



page 3 ANS output up 1.2% from Nov. with crude, NGLs averaging 503,123 bpd

Supreme Court agrees to pick up appeal over WOTUS interpretation

The U.S. Supreme Court has agreed to review a 9th Circuit Court of Appeals ruling, upholding the Environmental Protection Agency's interpretation of what constitutes the waters of the United States, or WOTUS. This issue is critically important in Alaska, with its myriad of waterways and wetlands — activities that may impact water bodies that are part of WOTUS are subject to federal regulation and permitting.

Although WOTUS clearly encompasses navigable waterways that can support interstate commerce, those waterways can be impacted by pollution from tributary waterways. And those tributary waterways can, in turn, be impacted by adjacent wetlands. So, where exactly does federal jurisdiction end? And at what point does federal jurisdiction unacceptably

see **WOTUS APPEAL** page 6

Geothermal bills goal to encourage resource exploration, development

Two bills, Senate Bill 104 and House Bill 135, introduced by Gov. Mike Dunleavy during last year's legislative session to revise statutes relating to geothermal energy exploration and development, are continuing to move through the Senate and House. On Jan. 21 officials from the Alaska Department of Natural Resources talked to the House Resources Committee about HB 135.

The concept is to better align the statutes governing geothermal activities with those governing oil and gas exploration and development, while also encouraging geothermal exploration. The bills would also modernize the statutes by using a new definition of geothermal energy, in particular allowing for

see **GEOTHERMAL BILLS** page 10

AOGCC v. French dispute on scope of agency authority continues

In February 2019 Hollis French, formerly commission chair at the Alaska Oil and Gas Conservation Commission, petitioned the commission to hold a hearing on a complaint of waste from a 2017 fuel gas leak in Cook Inlet.

After the commission denied the petition for a hearing, followed by two rounds in court, the second of which saw French the victor, the commission held a hearing Dec. 15 and on Jan. 20 issued an order denying the petition.

Alaska Superior Court had deferred to the commission in its ruling; the Alaska Supreme Court required the commission to hold a hearing, which it has now done, and also said the commission had not presented evidence that it investigated the leak.

see **AUTHORITY DISPUTE** page 10

UAA, Conoco name recipients of Arctic science, engineering award

Recently the University of Alaska Anchorage and ConocoPhillips Alaska announced the 2022 recipients of the ConocoPhillips Arctic Science and Engineering Endowment Award.

The endowment is one of the largest in the University of Alaska System and provides awards to recipients who have demonstrated potential to bring about the highest foreseeable impact on developing Arctic science and engineering programs. Historically, winning proposals have been granted anywhere between \$10,000 to \$100,000.

The new regiment of Arctic research includes projects on ice loss, climate change and geothermal energy.

Basic details on the 2022 awards are as follows, and more

see **ENGINEERING AWARD** page 11

EXPLORATION & PRODUCTION

Production up

FY2021 North Slope volumes up some 10,000 bpd; Feige addresses access

By **KRISTEN NELSON**

Petroleum News

Alaska North Slope production was up by 2% from fiscal year 2020 to FY2021, a 5% increase over the forecast for FY21, Maduabuchi Pascal Umekwe, Ph.D., reservoir engineer with the Alaska Division of Oil and Gas, told the Senate Finance Committee Jan. 19, as the Department of Natural Resources presented its latest production forecast numbers to legislative committees.

Actual FY21 ANS production averaged 493,820 barrels per day, Umekwe said, up some



CORRI FEIGE

10,000 bpd compared to the forecast.

He said the increase represented progress in how companies manage fields — growing production, stemming decline and adding volumes. Umekwe said it was a significant accomplishment, as production decline is the natural behavior of the state's mature fields.

Actual FY21 production was above that projected in the fall Revenue Sources Book for FY22, 486,730 bpd from the North Slope, followed by a 3% increase to 500,189 bpd in FY23.

Discussing FY21 results by unit, Umekwe said

see **PRODUCTION UP** page 7

FINANCE & ECONOMY

ANS tops 90 bucks

Demand ignores omicron, global supply tight; Beijing in pre-Olympic lockdown

By **STEVE SUTHERLIN**

Petroleum News

Alaska North Slope crude broke the \$90 mark Jan. 26, settling at \$90.51 per barrel — a gain of \$1.68 over the previous day's close. West Texas Intermediate gained \$1.75 to close at \$87.35, while Brent gained \$1.76 to close at \$89.86.

Brent broke above \$90 in early trading, rising to \$90.35, but it slid back into the upper \$80s prior to the day's close.

A few factors have driven prices to these levels, not seen since 2014.

On the demand side, the omicron variant of COVID-19 has failed to hammer demand for motor

fuels as severely as feared when omicron first surfaced to short-circuit the post-COVID rally in November.

With respect to ANS, demand on the West Coast has remained robust.

The reopening of India and heavy Chinese buying have sopped up surpluses of cargoes on the Pacific, as evidenced by the continuing premium on ANS relative to Brent.

Omicron, however, may be blunting motor fuel demand in China, as the Asian nation continues to impose draconian lockdowns as part of its zero-COVID policy. Beijing residents have been hit with abrupt lockdowns as officials attempt to tamp down

see **OIL PRICES** page 8

EXPLORATION & PRODUCTION

Theta West 1 well spud

Pantheon's North Slope program underway; Talitha A well testing started

By **KAY CASHMAN**

Petroleum News

London-based Pantheon Resources Plc said Jan. 24 that it spud its Alaska North Slope Theta West 1 well on Jan. 21 using the Nordic Calista Rig 3, as planned. Pantheon's Alaska subsidiary Great Bear Pantheon holds a 100% interest in the well.

Prior to moving eight and a half miles west to the Theta West well location, the rig completed preparations for testing operations at the Talitha A well which included a plugging operation in the Kuparuk formation, which won't be tested this year.

As of 10 p.m. GMT on Jan. 23, operator Great

Bear Pantheon was drilling ahead at a depth of 1,874 feet.

Theta West 1 is targeting two primary targets:

1. the Upper Basin Floor Fan.
2. the Lower Basin Floor Fan.

These combined horizons, Pantheon estimates, hold 12.1 billion barrels of oil in place with an approximate 1.4 billion barrels of recoverable resource.

The top of the formation is expected at a depth of about 7,600 feet with approximately 1,300 feet of reservoir thickness.

Pantheon said the plan is to drill to target depth, estimated at 9,200 feet, case the hole, and begin

see **THETA WEST 1** page 8

● EXPLORATION & PRODUCTION

PODs approved for Duck Island, Northstar

No drilling planned, but Hilcorp will do wellwork, workovers at Duck Island, facilities work, coastal defense repair at Northstar

By **KRISTEN NELSON**
Petroleum News

The Alaska Division of Oil and Gas has approved plans of development for two of the North Slope's smallest units, Duck Island and Northstar, both operated by Hilcorp Alaska.

In Jan. 20 approvals, signed by acting Director Justin Black, the division said neither POD includes any new wells, but both include other work to maintain and enhance production.

Duck Island unit

This is the 40th POD for Duck Island, which was formed in 1978 and currently includes 17,587.62 acres, with three participating areas, Endicott, Sag Delta and Eider.

The division said production from November 2020 through October 2021 increased slightly from the 39th

POD, totaling 2.34 million barrels of oil and natural gas liquids and 131.9 million cubic feet of gas.

For November 2019 through October 2020 production was 2.28 million barrels of oil and NGLs and 135.9 million cubic feet of gas.

Cumulative Duck Island unit oil and NGL production through November 2021 was 523.7 million barrels of oil and 3.956 billion cubic feet of natural gas.

Hilcorp did not drill any new wells during the 39th POD but planned up to three workover operations and various non-rig wellwork and a facility turnaround for planned maintenance.

The division said Hilcorp postponed a planned workover of the MPI 01-25 well, instead evaluating converting MPI 1-21 to gas injection. The company completed a planned surface facility turnaround. It also enhanced production with non-rig wellwork:

- 3-25B well perforation add;

- 2-60 well surface casing evacuation;

- 4-32 well surface casing evacuation;

- 1-39A well perforation add;

- 4-38 well re-perforation;

- 2-14 well perforation add;

- 3-03 well return to service following long-term shut-in;

and

- 1-29 well perforation add.

DIU 40th POD

For the 40th POD Hilcorp plans wellwork and workovers:

- Tracer study to understand injector/producer response to target potential future drilling targets;

- Rig workover on 3-11 well to install new tubing string and return well to production;

see **POD APPROVALS** page 4

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ON THE COVER

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EXPLORATION & PRODUCTION

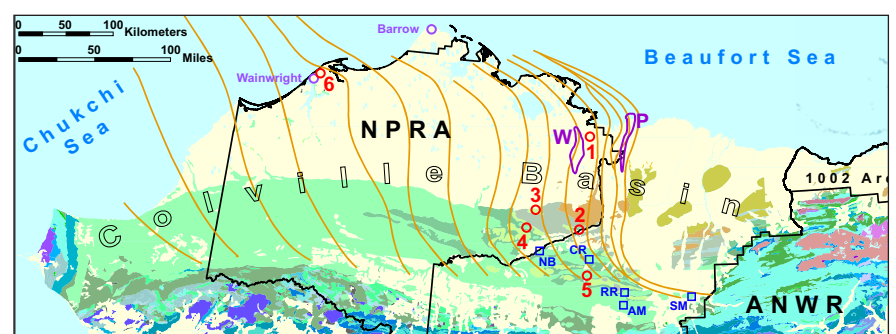
2 PODs approved for Duck Island, Northstar

3 ANS volumes up 1.2% month-over-month

Combined North Slope crude, NGL production averaged 503,128 bpd in December, up from November, but down 0.8% from December '20

SIDEBAR, PAGE 3: Cook Inlet gas production down marginally

6 US rotary drilling rig count 604, up by 3



GEOLOGY

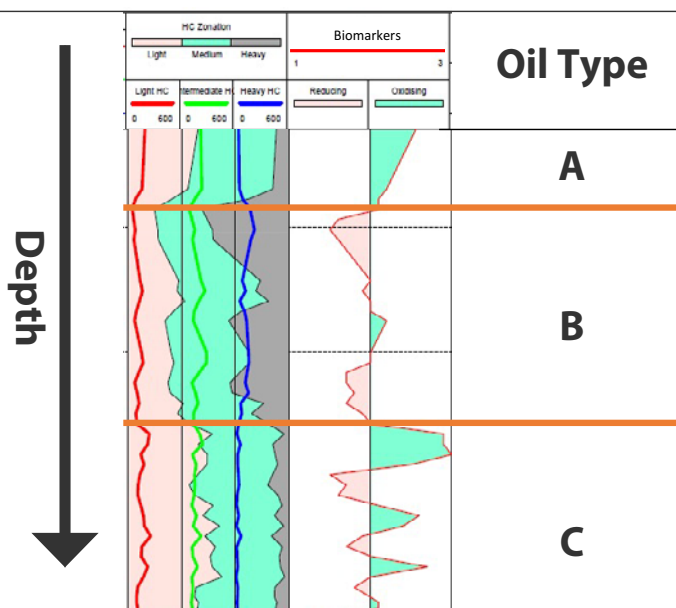
5 The intricacies of Nanushuk geology

DGGS releases reports describing and characterizing the rock formation that hosts recent major North Slope oil discoveries

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ANS volumes up 1.2% month-over-month

Combined North Slope crude, NGL production averaged 503,128 bpd in December, up from November, but down 0.8% from December '20

By KRISTEN NELSON
Petroleum News

Alaska North Slope crude oil and natural gas liquids averaged 503,128 barrels per day in December, up 1.2%, 5,213 bpd, from a November average of 497,281 bpd and down 0.8% from a December 2020 average of 507,185 bpd.

Crude was 87.8% of the total, 441,594 bpd, up 1.2%, 5,213 bpd, from a November average of 436,381 bpd, although down 2.3% from a December 2020 average of 451,798 bpd.

NGLs averaged 61,534 bpd in December, 12.2% of total volume, up 1%, 633 bpd, from a November average of 60,901 bpd and up 11% from a December 2020 average of 55,387 bpd.

Volumes are from the Alaska Oil and Gas Conservation Commission which reports production by field and well on a month delay basis.

Greater Mooses Tooth

The largest volume and percentage month-over-month increase for December was at ConocoPhillips Alaska's Greater Mooses Tooth unit in the National Petroleum Reserve-Alaska.

GMT1, the first pad at the unit, has been producing from the Lookout oil pool since October 2018, with production peaking in early 2019 at more than 12,000 bpd and declining to some 2,500-2,600 bpd in recent months.

Volumes from the new GMT2, producing from the Rendezvous oil pool, began showing up in AOGCC data in November, although ConocoPhillips did not begin sustained production until Dec. 12. For the month of December, AOGCC data show two wells online at GMT2 (one for only a few days during the month). Average December production for GMT2 was 4,738, 65% of total GMT production which averaged 7,298 bpd for December. That volume was an 85.6%, 3,365 bpd increase, from a November average of 3,933 bpd and a 110% increase from a December 2020 average of 3,473 bpd.

In an email to Petroleum News on Jan. 10 ConocoPhillips Alaska spokeswoman Rebecca Boys said GMT2 was currently producing more than 10,000 bpd, with production expected to peak at some 30,000 bpd.

Other month-over-month increases

Hilcorp Alaska's Milne Point averaged 37,565 bpd in December, up 4.7%, 1,675 bpd, from a November average of 35,89 bpd, and up 4.4% from a December 2020 average of 35,984 bpd, as Hilcorp continues to expand drilling at that field. It became operator and a 50% working interest owner in 2014; in December of 2014, by comparison, Milne production averaged 19,684 bpd, 52% of this December's average. Hilcorp's acquisition of all of BP's Alaska assets closed in mid-2020 and it then became 100% WIO at Milne.

The ConocoPhillips-operated Kuparuk River field averaged 85,036 bpd in December, up 1.3%, 1,116 bpd, from a November average of 83,920 bpd and down 11.4% from a December 2020 average of 96,026 bpd.

In addition to the main Kuparuk pool, Kuparuk produces from satellites at Meltwater, Tabasco and Tarn, and from West Sak.

The Hilcorp North Slope-operated Prudhoe Bay field averaged 284,294 bpd in

The largest volume and percentage month-over-month increase for December was at ConocoPhillips Alaska's Greater Mooses Tooth in the National Petroleum Reserve-Alaska.

December, up 0.3%, 881 bpd, from a November average of 283,413 bpd and up 1.4% from a December 2020 average of 280,262 bpd. The field averaged 227,222 bpd of crude, 79.9% of the total, up marginally (19 bpd) from a November average of 227,203 bpd and up 0.1% from a December 2020 average of 227,076 bpd. Prudhoe NGL production averaged 57,072 bpd in December, 20.1% of the field total, up 1.5%, 862 bpd, from a November average of 56,210 bpd and up 7.3% from a December 2020 average of 53,186 bpd.

In addition to the primary reservoir, production volumes from Prudhoe include Aurora, Borealis, Lisburne, Midnight Sun, Niakuk, Polaris, Point McIntyre, Put River, Raven and Schrader Bluff.

The ExxonMobil-operated Point Thomson field (Hilcorp Alaska has taken over as operator effective in January) averaged 9,316 bpd in December, up 9.1%, 776 bpd, from a November average of 8,540 bpd and up 21.9% from a December 2020 average of 7,644 bpd.

Month-over-month declines

Eni's Nikaitchuq averaged 16,753 bpd in December, down 5.2%, 918 bpd, from a November average of 17,671 bpd but up 5.7% from a December 2020 average of 15,849 bpd.

Eni's Oooguruk was also down, averaging 4,987 bpd in December, down 582 bpd, 10.5%, from a November average of 5,569 bpd and down 10.5% from a December 2020 average of 7,608 bpd.

ConocoPhillips' Colville River averaged 41,833 bpd in December, down 0.7%, 277 bpd, from a November average of 42,111 bpd and down 6.2% from a December 2020 average of 44,589 bpd. In addition to oil

see ANS OUTPUT page 4

Cook Inlet gas production down marginally

Natural gas production in Cook Inlet averaged 204,415 thousand cubic feet per day in December, down 0.8%, 1,585 mcf per day, from a November average of 205,988 mcf per day and down 9.5% from a December 2020 average of 225,968 mcf per day.

Volumes are from the Alaska Oil and Gas Conservation Commission, which reports production by field and well on a month-delay basis. For natural gas AOGCC reports measurements in thousands of cubic feet, mcf.

Seven large gas fields account for some 81% of current production.

The most productive natural gas field in Cook Inlet currently is Hilcorp's North Cook Inlet, which averaged 32,414 mcf per day in December, 15.9% of inlet production, up 839 mcf per day, 2.7%, from a November average of 31,576 mcf per day and up 87.3% from a December 2020 average of 17,302 mcf per day. Hilcorp has been working at the field which it acquired from ConocoPhillips in 2016; in December 2016 the field averaged 13,911 mcf per day.

Hilcorp's Ninilchik field averaged 30,830 mcf per day in December, 15.1% of inlet production, up 610 mcf per day, 2%, from a November average of 30,221 mcf per day but down 1.6% from a December 2020 average of 31,326 mcf per day.

Hilcorp's Kenai field averaged 28,819 mcf per day in December, 14.1% of inlet production, down 1.3%, 376 mcf per day, from a November average of 29,195 mcf per day and down 36.6% from a December 2020 average of 45,473 mcf per day.

The Hilcorp-operated Beluga River field averaged 28,645 mcf per day in December, 14% of inlet production, up 2,118 mcf per day, 8%, from a November average of 26,527 mcf per day and up 19.9% from a December 2020 average of 23,895 mcf per day.

Hilcorp's McArthur River field averaged 20,277 mcf per day, 9.9% of inlet production, down 7%, 1,520 mcf per day, from a November average of 23,797 mcf per day and down 27.8% from a December 2020 average of 28,096 mcf per day.

Hilcorp's Swanson River averaged 12,172 mcf per day in December, 6% of inlet production, down 183 mcf per day, 1.5%, from a November average of 12,355 mcf per day and down 37.4% from a December 2020 average of 19,442 mcf per day.

Furie's Kitchen Lights averaged 11,900 mcf per day in December, 5.8% of inlet production, up 706 mcf per day, 6.3%, from a November average of 11,194 mcf per day and down 19% from a December 2020 average of 14,690 mcf per day.

Smaller fields each contribute less than 5% of inlet production.

Hilcorp's Beaver Creek averaged 8,475 mcf per day in December, down 517 mcf per day, 5.8%, from a November average of 8,992 mcf per day and down 29.1% from a December 2020 average of 11,961 mcf per day.

Hilcorp's Ivan River averaged 7,183 mcf per day in December, down 26%, 2,530 mcf per day, from a November average of 9,713 mcf per day but up 16.4% from a December 2020 average of 6,169 mcf per day.

AIX's Kenai Loop averaged 4,118 mcf per day in December, down 170 mcf per day, 4%, from a November average of 4,288 mcf per day and down 19% from a December 2020 average of 5,085 mcf per day.

Hilcorp's Cannery Loop averaged 3,990 mcf per day in December, down 181 mcf per day, 4.3%, from a November average of 4,171 mcf per day and down 22.7% from a December 2020 average of 5,158 mcf per day.

see COOK INLET GAS page 4



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POD APPROVALS

•Rig workover on 1-29 well to fix production casing leak and return well to production;

•Conversion of 1-21 and 1-07A wells to gas injection for enhanced gravity draining recoveries;

•Increase injectivity on current water injection wells and convert wells to water injection;

•Perform additional workover operations as needed to enhance and maintain production; and

•Perform various non-rig wellwork operations to maintain and enhance production.

Key facility projects in the 40th POD include:

•Upgrade/repair SDI low flow test separator internals;

•Propane turbine demister install; and

•Facility turnaround for vessel cleaning and inspection, LACT meter upgrades, rotating equipment overhaul and repairs, retraying condensate stabilizer and flare inspection and repair.

Northstar unit

The Northstar unit was formed in 1990 and is jointly managed by the division and the U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement. There are four state leases and three federal leases, a total of 20,134.7 acres, and three participating areas, Northstar, Fido and Hooligan.

Northstar production from November 2020 through October 2021 increased from the previous POD, totaling 2.97 million barrels of oil and NGLs and 200 million cubic feet of gas. From November 2019 through October 2020 production totaled 2.28 million barrels of oil and 197.8 million cubic feet of gas.

Cumulative Northstar oil and NGL production through October 2021 was 186.7 million barrels and 3.209 bcf of gas.

Hilcorp had no new wells planned during the previous, 17th POD.

The company planned two projects:

•Converting Kuparuk oil pool producer NS-15 to an injector to increase gas injection; and

•Facility summer outage to perform planned maintenance.

The division said Hilcorp completed facility maintenance projects, including installing 45 heat pipes around modules to enable active ground refrigeration to reduce ground settlement, and ongoing repair of the island's coastal defenses.

The company did not convert NS-15 to an injector "due to an update in injection management strategy."

Northstar 18th POD

Hilcorp does not plan exploration or delineation drilling during the 18th POD but plans to install active refrigeration on 45 newly installed heat pipes and 41 converted thermosyphons as well as continuing repair of the island's coastal defenses.

The division said the company committed to long-range development activities:

•Exploring opportunity to import gas from Prudhoe for pressure maintenance of the Kuparuk reservoir;

•Reviewing potential coil tubing drilling candidates and determining if coil tubing operations are economically viable and mechanically feasible on the island; and

•Researching economic viability of Sag River development. The division that that might require stimulation techniques because of low permeability and porosity. ●

Contact Kristen Nelson
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ANS OUTPUT

from the main Alpine pool, Colville production includes satellite production from Nanuq and Qannik; production from Narwhal began in mid-December.

Badami, operated by Savant Alaska, a Glacier Oil & Gas company, averaged 964 bpd in December, down 8.9%, 94 bpd, from a November average of 1,058 bpd and down 40.6% from a December 2020 average of 1,622 bpd.

Hilcorp Alaska's Northstar averaged 8,310 bpd in December, down 1.1%, 92 bpd, from a November average of 8,402 bpd but up 20.3% from a December 2020 average of 6,910 bpd. Northstar has the highest percentage of NGLs on the North Slope, 42.1%, 3,501 bpd in December, down 4.6%, 168 bpd, from a November average of 3,670 bpd and up 181.4% from a December 2020 average of 1,244 bpd. Crude at Northstar averaged 4,809 bpd in December, 57.9% of the field's production, up 76 bpd, 1.6%, from a November average of 4,732 bpd and down 15.1% from a December 2020 average of 5,666 bpd.

The Hilcorp Alaska-operated Endicott field (the Duck Island unit) averaged 6,772 bpd in December, down marginally from a November average of 6,776 bpd, and down 6.2% from a December 2020 average of 7,219 bpd. NGLs were 14.2% of the field's production in December, averaging 960 bpd, down 61 bpd, 5.9%, from a November average of 1,021 bpd and up 0.4% from a December 2020 average of 956 bpd. Crude oil production at Endicott, 85.8% of the field's total, averaged 5,812 bpd in December, up 57 bpd, 1%, from a November average of 5,755 bpd but down 7.2% from a December 2020 total of 6,262 bpd.

Cook inlet down slightly

Liquids production from Cook Inlet, 99% crude oil, averaged 9,629 bpd in December, down 0.3%, 25 bpd, from a November average of 9,654 bpd and down

14.6% from a December 2020 average of 11,280 bpd.

Hilcorp Alaska's McArthur River field, Cook Inlet's largest, averaged 2,674 bpd in December, up marginally from 2,672 bpd in November but down 32% from a December 2020 average of 3,930 bpd.

Hilcorp's Granite Point averaged 2,560 bpd in December, up 0.8%, 21 bpd, from a November average of 2,539 bpd but down 11.8% from a December 2020 average of 2,904 bpd.

Redoubt Shoal, operated by Cook Inlet Energy, a Glacier Oil & Gas company, averaged 1,062 bpd in December, up 11 bpd, 1.1%, from a November average of 1,051 bpd. The field was not in production in December 2020.

Hilcorp's Trading Bay averaged 905 bpd in December, up 20 bpd, 2.3%, from a November average of 884 bpd but down 25% from a December 2020 average of 1,206 bpd.

BlueCrest's Hansen field averaged 825 bpd in December, down 26 bpd, 3%, from a November average of 851 bpd and down 11% from a December 2020 average of 927 bpd.

Hilcorp's Swanson River averaged 759 bpd in December (659 bpd of crude and 100 bpd of NGLs), up 9 bpd, 1.2%, from a November average of 750 bpd but down 18.2% from a December 2020 average of 927 bpd.

Hilcorp's Beaver Creek averaged 558 bpd in December, down 41 bpd, 6.9%, from a November average of 599 bpd but up 340.6% from a December 2020 average of 127 bpd.

Cook Inlet Energy's West McArthur River averaged 288 bpd in December, down 21 bpd, 6.7%, from a November average of 309 bpd; the field was not in production in December 2020.

ANS crude oil production peaked in 1988 at 2.1 million bpd; Cook Inlet crude oil production peaked in 1970 at more than 227,000 bpd. ●

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COOK INLET GAS

Hilcorp's Granite Point averaged 3,532 mcf per day in December, up 23 mcf per day, 0.7%, from a November average of 3,509 mcf per day but down 6.4% from a December 2020 average of 3,773 mcf per day.

Vision Operating's North Fork field averaged 3,296 mcf per day in December, up 309 mcf per day, 10.3%, from a November average of 2,987 mcf per day and up 5.4% from a December 2020 average of 3,126 mcf per day.

Hilcorp's Deep Creek averaged 3,157 mcf per day in December, down 9%, 312 mcf per day, from a November average of 3,469 mcf per day and down 9.7% from a December 2020 average of 3,496 mcf per day.

BlueCrest's Hansen field averaged 1,881 mcf per day in December, down 239 mcf per day, 11.3%, from a November average of 2,120 mcf per day and down 32.5% from a December 2020 average of 2,784 mcf per day.

Hilcorp's Trading Bay averaged 1,556 mcf per day in December, down 55 mcf per day, 3.4%, from a November average of 1,611 mcf per day, and down 30.9% from a December 2020 average of 2,250 mcf per day.

Hilcorp's Lewis River averaged 1,022 mcf per day in December, down 39 mcf per day, 3.7%, from a November average of 1,061 mcf per day and up 5.1% from a December

2020 average of 973 mcf per day.

Hilcorp's Seaview averaged 307 mcf per day in December, up 88 mcf per day, 40%, from a November average of 219 mcf per day. The field was not yet in production in December 2020.

Hilcorp's Nikolaevsk averaged 283 mcf per day in December, down 22 mcf per day, 7.2%, from a November average of 305 mcf per day and down 13.7% from a December 2020 average of 328 mcf per day.

Amaroq's Nicolai Creek averaged 267 mcf per day in December, down 148 mcf per day, 35.6%, from a November average of 415 mcf per day and down 29.8% from a December 2020 average of 381 mcf per day.

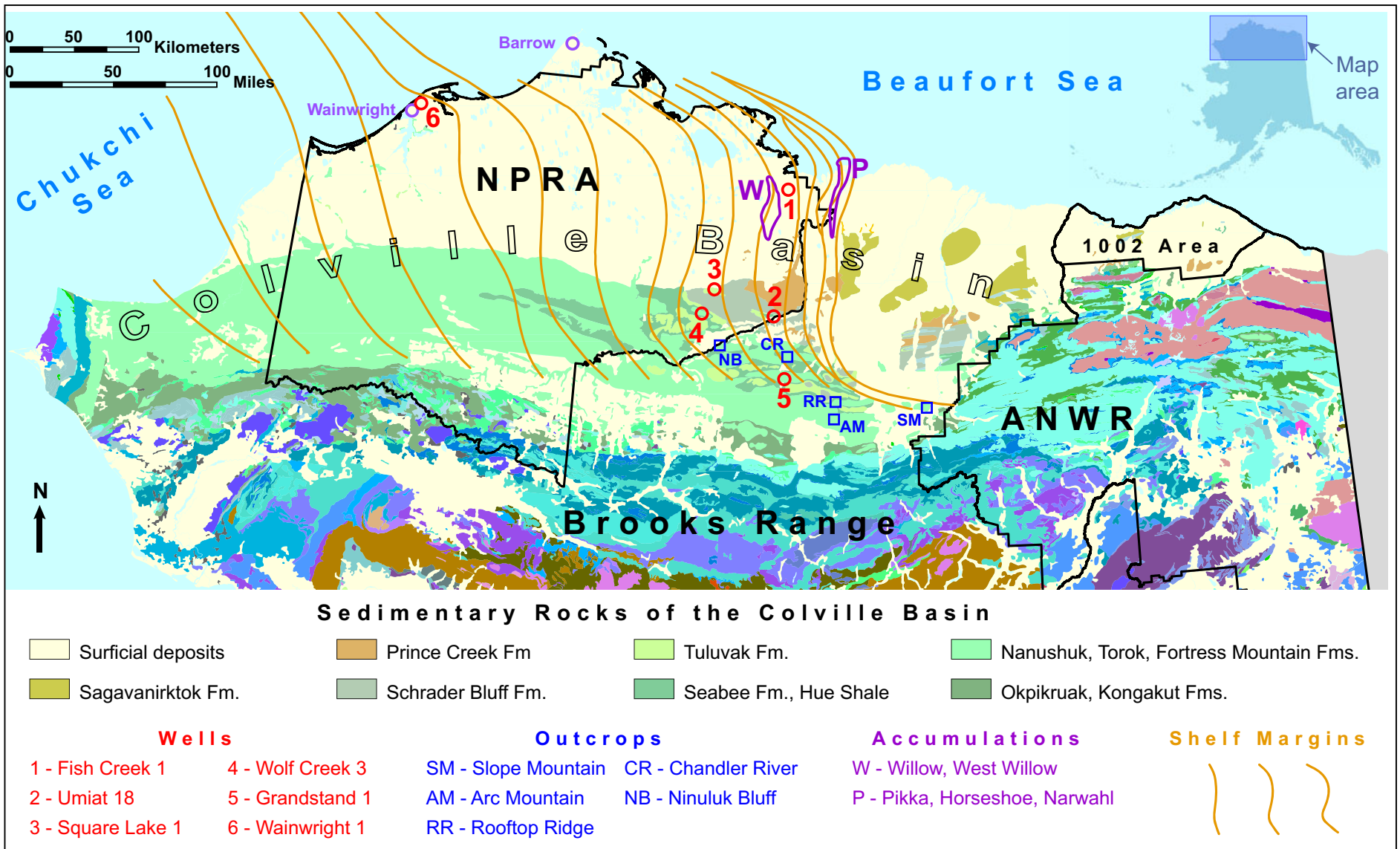
Redoubt Shoal, operated by Cook Inlet Energy, a Glacier Oil & Gas company, averaged 222 mcf per day in December, up 9 mcf per day, 4%, from a December average of 213 mcf per day. The field was not in operation in December 2020.

West McArthur River, also operated by Cook Inlet Energy, averaged 57 mcf per day in December, up 4 mcf per day, 7.8%, from a November average of 53 mcf per day. The field was not in operation in December 2020.

Cook Inlet natural gas production peaked in the mid-1990s at more than 850,000 mcf per day.

—KRISTEN NELSON

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A map of Alaska's North Slope illustrates the manner in which the margin of the Colville Basin migrated across the region as the basin filled with sediment. Rocks of the Nanushuk formation are exposed in the area of the Brooks Range foothills. Scientists from the Division of Geological and Geophysical Services researched Nanushuk rock samples from a number of wells and rock outcrops.

● GEOLOGY

The intricacies of Nanushuk geology

DGGS releases reports describing and characterizing the rock formation that hosts recent major North Slope oil discoveries

By ALAN BAILEY
For Petroleum News

Alaska's Division of Geological and Geophysical Surveys has published three new reports, describing in detail the geology and oil reservoir characteristics of the Nanushuk formation, the formation that hosts recent major new oil discoveries on the North Slope. The Willow, West Willow, Pikka, Narwahl and Horseshoe discoveries are all located in this formation. The DGGS scientists have used rock cores from wells drilled through the formation, and from rock samples collected from surface outcrops, to conduct their research.

In general terms, the sediments that now form the Nanushuk were deposited during the Cretaceous period, about 100 million years ago, down the sides and on the edge of an ancient marine basin, termed the Colville Basin, to the north of what is now the Brooks Range.

Riverborn sediment

The massive quantity of sediment filling the basin was carried by ancient rivers flowing into the region. The DGGS scientists say that the sediment deposition occurred in two large river delta complexes separated by a north-south trending area, referred to as the Meade Arch. To the west of this arch sediment was carried eastward by river systems originating to the west of current Arctic Alaska. To the east of the arch sediment carrying rivers flowed in a more south to north direction from the emerging Brooks Range. In both cases, major quantities of sediment were deposited in large river deltas on the edge of the basin. Sediment was also carried down the side of the basin and across the basin floor, as the basin filled.

The Nanushuk is particularly associated

The oil fields that have been discovered involve oil that has been trapped in sandstone layers by impervious rock strata above.

with these ancient river deltas. Sediments deposited deeper in the basin formed the Torok formation, a formation that lies under the Nanushuk although roughly contemporaneous in age.

Outcrops in the foothills

Along the northern foothills of the Brooks Range rocks of the Nanushuk are

found in outcrop at the surface along an area 30 to 50 km wide and 650 km in length, the DGGS scientists say. The lower part of the formation tends to consist of a succession of shale, siltstone and sandstone that would have been deposited in marine conditions, on a marine shelf associated with river deltas and the shore faces of the marine basin. However, these marine deposits grade upwards into a succession of mainly nonmarine sediments, including mudstone, coal, sandstone and conglomerate that would have been deposited in a river setting and in a river delta plain.

The oil fields that have been discovered involve oil that has been trapped in sand-

stone layers by impervious rock strata above.

Given the directions from which the Colville Basin became filled with sediment, the rocks of the Nanushuk become younger to the east. And as the basin filled, sediment that would form the Nanushuk eventually flowed north, over a major geologic high termed the Barrow Arch that runs roughly along the line of the current Beaufort Sea coast. To the east, under the northern North Slope, deposition of the Nanushuk stopped at the ultimate easterly shelf margin near the Colville River — in

see NANUSHUK GEOLOGY page 6

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EXPLORATION & PRODUCTION

US rotary drilling rig count 604, up by 3

Baker Hughes' U.S. rotary drilling rig count was 604 the week ending Jan. 21, a gain of three rigs over the previous week and up by 226 from a count of 378 a year ago.

When the count dropped to 244 in mid-August 2020 it was the lowest the domestic rotary rig count has been since the Houston based oilfield services company began issuing weekly U.S. numbers in 1944.

Prior to 2020, the low was 404 rigs in May 2016. The count peaked at 4,530 in 1981.

The count was in the low 790s at the beginning of 2020, where it remained through mid-March, when it began to fall, dropping below what had been the historic low in early May with a count of 374 and continuing to drop through the third week of August 2020 when it gained back 10 rigs.

The Jan. 21 count includes 491 rigs targeting oil, down by one from the previous week and up 202 from 289 a year ago, with 113 rigs targeting gas, up by four from the previous week and up 25 from 88 a year ago, and no miscellaneous rigs, unchanged from the previous week and down by one from a year ago.

Thirty-seven of the rigs reported Jan. 21 were drilling directional wells, 544 were drilling horizontal wells and 23 were drilling vertical wells.

Pennsylvania (22) was up by two rigs from the previous week, while Louisiana (56), Oklahoma (50) and Utah (10) were each up by a single rig.

Texas (280) and Wyoming (15) were each down by a single rig.

Rig counts in all other states were unchanged week over week: Alaska (6), California (8), Colorado (12), New Mexico (95), North Dakota (27), Ohio (11) and West Virginia (11).

Baker Hughes shows Alaska with six rigs active Jan. 21, unchanged from the previous week and up by one from a year ago, when the state's rig count stood at five.

The rig count in the Permian, the most active basin in the country, was up down by one from the previous week at 292 and up by 104 from 188 a year ago.

—KRISTEN NELSON

continued from page 1

WOTUS APPEAL

impact state jurisdiction?

In 2006, in a previous WOTUS court case that ended up in the Supreme Court, the court issued a split decision, with the justices being divided between a relatively narrow WOTUS definition and a more expansive view. Following that case there has been continuing confusion over the WOTUS definition. In 2015, for example, the Obama administration expanded the definition, while the Trump administration subsequently shrank it. The Biden administration has been making moves to expand it again.

The legal case in question results from the decision in 2004 by a couple in Idaho to build a house in wet ground near a lake. After the couple had filled the building lot with sand and gravel, in preparation for construction, the Environmental Protection Agency ordered them to restore the building site to its original condition. The EPA claimed that the site included WOTUS wetlands subject to protection under the Clean Water Act.

In 2008 the couple sued the EPA in the Idaho District Court. After the District Court found in favor of the EPA, the case was appealed to the 9th

In accepting the case, the Supreme Court said that it will limit its review to the question of whether the 9th Circuit "set forth the proper test for determining whether wetlands are 'waters of the United States' under the Clean Water Act."

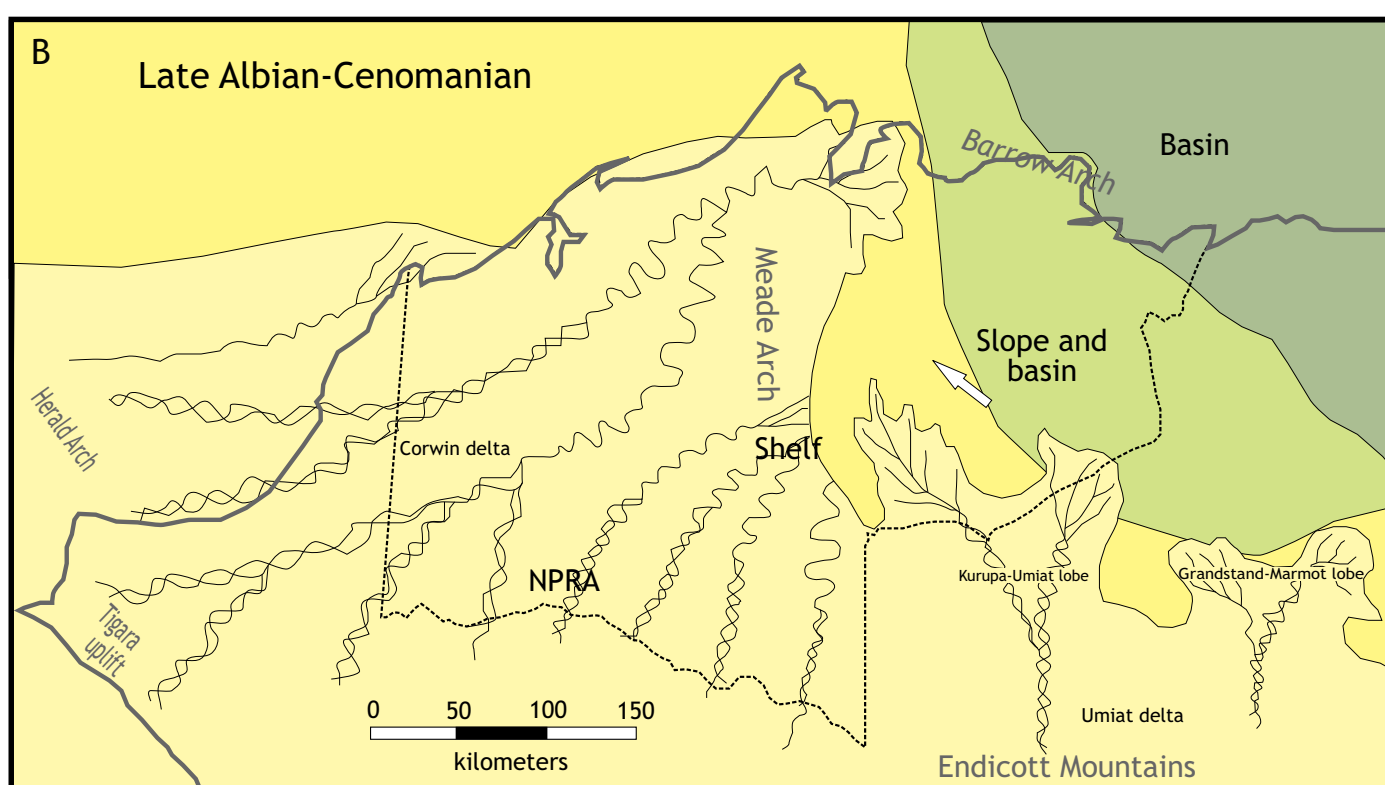
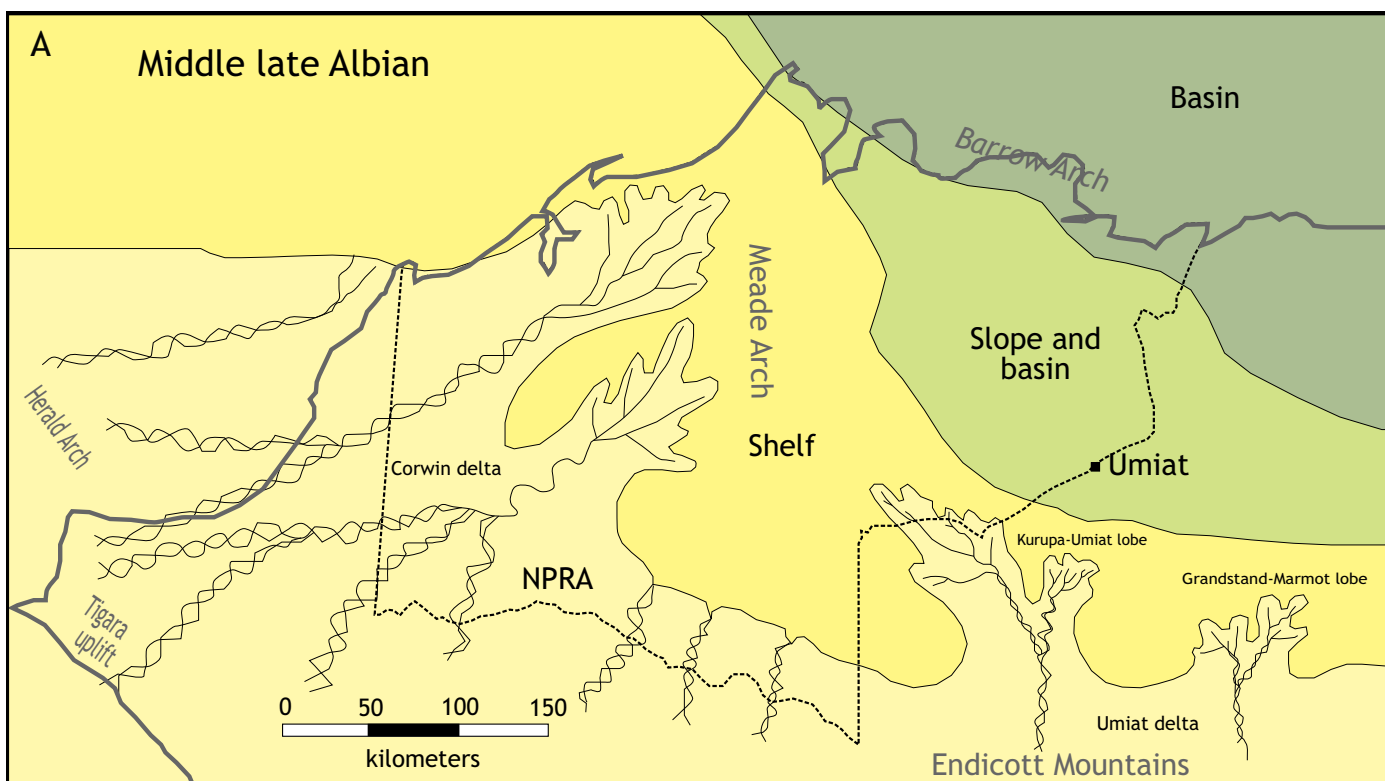
Circuit. Then, after the 9th Circuit upheld the District Court decision, the case was appealed to the Supreme Court. The 9th Circuit judges had commented that the wetlands encompassing the proposed building site are adjacent to a jurisdictional tributary feeding a waterway into a lake that is a traditional navigable waterway.

In October the State of Alaska joined the brief in the Supreme Court appeal.

In accepting the case, the Supreme Court said that it will limit its review to the question of whether the 9th Circuit "set forth the proper test for determining whether wetlands are 'waters of the United States' under the Clean Water Act."

—ALAN BAILEY

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Sediment that formed the Nanushuk formation was deposited from a complex system of river deltas on the edge of the Colville Basin, during the Cretaceous period. The shelf margin migrated as the basin filled. There were two river delta complexes, the Corwin delta and the Umiat delta, on either side of the Meade Arch.

continued from page 5

NANUSHUK GEOLOGY

the northern part of the North Slope rocks of the Nanushuk and Torok are not found east of this area. The major oil discoveries have been made in the area of the Colville River delta and to the west, in the National Petroleum Reserve-Alaska.

Evaluating reservoir quality

An evaluation of microscope slides of rocks obtained from well cores and rock outcrops has enabled the DGGs scientists to determine the detailed content and characteristics of the rocks, and hence their likely origins and their oil reservoir qualities. In general the reservoir quality encompasses a wide range from very poor to excellent. The scientists found that the reservoir quality of the sediments improves with increased grain size, with the grain size likely being linked to the energy of the river system that deposited the grains.

However, the reservoir quality is also linked to the depth of burial of the rocks, with deeper burial resulting in greater compression and, hence, lower porosity and permeability. Using rock samples where the rock grains were minimally cemented by carbonate minerals, the DGGs scientists were able to establish approximate numerical correlations linking porosities and permeabilities to maximum rock burial depths.

Thus, the reservoir quality of a Nanushuk sandstone body is largely controlled by the local environment in which the sand was deposited, and by the more regional impact of the maximum depth to which the rock has been buried.

Uncemented or lightly cemented sandstones can have porosities as low as 10% to 15% or as high as 45%, depending on the grain size. However, deep burial in excess of 10,000 feet at some point in the rock's history would likely reduce the porosity to less than 10%, the DGGs scientists say. Similar parameters determine the rock's permeability, the scientists have found. ●

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PRODUCTION UP

production was up 5% at Greater Prudhoe Bay, growth attributable to well and facility optimization efforts. He said one of the ways Hilcorp, which took over as Prudhoe operator midyear 2020, has improved production is to ensure facilities are working at capacity. This affects processes such as water and gas handling, and he said “one of the miracles” of what Hilcorp has achieved is that by ensuring facilities work at capacity, the company has been able bring on some wells that couldn’t be produced in the past because of the amount of water and gas those wells produced.

And at Point Thomson, operator ExxonMobil (handing over to Hilcorp beginning this January) has walked through a lot of fascinating challenges over the past six years, Umekwe said, including creating first-in-class equipment, such as compressors, and working through the issues with that equipment, with a result that wells at the field are now consistently online.

Milne Point production was up 20% over the period, Umekwe said, due to consistent drilling efforts by operator Hilcorp.

And at Point Thomson, operator ExxonMobil (handing over to Hilcorp beginning this January) has walked through a lot of fascinating challenges over the past six years, he said, including creating first-in-class equipment, such as compressors, and working through the issues with that equipment, with a result that wells at the field are now consistently online.

Fields seeing decreases include Kuparuk River, where operator ConocoPhillips Alaska essentially held production flat at FY20 levels, a small decrease given the size of the asset, Umekwe said.

At Greater Mooses Tooth 1 in the National Petroleum Reserve-Alaska, also a ConocoPhillips field, production has dropped by 50%, and reservoir challenges persist.

Decline at Eni’s Oooguruk is due to the absence of drilling since 2016.

Update on key future projects

Umekwe provided an update on key future projects, three at ConocoPhillips Alaska’s Colville River unit:

- Six wells are planned at Fiord West Kuparuk, with Doyon 26, a new rig constructed to do the extended reach drilling needed for this project, currently drilling and production estimated to reach some 20,000 bpd.

- CD5 is in its second expansion, which is ongoing, with three injectors drilled so far, and additional production estimated to reach more than 10,000 bpd.

- First oil was produced at Narwhal in December, with more drilling expected from CD4 and a new pad, CD8, projected to have from 20 to 40 wells and production estimates peaking at 32,000 bpd.

- GMT2 in NPR-A, another ConocoPhillips project, had first oil in November, with four wells drilled and production estimated to peak at some 30,000 bpd.

- Pikka, an Oil Search project, is planned for two-stage development, with phase 1 projected to start in 2025 with a

peak rate of 80,000 bpd.

- Willow, a ConocoPhillips project in NPR-A, is on hold pending litigation requiring a new Bureau of Land Management record of decision, with construction expected to start in the first quarter of 2023, first oil in 2025-26, and a peak rate of 130,000 bpd.

Access questions

The committee had questions about access issues on the Slope.

DNR Commissioner Corri Feige said Oil Search has opted to construct its own seawater treatment plant, and cited issues with the chemistry of water from the existing seawater treatment plant. The new and existing treatment plants will be side by side, she said, adding that for Willow ConocoPhillips will have to expand the Oliktok Point seawater treatment plant.

Feige said Oil Search always intended to construct its own processing facilities, with capacity beginning at 80,000 bpd and stepping up to 160,000 bpd.

Where there is “overlapping need and use” is with access roads, she said.

The companies are negotiating a commercial agreement for long-term access, Feige said, adding that these are state

resources being developed on state land. The state is prepared to step in, she said, as the issue is important to the state, which is monitoring very closely and engaging with both parties. Feige said the state would engage if the parties are not successful in reaching agreement.

This is the first time a party developing a new field is not a working interest owner in the unit or leases they need to cross, she said. In the past, with both parties having a working interest they’ve been able to arrive at a commercial arrangement.

Here, she said, the state is going back and taking a very close look at lease language because there is no exclusivity in access across state leases. It is clearly spelled out that other parties will be able to cross, and Feige said the state is looking at both lease language and unit agreement language.

Through statutes and regulations, she said, there is a path for the state to engage. ●

Contact Kristen Nelson at knelson@petroleumnews.com

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THETA WEST 1

testing operations on both the Lower Basin Floor Fan and Upper Basin Floor Fan.

Vertical test wells

Both the Theta West and Talitha wells are vertical test wells.

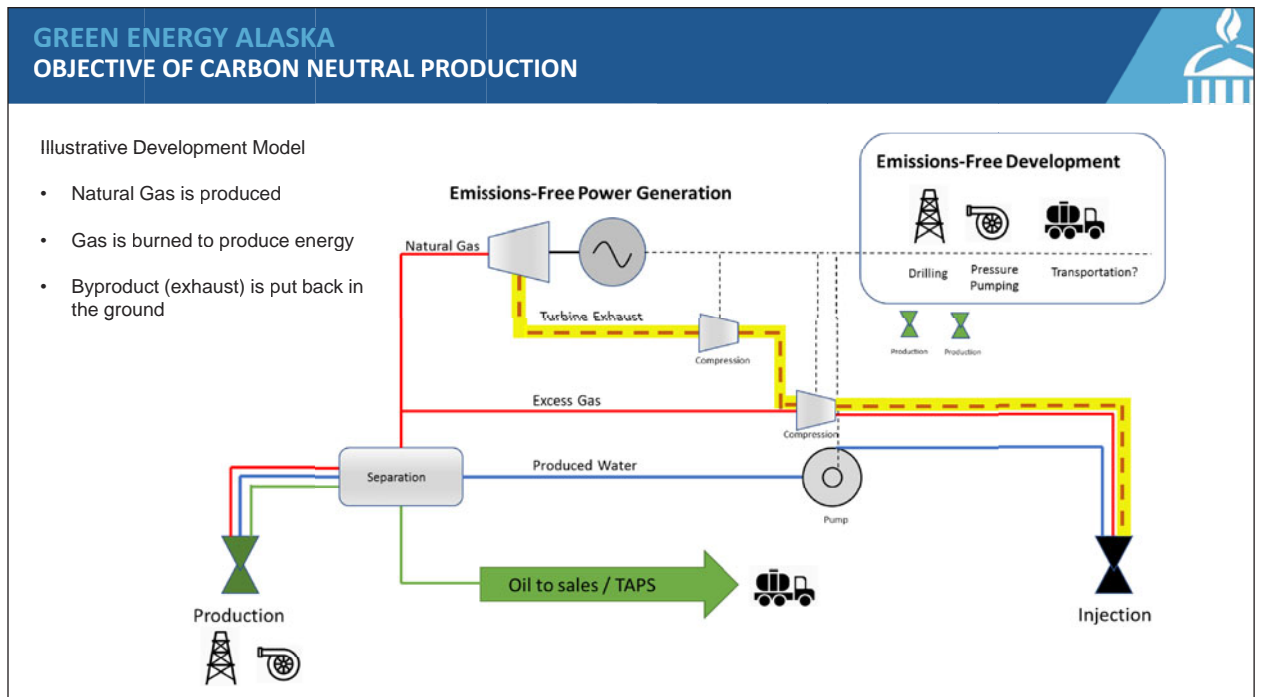
Pantheon said the objective of winter drilling and testing at Theta West and testing at Talitha is to determine reservoir deliverability — not about maximizing flow rates, as future production wells will be drilled horizontally, not vertically.

Pantheon wants to establish/prove the movability and quality of the oil.

There is a fracking unit and flow back testing equipment at Talitha A. Testing operations commenced over the weekend of Jan. 22 and 23, and will start from the lowest formation, the Lower Basin Floor Fan, before proceeding sequentially to the two shallower Slope Fans (which will be tested together) and the Shelf Margin Deltaic horizons.

A coiled tubing unit used for flow testing operations will mobilize to the location after fracking is finished.

Talitha A, which was drilled in 2021, encountered five independent oil horizons, including Kuparuk at the deepest level. (Testing starts at the deepest level and moves up.)



The company had a lot of problems in the Kuparuk zone last winter, but Pantheon executives said they think they understand now what went wrong. But with 2 billion barrels to test in the horizons above the Kuparuk, they have elected to drill a well sometime in the future to test the Kuparuk, likely choosing a better location for doing so.

Pantheon said independent “Volatiles Analysis” undertaken by Advanced Hydrocarbon Stratigraphy / Baker Hughes took 416 cuttings during the drilling of Talitha A over a 3,700 foot section covering the five horizons, with each and every sample confirming the presence of oil.

see THETA WEST 1 page 9

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OIL PRICES

cases in advance of the Winter Olympics, which opens Feb. 4. That action may accelerate; a Jan. 26 ABC report said China has announced dozens of cases detected among Winter Games personnel.

Additionally, Chinese factories are shutting down for the Chinese New Year holiday — officially the first week of February, but practically, the shutdowns last several weeks. Indeed, the 55-cent premium of ANS over Brent Jan 26 is smaller than it has been lately — averaging over a dollar since omicron emerged.

Supply-wise, global oil supplies are tight, exacerbated by the failure of the Organization of the Petroleum Exporting Countries and its allied producing countries to meet announced oil production increases to ratchet back curtailments imposed at the onset of the pandemic.

In December, OPEC+ added only 250,000 barrels per day, 40% shy of the 400,000 bpd the group had planned, according to the International Energy Agency.

The problem is ongoing. OPEC+ production is now running 790,000 bpd below its target production rate, the IEA said.

Wild cards in the deck

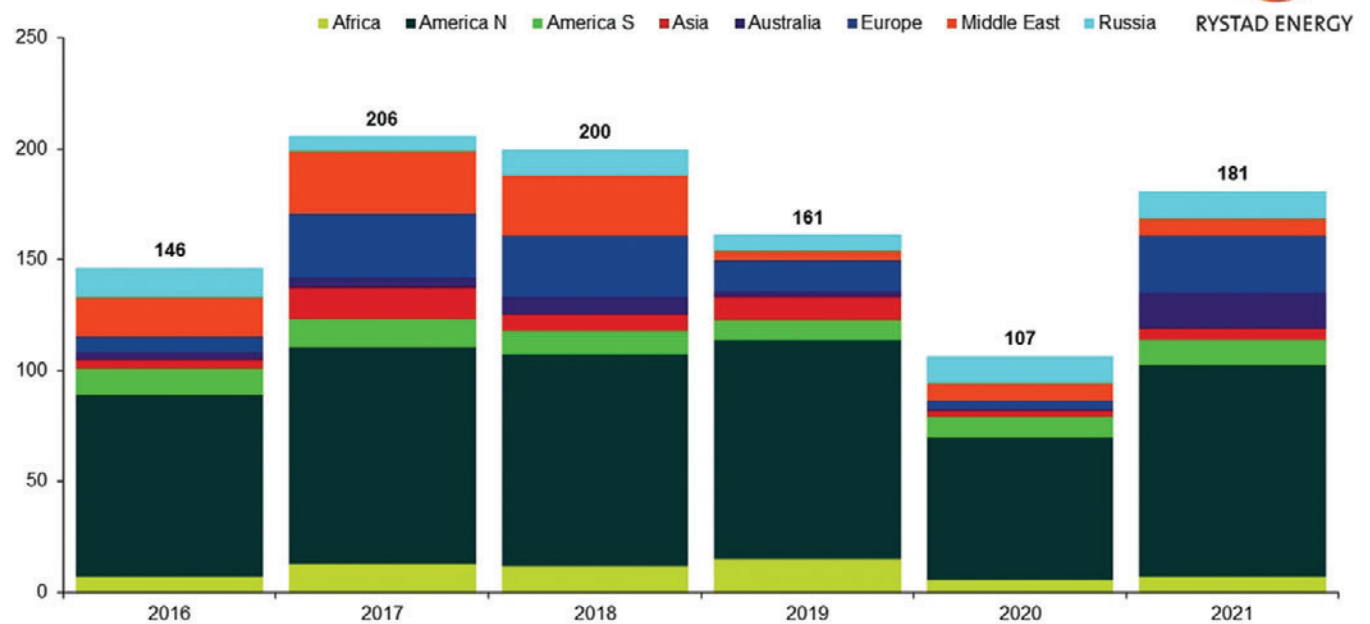
Beyond the structural issues of supply and demand, wild card events loom possible in the future, adding uncertainty for the direction of oil markets.

Futures markets have been influenced by escalating tensions between Russia and the West as Russia rattles sabers along the borders of Ukraine.

The emerging crisis raises political risk premium, Velandera Energy Partners CFO Manish Raj told MarketWatch.

Annual upstream M&A deal value by continent

Billion USD



“Whereas the Russian-Ukrainian crisis directly affects the regional natural gas prices, crude oil prices are generally aloof, since little Russian oil transits through Ukraine,” he said. “Still, the possibility of an armed conflict is a serious development, and has wide geopolitical ramifications, thereby boosting oil price premiums.”

An energy-centric crisis that isn’t Middle East-focused is unusual, Simon Henderson, director of the Bernstein Program on Gulf and Energy Policy at the Washington Institute for Near East Policy wrote in a Jan. 24 opinion piece appearing in The Hill.

High oil prices are good for oil-rich countries but destabilizing for those that missed out on hydrocarbon wealth, he said.

“Salvation by Saudi Arabia — the stock solution to many energy crises in the past — is unlikely,” Henderson said. “Pumping at record levels, its ability to produce even more oil in the short term is limited.”

Iran talks stall

When talks about restoring the 2015 nuclear deal with Iran began in April 2021, there was optimism that Iran might restore oil production later in the year once free of U.S. sanctions on its oil imports. Those talks appear to be stalling.

Three U.S. State Department officials have departed or stepped back from the talks because they felt the need to be tougher on Iran, the Wall Street Journal

reported Jan. 24.

Goldman Sachs said in a Jan. 17 commodities research note that due to lack of progress in the talks, it is pushing back its estimate of a ramp up in Iran’s production to the second quarter of 2023.

Goldman said it now sees oil inventory draws narrowing but persisting into Q1 2022, with the global surplus in Q2 2022 “smaller than seasonal” at 400,000 bpd.

By summer, Goldman expects Organization for Economic Cooperation and Development inventories to hit the lowest level since 2000, with OPEC+ spare capacity to hit historically low levels of 1.2 million bpd.

Prices fly; investment stalls

As oil prices climb, investment in new oil and gas projects has stalled as investors shun industries that produce fossil fuels and heavy carbon emissions, according to Michele Della Vigna, Goldman Sachs head of natural resources research.

Capital markets engagement on climate change has reached elevated levels, Della Vigna said in a Jan. 20 briefing.

“Because of this shift, the industry finds itself severely capital constrained on traditional hydrocarbon investment in different ways,” he said. “For smaller exploration and production companies it’s about getting

see OIL PRICES page 10

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THETA WEST 1

Alkaid 2 well next

Jay Cheatham, CEO of Pantheon Resources, said this winter's program of simultaneous operations at both Theta West 1 and Talitha A is a "first" for Pantheon.

"Following these wells, we intend to drill the Alkaid 2 well in spring/summer 2022 which, if successful, can commence production soon thereafter. These wells test very large targets and have the potential to be very material for all

shareholders," Cheatham said.

"The spudding of the Theta West 1 well marks another important day for Pantheon shareholders. As happened last year, our contractors have built the ice roads and drilling pads safely and on schedule. This has enabled us to have our equipment on both locations by mid-January, maximizing our time to complete our planned two well winter campaign," he said.

Throughout the Pantheon presentation, company officials pointed to the fact that Great Bear Pantheon's projects are located near, adjacent to and underneath the trans-Alaska oil pipeline infrastructure — "a major commercial advan-

tage over most other pre-development projects regionally."

The company's leases are all on state land and not close to any especially environmentally sensitive habitat, was also noted.

Finally, company officials also talked about their objective of carbon neutral production by reinjecting exhaust (carbon dioxide) back into the ground (see slide regarding this project in the pdf and print versions of this issue of Petroleum News). ●

Contact Kay Cashman
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Petroleum news

Oil Patch Bits

Kelly Droop named new COO for Colville

Dave Pfeifer, CEO of Colville Inc., said Jan. 25 he is pleased to announce that effective Feb. 2, Kelly Droop will become the company's chief operating officer. In her new role at Colville, Droop will manage day to day operations of the company's state-wide facilities and tanker truck fleet, which include North Slope, Kenai Peninsula and Fairbanks locations. The company operates year-round hauling and storing fuel, provides industrial supply and retail automotive parts through its Brooks Range Supply and NAPA stores, and owns and operates Brooks Camp in Deadhorse, all primarily for oil and gas industry customers.

"It is rare nowadays to find the talent, education and depth of experience that Kelly has. We are extremely pleased to have added her to our leadership team," said Pfeifer.

Droop's background includes over 32 years of oil field experience. Most recently she was the VP of Alaska field services for Worley.

Droop serves on three industry focused nonprofit boards and is the current president of the Alaska Support Industry Alliance.

For more information contact Dave Pfeifer at dave@colvilleinc.com or 907-952-8319



KELLY DROOP

Calista Corp. allocates remaining CARES Act funds

As reported on calistacorp.com Jan. 18, Calista Corp. has coordinated the remaining CARES Act tribal relief funds to provide meaningful impact to shareholders in the YK Region — through food security, ice roads — and to those experiencing homelessness.

In August 2021, Calista received \$12.2 million in CARES Act funding, about 2% of the funds were set aside for Alaska Native corporations, and they had to dedicate the use of these funds by the end of December 2021. The board directed up to \$11.4 million — or 93% — to be available for direct financial assistance to shareholders. The board also directed \$10,000 to purchase fish for distribution to lower Yukon River communities experiencing a



COURTESY CALISTA CORP.

salmon disaster.

Each shareholder who applied and qualified for Calista CARES Act financial assistance by the Nov. 30 deadline received a \$325 distribution. Nearly 80% of shareholders applied and qualified by the deadline.

The board directed Calista staff to determine an appropriate way to spend any CARES Act funds remaining after the financial assistance program ended, meeting strict U.S. Treasury requirements for the use of these funds. As a result, this winter, Calista entered into agreements with nonprofits for the following projects: \$17,000 for holiday food distribution for residents in Bethel and surrounding villages via Bethel Community Services Foundation; \$1.6 million for extensive food security program via BCSF; \$185,000 for Kuskokwim ice road via the Native Village of Napaimute; \$500,000 to support purchase of the Sockeye Inn in Anchorage to help those experiencing homelessness, via the Rasmuson Foundation.

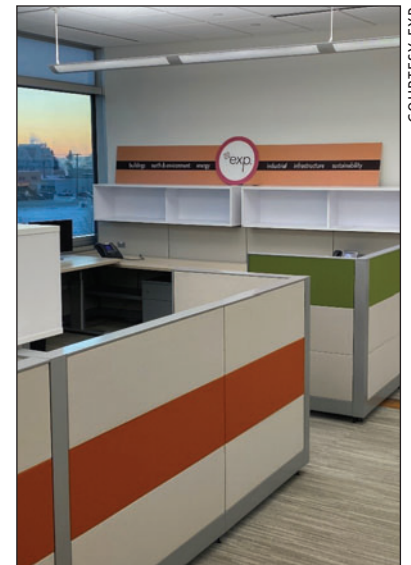
"Our mission has always been to provide Shareholders with benefits and opportunities. CARES funding has allowed us to provide some additional support to our Shareholders during this ongoing pandemic," said Andrew Guy, Calista Corp. president/CEO.

For more information visit www.calistacorp.com.

EXP announces new Anchorage office location

EXP Energy Services said recently that it has moved its Anchorage office to 725 E. Fireweed, Suite 300, located in the CIRI Fireweed Business Center.

EXP has continuously operated in Alaska since 2009 providing environmental, regulatory, engineering and geomatics services. With more than 50 years working in the energy industry, EXP is a multidisciplinary engineering, architecture, design and consulting firm with more than 90 locations. EXP offers full-service engineering, environmental regulatory and permitting, as well as integrity management services for energy and resource projects, with a proven track record of delivery focused on results. For more information visit www.exp.com.



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GEOTHERMAL BILLS

the fact that modern technology enables the production of geothermal energy from lower temperature resources than had been possible in the past.

Key changes

To better align the geothermal statutes with those for oil and gas exploration, under the revised statutory language proposed in the bill a prospecting permit would in future be termed a prospecting license. To encourage new exploration, the maximum possible land area encompassed by a prospecting license would be increased to 100,000 acres relative to the current maximum of 51,200 acres for a prospecting permit. In addition, a prospecting license would be able to run for five years, rather than for the two-year duration of a prospecting permit.

As with an oil and gas exploration license, there would be the possibility of converting a geothermal prospecting license to geothermal leases, if the licensee can demonstrate the completion of work commitments and the development of an acceptable exploration plan.

The existing statutes for geothermal land leasing would not change — as with oil and gas leasing, the state can conduct periodic geothermal lease sales for prospective state land. However, the rules for the unitization of leases would be brought into alignment with those for oil and gas. The issuance of geothermal leases confers exploration and development rights on the leased land.

Apply only to commercial operations

Under the proposals, a prospecting license would not be required for the exploration and development of geot-

hermal resources for domestic, noncommercial or small-scale industrial use. However, a current provision giving surface landowners preferential rights for geothermal exploration under their lands would be eliminated.

No impact on water rights

Committee members expressed some concern regarding whether the revised statutes might impact a surface property owner's water rights, should a nearby geothermal development be approved. During a follow-up committee meeting on Jan. 24 to address this issue state officials assured the committee that there would be no conflict between any geothermal development and water rights — geothermal water typically comes from much deeper levels than potable water and contains contaminants that render it unsuitable for drinking. Moreover, water rights would have priority.

During the Jan. 21 meeting Steve Masterman, director of the Division of Geological and Geophysical Surveys, also commented that a surface owner's use of heat pumps would not be impacted — heat pumps tend to operate at very shallow depths relative to the typical depths in excess of 1,000 feet of commercial geothermal resources, he said.

Alaska geothermal resources

Alaska has known geothermal resources in several regions of the state. The challenge is to establish commercial viability for a development, especially if the resources are located far from a significant demand center for electrical power.

Over the years there has been interest in the geothermal potential of state land on the flanks of Mount Spurr, an active volcano on the west side of the Cook Inlet. The volcano presents an obvious potential source of geothermal energy, while its location, only around 40 miles from

the nearest point on the Railbelt electricity grid, offers the possibility of generating electricity for the Railbelt.

Last year the state issued two prospecting permits for geothermal exploration on the southern flank of the volcano.

In 2009, following the acquisition of leases in a Mount Spurr geothermal lease sale, geothermal company Ormat Technologies conducted geothermal exploration in 15 state leases covering a fairway on the south side of Mount Spurr. The company drilled three boreholes, on the southeastern side of the mountain some distance from the volcanic crater but failed to find a hot water source. The company formally discontinued its exploration program in 2015. The new prospecting permits encompass land and geothermal prospects not tested by Ormat.

The state has also conducted geothermal lease sales for Augustine Island on the west side of the Cook Inlet. The volcano that forms this island presents potential geothermal resources but is distant from the nearest point on the Railbelt grid.

Other areas of interest include the Pilgrim Hot Springs, a known potential geothermal resource near Nome.

A geothermal system at Chena hot springs in the Interior has supported local power generation for a number of years. And a new geothermal power generation system is being developed on the eastern flank of the Makushin Volcano in the Aleutian Islands, to provide power for Unalaska and the port of Dutch Harbor. There are also a number of locations of known geothermal resources in southeast Alaska.

—ALAN BAILEY

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AUTHORITY DISPUTE

The current decision may be appealed for reconsideration within 20 days, and if reconsideration is denied, the decision may be appealed to Alaska Superior Court.

January petition denial

French argued in the hearing, as he did when he was commission chair, that the commission should take action on the leak, based on his belief that the commission has statewide authority over waste.

On its website, AOGCC says: "The Commission acts to prevent waste, protect correlative rights, improve ultimate recovery and protect underground freshwater."

French argues for a dictionary definition of waste.

The commission disagrees, saying in its Jan. 20 decision: "Oil and gas conservation law, which developed in response to the rush to find oil, was aimed at practices by drillers that resulted in loss of recoverable hydrocarbons when wells were drilled inefficiently, gas was flared, and well spacing and production was done in a manner that dissipated reservoir pressure thereby reducing ultimate recovery from a reservoir. These kinds of practices were defined as waste."

The commission said it had no jurisdiction over the gas leaking in Cook Inlet because that gas had been sold to the operator, Hilcorp Alaska, by a third party onshore, and was being shipped out to the platform as fuel gas.

French cited the statute establishing the commission, which says: "The authority of the commission applies to all land in the state lawfully subject to its police powers, including land of the United States and land subject to the jurisdiction of the United States."

The commission has said its authority ends once oil or gas is metered and leaves the field where it was produced. French argues that because the commission's authority extends statewide, per its authorizing statute, it has authority over oil and gas in the state.

In its Jan. 20 decision, the commission said: "Nothing in the AOGCC's enabling act or its legislative history suggests that the Alaska Legislature intended to expand the AOGCC's authority to regulate wasteful uses of oil or gas after it has been produced and purchased." The commission also said it is not aware, and French has not cited, instances where any U.S. conservation agency "has exercised its authority to make a waste determination as to gas or oil which has been produced and become private property."

The commission said: "To expand its authority, as suggested by French, would mean that the AOGCC

would be extending its authority over cases like the Exxon Valdez tanker spill, a rupture in an Enstar Natural Gas Company's gas line that serves its residential or business customers, and even private consumers who are wasteful with the oil and gas they purchase."

That authority, the commission said, was not included in the enabling act passed by the Legislature.

Commission's investigation

On the investigation issue, James Regg, a senior petroleum engineer at the commission, testified on the investigation the commission did at the time the leak occurred in 2017 at the commission's December hearing on the petition.

Regg reviewed work done by the commission on the leak, which included gathering information on the source of the gas leaking from the pipeline going to Platform A in Cook Inlet.

That investigation determined the gas had been purchased by Platform A operator Hilcorp Alaska and was being shipped to the platform from shore.

—KRISTEN NELSON

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OIL PRICES

financing. For larger integrated oil and gas companies it's about decarbonizing."

Either way, companies can no longer scale oil and gas projects as in the past, he said. The resulting supply tightness "ultimately generates what could be one of the most interesting commodity up-cycles we've seen in decades."

In previous recoveries, the norm was a doubling of capex within two or three years, but in the current one, Goldman expects capex increases closer to 20% in two or three years, Della Vigna said. Due to political uncertainty, carbon intensive businesses are delaying and reducing investment decisions.

The phenomenon is not limited to oil and gas.

Shipping, oil and gas, cement, and steel companies are investing 40% less of cash flow than in their long-term history, he said. "If you reinvest 40% less of your cash flow, the result is you've got a lot more money to use for balance sheet strengthening — but that has already largely happened — dividends and buybacks, which clearly are increasing, and at some point, M&A."

"From a pure economic perspective, higher oil and gas

prices accelerate the energy transition," Della Vigna said. "They just do it in a way that can be disruptive from a social perspective."

M&A deals soar in 2021

Global upstream merger and acquisition deals rebounded to pre-COVID-19 levels in 2021, reaching \$181 billion, a 70% increase over 2020, Rystad Energy said in a Jan. 21 release.

"The total deal value for 2021 was the highest in three years and almost reached the highs seen in 2017 and 2018 of \$205 billion and \$199 billion, respectively," Rystad said.

Big deals made a comeback on high commodity prices and a strengthening market, the consultancy said. Deals of more than \$1 billion accounted for \$126 billion of the global total.

Of the \$1 billion-plus deals, 13 were company acquisitions together valued at around \$65 billion, it said.

"Two large Australia-focused mergers — one between Santos and Oil Search and another between Woodside Petroleum and BHP — contributed about \$22 billion, while other \$1 billion-plus company acquisitions were focused on North American assets," Rystad said.

In 2021 gas accounted for 56% of all traded resources,

up from 43% in 2020, while oil accounted for 31%, and natural gas liquids 9%.

"With a strong potential deal pipeline, continuous pressure on companies to transform amid a global push to lower carbon emissions while simultaneously delivering profitable oil and gas production, and an average oil price of above \$60 per barrel expected for 2022, the upstream M&A market is likely to stay active for the foreseeable future," said Ilka Haarmann, Rystad senior analyst.

The upstream M&A market looks set to continue to strengthen, with deals in the United States likely to remain a crucial driver of global deal value, Rystad said, adding that large sales in other regions may occur, particularly if majors continue to streamline portfolios.

"While resources under development and production can receive high values in the current environment, buyers appear to be more cautious about discovered resources," Rystad said. "Without larger changes in the macroeconomic environment, this discrepancy could persist."

A further steady increase in valuations for producing and under development resources appears unlikely, based on historical values, Rystad said. ●

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ENGINEERING AWARD

information on individual awards is available from the university:

Cryosphere Degradation Drives Change in Arctic and High-Latitude Streams, Ecosystems and Communities (LeeAnn Munk, principal investigator; Jordan Jenckes, co-principal investigator)

This project team will collaborate with industry and Native Alaska communities to enhance understanding of how climate change impacts in the Arctic cause alteration of freshwater and nutrient export to the coastal ocean. The project will also build capacity for community involvement in environmental monitoring while enhancing STEM visibility and availability.

How Ground Ice Loss Affects Slope Stability and Groundwater Flow in Arctic Watersheds (Kynan Hughson, principal investigator; LeeAnn Munk, co-principal investigator)

In order to evaluate how ground ice loss is destabilizing and transforming surface materials in the Wulik River watershed, and how these changes are affecting groundwater flow, this project will: quantify the physical characteristics of ground ice loss induced landslides and mass wasting in culturally and economically important stream watersheds using drone based photogrammetry; identify the links between these features and ground ice/groundwater content using electromagnetic geophysics; and determine how these rapidly emerging landforms are altering stream discharge patterns and water resources by measuring the extent of the saturated groundwater region at various mass wasted and unaltered field sites.

Assessing Seismic Hazard of Arctic Infrastructure in Degrading Warm Permafrost: A Case Study of Nome, Alaska (Utpal Dutta, principal investigator)

Permafrost, an essential footprint of Alaska at many high-latitude landscapes, is forecast to thaw extensively in the decades ahead due to climate warming at a rate much faster than anticipated.

This project aims to fill a vital knowledge gap by conducting multi-method geophysical and geotechnical investigations at selected strategic sites in the Nome, Alaska, area to map subsurface soil conditions and investigate ground shaking characteristics during earthquakes.

The results will help uncover the impact of degrading permafrost and improve the resilience of Arctic infrastructure during seismic events while also enhancing separate studies on the resilience of public infrastructure in the Arctic.

Data for Predicting a Changing Alaska: Terrestrial Imaging for Machine Learning of Spatio-Temporal Processes (Matthew Kupilik, principal investigator; Frank Witmer, co-principal investigator)



Above, ConocoPhillips Alaska President Erec Isaacson says a few words before the start of the presentations. Right, Chancellor Sean Parnell talks about the importance of the ConocoPhillips Arctic Science and Engineering endowment.

pal investigator)

Climate change is affecting Alaska disproportionately, with shifting precipitation, receding sea ice, increasing wildfires and thawing permafrost causing communities, engineers and decision-makers to rapidly adapt.

This project aims to develop a tool to allow Alaska researchers to combine continuous measurements from moderate resolution high temporal frequency satellite imagery with updated downscaled climate and domain specific data sets to build predictive models.

Crude Oil Toxicity to Arctic Copepods: When to Apply Chemical Herders and Burn (Patrick Tomco, principal investigator)

In the event of a remote oil spill in Arctic or Subarctic waters, on-scene responders must decide how best to recover oil in a manner that mitigates the potential damage to marine aquatic life.

This topic has gained priority interest by government agencies who establish knowledge gaps and fund oil exposure work to feed into their risk assessment models, and these efforts would leverage several new funding opportunities with meaningful student involvement.

The goals of this project are to develop new techniques to conduct and gain preliminary toxicity data on Alaska copepods exposed to water-solubilized burned oil residue and herded burned oil residue, and to leverage preliminary data and supplemental funds in new federal proposals.

Is Central Alaska Hot Enough for Our Energy Needs? Exploring the Wrangell Volcanic Complex as a Potential Geothermal Resource Using Geochemical and Surface Temperature Analyses (Claudia Cannatelli, principal investigator)

Alaska is fourth in the U.S. for per capita energy demand and could largely benefit from the utilization of geothermal energy, but most of the geothermal



PHOTOS BY TED KINCAID, UNIVERSITY OF ALASKA ANCHORAGE COLLEGE OF ENGINEERING

resources in the state are scarcely studied and virtually unexplored.

In central Alaska, the distribution of heat flow suggests that there is a high probability for geothermal systems to exist in the area, and the close vicinity to the Anchorage metropolitan area makes it an appealing target for geothermal exploration.

This research will use geochemistry to evaluate the properties of a potential geothermal reservoir (magma chamber) in the Wrangell Volcanic Complex and determine the depth and mechanism of primary fluid-melt interaction that occurred during magma ascent and ponding in the crust.

The recorded temperatures and measured volatile contents in MIs will also allow researchers to quantify the water

The new regiment of Arctic research includes projects on ice loss, climate change and geothermal energy.

input in the upper crust and estimate the potential for geothermal energy.

For more information about ConocoPhillips Alaska, visit www.conocophillipsalaska.com.

For more information about the University of Alaska Anchorage learn more at www.uaa.alaska.edu.

—KAY CASHMAN

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