# PETROLOG

## Field Copy

| | | | |
|---|---|---|---|
| COMPANY: Southern California Gas Company<br>WELL: Standard Sesnon 4B<br>FIELD: Aliso Canyon, Los Angeles County, CA<br>API#: 04-037-30460 | LOCATION: 34.314788 -118.571823<br>Sec.29 T3N-R16W SBB&M<br><br>ELEVATION: 2888'GL, 2910.5'KB | DEPTH: 103' to 10338'<br>DATES: 8/16/15 to 10/17/15<br>SPUD DATE: 8/17/15<br>UNIT #7<br>661-301-0607 | LOGGING GEOLOGISTS<br>Nick Mitchell<br>Jim Bean<br>John Williams<br>Ilir Minga<br>Rob Curren |

### PENETRATION AND PETROLOGY LOG

COARSE SAND
MEDIUM SAND
FINE SAND
GRAVEL
SANDSTONE %
SILTSTONE
CLAY
LIMESTONE
DOLOMITE
KAOLINITE
CLAYSTONE
SHALE
CHERT
PORCELANITE
VOLCANICS
WEIGHT ON BIT

### SHOWS

LIVE OIL
TAR

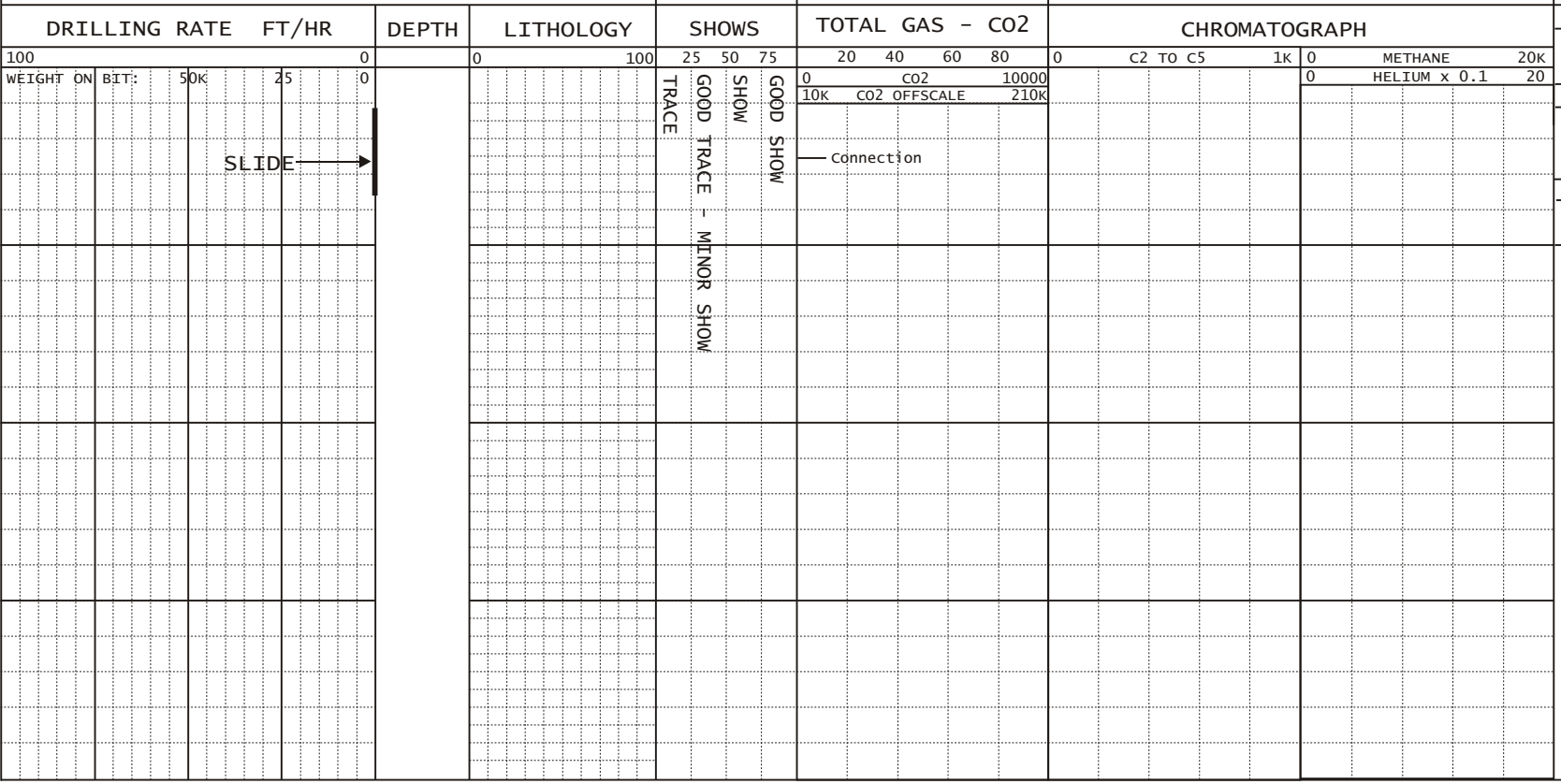
### PETROLEUM GAS LOG

AGITATOR
CUTTINGS
CO2
100 UNITS = 2% METHANE

METHANE (C1)
ETHANE (C2)
PROPANE (C3)
BUTANES (C4)
PENTANES(C5)
HELIUM

### DESCRIPTIVE LOG

| | | | |
|---|---|---|---|
| NB | NEW BIT | WOB | WEIGHT ON BIT |
| RR | RERUN BIT | RPM | REVS PER MIN. |
| TG | TRIP GAS | PP | PUMP PRESSURE |
| CG | CONN. GAS | SPM | STROKES/MIN. |
| WG | WIPER GAS | MW | MUD WEIGHT |
| SG | SURVEY GAS | VIS | MUD VISCOSITY |
| SWG | SWAB GAS | FTG | BIT FOOTAGE |
| SDG | SHUTDOWN GAS | HRS | BIT HOURS |

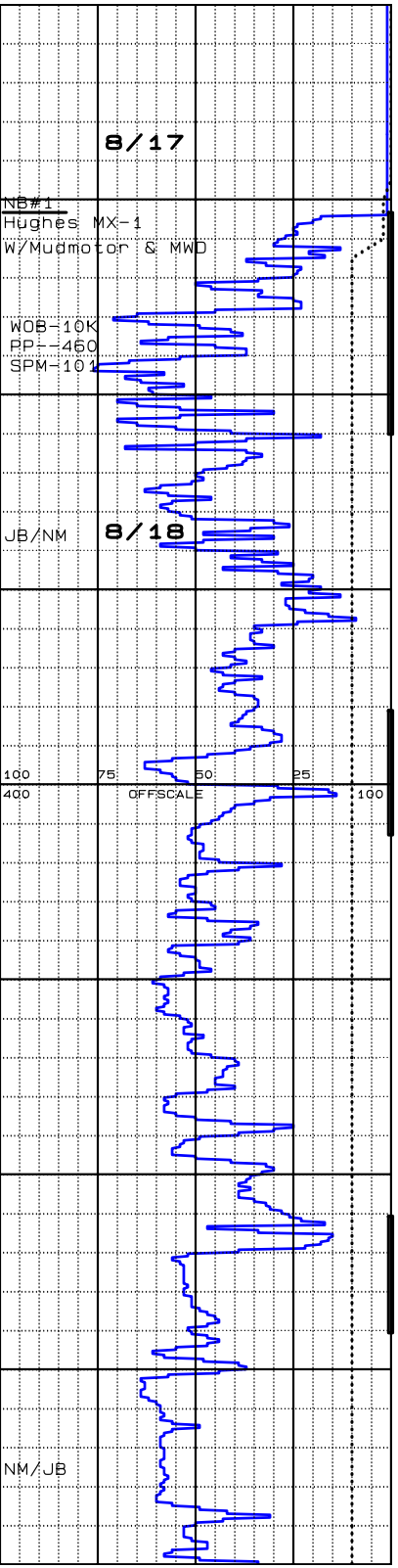


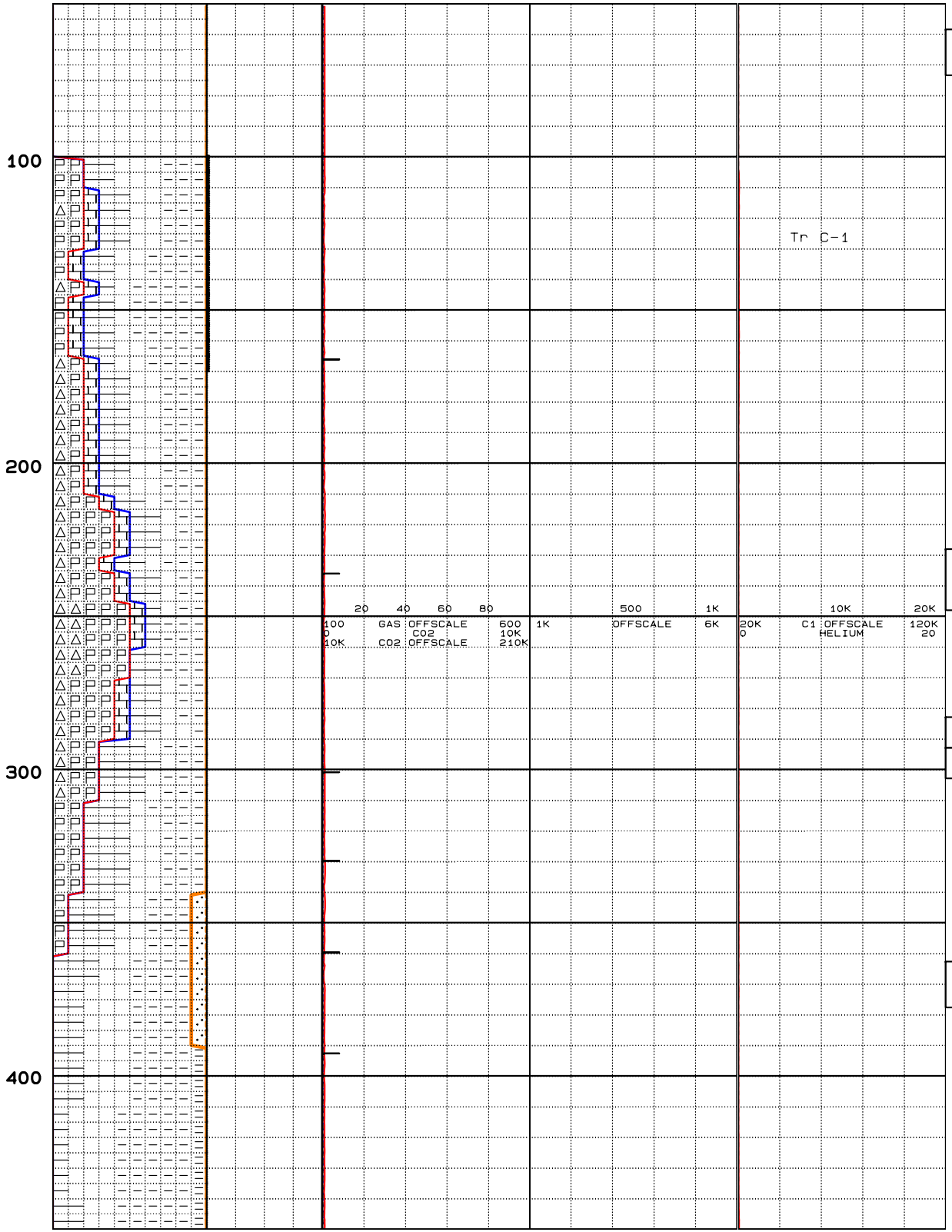

**CASING:**
13.375" @ 1436'
9.625" @ 8887'
7" Liner from 8695' to 9270'

**HOLE SIZE:**
17.5" to 1438'
12.25x14" to 9267'
8.5" to 9270'
6.125" to 10338'

**MUD TYPE:**
KCl/Polytek to 9270'
KCl GeoZan to T.D.

| | |
|---|---|
| GEOLOGISTS: | Steve Cardiff<br>Hilary Petrizzo |
| DRLG. REP.: | Kevin Katolas |
| ENGINEERS: | Todd Van de Putte<br>Mike Dozier |
| CONTRACTOR: | Ensign U.S. Drilling |
| RIG NO.: | 587 |
| RIG TYPE: | Top-Drive Triple |
| DIRECTIONAL: | Baker Hughes INTEQ |
| MUD COMPANY: | GEO Drilling Fluids |
| MUD PUMPS: | #1 Gardner-Denver PZ-10 6.5"x 10"<br>#2 Gardner-Denver PZ-10 6.5"x 10" |




On site @ 9pm 8/16/15.
Logging @ 8pm 8/17/15.

Shale: dk yelsh orng to mod yelsh brn, mod hard to hard, fair-strong fiss, porcel, Fe & Mn stns on fracs & bedding planes, thin Limestone intbds, tr gypsum veins, trace tar on bedding planes w/pale straw to no visible cuts.

Claystone: mod yelsh brn, orng brn, v firm to hard, blocky-sub blocky, argil to calc to silic w/intbdd Chert & Ls, sl traces tar staining on fracts.

Porcelanite: banded yelsh gry-creamy tan, yelsh white, occ mottled/banded w/ transl brn chert, hard-v hard, subblky-irreg cuttgs, occ conchoidal fracturing, sl calcareous, mnr thin Limestone interbeds, mnr yelsh gray mod sol Clay, tr drk microxln volc frags.

Began losing mud at 242', approximately 50 bbls/hr. Apparent full returns of cttgs.

Shale: dark yelsh gry, orangsh hues, yelsh brn, occ dk gry, sl hard-hard, mod fissility, platey-subplatey, sharp bedding contact w/ Porcelanite, mod calcareous.

Pumped sweep, full circulation

MW 9.1 Vis 39

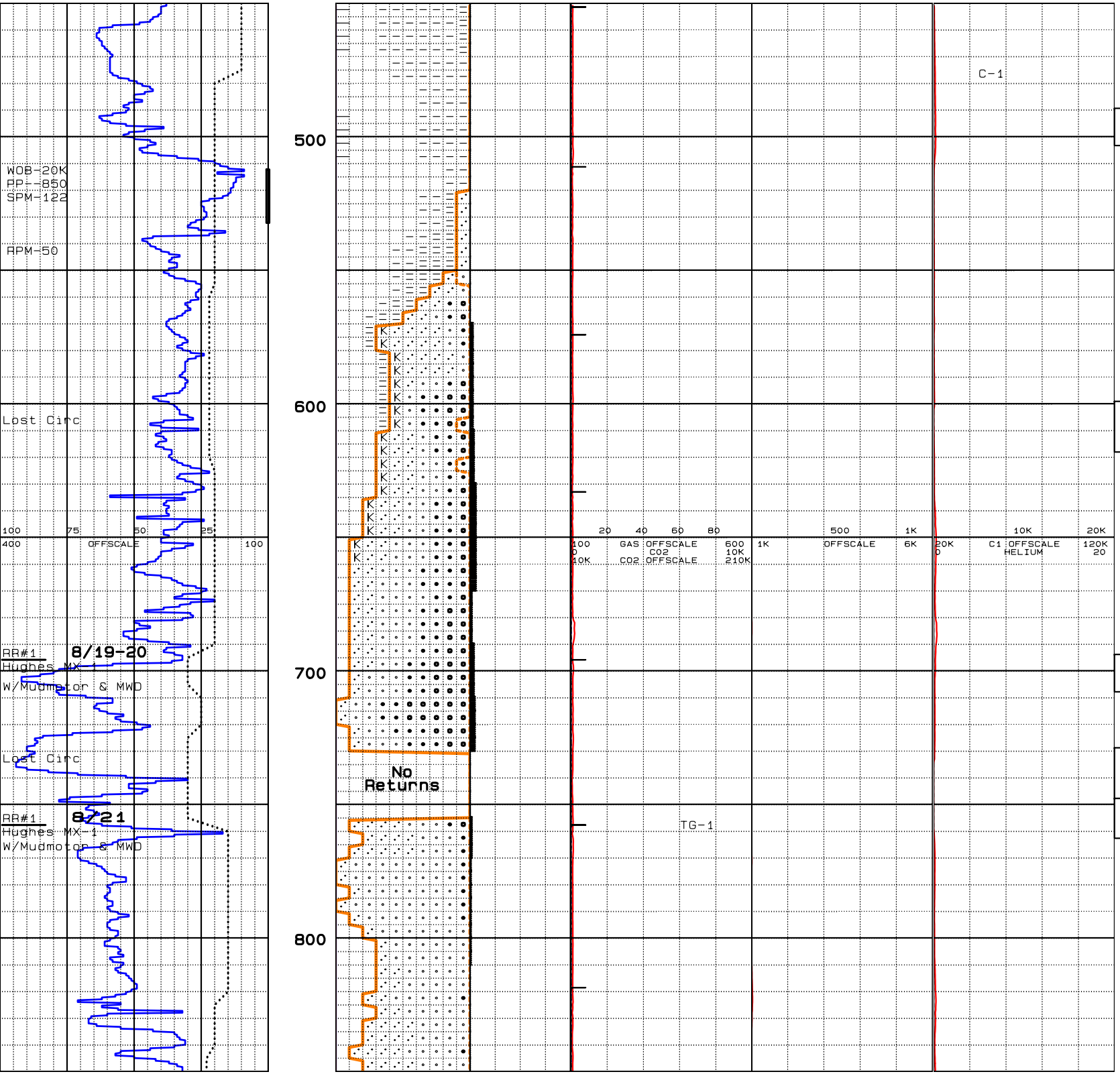
Shale: color change to v drk gray- grysh blk, firm-v firm, occ hard, subblky-irreg, sub-fiss, grades to nonfiss Claystone, mod-very calcareous.

Claystone: pred med gray hues, some lt gray, sl firm-firm, subblky-irreg cttgs, occ crumbly, grades to soft mod sol lt gray Clay, calcareous.

Survey @ 376' 0.8 deg 0.23 az TVD 375.9' 7.6'N 0.6'W

Clay: med-light gray hues, predom soft, occ sl firm, sl to mod soluble, non-sl sticky, mod calcareous.

Claystone: dk brownish gray-dusky yellowish brown, firm-hard, blocky-subblky w/rough irreg break, mod calc, sl-very argil, some grds to clay, occ silty, tr Ls & Porcel, few thin gray argil Clayst intbds w/ slight volc appearance.




Clay: med brownish gray, med-dk gray, mod firm-v firm, massive & structureless, v slowly sol, fairly well hydrated, mod plastic, sl silty in part, grds to Claystone.

Survey @ 499' 0.1 deg 155.4 az TVD 498.9' 8.3'N 0.5'W

Claystone: dark brownish gray, firm-sl hard, subblky, massive, calc in part, silty, tr Forams.

Clay: light-med gray, soft, slow soluble, sticky, sl calc in pt, sandy & occ silty, grds to argil Sandstone & Siltstone.

Siltstone: gray, firm-fria, sub-blocky, mod to very argil, grds to silty argil Sandstone.

Sand: clr-wht, gry & grn, lt gry overall, vf-cse, unconsol w/ some in soft clay matrix, ang-subrdd, qtz, feld, tr mica, slo wk pl yel cut flr, no vis cut.

Lost circ @ 606', drill w/part returns. Add LCM, 95% returns by 620' but still losing vol.

Sand: lt-med gray overall, vf-v cse & gran, predom qtz w/occ fled & few lithics, prly srtd, pred clean w/some in kaol Cly matrix, gen unconsol w/few calc cmtd interbeds, occ dull-brt yel sample fluor, fair fast yel wht cut fluor, no visible cut.

Clay: lt-dk gray, soft, slowly soluble, sticky & cohesive, massive, calcareous in part, mod well hydrated, occ sdy.

Drilled to 696' & Set 2 cement plugs. Drill ahead.

Gravel: multicol, gran to pbl size, unconsol, sandy, pred volc, granitic & meta clasts.

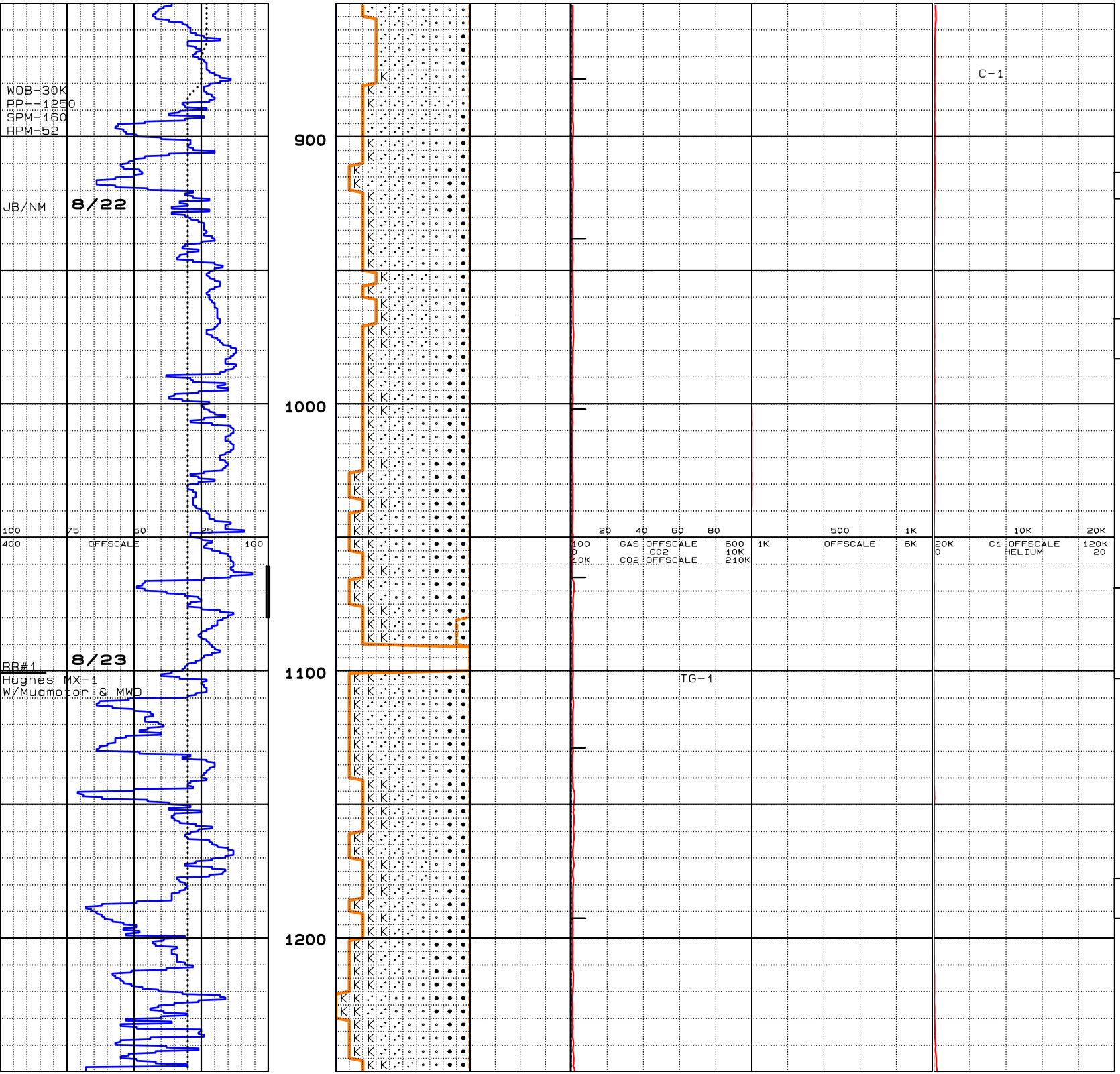
Lost circ @ 738'. Drill to 758' & set cement plug. Drill ahead.

Survey @ 742' 1.3Deg 166.0Az TVD 741.9' 5.0'N 0.87'E

Sand: clr-wht, occ gry & grn, lt gray overall, vf-cse, pred med, unconsol, some calc cmtd & mnr amts in Cly mtrx, pred qtz w/ occ mica flks, tr feldsp & v rare lithics, tr-few % yel smpl fluor, slow v fnt yel cut fluor.

Clay: light gray, soft, easily soluble, mod sticky, fairly w hydrated, sl-mod calc, vf sdy in part, some kaolinitic.

Sand: clr-wht, gray & occ grn, f-med w/few vf & cse grs.




Sand: lt-med gray overall, vf-cse w/most f-med, unconsol, sub ang to sbrndd, fair to mod w sorted, some w/Clay matrix, pred qtz w/occ feldsp & mica, v sl tr lithics.

Clay: lt gray w/rare fnt grnsh cast, some wht, soft, easily solu, sl-mod sticky, fair-prly cohesive, sandy, kaol in pt.

MW 8.8 Vis 39

Sand: pred clr-opaq qtx grs, lt gray overall, fine-med, some crse, rare v crse-pebb, mod sorted, ang-subrndd, mod amt biotite flks, tr fspar grains, pred unconsol, calc Clay matrix, some chalky non-hydrated Kaolin.

Survey @ 985' 12.2Deg 198.8Az
TVD 984.83' 0.6'N 0.6'E

Clay: med-light gray, lt grysh wht, pred soft, mod soluble, sl-med sticky, low plasticity, kaolinitc ip, calcareous.

Sand: lt grysh white overall, pred clr-opaq-milky qtz, some fine, pred med-crse grained, and-subrnd, mod well sorted, loose/unconsol, mnr biotite, tr pyrite, v sl tr lithics.

Kaolinite: off white, occ str-eaky gray, v soft-soft, non-sl sticky, crumbly, assoc w/ lt gray Clay matrix, mod calc.

Began losing mud @ 1067', drilled ahead to 1102' losing approx 60 bbls/hr. 1090'-1102' samples left in hole. Set cemt plug, drill ahead w/ aprox 20 bbls/hr loss.

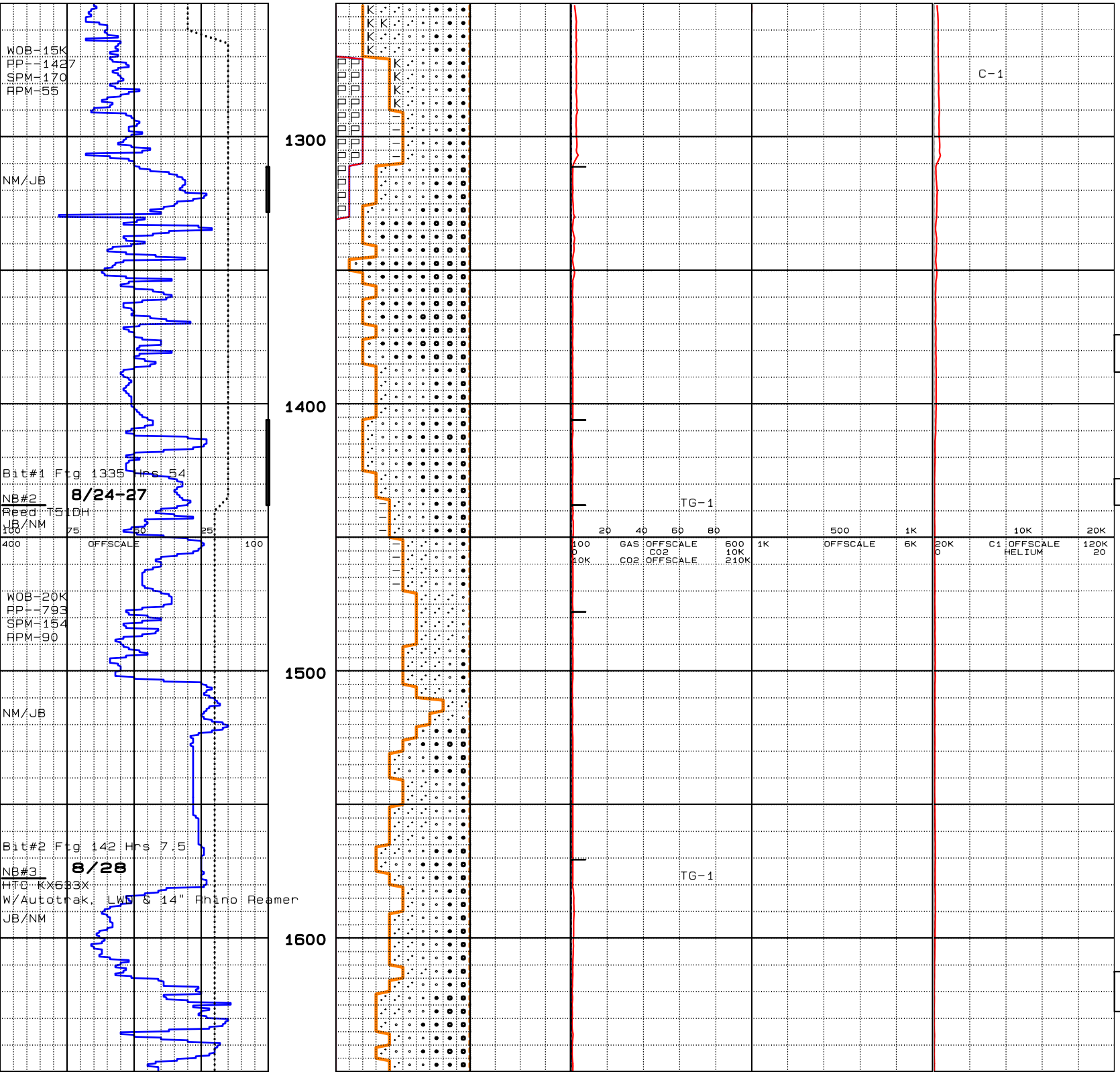
Sand: pred clr-opaq qtz grns, fine-crse, poorly sortd, sub-ang to subrnded, mnr drk mica flkes, tr lithics, lt graysh wht kaolinitic matrix, pred unconsol w/ occ pockets sl compacted, no vis oil indics.

Clay: med-light graysh hues, soft, mod-easily soluble, mod hydrated, sl sticky, low pla-sticity, amorphous, assoc w/ chalky wht-v lt gray Kaolin, mod calcareous.

Survey @ 1141' 0.22Deg 335.4Az
TVD 1140.8' 0.39'S 0.13'E

Kaolinite: off wht-occ streaky gray, soft, crumbly, clumpy nodules w/ fn sand entrained, poorly hydrated, stiff ip, non sticky, interbedded w/ unconsol fne-crse qtz Sand.

Clay: pred same as above, new appearance of grnsh gray-brn gray, v soft, well hydrtd.




Clay: med-light gray, occ w/ grensh gray cast, soft, sl-mos hydrated, mod soluble, mod sticky, sl tr brn hydrtd Clay mentioned above, mnr kaolin, some banded gry-yelsh gray Porcelanite, tr Chert in banded Porclanite, sl tr Ls interlaminated w/Porcelanite.

Sand: clr-wht, gry & occ grn, f-v cse becmng incr pbbly w/ depth, poorly sorted, ang-sb rndd, predom qtz & occ feldsp, scatt'd mica flakes & few lithic grains, unconsol w/very minor amts in soft Clay mrtx.

Gravel: gry-wht, clr, grn, pnk & blk grs, gran to pebbly, un-consol, subang to well rndd, predom quartz, occ feldsp & lithic grs.

Survey @ 1236' 0.38Deg 358.6Az
TVD 1235.8' 0.09'N 0.04'E

Clay: pale green, graysh grn, soft, slowly-occ mod solu, sticky & cohesive, massive, mod to very sandy, mod to well hydrated, predom noncalcareous w/few sl calc intbds, some grds to trcs frm waxy Clyst.

Set 13.375" casing @ 1436'.

Sand: clr-opaq-gray-occ grn-blk, fine-crse, some gravel, poorly sorted, ang-subrnd, pred unconsol w/ some compac-ted in Clay matirx, pred qtz and lithic frags.

Clay: pale grn-olv gray hues, soft to sl stiff ip, sl-mod soluble, poorly hydrated, vfn to fn quartz sand entrained, amorphous, clumpy, sl-mod st-icky, tr mica books, some med qtz and mnr lithic grains, weak-moderately calcareous.

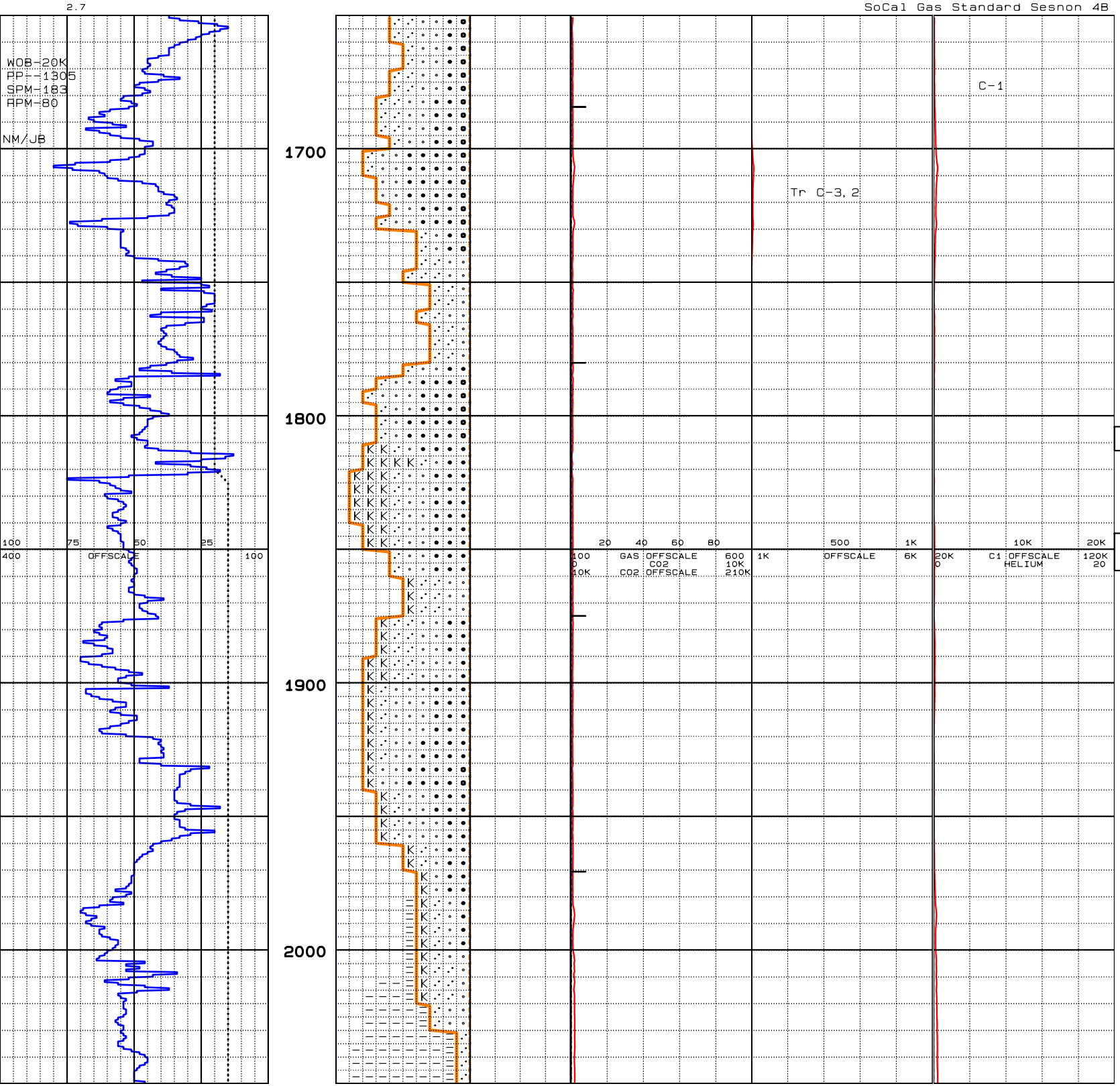
Sand: clr-wht, gry, grn & few multicol grs, f-gravelly, un-consol w/some in Cly mtrx, subang-subrndd w/occ w rndd, poorly sorted qtz, feld & few lithics & mica flks.

Clay: olive gray, grnsh gry, soft, v sticky & cohesive, massive, sl calcareous in pt, mod to very sandy.

Sand: clr-opaq-wht-gray-occ green grains, fine-crse grn, some well rounded gravel, pred subang-subrnd qtz, mnr fsapr and lithics, interbedded w/ mod calcareous Clay.

Survey @ 1648' 3.2deg 115.8az
TVD 1647.6' 3.89'S 7.24'E

Clay: olive gray-yelsh gray, soft, mod sticky, amorphous, sl calc, fine-gravelly grns.




Sand: clr-opaq-lt gray grains, some dark-grn-pink, lt gray overall, pred med-crse, some fine, tr lrg broken gravelly grains, poorly sorted, pred qtz, mnr meta lithics, subang to subrnd, occ well rounded.

Trace shell frags at 1700'.

Clay: lt-med gray, olive gray, pale yelsh brn, soft, slowly soluble, mod-v sticky, cohesive sl-mod calcareous, predom v finely sandy & silty, smooth to pred gritty text, earthy luster.

Clay: predom lt-med gray, soft, v sandy, v slowly solu, sticky, local traces bivalve shell frags, intbdd f-cse Sand.

Sand: clr-wht, gray, occ grn, few brn & blk grs, very fine to granular, pred subang-subrndd, qtz w/occ feldsp & lithic grs tr mica, unconsol, predom poorly to occ mod well sorted.

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Clay: pale yelsh brn, tr gray, com dull grysh wht, soft, slow-ly solu to insolu, noncalc in part, occ sandy, predom very kaolinitic.

Survey @ 1838' 4.5 deg 104.7az
TVD 1837.1' 8.26'S 20.31'E

Sand: clr-wht, occ gry, mnr grn grs, gray overall, vf-v cse w/ scatt'd granule sz grs, loose, ang-rndd w/most subang-sub rndd, finer fraction in soft Clay matrix, predom qtz & occ feldspar w/few lithic grs.

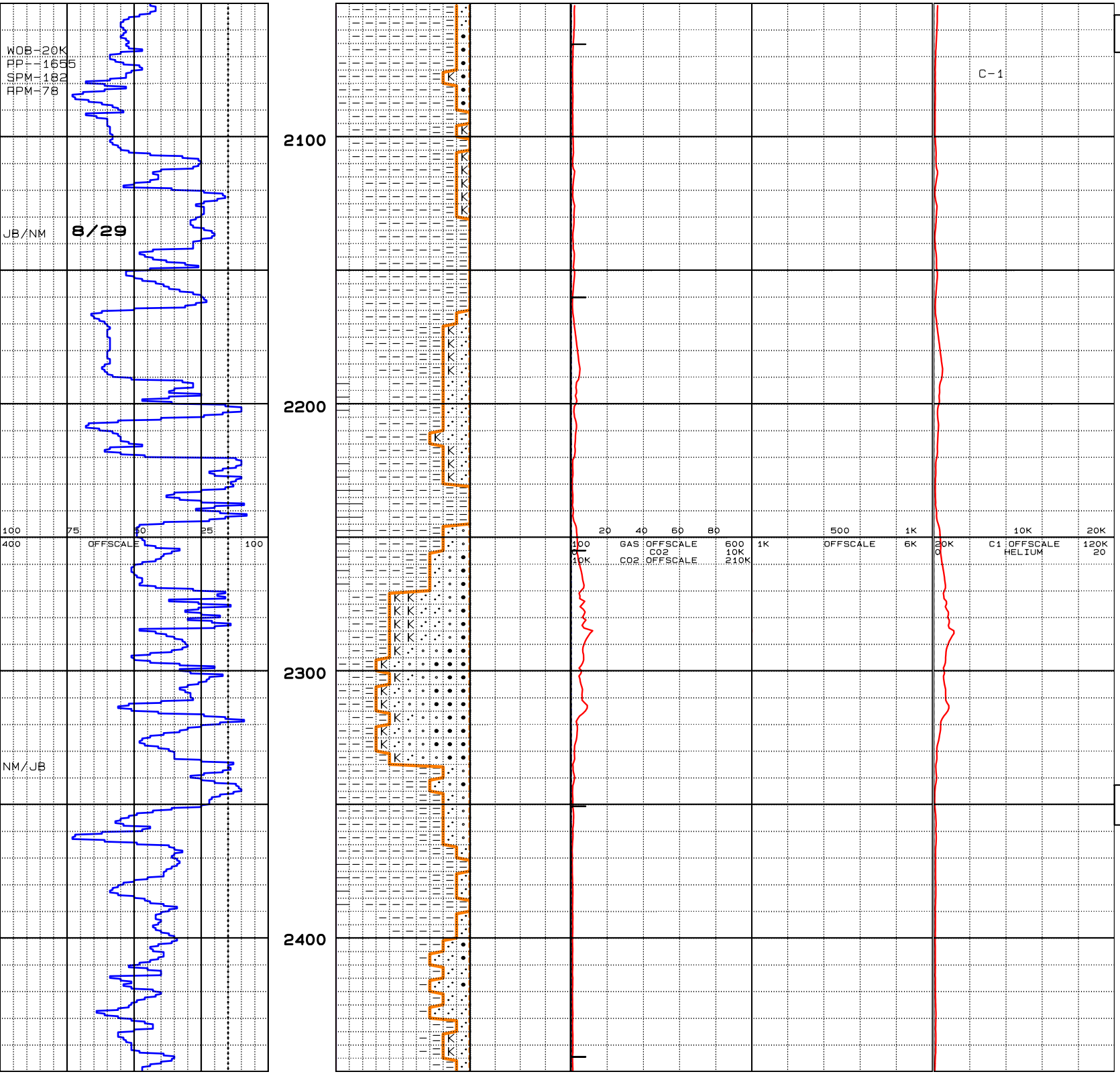
Kaolinite: dull wht-v lt gray, mod firm, v slowly soluble w/ mnr amts mod soluble, slightly sticky, cohesive, sandy.

Clay: olive gray, lt-med gray, soft, slowly to occ easily soluble, sticky, massive, v sl to mod calcareous, kaolinitic in part, sl-very sandy.

Sand: clr-wht-gray, some grn & dark grs, vf-cse, unconsol w/ some in Clay matrix, pred subang to subrndd, quartz, mnr feldsp & lithics.

Siltstone: med-dk gray, firm, subblocky, mod to very argil, some finely sandy, minor lignite streaks, few thin limy claystone interbeds.

Claystone: dk olive gray, firm, predom subblky, massive, mod to v silty in part, locally vf sandy grdg to argil Ss, micro carb specks, mod-v calc, trc Forams.




Survey @ 2028' 5.0deg 91.6az
TVD 2026.5' 10.0'S 35.4'E

Claystone: olive gray, firm, predom subblky, massive, occ silty & rarely coarsely sandy sl-v calcareous, trc carb specks & pyrite.

Siltstone: dk olive gray, firm-fria, subblocky, massive w/ irreg uneven break, mod to v argil, sl calcareous, locally vf sandy, few thin kaol Clay interbeds.

Clay: pred dark olive gray, some med-lt gray, soft, slowly soluble, amorphous, well cohesive, sticky, occ silty, tr pyrite, rare kaolin interbeds, mod calcareous.

Claystone: dark olive gray-drk gray, sl firm-firm, massive, subblky-blky, occ grades to grnsh brn Siltstone, mnr vfn-fn sndy seams, tr crunchy sub fissle hard Shale frags, mod calc, no oil indicators.

Sand: pred vfn-fn qtz grains, rare med-crse, mod well sorted, subang-subrnd, unconsol and entrained in kaolinitic/ clay matrix.

Siltstone: dark olive gray w/ sl brnsh hues, mod soft-sl firm, subblocky-amorphous, mod to very argil, occ vfn sand grains entrained, tr med grn, decr in drk gry-blk subfiss Shale, mod calcareous.

Kaolinite: off wht-grysh wht, soft, stiff ip, poorly hydrtd, amorphous, sl sticky, crumbly assoc w/ incr fn-crse sand.

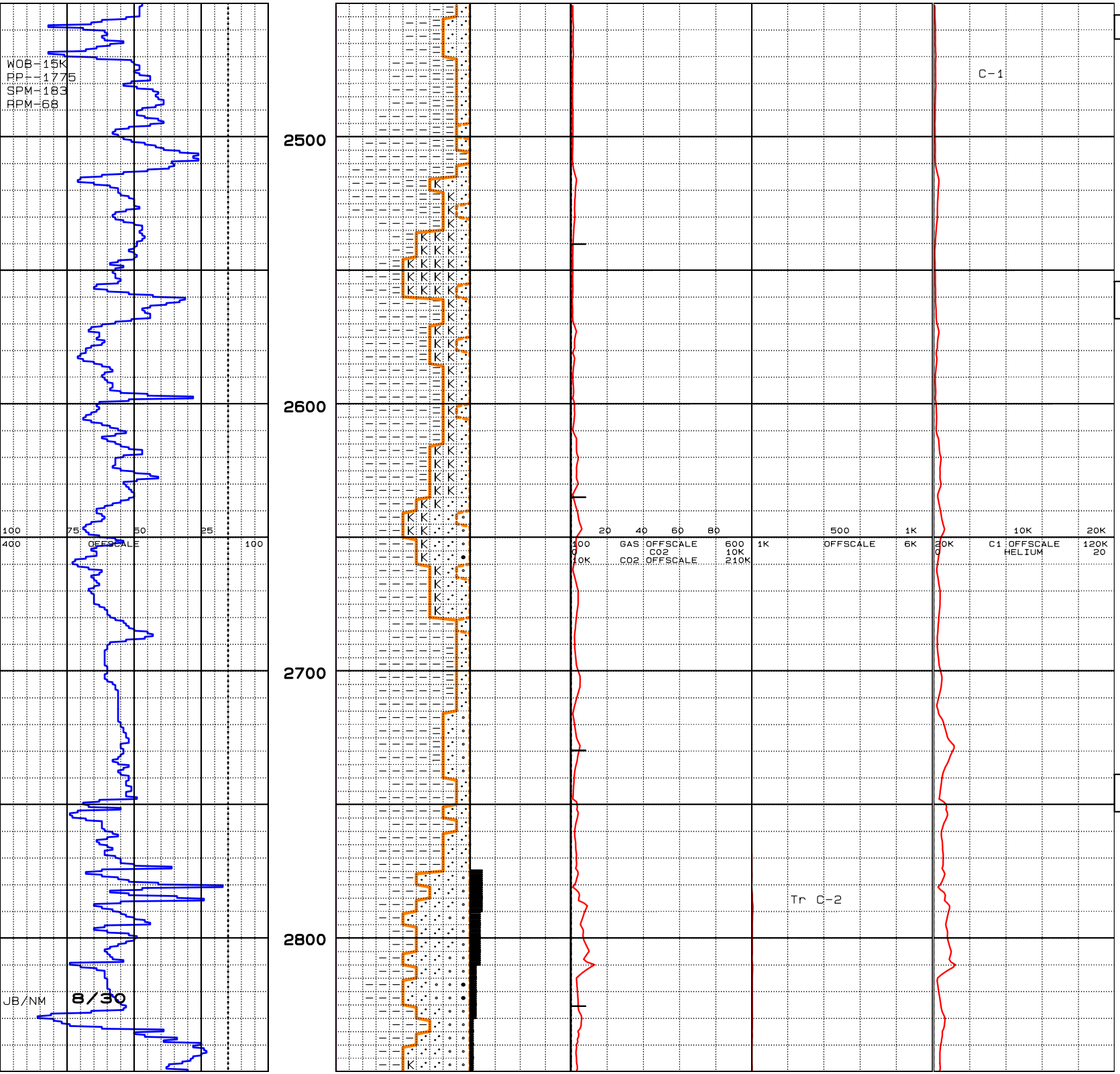
Sand: clr-opaq-lt gray-white grains, some fine, pred med-crse, mod well sorted, subang to subrnd, loose/unconsol, pred qtz, some fspar and drk gray lithics, some kaolin matx, interbedded w/ Clayst.

Survey @ 2313' 5.0deg 95.9az
TVD 2310.4' 12.2'S 60.2'E

Claystone: dark olive gray, dk gray, subblocky, massive, sl-very silty w/some grdg to Siltstone, good traces Forams, occ vf-f blk specks of carb material, mildly to fairly calcareous.

Sand: clr-wht, gray, occ grn, vf & cse, unconsol, gen subang-subrndd, mod well sorted, pred qtz & feldsp w/few lithics.

Clay: lt gray, v soft & easily soluble, sl-mod sticky, poorly cohesive, well hydrated, very finely sandy.




MW 8.7 Vis 39

Siltstone: olive gray, dk gry, firm-friable, pred subblocky, mod to very argil, occ kaol, weakly to mod calc, some v finely sandy.

Claystone: dk gray-dk olive gray, firm, massive, subblky to occ blky, silty & occ vf sandy sl-v calcareous.

Sand: med gray overall, vf-f, predom loose w/some in kaol clay matrix, subang-subrndd, pred qtz & feldsp, well sort-ed, some grds to trc amts of argil Sandstone.

Survey @ 2503' 5.0deg 95.7az
TVD 2499.7 13.7'S 76.8'E

Clay: light gray-gray white, soft, slowly to occ easily soluble, fairly sticky, cohes-ive, mod to very sandy & slty, calcareous in part, kaolin-itic in part.

Claystone: med gray, mnr olive gray, mod firm to firm, predom subblocky, massive, sandy & silty in pt, some kaolinitic, occ vf blk specks of carb material, trc mica.

Sand: clr-wht-gry, occ grn, vf-med gr, unconsol, some in solu kaol Clay mtrx, ang-subrndd, predom quartz, occ feldsp & mnr lithic grs, mod w srtd, tr fine mica flakes.

Sandstone: gry wht, vf-f gr, easily fria, predom qtz & occ feldsp in clay martix, some v weakly cmtd w/calcite, sub ang-subrndd, well sorted, trc mica.

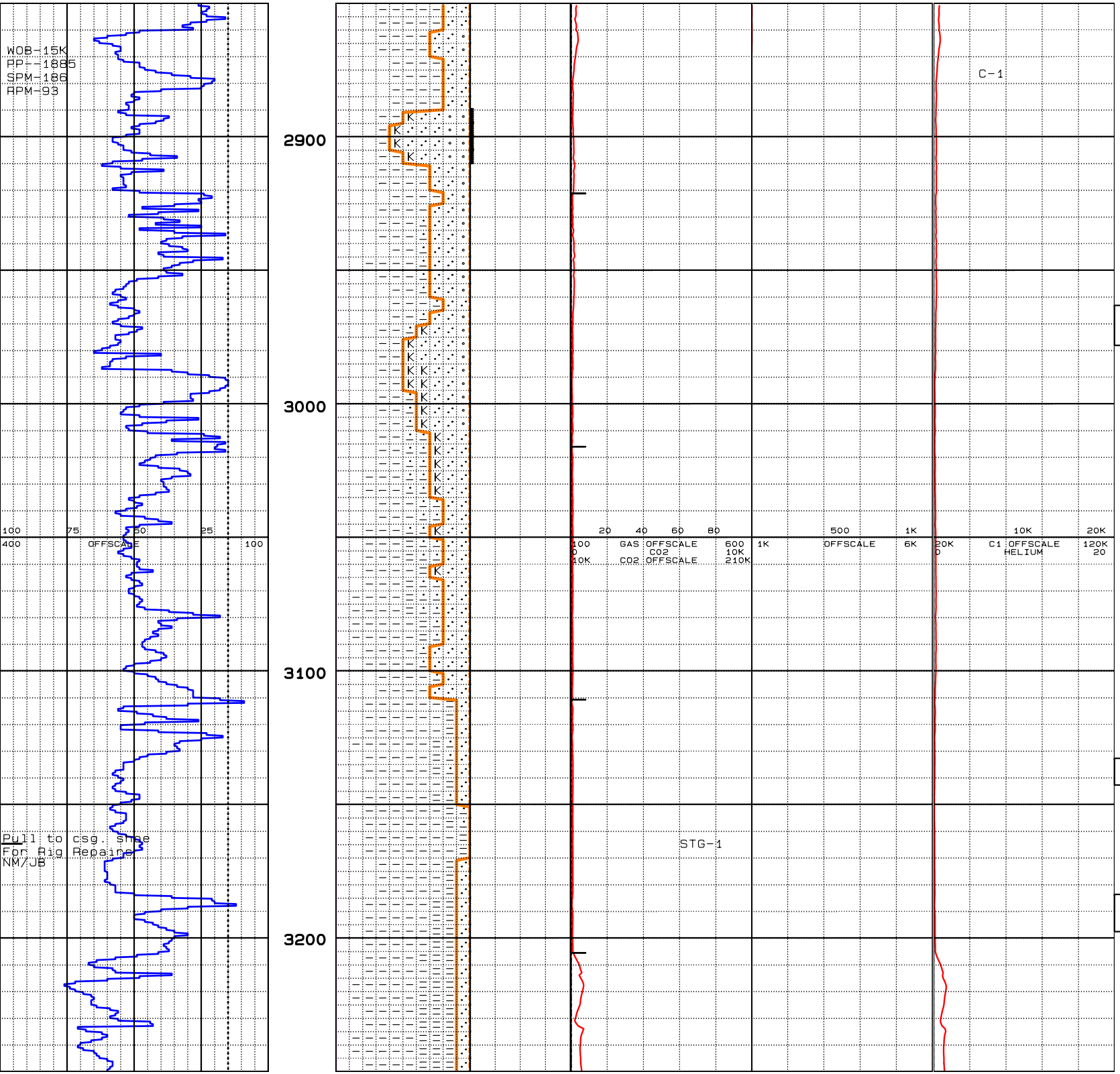
Clay: olive gray, soft, predom slowly soluble, sticky & cohesive, sl calcareous, mass-ive, silty & occ vf sandy, kaol in part, grds to Clayst.

Survey @ 2693' 5.1Deg 98.0Az
TVD 2689.0' 15.9'S 93.3'E

Claystone: olive gray-dark gray, mod firm to firm, sub blky to blocky, massive, some grds to siltst, occ vf sandy, weakly calcareous.

Oil: in v fine Sands, 40% dull orng sample fluor, inst trnslu brt grnsh yel cut fluor, med straw visible cut, irid film on unwashed smpl w/dull orng fluor.

Clay: med-light gray, olive gray hues, soft, sl-mod sol, mod well cohesive, sticky, sl calcareous, fn-med sand, v pl strw-no vis cut, tr irid.




Claystone: dark gray-drk olive gray, sl firm-firm, subblky-blocky, massive, occ silty seams, mnr vfn-fn Sand, interbedded w/ soft Clay, mod calcareous, no vis oil stns.

Sand: transl-opaq-gray-wht, pred fn-med, mod well sorted, subang-subrnd, loose/unconsol, pred qtz, mnr fspar and gray lithics, scatt 10-20% dull yel smpl fl, faint transl yel cut fl, no vis cut.

Clay: med-light gray hues, occ olive gray cast, pred soft, occ sl stiff, mod-easily sol, poorly hydrated, mod well cohesive, sticky, silty-vfn sand, mod calcareous.

Survey @ 2979' 5.0deg 95.5az
TVD 2973.9' 18.1'S 118.1'E

Sand: transl-gry-wht, pred vfn to fn qtz sand, tr med, mod well sorted, subang-subrnd, com shell frags, kaolinitic sl firm frags, trace lithic and mica, no oil indicators.

Clay: med-light gray hues, pred soft, stiff ip, mod soluble, well cohesive, sl sticky, vfn-fn qtz Sand entrained, tr wht kaolin, trc glauconite.

Claystone: med gray, sl firm-mod firm, subblky, massive, occ grds to sandy Siltstone, occ blk carb material.

Clay: med-light gray hues, occ whtsh gray, soft, stiff ip, mod soluble, sl-mod hydrated, cohesive, mod sticky, silty to vfn-fn Sand, com shell frags.

Sand: pred clr qtz, white-opq fspar, mnr dark lithics, vfn-fn, well sorted, tr kaolin in matirx, subang-subrnd, unconsol, occ compacted in Clay, some dark mica, occ shells.

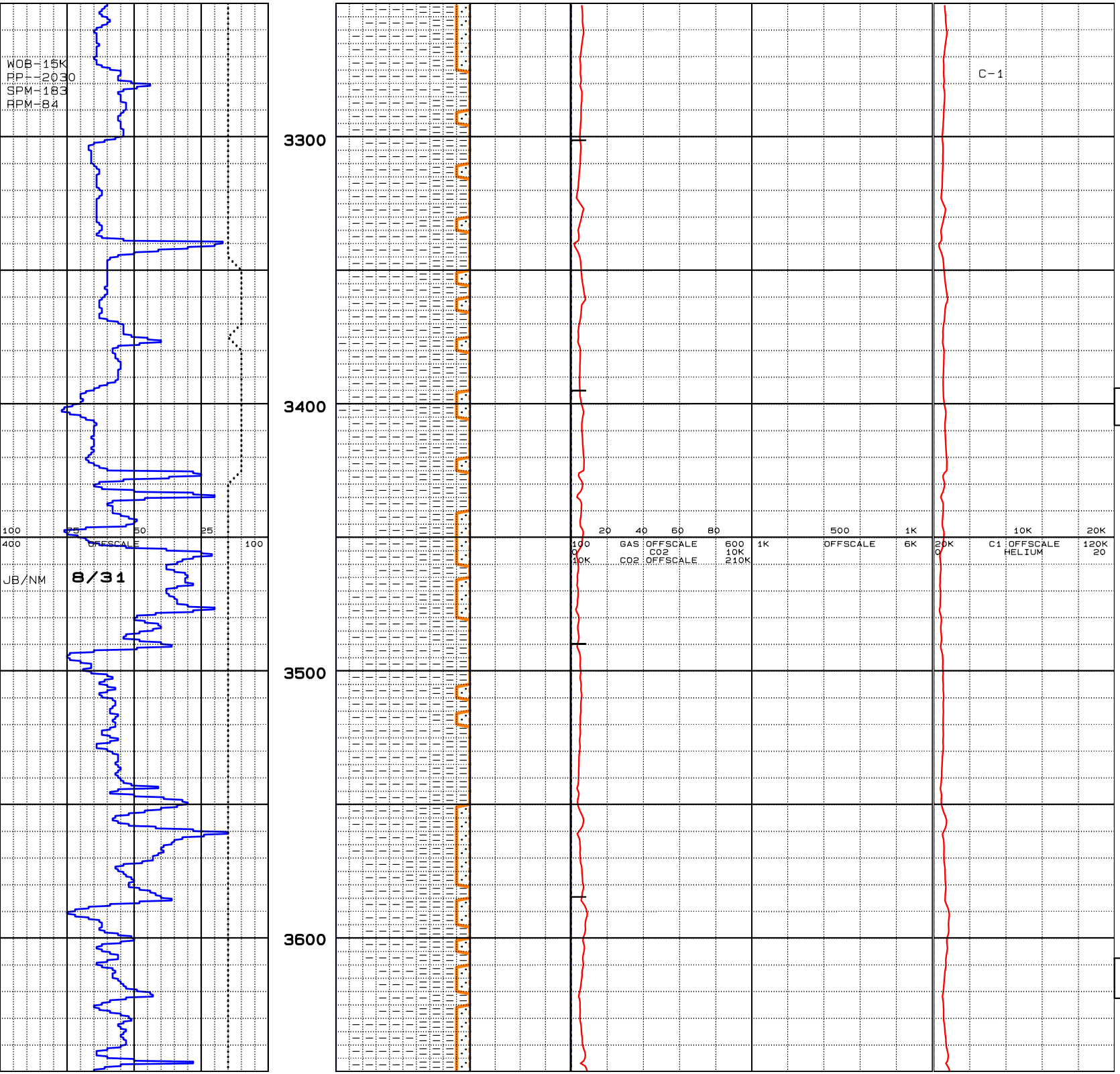
MW 8.9 Vis 41

Claystone: med-pred dark gray, firm-occ v firm, blocky-sub blocky, finely to micromicac, v sl to noncalcareous, good tr shell frags, few limy streaks, occ glauconite, carbonaceous material.

Survey @ 3169' 5.0deg 94.6az
TVD 3163.1' 19.8'S 134.7'E

Siltstone: med-dark gray, mod firm to firmly friable, sub blocky to blocky, mod to very argil, sandy in part, predom noncalcareous, micromicaceous, grades to Claystone.

Clay: med gray-gry wht, soft, slowly solu, mod-v silty.




Claystone: med-dark gray, mod firm-firm, tr v firm, subblky-blocky, sl-non calcareous, some silty & rarely vf sandy, micromicaceous & microcarb, occ glauc, grds to Siltst.

Siltstone: med-dark gray, some w/v slight olive or greensh cast, subblky-blky, pred massive w/rare fnt visible bedding, mod-v argil, sl-non calc, vf-micro carb specks, tr glauc & sl tr pyrite.

Abndt glauconite @ 3330'.

Clay: med gray, occ w/fnt grnish cast, soft, slowly-mod sol, sticky & cohesive, massive, dull earthy luster, silty ip.

Claystone: med gray w/sl purplish cast, some sl greensh, mod firm-firm, pred subblky, massive, some silty, few glauc rich zones, tr shell frags.

Survey @ 3359' 5.0deg 94.9az
TVD 3352.4' 21.2'S 151.3'E

Siltstone: sl greensh gray, pinkish-purplish gray, firm-fria, subblky-blky, sl-v glauc, vf carb specks, mod argil, thin argil Sands interbedded, grads w/Sand & Claystone.

Clay: med gray, occ brnsh grn hues, soft, amorphous, mod solule, mod hydrated, sticky/cohesive, silty ip, com glauconite in matrix, occ vfn sand grains, sl calcareous.

Claystone: pred med gray, occ greensh gray-lt gry w/ light purplsh cast, mod firm-firm, subbblocky, nonfiss/massive, grds to grysh brn Siltsotne, occ vfn sand, com dark green glauc pellets-pale grysh grn when broken, sl calcareous.

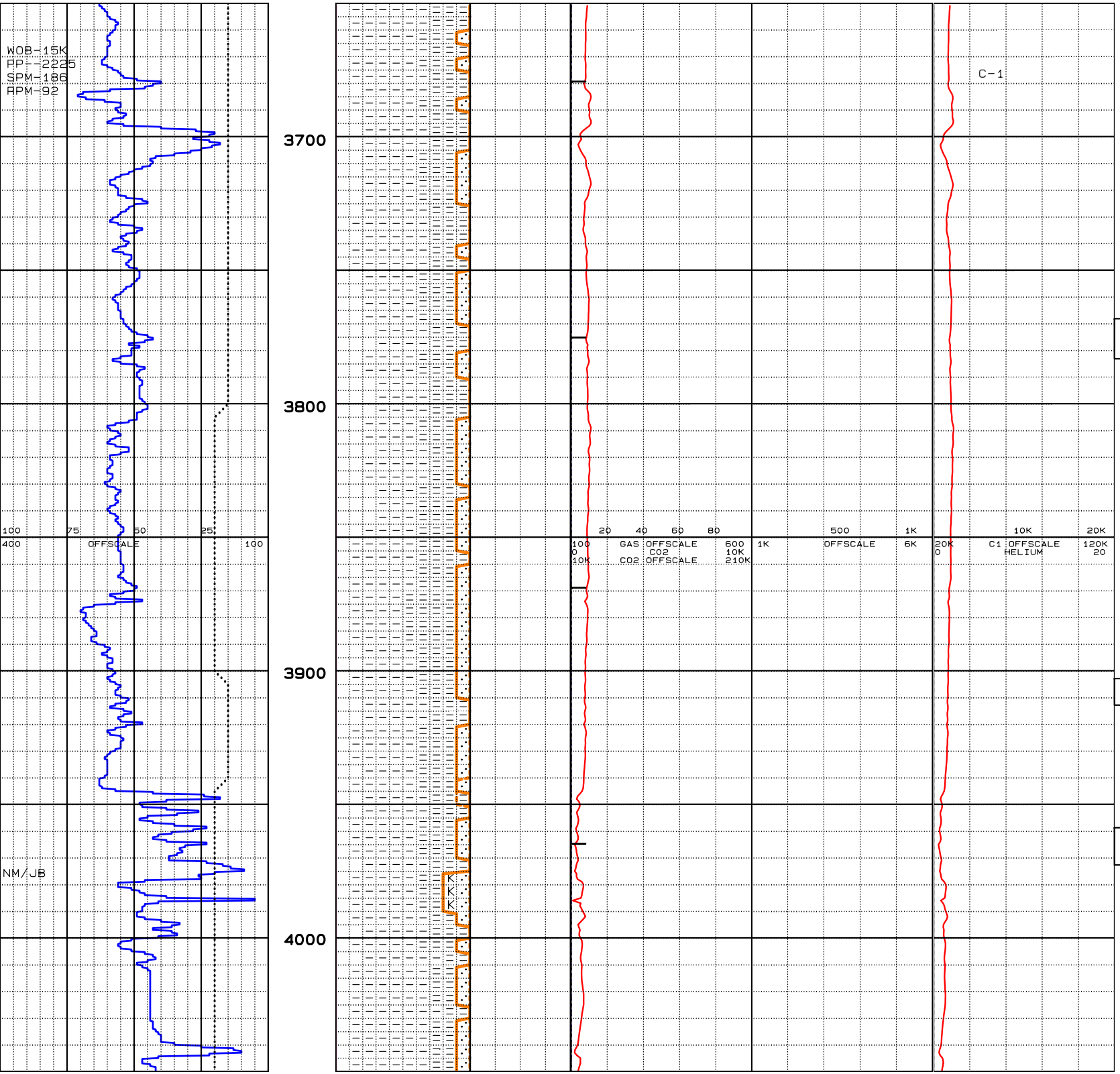
Siltstone: med-lt brnsh gray, occ greensh gray cast, firm to v firm, friable, crunchy, subblocky-sl subplty, mod argil, com blk carb specks.

Claystone: med gray, occ grysh green with abdt glauconite, mod firm, subblocky, massive, tr silty-vfn Sand, sl calc.

Clay: pred med-light gray hues occ brnsh gray, soft, slw-mod soluble, mod hydrated, sticky, dull earthy luster, rare drk carb material, non-sl calc.

Survey @ 3644' 5.1Deg 97.9Az
TVD 3636.4' 23.4'S 176.2'E

Siltstone: med-lt brnsh gray, pink-grn specks in matrix, firm, subblocky, pred massive w/ occ sl bedding, tr pyrite.




Claystone: light-med gray, brn-sh gray, occ sl grnsh hues, firm, subblocky, massive, sl to noncalcareous, some glauc, occ black carb micro streaks and specks, tr micromica, v mnr vfn snd, grads to Siltst, some amorph brnsh gray Clay.

Siltstone: med-light brownsh gray, occ pink-orange specks in matx, occ sl purplsh gray hues, occ pockets of abdt glauconite, some vfn transl qtz grains, gritty texture, v sl calcareous.

Clay: light gray-lt brnsh gry hues, soft, amorphous, mod hydrated, sticky, mod well cohesive, med plasticity, smooth text, occ sl gritty.

Survey @ 3739' 5.0Deg 99.2Az
TVD 3731.0' 24.6'S 184.5'E

Siltstone: med-light gray, com dark-blk specks in matx, some orang-pink, gritty texture, dull earthy luster, subblocky, rare subplaty cttgs, massive w/ occ micro bedding planes, grds to sl drkr Claystone, some Clay w/ tr vfn-fn sand.

Claystone: pred lt-med gray, mod firm, subblocky, decr to sl-no grn glauconite, abdt drk-blk carbanaceous micro specks, pred smooth texture, v sl-non calcareous.

Clay: pred lt brnsh gray, soft to occ sl stiff, mod-easily soluble, sticky/mod cohesive, amorphous clumps, sl silty ip, tr mica, tr pyrite, some drk green glauc in Siltstone and Claystone.

MW 8.9 FV 41

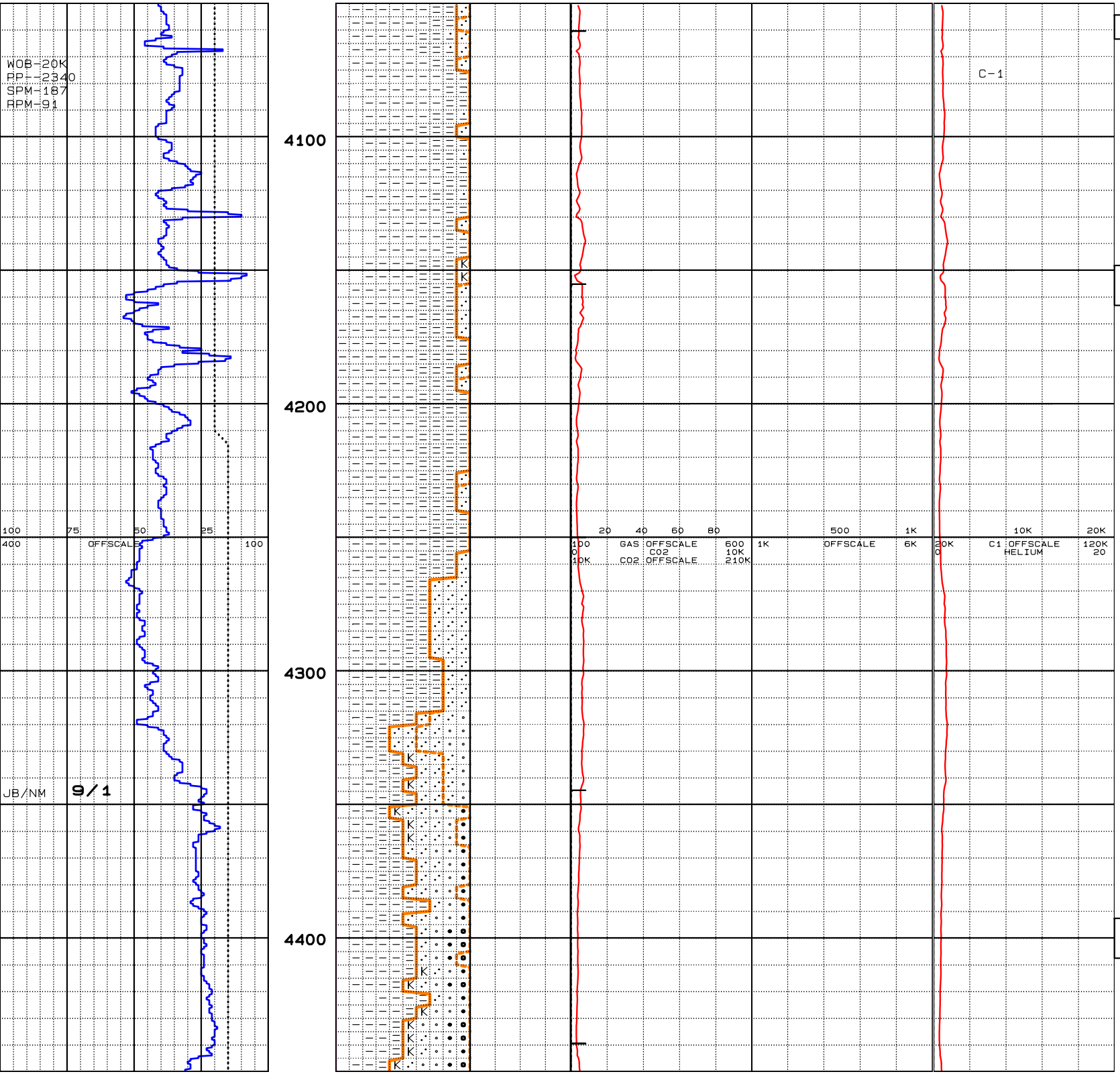
Siltstone: med-light brnsh gray, pred firm-occ v firm, subblky, rare subplaty, pred massive w/ occ tr bedding, occ orang-pink-drk grn in matrx, sl gritty texture, grds to Claystone, sl-non calcareous, tr hard vfn-fn ss frags.

Survey @ 3929' 5.0deg 92.2az
TVD 3920.2' 26.0'S 201.2'E

Claystone: lt-med gray w/sl brnsh cast, some w/purplish or grnsh cast, mod firm-firm, few hard streaks, subblky, sl-noncalcareous, tr v calc, mnr glauc, carb matl & mica.

Clay: med gray, soft, slowly-mod soluble, sticky & cohes-ive, pred noncalcareous, well hydrated, silty & micac.

Siltstone: med-dk gray, some w/ purplsh cast, firm, subblky.




Downhole temp 153 deg F.

Sand: med gray overall, pred vf gr to silt sz, mostly in soft Clay mtrx, grds to sandy Siltst & Clayst, tr Ss.

Clay: med gray, some w/sl purplsh cast, soft, slowly to occ easily soluble, sticky & cohesive, silty in part, grds to claystone.

Siltstone: med gray, some w/ fnt greensh or purplsh cast, firmly friable, subblky-occ blky, mod-v argillaceous, tr kaol Clay, trc glauc & mica.

Survey @ 4118' 5.0deg 102.0az
TVD 4108.5' 28.6'S 217.6'E

Sandstone: med-dark gray, sl brownish gray, vf gr, friable, argil matrix, predom qtz w/ trc+ glauc, carb mat'l & mica, grds to sandy Siltstone.

Claystone: med-dk gray, mod firm-pred firm, tr v firm, subblky, massive, sl-non calc, silty in part, tr shell frags.

Siltstone: med-dk gry, some w/ grnsh cast or purplsh/brnsh cast, firm-fria, mod argil, occ v finely sandy, tr-loc com glauc, tr mica & carb specks, predom weakly to non calc, grades to silty Sandstone.

Sandstone: gray-graysh wht, vf-f gr, easily fria w/mnr v diff fria, subang-sbrndd, predom qtz w/occ mica, few lithics & tr feldsp, argil mtrx w/some silic cmtd.

Clay: med gray, soft-stiff, slowly to mod solu, sticky & cohesive, sl-non calc, massive, silty in part.

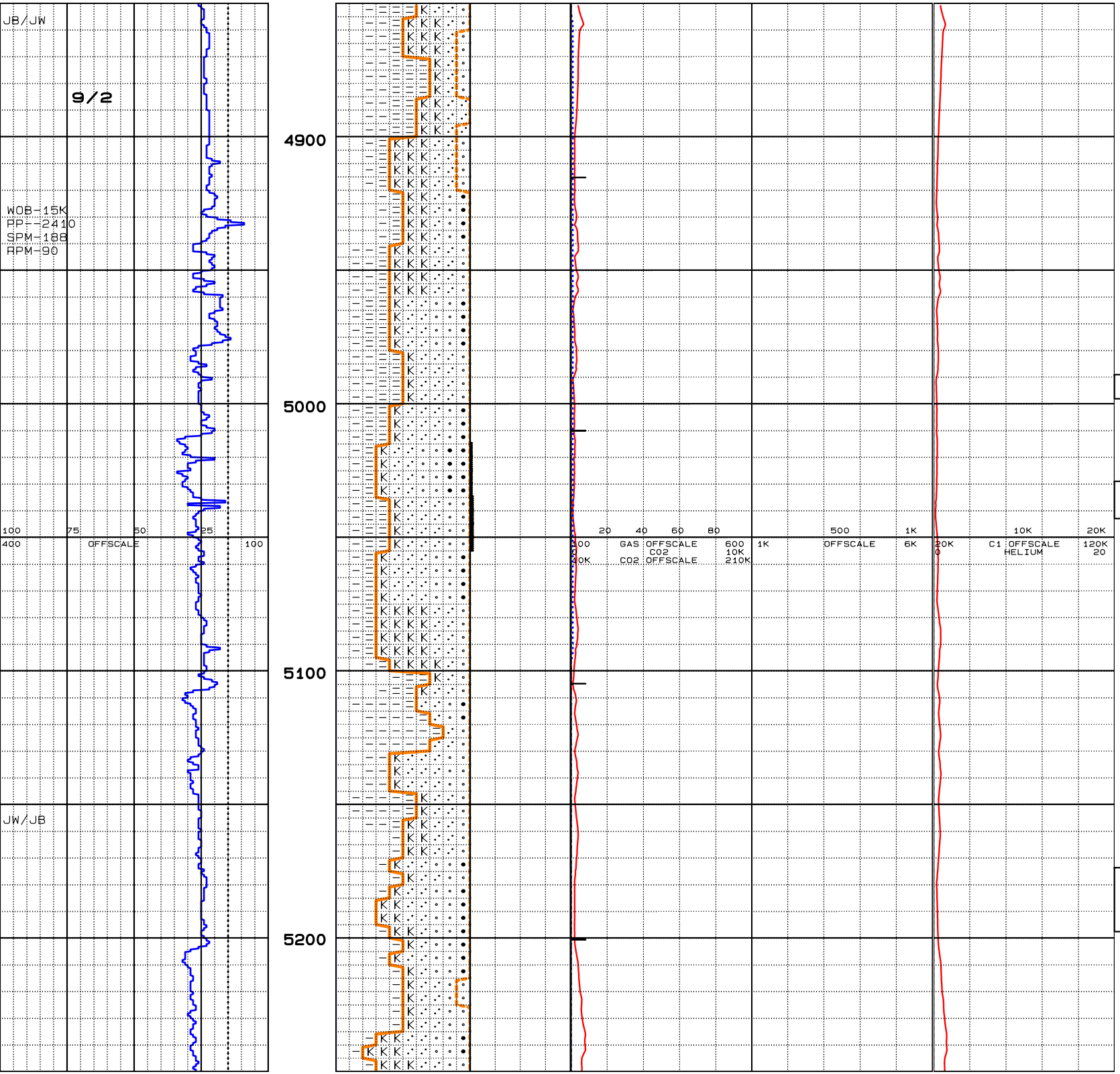
Sand: clr-wht, occ gry & grn, f-med gr, unconsol, subang-sbrndd qtz w/few lithics & mica, tr feldsp, occ consol in arg Ss, rare broken well rounded pebs @ 4350'.

Sand: pred clr-opaq-wht, some gray, rare grn, pred fine-med grain, some crse, tr v crse-pebbls, sunbang-subrnd, occ rnd-well rndd, pred qtz and some lithics, tr fspar, occ shell frags, tr mica/pyrite.

Survey @ 4403' 5.0deg 93.1az
TVD 4392.4' 31.2'N 242.4'E

Claystone: pred med gray, some drk gray, mod firm, subblky, massive, silty ip, sl calc.

Sand: pred fn-med qtz and gry lithics, some crse-pebbls, tr mica & pyrite, unconsol.




Clay & Claystone: light olive gry to olive gray shades of slightly firm, w/off wht grys decomposed feld kaolin clays, less fine-med qtz feld sd, minor amount fn Ss.

Sand & Sandstone: Mixed decomp feldspathic kaolinite-fn qtz sd-fn-vfn slightly firm Ss.
Sand: Mixed decomp feldspathic kaolinite-vfn-fn firm Ss & loose fn-med qtz grains.

Clay-Siltstone-Sand: Mixed interbdd, qtz-feld-kaolin-w/siltst-clyst-clys, slight color shift to yell gry-brns.
Kaolinitic Feldspathic Sand: decomp degraded w/partial biotite & occ indistinct dk mins, occ firm-v firm clyst.
Sand: qtz, subang-ang, clr-milky, med-crs, fn, occ pebble interbdd w/siltst & clyst.

MW 9.0 Vis 41

Sand & Sandstone: vfn-fn, silty friable grading to slghtly fm w/qtz fn-med-crs; clyst & slt
Oil: pale indistinct yel cut fluor, no irid.

Survey @ 5068' 5.0deg 97.1az
TVD 5054.8' 39.2'S 300.2'E

Sand: vfn-fine friable-slighty firm, interbdd w/siltst-clyst
V slight trace oil pale cut fl
Sand & Siltstone: med-dark gry yel shades, vfn-fn friable w/ med & crs qtz, no vis oil.

Decomposed Sand: increase in pale gray wht shades decomp feld & altered minerals, w/ less fn-med loose qtz sd.

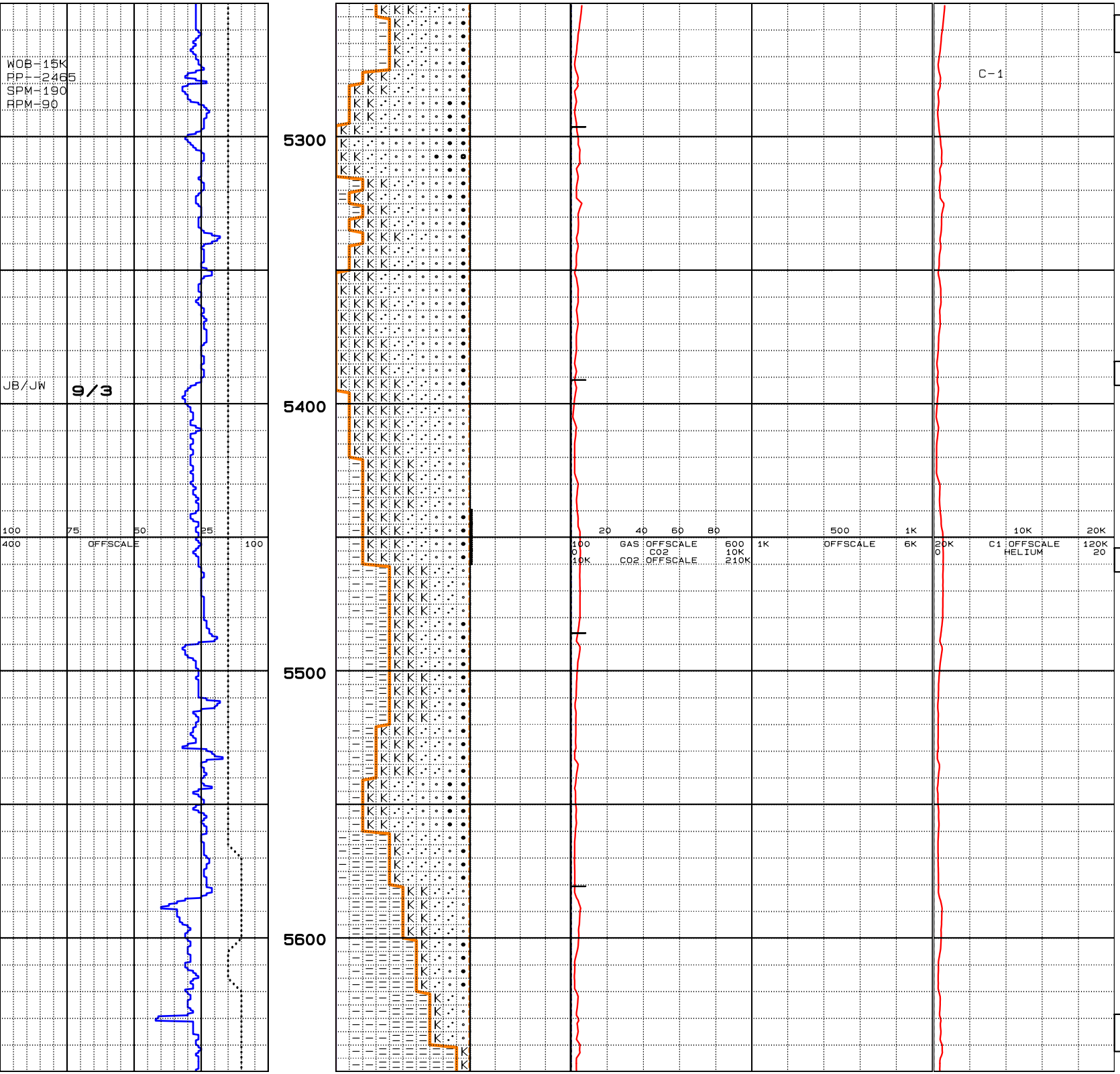
Claystone: med-dark gray, mod firm to firm, pred subblky, tr blky, massive, sl-mod calc, dull earthy luster, some silty, smooth to gritty texture.

Sand: clr-wht & gry, occ grn, f-med w/occ cse grs, unconsol, subang-subrndd, trc to w rndd, predom quartz & feldsp, few dark lithic grains & mica flakes, fair sorting, some in kaol Clay matrix.

MW 9.0 Vis 41 PV 13 YP 15 FC 1
Gel 3/4 Fil 8.2 pH 9 Sol 3.11
Sd .35 Cl 14100 Ca 56 Oil -
Downhole temp 161 F FLT 138 F

Clay: lt-med gray, graysh wht, soft, easily to slowly solu, sticky, massive, mod to pred well hydrated, calcareous in part, locally silty & sandy.

Sand: med gry overall, vf-occ cse, loose, subang-subrndd, pred qtz w/occ feldsp & mnr mica.




Survey @ 5258' 5.0deg 97.6az
TVD 5244.1' 41.4'S 316.7'E

Sand: clr-wht & gray, occ grn, med gray overall, f-cse gr, unconsol & occ in kaol Clay matrix, subang-subrndd w/mnr rndd grs, fair-poor sorting, predom qtz, scatt'd feldsp grs w/few lithic grs & mica flks.

Clay: light gray & gray wht, soft, slowly to occ easily soluble, sticky in part, cohesive, weakly to noncalcareous, massive, sl-v sandy & occ silty, kaolinitic in part, mod to well hydrated.

Sand: clr-wht & gray, occ grn, f-cse gr, unconsol, subang-sub rndd & rarely rndd, poorly sotred quartz, occ feldsp w/ tr mica & dk volc lithic grs, some in kaol Clay matrix.

MW 9 Vis 40 Vol 1118 20Bbl/Hr

Sand & Decomposed Sand: qtz feld, decomp feld to kaolin pale whitish gray cly, vfn-fn-med-crs clr & milky shades w/altered dark mins & micas.

Decomposed Sand: feldspathic decomp w/qtz grains embeded in the preserved kaolin mtx, pale whites-pinkish whts, less olive gry clyst, v pale cut.

MW 9 FV 40

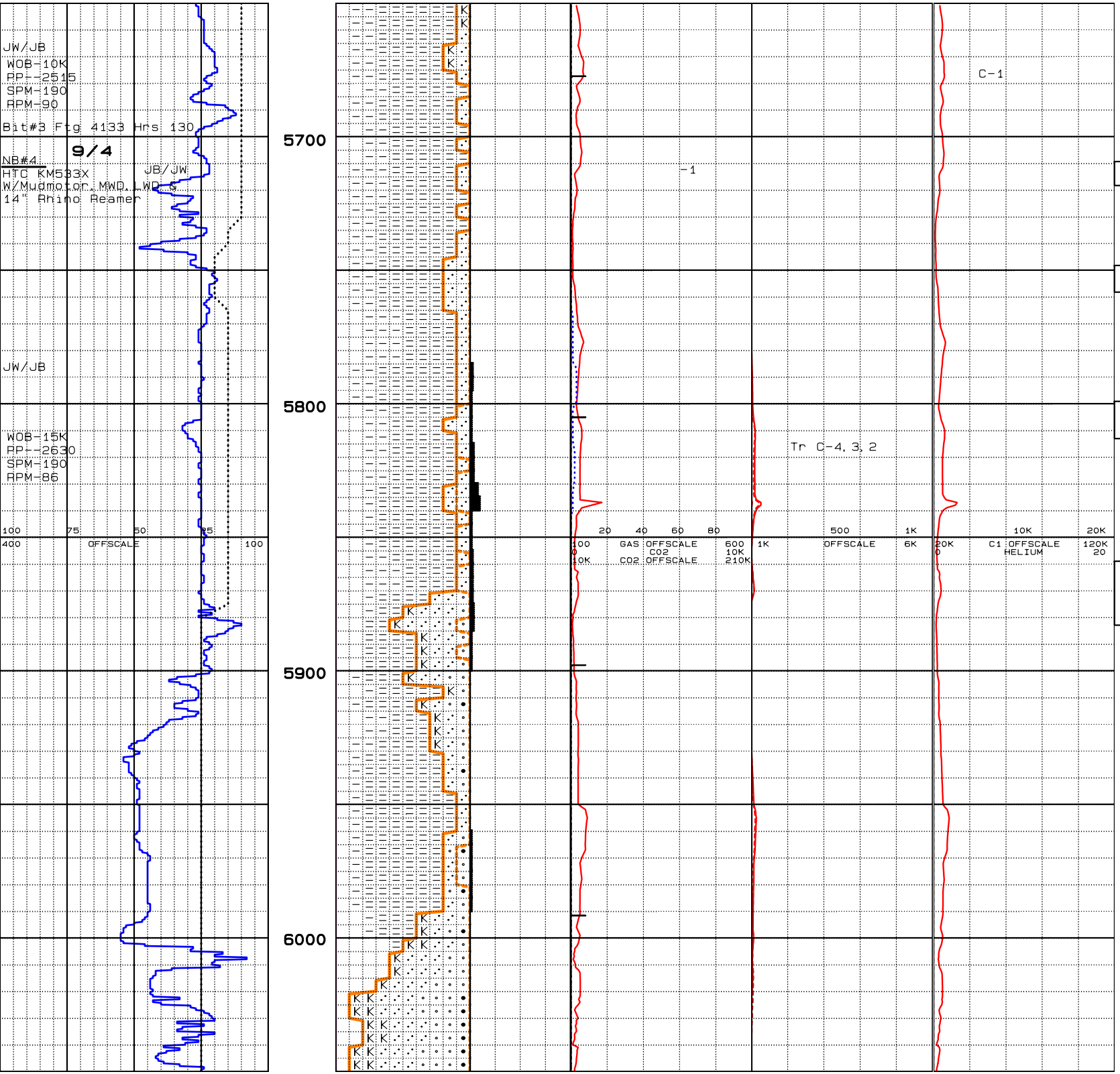
Decomposed Sand & Claystone: decomp w/qtz grns interbedd w clyst-siltst, no fluor.

Claystone & Decomposed Sand: as above w/sltst & sdy sltst,
Claystone & Decomposed Sand: decomp feldspathic->impure kaolinite-mica & dk minerals interbdd w/cly-clystn-siltst, yel brn to olive gray shades.
Claystone & Decomposed Sand: note firm-slightly hard clyst olive gray shades, no vis oil

Sand: qtz & feldspathic, less kaolinite, partially altered feldspars, pinkish & grayish orange pink shades w/mica min lesser firm to v firm clyst.
Sand & Siltstone: pale yel brn to yel brn-olive gray shades, inc in siltst, slightly firm

Siltstone: increase siltst-vfn sand, friable to slightly fm no fluorescence.
Siltstone: light olive gray to olive gray shades, friable to slightly firm; part decomposd feldspathic kaolin sand.

Survey @ 5639' 5.0deg 100.8az
TVD 5623.6' 46.5'S 349.8'E




Claystone & Siltstone: light olive gray to dk olive gray shades, decrease sand.

Siltstone: olive gray, some dk gray, firmly friable, subblocky to occ blocky, mod argil, some micromicaceous, vf sandy in part, trc micro carb specks.

MW 9 FV 41

Siltstone & Claystone: Olive gray - dark olive gray shades firm siltst-sdy siltst & firm clystn, less vfn-fn qtz-mica firm to vfirm Sandstone.

MW 9 Vis 43 Vol 961 20Bbl/hr

Silstone & Sand: slightly firm to friable siltst & silty Ss, light olive gray-olive grays. Claystone-Siltstone-VFn Sndst: light olive gray-olive gray shades, grading to vfn friabl silty sand, lt olive-lt brnsh

Survey @ 5861' 5.1deg 96.2az TVD 5844.7' 49.5'S 369.1'E

Sandstone: med-dk gray, some brownsh from oil stn, vf-f gr, easily fria in soft clay mtx, subang-subrndd, qtz & occ feld w/tr lithics & mica, 10-20% v faint orng smpl fluor, fast-inst brt yel cut fluor w/very pale straw to no visible cut.

MW 9.1 FV 42 PV 17 YP 4 FC 1 Gel 4/5 pH 9.1 FL 8.8 Sol 4.12 Sd .3 Ca 52 Cl 14500 Oil 0 FLT 132 deg F.

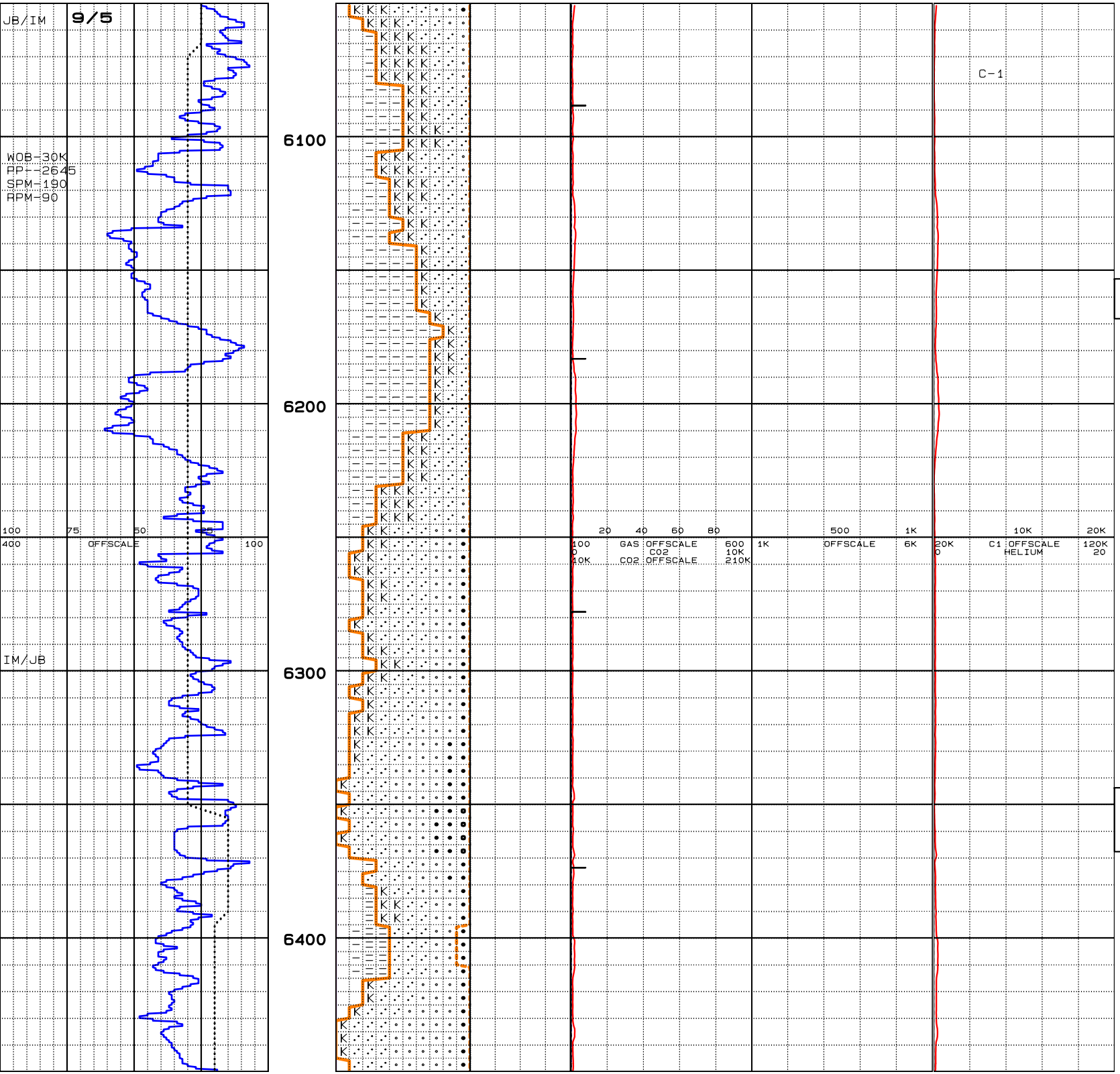
Sand: clr-wht-gray, occ grn, f-med gr, unconsol & occ easily fria in Clay matrix, predom subang, fair sorting, quartz w/ scatt'd feldsp grs, trc lithic & mica grs.

Siltstone: medium-dark gray, fria, subblocky, tr blocky, mod to very argil, some finely sandy, sl-v calcareous, minor micromica and micro carb specks, grades in part to arg Sandstone.

Sand: clr-wht-gray & grn, vf-occ cse, unconsol, pred subang-subrndd w/trcs w rndd, quartz occ feldsp & tr lithic grs, some in Clay matrix, v sl tr granules & pebbles, occ v weak oil shows.

Clay: lt gray-graysh wht, soft, easily-slowly soluble, sticky, sl-v calcareous, some silty & occ finely sandy, kaolinitic in part.

Sand: clr-wht-gry & grn, vf-cse gr, unconsol, tr granules, pred qtz & feld, tr mica & lithics.




Clay: light gray-grayish white soft, soluble, sticky, calcareous, silty, interbedded w sand, abundand Kaol, no cuttings gas, low gas reading, no sample fluor.

Claystone: olive gray to gray, firm, poorly hydrated, slightly calc, silty in part, grades to Siltstone, interbedded with Clay and fine Sand.

Sand: clear-white qtz grains, fine to medium, minor coarse, pred fine, mod-well sorted, loose-unconsol, subangular to subrounded, Clay matrix, Kaol and Claystone fragments.

Survey @ 6146' 5.0deg 97.8az
TVD 6128.6' 53.2'S 394.1'E

Claystone: olive gray-gray, firm, subblocky to blocky, silty, grades to Siltstone, poorly hydrated, calcareous, interbdd fine Sand.

Sand: clear and white quartz and occ feldspar, rare lithic fragments, pred fine grained, minor medium, subrounded to subang, well sorted, loose, gray Clay matrix, interbedd with Claystone.

Kaolinite: white-grayish white soft to firm, poorly hydrated mixed with fine to medium snd no cutting gas, no sample oil fluor.

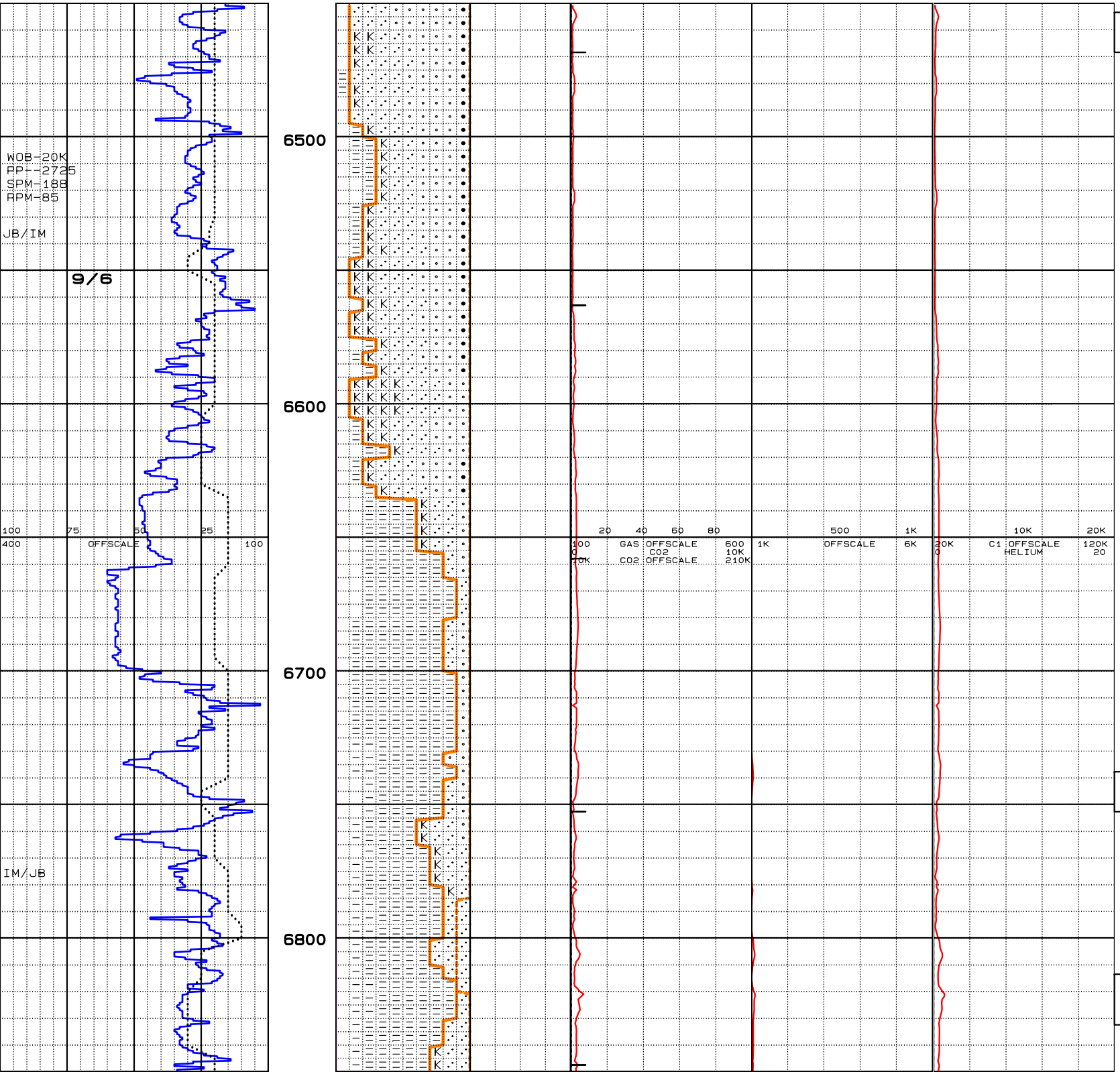
Sand: clear-white, fine to coarse, predom fine grains, moderately sorted, quartz grns occ feldsp and lithic frags, subrounded to rounded, loose kaol matrix, trace olive-gray Clay.

Clay: light-med gray, graysh wht, soft, slowly to easily soluble, sl-mod sticky, cohesive, weakly to v calcareous, massive, locally sandy, kaol in part.

MW 9.0 FV 41 PV 17 YP 16 FC 1
Gel 4/5 pH 9.2 Fil 8.7 Sol 4.1
Ca 52 Cl 14900 Oil 0 FLT 137F
Downhole Temp 164 deg F

Clay: med gray, grayish wht, soft, slowly to occ easily soluble, sticky & cohesive, mod to well hydrated, sandy in part, tr Claystone.

Siltstone: med-dk gray, firm to friable, predom subblky, sl to very argillaceous, weakly calcareous, vf-micro micac, occ vf sandy w/some grading to silty Sandstone, trc bivalve shell frags, dull earthy luster, gritty texture.




Survey @ 6431' 5.1deg 97.0az
TVD 6412.5' 55.8'S 419.4'E

Sand: clr-wht-gray & grn, tr brn, blk, red & yel grs, f-cse grained, unconsol, subang-sub rndd, tr w rndd, predom qtz w/ occ feld grs, trc lithics & mica flakes, poorly sorted.

Clay: light-med gray, grayish white, soft, easily to v slowly soluble, sticky, sandy & silty in part, mod to v well hydrated, slightly to noncalcareous, kaolinitic in part.

Siltstone: olive gray to dark gray, firm-friable, subblocky to blocky, slightly calcareous argillaceous, grades to Claystone, interbdd with Sand, trace shell fragments.

Sand: clear-white-smoky, trace dark minerals, predom quartz grains, occ feldspar, subang to rounded, fine to coarse, pred fine grns, poorly sorted uncosol, Kaol and gray Clay matrix.

Clay: light to medium gray and grayish white, soluble, soft, sticky, cohesive, slightly calcareous, kaol in part, matrix in Sand.

Claystone: gray to olive gray soft-firm, subblocky-blocky, clayey, grades to Claystone, poorly hydrated, sl calcareous interbedded with Sand.

Sand: clear-white-light gray, fine to coarse, pred fine, quartz grains occ feldspar & lithic fragments, mod-well sorted, subrndd grs, loose, mixed with Clay.

Claystone: olive gray-dark gry firm to very firm, blocky-sub blocky, clayey, slightly calc graded to claystone, tr micromica, occ fine Sand.

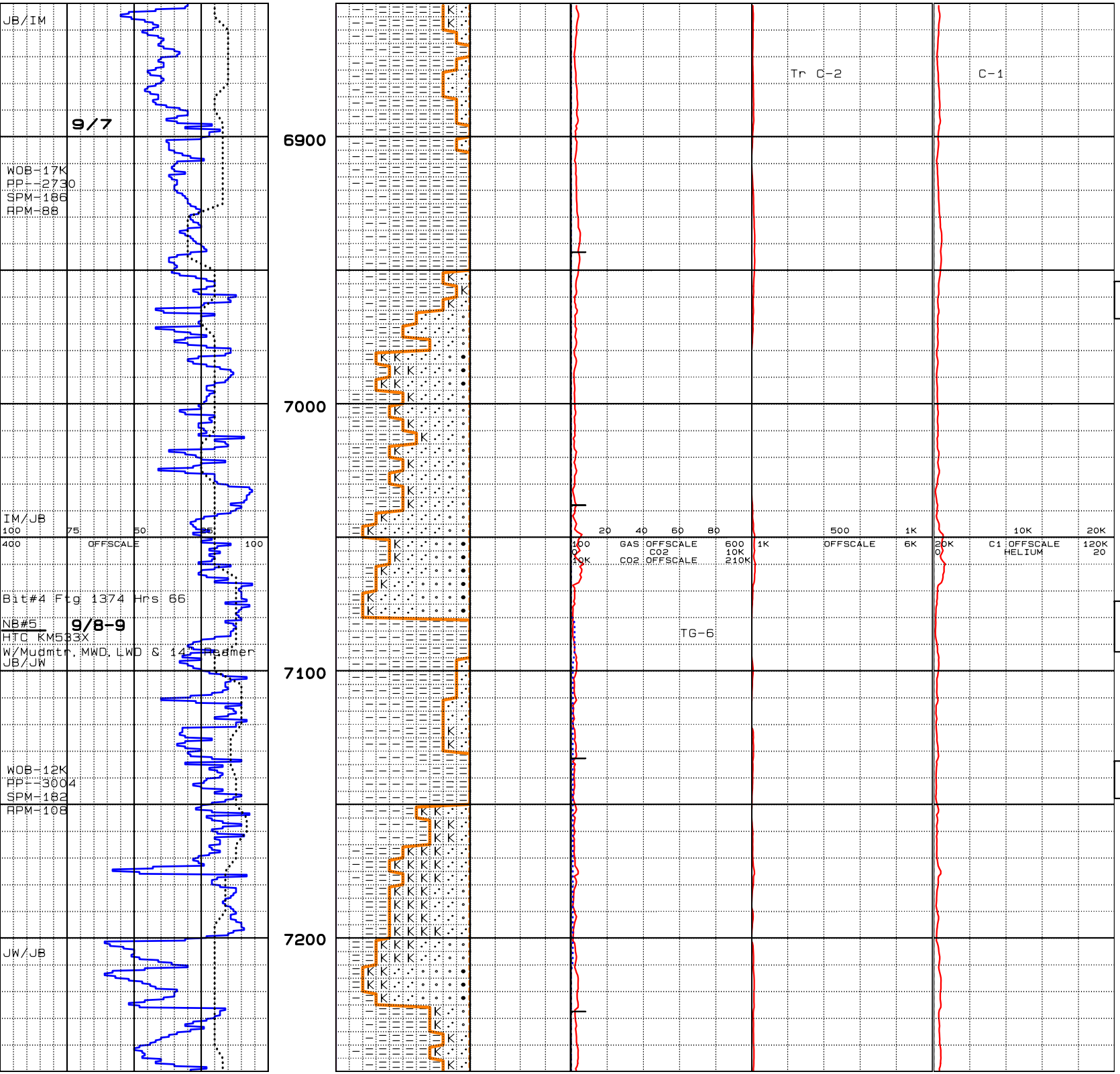
Survey @ 6716' 4.1deg 101.0az
TVD 6696.4' 59.3'S 443.3'E

Clay: medium gray and grayish white, soft-very soft, plastic, cohesive, solu, sticky, well hydrated, sandy in part trace Claystone, calcareous.

Siltstone: olive gray-med gry, fria to firm, dom subblky w/ mnr blky, mod to very argil, occ micromicaceous, sl-mod calcareous.

MW 9.1 FV 43 PV 18 YP 15 FC 1
Gel 4/4 pH 9.1 FL 8.8 Sol 4.12
Ca 52 Cl 15200 Oil 0 FLT 136F

Sand: clr-wht-gry, vf-f, loose, subang-sbrndd, qtz & feldsp.




Claystone: olive gry-dark gry, firm-very firm, poorly hydrated, sublocky-blocky, sl calcareous, silty in part, grades to Siltstone, occ micromica.

Siltstone: olive gray-med gray subblocky and minor blocky, friable to firm, mod calcareous, argillaceous, grades to Claystone, prly hydrated, occ very fine Sand, tr micromica.

Clay: med gray-gray, soluble, soft-very soft, plastic, cohesive, sticky, slightly calc, interbdd with Claystone and Siltstone.

Survey @ 6906' 1.98deg 182.2Az
TVD 6886.2' 64.1'S 450.5'E

Sand: clear-white, fine to med quartz grains, occ feldspar, subang-subrounded, loose, well sorted, interbedded w/Siltst, trace kaol Clay.

Clay: medium gray-gray, soft sticky, plastic, cohesive, mod soluble to soluble, hydrated, grades to Claystone, interbedded with fine-medium Sand, trace kaol, sl calc.

Sand: med gray overall, vf-cse gr, unconsol, sbang-occ w rndd, pred clr-wht-gry qtz w/occ grn inclus, occ gry-wht & tr pnk feldsp, trc dark lithics, few dk brn-blk mica flks, no oil indicators.

MW 9.0 FV 42 PV 17 YP 16 FC 1
Gel 5/6 pH 9.2 FL 8.9 Sol 4.12
Sd .45 Cl 14200 Oil 0 FLT 135F

Claystone & Siltstone: caving, rounded frags, olive gry & bn gry shades, firm-v firm, grdg to sandy siltstone in part.
Sand & Silty Ss: Increase qtz, fn-vfn w/olive gry-yel brown siltstone & sdysiltstone.

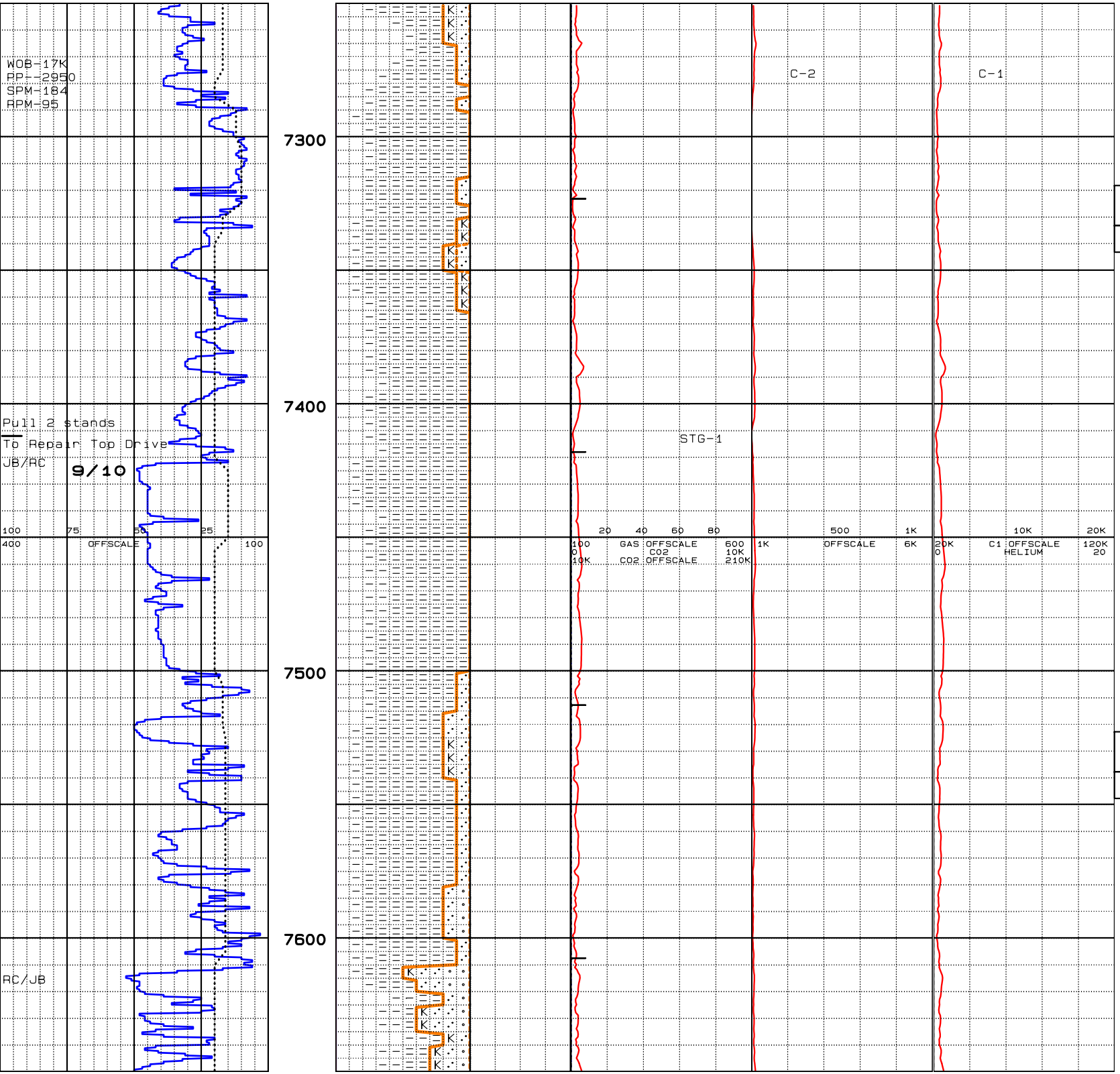
Survey @ 7096' 5.1deg 259.3az
TVD 7075.9' 69.9'S 442.2'E

Claystone & Siltstone: lesser amount of vfn decomposed sd, lt brn-pale yel brn-lt olv gr
Decomposed Sand: feldspathic kaolinitic, friable, mnr vfn qtz, occ v firm clyst frag.

Decomposed Sand and Silt: mnr vfn-fn qtz, occ v firm clyst.

Sand: clr-wht-gray, tr blk & gn grs, vf-med gr w/occ cse grs, subang-rndd, predom subang, fair-poor sorting, predom qtz & occ feldsp w/ v rare lithic grains, unconsolidated.

Siltstone: oilve gray-med gry, firm to friable, subblocky.




Clay: med-dk olive gray-med gray, soft, easily soluble, sl-noncalcareous, massive, silty in part, minor Kaol.

Siltstone: olive gray-some med-dk gray, firm-fria, pred blocky, mod to very argil, sl-v calcareous, com v fine-ly sandy, locally micromicac, some sl kaol, grades in part to traces of silty Ss.

Survey @ 7285' 11.9deg 267.2az
TVD 7262.7' 71.9'S 414.6'E

MW 9.0 Vis 44

Clay: olive gray-med gry, some w/wht mottling, soft, mod solu, sticky & fairly cohesive, occ sandy or silty, kaol in part, some grds to Claystone.

Claystone: med dark gray w/sl olive cast, mod firm-firm, pred subblky, massive, sl-mod calc.

Siltstone: pred olive gray hues, soft-sl firm, tr firm, sbfriable-sbfissle, sl calc, tr faint wht mottling, cohes-ive, grdg to sandy Siltstone, tr soft Clay, no visible oil indicators, no cuttings gas.

Clay: olive gray hues, soft, sl hydrated, mod cohes-cohes, sl calcareous, massive, grdg to sl firm Claystone, com argil Siltstone, no visible oil indicators.

Claystone: olive gray, soft-sl firm, sl hydrated, massive, subfria-subfiss, sl calc, grdg to sl firm-v firm Sltst, tr sandy Sltst.

Sand: clear-gray qtz, vfn-fn gr, subang-rndd, well sorted, unconsol, assoc w/ sandy Siltstone, no vis oil indics.

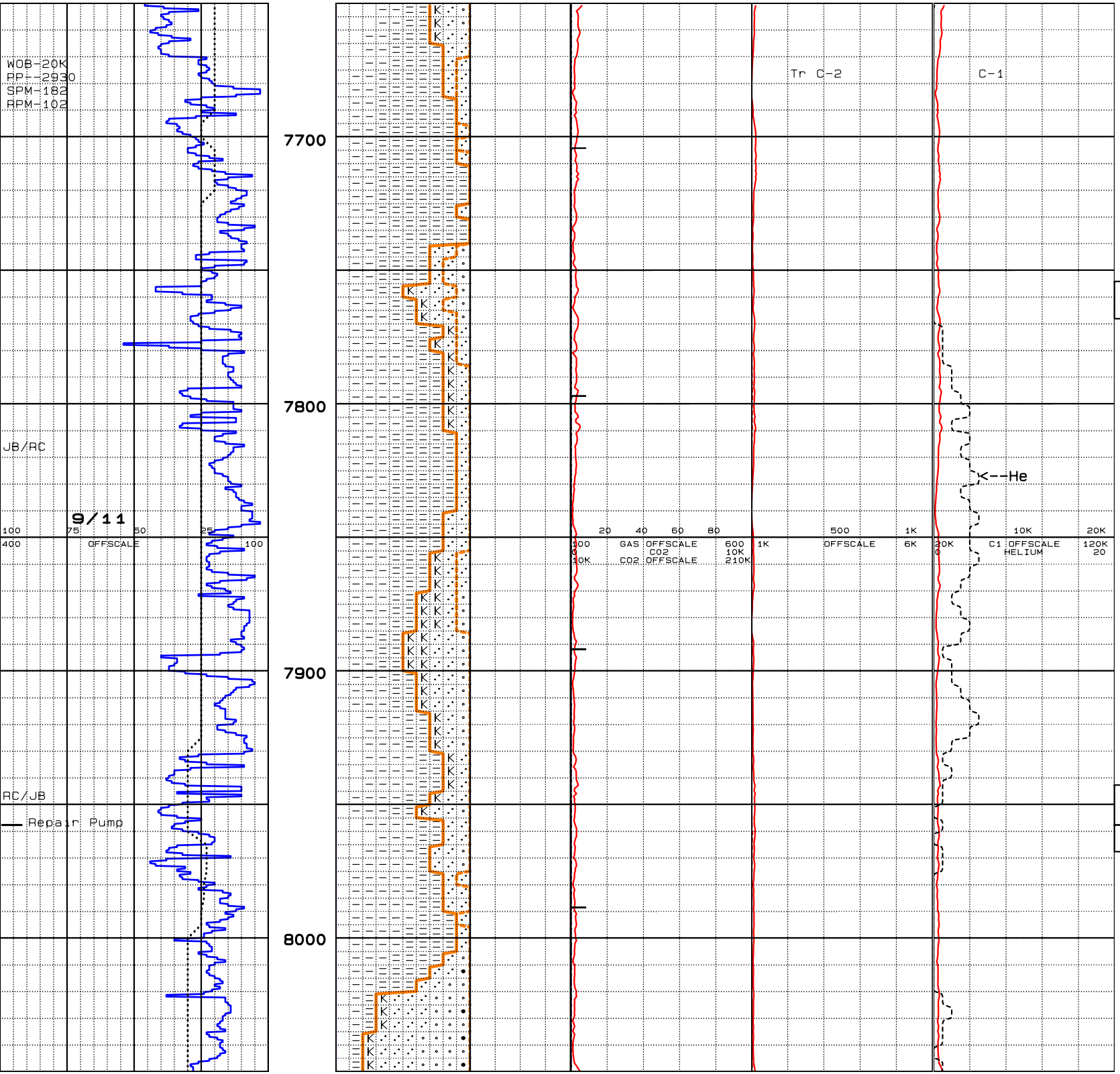
Survey @ 7570' 21.3deg 263.4az
TVD 7535.1' 78.8'S 332.3'E

MW 9.1 FV 45

Siltstone: pred olive gray hues, tr dk brn, soft-firm, sl hydrated, sl calcareous, vfn sandy in part, subblocky, sl grdg f/ argil sl firm Clyst, tr thin micro lams.

Sand: clr-wht-gray, mnr grn, tr pnk, orng & blk grs, vf-med w/ scatt'd cse grs & tr granules & pbbls, unconsol, angular-sub rounded, predom quartz, occ feldspar grs & tr volcanic appearing lithic grains, fair sorting.

Clay: med gray, occ olive cast, gray wht, soft, slow-mod solu, sticky & cohesive, silty ip.




Sandstone: brownish gray-dk gry, f-occ med gr, easily fria, sl-v argil, ang-sbang qtz, occ feldsp & mica, tr lithics, mrn amts well cmtd w/calcite, tr thin kaol Clay intbds.

Claystone: olive gray-med dk gray, mod firm, subblky, sl-very calcareous, silty in part, grades to Siltstone & Clay.

Clay: olive gray-med dk gray, tr gry-wht, soft, slowly to mod solu, sticky & cohesive, some sl calcareous.

Claystone & Siltstone: incr brownish gray.

Survey @ 7761' 27.6deg 266.1az
TVD 7709.6' 85.8'S 295.3'E

Sand: clr-wht-gry, mnr grn & tr blk, vf-med, unconsol, ang-subrndd, pred subang, qtz & some feld w/tr lithics & mica, intbdd argil-calc Ss.

Siltstone: pred dk olive gray-brnsh gray hues, soft-sl firm subblocky, sfria-sfiss, sl calcareous, argil-fn sandy, mixed w/ pred fn gr unconsol sands, occ wht mottling w/in cuttings, no vis oil indics.

Claystone: pred brnsh gry hues tr olive gray, soft-sl firm, subblocky, massive, sl calc, silty in part, occ thin wht mottling, argillaceous, mixed w/ silty fn gr Ss.

Sand: clear-gray qtz, fine-med gr, pred fine, subang-rndd, mod sorted, unconsolidated, intbdd w/ soft argil Clyst, sl-mod calc, occ wht Kaol cly tr sandy Siltstone.

Claystone: dk olive brn hues, soft-sl firm, subblky-subplty sl calcareous, silty in part, micro mica flakes, intbdd w/ fine sands/sandy Siltstone, no visible oil indicators.

Survey @ 7951' 35.3deg 265.5az
TVD 7870.7' 93.2'S 154.5'E

MW 9.0 Vis 43

Clay: med-dk brownish gray, occ w/olive cast, soft, slowly solu sticky & cohesive, silty in part, mod to well hydrated, sl-mod calcareous, tr Kaol.

Sand: clr-wht-gray, occ grn, f-med gr w/few cse grs & v sl tr granules, unconsol, ang-sub rndd, predom subang, qtz w/occ feldsp grs, sl tr lithic grs & v rare fine mica flakes.

Kaolinite: gry wht, soft, slow-insolu, sl-non sticky, mod hyd.