

**ORANGE WATER AND SEWER AUTHORITY  
SERVICE CONTRACT  
ORANGE COUNTY, NORTH CAROLINA**

**THIS CONTRACT** is made, and entered into this the 27th day of April, 2012, by and between **ORANGE WATER AND SEWER AUTHORITY**, a public corporate subdivision of the State of North Carolina, (hereinafter referred to as "**OWASA**"), party of the first part and **Hazen and Sawyer, PC**, (hereinafter referred to as "**CONTRACTOR**"), party of the second part.

**1. SERVICES TO BE PROVIDED AND AGREED CHARGES**

**CONTRACTOR** hereby agrees to provide services and/or materials under this contract (hereinafter referred to collectively as "**SERVICES**") pursuant to the provisions and specifications identified in "Attachment 1". **OWASA** hereby agrees to pay for services at per unit prices contained in Attachment 1 and pursuant to paragraph "3" of this contract. Attachment 1 is hereby incorporated by reference as if fully set out herein.

**2. TERM OF CONTRACT**

The term of this **CONTRACT** for services and supplies is from May 1, 2012 to October 31, 2012.

**3. PAYMENT TO CONTRACTOR**

**CONTRACTOR** shall receive from **OWASA** a sum not to exceed **\$42,000** as full compensation for the provision of services. **OWASA** agrees to pay at the rates specified for services, satisfactorily performed, in accordance with this contract, and the letter proposal, both of which are contained in Attachment 1. Unless otherwise specified, **CONTRACTOR** shall submit an itemized invoice to **OWASA** by the end of the month during which services are performed. Payment will be processed promptly upon receipt and approval of the invoice by **OWASA**.

**4. INDEPENDENT CONTRACTOR**

**OWASA** and **CONTRACTOR** agree that **CONTRACTOR** is an independent contractor and shall not represent itself as an agent or employee of **OWASA** for any purpose in the performance of **CONTRACTOR'S** duties under this contract. Accordingly, **CONTRACTOR** shall be responsible for payment of all federal, state and local taxes as well as business license fees arising out of **CONTRACTOR'S** activities in accordance with this contract. For purposes of this contract taxes shall include, but not be limited to, Federal and State Income, Social Security and Unemployment Insurance taxes.

**CONTRACTOR**, as an independent contractor, shall perform said services in a professional manner, with reasonable care, and in accordance with the standards and practices applicable in the industry, including those recommended or required by professional organizations and licensing agencies of the industry.

**5. INSURANCE AND INDEMNITY**

To the fullest extent permitted by laws and regulations, the **CONTRACTOR** shall indemnify and hold harmless **OWASA** and its officials, agents, and employees from and against all claims, damages, losses, and expenses, direct, indirect, or consequential (including but not limited to fees and charges of engineers or architects, attorneys, and other professionals and costs related to court action or arbitration) arising out of or resulting from the performance of this Contract or the actions of the **CONTRACTOR** or its officials, employees, or contractors under this Contract or under the contracts entered into by the **CONTRACTOR** in connection with this Contract. This indemnification shall survive the termination of this agreement.

In addition, **CONTRACTOR** shall maintain, at its expense, the following minimum insurance coverage:

Bodily Injury Liability.....	\$1,000,000
Property Damage Liability .....	\$100,000
Combined Single Limit Bodily Injury and Property Damage .....	\$1,000,000
Workers' Compensation for employer's liability and bodily injury by disease for each employee.....	\$100,000
Workers' Compensation for disease for each employee policy limit .....	\$500,000

**CONTRACTOR** shall have **OWASA** named as an additional insured on **CONTRACTOR'S** insurance policy.

**CONTRACTOR** shall furnish a certificate of insurance from an insurance company, licensed to do business in the State of North Carolina and acceptable to **OWASA** verifying the existence of any insurance coverage required by **OWASA**. The certificate will provide for sixty (60) days advance notice in the event of termination or cancellation of coverage.

**6. HEALTH AND SAFETY**

**CONTRACTOR** shall be responsible for initiating, maintaining, supervising and assuring compliance with all safety precautions and programs required by law or regulation, including but not limited to OSHA and all other regulatory agencies, while providing services under this contract.

**7. NON-DISCRIMINATION IN EMPLOYMENT**

**CONTRACTOR** shall not discriminate against any employee or applicant for employment because of age, sex, race, creed, national origin, or disability. **CONTRACTOR** shall take affirmative action to ensure that applicants are employed and that employees are treated fairly and legally during employment with regard to their age, sex, race, creed, national origin, or disability. In the event **CONTRACTOR** is determined by the final order of an appropriate agency or court to be in violation of any non-discrimination provision of federal, state or local law or this provision, this Contract may be canceled, terminated or suspended in whole or in part by **OWASA**, and **CONTRACTOR** may be declared ineligible for further **OWASA** contracts.

**8. GOVERNING LAW**

This contract shall be governed by and in accordance with the laws of the State of North Carolina. All actions relating in any way to this contract shall be brought in the General Court of Justice in the County of Orange and the State of North Carolina.

**9. TERMINATION OF AGREEMENT**

This contract is subject to the availability of funds to purchase the specified services and may be terminated at any time during the term upon thirty (30) days notice if such funds become unavailable.

This contract may be terminated, for cause, by the non-breaching party notifying the breaching party of a substantial failure to perform in accordance with the provisions of this contract and if the failure is not corrected within ten (10) days of the receipt of the notification. Upon such termination, the parties shall be entitled to such additional rights and remedies as may be allowed by relevant law.

Termination of this agreement, either with or without cause, shall not form the basis of any claim for loss of anticipated profits by either party.

**10. SUCCESSORS AND ASSIGNS**

**CONTRACTOR** shall not assign its interest in this contract without the written consent of **OWASA**. **CONTRACTOR** has no authority to enter into contracts on behalf of **OWASA**.

**11. COMPLIANCE WITH LAWS.**

**CONTRACTOR** represents that it is in compliance with all Federal, State, and local laws, regulations or orders, as amended or supplemented. The implementation of this contract will be carried out in strict compliance with all Federal, State, or local laws regarding discrimination in employment.

**12. NOTICES**

All notices which may be required by this contract or any rule of law shall be effective when received by certified mail sent to the following addresses:

**OWASA  
PURCHASING DEPARTMENT  
400 JONES FERRY ROAD  
CARRBORO, NORTH CAROLINA, 27510**

**HAZEN AND SAWYER, P.C.  
4011 WESTCHASE BLVD.  
RALEIGH, NC 27607**

**13. AUDIT RIGHTS**

For all services being provided under this contract, **OWASA** shall have the right to inspect, examine, and make copies of any and all books, accounts, invoices, records and other writings relating to the performance of said services. Audits shall take place at times and locations mutually agreed upon by both parties, although **CONTRACTOR** must make the materials to be audited available within one (1) week of the request for them.

**14. OWASA NOT RESPONSIBLE FOR EXPENSES**

**OWASA** shall not be liable to **CONTRACTOR** for any expenses paid or incurred by **CONTRACTOR** unless otherwise agreed in writing.

**15. EQUIPMENT**

**CONTRACTOR** shall supply, at its sole expense, all equipment, tools, materials, and/or supplies required to provide contracted services unless otherwise agreed in writing.

**16. ENTIRE AGREEMENT**

This Agreement and the attached document labeled "Attachment 1" shall constitute the entire understanding between **OWASA** and **CONTRACTOR**. There are no written or unwritten understandings or agreements between the parties, except as expressed herein, nor have any representations not contained herein been made to induce the execution of this Agreement. This Agreement shall supersede all prior understandings and agreements relating to the subject matter hereof and may be amended only by written mutual agreement of the parties.

17. HEADINGS.

The subject headings of the paragraphs are included for purposes of convenience only and shall not affect the construction or interpretation of any of its provisions. This agreement shall be deemed to have been drafted by both parties and no purposes of interpretation shall be made to the contrary.

**OWASA**

**CONTRACTOR**



Title: OWASA Planning Director



Title: Vice President

HAZEN AND SAWYER, PC

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.



Title: Director of Finance and Customer Service



Hazen and Sawyer, P.C.  
4011 WestChase Blvd.  
Raleigh, NC 27607  
919-833-7152  
Fax: 919-833-1828

APRIL 24, 2012

Mr. Ed Holland  
Orange Water and Sewer Authority  
Director of Planning  
400 Jones Ferry Road  
PO Box 366  
Carrboro, NC 27510-2001

Re: Update of Cary-Durham-OWASA Risk Model  
H&S Job No: 30164

Dear Mr. Holland:

Hazen and Sawyer is pleased to provide professional engineering consulting services, as requested, to assist OWASA in updating the Cary-Durham-OWASA Risk Model. As you know, Reed Palmer and Casey Caldwell developed this computer model under the direction of Professor Greg Characklis at UNC between 2005 and 2008, and Reed revised some of the model settings during risk analyses performed for OWASA in 2009.

Scope of Services

The services to be performed under this assignment are as follows:

1. Perform the following model updates:
  - a. Streamflow database through 2011.
  - b. Current Cary-OWASA-Durham demand projections and monthly demand profiles, as furnished by OWASA.
  - c. Use a CAWTF capacity of 56 mgd in the 2016 and 2025 scenarios and 64 mgd in the 2035 scenario.
  - d. Incorporate 3 mgd minimum WTP constraint on OWASA's reservoir drawdowns during periods when OWASA purchases water from Cary/Durham.
2. Run all scenarios using demand and capacity projections for 2016, 2025, and 2035
3. Model with and without peak season (May-Sept) purchase blackouts.
4. Assume 10 mgd (rather than 11 mgd) Cary→Durham transfer capacity year-round.
5. Run the model for the 1990-2011 period with actual streamflow data as well as for the following two extreme drought scenarios:

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- a. 12-month continuation of the 2001-02 drought (as recently estimated in OWASA's "what if the drought had continued" graphs; and
- b. 30% reduction of all 1990-2011 streamflows.

6. Run the model under 3 purchase trigger options:

- a. No purchases
- b. Durham and OWASA request purchases at their respective 2% risk levels (OWASA's Stage 1 trigger)
- c. Durham and OWASA request purchases at their respective 10% risk levels (OWASA's Stage 2 trigger)

7. Incorporate estimated demand reductions achieved through mandatory conservation in all model runs.

The above modeling effort will involve a total of 54 separate model runs, as follows:

- Three (3) streamflow scenarios (actual 1990-2011, 30% reduction, and 2001-02 drought extended)
- Three (3) purchase trigger scenarios (no purchases, purchase at 2% risk, and purchase at 10% risk)
- Three (3) simulation dates (2016, 2025, and 2035)
- Two (2) seasonal purchase options (May-Sept only, except for "emergency drawdown conditions, and no seasonal purchase restrictions)
- Total number of scenarios:  $3 \times 3 \times 3 \times 2 = 54$

### Information to be Furnished by OWASA

In addition to providing the water demand projections and monthly demand profiles specified above under paragraph I.b, OWASA will confirm the following modeling assumptions:

1. 14.5 percent process loss during treatment of Jordan Lake water at the CAWTP.
2. Water transfers (sales) from Durham to Chatham County will be assumed to be offset by the use of Durham's Teer Quarry, which has not been part of the existing model and will not be added at this time.
3. Demand reductions under OWASA and Durham Water Shortage Response Plans if different from those submitted to DWR.

## Deliverables

Hazen and Sawyer will deliver to OWASA via email a brief descriptive report, of up to three pages, summarizing the findings of the above analyses, plus one-page summary tables of results for Cary, Durham, and OWASA, respectively. The report and summary tables will be similar to those provided to OWASA in Hazen and Sawyer's June 2009 OWASA Long-Term Water Supply Plan Update, Interim Water Purchases report (copy attached). Hazen and Sawyer will also deliver to OWASA, in Excel format, time-series computer outputs of predicted reservoir storage levels (% full) under the various scenarios.

## Compensation

OWASA will compensate Hazen and Sawyer for all services under this contract. Total billings will not exceed the total amount stated below under Basis of Compensation without the written permission of OWASA.

An estimate of Hazen and Sawyer's hourly effort for this assignment is attached hereto. Hazen and Sawyer will invoice each hour of actual service on the basis of a direct charge at current employee payroll cost—including base salary, vacations, sick leave, holidays, payroll taxes, and insurance and pension plan—times the multiplier stated below under Basis of Compensation.

Mileage costs directly chargeable to this project shall be billed at the CONSULTANT's standard employee reimbursement rate, as established by the Internal Revenue Service from time to time. Other incidental project expenses, if any, will be billed at actual cost; invoices shall include copies of receipts.

### BASIS OF COMPENSATION

<u>Service Category</u>	<u>Salary Cost Multiplier</u>	<u>Cost Ceiling</u>	<u>Lump Sum</u>
All services and deliverables	2.33	\$42,000	N/A

Total amount payable under this Agreement: \$42,000

## Schedule

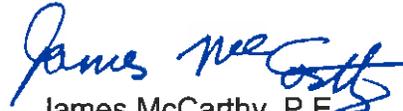
It is understood that the schedule for this assignment may be affected by factors outside of the control of Hazen and Sawyer, including necessary coordination with and input from OWASA and other stakeholders. To the fullest extent of work under our control, we will endeavor to complete the tasks outlined hereinbefore within approximately twenty (20) weeks of receipt of authorization to proceed from OWASA.

# HAZEN AND SAWYER

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It is our pleasure to assist OWASA on this important planning assignment. We look forward to receiving a Purchase Order authorizing this work.

Very truly yours,  
**HAZEN AND SAWYER, P.C.**

A handwritten signature in blue ink that reads "James McCarthy". The signature is fluid and cursive, with the last name "McCarthy" being more prominent.

James McCarthy, P.E.  
Senior Associate

Enclosures

Cc: Mr. R. Palmer  
Mr. D.L Cordell

**OWASA Risk Modeling in Support of Purchase Contract Negotiations with Cary and Durham  
April 20, 2011 (54 Model Run) Revision**

Task Description	Contingency Percentage	Model Set-ups	Model Executions	Coding, debugging and runtime Hours	Extraction and Formatting Hours	Report Preparation	Total Hours
Review existing state of OWASA model		0	various tests	4	0	0	4
Model Parameter Adjustment		0	various tests	12	0	4	16
Re-tool demand patterns to set monthly patterns		0	various tests	16	0	1	17
Add WSRP for Durham and OWASA		0	various tests	32	0	4	36
Execute 54 Model Runs		54	54	48	60	40	148
Contingency for coding and analysis	25%	-	-	28	15	12	55
Update Hydrologic database		0	various tests	16			16
Contingency for Hydrologic Update	100%		-	16			16
Review	5%						15
<b>Total</b>				<b>172</b>	<b>75</b>	<b>61</b>	<b>323</b>
<b>Not to Exceed Fee @</b>	<b>\$130/hr</b>						<b>\$42,000</b>

Coding tasks

Update streamflow database

Make sure we have appropriate risk charts for Durham and OWASA for Demands requested

Cary process loss to 14.5%

Put in 3 mgd JFR WTP low treatment limit

Winter transfer & year-round transfer coding

Retool demand patterns to use repeating monthly demand factors

Streamflow reduction

Jordan Lake Allocation limits (confirm)

Create modified inflow pattern for 2001-2003 for 3rd set of runs

Add WSRP stages and demand reduction for Durham and OWASA (OWASA has different triggers for each demand level)

## OWASA Long-Term Water Supply Plan Update Interim Water Purchases

Tables 1 and 2 summarize the results of modeling for 11 additional interim water purchase scenarios by OWASA from Cary/Apex (see also attached June 09 Modeling Summary.xls excel file). These results are based on the three-utility computer model developed by Reed Palmer and Casey Caldwell under the direction of Professor Greg Characklis at UNC between 2005 and 2008. The report entitled “Optimizing Water Supplies through Inter-Utility Transfer Agreements,” Caldwell and Characklis, July 8, 2008, includes a detailed discussion of this model. The following is a list of key model settings, assumptions, and changes:

- The model functions on a weekly time-step and was executed using an 18-year hydrologic sequence from 1990 – 2007.
- The risk threshold charts for OWASA used to trigger water purchases were developed using an 82-year hydrologic sequence from 1926 – 2007.
- Cary’s WTP capacity is not limiting for these scenarios. Cary’s demand was kept low while the water treatment capacity was increased to create a situation in which OWASA always had the opportunity to purchase up to 7 MGD when the 2.5% risk tolerance threshold was exceeded.
- The simulation of Durham’s water system was effectively turned off and as a result there are no situations where the two utilities (OWASA and Durham) would be forced to share either excess water treatment plant capacity at Cary or pipeline capacity between Cary and Durham.
- Water purchases were available year-round.
- The model feature that limits OWASA’s total withdrawals from Jordan Lake to no more than 1825 MG (365 days x 5 MGD) over any consecutive 52-week period was retained for the first set of results presented. This limit is consistent with OWASA’s 5% water supply allocation on Jordan Lake. This constraint was limiting in simulation year 13 (corresponding to hydrologic year 2002) for scenarios in which demand was greater than or equal to 12 MGD and risk tolerance was 2.5%. With a pipeline capacity limitation of 7 MGD, it takes at least 33 weeks for this constraint to become limiting. Because the drought of 2007 was only severe for the second half of the calendar year, this constraint did not become limiting. However, it is reasonable to expect that it could have become limiting in the high demand scenarios during the first quarter of hydrologic 2008, before the drought broke, if the model were extended to include 2008 hydrology.
- The results for purchase volume by year also indicate any year in which withdrawals exceeded 746 MG within any six month period. These cases are indicated because 746 MG is the volume equivalent of 5% of Jordan Lake’s water supply storage and when withdrawal rates exceed 5 MGD, as they do in these scenarios, there is a possibility that OWASA’s Jordan Lake water supply pool could be exhausted prior to withdrawing 1825 MG over 52 weeks. In lieu of integrating a model of the Jordan Lake water supply pool into this model, this indicator merely serves as an indicator that significant withdrawals are occurring and possibly at a rate that is more rapid than the water supply pool is being recharged.

- EXAM
- A minor change to the model incorporated for these simulations was to eliminate purchases made when OWASA's reservoir system is nearly full (within 50 MG). This only made a difference at the 14 MGD demand scenario, since this was the only scenario in the 9-14 MGD range for which the risk of failure exceeds 2.5% over a significant portion of the year even when the reservoirs are full. In other words, this is the only scenario in which the purchase algorithm would request a transfer when the reservoirs were almost full. Prior to this change, the model would still disallow purchases when the reservoirs were completely full at the end of the previous week, but not if they were any amount below full. This change simply puts a small buffer into that algorithm because it seems reasonable to assume that OWASA would not choose to purchase water from elsewhere when its own reservoirs are close to spill levels. This change would have had a negligible impact on the results presented in February for the 14 MGD scenario because the seasonal purchase conditions disallowed transfers in summer months (when relative risk tends to be higher), and the competition for capacity with Durham resulted in lower transfer rates.
  - Based on 2005-2007 plant data, it is assumed that process loss is equivalent to 12% of finished water production at the Cary/Apex facility. This loss is included in each utility's tally of withdrawals from Jordan Lake. For example, if OWASA were to use all of its 1825 MG allocation during a 52 week period, it would have received a treated water total of 1629 MG.
  - Tables 3 and 4 contain results for simulations with the same assumptions as those described above with the exception that withdrawals are not restricted based on OWASA's Jordan Lake allocation.

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Table 1: Summary of Results

OWASA Interim Water Purchases Modeling Summary									
Reduced Streamflow Scenarios (25% Reduction in Hydrologic History 1990 - 2007)									
9 MGD			11.5 MGD			14 MGD			
	No Purchases	2.5%		No Purchases	2.5%		No Purchases	2.5%	
System Reliability	100.00%	100.00%	100.00%	99.57%	100.00%	100.00%	97.54%	99.68%	99.68%
Failures (Weeks below 20% storage)	0	0	0	4	0	0	23	3	3
Lowest Storage Level	39.0%	39.0%	39.0%	13.1%	29.5%	25.7%	0.0%	16.4%	15.9%
Percentage of Years with Purchases	N/A	6%	0%	N/A	22%	11%	N/A	100%	72%
Average Purchase Weeks Per Year	N/A	0.1	0.0	N/A	2.3	1.7	N/A	14.9	6.1
Maximum Purchase Weeks in any year	N/A	1	0	N/A	25	23	N/A	31	35
Average Purchase Volume per Year (MG)	N/A	1	0	N/A	73	50	N/A	532	215
Purchase Volume in Max Year (MG)	N/A	17	0	N/A	906	786	N/A	1268	1404
% Purchases limited to <5MGD by WTP capacity	N/A	0.0%	0.0%	N/A	9.3%	12.9%	N/A	0.7%	3.6%
% Purchases limited to <5MGD by infrastructure competition	N/A	100.0%	0.0%	N/A	41.9%	35.5%	N/A	25.7%	35.5%
Total Interruptions as % of requests	N/A	100.0%	0.0%	N/A	51.2%	48.4%	N/A	26.5%	39.1%

OWASA Interim Water Purchases Modeling Summary									
Reduced Streamflow Scenarios (25% Reduction in Hydrologic History 1990 - 2007)									
9 MGD			11.5 MGD			14 MGD			
	No Purchases	2.5%		No Purchases	2.5%		No Purchases	2.5%	
System Reliability	100.00%	100.00%	100.00%	98.16%	99.89%	99.36%	95.97%	98.29%	98.18%
Failures (Weeks below 20% storage)	0	0	0	17	1	6	46	16	17
Lowest Storage Level	23.1%	32.5%	32.1%	0.0%	16.3%	14.7%	0.0%	0.0%	0.0%
Percentage of Years with Purchases	N/A	6%	9%	N/A	39%	17%	N/A	100%	78%
Average Purchase Weeks Per Year	N/A	0.8	0.6	N/A	4.3	2.9	N/A	20.5	10.1
Maximum Purchase Weeks in any year	N/A	15	14	N/A	38	31	N/A	40	33
Average Purchase Volume per Year (MG)	N/A	20	19	N/A	124	98	N/A	744	362
Purchase Volume in Max Year (MG)	N/A	359	308	N/A	1269	1041	N/A	1579	1298
% Purchases limited to <5MGD by WTP capacity	N/A	35.3%	50.0%	N/A	5.1%	7.4%	N/A	0.8%	1.7%
% Purchases limited to <5MGD by infrastructure competition	N/A	11.8%	12.9%	N/A	43.6%	33.3%	N/A	23.2%	35.6%
Total Interruptions as % of requests	N/A	47.1%	32.3%	N/A	48.7%	40.7%	N/A	24.0%	37.2%

**Modeling Assumptions**

Transfer Capacity to OWASA is pipeline limited to 7 MGD

Transfer Capacity to Durham is pipeline limited to 11 MGD

Durham Risk Chart is based on internal demand (not including Chatham obligation)

Both utilities assume same level of risk tolerance in each simulation (i.e. if OWASA is tolerant to 5% risk of failure within 52 weeks, Durham operates at 5% tolerance as w Cary treatment capacity is 40 mgd, 64 mgd, and 72 mgd corresponding to Demand Targets Years of 2011, 2024, and 2030

Risk charts were produced with 12 month (52 week) forward outlook

The reduced streamflow scenarios were run with unrevised risk charts (i.e. produced with actual 82 year hydrologic record, not reduced by 25%)

When both Durham and OWASA request transfers, capacity is shared as described in Casey's work

Use of Purchases was limited to 1825 MG and 3650 MG on a 52 week running average, for OWASA and Durham respectively

Assumed a 15% buffer to account for weekly model and process loss for treated water Jordan Lake

Assumed a 12% process loss for the utility's withdrawal limit from Jordan Lake (withdrawals are 12% higher than treated water production)