Minutes
Saltwater Intrusion Steering Committee Meeting
March 4, 2011

Attending: David Baize, Brian Baker, Richard Cyr, Billy Edwards, Kelly Ferda, Chris Foldesi Bill Garbett, Chuck Gorman, Rusty Hildebrand, Donna Katula, Dr. Jim Kennedy, Jeff Larson, Steve Liotta, Camille Ransom, John Sawyer, Charles Sexton, Mark Smith, Dr. Richard Spruill, Paul Vogel

Richard Cyr opened the meeting by welcoming the Saltwater Intrusion Steering Committee to Hilton Head.

David Baize reviewed the action steps from the last meeting, noting that potential management scenarios and associated costs which will be presented at today's meeting.

Jeff Larson stated that much progress has been made since the last meeting. This Committee will ultimately identify management scenarios that will be presented to the Governor's Committee (should it continue) and other appropriate state agencies, etc that will need to understand and act on this information. .

Dr. Jim Kennedy then presented his work entitled "Simulations of Options and Order-of-Magnitude Cost Estimates For Managing the Upper Floridan Aquifer For Salt Water Intrusion."

<u>Discussion Related to Dr. Kennedy's Presentation</u>

Do the studies include the Colleton River or Broad Creek plume?
No, but they can be added.

There are ongoing studies that include monitoring wells on a piece of property that has limited access

How long has Dr. Kennedy been working on this and what would it cost us if a consultant were hired to do the work?
Since late December. The cost would be between $80,000 and $120,000 or higher.

Regarding extraction wells, what would be done with the salt water that is extracted?
The order-of-magnitude cost estimate assumed that salt water would be discharged to Port Royal Sound.

A discharge into the sound may need an NPDES permit, which could take time.

Will extraction wells on the north end of Hilton Head Island draw salt water into the system?
Yes, and the chloride concentration in the plume would eventually stabilize.

Fresh water will be used for injection wells, correct?
Yes.

Which level of the aquifer would injection wells be placed?
Level 6-10, which is in the Upper Floridan Aquifer as defined by South Carolina.

Would injection wells drive the salt water plume further south on Hilton Head Island?
Yes, but the Sustainable Yield metric to increase the hydraulic head and stop salt water from entering the aquifer under Port Royal Sound will be met. Injection wells on the northern end of Hilton Head Island would cut off the source of salt water from Port Royal Sound and would allow the salt water plume south of the injection wells to continue to move downgradient to the south.

Was any consideration given to using injection wells as a buffer and withdrawing some of the injected water for use when needed, like ASR?
No, injection was considered only for hydraulic head restoration. Using injection wells as a buffer could be modeled. The model is currently a steady state model so it could not be used to model transient conditions such as ASR.

Where would the water go that is injected?
It may stay in the system or find its way into the sound.

Do we treat injection wells and extraction wells as mutually exclusive?
On Hilton Head Island, yes. They would not be used at the same time. However, combinations of injection wells in the Savannah area and extraction wells on Hilton Head Island could be considered because they are far enough apart.

Will all combinations of extraction wells, injection wells, and withdrawal reductions have the same effect on the hydraulic gradient?
No, each combination will have a different effect on the gradient.

Is the model combination with the highest gradient reduction also the most expensive?
Model combination 1 included a 97.5 percent reduction in groundwater withdrawals and resulted in elimination of the southward hydraulic gradient on Hilton Head Island. Model combination 1 had the highest order-of-magnitude cost estimate. Model combination 27 resulted in a 55.3 percent reduction of the hydraulic gradient on Hilton Head Island and was one of the six model combinations with an order-of-magnitude cost estimate higher than $500 million.

Would model combination 1 have the most effect on the hydraulic gradient?
Yes.

Even with the implementation of any of these options, the regional hydraulic gradient would still exist. These options will solve some of the problems, but not all.

Can we take some of the 13.7 mgd indentified in the extraction well model combination for use as a water supply?
That was not included in the order-of-magnitude cost estimates.

The water that is extracted could be treated with Reverse Osmosis. With 13.7 mgd extracted and 3 mgd reject, it may give 10 mgd for water supply.

What is the highest salinity level that can be treated with Reverse Osmosis?
Seawater concentrations.

Studies have been done on Hilton Head Island regarding the effects of injection and extraction wells. There will be a significant positive impact on the hydraulic gradient with both injection or extraction wells and what is being proposed here is a feasible approach. The logical next step is to determine how to integrate ASR into these model combinations. We also need to think about protecting individual wells with ASR.

With 29 model combinations, we need to choose 2 or 3. Cost is helpful, but should not be the only factor. Whatever our recommendations will be, a feasibility study will be necessary. We don't want to concentrate on just one problem when there may be more to consider, such as the Colleton River plume or downward migration.

How will extraction wells affect the rest of the island?
North of the extraction barrier, the gradient and plume movement will accelerate.

There is also a plume on the backside of the island.
A particle tracking model could be done to include that area.

We can start with these 29 model combinations and reduce it to the most feasible subset. Other elements or inputs could then be included in the chosen subset of model combinations.

The injection wells are just on Hutchinson Island in Savannah?
The injection wells on Hutchinson Island were simulated with all other model combinations. The only two model combinations that were not considered together were both injection wells <u>and</u> extraction wells on Hilton Head Island.

What do injection wells on Hutchinson Island do?
Increases the hydraulic head and reduces the hydraulic gradient on Hilton Head Island.

Does a 5 mgd reduction in Savannah have the same result as a 5 mgd barrier in Savannah?
No. A 5 mgd reduction is area-wide. Injection occurs at specific points.

The cone of depression under Savannah is shaped like concentric circles. If you construct injection wells on the north portion of the cone, you change the shape of the concentric circles.

Hilton Head Island has already reduced withdrawals by 50% and the plume is still accelerating. A barrier in Georgia makes more sense.

A barrier in Georgia would not capture the salt water plume on Hilton Head Island and keep it from moving downgradient.

We are making assumptions on the cost of surface water. Does Beaufort-Jasper County have the capacity to treat enough surface water to meet the needs of the consumer and injection wells?
Both Savannah and Beaufort-Jasper County have the treatment capacity, but not the infrastructure.

Per mgd, injection costs more than extraction because of the cost of treating surface water.

With injection wells on Hutchinson Island and extraction wells on Hilton Head Island, would salt water leave the system?
Probably not. Even with an extraction barrier on the north end of Hilton Head Island, there is still a hydraulic gradient toward Savannah.

Can the amount of water injected or extracted be increased so the hydraulic gradient is eliminated?
That has not been modeled.

We need to define what our objectives are. We defined Sustainable Yield before and it was not to restore contaminated existing wells back to potable water.

It will take 100's of years for salt water to leave the system.

We can start with the best options for addressing the existing plume and gradient and then see how the chosen options affect other plumes. Cost is an important factor in the recommended options.

The system is out of balance. Any strategy that allows the plume to accelerate or the gradient to increase should not be considered.

Injection wells in Savannah helps, but injection or extraction wells on Hilton Head Island will be needed.

Does model combination 4 (extraction barrier on Hilton Head Island) stop the plume movement?
It would capture the plume on the northern portion of the island.

The Colleton River plume is not addressed in any of the model combinations, nor is vertical migration. An extraction barrier could be put at the Colleton River to capture the plume there.

How long do we have to implement these options?
The chosen options need to be implemented soon to be most effective.

Model combination 4 (extraction barrier on Hilton Head Island) looks to be the most attractive. Can we expand that option to include the Colleton River plume?
Yes, that can be done.

These options are good first steps, but we do not want to leave the impression the problem is solved. We can take steps to address the most urgent problems, then add to that.

If we can develop a plan acceptable by both states, we may have a good chance to get Federal money to assist with implementation.

If a chosen option includes extraction wells on north Hilton Head Island, we need to understand the permitting implications. We also need to evaluate the regional effects of the chosen options to make sure there are no unintended consequences.

Would extraction wells increase the rate of downward migration of chlorides?
No.

Injection wells will decrease downward migration of chlorides, correct?
Yes.

Are extraction wells more effective than injection wells?
Yes. The order-of-magnitude cost estimates of combinations with extraction wells were lower than the cost estimates of combinations with injection wells. Extraction wells would capture the salt water plumes and keep them from moving downgradient. Injection wells would cut off the source of salt water from Port Royal Sound and would allow the salt water plume south of the injection wells to continue t move downgradient to the south

Would Dr. Kennedy consider a model run where injection wells are located at the salt water-freshwater interface and inject water for 300 days and withdraw water during other times of the year? Some of the water injected could possibly be withdrawn at specified times and used for drinking water.
Perhaps, but it would involve additional training on the model. The model is currently a steady state model so it could not be used to model transient conditions such as ASR. There is a possibility of combining Dr. Spruill's transient model and Dr. Kennedy's steady state model to evaluate this model combination.

<u>Action Steps</u>

- Dr. Kennedy will complete model simulations requested at today's meeting.
- David Baize will check on NPDES permitting of a discharge associated with extraction wells.