HIGHWAY FREIGHT TRAFFIC
Associated with the Development of Oil and Gas Wells
(Report specifically details impact to the Uinta Basin)

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OVERVIEW

The following is a basic outline of the steps involved in developing a new oil or gas well in the Uinta Basin of northeastern Utah, with a focus on the amount of truck traffic generated by each step in the process. This information was obtained from the State of Utah Division of Oil, Gas, and Mining (DOGM), the Federal Bureau of Land Management (BLM), and the following energy development industries: Halliburton, Stewart & Stevenson, Westroc, Questar Exploration, Western Petroleum, and Basin Western Transportation. It is important to note that all truck movements listed here involve the use of large semi-trucks, longer combination vehicles (LCVs), or oversize load-carrying trucks.

DEVELOPING AN OIL OR GAS WELL

1) **SURVEY GROUND:** This involves limited truck traffic consisting primarily of light utility trucks.
2) **BLM / DOGM PERMITS:** No truck traffic involved
3) **TRUCK IN CONSTRUCTION EQUIPMENT:** This involves bringing in the heavy equipment used to prepare the well site for drilling. The amount of equipment needed depends on where the well is located and its expected depth. In the Uinta Basin's northern oil and gas fields (those located north of US 40), the wells are deeper, ranging from 15 to 20,000 feet on average. However, the soils are softer in the northern fields due to the thick layers of alluvium that have washed down from the Uinta Mountains. Wells in this region of the basin require up to **45** truckloads of construction equipment brought in. The basin's southern oil and gas fields (located south of US 40 where the bulk of current drilling activity is ongoing) are not as deep. The ground is rocky and much harder in the southern part of the basin requiring more extensive site preparation. Most southern wells are from 10 to 12,000 feet in depth, and as shallow as 5,000 feet. Wells in this region of the Uinta Basin average **10** to **15** truckloads of construction equipment at the outset of well site development.

   (10-15 truckloads in the south, up to 45 in the north)
4) **BRING IN DRILL RIG:** Bringing in the drilling rig involves up to **30** truckloads of very heavy and often oversized equipment. The drill pipe (also known as drill steel) arrives as a part of the drilling rig set-up and can be reused several times.

   (30 truckloads)
5) **DRILL WELL:** Drilling an oil or gas well is not the simple, straightforward process assumed by many. Drilling a new well involves the following steps:

a) **Fresh Water:** Fresh water is an essential element in well drilling, being used as a circulating medium to lift rock cuttings out of the bore. First, two large ponds must be constructed for each new well. These ponds, which are complete with liners to prevent ground seepage, are called reserve ponds and will store fresh water for the drilling process. It usually takes at least **25** truckloads of water to fill these ponds initially. Second, depending upon the depth of the well, anywhere from **100** to **1,000** loads of fresh water will need to be trucked into the well site during the course of drilling. This water may come from a local stream, such as the Green, White, Duchesne, or Strawberry Rivers, or from wells that are usually in the northern or central part of the basin.

b) **Waste Disposal:** Water used in drilling comes out of the well along with waste rock that is deposited into one of the two reserve ponds. This waste water/rock combination must be trucked to approved treatment and disposal sites in the basin. Each of the ten oil and gas fields has its own assigned waste disposal site, and all sites are located within the basin. Between **50** and **100** truckloads of waste must be removed during the drilling process.

c) **Drill Mud (also known as Drilling Fluid):** Between **10** and **20** loads of "Bar and Gel" is trucked to the drill site to be mixed with water to make drill mud. The "Bar" stands for barite and the "Gel" is made-up of bentonite from Wyoming. Drill mud is a fluid used for removing rock cuttings from the bore and may vary in make-up depending upon the depth of the well and the nature of the rock strata being penetrated.

d) **Well Casing:** Once the well is drilled, well casing is brought to serve as the inner liner for the well. Well casing is very heavy and the average truck carries enough to line only 1,800 feet of well. Most wells have several casings of varying diameter placed one within another. Up to **10** truckloads of well casing may be needed per well.

e) **Cement Powder:** Between **2** and **5** truckloads of cement are needed for each new well. Cement is forced into the drill hole to fill the gaps in the rock strata outside the well casing. This serves to anchor the casing in the hole and prevent gases from literally blowing the casing out of the well. Fly ash is also used in this process, being mixed with the cement, which involves **2** to **4** truckloads per well.

(Drill Well Totals: 172 – 1,140 truckloads)

6) **GENERAL RIG MAINTENANCE:** During the process of drilling each well, an average of **10** truckloads of equipment must be brought in as a part of keeping the drilling operation going. This involves loads of fuel, pipe, replacement pumps and motors, etc.

(10 truckloads)

7) **REMOVE DRILLING RIG:** Once the well is drilled, about **30** truckloads are needed to remove all of the equipment that has been brought in for that purpose.

(30 truckloads)

8) **COMPLETION RIG PREPARATION:** Usually **1** or **2** loads of construction equipment must be brought in to prepare the well site for the set-up of the completion rig.

(1 or 2 truckloads)

9) **COMPLETION RIG:** The completion rig is another involved and complex process that literally completes the well and prepares it for production. The completion rig involves the following steps:

   a) **Rig Set-up:** It takes **3** to **4** trucks just to bring the completion rig's initial equipment to the well site.
   b) **Well Tubing:** Next, **1** to **2** truckloads of tubing arrives, usually about 8,000 feet in total length. This tubing is inserted down the middle of the well casing in order to extract natural gas from oil wells. The tubing is about two inches in diameter, allowing the crude oil to be pulled up around it inside the well casing (this step not required for gas wells).
   c) **Perforate Casing and Cement Outer Lining:** High explosive charges in a specially designed "gun" are inserted into each new well. This explosive gun shoots holes in the well casing and the surrounding cement that allows the oil and gas to enter the well for extraction. This process involves **1** truckload of explosives and **1** wireline truck for setting off the charge.
   d) **Frac Sand:** To facilitate the free flow of oil or gas into the newly "shot" holes in the well casing, a substance known as frac sand is pumped deep into the well to further break apart the oil or gas bearing rock strata. This involves **5** or **6** truckloads of frac sand mix, which is made-up of sand and chemicals, plus on an average, **20** large frac tanks (large rectangular boxes about the size of a large truck trailer), that are trucked in on their own wheels. On average, it takes **100** truckloads of water to keep the frac tanks filled during this process.

(Completion Rig Totals: 130 – 135 truckloads)

10) **REMOVE COMPLETION RIG:** Removal of equipment, frac tanks, etc., plus removal and disposal of unused water: **20** to **25** truckloads

(20 – 25 truckloads)

11) **CLOSE RESERVE PITS:** **3** to **5** truckloads of heavy equipment to close reserve pits and restore ground cover

(3 – 5 truckloads)

12) **BUILD FACILITY:** **10** to **12** truckloads to bring in and set up pumpjack, water and oil tanks, separators (used for separating gas from liquids, either water or oil), crude oil heaters, pipelines, and gas-powered pumpjack power generators

(10 – 12 truckloads)

(Large Truck Movement Totals: 365 – 1,370 truckloads per well)

***** The well is now ready to produce oil or gas*****

WELL OPERATION

Once a producing well is established, there will continue to be limited truck traffic to and from that well. Natural gas wells send their product to market via surface and subsurface pipelines. Oil wells in the Uinta Basin however, must rely mostly on trucks to deliver the crude oil they produce to refineries in Wyoming or along Utah's Wasatch Front. The following are some examples of the additional truck traffic needed in support of established and producing wells:

1) **Crude Oil Transport:** Depending on the productivity of the well, this can involve anywhere from **1 truck per month** to **5 trucks per day.** The trucks in question are mostly the large 129,000 pound LCV tank trucks known as "Supertankers" that are such a familiar sight along US 40 between the Uinta Basin and the Wasatch Front. These large tanker trucks are also found on US 191 north of Vernal climbing the Uinta Mountains en route to Wyoming refineries.
2) **Water Removal:** Oil wells also bring to the surface water that has been contaminated with hydrocarbons. This water is stored on site in tanks next to each well and must be trucked to an approved disposal site. This averages from **1** truck per week to **3** to **5** truckloads per day for each well. The older the well, the more water it produces, resulting in older wells being converted to pressure maintenance/secondary recovery wells.
3) **General Well Maintenance:** This is done on a periodic basis depending on well performance and production. In some cases **1** or **2** truckloads of acid is brought in every 3 to 5 years to address well corrosion. In situations where serious problems exist with a particular well, the entire completion rig must be returned to the well site. This process can involve between **25** and **40** truckloads of equipment and supplies.
4) **Pressure Maintenance / Secondary Recovery / Disposal Wells:** In order to maintain pressure on underground deposits of oil, water is injected through dedicated wells into the oil-bearing rock strata. In most cases, these are older wells whose oil deposits are depleted, allowing their conversion to pressure maintenance/secondary recovery wells. Most of this water comes from producing oil and gas wells, with some delivered by surface pipeline and the rest arriving by truck. Disposal wells are where excess well wastewater is injected deep underground rather than being allowed to evaporate in above ground ponds. All wastewater must be filtered and treated before it can be injected underground.

WHERE DOES IT ALL COME FROM

The previous information outlines what is involved in developing each new oil and gas well in the Uinta Basin, outlining the amount of truck traffic associated therewith. However, this intra-basin truck traffic does not tell the full story inasmuch as nearly all of the material and equipment used in well development must be brought into the basin from out-of-state by truck. The following is a quick overview of a selection of items used in well development, where they come from, and which routes are used to transport those items to the Uinta Basin:

1) **Wellheads:** Texas/Louisiana Gulf Coast Region – arrives into basin on US 40 from the east coming off I-70 from Denver via Rifle, Meeker, and Rangely, Colorado
2) **Well Casing:** Texas/Louisiana/Gulf Coast – arrives via US 40 from Union Pacific railhead in Craig, Colorado
3) **Drill Pipe:** Texas/Louisiana/Gulf Coast – arrives via US 40 from I-70 the same as wellheads
4) **Pumpjacks:** Bakersfield, California – arrives via US 191 from the southwest. Trucks use I-15 from southern California to I-70 at Cove Fort, then I-70 east to Fremont Jct., and SR 10 north to US 191 at Price
5) **Gas Separation Units:** Brownsville, Texas – US 40 and I-70 from east, or US 191 via Moab and Price from the south
6) **Tanks:** Garden City, Kansas – via I-70 and US 40 from the east
7) **Line Pipe:** Texas/Louisiana/Gulf Coast – via I-70/US 40 from Denver or US 191 via Moab and Price
8) **Line Heaters:** Texas (used for the thick "Wax Crude" oil found in the basin) – via US 40 from the east or US 191 from the south
9) **Valves:** Texas/Louisiana/Gulf Coast – via US 40 or US 191
10) **Cement:** Utah/Montana – via US 40 from the west via Heber City. Cement originates with Ash Grove Cement in Leamington, Utah or in Montana
11) **Frac Sand:** Wisconsin – by rail to Craig, Colorado then via truck on US 40.
12) **Fly Ash:** Wyoming – from Rocky Mountain Power's Jim Bridger Power Plant east of Rock Springs (the largest steam plant in the Mountain West) via truck over US 191 from the north
13) **Bar Gel Mix:** Salt Lake City, then by truck via US 40 to Uinta Basin
14) **Acid:** Salt Lake City – via US 40 through Heber City
15) **Explosives:** Wyoming and other western locations, via US 191 over the Uinta Mountains, or via US 40 from Craig, Colorado (however, explosives are handled over all highway corridors linking the basin with the rest of the West)

SUMMARY

The development of a new oil or gas well is a very transportation-intensive operation. Between **375** and **1,375** truckloads of material, supplies, and equipment are needed to establish **each** new well, depending upon the depth of the well and its location in the Uinta Basin. It is important to remember that each of these truck movements is, in reality, **two movements** over the basin's highway system, an **inbound loaded** movement and an **outbound empty** movement. There are very few backhaul loads for trucks bringing supplies into the Uinta Basin, which makes it difficult for those in the oil and gas industry to find truck companies willing to make trips into the area.

There are currently more than 10,000 wells under construction, permitted or planned for the Uinta Basin, in addition to the 5,700 active wells currently producing oil and gas. As of this writing, there are 44 drilling operations on-going in the basin, with gas wells making up the majority of the planned future activity. If only a small percentage of those

proposed wells are drilled, it is apparent that truck traffic levels will continue to increase over the next five years. A general breakdown of how productive each of those 44 drilling operations are in terms of days needed to establish each well is shown below. Also shown are a conservative average of the number of truckloads of material needed for each phase of well development.

	Trucks	Days	Trucks per day per well
Setup	**60**	**3**	**20**
Drilling	**800**	**14**	**57**
Removal	**190**	**3**	**63**

Active Drilling Rigs: 44 Truck trips per day for new wells: 6,160

There are currently more than 8,000 existing oil and gas wells in the Uinta Basin region, of which approximately 5,700 are still active, producing wells. The remaining wells have both been shut down and capped, or they have been converted into secondary recovery, pressure maintenance, or waste disposal wells. The following is a breakdown of current truck traffic levels associated with the operation of existing wells in the basin.

	Totals
Operating wells	**5,700**
Truck trips per well per day	**.25**
Truck trips per day for existing wells	**1,425**
Total energy extraction truck trips per day in Uinta Basin	**7,585**

Inasmuch as the trucks that support and supply well development are based in Duchesne, Myton, Roosevelt, Vernal or Naples, all of these intra-basin truck movements use US 40 for at least part of their daily trips. Likewise, all interstate truck operations bringing supplies into the basin's oil and gas fields also travel on US 40. Energy related truck traffic is also increasing on US 191 north of Vernal over the Uinta Mountains. The following data is from UDOT's permanent count stations on these two primary arterials linking the Uinta Basin with the rest of America.

Permanent Count Station	2003	2005	Increase	%
#424 (US 191 north of Vernal)	**1,700**	**4,000**	**2,300**	**58**
#425 (US 40 at Roosevelt)	**7,300**	**11,500**	**4,200**	**37**

In extensive interviews with oil and gas industry representatives, as well as those of the trucking industry, the following basic highway infrastructure needs and improvements have been identified and prioritized in the order of greatest impact and importance:

1) **Improved junctions where state or county roads handling high numbers of oil and gas field traffic intersect with US 40:** This would consist of traffic signals in some cases and improved turn pockets and acceleration/deceleration

lanes in ALL cases. The intersections of US 40 and SR 88 between Roosevelt and Vernal, as well as the intersection of US 40 and Pleasant Valley Road west of Myton, have been identified as the junctions most in need of the aforementioned improvements.

2) **Additional passing lanes and passing lanes of adequate length:** This is primarily an issue on US 40 in the inner-basin corridor between Duchesne and Naples, although downhill passing lanes in Daniel's Canyon were given high priority. This need also extends to selected state routes that feed energy-related truck and auto traffic into US 40.
3) **Full-width shoulders or more frequent safety pullouts:** Once again, the issue here is primarily on US 40 between Duchesne and Naples, with the Duchesne to Myton and Gusher to Vernal segments of the corridor identified as the route segments with the greatest need.

All segments of the energy development and transportation industry agree that while it would be great to see a four-lane road on US 40 across the Uinta Basin, they realize the costs involved, as well as the financial limitations UDOT and the State of Utah are inhibited by. There is general agreement that selected improvements in the above three categories will greatly improve both safety and freight mobility in support of the basin's growing energy development. It is vitally important that representatives of those trucking and extractive industries who use US 40 and its energy-serving feeder routes in the Uinta Basin, be an early and active part of the project selection process as we move toward improving this strategic freight corridor that is so important to Utah's economy.

SPECIAL NOTE

While the Uinta Basin is obviously Utah's largest and most productive oil and gas development area, there are eight other existing or potential energy fields currently in various stages of development. Broken down by UDOT region location, there is one field in Region One, one in Region Two, five in Region Four, plus exploration encompassing the entire eastern Great Basin, which involves all four regions. Extensive work is ongoing in these areas to bring in new oil and gas reserves, or to expand current production. Advances in drilling technology are allowing energy exploration companies to drill wells to greater depths than was heretofore possible or profitable. Likewise, advances in energy-related geologic research has identified the Great Basin, the Sevier Overthrust Belt, and the northern and southern Paradox Basin regions of Utah as areas of likely oil and gas deposits. The potential for other energy booms, with their related truck traffic issues, are a distinct possibility for each of UDOT's four regions.

DBK

AND THEN THERE ARE UTAH'S OIL SHALE AND TAR SAND DEPOSITS…