

Texas City Saves Time and Money with HDD: A DIY Approach

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Craig: North Richland Hills has been my hometown for over 33 years. I met Josh my first week on the job back in 2022. There was a project less than a mile from my house and I was getting trained with our specialty product, Certa-Lok. 3 years later I met Justin. I was driving back from lunch and saw our product going in. I stopped and visited with Justin about a Certa-Lok adapter we recently developed. Those meetings ultimately led to the presentation we are delivering today. This is more than a case study about a single project. Instead, it also discusses the HDD program that a relatively small city has been doing its own over a quarter of a century.

Outline



- Program's Origins
- Equipment
- Project Planning
- Project Installation
- Lessons Learned

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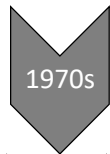
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Before getting into the specifics, I will preview for you the topics we will be covering.

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HDD's early History



- First HDD Project, 1971
4" gas line under a river in California



- Magnetic steering technology
- Ditch Witch slant nose, 1988
- Trenchless Technology Center, 1989



- Ditch Witch's Jet Stream, 1990
- NASTT, 1990
- Bottom feed pipe loader

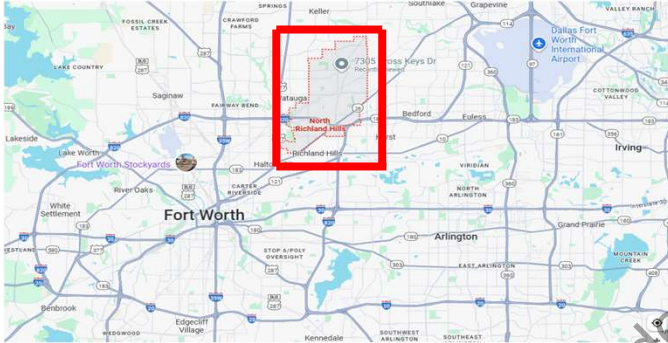
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First, I have to set the stage. When NRH's program was launched, HDD was still in its infancy. Its use and acceptance wasn't as widespread as it is today. From this slide, you will see that the equipment that NRH purchased had not been on the market all that long. This timeline is a brief reminder of the early days of the HDD industry. This was the environment that the Public Works Director was working in when he proposed developing an in-house HDD program.

NRH stats



Late 1990s

- 18.2 square miles
- ≈55,000 population

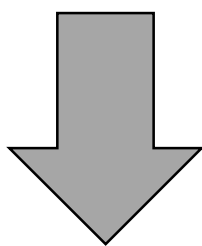
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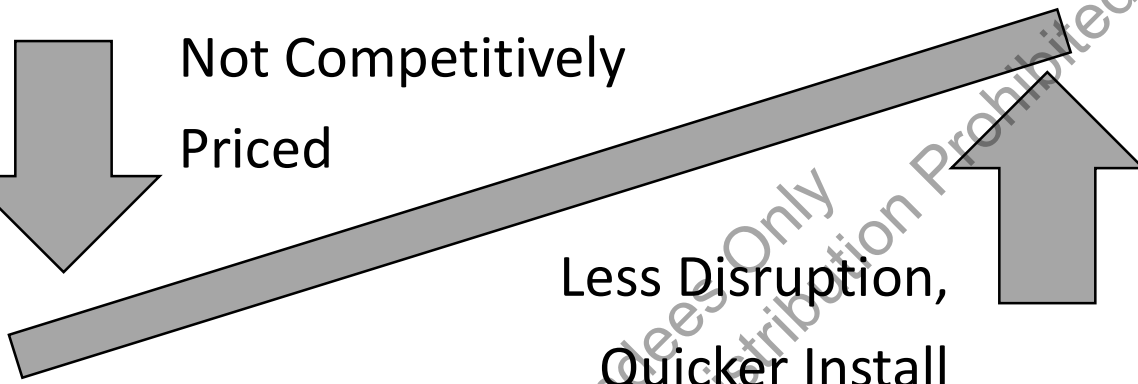
For those of you not familiar with my hometown, I offer a few basic stats. NRH is located just northeast of Fort Worth and lies mainly outside of the 820 loop. In the late 1990s, we had a population of around 55 thousand people. Then and now, the city occupies 18.2 square miles.

Challenges Late 1990s

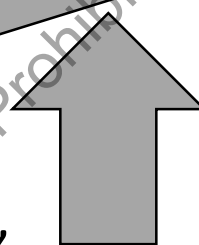


Not Competitively

Priced



Less Disruption,
Quicker Install



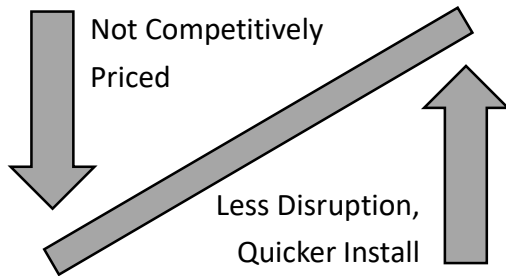
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The Public Works Director at the time was Larry Jones, and he had his work cut out for him. He wanted to add HDD as one of the options for renewing the water system in the older parts of town. HDD offered less disruption to the established neighborhoods where this work is done, and it'd allow Public Works to get in and out of those areas more quickly. Unfortunately, it would cost more to go HDD instead of open cut instead of less. The annual footage that NRH was installing was not sufficient for competitive pricing versus open cut from local HDD contractors.

Solution Late 1990s



**Solution =
DIY**

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After looking into the costs and benefits, Mr. Jones decided that NRH could do this work itself. One of the crews could be cross trained to run an HDD rig and do the HDD installations. This would also result in HDD being more cost-effective than open cut.

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Challenges Late 1990s



City Council



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Remember that HDD early history slide? This technology was relatively new, and City Council was hesitant.

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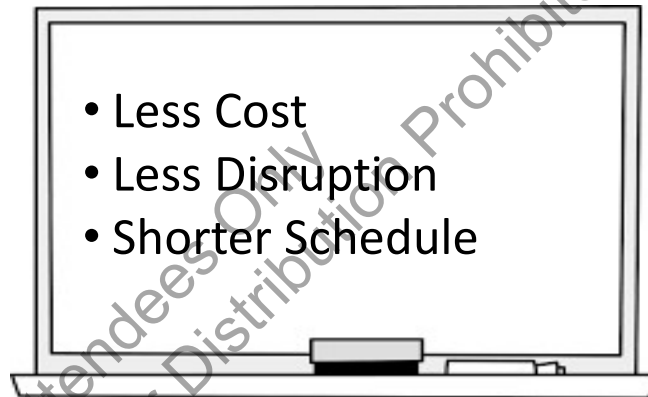
Solution Late 1990s



City Council



PW Director Jones



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While hesitant, the City Council wasn't immovable. By educating the council members about HDD benefits, Mr. Jones was able to persuade them to approve the capital expenditure needed to get NRH equipped to do its own HDD work.

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Challenges Late 1990s



Fleet Services



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City Council wasn't the only hesitant group. Fleet Services was reluctant to take on the maintenance responsibilities for an HDD rig. What the heck is that? No thank you.

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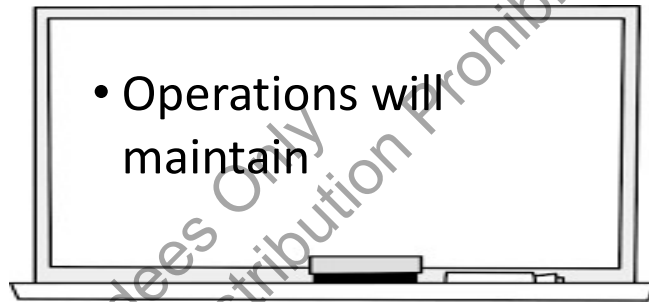
Solution Late 1990s



Fleet Services



PW Director Jones



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To overcome this challenge, Director Jones told Fleet Service that the Operations Department of Public Works would be responsible for the maintenance of its HDD equipment. Problem solved.

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Late 1990s. Program Launched.



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This just hits the highlights. The main point was that Mr. Jones was successful in getting its own HDD program underway at NRH.

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Equipment



25+ year program

- 4 projects/year
- 500 feet/project
- Over 50,000 feet

3rd Rig

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Josh: As Craig mentioned, this program has been in operation for over 25 years. During that time, we estimate that we have installed over 50,000 feet of water distribution pipe using our HDD equipment. We have only had one rig at a time, but we are on our third rig. We have learned over the life of the program that we held onto our equipment too long. Experience has shown us that it is more cost effective to replace equipment sooner than we had been. Repair costs grow as the equipment ages, and we discovered that we minimize overall costs by replacing the rig slightly quicker.

Equipment



Limitations

- Crew
- Equipment

HDD vs Open Cut

We were not afraid to find out the extent of both the equipment's capabilities and the crew's. We learned that we need to respect those limits. Cost overruns and schedule delays are more likely when either is operated at the edge of its capabilities. It just isn't worth the risk. We also remind ourselves that HDD is not always the best option. Sometimes open-cut is still the best way to go. It all depends upon project specific constraints.

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Current and Third HDD Rig



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Josh: This is our current rig and we got last year. We go with this size machine because it is optimal for our 6” and 8” projects, which is what we are normally installing. We’ve installed pipe as small as 4” and as large as 12”. For us, a bigger rig isn’t necessarily better because we may have to go into people’s backyards. We wanted a machine big enough to comfortably install 8” but not over sized. As far as pull length, our typically pull is 500 feet. We have done pulls as long as 950 feet. For those longer pulls, we have a second box of drill rods available.

Previous and Second HDD Rig



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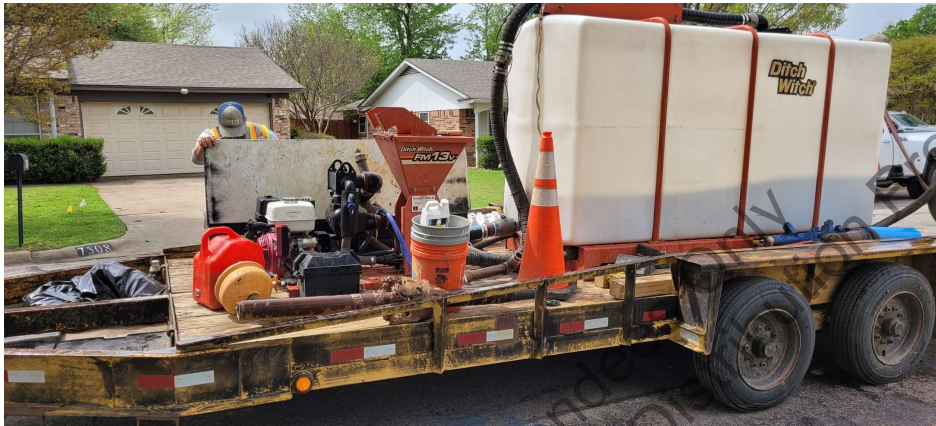
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Our previous rig was basically the same make & model for the reasons I just outlined.

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Mud Mixing System



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We got the Ditch Witch rig I just showed you in 2011. We purchased this fluid mixing system for it. For the new rig we just purchased last year, we could stick with the same mud mixing system.

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Mud Mixture



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NRH mostly has clay soils. Some of the clay soils have silt mixed in and other areas have a sandy layer above it. In the southern part of town, we run into some rock and some sandstone. This is our basic mud mix on the left – Bore Commander and Det Con 1. On the far right, you'll see soda ash which we use to control the pH. For a bore in clay soils, we add the Clay Bomb. We'll adjust this mixture as needed depending on what we are drilling through. We went through the "Mud School" that our rig manufacturer offers. That is where we learned which recipes work best for our soils.

Planning: Prioritization



- Older parts of town
- Higher repair rates
- Undersized
- Not looped
- Coordination with Streets

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Justin: We cannot renew our entire distribution system all at once, so we must prioritize. These are some of the factors that we consider when deciding which sections of our system are in most need of renewing. These tend to be in the older parts of town because those lines tend to be the ones that have higher repair rates. We also tend to find undersized pipe and dead ends in those parts. We check in with our Streets Division and see what roads are going to be improved in the near-term. This allows us to cut into old pavement that is about to be replaced instead of brand-new pavement.

Planning: Site Investigation



- New Alignment
- Franchise utility conflicts
- Utility connections
- Relief Pits

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When determining our new alignment, we must see what is available to us. Most of these projects are in well established neighborhoods, so there are several utilities to work around. We typically end up installing the new pipe under the road, which was the case for the project I will be reviewing.

Our planning includes verifying the locations of the other utilities in the area. We put eyes on their location by exposing them. Prior to the drill and pull-back, we dig relief pits for the drilling mud and access pits for disconnecting the old service and connecting the new service.

Planning: Communications



- Public letter
- Public meeting
- Door knocking
- Notices on cars
- Access

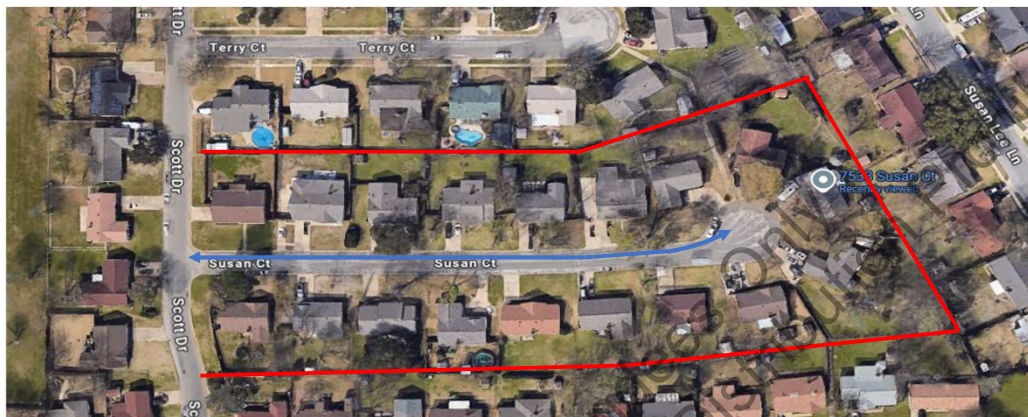
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The first way we let the neighborhood know that we will be renewing their water pipe is through a public letter sent to all affected parties. About a week before the project starts, we hold a public meeting. Just prior to the start of the project, we may have to knock on doors to ensure access to all the work areas.

Case Study



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The project was on Susan Court for four reasons. First, it was undersized. The cast iron line quickly reduced from a 6” to a 4”. Second, this was older pipe, and it required more maintenance. Third, renewing the system will improve the block’s water circulation. We installed a dead-end flush valve as part of the renewal. Lastly, the road was scheduled for replacement in the near-term by our Streets Department. They are going to remove the old asphalt by milling it and then lay new asphalt.

We planned this HDD bore and pullback for May 2. We had to work around the storms that were common during that time. The blue line shows the approximate location of the new water line. The project required 630’ of DR18 AWWA C900/Certa-Lok. That water main is in use now and everything went smoothly.

Case Study



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Here, DJ and Trey are tracking the depth and location of the transmitter. The transmitter is about two feet behind the drill head. DJ transfers this data by spray painting key details onto the road which later get incorporated into our as-builts.

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Case Study



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This photo shows the starting point of the old pipe that will soon be abandoned. It is an isolation valve near the intersection of Scott Drive and Susan Court. The pipe was undersized. It starts out as a 6-inch but quickly reduces to a 4-inch. The stacks for our valve boxes are typically just a drop piece of a PVC pipe, which is the case here.

Case Study



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One of the reasons we go with segmental PVC is practicality. Trying to string out a fused pipe string at a location like this would be difficult. With segmental, we can assemble the pipe string during the pullback operation, which you will see in a video clip later. We went with PVC because that is what we were familiar with. A fused product would require us to be trained on additional equipment – equipment that we'd have to maintain and store.

Case Study



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We dug this small pit to confirm the location of that orange communications conduit. You can see how close they laid it to our old cast iron main. There is a corporation stop just visible at the bottom of the picture. We'll have a similarly sized pit dug near the water meter. This allows us to disconnect the old service once the new pipe has passed its water quality test. After disconnecting the old service, we connect a new service from the new main.

Case Study



Video showing PVC pipe being carried by two works.

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We like PVC's light-weight. This video clip shows how easy it was to move a 20-foot stick of 6" DR18 AWWA C900. It is easily handled by two of my guys.

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Case Study



Video showing PVC pipe joint being assembled in under two minutes.

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We like the ability to assemble the pipe string during the pull-back. We keep our insertion pits to a minimum, so we make the joint above ground. This clip shows how easy it is to put together. Also note that this joint was assembled during the pullback operation. The device they used to put the pipe together is called the Eagle Claw.

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Lessons Learned



- Keeping a full and trained crew
- Prioritization
- Repair/Replace HDD Rig
- HDD vs Open Cut

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First, the top challenge is keeping a fully staffed crew of trained workers. Both the folks on that locating slide are no longer with me. I had to find replacements and train them up.

Second, prioritization the city's water lines that are most in need of replacement for the current fiscal year is not easy. We have more candidates than we have time and money to install. I explained how we go about prioritizing these earlier.

Third, Josh mentioned the value of replacing the equipment more frequently than we had been. He also reminded us that we need to look at both installation options. HDD and open cut.

We have confirmed what Director Jones believed. We get lower installation costs. We are in-and-out of those neighborhoods more quickly, and we minimized disruption. Those are the reasons why the program is still running and why the City Council approves the capital expenditure when it comes time to replace our equipment.

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We have time for one or two questions.

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