



**Kiewit**



WALTER P MOORE



**Texas**, the second most populous and largest of the 48 contiguous U.S. states, is home to some of the nation's largest infrastructure projects. The oil boom in the early 1900's, strong investment in higher education over the last fifty years, its large population and thriving cities, and its abundance of natural resources have put Texas in the lead in many industries, including agriculture, petrochemical, energy, computers, electronics, aerospace, and biomedical. There is an almost never-ending list of "largest in the U.S." associated with Texas. Texas has the most farms, the highest acreage of farms, the largest livestock production, the largest production of cotton, creates the most cement, crushed stone, lime, salt, sand, and gravel. The state leads the nation in export revenue. One-quarter of the known U.S. reserves of petroleum deposits are in Texas. Texas leads in natural gas production, produces the most wind power and has the highest solar power potential. Texans also consume the most energy in the nation per capita and as a whole, but unlike the rest of the nation, they have their own alternating power grid. Three of the 10 most populous U.S. cities are in Texas, as are headquarters of many high tech companies – Dell, Texas Instruments, AT&T. Aerospace industries such as ASA, Lockheed, and Bell Helicopter are based in Texas and the state has the joint-highest number of Fortune 500 companies (along with California). It has the second largest number of millionaires in the U.S. Unfortunately, Texas was also home to the deadliest natural disaster in U.S. history – the 1900 Galveston hurricane.

**The 2013 Department of Civil and Environmental Engineering and Earth Sciences Junior Field Trip** is designed to give students a behind-the-scenes look at a sample of Texas' major infrastructure projects and systems: the massive Kiewit Offshore Services yard in Ingleside, a construction facility for oil and gas structures; the levee and hurricane protection system around Texas City; the workings of the Port of Houston, the nation's leading port in terms of foreign tonnage; offshore and coastal research labs at Texas A&M, one of Texas's leading universities; a two-million tons per year lignite mine; the design firm for the world's longest single span roof for Cowboys Stadium; and Cowboys Stadium itself.

**The overall purpose of our annual field trips** is to expose students to some of the biggest and most innovative infrastructure design and construction efforts going on in the United States; to see first-hand that the need to rebuild our often failing infrastructure is huge; to see first-hand the complexity of these structural, transportation, water resources, and environmental projects that keep our nation productive, efficient and healthy; and to interact one on one with project and design engineers. These trips help students see the wide range of opportunities available to them to become innovative leaders and also help connect the classroom to the real world.

Red times are in Eastern Time Zone, all other times are in Central Time Zone

**Wednesday, October 2, 2013**

**3:45amET** Meet at Royal Excursion bus at Eck Visitor Center by bookstore

**4:00amET** Departure from campus. Bus to O'Hare Airport.

**7:55amCT-10:20amCT** American Airline flight # AA2305 Chicago – Dallas

**11:40amCT-12:55pmCT** American Airline flight # AA3367 Dallas – Corpus Christi

**1:30pmCT** Meet Gotta Go Trailways bus at Corpus Christi airport  
817-572-4114

**1:30pm-2:00pm** Bus to **Kiewit Offshore Services**, 2440 Kiewit Road, Ingleside, Texas

Dress for Wednesday: Long sleeve shirt, long pants, steel toe or sturdy closed shoe (not sneaker). Do not pack these items in your checked luggage if you plan to check your bags.

Remember to pack food for breakfast and lunch or pick up food in Chicago and Dallas airports.



Kiewit Offshore Services (KOS) builds a full range of offshore facilities from small platforms, modules, suction piles and tendons to large deepwater projects. This world-class fabrication facility consists of state-of-the-art equipment and infrastructure. With access to the Gulf of Mexico through the La Quinta and Corpus Christi ship channels, the facility was designed specifically for deepwater projects. The 400-acre fabrication yard is located in Ingleside, Texas, along the La Quinta ship channel in Corpus Christi Bay. The facility boasts 2,900 ft. of continuous pile-founded bulkhead space, with water depths up to 45-ft and a 77-ft. void for offloading unusually large floating structures.

With 13,000 tons of lifting capacity, the Heavy Lifting Device (HLD) is the centerpiece of the Kiewit Offshore Services equipment fleet. Capable of installing unusually large modules on hulls in fewer sections, the HLD minimizes offshore commissioning efforts and reduces overall project costs. Kiewit Offshore also houses a fleet of heavy-lift cranes and equipment capable of transporting nearly any onshore structure.

For safety and efficiency, the facilities include an underground utility infrastructure featuring a separate breathable air system and high-pressure pipelines for gas, mixed-gas and fiber optics. The four-acre structural assembly building contains more than 170,000 sq. ft. of covered workspace with four bays. An on-site skills center for training and medical/physical therapy is also available.

**2:00pm-5:00pm** Tour of **Kiewit Offshore Services (KOS)**  
Overview presentation and yard tour



**Everyone must wear long sleeve shirts, long pants, and steel toe (preferably) or closed toe shoes.  
Absolutely no exceptions.**



5:00pm- 9:00pm

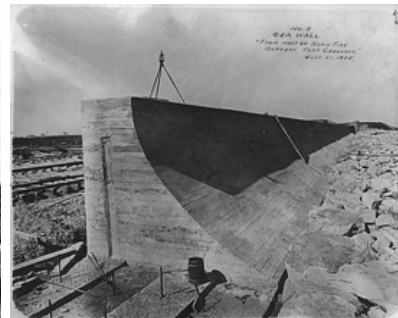
Bus to Galveston, box sandwiches to take on bus for dinner

Galveston Island is located on the coast of Texas just 50 miles south of Houston, and has over 30 miles of beaches. During the Texas Revolution (1835), Galveston served as the main port for the Texas Navy and later (1836-1846) served as the capital of the Republic of Texas. In the later part of the 19<sup>th</sup> century, Galveston became a major US commercial center and was one of the largest ports in the U.S. The Galveston hurricane of 1900, the deadliest hurricane of U.S. history, devastated the city, bringing a storm surge of over 15 feet to a city whose highest point was only 8.7 feet above sea level. An estimated 8,000 people lost their lives. The Galveston seawall was built and the island was raised with dredged sand from the ocean, but after the storm, development shifted to Houston. Galveston is a major tourist and vacation spot these days, although hurricanes and tropical storms continue to strike, the most recent being Hurricane Ike in 2008.

Overnight at:

[Hampton Inn & Suites Galveston](#)

6431 Central City Boulevard, Galveston, Texas, 77551, 409-744-5600



Images from the Galveston hurricane, 1900, and the seawall under construction in 1905. [http://en.wikipedia.org/wiki/1900\\_Galveston\\_Hurricane](http://en.wikipedia.org/wiki/1900_Galveston_Hurricane)

Thursday, October 3, 2013

Dress for Thursday: Business casual.

6:00am-7:50am Breakfast buffet available in hotel

7:50am Meet at bus with all luggage for 8:00am departure

Will need your government issued I.D. accessible at the Port of Houston in order to board the boat.

8:00am-11:30am Met by [Harris County Flood Control District](#) Chief Engineer, Steve Fitzgerald



Tour of the **Texas City hurricane protection levee**, which protects Texas City from rising waters in Galveston Bay during a hurricane.

Tour of U.S. Army Corps **flood control channels** which control rainfall runoff during big rainfall events in the Houston metropolitan area in order to get the water out of the city.



### Hurricane Protection

Two of the levee systems in the Houston area include the Texas City Hurricane Protection system and the Galveston Seawall.

**Galveston Seawall:** The Galveston Seawall was built after the Galveston Hurricane of 1900, and has not been overtopped by storm surge until Hurricane Ike (2008), although waves from some storms have caused considerable damage to buildings along Seawall Boulevard. The seawall is approximately 10 miles long, approximately 17 feet high and 16 feet thick at its base. Extensions of the seawall of about three miles were done in the 50s and 60s.

**Texas City Hurricane Protection:** The Flood Control Act of July 1958 authorized the Corps of Engineers to provide hurricane flood protection to Texas City and La Marque, located on the southwest shore of Galveston Bay: about 1.3 miles of concrete walls and 15.7 miles of levees with crown elevations varying from 15 to 23 feet above mean sea level, related drainage and closure structures, railroad and highway ramps, tide control and navigation structures and two pumping plants. The system was completed in 1987 (began in 1962) and encircles approximately 50,000 residents and six billion dollars' worth of property including BP, Marathon and Valero refineries and Dow, Sterling and ISP chemical plants. During Hurricane Ike (2008), the high water in Galveston Bay would have extensively flooded Texas City if the levee hadn't been there.

### Flood Control

**As Houston grew** in the 1900's, it became necessary to construct more extensive channels to drain the streets and subdivisions that began to spring up. During this period, numerous floods were documented in the local newspapers. In 1935, the worst flood that the city had suffered to date inundated sections of downtown Houston. The extensive damage spurred the creation of the Harris County Flood Control District (HCFCD) in 1937. The HCFCD began to embark on a series of ambitious flood control projects. In cooperation with the U.S. Army Corps of Engineers, Barker and Addicks Reservoirs were constructed in the late 1940's. These two reservoirs were the first and largest flood control detention facilities in the county, and provided a combined 400,000 acre-feet of flood storage. Meanwhile, the focus of the HCFCD's efforts was the construction of a series of major channels over approximately a 30-year period from the 1940's to the late 1970's. By the end of this period, HCFCD operated over 2,500 miles of improved channels. In addition to flood control infrastructure, rainfall and flood flow data has been collected in the Houston area for over 65 years in order to understand the impact of the built environments and to aid in developing design criteria.

(<http://www.ljaengineering.com/newsletter/Vol7issue1/default.html>)



11:30am

Lunch along way to the Port of Houston Authority at [Brady's Landing Restaurant](#), 8505 Cypress Street, Houston, TX 77012 (on ship channel)

**THE PORT OF HOUSTON AUTHORITY** – For nearly 100 years, the Port of Houston Authority has owned/operated the public cargo-handling facilities of the Port of Houston – the nation’s largest port in terms of foreign waterborne tonnage. The port has historically been an economic engine for the Houston region, the state of Texas and the nation. The port contributes to the creation of more than one million statewide and more than 2.1 million nationwide jobs and the generation of more than \$178.5 billion of statewide and \$499 billion of nationwide economic activity.



1:00pm-3:30pm

Tour of Port of Houston  
[Port of Houston Authority](#)  
 111 East Loop North  
 Houston, Texas 77029

Need I.D.s for boat!  
 Leave backpacks, oversize purses, large bags on bus – not allowed on boat.

Port of Houston overview presentation  
 Design of port and port operations  
 Boat trip to see Port



3:30pm-5:30pm

Bus to College Station, Texas

College Station is home to the main campus of Texas A&M University, one of the few institutions in the nation to hold triple federal designations as a land-grant, sea-grant and space-grant institution and has over \$700 million in research expenditures annually. With 50,000 students, it is the sixth-largest university in the country offering 120 undergraduate and 240 graduate degree programs in ten colleges. It is among the nation’s largest uniformed student bodies, with over 2,300 Corps of Cadets. Texas A&M also has one of the largest veterinary programs in the country and is home to the George Bush Presidential Library and Museum.

7:00pm-8:30pm

Dinner at [C&J Barbeque](#)  
 1010 South Texas Avenue, Bryan, Texas 77803, 979-822-6033

Overnight at:

[Hampton Inn College Station](#)  
 320 Texas Ave., S., College Station, Texas, 77840, 979-846-0184

Friday, October 4, 2013

6:00am-7:50am Breakfast buffet available at hotel  
7:50am Meet at bus with luggage for 8am departure

8:30am-9:30am

[Haynes Coastal Engineering Laboratory, Texas A&M University](#)

600 Discovery Drive, College Station  
Dr. Bob Randall

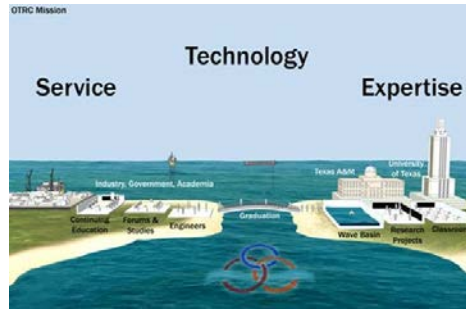


Group split in two: Conference room presentation/demonstration in laboratory of optical tracking of a barge/ship in waves, demonstration of wave gauge calibration and wave measurements, regular and irregular waves



Dedicated in June 2003, the 25,000-square-foot **Reta and Bill Haynes '46 Coastal Engineering Laboratory** at Texas A&M University brings ocean and estuarine environments into a laboratory setting where engineers, researchers and educators can tackle the most challenging problems of near-shore, offshore and estuarine regions. The large-scale, specialized testing capabilities model coastal, dredging, hydraulic, and offshore processes. A 3-ton overhead crane services both the Shallow water (3-D) wavebasin and the Two-dimensional tow-dredge tank, and an instrument carriage spans the shallow water basin. All valves, pumps, and weir gates are electronically controlled from the data acquisition room. Operator control is via computer or manual, and an observation well provides underwater viewing for both basin and tank.

10:00am-11:00am [Offshore Technology Research Center](#)  
Conference room presentation (half hour) Dr. Richard Mercier  
Group split in two: wave generation and the model (15 minutes with each)



**The Offshore Technology Research Center (OTRC)** is a National Science Foundation (NSF) Engineering Research Center supporting the offshore oil and gas industry. It is jointly operated by Texas A&M University and the University of Texas at Austin. The Center was created to conduct basic engineering research and develop systems for the economical and reliable recovery of hydrocarbons at ocean depths of 3,000 feet or more. In the past few years, gas and petroleum reserves under ultra-deep water (6,000 to 10,000 feet) on the continental slopes of the Gulf of Mexico have been demonstrated to be of enormous economic and strategic significance to the United States. OTRC's wave basin is playing a pivotal role in the development of these reserves, and testing capabilities are continually being expanded and improved to meet the challenges of testing structures for greater depths.

The OTRC operates a unique model testing basin that has played a vital role in helping U.S. oil producers reach new depths in the Gulf of Mexico's deepwater frontier. Most of the deepwater structures planned or installed in the Gulf of Mexico have been tested in the OTRC model wave basin. Researchers use the tank to develop high-quality data sets against which sponsors can validate their models. A three-dimensional wave maker along with wind and current generators simulate the conditions facing deepwater structures. The facility has tested models of structures ranging from Tension Leg Platforms and Spars to Remotely Operated Vehicles for the petroleum industry and an Assured Crew Return Vehicle designed by NASA for the international space station.

The OTRC model basin is capable of large scale simulations of the effects of wind, waves, and currents on fixed, floating and moored floating structures. The wave basin is 150 ft long and 100 ft wide, with a depth of 19 ft. The pit located in the center of the basin has a depth of 55 ft. With 48 individual controlled paddles, the wavemaker can generate a variety of wave conditions, including unidirectional and multidirectional regular and irregular (random) waves. Sixteen dynamically controlled fans can generate prescribed gusty wind conditions from any direction. A modular current generation system consisting of banks of submerged jets can generate sheared current profiles from any direction. The data acquisition system can record up to 96 channels of information.

11:30am Box lunches and kolaches from Kolache Rolfs (979-696-5544) delivered to OTRC

12:00pm-1:00pm Bus to [Walnut Creek Mining Company](#)  
10949 N Tidwell Prairie Rd  
Bremond TX, 76629  
David Martin, Mine Manager



**Walnut Creek Mining Company:** Kiewit Mining Group Inc. owns and is responsible for project operations and day-to-day management of this lignite mine located between Dallas and Houston, Texas. The operation includes an 80-cubic-yard dragline, a 20-cubic-yard mass excavator, an 18-cubic-yard hydraulic backhoe and a fleet of 150-ton end-dump trucks to move more than 20 million cubic yards of material annually.

The captive lignite operation produces more than two million tons of lignite per year and incorporates a blending program that provides consistent quality lignite to fuel two 150-megawatt circulating-fluidized-bed power plants. Quality control is maintained through a comprehensive testing program, and also includes an on-site staff of environmental specialists to ensure total compliance. Safety and compliance records have been exceptional with the mine, winning the MSHA Sentinels of Safety Award nearly each year of production, in addition to a Special Projects Reclamation Award from the Texas Mining and Reclamation Association.

The mine's primary client generates, purchases, transmits, distributes and sells electricity to 250,000 residential, electrical and industrial customers in 85 municipalities in Texas and New Mexico.

*Lignite, often referred to as brown coal, is a soft brown fuel with characteristics that put it somewhere between coal and peat. It is considered the lowest rank of coal. Lignite has a high content of volatile matter which makes it easier to convert into gas and liquid petroleum products than higher ranking coals. Unfortunately its high moisture content and susceptibility to spontaneous combustion can cause problems in transportation and storage. It is often burned in power stations constructed very close to the mine.*

1:00pm-4:00pm

Visit to **Walnut Creek Mine**

Overview

Mine Operations

Aquifer Depressurization required for mining

Other Civil Engineering work

General Surface Mine Tour

Dragline Operations

Truck Operations

Construction Project

Reclamation Efforts

Drive by Power Plant



4:00pm-6:00pm Bus to Austin  
(Bus lot – Laz Parking, 101 Red River)

7:00pm-10:00pm [Iron Cactus](#) Mexican Grill  
606 Trinity St., Austin, 512-472-9240  
Mezzanine 2<sup>nd</sup> floor reserved

Overnight at: [Hilton Austin](#)  
500 East 4<sup>th</sup> Street, Austin, TX 78701  
512-682-2880



## Saturday, October 5, 2013

Dress for Saturday:  
Business casual for  
morning.

6:30am-8:15am Breakfast in Liberty Tavern in hotel

8:15am Meet in hotel lobby to load luggage on bus

8:30am-8:45am Walk to Walter P. Moore

9:00am-11:30am [WALTER P MOORE](#)  
221 West 6th Street, Suite 800  
Austin, Texas 78701  
Larry Griffis, P.E., Senior Consultant, Principal



Presentation at Walter P. Moore, design firm for Cowboy's Stadium and other moveable roof stadiums.

Update provided by Professor Ahsan Kareem on wind research going on at Notre Dame.

### Walter P. Moore's Civil Engineering Services:

- Flood Mitigation
- Hydraulics & Hydrology
- Land and Site Development
- Master Planning
- Roadway Design
- Utility System Design

Founded in 1931, Water P. Moore is headquartered in Houston, Texas, with more than 400 professionals in full service offices from coast to coast. Their staff include civil, traffic, transportation, structural and structural diagnostic engineers, and parking consultants. Their projects range from healthcare and education facilities to corporate campuses, airports, sports stadiums, convention centers, entertainment centers, government facilities, and other infrastructure. Their clients are institutions, developers, corporations, government agencies, architects and contractors.

More info on [Civil Engineering at Walter P. Moore](#)

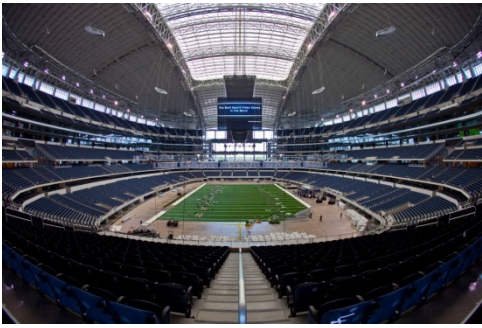


### World's Longest Single-Span Roof Cowboys Stadium Arlington, Texas

When this new, \$1.5 billion, 80,000-seat home of NFL's Dallas Cowboys opened in 2009, it set at least three structural engineering world records: the longest single-span roof structure; the largest center-hung HD video display; and the world's largest operable glass doors.

The 14,100-ton, structural steel, domed roof is supported by two 17-foot-wide by 35-foot-deep arch box trusses spanning 1,225 feet. The 660,800-square-foot





retractable roof features a 256-feet wide by 410-feet long roof opening. It has the first application of a rack-and-pinion retractable roof drive system in North America that opens and closes the bi-parting roof panels in less than 12 minutes.

Both end zones feature 180-foot-wide by 120-foot-high glass operable doors that open in 18 minutes, and the stadium is a leader in environmental performance.

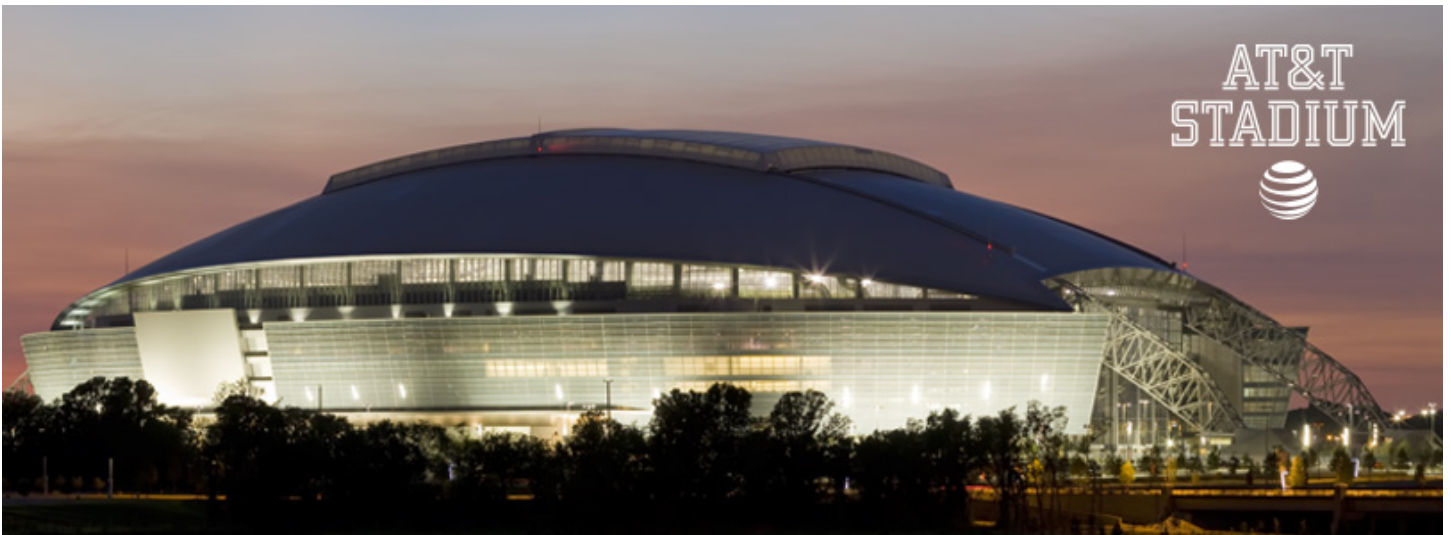
Cowboys Stadium was named "Sports Facility of the Year" by Sports Business Journal and has won countless engineering design awards.



WALTER P MOORE

- 12:00pm-12:45pm Depart Austin, bus north to Round Rock
- 12:45pm-2:00pm Lunch at [Salt Lick Bar-B-Que](#)  
3350 E. Palm Valley Blvd, Round Rock, TX 78665  
512-386-1044
- 2:00pm-5:00pm Bus to [AT&T Stadium](#) • One Legends Way • Arlington, TX 76011
- 5:00pm-6:30pm Assuming traffic is not too heavy, we should arrive around 5pm.
- 6:30pm **ND vs. ASU football game**
- After game: Make your way directly to bus for ride to hotel

No purses or bags allowed in stadium.  
[Click here for more info.](#)



Overnight at:

[Hilton Garden Inn DFW North Grapevine](#)

205 W. State Hwy 114, Grapevine, Texas 76051

817-421-1172

### Sunday, October 6, 2013

6:00am Meet at bus with all luggage for ride to Dallas Ft Worth airport

8:30am-10:45am 22 seats American Airlines #AA2332 Dallas to O'Hare

9:00am-11:15am 18 seats American Airlines #AA2334 Dallas to O'Hare

Upon arrival O'Hare

*After collecting luggage and before boarding bus – your chance to pick up some food for Royal Excursion bus ride back to ND*

1:00pm Royal Excursion bus back to Notre Dame

4:00pm-5:00pmET Arrival back on campus



#### Field Trip Leader Phone Numbers:

Joannes Westerink 574-532-3160

Diane Westerink 574-286-9696