

Summary Preliminary Engineering Report
Water Supply Source and Transmission System
Eagle Water Alternative for the City of Raleigh

Prepared for Eagle Water Company, LLC

May 10, 2010
(Updated June 9, 2010)



Eric G. Lappala, P.E.



Eagle Resources, P.A.
P.O. Box 11189
215 West Moore Street
Southport, NC 28461

Contents

Executive Summary 1
Introduction..... 2
Water Supply Source 2
Water Quality 3
Transmission System 3
Cost Estimate for Transmission Line..... 4
Legal Considerations 6
Economic Advantages to Raleigh..... 7
Environmental Advantages to Raleigh 7
Summary 8
Attachment 1 Spreadsheet Cost Model Used for Construction Cost Estimates. 11

Figures

Figure 1.--Chloride and Pressure Head in 2009 in the Vicinity of PCS in the Upper Castle Hayne Aquifer..... 9
Figure 2.--Eagle Water Transmission Line from PCS to Falls Lake..... 10

Tables

Table 1.--Number and Length of Features Crossed by Transmission Route..... 5
Table 2.--Summary Cost Estimate for Transmission Line from PCS to Falls Lake..... 6

Executive Summary

The City of Raleigh has an opportunity to solve its long term water resource needs by pursuing an innovative, environmentally conscious regional water reuse and recovery project.

How?

Reuse water from a source in Aurora, NC would be pumped to Raleigh and added as a supplement to Fall's Lake. This water would then be used at least once by Raleigh users and then subsequently discharged to the Neuse where it would enhance Neuse base flow, and be used again by Raleigh's downstream municipal neighbors.

Source and Quantity Up to 58 MGD of high quality water can be made available to the Triangle from the PCS Phosphate mine (PCS) in Aurora, NC. This high quality non-process groundwater is currently pumped by PCS to depressurize their mine floor and is subsequently discharged into the brackish Pamlico River.

PCS Phosphate has agreed to make this high quality water available for public use by local governments and has entered in to a contract with Eagle Water Company as the private entity that has been formed and permitted to market and develop this innovative environmentally conscious public-private water resource recovery project.

Environmental Use of this source would provide an additional beneficial use of the groundwater beyond the benefit of depressurization needed for PCS mining operations.

After consumption in the Triangle, discharge of the resulting effluent to the Neuse would increase its base flow and in-stream values, thereby benefiting Raleigh's downstream neighbors who rely upon the Neuse as a public water supply source.

The NC DWR has assured Eagle Water that Interbasin transfer regulations as written apply only to surface water and that an Interbasin transfer permit would not be required

Cost and Timing Supporting data to this summary show that this water reuse project can be developed at comparable cost and in less time than other sources by utilizing existing power easements to minimize the costs of the 132 mile long pipeline and by minimizing upgrade costs to the EM Johnson Treatment Plant to treat impaired water in Falls Reservoir.

Introduction

Eagle Water Company, LLC (Eagle) was established to develop bulk supplies of high quality groundwater near areas of the southeastern US that are experiencing high economic growth and development. These areas area also have experienced a series of moderate to severe drought conditions during the past several years. Eagle’s first water supply project has secured exclusive access to 58 million gallons per day of high-quality groundwater from a source in eastern North Carolina. This updated report includes minor adjustments in the cost model used to prepare the construction cost estimates. The complete excel spreadsheet model is being provided as an attachment to this report.

Water Supply Source

Eagle's groundwater source is water that is withdrawn from the artesian Upper Castle Hayne Aquifer which is one of the most prolific sources of groundwater along the entire east coast of the United States. Eagle’s exclusive access to this water supply is provided by the following three documents: 1) Contract between Eagle and PCS Phosphate (PCS); 2)Eagle Capacity Use Area Permit Number 1033 with the North Carolina Division of Water Resources (NCDWR); and 3) Capacity Use Area Permit Number 1003 held by PCS.

PCS operates a surface mining operation in Beaufort County, NC to extract phosphate-bearing sands that occur in the sediments overlying the Castle Hayne Aquifer. An integral part of the PCS mining operation is the use of multiple high capacity wells to relieve the artesian pressure in the Castle Hayne Aquifer on the floor of the areas being mined. Capacity Use Area Permit 1003 held by PCS allows water to be withdrawn from the Castle Hayne Aquifer at rates up to 78 million gallons per day (MGD). This water has been discharged to the Pamlico River since mining operations began in 1965.

The longevity of PCS operations are provided by the following summary from the SEC Form 10K statement for 2009¹:

“The reserves set forth above for Aurora would permit mining to continue at annual production rates for about 34 years. This mine life is based on an average annual production rate of approximately 3.66 million tonnes of 30.66% concentrate over the three-year period ended December 31, 2009. If mineral deposits covered by the new permit at Aurora and now reclassified as resources are included, the mine life at Aurora would be about 54 years at such rate of production. Mineral resources that are not mineral reserves do not have demonstrated economic viability.”

Eagle's contract with PCS and Eagle's Capacity Use Area Permit 1130 allow Eagle to sell up to 58 million gallons per day of water withdrawn by PCS to public or private entities.

1

<http://www.sec.gov/Archives/edgar/data/855931/000095012310017967/o57897e10vk.htm#106>

In the event that PCS does not withdraw sufficient water for Eagle to meet its contracted commitments to its customers, these documents allow Eagle to withdraw the difference from wells on the PCS property.

The Castle Hayne Aquifer that is the source of Eagle's contracted and permitted water source is recharged continuously by deep percolation of rainfall over an area lying west of PCS. Because the recharge area is higher than the mine area and because thick and impermeable clays are present between the top of the aquifer and the bottom of the mine, the artesian pressure levels at the mine would be above the land surface if the depressurization system was not pumping. It is a condition of the PCS Permit that pumping may not lower this pressure surface to less than 20 feet above the top of the aquifer. The pumping at PCS has resulted in a steady-state (not changing over time) cone of depression in the artesian pressure surface that extends approximately 20 miles radially from the mine and this extent has not changed materially since initiation of pumping began in 1965.

Water Quality

Based upon water sampling and analysis by PCS and Eagle, groundwater withdrawn from the Castle Hayne by the depressurization system meets primary drinking water standards. However because of the limestone and dolomite that comprise the rock matrix of the aquifer, hardness as CaCO₃ ranges from approximately 100 mg/l to 325 mg/l. There is no health-based drinking water standard for hardness. Based upon annual reports by PCS and its predecessors to the NCDWR, pumping of the depressurization system from 1965 to the present has not materially altered the water quality of the aquifer and has not induced the landward migration of saline water. Averaged chloride levels in water withdrawn by the depressurization wells in 2009 were less than 165 mg/l. Eagle proposes to deliver up to 58 MGD of untreated water to Raleigh's principal water supply reservoir at Falls Lake in Wake County. Using this delivery method eliminates the need to soften the water prior to delivery, and hence reduces the overall cost of the delivered water.

Figure 1 shows the most recent water level and chloride data for the area surrounding PCS. This map has been prepared using information provided by PCS² and NCDWR³. Click on the following [link](#) to view this information in Google Earth. If Google Earth is not loaded on your computer it can be freely downloaded from:

<http://earth.google.com/download-earth.html>

Transmission System

Eagle has conducted extensive technical and economic analyses to determine the least-likely cost route to bring 58 MGD from the source at PCS to Falls Lake. This route is

² Leggette, Brashears, and Graham, 2009 annual summary of Ground-Water Levels and Chloride-Concentration Trends in the Area of Aurora, North Carolina. Prepared for PCS Phosphate Aurora Division.

³ <http://www.ncwater.org/wrisars/>,
http://www.ncwater.org/Data_and_Modeling/Ground_Water_Databases/,
http://www.ncwater.org/Education_and_Technical_Assistance/Ground_Water/

132 miles long and is shown in Figure 2. Construction cost and time estimates were minimized by utilizing power transmission corridors for all but 30 miles of the 132-mile transmission line. The remaining 30 miles of the transmission corridor are contiguous in Pitt County to circumvent the Greenville urban area. (Click on this [link](#) to view Transmission Route map in Google Earth)

The use of power transmission lines avoids the time and associated costs of using transportation corridors. Preliminary discussions with Progress Energy indicate that they would be interested in working with Eagle to further assess the way to optimize the use of such corridors for the water transmission line.

The transmission route analysis included costs for crossing all streams, wetlands, roads, highways, and railroads along the route shown in Figure 1. It was further assumed that all these features would be crossed by using horizontal drilling beneath them.

The transmission line would be either a single 48-inch HDPE pipeline or parallel 30-inch HDPE lines. We have included the cost estimate for both of these alternatives. Using parallel smaller lines increases the construction cost, but provides for redundancy in the system to accommodate repairs and maintenance.

Three pumping stations would be required along the recommended route to overcome the 240-foot elevation difference between the source at PCS and Falls Lake in Wake County as well as the frictional resistance of the transmission line(s). These stations would require a total of 40,000 horsepower for the two 30-inch lines and a total of 24,000 horsepower for the single 48-inch line.

Cost Estimate for Transmission Line

The cost estimate for the transmission line has been computed using a pipeline construction cost model developed by Kings County Washington that uses unit pricing data current for that area in 2008⁴. The unit costs were then adjusted to 2010 costs using the Engineering News Record Construction Cost Index (ENR-CCI) and for location using the average of Atlanta, GA, and Birmingham, AL to be representative of Raleigh. We have assumed that the transmission lines will be HDPE pipe which provides the most cost-effective combination of material and installation costs. The cost estimate for the pumping stations is based upon nationwide data in the 2001 U.S. Environmental Protection Agency Infrastructure Needs Study⁵

The recommended pipeline route follows power transmission lines for approximately 100 miles of the total length of 132 miles and will cross wetlands, streams, roads, and railroads as shown in Table 1.

⁴ <http://www.kingcounty.gov/environment/wastewater/CSI/Tabula.aspx>

⁵ U.S. environmental Protection Agency, 2001. 1999 Drinking Water Infrastructure Needs Survey Modeling the Cost of Infrastructure EPA 816-R-01-005.

Crossing Type	Number	Distance Miles
Wetlands with Streams	119	17.46
Streams without Wetlands	120	6.82
Roads	133	10.15
Railroads	8	0.61

Table 1.--Number and Length of Features Crossed by Transmission Route.

Although Eagle's source water will not require softening if it is piped directly into Falls Lake, we have included the estimated costs for a nano-filtration treatment plant located at the source as a separate line item in the cost estimate tables.

The estimated cost for both the dual and single pipeline system to Raleigh is shown in Table 2. We have also included in this table the estimate made by CORPUD provided by Kenny Waldrup to Eric Lappala on March 10, 2010 for comparison. Note that the CORPUD estimate includes the cost estimate for a treatment system for a typical surface water source rather than the more limited softening system that is appropriate for Eagle's groundwater source if treatment is selected.

The complete Microsoft Excel™ spreadsheet cost model used to develop Tables 1 and 2 is included as an attachment to this report.

Item	Parallel 30 Inch Pipes	Single 48-Inch Pipe	CORPUD Estimate
Source Gathering Line System from PCS Wells	12,680,367	12,680,367	12,680,367 (1)
Pipeline Materials	148,023,748	184,331,460	374,267,604
Pipeline Construction (Trenching)	151,618,407	155,901,413	
Wetland Crossings	138,037,246	70,162,001	
Stream Crossings	53,901,332	27,419,675	
Road Crossings	80,253,094	40,810,852	
Railroad Crossings	4,791,229	2,436,487	
Pumping Station Construction	31,467,158	36,069,534	
Total Construction Estimate	620,772,582	529,811,789	415,947,971
Contingency @ 10%	62,077,258	52,981,179	41,594,797
Total Construction Estimate with Contingency	682,849,840	582,792,968	457,542,768
Easements	2,095,899	2,095,899	2,095,899 (1)
Engineering & Services During Construction	37,246,355	31,788,707	24,956,878 (2)
Legal Services	12,415,452	10,596,236	8,318,959 (2)
Environmental Assessments	6,207,726	5,298,118	4,159,480 (2)
Total Easement and Services	57,965,431	49,778,960	39,531,216
Water Right Acquisition	30,000,000	30,000,000	50,000,000
Total Project Investment Cost Estimate	770,815,271	662,571,927	547,073,984
Treatment Plant Option	74,198,636	74,198,636	250,000,000
Total With Treatment Plant	845,013,907	736,770,563	797,073,984
Notes:			
(1) Cost estimate not provided by CORPUD, Same value used as for Eagle estimate.			
(2) Cost estimate not provided by CORPUD, same percentage of construction estimate used as for Eagle estimate			

Table 2.--Summary Cost Estimate for Transmission Line from PCS to Falls Lake.

Legal Considerations

Eagle’s water source is located in the Tar-Pamlico surface water basin and the delivery point at Falls Lake is in the Neuse surface water basin. The water that Eagle Water is proposing to transport after withdrawal is excluded or exempted from the definition of “surface waters” contained in N.C. Gen. Stat. § 143-215.22G(2), since the water is “derived by pumping from groundwater.” The regulation and certification requirements of N.C. Gen. Stat. § 143-215.22I apply only to “surface waters,” as can be seen by the reference in subsection (k) to “surface waters,” as well as the other provisions of that section and Part 2A of Article 21 of Chapter 143 of the General Statutes.

The North Carolina Division of Water Resources has assured us that because of the above, a permit is not required regarding the transfer of water to other river basins.

Economic Advantages to Raleigh

Acquisition of the Eagle Water source would provide a long term water supply to both sustain the estimated growth of the metropolitan Raleigh and to attract new industries to the area that require a dependable source of water for manufacturing. The Eagle Water source has the following significant advantage to Raleigh over other potential sources to meet these needs:

- Wellfield development and permitting time and cost to Raleigh are zero;
- Known and monitored wellfield O&M costs are documented and monitored'
- PCS and/or Eagle are responsible for construction and maintenance of wellfield and source infrastructure; and
- PCS has preferred power costs for wellfield pumping from Progress Energy as well as its own power station; and
- Significant engineering and planning studies to select the transmission route and design have been completed.
- Placement of Eagle Water in Falls Lake would provide significant dilution of constituents in Raleigh's source water and hence avoid costs to upgrade the E.M. Johnson Water Treatment Plant.

As an example of the economic advantage to Raleigh, we have completed a comparison of the Eagle Water construction costs per gallon of delivered water using available information for the Little River Reservoir in Eastern Wake County. Using the published value of 13.7 MGD for the projected safe yield of the Little River Reservoir⁶ and projected construction costs \$250,000,000 (it is our understanding that this cost does not include the sunk costs for the land purchased so far), the Little River Reservoir construction cost/gallon is \$18.25. The construction cost /gallon from Table 2 for untreated water from Aurora to Falls Lake is between \$11.42 and \$13.29 depending upon if a single 48-inch or dual 30-inch lines are used. The construction cost/gallon for water treated using a nano-filtration plant located at PCS from Table 2 is between \$12.70 and \$14.57.

Environmental Advantages to Raleigh

One of the recently developed tools for integrating environmental considerations in river basin planning and management is the concept of Environmental Flows. Simply defined, Environmental Flows are those necessary to provide for a health and sustainable flow and water quality regimes in a river basin while considering existing and future uses of the water resources in the basin.

⁶ <http://www.littleriverreservoir.com/index.html>

North Carolina is currently in the process of developing a comprehensive water allocation process that will include these considerations. The NCDWR has developed comprehensive water management models for both the Neuse River system and Falls Lake as planning and management tools and bills are under consideration by the North Carolina General Assembly that would formalize the requirements for such planning and management.

Acquisition of the Eagle water source would not only be a benefit to Raleigh, but would provide the following enhancements to the environmental flows of the Neuse River Basin:

- Water imported from Eagle would be reused at least once by Raleigh, and by each downstream user of surface water from the Neuse River;
- Downstream water systems depending on Neuse surface waters will be provided with a more dependable supply;
- Impaired Water Quality in the Neuse River Basin would be reduced by the addition of water from the Eagle Source, including Falls Lake and the Neuse River;
- The addition of water from the Eagle Source would provide enhanced flow of the Neuse River during low flow periods; and
- The addition of water from the Eagle source would make up for water withdrawn from the Neuse River downstream from Raleigh that is not returned by wastewater treatment plants treating water delivered from such withdrawals.

Summary

Eagle Water Company is interested in working with the City of Raleigh to utilize up to 58 million gallons per day from our sustainable groundwater source of high quality drinking water. This water source can be made available to Raleigh in less time than the development and construction of other sources and at what we believe are comparable or lower costs.

In addition to the benefits to Raleigh from the utilization of this water source, significant economic benefits would be realized by downstream users of the Neuse River, and significant environmental benefits would accrue by providing a more stable and reliable flow in the Neuse during low flow periods.

Figure 1.--Chloride and Pressure Head in 2009 in the Vicinity of PCS in the Upper Castle Hayne Aquifer.

Figure 2.--Eagle Water Transmission Line from PCS to Falls Lake.

**Attachment 1 Spreadsheet Cost Model Used for
Construction Cost Estimates.**