

## **Session 7**

**Luis Vargas**

HDR Engineering

### ***Okeeshobee Road Depressed Section***

#### **Topic Description**

Project deals with the reconstruction of Okeechobee Road from 12th Ave to south of W19th St. in Hialeah, Dade-County and it eliminates an at-grade crossing of the FEC Railroad. The existing four lane roadway will be replaced by a six lane depressed roadway (boat section) to be built under the Hialeah Expressway overpass, the at-grade FEC railroad and the Metrorail overpass.

#### **Speaker Biography**

BS degree in Civil Engineering from National University of Engineering, Peru (1981); MSc (1983) and PhD (1988) from University of Texas at Austin.

Has practised engineering in New York and Florida for last 18 years.

Has been with HDR since 2004 and is the Structures Manager for HDR Miami Lakes Office.

Structures project manager and construction support manager for the Okeechobee Depressed Section.



# Okeechobee Depressed Roadway

- Overview
- History of Project
- Bidding Process
- Project Design
- Construction Activities

A photograph of a project sign for the 'Okeechobee Road Depressed Section'. The sign features the project title in English and Spanish: 'Okeechobee Road Depressed Section' and 'Yesterday's Promise, Today's Reality / La Promesa de Ayer, La Realidad de Hoy'. It includes a small graphic of the depressed roadway and the Florida Department of Transportation logo. The sign is set against a background of trees and a clear sky.

## Overview of Project

- Owner: FDOT District 6
- Design Build Team:
  - HDR Engineering
  - Kiewit Southern (Gilbert Southern)
- CEI: Consul-Tech Construction Management, Inc.



## Project Location

- Located in Hialeah, Miami-Dade County
- A heavy commercial corridor
- Part of Okeechobee Improvements Program conducted by FDOT

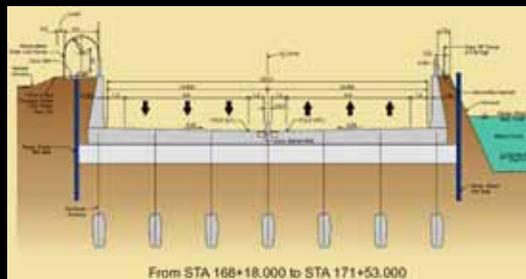


## Project Requirements

- Okeechobee Rd reconstruction to eliminate at-grade FEC railroad crossing (335 m)
- Provide a six-lane divided roadway
- Drainage system (pump station)
- Lighting & Intelligent Transportation System (ITS)
- Relocated existing water main
- New entrance to Metrorail Okeechobee Station parking lot



## Project Layout





## Okeechobee RFP

- **Technical Proposal Requirements**
  - Technical Approach/Understanding of Project
  - Construction Sequence
  - Phase Schedule Layout
  - Innovative Aspects
  - Design Support Documents
  - Estimated Contract Amount: \$35,299,710
- **Price Proposal (Bid Opening)**

Contractor	BPP	Adj. Score
<b>KSC / HDR</b>	<b>\$34,899,841</b>	<b>503,954.94</b>
MCM / HNTB	\$37,965,421	565,186.26
PCL / T.Y. Lin	\$39,880,975	632,862.59

## Project Challenges

- Support of excavation
- FEC coordination
- Erection of NB/SB RR Bridges
- Pump station construction
- Schedule: 10 mo road closure
- Metrorail and SR 934 Bridges
- Contracting method



## **Innovative/Unique Aspects**

- **Steel cofferdam construction**
- **Tie-down anchors to resist hydrostatic pressure**
- **Inverted slab**
- **Waterproofing materials –W.R. Grace**
- **Mass concrete – CTL Labs**
- **Wall aesthetics**

## **Design of Depressed Roadway**

- **Roadway geometry (DB Criteria Package)**
- **Structural requirements**
  - **Buoyant resisting system**
  - **Water leakage control**
  - **Stringent crack control limits**
  - **No impact on Metrorail & SR 934 bridge foundations**
- **Pump station**
  - **To drain stormwater**
- **FEC Bridges**
  - **No interruption of RR operations (6 hr window on Sundays only)**
- **Permitting**

# Design Document Management

## Design Team

- HDR Offices
  - Miami Lakes
  - Tampa
  - Jacksonville

## Electronic Management

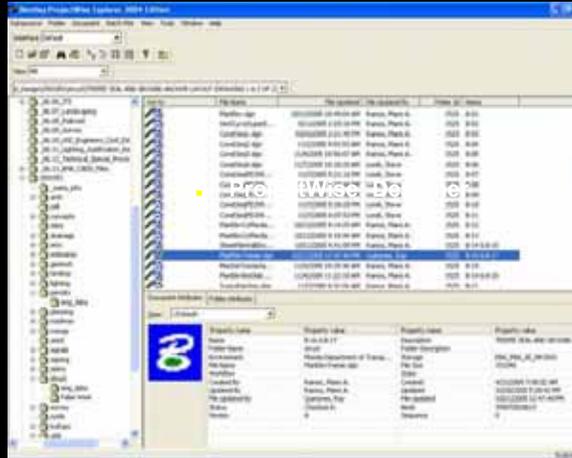
- ProjectWise

## Submittals

- 60%, 90%, 100%

## Design Time

- 4/05 ~ 10/05



# Construction Document Management

## Documents

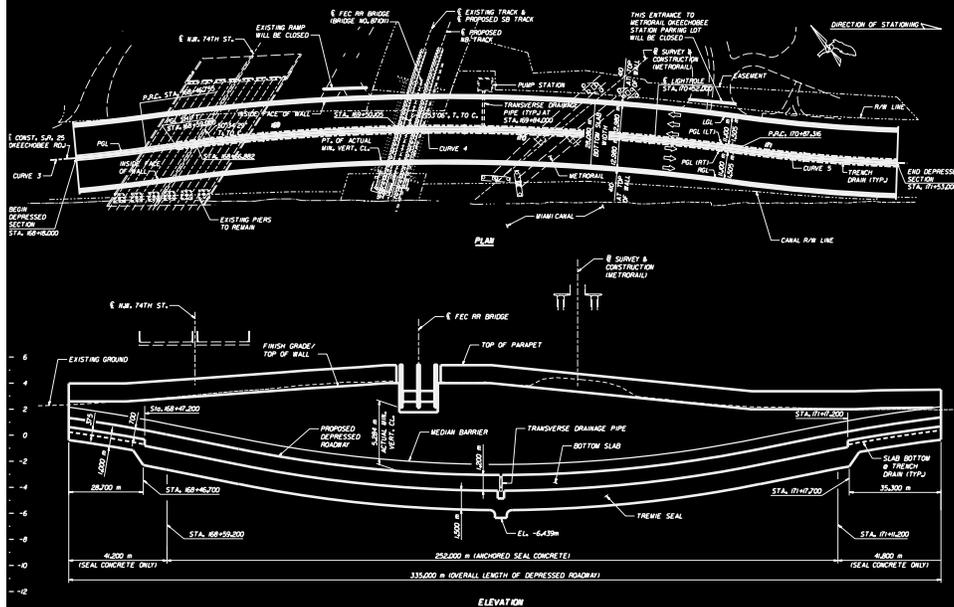
- RFI's
- Shop Drawings
- Redesigns
- Field Inspections
- As-built Drawings

## Electronic Management

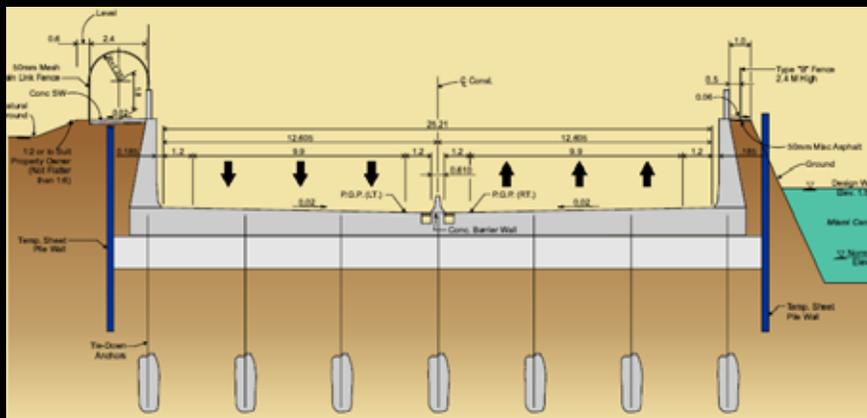
- ActiveProject
- ProjectWise



## Roadway Geometry



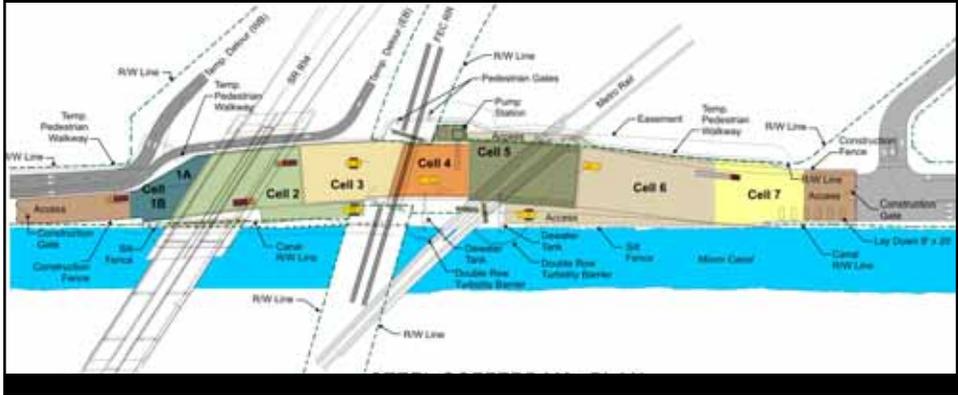
## Typical Section – Inverted Slab



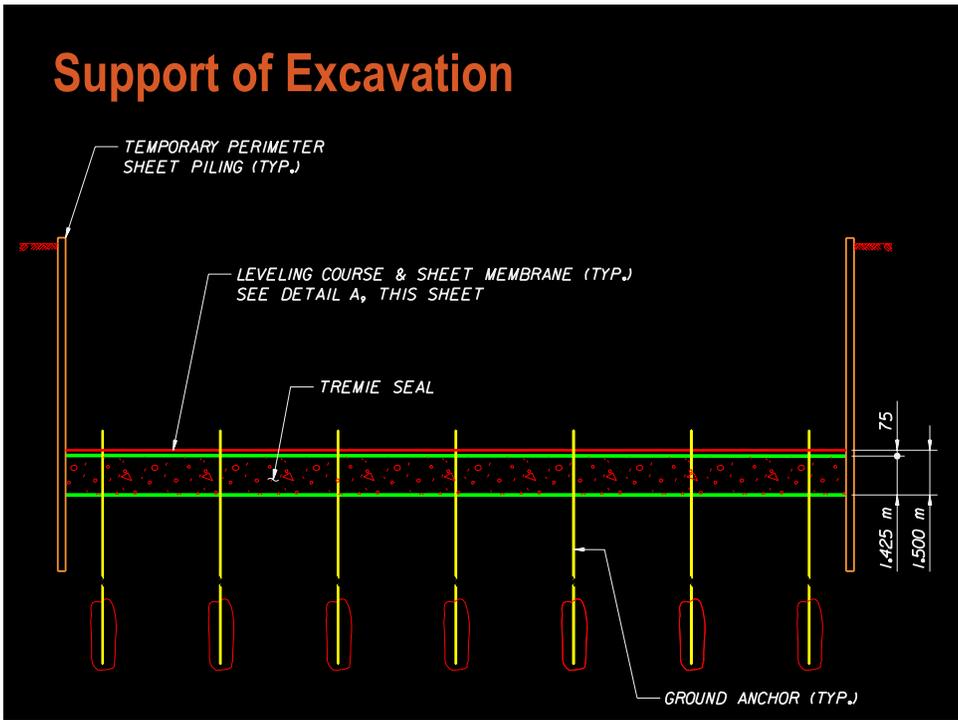
- Section of maximum stress at thickest slab section
- Maintenance of trench drains from only one location

# Cofferdam Layout

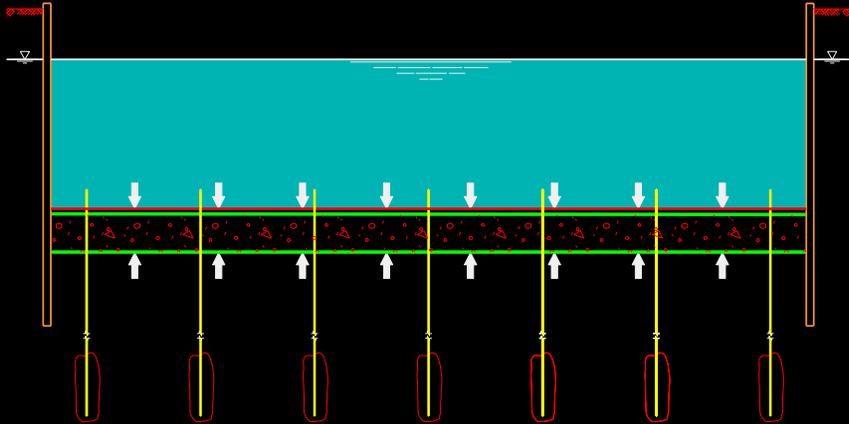
- Cofferdam construction divided in 7 cells
- Cells limited by concrete pours
- Perimeter and cut-off sheeting along Okeechobee



# Support of Excavation

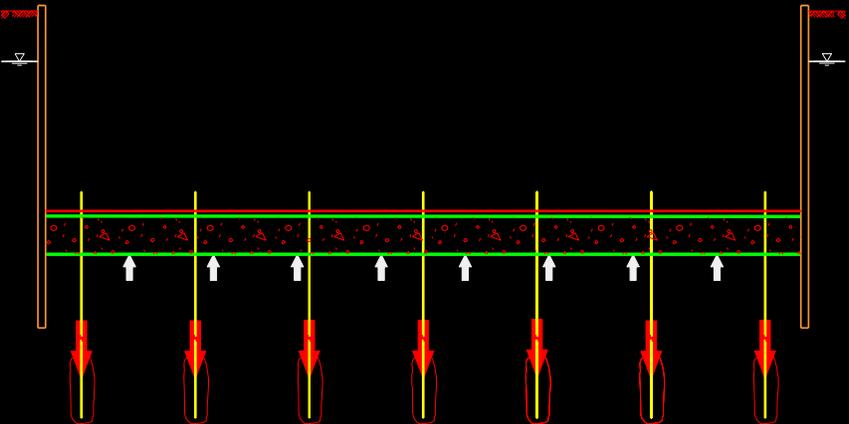


# Support of Excavation



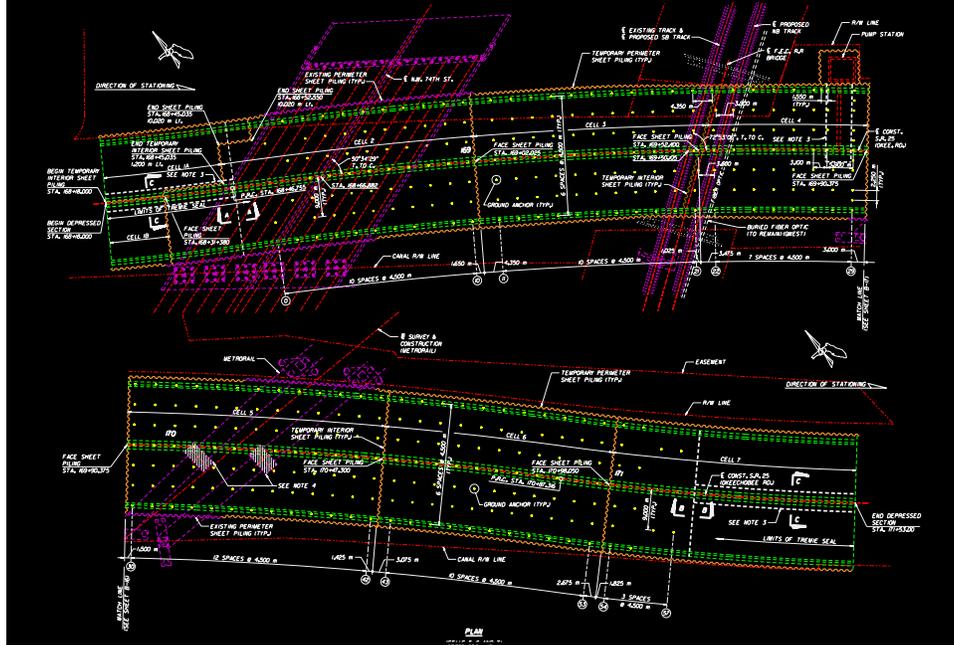
Excavated cell before dewatering

# Support of Excavation

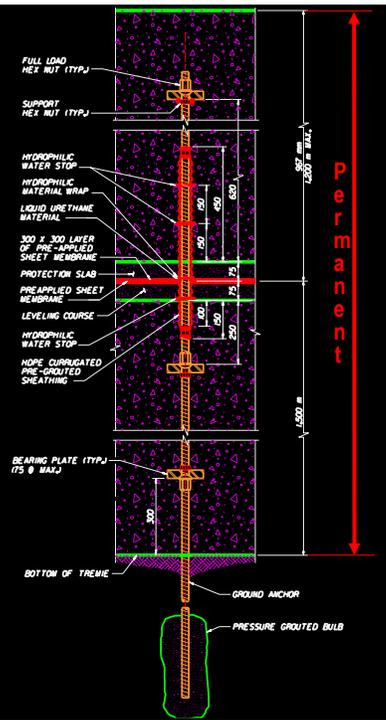


Cell after dewatering

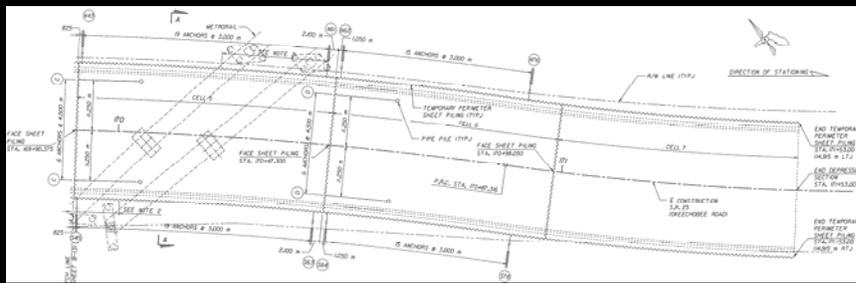
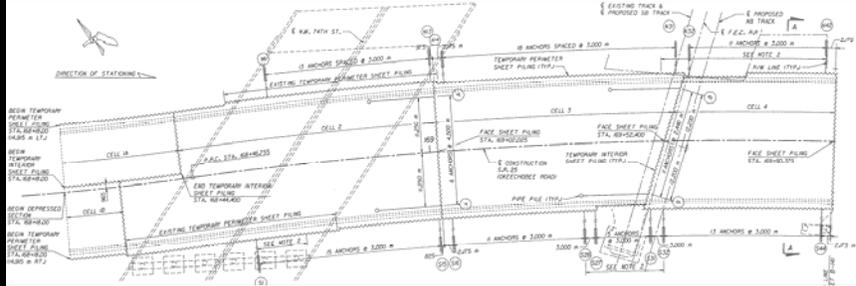
# Ground Anchors



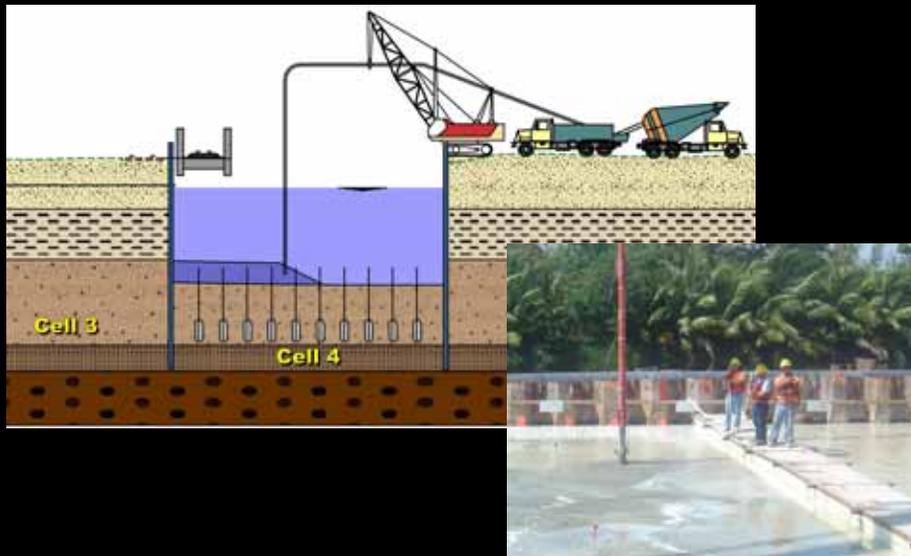
# Ground Anchors



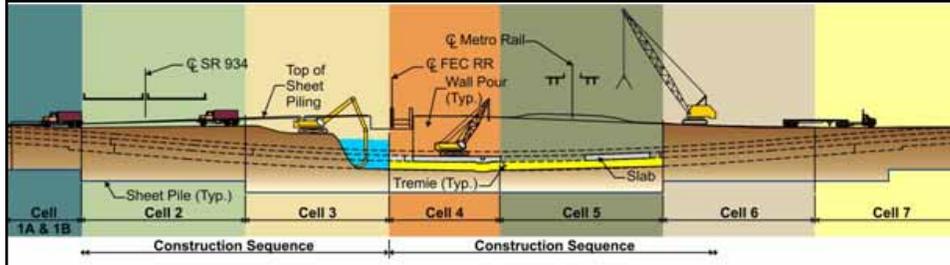
# Soil Anchors - Schnabel Foundations



# Tremie Construction



## Tremie Construction Sequence



Cell 7: 4/1/06 and 4/8/06, 800 CY each pour

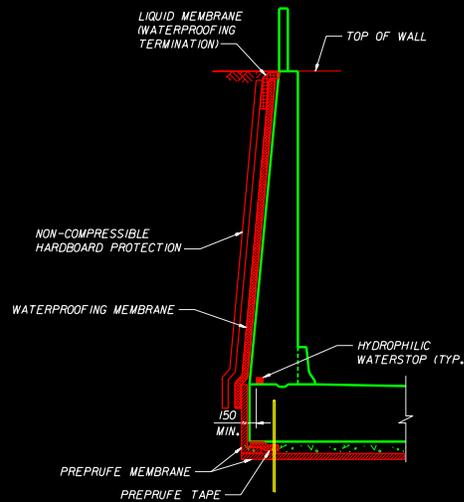
Cell 4: 4/29/06 4000 CY

Cell 6: 5/20/06 3500 CY

Cell 5: 7/1/2006 3200 CY

## Waterproofing

- Water Table up to EL. 1.52 m
  - Finish ground at EL. 2.5 m+
  - Deepest cut @ EL. -5.53m
- Water leakage – two tier
  - Waterproofing of walls and bottom slab
  - Waterstops at every CJ



## Waterproofing

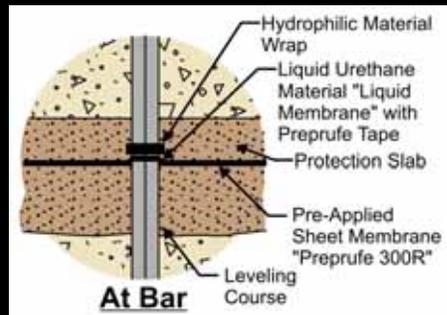


### Wall waterproofing

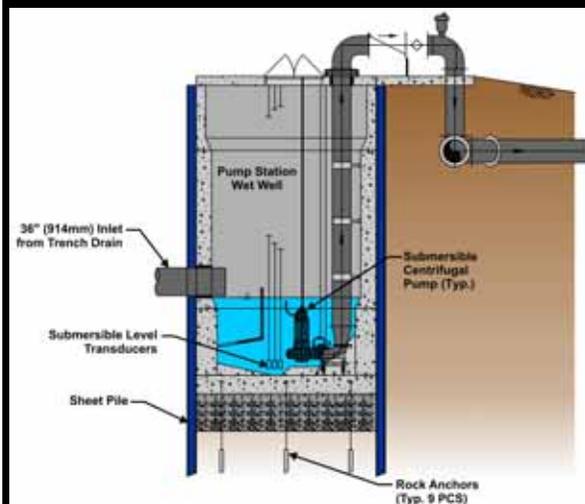
- Primer application
- Waterproofing membrane
- Hardboard protection

### Waterproofing at penetrations

- Ground anchors
- Drainage pipe



## Pump Station



- Stormwater discharge to detention ponds
- Wet well
- Three submersible 85 hp pumps (one backup)
- Control building
- Access drive

## Detention Ponds

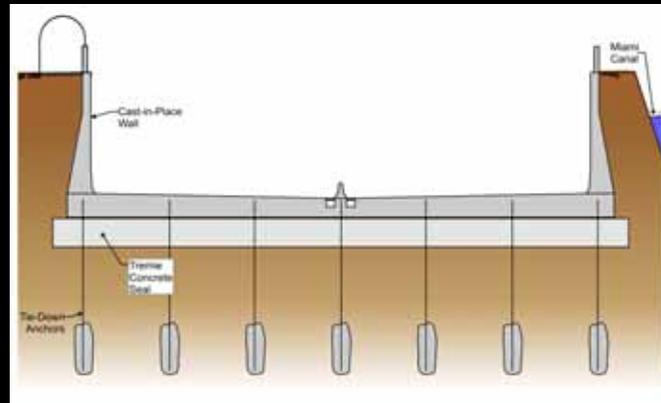


## Permitting

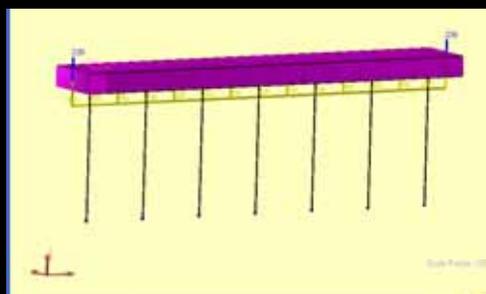
- **SFWMD Environmental Resource Permit**
  - Early Work Permit
  - Construction Dewatering Permit
  - Right of Way Use Permit
- **DERM Class II Stormwater Discharge Permit**
- **DERM Class V Temporary Dewatering Permit**
- **Florida Department of Environmental Protection – National Pollutant Discharge Elimination System (NPDES)**
- **U.S. Army Corps of Engineers (USACE)**
- **City of Hialeah Building Permit**
- **Water Use Permit**

## Depressed Section Structural Modeling

- Modeling follows construction sequence
  - Tremie seal with ground anchors
  - Final Section: Structural slab + walls

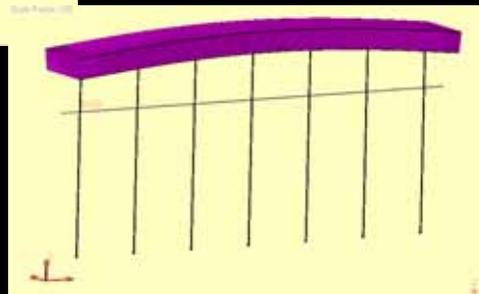


## Tremie Seal w/ Ground Anchors

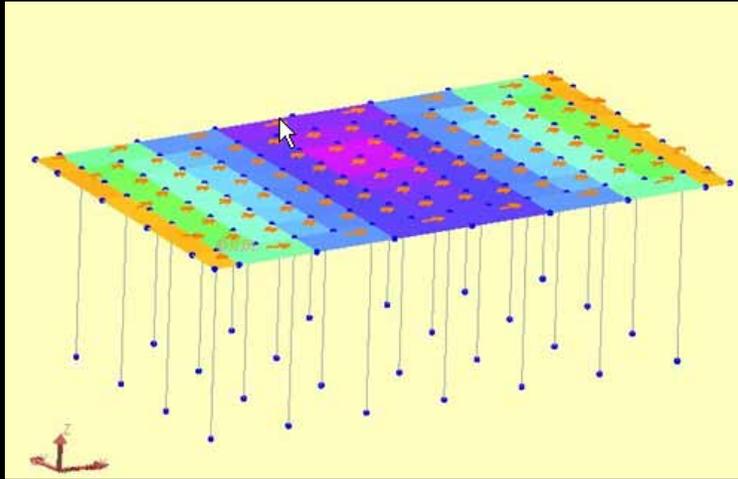


### Loading

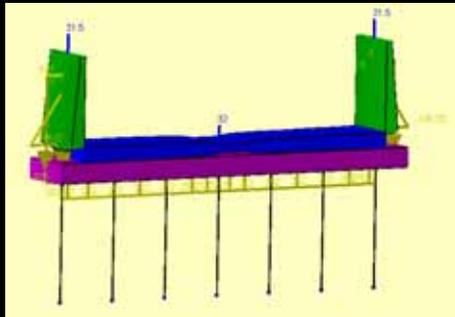
- Self Weight
- Sheet piling
- Water Pressure on Tremie



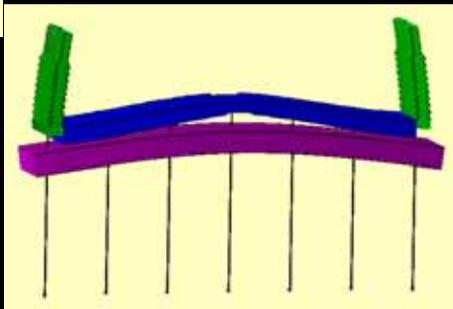
## Tremie Seal w/ Failed Ground Anchor



## Depressed Section

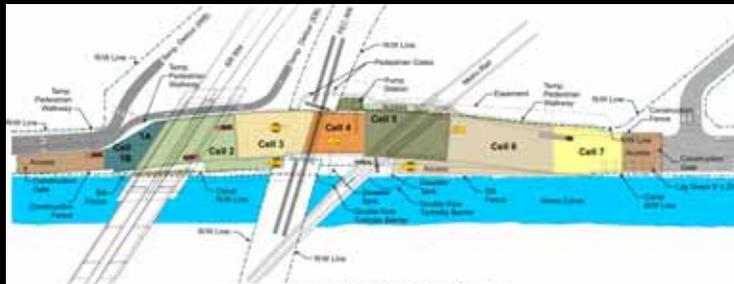
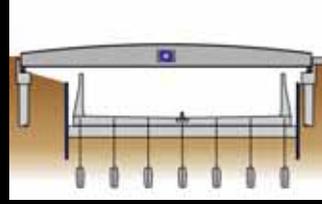


- Self Weight
- Water Pressure on Tremie
- Water Pressure on Walls
- Surcharge on Walls
- Earth Pressure on Walls



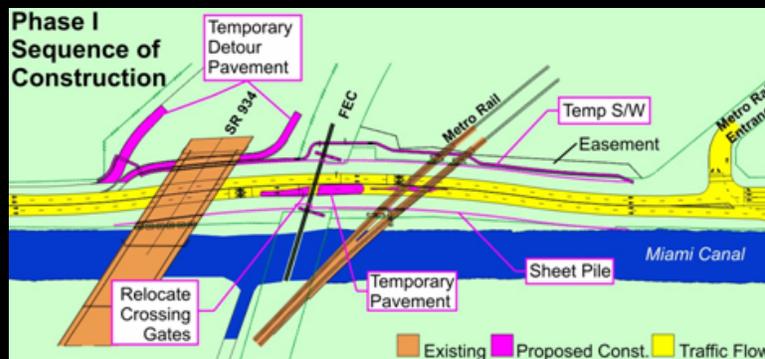
## Construction Phases

- Installation of perimeter sheeting
- Abutments of RR bridges
- Cell 7; Cell 4
- Erection of SB RR Bridge
- Cells 6-5
- Cells 2-3, 1A/1B & erection of NB FEC Bridge



## Phase I

- Shift traffic to median with 2-WB & 1-EB lanes.
- Drive perimeter sheeting along Okeechobee Rd (N & S)



## Phase I



Sheeting piling driving

## Jump Span

- Temporary RR track support to build foundations for new railroad bridges
- Hurricane Wilma made it happen!



## Drilled shaft foundation for RR Bridges



## Phases II

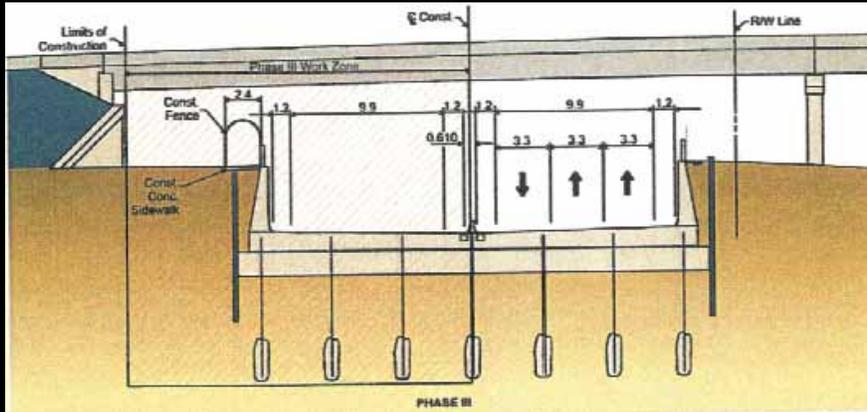
- Complete closure of Okeechobee Road between 8th and 12th Avenue for 10 MONTHS
- Depressed section construction



**Road closed on November 28, 2005**



## Phases III



## Construction Activities

## Overview of Site



## Soil Anchors



## Cell 4



## Pump Station Coffer Cell



## New FEC RR Bridges



RR Bridge Erection May 7, 2006



## Ground Anchor Installation



## Ground Anchor Installation



## Ground Anchor At Cell 6



## Waterproofing



## Cells 6/7 Leveling Course



## Leveling Course



## Slab Construction



## Depressed Road Looking North-West



July 25, 2006



July 14, 2006