Florida Keys Reasonable Assurance Documentation
Technical Working Group Meeting 3
February 22, 2007
Meeting Minutes

This is a summary of the third Technical Working Group (TWG) Meeting held February 22, 2007 at the Banana Bay Resort Coconut Conference Room between the Florida Department of Environmental Protection (FDEP) and representatives of stakeholders that comprise the TWG. The purpose of the meeting was to discuss FDEP's presentation at the Water Quality Steering Committee meeting, FKRAD management goals, and stakeholder requests. The meeting was attended by representatives of City of Layton, City of Marathon, Key Largo Wastewater Treatment Authority, Monroe County, and FDEP. A copy of the meeting agenda and sign-in sheet are appended to this memo along with a copy of the PowerPoint presentation.

DISCUSSION

Florida Keys Marine Sanctuary – WQIP Steering Committee Meeting

- Fred Calder presented the steering committee with an overview of the TMDL program, a phased State program. FDEP also described the Reasonable Assurance Document (RAD) alternative and its advantages over a TMDL program for the Florida Keys.

- Through the technical working group, stakeholders and FDEP are identifying existing impairments to the Florida Keys ecosystem, defining management goals, identifying existing management goals, and estimating nutrient reductions.

- The RAD process starts with technical working group meetings to identify the direction of the RAD, then proceeds with the development of the stakeholder agreements, followed by the preparation of the RAD documents, and ending with the execution of the stakeholder agreements.

- The Steering Committee presented FDEP with questions regarding the FKRAD process. The following are the relevant questions

  - What happens if Monroe County does not complete wastewater improvements mandated by 99-395 F.S. by June 2010? *The RAD is concerned about the extent to which current and proposed activities will reduce current nutrient loadings to the Keys ecosystem and timeframe for the implementation of the proposed projects. Meeting the 2010 mandate deadline or consequences for failing to meet the deadline are issues beyond the scope of the RAD.*

  - What is the effect of a delay in the Monroe County Wastewater Master Plan? *The RAD does not address the availability of resources for implementing the Sanitary Wastewater Master*

Plan, but is concerned with delays associated with the master plan relative to the date that the water quality objectives will be met by the proposed management practices. The main concern is for the RAD to document the best for the environment that responsible parties can do with the resources that are available.

- Has an imbalance in the ecosystem been demonstrated? *An general imbalance has not been conclusively demonstrated on a continuing basis, but there is sufficient literature review documenting the deteriorating health of the Florida Keys. Stakeholders know enough to start making decisions on improvements and don't need to know every detail before making decisions.*

- Can nutrient loads from the islands be quantified? *Yes. Baseline nutrient loads were developed in the Florida Keys Carrying Capacity Study. Reductions attributable to planned and/or implemented management practices are currently being documented in the RAD which will be used to estimate current and future nutrient loads from the islands. The modeling portion of the RAD will help establish a baseline condition that will be used as a guideline to measure the effectiveness of future activity.*

- Does partial funding provide reasonable assurance? *Existing funding establishes some measure of reasonable assurance with respect to management practices that are in place or being implemented, but does not constitute Reasonable Assurance. The RAD will identify partial funding for commitments and projects underway, but this may not constitute Reasonable Assurance.*

- Is the State of Florida conducting monitoring to support TMDLs? *The FDEP did conduct a monitoring program to support TMDLs and is collecting monitoring data from stakeholders to supplement the State's ongoing efforts.*

- Are marina regulations and retrofit projects being included in the FKRAD? *Marina regulations and retrofit projects are being implemented and it is anticipated that additional facilities and pump-out boats may be included in future years, and will be addressed in the RAD. It is important for the TWG to highlight such activities to prevent their omission from the RAD.*

- How is the FKRAD different from the Florida Keys Carrying Capacity Study (FKCCS)? *The FKRAD tidally-driven advection mass balance model builds on the FKCCS model, is more detailed, utilizes the FKCCS parcel data information to establish a baseline condition, and will calculate relative changes in the nutrient concentrations of the WBIDs in more detailed than the FKCCS.*

Compliance with 99-395

The TWG held a discussion on Monroe County's Comprehensive Plan, the 2010 mandate, its relation to the RAD, and related subjects. The following points were discussed in this regard.

- The Monroe County Comprehensive Plan and Laws of Florida, Chapter 99-395 mandates that nutrient loadings to the marine ecosystem be reduced by the year 2010 and that wastewater systems meet more stringent Florida Statutory treatment and effluent discharge standards. The mandates requires the removal septic tanks, cess pits, and other less sophisticated forms for wastewater disposal by connecting to a centralized sewer service or to a and this process is not in sink with wastewater master plan.

- FDEP local office is working with local governments to meet 2010 standards. The consensus among TWG attendees was that some local governments will not complete connections because of lack of funding and they expressed concern that the RAD is working under assumption that sewer connection will be completed by 2010.

- If local governments are relying on present anticipation of funding, then the 2010 mandate deadline will not be achievable. The TWG discussed considering a revised 2010 mandate timeline in the RAD stakeholder agreements.

- The reality that regulators are faced with is the difficulties of having landowners pay the costs of high connection fees. Individual landowners are required to connect to a centralized sewer system. If local governments are unable to provide the central sewer upgrade, then service providers and/or individual landowners would be required to install smaller engineers systems at their own expense. If a central sewer line should come by 2 years later, these individual landowners would be required to connect, thereby paying again. The TWG needs to make landowners aware of the consequences about not meeting the 2010 mandate deadline. Some Stakeholders are discussing the extension of the 2010 mandate to 2011 or 2012 as a way of bringing the mandated compliance into alignment with the timeline of the stakeholders' construction schedules.

- The Monroe County wastewater plan may need to re-evaluate whether private plants that were upgraded to comply with the 2010 mandates actually need to connect to delayed central sewer systems and/or whether the upgrading costs can be avoided altogether by continuing to operate until such time as the central sewer systems are constructed

- 99-395 F.S. requires individual landowners to connect to a centralized sewer system. If local governments are unable to provide assistance, then individual landowners are required to install their own small engineered systems in order to avoid non-compliance and enforcement.

- Main issue with the 2010 mandate deadline is time and funding.

- The inability of local governments and landowners to meet the 2010 deadline does not affect the RAD. The objective of the RAD is whether or not the activities meet the objectives and when will objective be met. Some objectives will be met in 2010, others in 2015, and the remaining objective can be met by 2030.

- The two questions that have to be answered in the RAD are (1) whether the objectives will be met? and (2) if they will be met, when will they be met?.

- A question was raised as to whether the inability to meet 2010 would blow the RAD out of the water. The answer as no. The binding component of the RAD is whether the objectives will be met. When is another question. Stakeholders can consider using the RAD as an impetus for local governments to push forward the 2010 mandate and other projects by listing specific projects that will be completed by 2010, 2015, and 2030.

- Funding for FY2007 from the Federal government's $100 Million commitment might be similar to FY2006 funding because all Federal funding is under intense executive and congressional scrutiny, and funds may be frozen in the next few years.

Florida Keys Water Quality and Living Resources Linkages

The following topics were addressed in the presentation and discussion on the agenda item regarding the linkages between Florida Keys Water Quality and Living Resources

- Queen conch study was also mentioned at the Steering Committee meeting. The Study documented reproduction problems and noted a loss of egg-laying hormones. The study, however, did not find a correlation between queen conch population and temperature.

- USEPA Water Quality Targets in EPA Strategic Plan include:

  - Achieve no net loss of stony coral in the FKNMS by 2011

  - Maintain the overall health and functionality of sea grass beds in the FKNMS annually beginning 2008 through 2011

  - Achieve chlorophyll levels less than or equal to 0.2 micrograms per liter and a vertical attenuation coefficient for downward irradiance less than or equal to 0.13 per meter for reef sites

  - Achieve levels of dissolved inorganic nitrogen less than or equal to 0.75 micromolar and total phosphorus less than or equal to 0.2 micromolar for all sites in the FKNMS

- The elements of a Reasonable Assurance Demonstration are:

  - Identification of segment and statement of problem causing the water quality impairment
  - Description of pollution controls and how they will achieve water quality standards
  - An estimate or projection of the time when water quality standards will be met
  - Schedule for implementing identified pollution controls

- Monitoring plan to track effectiveness of pollution controls
- Commitment to revise pollution controls, as necessary

- The statement of problem causing impairment should identify the impairment and pollutant causing the impairment and the sources of that pollutant (description of known sources, magnitude and location of sources, and description of naturally occurring sources of pollutant to the impaired water body).

- When the impairment is based on a non-numeric water quality criterion , the RAD must identify one or more appropriate numeric water quality target levels that will be used to evaluate attainment of the narrative water quality criteria, describe the basis for selecting the numeric target levels, and identify revisions of pollution control, as necessary.

- The RAD must describe the cause and effect relationship between water quality standard and numeric water quality target and the identified pollutant sources. The RAD must identify loading capacity of the water body for the pollutant of concern, and types of loadings acceptable to achieve water quality standards (point source, nonpoint source, and background).

Living Resources Thresholds

- Seagrass

  - At the highest level, FDOT aerial photograph document little change in the seagrass cover over the last 40 years.

  - Nutrient availability causes increases in seagrass biomass and growth rate.

  - As nutrient availability increases beyond what is required by a dense stand of T. testudinum, other seagrass species and macroalgae will compete with T. testudinum (natural succession).

  - Regional-scale changes in nutrient availability will eventually cause a shift in species dominance in South Florida seagrass beds that will cause changes in seagrass beds over wide portions of the FKNMS. These changes are not instantaneous and species replacement may take place on a time scale of a decade or more.

  - Some changes in seagrass communities have been noted at nearshore sites of the middle and lower Keys. Nutrient addition to aquatic environments shifts the competitive balance to faster growing primary producers.

  - Whereas no large scale trends in the abundance of dominance seagrasses have changed over the past seven years in the Keys, macroalgae have increased at several sites.

- The goal is to predict the tendency of the system to undergo changes in species dominance before it occurs so that management actions can be taken.

- Reef Building Corals

  - Regional decline in coral reef population, even in areas with good water quality, like the Dry Tortugas.

  - There are no stated water quality limits or thresholds for reefs.

- Fish

  - Although there are no identified water quality limits, thresholds, or toxicity concentration limits, reduction in fishing mortality inside regulated reserve areas resulted in a reduction of macro algae growing on the coral. This is due to grazing by parrot fish, which can increase in number if protected from being harvested by fishermen.

  - Parrot fish have become the dominant algae grazers since the decline of sea urchin populations starting in 1983.

  - FDEP has not located studies linking the relationship between nutrients and Florida Keys fisheries.

- Given the data requirements and logical assessment process that is required to to establish scientifically sound water quality based targets for the identified living resources in the Florida Keys, the following initial observations were made regarding the existing data on species of interest:

  - Preliminary data and literature review indicates that there is little or no data linking the relationship between nutrients and populations in manatee, green turtle, and loggerhead turtles.

  - Limited data found on fish, queen conch, and reefs. More data will be collected for these living resources.

  - Adequate data was found for algae and seagrass. Water quality linkages will be determined for these living resources.

  - So far, water quality targets cannot be determined for living resources with the data that is available.

- Without better data, better science and a better linkage of water quality to the health of these living resources, we will be unable to establish scientifically robust water quality

based targets for the identified living resources that will be able to withstand scientific scrutiny and legal challenges.

- Although there are no established linkages and no standards, does not exclude the fact that there are declines in living resources in the Florida Keys.

Stakeholder Data Acquisition Meetings

- FDEP has been holding data acquisition meetings with individual stakeholders to obtain information on current activities, and seek clarification on goals, targets, management actions, and implementation schedules.

- Through the information obtained from the data acquisition meetings, FDEP creates a draft summary of the information provided. These draft summaries are sent to the stakeholders for their review and comments. Once the summaries are finalized, they are included in the RAD document.

- Stakeholder summaries will include specific community information including:

  - Stakeholder adopted water quality targets and management goals;

  - FKCCS benchmark conditions data;

  - Identified management practices being planned, constructed and operated by individual stakeholders;

  - Established implementation schedules; and

  - Anticipated benefits (nutrient load reductions) and monitoring programs.

- By generating a list of funded activities and anticipated activities, stakeholders and establish FKRAD scenarios and determine a realistic schedule with management actions and target goals.

- Interviews have been conducted for KLWTD, Islamorada, Monroe County, FKAA, Key West, Layton, Marathon, Key Colony Beach, Monroe County, and U.S. Navy.

- Draft summaries for Islamorada and Layton have been completed and preparation of stakeholder summaries has been scheduled for the remaining stakeholders in March.

Assessment of Management Activities

- A brief summary was given on the WBID models. These fully mixed, mass balance advection models will be tidal driven, with a full tide cycle being represented as a single

step. Nutrients will be assumed to be completely mixed in the column of water in each tide step, and mass will be conserved through all iterations.

- The WBID models don't account for biological reactions, interactions with living resources or the complexity of the loop current in the Florida Keys.

- Beyond calculation of net nutrient loads removed by the management practices, it will be important for the RAD to relate pollutant loading reductions to improvements in water quality.

- The WBID models and the Canal models provide a quantitative basis for comparing the relative impacts of the stakeholders' management practices on the halo zone and nearshore WBIDs from the existing baseline.

- EPA's Little Venice monitoring activities has generated periodic data that was intended to demonstrate the water quality improvements that can be achieved through the construction of a central wastewater system. Unfortunately, the short period of monitoring data has not yet demonstrated much change in the water quality in the existing canals or any significant benefit in terms of living organisms. The environment has not had enough time to adapt to changes, which can be understood given the continuing leaching of nutrients from the soils, accumulated benthic deposits and limited tidal flushing volume in the canals.

Schedules

- Technical Working Group Meetings
  - Meeting 4: March 23, 2007
  - Meeting 5: April 26, 2007
  - Meeting 6: May 24, 1007
  - Meeting 7: June 13, 2007
  - Meeting 8: July 26, 2007
- FKRAD Document Target Dates
  - Completion of stakeholder interview: February
  - Delivery of draft stakeholder summaries: March
  - Completion of initial stakeholder reviews: April

- Delivery of final stakeholder summaries: May
- Digital release of draft FKRAD document: June
- Digital release of interim document: July
- Digital release of final document: September
- Distribution of final printed document: End of September

■ Stakeholder Agreement Target Dates

- Release of initial draft agreement: April
- Release of interim draft agreement: June
- Distribution of final agreement: August
- Execution of final agreement: September

Information Requests

■ Available stakeholder information regarding

- Living resources studies and data
- Community management goals and management actions (adopted, implemented, and in operation)
- Community issues and concerns (water quality management and impacts of pollutants on aquatic resources in impaired WBIDs)

Action Items

■ Follow up on data requests to seek clarification of plans, location of specific facilities, and pending and anticipated management actions

■ Assess benefits and selection of living resources to determine water quality criteria

■ Identify resource management goals from comprehensive plan element, local living resource concerns, wastewater plans, stormwater management plans, conservation and marine resource management plans, and community concerns

■ Identify management activities from adopted plans, completed design plans, operational projects, funded CIP projects, unfunded CIP projects and program elements, and enhanced regulations

Next Meeting

- Technical Working Group meeting 4: Management Actions and Anticipated Benefits
  - March 23, 2007 at the State Office Building, Conference Room 104, Marathon, FL.

Florida Keys Reasonable Assurance Documentation (FKRAD)
Technical Working Group Meeting No. 3
Banan Bay Resort - Coconut Conference Room
January 22, 2007 @ 9:30 am

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Margaret Blank	KLWTD	PO Box 491 Key Largo 33037	3054536804	453-5807	margaretblank@bellsouth.net
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Pat Fricano	FDEP				Pat.Fricano@dep.state.fl.us
George Garrett	MCounty	2798 Overseas Hwy, Marathon, FL 33050	305 289 2507	305 289 2536	garrett-george@monroecounty-fl.gov

TECHNICAL WORKING GROUP MEETING NUMBER 3
Banana Bay Resort - Coconut Conference Room;
4590 Overseas Highway
Marathon, Florida 33050

February 22, 2007 ❖ 9:30 AM – 1:30 PM

Final Agenda

I. **WELCOME** — Steve Lienhart

- A. Introductions and Sign-In
- B. Verification of Contact Information

II. **FKNMS-WQIP STEERING COMMITTEE MEETING** — Fred Calder

- A. Brief Overview of Meeting
- B. FDEP Presentation on FKRAD Program
- C. Steering Committee Responses and Questions
- D. Linkages
  - Water Quality Targets and Issues
  - Monitoring Activities
  - Living Resources Issues
  - Availability of Future Funding

III. **THE ROAD AHEAD OF US** — Steve Lienhart

- A. USEPA Guidance
- B. Completeness of the Current Science
- C. Selection of Living Resources for Water Quality Criteria Setting
- D. Consideration of Timeframes

IV. **WATER QUALITY IMPACTS ON LIVING RESOURCES** — Pat Fricano

- A. Seagrass
- B. Phytoplankton and Macro Algae
- C. Reef Building Corals
- D. Schooling Fish

V. **ONE-ON-ONE STAKEHOLDER DATA ACQUISITION MEETINGS** — Steve Lienhart

- A. Intent and Purpose
  - Management Goals
  - Management Actions
  - Committed Funding
  - Anticipated Funding
- B. Scenarios
  - 2010.5 Implemented Only
  - 2010.5 Implemented + Planned Management Actions with Likely Funding
  - 2030 Implemented + All Planned Management Actions
- C. Status to Date
  - Stakeholder Summaries
  - Acquired Data Matrix
  - Management Actions Spreadsheet

VI. **ASSESSMENT OF MANAGEMENT ACTIVITIES** Steve Lienhart

A. Review of Florida Keys WBIDs

B. Assessment of Relative Nutrient Impacts Assessment in Halo Zone and Nearshore WBIDs
- Inclusion of Nearshore WBIDs
- Utilization of Existing Canal Models

C. Expansion of the Simple Halo Zone Water Quality Model
- Model Development Concepts
- Boundary Water Quality Conditions
- Modified Schematic and Calculation Process

D. Application of Existing Canal Models

E. Comparative Changes in Estimated Concentrations

VII. **SCHEDULES** Steve Lienhart

A. Technical Working Group

B. FKRAD Documents

C. Stakeholders Agreement

VIII. **INFORMATION REQUESTS** Steve Lienhart

A. Last Call (Data and Impairments)
- Data Acquisition on Local Problems and Issues
- Keys Water Quality Data
- Established/Pending Community Management Goals and Management Actions
- Community Issues and Concerns Regarding Water Quality Management
- Community Issues and Concerns Regarding Impacts of Pollutants on Aquatic Resources in Impaired Waters Areas
- Specific Issues and Concerns That Are Uniquely Important in the Context of the Community and/or Relevant to the FKRAD Process

B. Current Needs (Management Goals)
- Current Land Use Plans
- Existing local management actions that are being used to implement adopted, interim and provisional local water quality management goals

C. New Requests (Management Actions and Programs)
- Recent CIP Projects – In Construction or Operating
- Funded CIP Projects – Scheduled for Implementation through 2010.5
- Funded CIP Projects – Scheduled for Implementation through 2030
- Identified/Planned CIP Projects – Currently Unfunded but Real

IX. **ACTION ITEMS** Steve Lienhart

A. Information Requests

B. Next Meeting

X. **ADDENDA AND ERRATA** Steve Lienhart

TECHNICAL WORKING GROUP MEETING NO. 3

BANANA BAY RESORT
Coconut Conference Center
4590 Overseas Highway

February 22, 2007 ❖ 9:30 am – 1:30 pm

CDM UBS

Agenda

I. Welcome
II. FKNMS-WQIP Steering Committee Meeting
III. The Road Ahead of Us
IV. Water Quality Impacts on Living Resources
V. Stakeholder Data Acquisition Meetings
Break
VI. Assessment of Management Activities
VII. Schedules
VIII. Information Requests
IX. Action Items
X. Next Meeting

FKNMS-WQIP STEERING COMMITTEE MEETING

- FDEP Review Of FKRAD Process
- Steering Committee Responses and Questions
- Linkages

Fred Calder
Florida Department of Environmental Protection

FDEP Review of FKRAD

- **TMDL Program Overview**
  - Phased State Program
  - TMDLs vs. RADs
- **FKRAD Process Overview**
  - Bottom-Up Process
  - Stakeholders → Working Group → FDEP → USEPA
- **Technical Working Group**
  - Role
  - TWG Meetings
- **Public Involvement Activities**

FDEP FKRAD Review

- **Current Focus Areas**
  - Identifying Existing Impairments
  - Defining Stakeholder Management Goals
  - Identifying Existing Management Actions
  - Estimating Nutrient Reductions
  - Evaluating Future Nutrient Conditions
- **Working Schedule**
  - Technical Working Group Meetings
  - Development of Stakeholders Agreement
  - Preparation of FKRAD Documents
  - Execution of Stakeholder Agreement

Steering Committee Questions

1. What Happens if we don't finish WW improvements on time (by June 2010)?
2. What is the effect of a delay in the Monroe County Sanitary Wastewater Master Plan?
3. Has an imbalance been demonstrated?
4. Can we quantify nutrient loads from islands?
5. Does partial funding provide reasonable assurance?
6. Is the State conducting monitoring to support TMDLs?
7. Are marina regulations and retrofitting being included?

FKRAD Linkages

- **Federal Funding Perspectives**
  - We've Heard a Lot But Don't Know Anything for Sure
  - Funding is Under Intense Executive and Congressional Scrutiny
  - Significant Funding May Be Frozen in the Next Few Years
  - 2007 Funding May Be Similar to 2006 Funding
- **Queen Conch Study**
  - Documented Reproduction Problems (inshore vs. offshore)
  - Loss of Egg-laying Hormones →Endocrine Disrupters (Ur, Cd, Sn)
  - No Temperature Correlation
  - Positive Correlation with Mosquito Spraying

FKRAD Linkages

- **Water Quality Communications Plan**
- **USEPA Water Quality Targets in EPA Strategic Plan**
  - Achieve "no net loss" of stony coral (mean percentage coverage) in the FKNMS by 2011
  - Annually maintain the overall health and functionality of sea grass beds in the FKNMS beginning 2008 through 2011
  - For reef sites in FKNMS through 2011achieve
    - Chlorophyll. 0.2 ug/l
    - Vertical light attenuation coefficient. 0.13/m
    - Dissolve Inorganic Nitrogen.. 0.75 uM
    - Total Phosphorus. 0.02 uM

FKRAD Linkages

- **Water Quality Booklet**
  - Splashy and Colorful with Many Pictures (Few Words)
  - Invited Guest Authors → Joe Boyer is the First (40± pages)
  - Shifting Baseline Syndrome
- **Review of FKNMS-WQIP Science Program**
  - "Peer Review" to be conducted by Battelle
  - Examination of All Aspects of the Monitoring Programs
  - EPA's Review Objectives
    - Validate Sampling Program Design, Methods, Networks, etc..
    - Avoid Duplication of Efforts

THE ROAD AHEAD OF US

- USEPA Reasonable Assurance Guidance
- Status of Current Science
- Selection of Living Resources for Water Quality Criteria Setting
- Consideration of Timeframes

Steve Lienhart
URS Corporation

USEPA Reasonable Assurance Guidance

- **Elements of a Category 4b Demonstration**
  1. Identification of segment and statement of problem causing the water quality impairment
  2. Description of pollution controls and how they will achieve water quality standards
  3. An estimate or projection of the time when water quality standards will be met
  4. Schedule for implementing identified pollution controls
  5. Monitoring plan to track effectiveness of pollution controls
  6. Commitment to revise pollution controls, as necessary

Need Defensible Linkages

Statement of Problem Causing Impairment

- **Identify Impairment and Causal Pollutant**
  - Identify the applicable water quality standard(s) not supported
  - Associated pollutant causing the impairment
- **Sources Of Pollutant Causing Impairment**
  - Description of the known and likely point, nonpoint, and background (upstream inputs) sources of the pollutant causing the impairment
  - Magnitude and locations of the sources
  - Description of the naturally occurring sources of the pollutant to the impaired segment.

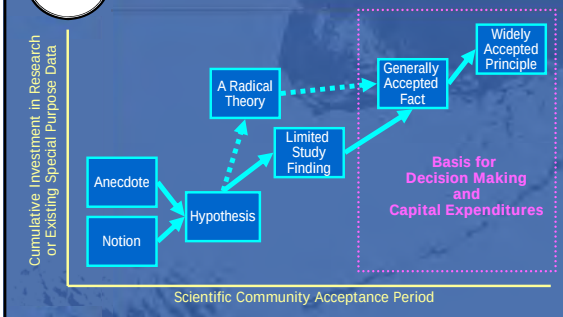
Narrative (Non-Numeric) Water Quality Criterion

- **When the Impairment is Based on Non-attainment of a Narrative (Non-Numeric) Water Quality Criterion, the RAD Must:**
  - Identify one or more appropriate numeric water quality target levels that will be used to evaluate attainment of the narrative water quality criteria
  - Describe the basis for selecting the numeric target levels
  - Identify when revision of pollution controls, as necessary

Establish Point Source and Nonpoint Source Loadings

- **Describe the cause-and-effect relationship between the water quality standard and numeric water quality target and the identified pollutant sources**
  - Based on this linkage, identify what loadings are acceptable to achieve the water quality standard
    - Point Source
    - Nonpoint Source
    - Background (Everyone Else!)
  - The cause-and-effect relationship may be used to determine the loading capacity of the waterbody for the pollutant of concern

Status of Current Science



"Charismatic Macro Fauna"

Lesser Layton Hippo-Crab

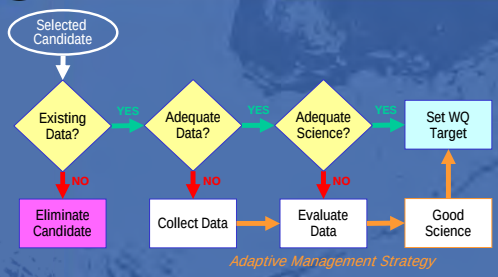
Islamorada Elephant Seal

Banana Bay Butterfly Ray

Rock Harbor Rhino-Clown Fish

Images Courtesy of ebaums.com

Selection of Living Resources for Water Quality Target Setting



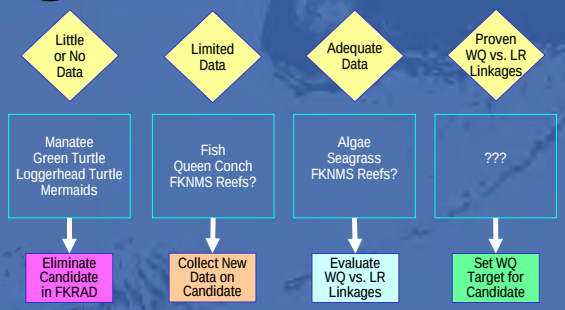
RAD Philosophy: Good Data + Good Science = Good RADs

LIVING RESOURCE THRESHOLDS

- Seagrass and Algae
- Phytoplankton and Macro Algae
- Reef Building Corals
- Schooling Fish

Pat Fricano
Florida Department of Environmental Protection

Assessment of Living Resources Data For Water Quality Target Setting



Seagrass

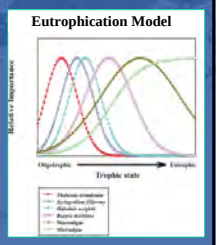
General Observations

- At the highest level, FDOT aerial photographs document very little change in the seagrass cover over the last 40 years
- Nutrient availability actually causes increases in seagrass biomass and growth rate
- As nutrient availability increases beyond what is required by a dense stand of T. testudinum, there are other seagrass species that will out-compete it (natural succession)
- No large scale trends in the abundance of dominant sea grasses over the past 7 years in the Keys. However, macro algae has increased at several sites
- **As you draw a closer focus, a relationship between nutrients and seagrass in the Keys begins to emerge . . .**

Seagrass and Algae

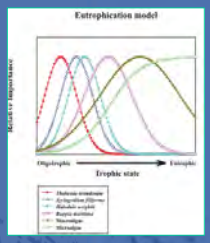
Seagrass Monitoring in FKNMS

- Significant changes in seagrass communities have been noted at some permanent Level 1 stations located closer to shoreline in the Middle and Lower Keys
- These changes are consistent with model predictions of nutrient-induced changes of these systems.
- In general, nutrient addition to aquatic environments shifts the competitive balance to faster-growing primary producers.
- The spatial pattern of changes and the agreement of the changes with models of the system suggest that there is regional-scale change in nutrient availability that is causing changes in seagrass beds over a wide portion of the FKNMS.



Sea Grass and Algae

Seagrass Monitoring in FKNMS



- Each species in the species dominance-eutrophication gradient model can potentially dominate over a range of nutrient availability
- The model predicts a change in species dominance as nutrient availability changes.
- These changes are not instantaneous
- Species replacements may take place on a time scale of a decade or more.
- It is desirable that we be able to predict the tendency of the system to undergo these changes in species dominance before they occur, so that management actions can be taken.

Sea Grass and Algae

Seagrass Monitoring in FKNMS

If humans are causing regional changes in nutrient availability because of alterations to quantity and quality of freshwater inputs to the marine ecosystem, these models suggest two trends in the seagrass communities of South Florida

- Regional eutrophication will cause N:P ratios of seagrasses to approach 30:1 from higher or lower values indicative of oligotrophic conditions
- Regional eutrophication will cause a shift in species dominance in South Florida seagrass beds.
  - ✓ The first responses to eutrophication will be evidenced by an increase in the relative abundance of fast-growing seagrass species (H. wrightii and S. filiforme) at the expense of the now-dominant, slow-growing T. testudinum.
  - ✓ At later stages of eutrophication, macroalgae and microalgae will become the dominant primary producers.

Sea Grass and Algae

Little Venice Study

Inshore waters off the canals of little Venice subdivision are clearly impacted by land use and the associated septic treatment systems.

- It is clear that *Thalassia* and *Halodule* abundance is highest in sites furthest from the canal mouth.
- Seagrass densities are lowest at the canal mouth.
- Sites closest to the canal mouths have the greatest abundance of green algae, which are typically considered to be strong indicators of elevated nutrient conditions.
- Brown algae are also primarily found at the nearshore area along with lowered DO.
- The authors expect that with decreased nutrient inputs, one would see a migration of Thalassia back into the nearshore waters off the canals

Algae

Key Points

- LaPointe demonstrated linkage of land based nutrient discharges with initiation of algal blooms
- Comparison of 3 sites (halo zone, nearshore and offshore) located downgradient of 2,000 septic tanks demonstrated that Chl-a concentrations varied inversely with distance from the shoreline, with significantly (3x) concentrations in the halo zone
- Red macro algae data at these stations indicated a similar trends for N^{15} concentrations

Reef Building Corals

Big Picture

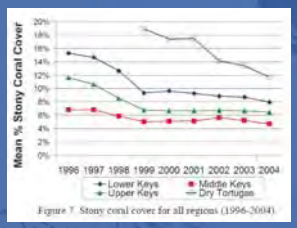


Figure 7. Stony coral cover for all regions (1996-2004).

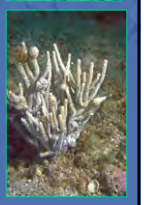
- Even the good water quality – in the Dry Tortugas – is not enough
- Regional Phenomenon
- Declining trends noted FKNMS-wide
- No stated water quality limits or thresholds

Reef Building Corals

Reef Building Corals

Key Points

- Stony coral growth and health are dependent upon light transmission
- Zooxanthellae of reef corals are nitrogen limited
- Cook's study comparing Middle Keys inshore and offshore sites
  - Nitrogen sources at both at both sites were sufficient if not excessive
  - Documented increased Chl-a content of the Zooxanthellae in the coral polyps of the inshore station
  - Thought to be a photo-adaptive response at the inshore site resulting from decreased light levels caused by turbidity (not elevated nutrients) originating in Florida Bay
  - No stated water quality limits or thresholds



Coral Reef Fish

Key Points

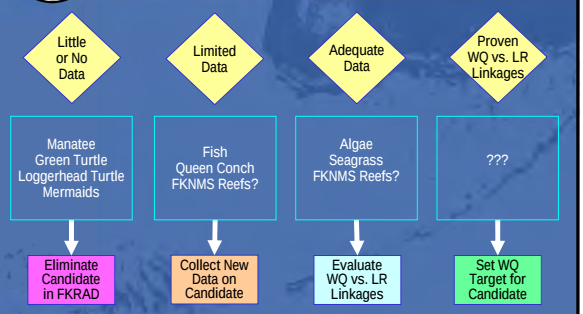
- Parrot fish have become the dominant macro algae grazers on corals in the Florida Keys since the demise of the sea urchin decline starting in 1983
- Reduced fishing mortality inside regulated reserve areas resulted in a 4x reduction of macro algae growing on the coral
- Top-down control of macro algae through fishery management is less important if nutrient sources are not controlled
- No identified water quality limits, thresholds or toxicity concentrations

Other Fish

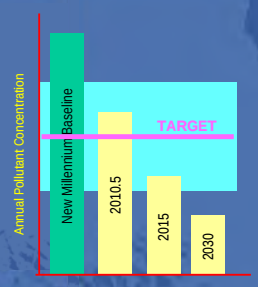
Key Points

- No studies on the relationship between nutrients and Florida Keys fisheries were found
- While sport fish are important to tourism, the economy and the quality of life enjoyed by Keys residents, they are not a good water quality indicator
- Consequently, no linkage was documented between nutrient concentrations and the health of the Keys fish
- No identified water quality limits, thresholds or toxicity concentrations

Preliminary Review
(For Further Discussion in March)



End of the Day Goal



- Use Existing Knowledge to Establish Credible Water Quality Targets
  - Water Quality Targets
  - Living Resource Requirements
  - Linkages Between Them
- Our Focus
  - Florida Keys First
  - Other Similar Places

STAKEHOLDER DATA ACQUISITION MEETINGS

- Intent and Purpose
- Stakeholder Summaries
- Establishment of "Real" Schedules
- Status to Date

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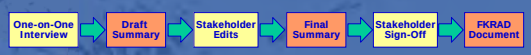
Intent and Purpose

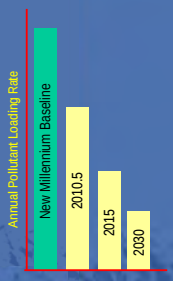
- Acquisition of Initial Information
- Clarification of Issues
  - Goals/Targets
  - Management Actions
  - Implementation Schedules
- Validation of Text Materials

Stakeholder Summaries

- Water Quality Targets
- Management Goals
- Benchmark Conditions
- Management Actions
- Anticipated Benefits
  - Nutrient Load Reductions
  - Implementation Timing
- Monitoring Programs
  - Water Quality and Living Resources
  - Effectiveness of Pollution Controls



Establishment of "Real" Schedules



- Funded Activities
- Anticipated Activities
- FKRAD Scenarios
  - **New Millennium Baseline**
    1999 FKCCS Loadings
  - **Scenario A** – Target Date 2010.5
    Only Facilities Operational on June 2010
  - **Scenario B** – Target Date 2015
    2010.5 Operational Facilities
    + Planned Facilities with Likely Funding
  - **Scenario C** – Target Date 2030
    2010.5 Operational Facilities
    + All Currently Planned Facilities

Status to Date

Stakeholder	Comprehensive Plan	Wastewater Master Plan	Stormwater Master Plan	Other Plans and Data
Islamorada	✓	✓	✓	✓
Key Colony Beach	✓	Not Required	✓	✓
Key West	✓	Not Required		✓
Layton	✓	In Process	None	NA
Marathon	✓	In Process	In Process	In Process
Monroe County	✓			✓
U. S. Navy	Meeting Scheduled for 2/22/07 at 3:30 pm			
FKAA	NA	✓	NA	✓
KLWTD	NA	✓	NA	

Management Actions Summary

WBID	Management Action	Estimated Total Nitrogen Load Reduction (lbs/year)	Estimated Total Phosphorous Load Reduction (lbs/year)	Anticipated Operational Date
CITY OF SPARKLING WATERS				
AAAA -S	Upgrade Existing Secondary WWTP to AWT (5-5-3-1) Treatment	XXX	YYY	ZZ/ZZ/ZZ
AAAA -S	Transition Existing Effluent Disposal Method from Ocean Outfall to Deep Injection Well	XXX	YYY	ZZ/ZZ/ZZ
AAAA -N	Reuse System Serving City Parks and Golf Course	XXX	YYY	ZZ/ZZ/ZZ
AAAA -S	Reuse System Serving City Parks and Schools	XXX	YYY	ZZ/ZZ/ZZ
AAAA -N	Street Sweeping Program	XXX	YYY	ZZ/ZZ/ZZ
AAAA -S	Street Sweeping Program	XXX	YYY	ZZ/ZZ/ZZ
AAAA -N	Addition of Capture Boxes and Disposal Wells	XXX	YYY	ZZ/ZZ/ZZ
AAAA -S	Addition of Capture Boxes and Disposal Wells	XXX	YYY	ZZ/ZZ/ZZ
	TOTAL COMMUNITY NUTRIENT REDUCTIONS	XXX	YYY	ZZ/ZZ/ZZ

ASSESSMENT OF MANAGEMENT ACTIVITIES

- Load Reductions from Management Actions
- WBIDs Models
- Canal Models
- Water Quality Boundaries

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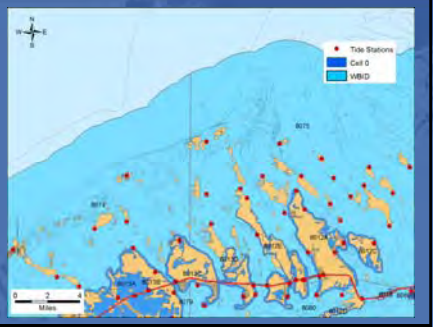
Impaired Waters in the Florida Keys

Example Model – Lower Keys

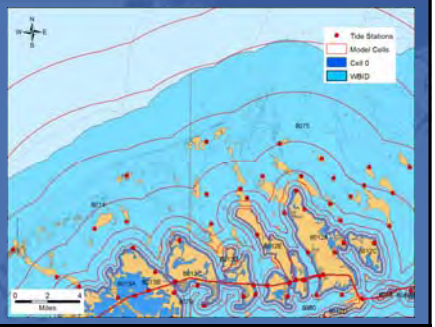
Example Model – Detail Area

Example Model – Halozone



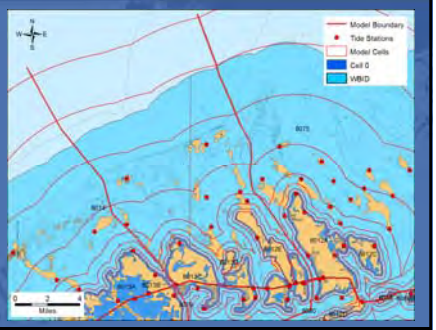
Florida Keys Reasonable Assurance Documentation

Example Model – Model Cells



Florida Keys Reasonable Assurance Documentation

Example Model – Model Divisions



Florida Keys Reasonable Assurance Documentation

Example WBID Challenges

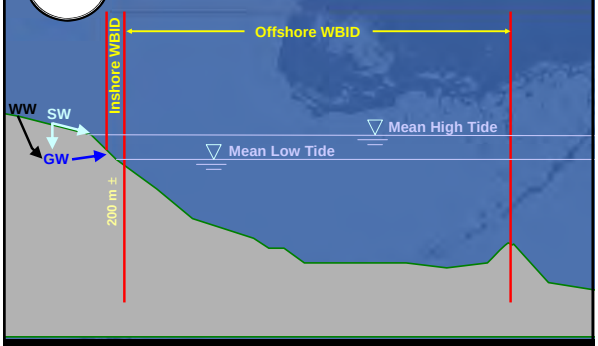
- Inconsistent Bubble WBID Widths
- Bridges
- Locations of Glass Walls
- No-Flow Barriers
- Beach WBIDs vs. Bubble WBIDs
- Interior Shallow Waterbodies
- Encapsulated WBIDs
- Donut Holes in WBIDs

Florida Keys Reasonable Assurance Documentation

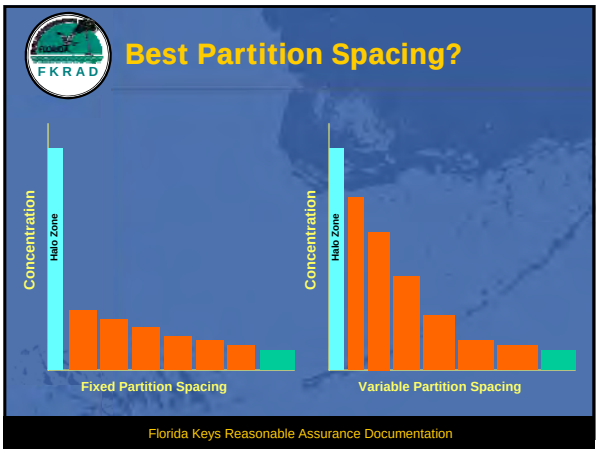
Model Concept

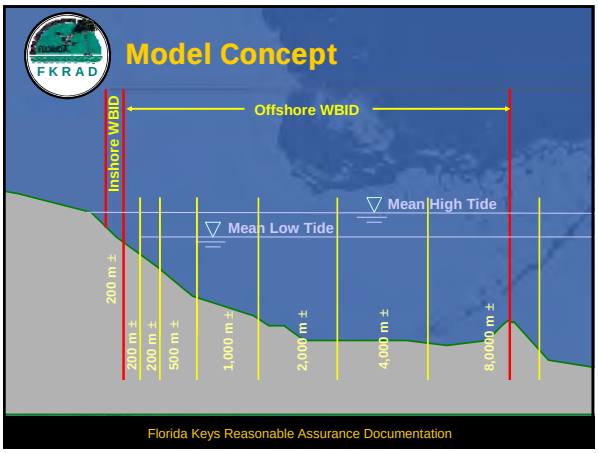
Florida Keys Reasonable Assurance Documentation

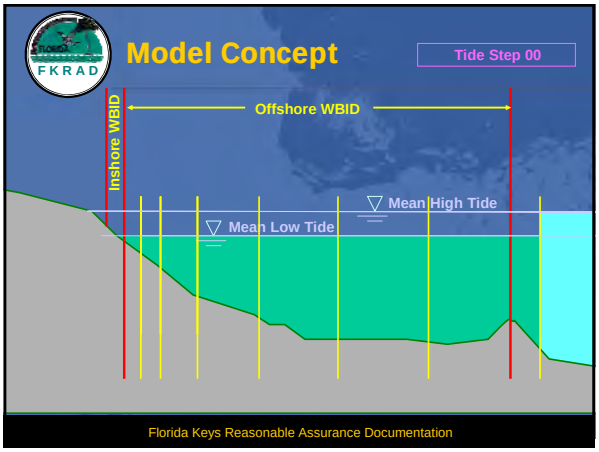
Model Concept



Florida Keys Reasonable Assurance Documentation


FKRAD
Best Partition Spacing?
Concentration
Halo Zone
Fixed Partition Spacing
Concentration
Halo Zone
Variable Partition Spacing
Florida Keys Reasonable Assurance Documentation


FKRAD
Model Concept
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
200 m ±
200 m ±
200 m ±
500 m ±
1,000 m ±
2,000 m ±
4,000 m ±
8,0000 m ±
Florida Keys Reasonable Assurance Documentation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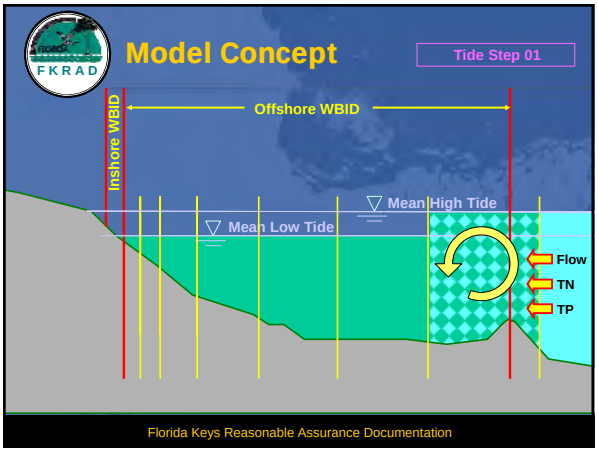
Model Concept
Tide Step 00
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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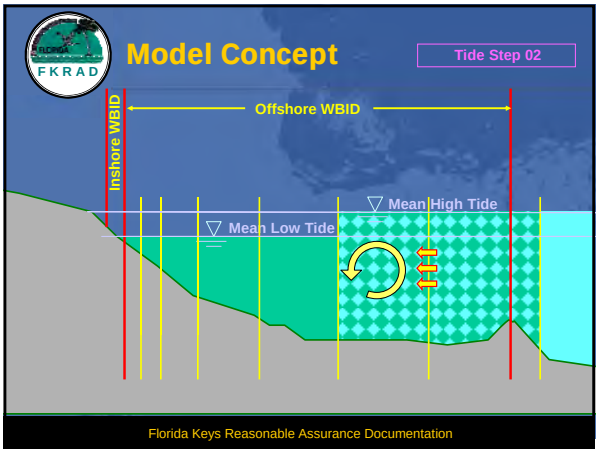
Model Concept
Tide Step 01
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Flow
TN
TP
Florida Keys Reasonable Assurance Documentation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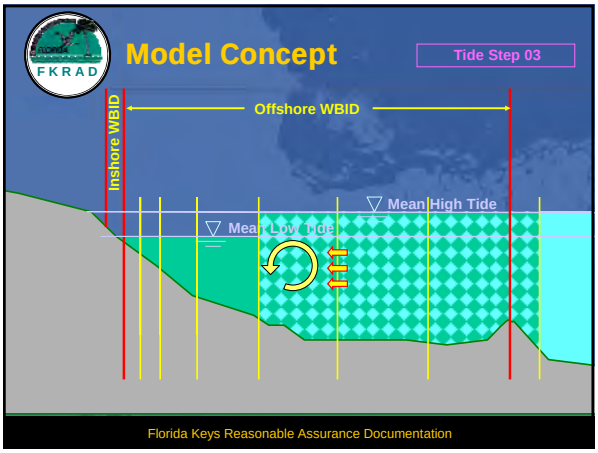
Model Concept
Tide Step 02
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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Model Concept
Tide Step 03
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
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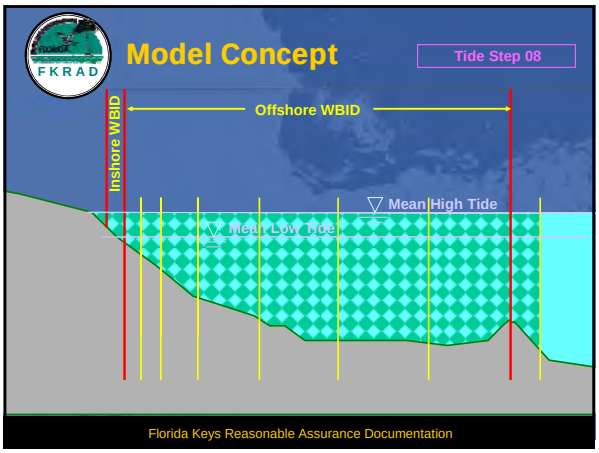
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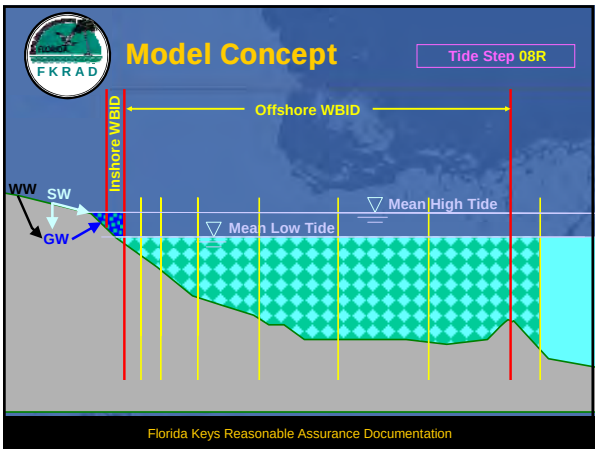
Model Concept
Tide Step 08
Offshore WBID
Inshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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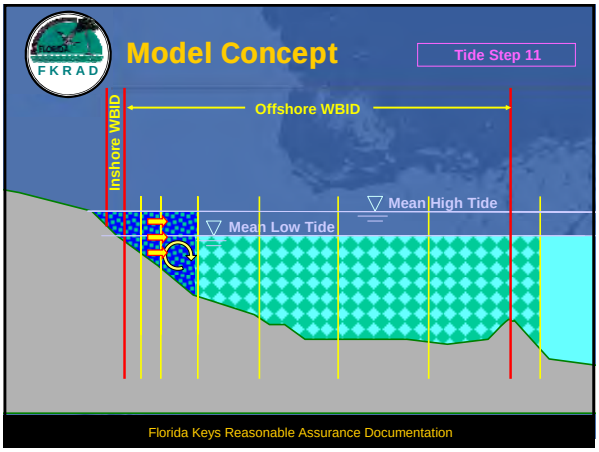
Model Concept
Tide Step 08R
Offshore WBID
Inshore WBID
WW
SW
GW
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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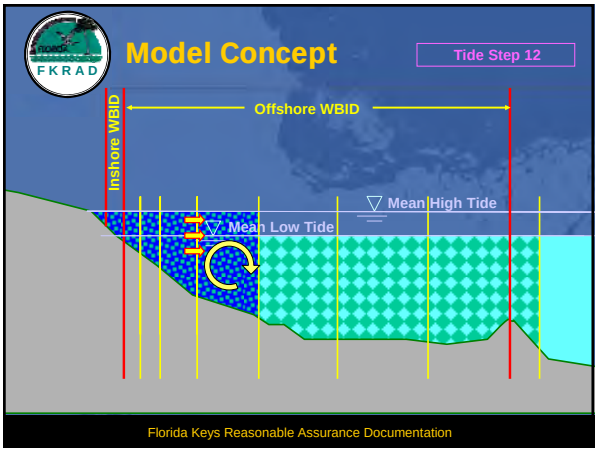
Model Concept
Tide Step 11
Offshore WBID
Inshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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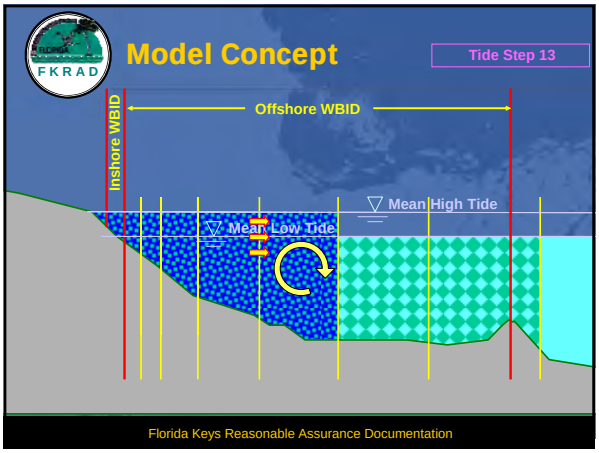
Model Concept
Tide Step 12
Offshore WBID
Inshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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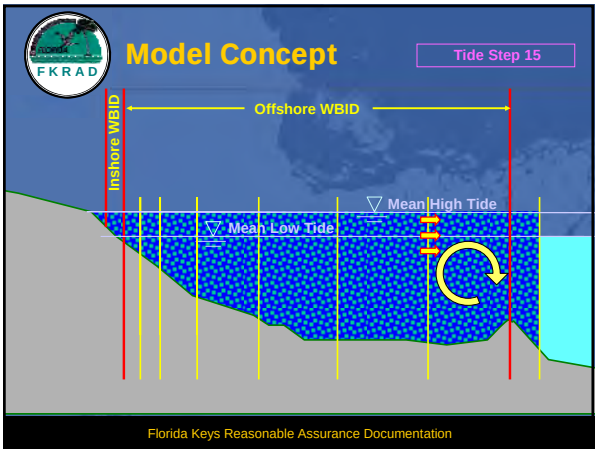
Model Concept
Tide Step 13
Offshore WBID
Inshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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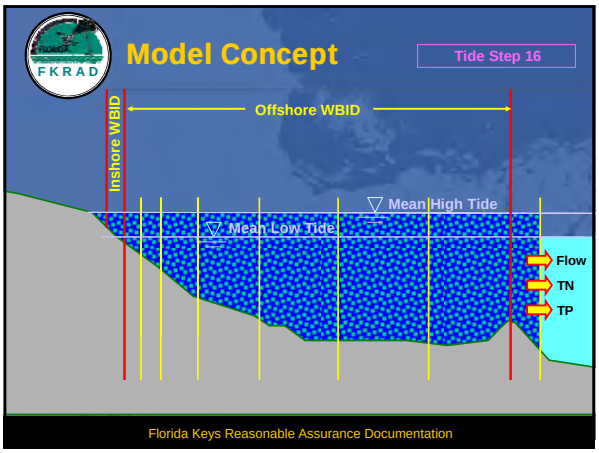
Model Concept
Tide Step 15
Offshore WBID
Inshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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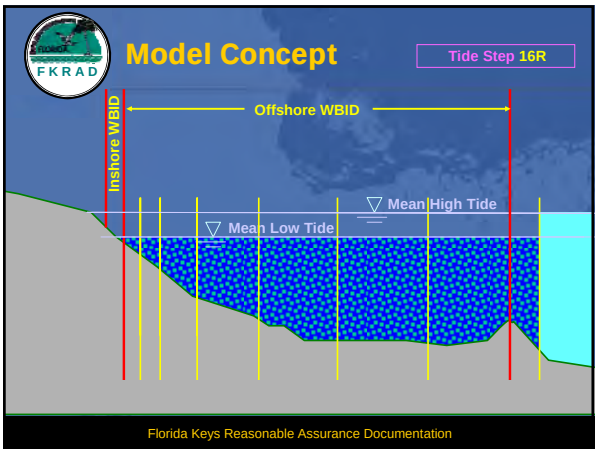
Model Concept
Tide Step 16
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Flow
TN
TP
Florida Keys Reasonable Assurance Documentation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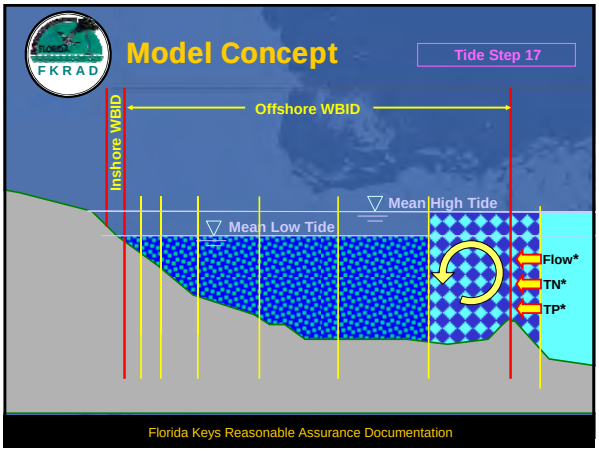
Model Concept
Tide Step 16R
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation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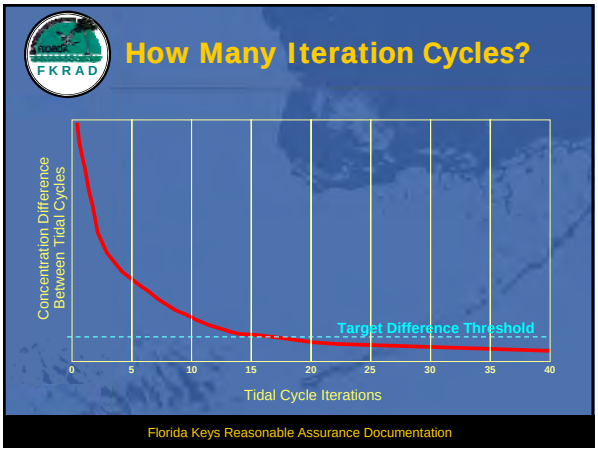
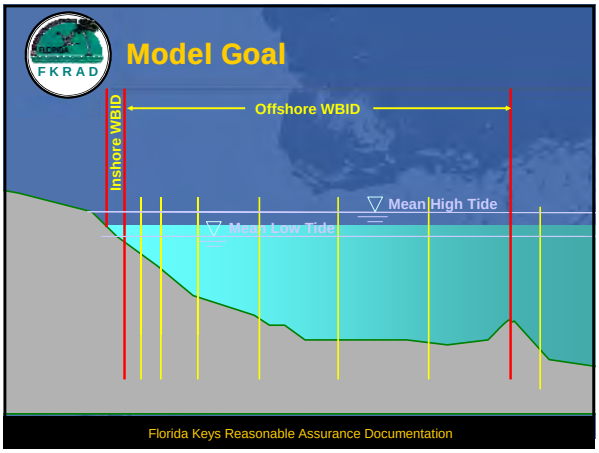
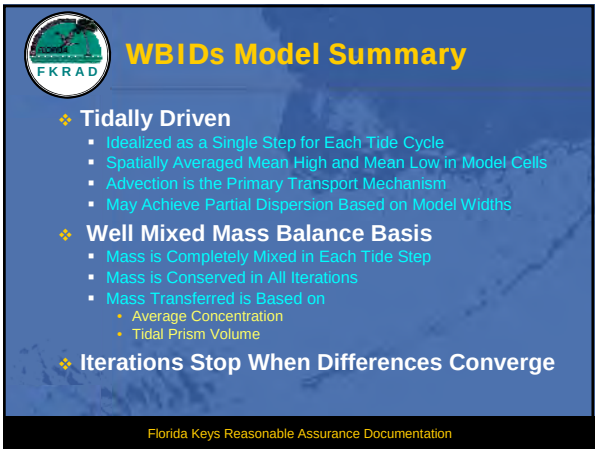
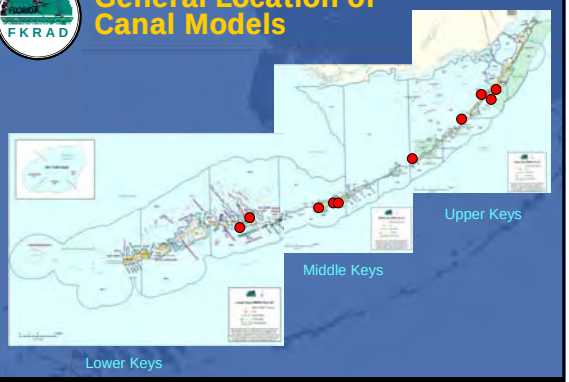
Model Concept
Tide Step 17
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Flow*
TN*
TP*
Florida Keys Reasonable Assurance Documentation


FKRAD
How Many Iteration Cycles?
Concentration Difference Between Tidal Cycles
Target Difference Threshold
0
5
10
15
20
25
30
35
40
Tidal Cycle Iterations
Florida Keys Reasonable Assurance Documentation


FKRAD
Model Goal
Inshore WBID
Offshore WBID
Mean High Tide
Mean Low Tide
Florida Keys Reasonable Assurance Documentation


FKRAD
WBIDs Model Summary
Tidally Driven
Idealized as a Single Step for Each Tide Cycle
Spatially Averaged Mean High and Mean Low in Model Cells
Advection is the Primary Transport Mechanism
May Achieve Partial Dispersion Based on Model Widths
Well Mixed Mass Balance Basis
Mass is Completely Mixed in Each Tide Step
Mass is Conserved in All Iterations
Mass Transferred is Based on
Average Concentration
Tidal Prism Volume
Iterations Stop When Differences Converge
Florida Keys Reasonable Assurance Documentation

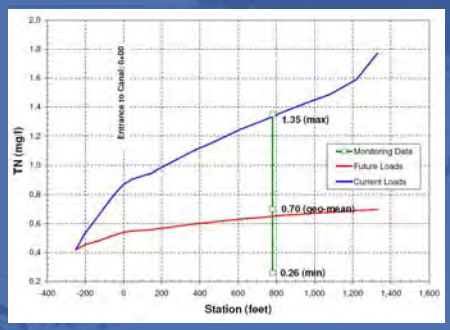
General Location of Canal Models



Rock Harbor Canal Model

Little Torch Key Canal Model

Example Canal Model Profile



SCHEDULES

- Technical Working Group Meetings
- FKRAD Documents
- Stakeholder Agreements
- Stakeholder Support Activities
- Public Information and Involvement Activities

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Revised Working Schedule

- Technical Working Group Meetings
  - Meeting 1: November 17, 2006
  - Meeting 2: December 13, 2006
  - **Meeting 3: February 23, 2007**
  - Meeting 4: March 23, 2007
  - Meeting 5: April 26, 2007
  - Meeting 6: May 25, 2007
  - Meeting 7: June 13, 2007
  - Meeting 8: July 26, 2007

Revised Working Schedule

FKRAD Document

Completion of One-on-One Interviews	February
Delivery of Draft Stakeholder Summaries	March
Completion of Initial Stakeholder Reviews	April
Delivery of Final Stakeholder Summaries	May
Digital Release of Draft FKRAD Document	June
Digital Release of Interim Document	July
Digital Release of Final Document	September
Distribution of Final Printed Document	End of September

Stakeholders Agreement

Release of Initial Draft Agreement	April
Release of Interim Draft Agreement	June
Distribution of Final Agreement	August
Execution of the Final Agreement	September

Revised Working Schedule

Stakeholder Support

Earliest Anticipated Presentation	June
Last Potential Presentation	End of September

Public Information

- What Is Appropriate?
- Which Methods and Media?

INFORMATION REQUESTS

- Living Resources Studies and Data
- Community Management Goals and Management Actions
  - **Adopted, Implemented and in Operation**
  - **Pending or Anticipated**
- Community Issues and Concerns
  - **Water Quality Management**
  - **Impacts of Pollutants on Aquatic Resources in Impaired WBIDs**

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ACTION ITEMS

- Follow-Up Data Requests
  - **Clarification of Plans**
  - **Location of Specific Facilities**
  - **Pending or Anticipated Management Actions**
- Assessment of Benefits
  - **Implementation Sequencing and Timing**
  - **Funding Status Water Quality Management**
- Selection of Living Resources for WQ Criteria

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Action Items

IDENTIFY RESOURCE MANAGEMENT GOALS
- Comprehensive Plan Element
- Local Living Resource Concerns
- Wastewater Plans
- Stormwater Management Plans
- Conservation and Marine Resource Management Plans
- Community Concerns

IDENTIFY MANAGEMENT ACTIVITIES
- Adopted Plans
- Completed Design Plans
- Operational Projects
- Funded CIP Projects
- Unfunded CIP Projects and Program Elements
- Enhanced Regulations

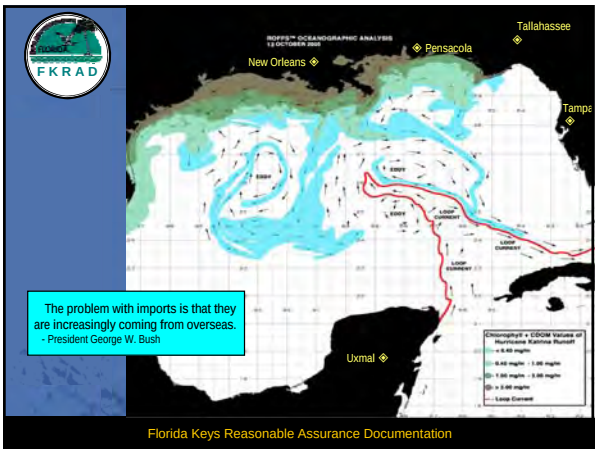
Next Meeting

TWG Meeting Number 4
MANAGEMENT ACTIONS AND ANTICIPATED BENEFITS

March 23rd ❖ 9:30AM – 1:30PM

State Office Building
Conference Room 104
Marathon, Florida

FKRAD
Questions?
Florida Keys Reasonable Assurance Documentation


FKRAD
Tallahassee
Pensacola
New Orleans
Tampa
Uxmal
The problem with imports is that they are increasingly coming from overseas.
- President George W. Bush
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