CONSTRUCTION CONSIDERATIONS

PONDS WORKSHOP - MARION COUNTY

- The clayey sands which comprise the lower part of the limestone overburden in this portion of Marion County are relatively leaky and the water table level generally corresponds to the potentiometric surface of the Floridan aquifer. While the clayey sands can be relatively impermeable on a small scale (and when remolded/compacted), the unit as a whole is leaky due to micro-cracks and fissures which are vertically interconnected and extend into the limestone aquifer.

MAINTAINING LEAKINESS OF POND BOTTOM EXCAVATED IN CLAYEY SAND

PONDS WORKSHOP - MARION COUNTY

Where exposed by the pond excavation, the clayey sand unit should be overexcavated by 1 ft, the overexcavated surface heavily scarified, and then backfilled with clean sand excavated from the upper soil profile. Prior to backfilling with sand, the surface should be inspected by the engineer to ensure heavy equipment track & wheel loads have not sealed the naturally occuring fractures and channels. As an added safety measure, at least two (2) double ring infiltrometer tests should be performed to ensure the vertical infiltration rate has not been reduced below an acceptable level.

MAINTAINING LEAKINESS OF POND BOTTOM FILLED ABOVE CLAYEY SAND

PONDS WORKSHOP - MARION COUNTY

- Prior to backfilling, the existing pond bottom should be desilted and scarified. It is important that the backfill soils not be compacted in this zone since it will reduce the permeability. As much as possible, loosely dumped sand or boulders should be placed in this zone. Since the sand will migrate into the spaces between the boulders and broken clay pipe and result in some settlement, the pond bottom should not be final graded until after a few heavy storms. It is recommended that the project geotechnical engineer monitor this earthwork operation.

EXFILTRATION TRENCHES UNDER PAVEMENT OR STRUCTURES

PONDS WORKSHOP - MARION COUNTY

- Not a good idea in Marion County unless thoroughly checked out by a geotechnical engineer. Concentration of stormwater can lead to sinkhole development which cannot be detected.
- FDOT tried this on I-75 and numerous sinkhole developed leading to a maintenance nightmare. Many of you remember when the southbound of I-75 was shut down. Abandoned trenches & went with swales

DESIGN OPTION WHERE POTENTIAL FOR SINKHOLE DEVELOPMENT IS HIGH

PONDS WORKSHOP - MARION COUNTY

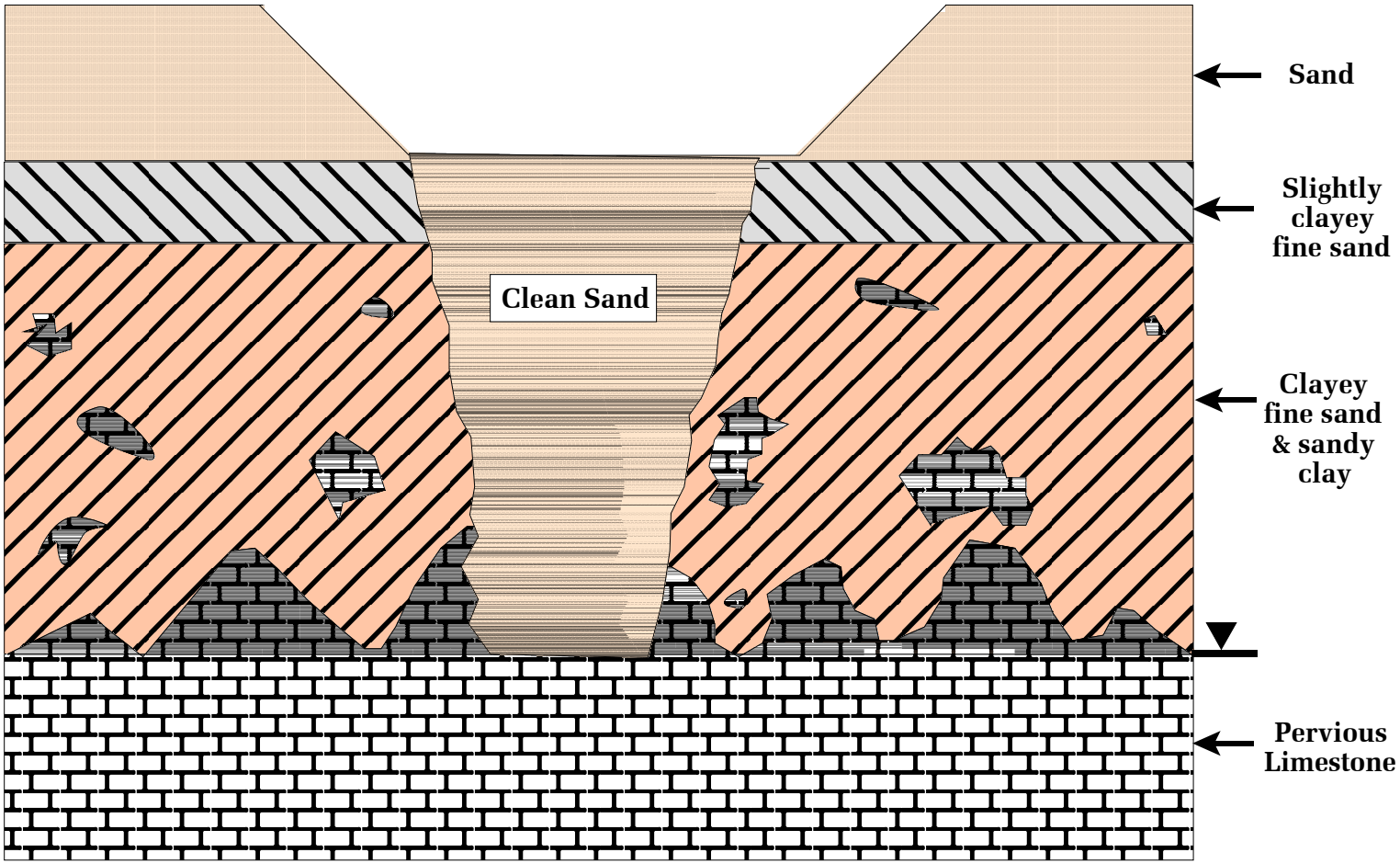
- If rock is shallow and sinkhole development could be a problem, design for spanning a 5 to 10 ft opening. Use 3 ft of sand cover over a structural filter fabric with about 1350 lb/ft of load carrying capacity.

AVOID CLAIMS
CAUTION CONTRACTOR ON POTENTIAL FOR ROCK EXCAVATION

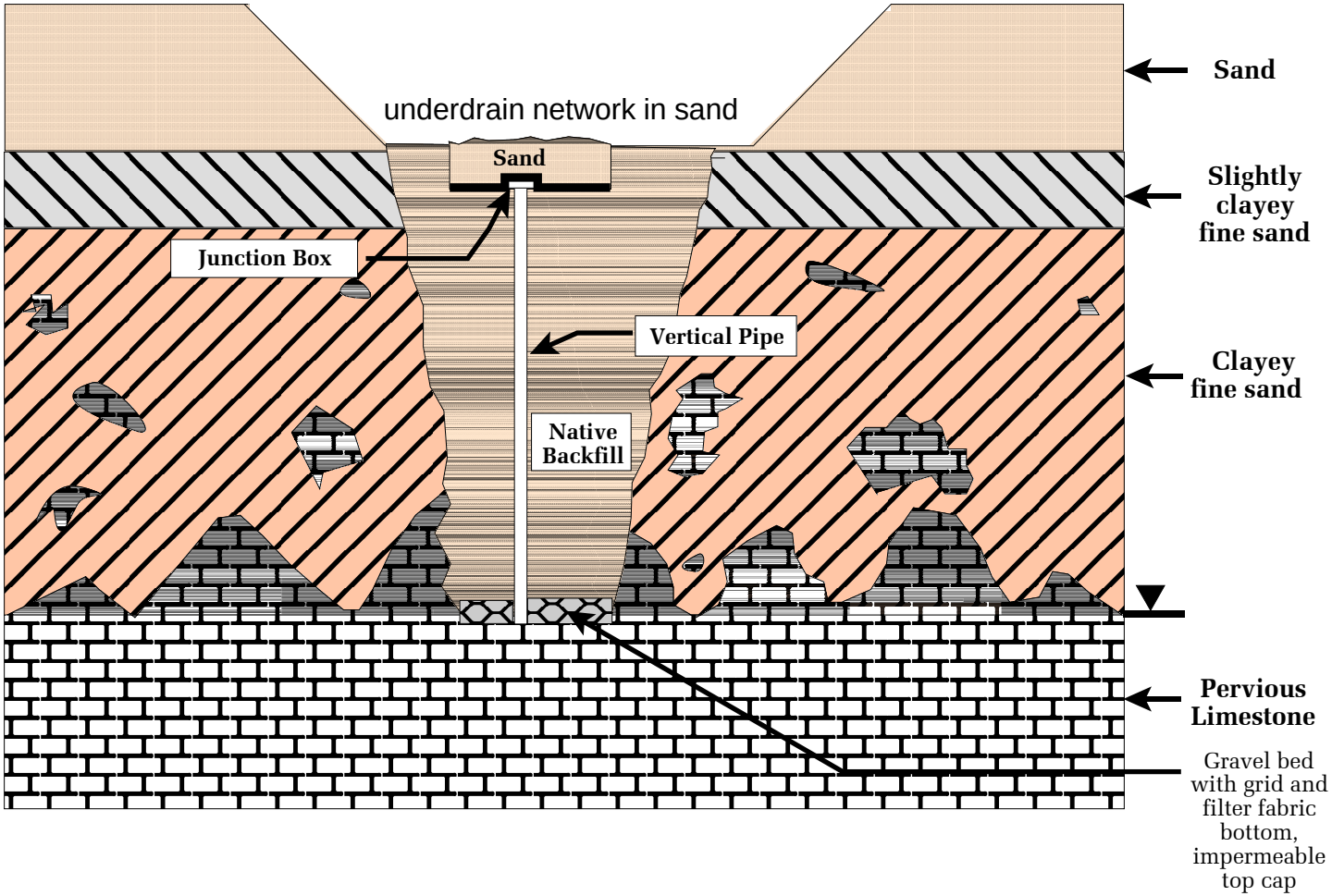
PONDS WORKSHOP - MARION COUNTY

- Contractors also have to be aware when digging these ponds that there is sometimes a large amount of rock within the soil matrix and also rock pinnacles. Some of this rock may require rock breakers or ripping.

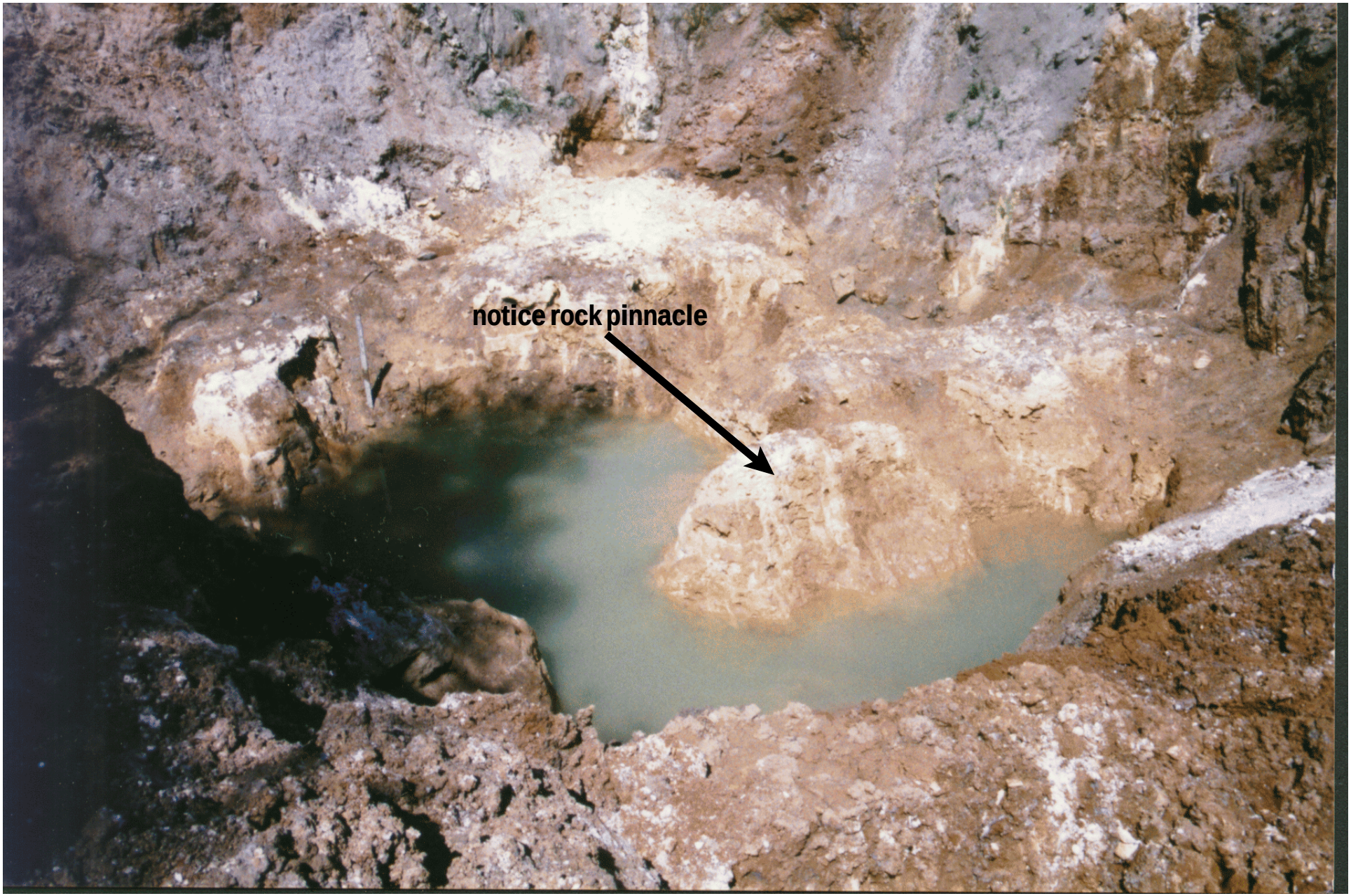
RETROFIT OPTION #1 - OVEREXCAVATE & BACKFILL WITH PERMEABLE SAND
ENSURE BOTTOM OF EXCAVATION HAS SUFFICIENT VERTICAL DISPOSAL CAPACITY
MOST ASSURED METHOD TO VERIFY THIS IS BY LOAD TESTING



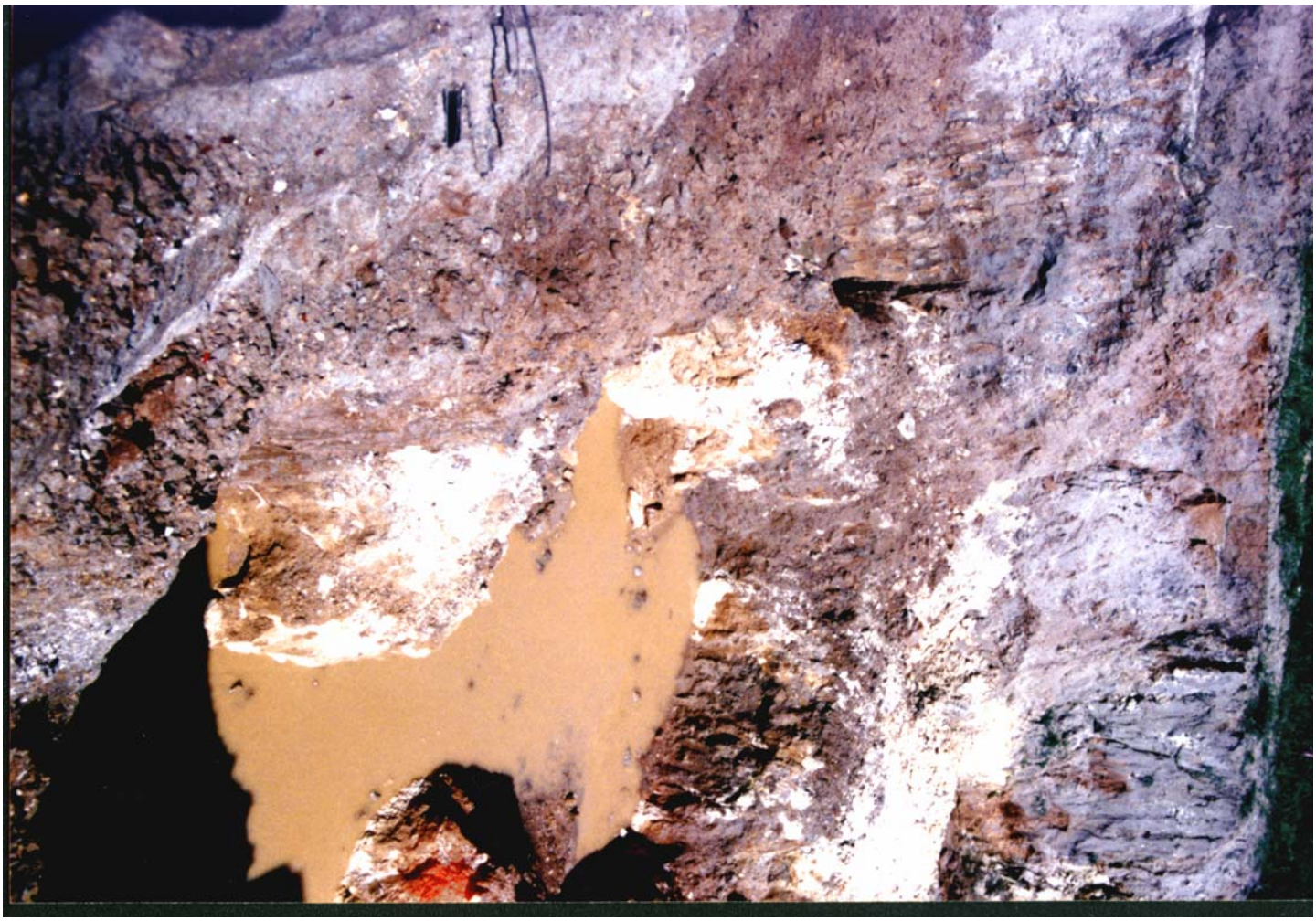
RETROFIT OPTION #2 - OVEREXCAVATE & BACKFILL WITH PERMEABLE SAND
ENSURE BOTTOM OF EXCAVATION HAS SUFFICIENT VERTICAL DISPOSAL CAPACITY
MOST ASSURED METHOD TO VERIFY THIS IS BY LOAD TESTING



EXAMPLE OF A DIG OUT TO TOP OF “ROCK”

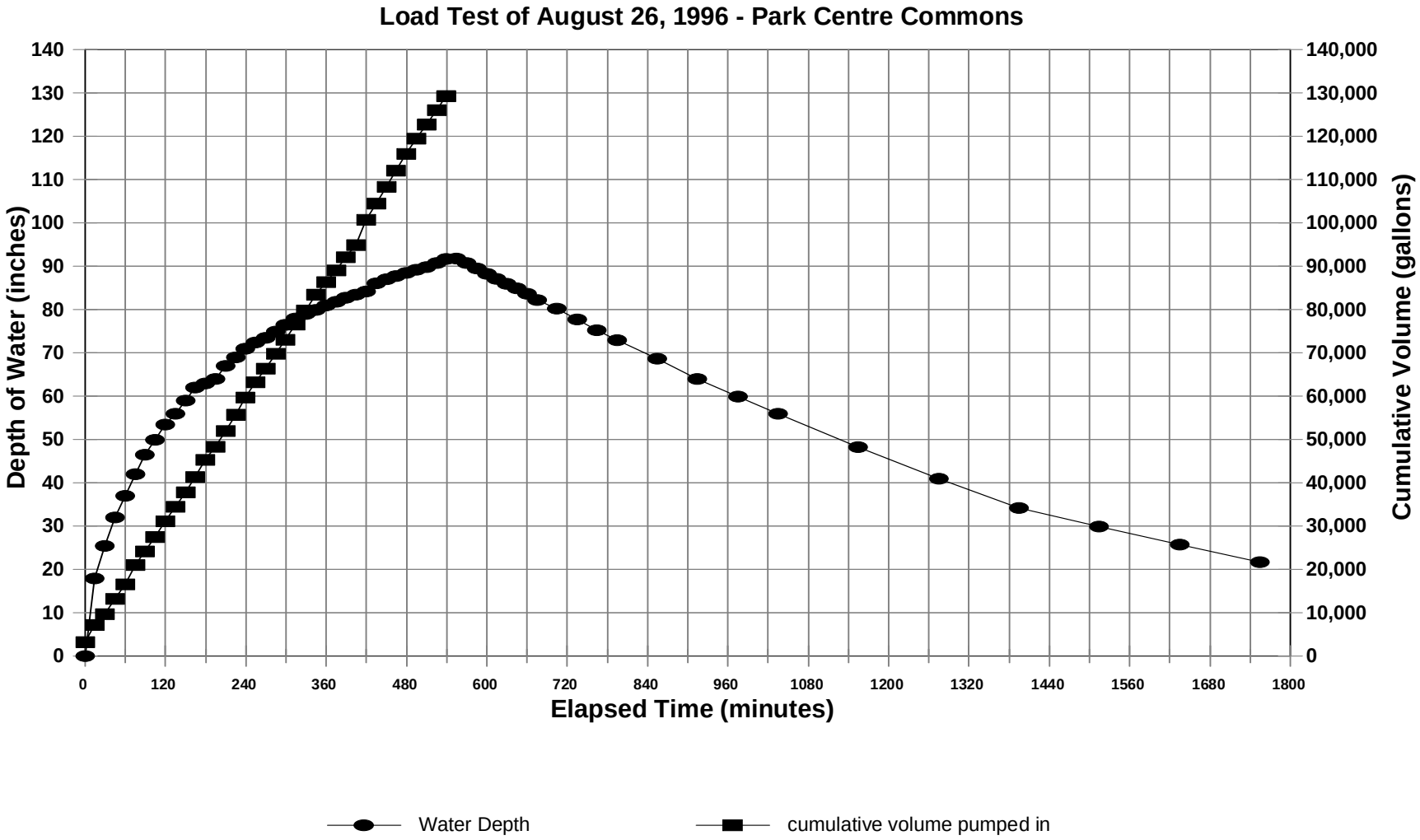


EXAMPLE OF A DEEP EXCAVATION FOR POND RETROFIT



EXAMPLE OF LOAD TEST ON BASE OF EXCAVATED AREA

WATER OBTAINED FROM NEARBY FIRE HYDRANT



SINKHOLE REPAIR IN STORMWATER PONDS

STEP #1 & #2 - FDOT RECOMMENDATIONS

- **Step #1: If the sinkhole consists only of a surface depression (re: no open fissure or exposed cavern), proceed to step #3.**
- **Step #2: If the sinkhole has an open fissure or exposed cavern, fill the sinkhole to within 3 feet of plan grade with either: a) concrete rubble or gravel, or b) flowable fill. If concrete rubble or gravel is used it should consist of hard, durable stone, broken concrete and/or broken concrete block. Material acceptance may be based on visual inspection. The most important material characteristics are that the concrete/stone pieces be durable (i.e. not soft and dissolvable), somewhat angular, and predominately coarser than a 1-1/2 inch sieve.**

SINKHOLE REPAIR IN STORMWATER PONDS

STEP #3 - FDOT RECOMMENDATIONS

Place two layers of geosynthetic reinforcement, and one layer of geotextile fabric- if required, as follows:

Material: The reinforcement to be used should have a minimum tensile strength of 1,35O lb/ft (ASTM D-4595) at a strain of 10% or less. If the reinforcement has an Apparent Opening Size (AOS) less than 70, place a layer of type D-3 (R&TD Standard Index 199) geotextile fabric with AOS $\geq$ 70 over the reinforcement layers.

Excavation: Excavate to a depth of approximately 3 feet below the pond bottom, and to a plan area which allows for a reinforcement/fabric installation that extends/provides coverage to at least 10 feet beyond the surface opening of the sinkhole, but does not interfere with existing travel lanes.

Placement: Place the geosynthetic reinforcement layers 3 feet below the pond bottom, within the above described excavation. If the reinforcement has an AOS less than 70, place a layer of above described geotextile fabric over the reinforcement layers. Anchor the two reinforcement layers (and the fabric, if installed) at least 10 feet beyond the limits of the fissure/cavern opening. In the 10 foot anchor zone area, the two reinforcement layers should be separated by at least 6 inches of soil. In the non-anchor zone area, the upper reinforcement layer may be laid directly on the underlying layer. Stagger the two reinforcement layers so the joints do not coincide. Fill the upper 3 feet of the excavation/sinkhole to grade using select backfill, and compact to a firm and unyielding surface.

SINKHOLE REPAIR IN WWTF PERC PONDS

① Immediately divert flow from the pond with the sinkhole to the other pond

② Exercise caution and walk the entire bottom area of the pond before commencement of repair work to ensure the construction equipment can be supported.

③ Use a backhoe to excavate near the surface of the sinkhole or solution pipe to allow adequate access for the equipment to reach the bottom of the hole.

④ Place clayey sand or clay in the hole, using the backhoe bucket to compact the backfill material. Perform this operation in lifts with no lift thickness exceeding 2 feet.

⑤ Place & compact the backfill material to within 4± inches of the surface of the sinkhole.

⑥ Form and pour a concrete cap over the disturbed area using 2500 psi concrete and form board to ensure a minimum cap thickness of 4 inches. Ensure the concrete cap is at the same level as the adjacent grade.

⑦ Repair and resod the bottom and /or side slopes of basin in the disturbed area, and remove and haul off any excess material.