
# MEETING MATERIALS

## February 4, 2009

## San Jacinto River Authority

**Region H Water Planning Group**
**10:00 AM Wednesday**
**February 4, 2009**
**San Jacinto River Authority Office**
**Lake Conroe Dam**
**1577 Dam Site Rd.**
**Conroe, Texas**

## Agenda

1. Introductions.
2. Review and approve minutes of November 5, 2008 meeting.
3. Receive public comments on specific issues related to agenda items 4 through 16 (Public comments to be limited to 3 minutes per speaker).
4. Accept the resignation of John Baker as a voting member of the Region H Regional Water Planning Group representing River Authorities.
5. Consider and take action on the nomination and appointment of John Hoffman (Central and Lower Region Manager for Brazos River Authority) as a voting member of the Region H Regional Water Planning Group representing River Authorities.
6. Accept the resignation of Jack Harris as a voting member of the Region H Regional Water Planning Group representing Counties.
7. Receive recommendations from the Nominating Committee for calendar year 2009 Executive Committee members.
8. Take action on the appointment of Executive Committee members of the Region H Regional Water Planning Group for calendar year 2009.
9. Consider and take action on approving the Drought Management Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.
10. Consider and take action on approving the Interruptible Supply Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.
11. Receive presentation from consultant on the results of the Environmental Flows Study Draft Report.
12. Receive public comments on Item 11.
13. Consider and take action on approving the Environmental Flows Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.
14. Receive presentation from Consultant on the status of current planning and future work schedule for the 2011 Region H Regional Water Plan.
15. Consider and take action on requesting approval from the TWDB for potential use of alternatives to using WAM Run 3 models and potential use of alternatives to firm yield for defining regional water supplies in Region H.
16. Receive presentation from representatives of Montgomery County MUD 8 and 9 regarding planning for a regional reuse project and discussion of potential amendments to the Region H plan to allow for additional reuse projects.
17. Receive updates by local water agencies or other interested parties regarding any water-related initiatives or projects currently underway or planned.
18. General public comments. (Public comments to be limited to 3 minutes per speaker)

19. Agency communications.
20. Next Meeting: TBD
21. Adjourn.

# Agenda Item 2

Review and approve minutes of November 5, 2008 meeting.

**MINUTES**
**REGION H WATER PLANNING GROUP MEETING**
**10:00 A.M.**
**NOVEMBER 5, 2008**
**SAN JACINTO RIVER AUTHORITY OFFICE**
**LAKE CONROE DAM**
**1577 DAM SITE ROAD**
**CONROE, TEXAS**

**MEMBERS PRESENT:** Roosevelt Alexander, John Bartos, John Blount, Robert Bruner, Reed Eichelberger, Mark Evans, Jack Harris, Bob Hebert, John Howard, Robert Istre, Ted Long, Glynna Leiper, Marvin Marcell, Jimmie Schindewolf, Jeff Taylor, William Teer, Steve Tyler, C. Harold Wallace, and Pudge Willcox.

**DESIGNATED ALTERNATES:** Tom Michel for Ron Neighbors, and Jim Sims for Danny Vance.

**MEMBERS ABSENT:** John Baker, James Morrison, Ron Neighbors, Mike Uhl, and Danny Vance.

**NON-VOTING MEMBERS PRESENT:** Temple McKinnon and Rebecca Hensley.

**PRESIDING:** Jeff Taylor, Chair

**CALL TO ORDER PUBLIC MEETING AT 10:10 A.M.**

**MINUTES OF AUGUST 6, 2008 MEETING**

Reed Eichelberger with the San Jacinto River Authority requested revisions be made to the minutes of the meetings of May 28, 2008, and August 6, 2008, to reflect John Howard present at both meetings.

A vote was taken to approve the minutes of the August 6, 2008, meeting and to revise the May 28, 2008, minutes to reflect John Howard's presence. The vote passed unanimously.

**PUBLIC COMMENTS ON AGENDA ITEMS 4 – 18**

No public comments.

**ACCEPT THE RESIGNATION OF JEFF TAYLOR AS A VOTING MEMBER AND CHAIR OF THE REGION H REGIONAL WATER PLANNING GROUP REPRESENTING MUNICIPALITIES**

Jimmy Schindewolf commented on Jeff Taylor's hard work and leadership as both a consultant and chairman of Region H.

A motion was made by Jack Harris to accept the resignation of Jeff Taylor; seconded by Bob Hebert. The motion carried unanimously. Jeff Taylor commented briefly on his service with the Region H Water Planning Group and involvement with regional planning, and then he turned the meeting over to Mark Evans.

**PRESIDING:** Mark Evans, Vice-Chair

A nominating committee was appointed to include: Jimmy Schindewolf, Marvin Marcell, and Robert Bruner.

**CONSIDER AND TAKE ACTION ON THE SELECTION OF JUN CHANG AS A VOTING MEMBER OF THE REGION H REGIONAL WATER PLANNING GROUP REPRESENTING MUNICIPALITIES**

After a brief introduction of Jun Chang, motion was made by Bob Hebert on the selection of Jun Chang to serve as a voting member on the Region H Regional Water Planning Group representing municipalities; seconded by Robert Istre. The motion carried unanimously.

**RECEIVE PRESENTATION FROM CONSULTANT ON THE STATUS OF NEGOTIATIONS FOR THE SCOPE OF WORK FOR THE 2011 REGION H REGIONAL WATER PLAN**

Mike Reedy updated everyone on the status and negotiations related to the 2011 scope of work. He discussed the Second Biennium Tasks and Texas Water Development Board funding for same. Mr. Reedy continued with the timeline. Temple McKinnon discussed preparation of the plan, public meeting requirements, and notice prior to the March due date.

**CONSIDER AUTHORIZING THE SAN JACINTO RIVER AUTHORITY TO NEGOTIATE AND EXECUTE THE TEXAS WATER DEVELOPMENT BOARD CONTRACT FOR COMPLETION OF THE 2011 REGION H REGIONAL WATER PLAN**

After brief discussion, a motion was made by Harold Wallace to authorize the San Jacinto River Authority to negotiate and execute the Texas Water Development Board grant contract for completion of the 2011 Region H Regional Water Plan; seconded by John Blount. The motion carried unanimously.

**CONSIDER AUTHORIZING THE SAN JACINTO RIVER AUTHORITY TO EXECUTE CONTRACT WITH CONSULTANT FOR COMPLETION OF THE 2011 REGION H REGIONAL WATER PLAN**

Motion was made by Tom Michel to authorize the San Jacinto River Authority to execute a contract with AECOM for completion of the 2011 Region H Regional Water Plan; seconded by Jimmy Schindewolf. The motion carried unanimously.

**RECEIVE PRESENTATION FROM CONSULTANT ON THE RESULTS OF THE DROUGHT MANAGEMENT STUDY DRAFT REPORT**

Mike Personett with KBR presented the results of the Drought Management Study, which included the evaluation of impacts of drought management strategies on surface water reservoirs in Region H and the methodology of same. Chris Krueger with KBR continued with the modeling scenarios for Lake Livingston, Lake Conroe, Lake Houston, and Allens Creek Reservoir. Mr. Personett concluded the presentation with the key findings and observations of drought contingency planning within Region H. Marvin Marcell commented on the lack of feedback that would support one strategy over another. Mr. Marcell inquired as to the data available on pricing structures, including the inclining rate structure. Mike Personett addressed rate structures and the incentives for same. Mike Reedy explained that pricing may or may not have an impact in some areas due to the social and economic differences. Mr. Personett explained how education and pricing can trigger behavioral responses of individuals; he also addressed Harold Wallace's questions regarding planned retention areas for reuse. Discussion continued with Mr. Personett addressing Robert Istre's questions on the per capita per day water demand in various communities as stated in a previous presentation. Mr. Istre encouraged additional analysis of Region H's dependence on other reservoirs as it could impact the local region. Mike Personett concluded his remarks and stated that the drafted report would be available on the Region H website and comments should be addressed to Jason Afinowicz's attention no later than November 19, 2008.

**RECEIVE PRESENTATION FROM CONSULTANT ON THE RESULTS OF THE INTERRUPTIBLE SUPPLY STUDY DRAFT REPORT**

Mike Personett presented the results of the Interruptible Water Supply Study. He discussed the two phases of the study and the conclusions of same. He stated that the drafted report would be available on the Region H website and comments should be addressed to Jason Afinowicz's attention no later than November 19, 2008.

**CONSIDER AND TAKE ACTION AUTHORIZING SAN JACINTO RIVER AUTHORITY TO REQUEST A SCOPE AMENDMENT FROM THE TWDB RELATED TO THE INTERRUPTIBLE SUPPLY STUDY ALLOWING THE REMOVAL OF CERTAIN SCOPE ITEMS FROM THE SCOPE OF WORK**

Mike Reedy stated that based on Mike Personett's previous presentation and conclusions, interruptible water supplies do not offer enough opportunity to justify completion of the remaining scope items. He requested approval to remove the related tasks from the scope of work with the understanding that the removal of unnecessary tasks may result in the return of funds to the Texas Water Development Board. Motion was made by Marvin Marcell to authorize the San Jacinto River Authority to request a scope amendment from the Texas Water Development Board related to the Interruptible Supply Study; seconded by John Blount. The motion carried unanimously.

**RECEIVE PUBLIC COMMENTS ON AGENDA ITEMS 9, 10, AND 11**

Ken Kramer with the Lone Star Chapter of the Sierra Club stated that he had not yet reviewed the Drought Management Study, but that he would be reviewing it and his comments would be forthcoming. He inquired as to the submittal of the study to the Texas Water Development Board by December 31, 2008, and the opportunity for public comments on same prior to the submittal. Mike Reedy addressed Mr. Kramer's concerns and stated that the guidelines had been followed; Temple McKinnon with the Texas Water Development Board confirmed the Group's decision. A brief discussion followed. Mr. Reedy emphasized that under the contract, reports are due by December 31, 2008. Robert Istre inquired as to the possibility of the Texas Water Development Board amending the contract to allow an extension. Jimmy Schindewolf and John Bartos inquired as to whether or not it is in the bylaws to allow the requested extension. After discussion it was determined a letter would be presented to the TWDB addressing the need for an extension and the RHWPG's ability to extend the deadline. The submittal of this request will determine whether or not a December meeting of the Region H Water Planning Group is needed.

**CONSIDER AUTHORIZING CONSULTANT TO SUBMIT DRAFT DROUGHT MANAGEMENT AND DRAFT INTERRUPTIBLE SUPPLY STUDY REPORTS TO TWDB ON OR BEFORE DECEMBER 31, 2008**

No action taken.

**CONSIDER AND TAKE ACTION AUTHORIZING SJRA TO REQUEST A CONTRACT AMENDMENT FROM THE TWDB TO EXTEND THE SUBMITTAL DATE FOR THE DRAFT ENVIRONMENTAL FLOWS STUDY FROM DECEMBER 31, 2008 TO MARCH 31, 2009**

After brief discussion, this action was amended to include the Draft Drought Management and Draft Interruptible Supply Study Reports. Motion was made by John Bartos to authorize SJRA to request an amendment from the TWDB to extend the submittal dates for the Draft Drought Management, Draft Interruptible Supply Study, and the Draft Environmental Flows Study from December 31, 2008, to March 31, 2009; seconded by Steve Tyler. The motion carried unanimously.

**RECEIVE PRESENTATION FROM CONSULTANT ON THE CURRENT STATUS AND PROGRESS OF REGIONAL WATER PLANNING**

Discussion ensued regarding the Environmental Flows Study. It was determined that further dissemination and discussion was needed. An Environmental Flows Committee was appointed to include: John Bartos as Chair, Jun Chang, Reed Eichelberger, Danny Vance, and Jimmy Schindewolf.

**CONSIDER AUTHORIZING A LETTER RESPONDING TO REQUESTS FOR INFORMATION FROM THE TEXAS WATER CONSERVATION ADVISORY COUNCIL REGARDING WATER CONSERVATION MANAGEMENT STRATEGIES IN REGION H**

After brief discussion, motion was made by John Howard to authorize a letter to the Texas Water Conservation Advisory Council regarding water conservation management strategies in Region H; seconded by Jimmy Schindewolf. The motion carried unanimously.

**CONSIDER AND TAKE ACTION ON A PROPOSED CONSISTENCY WAIVER REQUESTED BY THE NORTH FORT BEND WATER AUTHORITY**

Melinda Silva with Brown & Gay Engineers gave an update on the North Fort Bend Water Authority's loan application to the Texas Water Development Board for their infrastructure expenses. She explained that in order for NFBWA to receive TWDB loan funds they must be consistent with the Region H plan. Motion was made by John Blount to support a consistency waiver; seconded by Jimmy Schindewolf. The motion carried unanimously.

**RECEIVE UPDATE FROM PUDGE WILLCOX, GENERAL MANAGER, CHAMBERS LIBERTY COUNTY NAVIGATION DISTRICT, ON STATUS OF CURRENT ACTIVITIES RELATED TO DEVELOPMENT OF A PROPOSED SURFACE WATER TREATMENT PLANT IN WEST CHAMBERS COUNTY AND A PROPOSED PLAN AMENDMENT TO THE 2006 REGION H RWP**

Pudge Willcox gave an update on the current activities related to the development of a proposed surface water treatment plant in West Chambers County and the need for an amendment to the 2006 Region H Regional Water Plan. Mr. Willcox stated that the Chambers-Liberty County Navigation District's Board approved payment of their consultant to provide additional data to the Region H Water Planning Group as needed.

**CONSIDER AND TAKE ACTION, IF NEEDED, ON THE PROPOSED PLAN AMENDMENT RELATED TO THE ABOVE ITEM**

No action needed.

**RECEIVE UPDATES BY LOCAL WATER AGENCIES OR OTHER INTERESTED PARTIES REGARDING ANY WATER RELATED INITIATIVES OR PROJECTS CURRENTLY UNDERWAY OR PLANNED**

Temple McKinnon with Texas Water Development Board stated that water demand projection information was available on TWDB's website. She also discussed grant funding and application information.

**GENERAL PUBLIC COMMENTS**

Jeff Taylor stated that he has received calls from Madison County with concerns focused on the development of Bedias Reservoir. Temple McKinnon stated that an agency newsletter may have caused some confusion, however she stated that she had not heard from anyone concerning this issue.

Tom Michel commented on the Texas Water Development Board's letter regarding public water supply in Surfside Beach and Region H's involvement in the planning process. Temple McKinnon stated that the TWDB referred the Surfside resident to the Region H Water Planning Group as a source for information, but they would in the future refer them to local agencies as well.

Mark Evans referred everyone to a couple of letters in their meeting information regarding Madison County's request for representation on the Region H Water Planning Group. He also referred to a letter to the Texas Comptroller of Public Accounts to address the successes and challenges facing Region H related to water funding.

**AGENCY COMMUNICATIONS**

None

**NEXT MEETING**

It was determined that the next meeting will take place in February unless it is determined that a meeting is needed in December as discussed above.

Location of next meeting will remain the same:

San Jacinto River Authority
Lake Conroe Dam
1577 Dam Site Road
Conroe, Texas 77304

**ADJOURNED AT 12:10 P.M.**

# Agenda Items 4 and 5

Accept the resignation of John Baker as a voting member of the Region H Regional Water Planning Group representing River Authorities.

Consider and take action on the nomination and appointment of John Hoffman (Central and Lower Region Manager for Brazos River Authority) as a voting member of the Region H Regional Water Planning Group representing River Authorities.

November 13, 2008

The Honorable Mark Evans
Acting Chair
Region H Regional Water Planning Group
C/O San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305

Dear Judge Evans:

This letter is to inform you and the planning group of my resignation as a voting member (representing river authorities) of the Region H Regional Water Planning Group, effective immediately. I have enjoyed my service with the group and planning for the water supply future of Region H and the lower Brazos River basin.

Sincerely,

John M. Baker

Brazos River Authority

November 13, 2008

The Honorable Mark Evans
Acting Chair
Region H Regional Water Planning Group
C/O San Jacinto River Authority
P.O. Box 329
Conroe, Texas 77305

Dear Judge Evans:

I would like to put forward for consideration Mr. John B. Hofmann as a voting member of the Region H Regional Water Planning Group representing the Brazos River Authority. Mr. Hofmann serves as the Manager of our Central and Lower Regions, and as such will make an excellent person to represent the interests of the Brazos River Authority on the Region H Board.

Please don't hesitate to contact me if you have any question or concerns.

Sincerely,

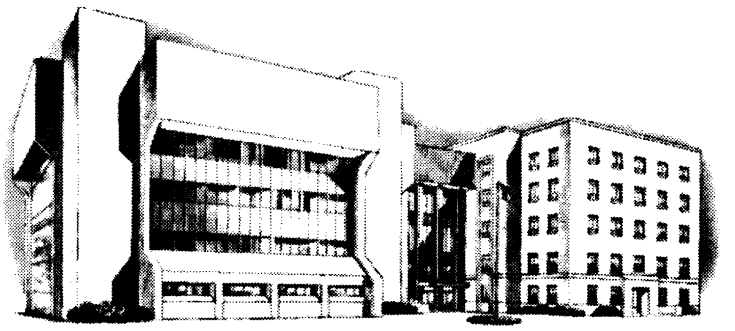
Phillip J. Ford
General Manager/CEO
Brazos River Authority

4600 Cobbs Drive • P.O. Box 7555 • Waco, Texas 76714-7555
254-761-3100 • FAX 254-761-3215

# Agenda Item 6

Accept the resignation of Jack Harris as a voting member of the Region H Regional Water Planning Group representing Counties.

JACK HARRIS
COUNTY COMMISSIONER
PRECINCT #3
281-331-4392



NORTH SERVICE CENTER
P.O. BOX 548
ALVIN, TEXAS 77512
281-331-3197
FAX 281-331-6586

# BRAZORIA COUNTY

**ANGLETON, TEXAS 77515**

December 10, 2008

Jace Houston
San Jacinto River Authority
Lake Conroe Dam
1577 Dam Site road
Conroe, Texas 77304

Dear Jace and Fellow Board Members:

I would like to take this time to thank you for the opportunity to have served on the Region H Water Board. It has been an honor to serve with such a distinguished group of people.

It has been a pleasure to work with each of you in establishing ideas that would benefit us all in the region we live and work.

I regret that I will not be able to serve in this capacity any longer and therefore submit my resignation to this board effective December 31, 2008. I know that each of you will continue to strive for what is best for our area as this is such a vital part of our future.

Again, I say thank you for the privilege to serve.

Jack

Jack Harris
Brazoria County Commissioner
Precinct 3 .

# Agenda Items 9-14

Consider and take action on approving the Drought Management Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.

Consider and take action on approving the Interruptible Supply Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.

Receive presentation from consultant on the results of the Environmental Flows Study Draft Report.

Receive public comments on Item 11.

Consider and take action on approving the Environmental Flows Study Draft Report for submittal to the Texas Water Development Board (TWDB) on or before March 31, 2009.

Receive presentation from Consultant on the status of current planning and future work schedule for the 2011 Region H Regional Water Plan.

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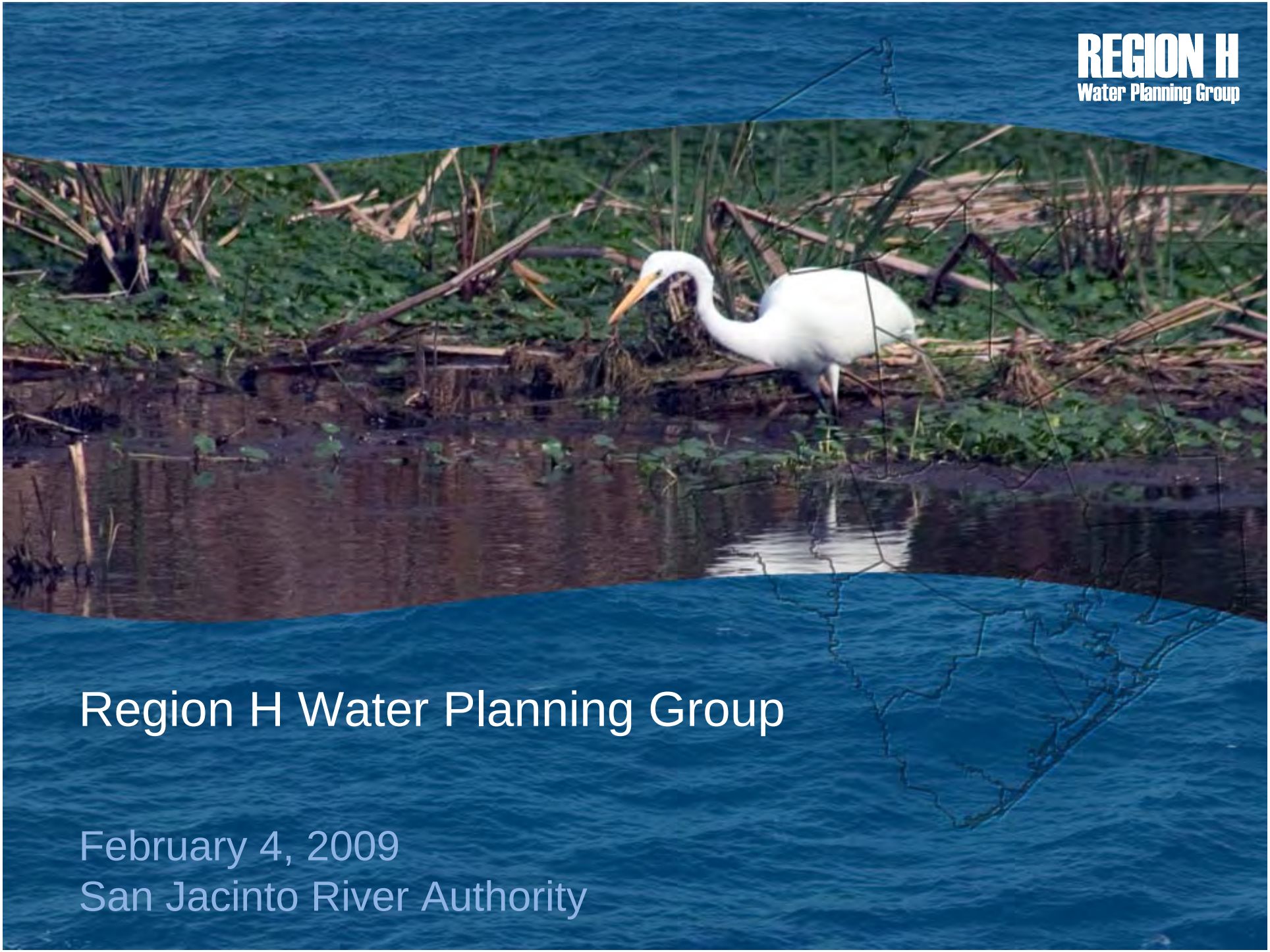
Water Planning Group




# Region H Water Planning Group

February 4, 2009
San Jacinto River Authority


# Drought Management Study

February 4, 2009

San Jacinto River Authority

**History to Date**

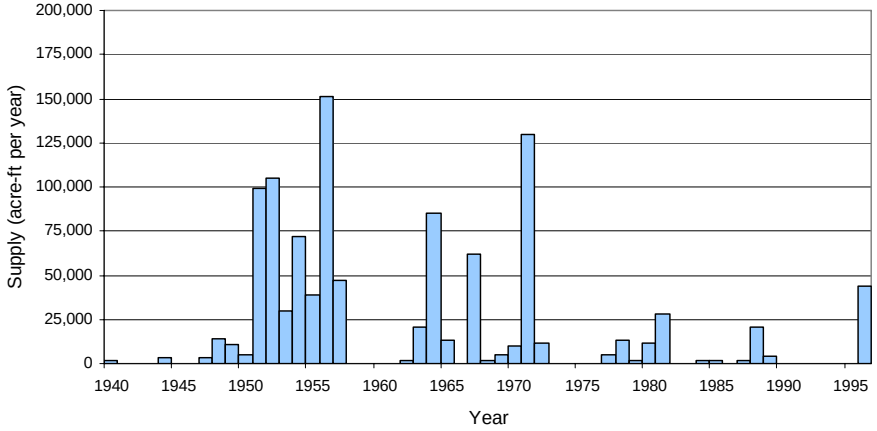
- Results presented at November 5th meeting.
- Comments officially received through November 19th
  - No comments received to date
- Extended deadline for draft final submittal to March 31, 2009
- Final submittal revised to July 31, 2009
- Some additional clarifications made to the report
- Revised report available since January ??, 2009

## Changes Since September Draft

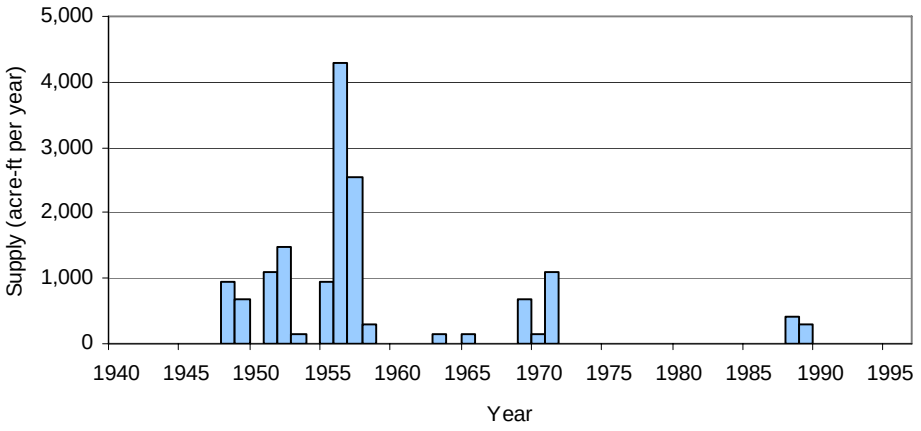
- No changes made to study results
- Additional discussion to address:
  - Availability and reliability of new supplies from drought management
  - Potential use of new supplies to offset 2006 RWP strategies
  - Ability to use interruptible supplies along with new supplies from drought management

# Availability and Reliability

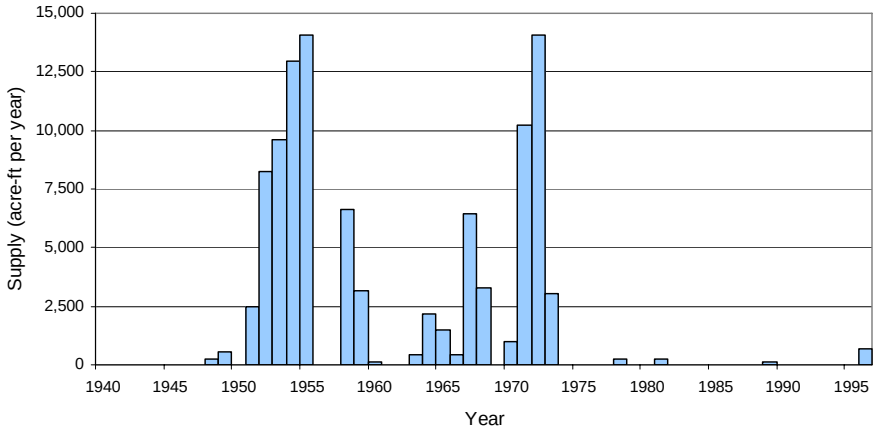
## Lake Livingston



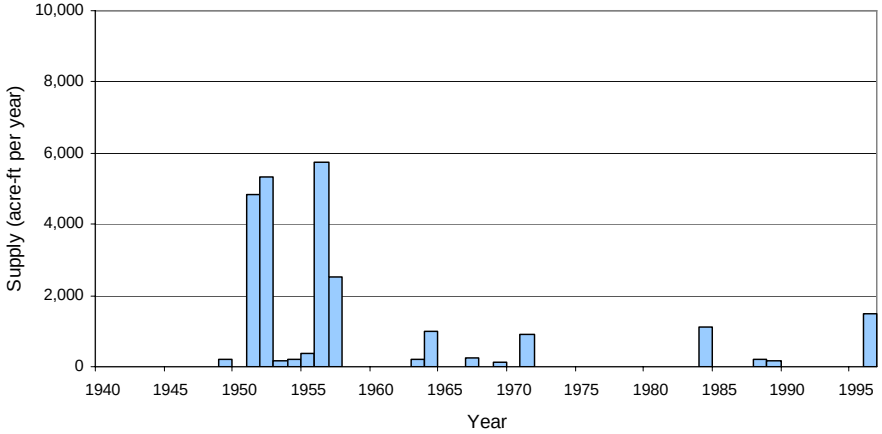

## Lake Houston




## Lake Conroe




## Allens Creek



# Drought Management Study

REGION H
Water Planning Group

**Potential Use**

- Generally limited to interruptible or conjunctive use
- Potential for Replacing 2006 Strategies
  - No incentive to develop conjunctive use strategies in the Trinity as surplus water supplies currently exist to meet projected demands through 2060
  - Interruptible drought supply could be made available for irrigation use but is not recommended in lieu of irrigation conservation
  - Additional water made available in Lake Conroe could be of sufficient magnitude to delay TRA-SJRA from 2030 to 2060 but would require aggressive drought management measures
  - Demand reduction in the San Jacinto basin will reduce operational costs of transferring supplies from Trinity to San Jacinto
  - New supplies from drought measures could be used for environmental flows rather than new water supplies

# Drought Management Study

REGION H
Water Planning Group

## Action

- Approve submittal of draft final Drought Management Study to fulfill contractual agreement with TWDB.


# Interruptible Supplies Study

February 4, 2009
San Jacinto River Authority

# Interruptible Supplies Study

REGION H
Water Planning Group

**History to Date**

- Results presented at November 5th meeting.
- Comments officially received through November 19th
  - No comments received to date
- Extended deadline for draft final submittal to March 31, 2009
- Final submittal revised to July 31, 2009
- **No changes to report content**
- Submitted request to amend SOW to TWDB

# Interruptible Supplies Study

REGION H
Water Planning Group

## Amendments to Interruptible Supplies SOW

- Formally requested by SJRA on January 5th
- Removing the **following items**:

A. Evaluate existing permitted interruptible supplies using the 75-75 rule.
B. Evaluate existing permitted interruptible supplies using the TCEQ WAMs.
C. Evaluate new unpermitted interruptible supplies using the TCEQ WAMs.
D. Evaluate and quantify potential uses for interruptible water supplies within Region H.
   1. Evaluate predominant regional crop types and seasonal irrigation requirements and patterns.
   **2. Survey agricultural users in the region.**
E. Compare available interruptible supplies and demands to evaluate the feasibility of use.
**F. Identify and assess regulatory and institutional issues associated with this strategy.**
G. Evaluate firm yield supplies made available as a result of implementing this strategy.
H. Evaluate the impacts on other water management strategies.
**I. Determine if the impacts are reasonable and consistent with the protection of environmental flows and other factors.**
**J. Evaluate and quantify the economic impacts of this strategy.**
**K. Develop a water policy for curtailing interruptible supplies in time of drought.**
L. Prepare a summary report.

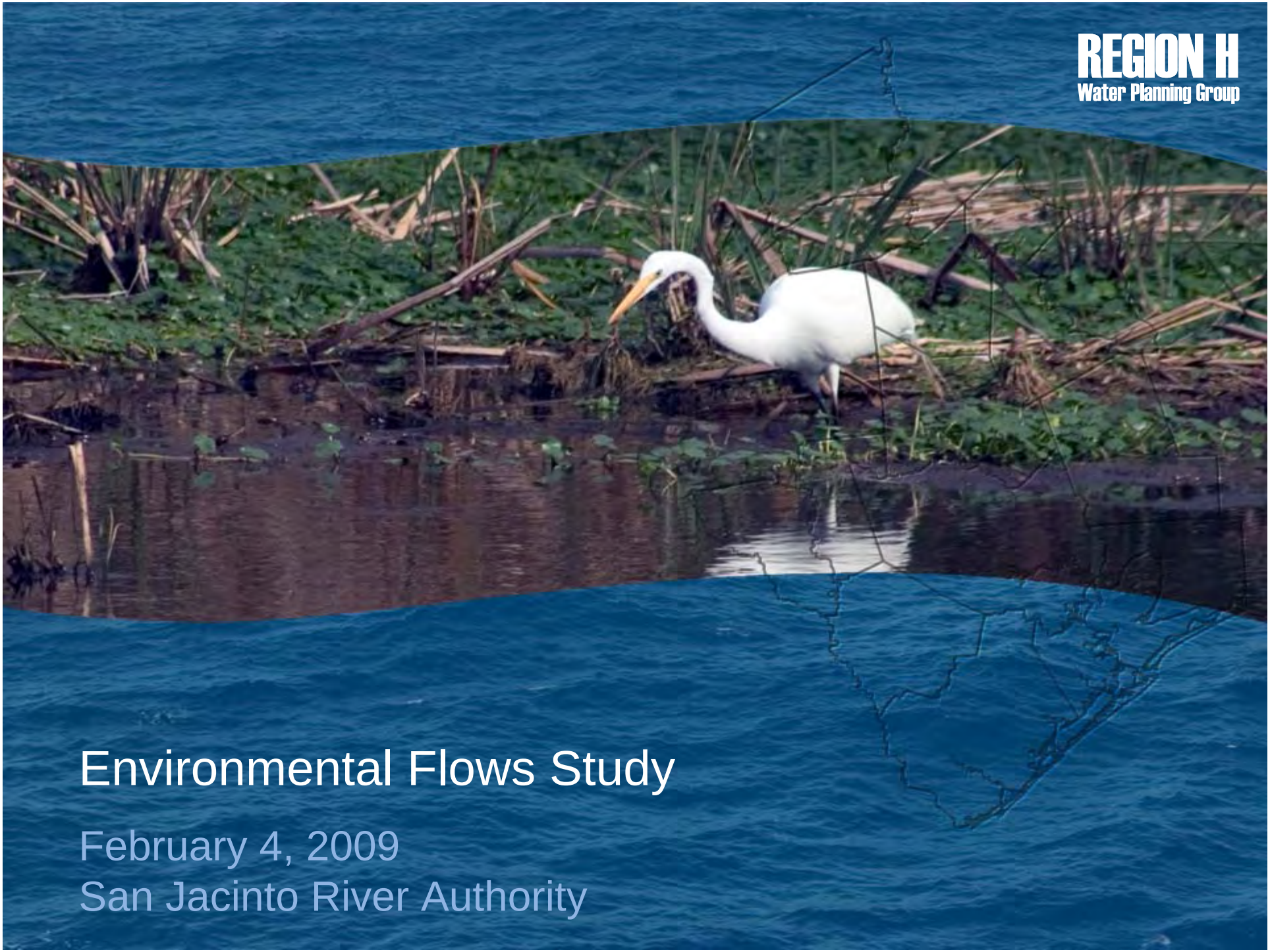
- Reduced total 1st Biennium budget by $77,260

# Interruptible Supplies Study

REGION H
Water Planning Group

## Action

- Approve submittal of draft final Interruptible Supplies Study to fulfill contractual agreement with TWDB.




# Environmental Flows Study

February 4, 2009
San Jacinto River Authority

# Purpose of Study

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- Evaluate TWDB recommended B&E target flows in relationship to target frequencies established by GBFIG and adopted by Region H.
  - Evaluate the ability to meet these target frequencies under various baseline hydrologic conditions and variable durations (i.e., annual, monthly, seasonal).
  - Evaluate whether changes (pass through flows and/or reservoir releases) could be made to potentially achieve the target frequencies.
  - Evaluate what impacts would occur to our water supplies if these changes were made.

# What This Study Isn't

REGION H
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- Not evaluating the validity or accuracy of the recommended TWDB freshwater inflow targets.
- Not validating the accuracy of the recommended Region H freshwater inflow target frequencies.
- Not trying to figure out the "needs of the bay".
- Not really trying to develop or recommend an operational "solution" for achieving the desired B&E flows.
- *Simply using the goals already established by TWDB and Region H to evaluate how we might achieve those goals and what impacts to future water supply may result.*

# Project Overview

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- Used WRAP to assess bay and estuary (B&E) target inflows in the year 2060.
- Models are based on a full diversion scenario with expected return flows.
- Models include all 2006 RWP Region H strategies, including:
  - TRA to Houston and SJRA transfers
  - Municipal and industrial effluent reuse
- Models include all upstream strategies in Region C 2006 RWP, including:
  - Water imports (Marvin Nichols, Toledo Bend, etc.)
  - Reuse projects

# Project Overview

REGION H
Water Planning Group

- Identify shortages (defined as target B&E flows – simulated B&E flows) for period of record
- Evaluated the feasibility of operational changes (i.e., pass through flows and/or reservoir releases) to reduce the frequency of B&E target flow shortages.
- The underlying assumption to our approach is that B&E needs are met if the desired frequency of occurrence is achieved.
- *Can a methodology be developed to achieve a desired target B&E inflow frequency while also maintaining current and future water supplies?*

# Future Model B&E Results

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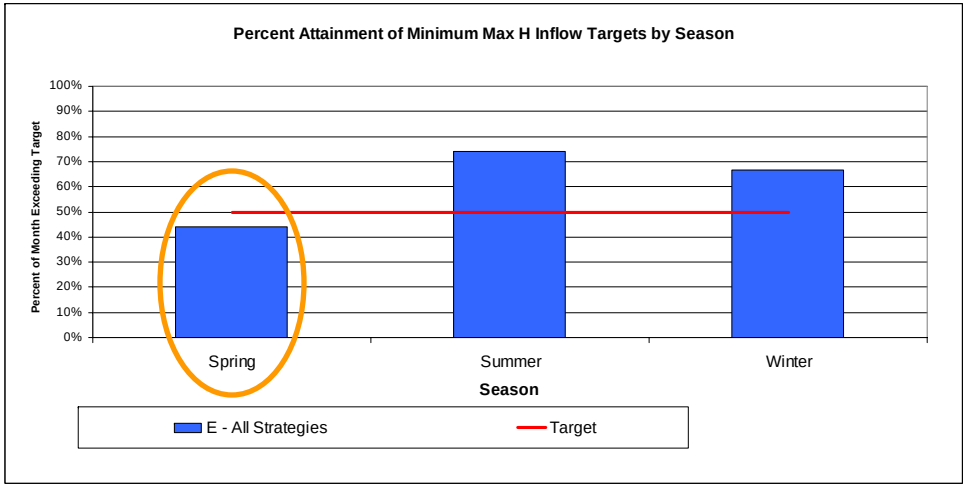
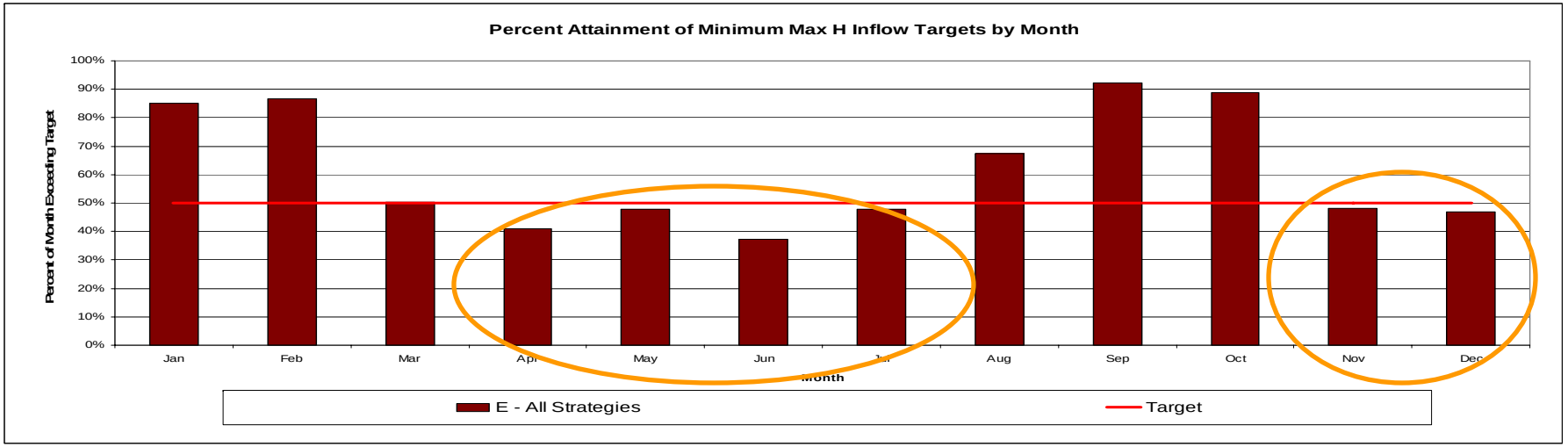
## Max H

| Scenario | Annual Max H |
|---|---|
| GBFIG Target | 50% |
| E – All Strategies | 61% |



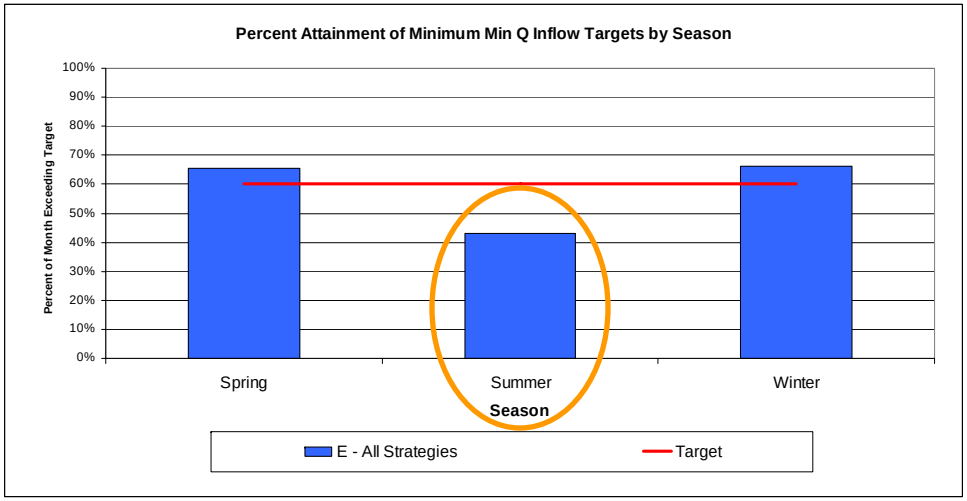



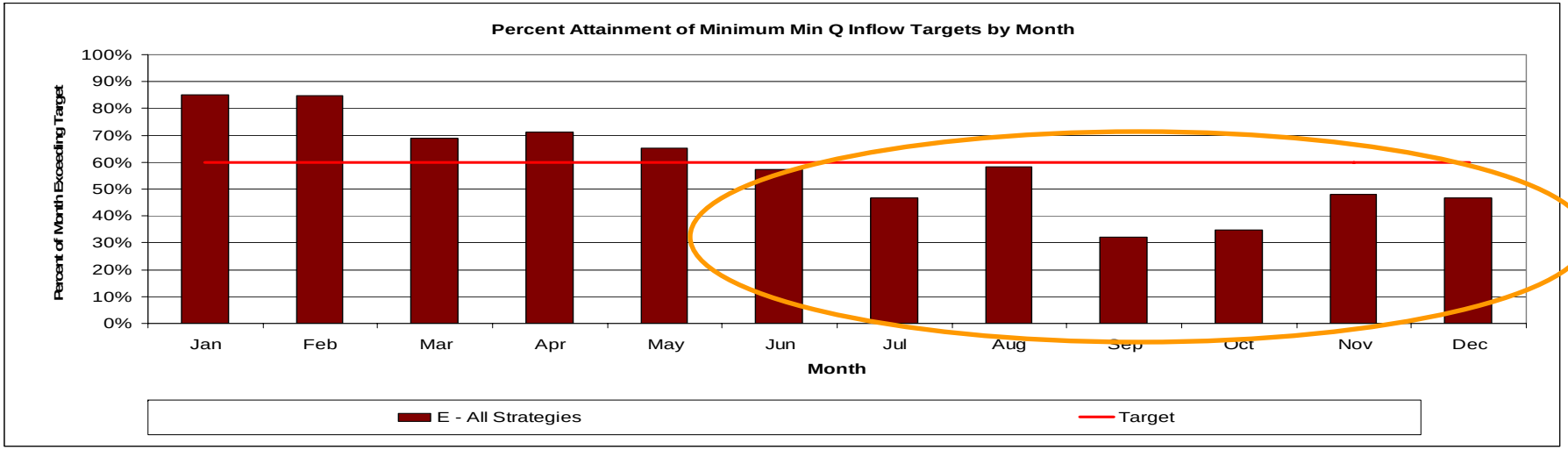
# Future Model B&E Results

REGION H
Water Planning Group

## Min Q

| Scenario | Annual Min Q |
|---|---|
| GBFIG Target | 60% |
| E – All Strategies | 58% |



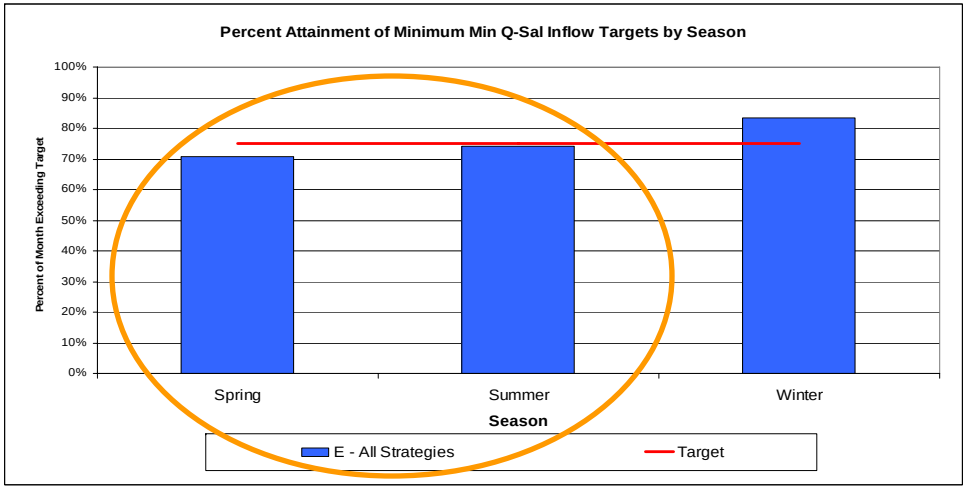



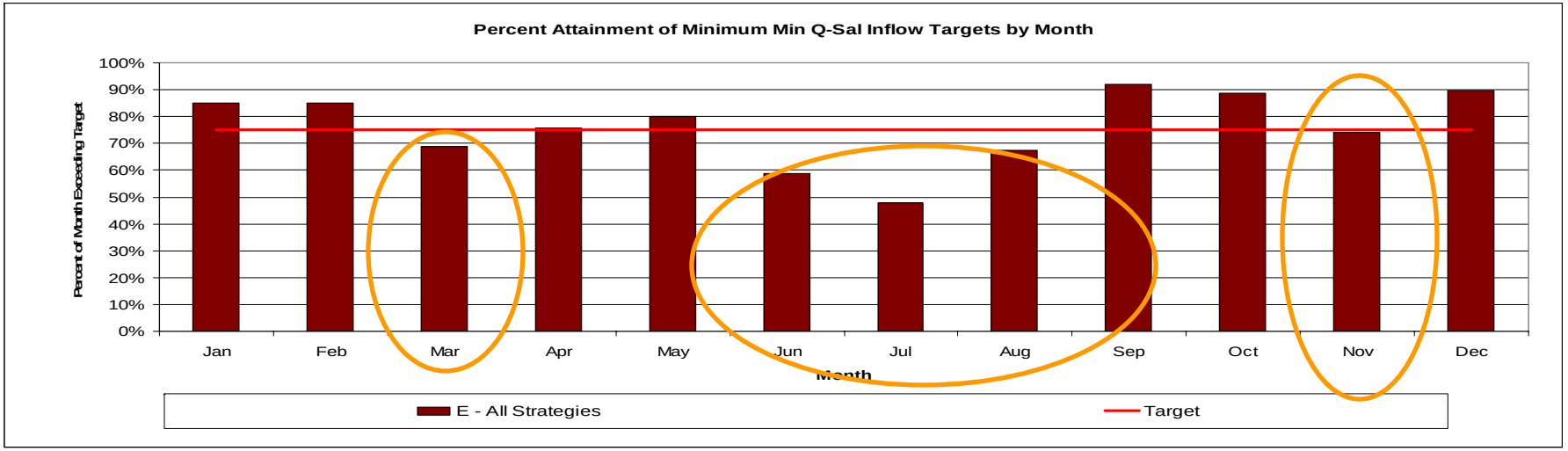
# Future Model B&E Results

REGION H
Water Planning Group

## Min Q-Sal

| Scenario | Annual Min Q-Sal |
|---|---|
| GBFIG Target | 75% |
| E – All Strategies | 76% |



# Defining Desired Frequency Using Max H

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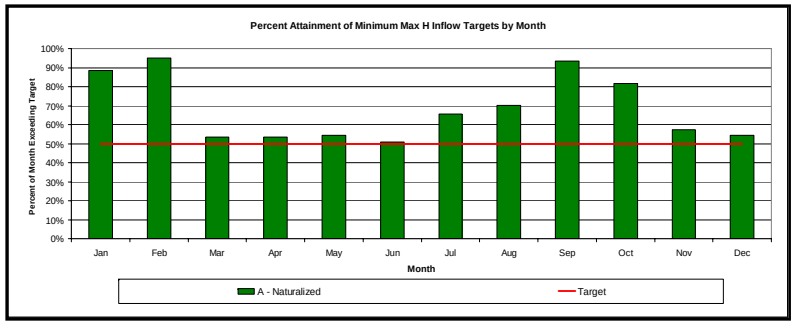
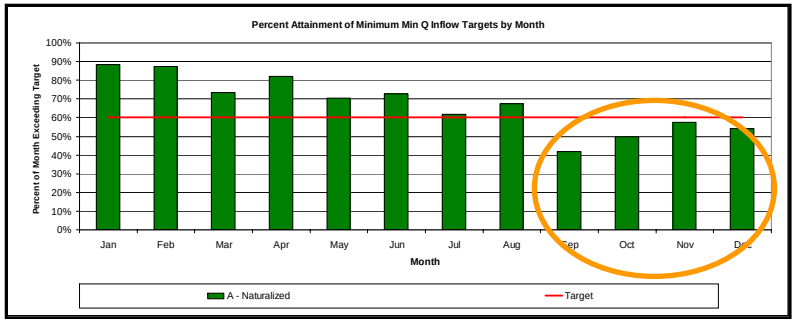
## Why Use Max H as a Target Condition?

- Max H target flows are achieved at the desired frequency (50% of the monthly records) under naturalized conditions.
- Min Q and Min Q-Sal are not achieved at the desired frequency even under naturalized conditions.

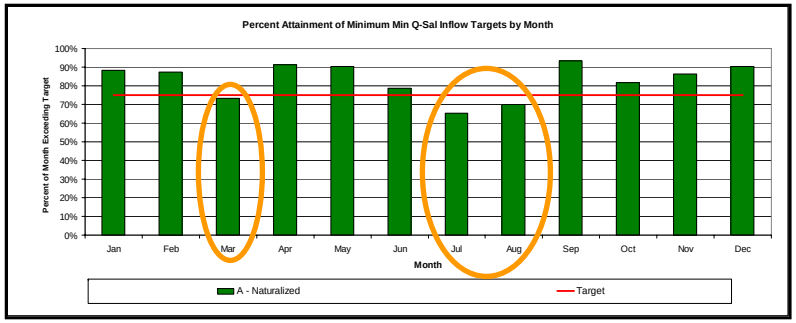
**Max H**




**Min Q**




**Min Q-Sal**



# Defining Desired Frequency Using Min Q-Sal

REGION H
Water Planning Group

## Why Use Min Q-Sal as a Target Condition?

- Min Q-Sal is represented as the minimum acceptable inflow required to maintain the salinity needed for bay and estuary fisheries productivity.

- Should be focusing on the lower targets which provide a “minimum acceptable” flow and not on the higher flow targets that we know haven’t historically been achieved consistently and will likely not be achieved in the future.

- Intuitively, one might assert that focusing on Min Q-Sal might tend to result in lesser impacts on water supplies due to the lower target flows.

# It's About Frequency…..Not Volume

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Water Planning Group

## Strategy for Increasing Frequency of Achieving Target Flows

- B&E target flows are "achieved" by any flow that equals or exceeds that target flow. Flow can't be too high, only too low.
- Frequency is increased by increasing the number of months meeting the volume target, not by increasing the volume.
- Target the months with the smallest shortages.
- Manage reservoir releases when shortages for a particular month are ***less than some specified level.***

# It's About Frequency…..Not Volume

REGION H
Water Planning Group

## Strategy for Increasing Frequency of Achieving Target Flows

- Larger shortages, typically during dry periods, are "off the table" because these likely can't be achieved without significant loss to water supply.
- Focus on the "most efficient" (least water volume) approach for meeting target frequencies.
- Once the desired target frequencies are achieved, determine impacts to existing and future water supplies.
- "Success" of methodology will be determined by the ability to achieve recommended frequencies while minimizing impacts to water supply.

# Pass Through Flows or Reservoir Releases?

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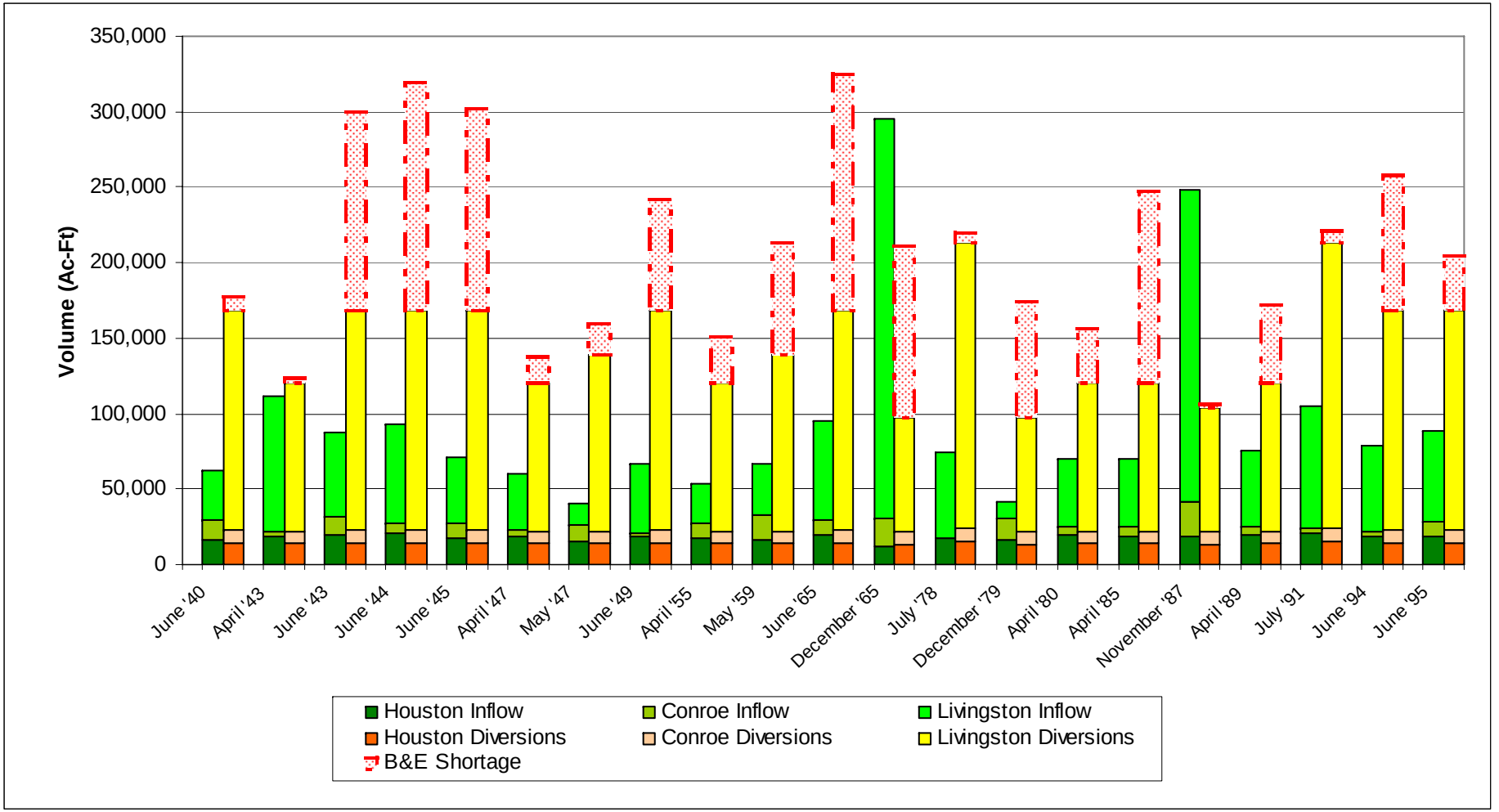

# Max H Target Flow Shortages

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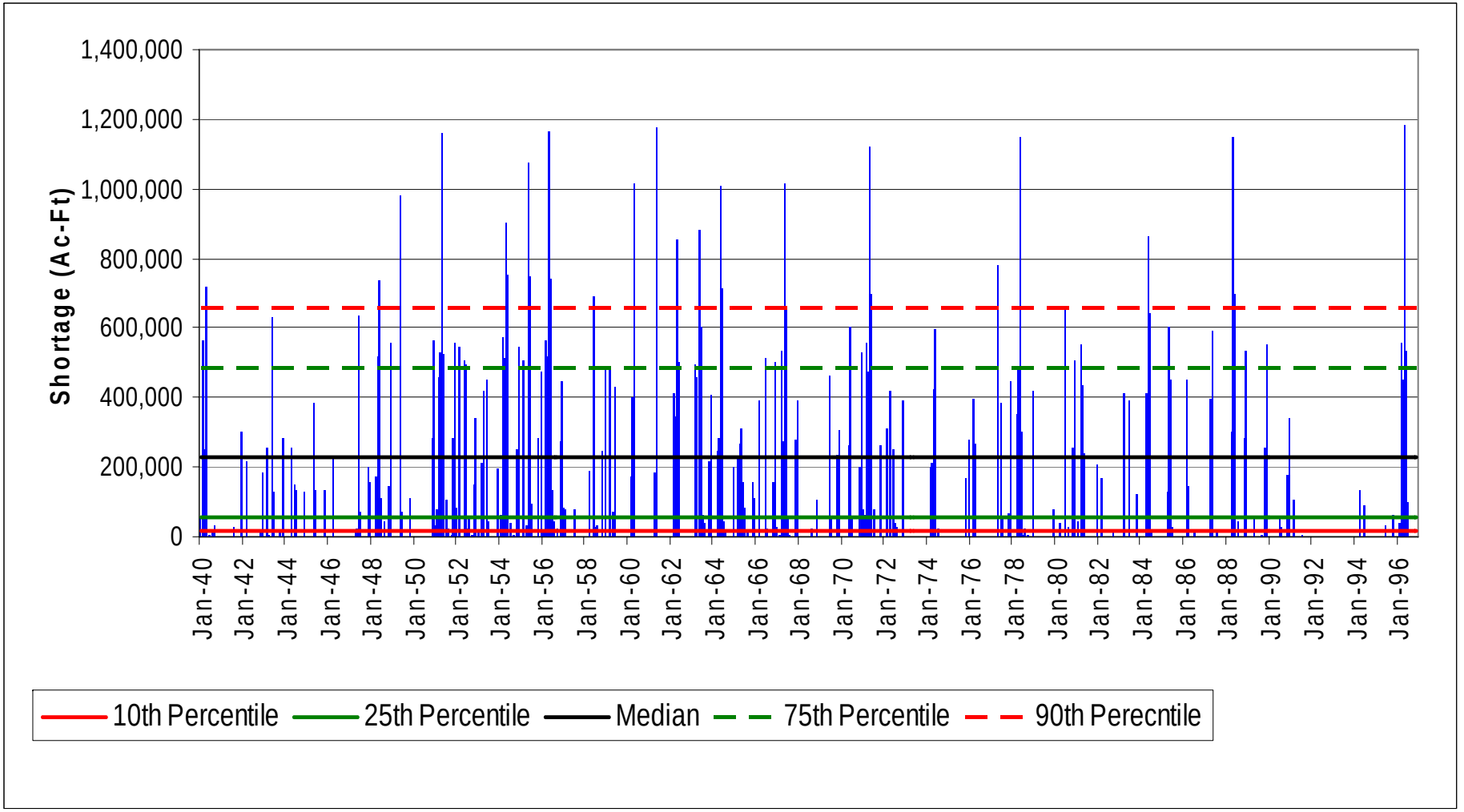
Water Planning Group



# Applying Methodology for Max H

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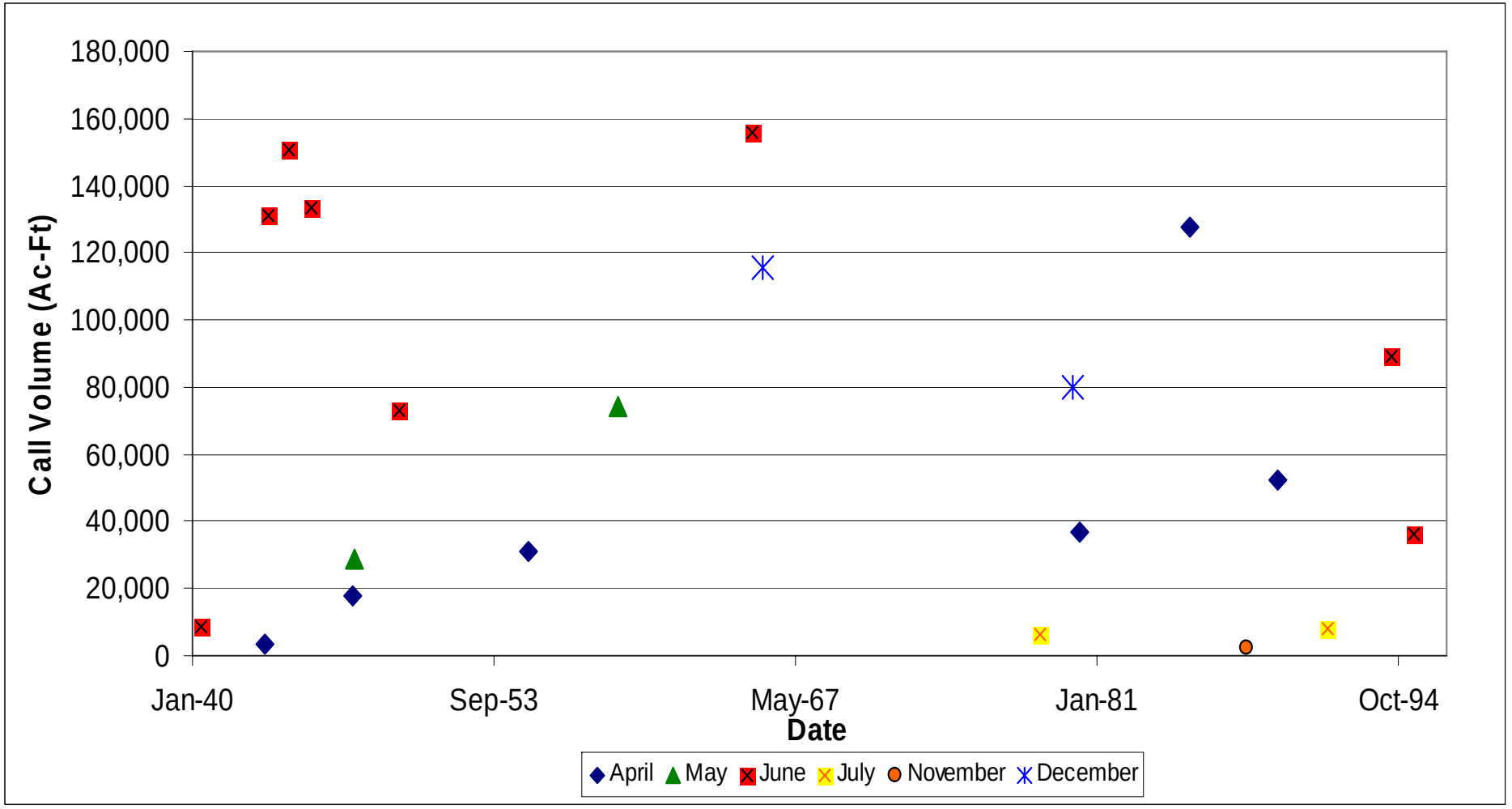
Water Planning Group

- Identified shortages between simulated B&E inflow and the B&E target flows.
- Released water from reservoir storage to increase simulated inflows.
- Target releases increased until shortages were reduced to achieve the desired frequency of 50%.

| Month | E Model Frequency | Maximum Target Volume (Ac-Ft) | Target Percentile of Shortage | Revised Frequency | Months Adjusted |
|---|---|---|---|---|---|
| January | 85.0% | | | 85.0% | |
| February | 86.5% | | | 86.5% | |
| March | 50.3% | | | 50.3% | |
| April | **41.0%** | 127,500 | 15.1% | 50.1% | 6 |
| May | **47.8%** | 74,200 | 3.4% | 50.1% | 2 |
| June | **37.3%** | 156,100 | 20.0% | 50.1% | 8 |
| July | **47.9%** | 7,900 | 3.4% | 50.1% | 2 |
| August | 67.5% | | | 67.5% | |
| September | 92.1% | | | 92.1% | |
| October | 88.8% | | | 88.8% | |
| November | **48.1%** | 2,100 | 0.0% | 50.1% | 1 |
| December | **46.8%** | 115,400 | 3.5% | 50.1% | 2 |

# Target Reservoir Releases for Max H

REGION H
Water Planning Group



# Min Q-Sal Target Flow Shortages

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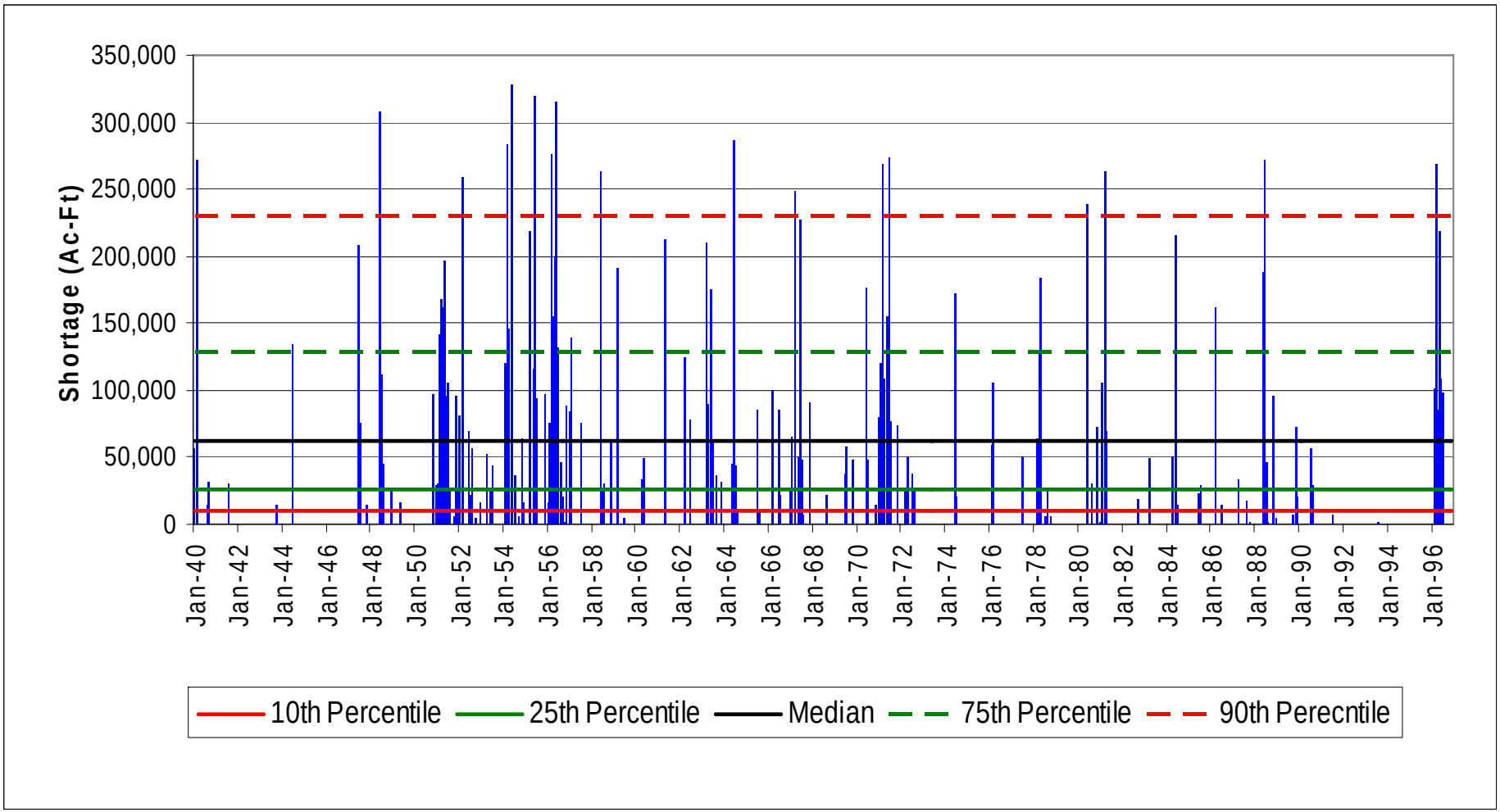
Water Planning Group



# Applying Methodology for Min Q-Sal

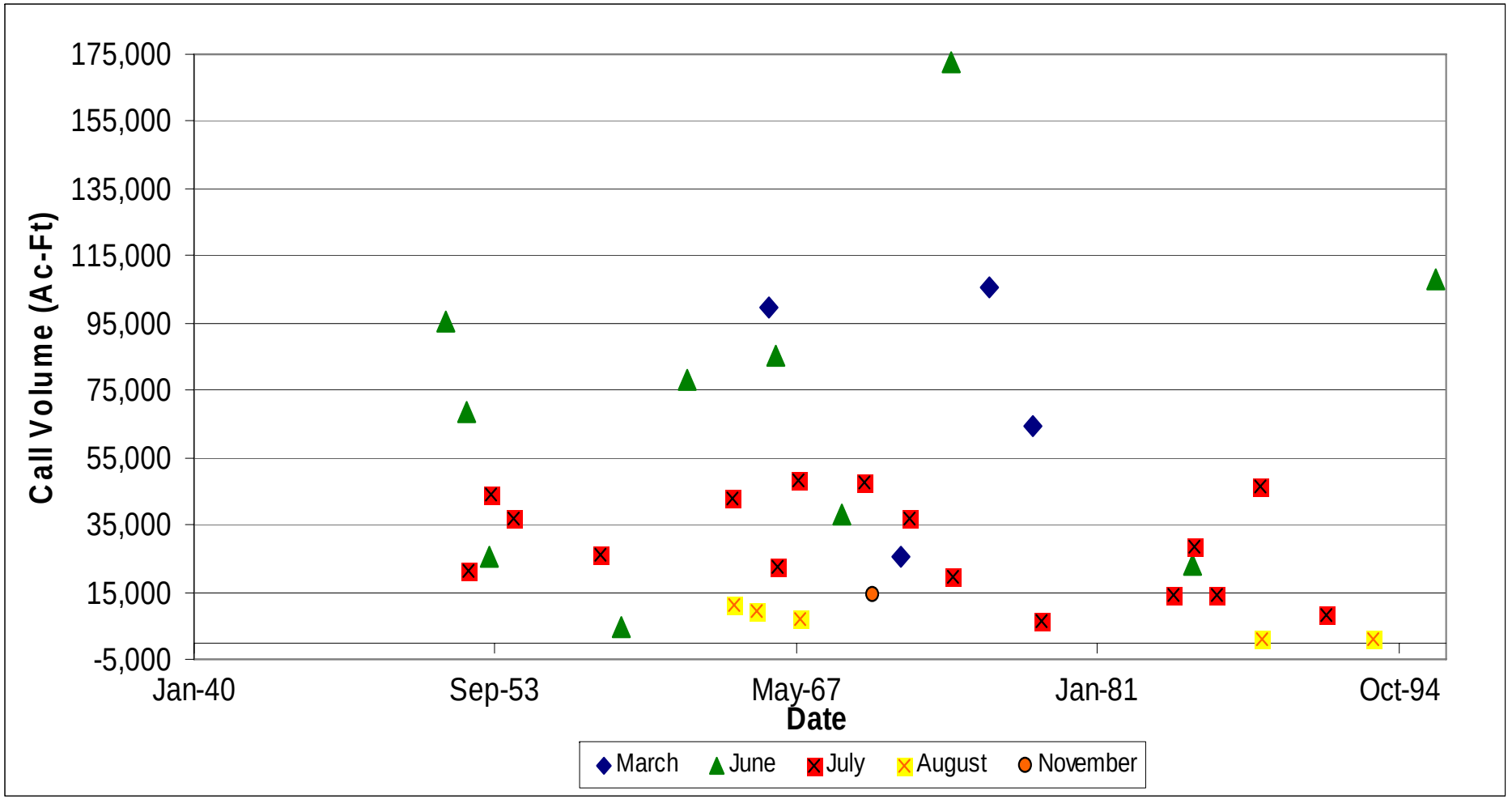
REGION H
Water Planning Group

- Identified shortages between simulated B&E inflow and the B&E target flows.
- Released water from reservoir storage to increase simulated inflows.
- Target releases increased until shortages were reduced to achieve the desired frequency of 75%.

| Month | E Model Frequency | Maximum Target Volume (Ac-Ft) | Target Percentile of Shortage | Revised Frequency | Months Adjusted |
|---|---|---|---|---|---|
| January | 85.0% | | | 85.0% | |
| February | 84.9% | | | 84.9% | |
| March | **68.9%** | 105,500 | 17.6% | 75.1% | 4 |
| April | 75.7% | | | 75.7% | |
| May | 80.0% | | | 80.0% | |
| June | **58.8%** | 172,600 | 39.2% | 75.1% | 10 |
| July | **47.9%** | 48,100 | 51.8% | 75.1% | 16 |
| August | **67.5%** | 11,200 | 22.2% | 75.1% | 5 |
| September | 92.1% | | | 92.1% | |
| October | 88.8% | | | 88.8% | |
| November | **74.0%** | 14,200 | 1.5% | 75.1% | 1 |
| December | 89.6% | | | 89.6% | |

# Target Reservoir Releases for Min Q-Sal

REGION H
Water Planning Group



# Impacts to Future Water Supply

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Water Planning Group

- Impacts to water supply projects include impacts to future firm yield as well as future reservoir storage.
- Future firm yield represents the yield of a project after 2060 strategies and expected return flows.
- Impacts to future firm yield could result from releases from reservoir storage for B&E flows.
- Impacts to future reservoir storage may also result from releases for B&E flows.
- Future reservoir storage may represent a future water supply for the Region.

# Impacts to Future Water Supply Yield

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## Existing Rights

| Basin | Description | Permit | Minimum Annual Diversion | | |
|---|---|---|---|---|---|
| | | | E Model | Revised Max H Model | Revised Min Q-Sal Model |
| SJ | Lake Houston | 168,000 | 168,000 | 168,000 | 168,000 |
| SJ | Lake Conroe | 100,000 | 82,266 | 82,266 | 82,266 |
| T | COH Livingston | 940,800 | 744,149 | 744,149 | 744,149 |
| T | *SJRA/Devers ROR | 58,500 | 58,285 | 58,285 | 58,285 |
| T | *COH/Dayton | 38,000 | 34,084 | 34,084 | 34,084 |
| T | CLCND - Lake Anahuac | 39,613 | 9,317 | 9,317 | 9,317 |
| T | *CLCND Fixed Right - CWA | 73,334 | 73,334 | 73,334 | 73,334 |
| T | *SJRA - CLCND Fixed Right - CWA | 30,000 | 30,000 | 30,000 | 30,000 |
| T | Livingston - TRA | 403,200 | 403,200 | 403,200 | 403,200 |

*Fixed right agreements

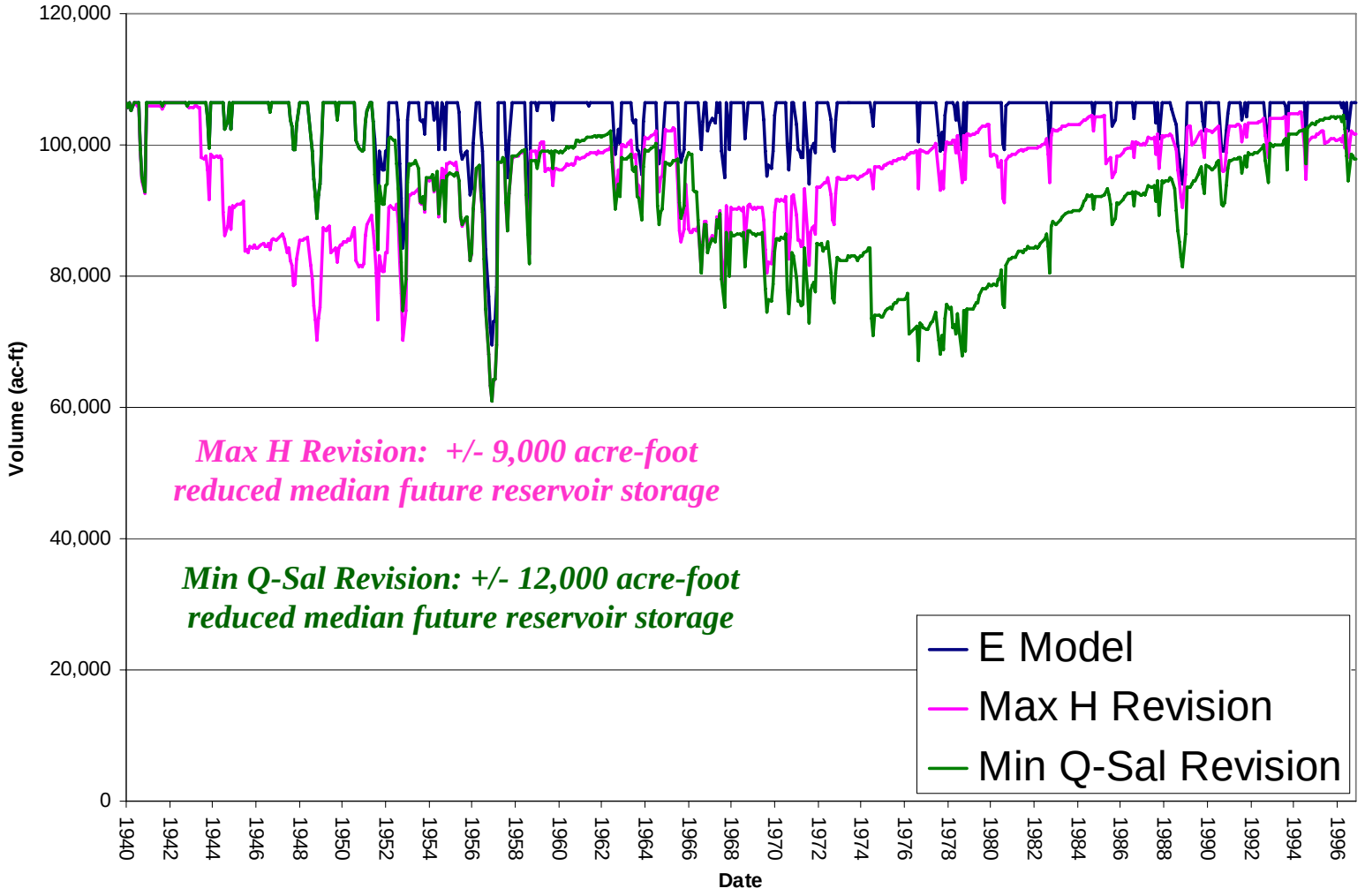
## Future Strategies

| Basin | Description | Permit | Minimum Annual Diversion | | |
|---|---|---|---|---|---|
| | | | E Model | Revised Max H Model | Revised Min Q-Sal Model |
| SJ | Lake Houston Additional Yield | 32,500 | 32,500 | 32,500 | 32,500 |
| SJ | NHCRWA Indirect Reuse | 31,400 | 11,263 | 11,263 | 11,263 |
| SJ | Houston Indirect Reuse | 60,524 | 58,369 | 58,369 | 58,369 |

# Impacts to Future Reservoir Storage

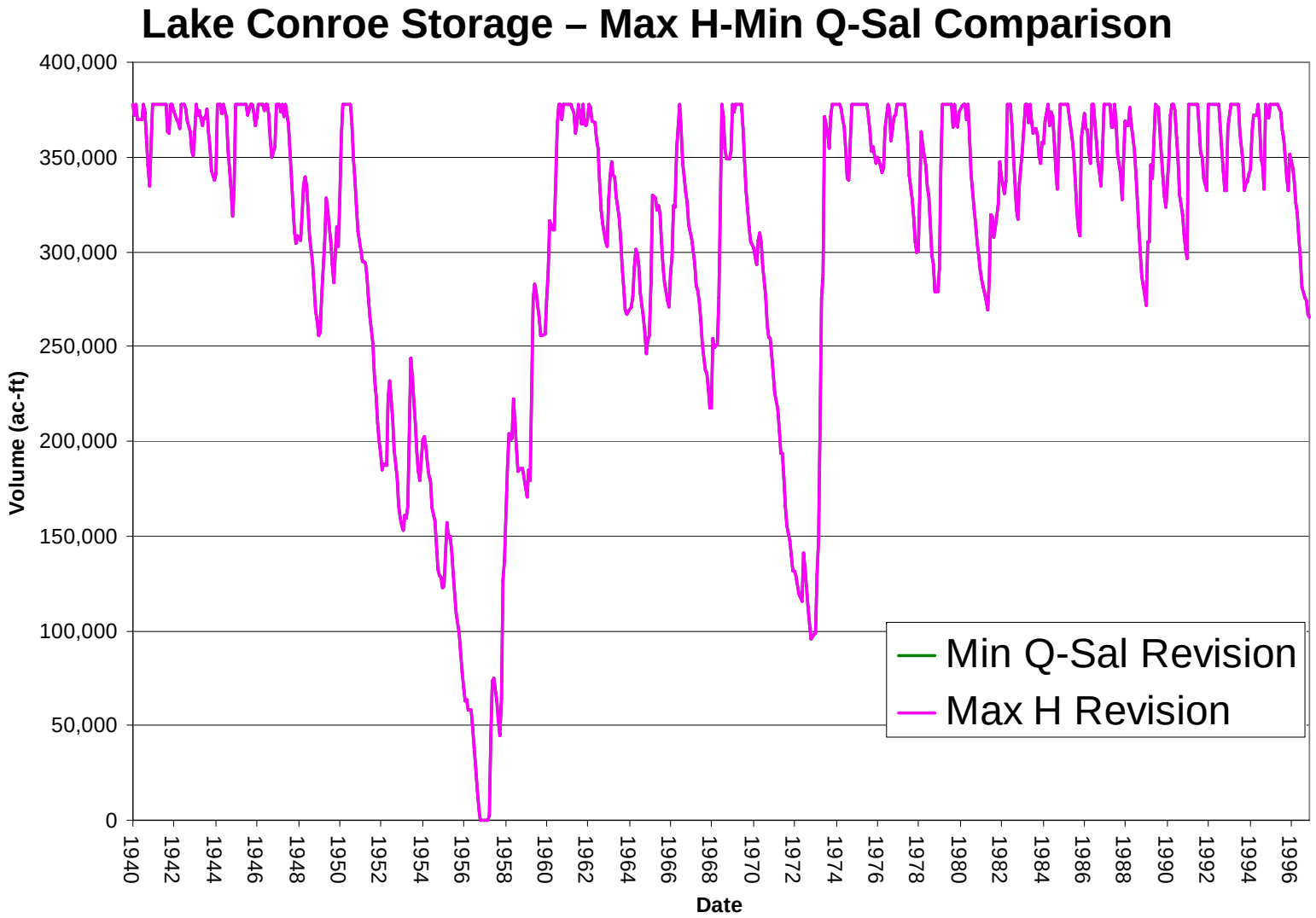
REGION H
Water Planning Group

## Lake Houston Storage – Max H-Min Q-Sal Comparison



# Impacts to Future Reservoir Storage

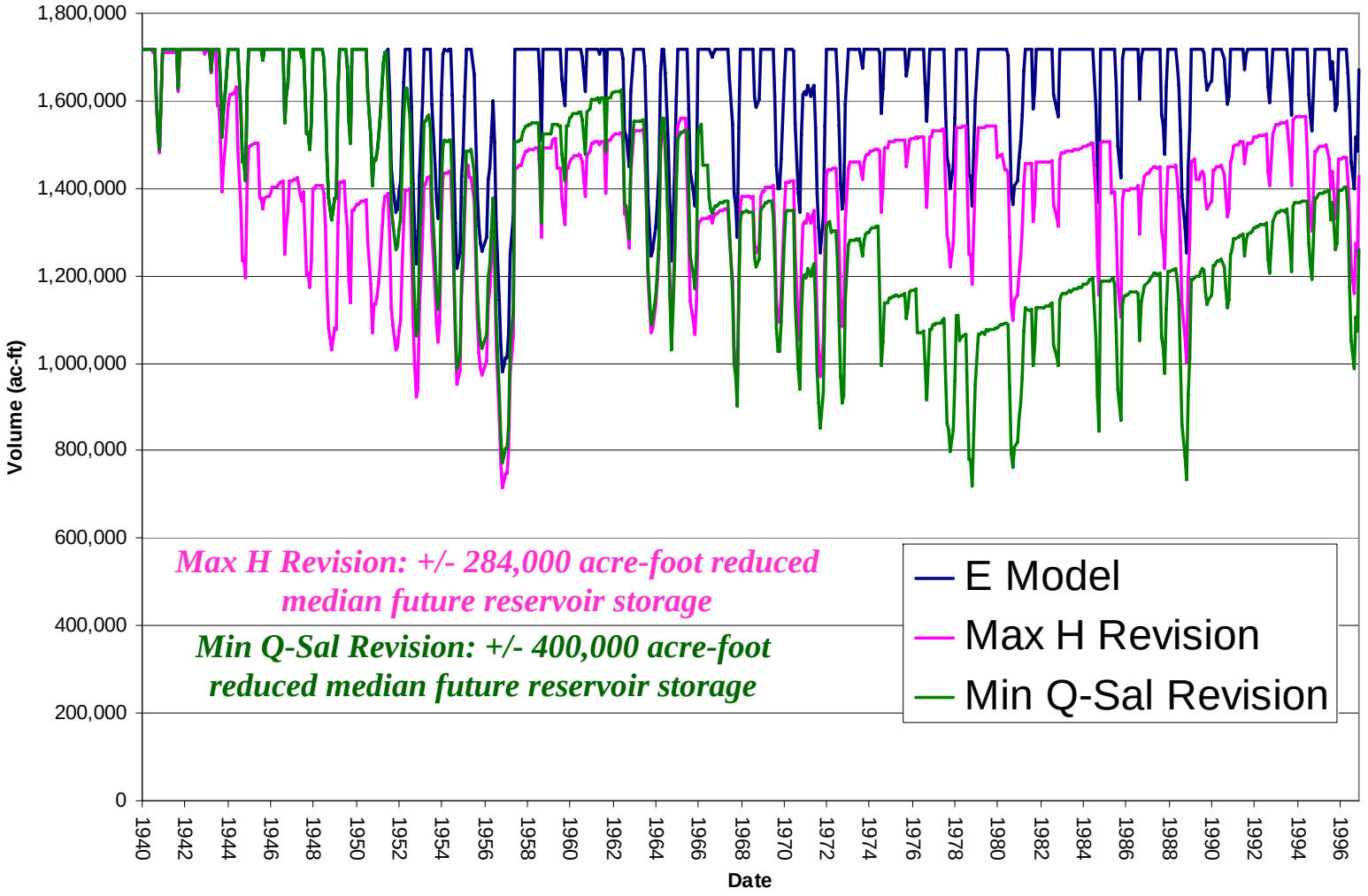
REGION H
Water Planning Group



# Impacts to Future Reservoir Storage

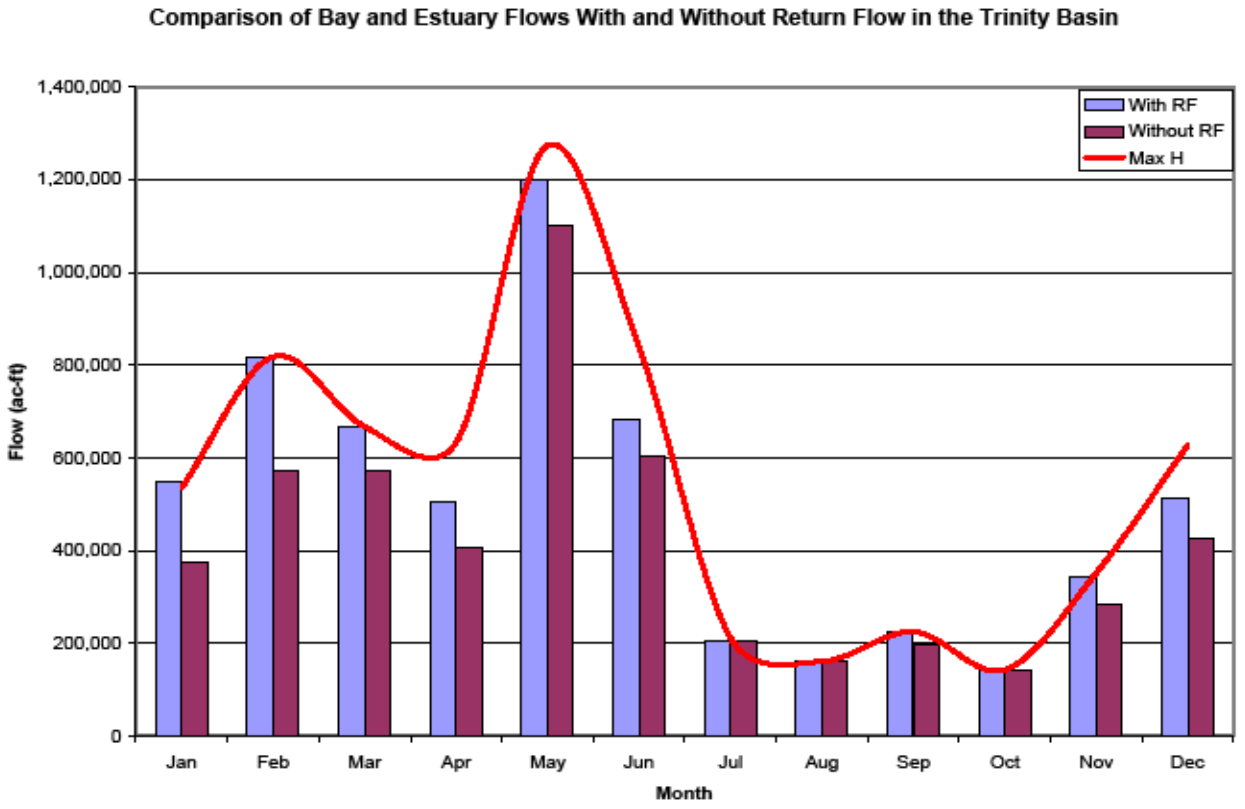
REGION H
Water Planning Group

## Lake Livingston Storage – Max H-Min Q-Sal Comparison



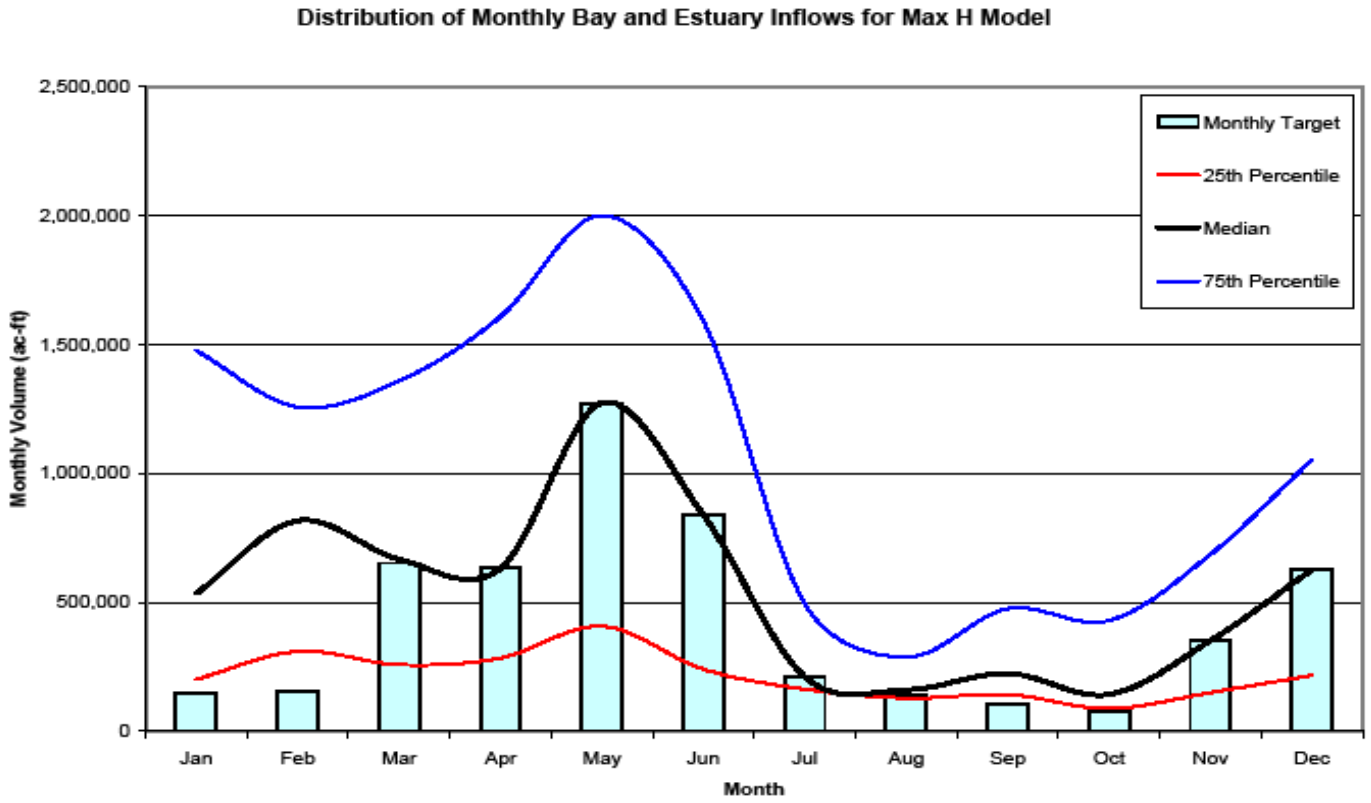
# Simulated Future Expected Return Flows

REGION H
Water Planning Group



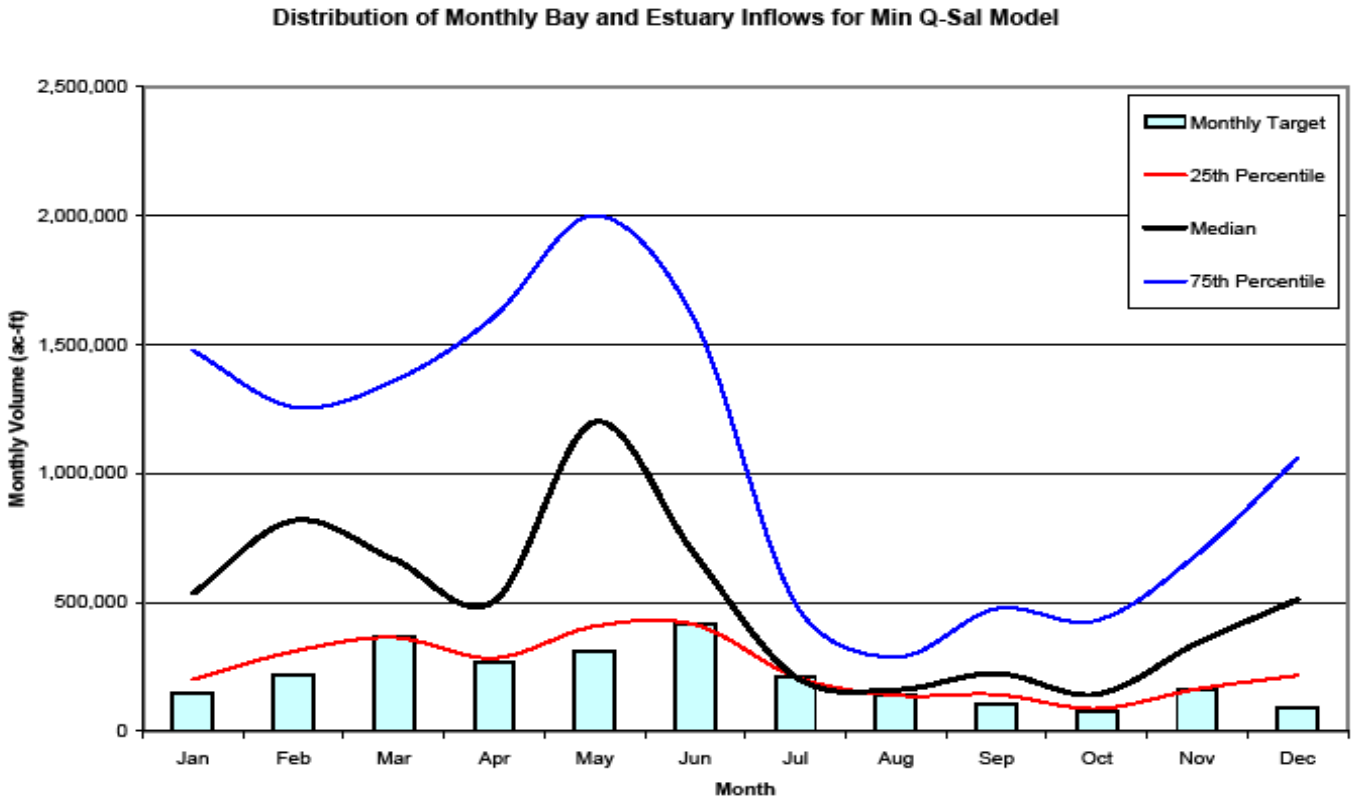
# Bracketing of Inflows
# Inflow Distribution for Max H Model

REGION H
Water Planning Group

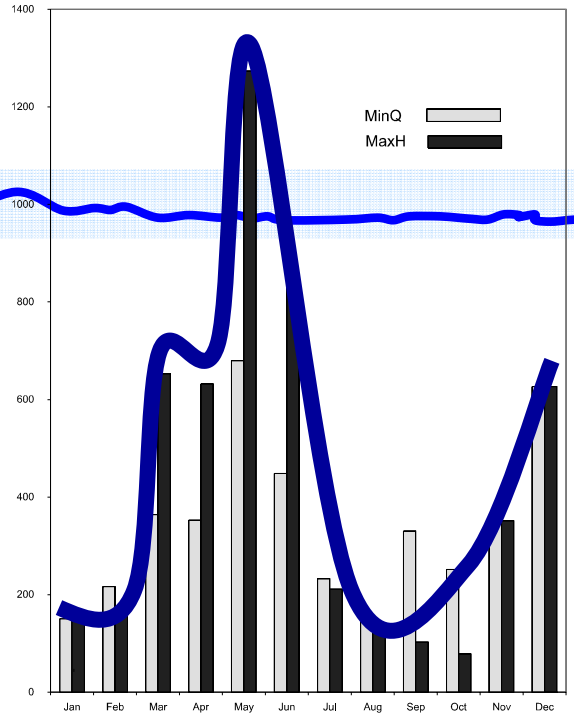


# Bracketing of Inflows
# Inflow Distribution for Min Q-Sal Model

REGION H
Water Planning Group



# Monthly Flows of MinQ and MaxH



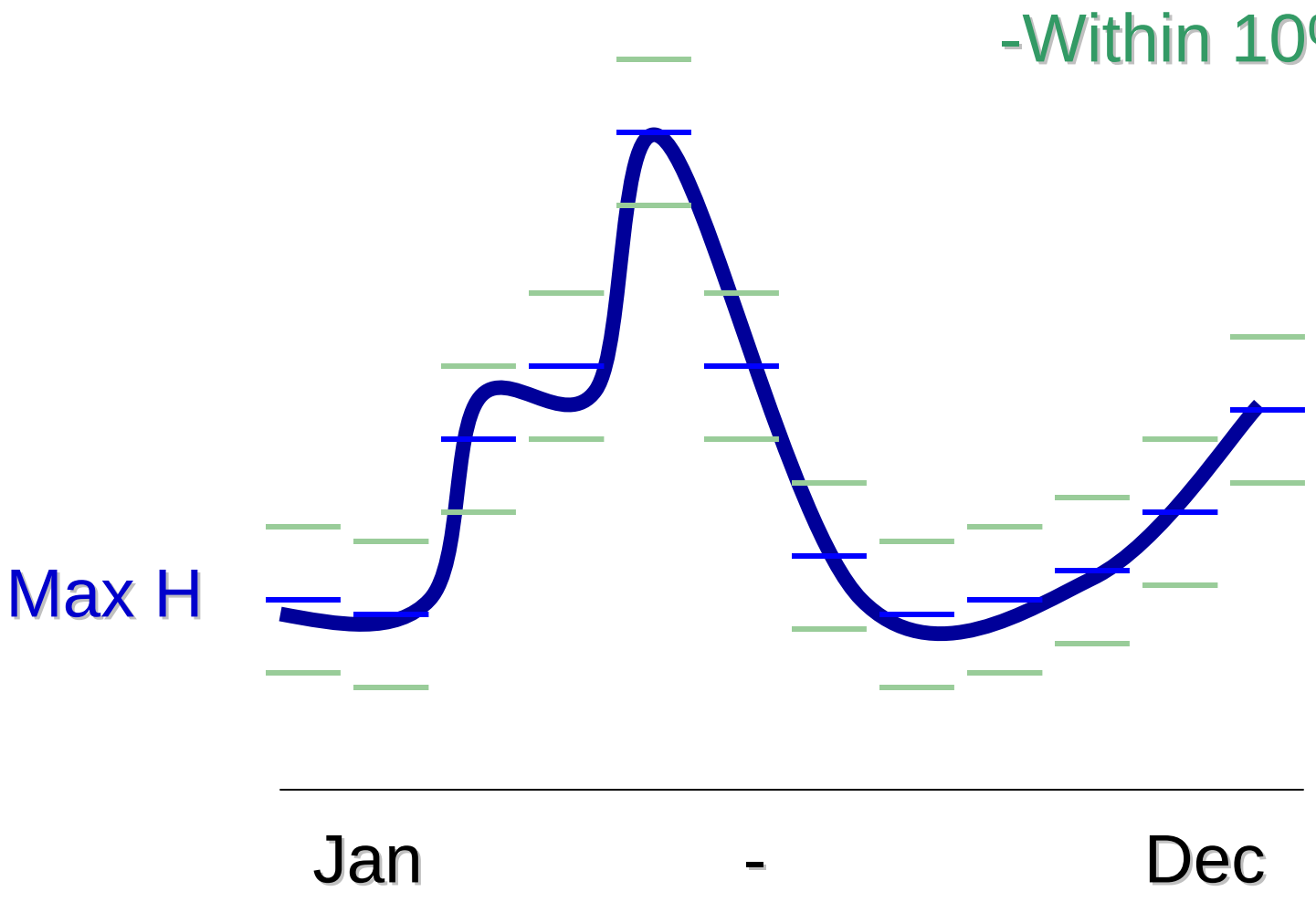

Monthly flows of MinQ and MaxH solutions

- The State Methodology's Max H flow regime is not comprised of individual Max H flow targets.

- Rather, to achieve maximum harvest in a given year monthly flows must be at (or near) all 12 of those flow targets in their respective months.

# Test to Achieve Max H

Does a year provide the optimal flow pattern as defined by the state methodology?



# Historical Analysis of Galveston Bay Inflows (within 10%)

**Recall, Maximum Harvest is achieved by all twelve months in year being optimum**

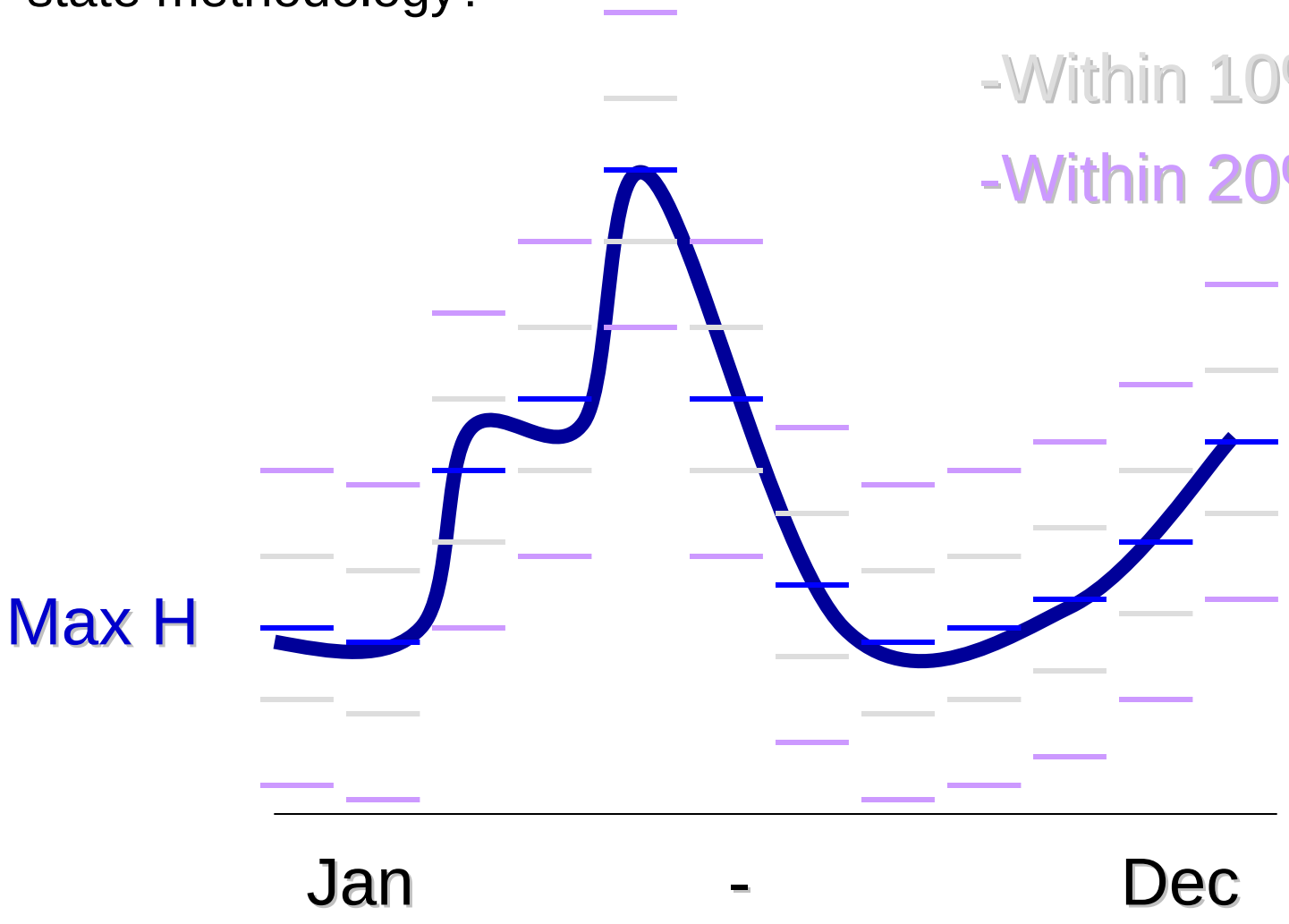
| | | | | | | | | | | | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1943 | | | | | | 911,100 | | | | | |
| 1944 | | | | | | 848,100 | | 135,020 | | | 378,600 | |
| 1945 | | | | | 1,177,100 | | | | | | 323,900 | |
| 1946 | | | | | | | | | | | | |
| 1947 | | | | 661,500 | | | | | | 81,680 | | |
| 1948 | | | | | | | | | | | | |
| 1949 | | | | | | | | | 100,240 | | | |
| 1950 | | | | | | | | | | | | |
| 1951 | | 159,400 | | | | | | | | | | |
| 1952 | | | | | | | | | | | | 625,300 |
| 1953 | | | | | | | | | | | 348,800 | |
| 1954 | | | | | | | 217,790 | | | | | |
| 1955 | | | | 675,300 | | | | | | 83,140 | | |
| 1956 | | | | | | | | | | | | |
| 1957 | | | | | | | | | | | | |
| 1958 | | | | 645,200 | | | | | | | | |
| 1959 | | | | | | | | | | | 354,200 | |
| 1960 | | | | | | | | | | | | |
| 1961 | | | | 619,800 | | | | | | | | |
| 1962 | | | | | | | 229,600 | | | | 341,900 | |
| 1963 | | | | | | | | | | | | |
| 1964 | | | 677,100 | | | | | | | | | |
| 1965 | | | 628,500 | | 1,329,000 | | | 132,220 | | | | |
| 1966 | | | | | | 831,300 | | | | | | |
| 1967 | | 150,980 | | | | | | | | | | |
| 1968 | | | | | | | | | | | | 612,200 |
| 1969 | | | | | | | | | | | | |

# Historical Analysis of Galveston Bay Inflows (within 10%)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | | | | | 1,311,900 | | 232,000 | | | | | |
| 1971 | | | | | | | | | | | 346,097 | |
| 1972 | | | | | | | | | | | | |
| 1973 | | | | | | | | | | | | |
| 1974 | | | | | 1,235,500 | | | | | | | |
| 1975 | | | | | | | | | | | | |
| 1976 | | | | | | | | | | | | |
| 1977 | | | | | | | 196,385 | | | | | |
| 1978 | | | | | | | 219,854 | | | 83,335 | | |
| 1979 | | | | | | | | | | | | 628,459 |
| 1980 | | | | | | | | 136,969 | | | | |
| 1981 | | 144,442 | | | | | | | | | | |
| 1982 | | | 627,602 | | | | | | | | | |
| 1983 | | | | | | 792,112 | | | | | 348,551 | 669,614 |
| 1984 | | | | | | | | | | | | |
| 1985 | | | | 659,034 | | 862,874 | | | | | | |
| 1986 | | | | | | | | | | | | |
| 1987 | | | | | | | | | | | | |
| 1988 | | | | | | | | | | | | |
| 1989 | | | | | | | | | | | | |
| 1990 | | | | | | | | | | | 376,161 | |
| 1991 | | | | | | | | | | | | |
| 1992 | | | | | | | | | | 77,416 | | |
| 1993 | | | | | | | | | | | | |
| 1994 | | | | 606,518 | | | | | | | | |
| 1995 | | | | | | | | | | | | |
| 1996 | | | | | | | | | | | | |

# Test to Achieve Max H

Does a year provide the optimal flow pattern as defined by the state methodology?



# Historical Analysis of Galveston Bay Inflows (within 20%)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1941 | | | | | | | | | | | | |
| 1942 | | | 586,300 | | | | | | | | | |
| 1943 | | | 562,200 | | | 911,100 | | | | | | |
| 1944 | | | | | | 848,100 | | 135,020 | | | 378,600 | |
| 1945 | | | | | 1,177,100 | 941,200 | | | | | 323,900 | |
| 1946 | | | | 544,200 | | | | | | | | |
| 1947 | | | | 661,500 | 1,488,600 | | | | | 81,680 | | |
| 1948 | | | | 516,600 | | | 185,300 | | 116,150 | | | |
| 1949 | | | | | | 926,000 | | | 100,240 | | | |
| 1950 | | | | | 1,429,000 | | | | | | | |
| 1951 | 128,100 | 159,400 | | | | | | | | | | |
| 1952 | | | | | | | | | | | | 625,300 |
| 1953 | | | 574,200 | | | | | | | | 348,800 | 726,100 |
| 1954 | | | | | | | 217,790 | | | | | |
| 1955 | | | | 675,300 | | | | | | 83,140 | | |
| 1956 | | | | | | | | | | | | |
| 1957 | | 174,700 | | | | | | | | | | 712,200 |
| 1958 | | | | 645,200 | | | | 113,400 | | | | |
| 1959 | | | | | 1,484,900 | | | | | | 354,200 | |
| 1960 | | | 530,900 | | | | | | | | | |
| 1961 | | | | 619,800 | | | | | | | | |
| 1962 | | | | | | | 229,600 | | | | 341,900 | |
| 1963 | | | | | | | | | 86,410 | | | |
| 1964 | | | 677,100 | | | | | | | | 417,600 | |
| 1965 | | | 628,500 | | 1,329,000 | 1,005,800 | | 132,220 | | | 305,000 | |
| 1966 | | | | | | 831,300 | | | | | | |
| 1967 | | 150,980 | | | | | | | | | | |
| 1968 | | | | | | | | | | | | 612,200 |
| 1969 | | | | | | 966,500 | | | | | | 528,600 |

# Historical Analysis of Galveston Bay Inflows (within 20%)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | | | | | 1,311,900 | | 232,000 | | | | | |
| 1971 | | | | | | | | | | | 346,097 | |
| 1972 | | | | | | | | 123,356 | | | | |
| 1973 | | | | | | | | | | | | |
| 1974 | | | | | 1,235,500 | | 250,254 | | | | | |
| 1975 | | | 770,507 | | | | | | | | | |
| 1976 | 172,870 | 127,541 | | 549,930 | | | | | | | 413,510 | |
| 1977 | | | 728,524 | | | | 196,385 | | | | | |
| 1978 | | | | | | | 219,854 | | | 83,335 | | |
| 1979 | | | | | | | | | | | | 628,459 |
| 1980 | | | | | | | 246,871 | 136,969 | | | | |
| 1981 | | 144,442 | | | | | | | | | | |
| 1982 | | | 627,602 | | | | | | | | | |
| 1983 | | | | | | 792,112 | | | | | 348,551 | 669,614 |
| 1984 | | | | | | | | | | | | |
| 1985 | | | | 659,034 | | 862,874 | | | | | | |
| 1986 | | | | | | | | | | | | |
| 1987 | | | | | | | | 154,266 | | | 408,387 | |
| 1988 | | | | | | | | | | | | |
| 1989 | | | 559,738 | | | | | | | | | |
| 1990 | | | | | | | | | | | 376,161 | |
| 1991 | | | | | | | | | | | | |
| 1992 | | | | | | | | | | 77,416 | | |
| 1993 | | | | | | | | | | | | |
| 1994 | | | | 606,518 | | | | | | | | |
| 1995 | | | | | | | | | | | | |
| 1996 | | 181,627 | | | | | 248,984 | | | | | |

# Historical Analysis of Galveston Bay Inflows (within 1045%)

To achieve 50% of years must adjust such that historic flows must be within 1045% of Max H.

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1941 | | | | | | | | | | | 1,542,900 | 357,400 |
| 1942 | 288,2 | | | | | | | | | 700 | 443,700 | 495,300 |
| 1943 | 1,098,5 | | | | | | | | | 700 | 514,240 | 462,600 |
| 1944 | | | | | | | | | | 640 | 378,600 | 1,408,900 |
| 1945 | | | | | | | | | | | 323,900 | 1,298,400 |
| 1946 | | | | | | | | | | 150 | | 1,120,400 |
| 1947 | | | | | | | | | | 680 | 173,100 | 911,400 |
| 1948 | 817,6 | | | | | | | | | 060 | 143,750 | 55,290 |
| 1949 | 379,0 | 1,4 | 1,9 | 1,0 | 3 | 9 | 4 | 2 | 1 | | 270,100 | 1,609,100 |
| 1950 | 1,574,400 | | 853,500 | 978,300 | 1,429,000 | 1,693,900 | 484,000 | 258,700 | 677,900 | 215,600 | 90,660 | 71,560 |
| 1951 | 128,100 | 159,400 | 388,600 | 136,200 | 139,400 | 597,300 | 150,500 | 49,580 | 507,090 | 42,900 | 45,050 | 75,050 |
| 1952 | 73,100 | 695,800 | 288,300 | 1,462,500 | 1,010,400 | 443,100 | 285,750 | 20,590 | 61,100 | 28,710 | 138,160 | 625,300 |
| 1953 | 363,000 | 656,900 | 574,200 | 286,400 | 3,351,000 | 521,300 | 92,630 | 571,200 | 69,080 | 47,710 | 348,800 | 726,100 |
| 1954 | 317,900 | 81,720 | 73,530 | 145,510 | 461,500 | 56,540 | 217,790 | 93,840 | 15,740 | 214,400 | 276,000 | 92,880 |
| 1955 | 352,700 | 1,189,100 | 208,900 | 675,300 | 251,100 | 147,500 | 84,260 | 745,420 | 169,660 | 83,140 | 31,300 | 176,050 |
| 1956 | 180,700 | 432,800 | 131,700 | 189,900 | 388,200 | 138,080 | 44,350 | 54,860 | 26,830 | 21,100 | 95,520 | 167,240 |
| 1957 | 41,630 | 174,700 | 1,415,500 | 2,027,500 | 4,126,000 | 3,273,000 | 701,000 | 678,300 | 412,900 | | 2,097,000 | 712,200 |
| 1958 | 1,567,500 | 1,024,300 | 517,100 | 645,200 | 2,422,000 | 517,200 | 416,300 | 113,400 | | 341,000 | 88,300 | 118,700 |
| 1959 | 218,080 | | 207,100 | 2,027,700 | 1,484,900 | 469,300 | 1,518,700 | 764,100 | 160,800 | | 354,200 | 1,055,400 |
| 1960 | 1,505,000 | 1,333,000 | 530,900 | 268,900 | 282,900 | 1,548,900 | 329,900 | 878,280 | 193,340 | | 1,004,100 | 2,582,000 |
| 1961 | | | 820,300 | 619,800 | 150,500 | 1,826,800 | 1,265,100 | 172,850 | | 96,940 | 832,900 | 788,200 |
| 1962 | 433,100 | 295,300 | 327,000 | 322,900 | 564,900 | 471,900 | 229,600 | 303,300 | 422,400 | 556,100 | 341,900 | 1,075,700 |
| 1963 | 615,200 | 486,900 | 168,000 | 188,900 | 476,000 | 320,100 | 138,030 | 63,750 | 86,410 | 40,420 | 81,940 | 194,560 |
| 1964 | 255,590 | 596,360 | 677,100 | 384,400 | 268,900 | 176,900 | 103,640 | 111,770 | 216,320 | 372,300 | 417,600 | 981,100 |
| 1965 | 401,900 | 1,064,700 | 628,500 | 407,300 | 1,329,000 | 1,005,800 | 111,770 | 132,220 | 136,060 | 124,590 | 305,000 | 983,400 |
| 1966 | 782,100 | 1,344,300 | 302,800 | 1,675,000 | 4,571,000 | 831,300 | 490,700 | 730,000 | 263,700 | 265,800 | 241,640 | 94,850 |
| 1967 | 106,550 | 150,980 | 120,730 | 463,200 | 389,200 | 359,900 | 291,700 | 92,210 | 274,700 | 240,400 | 525,100 | 395,100 |
| 1968 | 1,512,500 | 616,700 | 1,053,900 | 2,183,000 | 3,087,000 | 3,171,000 | 734,400 | 194,800 | 300,800 | 256,090 | 250,540 | 612,200 |
| 1969 | 288,500 | 1,374,600 | 1,889,000 | 2,213,000 | 3,057,000 | 966,500 | 287,700 | 201,520 | 211,390 | 183,960 | 173,700 | 528,600 |

# Historical Analysis of Galveston Bay Inflows (within 1045%)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 399,400 | 352,900 | 1,912,000 | 762,300 | 1,311,900 | 312,900 | 232,000 | 170,780 | 581,660 | | 190,740 | 89,610 |
| 1971 | 63,310 | 70,990 | 108,210 | 197,970 | 153,090 | 119,950 | 153,580 | 295,400 | 625,930 | 122,511 | 346,097 | 1,904,850 |
| 1972 | 1,611,070 | 431,120 | 293,620 | 421,980 | 1,584,050 | 382,720 | 319,080 | 123,356 | 463,570 | 101,620 | 744,110 | 421,510 |
| 1973 | 1,096,890 | 1,093,660 | 2,250,030 | 3,132,680 | 1,741,020 | 4,011,820 | 1,046,890 | 550,350 | | | 1,162,130 | 1,147,070 |
| 1974 | | 643,276 | 518,320 | 428,700 | 1,235,500 | 278,831 | 250,254 | 316,230 | | 540,840 | 3,217,410 | 2,000,490 |
| 1975 | 1,174,310 | | 770,507 | 1,471,960 | 2,127,080 | 1,784,680 | 571,020 | 680,880 | 246,162 | 322,390 | 246,575 | 204,630 |
| 1976 | 172,870 | 127,541 | 224,111 | 549,930 | 276,260 | 1,615,280 | 759,150 | 198,855 | 325,650 | 390,580 | 413,510 | 1,606,280 |
| 1977 | 672,654 | 1,346,984 | 728,524 | 2,483,480 | 822,157 | 561,989 | 196,385 | 216,927 | 356,242 | 117,139 | 570,367 | 449,329 |
| 1978 | 1,140,469 | 984,419 | 439,787 | 166,514 | 161,481 | 512,117 | 219,854 | 171,138 | 335,434 | 83,335 | 461,198 | 282,025 |
| 1979 | 1,416,306 | 1,460,504 | 1,620,518 | 3,134,120 | 1,899,800 | 2,042,148 | 2,387,442 | 641,356 | | 313,664 | 634,952 | 628,459 |
| 1980 | 1,450,677 | 1,038,146 | 950,560 | 771,168 | 1,709,478 | 321,883 | 246,871 | 136,969 | 584,127 | 424,883 | 136,320 | 165,558 |
| 1981 | 188,749 | 144,442 | 161,204 | 234,102 | 919,102 | 3,674,986 | 1,311,544 | 346,893 | 1,053,224 | | 1,783,010 | 892,675 |
| 1982 | 728,692 | 654,847 | 627,602 | 960,395 | 2,001,583 | 1,550,919 | 936,525 | 553,662 | 193,134 | 146,595 | 787,968 | 1,805,511 |
| 1983 | 807,453 | | 1,505,404 | 382,804 | 1,731,824 | 792,112 | 1,138,575 | | | 224,518 | 348,551 | 669,614 |
| 1984 | 626,169 | 635,400 | 927,617 | 356,239 | 528,271 | 294,455 | 314,642 | 209,571 | 233,328 | | 904,977 | 969,674 |
| 1985 | 1,091,971 | 1,379,032 | 2,015,201 | 659,034 | 902,381 | 862,874 | 352,022 | 276,931 | 462,290 | 899,573 | 1,763,157 | 1,827,069 |
| 1986 | 311,759 | 1,340,362 | 370,369 | 401,150 | 1,561,330 | 2,957,854 | 605,028 | 237,042 | 615,560 | | 1,727,561 | 2,168,585 |
| 1987 | 998,087 | 910,759 | 1,560,093 | 396,326 | 540,534 | 2,536,267 | 1,122,183 | 154,266 | 325,502 | 122,680 | 408,387 | 913,150 |
| 1988 | 581,338 | 415,809 | 804,665 | 466,340 | 290,255 | 203,841 | 261,983 | 267,840 | 358,979 | 112,438 | 88,068 | 103,134 |
| 1989 | 358,352 | 445,789 | 559,738 | 820,156 | 2,534,524 | 3,615,843 | | 929,499 | 209,071 | 314,223 | 193,024 | 104,258 |
| 1990 | 731,678 | 1,128,868 | 1,950,090 | 2,291,570 | 4,355,617 | 1,850,399 | 517,124 | 340,626 | 242,278 | 286,292 | 376,161 | 323,617 |
| 1991 | | | 1,234,321 | 2,993,057 | 2,100,966 | 1,682,881 | 972,321 | 690,098 | | 453,762 | 2,208,921 | 3,427,117 |
| 1992 | | | 4,249,316 | 2,255,058 | 1,848,335 | 2,418,949 | 995,548 | 679,250 | 264,294 | 77,416 | 863,499 | 1,892,896 |
| 1993 | | 1,559,573 | 3,361,311 | 2,361,784 | 2,290,356 | 3,116,278 | 1,095,797 | 493,887 | 480,115 | 721,124 | 1,077,556 | 765,086 |
| 1994 | 469,944 | 1,040,829 | 1,674,030 | 606,518 | 1,997,939 | 1,078,111 | 427,111 | 596,629 | 385,497 | | 1,272,848 | 2,625,314 |
| 1995 | | 783,937 | 2,339,693 | 2,224,262 | 2,370,657 | 1,445,844 | 760,794 | 975,573 | 217,460 | 357,231 | 462,950 | 1,003,947 |
| 1996 | 446,653 | 181,627 | 117,830 | 199,175 | 148,855 | 502,987 | 248,984 | 768,018 | | 309,632 | 224,856 | 847,411 |

# Summary of Results

REGION H
Water Planning Group

- Meeting the prescribed seasonal frequencies for Max H and Min Q-Sal requires releases from reservoir storage for several months (21 for Max H, 36 for Min Q-Sal) over the period of record.

- Approach used in this study was designed specifically to minimize the volume of those reservoir releases.

- Loss of reservoir storage appears to be unavoidable unless the desired frequency of achieving the seasonal target flows is different from the current GBFIG annual flow recommendations.

- No observed impacts to future 2060 “firm yield” as a result of reservoir releases for B&E flows, although reservoir levels maintain a significant lower level of storage over the period of record.

# Summary of Results

REGION H
Water Planning Group

- Future 2060 “firm yield” is not impacted primarily as a result of significant upper basin return flows assumed in our approach and simulated in the model.

- Both Max H and Min Q-Sal seasonal targets resulted in significant impacts to future reservoir storage.

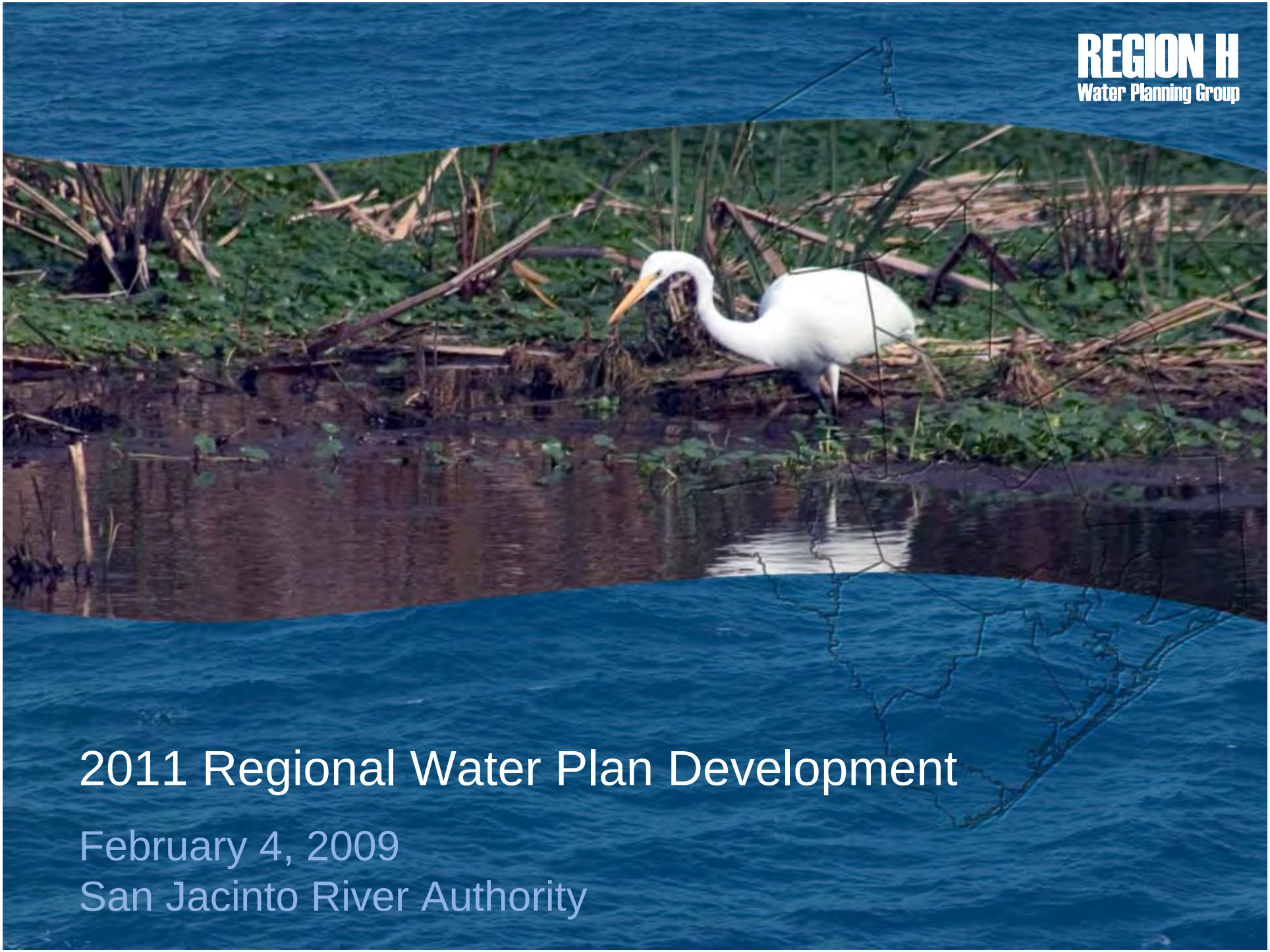
- The Min Q-Sal seasonal target frequency appears to result in greater impacts to future reservoir storage than Max H due to the higher level of desired frequency (75% for Min Q-Sal versus 50% for Max H).

- This study focused on the “end game” (i.e., 2060 conditions). This decade may not represent the most critical scenario due to the staging of strategies and return flows over time. Region H 2011 plan scope has elements to address the planning decades prior to 2060.

# Summary of Results

REGION H
Water Planning Group

- The underlying assumption that B&E flow needs are met if desired frequency of occurrence is achieved has no real technical basis.
- The approach does not consider a “bracket” of acceptable flows, only whether the flow equals or exceeds the desired B&E flow.
- The strategy used to “fix” the problem represents a hard-wired approach to meeting the desired frequency and couldn’t be replicated in the real world.
- The validity of using the same annual recommended frequencies for Max H and Min Q-Sal for evaluating seasonality (i.e., monthly target flows) is questionable and should be studied further.




# 2011 Regional Water Plan Development

February 4, 2009
San Jacinto River Authority

# 2nd Biennium Efforts

REGION H
Water Planning Group

- Beginning 2nd Biennium efforts
- Progressing on Population and Water Demand Projections task in order to accelerate the schedule
- Presenting preliminary data and methodology today for Planning Group approval

# Population Projections

REGION H
Water Planning Group

- TWDB not providing demand projections for uses other than Steam-Electric
- Planning Groups may elect to revise population projections
- New WUGs have been identified based on creation and growth
- Region H has 78 WUGs identified by TWDB as potential candidates for revision
- Consultant has also identified other areas of interest for consideration

# Population Projections: New WUGs in Region H

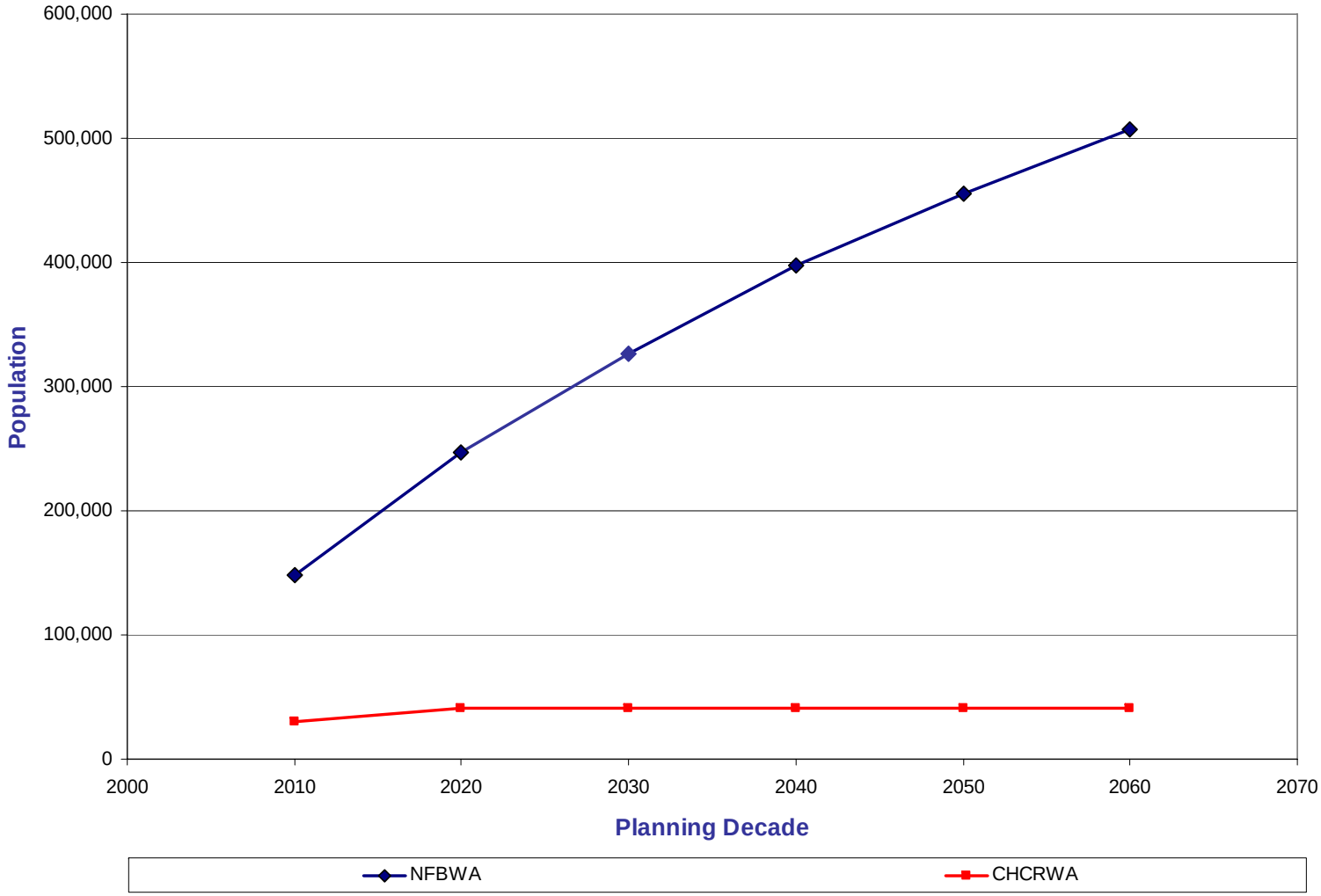
REGION H
Water Planning Group

- The North Fort Bend Water Authority and Central Harris County Regional Water Authorities have been added as a result of their creation
- Three additional users have been identified as WUGs due to their growth
  - Kendleton
  - Montgomery
  - Stagecoach

# Population Projections:
# New WUGs in Region H

REGION H
Water Planning Group

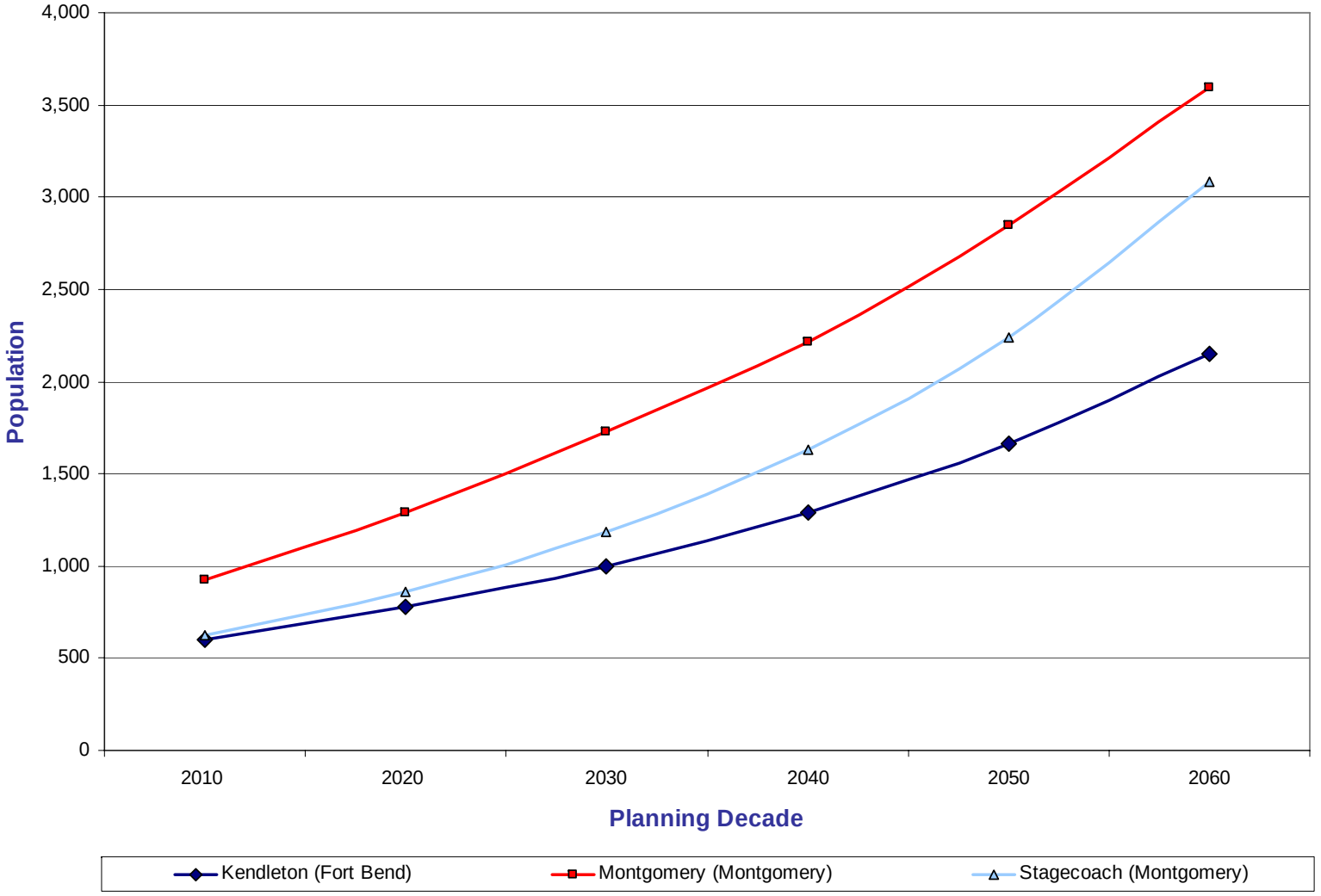
***Two new WUGs representing NFBWA and CHCRWA***



# Population Projections: New WUGs in Region H

REGION H
Water Planning Group

## *Three new city WUGs in Fort Bend and Montgomery Counties*



# Population Projections: TWDB Alternative Projections

REGION H Water Planning Group

- Based on 2007 Texas State Data Center estimates
- Generated by the Board but do not represent *Board approved* projections
- WUGs with more than 5 percent variance from 2006 RWP projection
- May be recommended by the Planning Group for approval by the Board
- Revised projections based on a variety of techniques
  - Increasing initial and subsequent populations by difference of 2007 TWDB and SDC estimates
  - Using County growth rate to steer WUG growth rates

# Population Projections: TWDB Alternative Projections

REGION H Water Planning Group

| County | City WUGs Adjusted | Increased Population Resulting from Revisions | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Austin | 2 | 3,002 | 5,852 | 7,839 | 9,020 | 9,587 | 10,364 |
| Brazoria | 6 | 22,382 | 27,555 | 32,266 | 36,617 | 41,219 | 46,019 |
| Chambers | 2 | 316 | 381 | 441 | 493 | 546 | 600 |
| Fort Bend | 9 | 33,860 | 44,198 | 56,838 | 69,835 | 86,878 | 106,355 |
| Harris | 5 | 10,057 | 11,235 | 12,394 | 13,541 | 14,681 | 15,816 |
| Leon | 1 | 54 | 109 | 141 | 143 | 141 | 145 |
| Liberty | 2 | 1,529 | 3,214 | 4,830 | 6,413 | 8,148 | 10,094 |
| Madison | 1 | 6 | 12 | 17 | 21 | 25 | 28 |
| Montgomery | 5 | 15,113 | 30,541 | 43,127 | 56,032 | 73,054 | 92,824 |
| Polk | 2 | 1,330 | 2,633 | 3,690 | 4,463 | 5,145 | 5,816 |
| San Jacinto | 1 | 383 | 759 | 1,059 | 1,246 | 1,355 | 1,404 |
| Waller | 3 | 3,009 | 6,573 | 10,541 | 14,955 | 20,213 | 26,251 |

# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

- 2007 Texas State Data Center estimates indicate 9 Region H counties were under-projected in 2007 – 5 of these under-projections are > 5%
- 2011 2nd Biennium SOW includes a task to evaluate changes in County and WUG populations and develop revised population projections where appropriate
- Revision process begins with the development of County-wide projections

# Population Projections: Other Population Revisions

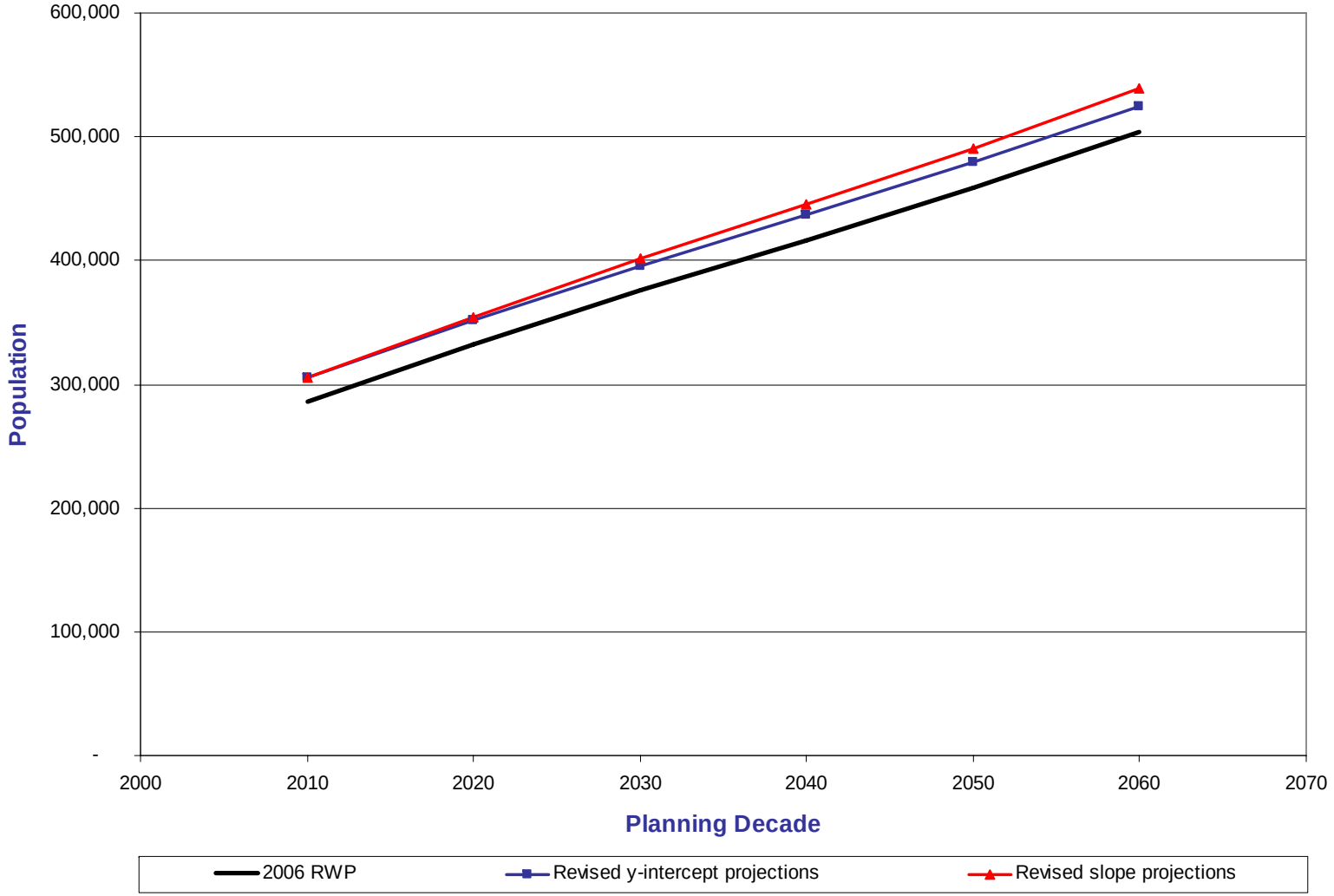
REGION H
Water Planning Group

- Developed potential County-wide revisions based on two techniques
  - Applying change in population as a one-time occurrence (increase "y-intercept")
  - Applying percent change in population as a long-term trend (increase "slope")
- Excluded Galveston County at this time due to uncertainty in perpetuation of any population trends
- Included Harris County due to magnitude of difference although change is less than 5%

# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

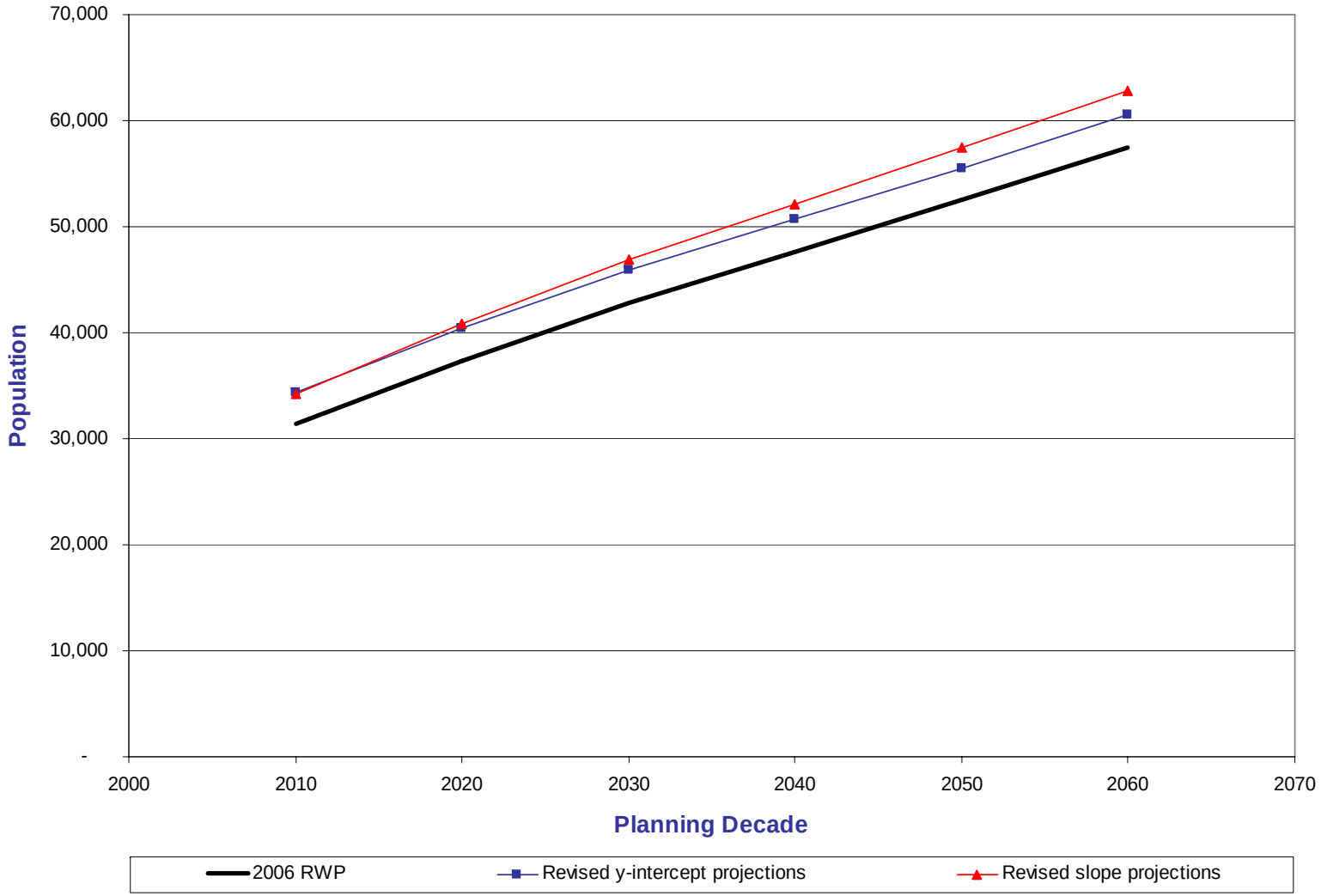
## Brazoria County



# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

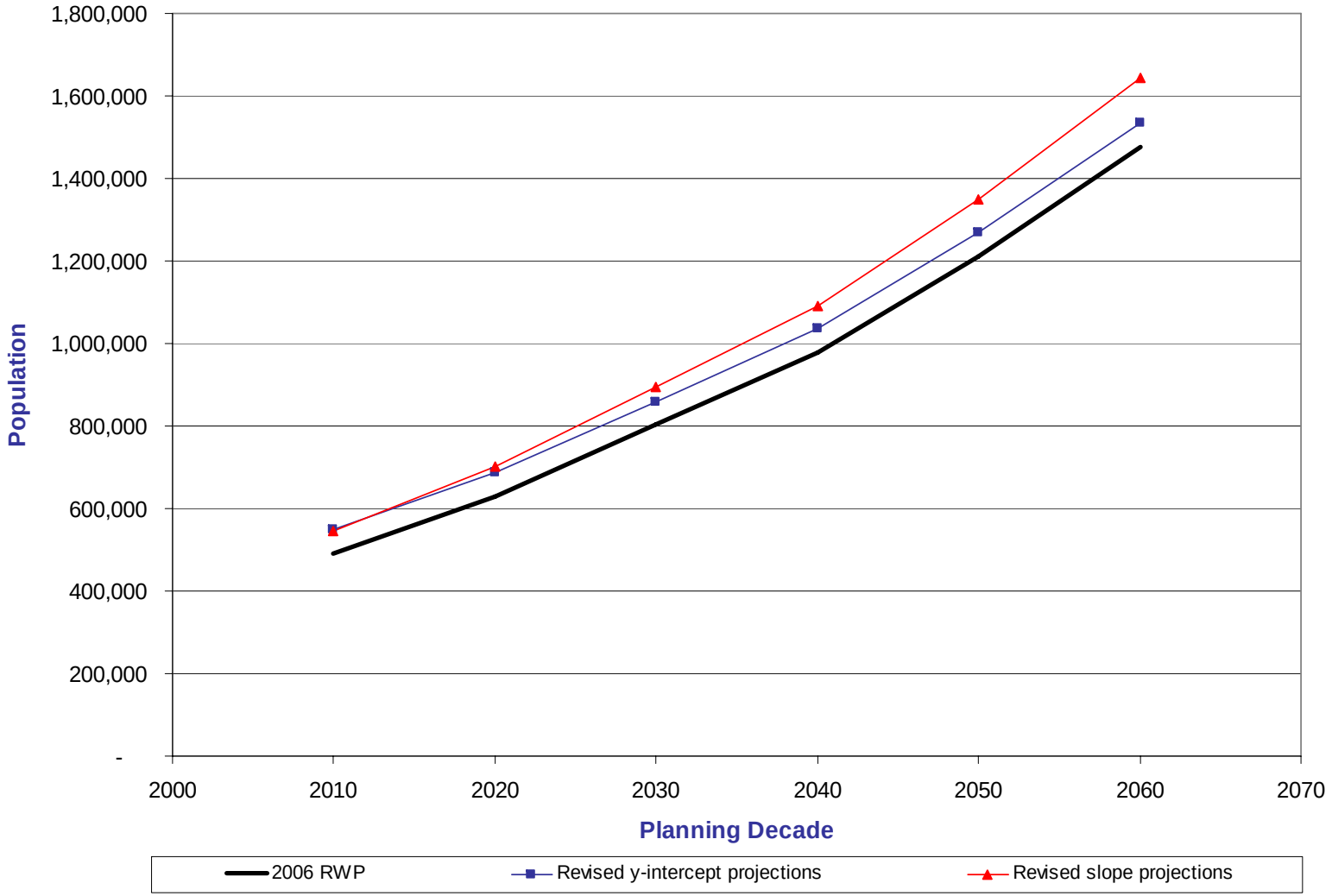
## Chambers County



# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

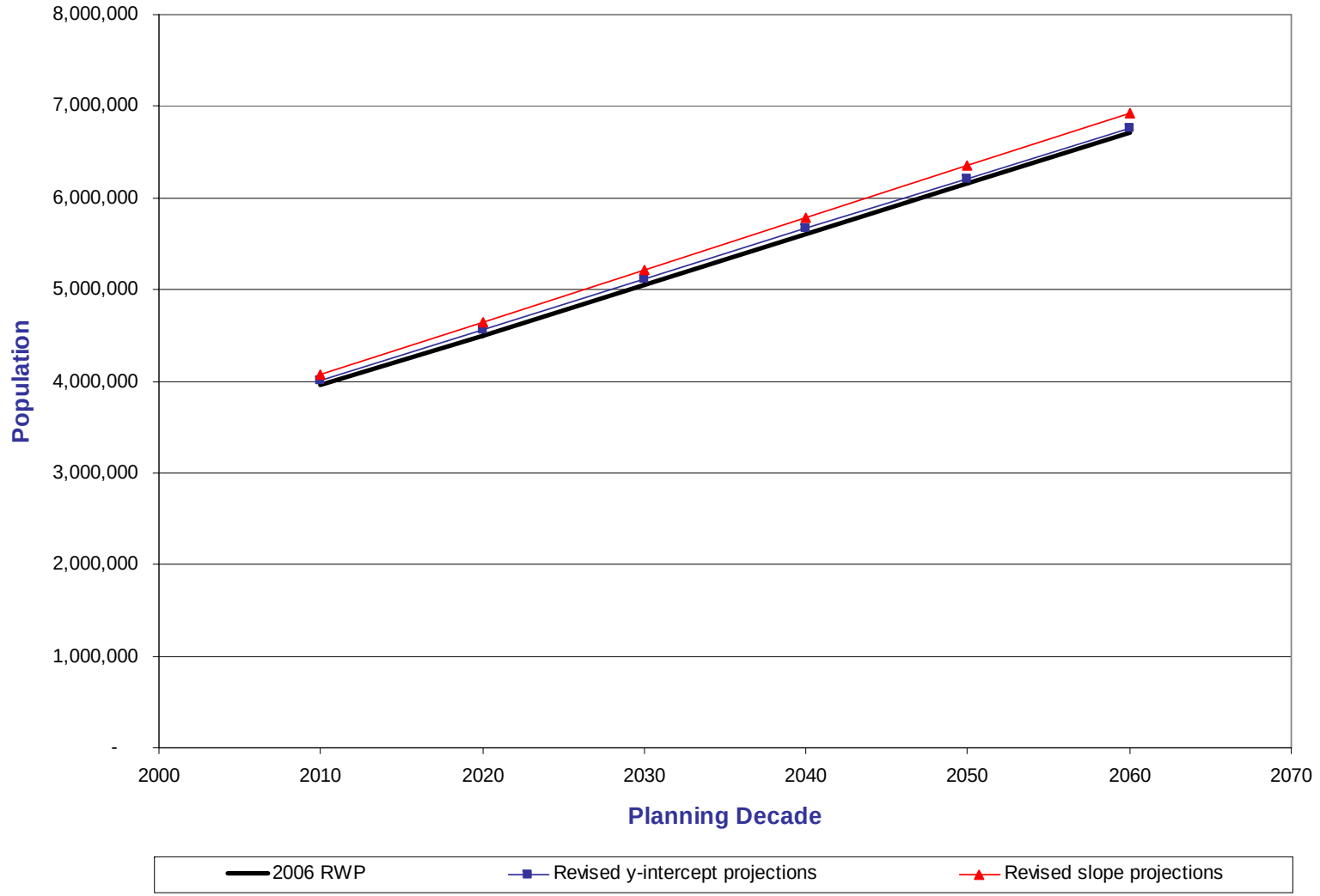
## Fort Bend County



# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

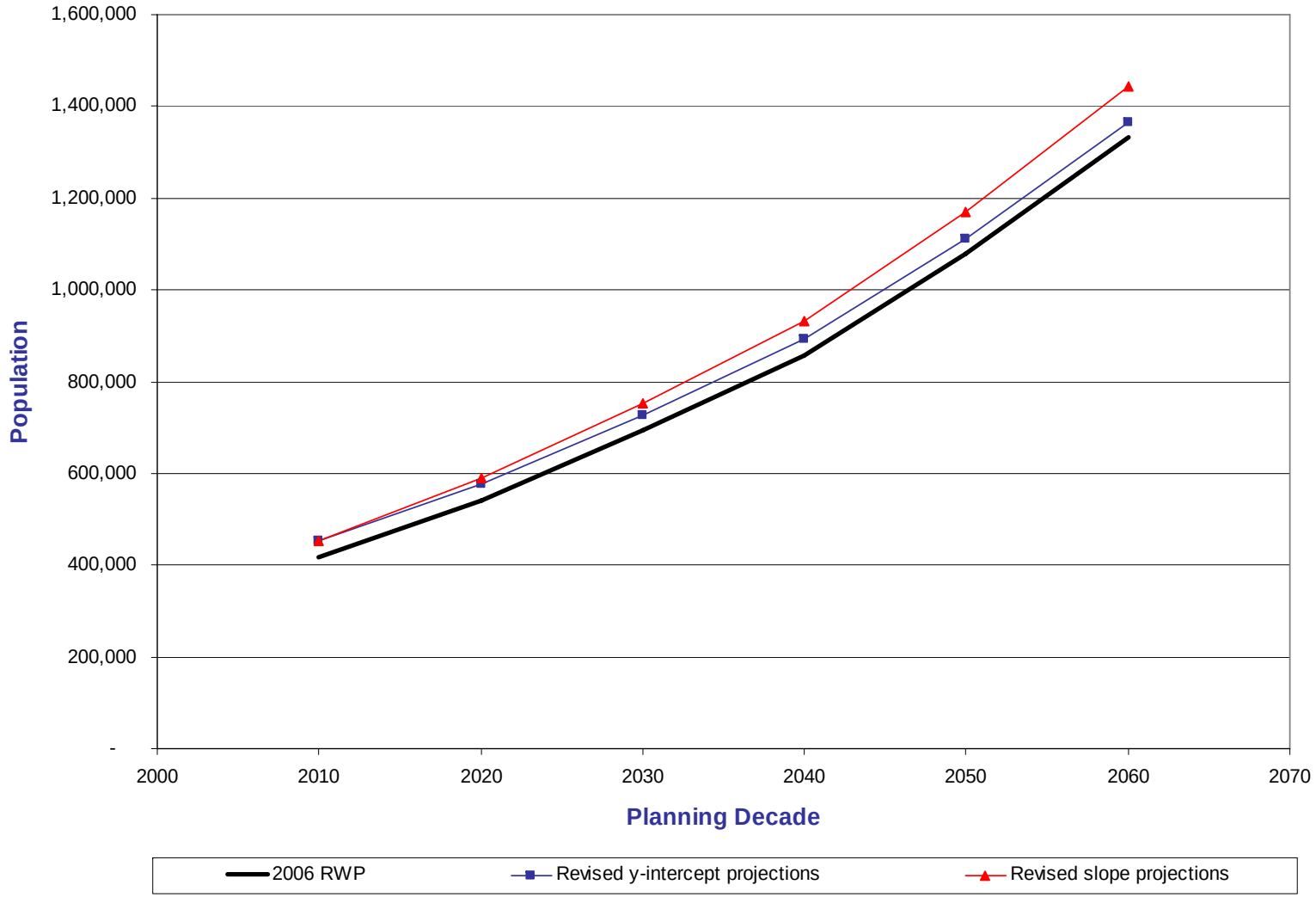
## Harris County



# Population Projections:
# Other Population Revisions

REGION H
Water Planning Group

## Montgomery County



REGION H
Water Planning Group

# Procedure for Developing WUG Demands

- Allocate revised or existing County-wide populations (where appropriate) to revised and new WUGs based on various sources first
- Allocate any remaining growth to County-Other and utility WUGs based on projected growth between 2000 and 2010 in the 2006 RWP
- Water demand projections based on revised populations to be provided by TWDB

# Population Projections

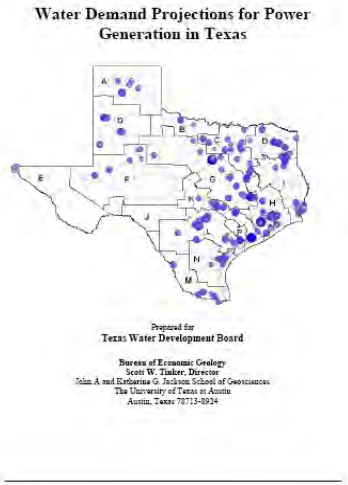
REGION H
Water Planning Group

## Receiving Planning Group input on:

- New WUGs and Population Projections
- TWDB Alternative Projections
- County-Wide Population Revisions
- Methodology for Developing WUG-level Revisions

# Steam-Electric Demands

REGION H
Water Planning Group


Water Demand Projections for Power Generation in Texas

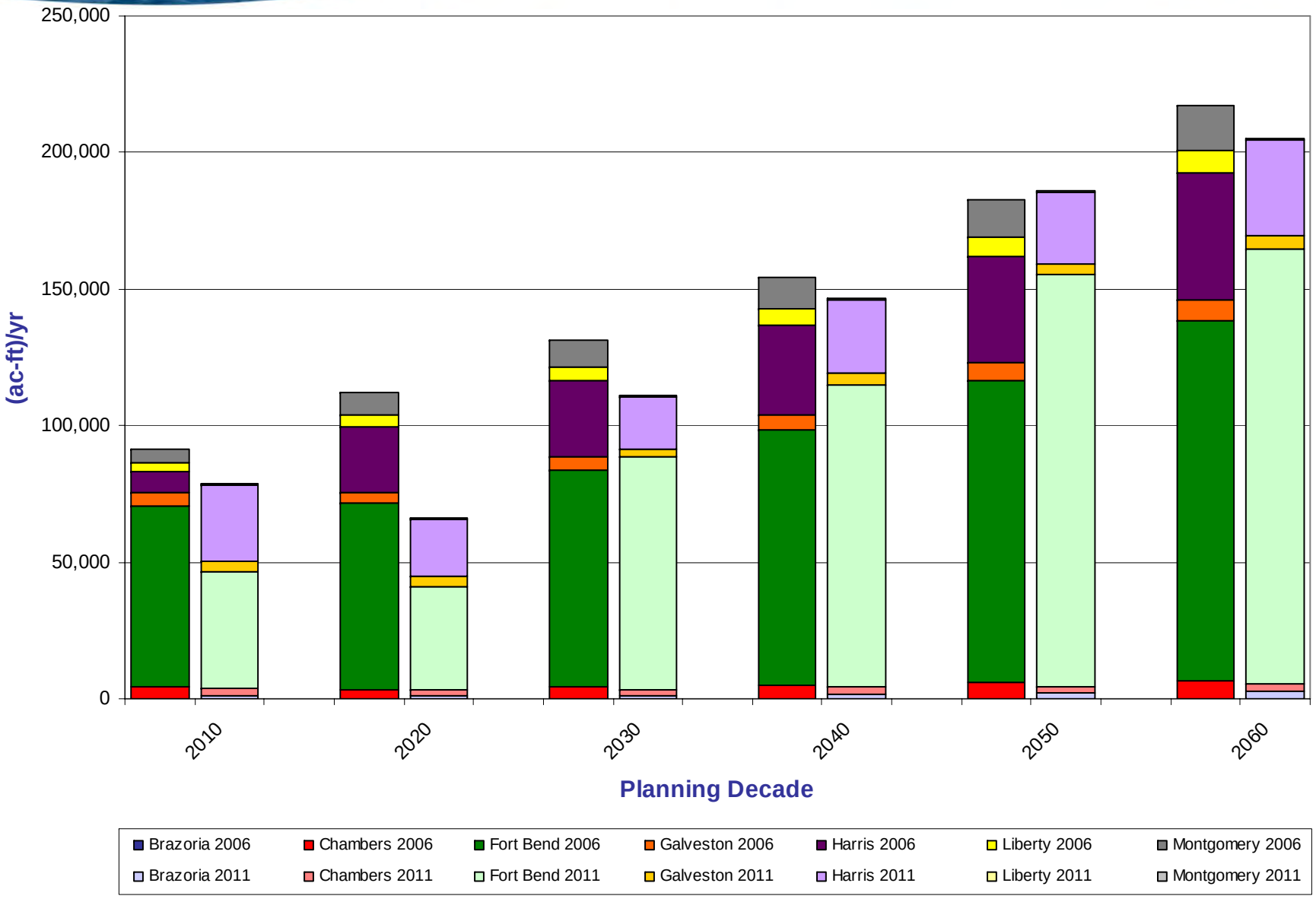
Prepared for
Texas Water Development Board

Bureau of Economic Geology
Scott W. Tinker, Director
John A and Katherine G. Jackson School of Geosciences
The University of Texas at Austin
Austin, Texas 78713-8924

- Several demand scenarios were developed as part of *Water Demand Projections for Power Generation in Texas*
- TWDB made selection based on results of the study for the entire state
- Planning Groups have the opportunity to select other demand projections as they see fit

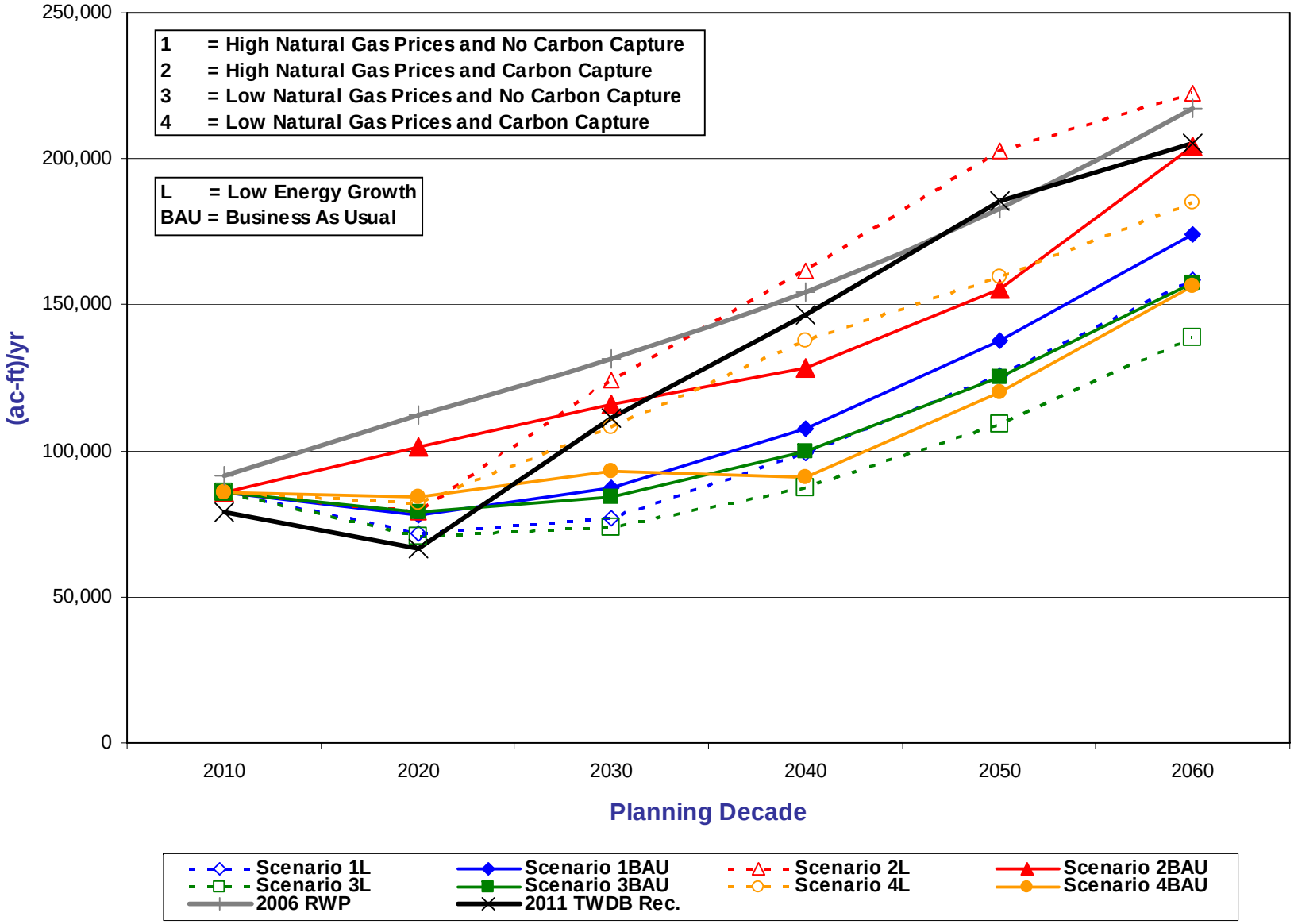
# Steam-Electric Demands by County

REGION H
Water Planning Group



# Steam-Electric Demand Scenarios

REGION H
Water Planning Group



# Steam-Electric Demands

REGION H
Water Planning Group

## Receiving Planning Group input on:

- TWDB Steam-Electric demands
- Use of TWDB or other projections in 2011 RWP

# Schedule of Deliverables

REGION H
Water Planning Group

| Date | Event | Items Due |
|---|---|---|
| 02/04/09 | RWPG Meeting | No Deliverables |
| 04/15/09 | RWPG Meeting | Draft Chapter 1; Water Demand Projections for Consideration by RWPG |
| 06/03/09 | RWPG Meeting | Draft Chapters 2 and 3; Proposed Recommendations and Strategies for Consideration by RWPG |
| 08/05/09 | RWPG Meeting | Draft Chapters 4, 5, and 8 |
| 10/07/09 | RWPG Meeting | Draft Chapters 6, 7, and 9 |
| 12/02/09 | RWPG Meeting | Draft Initially Prepared Plan |
| 03/01/10 | Due Date | Draft Final Initially Prepared Plan |
| 09/01/10 | Due Date | Regional Water Plan |

# Agenda Item 19

Agency communications.

# San Jacinto River Authority

P.O. Box 329 Conroe, Texas 77305-0329


January 5, 2009

Ms. Carolyn L. Brittin
Deputy Executive Director
Texas Water Development Board
PO Box 13231
Austin, TX 78711-3231

**Subject: Request for Amendment to Scope of Work for Regional Water Planning Activities for 2011 Round, 1st Biennium**

Dear Ms. Brittin:

The Region H Water Planning Group (WPG) identified the study of the potential use of interruptible supplies as a future Water Management Strategy (WMS) in its Scope of Work (SOW) for the First Biennium of the 2011 Planning Round. Through the course of this study, the WPG has learned of limited opportunity to pursue interruptible supplies as a viable strategy for meeting the future water needs of Region H. At this point the WPG requests that the SOW be amended to remove several items from the approved Task 3 that are not recognized as beneficial avenues of study at this time.

Specifically, the WPG wishes to remove the following items from the approved Task 3 SOW:

*D.1. Survey agricultural users in the region to assess the acceptability and feasibility of using interruptible supplies as a mechanism for maintaining affordable water for agricultural users.*

*F. Identify and assess regulatory and institutional issues and constraints associated with this strategy.*

*I. Determine if the impacts are reasonable, consistent with protection of environmental flows, and consistent with long-term protection of the state's water resources, natural resources, and agricultural resources.*

*J. Evaluate and quantify the economic impacts of this strategy.*

*J.1. Based on literature and data obtained from the Texas Agricultural Extension Service, Texas Agriculture Department, universities, and other available sources, assess and evaluate the economic impacts of lost agricultural opportunities for predominant crop types in Region H.*

*J.2. Using the results from the TCEQ WAM analysis conducted as part of this study, assess and evaluate the frequency and duration that interruptible supplies would not be available for use over the period of record for the WAM.*

*J.3. Based on the frequency and duration that interruptible supply would not be available as well as the economic impacts associated with lost agricultural opportunities, evaluate the long-term economic impacts associated with this strategy.*

*J.4. Assess and evaluate the projected costs associated with providing firm yield supplies to agricultural users over the planning period.*

*J.5. Compare and evaluate the estimated economic impacts associated with the use of interruptible supplies to the long-term projected costs associated with providing firm yield supplies to agricultural users.*

*K. Identify the important elements and the potential for creation of a water policy for resolving conflicting water demands and the fundamental drought management plan elements required to curtail interruptible supplies during periods of severe drought so that firm water demands can be fully met.*

The suggested omissions result in a budget reduction of $77,260 for this task, making the total budgets for this task and the total 1st Biennium $97,730 and $550,400, respectively. As the WPG has been informed that these funds cannot be budgeted for other efforts of interest to the group, the existing agreement between TWDB and SJRA should be amended to reflect that these tasks will not be performed.

Let it be noted that this amendment to the approved SOW does not exclude the development of a summary report of the WPG's findings. A full report on the efforts undertaken by the WPG will be prepared and provide to TWDB according to the amended schedule discussed prior.

Please contact me with any questions regarding this request and to also to inform me of any additional information you may need from SJRA to fulfill this request.

Sincerely,

Reed Eichelberger, P.E.
General Manager

cc: Mark Evans
Michael Reedy