

## TYPICAL PROJECT DESCRIPTIONS

### Dam Safety Engineering and Water Resources Consulting

#### **Project #2**

##### **Name/Location:**

Randell Lake Dam  
Denison, Texas

##### **Firm Name Work Performed Under:**

Purkeypile Consulting, LLC  
TRC Environmental Corporation

##### **Year Completed:** Ongoing

##### **Project Budget:** \$2,000,000.

##### **Client or Owner's Representative:**

David Howerton, P. E.

##### **Title of person named above:**

Public Works Director

##### **Address of person named above:**

500 West Chestnut  
Denison, Texas 75020

##### **Phone number of person named above:**

(903) 465-2720 ext. 455

##### **Project timeline:**

Start -2008, Completion-2013

**Project Description:** The City of Denison initially contracted with TRC Environmental Corporation (TRC) to perform a hydrologic and hydraulic (H&H) analysis of Randell Lake Dam as well as a breach analysis for the dam in 2008. An Emergency Action Plan (EAP) was also developed for the dam. The H&H analysis, breach analysis and the EAP were approved by the TCEQ Dam Safety Program. Mr. Purkeypile acted as the Project Manager and Project Engineer. After Mr. Purkeypile formed his own company in 2010, the City of Denison contracted with Purkeypile Consulting, LLC; to develop plans and specifications to rehabilitate the dam.

Randell Lake Dam is owned by the City of Denison and is located approximately 4 miles northwest of the City of Denison. The rolled-earth dam is 100-years old, and has a height of 55-feet. The spillway consists of 23 small radial gates. The lake has a maximum volume of 6,824 acre-feet at its effective crest of dam elevation of 625.04 feet mean sea level (msl). Randell Lake is used as the primary water supply for the City of Denison which has a water treatment plant located near the dam.

It was determined that the dam was found to be capable of passing the TCEQ's the design flood (57% PMF) for an intermediate-sized, significant hazard dam of this size and classification assuming the gates were capable of being opened within three hours. The physical practicality of operating the gate system manually and the safety of the gate operators led the City to evaluate alternative gate operation procedures which included fixed crest gate replacement.



The dam has a spillway that consists of 23 small, manually operated radial gates and two fixed concrete ogee weirs. The gates are under design to be replaced by reinforced concrete ogee weirs with variable fixed crest elevations that will allow the dam to pass the TCEQ design flood. The fixed weirs will eliminate the need to use City staff to operate the gates during inclement weather.

The stilling basin exhibited severe scour erosion with the development of a 35-foot deep scour hole at the terminal end of the spillway chute. The scour hole is currently under design to be repaired using either a roller-compacted concrete basin or a

reinforced concrete stilling basin.

The dam was raised approximately 11 feet in 1940 using mechanically stabilized earth fill with a steel bulkhead located on the upstream slope. The steel bulkhead is failing. The dam is currently under design to stabilize the slope with large rock rip rap.

Significant seepage was noted between the contact zone between the natural upper abutment and the raised section of the dam. A weighted filter-berm was designed to safely collect the seepage and prevent the embankment fines from being transported in the seepage flow; thereby preventing a failure of the embankment due to internal erosion.

**Work performed:** Mr. Purkeypile serves as the Project Engineer (Engineer of Record), dam designer, and dam safety expert for the execution of this project. In this capacity, he has either completed or directed all aspects of the project. He performed hydrologic and hydraulic evaluations, breach analyses, developed plans and specifications, performed construction observation and worked to obtain TECQ approval of the plans and specifications.

- ✓ Project Manager & Design Engineer
- ✓ Hydrology and Hydraulics
- ✓ Breach Analysis & Emergency Action Plan Development
- ✓ Plans & Specifications for Rehabilitation of Dam

## TYPICAL PROJECT DESCRIPTIONS

### Dam Safety Engineering and Water Resources Consulting

#### **Project #3**

**Name/Location:**

Spohn Ranch Lake Dam  
Webb County, Texas

**Firm Name Work Performed Under:**

Purkeypile Consulting, LLC  
TRC Environmental Corporation

**Year Completed:** Ongoing

**Project Budget:** \$200,000

**Client or Owner's Representative:**

D. Mayes Middleton

**Title of person named above:**

Ranch Manager, Owner

**Address of person named above:**

4565 San Felipe, Suite #490  
Houston, TX 77027

**Phone number of person named above:**

(713) 754-5477

**Project timeline:**

Start -2006, Completion-2012

**Project Description:** Spohn Ranch Lake Dam was inspected in 2006 by TRC under contract with the TCEQ Dam Safety Program. Several deficiencies were noted and recommendations were made to bring the dam into compliance with the TCEQ's rules for dam safety. Purkeypile Consulting, LLC, was engaged to evaluate and address any deficiencies, perform an H&H analysis, develop an Emergency Action Plan (EAP) and to develop plans and specifications to modify the dam to pass the TCEQ's required test flood for this intermediate-sized, high hazard dam.

The dam is 16 feet high and has a maximum capacity of 1740 acre-feet. The dam is approximately 3 miles long and is very uneven in height. The dam is located near the Rio Grande in a flat valley that has a sometimes undefined and braided creek system. The dam's immediate drainage area is 2.5 square miles in size. An adjacent creek has a drainage area of 26 square miles. Historically, the adjacent creek overflows into Spohn Ranch Lake and has resulted in several failures of the three mile long embankment at various locations. The dam does not have a defined spillway except for a 48-inch diameter gated conduit located in a diversion berm which is used to divert flood flows from the much larger adjacent drainage area.

Mr. Purkeypile performed an H&H analysis and determined that the dam could pass less than 2% of the PMF. A hydraulic analysis was performed to determine the quantity and impact of overtopping flows over the diversion berm.

Based on the results of the H&H analyses, it was determined that additional spillway capacity was necessary.

Plans and specifications were developed for a 600-foot wide spillway. The spillway was located such that the elevation of the spillway would be close to the elevation of the downstream toe of the dam. The design incorporated earthen entrance berms that would protect the upstream face of the dam from high velocity flows. Diversion berms were extended downstream of the spillway to safely direct spillway discharges into the downstream creek. The spillway was sized to adequately discharge the peak runoff from the dam's immediate drainage and a percentage of the larger drainage area's runoff.

The diversion berm was raised and improved to insure that the berm could withstand overtopping during the design flood. Additional spillway



capacity was provided to account for the possible breach of the diversion berm.

**Work performed:** Mr. Purkeypile served as the Project Engineer (Engineer of Record), dam designer, and dam safety expert for the execution of this project. In this capacity, he has either completed or directed efforts in all aspects of the design of the dam modifications. He performed hydrologic and hydraulic evaluations, breach analyses, developed plans and specifications, performed construction observation and worked to obtain TECQ approval of the plans and specifications.

- ✓ Project Manager & Design Engineer
- ✓ Hydrology and Hydraulics
- ✓ Breach Analysis & Emergency Action Plan Development
- ✓ Plans & Specifications for Rehabilitation of Dam

## TYPICAL PROJECT DESCRIPTIONS

### Dam Safety Engineering and Water Resources Consulting

#### **Project #4**

**Name/Location:**

W.O. Gross Dam  
McLennan County, Texas

**Firm Name Work Performed Under:**

Purkeypile Consulting, LLC  
TRC Environmental Corporation

**Year Completed:** Ongoing

**Project Budget:** \$80,000

**Client or Owner's Representative:**

Bob and Barry Gross

**Title of person named above:**

Owners

**Address of person named above:**

3720 Franklin Avenue  
Waco, TX 76710

**Phone number of person named above:**

(254) 754-5477

**Project timeline:**

Start -2006, Completion-2012

**Project Description:** W.O Gross Dam was inspected in 2006 by TRC under contract with the TCEQ Dam safety Program. Several deficiencies were noted and recommendations were made to bring the dam into compliance with the TCEQ's rules for dam safety. Purkeypile Consulting was engaged to evaluate and address any deficiencies, perform an H&H analysis and develop an Emergency Action Plan (EAP).

The dam is 15 feet high and has a maximum capacity of 180 acre-feet. The dam was modified in 1987 to pass the 50% PMF. At that time the TCEQ performed a breach analysis and determined that no adverse impact would occur to downstream houses if the dam was modified to pass the 50% PMF.

The dam has two earthen spillways and a principal spillway located in the old creek channel, which is removed from the dam proper. The spillway consisted of two 48-inch diameter corrugated metal pipes (CMP) with an integrated drop inlet spillway made of CMP conduits. The principal spillway failed completely due to deterioration of the CMP conduits. The small embankment was also washed out from a piping condition that developed along the rusted pipes.

Mr. Purkeypile developed plans and specifications to replace the principal spillway with a 36-inch diameter HDPE corrugated conduit with a reinforced concrete drop inlet and a reinforced concrete outlet.

The inlet is a rectangular drop inlet structure that maintains the normal water level in the lake. A coffer dam was constructed to eliminate water from the construction site. Flowable fill was used to embed the pipe and fill all the voids around the pipe. The fill created a seepage proof bedding for the pipe. The outlet was modeled after an NRCS style impact basin with a four foot deep toe wall. Rock rip rap with an underlayment of filter fabric was used to create a further zone of protection for the outlet.

**Work performed:** Mr. Purkeypile served as the Project Engineer (Engineer of Record), dam designer, and dam safety expert for the execution of this project. In this capacity, he has either completed or directed efforts in all aspects of the design of the dam modifications. He performed hydrologic and hydraulic evaluations, developed plans and specifications, performed construction observation and worked to obtain TECQ approval of the plans and specifications.



- ✓ Project Manager & Design Engineer
- ✓ Hydrology and Hydraulics
- ✓ Breach Analysis & Emergency Action Plan Development
- ✓ Plans & Specifications for Rehabilitation of Dam

## TYPICAL PROJECT DESCRIPTIONS

### Dam Safety Engineering and Water Resources Consulting

#### **Project #5**

##### **Name/Location:**

Zimmerhansel Lake Dam  
Williamson County, Texas

##### **Firm Name Work Performed Under:**

Purkeypyle Consulting, LLC  
TRC Environmental Corporation

##### **Year Completed:** Ongoing

##### **Project Budget:** \$200,000

##### **Client or Owner's Representative:**

The Lookout Property Owners, Inc.  
C/o RealManage

##### **Title of person named above:**

Shirley Vega, Property Manager

##### **Address of person named above:**

PO Box 700128  
Dallas, Texas 75370

##### **Phone number of person named above:**

(512) 261-0439

##### **Project timeline:**

Start -2006, Completion-2012

**Project Description:** Zimmerhansel Lake Dam was inspected in 2006 by TRC under contract with the TCEQ Dam Safety Program and again in 2009 by TRC. Deficiencies were noted and recommendations were made to repair and improve the dam. Purkeypyle Consulting was engaged to evaluate and address any deficiencies and to bring the dam into compliance with the TCEQ's dam safety rules.

The dam is 18 feet high and has a maximum capacity of 199 acre-feet. The dam is considered to be a high hazard structure due to the presence of approximately 15 houses located immediately downstream of the dam. The dam also exhibited significant seepage and an unstable downstream slope with a slide area. The spillway is founded on Blackland clay soils that have high shrink/swell characteristics. The result is the presence of active cracking of the concrete spillway chute. The low flow outlet deteriorated.

As a high hazard structure the dam is required to pass the TCEQ's design flood which is 75% of the PMF. A hydrologic and hydraulic (H&H) evaluation was performed which revealed that the dam was only capable of passing 37% of the PMF.

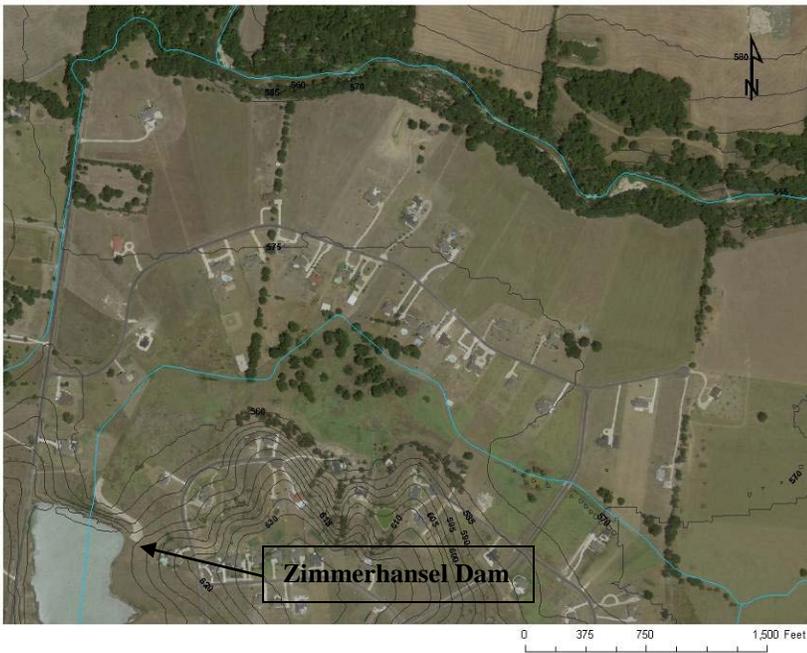
A breach analysis was performed that determined that no adverse impact would occur to any downstream houses if the dam were to fail for any reason. This would normally lead to a reduction of the hazard classification to low hazard. However, the entry roads into

the neighborhood would be flooded during the event and therefore a significant hazard classification (50% PMF) was considered to be appropriate. The breach analysis with inundation maps were included in an EAP for the dam which was approved by the TCEQ.

The dam was found to be capable of safely passing the 50% PMF if the crest of the dam was raised by an average of 1.5 feet.

Plans and specifications were developed to raise the dam, flatten the downstream slope, install an integrated "French" drain to collect seepage flows and prevent fines from escaping the embankment. The concrete cracking will be repaired by a concrete crack specialist and the low flow outlet conduit will be grouted with flowable fill.

**Work performed:** Mr. Purkeypyle served as the Project Engineer (Engineer of Record), dam designer, and dam safety expert for the



execution of this project. In this capacity, he has either completed or directed efforts in all aspects of the design of the dam modifications. He performed hydrologic and hydraulic evaluations, developed plans and specifications, and worked to obtain TCEQ approval of the plans.

- ✓ Project Manager & Design Engineer
- ✓ Hydrology and Hydraulics
- ✓ Breach Analysis & Emergency Action Plan Development
- ✓ Plans & Specifications for Rehabilitation of Dam