Mount Coty 2K-02 (302K026020123300)
Laboratory Analysis Report
OF-EP-Gen-SR-2009 0101
Sampling ID#12550
Chevron Canada Resources

April 12, 2011

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1.0 Executive Summary

In late 2009 through the middle of 2010 Chevron Canada Resources conducted a series of laboratory analyses on cuttings collected from the Mount Coty 2K-02 (UWI 302K026020123300) well form the Northwest Territories, Canada to evaluate the sampled intervals for potential hydrocarbon exploration. Bagged unwashed cuttings were selected and prepared for laboratory studies which included organic matter richness and maturity via total organic content (TOC) and Rock Eval pyrolysis, X-Ray Diffraction (XRD) for mineralogical compositional analysis, and porosity and permeability analysis.

2.0 Results & Conclusions

- Source Rock Analysis results indicate that the TOC range for the 57 cuttings samples that were analyzed by CBM Solutions, Ltd. ranges from approximately 2.30% to 5.24%. The TOC range for the seven composited samples that were analyzed by Core Laboratories Canada, Ltd. ranges from approximately 2.10% to 5.05%.
- Thermal maturity values based on converted vitrinite reflectance for three analyzed samples are 2.11%, 2.07%, and 2.07%.
- Quantitative X-Ray Diffraction results conducted by CBM Solutions, Ltd. on fifteen samples and Core Laboratories Canada, Ltd. on ten samples reveal quartz compositions greater than 60%, clay mineral components that range from 5% to 30%, a pyrite presence in all samples, and minimal carbonate content.
- Total porosities in the seven samples that were analyzed by CBM Solutions, Ltd. range from 0.15% to 12.51% with an average porosity of 4.54%. These results are considered to be unreliable and should be used with caution.
- Matrix permeabilities for the seven samples that were analyzed are considered to be unreliable and are therefore not reported.

3.0 Testing / Analysis Procedures

3.1 Cuttings Sampling & Preparation

On July 29, 2009 a Chevron geologist visited the Geological Core and Sample Repository at the Geological Survey of Canada (GSC) in Calgary, Alberta to sample cuttings from the Mount Coty 2K-02 (UWI 302K026020123300) well. Bagged unwashed samples from the 3,200 – 3,500 m intervals were reviewed and sampled. Chevron was limited to taking a maximum of 20 grams of cuttings samples per 5 m bagged interval per the authorization provided by the National Energy Board (NEB) dated June 23, 2009 (see Appendices). Where the sample volumes were limited, the samples were composited with smaller amounts of material from adjacent bags.

In August 2009 Petrocraft Products, Ltd. was contracted by Chevron Canada Resources to wash the cuttings samples because it was noted during sample collection that the samples contained residue from invert drilling mud that would require cleaning. After shipping the samples to Petrocraft Products, they were sorted according to depth from shallowest to deepest. The samples were poured into jars and mixed with 100 – 150 ml of water with no more than 5 ml of Kwikleen concentrated cleaner. The samples were then agitated for approximately 10 – 15 seconds and cleaned with water using a 100 mesh sieve. Following cleaning, they were placed into cardboard trays and allowed to air dry for two days (48 hours). They were then poured into labeled seven dram (25 ml) vials in each depth's entirety.

In early September 2009 Chevron contracted the services of a wellsite geologist through Pro Geo Consultants to pick samples by removing cavings and damaged cuttings components following the cleaning by Petrocraft Products Ltd. This was done because any cavings and damaged cuttings that were present would negatively affect the laboratory analysis results performed by the commercial laboratories, in addition to the fact that the commercial labs would not go through the process to remove these components. The samples were initially studied by a consulting geologist using a geological microscope. The intention was to retain a wide range of larger cutting and particle sizes using a 100 mesh size to catch the coarser fraction, and to discard the finer cavings and damaged cuttings smaller than 0.150 mm. To do this a hand-held regular sieve (40 to 100 mesh) was used, however ten 2 to 3 mm holes were punched in the center of the sieve manually using a nail or a screwdriver because the original mesh size was too fine for the cuttings. The sieved samples were then checked under the microscope to pick and remove any damaged cuttings that may have gone through. The sieved samples were then stored in vials with secured caps and prepared for shipping to the commercial laboratory for various analyses. Additional information on the sampling procedure and descriptions by Pro Geo Consultants can be found in the appendix of this report.

3.2 Source Rock Analysis & Thermal Maturity

In October 2009, 57 vials of cleaned sieved cuttings samples were delivered to CBM Solutions, Ltd. in Calgary, Alberta for source rock analysis to determine organic matter content. CBM Solutions tested an initial sample set of ten samples taken every 30 m with the Source Rock Analyzer to determine if the samples were still contaminated with the oil-based mud that was used to drill the well. Based on the results from this initial sample set, it was observed that there were elevated free hydrocarbon (S1) values which are a positive indicator of drilling fluid contamination (**Table 1**). It was then recommended that the samples be cleaned with toluene prior to rerunning the remainder of the sample set. Following the toluene cleaning of all samples, 57 sets of cuttings were analyzed with the source rock analyzer. The results indicate that the toluene did remove the oil-based drilling mud in order to produce more reliable results (**Table 2** with pyrograms in the appendix).

Sample ID	Depth (m)	Tmax °C	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PC (%)	PI	S2/S3	S1/TOC	TOC%	HI	OI
3225	3225.00	406.5	4.39	3.54	0.16	0.66	0.55	22.13	1.16	3.77	94	4
3255	3255.00	420.4	4.25	3.75	0.15	0.66	0.53	25.00	1.12	3.78	99	4
3285	3285.00	450.5	3.61	4.39	0.15	0.66	0.45	29.27	0.94	3.84	114	4
3315	3315.00	430.2	4.19	3.29	0.17	0.62	0.56	19.35	0.94	4.44	74	4
3345	3345.00	433.4	4.12	3.82	0.19	0.66	0.52	20.11	0.81	5.11	75	4
3375	3375.00	431.7	1.95	1.77	0.13	0.31	0.52	13.62	0.53	3.67	48	3
3405	3405.00	436.6	1.62	1.8	0.17	0.28	0.47	10.59	0.48	3.37	53	5
3435	3435.00	435.9	2.17	2.77	0.18	0.41	0.44	15.39	0.57	3.82	72	5
3465	3465.00	435.3	0.93	1.54	0.18	0.21	0.38	8.56	0.41	2.25	68	8
3480	3480.00	435.2	0.93	2.38	0.22	0.27	0.28	10.82	0.42	2.21	107	10

Table 1: Initial sample set of ten samples tested by CBM Solutions with the Source Rock Analyzer to determine if the cuttings samples were still contaminated with oil-based drilling mud. Note that the elevated S1 values indicate that there were still free hydrocarbons present.

In March 2010, following the CBM Solutions source rock analysis, Core Laboratories Canada, Ltd. also completed a source rock analysis study as part of a larger investigation of thermal maturity and microscopic organic analysis of bitumen. It should also be noted that the TOC determinations conducted by Core Laboratories utilized the LECO technique. The Core Laboratories source rock analysis investigation was limited by the amount of sample volume that remained from the CBM Solutions study, and it was therefore necessary to combine the samples over seven depth intervals to create enough rock volume for source rock analysis. These seven depth intervals included: 3,335 – 3,355 m, 3,355 – 3,370 m, 3,370 – 3,400 m, 3,400 – 3,425 m, 3,425 – 3,440 m, 3,440 – 3,460 m, 3,460 – 3,480 m. Core Laboratories TOC and Rock Eval pyrolysis analyses were performed at the GSC in Calgary to ensure that the samples did not leave Canada. However, once the results were compiled, the data was sent to a Core Laboratories technician in Houston, Texas, U.S.A. in order to analyze and interpret the results.

The thermal maturity evaluation based on vitrinite reflectance (Ro) and the microscopic organic analysis of bitumen was conducted by Core Laboratories on three samples based on the remaining sample volume that was available. One sample was derived from the 3,255 – 3,355 m interval, while the remaining two samples were derived from the 3,355 – 3,480 m interval.

Sample ID	Depth (m) Top	Tmax °C	TRUE Tmax °C	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PC (%)	PI	S2/S3	S1/TOC	TOC%	HI	OI
3200	3200.00	421.7	460.7	1.55	3.11	0.13	0.39	0.33	23.92	0.44	3.56	87	4
3205	3205.00	419.4	458.4	1.46	3.26	0.17	0.39	0.31	19.18	0.42	3.45	95	5
3210	3210.00	415.6	454.6	1.55	3.18	0.16	0.39	0.33	19.88	0.42	3.69	86	4
3215	3215.00	412.7	451.7	1.39	3.12	0.15	0.37	0.31	20.80	0.41	3.41	91	4
3220	3220.00	423.3	462.3	1.05	3.08	0.16	0.34	0.25	19.25	0.30	3.52	88	5
3225	3225.00	416.8	455.8	0.98	2.86	0.13	0.32	0.26	22.00	0.29	3.43	83	4
3230	3230.00	422.9	461.9	1.13	3.54	0.12	0.39	0.24	29.50	0.30	3.71	95	3
3235	3235.00	423.5	462.5	1.84	3.34	0.11	0.43	0.36	30.36	0.37	4.92	68	2
3240	3240.00	420.2	459.2	1.94	3.28	0.11	0.43	0.37	29.82	0.39	4.95	66	2
3245	3245.00	425.7	464.7	1.50	3.63	0.11	0.43	0.29	33.00	0.41	3.66	99	3
3250	3250.00	426.8	465.8	1.58	4.40	0.15	0.50	0.26	29.33	0.43	3.68	120	4
3255	3255.00	429.3	468.3	1.44	3.61	0.09	0.42	0.29	40.11	0.41	3.47	104	3
3260	3260.00	426.5	465.5	1.33	2.68	0.08	0.33	0.33	33.50	0.38	3.49	77	2
3265	3265.00	427.6	466.6	1.24	2.99	0.10	0.35	0.29	29.90	0.36	3.43	87	3
3270	3270.00	424.9	463.9	1.28	2.69	0.07	0.33	0.32	38.43	0.36	3.59	75	2
3275	3275.00	424.7	463.7	1.38	2.92	0.07	0.36	0.32	41.71	0.36	3.80	77	2
3280	3280.00	425.4	464.4	1.28	2.64	0.08	0.33	0.33	33.00	0.35	3.71	71	2
3285	3285.00	427.4	466.4	1.26	2.82	0.07	0.34	0.31	40.29	0.36	3.46	82	2
3290	3290.00	429.6	468.6	1.36	3.14	0.08	0.37	0.30	39.25	0.36	3.74	84	2
3295	3295.00	422.6	461.6	1.26	2.45	0.07	0.31	0.34	35.00	0.35	3.65	67	2
3300	3300.00	423.9	462.9	1.35	2.88	0.09	0.35	0.32	32.00	0.35	3.81	76	2
3305	3305.00	426.9	465.9	1.26	2.88	0.13	0.34	0.30	22.15	0.35	3.63	79	4
3310	3310.00	428.9	467.9	1.36	2.75	0.10	0.34	0.33	27.50	0.34	4.02	68	3
3315	3315.00	426.1	465.1	1.29	2.57	0.09	0.32	0.33	28.56	0.30	4.23	61	2
3320	3320.00	425.8	464.8	1.41	2.38	0.11	0.31	0.37	21.64	0.32	4.37	55	3
3325	3325.00	427.3	466.3	1.20	2.42	0.18	0.30	0.33	13.44	0.28	4.34	56	4
3330	3330.00	427.2	466.2	1.11	2.18	0.17	0.27	0.34	12.82	0.25	4.39	50	4
3335	3335.00	428.4	467.4	1.19	2.29	0.11	0.29	0.34	20.82	0.26	4.50	51	3
3340	3340.00	426.3	465.3	1.33	2.17	0.11	0.29	0.38	19.73	0.30	4.43	49	2
3345	3345.00	429.9	468.9	1.36	2.44	0.13	0.32	0.36	18.77	0.29	4.75	51	3
3350	3350.00	431.9	470.9	1.48	2.60	0.20	0.34	0.36	13.00	0.31	4.83	54	4
3355	3355.00	425.4	464.4	1.29	1.88	0.19	0.26	0.41	9.89	0.25	5.18	36	4
3360	3360.00	433.1	472.1	1.27	2.10	0.25	0.28	0.38	8.40	0.24	5.24	40	5
3365	3365.00	427.8	466.8	1.22	2.01	0.20	0.27	0.38	10.05	0.25	4.80	42	4
3370	3370.00	428.7	467.7	1.20	2.19	0.22	0.28	0.35	9.95	0.23	5.16	42	4
3375	3375.00	426.9	465.9	0.70	1.11	0.18	0.15	0.39	6.17	0.21	3.29	34	6
3380	3380.00	427.6	466.6	0.98	1.40	0.28	0.20	0.41	5.00	0.28	3.52	40	8
3385	3385.00	429.2	468.2	0.82	1.46	0.23	0.19	0.36	6.35	0.25	3.29	44	7
3390	3390.00	427.7	466.7	0.80	1.53	0.11	0.19	0.34	13.91	0.25	3.22	48	4
3395	3395.00	429.1	468.1	0.78	1.37	0.07	0.18	0.36	19.57	0.25	3.07	44	2
3400	3400.00	432.1	471.1	0.73	1.26	0.05	0.17	0.37	25.20	0.24	3.02	42	2
3405	3405.00	435.4	474.4	0.84	1.51	0.17	0.20	0.36	8.88	0.26	3.24	47	5
3410	3410.00	426.6	465.6	0.79	1.19	0.06	0.16	0.40	19.83	0.27	2.96	40	2
3415	3415.00	428.1	467.1	0.63	0.92	0.13	0.13	0.41	7.08	0.25	2.51	37	5
3420	3420.00	436.9	475.9	0.63	1.22	0.08	0.15	0.34	15.25	0.25	2.48	49	3
3425	3425.00	430.5	469.5	0.83	1.54	0.07	0.20	0.35	22.00	0.26	3.19	48	2
3430	3430.00	430.0	469	0.84	1.58	0.13	0.20	0.35	12.15	0.28	3.04	52	4
3435	3435.00	430.3	469.3	0.97	1.62	0.08	0.21	0.37	20.25	0.28	3.50	46	2
3440	3440.00	432.1	471.1	0.80	1.47	0.27	0.19	0.35	5.44	0.23	3.50	42	8
3445	3445.00	434.6	473.6	0.68	1.55	0.16	0.19	0.30	9.69	0.20	3.43	45	5
3450	3450.00	431.6	470.6	0.50	0.98	0.27	0.12	0.34	3.63	0.19	2.57	38	10
3455	3455.00	432.8	471.8	0.44	1.12	0.16	0.13	0.28	7.00	0.18	2.38	47	7
3460	3460.00	431.4	470.4	0.40	0.97	0.12	0.11	0.29	8.08	0.17	2.30	42	5
3465	3465.00	434.8	473.8	0.79	2.01	0.09	0.23	0.28	22.33	0.33	2.36	85	4
3470	3470.00	432.2	471.2	0.82	2.14	0.13	0.25	0.28	16.46	0.32	2.54	84	5
3475	3475.00	433.1	472.1	0.71	1.81	0.10	0.21	0.28	18.10	0.30	2.37	77	4
3480	3480.00	438.7	477.7	0.76	2.19	0.13	0.24	0.26	16.85	0.33	2.33	94	6

Table 2: Source Rock Analysis results for the 57 Mount Coty 2K-02 samples analyzed by CBM Solutions.

3.2.1 Methodology

Both CBM Solutions, Ltd. and Core Laboratories Canada, Ltd. utilize a similar procedure for source rock analysis. For the purpose of this report the source rock analysis methodology described below is based off of the CBM Solutions' procedure.

Sample preparation involved crushing the shale samples finely enough so that 85% fell through a 75 mesh screen. Approximately 100 mg of each sample was then loaded into a stainless steel crucible and capped with a micro mesh filter. The Source Rock (SR) Analyzer consists of a Flame Ionization Detector (FID) and two IR detector cells. The free hydrocarbons (S1) were determined through isothermal heating of the sample at 340 degrees Celsius, and were measured by the Flame Ionization Detector. The temperature was then increased from 340-640 degrees Celsius. Hydrocarbons were then released from the kerogen and measured by the Flame Ionization Detector creating the S2 peak. The temperature at which S2 reaches its maximum rate of hydrocarbon generation is referred to as Tmax. The CO_2 generated from the oxidation step in the 340-580 degrees Celsius was measured by the IR cells and is referred to as the S3 peak. To ensure accuracy, standard samples were loaded at the beginning and the end of the run. Any drift in data was detected and the samples were rerun when necessary.

There are a number of measurements that resulted from this analysis. S1 indicates the amount of free hydrocarbons in the sample (mg/g); S2 is the amount of hydrocarbons generated through thermal cracking (mg/g), and provides the quantity of hydrocarbons that the rock has the potential to produce through diagenesis. S3 is the amount of CO_2 (mg of CO_2/g of rock), and reflects the amount of oxygen in the oxidation step. Tmax is the temperature at which the maximum rate of generation of hydrocarbons occurs during pyrolysis. Lastly TOC is the weight percentage of organic carbon in the sample.

3.2.2 Analysis Results

Table 2 contains the results of the 57 samples that were analyzed by CBM Solutions. Tmax values range from 451.7°C in the sample from 3,215 m to 477.7°C in the sample from 3,480 m. TOC measurements range from 2.30% to 5.24% with the lowest value in the sample from 3,460 m and the highest value in the sample from 3,360 m.

Table 3 contains the results of the seven samples analyzed by Core Laboratories. Tmax values range from 419°C in the composited sample derived from 3,400 m to 428°C in the samples composited from both 3,370 m and 3,480 m. TOC measurements range from 2.10% to 5.05% with the lowest value in the composited sample from 3,480 m and the highest value in the composited sample from 3,370 m.

Project / Sample ID	Leco TOC (wt% HC)	Rock-Eval S1 (mg HC/g)	Rock-Eval S2 (mg HC/g)	Rock-Eval S3 (mg CO2/g)	Tmax (°C)
3355 m	5.00	3.54	2.84	0.28	424
3370 m	5.05	3.12	2.33	0.32	428
3400 m	3.10	1.84	1.25	0.24	419
3425 m	2.59	1.48	1.07	0.26	421
3440 m	3.18	1.85	1.40	0.27	425
3460 m	2.78	1.52	1.10	0.23	423
3480 m	2.10	1.29	1.67	0.27	428

Table 3: Core Laboratories Rock Eval and TOC results for the seven analyzed Mount Coty 2K-02 samples.

The description of the sample derived from 3,255 m for thermal maturity evaluation based on vitrinite reflectance (Ro) and the microscopic organic analysis of bitumen can be found in the appendix of this report. The mean random bitumen reflectance as observed from twelve readings is 2.77%. In order to convert this to vitrinite reflectance the Jacob Formula (Rvit = Rbit x 0.618 = 0.4) was utilized to derive a vitrinite equivalent of 2.11%. The organic matter was observed to be post mature and in the lower part of the gas generation zone.

The description of the sample derived from 3,415 m for thermal maturity evaluation based on vitrinite reflectance (Ro) and the microscopic organic analysis of bitumen can also be found in the appendix of this report. The mean random bitumen reflectance as observed from 26 readings is 2.70%. Again, the Jacob Formula was utilized to derive a vitrinite equivalent of 2.07%. In this sample it was also observed that the organic matter is post mature and in the lower part of the dry gas generation zone.

The description of the sample derived from 3,450 m for thermal maturity evaluation based on vitrinite reflectance (Ro) and the microscopic organic analysis of bitumen can be found in the appendix of this report. The mean random bitumen reflectance as observed from 41 readings is 2.70%. The Jacob Formula was utilized to derive a vitrinite equivalent of 2.07%. The organic matter was again observed to be post mature and in the lower part of the gas generation zone.

3.2.3 Interpretation

Two of the samples have S1 greater than 3 mg HC/g rock. When S1 is above 2 mg HC/g rock, and when it is also associated with a bimodal S2 peak, a very low Tmax, and an anomalous production index (PI), then the indication is that these samples are either contaminated by drilling fluid additives, or contain migrated hydrocarbons. The S2 is distinctly bimodal because the pyrogram displays a lower temperature S2 "shoulder" (Tmax) and a higher temperature S2 peak (Tpeak) even if the S2 yields are very low (<3 mg HC/g TOC). The Tmax values are in the mid 420°C, which suggests immaturity which is equivalent to an Ro of less than 0.6%. The Tpeak values which are in the

460°C range suggest mature organic matter equivalent to an Ro of about 1.0%. Additionally, the Tpeak values are still very low and do not reflect the true level of thermal maturity of the samples. Furthermore, the hydrogen index (HI) values are less than 100 mg HC/g TOC, which suggest gas-prone organic matter. Gas-prone organic matter is also indicated by the HI vs. oxygen index (OI) plot (se Appendices), although the S2/S3 ratio is in the in the 5-10 range which suggests organic matter with both oil and gas potential. Finally, the HI vs. Tmax and PI vs. Tmax plots are not considered to be reliable.

The measured Ro values are considered to be reliable. Reflectance was measured on bitumen and then converted to vitrinite Ro-equivalent using the Jacob Formula as described above (Rvit = Rbit x 0.618 + 0.4). Bitumen random Ro had a mean value in the 2.7% to 2.8% range. The vitrinite isoreflectance is approximately 2.1%. This is in very good agreement with Ro data published for middle Devonian source rocks at approximately 3,500 m depth from the general vicinity of these samples. This data is published in a series of GSC "Current Research" articles and compiled in GSC Open File Report #1944, 65 pp (Feinstein, S. Brooks, P.W., Gentzis, T., Snowdon, L.R. and Williams, G.K.). The report is entitled "*Thermal maturity in the Mackenzie Corridor, Northwest and Yukon Territories.*" Published Tmax values for the area based on that study suggest that a reliable Tmax should be greater than 550°C and closer to 600°C with a vitrinite Ro of about 2.2%.

The interpretation for the S2 bimodality and a possible explanation of the Rock Eval data is due to the presence of relatively large amounts of bitumen that is both labile in the S1 peak and residual in the lower-temperature part of the S2 peak. There are two possible causes for this anomalous response. Either the samples are “contaminated" by drilling fluids, or they constitute a "shale" (i.e. tight to ultra tight) reservoir, where an indigenous petroleum/bitumen comprising the S1 peak and low-temperature part of the S2 peak is stored in intrinsic porosity within the lithology. Ideally, S1 is a measure of the soluble bitumen content or free hydrocarbon compounds present in the rock, and S2 is a measure of the insoluble kerogen content derived from kerogen cracking during pyrolysis. However, the S2 peak may not be comprised solely of hydrocarbon compounds coming from kerogen cracking, as it may also contain heavy ends of migrated oil and indigenous bitumen, or even organic drilling mud additives that can affect the size and shape of the S2 peak as well as the Tmax temperature. Anomalously low Tmax (<400°C) often indicates the presence of residual or refractory bitumen in the rock that is not volatilized during the S1 heating stage of Rock Eval pyrolysis. The residual bitumen that forms the low-temperature part or “the shoulder” of the bimodal S2 peak is likely occupying a matrix pore space. This is a positive indication for the potential for shale gas reservoir development because residual bitumen indicates that the rock has some porosity that could facilitate gas storage. It should be noted that gas production is mainly a function of rock permeability, although having high porosity is still desired.

3.3 X-Ray Diffraction Analysis

Of the 57 cuttings samples sent to CBM Solutions, Ltd. for source rock analysis, fifteen samples (one sample every 20 meters) were selected for X-Ray Diffraction analysis and Rietveld quantification in October of 2009. This procedure was conducted to determine and quantify the mineralogical compositions of the samples, and was intended for use as an input into petrophysical modeling and for predicting the mechanical properties of the samples. The full report documenting the methodology employed by CBM Solutions, Ltd. and their results can be found in the appendix of this report.

In July of 2010 Core Laboratories was also asked to perform quantitative X-Ray Diffraction analyses on the same sample material that they received for source rock analysis and thermal maturity evaluation. This evaluation was conducted because Core Laboratories incorporates organic matter content into their XRD results by computing mineralogy volume percentage in addition to the standard mineralogy weight percentage. This additional step is very useful to the formation evaluation specialist conducting petrophysical mineral modeling. Core Laboratories X-Ray Diffraction analysis was run in their laboratory in Calgary, but the raw diffractograms were sent to their Houston office for interpretation and integration with the TOC results. Ten samples were selected based on the amount of cuttings material remaining from all previous analyses. Three of the samples were derived from the depth interval 3,255 – 3,355 m while the remaining seven were derived from the 3,355 – 3,480 m interval.

3.3.1 Analysis Results

All fifteen of the CBM Solutions analyzed samples have detectable and quantifiable amounts of quartz, feldspar, clay minerals, carbonates, and pyrite. In all of the samples, quartz (63-87%) and clay minerals (5-30%) make up the majority of the composition. Carbonates (0-12.5%), feldspars (0-5%), and pyrite (1.5-4%) are present in only subordinate amounts (**Table 4** & **Figure 1**). These results were plotted on a ternary diagram with the endmembers of quartz, clay, and carbonate content (**Figure 2**). All of the samples plot very near the quartz endmember with a slight shift towards the clay endmember due to the relative lack of carbonate content. It is also observed that the eight samples from the upper portion of the interval plot closer to the clay baseline on the ternary plot while the seven lower samples generally plot more evenly between the clay and carbonate baselines. The three samples from the uppermost portion of the interval contain both illite and kaolinite, while illite is the only clay mineral in the deeper samples (3,260 – 3,480 m). No swelling clay minerals were identified in these samples. The carbonate minerals are composed of calcite, dolomite, and iron-rich dolomite (ankerite). An overall increase in quartz content with depth is observed across the sampled interval which is accompanied by a decrease in clay content. All other mineral phases make up a minor percentage of the total rock composition.

XRD File	Drill Depth (m)	Quartz	Feldspars	Clays		Carbonates			Sulphide
			Albite	Illite	Kaolinite	Calcite	Dolomite	Ankerite	Pyrite
CH3200	3200	63	0	24.2	4.2			4.7	3.8
CH3220	3220	65.4	3.4	24	3			0.8	3.3
CH3240	3240	62.7	0.1	26.8	2.7			3.3	4.3
CH3260	3260	77.1	0.1	19				1.3	2.5
CH3280	3280	80.5	3.1	14.1				0.2	2.1
CH3300	3300	76.2	3.4	16.4				1.3	2.7
CH3320	3320	80.7	4.8	12.1				0.1	2.4
CH3340	3340	83.7	3.2	9.9				1.2	2
CH3360	3360	73	3.8	8.3		6.7	5.8		2.4
CH3380	3380	84.5	2.8	5.9		2.8	2.3		1.7
CH3400	3400	80.9	3.9	6.5		2.4	4.2		2.1
CH3420	3420	87.1	1.4	6.2		1.6	1.9		1.8
CH3440	3440	86.5	1.9	6.4		2.2	1.6		1.5
CH3460	3460	83.3	3	4.6		2.2	5.2		1.8
CH3480	3480	77.8	3.7	7.5		2.9	6.4		1.7

Table 4: Mineralogy results for the Mount Coty 2K-02 samples conducted by CBM Solutions using Rietveld analysis.

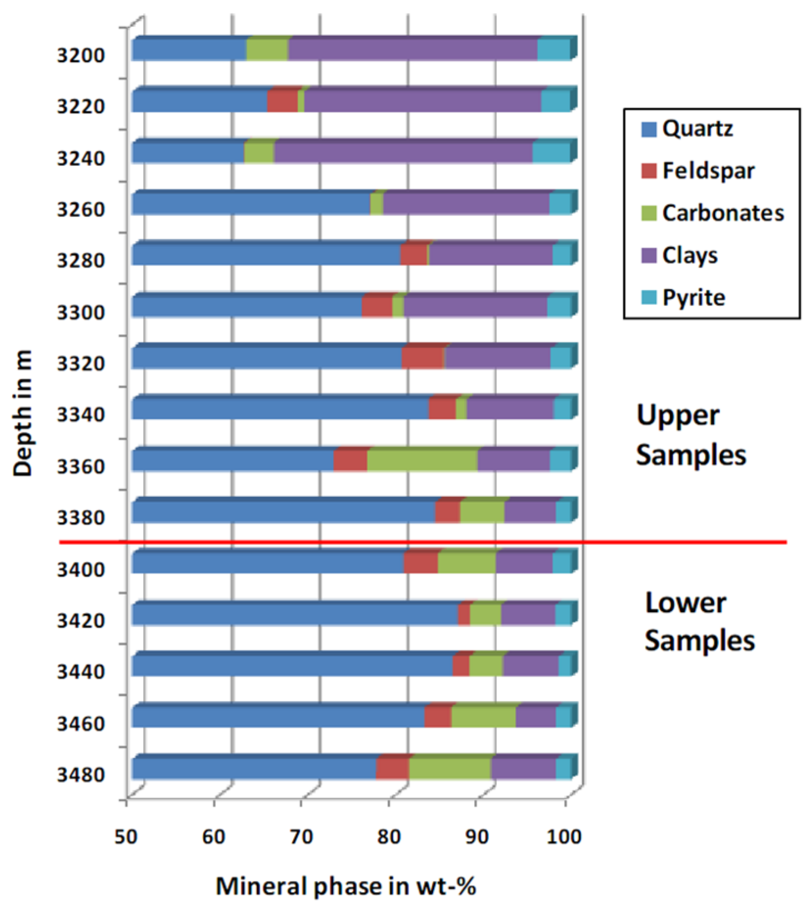


Figure 1: Mean mineral weight percentage by sample depth as analyzed by CBM Solutions.

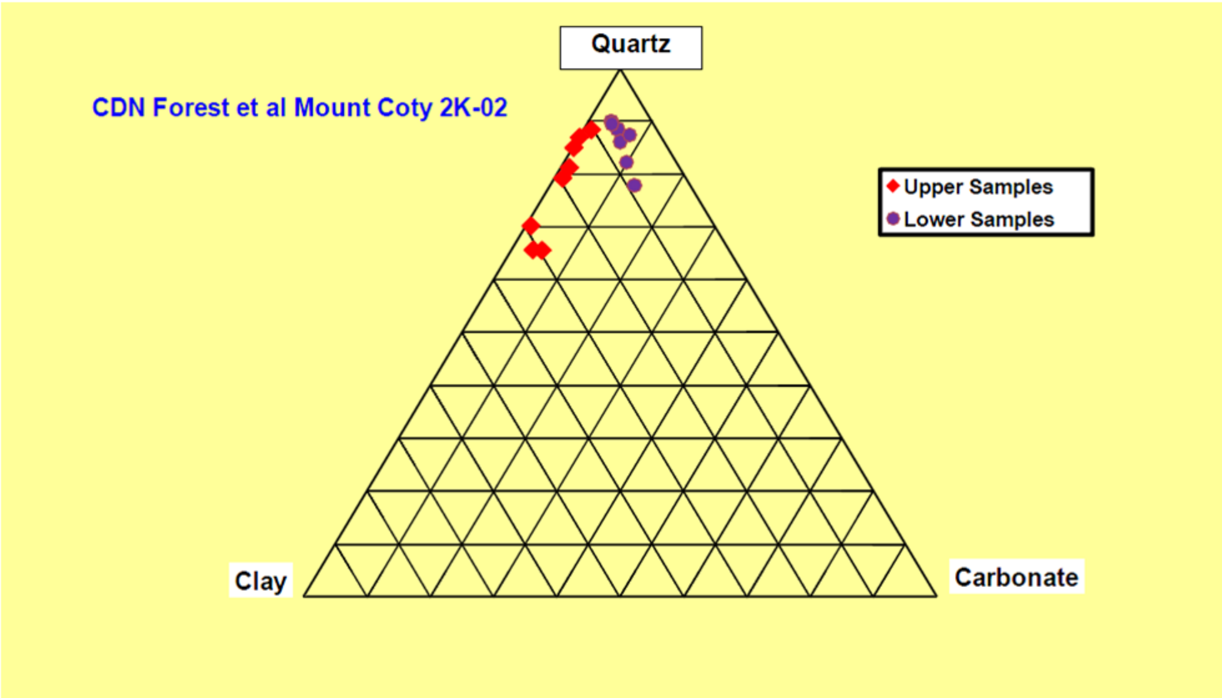


Figure 2: Ternary diagram of the Mount Coty 2K-02 sample results from CBM Solutions showing the quartz, clay, and carbonate contents.

The ten samples analyzed by Core Laboratories also have detectable and quantifiable amounts of quartz, feldspar, clay minerals, carbonates, and pyrite. Again, in all of the samples quartz (60.2-83.3%) and clay minerals (10.0-31.8%) make up the majority of the composition (**Table 5**). Carbonates (0-7.3%), feldspars (0-1.6%), and pyrite (2.3-6.5%) make up the remaining mineralogical material.

	CDN Forest Et Al Mount Coty 2K-02									
Sample ID	1	2	3	4	5	6	7	8	9	10
Depth Interval (ft)	3255	3280	3330	3335-3355	3355-3370	3370-3400	3400-3425	3425-3440	3340-3460	3460-3480
Weight % TOC	0.00	0.00	0.00	5.00	5.05	3.10	2.59	3.18	2.78	2.10
Mineralogy Weight %										
Mineral	Whole Rock Weight %									
Quartz	60.2	72.8	76.8	79.6	70.5	79.5	83.3	81.3	82.4	78.4
Plagioclase	0.8	1.1	0.6	0.7	1.6	0.5	0	0	0.6	1.5
Calcite	0	0	0	0	2.8	1.8	1.4	1.8	1.6	1.9
Dolomite & Fe-Dolomite	0.8	0.8	1.2	0.6	2.5	1.5	2.1	1.1	1.9	1.9
Pyrite	6.5	4.3	3.3	2.3	4.4	2.9	3	3.8	3.5	3.2
Total Clay	31.8	21	18.2	16.7	18.2	13.7	10.2	12.1	10	13.1
Total	100.1	100	100.1	99.9	100	99.9	100	100.1	100	100
Clay Mineral	Relative Clay %									
Illite/Smectite 10-15% S	20	0	0	0	22	16.9	0	0	0	14
Illite & Mica	80	100	100	100	66.9	72	100	100	100	70.1
Chlorite	0	0	0	0	11.1	11.1	0	0	0	15.9
Sum Bulk	100.1	100	100.1	99.9	100	99.9	100	100.1	100	100
Sum Clay	100	100	100	100	100	100	100	100	100	100
Mineralogy Volume % (incl. TOC as Kerogen)%										
Mineral	Whole Rock Weight %									
Quartz	62.2	74.5	78.2	72	64.4	75.4	79.8	77.1	78.8	76.2
Plagioclase	0.8	1.2	0.6	0.7	1.5	0.5	0	0	0.6	1.4
Calcite	0	0	0	0	2.5	1.6	1.3	1.6	1.5	1.8
Dolomite & Fe-Dolomite	0.7	0.7	1.1	0.5	2.1	1.4	1.8	1	1.7	1.7
Pyrite	3.6	2.3	1.7	1.1	2.1	1.5	1.5	1.9	1.8	1.7
Illite/Smectite 10-15% S	6.6	0	0	0	3.7	2.2	0	0	0	1.8
Illite & Mica	26.1	21.3	18.4	15	11	9.3	9.7	11.4	9.5	8.9
Chlorite	0	0	0	0	1.7	1.3	0	0	0	1.8
Kerogen	0	0	0	10.7	11	6.8	5.7	7	6.2	4.7
Total	100	100	100	100	100	100	99.8	100	100.1	100
Vclay	32.7	21.3	18.4	15	16.4	12.8	9.7	11.4	9.5	12.5
Calc. G.D. (g/cc)	2.74	2.711	2.697	2.535	2.564	2.601	2.616	2.606	2.615	2.637

Table 5: Mineralogy results for the Mount Coty 2K-02 samples conducted by Core Laboratories.

3.3.2 Interpretation

These results indicate that the fifteen samples analyzed by CBM Solutions and the ten samples analyzed by Core Laboratories are very siliceous. All of the samples that were analyzed have greater than 60% quartz content. Additionally, it should be noted that pyrite was measured in all of the samples. The presence of certain types of pyrite in black mudrocks is typically indicative of deposition in a euxinic (anoxic & sulfidic) water column. This would imply that the sampled interval at this locality was deposited in a deep marine anoxic environment with a significant silica input most likely through diagenetically altered sponge spicules or radiolarian tests. No petrographic or SEM analyses were completed on these samples to verify the textural distribution of mineralogy due to the minimal sample size that was allotted for this study. It is therefore difficult to conclude on the types of mineral phases that are present and their relationships to both the depositional and diagenetic histories of these samples. In addition, it is interpreted that this formation will behave in a brittle manner in the subsurface based on the significant quartz content that is present.

3.4 Porosity / Permeability

Seven composited samples were analyzed by CBM Solutions, Ltd. in March of 2010 for porosity and permeability using bulk density and skeletal (grain) density under minimal stress conditions. These seven depth intervals included: 3,335 – 3,355 m, 3,355 – 3,370 m, 3,370 – 3,400 m, 3,400 – 3,425 m, 3,425 – 3,440 m, 3,440 – 3,460 m, 3,460 – 3,480 m. As stated previously, it was necessary to combine samples from multiple depth intervals in order to create enough sample volume to conduct the analysis.

3.4.1 Methodology

The laboratory methodology utilized by CBM Solutions to measure porosity and permeability in tight rock reservoirs is proprietary, but is conceptually outlined here for this report.

The samples were initially crushed to pass through a 20 mesh screen (<0.841 mm) and were captured by a 35 mesh screen (>0.500 mm). The skeletal (grain) volume was calculated using a calibrated double cell apparatus (helium pycnometer) and Boyle's Law. A known weight of sample was dosed with helium from a reference cell and allowed to come to equilibrium. Bulk volume was then calculated using mercury immersion and displacement (Archimedes principle). The volume of mercury displaced by the submerged sample was calculated using the density of mercury and the mass of the mercury displaced, and was used to equal the bulk volume of the sample. Bulk density equals the sample weight over the bulk volume. The porosity was then calculated from skeletal and bulk densities. Matrix permeability was determined from the rate at which helium gas penetrated the pores using a pressure decline curve.

3.4.2 Analysis Results

Total porosities for the seven samples range from 0.15% to 12.51% with an average porosity of 4.54% (**Table 6**). Matrix permeability results were considered to be unreliable and are therefore not reported.

Sample	Drill Depth		Density g/cc	Skeltal Density g/cc		Porosity %
	Top (m)	Btm (m)	Avg	Avg	Std Dev	Total
3335-3355	3335.00	3355.00	2.28	2.60	0.0042	12.51
3355-3370	3355.00	3370.00	2.27	2.57	0.0104	11.75
3370-3400	3370.00	3400.00	2.49	2.62	0.0088	4.77
3400-3425	3400.00	3425.00	2.64	2.65	0.0058	0.33
3425-3440	3425.00	3440.00	2.68	2.70	0.0052	0.51
3440-3460	3440.00	3460.00	2.63	2.63	0.0059	0.15
3460-3480	3460.00	3480.00	2.62	2.67	0.0047	1.73

Table 6: Porosity and permeability results for the seven Mount Coty 2K-02 samples analyzed by CBM Solutions.

3.4.3 Interpretation

Like the permeability data mentioned above, the porosity results gathered from these samples is considered to be unreliable. The small sample size that is associated with cuttings make it difficult to collect quality bulk density results. While the samples were analyzed multiple times in an attempt to document repeatable results, the numbers in **Table 6** were the ultimately the best absolute values that were collected. These results should be used with extreme caution, and are only useful for providing possible porosity ranges.

3.5 Researcher Information

Core sampling was requested and conducted by:

Greg Hayden: *BSc. (hon) Geology (Saskatchewan)*
Work Experience (years) - 33 with Chevron
Petros Papazis: *M.S. Geology (Texas), B.S. (hon) Geology (Texas)*
Work Experience (years) - 5 with Chevron

Cuttings sample preparation was conducted by:

Petrocraft Products, Ltd.,
2410c – 2nd Ave S.E.
Calgary, Alberta T2E 6J9
Canada
(403) 272-9590

Pro Geo Consultants
511, 609 – 14th St. N.W.
Calgary, Alberta T2N 2A1
Canada
(403) 262-9229

Laboratory analyses were conducted by:

CBM Solutions, Ltd., Calgary, Alberta, Canada
621 – 37th Ave. N.E.
Calgary, Alberta T2E 2M1
Canada
(403) 250-5582

Core Laboratories Canada, Ltd.
2810 – 12th Street N.E.
Calgary, Alberta T2E 7P7

Canada
(403) 250-4000

4.0 Future Work

At this time it is not recommended that further analyses be conducted on these cuttings samples. The presence of oil-based drilling mud made it especially difficult to obtain accurate geochemical results without thoroughly cleaning the samples with toluene first. For this reason it is recommended not to rely on the TOC data compiled in this report. Additionally, the sample size associated with the cuttings made it extremely difficult to obtain porosity and permeability results utilizing the methodology employed by the CBM Solutions, Ltd. Ultimately, the types of analyses conducted in this study are better suited for core samples as opposed to cuttings. The only exception to this are the XRD results that have no size restriction, nor does the presence of oil-based drilling mud have any effect on the results. One potential analysis that was not conducted was the use of scanning electron microscopy (SEM). An investigation utilizing this technique may be useful for understanding the nature and distribution of the minerals identified during the XRD analysis, in addition to identifying micropores present in the samples.

5.0 Appendices

National Energy Board

Office national de l'énergie

File: OF-EP-Gen-SR-2009 0101
Sampling ID # 12550
23 June 2009

Greg Hayden
Sr. Staff Geologist
Chevron Canada Resources
500- 5th Ave. S.W.
Calgary, AB T2P 0L7

Dear Mr. Hayden:

Sampling Request

We have considered your request to sample unwashed cuttings and core from two wells in the NWT. Please note that the Sampling Identifier No.**12550** has been assigned to this authorization and should be quoted on all future correspondence.

This is your authorization to conduct TOC analysis, rock eval pyrolysis, He/Hg, SEM/SEMBSEM, XRD analysis on core, and plain light microscopy subject to the following conditions:

1. The wells authorized for sampling are:
   a. Mount Coty 2K02, 3000 -3600 m; bagged samples;
      4300-4570 m; bagged samples;
   b. Bovie Lake J-72, 2925.2-2935.2 m; core; (core fragments)

2. A "Record of Examination and Loan" form must be obtained by the applicant from the Head, Core and Sample Repository prior to commencement of the study and the completed form will be returned to the Head, Core and Sample Repository at the conclusion of the study.

3. Cutting sample size is limited to a maximum of 20 grams per bagged interval. Where sample volumes are limited, the sample may consist of a composite of smaller amounts of material from adjacent bags.

4. Sampling is authorized for Bovie Lake J-72, 6 plugs at 1.5 meter spacing, no closer than 30 cm from any plug location.

5. No sample from a core may include more than twenty-five (25) per cent of the original diameter of the core.

6. Actual sample size will be determined by the Head, Core and Sample Repository and will depend on availability of material for sampling.

7. Sampling must be done under the supervision of the Head, Core and Sample Repository.

444 Seventh Avenue SW
Calgary, Alberta T2P 0X8

444, Septième Avenue S.-O.
Calgary (Alberta) T2P 0X8

Canada

Telephone/Téléphone : 403-292-4800
Facsimile/Télécopieur : 403-292-5503
http://www.neb-one.gc.ca
Telephone/Téléphone : 1-800-899-1265
Facsimile/Télécopieur : 1-877-288-8803

8. Where a report for sampling authorization exceeds a period of one year, a written status update is required for that authorization.

9. Two paper copies and one PDF copy of the study are required within six months of completion of the study. One paper and PDF copy of the report is to be sent to the National Energy Board, at this address, and one paper copy to the Head, Core and Sample Repository at the GSC Calgary. The report will include the purpose of the study, the procedures used for analysis and the results of tests and analyses performed and any interpretations made. More specifically, the report should include:
   a. an introduction which includes the background information and the purpose of the study;
   b. a summary of the testing/analysis procedures utilized, a list of companies and individuals that performed the testing/analysis and their relevant professional credentials;
   c. a description of the results achieved;
   d. an interpretation of the results and implications for future work; and
   e. appendices that include the raw data, any graphs/plots/strip logs, any photographs/SEM photomicrographs or other such representations.

A period of privilege of two years is granted to final reports from studies on non-privileged wells from the date of completion of the study. These reports will be made available to the public after the expiration of the period of privilege.

Yours truly,

Bharat Dixit
Chief Conservation Officer

c.c. Richard Fontaine, Geological Survey of Canada - Calgary

Sample Washing Process

Cdn Forest Et Al Mount Coty
2K-02
302K023020123300

- Samples sorted into order according to depth, shallow to deepest.
- Sample poured into jars, added 100 – 150 ml. water mixed with no more than 5 ml of Kwikleen concentrated cleaner.
- Agitated for approx. 10 -15 seconds.
- Cleaned from below with water using 100 mesh sieve.
- Placed into cardboard trays and allowed to air dry for 2 days (48 hrs.)
- Poured into labeled 7 dram (25 ml) vials in each depths entirety.

Any question or concerns with this process is welcome to call:

Bob Rossow
Warehouse Manager
Petrocraft Products Ltd.
Calgary, AB.
403-272-9590
403-620-8817
bobr@petrocraft.ab.ca

SAMPLE STUDY

CDN Forest Et Al Mount Coty 2K-02

302K02602123300

Prepared For: Darcy Deibert, Chevron Canada

By: Amjad Riaz, September 11, 2009

Pro
Geo
Consultants

TABLE OF CONTENTS

PROCEDURE

Description and cleaning of drill cuttings – Interval 3195m to 3480m

1. The invert wet drill cuttings were washed by Petrocraft Geological Supplier

2. The drill cuttings were studied by consulting geologist using a geological microscope.

3. The samples were good for this study but there were cavings and damaged cuttings which had to be removed from the samples for good laboratory results such as Phi, Perm, XRD, SEM, etc.

4. To remove cavings and damaged (due to the PDC drilling bit) drill cuttings, a hand held regular sieve (40 to 100 mesh) was used. Since the cuttings cant go through this, approximately 10 (2 to 3mm) holes were punched in the centre of the sieve manually using a nail or small screw driver.

5. The sieve will pick up the cavings and most of the damaged cuttings. The sieved samples can be checked under the microscope to pick any bad cuttings which might go through. These sieved samples are also fairly uniform in size.

6. The samples should be stored in vials and secured by caps.

7. These samples are ready to send to laboratory for various tests.

M. Amjad Riaz, P.Geo
Pro Geo Consultants
September 10, 2009

SAMPLE DESCRIPTIONS

3,195.00 to 3,200.00 (5.00)	100%	**Shale** Dark gray to black, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous.
3,200.00 to 3,205.00 (5.00)	100%	**Shale** As above.
3,205.00 to 3,210.00 (5.00)	100%	**Shale** Dark gray, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous.
3,210.00 to 3,215.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally bituminous.
3,215.00 to 3,220.00 (5.00)	100%	**Shale** As above.
3,220.00 to 3,225.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous.
3,225.00 to 3,230.00 (5.00)	100%	**Shale** As above.
3,230.00 to 3,235.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous, occasionally slightly calcareous.
3,235.00 to 3,240.00 (5.00)	100%	**Shale** As above.
3,240.00 to 3,245.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally, slightly bituminous.
3,245.00 to 3,250.00 (5.00)	100%	**Shale** As above.
3,250.00 to 3,255.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous, trace disseminated pyrite.
3,255.00 to 3,260.00 (5.00)	100%	**Shale** As above.
3,260.00 to 3,265.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous.
3,265.00 to 3,270.00 (5.00)	100%	**Shale** As above, in part calcareous.
3,270.00 to 3,275.00 (5.00)	100%	**Shale** Black to dark gray, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous.

3,275.00 to 3,280.00 (5.00)	100%	**Shale** Black, soft, sub fissile, slightly micromicaceous, slightly bituminous.
3,280.00 to 3,285.00 (5.00)	100%	**Shale** As above.
3,285.00 to 3,290.00 (5.00)	100%	**Shale** Black, soft, sub fissile, slightly micromicaceous, slightly bituminous, trace disseminated pyrite.
3,290.00 to 3,295.00 (5.00)	100%	**Shale** As above.
3,295.00 to 3,300.00 (5.00)	100%	**Shale** Black, soft, sub fissile, slightly micromicaceous, occasionally slightly bituminous, slightly calcareous, trace disseminated pyrite.
3,300.00 to 3,305.00 (5.00)	100%	**Shale** As above.
3,305.00 to 3,310.00 (5.00)	100%	**Shale** Black, soft to moderately hard, slightly micromicaceous, slightly bituminous, slightly siliceous.
3,310.00 to 3,315.00 (5.00)	100%	**Shale** As above, in part slightly calcareous, trace disseminated pyrite.
3,315.00 to 3,320.00 (5.00)	100%	**Shale** Black, soft to moderately hard, slightly micromicaceous, slightly siliceous, slightly bituminous.
3,320.00 to 3,325.00 (5.00)	100%	**Shale** As above, trace disseminated pyrite,
3,325.00 to 3,330.00 (5.00)	100%	**Shale** Black, moderately hard, slightly micromicaceous, slightly bituminous, siliceous, trace disseminated pyrite.
3,330.00 to 3,335.00 (5.00)	100%	**Shale** As above.
3,335.00 to 3,340.00 (5.00)	100%	**Shale** Black, moderately to very hard, slightly micromicaceous, slightly bituminous, siliceous.
3,340.00 to 3,345.00 (5.00)	100%	**Shale** As above, trace disseminated pyrite.
3,345.00 to 3,350.00 (5.00)	100%	**Shale** Black, moderately to very hard, slightly micromicaceous, slightly bituminous, siliceous.
3,350.00 to 3,355.00 (5.00)	100%	**Shale** As above.

3,355.00 to 3,360.00 (5.00)	100%	**Shale** Black, moderately to very hard, siliceous, micromicaceous, slightly bituminous, trace disseminated pyrite.
3,360.00 to 3,365.00 (5.00)	100%	**Shale** Black to dark gray, hard, siliceous, slightly micromicaceous disseminated pyrite, in part slightly calcareous.
3,365.00 to 3,370.00 (5.00)	100%	**Shale** As above.
3,370.00 to 3,375.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous, trace disseminated pyrite.
3,375.00 to 3,380.00 (5.00)	100%	**Shale** As above, in part slightly calcareous.
3,380.00 to 3,385.00 (5.00)	100%	**Shale** Dark gray to black, very hard, siliceous, slightly micromicaceous.
3,385.00 to 3,390.00 (5.00)	100%	**Shale** As above, trace disseminated pyrite.
3,390.00 to 3,395.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous, trace disseminated pyrite.
3,395.00 to 3,400.00 (5.00)	100%	**Shale** As above, in part slightly calcareous.
3,400.00 to 3,405.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous, in part slightly calcareous, trace disseminated pyrite.
3,405.00 to 3,410.00 (5.00)	100%	**Shale** As above.
3,410.00 to 3,415.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous, in part slightly calcareous.
3,415.00 to 3,420.00 (5.00)	100%	**Shale** As above, trace disseminated pyrite, trace calcite probably fracture fill.
3,420.00 to 3,425.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous, in part slightly calcareous.
3,425.00 to 3,430.00 (5.00)	100%	**Shale** As above.
3,430.00 to 3,435.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, very hard, slightly micromicaceous.

3,440.00 to 3,445.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, hard, slightly micromicaceous, trace calcite crystals.
3,445.00 to 3,450.00 (5.00)	100%	**Shale** As above, trace pyrite concretions.
3,450.00 to 3,455.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, hard, slightly micromicaceous.
3,455.00 to 3,460.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, hard, slightly micromicaceous, calcareous.
3,460.00 to 3,465.00 (5.00)	100%	**Shale** As above.
3,465.00 to 3,470.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, hard, slightly micromicaceous, trace brown calcareous chert inclusions.
3,470.00 to 3,475.00 (5.00)	100%	**Shale** As above.
3,475.00 to 3,480.00 (5.00)	100%	**Shale** Dark gray to black, siliceous, hard, slightly micromicaceous, in part calcareous.

Well Information

Operator:
Well Name: CDN FOREST ET AL MOUNT COTY 2K-02
Location:
UWI: 302K026020123300
Pool:
Field:
Province / State:
Country:

Elevations

Reference:
Cut(-) / Fill(+):
K.B. to Ground: m
Ground: m
Kelly Bushing: m
Casing Flange: m

Total Depth

Measurement Type	Measured Depth	True Vertical Depth
Drillers TD (Tally)	m	m
Drillers TD (Strap or SLM)	m	m
Loggers TD	m	m

Well Co - Ordinates

	Longitude	Latitude	Well Type: Straight
Surface Co-Ordinates:			NS: EW:
Int. Casing Co-Ordinates:			NS: EW:
Bottom Hole Co-Ordinates:			NS: EW:

UTM Surface Co-Ordinates: Northing: Easting:

Drilling Fluid Summary

Fluid Type	From	To

Casing Summary

Type	Hole Size	Casing Size	Landed At

Well Summary

Spud Date:
TD Date:
Contractor:
Rig Release Date:

Work Schedule

Contractor	Geologist	Log Interval	Dates Logged

Remarks

Legend

Rock Types and Thin Beds

Whole Bed	Stringer	Nodule	Breccia	Clast	Pebble	Grain	Rock Type
							Anhydrite - primary
							Anhydrite - secondary
							Argillite
							Barite
							Bentonite
							Breccia
							Cement
							Conglomerate - mixed
							Conglomerate - dark chert
							Conglomerate - light chert
							Conglomerate - varicolored chert
							Chert - dark
							Chert - fossiliferous
							Chert - light
							Chert - tripolitic
							Chert - varicolored
							Claystone - colored
							Claystone - gray
							Coal
							Dolomite
							Ferruginous
							Feldspar
							Gypsum
							Igneous - acidic
							Igneous - basic
							Igneous - metamorphic
	Muddy IHS burrowed						Muddy Inclined Heterolithic Strata
							Limestone - grain supported
							Limestone - mud supported
							Marlstone - calcareous
							Marlstone - dolomitic
							Mud breccia
							Mudstone
							Paleosol
							Phosphate
							Quartz
							Salt
							Shale - black
							Shale - dark gray
							Shale - medium gray
							Shale - light gray
							Shale - brown
							Shale - green
							Shale - red
							Siderite
							Sandstone
							Siltstone
	Sandy IHS burrowed						Sandy Inclined Heterolithic Strata
							Till - glacial
							Volcanic (Tuff)
							Welded Volcanic (Tuff)

Accessories

	Anhydritic	G	Gibbsitic
	Argillaceous	I	Illitic
	Baritic	K	Kaolinitic
	Bentonitic	L	Lithic Fragment
	Bituminous		Marly - calcareous
	Calcareous		Marly - dolomitic
	Carbonaceous		Micromicaceous
	Cherty - dark	ML	Mixed layer clayey
F	Cherty - fossiliferous	M	Montmorillonitic
	Cherty - light		Phosphate pellets
	Cherty - tripolitic	P	Pyritic
	Cherty - varicolored		Salt casts
C	Chloritic		Sandy
	Clayey		Sideritic
	Dolomitic		Siliceous
Fe	Ferruginous staining		Silty
	Fractures		Stylolitic
	Glauconitic		Tuffaceous
	Gypsiferous	Z	Zeolitic

Fossils (Rock Builders)

	Aggregate grains		Foraminifera
	Algae - laminations	F	Fossil
	Algae - non descript		Fragmental
	Algae - ootoid		Gastropod
	Algae - skeletal		Graptolite
	Amphipora	H	Hydrozoa
	Belemnite		Intraclast
	Bioclastic		Mollusc
	Brachiopod		Oncolite
	Bryozoa		Oolite
	Calciphaera		Ostracod
	Cephalopod		Pelecypod
	Chaetetes		Pellet
	Coated grain		Pisolite
	Conodont		Plant Remains
	Coral	S	Plant Spores
	Coral - branching		Scaphopod
	Coral - head		Spicule
	Coral - colonial		Sponge
S	Coral - solitary		Stromatoporoid
	Crinoid	B	Stromatoporoid - bulbous
	Diatom	M	Stromatoporoid - massive
	Echnoid		Stromatoporoid - tabular
	Echnoid - spine		Tentaculites
	Fish Remains		Trilobite
	Euryamphipora		

Matrix

	Argillaceous		Marl - calcareous
BFS	Bafflestone		Marl - dolomitic
B	Bentonite		Micrite
BS	Bindstone	ML	Mixed Clay
	Bituminous	M	Montmorillonite
	Clay	MS	Mudstone
C	Chlorite	PS	Packstone
FLS	Floatstone	RS	Rudstone
FS	Framestone		Sand
G	Gibbsite		Silt
GS	Grainstone		Sparry Calcite
I	Illite	WS	Wackestone
K	Kaolinite	Z	Zeolite

Textures

C	Chalky	e	Earthy	mx	Microcrystalline
CX	Cryptocrystalline	L	Lithographic		Slickenside
MS	Mudstone	GS	Grainstone	BFS	Bafflestone
WS	Wackestone	FLS	Floatstone	BS	Bindstone
PS	Packstone	RS	Rudstone	FS	Framestone

Miscellaneous Grains

	Biotite		Mineral crystal		Orthoclase
	Glauconite		Mineral - dark		Plagioclase
	Mica flakes		Muscovite		Sand grain

Cement

	Anhydritic		Gypsiferous
	Baritic		Hematitic
	Bituminous		Limonitic
	Calcareous		Pyritic
	Chert - dark		Salt
	Chert - light		Sideritic
	Dolomitic		Siliceous
	Ferruginous		

Porosity Type Track

e	Earthy - low permeability - crystals / grains less than 1 / 16 mm		
	Fenestral - voids from gas bubbles - shrinkage cracks - birdseye texture		
X	Intercrystalline - Interfragmental - Intergranular		
F	Fracture	O	Organic - Bridged - Intrafossil
	Interoolitic - Interpelletoidal	P	Pinpoint - voids less than 1/ 16 mm
	Moldic	V	Vuggy - voids greater than 1 / 16 mm

Sorting Track

vP	Very poorly sorted - > 10 phi size grade classes
P	Poorly sorted - 6-10 phi size grade classes
M	Moderately sorted - 3-6 phi size grade classes
mW	Moderately well sorted - 2-3 phi size grade classes
W	Well sorted - < 2 phi size grade classes

Oil Show Track

	Even staining (75 - 100% of the rock is stained) - fluoresces in solvent
	Spotted staining (50 - 75% of the rock is stained) - fluoresces in solvent
	Spotted staining (25 - 50% of the rock is stained) - fluoresces in solvent
	Spotted staining (1 - 25% of the rock is stained) - fluoresces in solvent
	Questionable oil staining - No fluorescents in solvent
D	Dead oil staining - asphaltic - bitumen - pyrobitumen etc.
F	Fluoresces - no visible oil staining

Rounding Track

vA	Very Angular	r	Subrounded
A	Angular	R	Rounded
a	Subangular	wR	Well Rounded

Framework Track

Framework is a ratio between clastic material greater than 1/16 mm and primary void filler less than 1/16 mm.
? indicates questionable interpretation

Trace Fossil Track

An	Anconichnus	Ar	Arenicolites	At	Arthrophycus	As	Asterosoma
Au	Aulichnites	Be	Bergaueria	Cg	Camborygma	Cf	Celliforma
Cb	Chabutolithes	Ch	Chondrites	Cl	Climactichnites	Co	Conichnus
Cp	Cosmoraphe	C	Cruziana	Cy	Cylindrichnus	Da	Dactyloidites
Dm	Dimorphichnus	D	Diplocraterion	Ea	Eatonichnus	En	Entobia
Et	Entomichnus	Esc	Escape Traces	Ga	Gastrochaenolites	Gl	Glossifungites
G	Gyrolithes	Gy	Gyrophyllites	H	Helminthopsis	K	Kouphichnium
L	Lockeia	Lo	Lorenzinia	Mp	Macanopsis	Ma	Macaronichnus
Mo	Monocraterion	Ne	Neonereites	N	Nereites	O	Ophiomorpha
Pa	Palaeophycus	Pd	Paleodictyon	Pc	Paleohelcura	Pl	Paleoscolytus
Pt	Petalichnus	Py	Phycodes	Ph	Phycosiphon	P	Planolites
Pm	Psammichnites	Ps	Psilonichnus	Rh	Rhizocorallium	Rg	Rogerella
Ro	Rosselia	Ru	Rusophycus	Sb	Scalarituba	Sc	Schaubcylindrichnus
Sy	Scoyenia	Si	Siphonichnus	S	Skolithos	Sp	Spirophycus
Su	Subphyllochorda	Syn	Synaeresis Cracks	Te	Teichichnus	Tr	Terebellina
Td	Teredolites	Th	Thalassinoides	Tc	Trichichnus	Tp	Trichophycus
Ty	Trypanites	Z	Zoophycos				

Core Track

Indicates Cored Interval
Indicates Lost Core

Test Track

Indicates Tested Interval

Sedimentary Structures Bedding / Cross Bedding

CM	Centimeter bedding		Inverted graded bedding
DM	Decimeter bedding		Massive bedding
MM	Millimeter bedding		Normal graded bedding
	Chevron x-bedding		Herringbone x-bedding
	Sigmoidal x-bedding		Hummocky x-bedding
	Swaley x-bedding		Planar/Tabular x-bedding
	Trough x-bedding		

Sedimentary Structures

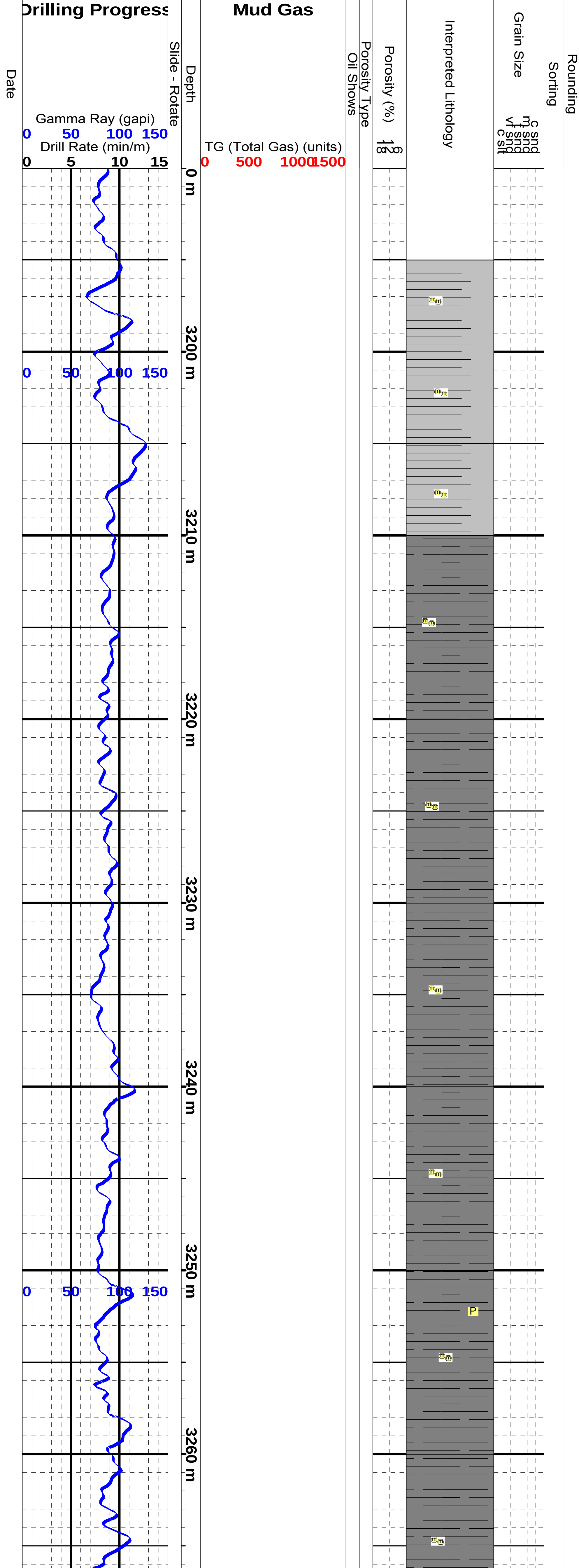
	Ball and pillow		Bioturb-churned		Bioturb-slightly		Bioturb-moderate
	Bioturb-mod well		Bioturb-well		Boudinage		Burrows
	Clastic Dike		Clastic sill		Desiccation crack		Dish structure
	Fault-Large scale		Fault-Small scale		Flame structure		Flute mark
	Geopetal		Groove casts		Gutter casts		Load casts
IHS	Inclined heterolithic strata				Mud chips		Mud drapes
	Neptunian dike		Pit marks		Pull-a-part		Rill marks
	Rip up clasts		Roots / root trace		Scour and Fill		Slump structure
	Swash marks		Synersis crack		Teepee structure		Tool marks
	Water Escape						

Sedimentary Structures Laminations / Cross Laminations

	Climbing ripple xlam		Contorted/Slumped lams
	Current ripple xlam		Flaser laminations
	High angle xlam		High angle parrallel lams
	Lenticular lams		Low angle xlam
	Low angle para lam		Parallel laminations
	Trough xlam		Varved laminations
	Wave ripple xlam		Wavy laminations

Sedimentary Bedding Contacts

BIO	Bioturbated	BORED	Bored	CAL	Caliche / calcrete	COR	Corrosional	DC	Dessication cracks
EX	Exposure	FS	Flooding surface	GLOSS	Glossifungites	GRAD	Gradational	HG	Hardground
INCL	Inclined - sharp	IRR	Irregular - sharp	MFS	Maximum flooding surface			MC	Mud cracks
NOD	Nodular	PB	Parasequence boundary	RS	Ravinement surface	RSE	Regressive surface of erosion		
ROOT	Rooted	SCOUR	Scour	SB	Sequence boundary	SHARP	Sharp	TRUN	Truncation
TSE	Transgressive surface of erosion	UNCON	Unconformity	WAVY	Wavy				



Lithology Description

Sample study starts at 3195m

Sh: Dk gy - blk, sft, sub fis, slly micmica, occly slly bits.

Sh: As abv.

Sh: Dk gy, sft, sub fis, slly micmica, occly slly bits.

Sh: Blk - dk gy, sft, sub fis, slly micmica, occly bits.

Sh: As abv.

Sh: Blk - dk gy, sft, sub fis, slly micmica.

Sh: As abv.

Sh: Blk - dk gy, sft, sub fis, slly micmica, occly slly bits, occly slly calcs.

Sh: As abv.

Sh: Blk - dk gy, sft, sub fis, slly micmica, occly, slly bits.

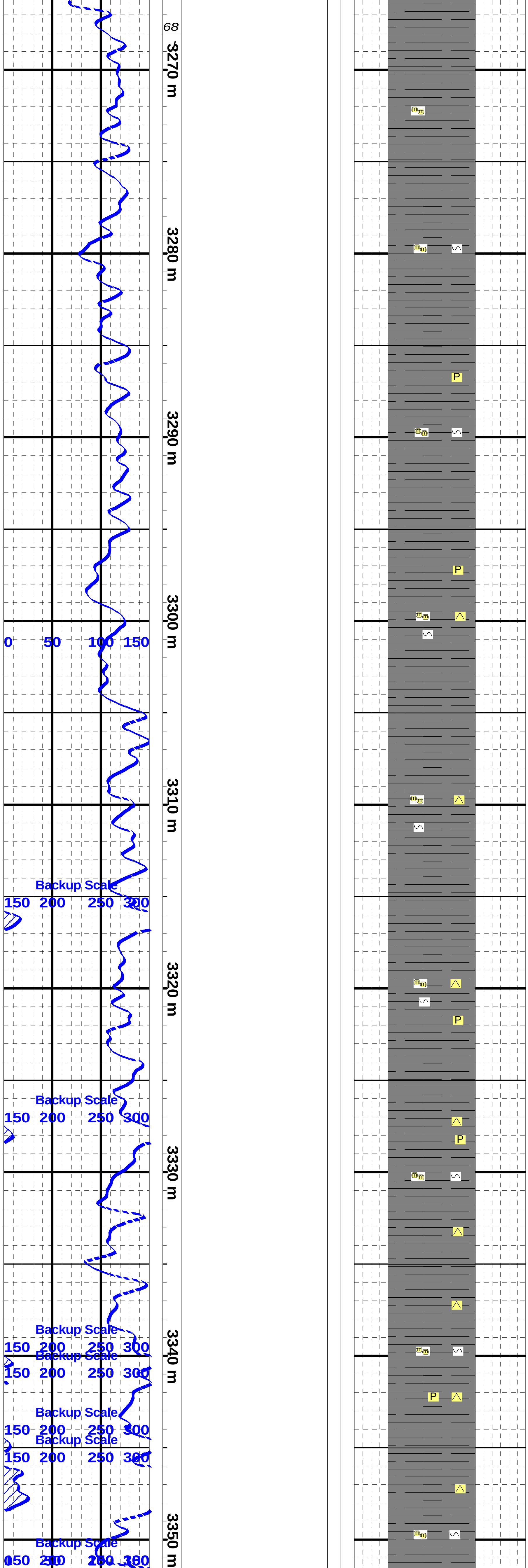
Sh: As abv.

Sh: Blk - dk gy, sft, sub fis, slly micmica, occly slly bits, tr dism pyr.

Sh: As abv.

Sh: Blk - dk gy, sft, sub fis, slly micmica, occly slly bits.

Sh: As abv, ip calcs.



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Sh: Blk, sft, sub fis, slly micmica, slly bits.

Sh: As abv.

Sh: Blk, sft, sub fis, slly micmica, slly bits, tr dism pyr.

Sh: As abv.

Sh: Blk, sft, sub fis, slly micmica, occly slly bits, slly calcs, tr dism pyr.

Sh: As abv.

Sh: Blk, sft - modly hd, slly micmica, slly bits, slly sils.

Sh: As abv, ip slly calcs, tr dism pyr.

Sh: Blk, sft - modly hd, slly micmica, slly sils, slly bits.

Sh: As abv, tr dism pyr,

Sh: Blk, modly hd, slly micmica, slly bits, sils, tr dism pyr.

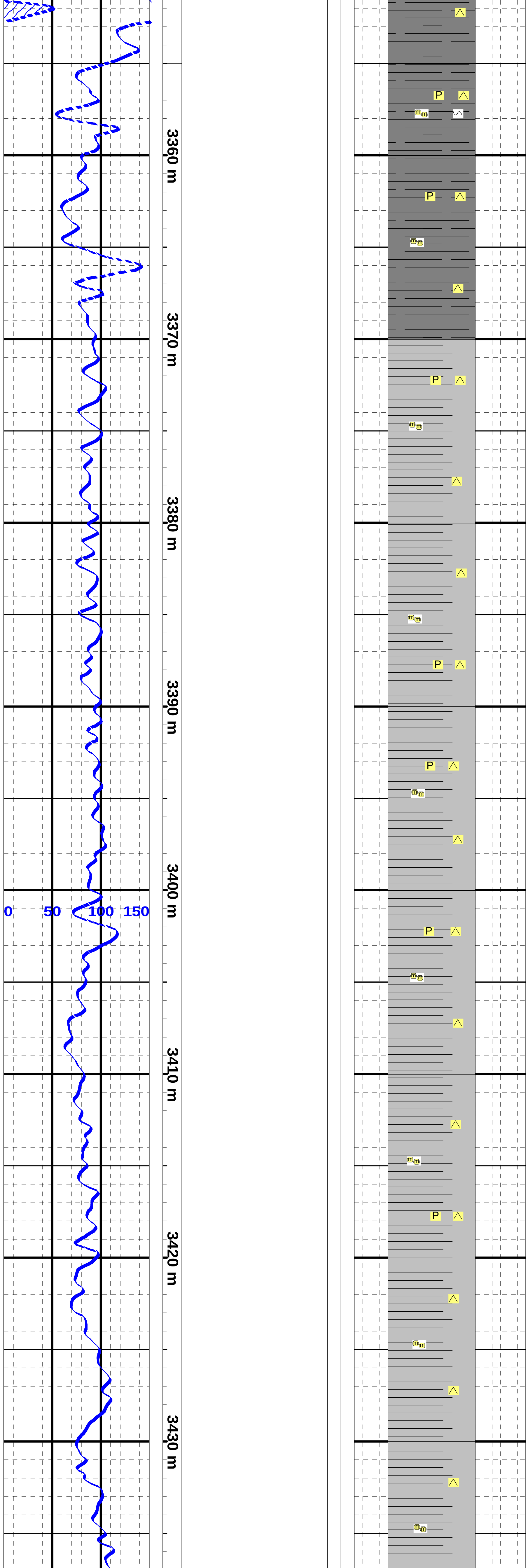
Sh: As abv.

Sh: Blk, modly - v hd, slly micmica, slly bits, sils.

Sh: As abv, tr dism pyr.

Sh: Blk, modly - v hd, slly micmica, slly bits, sils.

Sh: As abv.



Sh: Blk, modly - v hd, sils, micmica, slly bits, tr dism pyr.

Sh: Blk - dk gy, hd, sils, slly micmicatr dism pyr, ip slly calcs.

Sh: As abv.

Sh: Dk gy - blk, sils, v hd, slly micmica, tr dism pyr.

Sh: As abv, ip slly calcs.

Sh: Dk gy - blk, v hd, sils, slly micmica.

Sh: As abv, tr dism pyr.

Sh: Dk gy - blk, sils, v hd, slly micmica, tr dism pyr.

Sh: As abv, ip slly calcs.

Sh: Dk gy - blk, sils, v hd, slly micmica, ip slly calcs, tr dism pyr.

Sh: As abv.

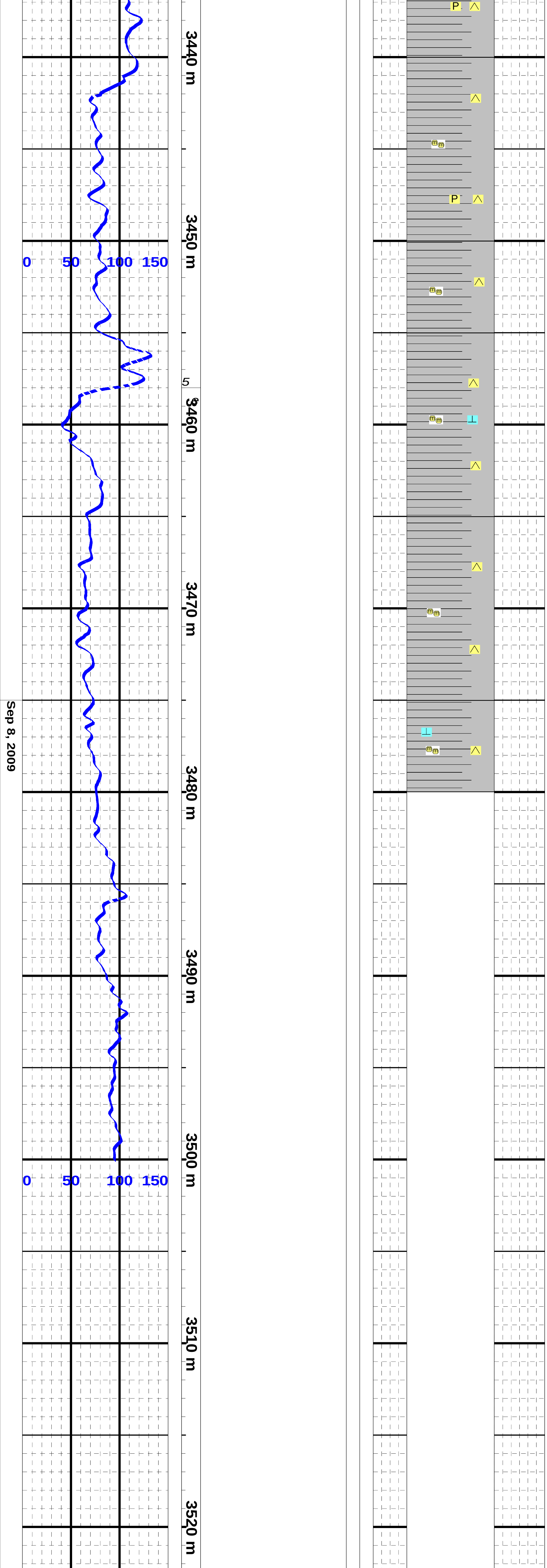
Sh: Dk gy - blk, sils, v hd, slly micmica, ip slly calcs.

Sh: As abv, tr dism pyr, tr calc probly frac fill.

Sh: Dk gy - blk, sils, v hd, slly micmica, ip slly calcs.

Sh: As abv.

Sh: Dk gy - blk, sils, v hd, slly micmica.



Sh: Dk gy - blk, sils, hd, slly micmica, tr calc xls.

Sh: As abv, tr pyr concs.

Sh: Dk gy - blk, sils, hd, slly micmica.

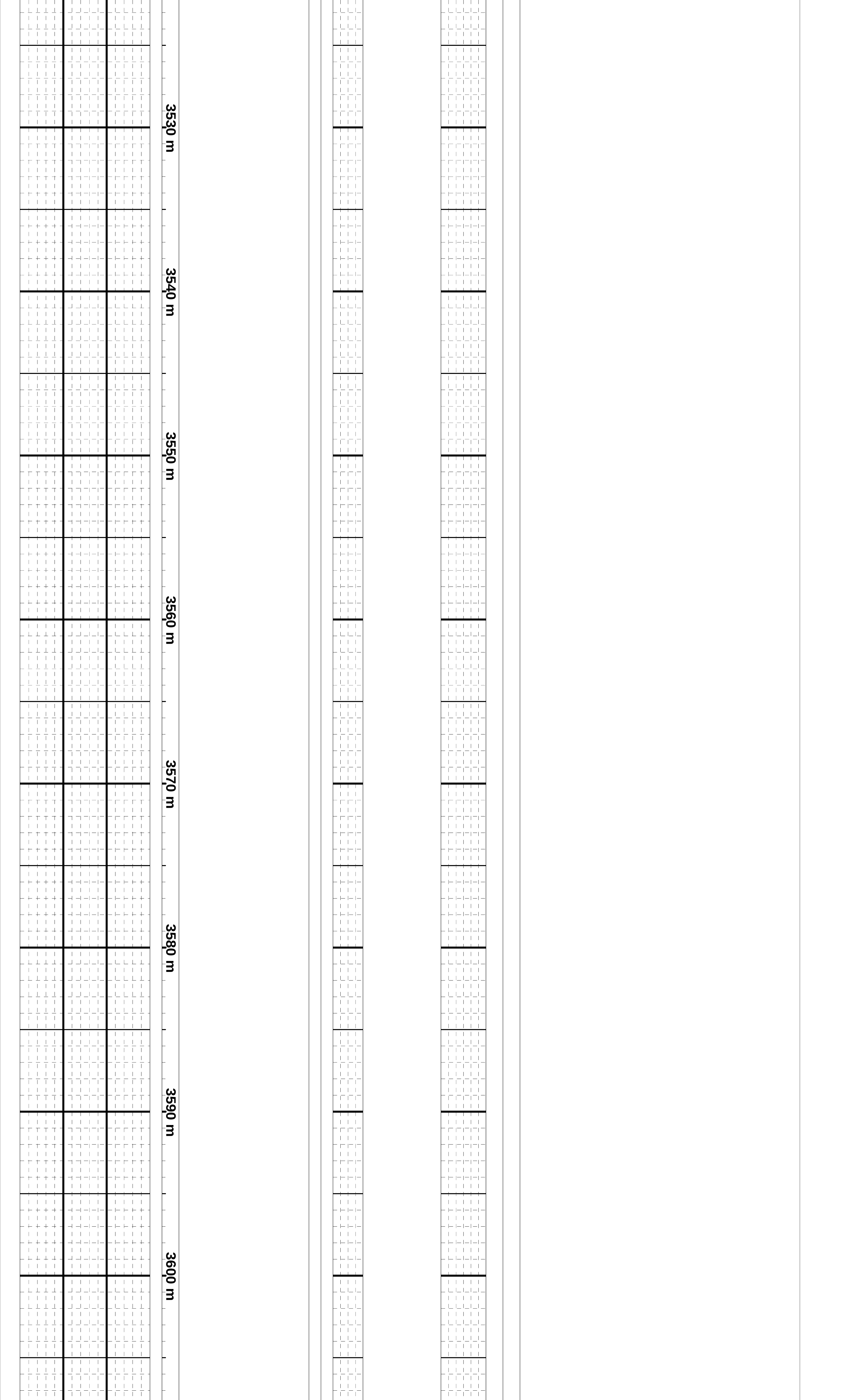
Sh: Dk gy - blk, sils, hd, slly micmica, calcs.

Sh: As abv.

Sh: Dk gy - blk, sils, hd, slly micmica, tr brn calcs cht incls.

Sh: As abv.

Sh: Dk gy - blk, sils, hd, slly micmica, ip calcs.



3530 m
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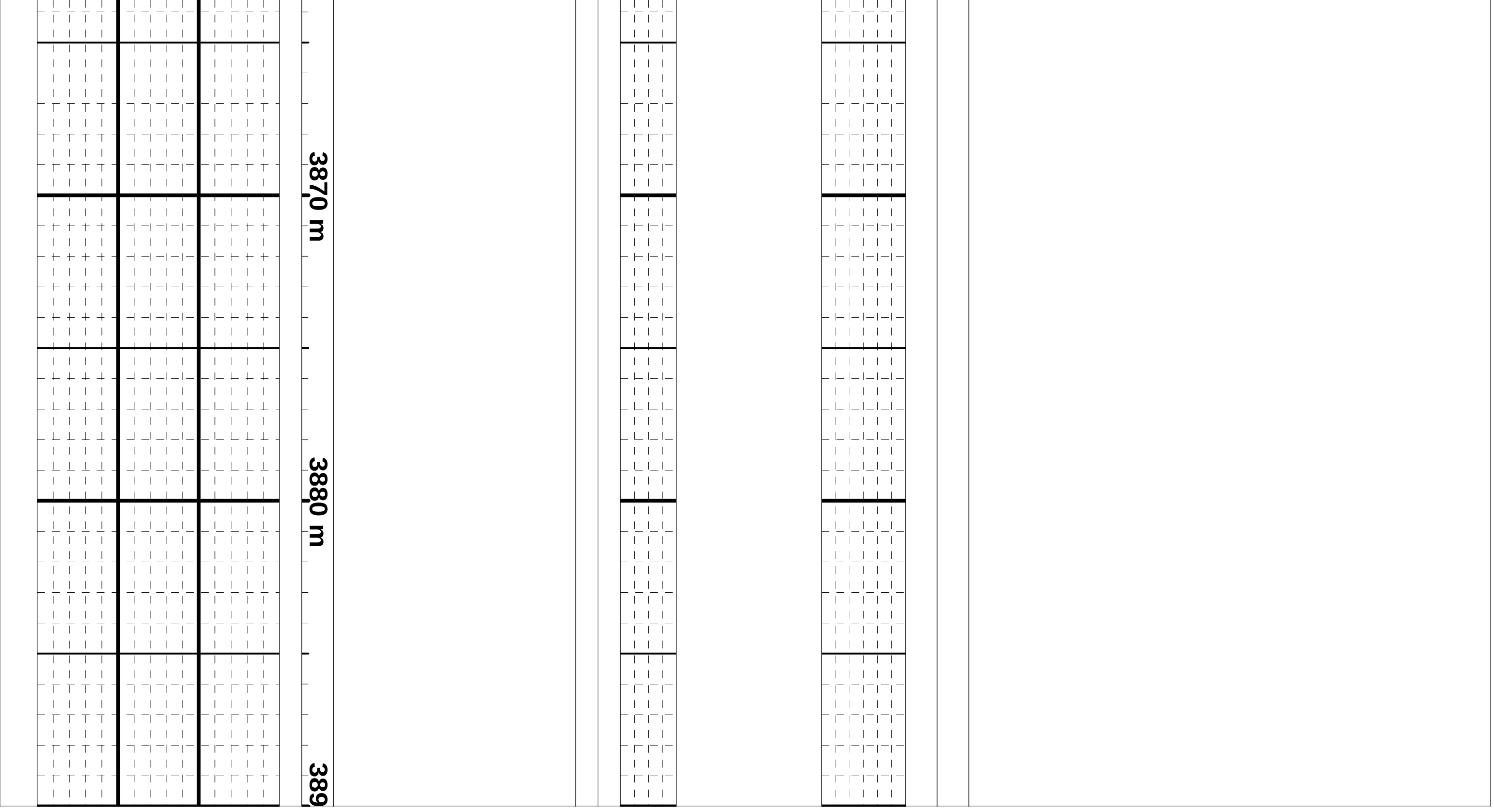
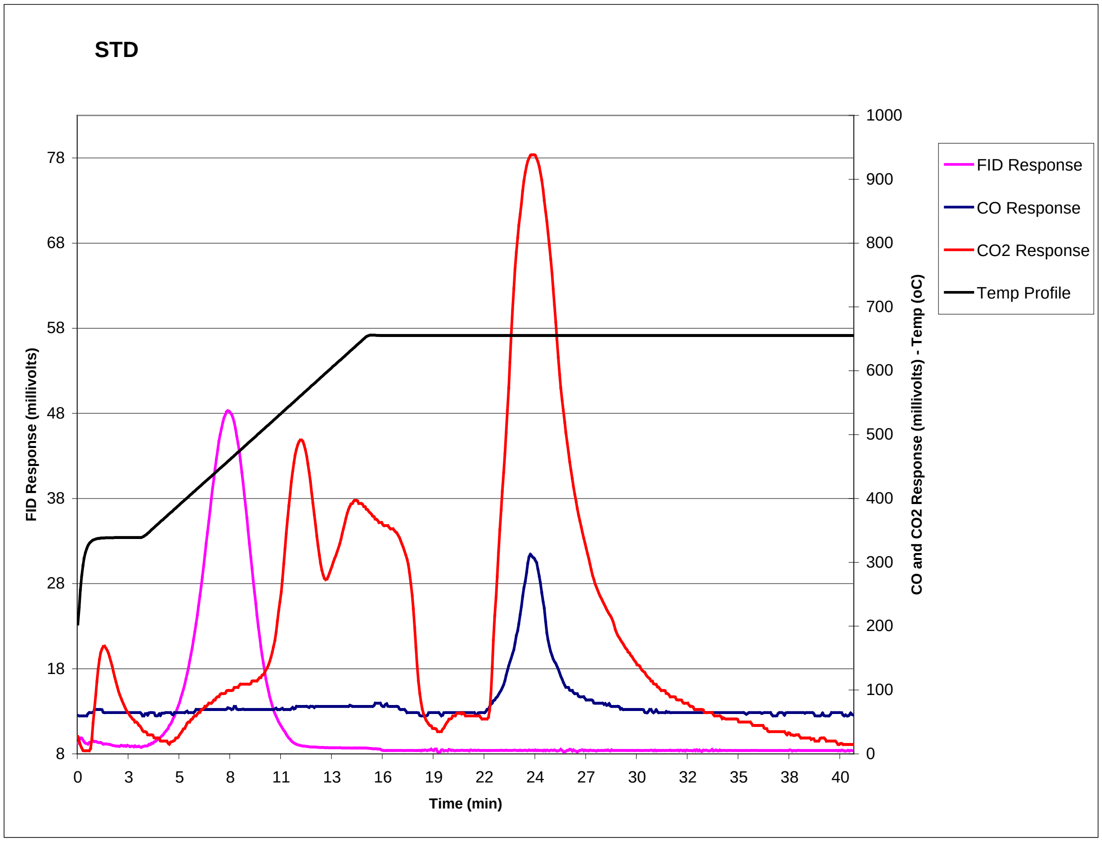
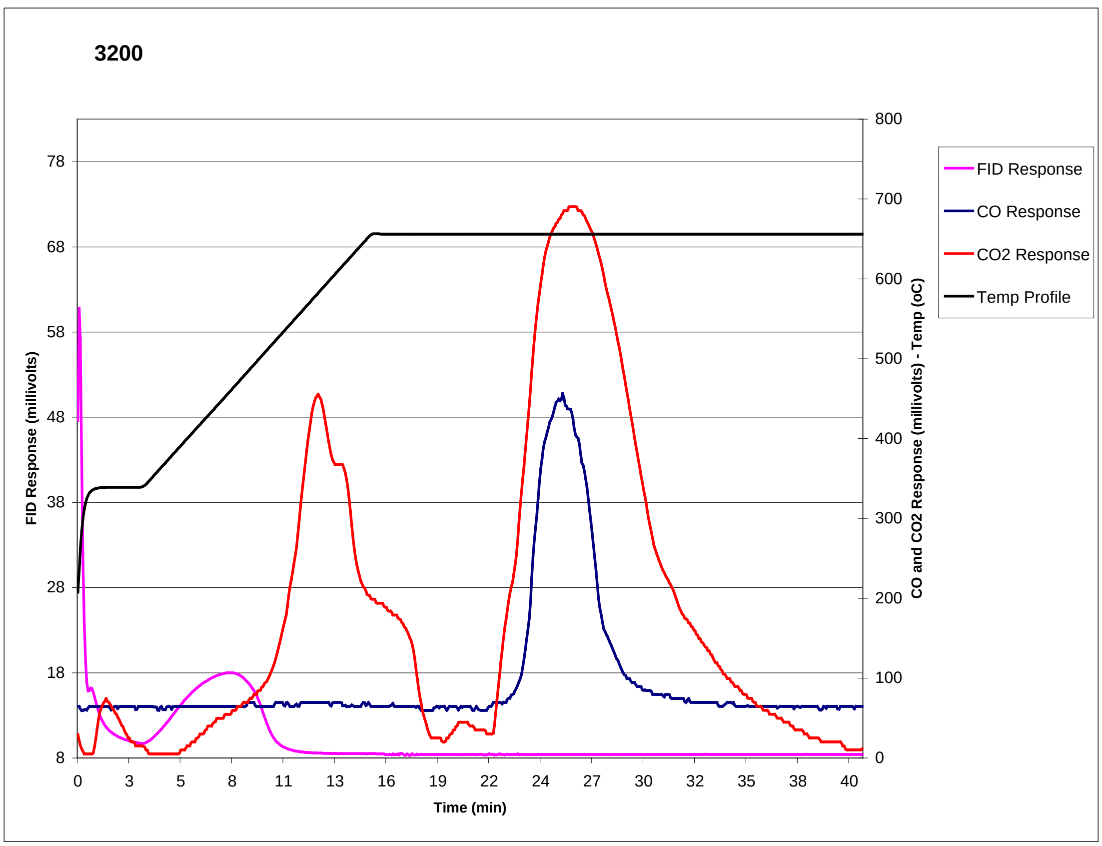
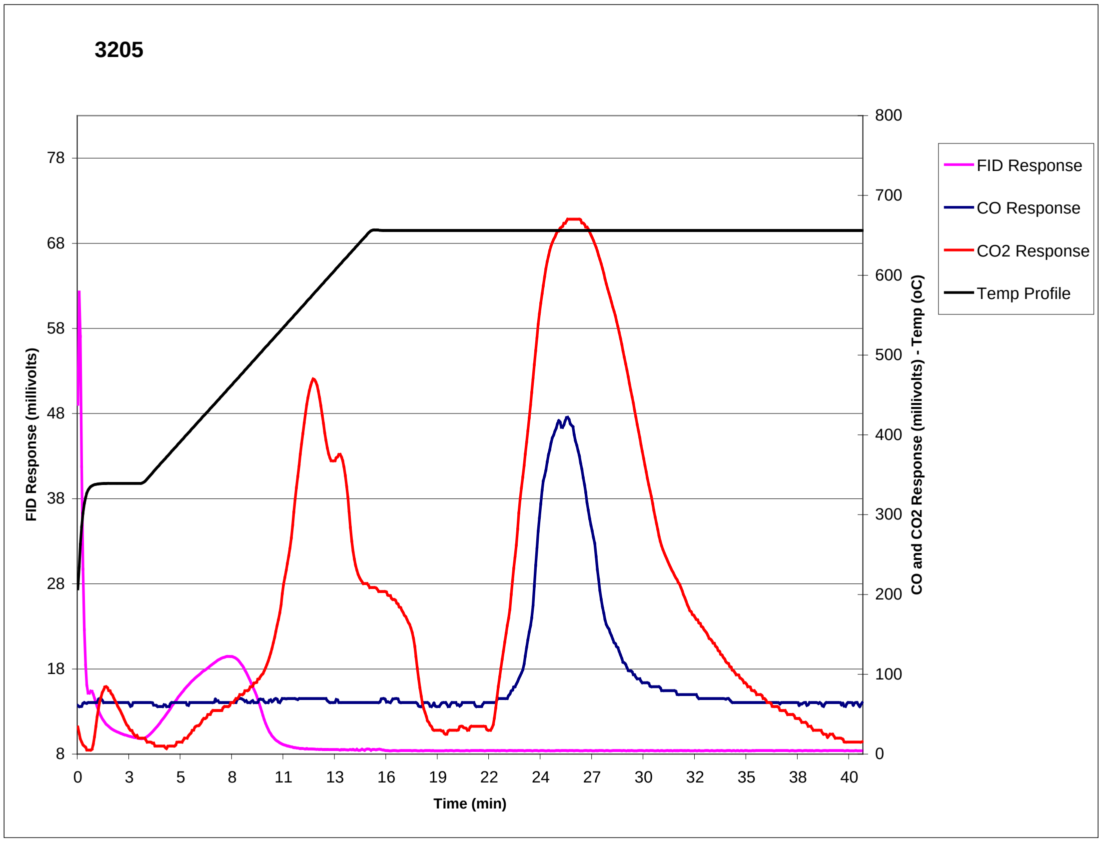

3870 m
3880 m

Chevron CDN Forest et al Mount Coty 2K-02






3205
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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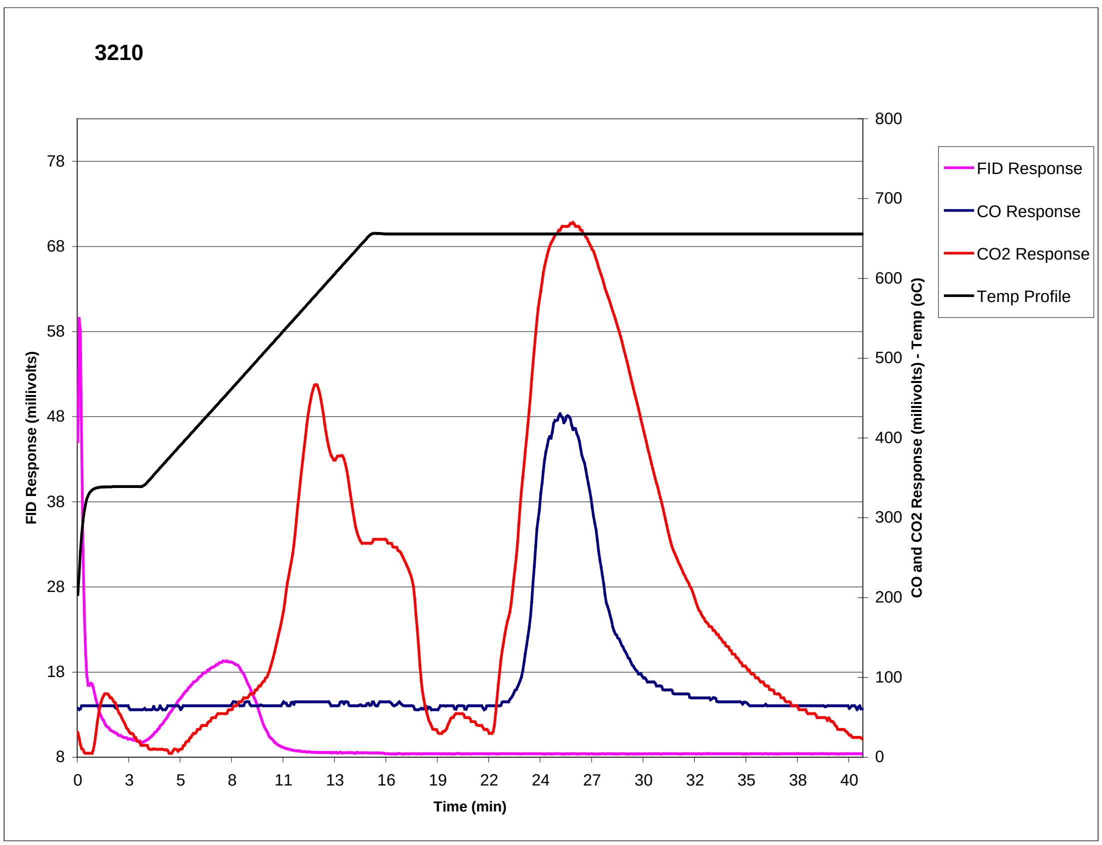
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FID Response (millivolts)
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Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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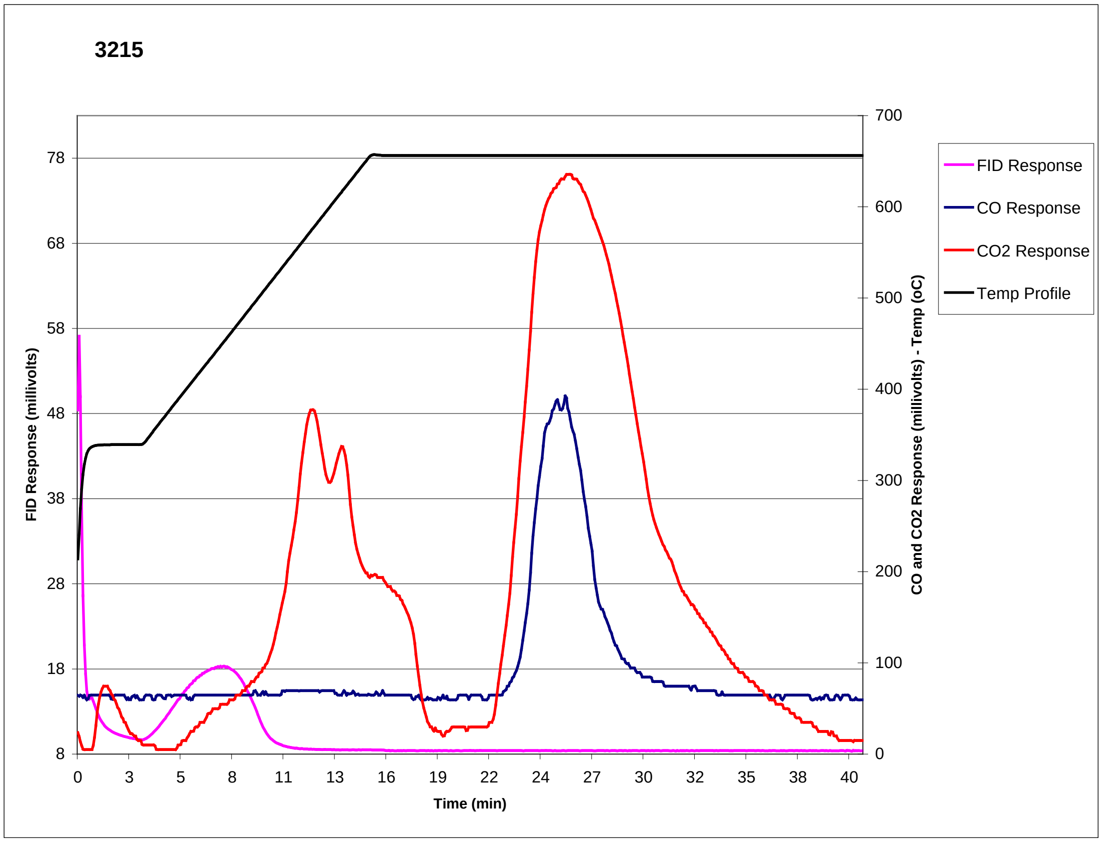
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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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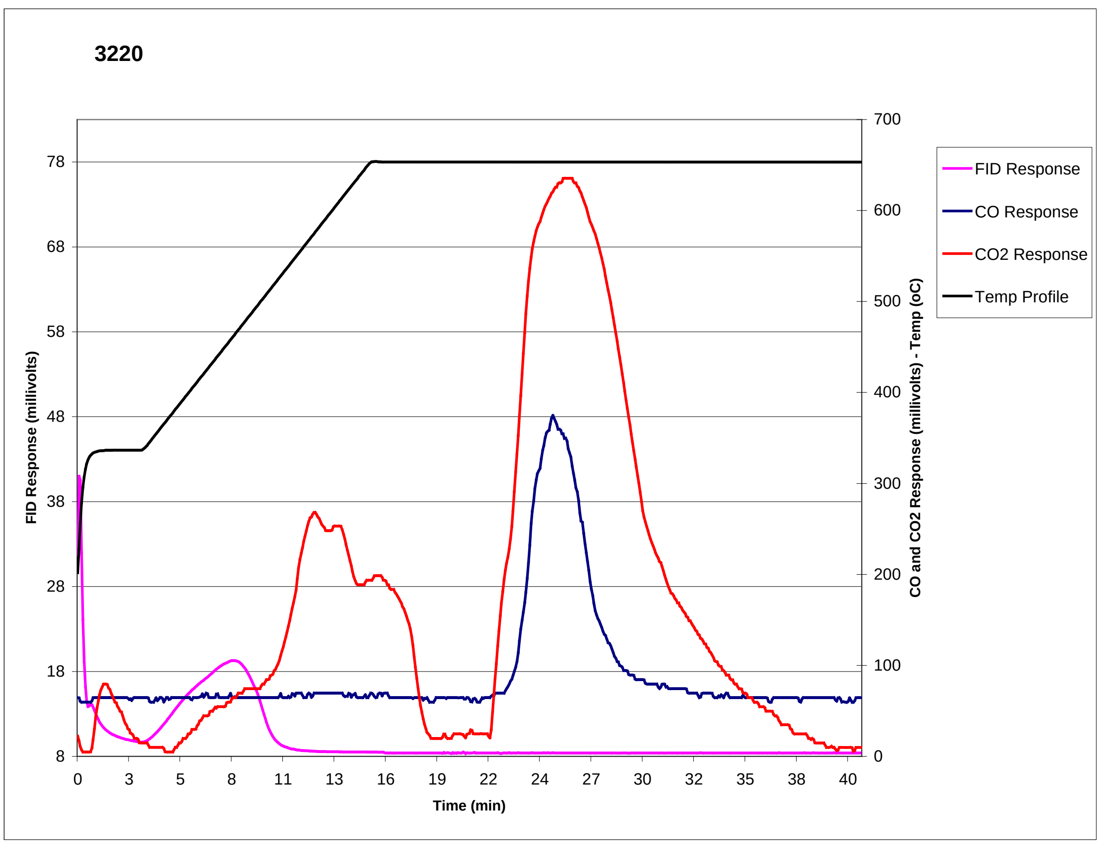
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Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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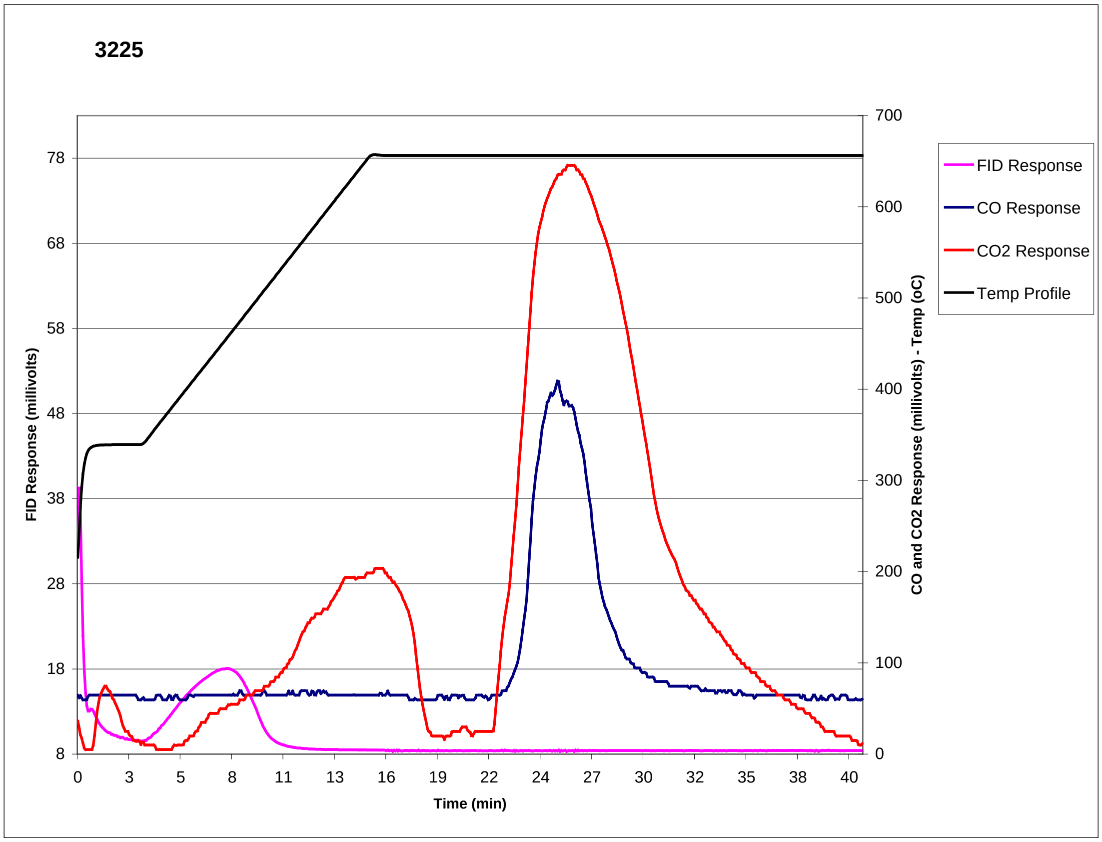
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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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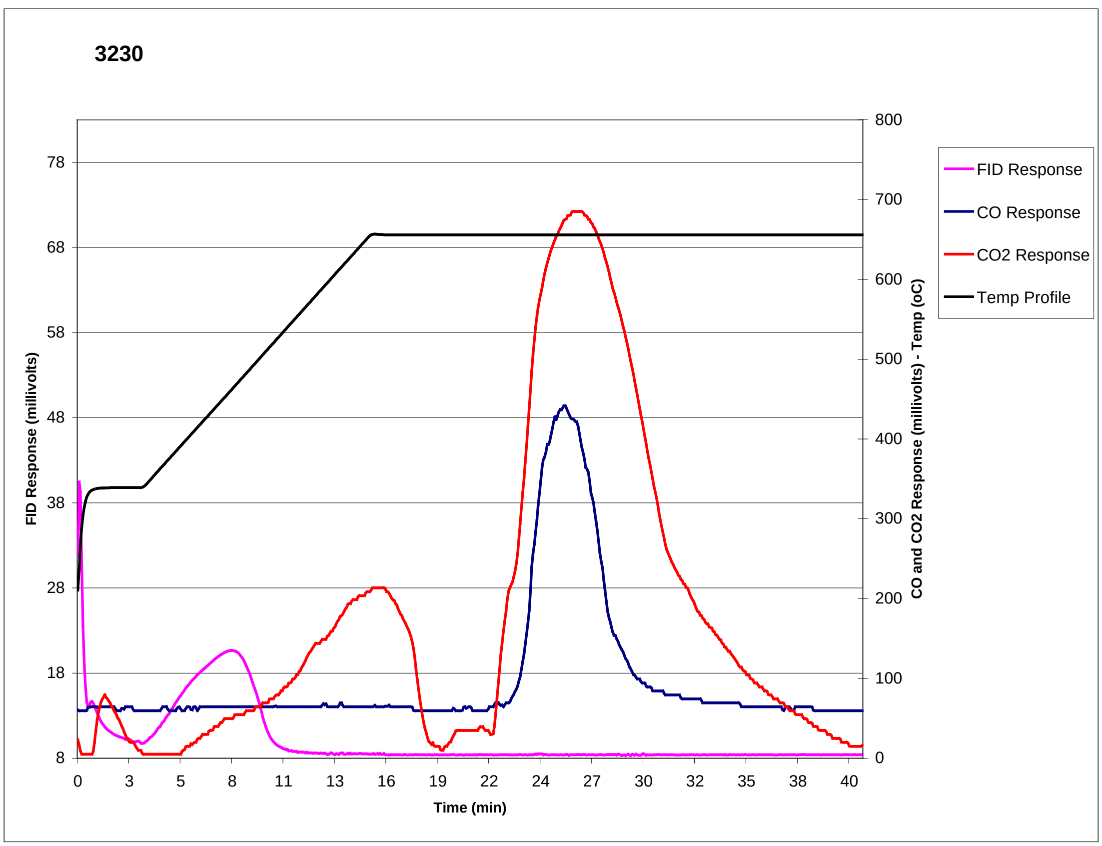
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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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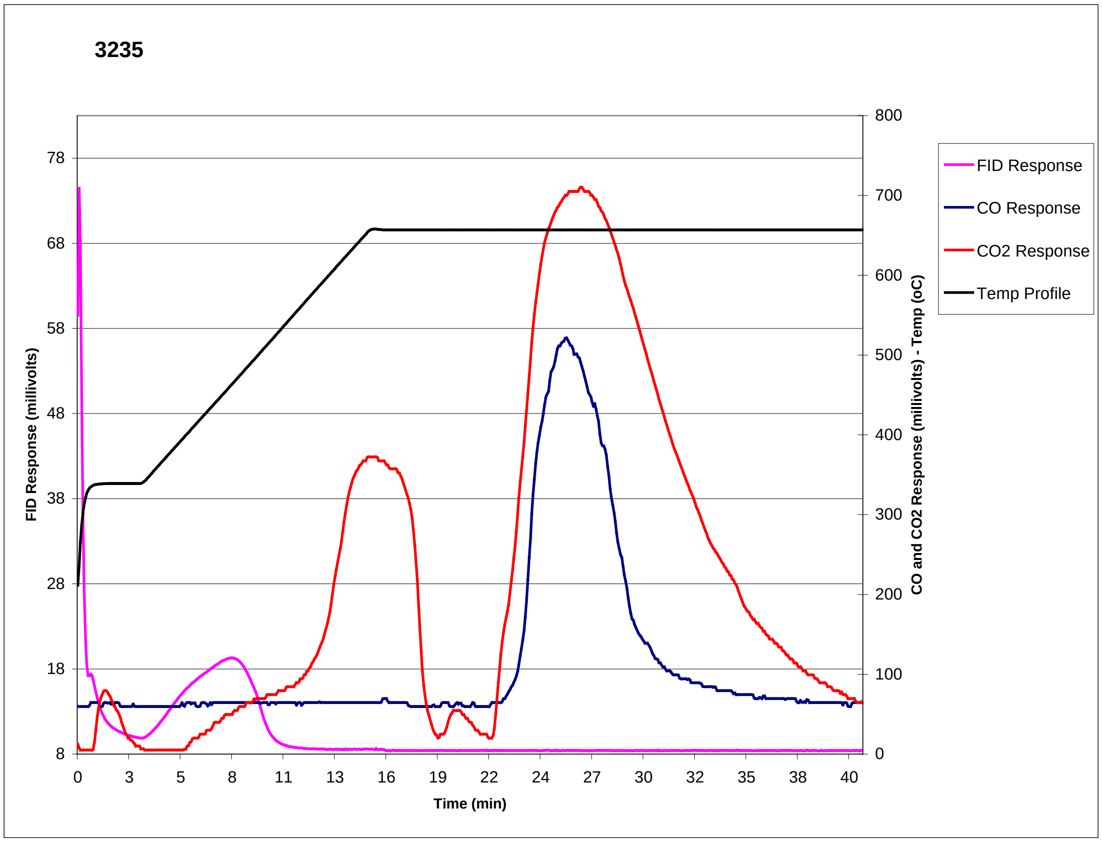
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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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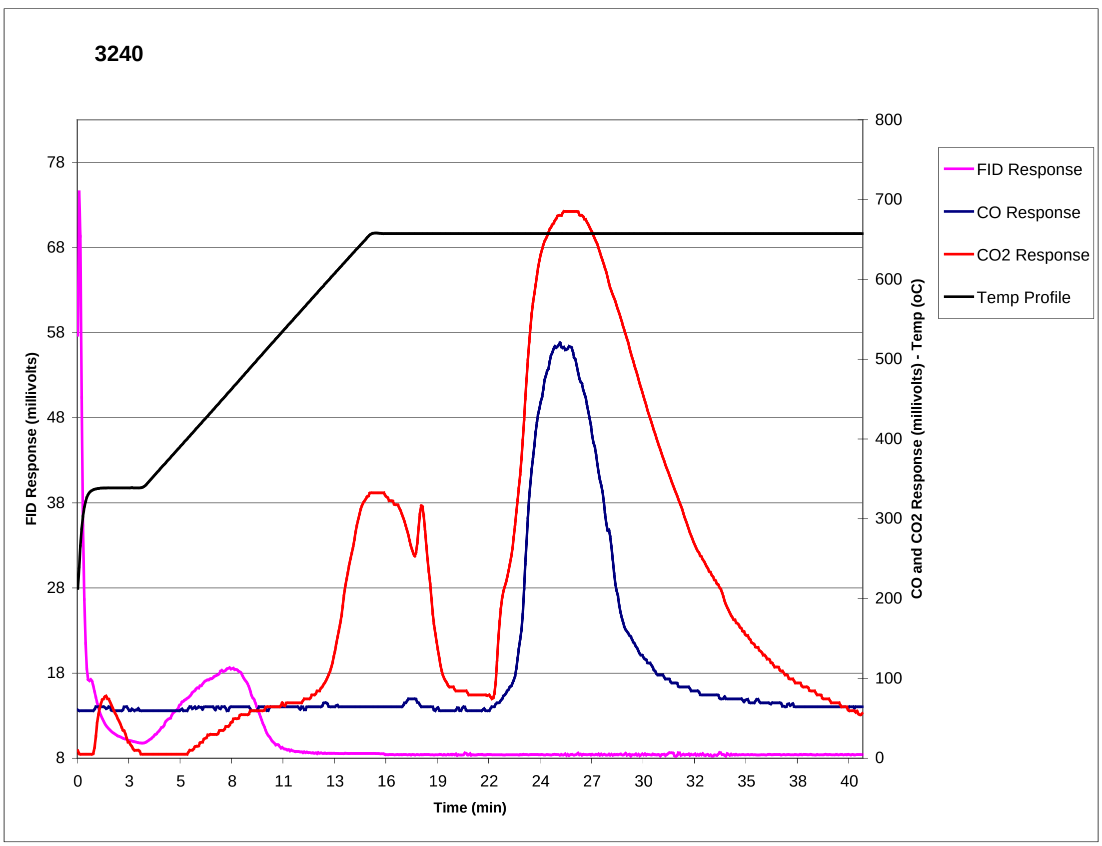
FID Response
CO Response
CO2 Response
Temp Profile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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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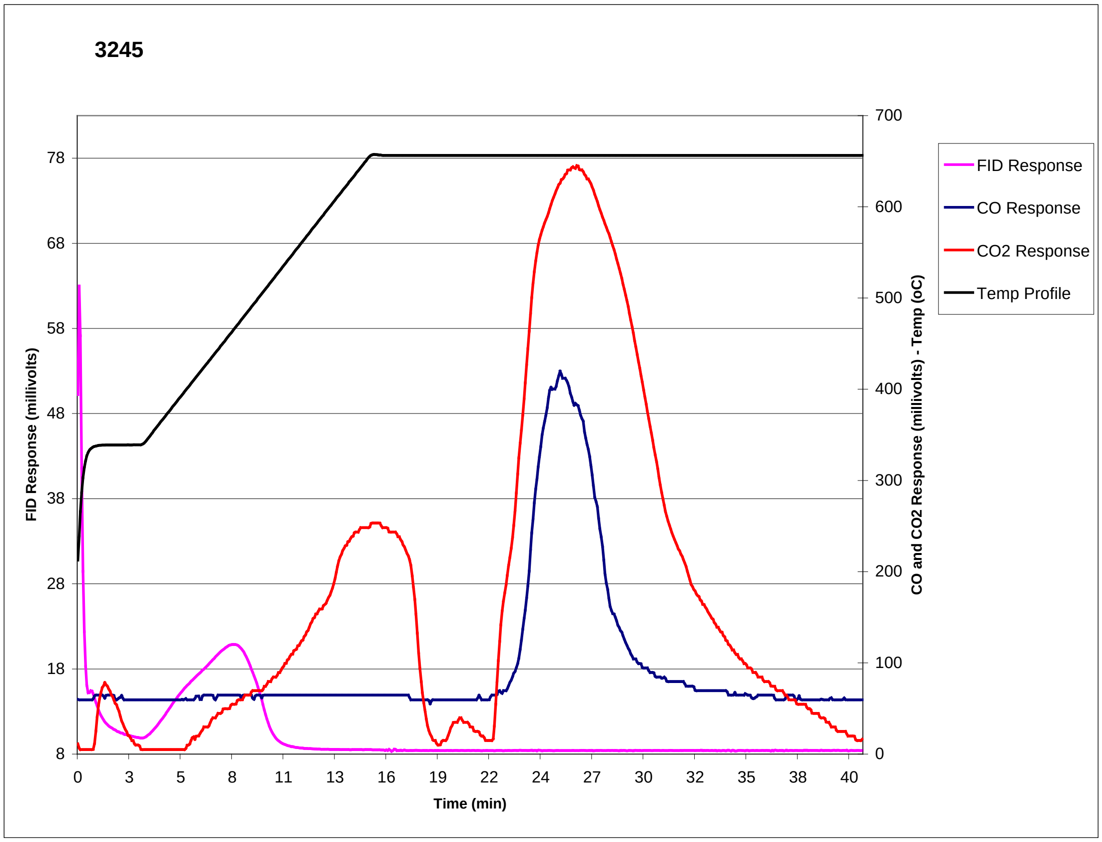
FID Response
CO Response
CO2 Response
Temp Profile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CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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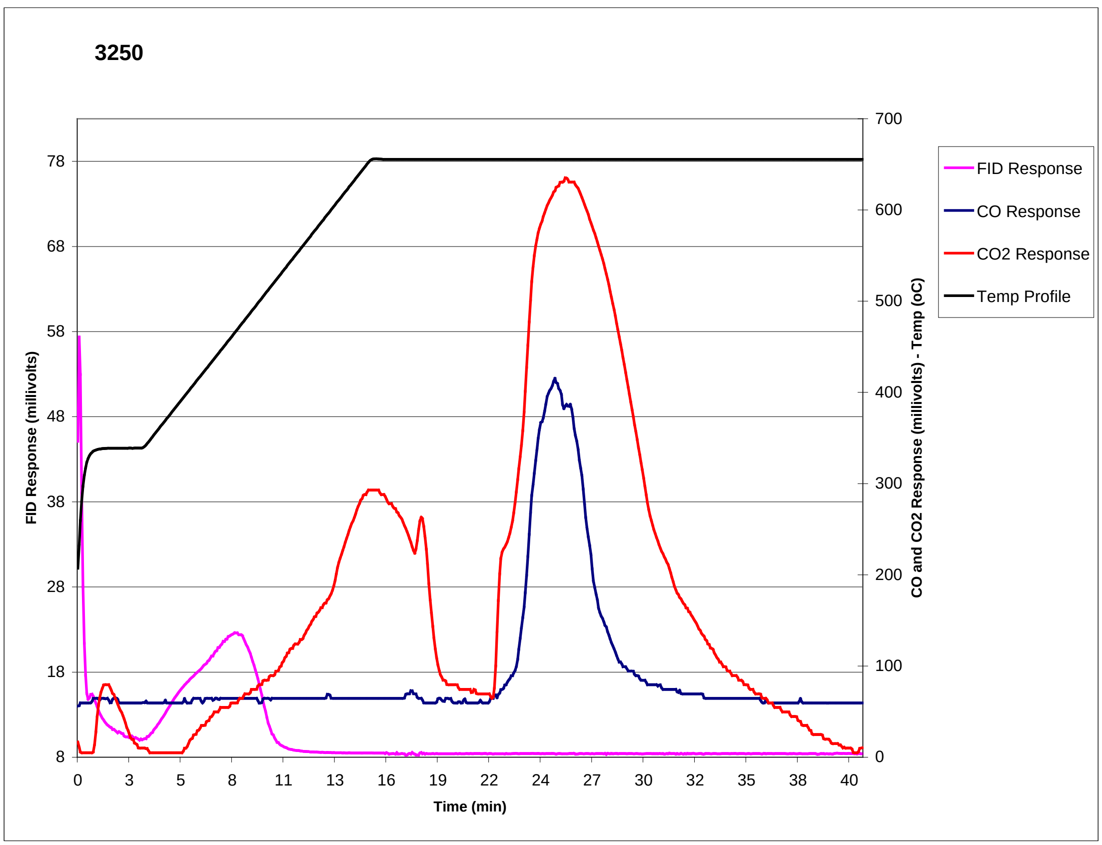
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FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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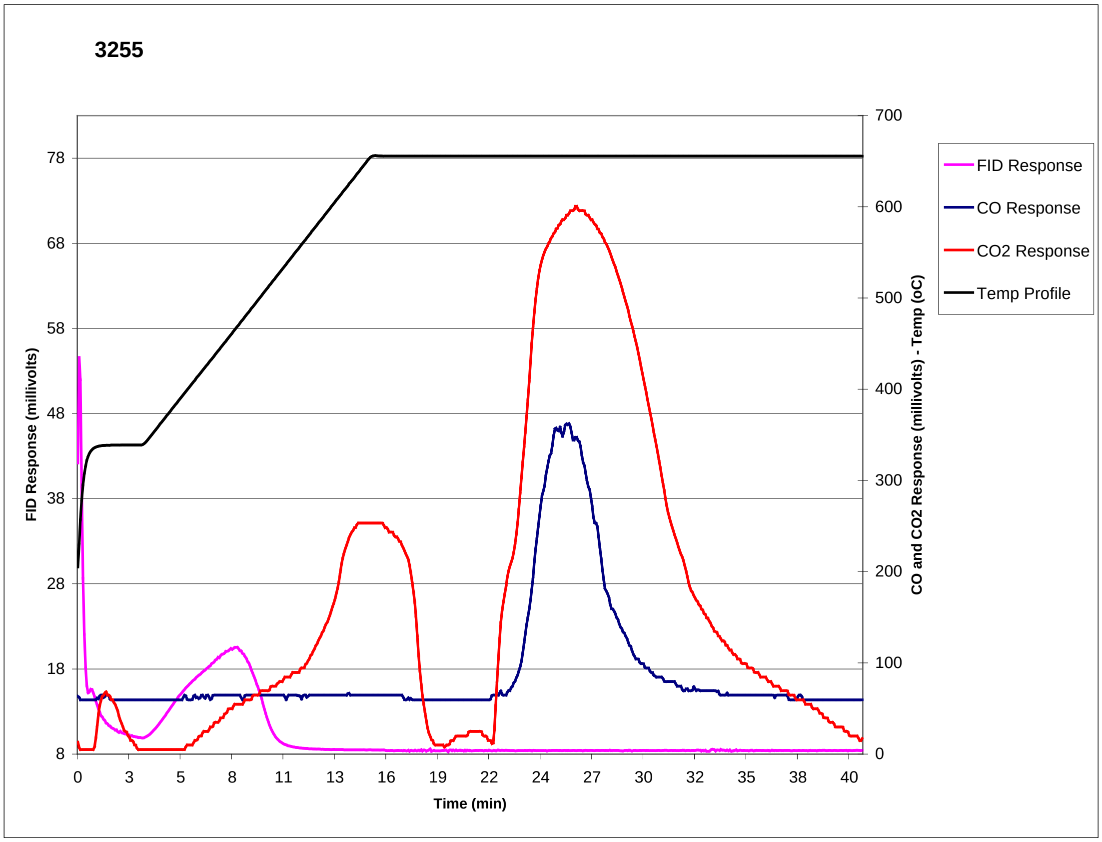
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FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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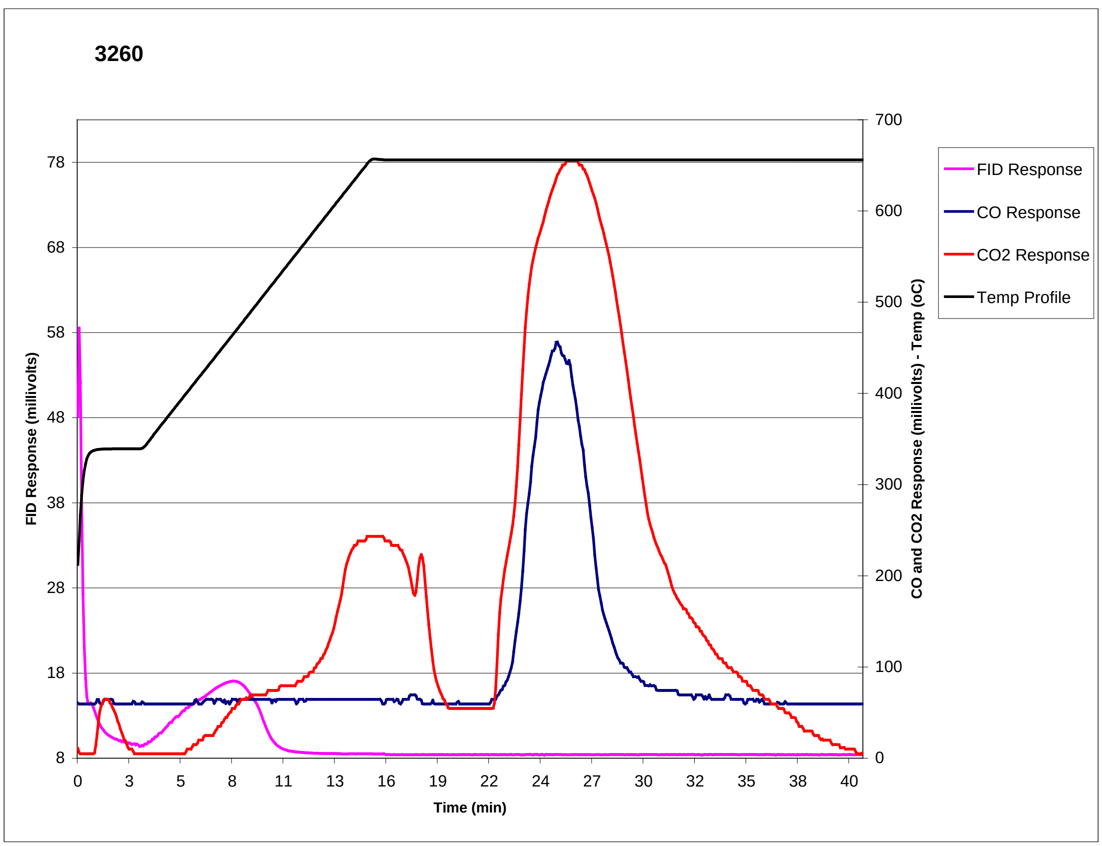
3260
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
78
68
58
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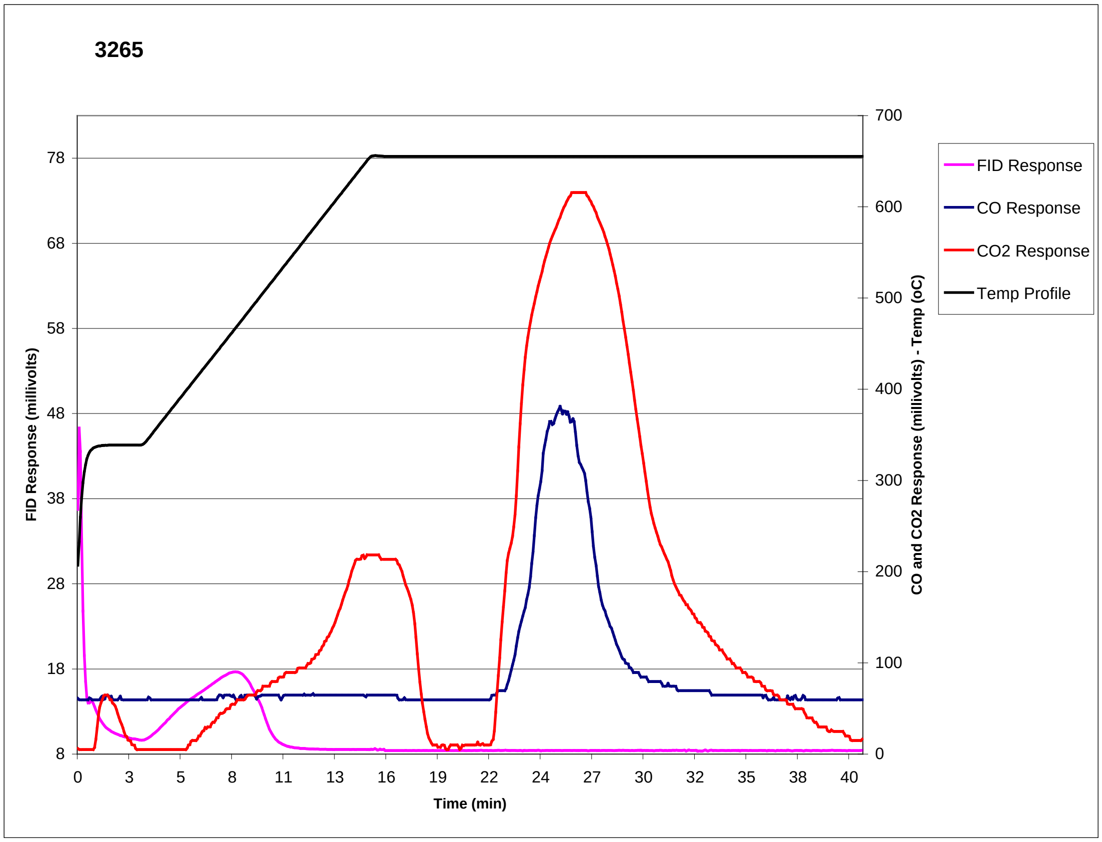
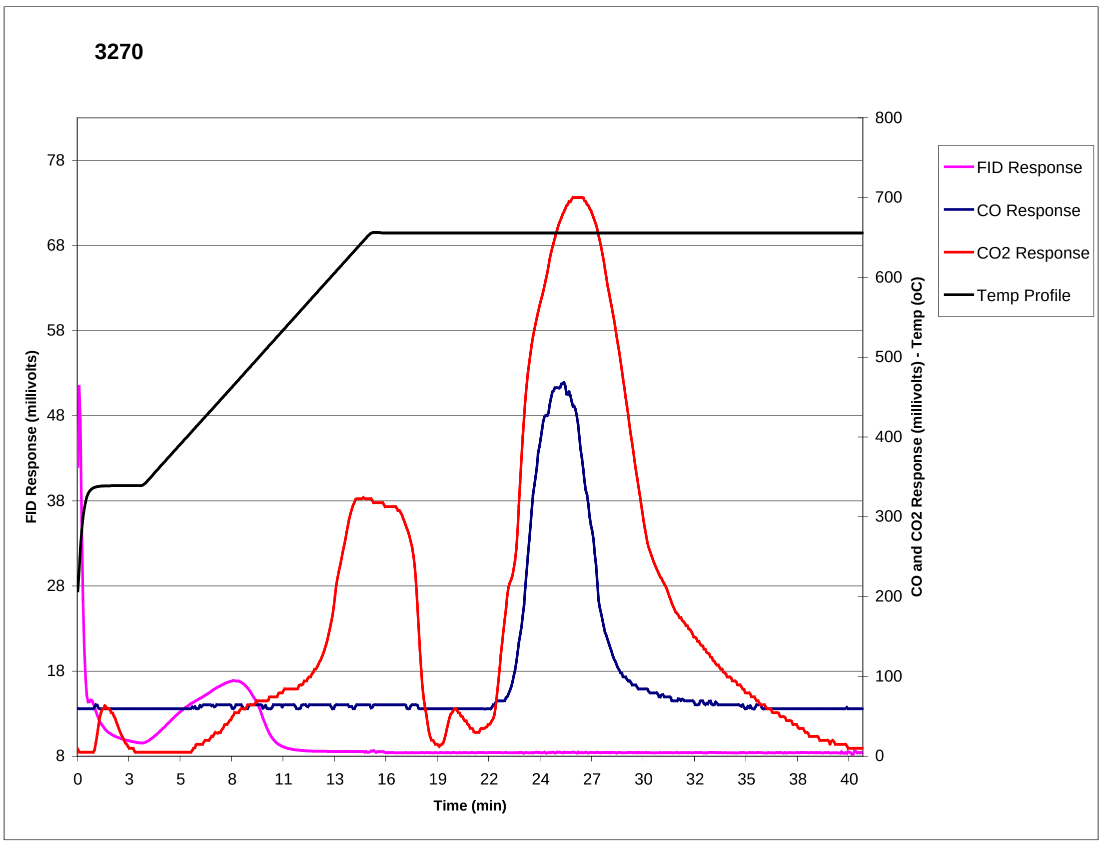
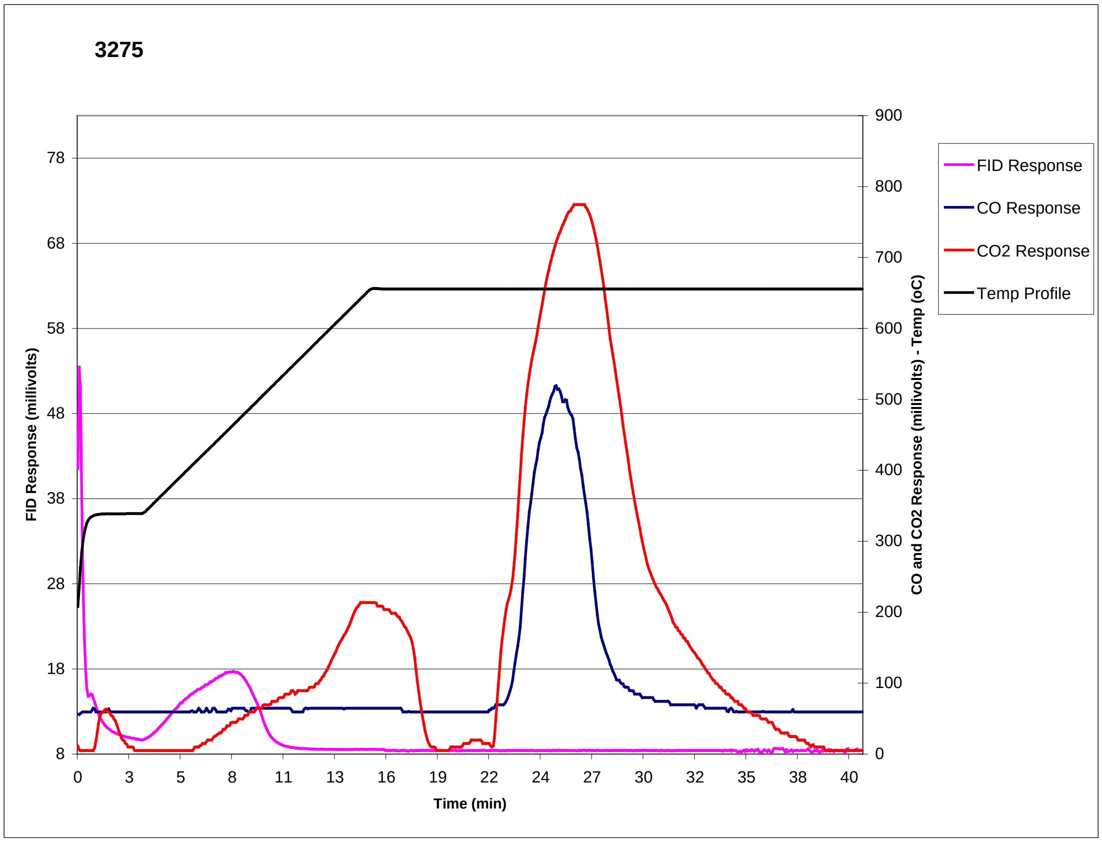


3265
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile



3270
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile


3275
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
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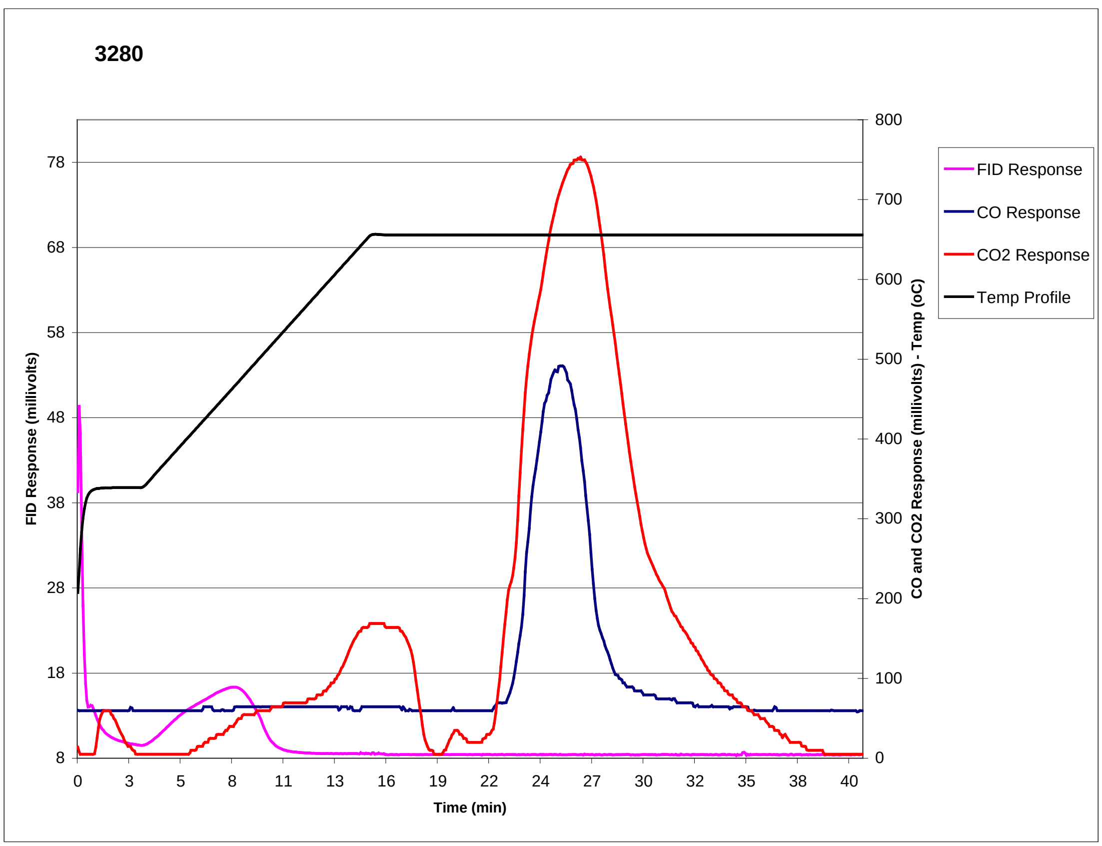
3280
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
18
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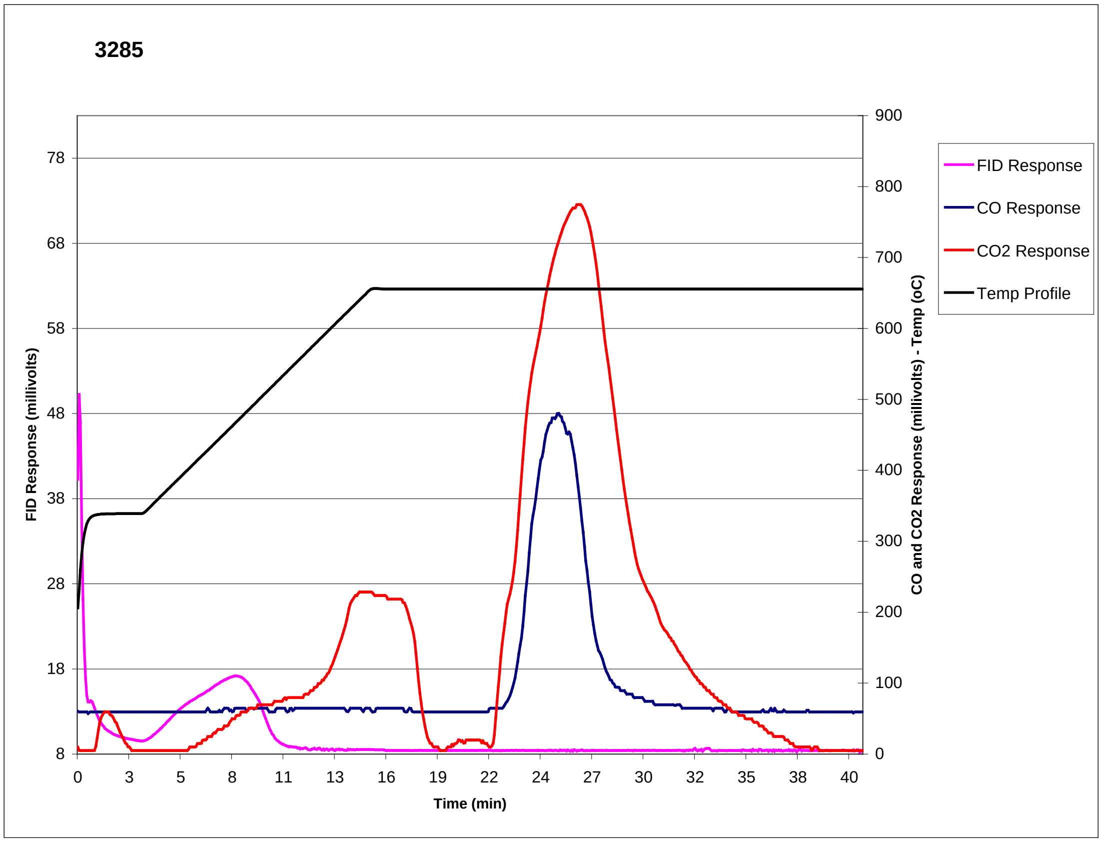
3285
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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18
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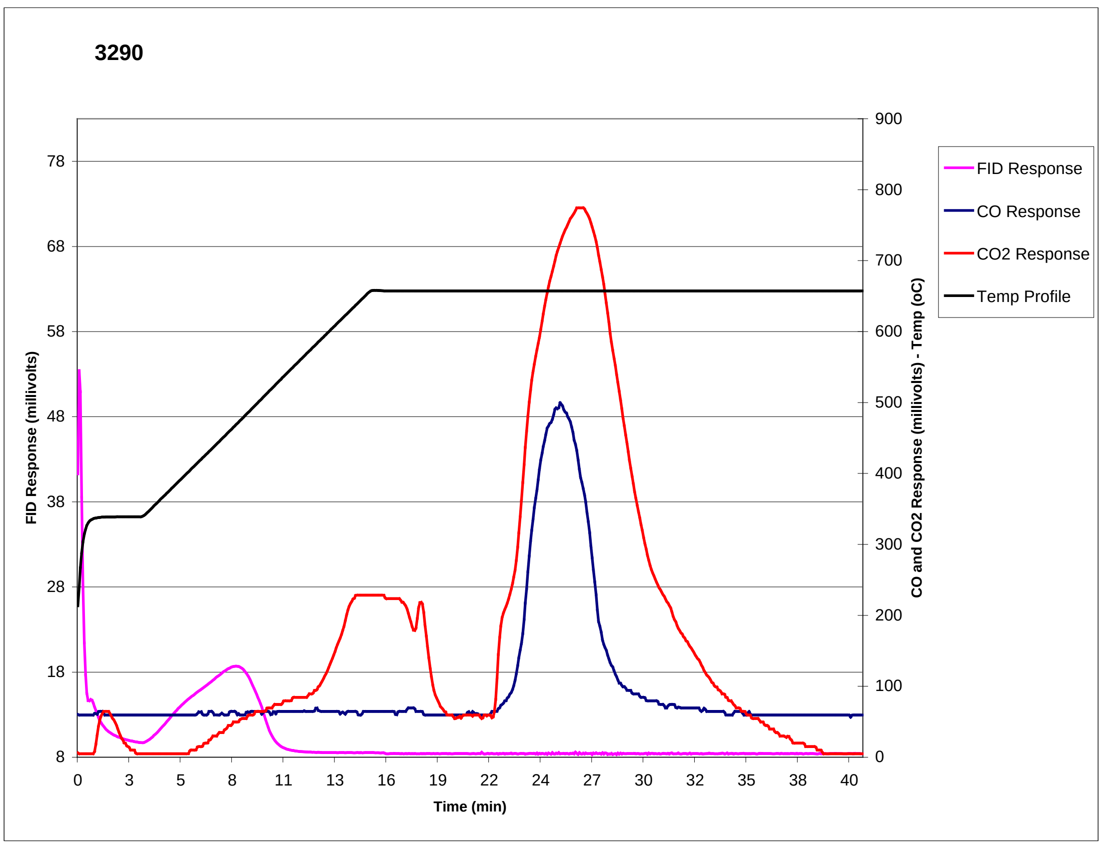
3290
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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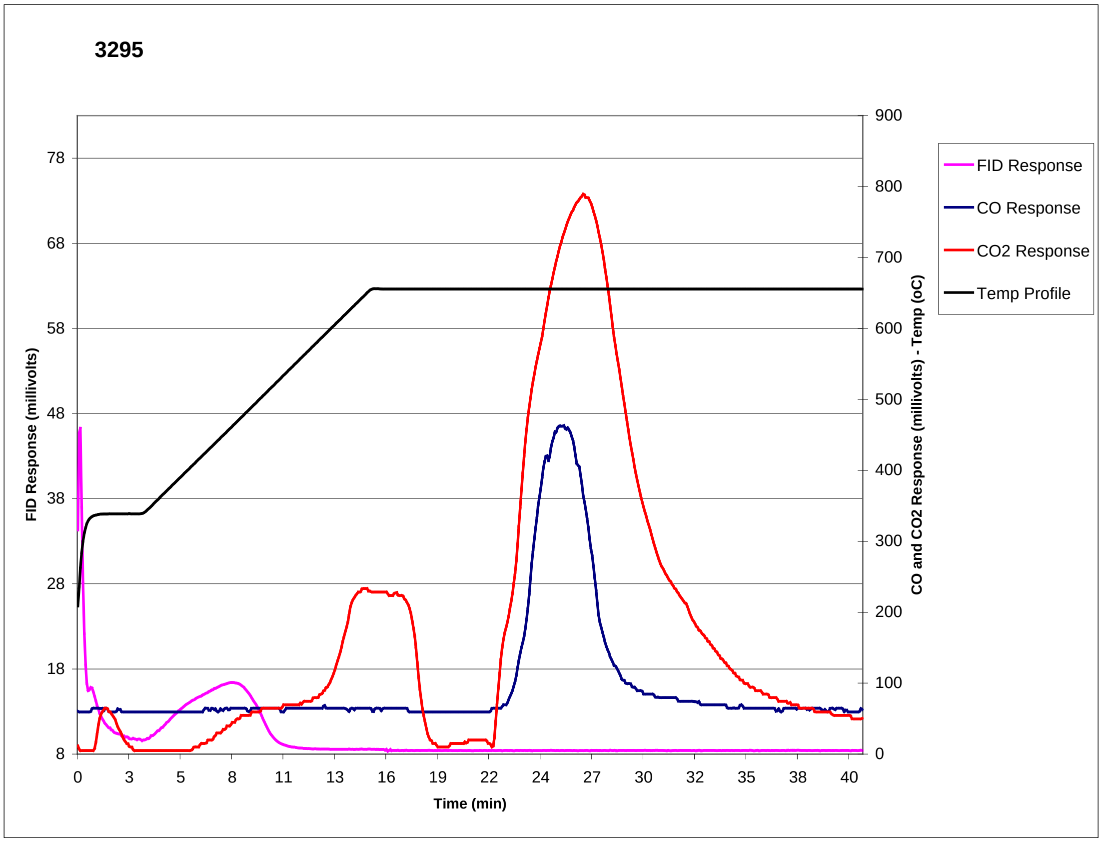
3295
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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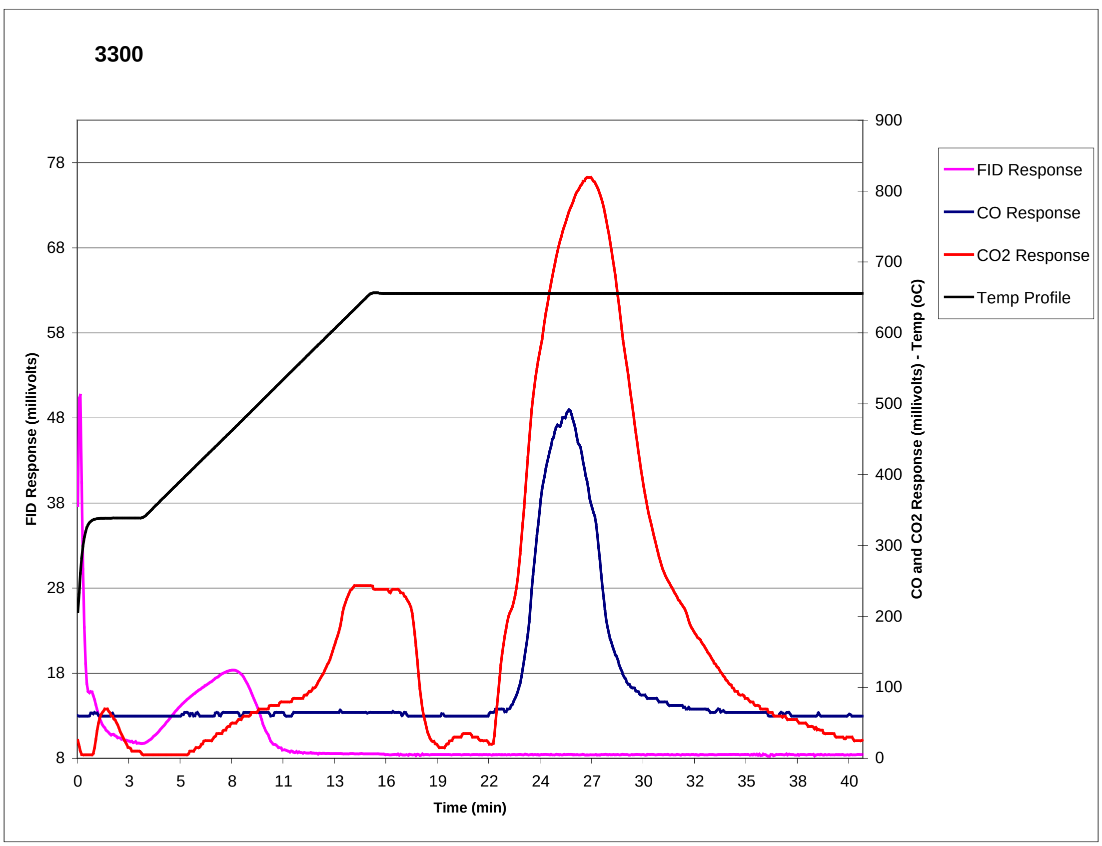
3300
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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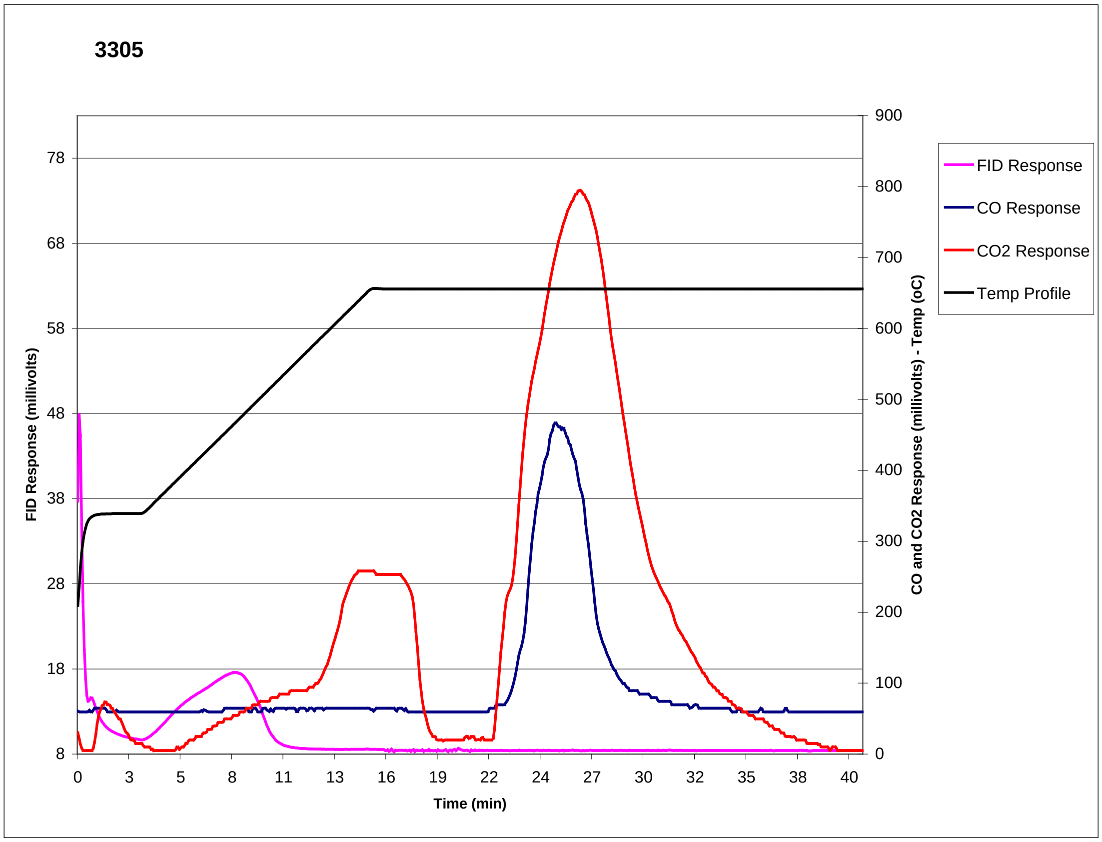
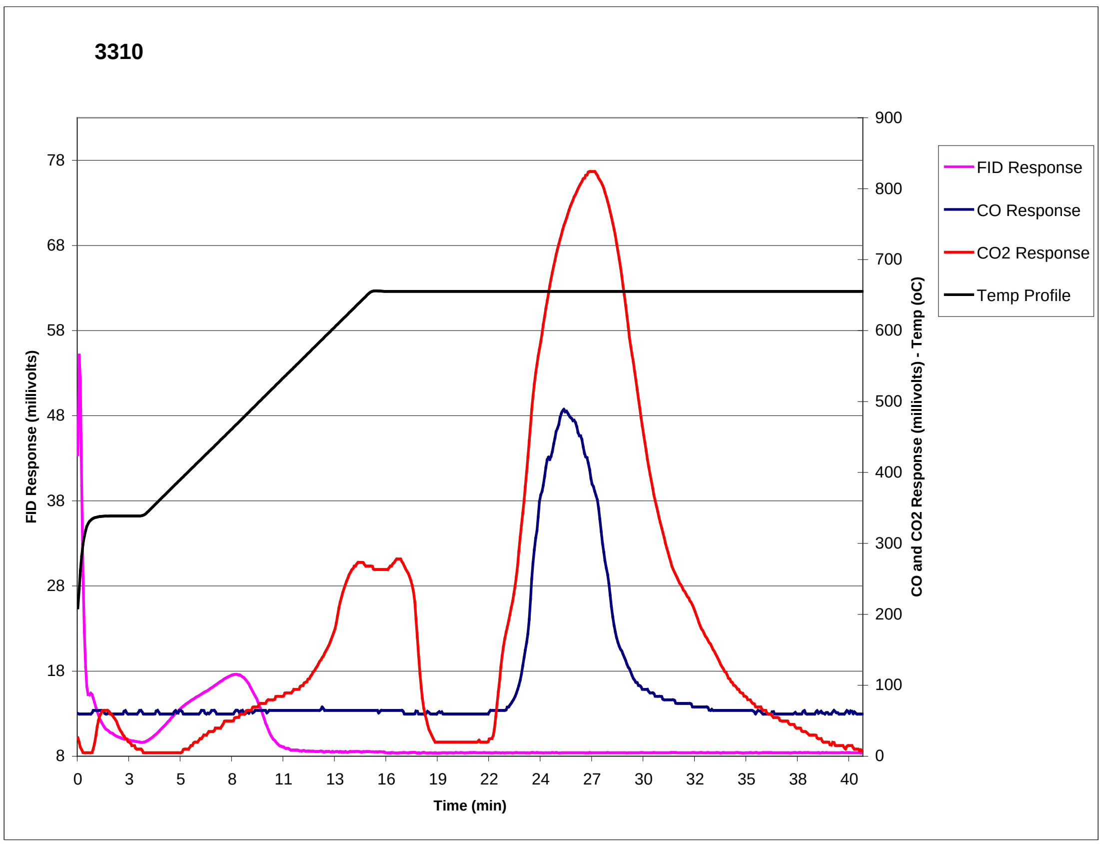
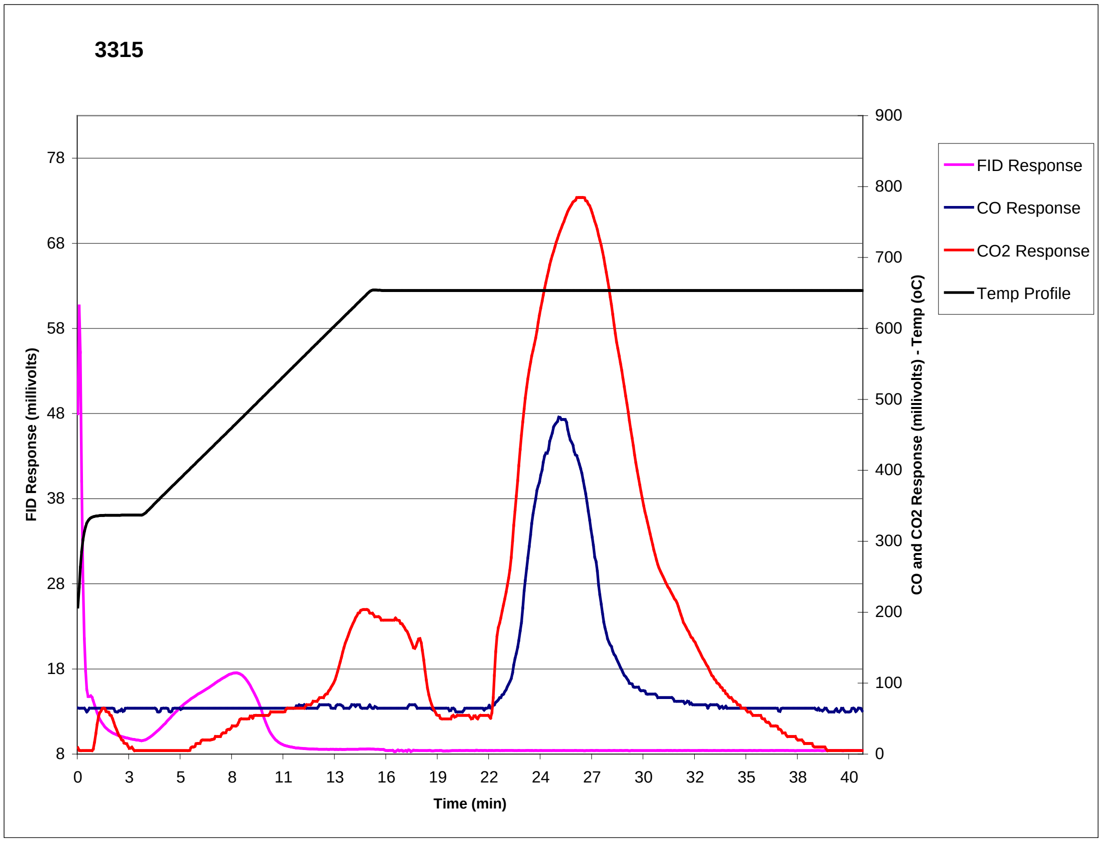


3305
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile



3310
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile


3315
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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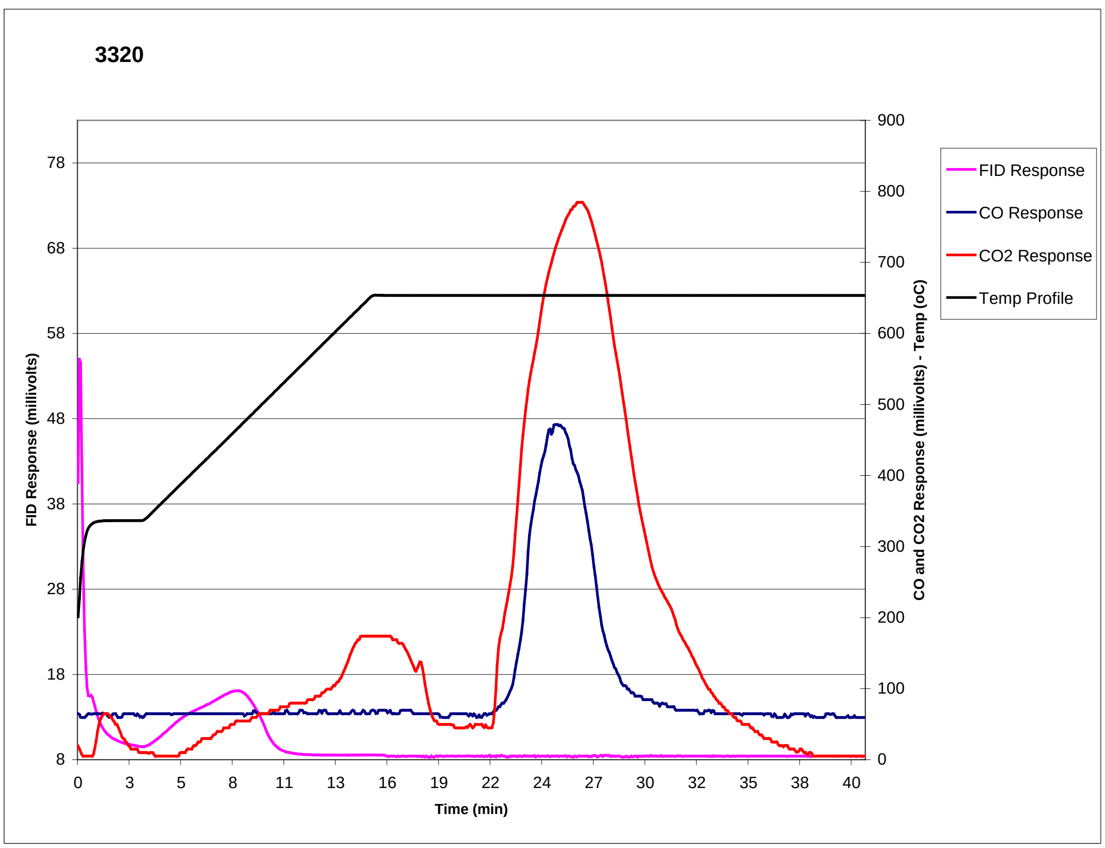
3320
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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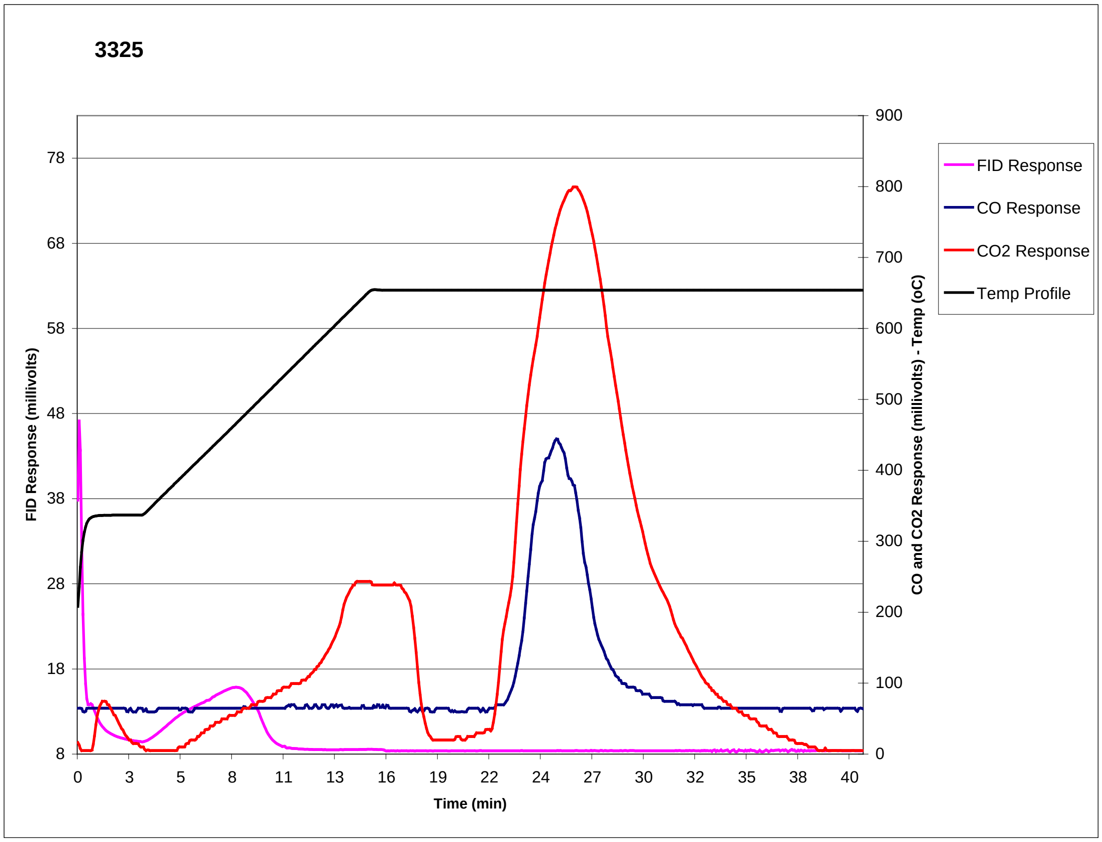
3325
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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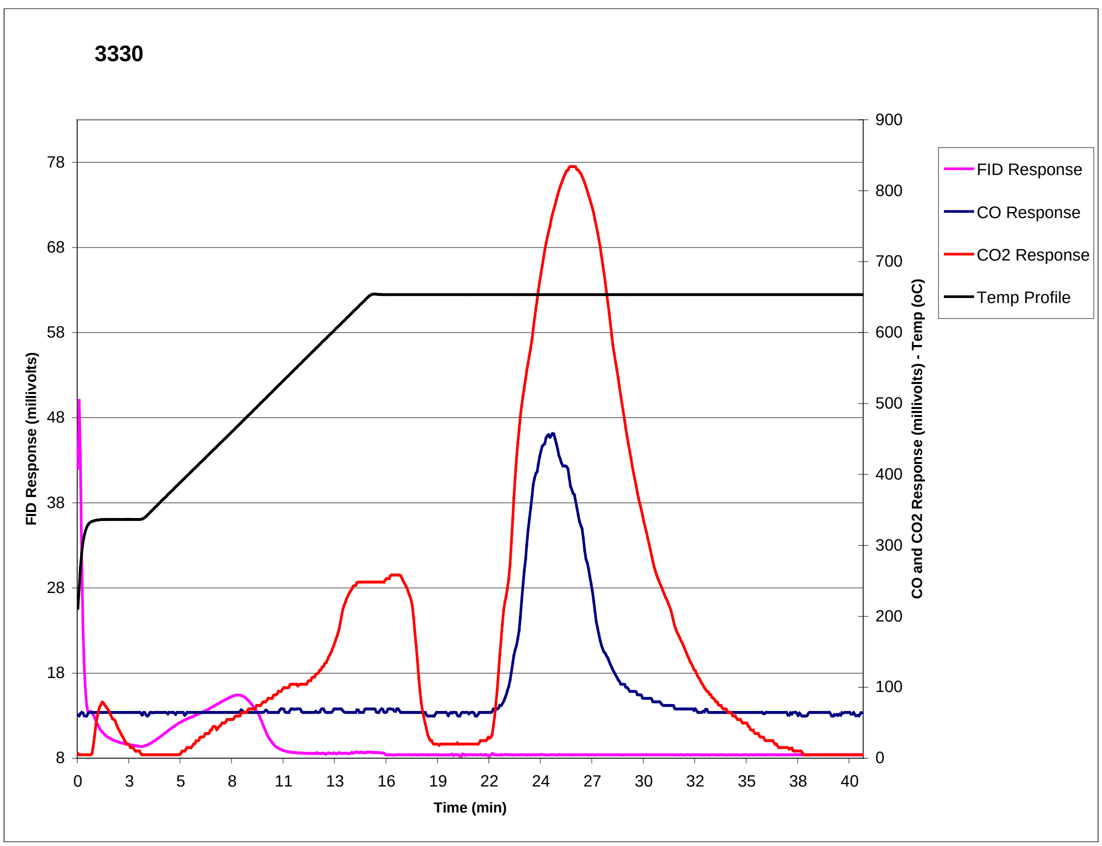
3330
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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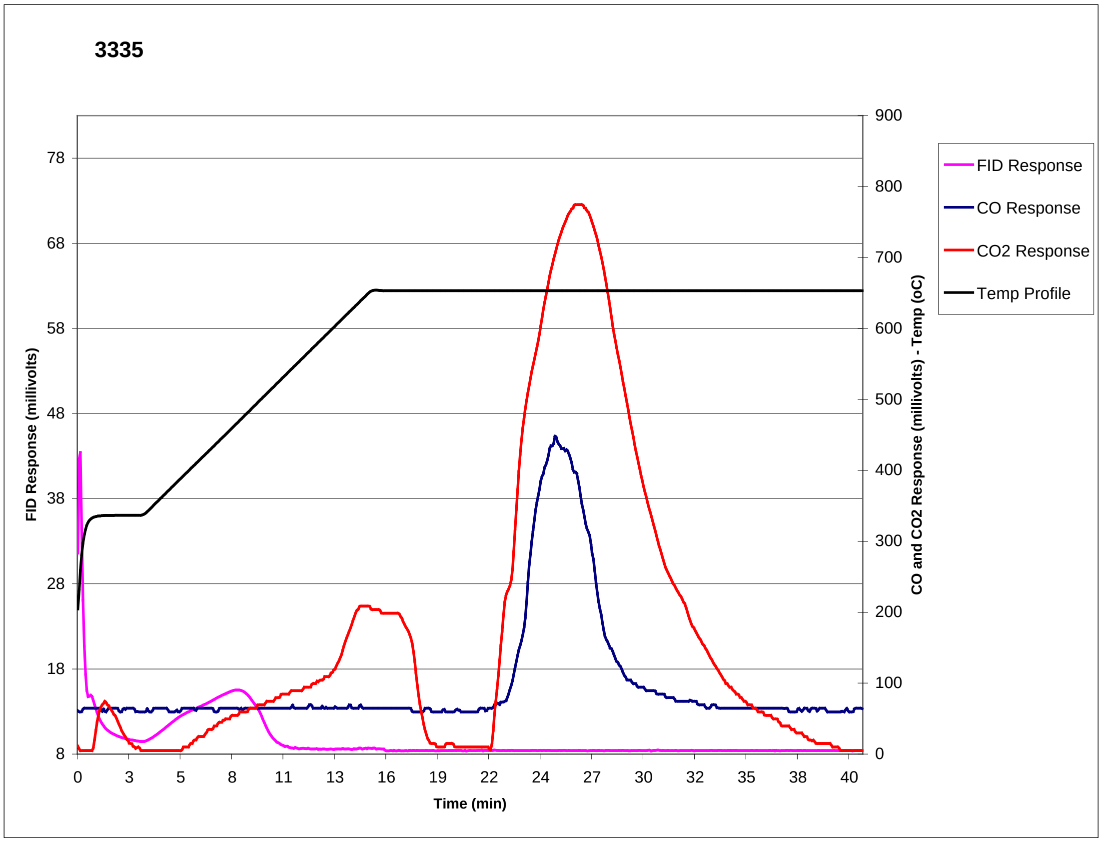
3335
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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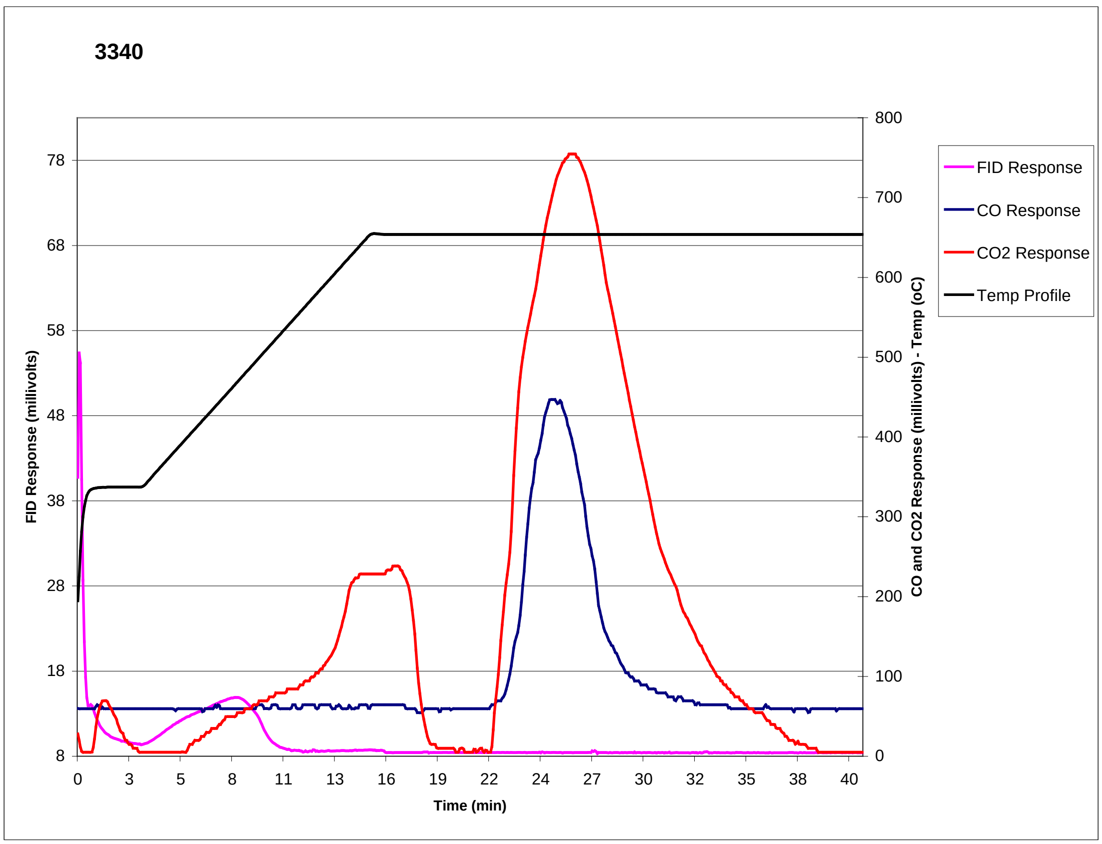
3340
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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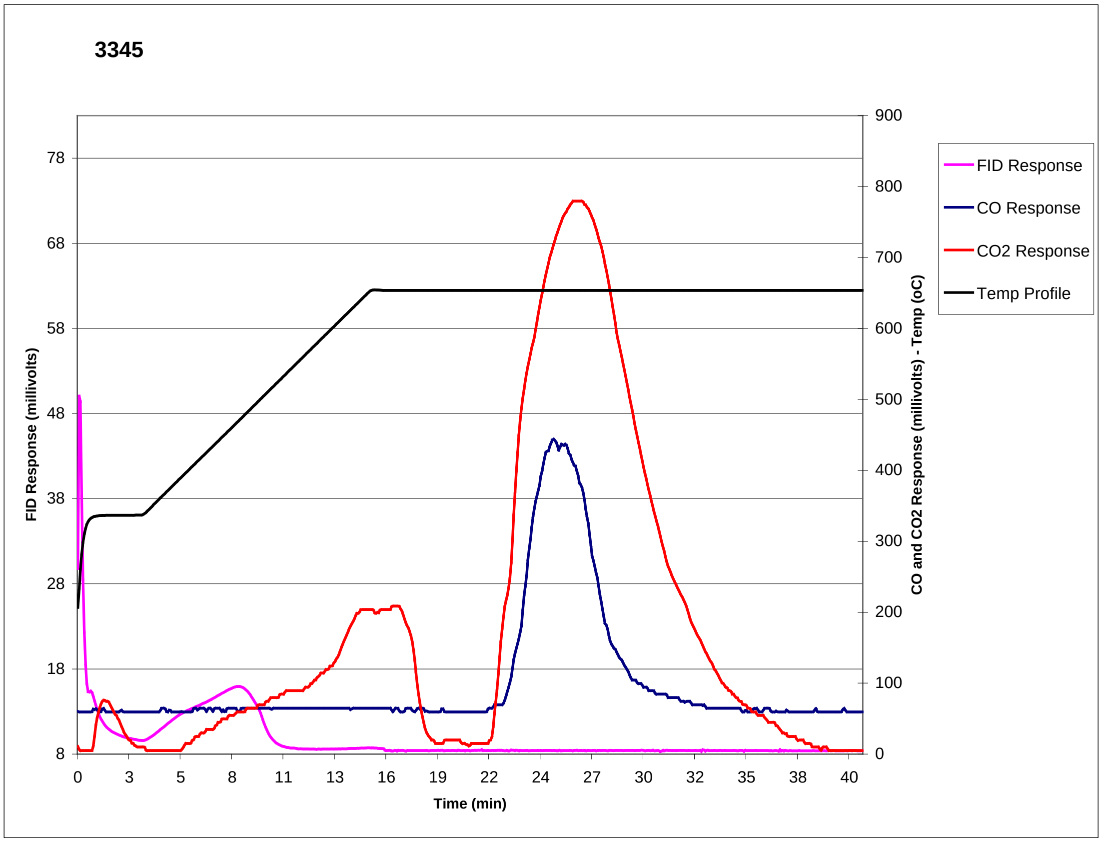

3345
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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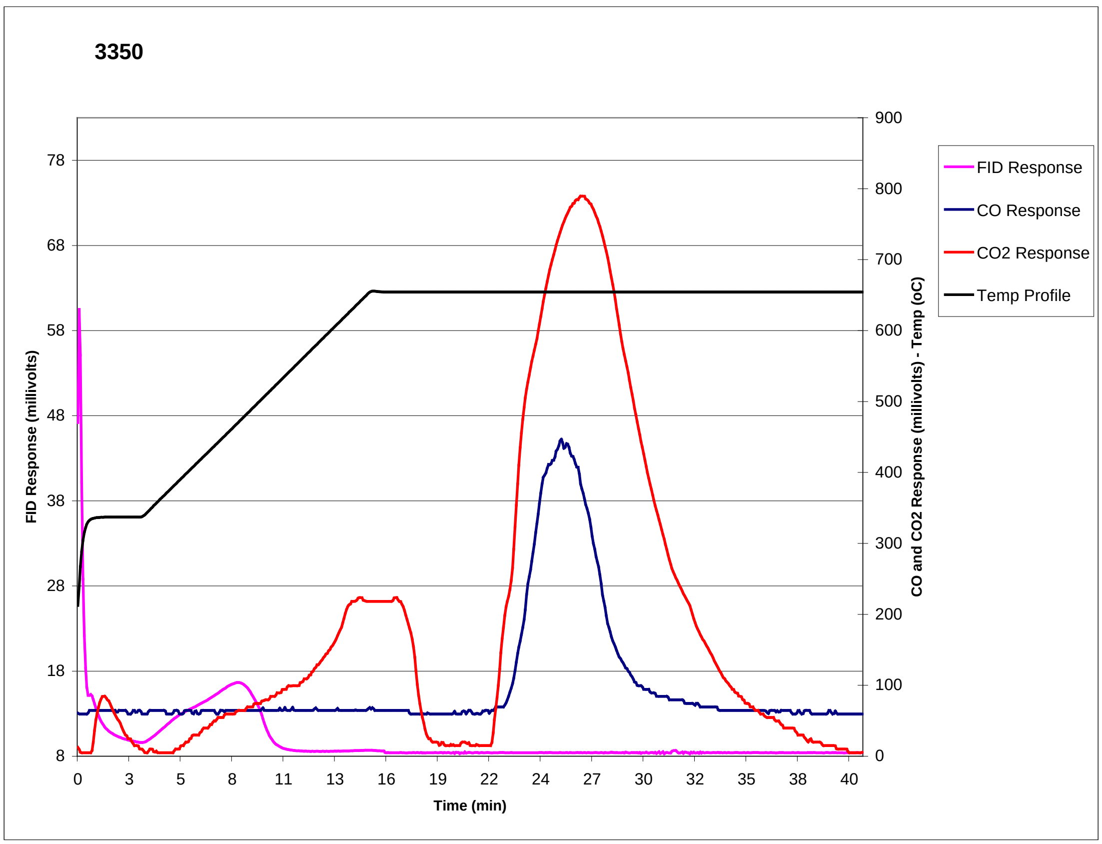

3350
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
78
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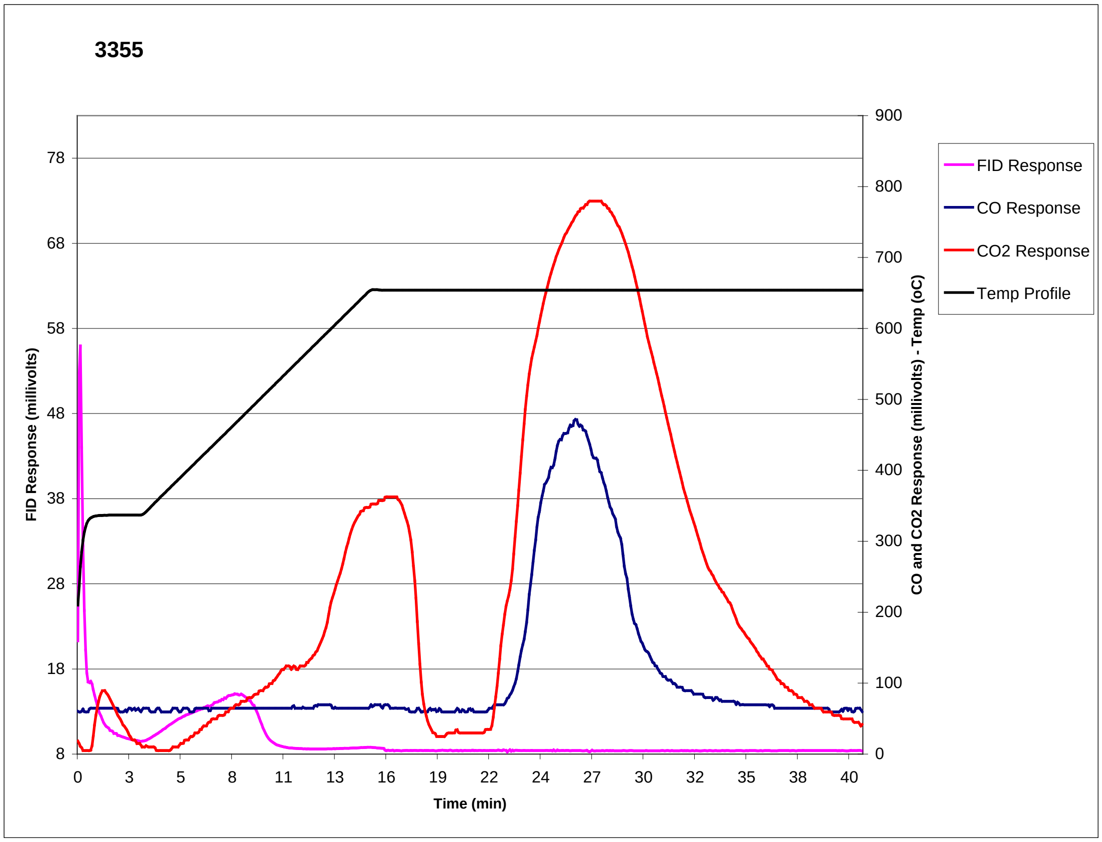
3355
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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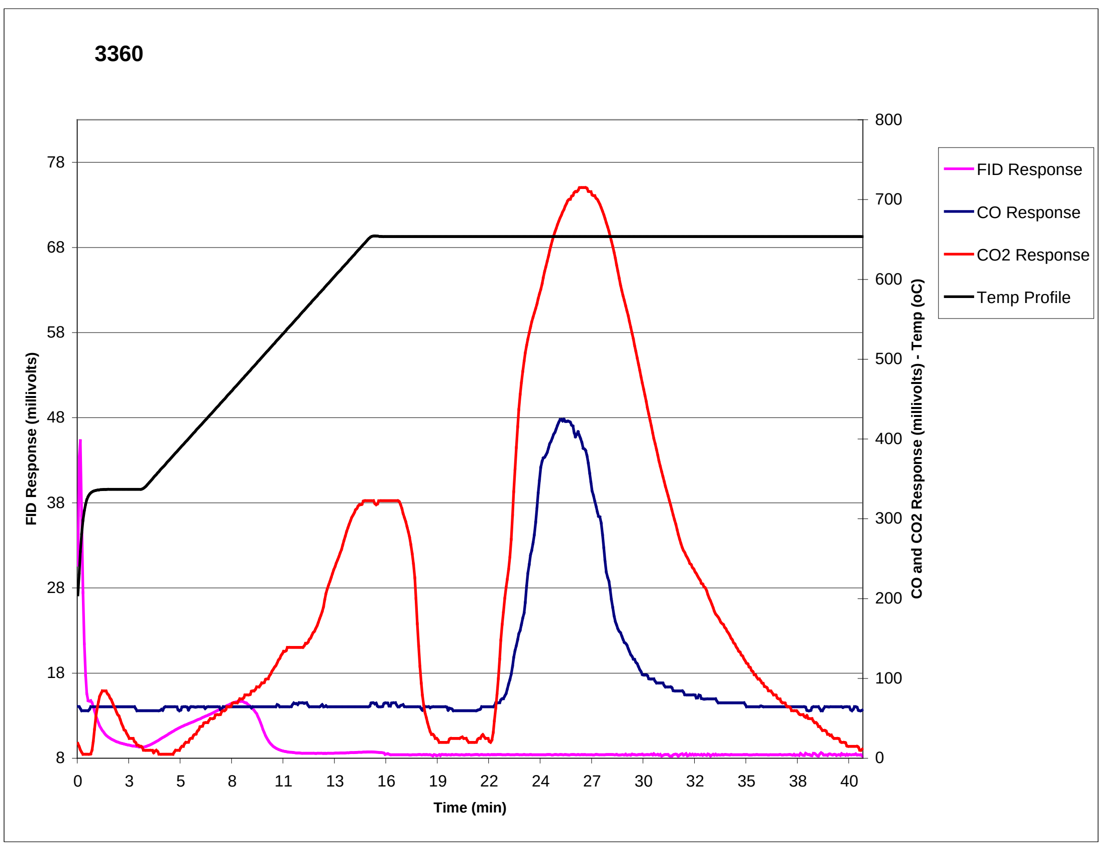
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40


3360
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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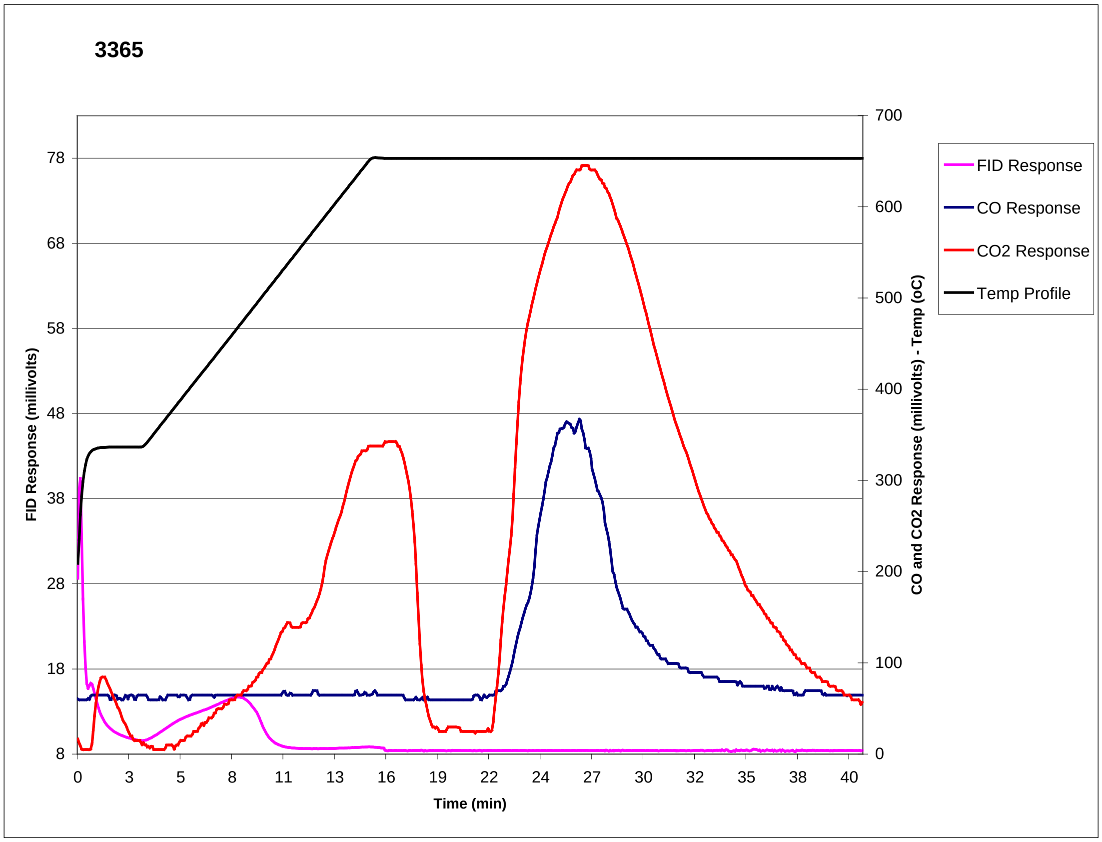
3365
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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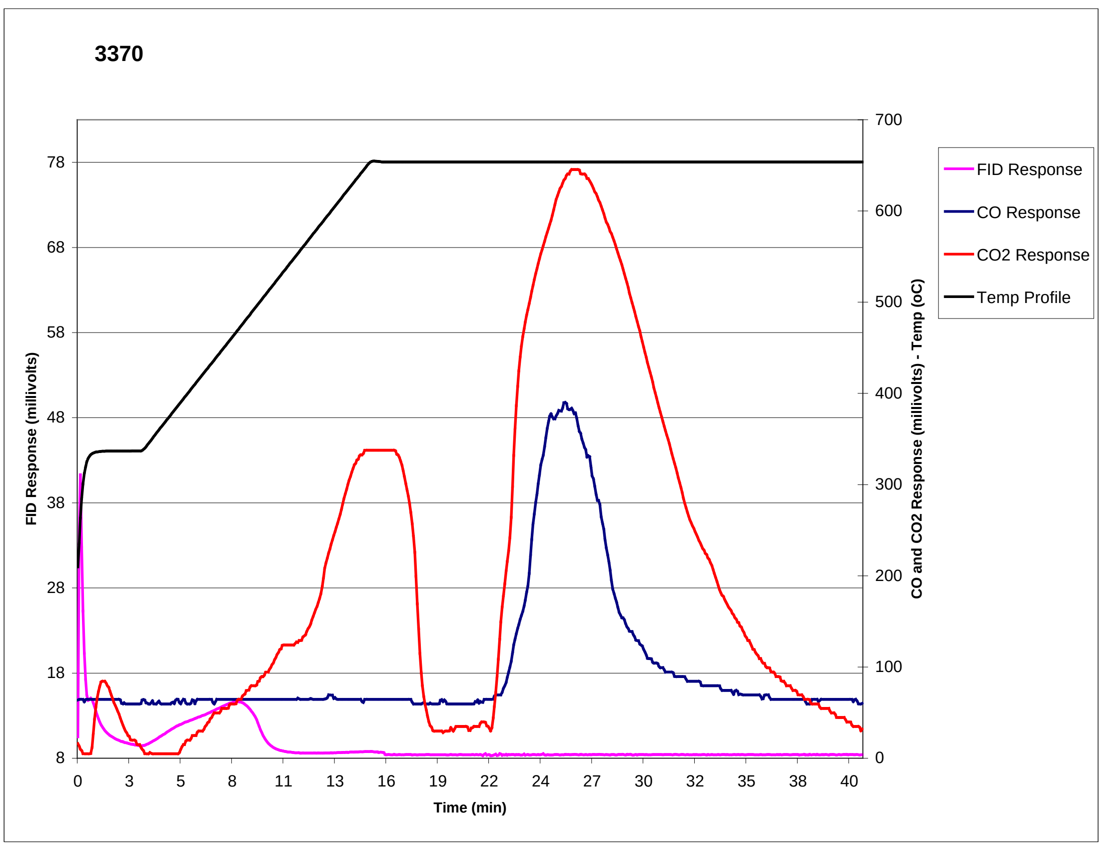
3370
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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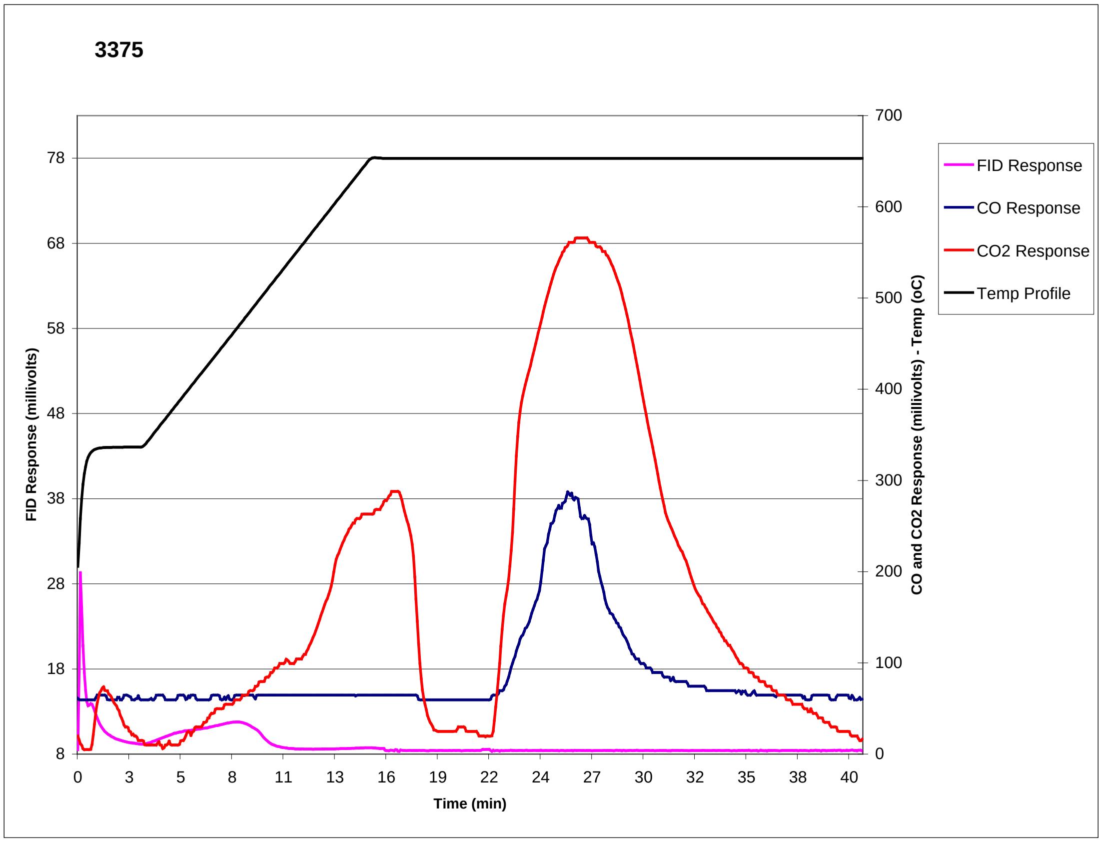
3375
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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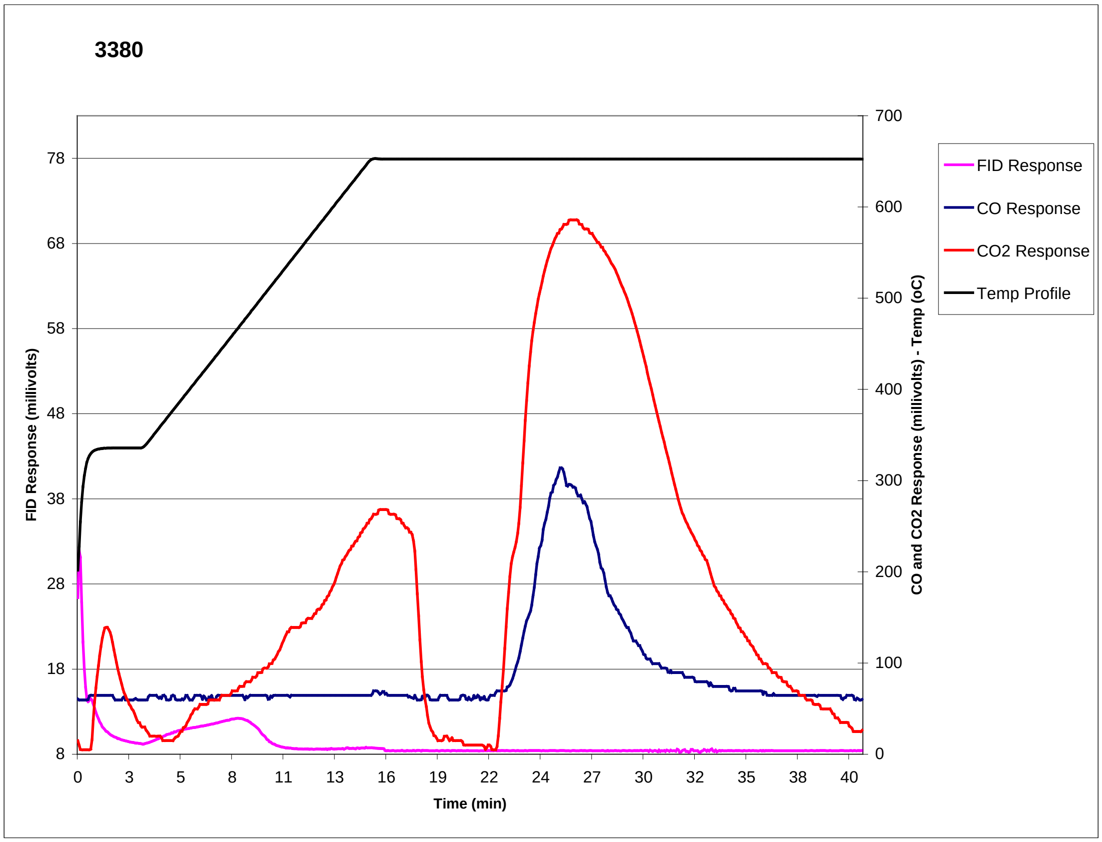
3380
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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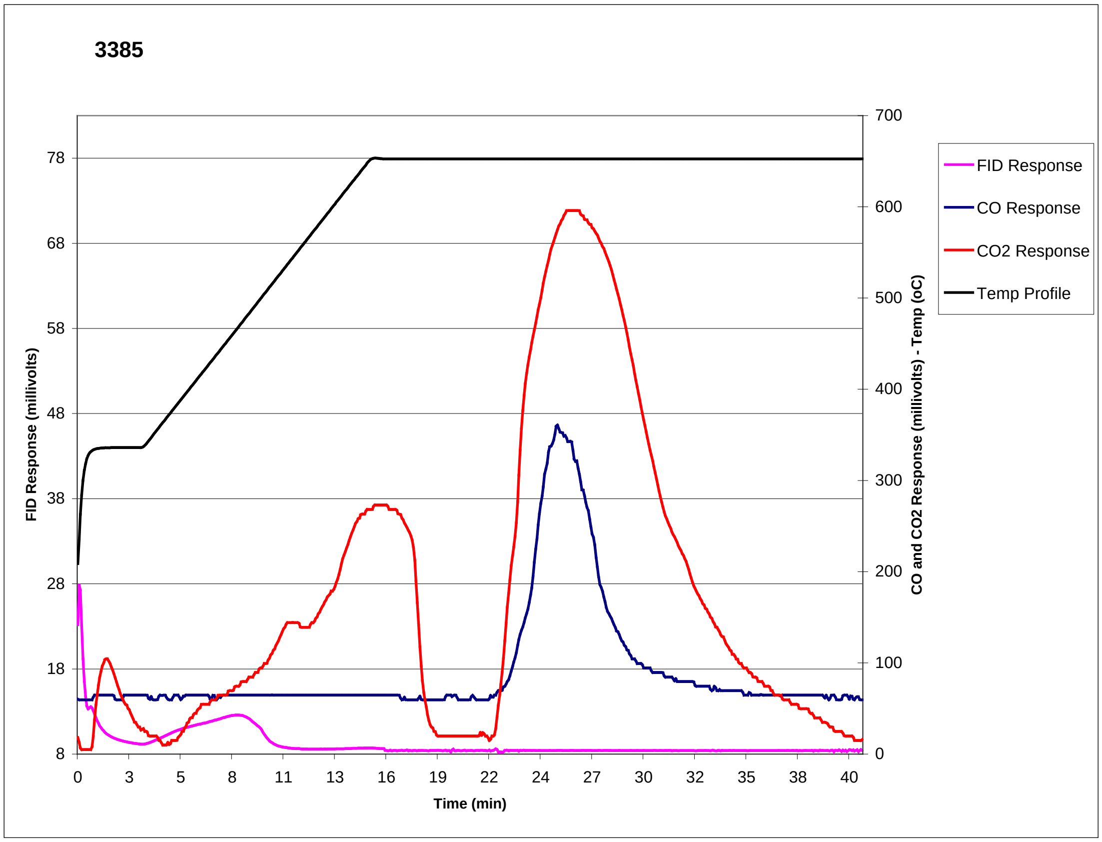
3385
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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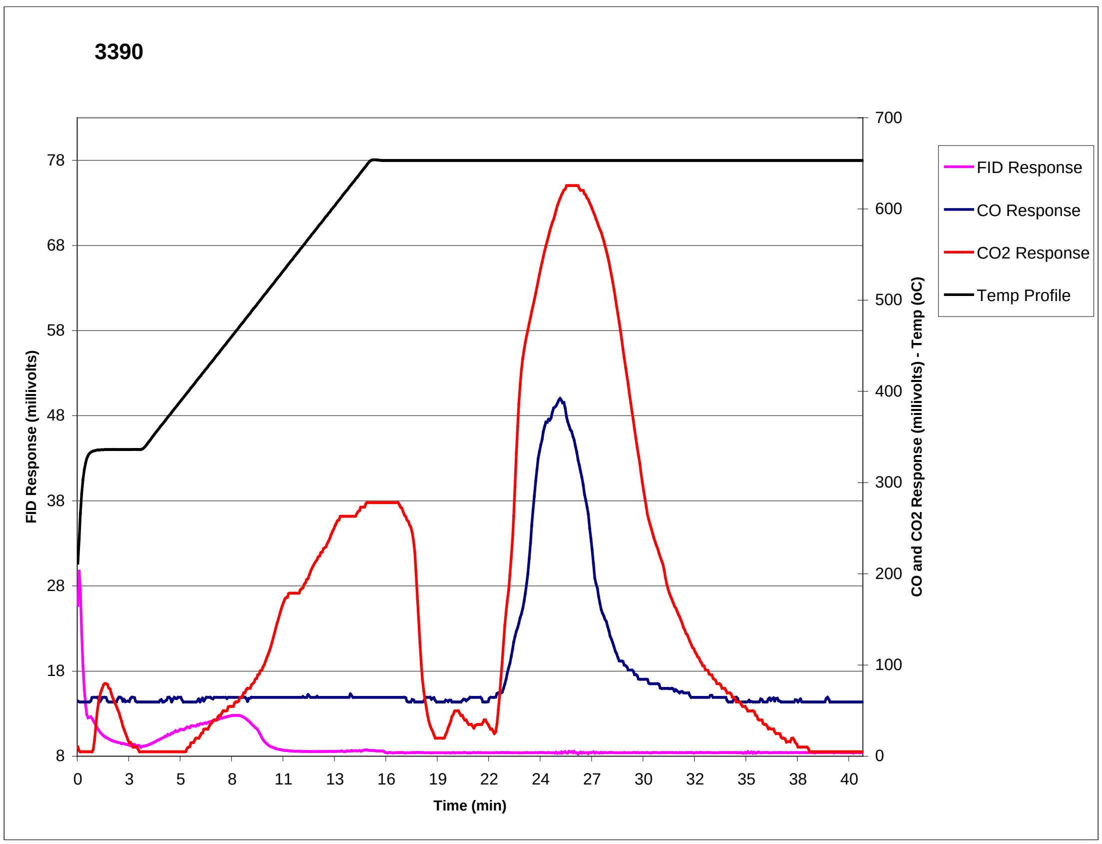
3390
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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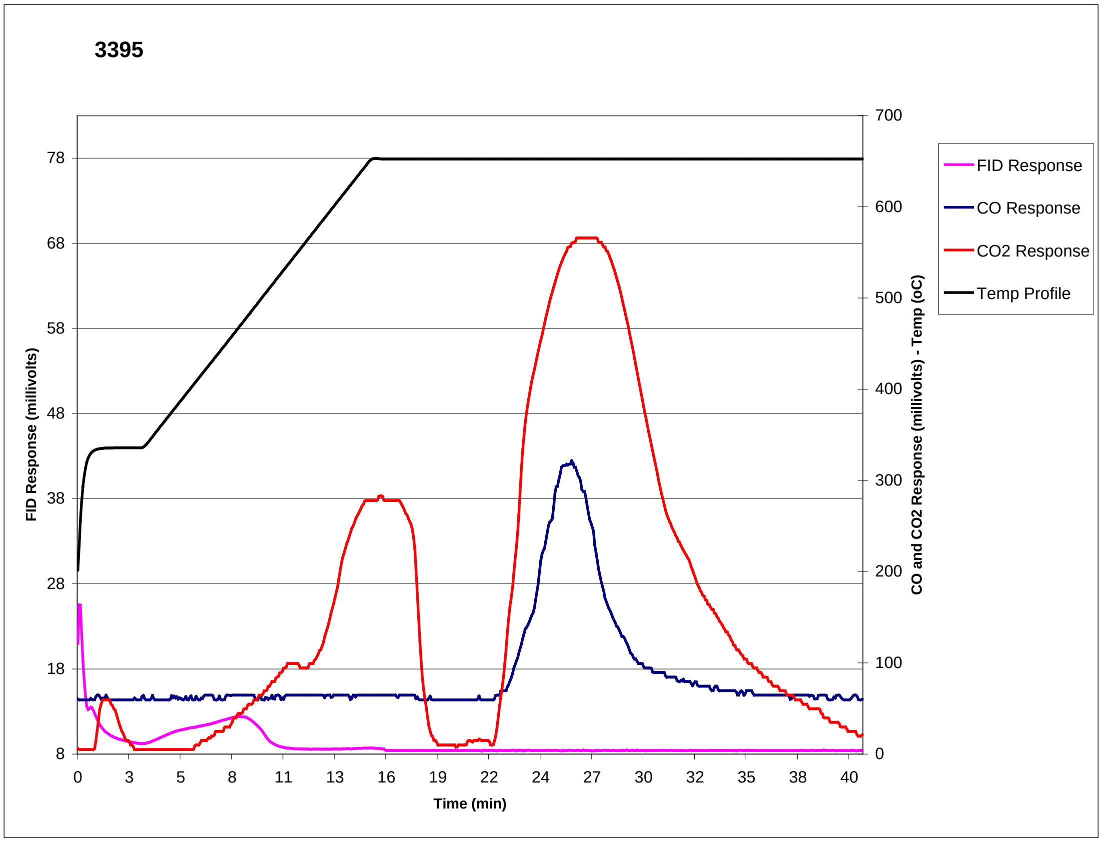
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FID Response (millivolts)
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Time (min)
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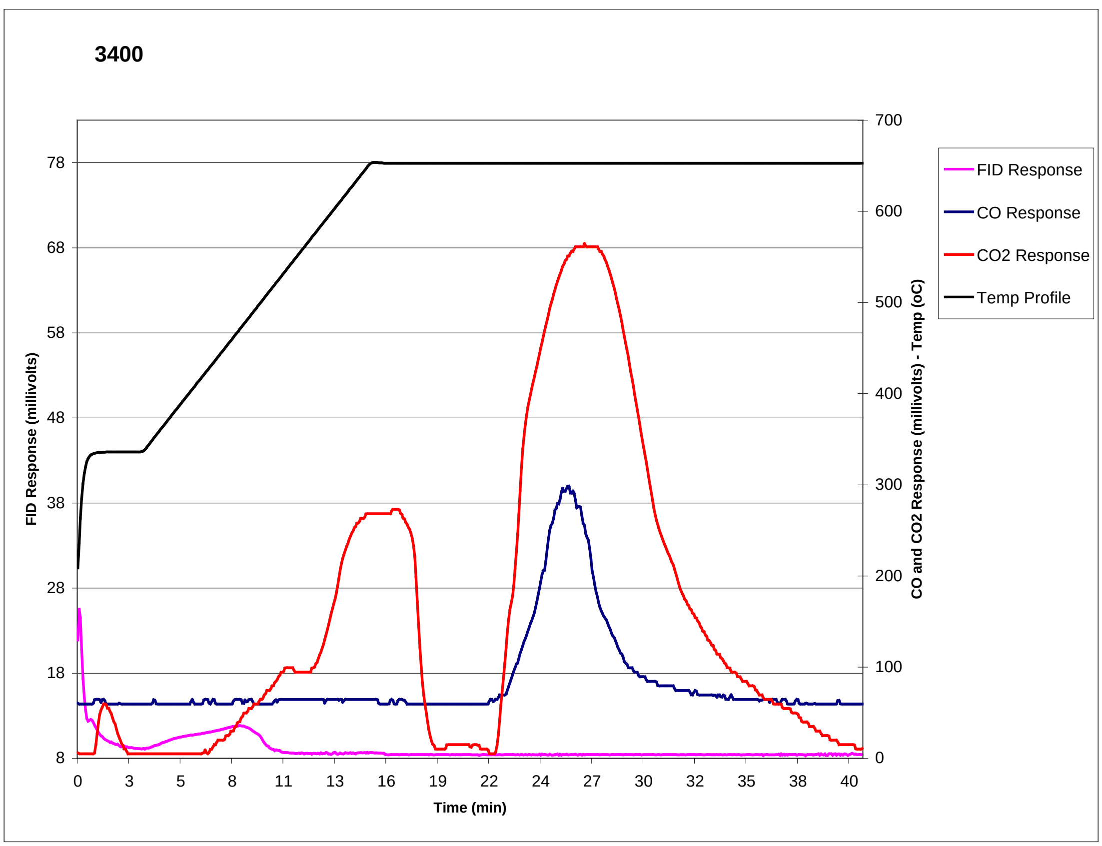
CO and CO2 Response (millivolts) - Temp (oC)
FID Response
CO Response
CO2 Response
Temp Profile


3400
FID Response (millivolts)
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Time (min)
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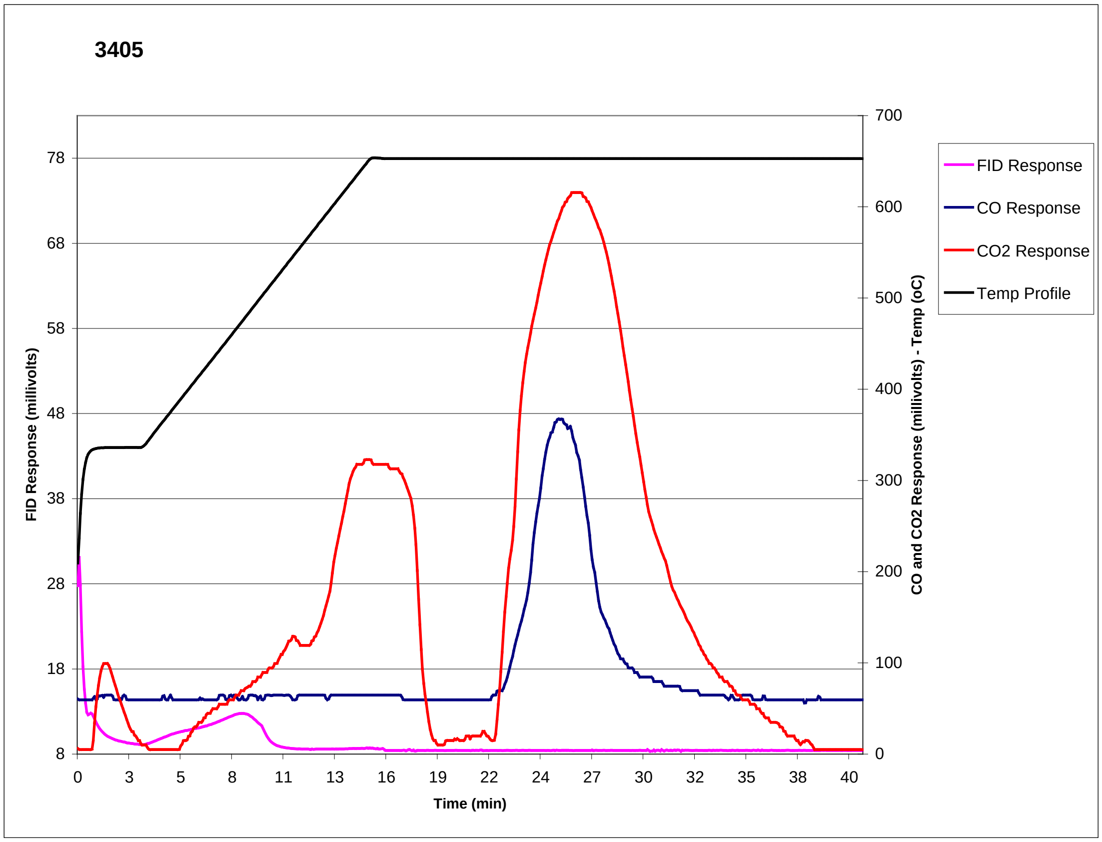
CO and CO2 Response (millivolts) - Temp (oC)
FID Response
CO Response
CO2 Response
Temp Profile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FID Response (millivolts)
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Time (min)
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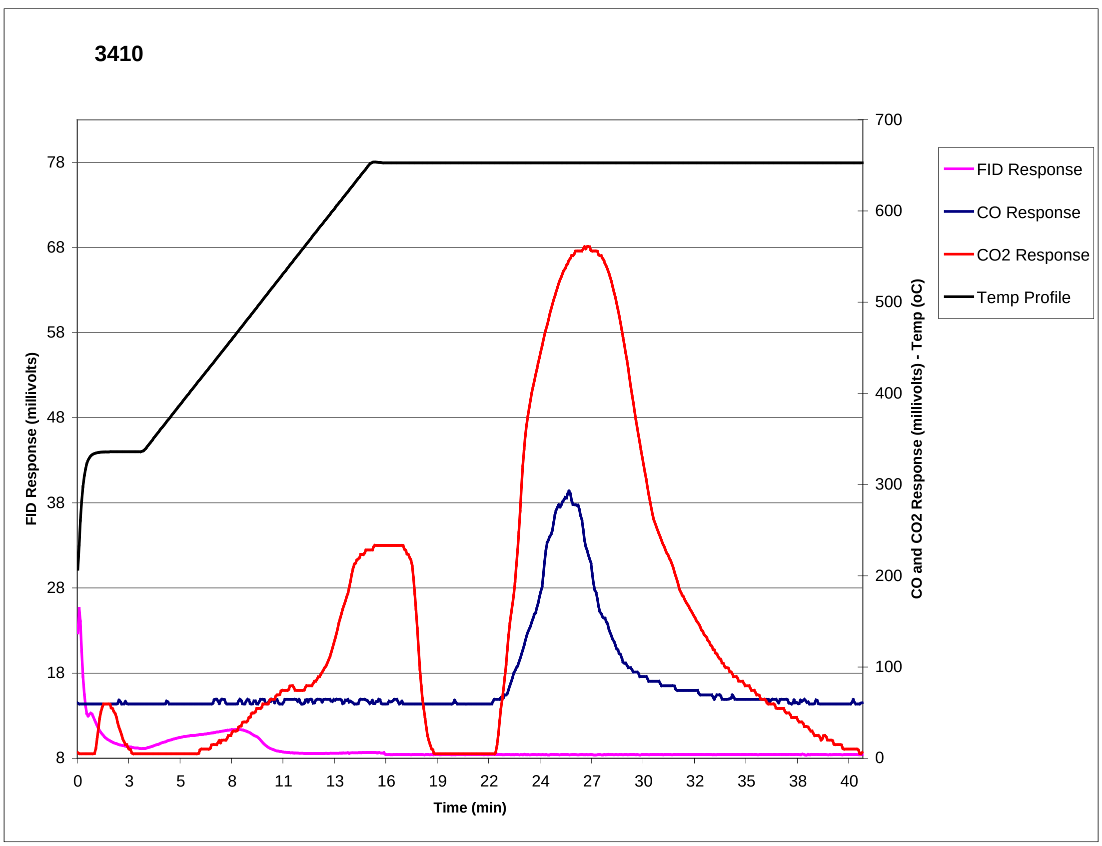
CO and CO2 Response (millivolts) - Temp (oC)
FID Response
CO Response
CO2 Response
Temp Profile


3410
FID Response (millivolts)
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Time (min)
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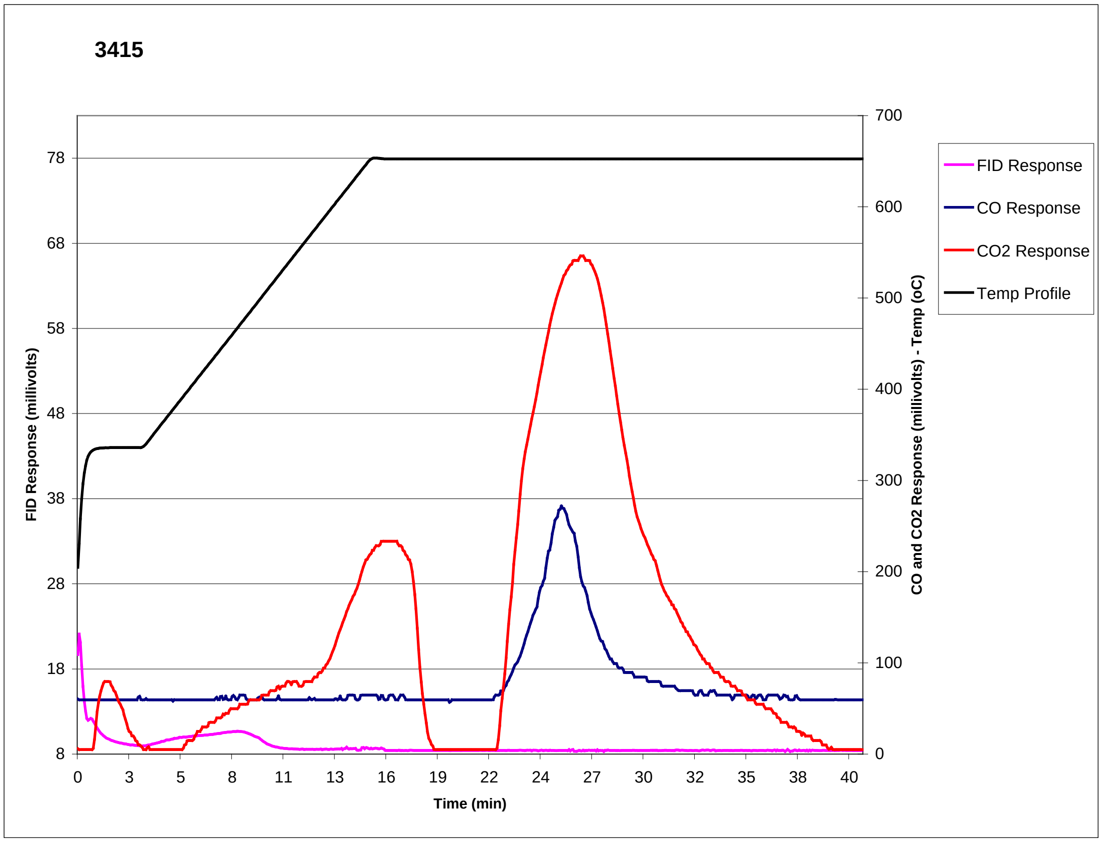
CO and CO2 Response (millivolts) - Temp (oC)
FID Response
CO Response
CO2 Response
Temp Profile


3415
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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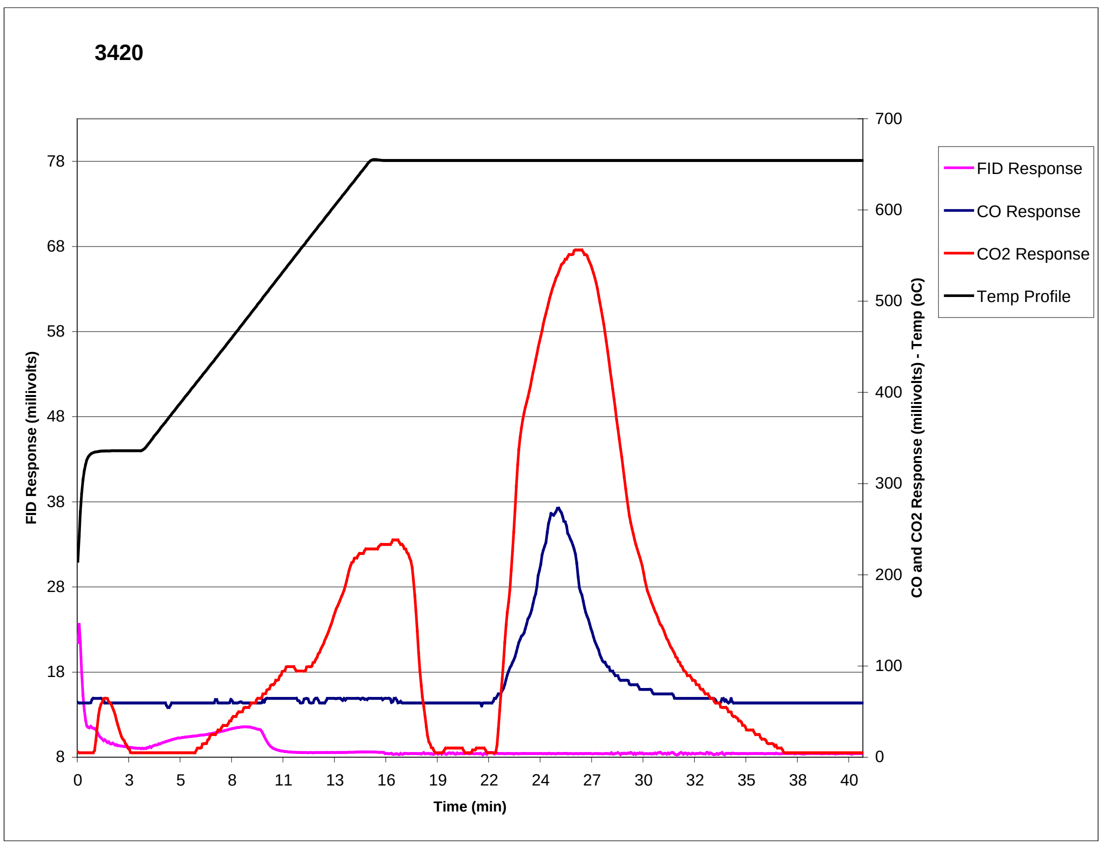
3420
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
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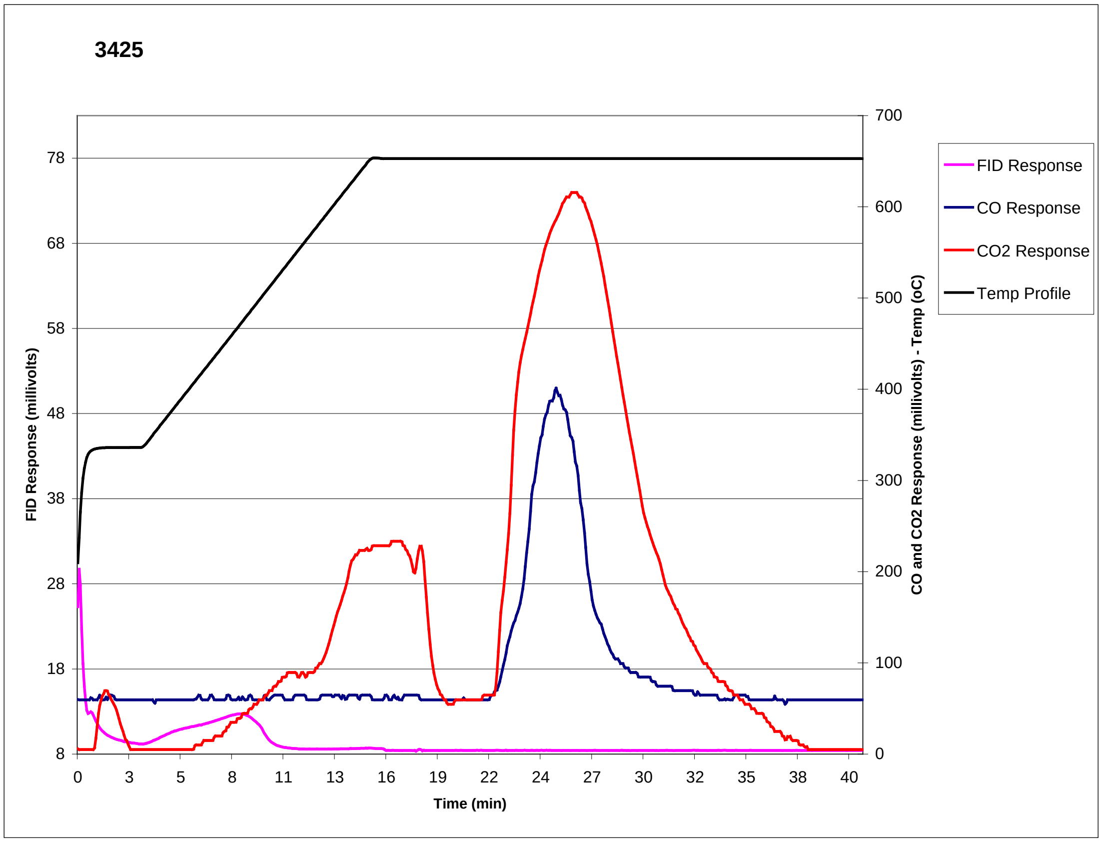
3425
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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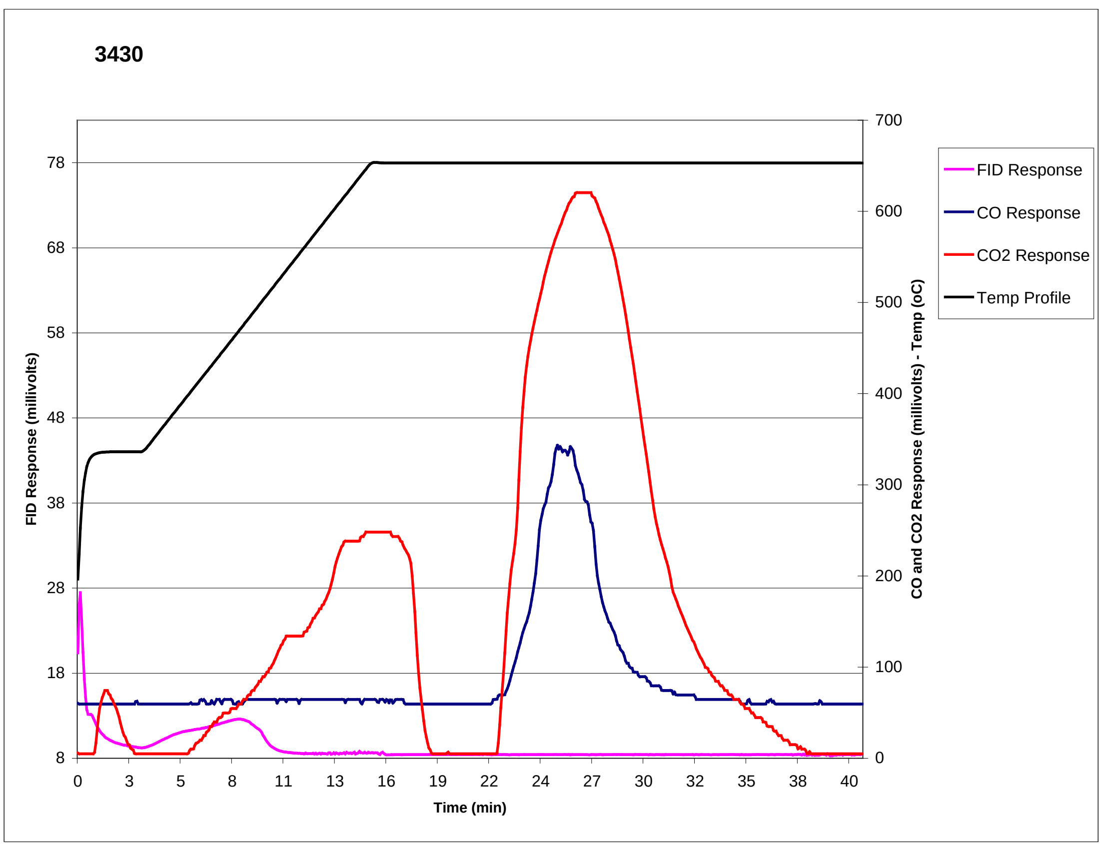
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40
FID Response
CO Response
CO2 Response
Temp Profile


3430
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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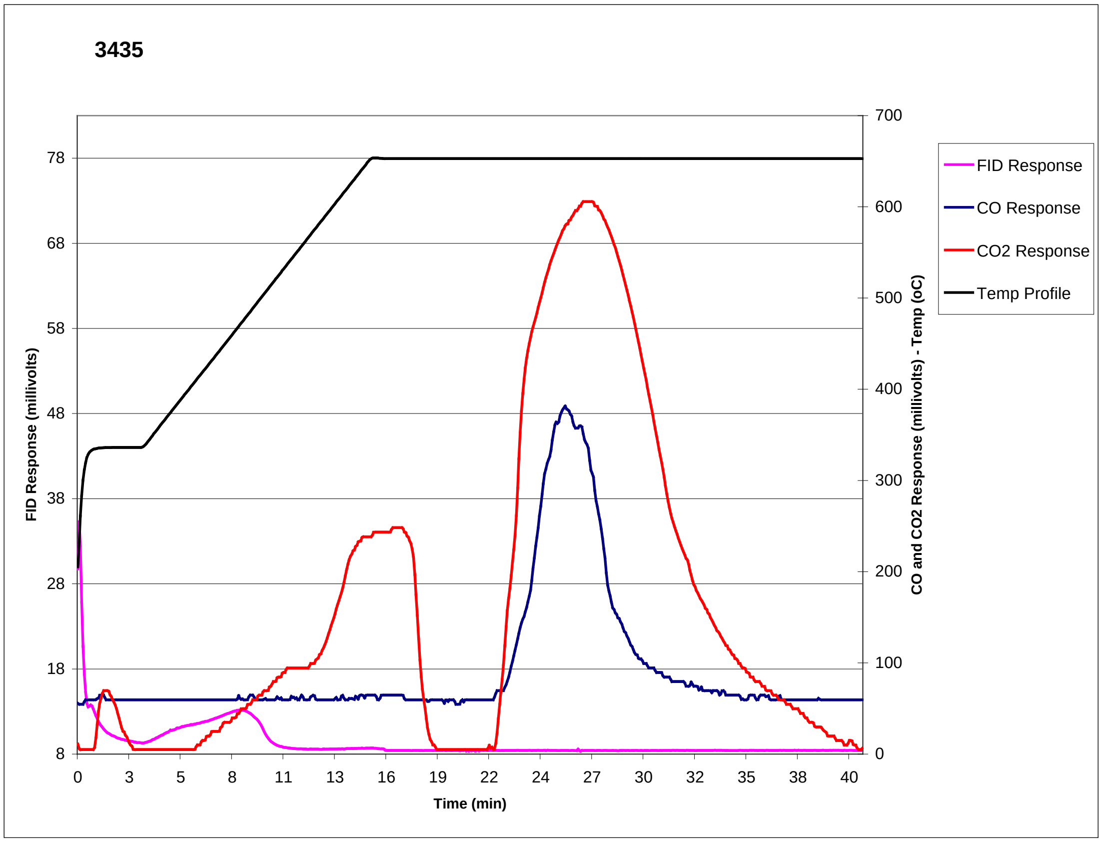
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40
FID Response
CO Response
CO2 Response
Temp Profile


3435
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
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100
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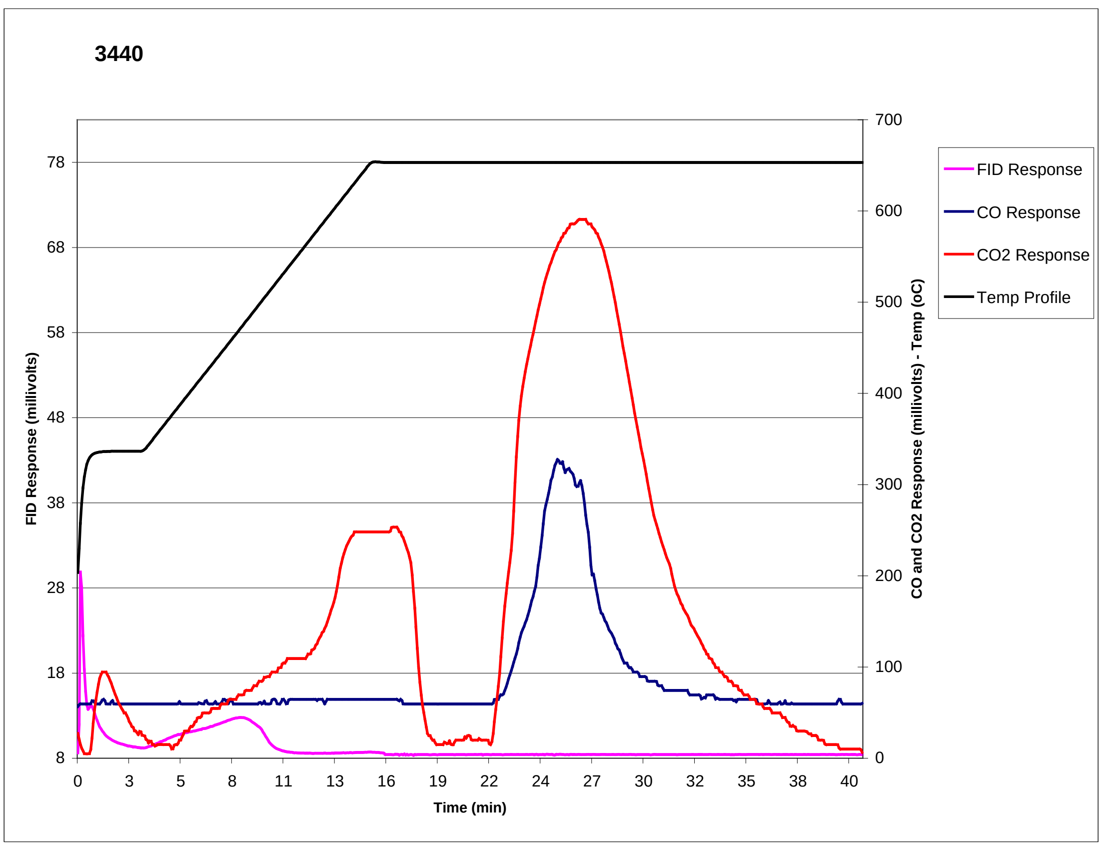
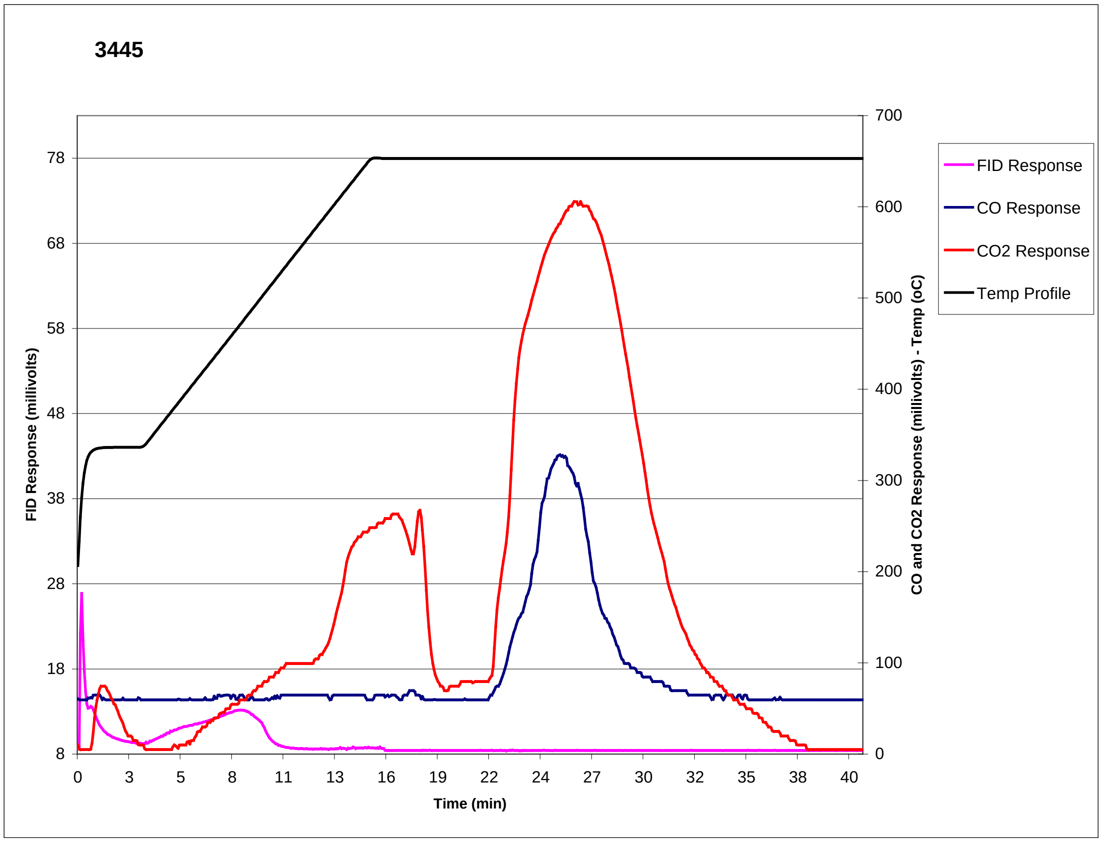
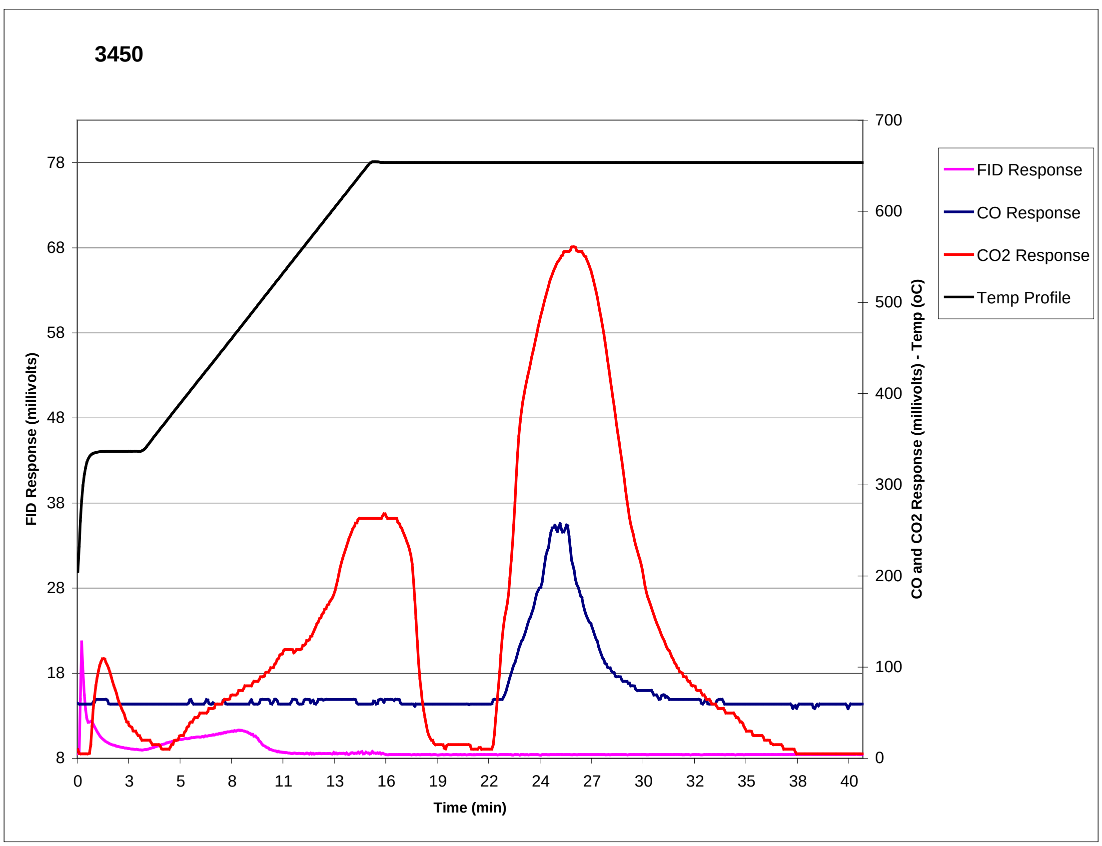
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40
FID Response
CO Response
CO2 Response
Temp Profile


3440
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
78
68
58
48
38
28
18
8
700
600
500
400
300
200
100
0
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40
FID Response
CO Response
CO2 Response
Temp Profile


3445
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
18
28
38
48
58
68
78
0
100
200
300
400
500
600
700
0
3
5
8
11
13
16
19
22
24
27
30
32
35
38
40


3450
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
18
28
38
48
58
68
78
0
100
200
300
400
500
600
700
0
3
5
8
11
13
16
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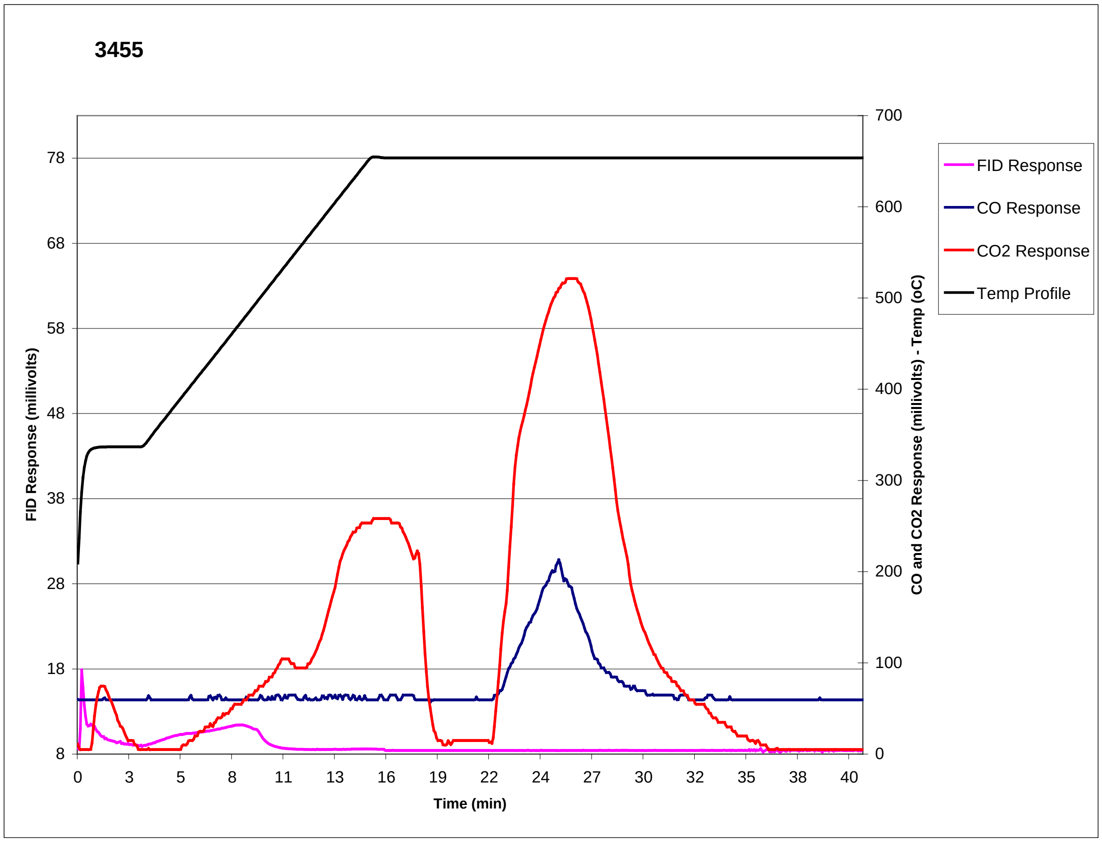
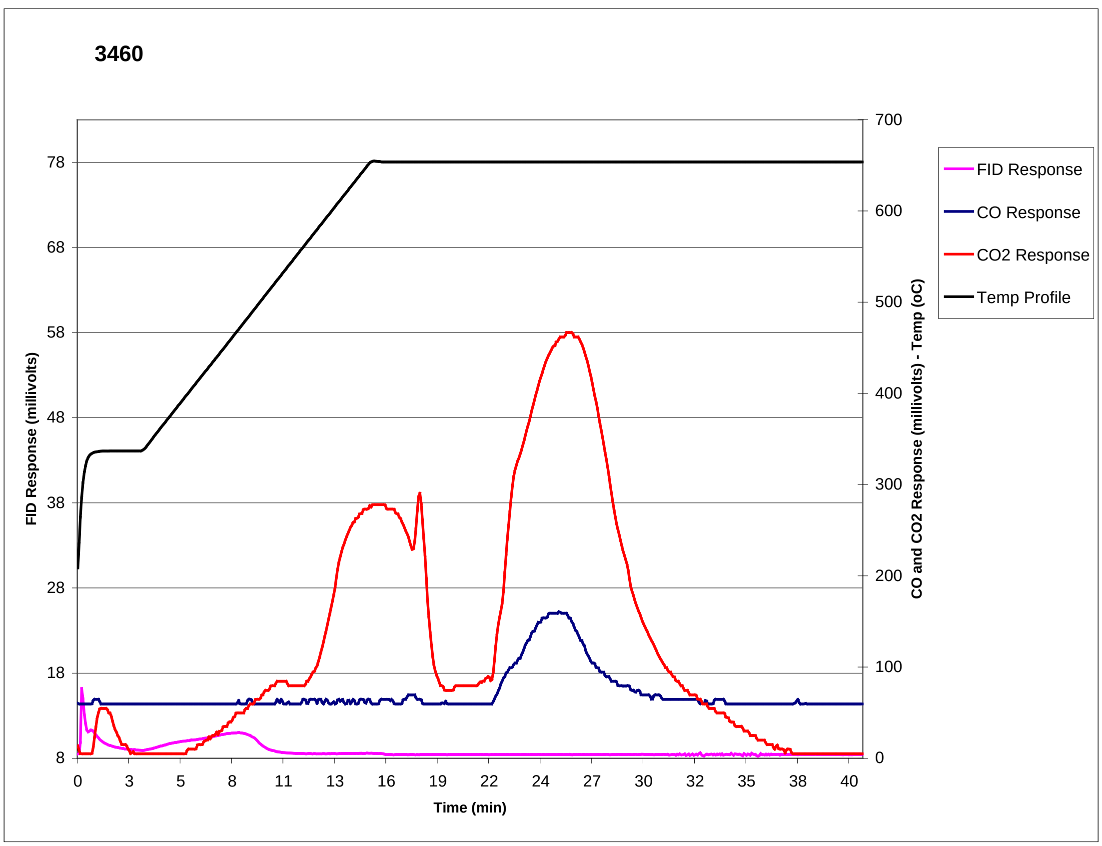
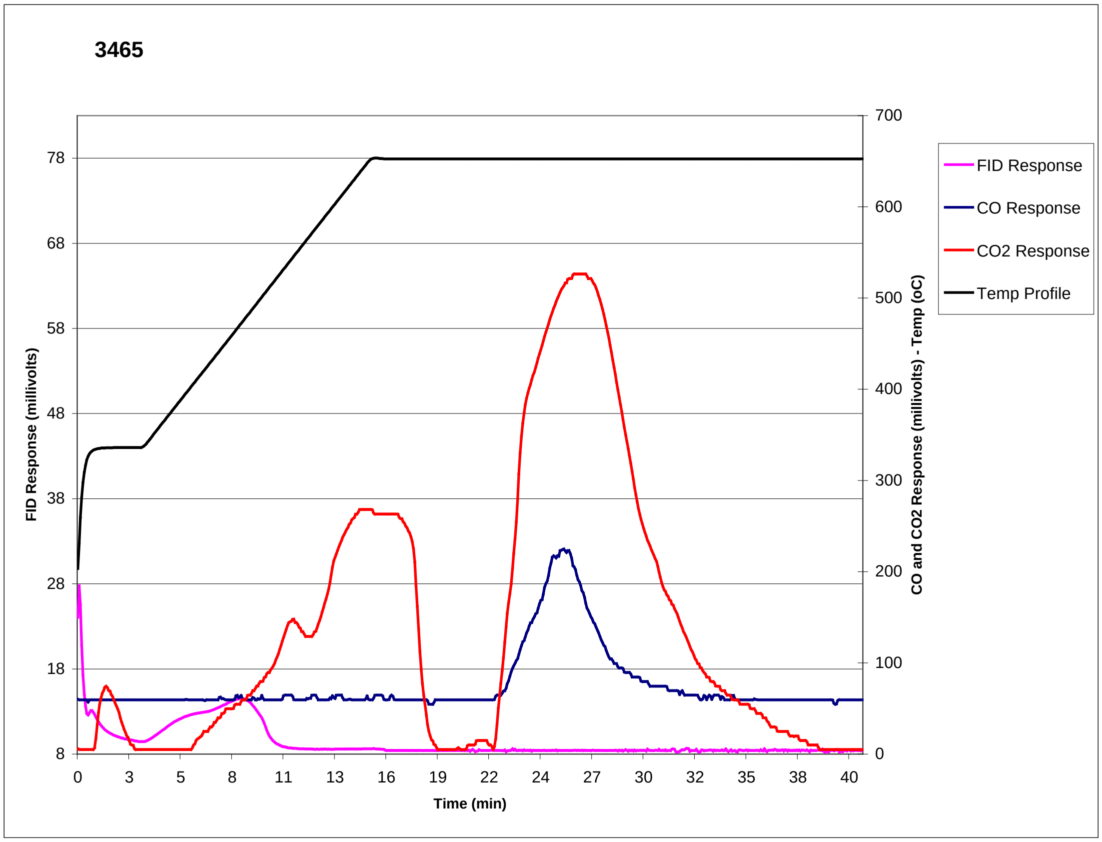
30
32
35
38
40


3455
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
18
28
38
48
58
68
78
0
100
200
300
400
500
600
700
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40


3460
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
FID Response
CO Response
CO2 Response
Temp Profile
8
18
28
38
48
58
68
78
0
100
200
300
400
500
600
700
0 3 5 8 11 13 16 19 22 24 27 30 32 35 38 40


3465
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
78
68
58
48
38
28
18
8
700
600
500
400
300
200
100
0
0
3
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8
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22
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27
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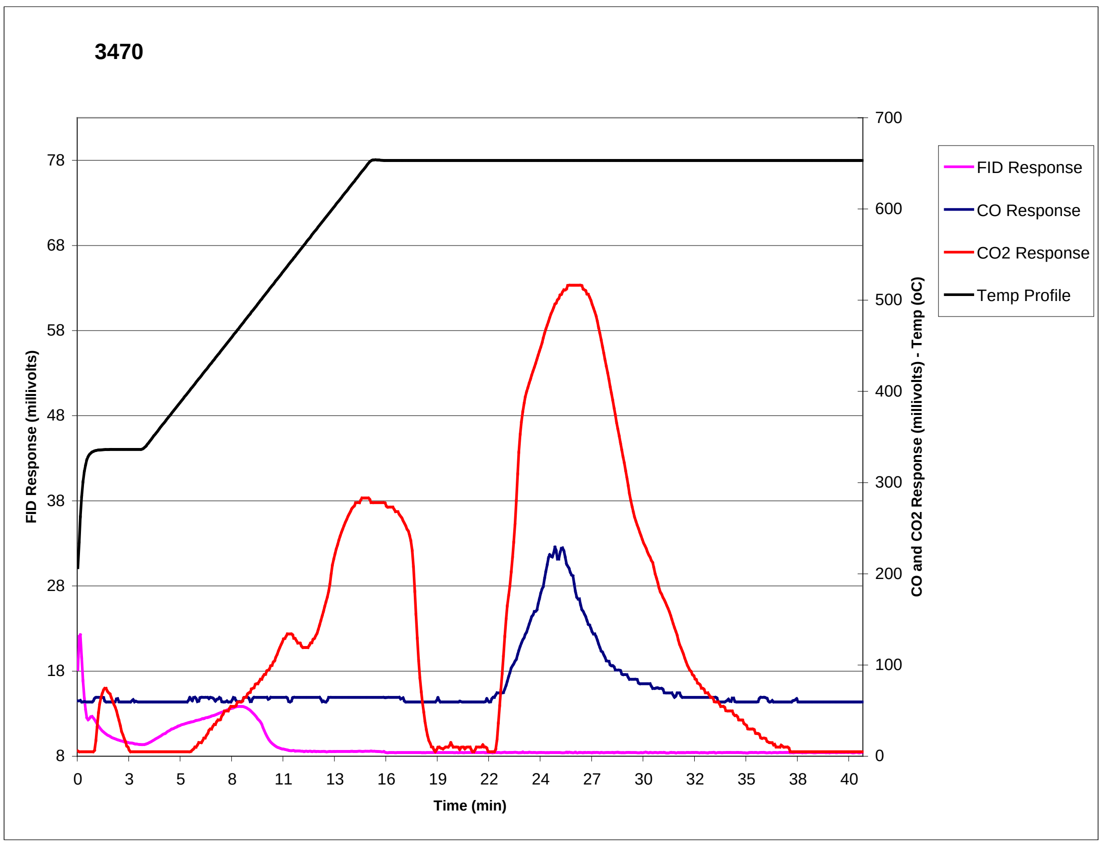
32
35
38
40


3470
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
78
68
58
48
38
28
18
8
700
600
500
400
300
200
100
0
0
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38
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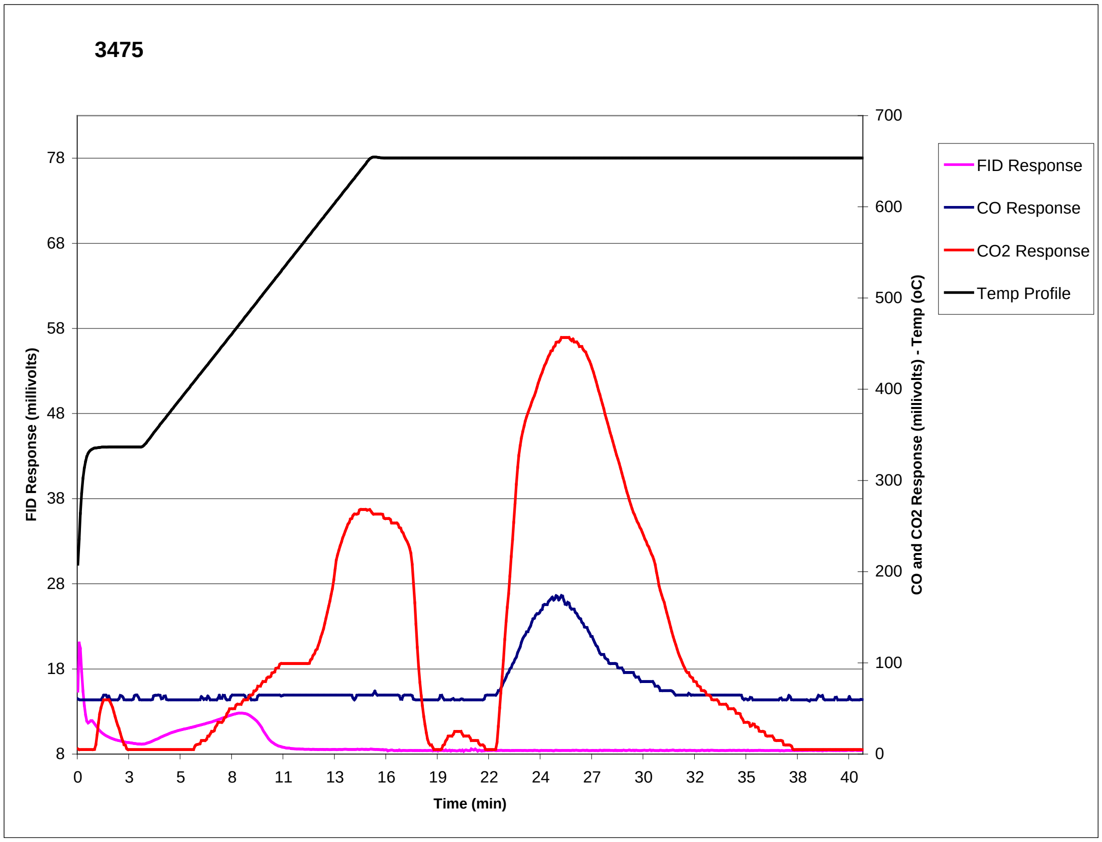

3475
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
78
68
58
48
38
28
18
8
700
600
500
400
300
200
100
0
0
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38
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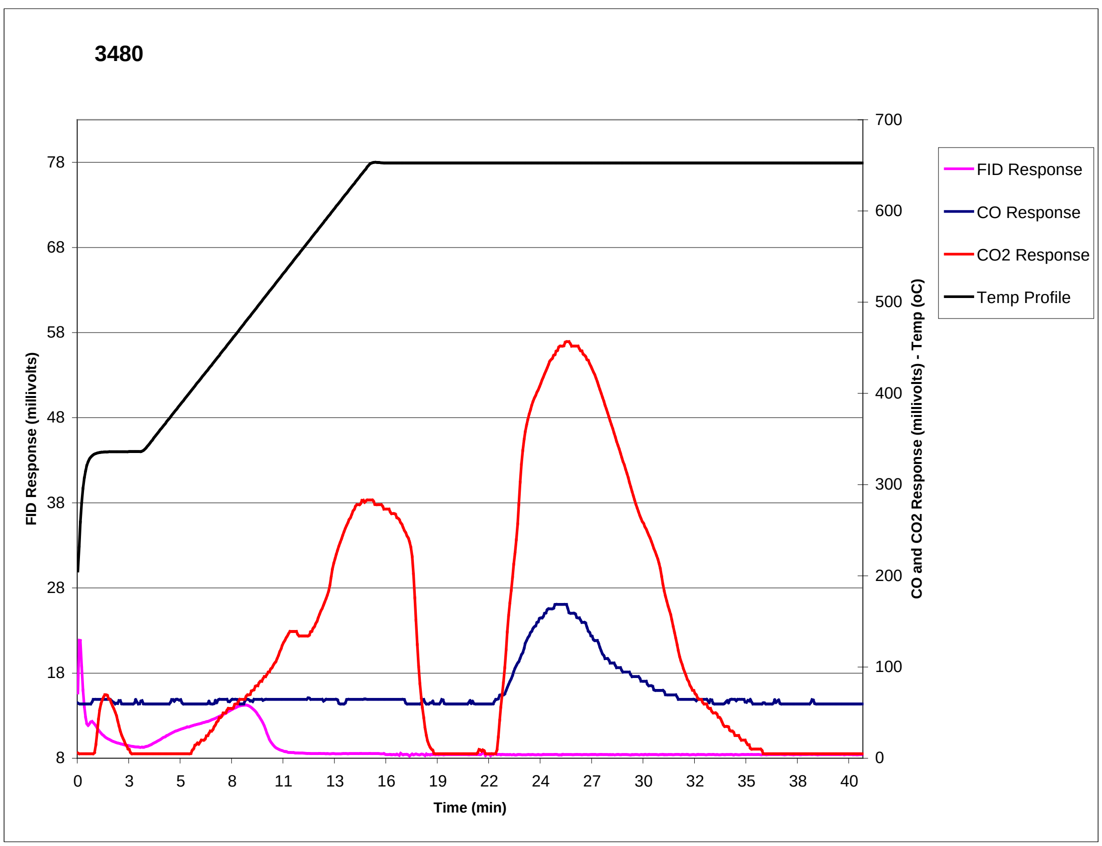

3480
FID Response
CO Response
CO2 Response
Temp Profile
FID Response (millivolts)
CO and CO2 Response (millivolts) - Temp (oC)
Time (min)
78
68
58
48
38
28
18
8
700
600
500
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38
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Source Rock Analyses

TOC, Rock-Eval and Maturity Testing

Core Laboratories

Core Laboratories - Thomas Gentzis

Project / Sample ID	Rock ID	Well Name	Sampling Date	Sampling Time	Formation Name	Upper Depth (ft)	Lower Depth (ft)	Median Depth (ft)	Sample Type	Percent Carbonate (wt%)	Leco TOC (wt% HC)	Rock-Eval S1 (mg HC/g)	Rock-Eval S2 (mg HC/g)	Rock-Eval S3 (mg CO2/g)	Tmax (°C)	Measured %Ro (Vitrinite Refl.)	PyGCMS "Z" Maturity (VRE)	Hydrogen Index (S2x100/TOC)	Oxygen Index (S3x100/TOC)	S2/S3 Conc. (mg HC/mg CO2)	S1/TOC Norm. Oil Content	Production Index (S1/(S1+S2))	Experimental Notations
9598 ft	24	Bovie Lake J-72						9,598.00	Core	0.02	3.60	0.01	0.07	0.22	610			2	6	0	0	0.13	
9605 ft	23	Bovie Lake J-72						9,605.00	Core	0.02	4.55	0.02	0.10	0.19	611			2	4	1	0	0.17	
9611 ft	22	Bovie Lake J-72						9,611.00	Core	0.04	4.93	0.06	0.20	0.24	351			4	5	1	1	0.23	
9616 ft	21	Bovie Lake J-72						9,616.00	Core	0.02	4.29	0.02	0.09	0.17	337			2	4	1	0	0.18	
9621 ft	17	Bovie Lake J-72						9,621.00	Core	0.03	4.50	0.04	0.14	0.18	321			3	4	1	1	0.22	
9628 ft	16	Bovie Lake J-72						9,628.00	Core	0.03	5.66	0.04	0.18	0.31	346			3	5	1	1	0.18	
3355 m	15	DN Forest et al Mount Koty 2K-02						11,004.40	Core	0.55	5.00	3.54	2.84	0.28	424			57	6	10	71	0.55	
3370 m	13	DN Forest et al Mount Koty 2K-02						11,053.60	Core	0.47	5.05	3.12	2.33	0.32	428			46	6	7	62	0.57	
3400 m	12	DN Forest et al Mount Koty 2K-02						11,152.00	Core	0.27	3.10	1.84	1.25	0.24	419			40	8	5	59	0.60	
3425 m	10	DN Forest et al Mount Koty 2K-02						11,234.00	Core	0.23	2.59	1.48	1.07	0.26	421			41	10	4	57	0.58	
3440 m	9	DN Forest et al Mount Koty 2K-02						11,283.20	Core	0.29	3.18	1.85	1.40	0.27	425			44	8	5	58	0.57	
3460 m	8	DN Forest et al Mount Koty 2K-02						11,348.80	Core	0.23	2.78	1.52	1.10	0.23	423			40	8	5	55	0.58	
3480 m	7	DN Forest et al Mount Koty 2K-02						11,414.40	Core	0.26	2.10	1.29	1.67	0.27	428			80	13	6	61	0.44	

Depths in column I are in ft

Client: Core Laboratories
Field / Well: Job # 100153G
Contact: Thomas Gentzis

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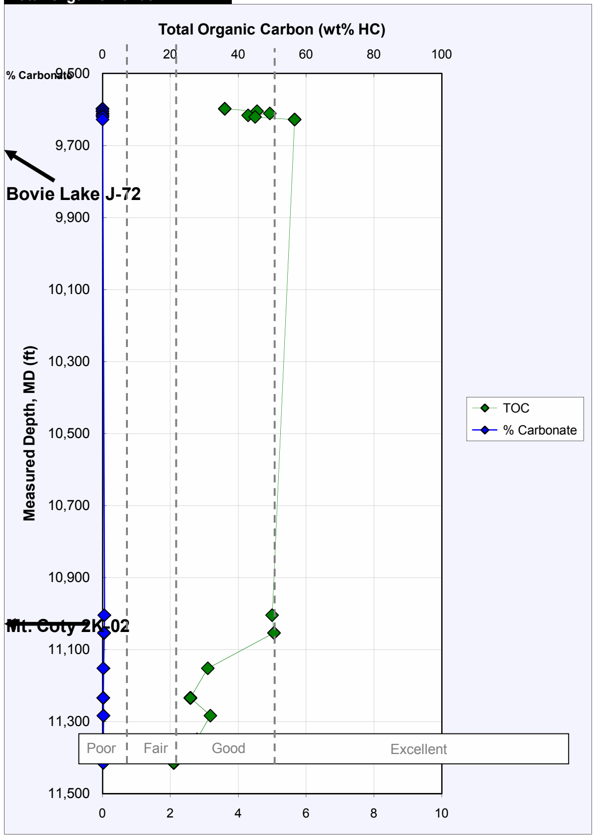
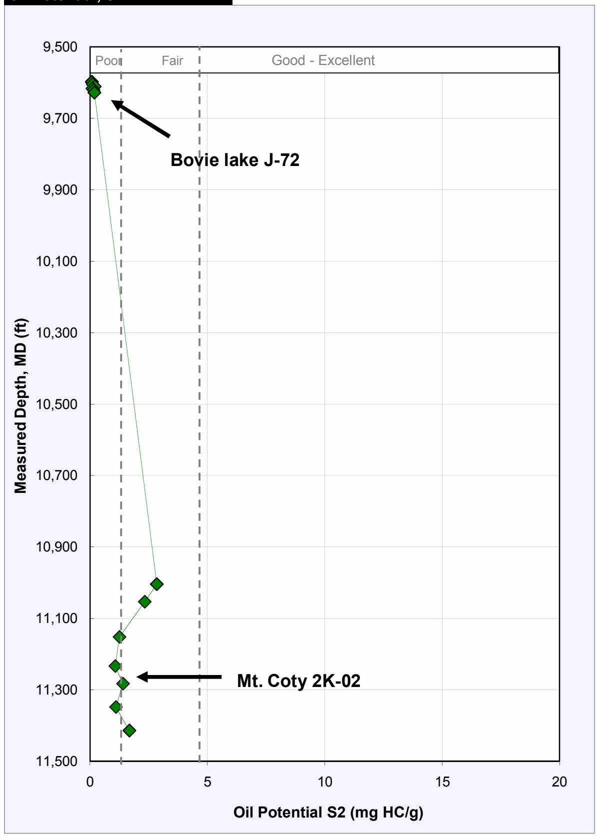
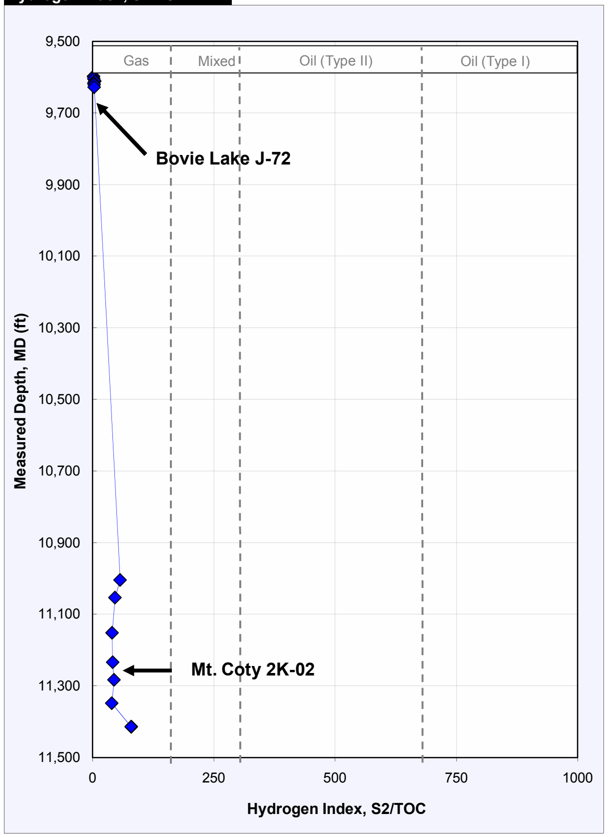
Total Organic Carbon



Oil Potential, S2

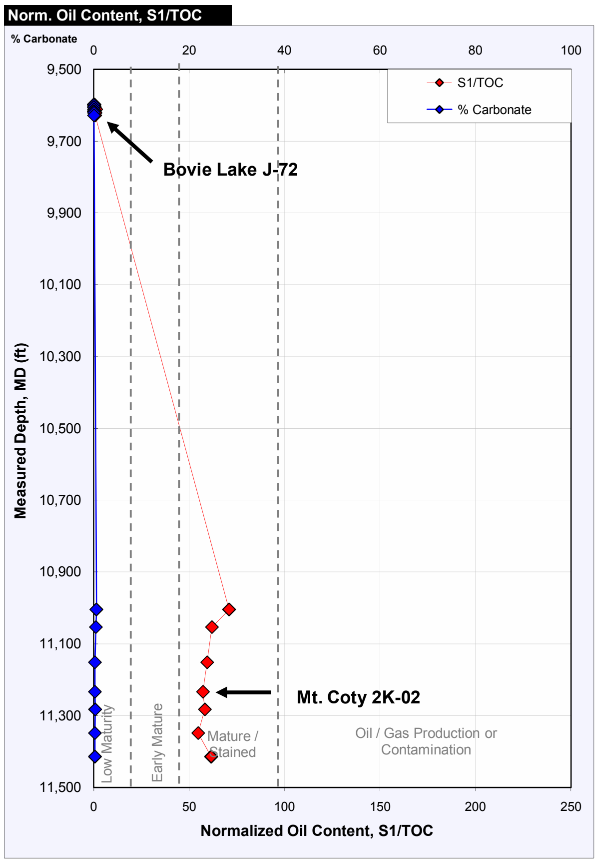


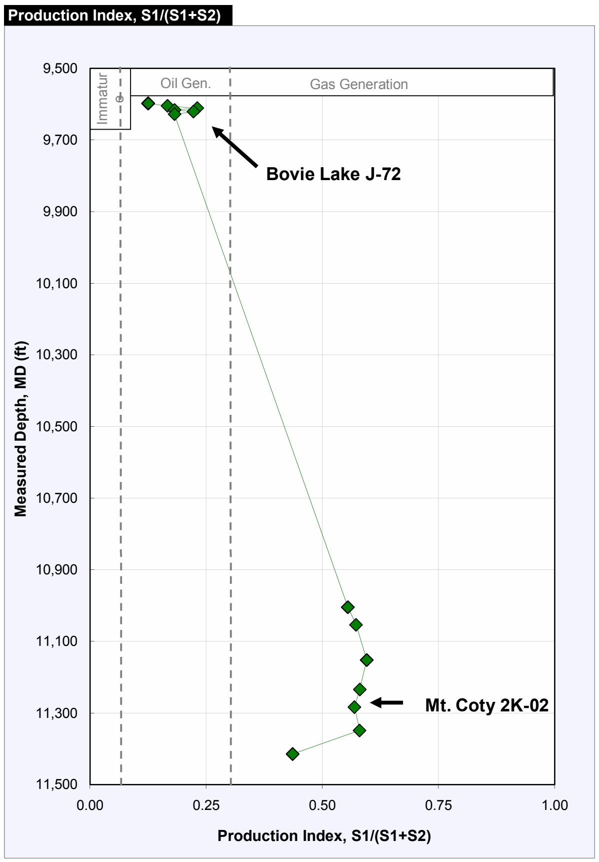
Hydrogen Index, S2/TOC

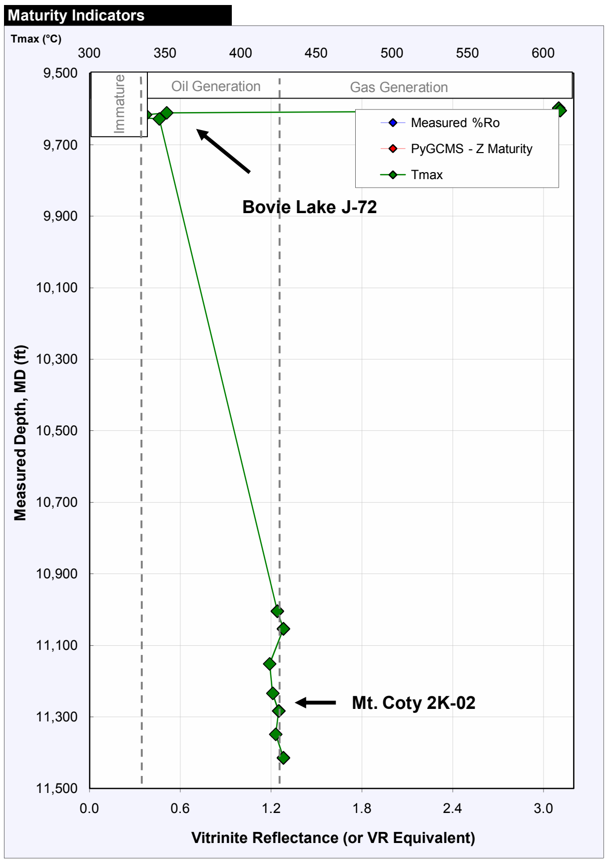


Client: Core Laboratories
Field / Well: Job # 100153G
Contact: Thomas Gentzis

Core Laboratories - Thomas Gentzis







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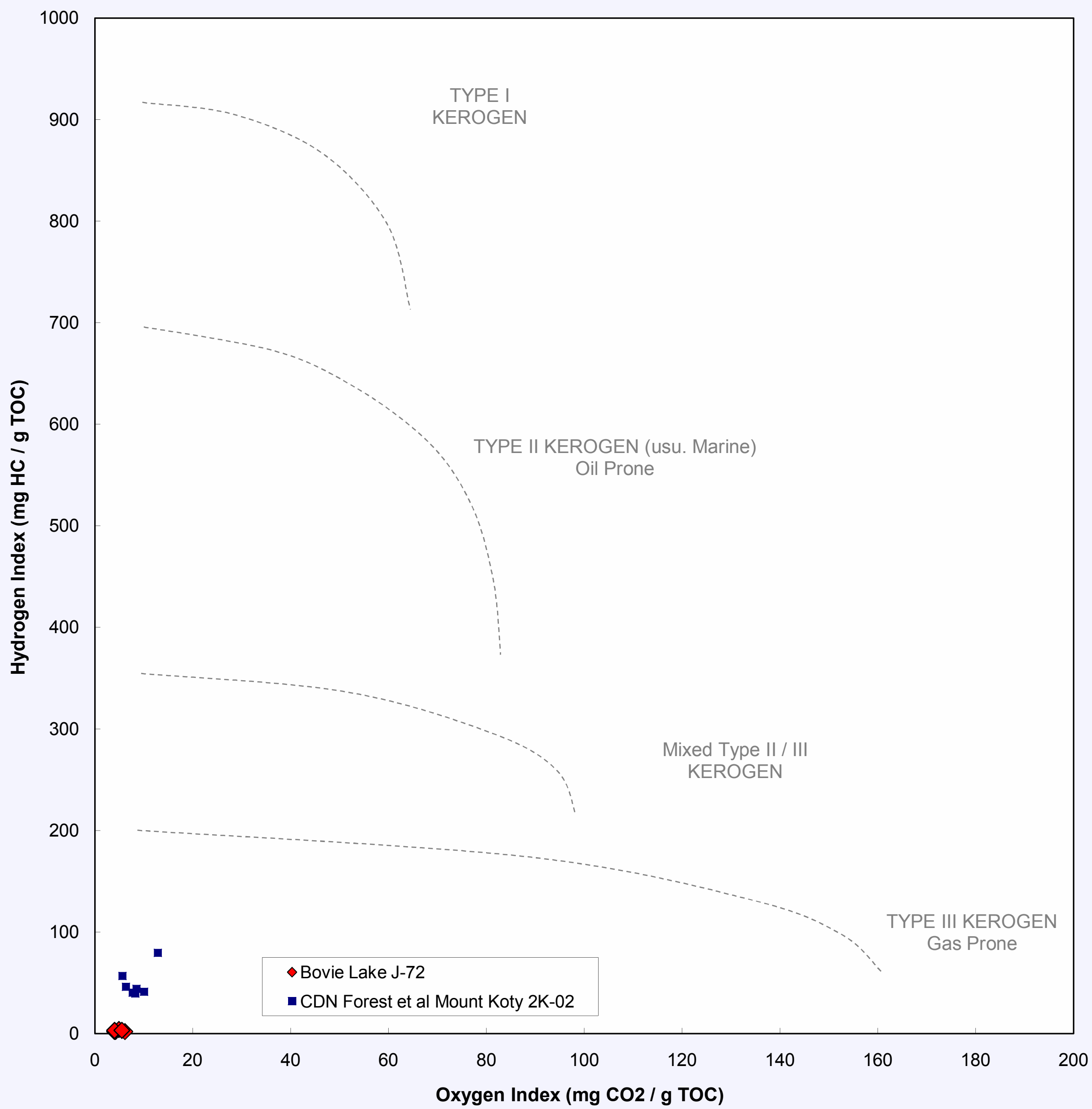
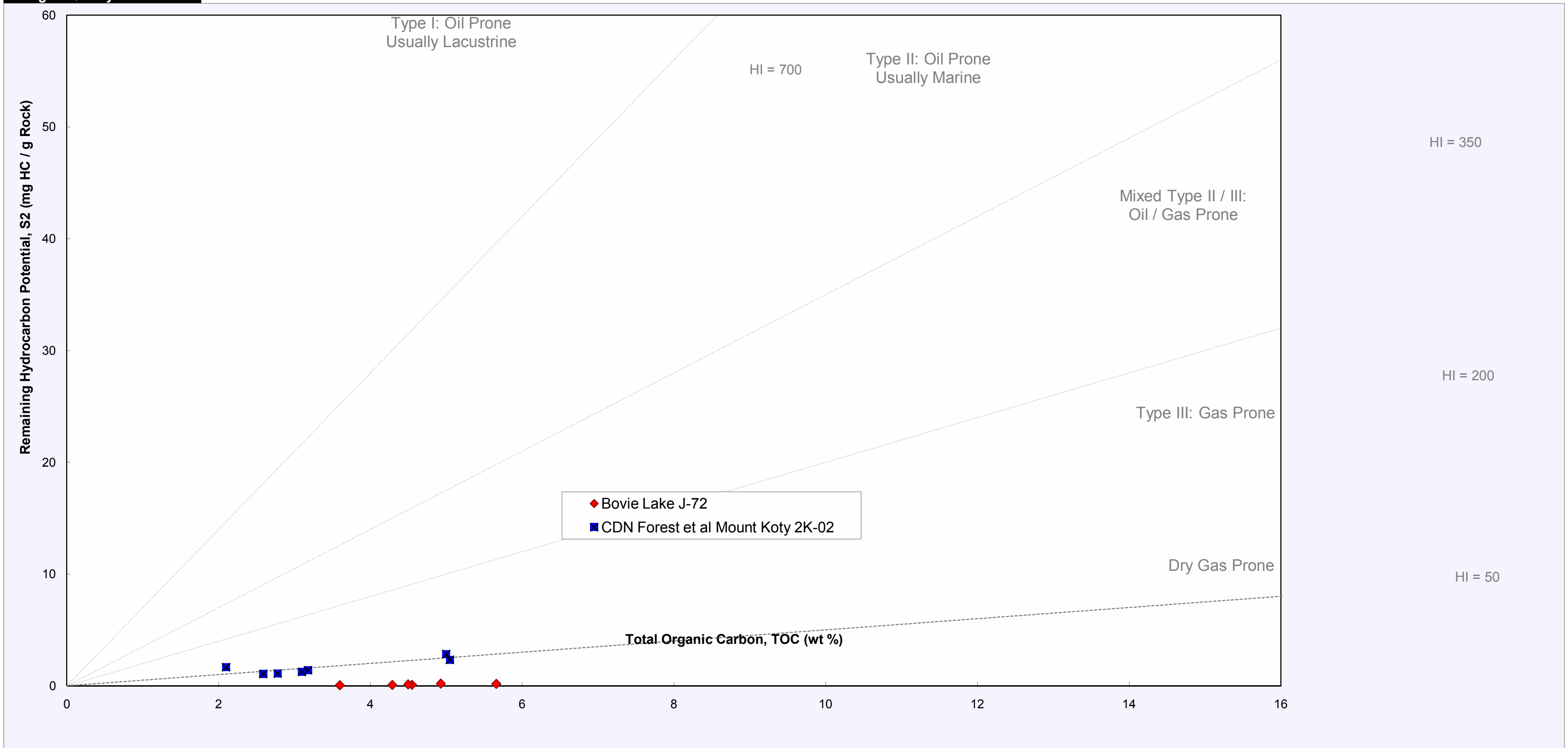
Pseudo Van Krevelen Plot



Core Laboratories - Thomas Gentzis ,

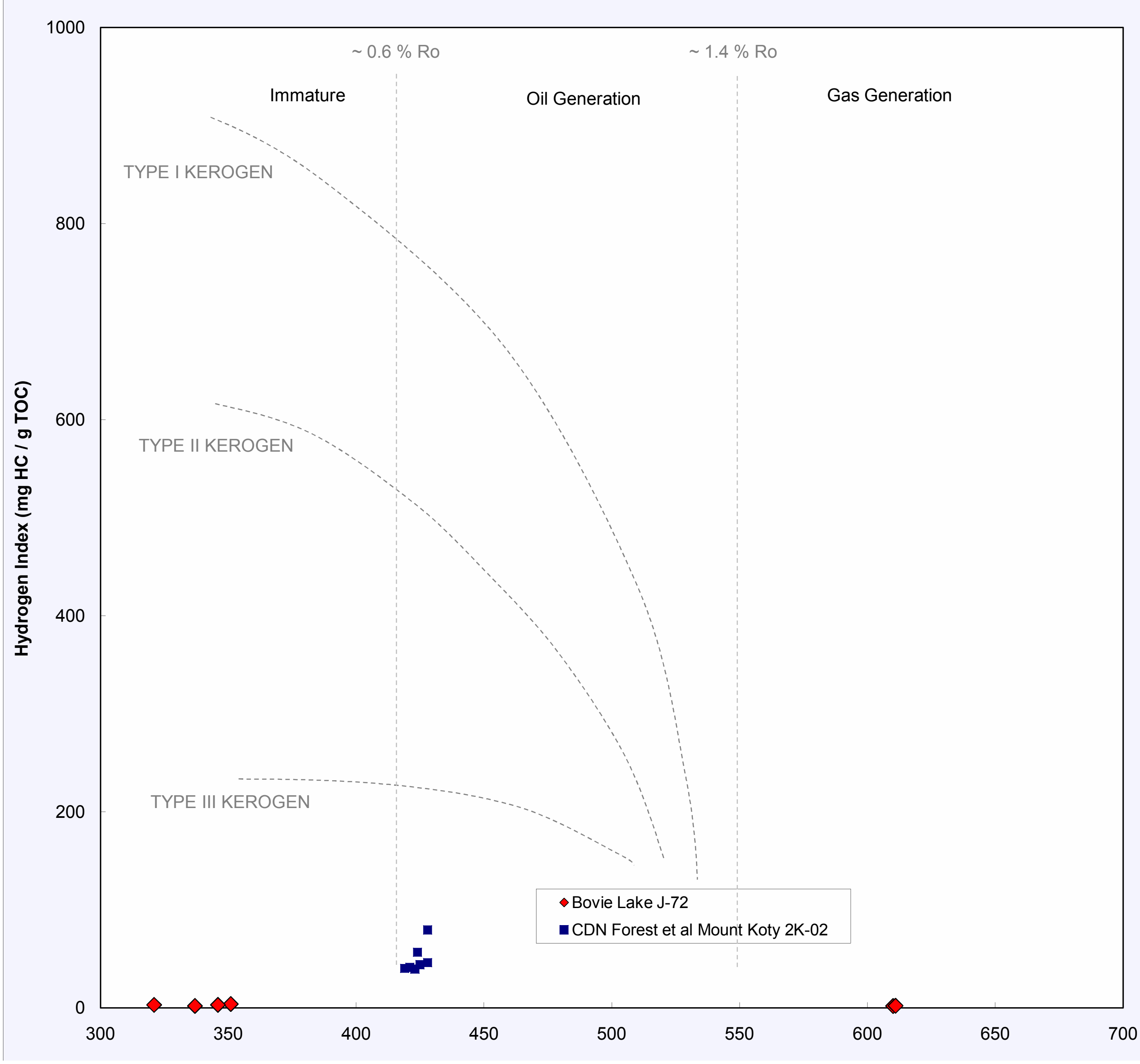
Kerogen Quality Plot



Client: Core Laboratories
Field / Well: Job # 100153G
Contact: Thomas Gentzis

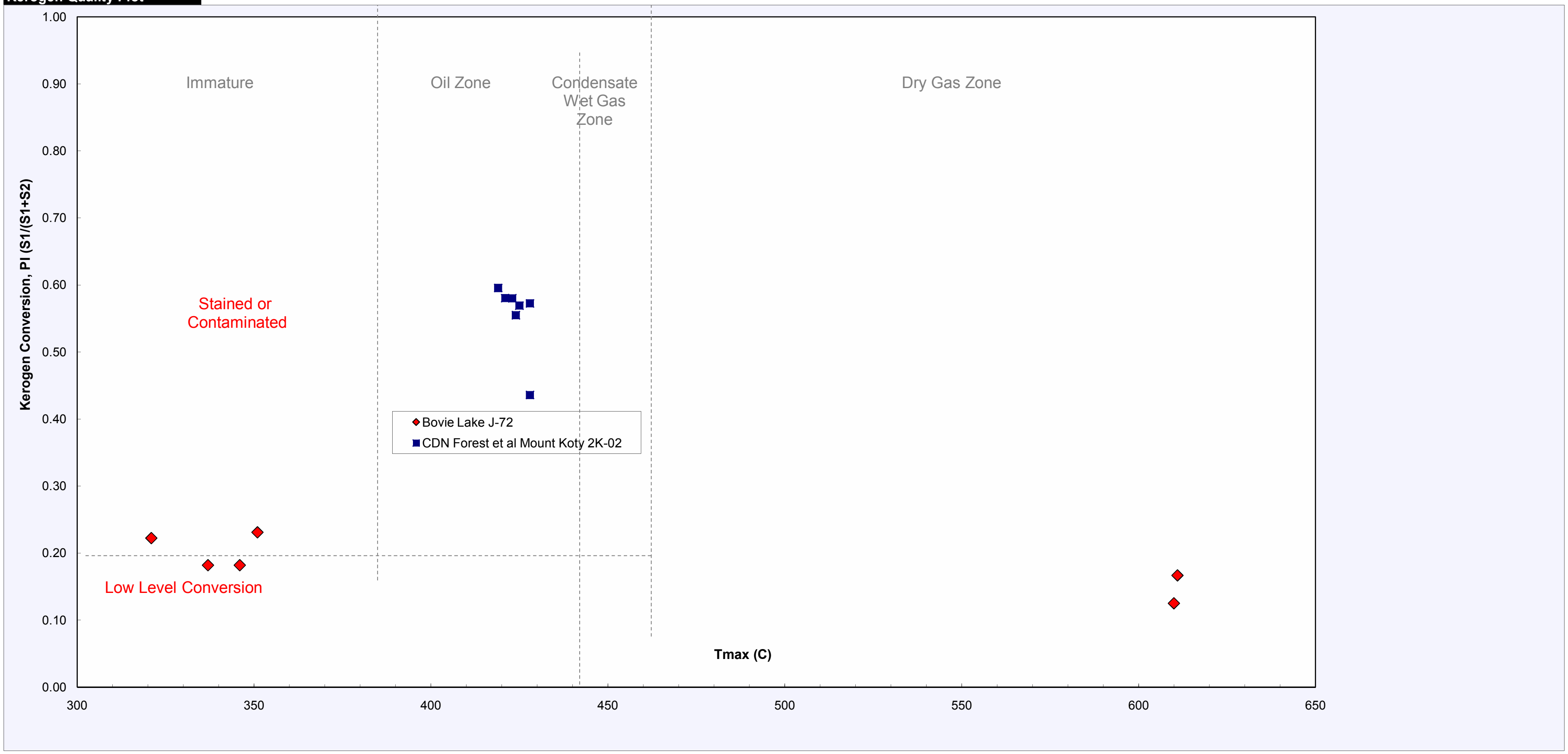
Core Laboratories - Thomas Gentzis ,

Kerogen Type and Maturity



Core Laboratories - Thomas Gentzis

Kerogen Quality Plot

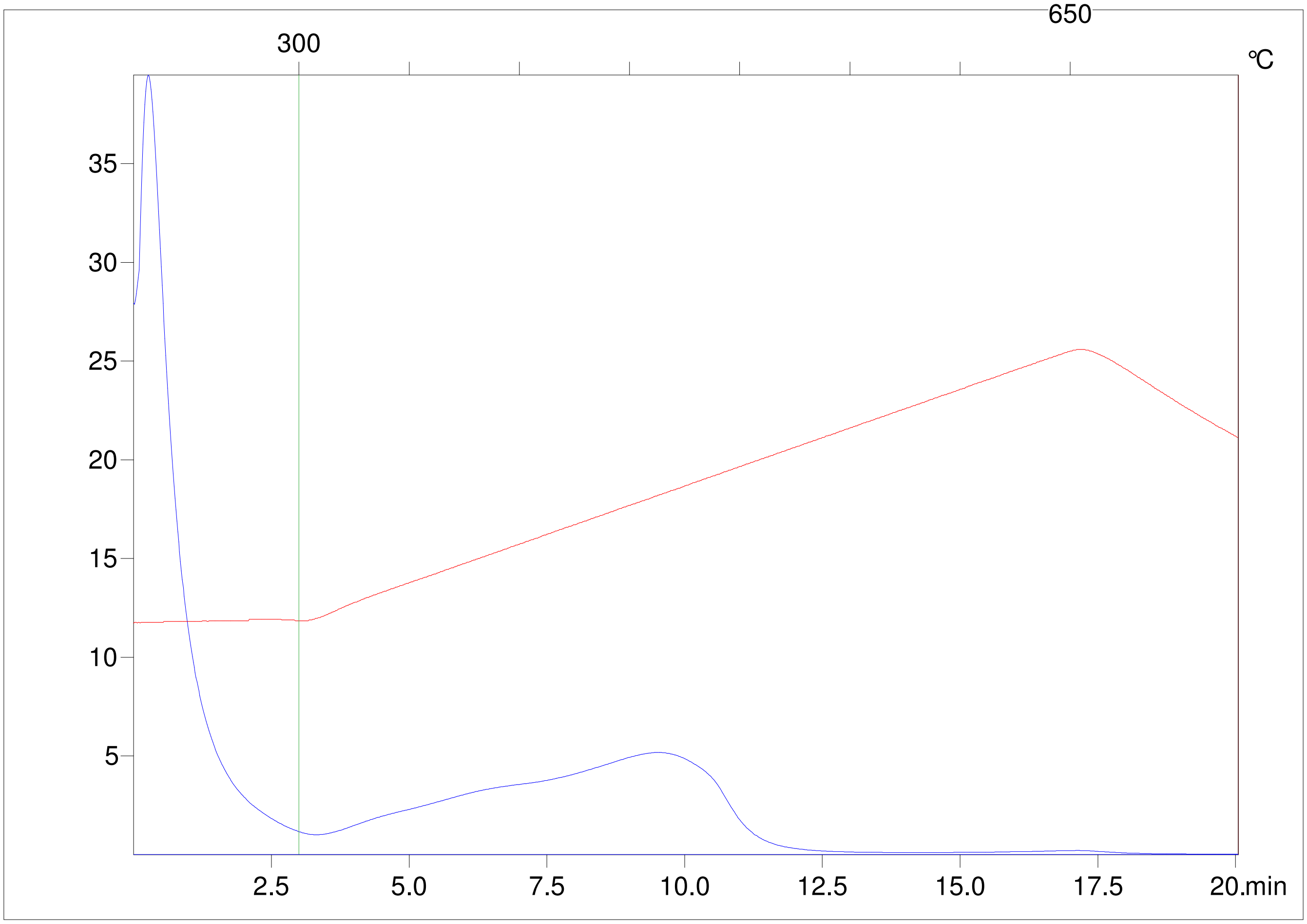


Customer : customer

Customer part : customer part

Comment : Comment

S1(mg/g)=3.54	Sample =3355
S2(mg/g)=2.84	Method =Bulk Rock
Tmax(℃)=424	Cycle=Basic
TpkS2(℃)=461.0	KFID(10*9)=1206
PI=0.55	Qty(mg)=70.2
HI=57	TOC(%)=5



C:\VINCI\CHEVR101\CHEV009.R00 : FID pyrolysis graphic

State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :

customer

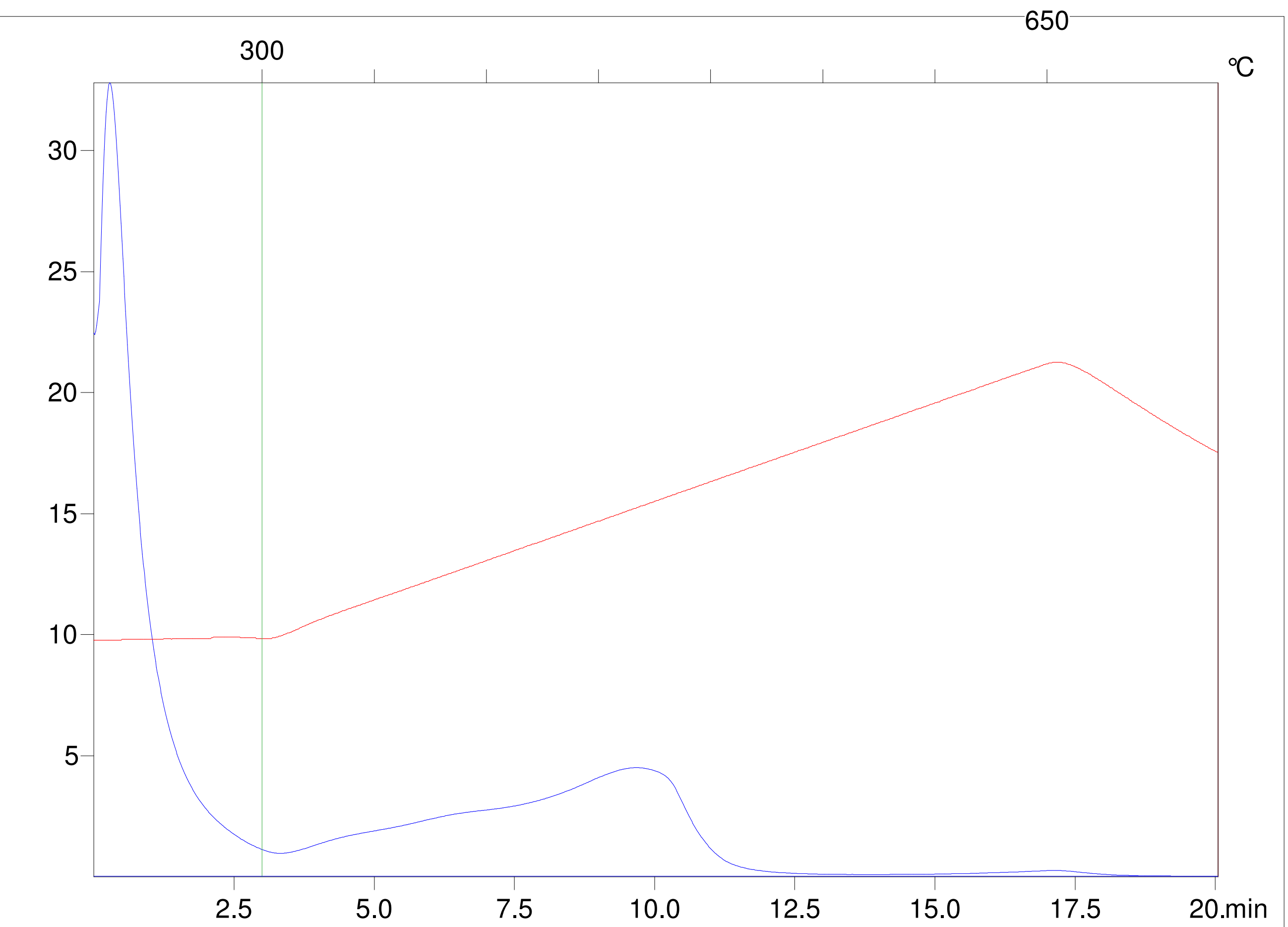
Customer part :

customer part

Comment :

Comment

S1(mg/g)=3.12	Sample =3370
S2(mg/g)=2.33	Method =Bulk Rock
Tmax(℃)=428	Cycle=Basic
TpkS2(℃)=465.0	KFID(10*9)=1206
PI=0.57	Qty(mg)=70.1
HI=46	TOC(%)=5.05



C:\VINCI\CHEVR101\CHEV010.R00 : FID pyrolysis graphic

State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :

customer

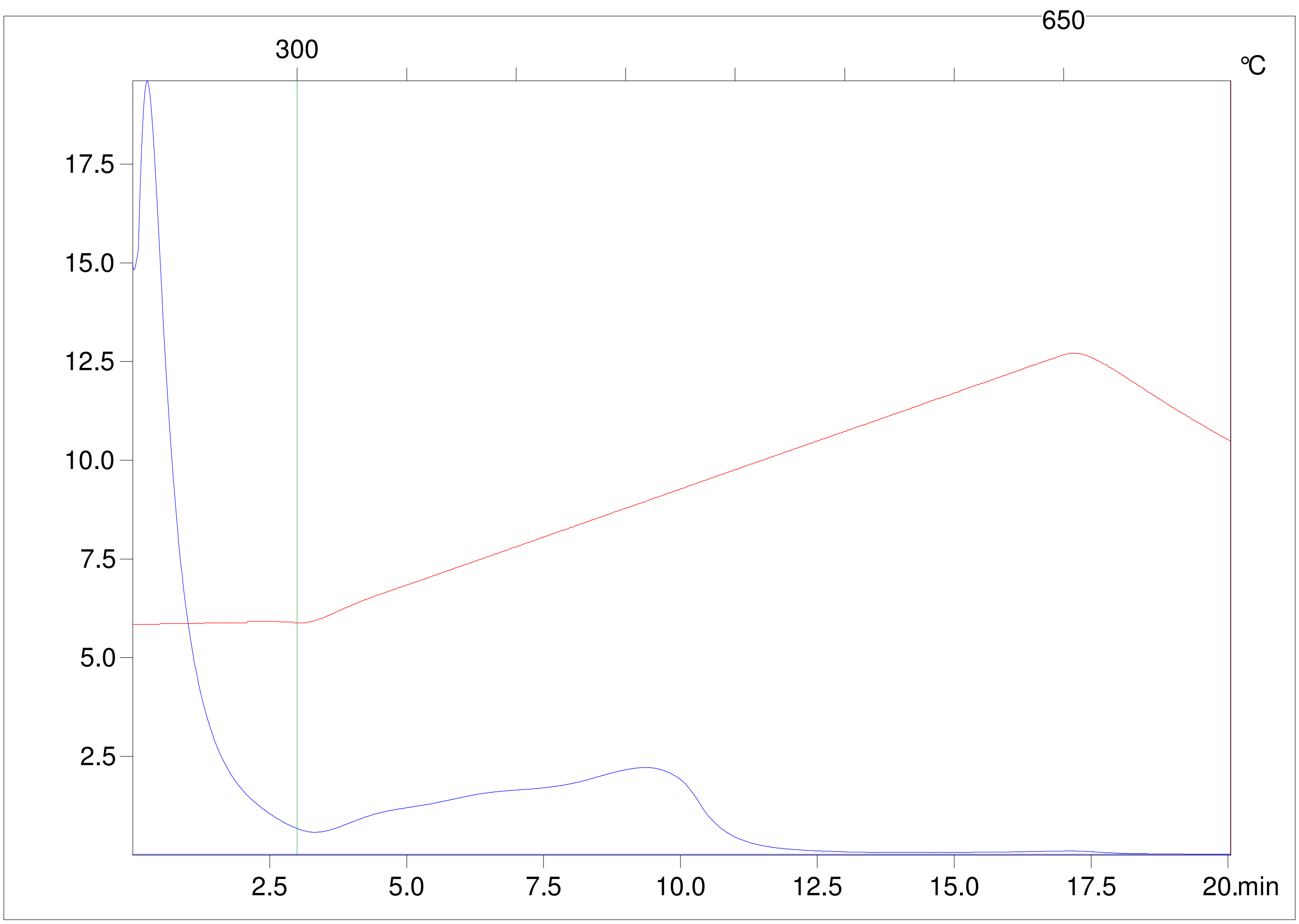
Customer part :

customer part

Comment :

Comment

S1(mg/g)=1.84	Sample =3400
S2(mg/g)=1.25	Method =Bulk Rock
Tmax(℃)=419	Cycle=Basic
TpkS2(℃)=456.0	KFID(10*9)=1206
PI=0.6	Qty(mg)=70.0
HI=40	TOC(%)=3.1



C:\VINCI\CHEVR101\CHEV011.R00 : FID pyrolysis graphic

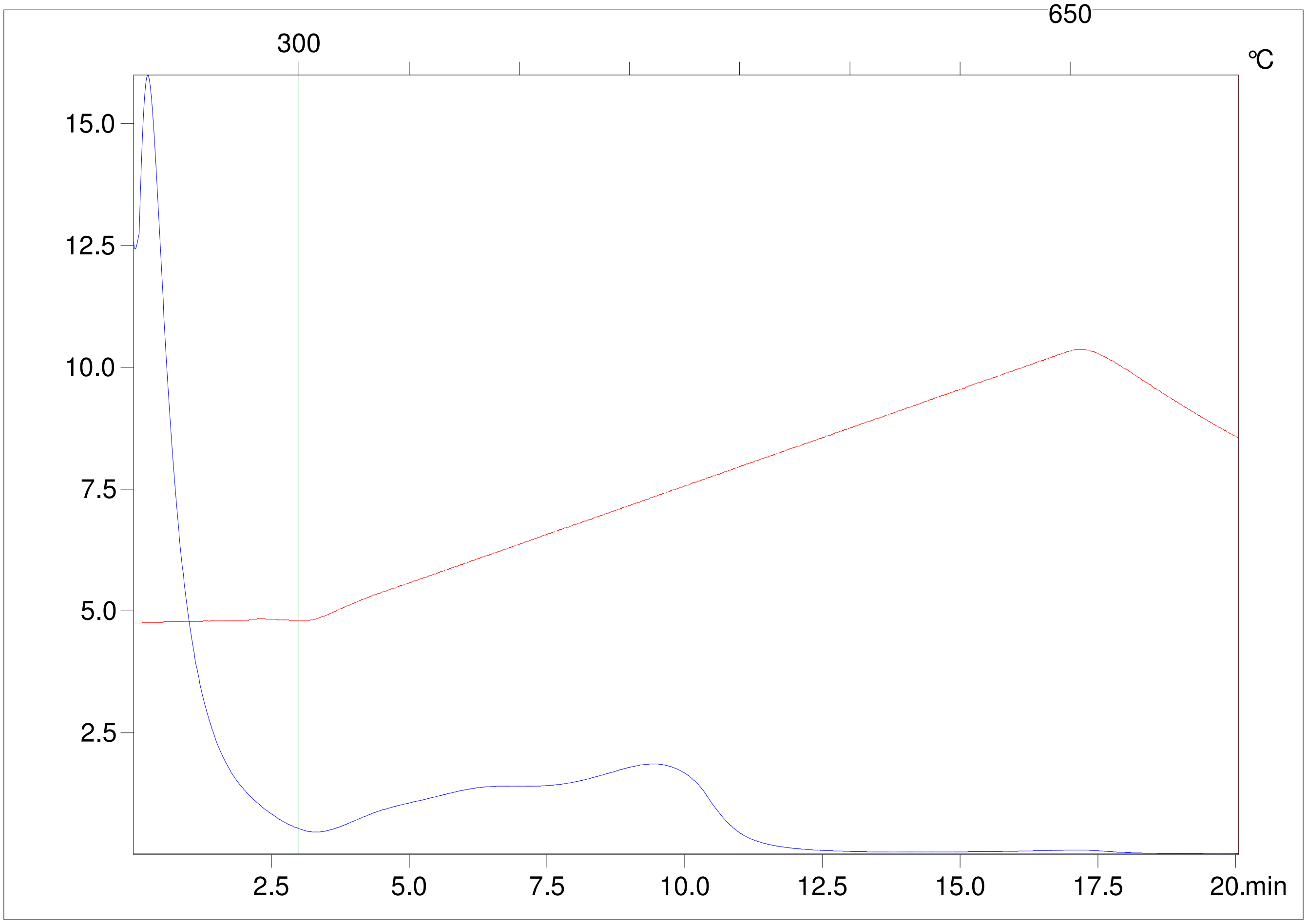
State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :	Customer part :
customer	customer part

Comment :

Comment

S1(mg/g)=1.48	Sample =3425
S2(mg/g)=1.07	Method =Bulk Rock
Tmax(℃)=421	Cycle=Basic
TpkS2(℃)=458.0	KFID(10*9)=1206
PI=0.58	Qty(mg)=70.4
HI=41	TOC(%)=2.59



C:\VINCI\CHEVR101\CHEV012.R00 : FID pyrolysis graphic

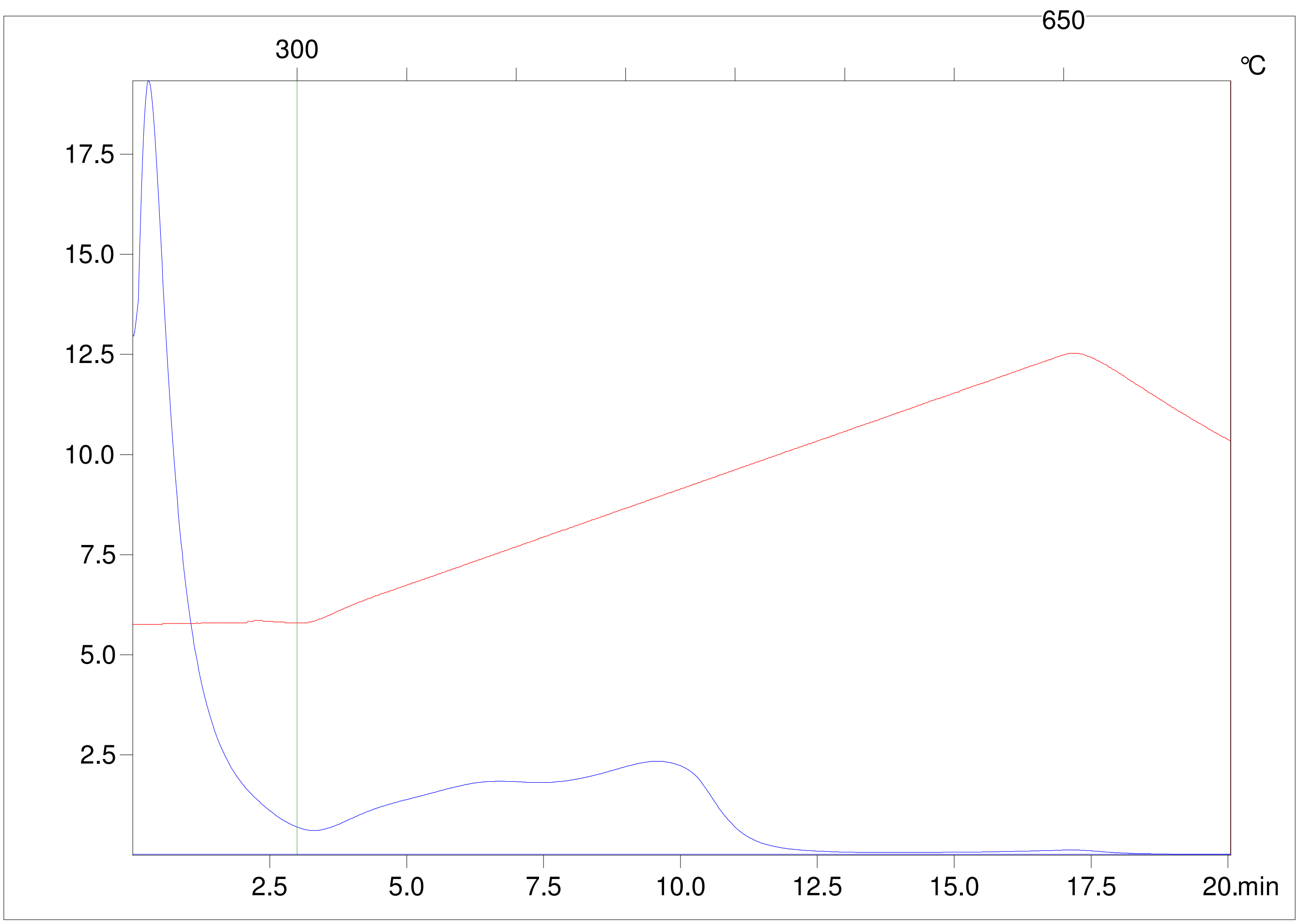
State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :	Customer part :
customer	customer part

Comment :

Comment

S1(mg/g)=1.85	Sample =3440
S2(mg/g)=1.4	Method =Bulk Rock
Tmax(℃)=425	Cycle=Basic
TpkS2(℃)=462.0	KFID(10*9)=1206
PI=0.57	Qty(mg)=70.6
HI=44	TOC(%)=3.18



C:\VINCI\CHEVR101\CHEV013.R00 : FID pyrolysis graphic

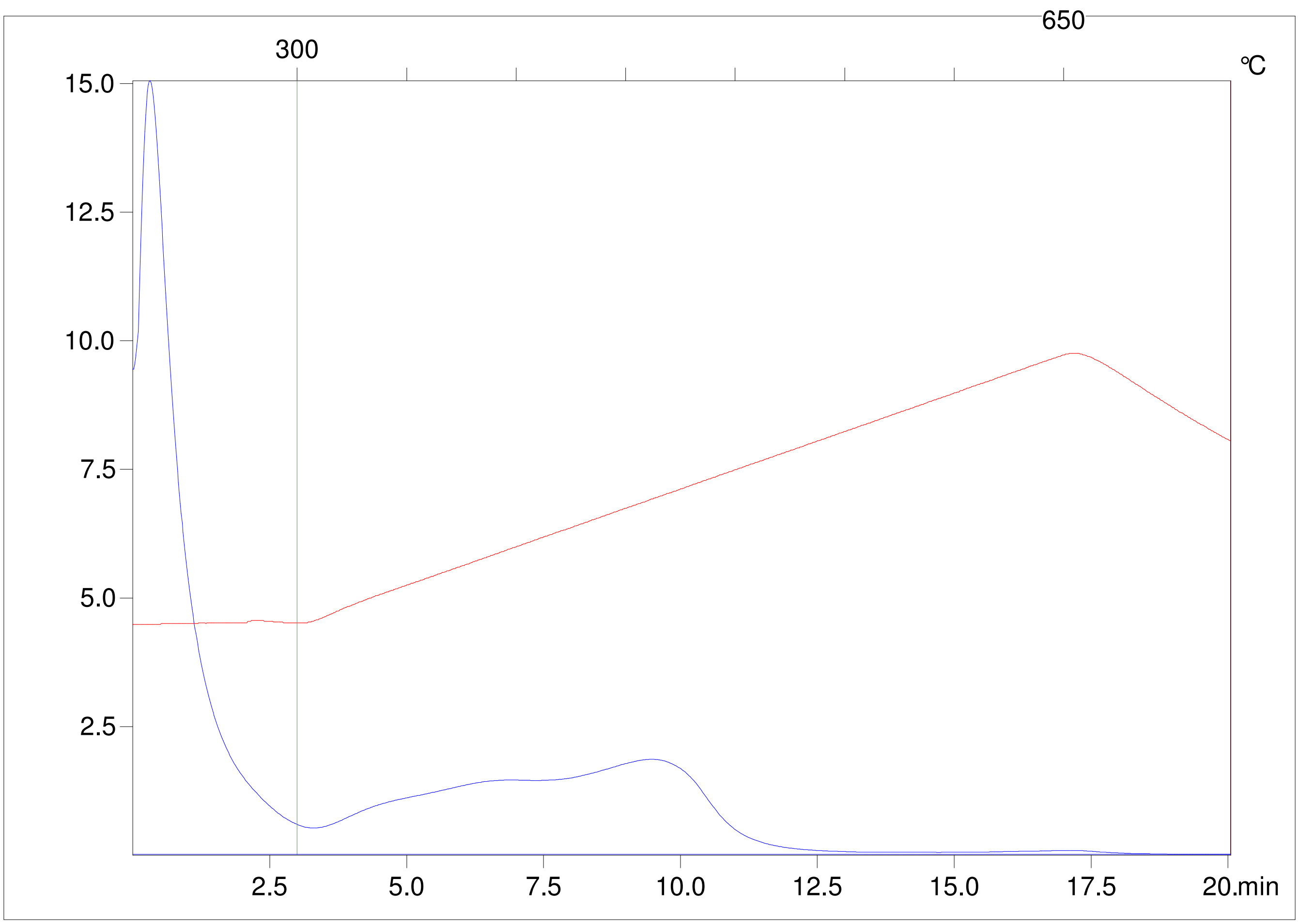
State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :	Customer part :
customer	customer part

Comment :

Comment

S1(mg/g)=1.52	Sample =3460
S2(mg/g)=1.1	Method =Bulk Rock
Tmax(℃)=423	Cycle=Basic
TpkS2(℃)=460.0	KFID(10*9)=1206
PI=0.58	Qty(mg)=70.1
HI=40	TOC(%)=2.78



C:\VINCI\CHEVR101\CHEV014.R00 : FID pyrolysis graphic

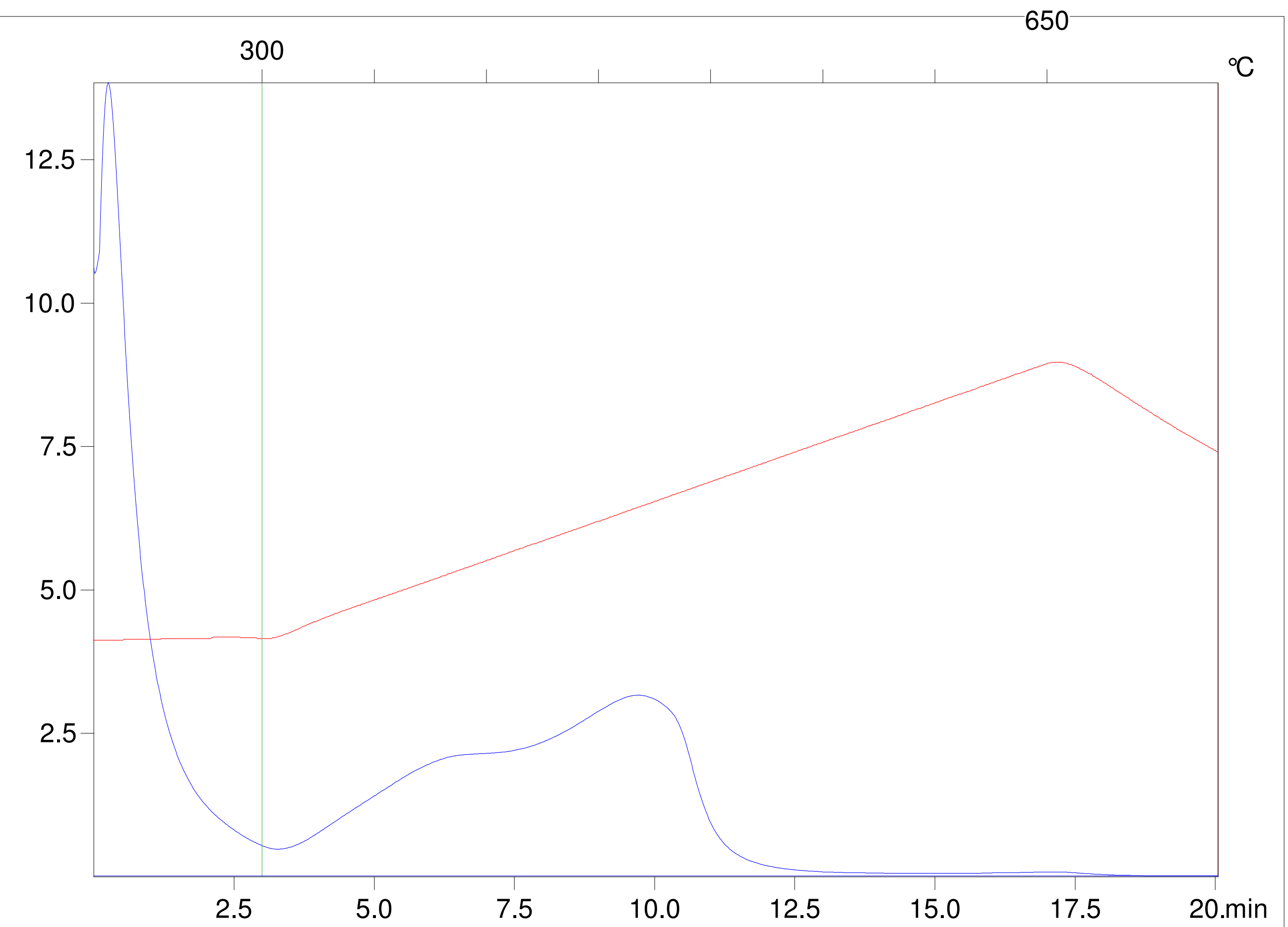
State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Customer :	Customer part :
customer	customer part

Comment :

Comment

S1(mg/g)=1.29	Sample =3480
S2(mg/g)=1.67	Method =Bulk Rock
Tmax(℃)=428	Cycle=Basic
TpkS2(℃)=465.0	KFID(10*9)=1206
PI=0.44	Qty(mg)=70.5
HI=80	TOC(%)=2.1



C:\VINCI\CHEVR101\CHEV015.R00 : FID pyrolysis graphic

State	Ok
Pyro Status	No blank substraction
Oxi Status	No blank substraction

Plate 1 A-D Vitrinite Reflectance Measurements, Histogram and Images

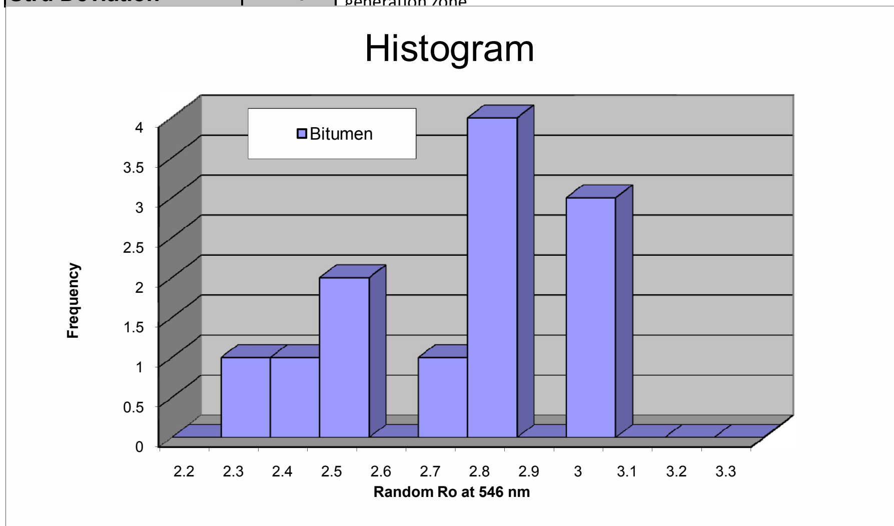
Company: Chevron Canada
Formation N/A
Well: Mount Coty 2K-02
Depth (m): 3255
File: 5213-10-3168

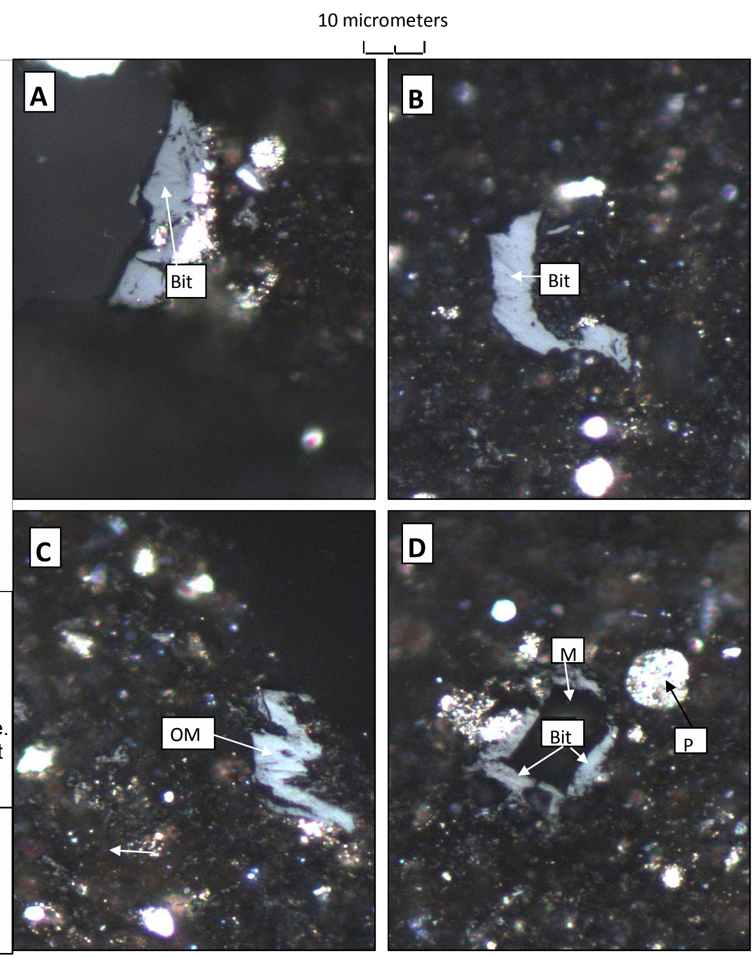
List of Ro Values in Increasing Order:

2.39	2.45	2.56	2.57	2.74	2.82	2.83	2.84	2.89	3.03
3.05	3.10								

Min Value	2.39
Max Value	3.10
Mean Value	**2.77**
# of Measurements	12
Strd Deviation	0.24

Mean random reflectance of solid bitumen is 2.77% based on 12 readings. Vitrinite Ro-equivalent is 2.11 based on the Jacob formula (Rvit = Rbit x 0.618 = 0.4). Organic matter is post-mature and in the lower part of the dry gas generation zone





General Description: The sample contains few organic matter fragments suitable for Ro measurements. Kerogen consists of small and often angular solid bitumen particles that show a basic (non-granular) anisotropy. Bitumen is also seen lining the inside of pore spaces and often encloses or is associated with pyrite. Bitumen is of high thermal maturity as expressed by its mean reflectance value. Oval inetrinite and angular inertodetrinite are seen. The vitrinite isoreflectance is >2.0%, which suggests that organic matter is inside the dry gas generation zone. The matrix is more argillaceous than the two deeper samples of this core and contains significant quantities of iron sulfides.

Photo Captions:
(A) Bitumen (Bit) having high reflectance (Ro=2.75%) and enclosing pyrite.
(B) Similar to (A) above. The Ro of this fragment is 2.9%.
(C) Anisotropic organic matter (OM) of high thermal maturity (Ro=2.45).
(D) Bitumen (Bit) deposited along the boundaries of a rectangular mineral grain (M). Pyrite (P) is

Plate 2 A-D Vitrinite Reflectance Measurements, Histogram and Images

Company: Chevron Canada
Formation N/A
Well: Mount Coty 2K-02
Depth (m): 3415

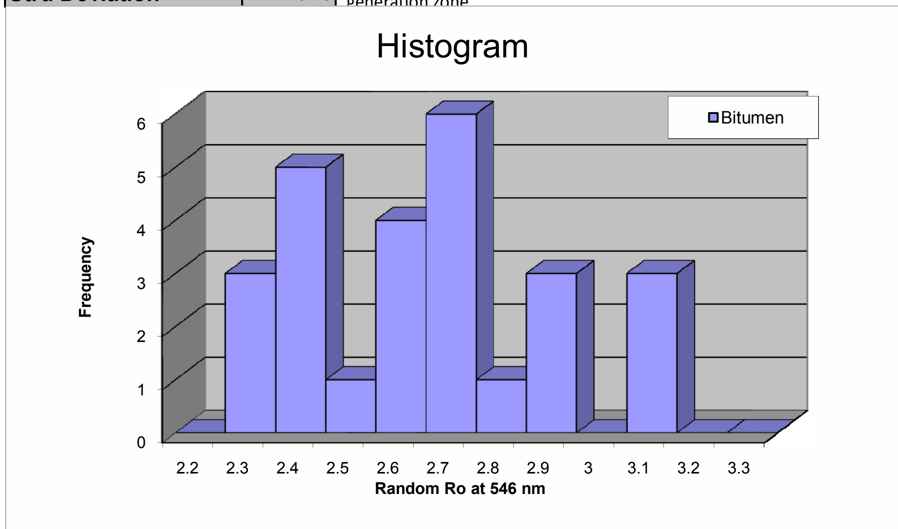
File: 5213-10-3168

Min Value	2.38
Max Value	3.12
Mean Value	**2.70**
# of Measurements	26
Strd Deviation	0.23

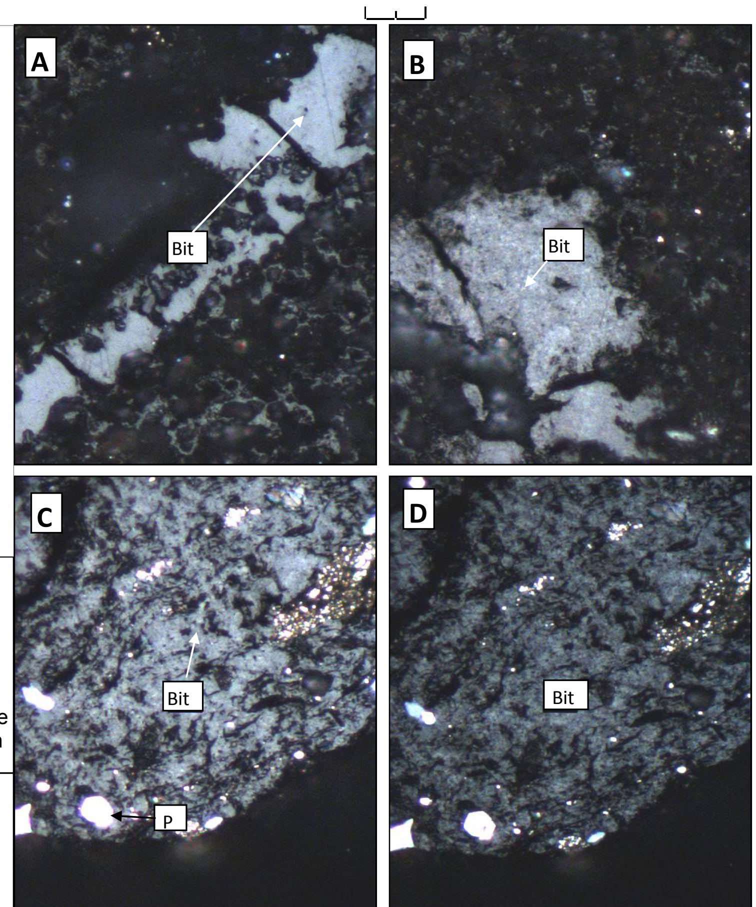
Mean random reflectance of solid bitumen is 2.70% based on 26 readings. Vitrinite Ro-equivalent is 2.07 based on the Jacob formula (Rvit = Rbit x 0.618 = 0.4). Organic matter is post-mature and in the lower part of the dry gas generation zone

List of Ro Values in Increasing Order:

2.38	2.38	2.40	2.44	2.47	2.47	2.48	2.49	2.59	2.61
2.65	2.66	2.67	2.71	2.74	2.74	2.75	2.77	2.80	2.81
2.94	2.96	3.00	3.11	3.11	3.12				



10 micrometers



General Description: Organic matter consists of solid bitumen of high thermal maturity (the Rovit-eq is more than 2.0%). Bitumen occurs as thick and massive fragments that enclose small to large pyrite framboids or as thin linings of the pore space around mineral grains. Occasionally, bitumen consists of small but highly-angular particles that fill voids and/or are highly-dispersed in the matrix. Bitumen exhibits a fine-grained granular (mosaic) anisotropy, an indication of its high thermal maturation. This insoluble in oil bitumen is likely an epi-impsonite. Few fragments of kerogen Type IV (inertinite) are also present. The sample contains large quantities of pyrite, some of which has been weathered to jarosite (iron sulfate hydroxide). Dry gas is the only hydrocarbon

Photo Captions:
(A) An elongate bitumen fragment (Bit) showing non-granular (basic) anisotropy. The Ro is 3.1%.
(B) Bitumen (Bit) showing fine granular texture. The Ro is 2.4%.
(C) Massive bitumen (Bit) having a "rough" surface and enclosing pyrite framboids (P). The Ro is 2.45%.

Plate 3 A-D   Vitrinite Reflectance Measurements, Histogram and Images

Company: Chevron Canada
Formation N/A
Well: Mount Coty 2K-02
Depth (m): 3450

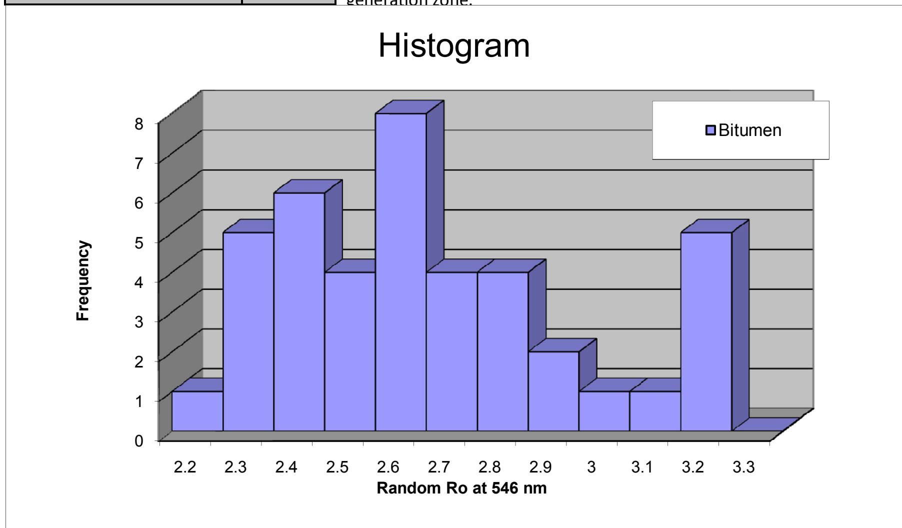
File: 52135-10-3168

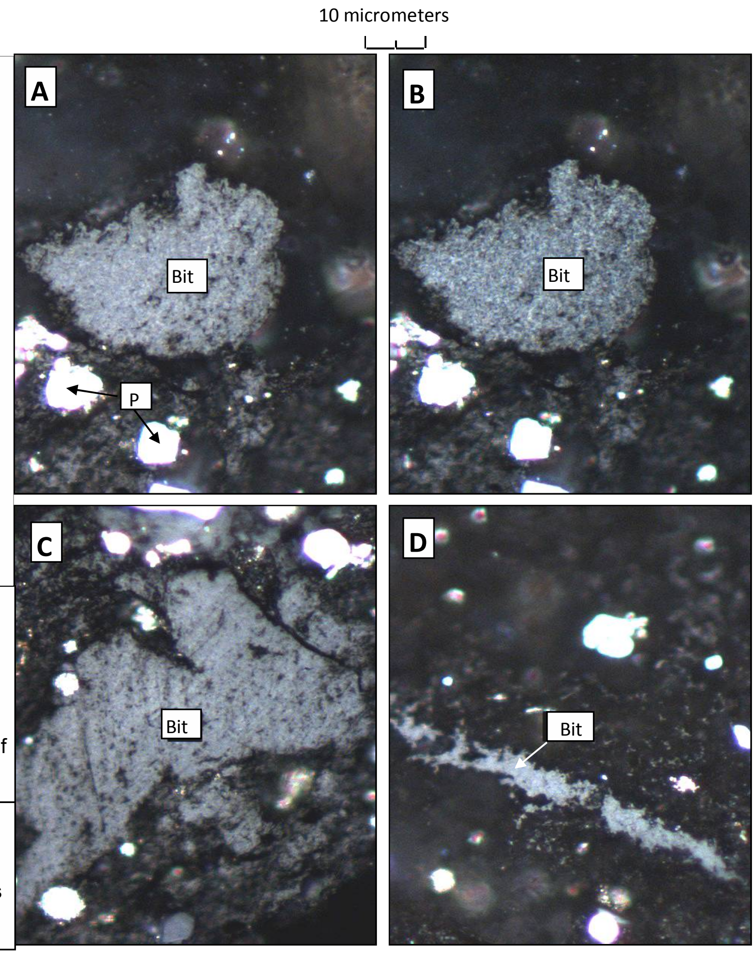
Min Value	2.25
Max Value	3.27
Mean Value	**2.70**
# of Measurements	41
Strd Deviation	0.29

Mean random reflectance of solid bitumen is 2.70% based on 41 readings. Vitrinite Ro-equivalent is 2.07 based on the Jacob formula (Rvit = Rbit x 0.618 = 0.4). Organic matter is post-mature and in the lower part of the dry gas generation zone.

List of Ro Values in Increasing Order:

2.25	2.31	2.32	2.32	2.36	2.37	2.41	2.41	2.41	2.43
2.44	2.45	2.57	2.60	2.60	2.60	2.63	2.64	2.64	2.65
2.65	2.66	2.67	2.68	2.70	2.71	2.78	2.78	2.81	2.82
2.84	2.85	2.95	2.96	3.10	3.14	3.20	3.21	3.25	3.26
3.27									





General Description: Organic matter is highly mature and consists mostly of epi-impsonite bitumen. Bitumen occurs as thin and elongate or as massive and to angular bodies. Bitumen also occurs as small and angular fragments that are highly-dispersed in the matrix. Bitumen has a fine granular (mosaic) texture. Few kerogen wisps are also seen, likely having a marine algal origin. Kerogen displays strain (non-granular) anisotropy, an indication of its response to a stress field. Kerogen and bitumen Ro are similar (>2.0%). This sample also contains macrinite showing high relief and reflectance and sclerotinite (fungal remains). Abundant iron sulfides and the presence of carbonates characterize the sample.

Photo Captions:
(A) Bitumen (Bit) with fine-grained mosaic texture adjacent to framboidal pyrite grains (P). The Ro of this fragment is 3.0%.
(B) Similar to (A) above under crossed polarized light to emphasize the granular anisotropy that is typical of heat-affected organic materials.

Mineralogical Analyses

by X-Ray Diffraction

of Gas Shales

CDN Forest et al Mount Coty 2K-02

Chevron

October 26, 2009

CBM Solutions

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TABLE OF CONTENTS

WELL SUMMARY

Well Name: CDN Forest et al Mount Coty 2K-02
Well Location: 302K026020123300

KB: 3200 m
GL: 3480 m

# of Sample Collected: 15

Sample Type: cuttings (archived well)

Analyses Completed: X-ray diffraction analysis, Rietveld quantification

EXCECUTIVE SUMMARY

The mineralogical composition of 15 cutting samples from CDN Forest et al Mount Coty 2K-02 was determined and then quantified using Rietveld refinement methods. Quartz, feldspar, clay minerals, carbonates, and pyrite were detected and quantified. In most samples, the quartz (63-87%) and clay minerals (5-30%) make up the majority of the composition. Carbonates (0-12.5%), feldspars (0-5%) and pyrite (1.5-4%) are present only in subordinate amounts. The top three samples contain both illite and kaolinite, whilst illite is the only clay mineral in the deeper samples (3260-3480 m). No swelling clay minerals were identified in these samples. The carbonate minerals were composed of calcite, dolomite and Fe-rich dolomite (ankerite). An overall increasing quartz content with depth is displayed across the core interval which is accompanied by a decreasing clay content. All other mineral phases play a minor role in the rock composition.

DISCLAIMER

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INTRODUCTION

X-ray diffraction (XRD) analyses of **15** shale samples from the ***CDN Forest et al Mount Coty 2K-02*** well were carried out in order to determine and quantify the mineralogical composition. XRD is generally the fastest and most reliable method used in the identification and quantification of crystalline materials. The technique utilises the diffraction (reflection) of X-rays from the unique arrangement of atoms in a crystal structure. The technique is particularly useful for materials with grain sizes too small for microscopic identification (ie. clay minerals, soils minerals, dusts etc.). The XRD trace data were analysed by Rietveld methods to quantify the mineralogy.

This report summarizes the methods and analytical results.

METHODS AND SAMPLE DETAILS

Fifteen shale samples were investigated for their mineralogy. Details of the samples are listed in Table 1. The samples were ground to a homogenous particle size of ~2 micrometres using a micronising mill. Using ethanol as the transfer medium, smear slides of the ground material were made on glass disks and dried. X-ray diffraction was conducted between 3 and 70° 2Theta using a Cu X-ray tube with a Siemens D500 Kristalloflex instrument. The instrument features a 39 position sample changer, fixed divergence slit geometry, an anti-scatter slit and a curved graphite crystal diffracted beam monochromator.

After the samples were analysed, they were glycolated overnight in a glass desiccator at 60°C in order to determine expandable water sensitive clays (i.e. smectites or illite/smectite mixed-layers). These samples were then analysed between 3-27° 2Theta.

The results of the x-ray diffraction analyses were analysed using the PDF-4 Minerals database 2009 (peak identification) and then quantified using Jade 9 software, a commercial Rietveld analyses program for quantification of the mineralogy. For further information on Rietveld theory refer to http://www.xraydiffrac.com/xrd.htm.

The standard patterns in the PDF-4 minerals database are used for both phase identification and quantification. Prior to all analysis, XRD pattern shifts were corrected using the Quartz 101 or Quartz 100 peak. For all samples, refinement of the scale factor and instrument zero was performed first and the background determination checked. The background was not corrected or subtracted prior to the Rietveld analysis.

In samples in which the mineralogy is composed of discrete minerals with fixed cell dimensions, such as calcite, quartz, gypsum and pyrite, the accuracy of the analyses by Rietveld is considered to be ±3-5% relative. Samples with disordered clays, such as some samples in this study, the accuracy of the data is less (sometimes >±10%), the amount of which varies with the amount of disordered minerals. In samples in where substantial disordered clays are present Rietveld analyses does not fit the mineral patterns unless standard specifics to the samples are developed.

Table 1: Sample listing and depth details of the XRD analysis of CDN Forest et al Mount Coty 2K-02.

Well	Sample Type	Drill Depth Top
CDN Forest et al Mount Coty 2K-02	Shale	3200
CDN Forest et al Mount Coty 2K-02	Shale	3220
CDN Forest et al Mount Coty 2K-02	Shale	3240
CDN Forest et al Mount Coty 2K-02	Shale	3260
CDN Forest et al Mount Coty 2K-02	Shale	3280
CDN Forest et al Mount Coty 2K-02	Shale	3300
CDN Forest et al Mount Coty 2K-02	Shale	3320
CDN Forest et al Mount Coty 2K-02	Shale	3340
CDN Forest et al Mount Coty 2K-02	Shale	3360
CDN Forest et al Mount Coty 2K-02	Shale	3380
CDN Forest et al Mount Coty 2K-02	Shale	3400
CDN Forest et al Mount Coty 2K-02	Shale	3420
CDN Forest et al Mount Coty 2K-02	Shale	3440
CDN Forest et al Mount Coty 2K-02	Shale	3460
CDN Forest et al Mount Coty 2K-02	Shale	3480
Total Shale Samples	**15**	

The quantitative mineralogy is tabulated in Table 2. Selected trace patterns and major phase peaks are provided in Figure 1 to 3. Please note that only the major peaks are labelled and many peaks have subordinate or underlying peaks of other mineral phases. The x-ray traces with mineral identification are provided on the CD as Appendix A Rietveld analyses.

Figure 1 shows the full XRD pattern (2Theta degrees) of sample CH3220. The figure illustrates the peak positions of the major minerals identified and the abundance of peaks identified in XRD analysis. Please be aware that most peaks have subordinate and underlying peaks of other mineral phases (i.e. the calcite 104 has an underlying illite peak, illite 112). ***No swelling clay minerals*** were identified in any of the 15 samples from CDN Forest et al Mount Coty 2K-02. Sample CH3220 (Fig. 1) shows that quartz and clay minerals are dominating the mineralogical composition in this sample with small amounts of pyrite.

Fig. 1: Example of typical mineral phases identified in the rock samples from CDN Forest et al Mount Coty 2K-02 showing sample CH3220. Scan length: 3-70° 2Theta.

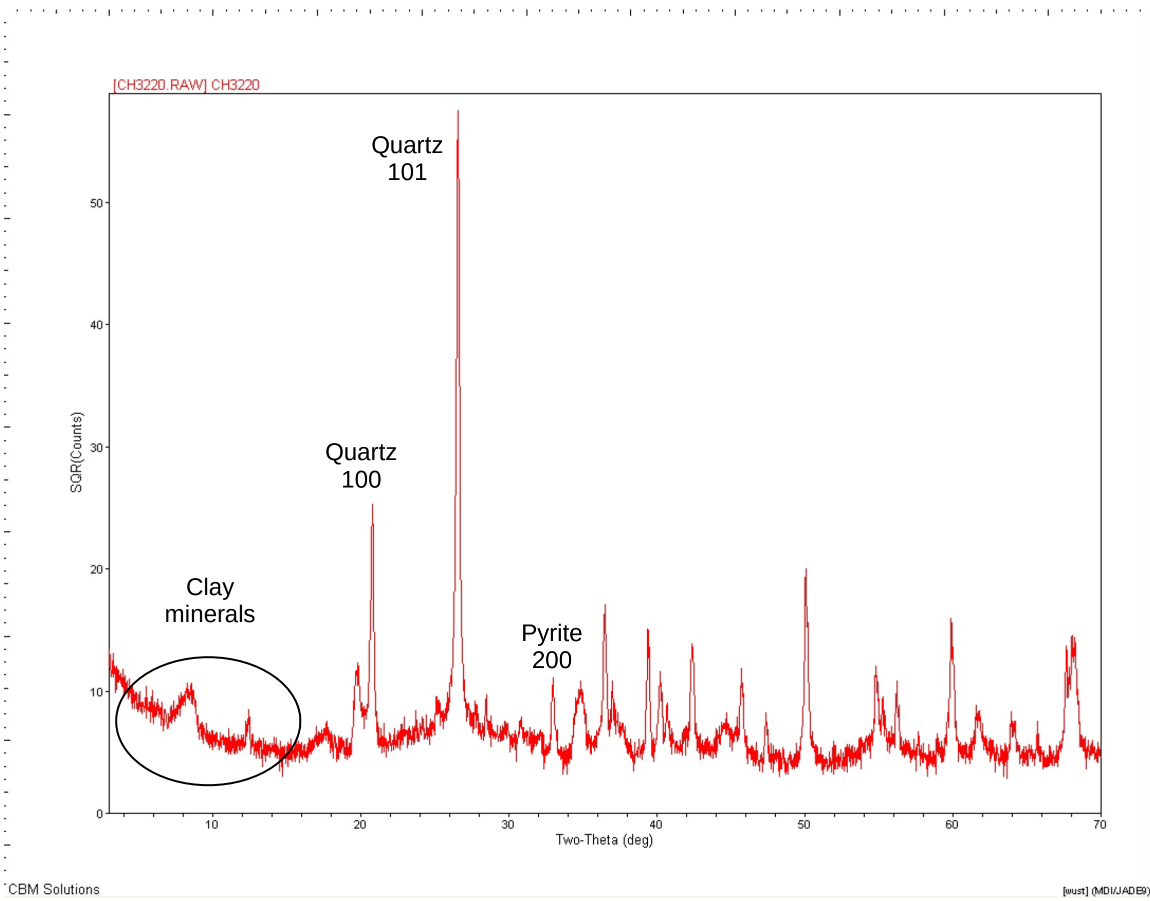


Figure 2 shows the pattern up to 39° 2Theta of sample CH3200 that shows in detail the main peaks of the clays, quartz, carbonates, and pyrite. In all samples, illite is the predominant clay mineral. In the lower section kaolinite becomes absent. The illite 002 peak (Fig. 2) is fairly broad which implies poorly crystalline structures which affects the proper quantification through Rietveld.

Fig. 2: Example of typical mineral phases identified in the rock samples from CDN Forest et al Mount Coty 2K-02 showing sample CH3200. Please note that in this figure, the scan length only ranges from 3-39° 2Theta.

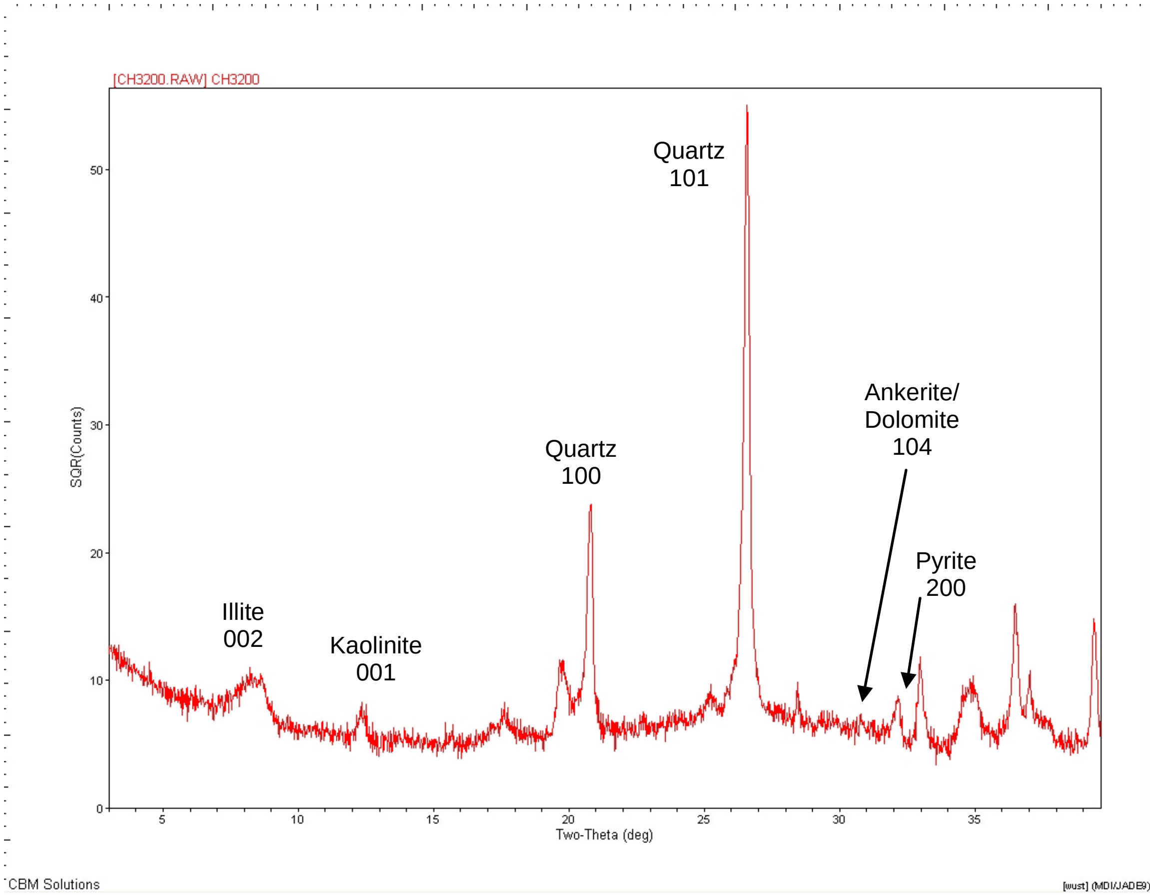
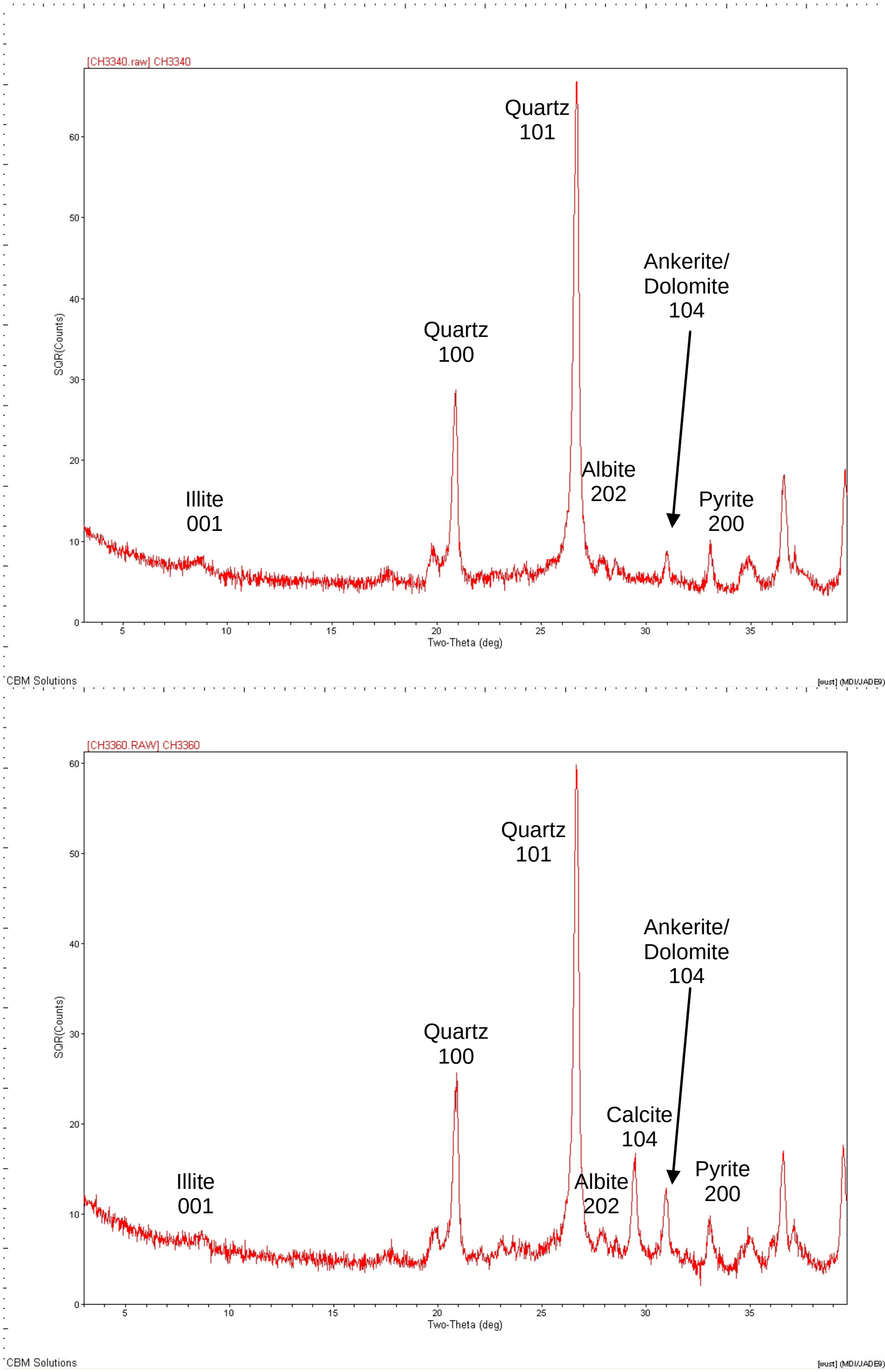


Figure 3 provides a comparison between two samples with different carbonate contents. Sample CH3340 has ~3% albite, 1% dolomite, 10% illite and 84% quartz, whilst sample CH3360 contains about 4% albite, 6% dolomite, 7% calcite, 8% illite and 73% quartz. Please note the marked difference in calcite and dolomite content.

Fig. 3: Carbonate mineral phases identified in the rock samples from CDN Forest et al Mount Coty 2K-02. Top: Sample CH3340 showing the presence of quartz, illite, albite, dolomite, and pyrite. Bottom: Sample CH3360 showing the presence of quartz, illite, albite, calcite, dolomite, and pyrite.



Mineralogy of the eight upper samples

Eight upper samples (Table 2) of CDN Forest et al Mount Coty 2K-02 were analysed. The samples are composed of quartz, clay minerals (illite, kaolinite), feldspars, carbonates (Fe-dolomite = ankerite), and pyrite. Quartz makes up between 63% (CH3200, 3240) and 84% (CH3340). Feldspars are dominated by albite up to 5%. The carbonate fraction of the samples is dominated by ankerite up to 5% (CH3200). It needs to be noted that according to the peak positions, ankerite and dolomite appear to be present as minerals covering the entire “dolomite” solid solution spectra. The clay fraction of the samples is composed of mainly illite (10-27%), with only the top three samples (CH3200, 3220, 3240) containing traces of kaolinite up to 4%. Pyrite is present in all samples and ranges between 2-4%.

Table 2. Mineralogy of the CDN Forest et al Mount Coty 2K-02 samples quantified using Rietveld Analyses. Please note that there is a poor fit for illite and occasionally calcite/dolomite peaks due to poor cristallinity and not pure endmembers (i.e. calcite with small % of Mg substitutions) which could result in underestimations of these mineral phases.

XRD File	Drill Depth	Quartz	Feldspars	Clays		Carbonates			Sulphide
	(m)		Albite	Illite	Kaolinite	Calcite	Dolomite	Ankerite	Pyrite
CH3200	3200	63	0	24.2	4.2			4.7	3.8
CH3220	3220	65.4	3.4	24	3			0.8	3.3
CH3240	3240	62.7	0.1	26.8	2.7			3.3	4.3
CH3260	3260	77.1	0.1	19				1.3	2.5
CH3280	3280	80.5	3.1	14.1				0.2	2.1
CH3300	3300	76.2	3.4	16.4				1.3	2.7
CH3320	3320	80.7	4.8	12.1				0.1	2.4
CH3340	3340	83.7	3.2	9.9				1.2	2
CH3360	3360	73	3.8	8.3		6.7	5.8		2.4
CH3380	3380	84.5	2.8	5.9		2.8	2.3		1.7
CH3400	3400	80.9	3.9	6.5		2.4	4.2		2.1
CH3420	3420	87.1	1.4	6.2		1.6	1.9		1.8
CH3440	3440	86.5	1.9	6.4		2.2	1.6		1.5
CH3460	3460	83.3	3	4.6		2.2	5.2		1.8
CH3480	3480	77.8	3.7	7.5		2.9	6.4		1.7

Mineralogy of the seven lower samples

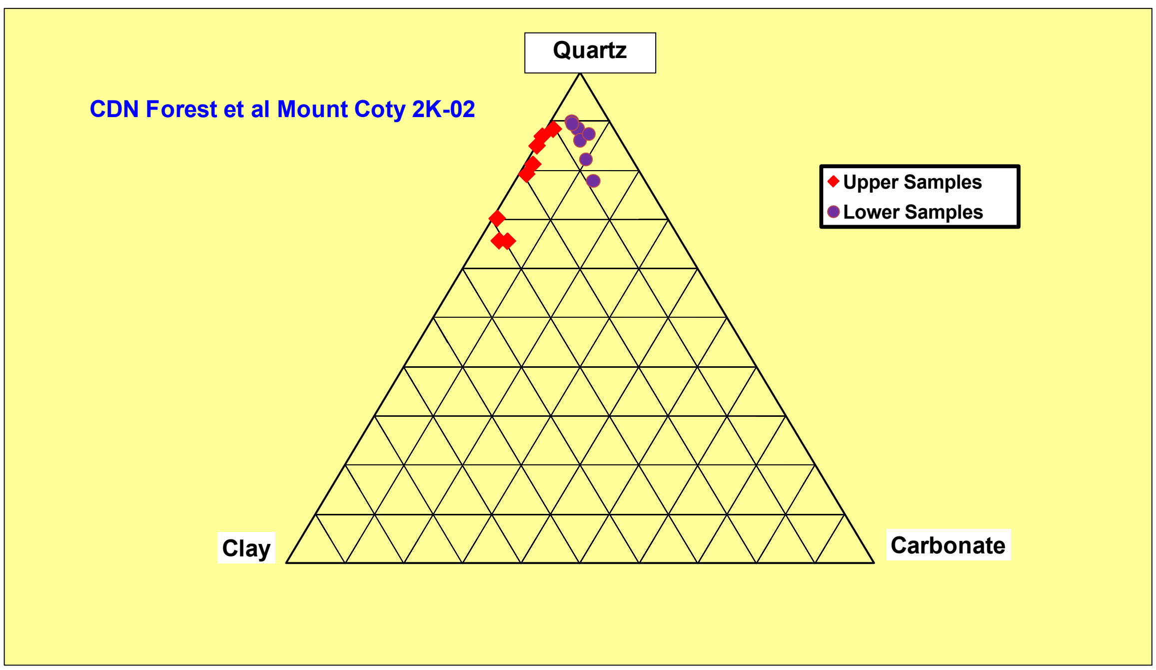
The seven lower shale samples (Table 2) of CDN Forest et al Mount Coty 2K-02 contain quartz, clay minerals (illite only), feldspar, carbonates (calcite and dolomite), and pyrite (Table 2). Quartz makes up between 73% (CH3360) and 87% (CH3420). Feldspars, mainly albite, make up to a maximum of 4% (CH3360, 3400, 3480). In contrast to the rock composition of the eight upper samples, carbonate minerals in the rock samples of the seven lower samples are composed of both calcite and dolomite where the calcite ranges from 2-7% and the dolomite from 2-6%. It is noted here that the dolomite peak position indicates that small amounts of Fe may also be present in this phase and quantification of the individual phases poses a challenge. Pyrite is present in all samples and ranges from about 1.5-2.5%. The clay fraction is only composed of illite which ranges from 5-8% which is markedly lower than the clay contents of the eight upper (Table 2).

It is important to notice that the Rietveld analyses is highly accurate for well-crystalline mineral phases but is less accurate when using poorly crystalline minerals such as clays and organic materials. As a result, the accuracy of the results will be poor i.e. plus or minus a sizable number for the clays. **Within all samples analysed for the CDN Forest et al Mount Coty 2K-02 well, no water-sensitive (i.e. expandable) clay minerals were identified.**

Sample composition on a ternary clay-quartz-carbonate diagram

All samples were plotted on a ternary plot with the end members of quartz, clays and carbonates to illustrate the population distribution according to the individual units (Fig. 4). The samples of the eight upper samples fall closely to the quartz-clay line due to their low carbonate contents and close to the quartz endmember. The seven lower samples plot also close to the quartz endmember but closer to the carbonate line due to elevated carbonate contents compared to the eight upper samples.

Figure 4: Ternary Diagram of the samples from CDN Forest et al Mount Coty 2K-02 Well showing the quartz, clay and carbonate contents.

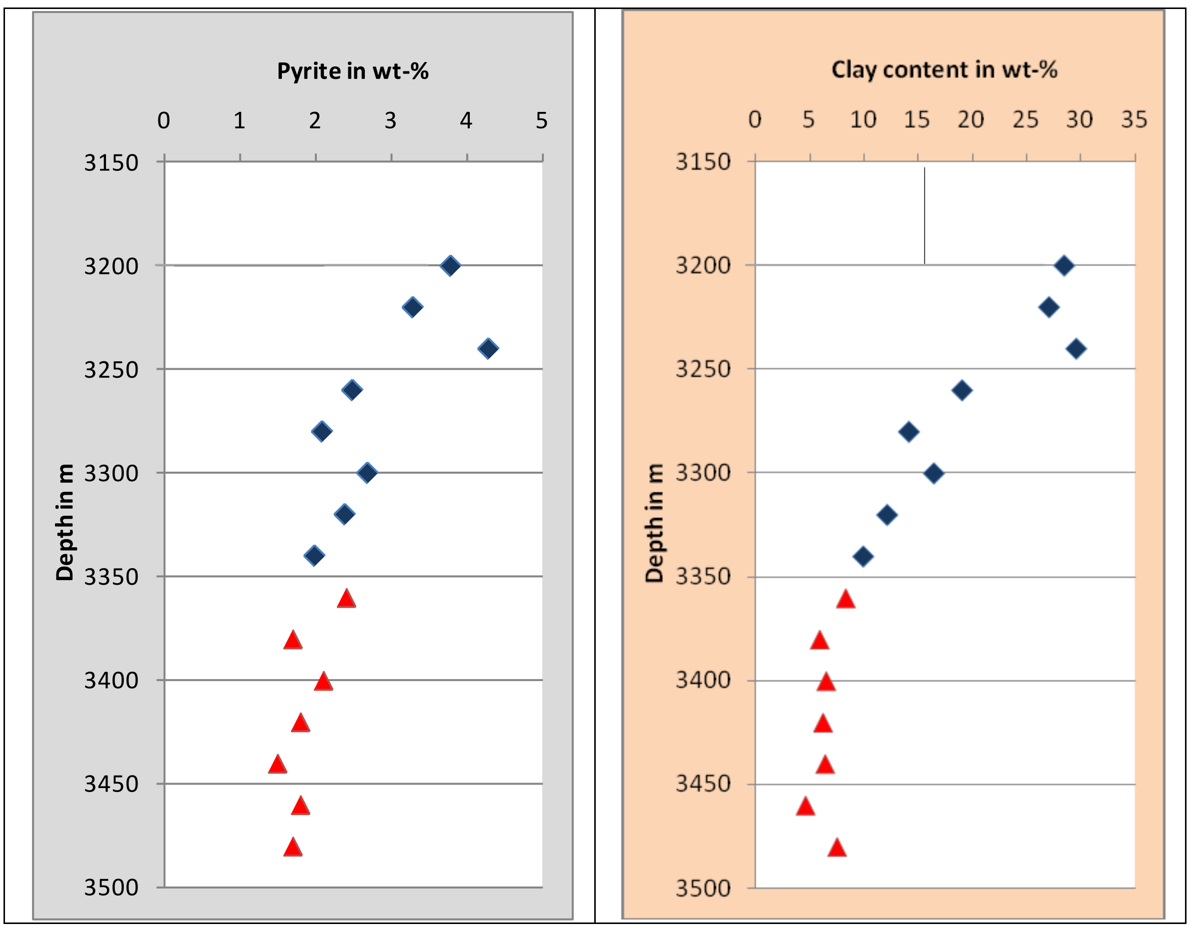


Downcore mineralogical variations

In order to identify trends and variations of the mineralogical composition, downcore analyses were also compiled (Fig. 5-8). These trends may be helpful in identifying zones or sections that show better mineralogical properties for future well applications (i.e. fracing).

The pyrite content versus depth plot (Fig. 5) shows that certain sections of the core contain slightly higher pyrite than other sections. The top samples contain the highest pyrite contents (3-4.5%) while the lower samples have often less than 2.5%. Overall, the **mean pyrite content of all samples is about 2.4%, while the mean pyrite content of the upper samples is 2.9% and the lower sample mean pyrite content is 1.9%.**
The total amount of clay minerals shows a slightly decreasing trend with depth (Fig. 5). Although the **mean clay content** of all samples is approximately **13%, the upper samples** contain **an average of 18% illite** (top three samples have also an additional mean kaolinite content of 3%) while the **lower samples** average only **6.5%**.

Figure 5: Downhole mineralogical variation of pyrite and total clay contents of all samples from CDN Forest et al Mount Coty 2K-02.

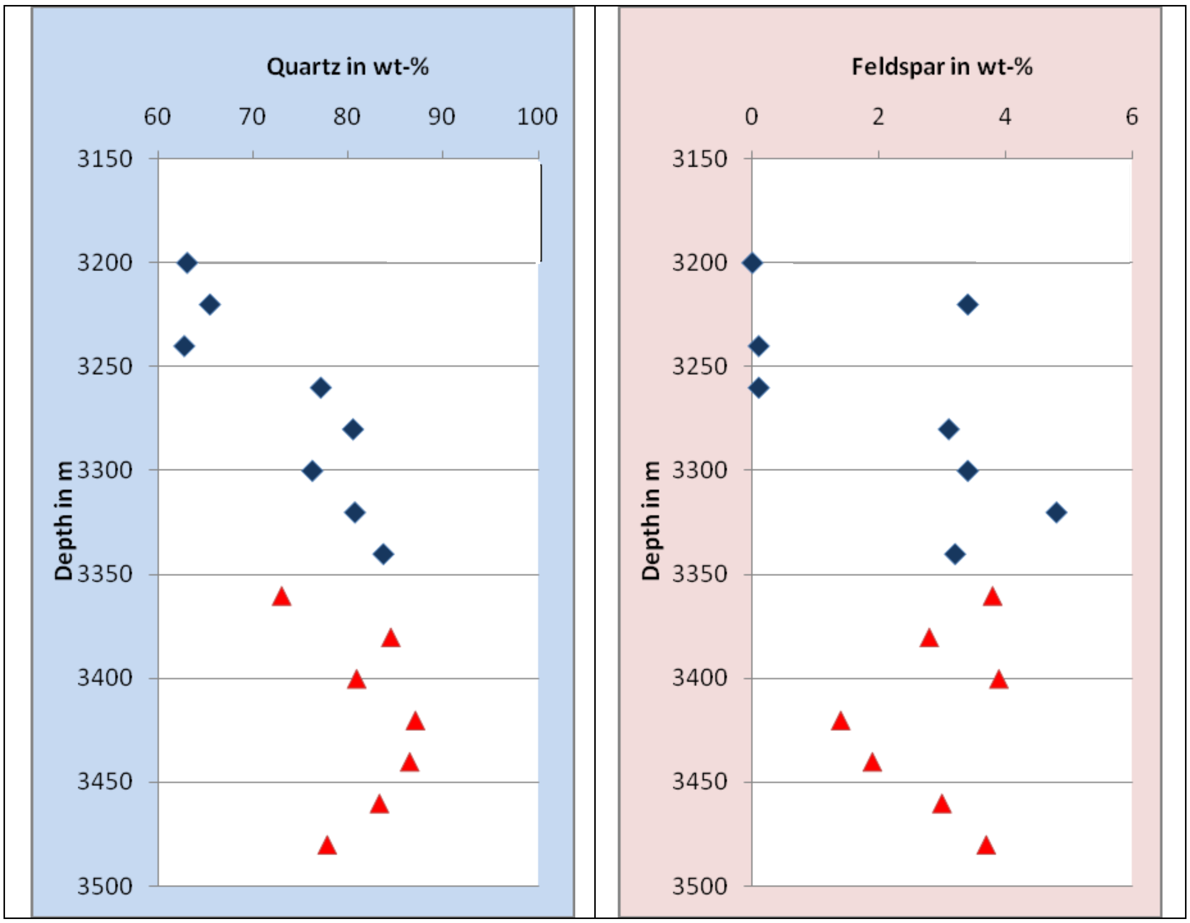


Contrary to the clay content, the quartz content slightly increases with increasing depth (Fig. 6). Quartz contents at the top of the core in upper samples are approximately 65% while in the lower part of the upper samples are ~80%, and ~85% in the lower samples.

The **mean quartz** value of all samples is **77%.** The quartz content of the samples from the **upper portion** averages **73%,** whilst the samples from the **lower portion** have a quartz average of **82%.**

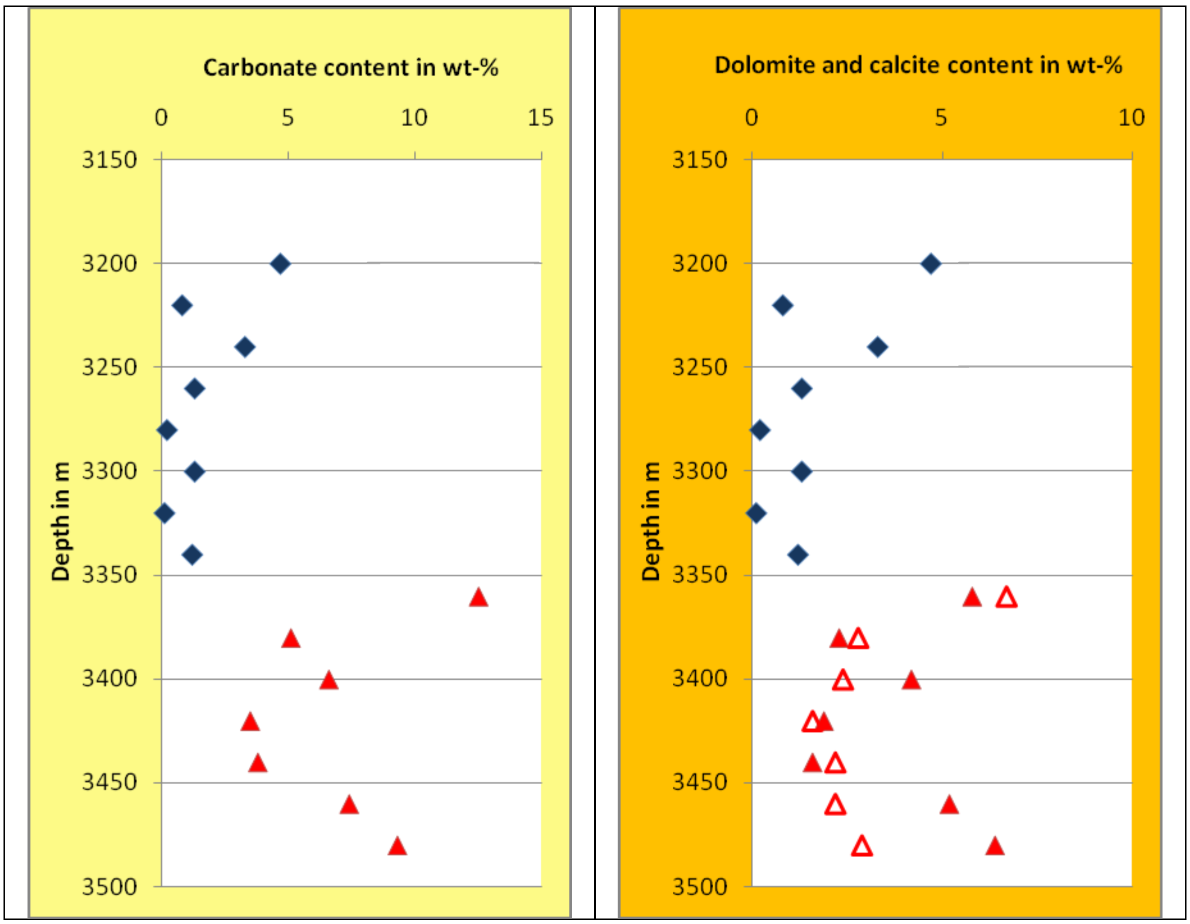
Feldspar content shows little trend (Fig. 6), with several samples in the top part of the core having no albite present. The **mean feldspar** content of the samples from the **upper samples is 2.3%,** while the mean carbonate content of the **lower samples is 2.9%.**

Figure 6: Downhole mineralogical variation of quartz and feldspar contents of all samples from CDN Forest et al Mount Coty 2K-02.



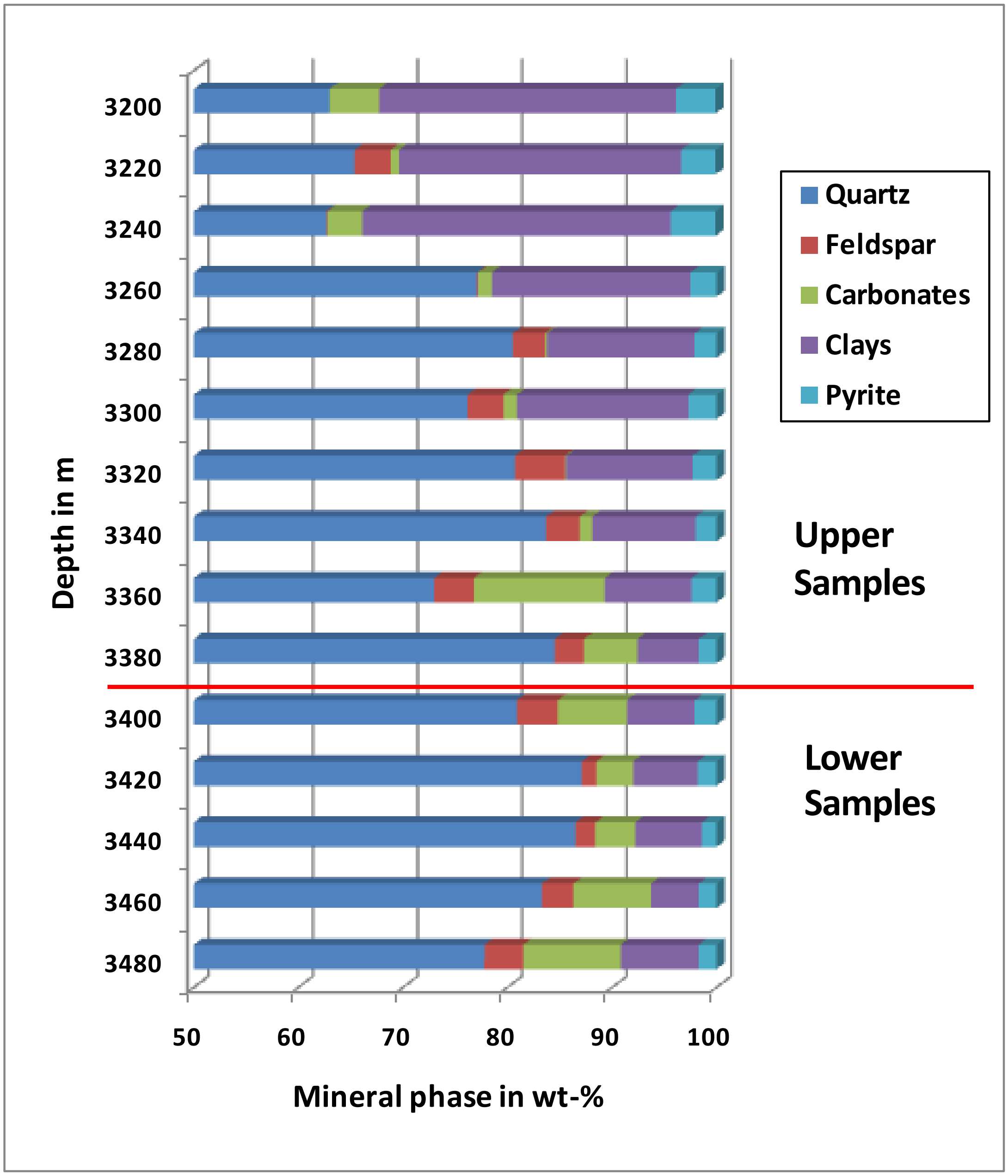
Carbonate content and carbonate phases, i.e, calcite and dolomite, were plotted separately (Fig. 7). This analysis highlights the marked changes of the calcite content in the core of CDN Forest et al Mount Coty 2K-02 from the upper samples to the lower samples. Carbonate content increases downcore mainly due to additional calcite in the lower samples, although only small amount of calcite occurs. **Calcite** content of all samples within the **lower samples** averages ~**3%.** The **dolomite** content in the **upper samples** averages **1.6%,** whilst the **lower samples has 3.9%.**

Figure 7: Downhole carbonate content variability and dolomite / calcite contents of all samples from CDN Forest et al Mount Coty 2K-02. Note the downcore trend or shift of calcite content and the increasing dolomite content trend with increasing depth.



Overall trends of all mineral phases are represented in Figure 8 which illustrates the increasing quartz content with depth and the associated decreasing clay content. Carbonate content also increases slightly in the lowermost samples of the core.

Figure 8: Downhole mineralogical variation of all samples from CDN Forest et al Mount Coty 2K-02. Please note the x-axis scale which ranges only from 50-100 wt-%.



CONCLUSIONS

The mineralogical composition of 15 cutting samples from CDN Forest et al Mount Coty 2K-02 was determined and then quantified using Rietveld refinement methods. Quartz, feldspar, clay minerals, carbonates, and pyrite were detected and quantified. In most samples, the quartz (63-87%) and clay minerals (5-30%) make up the majority of the composition. Carbonates (0-12.5%), feldspars (0-5%) and pyrite (1.5-4%) are present only in subordinate amounts. The top three samples contain both illite and kaolinite, whilst illite is the only clay mineral in the deeper samples (3260-3480 m). No swelling clay minerals were identified in these samples. The carbonate minerals were composed of calcite, dolomite and Fe-rich dolomite (ankerite). In the upper samples, only ankerite occurs (mean 1.6%), whilst in the lower samples, dolomite and calcite occur. There calcite averaged 3% whilst dolomite averaged 3.9%. Overall increasing quartz content with depth is displayed across the core interval which is accompanied by decreasing clay contents. All other mineral phases play a minor role in the rock composition.

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