ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

TO: **Natural Resources/Technical Systems Committee**
Alan Rimer (Chair)
Terri Buckner
Will Raymond
William Stott
Amy Witsil
Gordon Merklein (*ex officio*)

THROUGH: Ed Kerwin

FROM: Mason Crum

DATE: December 13, 2011

SUBJECT: **December 16, 2011 Natural Resources/Technical Systems (NRTS) Committee Meeting**

The NRTS Committee will meet Friday, December 16, 2011, at 8:00 A.M. in the OWASA Boardroom. Main topics will be:

1. December 8, 2011 Discussion with Mr. Tom Fransen, Deputy Director, NC Division of Water Resources: The Committee will discuss information gained from Mr. Fransen's discussion with the Board.

Tom Fransen's presentation and a transcript of his remarks, answers to questions, etc. are available on the OWASA website at:
http://www.owasa.org/client_resources/about/minutes/2011/fransen%20transcript%2012-08-2011.pdf

Committee Action Requested: Discuss what impact, if any, Mr. Fransen's presentation and remarks may imply for OWASA's efforts to retain and gain access to its Jordan Lake allocation.

2. Proposed Drought Response Operating Protocol (DROP): On December 8, 2011, the OWASA Board received and discussed the staff's initial DROP proposal, which includes recommended trigger levels for water supply advisories, water shortage stages, and recommended water purchases. The proposal was initially reviewed by the NRTS Committee on November 29, 2011. On December 8, the Board provided comments on the draft and referred it back to the Committee for continued review.

Committee Action Requested:

- Further discussion of, and comments and guidance on, the draft DROP (Attachment 1). This draft has been revised to reflect Board comments received to date and is provided in a "Track Changes" mode. Per questions and comments from the Board, staff has also prepared a background brief about the technical basis for the DROP proposal. That overview also reviews the advantages and disadvantages of several alternative approaches to the trigger thresholds (Attachment 2).

- Review and modify, if desired, staff's draft PowerPoint presentation with which Gordon Merklein may present the proposed DROP to the Chapel Hill Town Council's OWASA Committee in a meeting to be scheduled in January 2012 (Attachment 3). This or a similar presentation might also be presented to members of the Carrboro Board of Aldermen if desired.

3. Other Business

4. Next Meeting?

We look forward to seeing you at 8:00 A.M. on December 16th.

Mason Crum, P.E.
Director of Engineering and Planning

Enclosures

cc: Board of Directors
Robert Epting

DROUGHT RESPONSE OPERATING PROTOCOL
DRAFT – DECEMBER 13, 2011

Purpose

To describe the procedures and criteria that OWASA will use for making water supply and demand management decisions during an extended drought, including provisions for public notice of potential Water Supply Shortage declarations, water purchases, and/or use of OWASA's Jordan Lake water supply storage allocation. The protocol outlined below will provide OWASA's customers and the overall Carrboro-Chapel Hill-UNC community with timely notice of a potential water shortage due to extended drought and the opportunity to reduce water consumption in order to avoid and/or minimize the need for future water use restrictions.

Protocol

1. OWASA shall monitor OWASA's water supply and demand conditions, short-and long-term weather forecasts, regional water supply conditions, and other factors which may affect the risk of a water supply shortage due to drought.

2. The attached graph, which is a modified version of the 8 mgd "trigger table"* in OWASA's State-approved *Water Shortage Response Plan*, shall guide OWASA's drought response decisions. Any drought-related Water Supply Shortage declaration at storage levels above those indicated on the trigger table, and/or any decision to purchase water from a neighboring jurisdiction during a drought, shall be made only with approval by the OWASA Board of Directors.

   When total water storage in OWASA's reservoirs drops to within 5 percent of the Stage 1 trigger (represented by ~~to~~ the black dashed line on the attached graph), OWASA ~~will~~ shall initiate outreach activities to inform customers and other stakeholders that Stage 1 Water Use Restrictions will likely go into effect if current drought conditions continue or worsen. OWASA will emphasize the importance of prudent ~~using~~ water ~~wisely~~ use and voluntary conservation by all customers, and will review the restrictions and surcharges which go into effect.

3. When total water in storage declines to the purple block on the attached graph, OWASA shall declare a Stage 1 ~~Water Use Restrictions~~ Shortage and inform its customer community that it may be necessary to begin purchasing water from Durham and/or Cary if drought and demand conditions continue. *(Note: under the mutual aid agreements currently in place, and with only a Level II Jordan Lake allocation, OWASA may obtain water from Durham or Cary only if it is available from Durham's or Cary's own supplies. To assure that it can obtain supplemental water when OWASA determines that it needs it, OWASA's existing Jordan Lake allocation must be converted to Level I, and the agreements with Durham and Cary must be modified.)*

4. When total water in storage declines 5 percent below the Stage 1 trigger level (as represented by ~~to~~ the red dashed line inside the purple block on the attached graph), OWASA may begin purchasing water with the objective of avoiding more severe (Stage 2, Stage 3, or Emergency) restrictions. ~~Purchases (and r~~Restrictions~~) will~~ shall, and purchases may, continue until storage returns to levels above the red dashed line inside the purple block.

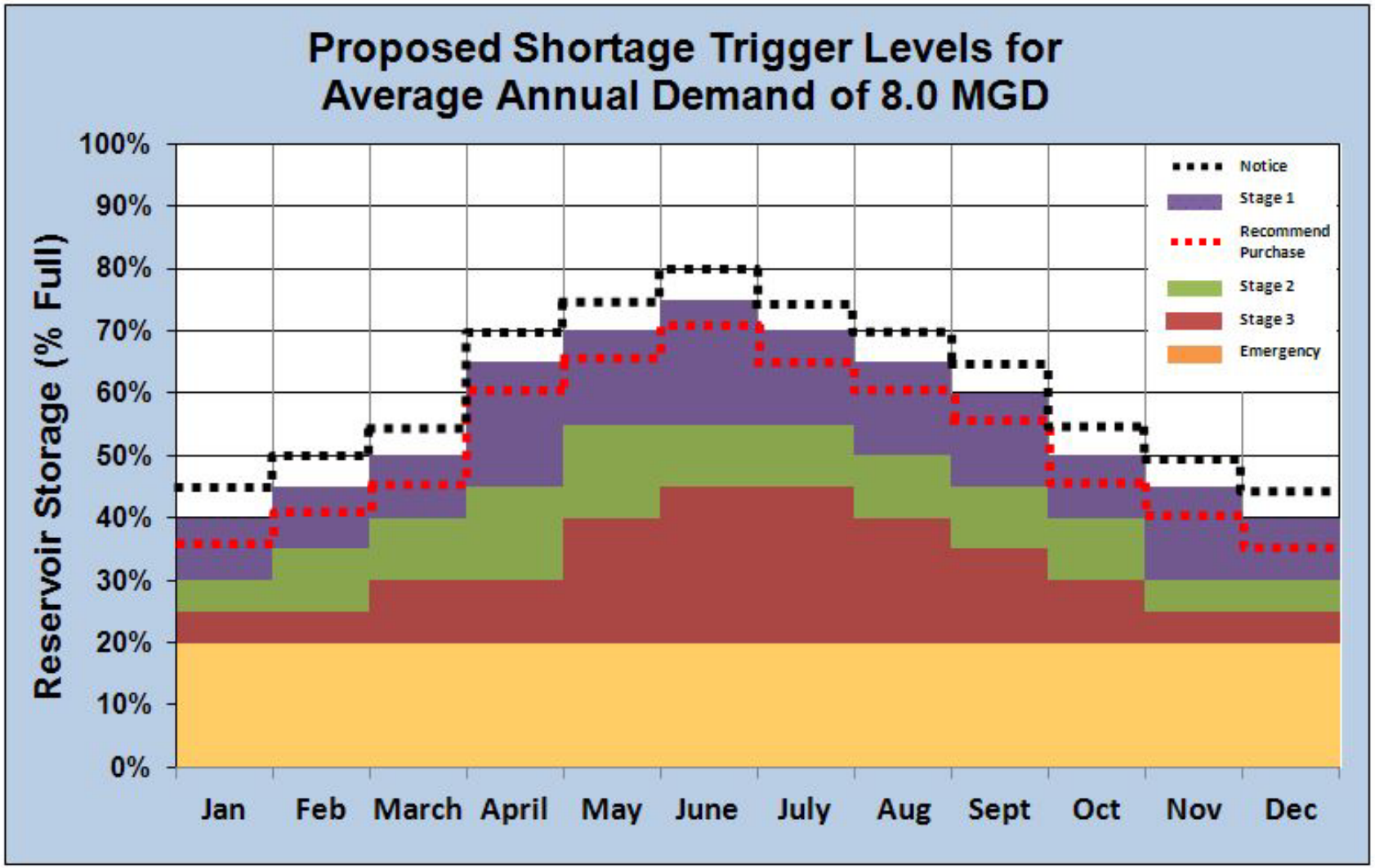
* The attached graph is based on an average daily water demand of 8 mgd. Trigger levels for greater or lesser demands will be correspondingly higher or lower than those depicted for an 8 mgd demand.

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Restrictions ~~(but not purchases) will~~ shall continue until storage returns to the "rescission" levels specified in OWASA's State-approved *Water Supply Shortage Response Plan*.

5. OWASA ~~will~~ shall provide regular updates to its customer community and to local governments throughout the drought. The Board and staff ~~will~~ shall be available to attend ~~any~~ meetings of the local governments to provide information about supply and demand conditions~~,~~ and to provide any information or answer ~~any~~ questions elected officials may have.

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Proposed Shortage Trigger Levels for
Average Annual Demand of 8.0 MGD
Reservoir Storage (% Full)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec
Notice
Stage 1
Recommend Purchase
Stage 2
Stage 3
Emergency

Attachment #2

DRAFT DROUGHT RESPONSE OPERATING PROTOCOL: AN OVERVIEW OF THE TECHNICAL BASIS AND REVIEW OF SOME ALTERNATIVE APPROACHES
December 13, 2011

Background

OWASA staff has prepared a proposed Drought Response Operating Protocol (DROP) which includes recommended trigger levels for water supply advisories, implementation of water use restrictions for various stages of drought, and recommended water purchases. The proposal was initially reviewed by the OWASA Board of Directors' Natural Resources and Technical Systems (NRTS) Committee on November 29, 2011 and then by the full Board on December 8, 2011. At that time, the Board provided questions and comments and referred the draft back to the NRTS Committee for further review. Staff was requested to provide additional information, including a discussion of alternative trigger thresholds for the proposed DROP.

Following is an overview of the technical approach that was used to develop the draft proposal, and a brief discussion of the pros and cons of several alternative approaches to the proposed trigger levels.

Technical Approach

OWASA's Water Conservation Standards (adopted in October 2009), State-approved *Water Shortage Response Plan* (WSRP, adopted in November 2010), and the corresponding local ordinances of Carrboro, Chapel Hill, and Orange County, are all "*guided primarily by the risk that OWASA's water supplies will decline to 20 percent or less of total storage capacity with the next 12-month period. A Stage One Water Shortage declaration will generally correspond to a two percent (or greater) risk that reservoir levels will decline to 20 percent or less of total storage capacity within the next 12 months . . .*"

The draft DROP incorporates this same approach to drought risk. Staff of the NC Division of Water Resources Water Supply Planning Branch, which is responsible for overseeing and approving local water shortage response plans, has stated that OWASA's existing triggers may be the most technically advanced approach to water shortage response planning of any local water utility in North Carolina. DWR staff has also cautioned us not to establish overly complicated WSRP triggers that are difficult for decision-makers and customers to understand.

OWASA's risk levels are based on the Reservoir Optimization Model (OWASA-ROM) developed by Hazen and Sawyer, our water supply consultants. Among other functions, OWASA-ROM estimates the total reservoir storage volumes ("percent full") that correspond to probabilities (risk levels) of approximately 2 percent (2 years out 85), 10 percent (8 years in 85) and 20% (16 years in 85) that our reservoir storage will be drawn down to 20% or less during the following 12 months assuming a range of annual average-day demand levels and assuming that no other actions are taken to reduce demands or augment the supply (e.g., additional

conservation, water purchases, or emergency measures, such as pumping Haw River water to the Cane Creek Reservoir).

Risk estimates from the model were provided in 52 weekly time-step increments, as reflected in the graphs in Appendix III.B and Figure 4 on page 9 of OWASA's *2010 Long-Range Water Supply Plan*.

The OWASA-ROM risk estimates were confirmed by regional water supply optimization modeling work completed by Dr. Greg Characklis at UNC-Chapel Hill, which evaluated the potential use of supplemental water purchases during extended droughts. The Characklis model simulated the initiation of OWASA water purchases when at risk levels of 2 percent, which was recommended to ensure that demands could be met without drawing our reservoir storage below 20 percent and to reduce the financial hardship and inconvenience to OWASA customers of severe water shortage restrictions.

In accordance with NC Session Law 2008-143, our WSRP specifies the supply and demand conditions ("triggers") that represent the ***latest mandatory point*** at which the various Water Shortage Stages specified in our Water Conservation Standards ***must be implemented***. OWASA (and other water providers) have the authority to implement their Water Shortage stages earlier – but no later – than specified in their State-approved WSRPs.

OWASA's WSRP trigger tables and the draft DROP are based on monthly (rather than weekly) storage levels and therefore represent a certain amount of "smoothing" of the original analyses. The trigger thresholds were established at storage increments of 5 percent (175 million gallons), which corresponds to more than three weeks of water supply at an average-day demand of 8 million gallons per day. This time/storage increment for our trigger levels was selected to provide OWASA customers a reasonable amount of time to respond to conservation measures so that the next (more severe) Water Shortage stage could be deferred or avoided.

What Has Changed in the Rationale That Led to the Current Stage 1 Trigger Line?

When the triggers in our WSRP were approved in November 2010, they reflected the recommendations of the Board-approved *2010 Long-Range Water Supply Plan* that we begin purchasing supplemental water before implementing Stage 1 Water Shortage restrictions and surcharges during an extended drought.

The revised Stage 1 trigger levels in the recently proposed DROP reflect the Board's October, 20, 2011 policy resolution that: "*OWASA shall only purchase water from other communities or obtain water from its Jordan Lake storage allocation during periods of increased drought risk after it has declared a Stage 1 Water Supply Shortage per OWASA's State-approved Water Shortage Response Plan and OWASA's Water Conservation Standards as incorporated therein.*"

The 5 percent increase to the Stage 1 triggers is needed to compensate for the additional risk that would otherwise be incurred by delaying water purchases to storage volumes below the 2 percent risk levels of the original Characklis modeling work.

What are the Pros and Cons of Moving the Trigger Line for a Stage 1 Shortage? *(This is the configuration of the current DROP proposal)*

Moving the Stage 1 trigger threshold to an earlier action point (higher remaining storage on the graph) than shown in our adopted WSRP has the following pros and cons:

Pros: Results in earlier implementation of water use restrictions, thereby reducing the rate of reservoir drawdown and our vulnerability to an extended drought. The issuance of a Water Supply Advisory in advance of the Stage 1 threshold can provide OWASA customers earlier notice of the potential need for water use restrictions, related drought surcharges, and other measures, thereby providing additional time to adjust to and plan for anticipated drought response measures.

Cons: If the drought ends sooner rather than later, early implementation of the Stage 1 water use restrictions and related drought surcharge rates (and the associated inconvenience and financial burden to customers) may subsequently be considered "premature" or unnecessary.

Moving the Stage 1 trigger to a later action point (lower remaining storage on the graph) would have the following pros and cons:

Pros: Would reduce the immediate inconvenience and financial burden to customers, especially if the drought ends sooner rather than later. Near-term water and sewer commodity charge revenues would not be affected as soon as they would be otherwise.

Cons: Continued drought conditions could require the implementation of more severe water use restrictions and associated rate surcharges than would otherwise have been required if restrictions and (lesser) surcharges had been implemented earlier. Deferring reductions in customer demands could accelerate the need for implementing costly emergency measures (e.g., the Haw River option) if the drought continues and no other options are available.

What are the Pros and Cons of Moving the Trigger Line for Recommended Purchases?

Moving the Recommended Purchase trigger to an earlier action point (higher remaining storage on the graph) would have the following pros and cons:

Pros: Would reduce the risk of subsequent water supply shortage and allow the deferral or avoidance of more severe water restrictions and rate surcharges. Would reduce the near-term inconvenience and financial hardship to customers, and reduce the potential need for costly emergency water supply augmentation measures (such as the Haw River option) if the drought continues. Water purchases, in combination with less severe restrictions and surcharges, will likely have less effect on longer-term customer demand patterns and future operating revenues, thus providing greater stability in water and sewer commodity charge revenues, than more severe restrictions.

Cons: Would increase immediate water operating costs (to pay for purchased water) and increase our dependence on other water sources. If the drought ends sooner rather than later, such purchases (and related expenses) may subsequently considered to have been unnecessary.

Moving the Recommended Purchase trigger line to a later action point (lower remaining storage on the graph) would have the following pros and cons:

Pros: If purchases are deferred and the drought ends sooner rather than later, we would have reduced or avoided the costs of purchasing water.

Cons: We would have incurred a greater risk of water supply shortage and the attendant consequences as discussed for moving the Stage 1 trigger to a later action point.

How Would This Analysis Change if OWASA has a Level 1 Allocation?

The current DROP proposal assumes that we would have immediate access (as needed) to our Jordan Lake allocation. Without immediate access, our actual response timetable during a future drought would need to reflect the additional time expected to convert our Level II allocation to Level 1.

Should We Have Different Policies for Purchasing Water from Other Communities Versus Having Our Jordan Lake Water Treated and Delivered to OWASA?

There is no need for different policies and trigger thresholds for different types of purchases. The statistical basis for the risks and benefits of purchasing supplemental water is the same, regardless of where that water comes from. Staff believes that the immediate, assured access to our Jordan Lake water allocation during future droughts will provide a much greater level of certainty – and therefore less risk – than if OWASA is dependent on water purchases "if and when available" from another community.

It has been suggested that we should consider purchasing water from another party that has its own Level 1 Jordan Lake water storage allocation. That might enable us to defer the capital cost associated with having our own Level 1 allocation; however, it is likely that the water purchase costs we incur will reflect the supplier's operating and capital costs (including a portion of their Level 1 allocation costs, as applicable).

Consistent with the terms of our existing Mutual Aid agreements with Durham and Cary, those parties are required to provide us water during a drought only if it "originates from [OWASA's] water supply allocation from Jordan Lake…"

Closing

No water utility industry standard or guidance documents are available for determining when to implement water shortage stages, associated restrictions, rate surcharges, supplemental water purchases, emergency options, etc.

The proposed Drought Operating Response Protocol reflects different assumptions than were made during the development of our 2010 WSRP. The revised DROP proposal is intended to further reduce our community's risk of shortage during future extended droughts, now that we have established a policy not to initiate water purchases or use our Jordan Lake allocation until after implanting Stage 1 of our WSRP and Water Conservation Standards.

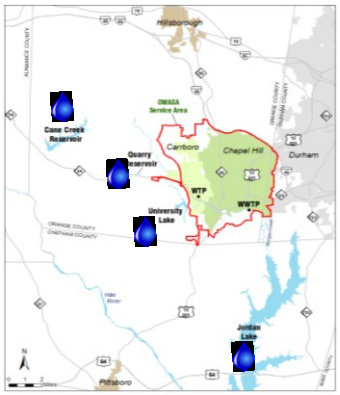
(December 13, 2011)

Attachment 3

Slide 1

Ensuring a Sustainable Water Supply
for Carrboro, Chapel Hill and UNC

OWASA

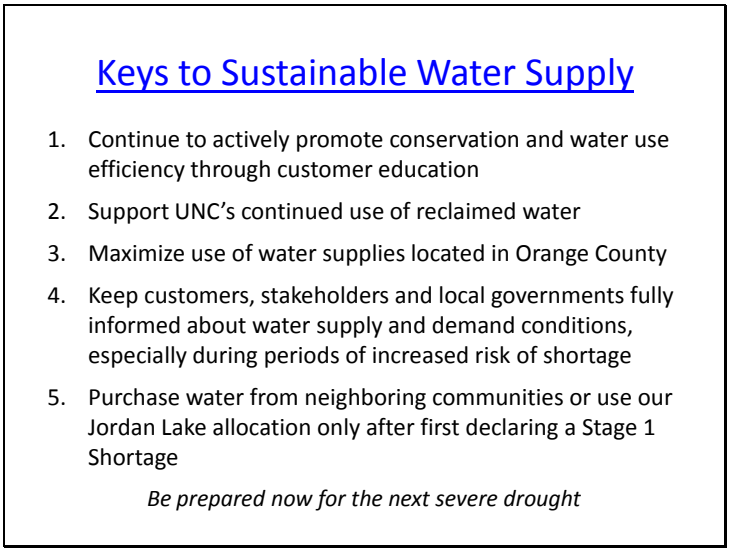


- We've had a number of meetings and communications with Chapel Hill and Carrboro about this matter since our December 2010 request to amend the Water and Sewer Management, Planning and Boundary Agreement regarding the use of our Jordan Lake water supply allocation.

- We have very carefully considered the feedback we have received from the Towns and as a result we have amended our planned use of Jordan Lake.

- The purpose of this presentation to very briefly explain our plan to ensure a sustainable and cost-effective water supply for our customers, today and in the future.

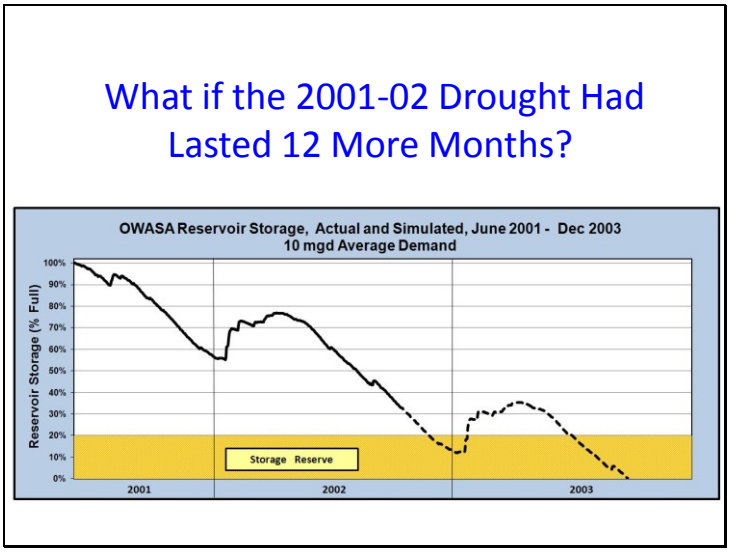
Slide 2



- Here are the key elements to ensure a sustainable water supply for the folks we serve.
- OWASA will continue to be a leader in promoting conservation and in educating our customers about the important short- and long-term benefits of using water wisely.
- We will continue to support UNC's use of reclaimed water as a key element in our overall water management strategy.
- Proactive conservation and use of reclaimed water will allow us to make the best use of our Orange County supplies.
- We will keep our customers, stakeholders and local governments fully informed about water supply and demand conditions, especially when we face an increased risk of a shortage due to extended drought or other unforeseen conditions.
- As a matter of policy and practice, we will only use our Jordan Lake allocation during periods of increased drought risk only after first providing our customers and community notice of an increased risk of a shortage and subsequently declaring a Stage 1 Shortage.
- It is very important that we prepare now for the next severe drought.

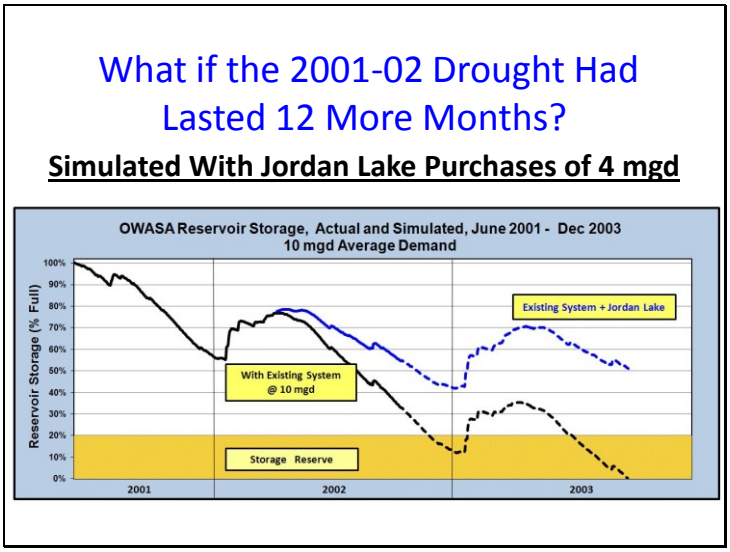
Attachment 3

Slide 3



- As you know, our water supply remains vulnerable to severe drought.
- The worst drought in the past 85 years, for which we have stream flow data, occurred in 2001-02.
- This graph shows OWASA's actual reservoir levels during 2001-2002, and projects what those levels would have been if that drought had not ended abruptly in October 2002.
- As you can see in this simulation, our supply would have dropped to 20% of capacity before the end of November. Without purchasing water, this would have triggered our "worst case" emergency plan to install a temporary above-ground piping system to pump Haw River water to the Cane Creek reservoir.
- Without this *(going to Haw River)* drastic, costly, and unpalatable option, we would have run out of water completely within the next 12 months. This scenario assumes an average demand of 10 million gallons per day – which is where we expect to be before the expanded Quarry reservoir is available in the mid-2030s.

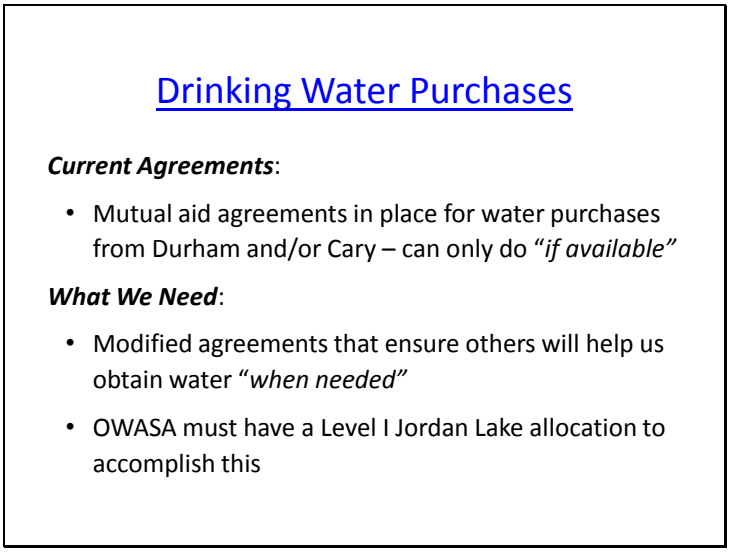
Slide 4



- This shows the same 2001-02 drought scenario, but with a 4 million gallon per day supplement from Jordan Lake.

- As you can see, this provides several essential benefits:
  - First and foremost, we don't run out of water.
  - Secondly, we avoid the very costly and temporary option of pumping Haw River water to the Cane Creek Reservoir;
  - And finally, we avoid – or at least we reduce the duration of – inconvenient water use restrictions and costly surcharges to our customers.

Slide 5



- Currently, our most viable water purchase option during a severe drought would be from the Town of Cary, whose water comes from Jordan Lake. Water withdrawn from Jordan Lake and treated by Cary would be transmitted to us through Durham's drinking water system, which is interconnected to OWASA's.

- Currently, we have mutual aid agreements with the Town of Cary and City of Durham to purchase drinking water, but this purchase arrangement is only "if available" – meaning neither Cary or Durham have an obligation to sell water to OWASA.

- To **ensure** access to OWASA's Jordan Lake allocation when it is needed by our customers, we must have a Level 1 allocation from the State of North Carolina, and we must modify our agreements with Cary and Durham to be sure that we can obtain water when we need it.

Slide 6

Drought Response Operating Protocol
(proposed)

Guiding Principles:

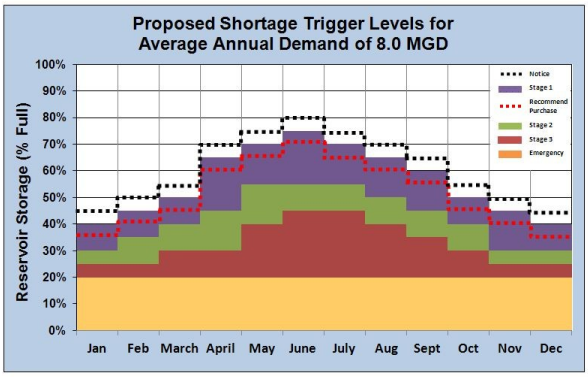
1. Ensure safe and adequate water supply at all times, keep customers well-informed
2. Be prepared *now* for the next severe drought
3. Provide early warning of impending Stage 1 Shortage, greater opportunity for customers to save more water
4. Use our Jordan Lake allocation (through purchase of drinking water from neighboring communities) *only after first declaring a Stage 1 Shortage.* **Purpose:** to lower the risk of Stage 2 (or more severe) restrictions

- To provide specificity to how OWASA would use its Jordan Lake allocation during a drought, we have developed a Drought Response Operating Protocol.

- The guiding principles of our protocol are:
    - Ensure safe and adequate water supply at all times, keep customers well-informed
    - Be prepared *now* for the next severe drought
    - Provide early warning of impending Stage 1 Shortage, greater opportunity for customers to save more water
    - Use our Jordan Lake allocation (through purchase of drinking water from neighboring communities) *only after first declaring a Stage 1 Shortage.* **Purpose:** to lower the risk of Stage 2 (or more severe) restrictions

Slide 7

Drought Response Operating Protocol
(proposed)



Here's how it would work:

- This graph, with a few minor changes, which is from OWASA's Nov 2010 Water Shortage Response Plan (WSRP), was submitted to meet the State's requirement for formal trigger points at which the water provider must take certain actions to reduce water demands . Utilities can act sooner, but not later.
- Differences between this graph and the one currently included in our WSRP are the addition of the red and black dotted lines, and the trigger points for stage 1 (purple block) have all been increased by 5%. This results in earlier Stage 1 declarations to provide the community with more time to conserve water and perhaps delay or prevent making water purchases necessary.
- Our first action would be full-scale public notice to all customers and local governments that Stage 1 Water Shortage restrictions will go into effect if drought conditions don't improve in the near future. This would occur at lave levels shown by the black dotted line.
- The next step would be the declaration of a Stage 1 Shortage, as indicated by the purple blocks. Stage 1 imposes additional outdoor water use restrictions for all customers and a drought rate surcharge for some customers.
- If lake levels declined to the red dotted line, the OWASA Board would then consider purchasing water from Cary or Durham, as described earlier. Stage 1 restrictions and rate surcharges would still be in effect.
- The green and brown colored blocks represent Stages 2 and 3, and the tan line at 20% full represents the Emergency situation that we're trying to avoid by conserving and purchasing water.

Slide 8

Why Action is Needed Now

- Prudent preparation for the next severe drought (similar to OWASA action plans for other contingencies)
- Greater certainty that water purchases will be available *when needed,* to avoid the Haw River emergency option
- Jordan Lake Round 4 allocation process is underway, the most practical opportunity to convert existing Level II allocation to Level I

Slide 9

