Project Overview

- Re-Align & Widen 4 Miles of I-70 Mainline + New CD System
- Construct New Six Points Interchange
- Construct New Airport Interchange
- Construct 10 New Bridge Structures
- Install 2 Miles of 96" Pipe
- Relocate 10,000 Ft. of Creek Channels
- Project Design Started in April 2002
- Open to Traffic Date - December 2004

Grading Contract

- Major Embankments to be Complete by May 2003
- All Excavation Complete by July 2003
- Winter Embankment Construction Critical to Schedule
- Soil Modification Selected to Allow Uninterrupted Construction During Winter
- Analysis Indicated Use of KLD
- Winter '02-'03 Produced Extreme Weather Conditions

2.9 Million Cys Excavation & Embankment Required
Grading & Embankment Contract Completion Key to Project Success
Grading Contract Let October 2002; Work Started in November 2002
**Site Investigation**

- Existing I-70
- Proposed Ramps

- 1.9 Million CY of Cut
- 800,000 CY of Fill
- 300,000 CY of Fill
- 12,000 ft One Way
- 11,000 ft One Way

**Economic Haul**

- Courtesy INDOT & PB

**Machine Selection**

- Caterpillar 637 Scraper
  - Dual Engines
  - Tractor Engine = 450 HP
  - Scraper Engine = 249 HP
  - Heaped Capacity = 31 CY

- Wheel Tractor with Pulled Scraper
  - Single Engine
  - Tractor Engine = 425 HP
  - 3 Bucket Set Up Heaped Capacity = 54 CY
  - Top Speed = 25 MPH

- Quadtrac Tractor with Pulled Scraper
  - 4 Independent Tracks
  - Single Engine
  - Tractor = 450 HP
  - 3 Bucket Set Up Heaped Capacity = 54 CY

**Case Scenario**

- Courtesy INDOT & PB

- Courtesy Caterpillar Inc
Productivity & Cost

- Dual Engines
  - Productivity = 90 CY/HR
  - Much Higher EOE
  - $3.19/CY

- Single Engine
  - Productivity = 75 CY/HR
  - Average EOE
  - $2.80/CY

Mass Haul & Haul Road

Bridgeport Bridge Shoring

- Existing Bridgeport was the only access across I-70 closed to traffic
- Predetermined by INDOT that existing structure could only carry 40 Ton load across.
- Extra weight of Tractors and 3 full Scraper Buckets necessitated the use of Temporary Shoring
- H piles and cross beam members used on each span without effecting traffic on I-70 accomplished this.

Haul Road Maintenance

- Walsh Construction's goal was to provide straight and smooth haul roads.
- The condition of the haul road greatly affected our production.
- Big difference between a tractor moving at 20 mph vs. 25 mph, hauling 54 CY each time over an 11 hour shift.
- We accomplished this by constantly using a CAT 12H Motor Grader.

Scrapper Operations

(in cut section)

- Pull Type 18 CY Scraper Buckets.
- Two models used: Miskin SP-D18 & John Deere 1810E
- Unnecessary for Excavator and Dozer to load scraper buckets.
- Wide open mouth scraper bucket. 30 Degree cutting edge angle.
- Each cut is 3 to 5 inches deep, i.e. clean cut area.
- Smooth cutting edges typically used, however serrated edges can be used in hard ground.
- Scraper Buckets can also be top loaded.

(in fill section)

- Miskin Scraper Buckets use gravity to unload in the fill
- John Deere Scraper Buckets use a hydraulic ejector to unload.
- Unloads in even 8" to 12" lifts
- Precise Dumping. Dump one Bucket after another in a continuous train.
Placement of Fill

- After Scraper Bucket has dumped, a CAT D6 Dozer will knock down any small piles to create an even 8” lift.
- The lift is either compacted with a CAT 815 Sheepfoot Compactor to achieve the required density or Soil Modified.
- All Dozers were equipped with GPS.

Cat D6R GPS Dozer

- All grades are downloaded from a website, created by an outside engineering firm that generated the grades from the contract drawings.
- Information is downloaded onto a Memory Card. This memory card is installed into a Sitemvision Monitor in each dozer cab.
- Stakeless Environment.
- Typically six crews of two men each would have been used to stake a project of this magnitude. Walsh Construction used two engineers.

Soil Modification

- Walsh Construction used a day and night shift to complete the project on schedule.
- Two 11 hour shifts were incorporated each day.
- The 12th hour was used for re-fueling and maintenance.
- During winter months, Walsh Construction worked 7 days a week to maintain soil temperature above 35 degrees.
- The third worst winter in Indiana was just another challenge for Walsh Construction to overcome.

96” Pipe

- Over 11,000 LF of 96” Pipe
- Deepest section was 42’ below existing grade
- Material used for pipe was “96” SmoothCor Metal Pipe”
- Polymer Coated Double Walled Pipe.

Pipe Material Selection

- Reduced Weight. 66% lighter than concrete pipe
- Reduced weight also affected handling and placement.
- 20’ long sections. Less joints, over 11,000 LF.
- Material Selection affected equipment selection
**Soil Condition**

- Soil Borings were carried out prior to the bid to establish exact material that was to be encountered on 96" pipe.
- Typically the material encountered was clay, hard (blue) clay, sandstone, siltstone and shale.
- Pockets of groundwater were encountered above hard rock. The hard rock was approximately 10' below the invert of the pipe.

**Equipment Selection**

- Hitachi EX1200 excavator was used to dig and place the 96" pipe. The operating weight of this piece of equipment is 250,000#. Walsh Construction used a 7 ½ CY bucket.
- The spoil material was handled with a CAT 345 Excavator.
- B-Borrow material was placed using a CAT 325 with plate tamp.
- Dirt Backfill was placed with two CAT D8 Dozers and CAT 815 Sheepfoot Compactor.
- A Trench Box was specially made for this application. 28' long, 14' wide and 18' tall.

**Construction Statistics**

- 3,000,000 CY of Earthwork (volume of 3 Conseco Fieldhouses)
- 11,000 LF of 96" Pipe
- One of the worst winters in decades
- Completed the job as scheduled!!!

**Final Product**

**Construction Issues**

- Continuous shifts during sub-freezing temps. to maintain 35 degree soil
- Proctor required for each lift due to time sensitivity of modified soil properties
- Reduced durability of nuke gauges in freezing temps.
- Excess material > planned due to reduced shrinkage of treated soil
- Post modified soil is an “engineered” material - may be < 100pcf
- JTRP Studying lime modification & developing new guidelines for use by INDOT
Construction Issues

- Final quantity measurements?
  - Use of GPS for original & final surfaces
  - Use of DTM to provide quantities
  - Additional CE for sectioning
- When is modification warranted?
  - MC taken daily compared to optimum
  - Drying time vs. Schedule
  - Sub on-site vs. Additional mobilizations

Construction Facts

- 2.97 Million Cys Moved from Nov. 2002 thru August 2003 at a Cost of $11.2 Million
- 118,000 Tons of KLD Incorporated into Embankments at a Cost of $7.1 Million
- Total Unit Cost = $6.87 per Cy in Embankment
- Avg. Pct. KLD = 5.4%
- Critical Embankments Completed on Schedule

Temperature

Precipitation

Production

Production

Production
### Production

#### Production vs. Weather

- [Graph showing production trends over time.]

### Benefits

- Eliminates Typical Construction Winter Downtime
- Provides Engineered Soil & Improved Material for Embankment
- Allows Excellent Process Control
- Cost Effective? - $7.1 Million to Gain 5 Month's Production – 1 Construction Season
- Maintained Critical Schedule for Project Completion

### Work in Progress

- [Image of construction site with the text: "Dec. ‘03"]

### Questions