations are summarized in a Technical Memorandum (TM), prepared by Water Supply Solutions, Inc, available for download on the SJRWMD web site as Special Publication SJ2008-SP13.

> Water Supply Solutions, Inc. 2008 *Water Supply Facilities Cost Equations for Application to Alternative Water Supply Projects Investigations and Regional Water Supply Planning* Prepared for St. Johns River Water Management District, Palatka FL. Special Publication SJ2008-SP13.

The construction and O&M guidance provided by the Black and Veatch report and by the Water Supply Solutions TM provide planning level estimates. These planning level estimates (OPCs) are not based on site specific detail. In general, such estimates are considered to be accurate within +/-35% (Black and Veatch, 2008).

If, for a given water supply project option, more detailed construction and/or O&M costing information is available the more detailed information should be used.

Non-construction Capital Cost

Non-construction capital cost will equal 20% of the planning level estimated construction cost. The non-construction capital cost provides for project planning, engineering design, permitting, services during construction and administration.

The 2010 DWSP non-construction capital cost allowance (20%), for the above items, is the same value used in the 2000 and 2005 DWSP. However, in previous water supply plans the non-construction capital cost allowance also included construction contingency which is now included as a component of the construction cost.

Land Cost

Unit land cost ($/acre) for each parcel type are based upon general land use classifications as supplied by SJRWMD land acquisition staff (Raymond Burton, personal communication, 2009).

General land use classifications include residential, commercial, industrial and timberlands/rural. The mid-range value for typical unit costs for these land classifications are reported in Table 1. If actual site-specific land values are available for a given parcel and water supply option, then the site-specific value should be used in lieu of these typical regional values.

Table 1. Typical Unit Land Costs for Regional Water Supply Planning

Land Use	Unit Cost -- $/acre
Residential	$48,000
Commercial	$165,000
Industrial	$69,000
Timberlands/Rural	$12,500

Unit costs ($/ft^2) for pipeline right-of-way (ROW) corridors vary based on the land use classification. Table 2 presents unit costs for pipeline ROW corridors located within SJRWMD to be applied in the 2010 DWSP. These ROW unit costs are the same as those used in the 2005 DWSP.

Table 2. Typical Unit Pipeline ROW Corridor Costs for Regional Water Supply Planning

Land Use	Unit Cost -- $/ft. sq.
Urban (Commercial and Industrial)	$3.00
Suburban (Residential)	$1.00
Rural	$0.50

Recommended minimum ROW width requirements, as a function of pipe diameter, are reported in both Black and Veatch (2008) and Water Supply Solutions (2008).

Land Acquisition Cost

Land acquisition cost estimates will vary as a function of condemnation requirements, as follows:

- 12% of land value for known non-condemnation parcels
- 25% of land value for known condemnation parcels
- 18% of land value where condemnation status is unknown

These land acquisition cost percentages are the same as those applied in the 2005 DWSP.

In most cases, at the conceptual regional planning level of analysis, it is anticipated that condemnation status will be unknown and therefore the 18% value will apply.

Interest Rate

For the 2010 DWSP, the interest rate to be used in all economic analysis calculations will be the current (FY09) federal water resources planning rate. This rate, set annually by the US Bureau of Reclamation for use by all federal agencies, is based on US Treasury bond rates. Although it is adjusted annually, it cannot be changed by more than ¼ percent in any single year. The current (FY09) federal water resources planning rate is 4.625 % per annum (Richard M. Vinton, personnel communication, 2009). This value will be used in all economic calculations for the 2010 DWSP.

The federal water resources planning discount rate has been the interest rate, or time value of money, criteria applied in previous DWSPs. In the 2005 DWSP the FY04 rate of 5.625% was applied.

Economic Life of Facilities

The economic service life of facilities is unchanged from the criteria used in the 2000 and 2005 DWSPs. Table 3 provides the economic service life, in years, based on

water supply system component type. These values will be used in all annual cost calculations.

In all cases, land is considered a permanent resource and therefore has an infinite service life.

Table 3. Economic Service Life of Water Supply System Components

Component Type	Service Life -- years
Water Conveyance Structures (pipelines, collection and transmission systems)	40
Other Structures (buildings, tankage, site improvements, etc.)	35
Wells	30
Process and Auxiliary Equipment (treatment equipment, pumps motors, mechanical equipment, etc.)	20
Reverse Osmosis Membranes	5

The non-construction capital costs associated with a given project, or major project component, will also be distributed in proportion to expected service life of the project. For example, if a given project, or major project component, has an economic service life of 20 years then the non-construction capital cost for that project, or major project component, also has an economic service life of 20 years.

Summary

Generally, definitions and cost estimating and economic criteria applied to the 2010 DWSP will be the same as those applied to the 2005 DWSP, updated as appropriate. The main updates are the cost basis, the unit land cost and the interest rate.

In addition, planning level construction and O&M cost estimating information applicable to the SJRWMD planning area, developed by Black and Veatch (2008) are incorporated into these criteria by reference.

References

Black and Veatch, Inc. 2008. *Engineering Assistance in Updating Information on Water Supply and Reuse System Component Costs* Prepared for St. Johns River Water Management District, Palatka FL. Special Publication SJ2008-SP10.

Burton, Raymond B., Director, Division of Land Acquisition, SJRWMD, personal communication, 2009

Vinton, Richard M., Manager, Economics and Resource Planning Group U.S. Bureau of Reclamation, personnel communication, 2009

Water Supply Solutions, Inc. 2008 *Water Supply Facilities Cost Equations for Application to Alternative Water Supply Projects Investigations and Regional Water Supply Planning* Prepared for St. Johns River Water Management District, Palatka FL. Special Publication SJ2008-SP13.