

Drilling for Oil



Drop
of Oil

Chapter Five:



It was a day of celebration in **Chris Houser's Bakersfield, California, home.**

His 18-year-old son, **Brayden**, was graduating high school and would enroll later that fall at the University of California-Davis, a prestigious college with a distinction as one of a handful of “Public Ivy” institutions in the country.

So it was a given that **Chris**, a Pioneer drilling rig move lead and 24-year veteran of the oil and gas business, was beaming with pride watching his boy walk across the convocation stage to collect his diploma.

After the ceremony, **Chris** approached his son and gripped him in a hug.

“I’m proud of you, son,” he told the young man.
“Congratulations.”

The teenager looked up, paused, then ...

“Dad, you’ve only been in my life nine years.”

The words landed like a gut punch. **Chris** knew his son was right.

The oil and gas business afforded him a slice of the American Dream, the chance to raise his family in California, put down roots. In trade, the business required 13 two-week hitches a year away from home, working on drilling rigs in the oil patch. For 26 weeks of the year, **Chris** was putting in the 12 and 16-hour shifts, perfecting his trade, gritting it out in oppressive conditions – scorching heat, rain, blizzards – even a global pandemic.

But **Chris** didn’t explain himself on his son’s big day.



Chris Houser & his son at his high school graduation

In a different setting,

maybe he'd tell his son that because of the 219,000 workers in the U.S. oil and gas extraction industry like him, people can travel easily, power their homes, curb headaches and allergies, prevent sunburn, bandage scrapes and cuts, and watch their kids run for the end zone under Friday night lights.

“To be in this business, you have to have a strong family,” Chris says. “You need to have a family that understands the work you do in oil and gas, the hours you put in and why you do it. It’s not for everyone, but I honestly wouldn’t want to be doing anything else.”

We’ve arrived at what is among the most manual labor-intensive steps in our journey charting the **life of a drop of oil**.

In previous weeks, we’ve laid the intricate groundwork ahead of the drilling process, and we explained how it often takes months and even years to reach the point when we’re ready to commit to a drill job. And we learned in past weeks that we must be prudent, cautious and both fiscally and environmentally responsible whenever we prepare to put a well into production. It’s not like the movies or television, which portray just the finished product – the iconic pumpjacks scattered across a prairie.

Our geologists and reservoir engineers have employed cutting-edge science and technology like 3D imaging to pinpoint hydrocarbon-rich subsurface targets and we’ve calculated for every possible scenario, all to ensure we’re tapping the most optimal oil and gas swath. Finally, after our landmen verify the deeds and titles that have changed hands over a desired bundle of properties we’ve targeted for exploration – some dating back several generations – we’ve assembled our drilling fairway.

We now hand the reins over to our Permian drilling team to begin the complex process of unlocking the oil and natural gas reservoirs buried millions of years ago, deep below the West Texas landscape.



Midland – Any successful

drill job begins with a solid foundation, and that's where Pad Senior Construction Superintendent **Jason Stuart** comes into our picture. Employing military-like precision, the eight-year Pioneer veteran coordinates and dispatches our fleet of roughly 175 pieces of heavy machinery into the field to build well pads, tank battery pads, reserve pits and create lease roads virtually from scratch for access by the small army of laborers and specialists who will soon descend upon the site.



Here's where
the meticulous
planning pays off.

“Before we ever mobilize equipment, our Surface Development team has generated a site that is ready for construction,” **Jason** says. “We will take topographic surveys of the site and use the data to generate a 3D model of the location, so we know the exact volume of dirt, crushed stone and other materials we’ll need for the pad.”

A standard, six-well **simulfrac pad** occupies more than four-and-a-half football fields in area. Line up another football field sideline, end zone to end zone, and that's equal to the pad's **reserve pit**, or the plastic-lined area that stores the mud, wastewater and other fluids extracted during the drilling process to prevent the substances from seeping into the groundwater.

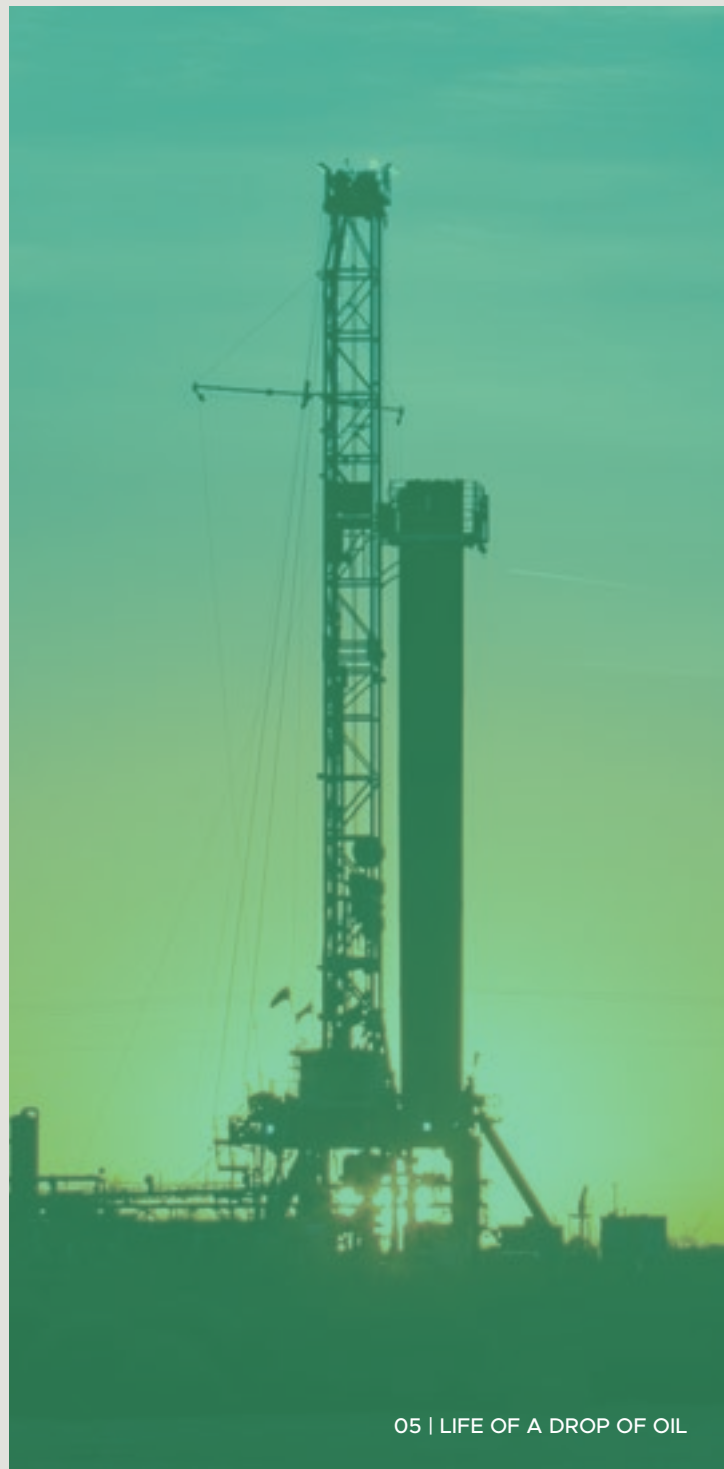
Simulfrac, short for simultaneous fracturing, is a relatively newer technique that has revolutionized shale exploration in the Permian Basin and beyond. The process allows crews to frac multiple wells at once, dramatically slashing downtime. Frac, or hydraulic fracturing, is a method that injects highly pressurized water, sand and other fluids deep underground to crack open rock layers and release the hydrocarbons trapped inside.

Fracking has changed the game by giving drillers access to pockets of oil and gas once thought unrecoverable. (We'll explore these methods in greater detail next week for our Completions chapter.)

With the well pad site prepped, Jason's crew heads for the next job and, like clockwork, Field Drilling Superintendent and 10-year Pioneer employee Will Bledsoe arrives with his team to tackle the next phase.

They'll use a mechanical drilling rig – called a **conductor rig** – to bore a conductor hole about 80 feet below ground. Next, a **conductor casing** is installed by welding 40-foot joints of pipe together. Cement is then pumped into the space around the outside of the casing.

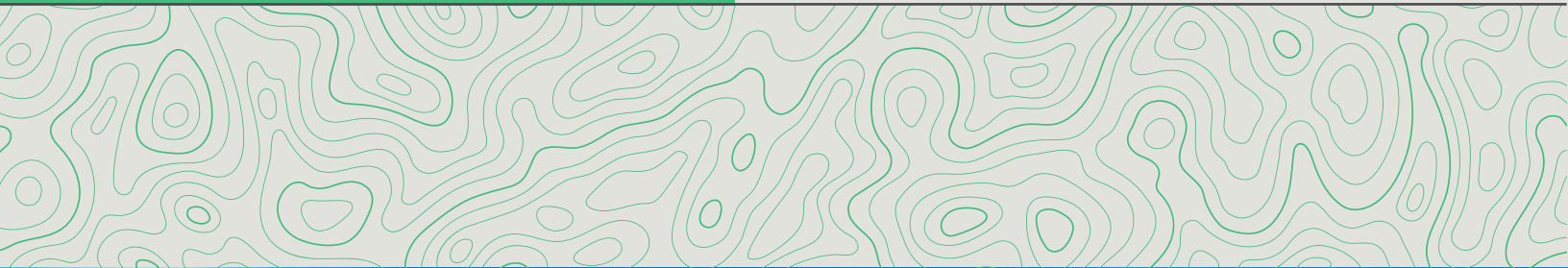
The conductor casing provides a conduit for installing the bit and drilling tools for drilling the upcoming surface hole section. With the conductor casing installed, the mechanical rig leaves to allow a larger **spudder rig** to move over the well to drill the surface hole section.



“The purpose of the surface hole is to drill to a depth below the freshwater table, and freshwater is intentionally used as the drilling fluid to prevent contaminating the fresh

groundwater,” explains Field Drilling Superintendent Daniel Doverspike, a seven-year Pioneer employee who works a two-week rotation opposite Will.

For this leg, 40-foot joints of surface casing are screwed together and run into the hole to depths ranging from 800 to 2,000 feet – depending on the depth required to expose and cover all fresh groundwater formations. After the surface casing is installed, cement is circulated into the void between the casing and the formations to isolate and protect all fresh groundwater from the combinations of brine water-based and oil-based fluids required for drilling deeper hole sections.



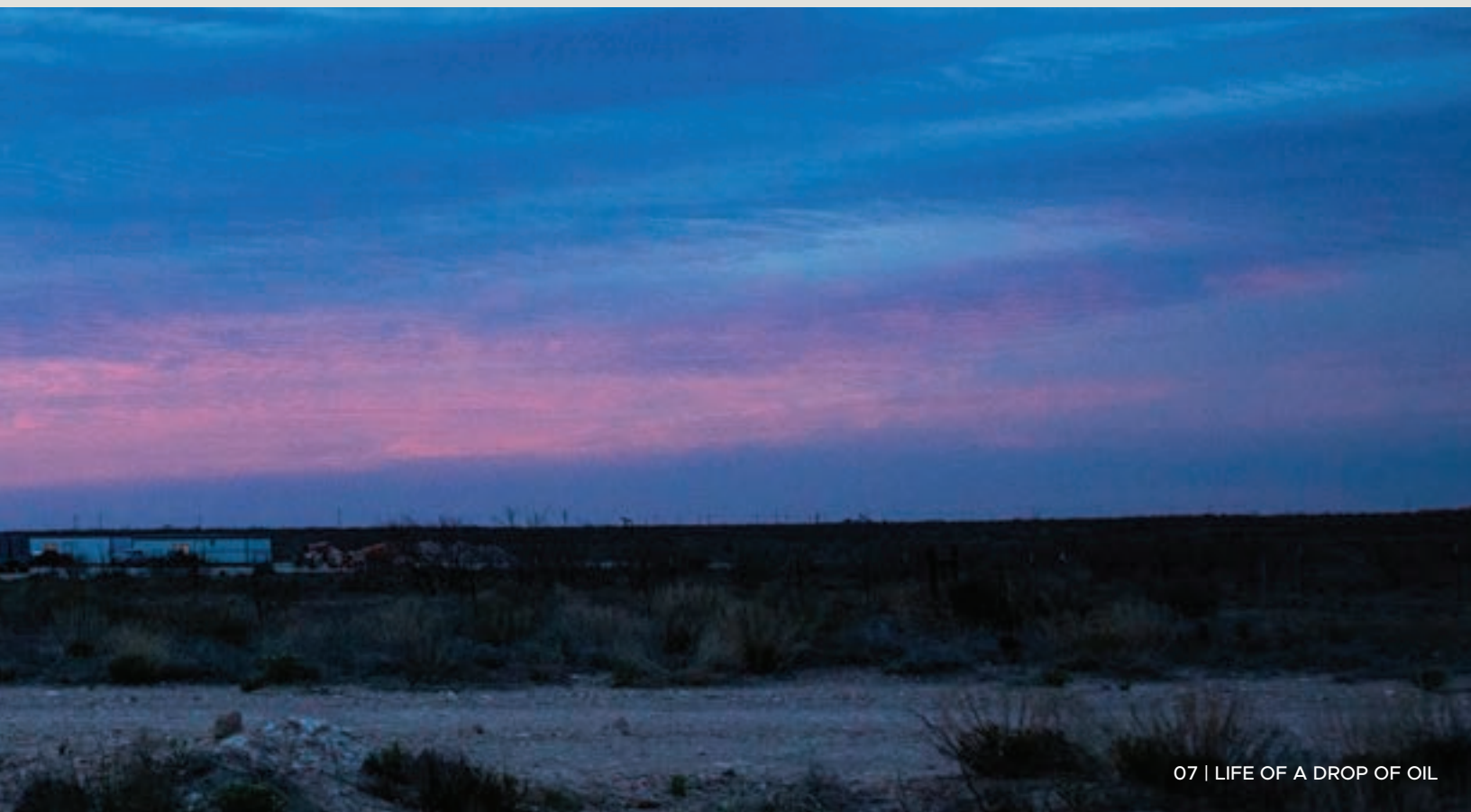
What Daniel shared is worth noting:



We talked to him and 13 additional members of Pioneer's drilling unit for this chapter – who collectively possess more than two centuries of industry experience – and as each shared a critical component of what it takes to construct a well, all of them discussed Pioneer's longstanding commitment to extracting oil and gas in the most sustainable, environmentally-conscious manner possible – even if that process costs more or takes longer.

With the *spudder rig* gone, a larger rig arrives, capable of drilling horizontal wells ranging from **16,000 feet to 26,000 feet** – or **3 to 5 miles** – in total length. This feat will require drilling and casing the nearly vertical intermediate hole section to depths between **5,500 feet and 9,500 feet**, depending on which one of several oil-bearing shale oil formations is being targeted.

It's sometimes possible to drill one intermediate hole section from the end of the surface casing to the targeted oil-bearing shale formation. A single intermediate casing is then installed and cemented in preparation to drill the horizontal lateral within the targeted oil-bearing shale formation.





Unfortunately, this isn't always the case because the near-vertical intermediate hole section can present difficult drilling challenges. Hurdles range from encountering shallow, over-pressured formations with water flows containing poisonous hydrogen sulfide (H₂S) gas to exposing deeper depleted zones where significant volumes of drilling fluid can be lost.

When these two challenges are encountered on the same well, it's necessary to install and cement a shorter **intermediate casing** to isolate the shallow, over-pressured formations and protect our crews by preventing the water flows and H₂S gas from reaching the surface.

It's then possible to reduce the density of the drilling fluid required to drill the deeper depleted formations while minimizing the drilling fluid losses to effectively reach the oil-bearing shale formation being targeted for the production lateral.

A shorter, second length of intermediate casing called a **drilling liner** is then installed and cemented across this deeper intermediate hole section to isolate the oil-bearing shale formation in preparation to drill a horizontal production hole section ranging from 7,500 to 15,000 feet in length.

This production lateral is then cased and cemented in before the well is turned over to our Completions team, who we'll meet in next week's chapter.



When we visited Rotational Drilling Supervisor Dustin Wiatrek at a sprawling rig site on an 87-degree mid-April afternoon, the scene to any outsider might resemble a traffic jam.

Trucks hauling supplies such as water, cement, fuel, drilling fluid and casing queue up to unload these raw materials for the drill site while a hive of workers on the rig monitor pressure gauges, filtration equipment and **shale shakers**, massive screens that separate larger solids from the drilling fluids used for cleaning, stabilizing and lubricating the wellbore.

What might look like controlled chaos to an outsider is in reality an immaculately scripted game plan **Dustin** and his crew have drawn up. This year **Dustin** marks a decade with Pioneer, so he's learned how to pull off large jobs like HP 643

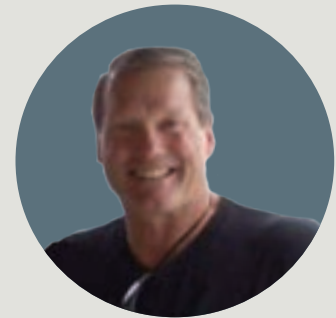
"The work is constantly in motion," he says, as he escorts us to the rig floor – high enough to easily be spotted on the horizon as our truck slowly approached the site along a meandering lease road. "Everything is timed and planned out: all the trucks hauling our supplies and all of the machine processes."

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We have **23 rigs** in operation, and our crews drill a well every **14-15 days on average**. Just a few years ago, it took twice as long.

Leading up to that remarkable drilling performance improvement, Pioneer implemented a continuous improvement effort referred to as Target Elite. We also created our Performance Drilling Center, staffed with operations drilling engineers, operations geologists, directional drillers and measurement-while-drilling (MWD) technicians who support rig operations. The center improves drilling operations in areas such as drilling parameter optimization, real-time torque and drag monitoring for drill pipe and casing, optimizing hole cleaning practices and monitoring rig automation techniques. Running something like the PDC is another example of what makes Pioneer tick: We don't rest on our laurels. We're always looking to streamline and improve operations.

“Pioneer is collecting the data while developing the processes necessary to apply machine learning to drilling operations for assisting the Field Drilling Execution Team to achieve optimum drilling performance,” says Area Drilling Superintendent **Joe Polya**, a 13-year Pioneer veteran with nearly 40 years in the business.



The rigs are divided into pods, with seven rigs to each pod, and drillers usually work in 12-hour shifts until the well is online. It's an around-the-clock operation, and any down time, maybe due to a mechanical failure or stuck tool down a wellhole, is measured in minutes, not hours. By the end of the year, we'll have drilled as many as **500 wells**.



“I liken each pod team to a pit crew,” says Pioneer Vice President of Drilling **Bonnie Black**, “You have to prepare the drilling pad, establish the drilling process, take into account environmental concerns, worksite safety and troubleshooting. Each drill pad is its own unique ecosystem.”

During **Bonnie's** 14-year career at Pioneer – which started in Alaska – she's had plenty of time to source and perfect the ingredients required to assemble an adept team.

“I look at my role as a utility player, to just have that ability to be able to build great teams and stress teamwork over individuality,” she explains. “You have to build trust, diversity of thought and ideas, and when you can do that, you have success.”

There’s a stretch of county road in southwestern California that carves its way from Highway 119 in the small town of Taft, then meanders nine more miles until it reaches Highway 33 in a spit of a town called Fellows – population 54.

It’s known by many of the drilling veterans here as Duffel Bag Drag because its shoulders are usually lined with a steady clip of down-on-their-luck men and discarded luggage. They were lured to the oil patch expecting to cash in and set themselves up for life before realizing the kind of moxie and mental toughness the job demands.

“They see dollar signs, come out here to see what goes on, then you see them turn around and hitchhike their way back home,” Chris says. “They see the physical labor that’s required, or they work their first shift on a July day in the heat and the dirt. I’ve seen grown men crying because they can’t face telling their wives they couldn’t hack it.”

Duffel Bag Drag is perhaps emblematic of a larger issue: the dramatic lack of knowledge among the general public about drilling – and the industry at large.



“Many people greatly underestimate the talent you need to have to get this job done,” says Area Drilling Superintendent Ken Richardson. “They underestimate the skillset, consistency and discipline these guys in the field possess. That part is either lost on a lot of people, or maybe people don’t want to take a little time to learn about what we do and the resources we provide to the world.”



COMING NEXT WEEK:

We'll meet members of our Completions team as they take the reins from the Drilling unit and begin the process of hydraulic fracturing, or fracking, the wells prepped by their counterparts. Fracking has roots dating back to the Civil War, and we'll learn how companies like Pioneer have harnessed and fine-tuned the technology to remake the energy landscape at home and abroad.

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