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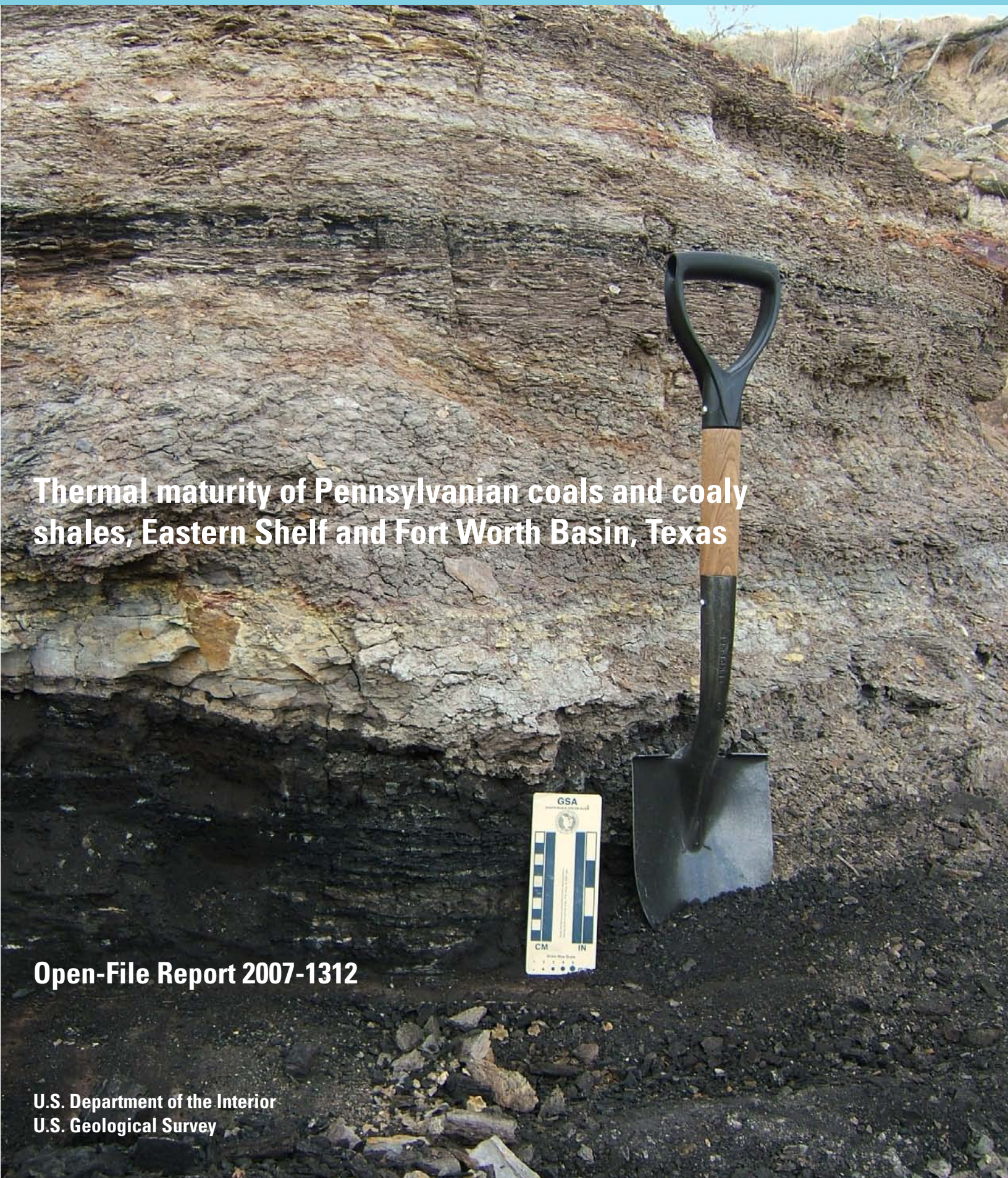

Thermal maturity of Pennsylvanian coals and coaly shales, Eastern Shelf and Fort Worth Basin, Texas

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Contents

Thermal maturity of Pennsylvanian coals and coaly shales, Eastern Shelf and Fort Worth Basin, Texas

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Introduction

The U.S. Geological Survey (USGS) and the Texas Bureau of Economic Geology (TBEG) are engaged in an ongoing collaborative study to characterize the organic composition and thermal maturity of Upper Paleozoic coal-bearing strata from the Eastern Shelf of the Midland basin and from the Fort Worth basin, north-central Texas (fig. 1). Data derived from this study will have application to a better understanding of the potential for coalbed gas resources in the region. This is an important effort in that unconventional resources such as coalbed methane (CBM) are expected to satisfy an increasingly greater component of United States and world natural gas demand in coming decades (Energy Business Reports, 2007). In addition, successful CBM production from equivalent strata in the Kerr basin of southern Texas (fig. 1), and from equivalent strata elsewhere in the United States (e.g., Cherokee, Arkoma, Warrior, and Appalachian basins) suggests that a closer examination of CBM potential in north-central Texas is warranted (Barker and others, 2003).

This report presents the results of efforts to date which mainly have focused on determining the thermal maturity of shallow (<2,000 ft; <610 m) coal and coaly shale cuttings from the Middle-Upper Pennsylvanian Strawn, Canyon, and Cisco Groups (fig. 2) from the Eastern Shelf of the Midland basin. Samples from ten conventional wells in Archer and Young Counties (northwest and downdip from the outcrop) yield mean random vitrinite reflectance (R_o) measurements between about 0.4 and 0.8 percent, indicating coal rank from subbituminous C to high volatile A bituminous. Core samples of Lower Pennsylvanian strata (lower Atoka Group) from two deeper wells (samples from ~5,400 ft; 1,645 m) in eastern Jack and western Wise Counties in the western part of the Fort Worth basin yield higher thermal maturities. In addition to the maturation data for these subsurface samples, R_o data from approximately twenty shallow coal core and outcrop samples are presented herein. Original R_o data are contained in Appendices 1-2 of this report. Selected samples also were investigated by geochemical methods, including Rock-Eval pyrolysis and proximate-ultimate analyses. Data from the current study indicate that the maturity of some Pennsylvanian coal and coaly shale samples is sufficient to support thermogenic coalbed gas generation on the Eastern Shelf and in the western Fort Worth basin.

Methods

Sample Collection

Wells in Young and Archer Counties that have coal and coaly shale drilling cuttings available were identified based on open-file data at the TBEG, including strip logs, narrative descriptions of well cuttings samples, and annotated spontaneous potential and resistivity electric logs (Guevara and others, 2007). Annotated logs allowed determination of the general stratigraphic position of the collected samples. Cuttings were handpicked for organic-rich facies. Subsurface core and shallow core samples from coal mines were collected from the Texas Natural Science Center in Austin, the Austin Core Research Center of the TBEG, and from the Little Bull Creek coal mine, Coleman County, near the town of Waldrip. Outcrop samples of Cisco Group coal beds were collected according to American Society for Testing and Materials (ASTM) D 4596: Practice for collection of channel samples in a mine (ASTM, 2007). Outcrop locations in Jack, Young, Stephens, and Eastland Counties were determined from the field notes of Robert W. Hook based on previous studies

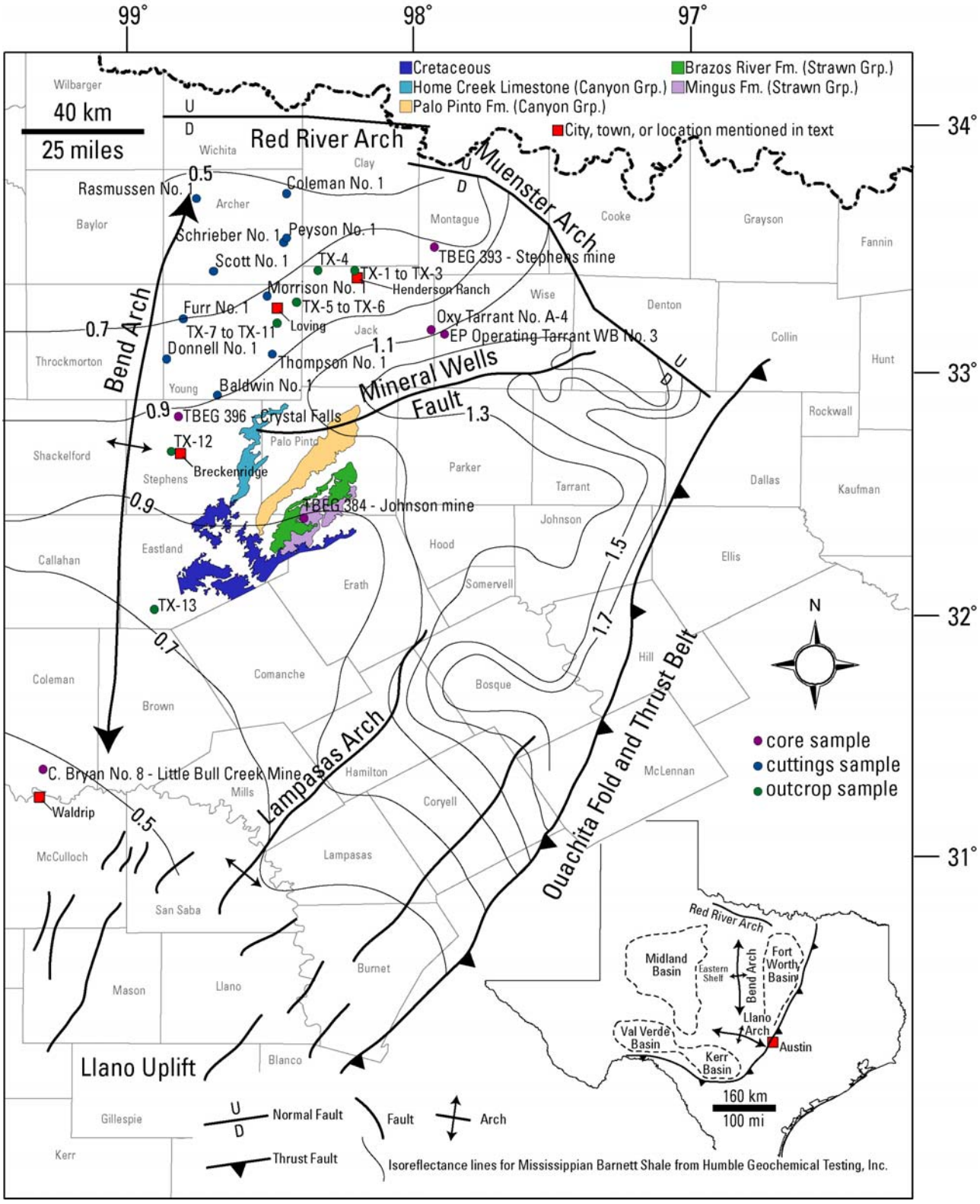

Figure 1. Study area showing sample locations, outcrop trend of coal-bearing Pennsylvanian strata, and isoreflectance contours (in percent) for maturation of the Mississippian Barnett Shale. Modified from Brown and others (1973), Montgomery and others (2005), and Guevara and others (2007). Reflectance data from Humble Geochemical Services, Inc. (cited in Pollastro and others, 2007). Refer to Figure 2 for stratigraphic nomenclature. Grp. = Group, Fm. = Formation.

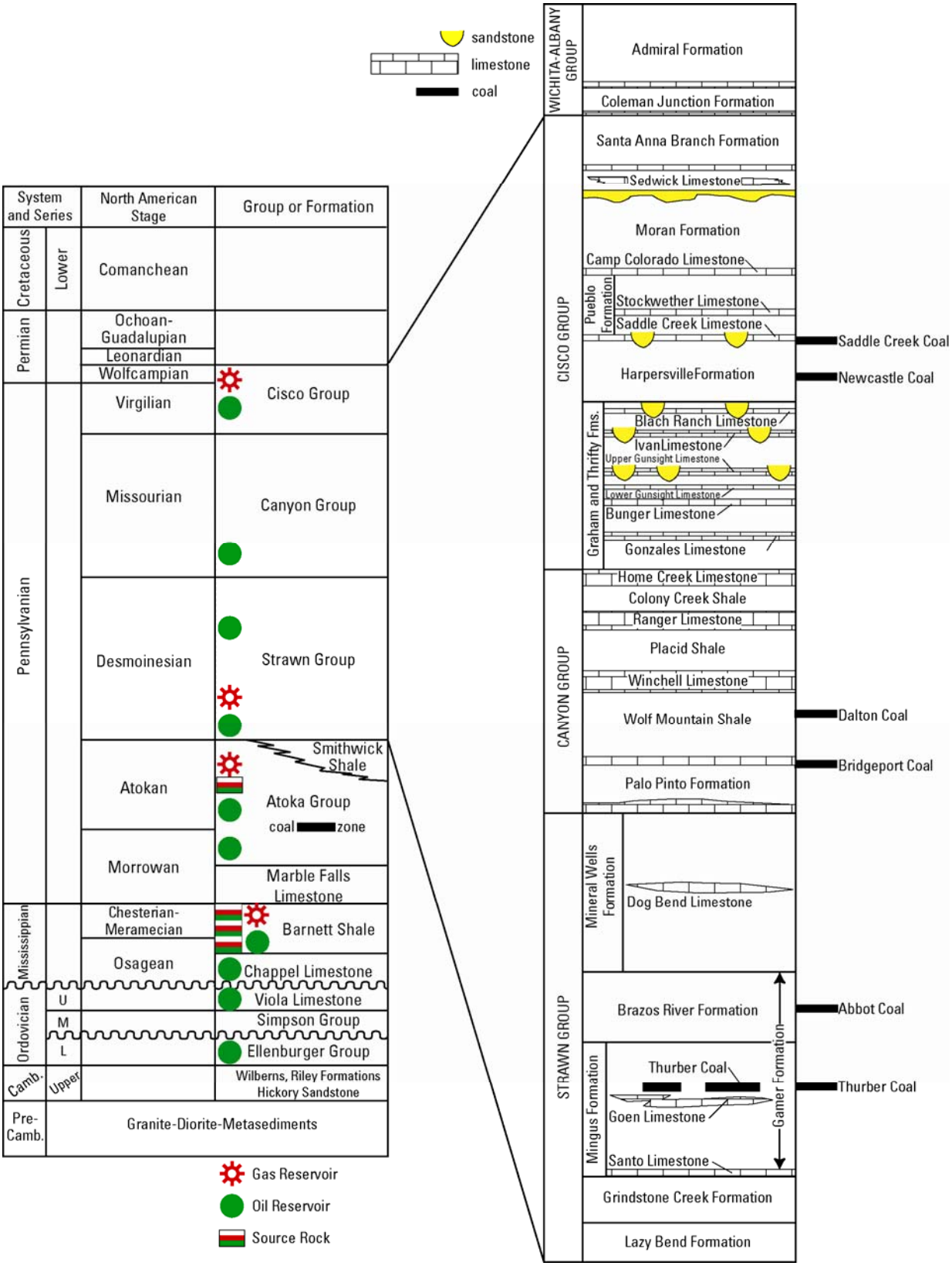

Figure 2. Stratigraphic column showing the Paleozoic section (expanded in Upper Pennsylvanian and Lower Permian) for north-central Texas and approximate position of named coal beds. From Brown and others (1972, 1973), and Montgomery and others (2005). Fms. = Formations.

(Hook, 1989), and from consultation of the reports by Plummer and others (1949) and Evans (1974). Samples TX-7 through TX-10 were collected as multiple benches of a channel sample through a 2.4 ft (0.73 m) thick coal bed south of Loving, Young County (fig. 1); other coal bed outcrops were collected as single-bench channels.

Sample Preparation

Samples were prepared for analysis according to ASTM D 2797: Preparing coal samples for microscopical analysis by reflected light (ASTM, 2007). Cuttings samples were mounted as-sampled; core and outcrop samples were ground to pass a 850-µm (No. 20 mesh) or 1000-µm (No. 16 mesh) sieve in most cases. Samples were mounted for reflectance analysis in a 1-inch mold using a heat-setting thermoplastic powder or epoxy resin medium. Two mounts were made for outcrop samples; a single mount was prepared for cuttings and core samples. Examination surfaces were ground and polished, then desiccated overnight prior to analysis.

Vitrinite Reflectance

Vitrinite reflectance analyses were conducted according to ASTM D 2798: Microscopical determination of the vitrinite reflectance of coal (ASTM, 2007), using a Leitz* Orthoplan microscope equipped with a MPV-2 photomultiplier-based light measuring system, or a Leica DMRX microscope equipped with a J&M MSP200 photomultiplier system (see webpage *http://energy.er.usgs.gov/coal_studies/organic_petrology/laboratory.html* for photographs and information about microscope systems). One hundred measurements of the random reflectance (R_o) of individual vitrinite grains in the outcrop samples were performed; fifty measurements were made on each mount. For the cuttings samples, insufficient sample volume did not permit 100 measurements as proscribed by ASTM (2007). The number of determinations for cuttings was dependent on sample volume, ranging from 1-65 measurements.

A subset of ten cuttings samples from Young County were submitted to Humble Geochemical Testing, Inc. for preliminary R_o analysis, primarily to determine the range of reflectance values present at depths of 0-2,000 ft (0-610 m) (Guevara and others, 2007). Original data from these samples are contained in Guevara and others (2007), and are summarized in Appendix 2 of this report. Samples analyzed by Humble were in several cases confirmed by reanalysis at USGS (see sample reports in Appendix 1).

Proximate-ultimate and Rock-Eval analyses

Depending on degree of weathering, selected outcrop samples were analyzed for proximate, ultimate, calorific values, and free swelling indices at Geochemical Testing, Inc., according to ASTM methods and procedures (ASTM, 2007). Depending on the availability of sufficient sample volume, selected outcrop, cuttings, and core samples also were analyzed by Rock-Eval pyrolysis at Humble Geochemical Testing, Inc., according to the methods described in Barker (1974) and Espitalié and others (1977).

Results

Thermal maturity as determined by the mean random reflectance of vitrinite (R_o) ranges from 0.4-1.0 % for all samples reported herein. This is consistent with published isoreflectance contour intervals for the underlying Mississippian Barnett Shale (data from Humble Geochemical Testing, Inc.; cited in Pollastro and others, 2007). The Barnett occurs at depths of several hundred to several thousand feet below the samples collected for this study, depending on location (compare sample locations in fig. 1, this study, with structural top of Barnett, fig. 15 of Pollastro and others, 2007). R_o values are compiled in Table 1 and the original data for each sample are contained in Appendix 1 of this report. Samples analyzed by Humble Geochemical Testing, Inc., are indicated with an asterisk in Table 1.

Cuttings samples generally exhibit a modest correlation between sample depth and reflectance (figs. 3-10) for the wells with enough data to construct a meaningful regression (linear correlation coefficients in figs. 3-10 computed in spreadsheet software using all data points for each well). Poor correlation coefficients in the Furr No. 1 (fig. 5) and Schreiber No. 1 (fig. 9) wells may indicate possible contamination from cavings, oxidation, or inclusion of recycled vitrinite. Cuttings R_o values range 0.4-0.8 %, indicating coal rank from subbituminous C to high volatile A bituminous. A high value of 1.01 % at 3,570-3,580 ft (1,088-1,091 m) in the Peyson No. 1 well (fig. 10) is considered suspect due to proximity to high-reflecting pyrite mineralization. This range of thermal maturity (0.4-0.8 %) is sufficient for the early stages of thermogenic coalbed gas generation in the higher maturity samples (e.g., Michael and others, 1993). However, few cuttings show indications of well-established, thick coal beds in the subsurface, i.e., most rock fragments are carbominerite (fig. 11A). There are some exceptions to this case, as noted in the brief descriptive comments associated with each sample in Appendix 1. Organic material in all of the cuttings is dominated by vitrinite (fig. 11B), indicating that generated hydrocarbons should be gas-prone.

*Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

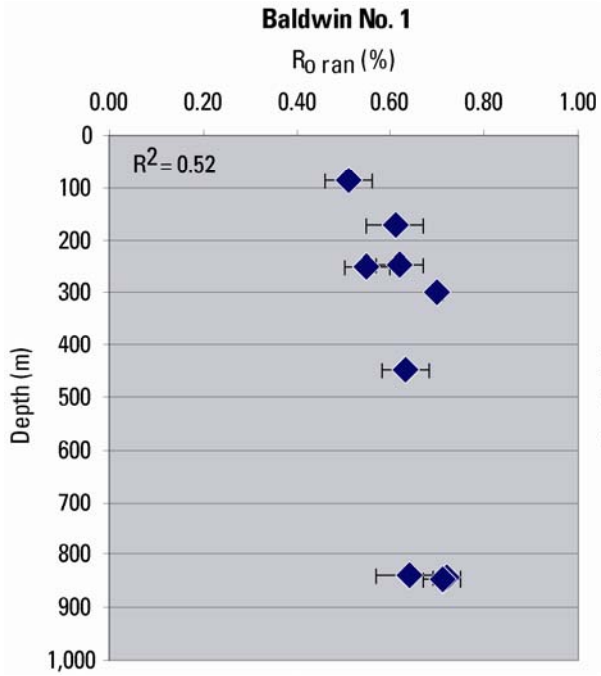

Figure 3. Vitrinite reflectance versus depth for cuttings samples from the Baldwin No. 1 well, Young County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

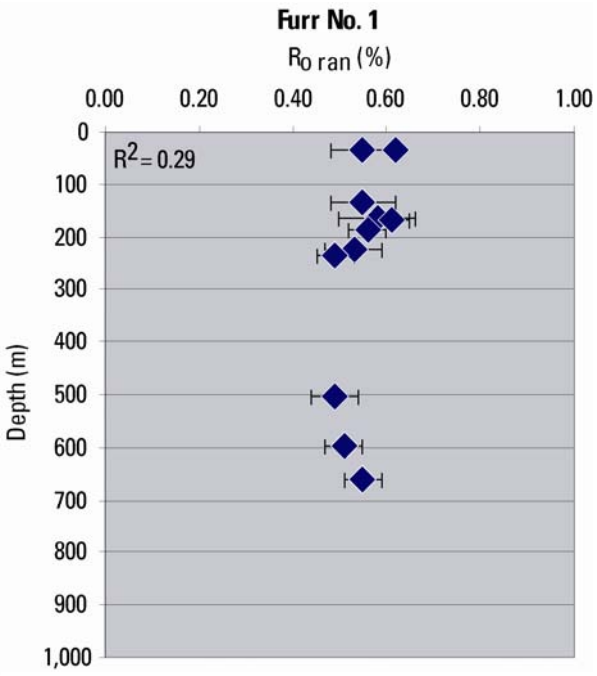

Figure 5. Vitrinite reflectance versus depth for cuttings samples from the Furr No. 1 well, Young County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

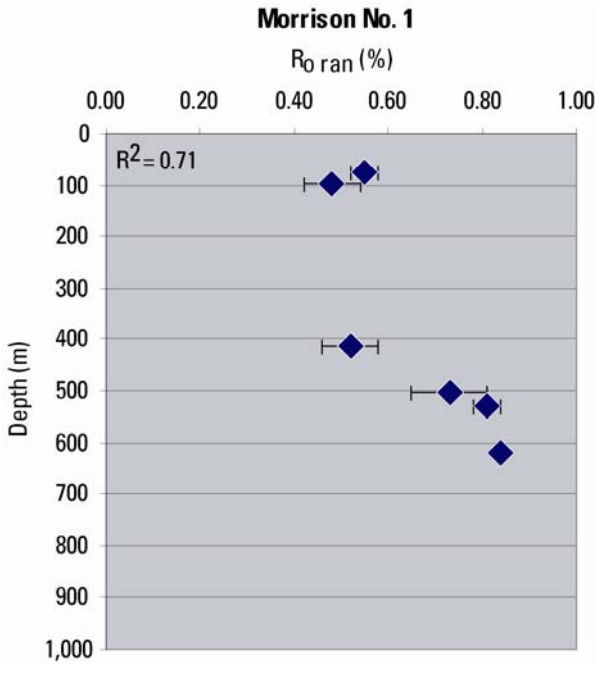

Figure 4. Vitrinite reflectance versus depth for cuttings samples from the Morrison No. 1 well, Young County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

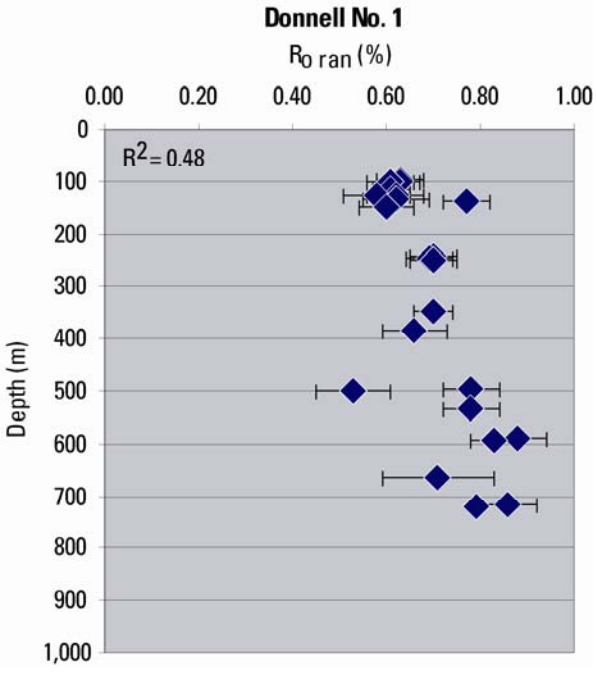

Figure 6. Vitrinite reflectance versus depth for cuttings samples from the Donnell No. 1 well, Young County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

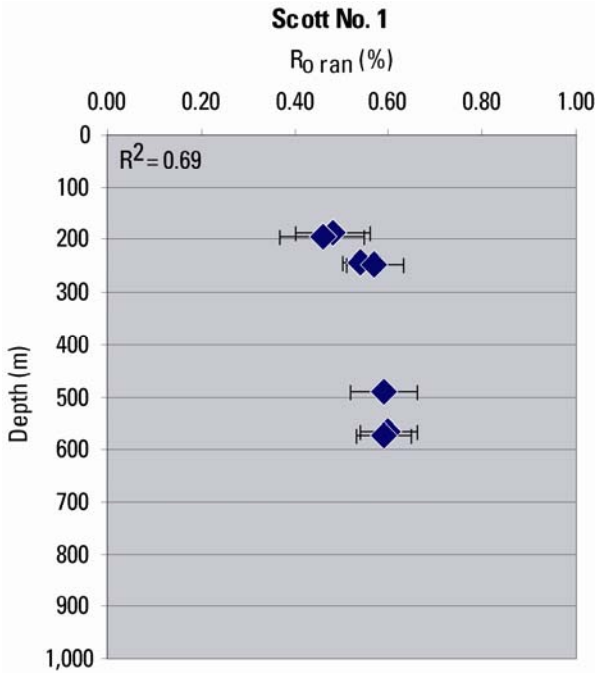

Figure 7. Vitrinite reflectance versus depth for cuttings samples from the Scott No. 1 well, Archer County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

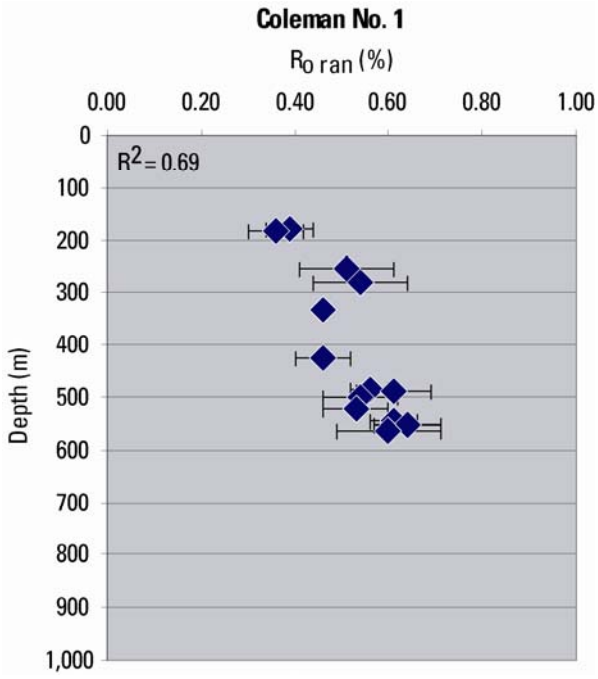

Figure 8. Vitrinite reflectance versus depth for cuttings samples from the Coleman No. 1 well, Archer County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

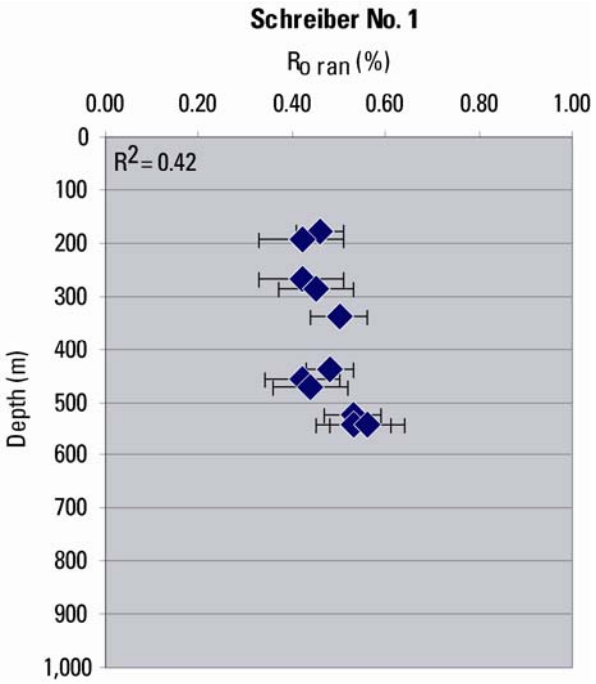

Figure 9. Vitrinite reflectance versus depth for cuttings samples from the Schreiber No. 1 well, Archer County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

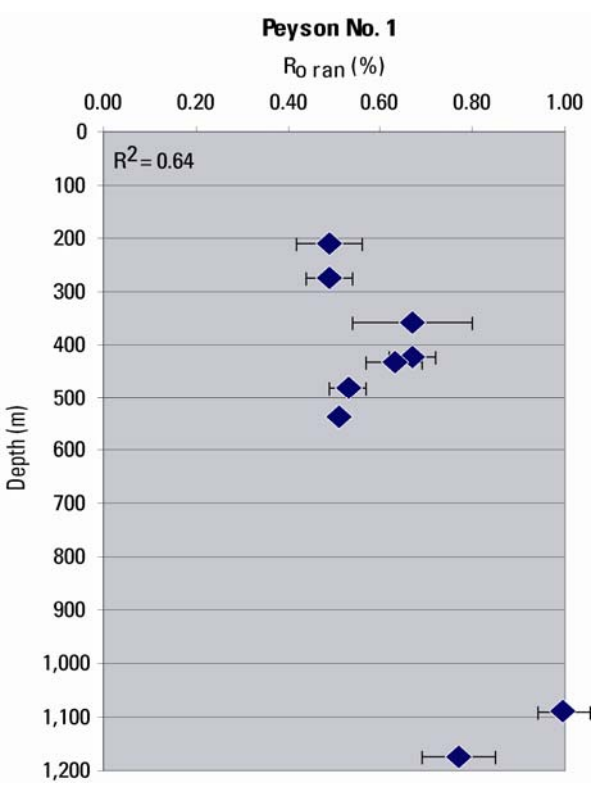

Figure 10. Vitrinite reflectance versus depth for cuttings samples from the Peyson No. 1 well, Archer County. Refer to Appendices for actual data. Well location is shown on Figure 1 and in Table 1.

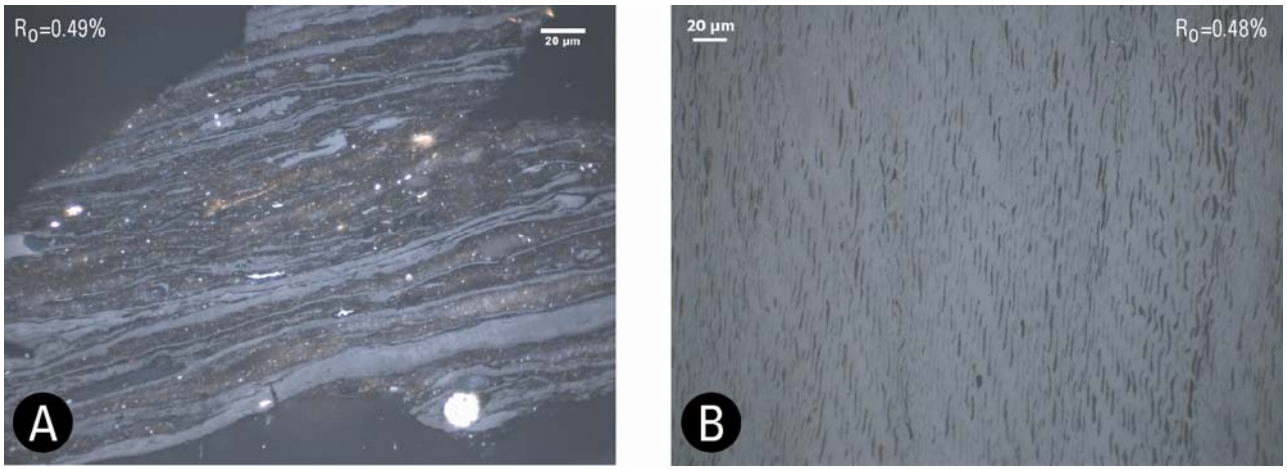

Figure 11. A. Typical carbominerite cuttings fragment. Peyson No. 1 680-690 ft, Cisco Group, Archer County. B. Rare telinite fragment; high number of similar fragments in sample interpreted to indicate well-developed coal bed present. Morrison No. 1 310-320 ft, Cisco Group, Young County. See Figure 1 and Table 1 for sample locations.

R_o values for coal core samples also are consistent with maturity levels suitable for early thermogenic gas generation. Samples were collected from now-abandoned coal mines in close proximity to the outcrop belt (Coleman to Montague Counties, updip from cuttings samples previously described; fig. 1). These samples have petrographic properties consistent with the thicker (though still <3 ft thick; <1 m), cleaner character of coal beds known near the outcrop belt, containing well-developed monomaceral-trimaceral microlithotypes with few mineral inclusions (fig. 12A-B). Four samples from Cisco Group coals yield R_o values of 0.52-0.83 % (Table 1); a Strawn Group coal core sample (Thurber coal) has a R_o value of 0.66 %.

Lower Atoka Group (fig. 2) core from Jack and Wise Counties contains thin (<2 ft; <0.60 m) coaly shale layers (fig. 13A-B) which yield R_o values of about 1.0 % (Table 1). These samples are significantly deeper (collected from 5,400-5,540 ft; 1,645-1,690 m) than the cuttings samples from Archer and Young Counties, most of which are from <2,000 ft (<610 m). The maturity data for the lower Atoka Group samples are consistent with an area of indigenous wet gas production from the underlying continuous Barnett Shale reservoir.

Outcrop channel samples of Cisco Group coals (fig. 14A-C) also yield R_o values from 0.5 to 0.8 % (table 1). Proximate-ultimate analyses (table 2) indicate alteration due to surface weathering (Fig. 14D), including lower than expected calorific values (6,300-8,700 Btu/lb on a moist, mineral-matter-free basis). These calorific values indicate ASTM rank of lignite-subbituminous C, inconsistent with the subbituminous A-high volatile bituminous A rank determined by the reflectance of vitrinite. Corroborating the results of calorific value analyses, free swelling indices of 0.0 (table 2) also indicate

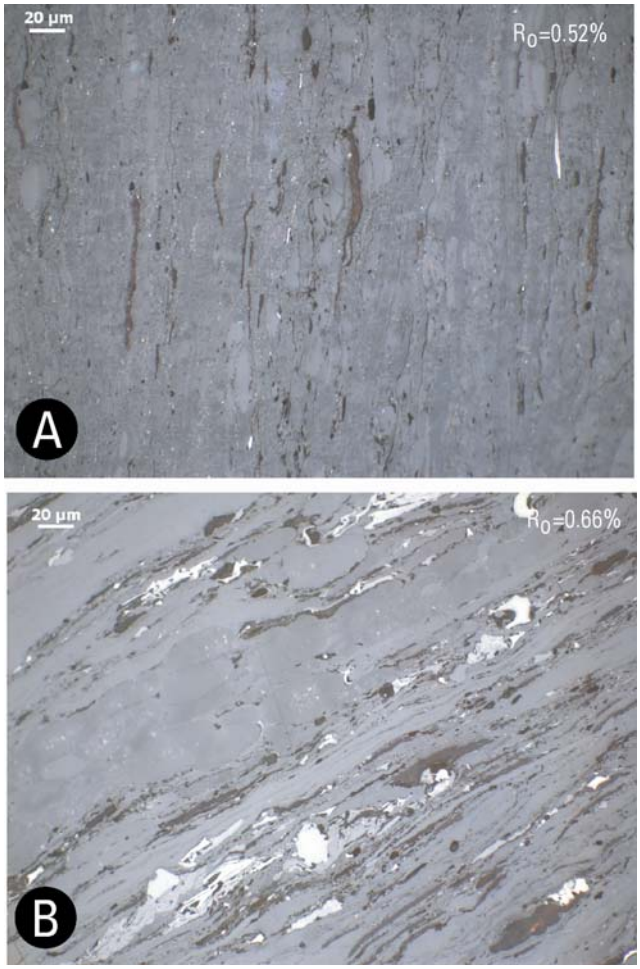

Figure 12. A. Well-developed trimaceral coal facies; Harpersville Formation coal, Cisco Group. Coal core from Little Bull Creek mine, Coleman County. Sample Identification in Table 1: C. Bryan No. 8, Sample 5. B. Well-developed trimaceral coal facies; Thurber Coal, Mingus Formation, Strawn Group. Coal core from the Johnson mine, Erath County. Sample Identification in Table 1: TBEG 384. See Figure 1 and Table 1 for sample locations.

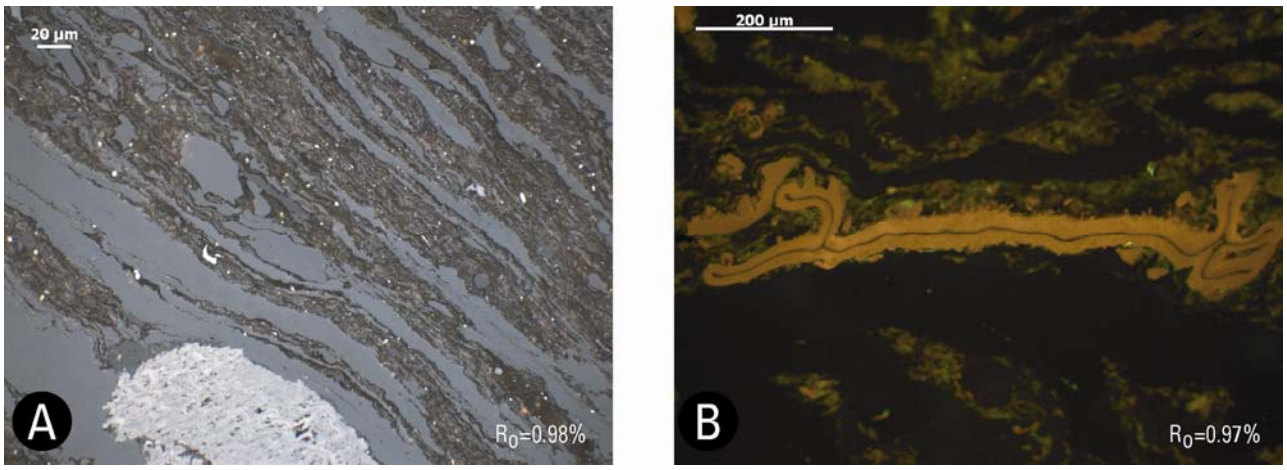

Figure 13. A. Vitrinite bands in coaly shale, lower Atoka Group. EP Tarrant WB-3 5,400 ft, Wise County. B. Ornamented megaspore, lower Atoka Group. Oxy Tarrant A-4 5,540 ft, Jack County. See Figure 1 and Table 1 for sample locations.

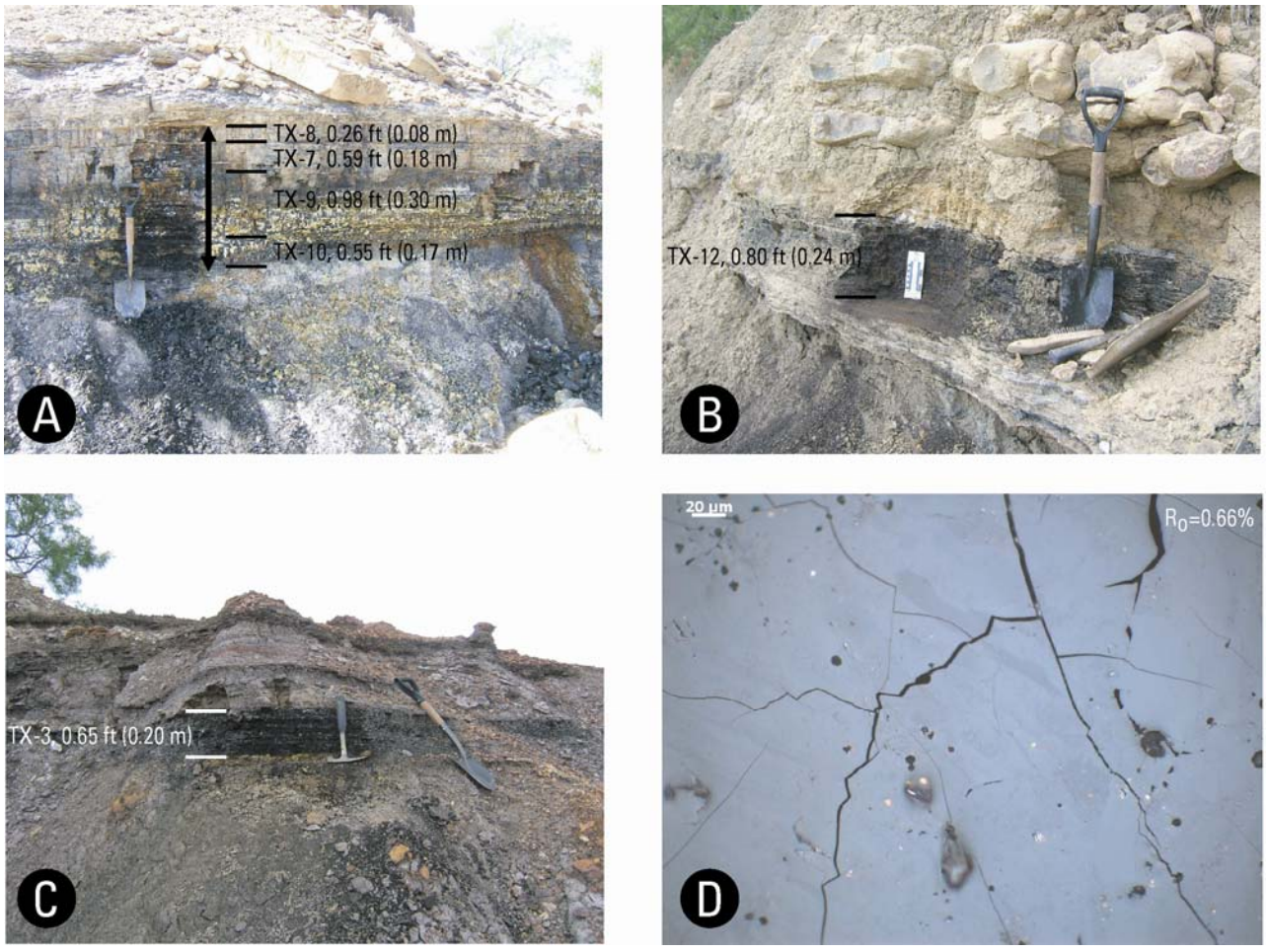

Figure 14. A. Cisco Group coal south of Loving, Young County, 2.4 ft (0.73 m) thick; samples TX-7 to TX-10. Shovel handle is 2.2 ft (0.67 m) long. Divisions across coal bed show multiple benches of channel sample and sample identification. B. Newcastle Coal (Cisco Group) west of Breckenridge, Stephens County, 0.8 ft (0.24 m) thick, sample TX-12. Scale is 0.5 ft (0.15 m) long. Sample collected as single bench channel. C. Cisco Group coal, Henderson Ranch, Jack County, 0.65 ft (0.20 m) thick. Hammer handle is 0.8 ft (0.24 m) long. Sample collected as single bench channel TX-3; samples TX-1 and TX-2 were collected as single bench channel samples across same coal bed at nearby outcrops. D. Vitrinite with desiccation cracks and secondary surface mineralization; Cisco Group coal, sample TX-6, Young County. See Figure 1 and Table 1 for all sample locations.

surface oxidation and consequent plasticity loss. Sampled coal beds range 0.3 to 2.4 ft (0.10-0.75 m) in thickness and contain high mineral matter content (7-27 vol.% whole coal; determined by quantitative point count).

A select number of samples were analyzed by Rock-Eval pyrolysis and for total organic carbon (TOC) (table 3). T_{max} values correlate well with measured R_o (fig. 15) and confirm that analyzed samples are in the oil window (approximately 0.6-1.2 % R_o). Gas-prone Cisco Group coal and coaly shales plot on Type III organic matter maturation pathways (fig. 16). Surface weathering of Cisco coal outcrop samples may be evidenced in high oxygen index (OI) values (fig. 17). Samples contain 28-67 wt.% TOC; lower Atoka Group samples contain the highest pyrolysis yields and could be considered good potential source rocks (fig. 18).

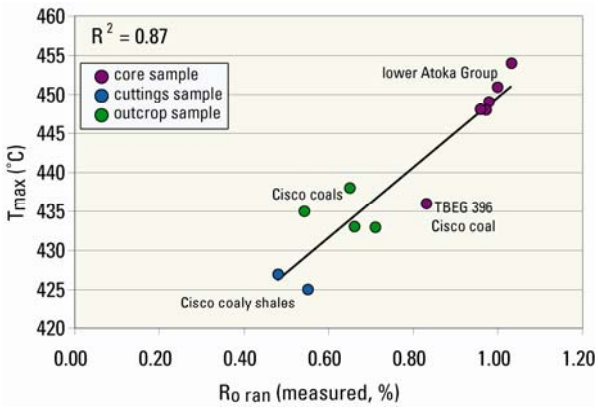

Figure 15. T_{max} (°C) vs. measured R_o (%) for selected cuttings, core, and outcrop samples.

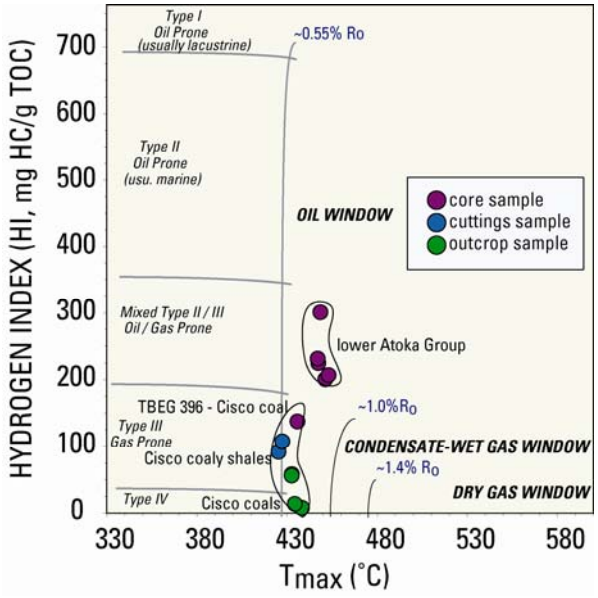

Figure 16. Hydrogen Index (S2*100/TOC) vs. T_{max} (°C) for selected cuttings, core, and outcrop samples.

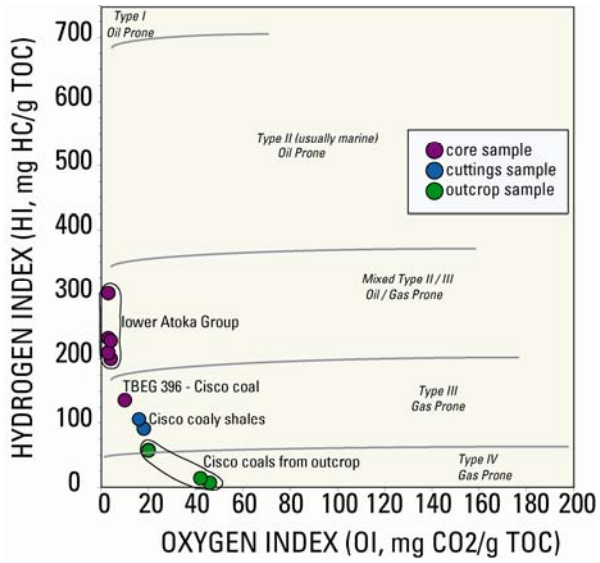

Figure 17. Hydrogen Index vs. Oxygen Index (S3*100/TOC) for selected cuttings, core, and outcrop samples.

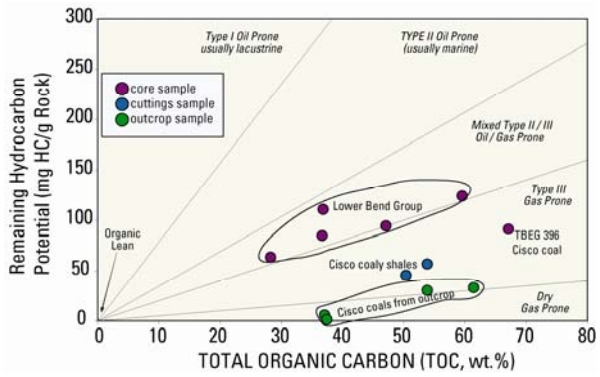

Figure 18. Remaining hydrocarbon potential (S2; mg hydrocarbon per gram of rock) vs. TOC (wt.%).

Discussion

Successful production of coalbed methane from the Pennsylvanian-Permian strata of the Kerr Basin in south Texas has warranted a closer examination of equivalent strata in the tectonically-related basins of other parts of Texas (Barker and others, 2003), including the north-central Texas Fort Worth basin and the Eastern Shelf of the Midland basin examined herein (fig. 1). Pennsylvanian coals of the Eastern Shelf and of the Fort Worth basin are of appropriate rank to support thermogenic coalbed gas generation. However, coals are thin (<1-3 ft; <0.3-1.0 m), high in ash yield (generally >15 wt.%, dry basis), and laterally discontinuous (Evans, 1974), whereas successful production in the Kerr basin is from a laterally extensive 25 ft (7.6 m) thick coal zone with over 14 ft (4.3 m) of net coal (Barker and others, 2003). Moreover, facies become more marine to the northwest (downdip) from the outcrop belt in north-central Texas according to descriptions of

lithostratigraphy and depositional environments derived from log-based facies studies (Galloway and Brown, 1972; Brown and others, 1973). However, despite the modest thickness and relatively poor quality (high ash yield) of coal beds in the study area, economic coalbed gas potential may be present as evidenced by the successful development of similarly thin, poor-quality coal beds in the Cherokee basin of Oklahoma and Kansas (Tedesco, 2007).

Based on the currently available data, the best avenue for future investigation of coalbed methane potential on the Eastern Shelf may be to focus on examination of the Thurber Coal (Strawn Group) in the areas of historical coal mining (1890s-1920s) in southern Palo Pinto and northern Erath Counties. Mining records indicate lateral persistence of the 3 ft (1 m) thick bed (Evans, 1974) and log-based studies indicate the subsurface presence of the Thurber coal across eight or more counties in north-central Texas (Mapel, 1967; Brown and others, 1973). Planned future USGS-TBEG collaboration will include a focus on the characterization of Strawn coal cuttings from coal company wells.

Conclusions

Ongoing thermal maturation studies conducted jointly by the TBEG and the USGS on the Pennsylvanian strata of north-central Texas have included to-date analysis of approximately 120 samples for reflectance of vitrinite. R_o data range from 0.4-1.0 %, indicating coal rank from subbituminous C to high volatile A bituminous, consistent with the potential for early thermogenic gas generation in higher maturity samples.

Acknowledgements

Susan Tewalt and Peter Warwick of USGS helped with project coordination. Christopher Burr and Martina Hopkins of USGS helped with sample preparation. Reviews by Peter Warwick and MaryAnn Malinconico of USGS improved the quality and clarity of this report. Samples from the C. Bryan No. 8 core of the Little Bull Creek coal mine were donated by Susan Tewalt.

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Table 1. Vitrinite reflectance of coal and coaly shale samples from north-central Texas. See Figure 1 for sample locations. See bottom of table for explanation of table abbreviations.

Sample ID (depth in ft)	County	Group	Ro	s.d.	n	Sample Type	Latitude	Longitude
Baldwin No. 1 280-290'	Young	Cisco	0.51	0.05	11	cuttings	32.96937	-98.74462
*Baldwin No. 1 560-570'	Young	Canyon	0.61	0.06	27	cuttings	32.96937	-98.74462
Baldwin No. 1 800-810'	Young	Canyon	0.62	0.05	30	cuttings	32.96937	-98.74462
Baldwin No. 1 810-820'	Young	Canyon	0.55	0.05	25	cuttings	32.96937	-98.74462
Baldwin No. 1 980-990'	Young	Canyon	*0.70*	0.01	4	cuttings	32.96937	-98.74462
*Baldwin No. 1 1460-1470'	Young	Strawn	0.63	0.05	19	cuttings	32.96937	-98.74462
Baldwin No. 1 2750-2760'	Young	Strawn	*0.64*	0.07	5	cuttings	32.96937	-98.74462
Baldwin No. 1 2760-2770'	Young	Strawn	*0.72*	0.03	3	cuttings	32.96937	-98.74462
Baldwin No. 1 2770-2780'	Young	Strawn	*0.71*	0.04	8	cuttings	32.96937	-98.74462
Morrison No.1 240-250'	Young	Cisco	0.55	0.03	50	cuttings	33.34827	-98.55591
*Morrison No.1 310-320'	Young	Cisco	0.48	0.06	65	cuttings	33.34827	-98.55591
*Morrison No.1 1350-1360'	Young	Canyon	0.52	0.05	10	cuttings	33.34827	-98.55591
Morrison No.1 1650-1660'	Young	Canyon	0.73	0.08	10	cuttings	33.34827	-98.55591
Morrison No.1 1730-1740'	Young	Canyon	0.81	0.03	10	cuttings	33.34827	-98.55591
*Morrison No.1 2030-2040'	Young	Canyon	*0.84*	0.0	1	cuttings	33.34827	-98.55591
Furr No. 1 100-110'	Young	Cisco	*0.62*	0.0	1	cuttings	33.26032	-98.87524
Furr No. 1 110-120'	Young	Cisco	*0.55*	0.07	8	cuttings	33.26032	-98.87524
Furr No. 1 380-390'	Young	Cisco	n.v.	-	-	cuttings	33.26032	-98.87524
Furr No. 1 440-450'	Young	Cisco	0.55	0.07	22	cuttings	33.26032	-98.87524
Furr No. 1 530-540'	Young	Cisco	0.58	0.08	25	cuttings	33.26032	-98.87524
Furr No. 1 540-550'	Young	Cisco	0.61	0.04	15	cuttings	33.26032	-98.87524
Furr No. 1 610-620'	Young	Cisco	0.56	0.04	35	cuttings	33.26032	-98.87524
Furr No. 1 730-740'	Young	Cisco	*0.53*	0.06	4	cuttings	33.26032	-98.87524
Furr No. 1 770-780'	Young	Cisco	*0.49*	0.04	9	cuttings	33.26032	-98.87524
*Furr No. 1 820-830'	Young	Cisco	n.v.	-	-	cuttings	33.26032	-98.87524
Furr No. 1 1650-1660'	Young	Canyon	0.49	0.05	30	cuttings	33.26032	-98.87524
Furr No. 1 1950-1960'	Young	Canyon	0.51	0.04	10	cuttings	33.26032	-98.87524
*Furr No. 1 2160-2170'	Young	Canyon	0.55	0.04	26	cuttings	33.26032	-98.87524
*Thompson No. 1 780-790'	Young	Canyon	0.52	0.06	27	cuttings	33.12688	-98.53619
Thompson No. 1 820-830'	Young	Canyon	*0.86*	0.0	2	cuttings	33.12688	-98.53619
Thompson No. 1 980-990'	Young	Canyon	*0.75*	0.02	2	cuttings	33.12688	-98.53619
Donnell No. 1 30-40'	Young	Cisco	n.v.	-	-	cuttings	33.10896	-98.93902
Donnell No. 1 310-320'	Young	Cisco	0.63	0.05	30	cuttings	33.10896	-98.93902
Donnell No. 1 320-330'	Young	Cisco	0.63	0.04	25	cuttings	33.10896	-98.93902
Donnell No. 1 330-340'	Young	Cisco	0.61	0.05	40	cuttings	33.10896	-98.93902
Donnell No. 1 380-390'	Young	Cisco	0.61	0.04	30	cuttings	33.10896	-98.93902
*Donnell No. 1 390-400'	Young	Cisco	n.v.	-	-	cuttings	33.10896	-98.93902
Donnell No. 1 410-420'	Young	Cisco	0.62	0.06	28	cuttings	33.10896	-98.93902
Donnell No. 1 420-430'	Young	Cisco	0.58	0.07	15	cuttings	33.10896	-98.93902
Donnell No. 1 440-450'	Young	Cisco	0.62	0.07	50	cuttings	33.10896	-98.93902
Donnell No. 1 450-460'	Young	Cisco	0.77	0.05	50	cuttings	33.10896	-98.93902
Donnell No. 1 480-490'	Young	Cisco	0.60	0.06	13	cuttings	33.10896	-98.93902
Donnell No. 1 790-800'	Young	Cisco	*0.70*	0.05	5	cuttings	33.10896	-98.93902
Donnell No. 1 800-810'	Young	Cisco	*0.69*	0.05	6	cuttings	33.10896	-98.93902
Donnell No. 1 810-820'	Young	Cisco	*0.70*	0.05	4	cuttings	33.10896	-98.93902
Donnell No. 1 1130-1140'	Young	Cisco	0.70	0.04	20	cuttings	33.10896	-98.93902
Donnell No. 1 1240-1250'	Young	Cisco	n.v.	-	-	cuttings	33.10896	-98.93902
Donnell No. 1 1250-1260'	Young	Cisco	0.66	0.07	12	cuttings	33.10896	-98.93902
Donnell No. 1 1340-1350'	Young	Canyon	n.v.	-	-	cuttings	33.10896	-98.93902
Donnell No. 1 1620-1630'	Young	Canyon	*0.78*	0.06	3	cuttings	33.10896	-98.93902
*Donnell No. 1 1630-1640'	Young	Canyon	0.53	0.08	10	cuttings	33.10896	-98.93902
Donnell No. 1 1750-1760'	Young	Canyon	0.78	0.06	16	cuttings	33.10896	-98.93902
Donnell No. 1 1930-1940'	Young	Canyon	0.88	0.06	20	cuttings	33.10896	-98.93902
Donnell No. 1 1940-1950'	Young	Canyon	*0.83*	0.05	2	cuttings	33.10896	-98.93902

Table 1 continued.

Sample ID (depth in ft)	County	Group	Ro	s.d.	n	Sample Type	Latitude	Longitude
Donnell No. 1 2180-2190'	Young	Strawn	0.71	0.12	15	cuttings	33.10896	-98.93902
Donnell No. 1 2350-2360'	Young	Strawn	0.86	0.06	30	cuttings	33.10896	-98.93902
Donnell No. 1 2360-2370'	Young	Strawn	*0.79*	0.0	1	cuttings	33.10896	-98.93902
Rasmussen No. 1 940-950'	Archer	Cisco	*0.67*	0.0	1	cuttings	33.72129	-98.82598
Rasmussen No. 1 1210-1220'	Archer	Cisco	n.v.	-	-	cuttings	33.72129	-98.82598
Rasmussen No. 1 1290-1300'	Archer	Cisco	n.v.	-	-	cuttings	33.72129	-98.82598
Rasmussen No. 1 1500-1510'	Archer	Cisco	*0.58*	0.0	2	cuttings	33.72129	-98.82598
Rasmussen No. 1 1700-1710'	Archer	Cisco	*0.52*	0.0	1	cuttings	33.72129	-98.82598
Scott No. 1 610-620'	Archer	Cisco	0.48	0.08	50	cuttings	33.45155	-98.77245
Scott No. 1 630-640'	Archer	Cisco	0.46	0.09	30	cuttings	33.45155	-98.77245
Scott No. 1 690-700'	Archer	Cisco	n.v.	-	-	cuttings	33.45155	-98.77245
Scott No. 1 780-790'	Archer	Cisco	*0.45*	0.0	1	cuttings	33.45155	-98.77245
Scott No. 1 790-800'	Archer	Cisco	0.54	0.04	50	cuttings	33.45155	-98.77245
Scott No. 1 810-820'	Archer	Cisco	0.57	0.06	50	cuttings	33.45155	-98.77245
Scott No. 1 850-860'	Archer	Cisco	n.a.	-	-	cuttings	33.45155	-98.77245
Scott No. 1 1610-1620'	Archer	Cisco	0.59	0.07	50	cuttings	33.45155	-98.77245
Scott No. 1 1850-1860'	Archer	Canyon	0.60	0.06	41	cuttings	33.45155	-98.77245
Scott No. 1 1870-1880'	Archer	Canyon	0.59	0.06	12	cuttings	33.45155	-98.77245
Coleman No. 1 580-590'	Archer	Cisco	0.39	0.05	22	cuttings	33.73802	-98.49150
Coleman No. 1 600-610'	Archer	Cisco	0.36	0.06	23	cuttings	33.73802	-98.49150
Coleman No. 1 830-840'	Archer	Cisco	0.51	0.10	40	cuttings	33.73802	-98.49150
Coleman No. 1 910-920'	Archer	Cisco	0.54	0.10	28	cuttings	33.73802	-98.49150
Coleman No. 1 1010-1020'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1040-1050'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1050-1060'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1090-1100'	Archer	Cisco	*0.46*	0	1	cuttings	33.73802	-98.49150
Coleman No. 1 1150-1160'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1280-1290'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1390-1400'	Archer	Cisco	0.46	0.06	40	cuttings	33.73802	-98.49150
Coleman No. 1 1500-1510'	Archer	Cisco	n.v.	-	-	cuttings	33.73802	-98.49150
Coleman No. 1 1590-1600'	Archer	Cisco	0.56	0.04	12	cuttings	33.73802	-98.49150
Coleman No. 1 1600-1610'	Archer	Cisco	0.61	0.08	23	cuttings	33.73802	-98.49150
Coleman No. 1 1630-1640'	Archer	Cisco	0.54	0.07	50	cuttings	33.73802	-98.49150
Coleman No. 1 1710-1720'	Archer	Cisco	0.53	0.07	34	cuttings	33.73802	-98.49150
Coleman No. 1 1780-1790'	Archer	Cisco	0.61	0.05	17	cuttings	33.73802	-98.49150
Coleman No. 1 1810-1820'	Archer	Cisco	0.64	0.07	21	cuttings	33.73802	-98.49150
Coleman No. 1 1840-1850'	Archer	Cisco	0.60	0.11	35	cuttings	33.73802	-98.49150
Schrieber No.1 580-590'	Archer	Cisco	0.46	0.05	50	cuttings	33.53796	-98.44995
Schrieber No.1 630-640'	Archer	Cisco	0.42	0.09	60	cuttings	33.53796	-98.44995
Schrieber No.1 870-880'	Archer	Cisco	0.42	0.09	13	cuttings	33.53796	-98.44995
Schrieber No.1 930-940'	Archer	Cisco	0.45	0.08	12	cuttings	33.53796	-98.44995
Schrieber No.1 1070-1080'	Archer	Cisco	n.v.	-	-	cuttings	33.53796	-98.44995
Schrieber No.1 1110-1120'	Archer	Cisco	0.50	0.06	17	cuttings	33.53796	-98.44995
Schrieber No.1 1440-1450'	Archer	Cisco	0.48	0.05	41	cuttings	33.53796	-98.44995
Schrieber No.1 1490-1500'	Archer	Cisco	0.42	0.08	50	cuttings	33.53796	-98.44995
Schrieber No.1 1540-1550'	Archer	Cisco	0.44	0.08	38	cuttings	33.53796	-98.44995
Schrieber No.1 1710-1720'	Archer	Canyon	0.53	0.06	36	cuttings	33.53796	-98.44995
Schrieber No.1 1770-1780'	Archer	Canyon	0.53	0.08	11	cuttings	33.53796	-98.44995
Schrieber No.1 1780-1790'	Archer	Canyon	0.56	0.08	20	cuttings	33.53796	-98.44995
Peyson No. 1 680-690'	Archer	Cisco	0.49	0.07	50	cuttings	33.55365	-98.49251
Peyson No. 1 870-880'	Archer	Cisco	n.v.	-	-	cuttings	33.55365	-98.49251
Peyson No. 1 900-910'	Archer	Cisco	0.49	0.05	29	cuttings	33.55365	-98.49251
Peyson No. 1 1170-1180'	Archer	Cisco	*0.67*	0.13	7	cuttings	33.55365	-98.49251

Table 1 continued.

Sample ID (depth in ft)	County	Group	Ro	s.d.	n	Sample Type	Latitude	Longitude
Peyson No. 1 1180-1190'	Archer	Cisco	n.v.	-	-	cuttings	33.55365	-98.49251
Peyson No. 1 1390-1400'	Archer	Cisco	0.67	0.08	50	cuttings	33.55365	-98.49251
Peyson No. 1 1420-1430'	Archer	Cisco	0.63	0.06	10	cuttings	33.55365	-98.49251
Peyson No. 1 1580-1590'	Archer	Cisco	0.53	0.06	27	cuttings	33.55365	-98.49251
Peyson No. 1 1760-1770'	Archer	Canyon	*0.51*	0.02	4	cuttings	33.55365	-98.49251
Peyson No. 1 3570-3580'	Archer	Strawn	*1.01*	0.07	11	cuttings	33.55365	-98.49251
Peyson No. 1 3850-3860'	Archer	Strawn	*0.77*	0.08	8	cuttings	33.55365	-98.49251
Oxy Tarrant No. A-4 5541.0'	Jack	lower Atoka	0.97	0.05	50	core	33.22028	-97.92909
Oxy Tarrant No. A-4 5541.3'	Jack	lower Atoka	1.00	0.03	50	core	33.22028	-97.92909
Oxy Tarrant No. A-4 5541.7'	Jack	lower Atoka	0.96	0.07	50	core	33.22028	-97.92909
EP Operating Tarrant No. WB-3 5402.0'	Wise	lower Atoka	0.97	0.06	50	core	33.20265	-97.87855
EP Operating Tarrant No. WB-3 5402.3'	Wise	lower Atoka	1.00	0.04	50	core	33.20265	-97.87855
EP Opertaing Tarrant No. WB-3 5403.8'	Wise	lower Atoka	1.03	0.03	50	core	33.20265	-97.87855
EP Operating Tarrant No. WB-3 5404.2'	Wise	lower Atoka	0.98	0.05	50	core	33.20265	-97.87855
TBEG 396 (depth unknown)	Stephens	Cisco	0.83	0.04	100	core	32.50000	-98.40925
TBEG 393 (depth unknown)	Montague	Cisco	0.66	0.04	100	core	32.89583	-98.89167
TBEG 384 (depth unknown)	Erath	Strawn	0.66	0.04	50	core	33.53333	-97.92778
C. Byan No. 8, Sample 5 (depth unknown)	Coleman	Cisco	0.52	0.06	15	core	31.49167	-99.40833
C. Byan No. 8, Sample 4A (depth unknown)	Coleman	Cisco	0.52	0.04	30	core	31.49167	-99.40833
TX-1	Jack	Cisco	0.63	0.05	100	outcrop - channel, single bench	33.44626	-98.22089
TX-2	Jack	Cisco	0.65	0.05	100	outcrop - channel, single bench	33.44626	-98.22089
TX-3	Jack	Cisco	0.66	0.04	100	outcrop - channel, single bench	33.44626	-98.22089
TX-4	Jack	Cisco	0.62	0.07	37	outcrop - channel, single bench	33.44626	-98.36130
TX-5	Young	Cisco	0.58	0.06	100	outcrop - channel, single bench	33.32615	-98.44349
TX-6	Young	Cisco	0.66	0.07	100	outcrop - channel, single bench	33.32615	-98.44349
TX-7	Young	Cisco	0.68	0.07	100	outcrop - channel, multiple bench	33.24486	-98.51884
TX-8	Young	Cisco	0.65	0.06	100	outcrop - channel, multiple bench	33.24486	-98.51884
TX-9	Young	Cisco	0.71	0.06	100	outcrop - channel, multiple bench	33.24486	-98.51884
TX-10	Young	Cisco	0.60	0.08	100	outcrop - channel, multiple bench	33.24486	-98.51884
TX-11	Young	Cisco	0.64	0.07	100	outcrop - channel, single bench	33.24486	-98.51884
TX-12	Stephens	Cisco	0.54	0.06	100	outcrop - channel, single bench	32.75575	-98.92123
TX-13	Eastland	Cisco	0.88	0.09	100	outcrop - channel, single bench	32.15374	-98.98459

Values in italic are considered suspect due to low number of measurements, oxidation/tarnish, or proximity to high-reflecting pyrite. s.d. = standard deviation, n.v. = no vitrinite, n.a. = not analyzed. Samples TX-7 through TX-10 are multiple benches of a channel sample (see fig. 14A); all other outcrop samples (TX-1 through TX-6 and TX-11 through TX-13) are single bench channel samples. *Samples analyzed by Humble Geochemical Testing, Inc. (see Appendix 2 and Guevara and others, 2007).

Table 2. Proximate-ultimate analytical data for coal and coaly shale samples from north-central Texas. See Figure 1 for sample locations. All data on an as-received basis except moist, mineral-matter-free calorific value.

Sample ID	ADL (wt.%)	RM (wt.%)	Moisture (wt.%)	EM (wt.%)	Ash (wt.%)	VM (wt.%)	FC (wt.%)	H (wt.%)	C (wt.%)	N (wt.%)	S (wt.%)	O (wt.%)	CV (Btu/lb)	CV m,mmf Btu/lb	ASTM rank	FSI
TX-7	20.47	4.71	24.22	25.17	11.63	27.56	36.59	2.75	45.31	1.01	0.65	14.43	7,202	8,233	Lignite	0
TX-8	20.91	6.14	25.77	26.36	10.11	29.12	35.00	2.78	44.53	1.05	0.81	14.95	7,093	7,957	Lignite	0
TX-9	24.42	4.45	27.78	25.28	5.54	26.59	40.09	2.99	49.05	1.09	0.65	12.90	8,029	8,538	SubC	0
TX-10	23.54	3.37	26.12	20.22	21.74	20.65	31.49	2.79	39.35	0.80	0.60	8.60	6,675	8,721	SubC	0
TX-11	24.45	6.72	29.53	28.45	12.09	26.82	31.56	2.25	38.96	0.82	1.10	15.25	6,071	6,968	Lignite	0
TX-12	17.43	11.20	26.68	29.17	25.59	35.36	12.37	1.78	30.05	0.70	4.06	11.14	4,621	6,300	Lignite	0

ADL = air-dried loss, wt.% = weight percent, RM = remnant moisture, EM = equilibrium moisture, VM = volatile matter, FC = fixed carbon, CV = calorific value, m,mmf = moist, mineral-matter-free, FSI = free swelling index, Btu/lb = British thermal units per pound, SubC = subbituminous C.

Table 3. Rock-Eval and Leco TOC data for coals and coaly shales from north-central Texas. Refer to Figure 1 for sample locations.

Sample ID	Sample Type	TOC	S1	S2	S3	T_{max} (°C)	R_o Calc. (%)	R_o Meas. (%)	HI	OI	PI
TX-2	outcrop	37.29	0.22	2.78	17.29	438	0.72	0.65	7	46	0.07
TX-6	outcrop	53.75	0.39	31.44	10.58	433	0.63	0.66	58	20	0.01
TX-9	outcrop	61.50	0.35	35.35	12.32	433	0.63	0.71	57	20	0.01
TX-12	outcrop	37.13	0.13	5.11	15.47	435	0.67	0.54	14	42	0.02
Morrison No. 1 240-250'	cuttings	50.28	2.66	45.71	9.07	425	0.49	0.55	91	18	0.05
Morrison No. 1 310-320'	cuttings	53.71	1.90	57.04	8.79	427	0.53	0.48	106	16	0.03
EP Tarrant WB-3 5402.3'	core	46.93	13.15	94.05	1.74	451	0.96	1.00	200	4	0.12
EP Tarrant WB-3 5403.8'	core	59.59	14.56	124.59	1.81	454	1.01	1.03	209	3	0.10
EP Tarrant WB-3 5404.2'	core	36.83	11.85	111.01	1.26	449	0.92	0.98	301	3	0.10
Oxy Tarrant A-4 5541.0'	core	36.72	6.79	84.73	1.21	448	0.90	0.97	231	3	0.07
Oxy Tarrant A-4 5541.7'	core	28.20	4.81	64.13	0.99	448	0.90	0.96	227	4	0.07
TBEG 396	core	67.13	3.15	91.47	6.61	436	0.69	0.83	136	10	0.03

TOC = wt.% total organic carbon, S1, S2 = mg hydrocarbons, S3 = mg CO_2, HI = hydrogen Index (S2*100/TOC), OI = Oxygen Index (S3*100/TOC), PI = Production Index (S1/(S1+S2)). R_o Calc. (%) = 0.0180*T_{max} - 7.16 (Humble Geochemical Testing, Inc.), R_o Meas. (%) from USGS Organic Petrology Laboratory (Table 1).

Appendix 1: U.S. GEOLOGICAL SURVEY ORGANIC PETROLOGY LABORATORY REPORTS

Report Information

Results of petrographic analyses of coal and rock samples in the U.S. Geological Survey Organic Petrology Laboratory usually are reported in three parts; 1) a summary table (Table 1 of this report), 2) a vitrinite reflectance report (contained in this Appendix), and 3) a petrographic analysis report (not conducted as part of this study).

The vitrinite reflectance report (this Appendix) includes five components; 1) a header with basic sample information including sample submitter, submission date, project name, sample identification, sample type, date of analysis, and the name of the analyst, 2) results, including the number of vitrinite reflectance measurements, the type of vitrinite maceral analyzed, the mean maximum or mean random reflectance value, the standard deviation of the mean reflectance value, and the sample rank, 3) data, which contain all of the measured reflectance values in percent to three decimal places, the maximum and minimum measured values, and the number of V-types (reflectance ranges of 0.1 percent), 4) a histogram of the reflectance data, and 5) a comment section which allows the analyst to record any pertinent details about the petrographic character of the sample.

Sample Preparation and Analysis

Samples submitted to the U.S. Geological Survey Organic Petrology Laboratory usually are prepared for analysis according to the American Society for Testing and Materials (ASTM) Standard Practice D 2797: Preparing Coal Samples for Microscopical Analysis by Reflected Light (ASTM, 2007), or the International Standards Organization (ISO) standard 7404-2: Methods for the petrographic analysis of coal-Part 2: Method of preparing coal samples (ISO, 1985).

Samples are ground to pass a 850-μm (No. 20 mesh) or 1000-μm (No. 16 mesh) sieve in most cases (as-sampled drill cuttings sometimes are mounted for reflectance analysis without grinding). The particulate sample is mounted in a 1-inch mold in a heat-setting thermoplastic powder or epoxy resin medium. Two mounts are made for each sample. Examination surfaces are ground and polished prior to overnight desiccation.

Vitrinite reflectance analyses are conducted according to the ASTM Standard Test Method D 2798: Microscopical Determination of the Vitrinite Reflectance of Coal (ASTM, 2007). One hundred measurements of the maximum or random reflectance of individual vitrinite grains in the sample are performed. Fifty measurements are made on each sample mount. In some cases, as when drill cuttings samples are analyzed, there is not sufficient sample present to obtain 100 measurements.

Petrographic analyses are conducted according to the ASTM Standard Test Method D 2799: Microscopical Determination of the Maceral Composition of Coal (ASTM, 2007), or ISO standard 7404-3: Methods for the petrographic analysis of bituminous coal and anthracite-Part 3: Method of determining maceral group composition (ISO, 1994). In some cases, a modification of the ASTM D 2799 test method is included to incorporate examination with fluorescence microscopy, primarily for low-rank samples (lignite-subbituminous). For quantitative petrographic analysis, 500 identifications are performed per sample according to the ISO 7404-3 standard and 1000 identifications are performed per sample according to the ASTM D 2799 standard. When the fluorescence microscopy modification of ASTM D 2799 is incorporated into the analysis, 2000 identifications are performed per sample – 1000 under tungsten halogen illumination and 1000 under xenon gas discharge (or other fluorescence source) illumination. Maceral nomenclature for huminite, vitrinite, and inertinite groups is according to the classification schemes formulated by members of the International Committee for Coal and Organic Petrology (ICCP), and presented in ICCP (1998), ICCP (2001), and Sýkorová and others (2005). Maceral nomenclature for the liptinite group is according to Taylor and others (1998). Mineral matter content of the sample is calculated according to the Parr Formula (ASTM, 2007) when ash yield and other pertinent data are available, or is determined by petrographic point count.

Data Quality

The U.S. Geological Survey Organic Petrology Laboratory participates in a quarterly round robin inter-laboratory exercise hosted by a commercial laboratory (CoalTech Petrographic Associates, Inc.). Results of the exercise are used to evaluate the precision and bias of our analytical methods, to develop proficiency in analyses of different sample types, to correct deficiencies in

analytical techniques, and to develop evidence of the repeatability and reproducibility of analytical methods. In addition, the U.S. Geological Survey Organic Petrology Laboratory maintains accreditations in methods of coal and dispersed organic matter petrographic analysis from the International Committee for Coal and Organic Petrology. Accreditation information, certificate number, and expiration date are given in the footer material of individual sample reports.

References

ASTM, 2007, Annual book of ASTM standards: Petroleum products, lubricants, and fossil fuels; Gaseous fuels; coal and coke, sec. 5, v. 5.06: ASTM International, West Conshohocken, PA, 711 p.

ICCP, 1998, The new vitrinite classification (ICCP System 1994): Fuel, v. 77, p. 349-358.

ICCP, 2001, The new inertinite classification (ICCP System 1994): Fuel, v. 80, p. 459-471.

ISO, 1985, Methods for the petrographic analysis of bituminous coal and anthracite-Part 2: Method of preparing coal samples: International Organization for Standardization Standard 7404-2, 8 p.

ISO, 1994, Methods for the petrographic analysis of bituminous coal and anthracite-Part 3: Method of determining maceral group composition: International Organization for Standardization Standard 7404-3, 6 p.

Sýkorová, I., Pickel, W., Christanis, K., Wolf, M., Taylor, G.H., and Flores, D., 2005, Classification of huminite-ICCP System 1994: International Journal of Coal Geology, v. 62, p. 85-106.

Taylor, G.H., Teichmüller, Davis, A., Diessel, C.F.K., Littke, R., and Robert, P., 1998, Organic Petrology: Gerbrüder Borntraeger, Berlin, 704 p.

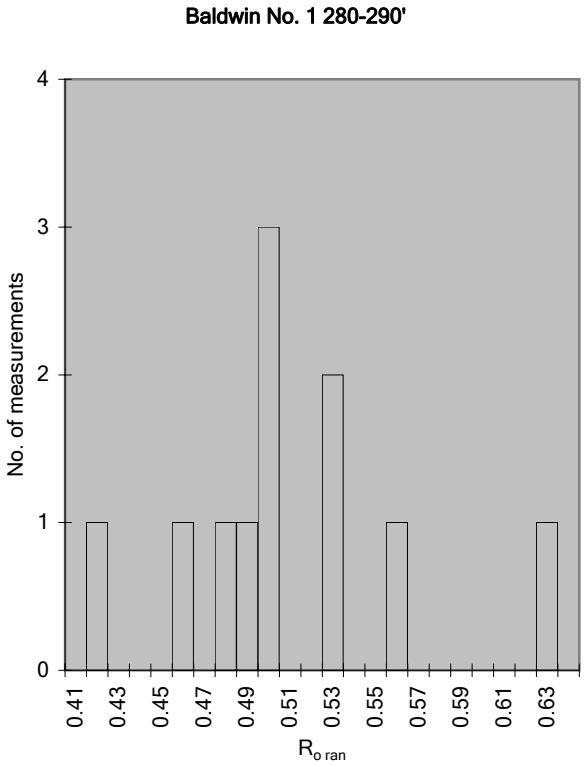
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 280-290'**
Sample Type	cuttings
Date Analyzed:	2/26/2007
Operator:	P. Hackley

RESULTS

# measurements:	11 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.51
s.d.:	0.05



DATA

0.625	0.522
0.558	
0.495	
0.475	
0.456	
0.499	
0.414	
0.499	
0.488	
0.525	

min: 0.414 **max:** 0.625 **V-types:** 3

COMMENT

Sample consists of 10-15 small rock fragments containing dispersed vitrinite fragments.

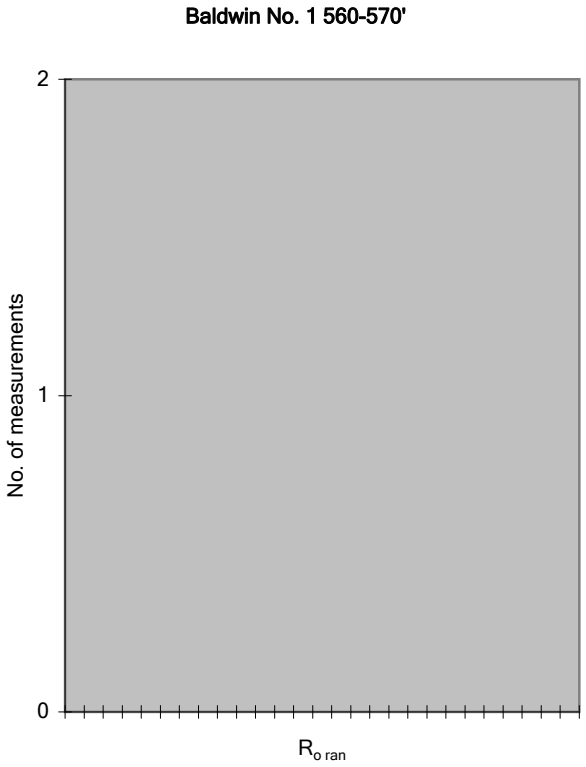
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 560-570'**
Sample Type	cuttings
Date Analyzed:	
Operator:	P. Hackley

RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	



DATA

min: **max:** **V-types:**

COMMENT

Sample originally analyzed by Humble (Appendix 2). Checked and accepted at USGS 3/12/07.

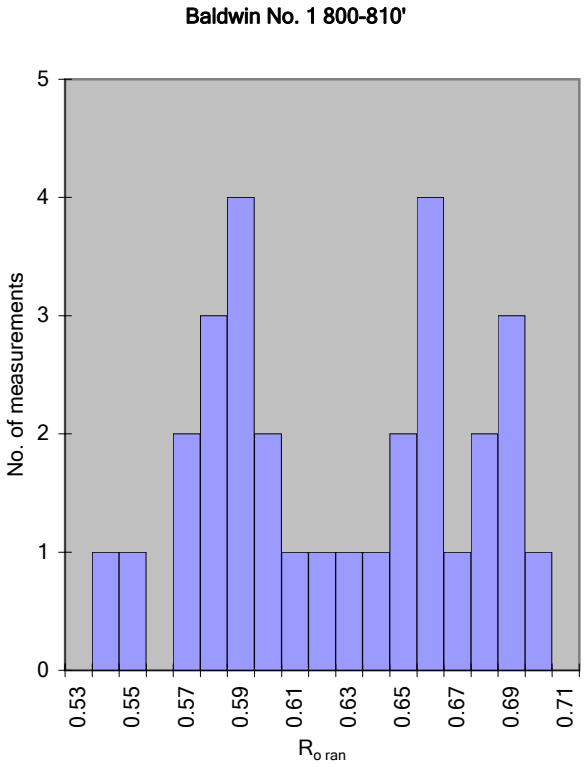
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 800-810'**
Sample Type	cuttings
Date Analyzed:	8/4/2006
Operator:	P. Hackley

RESULTS

# measurements:	30 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.62
s.d.:	0.05



DATA

0.682	0.689	0.584
0.588	0.660	0.627
0.652	0.609	0.641
0.577	0.598	0.578
0.660	0.618	0.684
0.583	0.698	0.533
0.563	0.642	0.674
0.544	0.582	0.573
0.592	0.673	0.568
0.651	0.662	0.637

min: 0.533 **max:** 0.698 **V-types:** 2

COMMENT

Sample contains approximately 10 rock fragments with dispersed indigenous vitrinite and inertinite fragments. Possible bimodal distribution with 1 population at 0.59% and another at 0.66% reflectance but probably not enough data to make the distinction. Mean value of all data is consistent with Humble determinations from higher and lower in well. High polishing relief.

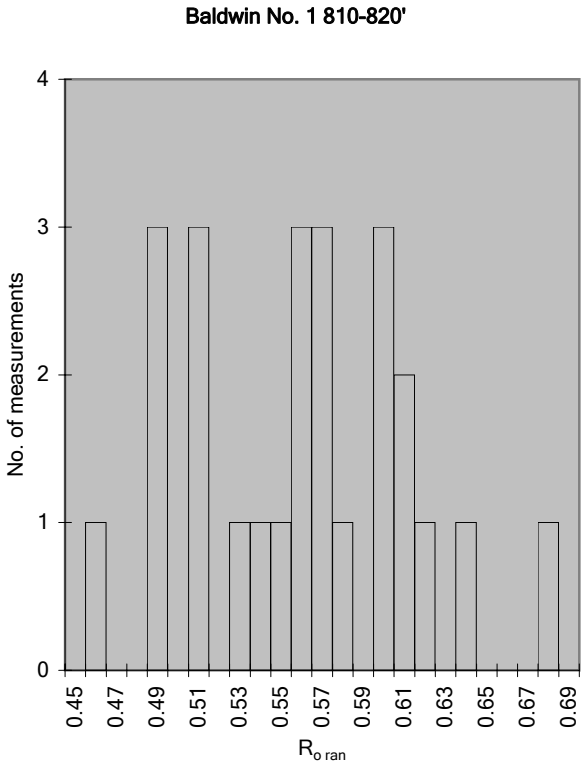
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 810-820'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	25 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.55
s.d.:	0.05



DATA

0.542	0.596	0.615
0.553	0.502	0.679
0.525	0.482	0.459
0.551	0.594	0.603
0.600	0.562	0.506
0.553	0.564	
0.601	0.486	
0.561	0.508	
0.482	0.571	
0.534	0.633	

min: 0.459 **max:** 0.679 **V-types:** 3

COMMENT

Sample contains 25-30 rock fragments consisting primarily of telinite and carbonaceous shale with dispersed vitrinite and inertinite fragments. Measured value is generally consistent with others determined for Baldwin hole.

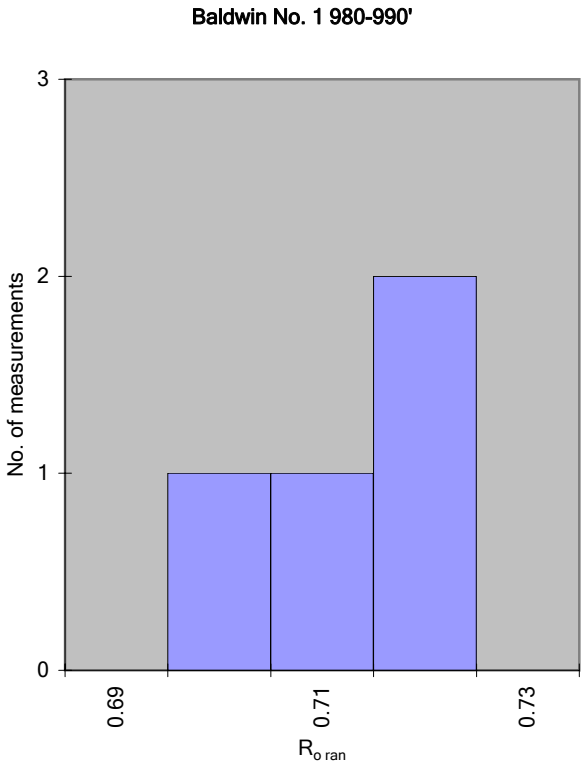
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 980-990'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	4 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.70
s.d.:	0.01



DATA

0.701
0.712
0.692
0.712

min: 0.692 **max:** 0.712 **V-types:** 2

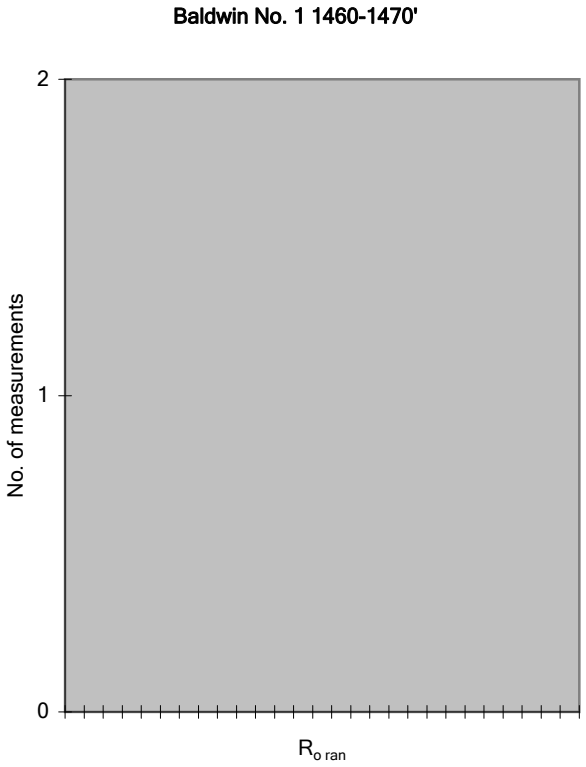
COMMENT

Sample contains four rock fragments which consist of homogenized clean telinite. Measured value may be boosted by coaggulated corpogelinite.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 1460-1470'**
Sample Type	cuttings
Date Analyzed:	
Operator:	P. Hackley



RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	

DATA

min: **max:** **V-types:**

COMMENT

Sample originally analyzed by Humble (Appendix 2). Checked and accepted at USGS 3/13/07.

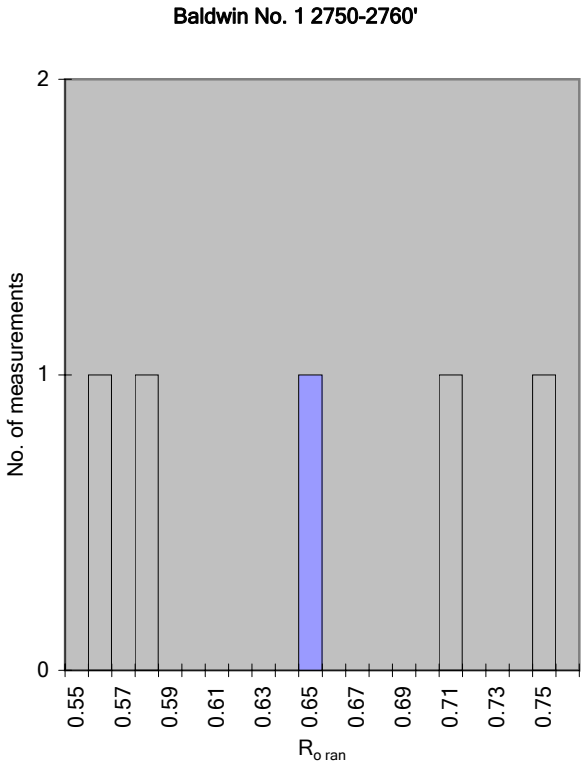
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 2750-2760'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley

RESULTS

# measurements:	5 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.64
s.d.:	0.07



DATA

0.646
0.573
0.703
0.554
0.742

min: 0.554 **max:** 0.742 **V-types:** 3

COMMENT

Sample contains 6 rock fragments, of which one is tarnished and oxidized telovitrinite. Measured value should be considered suspect. Other rock fragments contain dispersed inertinite.

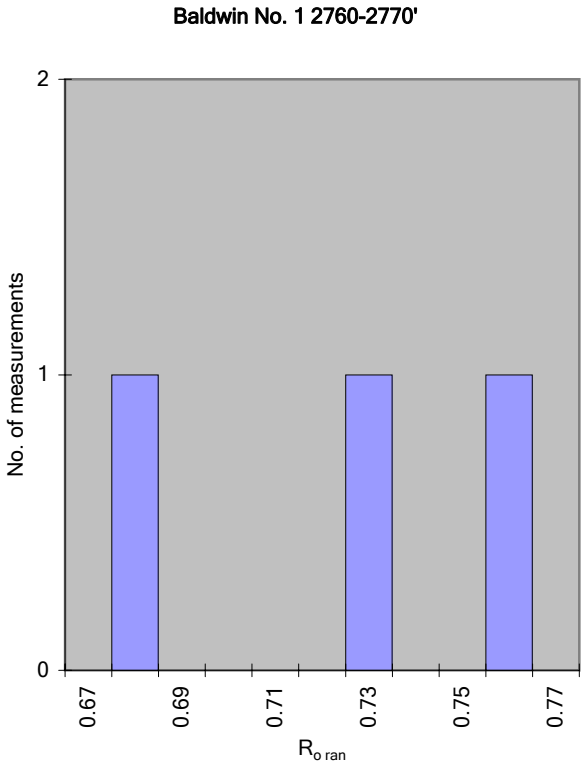
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 2760-2770'**
Sample Type	cuttings
Date Analyzed:	2/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	3 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.72
s.d.:	0.03



DATA

0.674
0.727
0.751

min: 0.674 **max:** 0.751 **V-types:** 2

COMMENT

Sample consists of three small rock fragments.

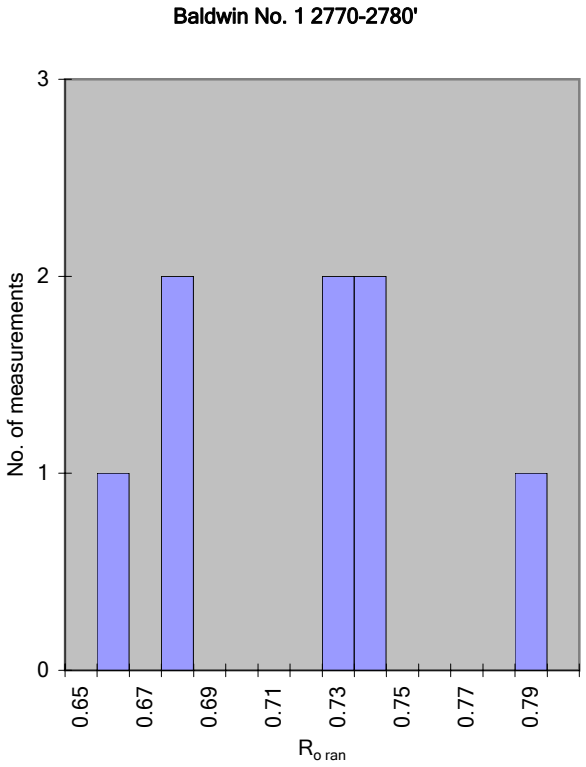
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Baldwin No. 1 2770-2780'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley

RESULTS

# measurements:	8 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.71
s.d.:	0.04



DATA

0.789
0.675
0.731
0.723
0.731
0.728
0.675
0.656

min: 0.656 **max:** 0.789 **V-types:** 2

COMMENT

Sample consists of 6 rock fragments containing pyrite-rich banded telovitrinite. Fragments display various poor-good polish quality and some tarnishing is present.

VITRINITE REFLECTANCE REPORT

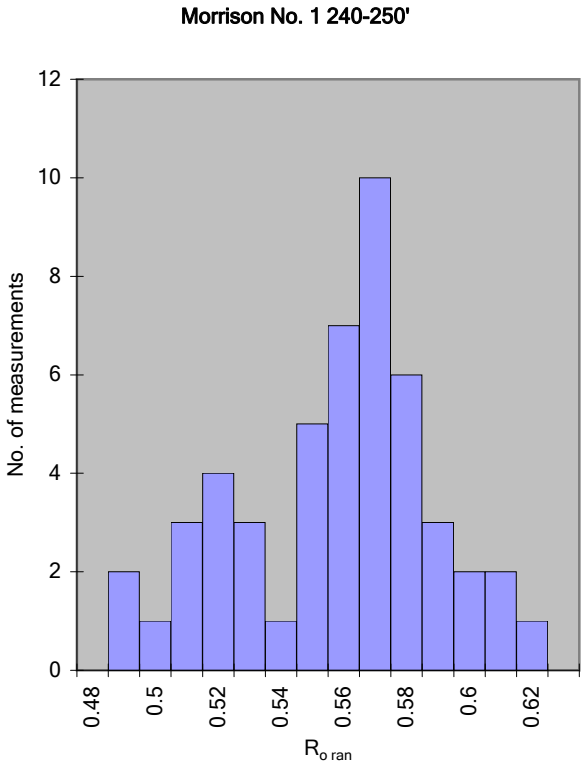
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Morrison No. 1 240-250'**
Sample Type	cuttings
Date Analyzed:	11/14/2006
Operator:	P. Hackley

RESULTS

# measurements:	50
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.55
s.d.:	0.03



DATA

0.530	0.525	0.571	0.567	0.519
0.542	0.546	0.565	0.543	0.508
0.511	0.515	0.593	0.563	0.568
0.504	0.561	0.577	0.581	0.556
0.527	0.488	0.533	0.573	0.559
0.565	0.581	0.541	0.551	0.567
0.554	0.552	0.488	0.493	0.555
0.613	0.570	0.516	0.604	0.577
0.601	0.565	0.509	0.586	0.579
0.562	0.599	0.560	0.574	0.547

min: 0.488 **max:** 0.613 **V-types:** 3

COMMENT

Contains abundant trimaceral coal fragments. Good coal bed intersected at this depth in well. This measurement is considered well-constrained. Fluorescence is relatively faint.

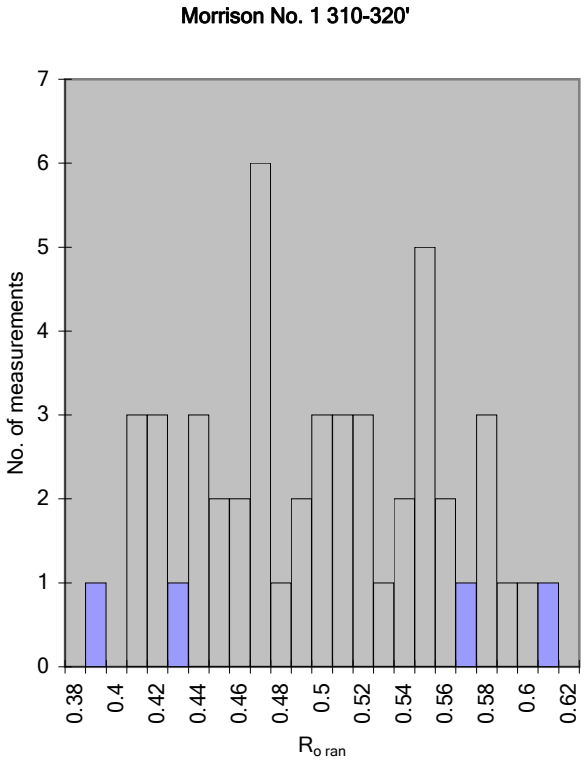
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Morrison No. 1 310-320'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	65	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.48	
s.d.:	0.06	



DATA

0.469	0.512	0.402	0.460	0.602	0.541	0.413
0.544	0.533	0.437	0.542	0.492	0.498	0.530
0.509	0.443	0.485	0.491	0.412	0.472	0.404
0.585	0.448	0.414	0.467	0.434	0.337	0.496
0.561	0.485	0.576	0.456	0.464	0.442	0.508
0.571	0.543	0.507	0.598	0.496	0.396	
0.547	0.537	0.516	0.408	0.467	0.472	
0.549	0.468	0.431	0.558	0.554	0.390	
0.382	0.516	0.523	0.471	0.469	0.429	
0.424	0.506	0.405	0.412	0.575	0.492	

min: 0.337 **max:** 0.602 **V-types:** 4

COMMENT

Originally analyzed by Humble (see Appendix 2). Reanalyzed at USGS 3/5/07. Reflectance value determined at USGS is more consistent with other values from Morrison No. 1 hole and is preferred. Sample consists of approximately 50 small (<1 mm) clean coal fragments. Coal is telinite-rich, inertinite-poor. Detrovitrinite less abundant than telovitrinite.

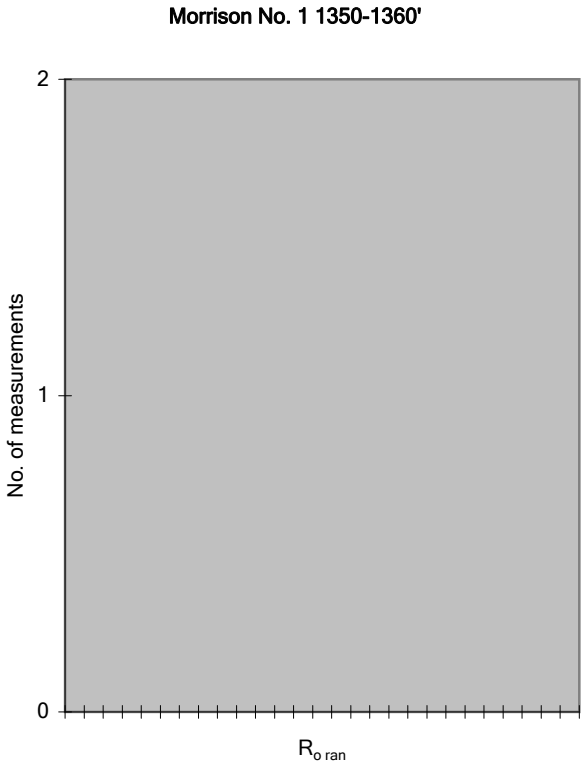
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	Morrison No. 1 1350-1360'
Sample Type	cuttings
Date Analyzed:	
Operator:	P. Hackley

RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	



DATA

min: max: V-types:

COMMENT

Originally analyzed by Humble (see Appendix 2). Checked and accepted at USGS 3/12/07. High polishing relief. Mineralized vitrinite fragments present.

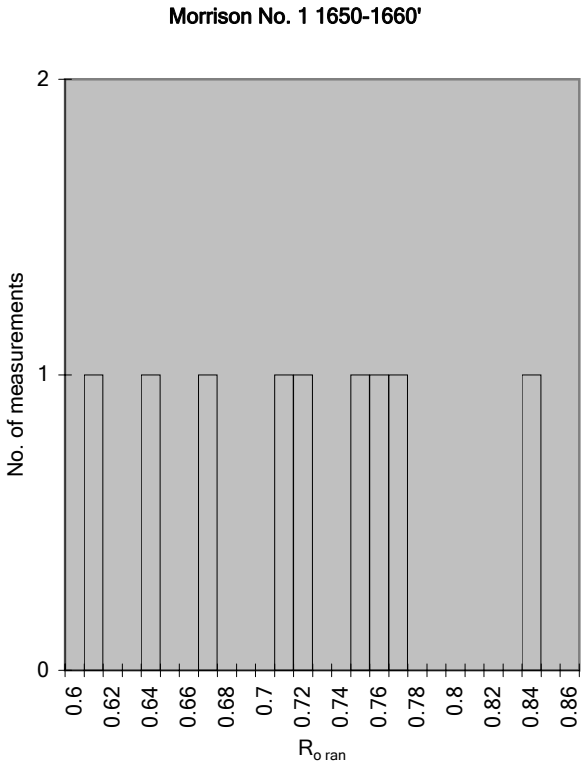
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	Morrison No. 1 1650-1660'
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	10 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.73
s.d.:	0.08



DATA

0.717
0.758
0.749
0.770
0.834
0.866
0.668
0.704
0.602
0.637

min: 0.602 **max:** 0.866 **V-types:** 3

COMMENT

Sample contains approximately 10 rock fragments consisting of homogeneous telinite.

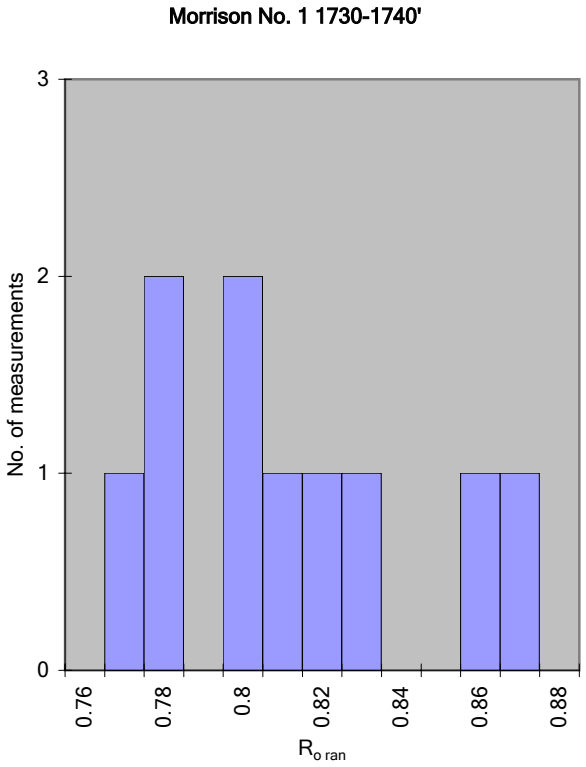
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Morrison No. 1 1730-1740'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	10 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.81
s.d.:	0.03



DATA

0.795
0.801
0.824
0.773
0.811
0.762
0.791
0.856
0.779
0.864

min: 0.762 **max:** 0.864 **V-types:** 2

COMMENT

Tarnished and discolored sections present. Measured mean random reflectance is consistent with other values in hole.

VITRINITE REFLECTANCE REPORT

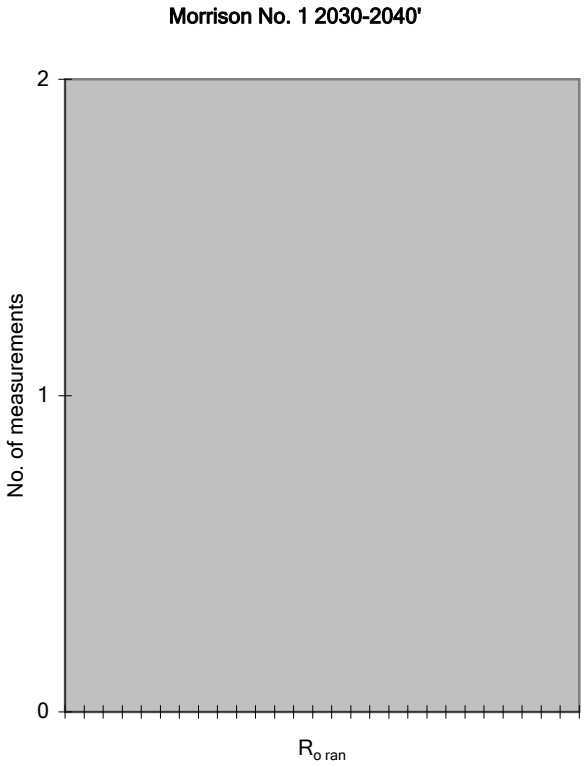
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Morrison No. 1 2030-2040'**
Sample Type	cuttings
Date Analyzed:	3/13/2006
Operator:	P. Hackley

RESULTS

# measurements:	1 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.84
s.d.:	0.00



DATA

0.836

min: 0.836 **max:** 0.836 **V-types:** 1

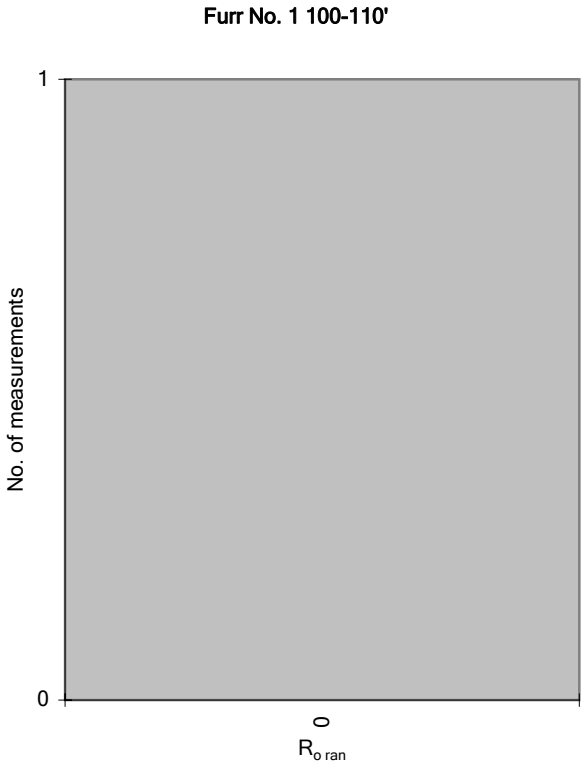
COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and examined at USGS on 3/12/07. Most of organic material is fusinite. One fragment reflects at 0.84%, consistent with mean Humble value of 0.91%. However, Humble reported a total of 29 measurements (see Appendix 2), inconsistent with the amount of material available. Sample material may have been lost during repolish. USGS value of 0.84% is preferred.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 100-110'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley



RESULTS

# measurements:	1 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.62
s.d.:	0.00

DATA

0.624

min: 0.624 **max:** 0.624 **V-types:** 1

COMMENT

Sample contains approximately 15 rock fragments which contain dispersed recycled or oxidized vitrinite (R_o>0.70), and inertinite fragments. One measured value (0.62 %) is consistent with Furr No. 1 540-550' (R_o=0.61 %, n=15).

VITRINITE REFLECTANCE REPORT

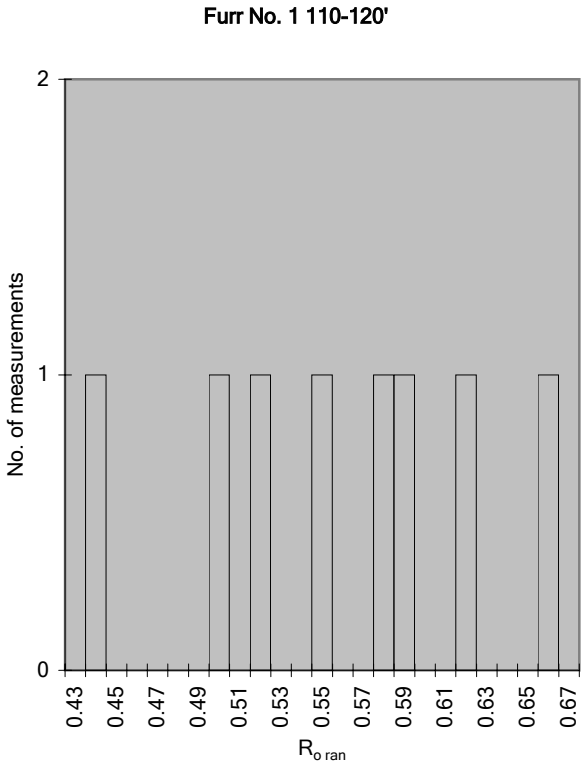
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 110-120'**
Sample Type	cuttings
Date Analyzed:	3/1/2007
Operator:	P. Hackley

RESULTS

# measurements:	8 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.55
s.d.:	0.07



DATA

0.433
0.546
0.583
0.520
0.491
0.573
0.615
0.652

min: 0.433 **max:** 0.652 **V-types:** 3

COMMENT

Sample contains 10-15 rock fragments, consisting of mineral matter with dispersed vitrinite and inertinite fragments. Most are partially plucked from examination surface. Measured value is consistent with others from close intervals in the Furr No. 1 hole.

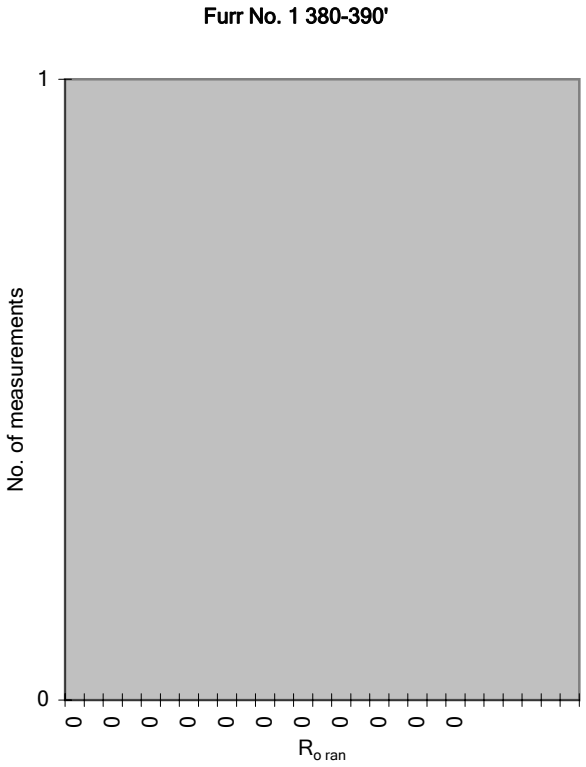
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 380-390'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample contains 5 rock fragments which contain dispersed inertinite fragments. No vitrinite in sample. High polishing relief.

VITRINITE REFLECTANCE REPORT

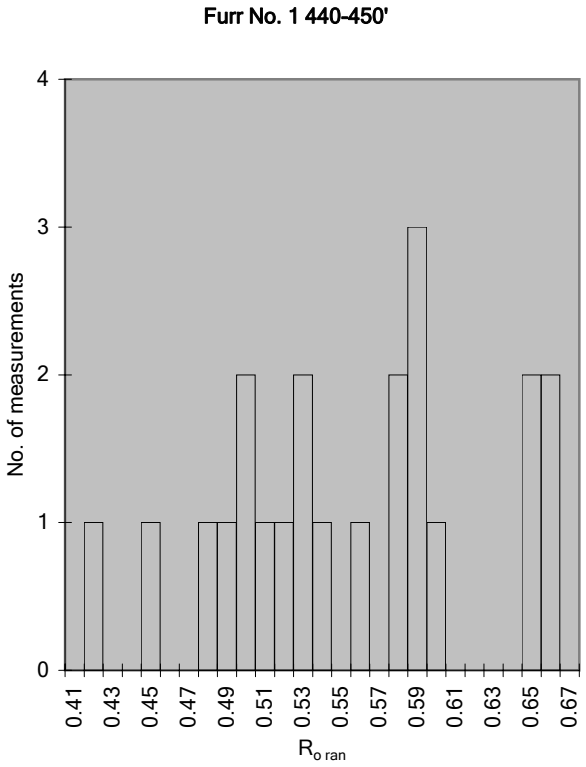
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	2/26/2007
Project:	Texas CBM
Sample:	**Furr No. 1 440-450'**
Sample Type	cuttings
Date Analyzed:	2/26/2007
Operator:	P. Hackley

RESULTS

# measurements:	22 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.55
s.d.:	0.07



DATA

0.651	0.552	0.582
0.505	0.584	0.647
0.519	0.493	
0.646	0.488	
0.536	0.585	
0.572	0.523	
0.475	0.524	
0.418	0.448	
0.653	0.492	
0.594	0.576	

min: 0.418 **max:** 0.653 **V-types:** 3

COMMENT

Sample consists of 5 larger (2-10 mm) and 6 smaller (<1 mm) rock fragments containing dispersed vitrinite and inertinite.

VITRINITE REFLECTANCE REPORT

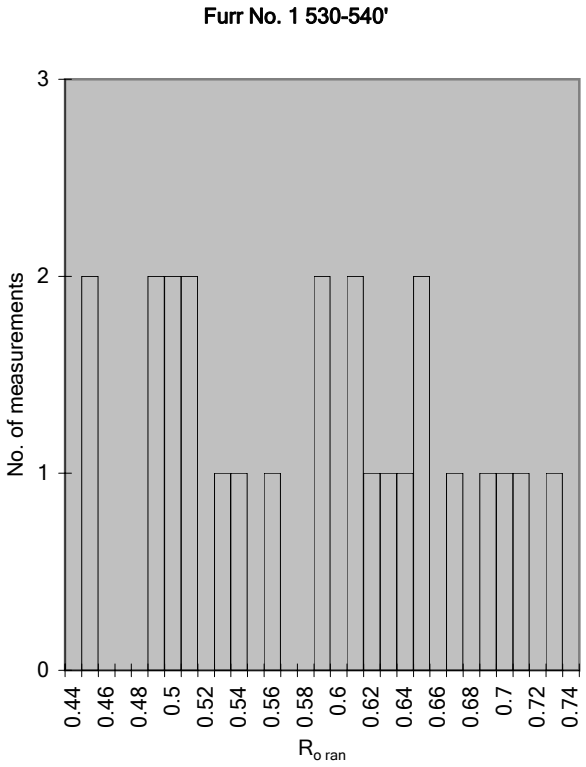
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 530-540'**
Sample Type	cuttings
Date Analyzed:	3/1/2007
Operator:	P. Hackley

RESULTS

# measurements:	25 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.58
s.d.:	0.08



DATA

0.623	0.647	0.701
0.662	0.637	0.492
0.481	0.582	0.494
0.447	0.608	0.521
0.553	0.489	0.641
0.505	0.509	
0.724	0.691	
0.538	0.688	
0.618	0.583	
0.445	0.602	

min: 0.445 **max:** 0.724 **V-types:** 4

COMMENT

Sample consists of 30-50 mineralized coal fragments, equally divided between inertinite and vitrinite. Tarnishing and signs of oxidation present. Measured value is consistent with others in Furr No. 1 hole.

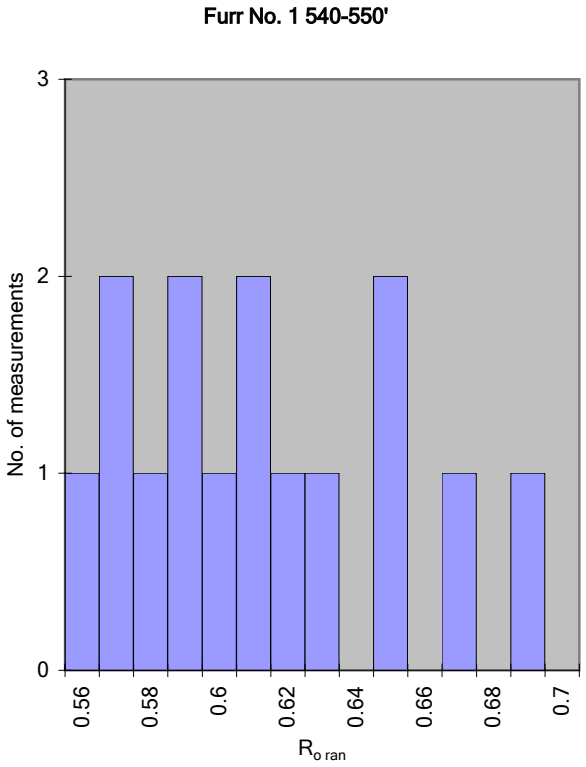
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 540-550'**
Sample Type	cuttings
Date Analyzed:	8/3/2006
Operator:	P. Hackley

RESULTS

# measurements:	15 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.61
s.d.:	0.04



DATA

0.593	0.614
0.565	0.606
0.587	0.590
0.685	0.561
0.670	0.605
0.645	
0.579	
0.560	
0.628	
0.650	

min: 0.560 **max:** 0.685 **V-types:** 2

COMMENT

Sample contains seven rock fragments with dispersed and texturally indigenous vitrinite (of same reflectance) and minor fusinite. Mean value is interpreted to reflect in situ maturity.

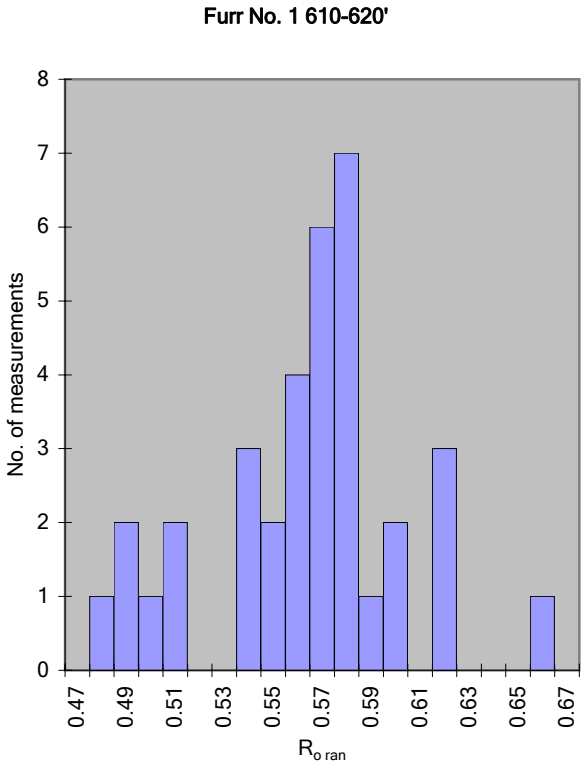
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 610-620'**
Sample Type	cuttings
Date Analyzed:	2/27/2007
Operator:	P. Hackley

RESULTS

# measurements:	35	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.56	
s.d.:	0.04	



DATA

0.495	0.535	0.553	0.570
0.505	0.613	0.539	0.545
0.598	0.547	0.564	0.552
0.619	0.562	0.573	0.575
0.563	0.561	0.477	0.575
0.538	0.482	0.586	
0.487	0.558	0.573	
0.506	0.592	0.575	
0.567	0.556	0.613	
0.577	0.579	0.656	

min: 0.477 **max:** 0.656 **V-types:** 3

COMMENT

Sample contains 20-25 coal fragments. Coal is banded and relatively ash-free, pyrite is abundant.

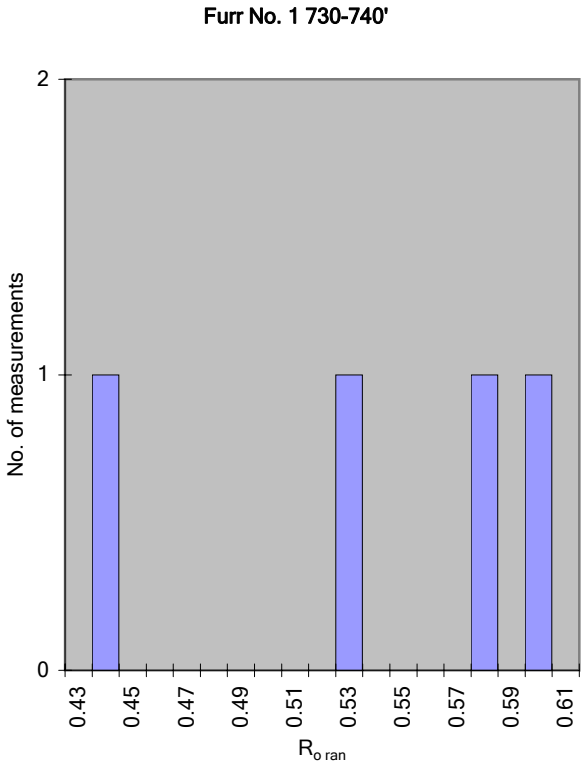
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 730-740'**
Sample Type	cuttings
Date Analyzed:	3/1/2007
Operator:	P. Hackley

RESULTS

# measurements:	4 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.53
s.d.:	0.06



DATA

0.528
0.592
0.433
0.579

min: 0.433 **max:** 0.592 **V-types:** 2

COMMENT

Sample contains 15-20 rock fragments, most of which is pyritized fusinite. Some homogenenous vitrinite fragments with framboidal pyrite inclusions reflect at 0.7-0.8 percent and probably are somewhat oxidized.

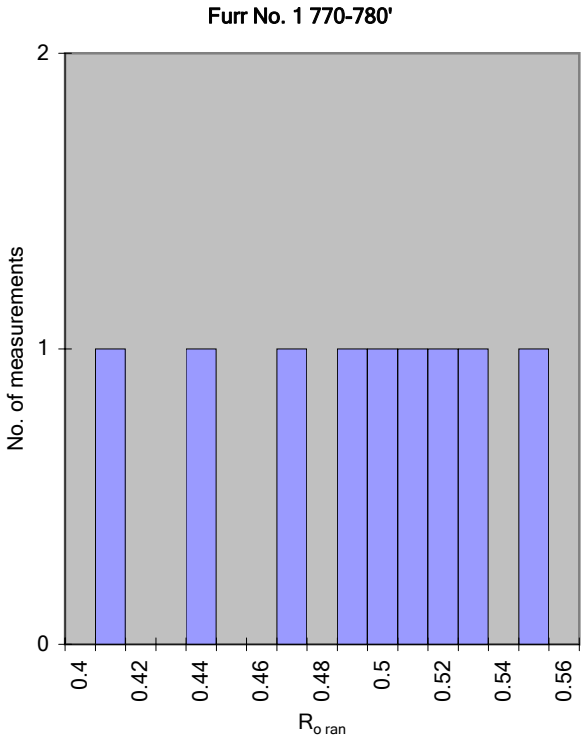
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 770-780'**
Sample Type	cuttings
Date Analyzed:	9/11/2006
Operator:	P. Hackley

RESULTS

# measurements:	9 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.49
s.d.:	0.04



DATA

0.431
0.407
0.517
0.484
0.503
0.499
0.521
0.464
0.544

min: 0.407 **max:** 0.544 **V-types:** 2

COMMENT

Sample contains 6 rock fragments with dispersed vitrinite. Crystalline fragments of cottonball (non-fused lucite) have extruded onto examination surface through partial pluck.

VITRINITE REFLECTANCE REPORT

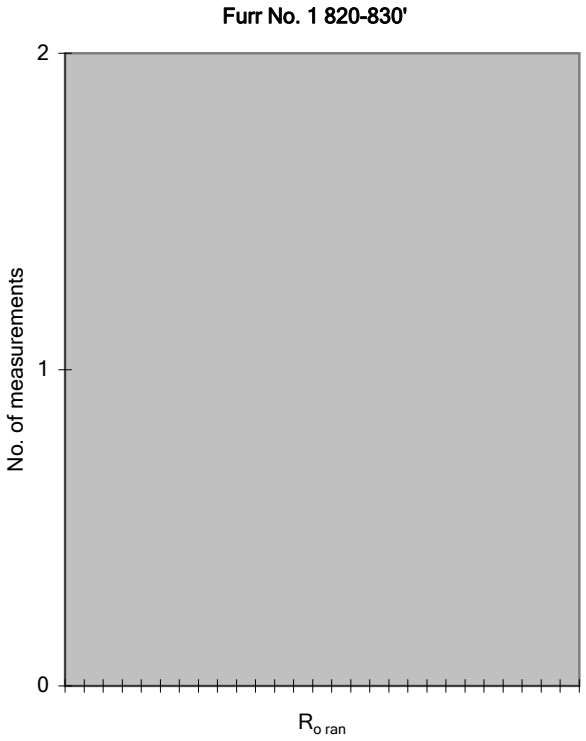
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 820-830'**
Sample Type	cuttings
Date Analyzed:	3/12/2007
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:		
$R_{o\ ran}$ (ISO/ASTM):		
s.d.:		



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and examined on 3/12/07 at USGS. Does not contain vitrinite, consistent with Humble report.

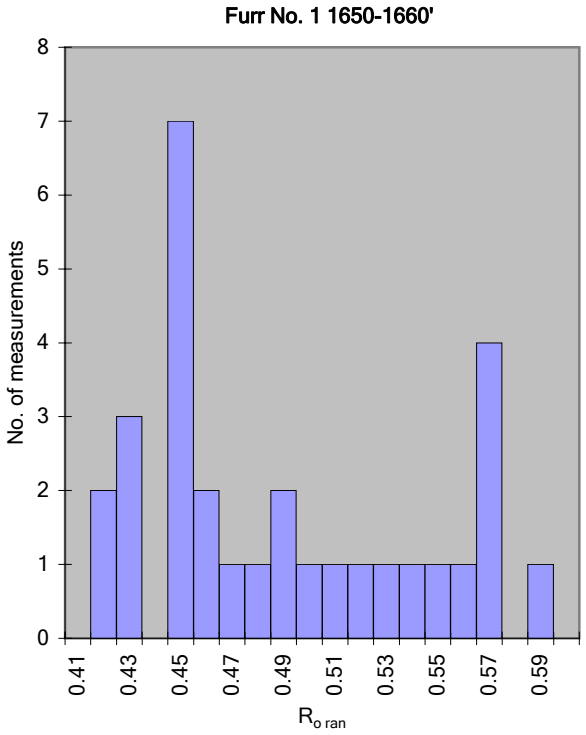
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 1650-1660'**
Sample Type	cuttings
Date Analyzed:	9/11/2006
Operator:	P. Hackley

RESULTS

# measurements:	30	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.49	
s.d.:	0.05	



DATA

0.420	0.478	0.569
0.462	0.569	0.428
0.561	0.448	0.443
0.554	0.543	0.447
0.423	0.445	0.448
0.452	0.417	0.491
0.583	0.452	0.569
0.428	0.445	0.485
0.532	0.445	0.524
0.489	0.511	0.509

min: 0.417 **max:** 0.583 **V-types:** 2

COMMENT

Sample contains 15-20 rock fragments with dispersed vitrinite and inertinite. Scattered pyrite present. Measured value is consistent with Humble-determined value from deeper in hole (0.55 @ 2160-2170'; see Appendix 2).

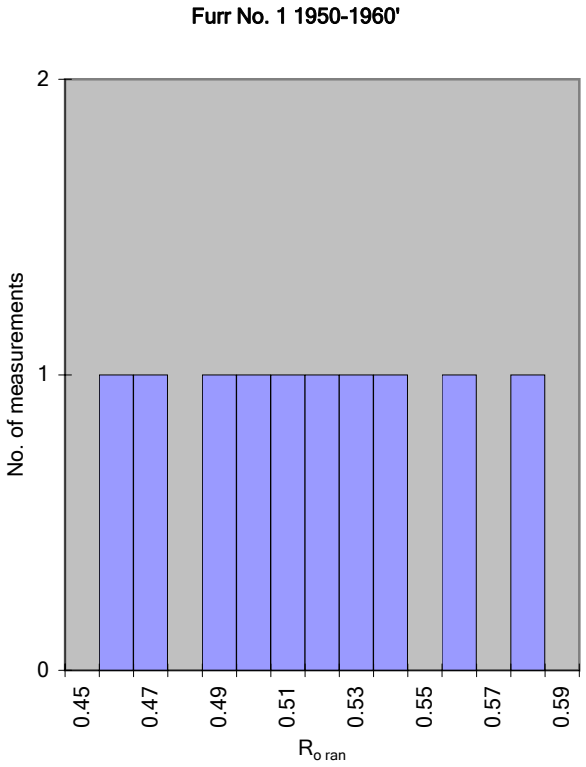
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 1950-1960'**
Sample Type	cuttings
Date Analyzed:	11/14/2006
Operator:	P. Hackley

RESULTS

# measurements:	10	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.51	
s.d.:	0.04	



DATA

0.577
0.468
0.494
0.555
0.482
0.455
0.537
0.530
0.508
0.516

min: 0.455 **max:** 0.577 **V-types:** 2

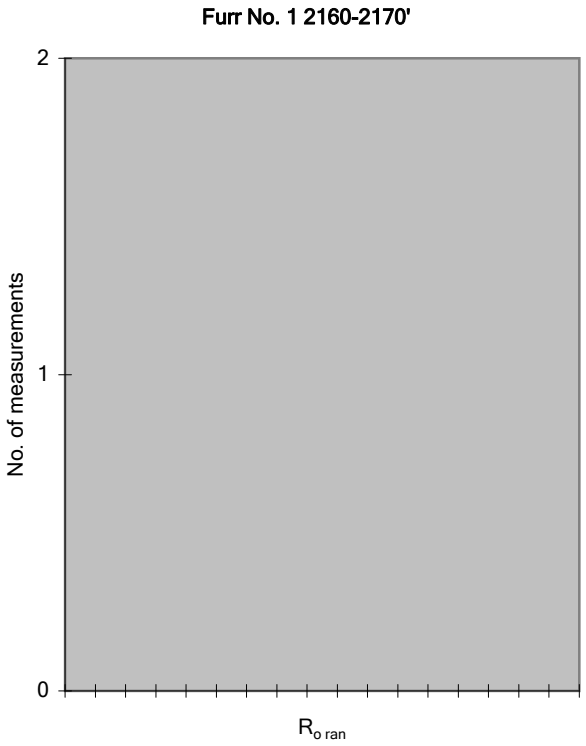
COMMENT

Sample contains 5 rock fragments, of which two contain dispersed indigenous vitrinite. Measured value is consistent with others determined above and below in Furr No. 1.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Furr No. 1 2160-2170'**
Sample Type	cuttings
Date Analyzed:	
Operator:	



RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	

DATA

min: **max:** **V-types:**

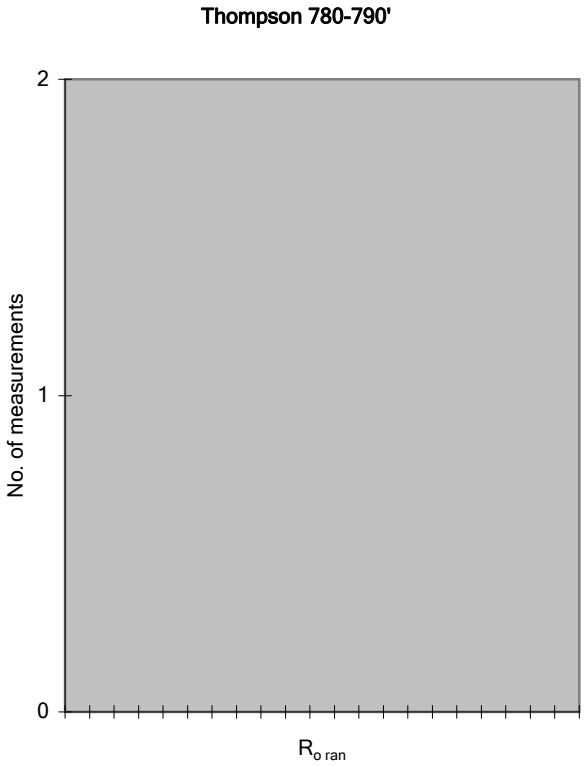
COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and checked at USGS on 2/28/07. No organic material present. Material may have been lost during repolish.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Thompson 780-790'**
Sample Type	cuttings
Date Analyzed:	
Operator:	



RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	

DATA

min: **max:** **V-types:**

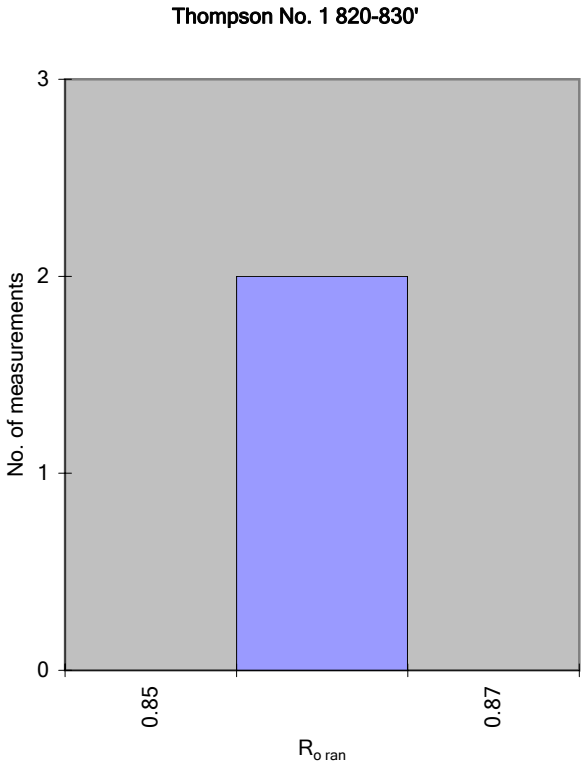
COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and checked at USGS on 3/12/07. No organic material present. Material may have been lost during repolish.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Thompson No. 1 820-830'**
Sample Type	cuttings
Date Analyzed:	8/3/2006
Operator:	P. Hackley



RESULTS

# measurements:	2 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.86
s.d.:	0.00

DATA

0.857
0.857

min: 0.857 **max:** 0.857 **V-types:** 1

COMMENT

Sample is 3 very small rock fragments. Two are telovitrinite of relatively high and equivalent reflectance, probably not representative of in situ maturity based on comparison to measured values from other Young and Archer County well cuttings. Interpreted to be recycled. Third rock fragment does not contain vitrinite.

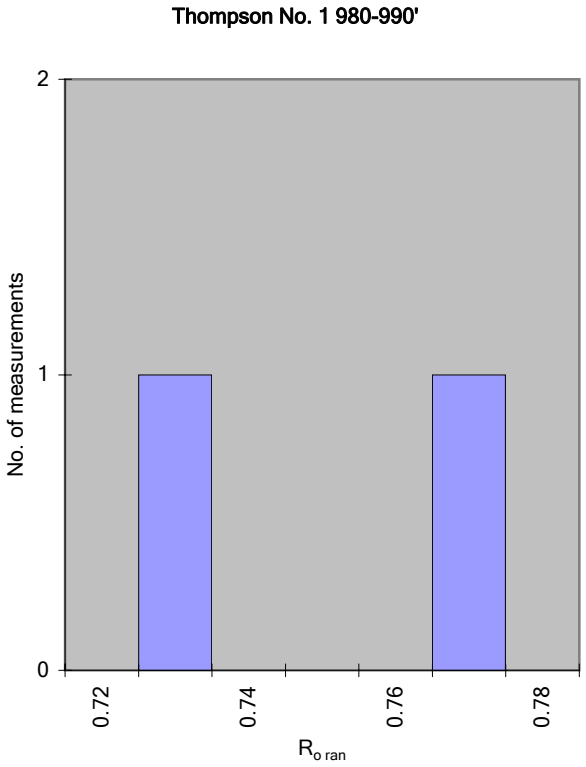
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Thompson No. 1 980-990'**
Sample Type	cuttings
Date Analyzed:	8/4/2006
Operator:	P. Hackley

RESULTS

# measurements:	2 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.75
s.d.:	0.02



DATA

0.724
0.770

min: 0.724 **max:** 0.770 **V-types:** 1

COMMENT

Sample contains two rock fragments, one of which is recycled? vitrinite with obvious oxidation rinds. The two measured reflectance values were determined on this fragment. The other rock fragment is mostly fusinite with pyrite mineralization.

VITRINITE REFLECTANCE REPORT

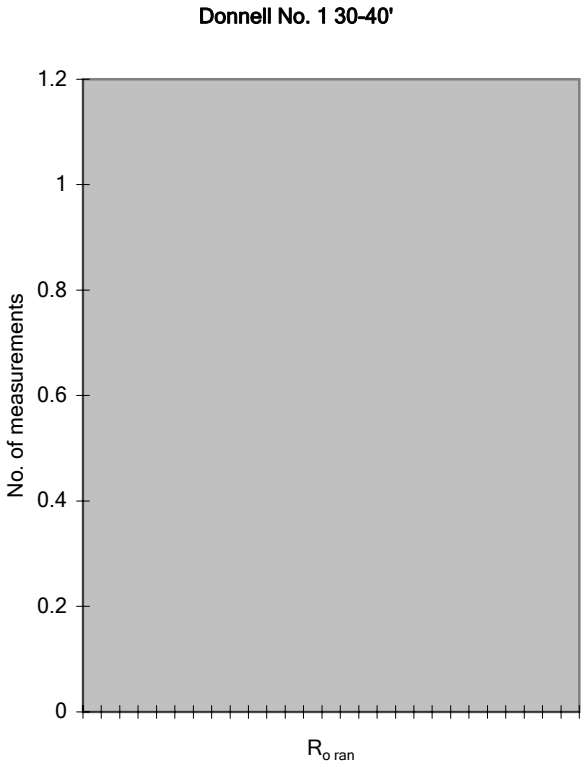
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 30-40'**
Sample Type	cuttings
Date Analyzed:	11/14/2006
Operator:	P. Hackley

RESULTS

# measurements:	0
maceral type:	
$R_{o\ ran}$ (ISO/ASTM):	
s.d.:	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample is five rock fragments which do not contain indigenous vitrinite. One fragment is recyled bitumen with reflectance of 1.2%.

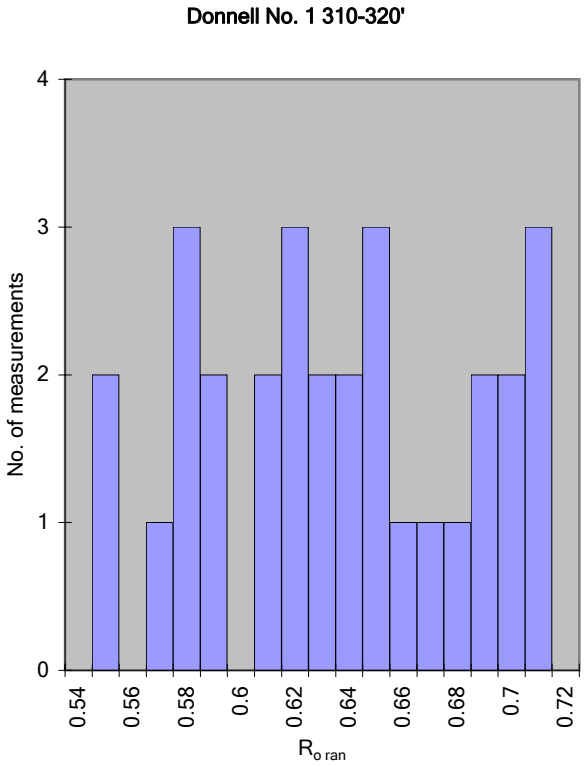
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 310-320'**
Sample Type	cuttings
Date Analyzed:	11/13/2006
Operator:	P. Hackley

RESULTS

# measurements:	30 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.63
s.d.:	0.05



DATA

0.650	0.682	0.566
0.696	0.706	0.645
0.654	0.622	0.610
0.636	0.618	0.708
0.695	0.614	0.686
0.603	0.549	0.629
0.575	0.641	0.636
0.584	0.572	0.661
0.617	0.581	0.707
0.549	0.672	0.576

min: 0.549 **max:** 0.708 **V-types:** 3

COMMENT

Sample is approximately 30 rock fragments. Dirty, trimaceralic coal. Brighter corpogelinite is abundant and reflects at approximately 0.75%. Oxidation along cracks in vitrinite reflects at around 0.95%. Tarnishing present.

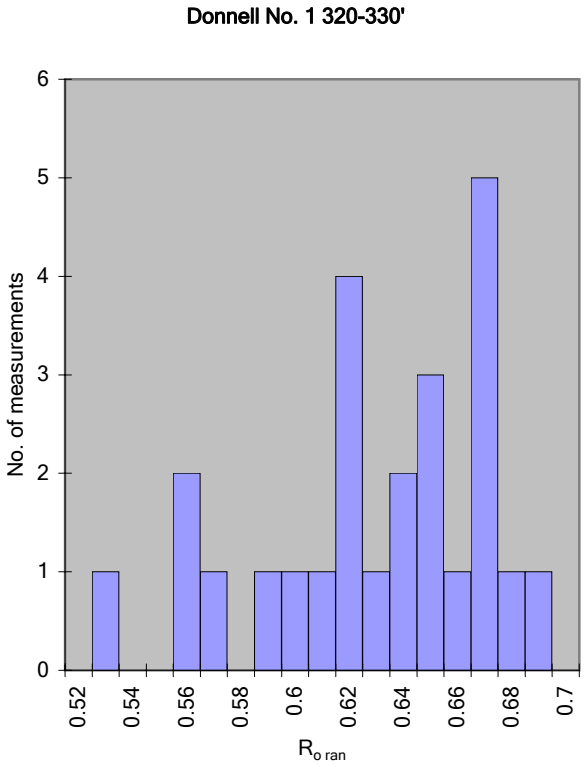
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 320-330'**
Sample Type	cuttings
Date Analyzed:	11/14/2006
Operator:	P. Hackley

RESULTS

# measurements:	25 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.63
s.d.:	0.04



DATA

0.615	0.644	0.618
0.591	0.667	0.672
0.584	0.628	0.667
0.662	0.557	0.562
0.526	0.650	0.608
0.649	0.631	
0.689	0.560	
0.668	0.617	
0.664	0.657	
0.637	0.611	

min: 0.526 **max:** 0.689 **V-types:** 2

COMMENT

Sample is approximately 20 rock fragments. Fragments are dirty trimaceral coal. Brighter corpogelinite present in range of 0.7-0.8% reflectance. Sample is very similar to overlying 310-320' fragments. High polishing relief.

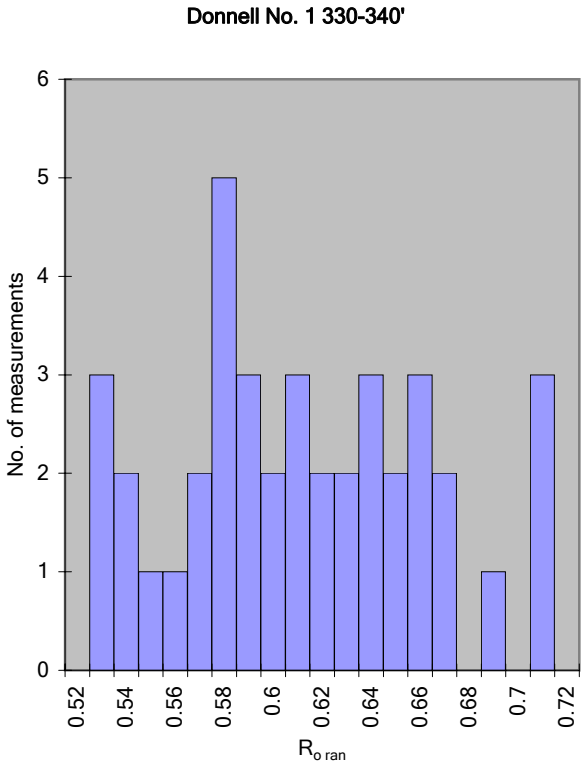
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	11/21/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 330-340'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley

RESULTS

# measurements:	40	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.61	
s.d.:	0.05	



DATA

0.633	0.594	0.602	0.612
0.615	0.604	0.590	0.566
0.654	0.707	0.532	0.669
0.522	0.528	0.552	0.586
0.626	0.628	0.575	0.602
0.657	0.709	0.637	0.576
0.634	0.684	0.529	0.655
0.661	0.702	0.642	0.583
0.576	0.568	0.537	0.643
0.572	0.545	0.577	0.591

min: 0.522 **max:** 0.709 **V-types:** 3

COMMENT

Sample contains approximately 5 rock fragments sized 4-5 mm and approximately 35 rock fragments sized <1mm. Fragments are of vitrinite-rich carbonaceous shale, and very dirty detrital coal.

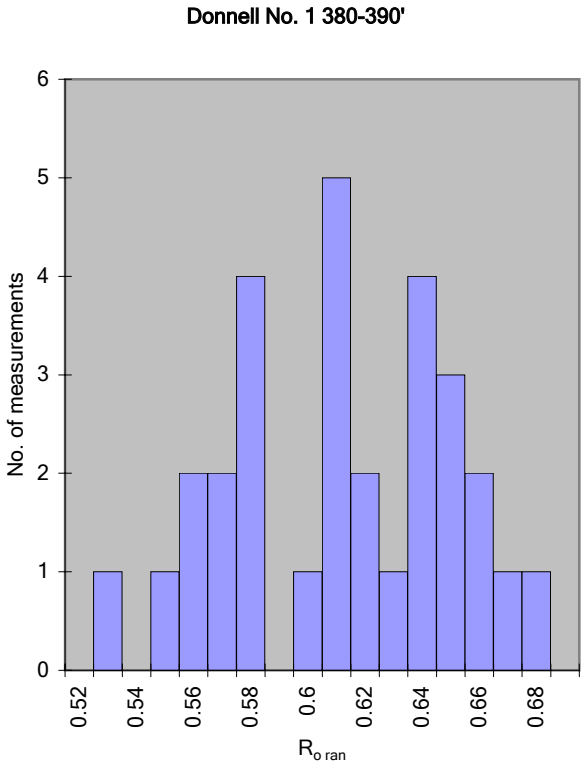
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 380-390'**
Sample Type	cuttings
Date Analyzed:	8/4/2006
Operator:	P. Hackley

RESULTS

# measurements:	30 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.61
s.d.:	0.04



DATA

0.608	0.604	0.648
0.564	0.551	0.652
0.555	0.620	0.621
0.577	0.572	0.603
0.548	0.637	0.657
0.603	0.649	0.572
0.605	0.562	0.639
0.678	0.573	0.638
0.632	0.591	0.662
0.521	0.613	0.641

min: 0.521 **max:** 0.678 **V-types:** 2

COMMENT

Sample comprised of approximately 15 rock fragments, 85 percent of which are coal with approximately equal distribution of telo- and detrovitrinite. Several fragments are detrital, inertinite-, liptinite-, and mineral matter-rich. 1-2 rock fragments with dispersed organic material also present.

VITRINITE REFLECTANCE REPORT

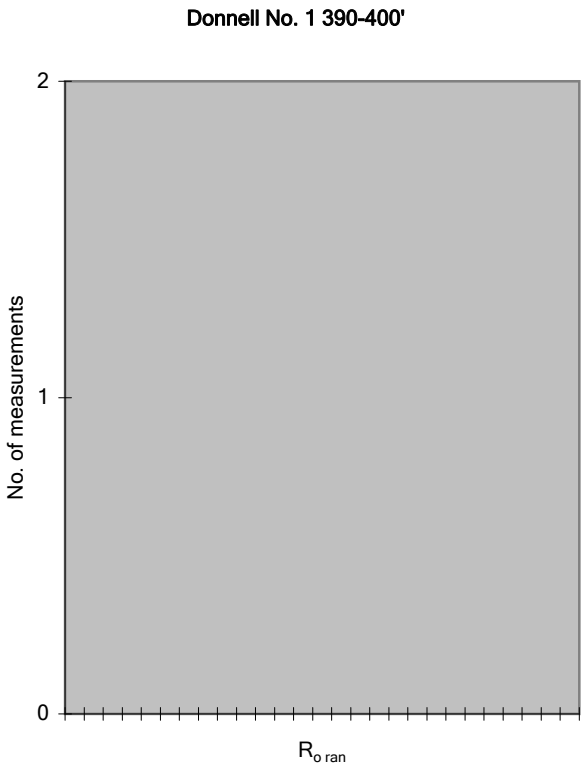
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 390-400'**
Sample Type	cuttings
Date Analyzed:	3/12/2007
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:		
$R_{o\ ran}$ (ISO/ASTM):		
s.d.:		



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and examined at USGS 3/12/07. Does not contain vitrinite, consistent with Humble report.

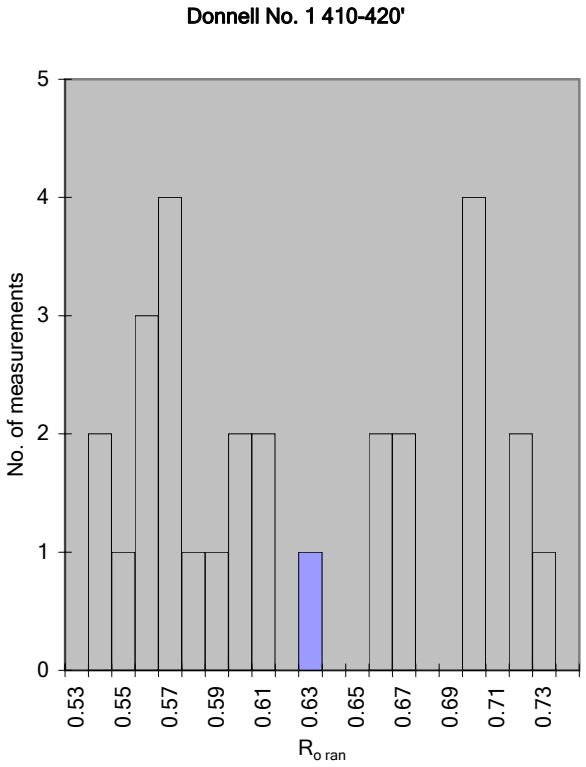
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 410-420'**
Sample Type	cuttings
Date Analyzed:	2/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	28 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.62
s.d.:	0.06



DATA

0.544	0.588	0.699
0.599	0.721	0.553
0.657	0.566	0.655
0.599	0.573	0.621
0.601	0.570	0.531
0.692	0.564	0.700
0.669	0.553	0.696
0.603	0.566	0.718
0.715	0.532	
0.662	0.560	

min: 0.531 **max:** 0.721 **V-types:** 3

COMMENT

Sample contains approximately 30 coal fragments - some are inertinite plus mineral matter.

VITRINITE REFLECTANCE REPORT

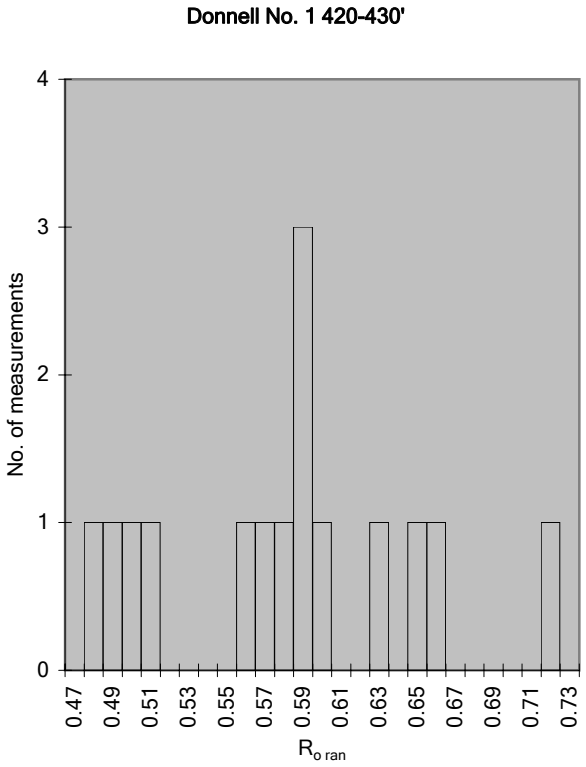
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 420-430'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	15 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.58
s.d.:	0.07



DATA

0.473	0.649
0.561	0.656
0.510	0.592
0.627	0.712
0.584	0.582
0.576	
0.556	
0.492	
0.581	
0.487	

min: 0.473 **max:** 0.712 **V-types:** 4

COMMENT

3/5/07 - Sample needs to be repolished. Tarnished - oxidation alteration present. Repolished and examined 3/12/07. Measured mean (0.58%) is slightly lower than other intervals nearby in Donnell hole but consistent overall. Sample consists of about 8 rock fragments of 2-10 mm size. Fragments are of trimacerite coal, fusinite, and mineral matter with no organic material present.

VITRINITE REFLECTANCE REPORT

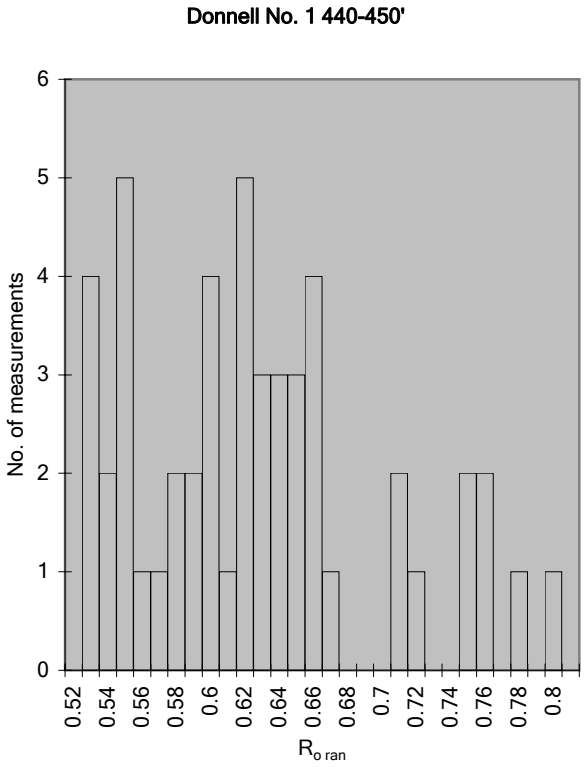
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 440-450'**
Sample Type	cuttings
Date Analyzed:	2/28/2007
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.62
s.d.:	0.07



DATA

0.644	0.542	0.614	0.631	0.544
0.754	0.607	0.615	0.621	0.526
0.598	0.547	0.745	0.634	0.549
0.776	0.702	0.712	0.554	0.523
0.792	0.701	0.591	0.542	0.627
0.627	0.616	0.658	0.657	0.574
0.643	0.639	0.523	0.668	0.591
0.748	0.571	0.581	0.619	0.759
0.596	0.615	0.538	0.651	0.538
0.521	0.656	0.587	0.565	0.648

min: 0.521 **max:** 0.792 **V-types:** 3

COMMENT

Sample consists of abundant fragments of banded coal. Many fragments are tarnished. Measured value is consistent with overlying 410-420' interval (R_o = 0.62 percent), but inconsistent with underlying 450-460' interval, which is about 0.75 percent.

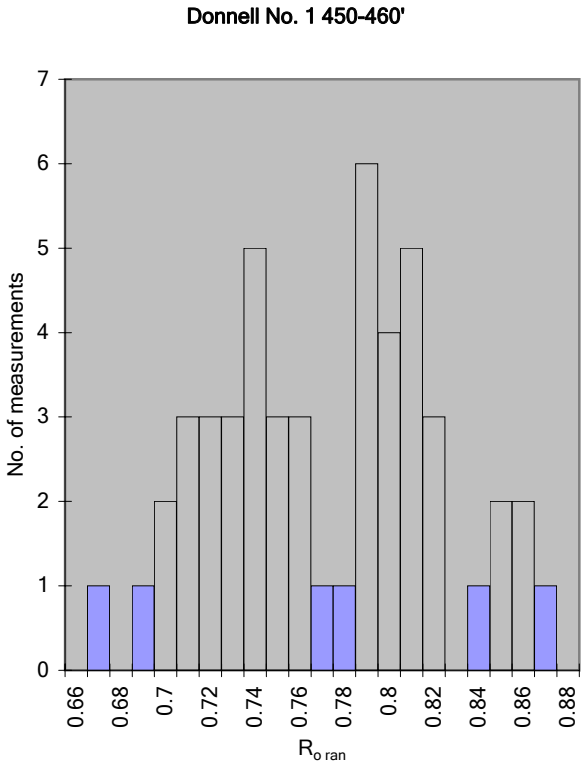
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 450-460'**
Sample Type	cuttings
Date Analyzed:	2/12/2007
Operator:	P. Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.77	
s.d.:	0.05	



DATA

0.785	0.748	0.819	0.771	0.720
0.749	0.718	0.756	0.792	0.768
0.802	0.857	0.689	0.703	0.783
0.792	0.832	0.662	0.692	0.810
0.788	0.858	0.740	0.754	0.733
0.815	0.785	0.716	0.704	0.739
0.744	0.842	0.793	0.868	0.727
0.751	0.803	0.736	0.841	0.703
0.729	0.786	0.815	0.801	0.695
0.732	0.798	0.801	0.783	0.726

min: 0.662 **max:** 0.868 **V-types:** 3

COMMENT

Sample contains 50+ rock fragments, composed of dirty trimaceral carbonaceous shale and detrital coal. Post sampling oxidation evidence abundant.

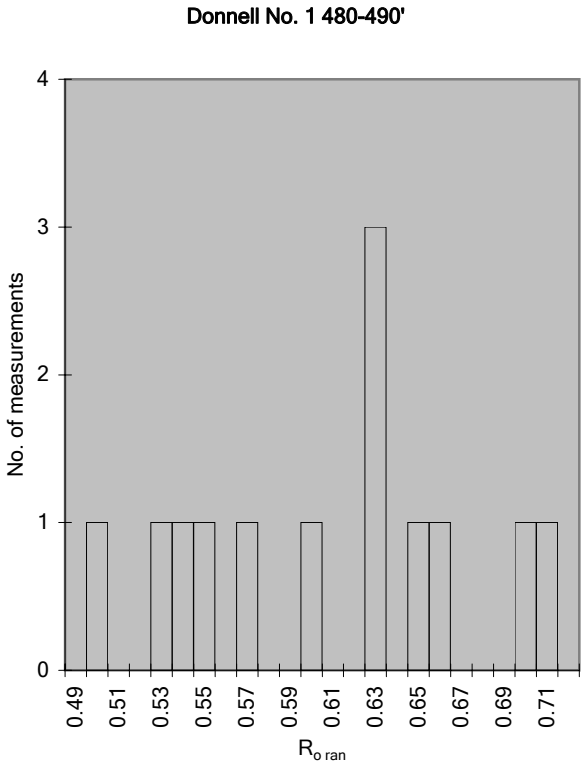
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 480-490'**
Sample Type	cuttings
Date Analyzed:	3/14/2007
Operator:	P. Hackley

RESULTS

# measurements:	13 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.60
s.d.:	0.06



DATA

0.626	0.702
0.641	0.653
0.550	0.628
0.531	
0.526	
0.493	
0.569	
0.628	
0.591	
0.694	

min: 0.493 **max:** 0.702 **V-types:** 4

COMMENT

Sample contains 6 rock fragments consisting of coal, fusinite, and mineral matter with dispersed vitrinite, and inertinite particles. Measured value is consistent with others from hole.

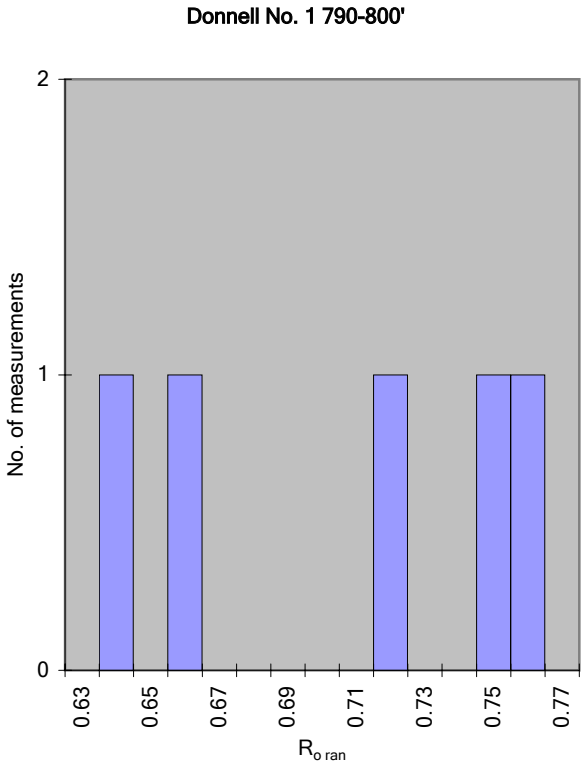
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 790-800'**
Sample Type	cuttings
Date Analyzed:	8/4/2006
Operator:	P. Hackley

RESULTS

# measurements:	5 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.70
s.d.:	0.05



DATA

0.656
0.758
0.718
0.633
0.744

min: 0.633 **max:** 0.758 **V-types:** 2

COMMENT

Sample contains approximately 10 rock fragments, of which 2-3 contain some oxidized and/or stained-tarnished vitrinite. Mean reflectance value should be considered suspect due to oxidation and tarnishing.

VITRINITE REFLECTANCE REPORT

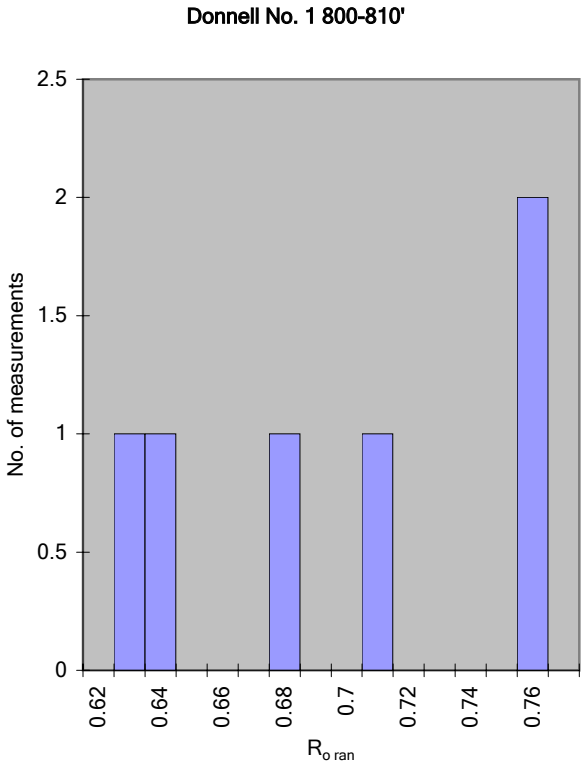
SAMPLE INFORMATION

Submitted by: Edgar Guevara
Date Submitted: 3/13/2006
Project: Texas CBM

Sample: **Donnell No. 1 800-810'**
Sample Type cuttings
Date Analyzed: 11/21/2006
Operator: P. Hackley

RESULTS

measurements: 6 <ASTM/ISO Standards
maceral type: telovitrinite
$R_{o\ ran}$ (ISO/ASTM): 0.69
s.d.: 0.05



DATA

0.634
0.755
0.621
0.671
0.704
0.755

min: 0.621 **max:** 0.755 **V-types:** 2

COMMENT

Sample contains approximately 15 rock fragments with high polishing relief. Very lean in dispersed vitrinite. High-reflecting pyrite obscures reflectance of adjacent vitrinite in best fragment.

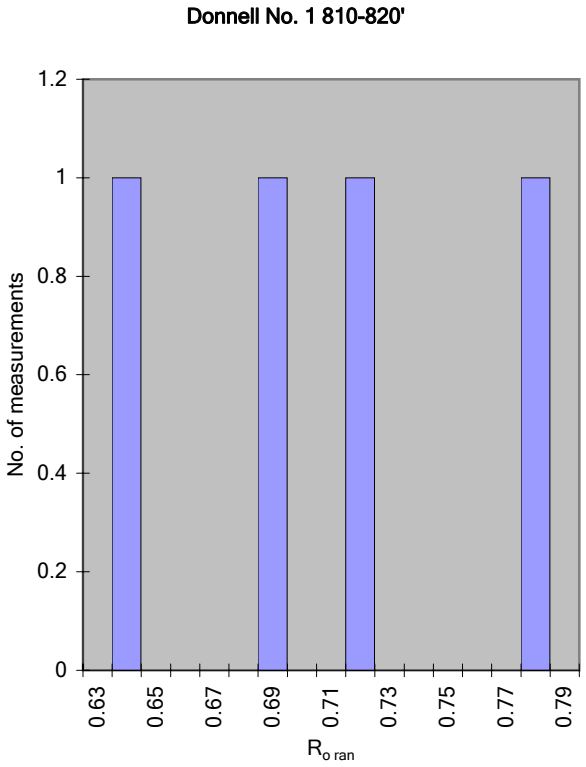
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 810-820'**
Sample Type	cuttings
Date Analyzed:	11/21/2006
Operator:	P. Hackley

RESULTS

# measurements:	4 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.70
s.d.:	0.05



DATA

0.720
0.682
0.779
0.637

min: 0.637 **max:** 0.779 **V-types:** 2

COMMENT

Sample contains three very small rock fragments. Two contain small sparse dispersed indigenous vitrinite fragments; the third contains inertinite fragments only.

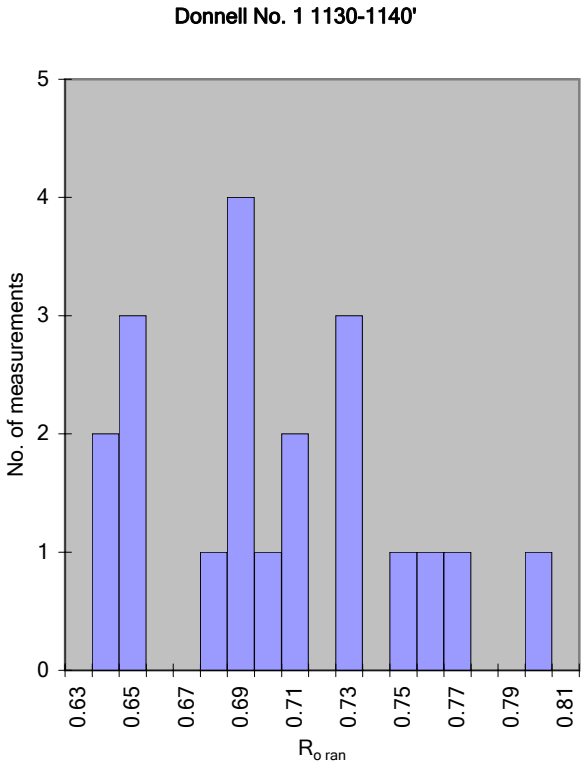
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1130-1140'**
Sample Type	cuttings
Date Analyzed:	11/16/2006
Operator:	P. Hackley

RESULTS

# measurements:	20 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.70
s.d.:	0.04



DATA

0.756	0.681
0.694	0.646
0.792	0.686
0.722	0.644
0.681	0.708
0.633	0.749
0.640	0.725
0.727	0.702
0.673	0.683
0.770	0.649

min: 0.633 **max:** 0.792 **V-types:** 2

COMMENT

Sample contains approximately 20 rock fragments consisting of dirty, detrital-rich coal.

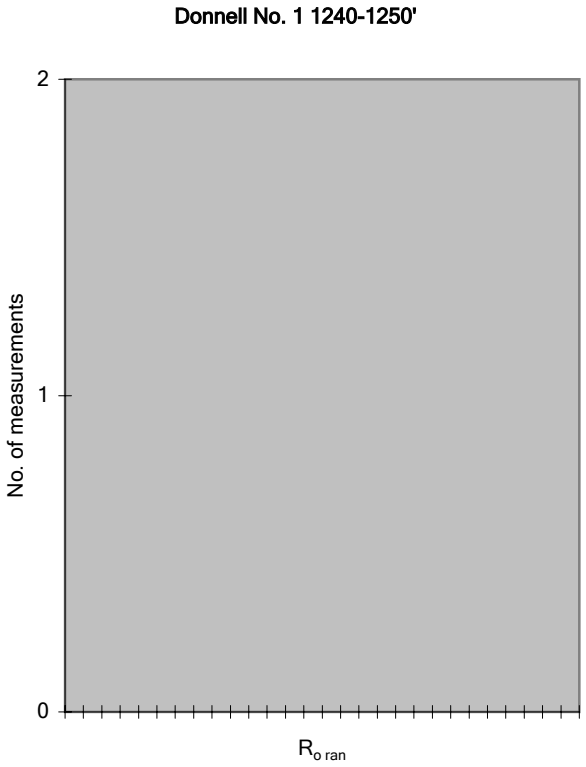
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1240-1250'**
Sample Type	cuttings
Date Analyzed:	2/26/2007
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample does not contain vitrinite.

VITRINITE REFLECTANCE REPORT

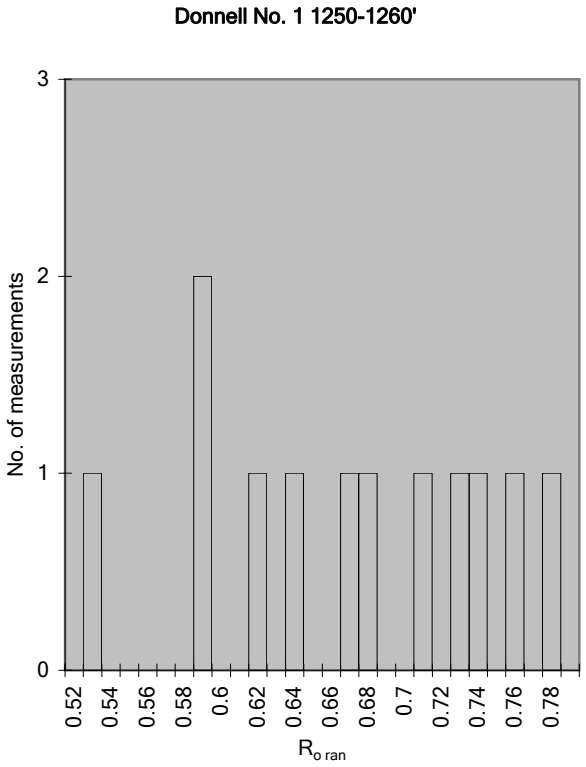
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1250-1260'**
Sample Type	cuttings
Date Analyzed:	2/26/2007
Operator:	P. Hackley

RESULTS

# measurements:	12	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.66	
s.d.:	0.07	



DATA

0.584	0.611
0.523	0.756
0.736	
0.585	
0.705	
0.672	
0.635	
0.668	
0.721	
0.776	

min: 0.523 **max:** 0.776 **V-types:** 3

COMMENT

Sample consists of approximately 15 rock chips with fine dispersed vitrinite fragments on the order of 20-50 square microns in size.

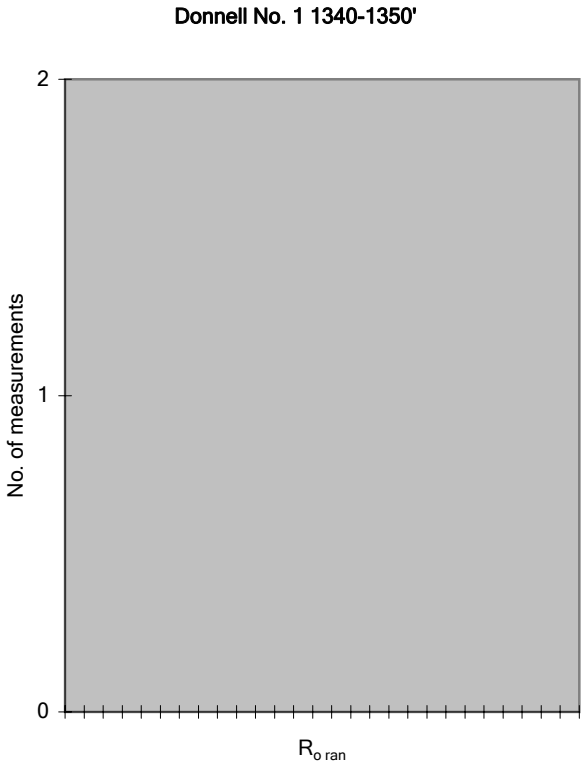
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1340-1350'**
Sample Type	cuttings
Date Analyzed:	2/12/2007
Operator:	P.Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:		
$R_{o\ ran}$ (ISO/ASTM):		
s.d.:		



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample contains six rock fragments, none of which contain vitrinite suitable for measurement (one fragment contains finely comminuted, dispersed, poorly-polished vitrinite particles). Inertinite present in several fragments.

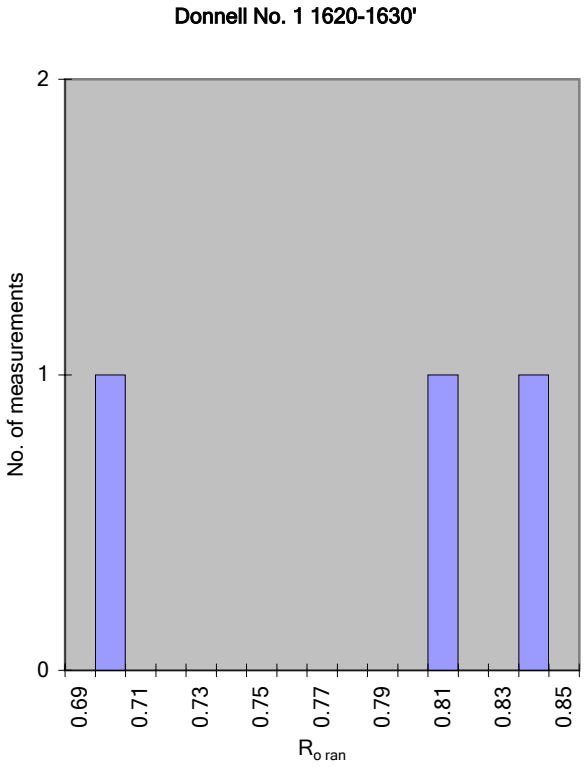
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1620-1630'**
Sample Type	cuttings
Date Analyzed:	11/21/2006
Operator:	P. Hackley

RESULTS

# measurements:	3 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.78
s.d.:	0.06



DATA

0.695
0.835
0.804

min: 0.695 **max:** 0.835 **V-types:** 3

COMMENT

Sample contains four rock fragments, two of which do not contain vitrinite. One of these contains abundant dispersed inertinite. One of the vitrinite-containing particles is highly tarnished, not removed by detergent wiped vigorously with lens paper. Measured reflectance value should be considered suspect due to tarnishing.

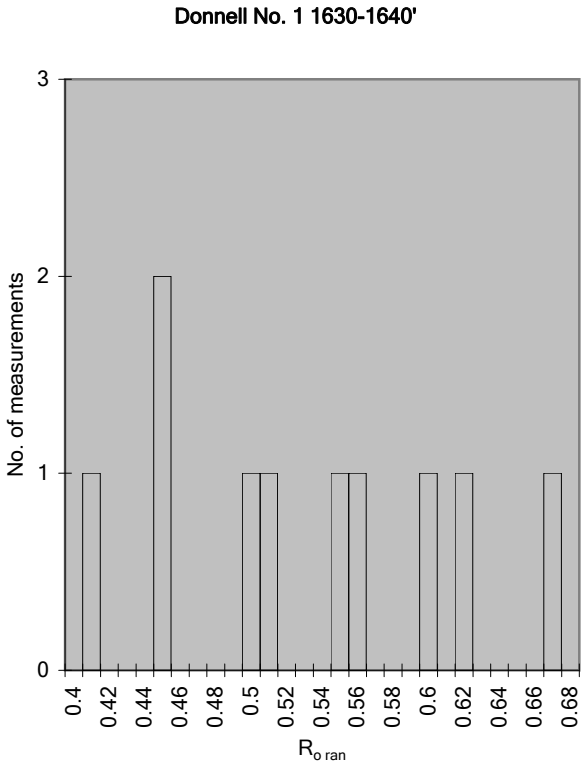
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1630-1640'**
Sample Type	cuttings
Date Analyzed:	3/12/2007
Operator:	P. Hackley

RESULTS

# measurements:	10 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.53
s.d.:	0.08



DATA

0.612
0.547
0.446
0.506
0.442
0.498
0.668
0.596
0.558
0.404

min: 0.404 **max:** 0.668 **V-types:** 3

COMMENT

Originally analyzed by Humble (see Appendix 2). Repolished and analyzed at USGS on 3/12/07. USGS value (preferred; listed in Table 1) generally is consistent with Humble value (0.45%); both determinations are lower than other nearby intervals in hole. Possible cavings contamination.

VITRINITE REFLECTANCE REPORT

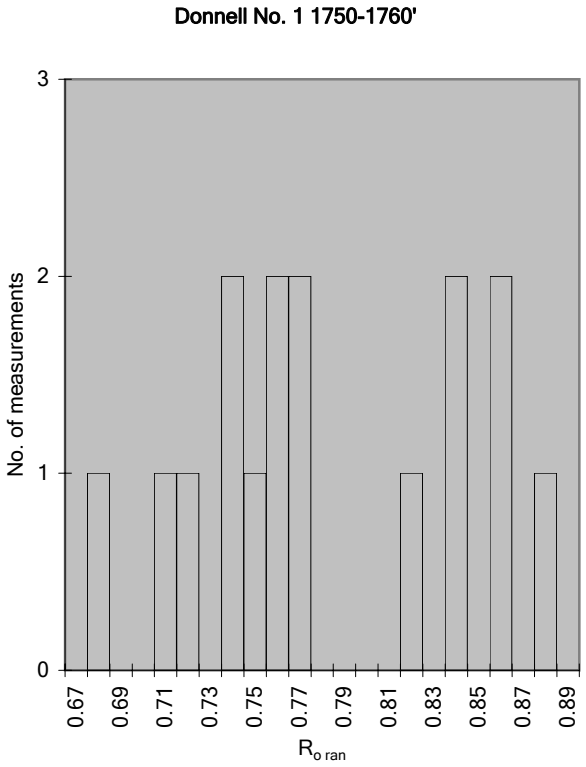
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1750-1760'**
Sample Type	cuttings
Date Analyzed:	11/21/2006
Operator:	P. Hackley

RESULTS

# measurements:	16	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.78	
s.d.:	0.06	



DATA

0.743	0.703
0.757	0.762
0.832	0.731
0.854	0.737
0.820	0.761
0.852	0.757
0.837	
0.678	
0.712	
0.873	

min: 0.678 **max:** 0.873 **V-types:** 3

COMMENT

Contains approximately 15 rock fragments with dispersed vitrinite. Contains one fragment with abundant vitrinite reflecting in the range 0.5-0.6 % interpreted to be from caving.

VITRINITE REFLECTANCE REPORT

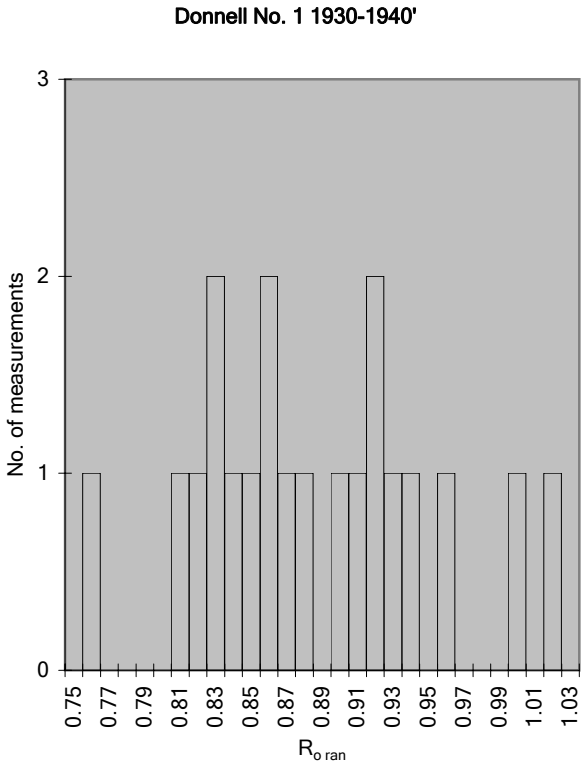
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1930-1940'**
Sample Type	cuttings
Date Analyzed:	2/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	20 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.88
s.d.:	0.06



DATA

1.019	0.836
0.822	0.864
0.894	0.921
0.757	0.997
0.957	0.877
0.919	0.826
0.804	0.916
0.846	0.901
0.853	0.934
0.853	0.816

min: 0.757 **max:** 1.019 **V-types:** 4

COMMENT

Sample contains oxidized? vitrinite, reflecting at 1.1 percent, as well as corpogelinite of approximately 1.1 percent reflectance. Value of 0.88 percent is consistent with value of 0.86 percent (n=30) from 2350-2360 ft interval. Sample consists of 2 larger (7-10 mm) fragments and 8-10 smaller (<2 mm) fragments.

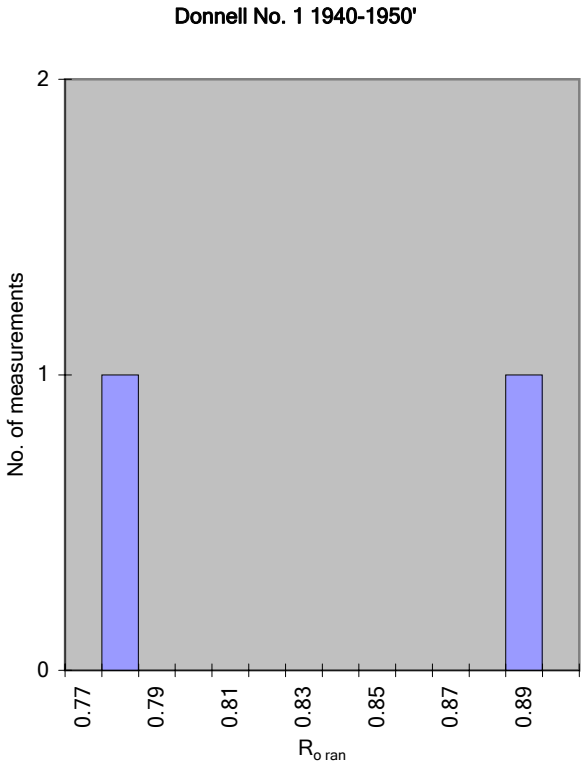
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 1940-1950'**
Sample Type	cuttings
Date Analyzed:	3/5/2007
Operator:	P. Hackley

RESULTS

# measurements:	2 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.83
s.d.:	0.05



DATA

0.887
0.777

min: 0.777 **max:** 0.887 **V-types:** 2

COMMENT

Sample contains 4 small (<1 mm) rock fragments, two of which contain dispersed vitrinite and inertinite.

VITRINITE REFLECTANCE REPORT

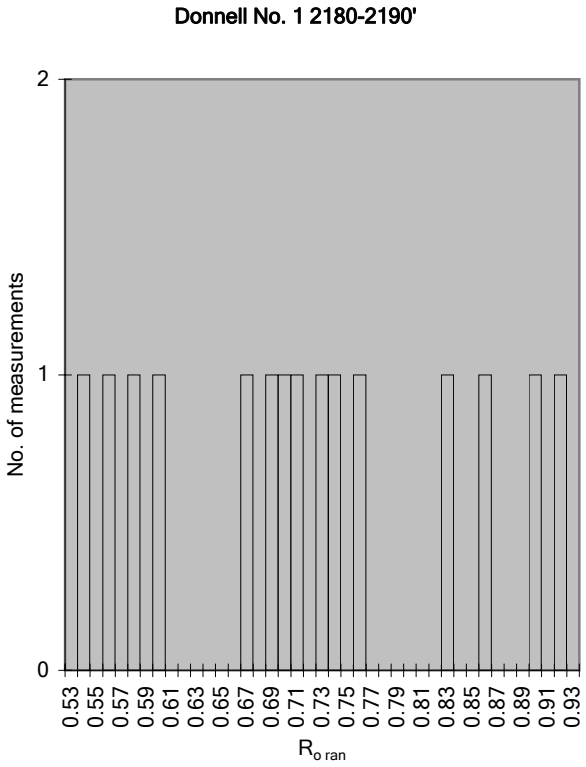
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 2180-2190'**
Sample Type	cuttings
Date Analyzed:	12/6/2006
Operator:	P. Hackley

RESULTS

# measurements:	15	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.71	
s.d.:	0.12	



DATA

0.823	0.575
0.891	0.664
0.916	0.595
0.736	0.702
0.759	0.558
0.859	
0.721	
0.683	
0.699	
0.538	

min: 0.538 **max:** 0.916 **V-types:** 5

COMMENT

Sample consists of 3 larger (2-5 mm) rock fragments and 3-4 smaller (<1mm) fragments. Measured values are highly disparate, suggesting that not all are measured on indigenous vitrinite population. Nearby intervals in Donnell hole return measurements of 0.88 and 0.86%, suggesting that higher range values in this sample indicate in situ vitrinite maturation. However, lower reflecting particles are from same rock fragment - possibly suppressed in original source? Alternatively, could be bitumen particles.

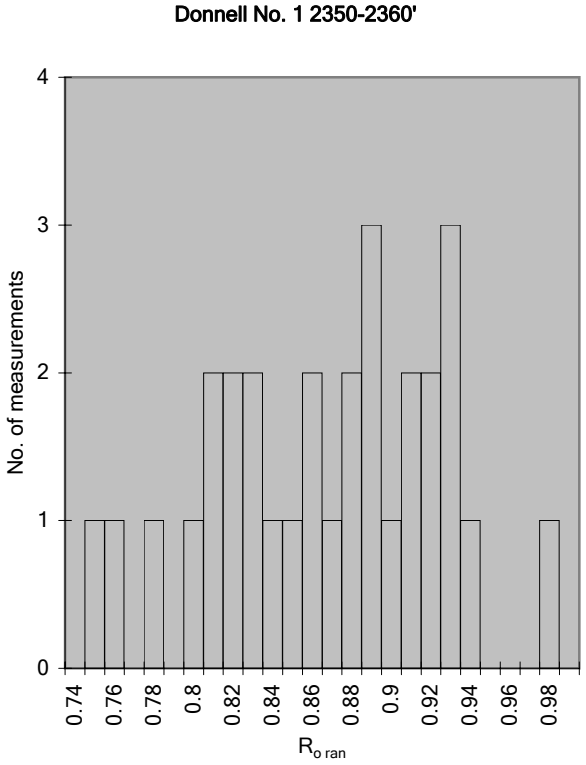
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	E. Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 2350-2360'**
Sample Type	cuttings
Date Analyzed:	8/3/2006
Operator:	P. Hackley

RESULTS

# measurements:	30 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.86
s.d.:	0.06



DATA

0.885	0.745	0.979
0.897	0.929	0.833
0.757	0.887	0.842
0.853	0.908	0.806
0.860	0.920	0.875
0.875	0.888	0.921
0.927	0.817	0.904
0.772	0.865	0.823
0.812	0.804	0.793
0.822	0.914	0.933

min: 0.745 **max:** 0.979 **V-types:** 3

COMMENT

Sample contains approximately 25 rock fragments composed of oxidized detrovitrinite hosting liptinite and inertinite fragments. Some rock fragments contain dispersed vitrinite in mineral matter. Secretinite abundant. Mean value is consistent with measurement by Humble on Morrison No. 1 2030-2040'.

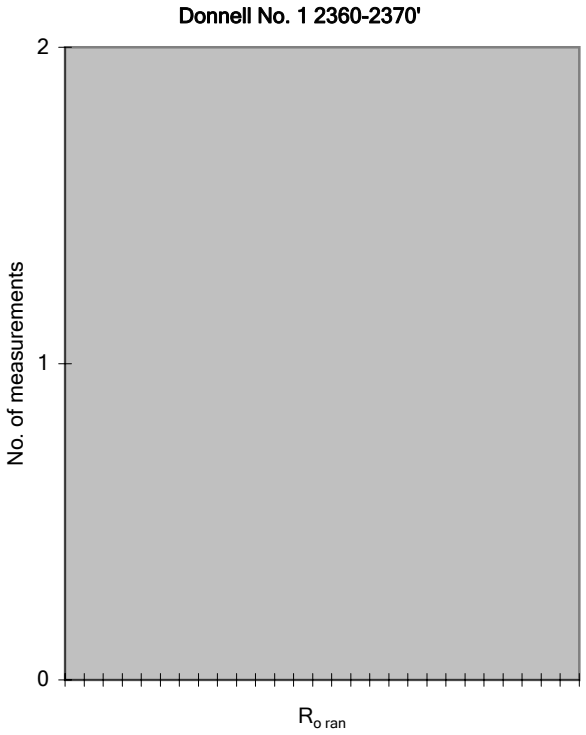
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	**Donnell No. 1 2360-2370'**
Sample Type	cuttings
Date Analyzed:	2/12/2007
Operator:	P. Hackley

RESULTS

# measurements:	1 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.79
s.d.:	0.00



DATA

0.794

min: 0.794 **max:** 0.794 **V-types:** 1

COMMENT

Sample contains 4 rock fragments, one of which contains dispersed vitrinite and inertinite fragments. 0.794 is sole reflectance value determined.

VITRINITE REFLECTANCE REPORT

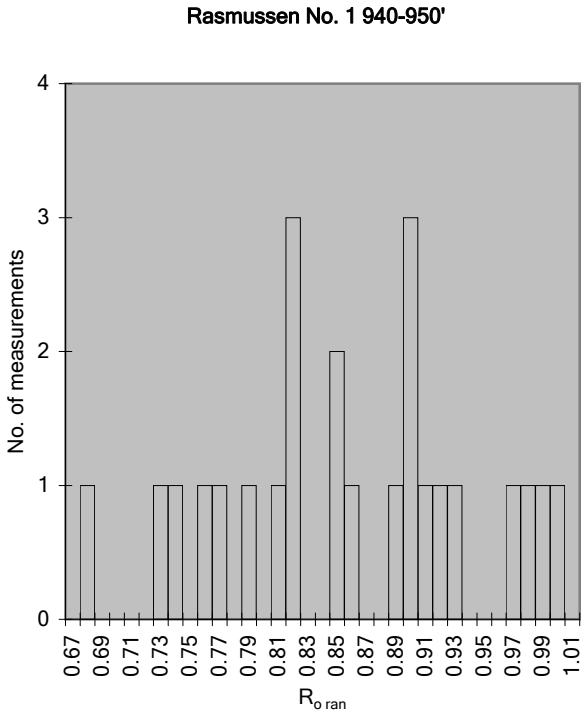
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Rasmussen No. 1 940-950'**
Sample Type	well cuttings
Date Analyzed:	1/26/2006
Operator:	P.Hackley

RESULTS

# measurements:	24 <ASTM/ISO Standards
maceral type:	oxidized vitrinite
$R_{o\ ran}$ (ISO/ASTM):	N/A
s.d.:	N/A



DATA

0.817	0.808	0.763
0.739	0.918	0.788
0.847	0.815	0.816
0.964	0.929	0.844
0.852	0.754	
0.985	0.892	
0.995	0.890	
0.671	0.894	
0.730	0.978	
0.907	0.899	

min: 0.671 **max:** 0.995 **V-types:** 4

COMMENT

Carbonaceous shale. Sample comprised of approximately 20 rock fragments. Contains dispersed oxidized vitrinite and inertinite in mineral-matter groundmass, fine-grained sandstone with high polishing relief. Several reflectance measurements are in range 0.6-1.1%. Lowest measured value (0.67 %) accepted as representing approximate in situ maturity.

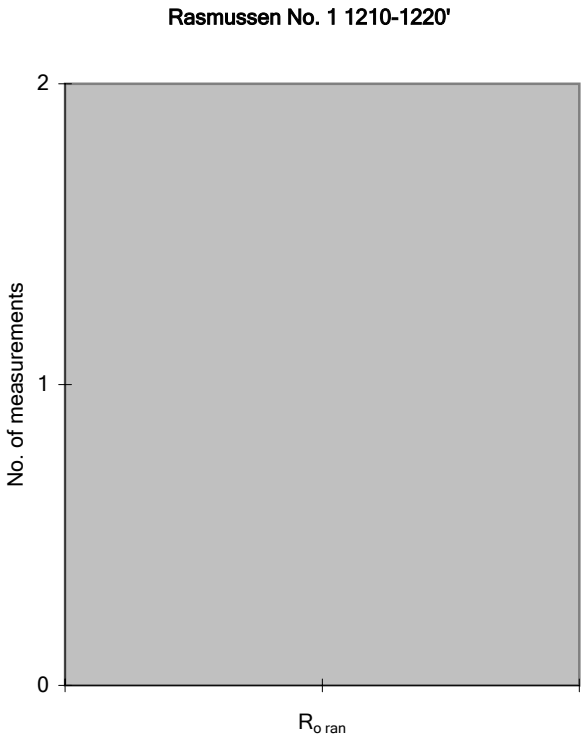
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Rasmussen No. 1 1210-1220'**
Sample Type	well cuttings
Date Analyzed:	1/27/2006
Operator:	P.Hackley

RESULTS

measurements: 0



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample does not contain vitrinite.

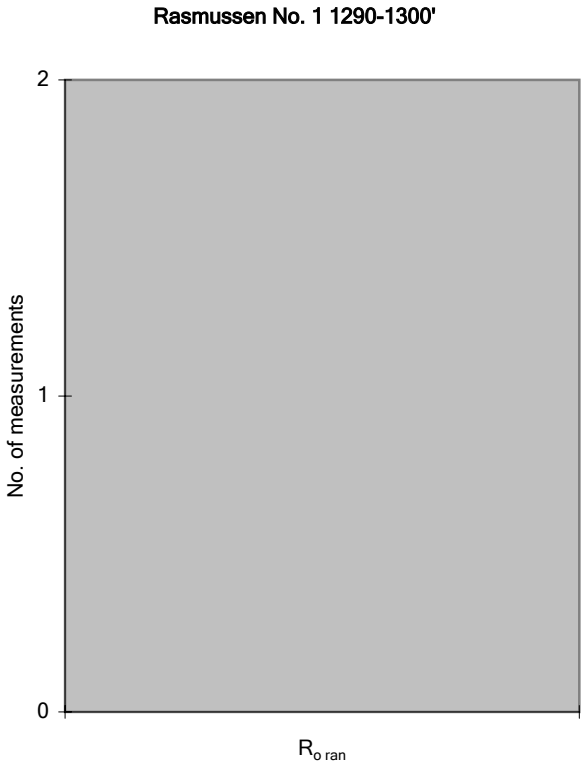
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Rasmussen No. 1 1290-1300'**
Sample Type	well cuttings
Date Analyzed:	3/3/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample is one cutting (1-2 other cuttings lost during polishing of briquette), which does not contain vitrinite.

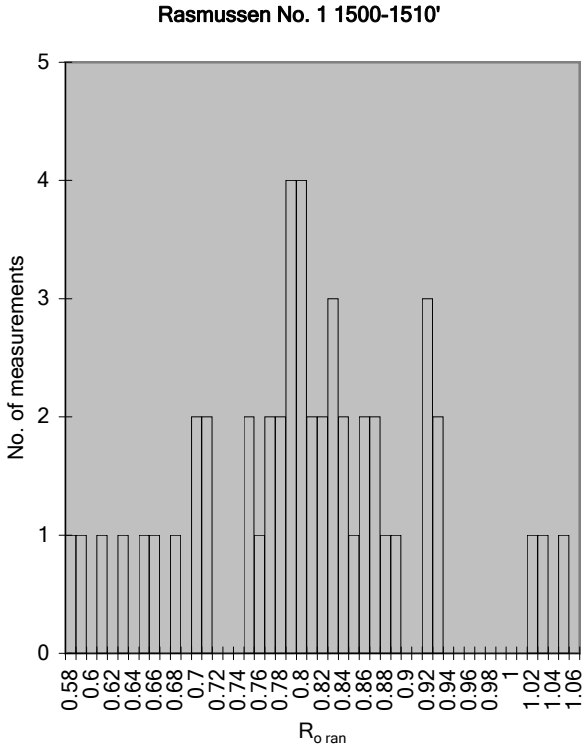
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Rasmussen No. 1 1500-1510'**
Sample Type	well cuttings
Date Analyzed:	1/27/2006
Operator:	P.Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	oxidized vitrinite
$R_{o\ ran}$ (ISO/ASTM):	N/A
s.d.:	N/A



DATA

0.628	0.914	0.794	0.840	0.751
0.609	0.911	0.771	0.806	0.744
0.787	0.741	0.580	0.792	0.866
0.783	0.767	0.581	0.778	0.811
0.793	0.866	0.677	0.804	0.828
0.874	0.852	0.923	0.929	0.768
0.884	1.026	0.785	0.823	0.837
0.916	0.814	0.830	0.789	0.646
0.651	0.698	0.699	0.706	0.703
1.047	1.015	0.799	0.849	0.854

min: 0.580 **max:** 1.047 **V-types:** 6

COMMENT

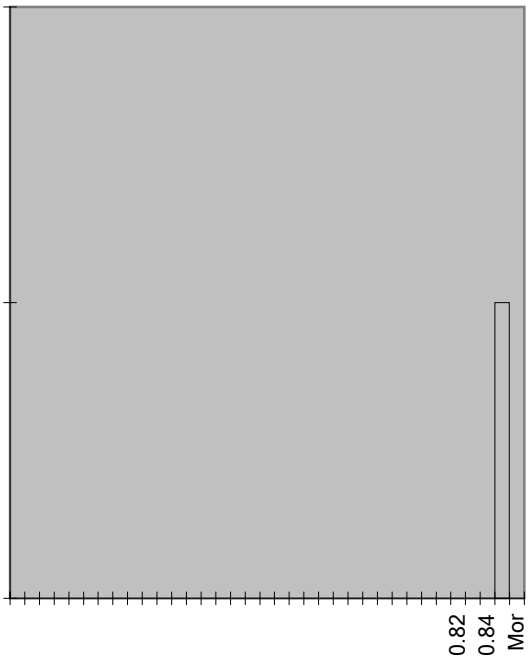
Carbonaceous shale. Sample comprised of approximately 40 rock fragments. Contains organic matter dispersed and occurring in situ in mineral-matter groundmass. Contains abundant obvious fusinite; dispersed inertodetrinite fragments (oxidized vitrinite) in sandstone. One tri-maceral rock fragment with in situ vitrinite stringers give reflectance measurements of 0.5-0.6%, probable reflecting actual thermal maturity. Higher reflectance values mostly collected on dispersed oxidized vitrinite fragments. Two lowest measured values (0.58 %) interpreted to reflect in situ maturity.

VITRINITE REFLECTANCE REPORT

USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Rasmussen No. 1 1700-1710'**
Sample Type	well cuttings
Date Analyzed:	3/3/2006
Operator:	P. Hackley



RESULTS

# measurements:	4 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	N/A
s.d.:	N/A

DATA

0.520
0.549
0.844
0.538

min: 0.520 **max:** 0.844 **V-types:** 4

COMMENT

Sample contains 8 cuttings, none of which contain vitrinite suitable for analysis. Measurement of 0.844 % is consistent with values from oxidized vitrinite other cuttings samples from Rasmussen No. 1. In situ maturity is interpreted to be on the order of 0.52 % consistent with low values measured in other Rasmussen samples.

VITRINITE REFLECTANCE REPORT

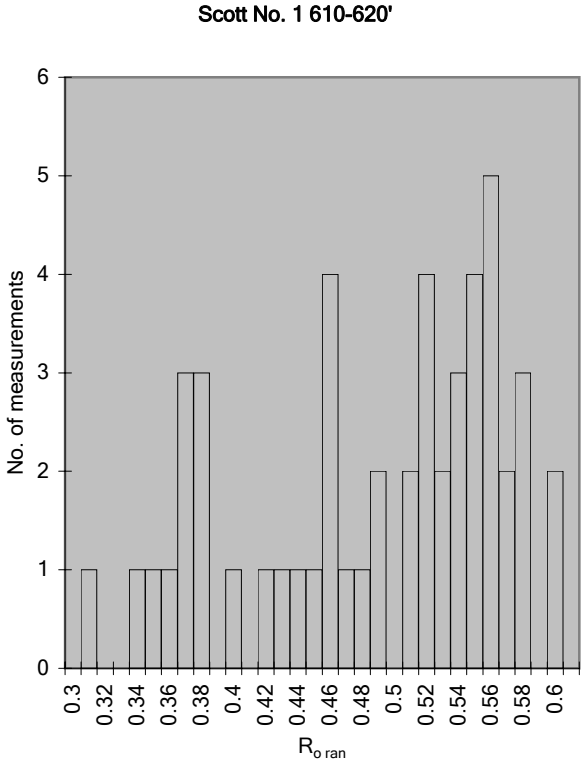
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 610-620'
Sample Type	well cuttings
Date Analyzed:	3/1/2006
Operator:	P. Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.48	
s.d.:	0.08	



DATA

0.364	0.340	0.546	0.346	0.458
0.441	0.484	0.562	0.377	0.548
0.352	0.531	0.488	0.541	0.371
0.400	0.454	0.517	0.598	0.306
0.380	0.412	0.477	0.553	0.430
0.453	0.564	0.440	0.555	0.556
0.461	0.530	0.514	0.512	0.363
0.455	0.579	0.510	0.557	0.542
0.515	0.503	0.573	0.555	0.579
0.540	0.522	0.365	0.533	0.592

min: 0.306 **max:** 0.598 **V-types:** 3

COMMENT

Cuttings contain abundant tri-maceral grains.

VITRINITE REFLECTANCE REPORT

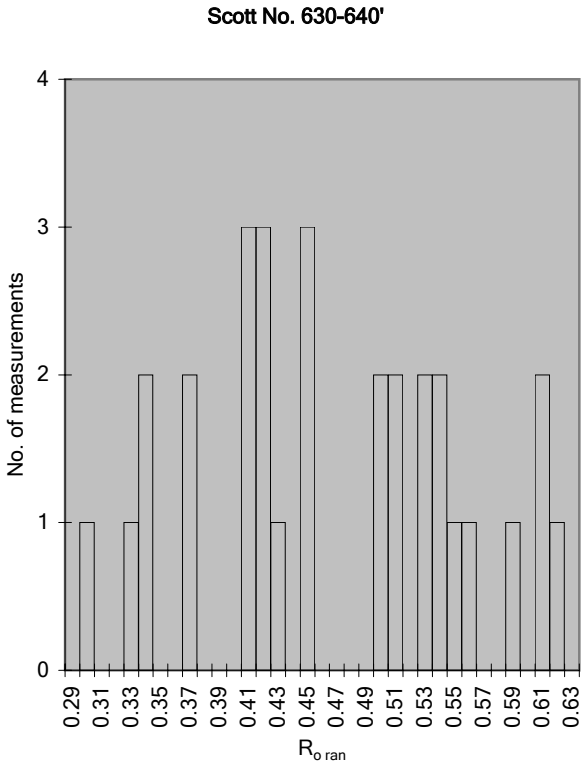
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 630-640'
Sample Type	well cuttings
Date Analyzed:	3/22/2006
Operator:	P. Hackley

RESULTS

# measurements:	30	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.46	
s.d.:	0.09	



DATA

0.414	0.332	0.404
0.537	0.616	0.443
0.542	0.528	0.298
0.534	0.492	0.339
0.361	0.582	0.449
0.445	0.557	0.428
0.405	0.361	0.527
0.507	0.414	0.604
0.604	0.416	0.499
0.410	0.326	0.509

min: 0.298 **max:** 0.616 **V-types:** 5

COMMENT

Carbonaceous shale with dispersed and in situ vitrinite.

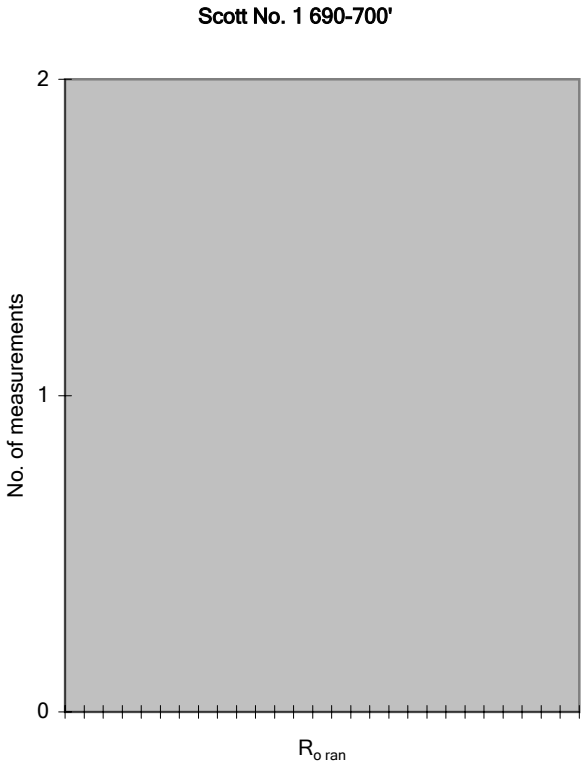
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 690-700'
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Carbonaceous shale. Sample contains approximately 10 rock fragments, some of which contain dispersed inertinite. No vitrinite is present in sample.

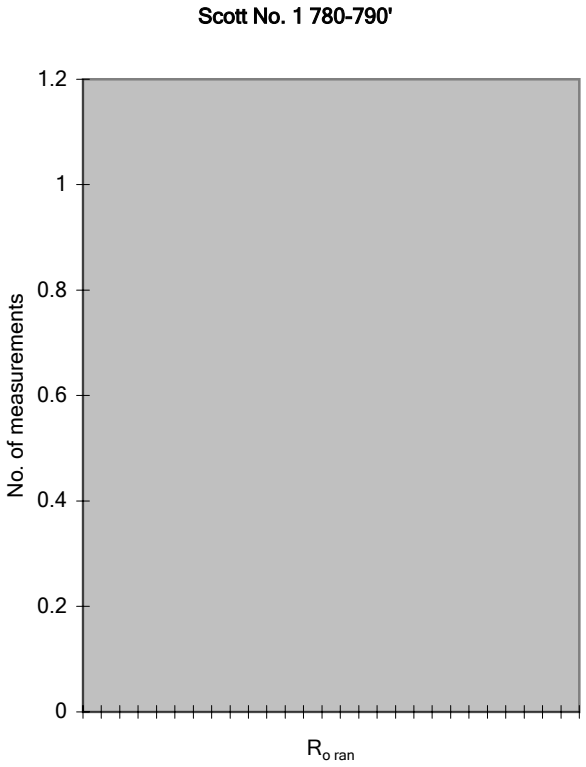
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Scott No. 1 780-790'**
Sample Type	well cuttings
Date Analyzed:	3/21/2006
Operator:	P.Hackley

RESULTS

# measurements:	1 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.45
s.d.:	N/A



DATA

0.451

min: 0.451 **max:** 0.451 **V-types:** 1

COMMENT

Sample consists of 5 rock fragments, which contain abundant dispersed inertinite. Reflectance measurement (0.45 %) of the 1 dispersed vitrinite particle present is consistent with mean measurements (0.48-0.57 %) from the same general interval of the well (610-820' depth interval).

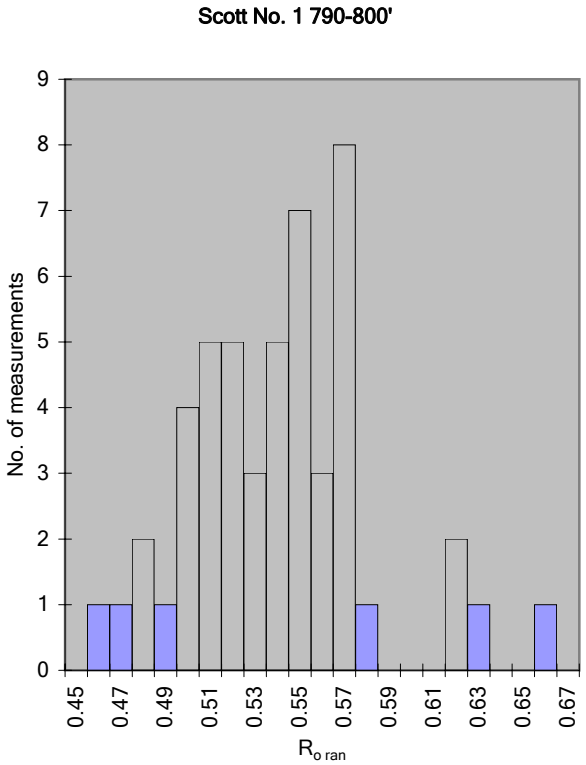
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 790-800'
Sample Type	well cuttings
Date Analyzed:	2/23/2006
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.54
s.d.:	0.04



DATA

0.549	0.521	0.517	0.571	0.522
0.554	0.562	0.463	0.629	0.541
0.507	0.570	0.659	0.616	0.561
0.458	0.532	0.556	0.509	0.564
0.505	0.567	0.568	0.473	0.526
0.495	0.531	0.542	0.507	0.493
0.517	0.564	0.561	0.515	0.479
0.509	0.541	0.492	0.532	0.533
0.486	0.548	0.550	0.491	0.537
0.512	0.611	0.556	0.511	0.541

min: 0.458 **max:** 0.659 **V-types:** 3

COMMENT

Cuttings contain abundant tri-maceral grains. Oxidation rims indicate post-sampling desiccation.

VITRINITE REFLECTANCE REPORT

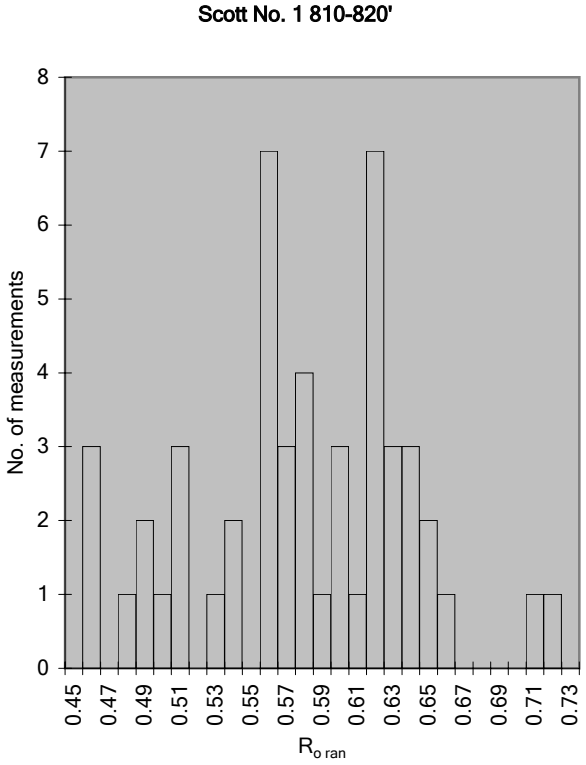
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Scott No. 1 810-820'**
Sample Type	well cuttings
Date Analyzed:	2/25/2006
Operator:	P. Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.57	
s.d.:	0.06	



DATA

0.506	0.474	0.451	0.527	0.556
0.559	0.635	0.646	0.504	0.484
0.458	0.492	0.574	0.707	0.505
0.569	0.620	0.576	0.585	0.593
0.628	0.640	0.558	0.566	0.616
0.630	0.551	0.486	0.599	0.605
0.631	0.554	0.531	0.456	0.653
0.531	0.712	0.647	0.614	0.617
0.559	0.562	0.615	0.619	0.618
0.626	0.555	0.592	0.571	0.571

min: 0.451 **max:** 0.712 **V-types:** 4

COMMENT

Coal. Contains abundant organic material. Very similar in character to Scott No. 1 790-800'. Evidence of post-sampling desiccation and oxidation. Some radioactive? halos around heavy minerals. Frequency of coal fragments in cuttings suggests a well-developed coal bed is present in this interval. Sample contains approximately 25 coal and rock fragments.

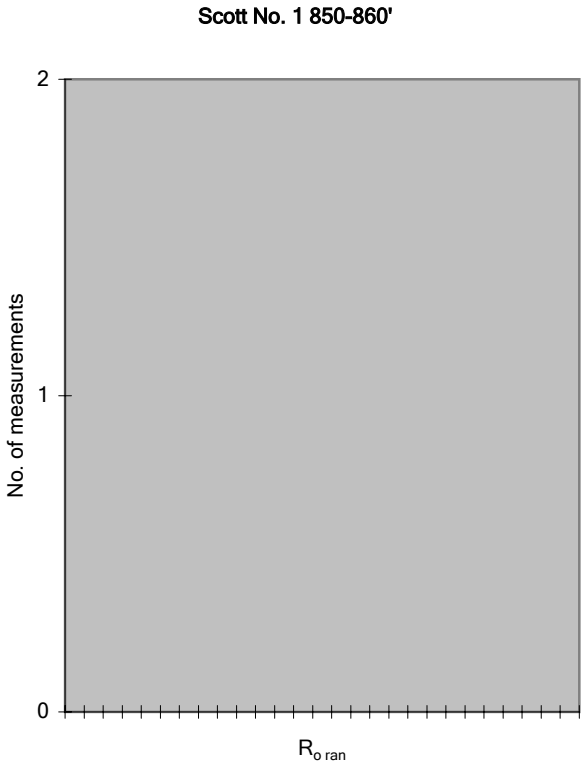
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 850-860'
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	0 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	N/A
s.d.:	N/A



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Poor polish. Some vitrinite is present but sample needs to be repolished before analysis.

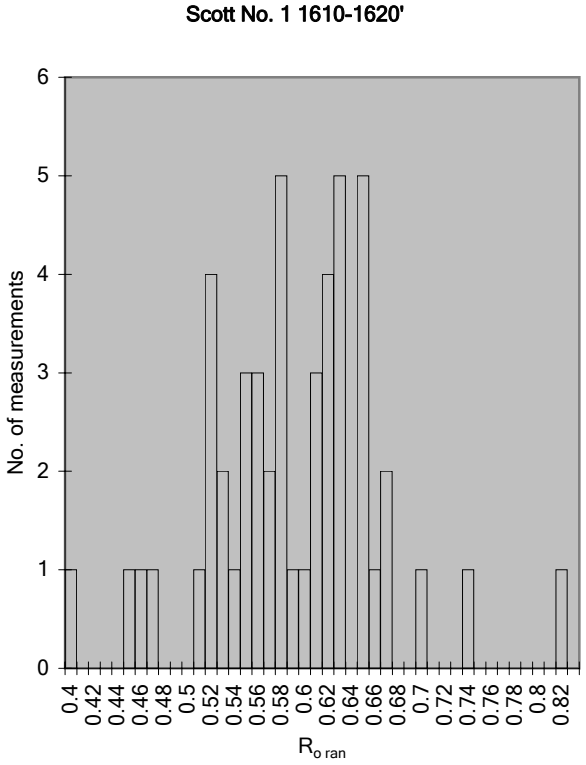
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 1610-1620'
Sample Type	well cuttings
Date Analyzed:	2/25/2006
Operator:	P.Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.59
s.d.:	0.07



DATA

0.559	0.646	0.661	0.547	0.662
0.448	0.646	0.577	0.604	0.558
0.811	0.602	0.520	0.593	0.575
0.737	0.586	0.642	0.562	0.579
0.628	0.612	0.621	0.613	0.572
0.564	0.647	0.551	0.456	0.547
0.539	0.615	0.697	0.543	0.611
0.529	0.603	0.400	0.528	0.514
0.513	0.466	0.626	0.653	0.629
0.641	0.516	0.627	0.505	0.580

min: 0.400 **max:** 0.811 **V-types:** 5

COMMENT

Abundant tri-maceral organic material present in cuttings. Excellent secretinite examples.

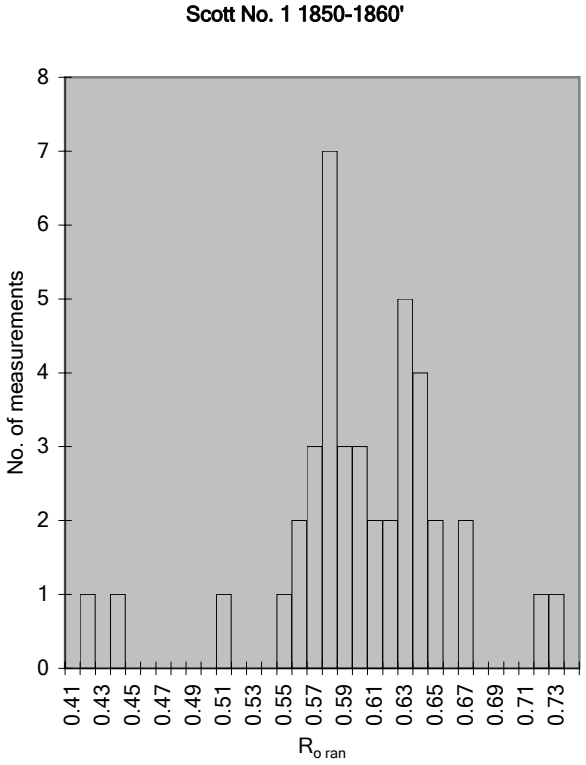
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Scott No. 1 1850-1860'
Sample Type	well cuttings
Date Analyzed:	3/1/2006
Operator:	P. Hackley

RESULTS

# measurements:	41 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.60
s.d.:	0.06



DATA

0.633	0.580	0.503	0.561	0.721
0.573	0.632	0.586	0.664	
0.581	0.570	0.418	0.645	
0.593	0.600	0.627	0.639	
0.549	0.579	0.608	0.553	
0.718	0.616	0.646	0.573	
0.552	0.579	0.624	0.561	
0.598	0.572	0.435	0.634	
0.586	0.621	0.628	0.604	
0.574	0.621	0.668	0.614	

min: 0.418 **max:** 0.721 **V-types:** 4

COMMENT

Cuttings contain dispersed vitrinite and inertinite fragments, and scattered in-situ vitrinite stringers.

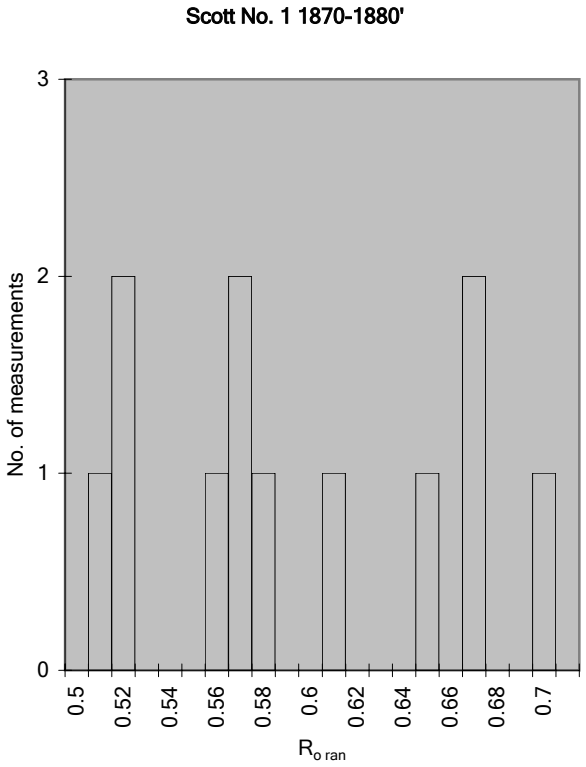
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Scott No. 1 1870-1880'**
Sample Type	well cuttings
Date Analyzed:	3/21/2006
Operator:	P. Hackley

RESULTS

# measurements:	12 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.59
s.d.:	0.06



DATA

0.601	0.503
0.578	0.520
0.569	
0.519	
0.553	
0.564	
0.667	
0.699	
0.667	
0.646	

min: 0.503 **max:** 0.699 **V-types:** 2

COMMENT

Sample contains approximately 20 rock fragments with dispersed vitrinite and inertinite particles. Result is consistent with other analysis from same interval of well.

VITRINITE REFLECTANCE REPORT

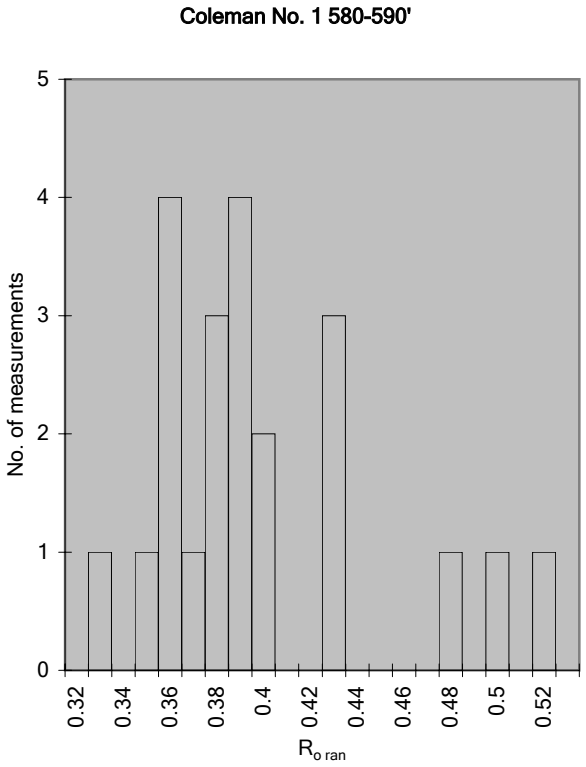
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 580-590'**
Sample Type	well cuttings
Date Analyzed:	3/23/2006
Operator:	P. Hackley

RESULTS

# measurements:	22	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.39	
s.d.:	0.05	



DATA

0.341	0.429	0.377
0.422	0.375	0.393
0.351	0.511	
0.387	0.353	
0.373	0.381	
0.328	0.472	
0.351	0.382	
0.354	0.425	
0.362	0.500	
0.390	0.398	

min: 0.328 **max:** 0.511 **V-types:** 3

COMMENT

Sample comprised of 4 carbonaceous shale rock fragments with dispersed and in situ vitrinite.

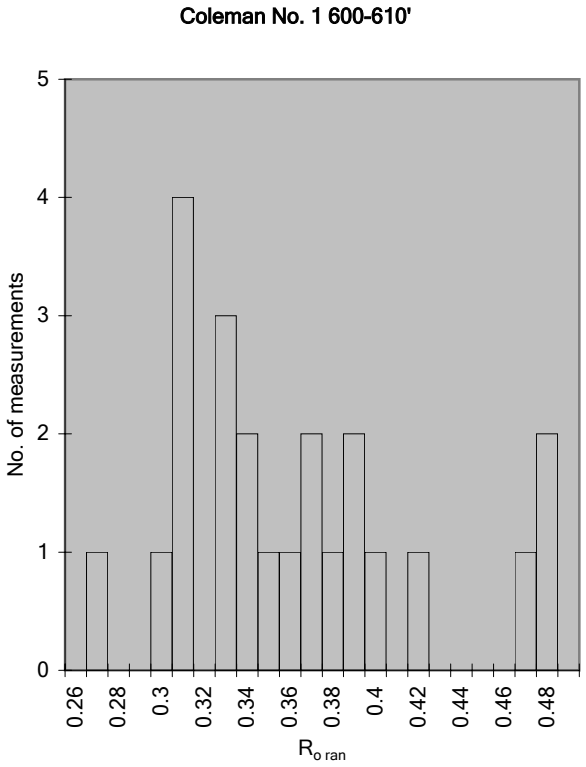
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 600-610'
Sample Type	well cuttings
Date Analyzed:	3/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	23 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.36
s.d.:	0.06



DATA

0.366	0.472	0.354
0.304	0.382	0.393
0.304	0.478	0.370
0.323	0.306	
0.382	0.349	
0.332	0.325	
0.322	0.307	
0.336	0.377	
0.461	0.269	
0.420	0.298	

min: 0.269 **max:** 0.478 **V-types:** 3

COMMENT

Sample comprised of 3 rock fragments - 2 carbonaceous shale fragments with dispersed vitrinite and inertinite and a third fragment which is epigenetic pyrite.

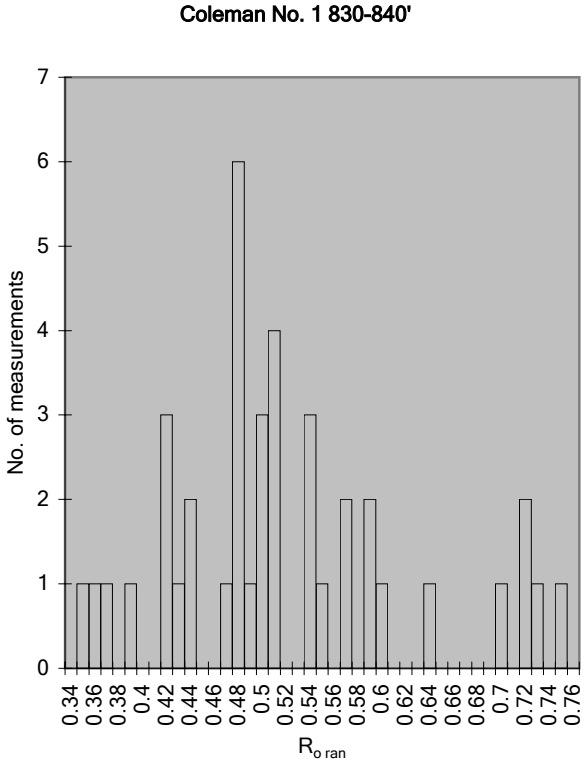
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 830-840'**
Sample Type	well cuttings
Date Analyzed:	2/23/2006
Operator:	P.Hackley

RESULTS

# measurements:	40 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.51
s.d.:	0.10



DATA

0.427	0.472	0.534	0.750
0.593	0.431	0.507	0.725
0.479	0.411	0.541	0.496
0.465	0.382	0.499	0.472
0.501	0.503	0.510	0.471
0.635	0.570	0.488	0.567
0.416	0.588	0.533	0.435
0.535	0.581	0.344	0.474
0.366	0.353	0.480	0.692
0.411	0.493	0.712	0.712

min: 0.344 **max:** 0.750 **V-types:** 5

COMMENT

Carbonaceous shale. Dispersed vitrinite-inertinite in mineral matter.

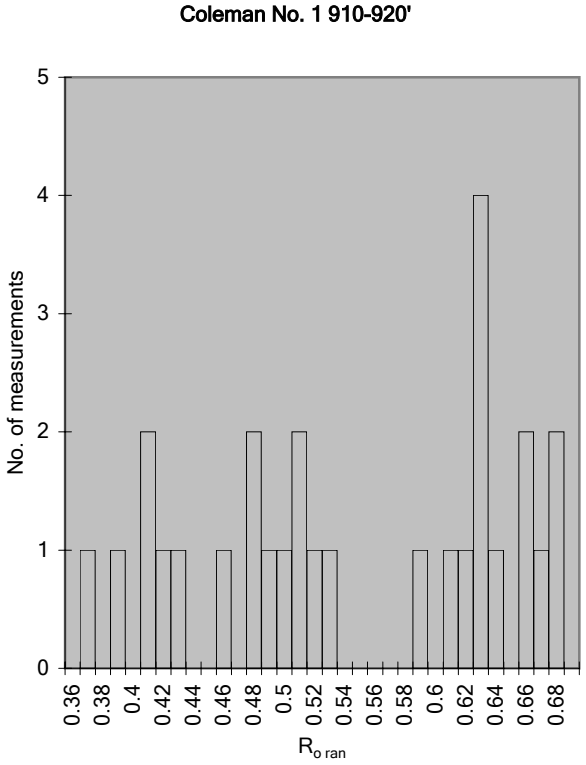
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 910-920'
Sample Type	well cuttings
Date Analyzed:	2/22/2006
Operator:	P.Hackley

RESULTS

# measurements:	28 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.54
s.d.:	0.10



DATA

0.485	0.604	0.671
0.477	0.625	0.668
0.368	0.627	0.415
0.402	0.680	0.509
0.389	0.590	0.657
0.457	0.471	0.614
0.625	0.491	0.633
0.508	0.625	0.523
0.511	0.408	
0.660	0.421	

min: 0.368 **max:** 0.680 **V-types:** 4

COMMENT

Carbonaceous shale. Dispersed organic matter in mineral groundmass. Sample comprised of 4 cuttings, 1 of which (largest) contains all acceptable vitrinite.

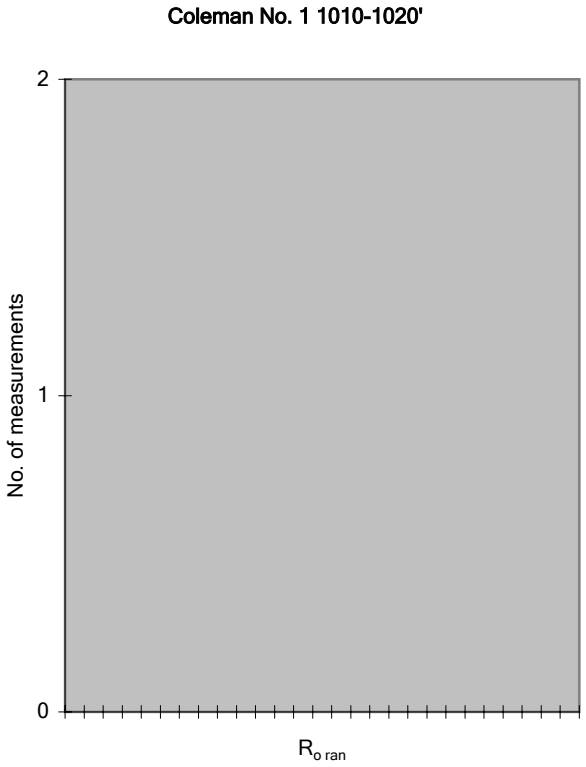
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1010-1020'
Sample Type	well cuttings
Date Analyzed:	3/22/2006
Operator:	P.Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample consists of 3 small rock fragments which do not contain vitrinite.

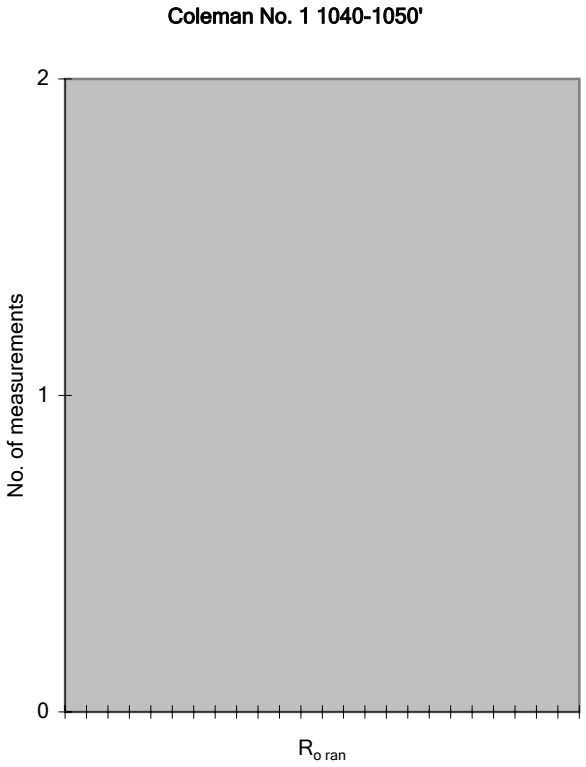
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1040-1050'
Sample Type	well cuttings
Date Analyzed:	3/16/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample contains 2 rock fragments, neither of which contains vitrinite.

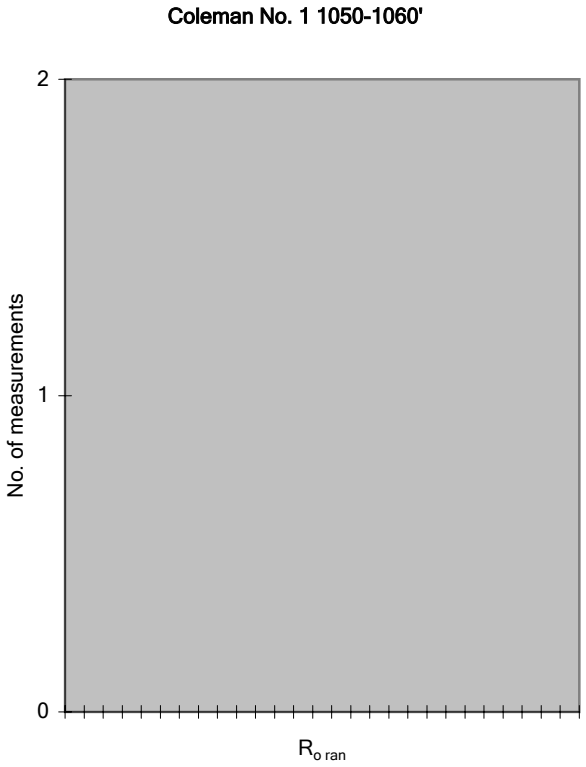
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1050-1060'
Sample Type	well cuttings
Date Analyzed:	3/23/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample does not contain vitrinite. Sample comprised of 10-15 rock fragments, of which <10 contain dispersed inertinite.

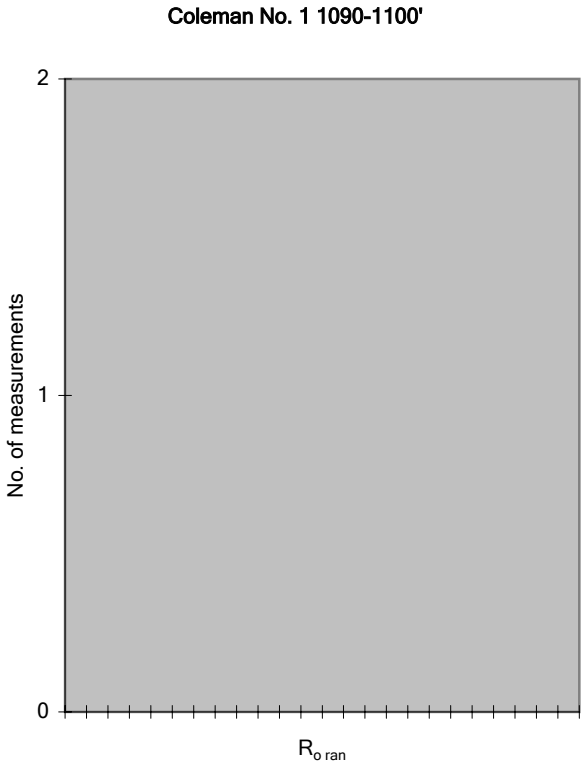
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1090-1100'**
Sample Type	well cuttings
Date Analyzed:	3/16/2006
Operator:	P. Hackley

RESULTS

# measurements:	1 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.46
s.d.:	N/A



DATA

0.455

min: 0.455 **max:** 0.455 **V-types:** 1

COMMENT

Sample contains 3-5 rock fragments. One contains dispersed inertinite. Measurement of 0.455 is on an isolated vitrinite? fragment.

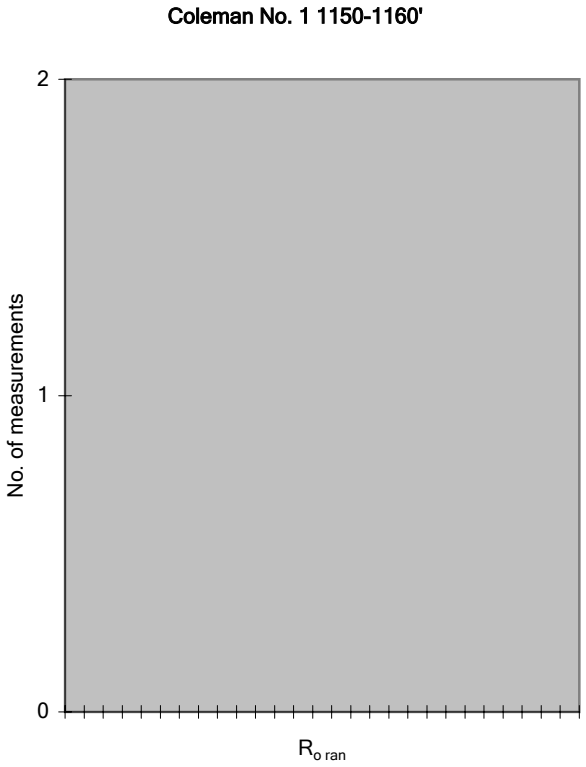
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1150-1160'
Sample Type	well cuttings
Date Analyzed:	3/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample does not contain vitrinite. Dispersed inertinite present in 1 of approximately 10 rock fragment, some of which are red indicating oxidation.

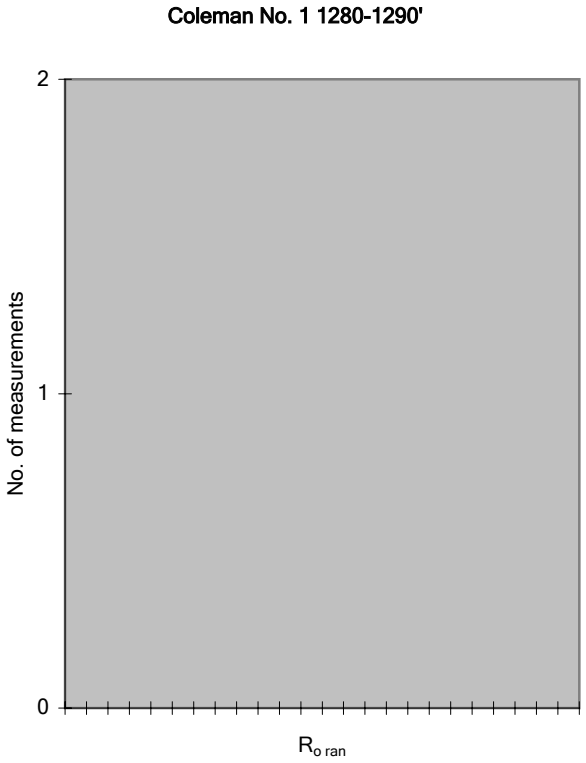
VITRINITE REFLECTANCE REPORT

USGS

SAMPLE INFORMATION

Submitted by: Edgar Guevara
Date Submitted: 7/1/2005
Project: Texas CBM

Sample: **Coleman No. 1 1280-1290'**
Sample Type well cuttings
Date Analyzed: 2/8/2006
Operator: P. Hackley



RESULTS

measurements: 5 <ASTM/ISO Standards
maceral type: N/A

DATA

1.454
1.612
1.656
0.961
1.416

min: 0.961 **max:** 1.656 **V-types:** 8

COMMENT

Sample consists of only 5 chips of rock, none of which contain vitrinite. Reflectance measurements were determined on fusinitized material dispersed in mineral matter.

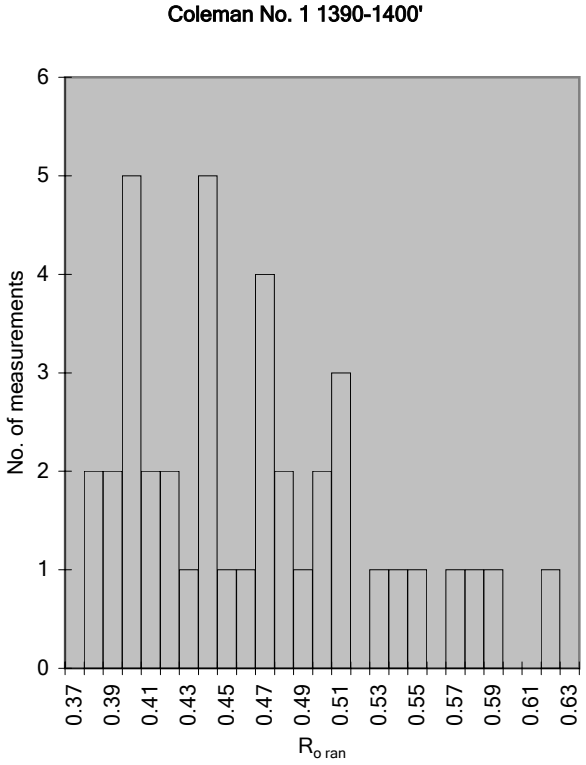
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1390-1400'**
Sample Type	well cuttings
Date Analyzed:	3/23/2006
Operator:	P. Hackley

RESULTS

# measurements:	40 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.46
s.d.:	0.06



DATA

0.493	0.534	0.581	0.379
0.463	0.501	0.433	0.401
0.617	0.404	0.474	0.393
0.525	0.392	0.400	0.372
0.462	0.386	0.439	0.477
0.542	0.459	0.500	0.463
0.416	0.567	0.437	0.397
0.450	0.578	0.381	0.505
0.437	0.399	0.482	0.422
0.438	0.467	0.504	0.420

min: 0.372 **max:** 0.617 **V-types:** 4

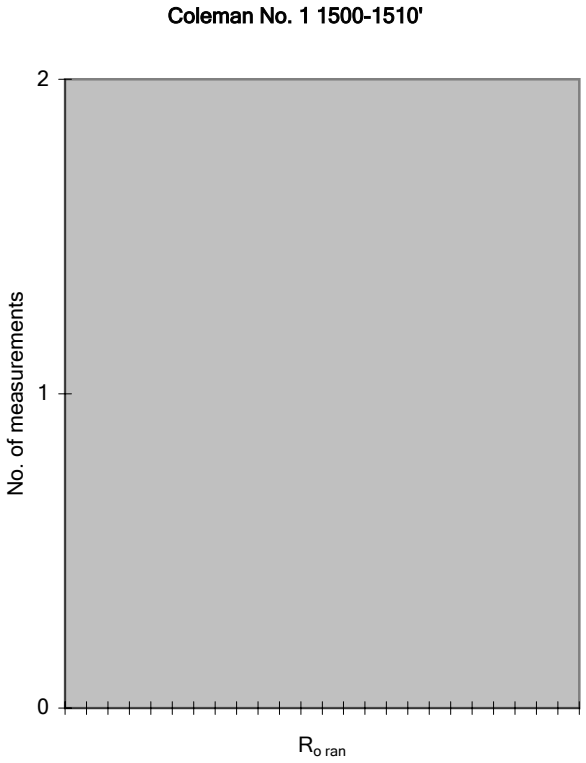
COMMENT

Carbonaceous shale. Contains dispersed and in situ vitrinite in mineral matter. Sample is approximately 15 rock fragments.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1500-1510'**
Sample Type	well cuttings
Date Analyzed:	2/8/2006
Operator:	P.Hackley



RESULTS

# measurements:	16	<ASTM/ISO Standards
maceral type:	N/A	

DATA

1.314	1.095
1.435	1.329
1.706	0.467
1.567	0.464
1.577	0.723
2.285	0.698
1.410	
1.684	
0.865	
1.817	

min: 0.464 **max:** 2.285 **V-types:** 19

COMMENT

Carbonaceous shale. Sample contains seven rock chips. Most of organic material is fusinite. Reflectance values 0.698 and 0.723 (last 2 measurements) probably are closest to actual in situ thermal maturity (~0.7).

VITRINITE REFLECTANCE REPORT

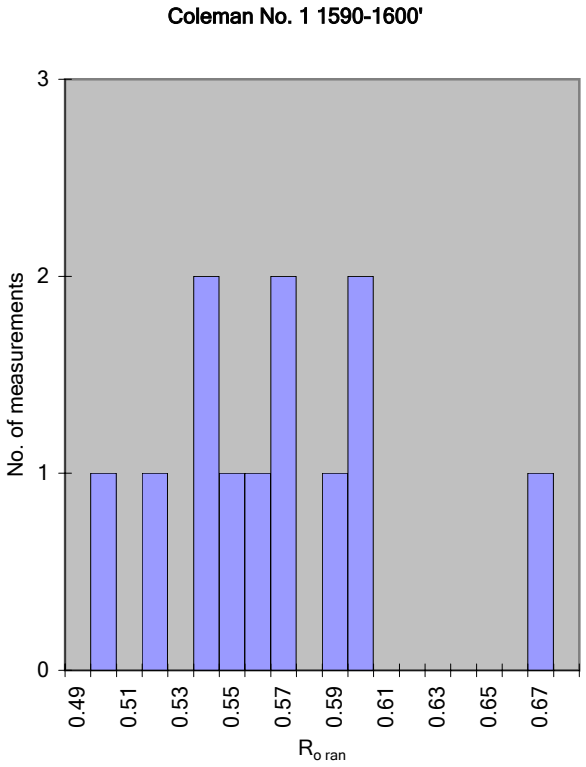
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1590-1600'**
Sample Type	well cuttings
Date Analyzed:	3/22/2006
Operator:	P. Hackley

RESULTS

# measurements:	12 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.56
s.d.:	0.04



DATA

0.562	0.669
0.596	0.533
0.537	
0.491	
0.583	
0.517	
0.565	
0.556	
0.548	
0.599	

min: 0.491 **max:** 0.669 **V-types:** 3

COMMENT

Poor preparation - sample dispersed to edges of briquette. Rock fragments contain dispersed inertinite and vitrinite adequate for analysis.

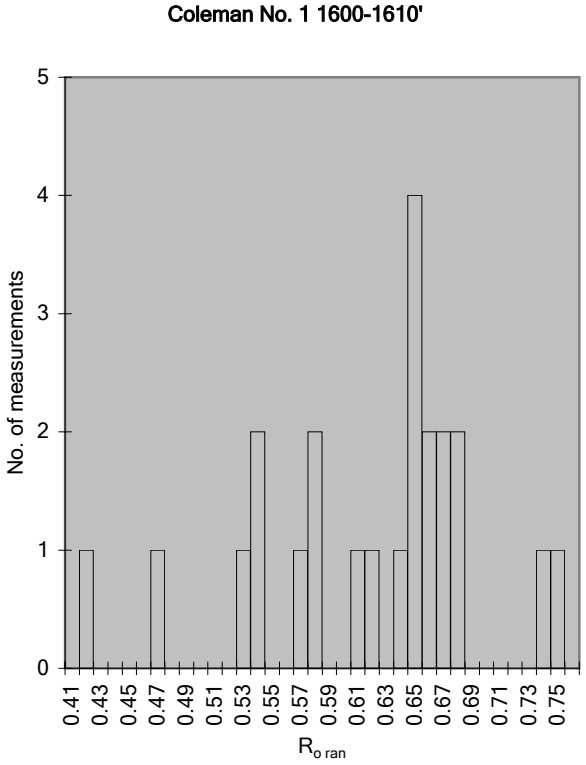
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1600-1610'
Sample Type	well cuttings
Date Analyzed:	3/22/2006
Operator:	P. Hackley

RESULTS

# measurements:	23 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.61
s.d.:	0.08



DATA

0.647	0.566	0.577
0.615	0.669	0.652
0.645	0.663	0.537
0.671	0.462	
0.643	0.741	
0.527	0.674	
0.655	0.414	
0.537	0.647	
0.573	0.637	
0.601	0.740	

min: 0.414 **max:** 0.741 **V-types:** 4

COMMENT

Sample contains approximately 10 carbonaceous shale rock fragments with dispersed and in situ vitrinite.

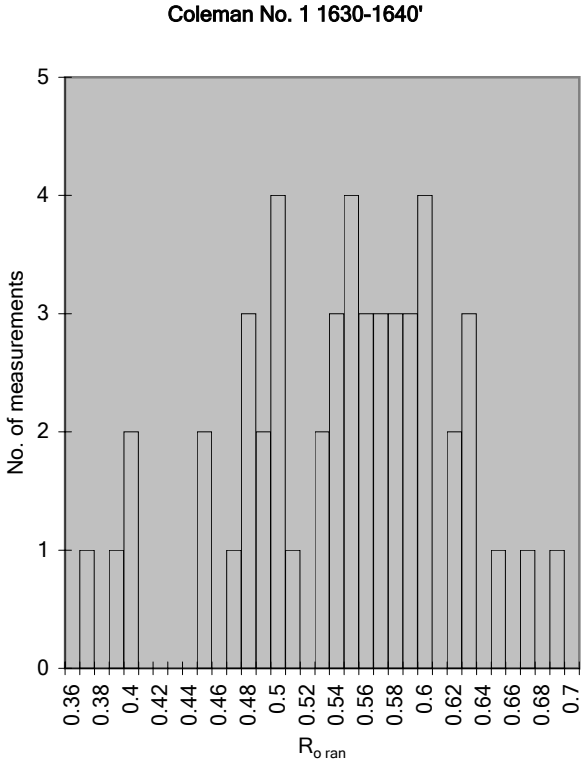
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1630-1640'
Sample Type	well cuttings
Date Analyzed:	3/22/2006
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.54
s.d.:	0.07



DATA

0.549	0.662	0.506	0.558	0.479
0.525	0.545	0.597	0.393	0.486
0.568	0.599	0.622	0.392	0.462
0.554	0.583	0.593	0.688	0.562
0.499	0.526	0.447	0.577	0.534
0.362	0.496	0.624	0.531	0.546
0.630	0.472	0.497	0.582	0.548
0.573	0.577	0.555	0.592	0.498
0.483	0.616	0.386	0.581	0.611
0.649	0.476	0.441	0.539	0.562

min: 0.362 **max:** 0.688 **V-types:** 4

COMMENT

Sample comprised of approximately 20 carbonaceous shale rock fragments with abundant in situ vitrinite.

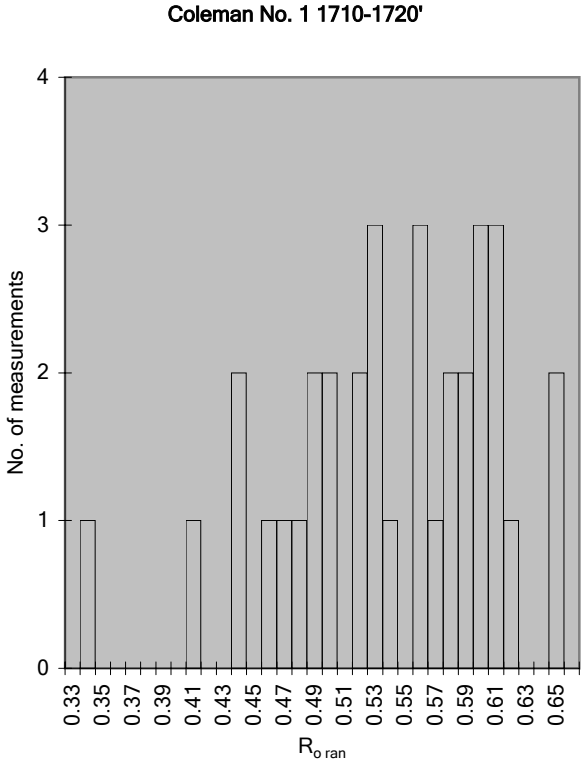
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1710-1720'
Sample Type	well cuttings
Date Analyzed:	3/23/2006
Operator:	P. Hackley

RESULTS

# measurements:	34 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.53
s.d.:	0.07



DATA

0.530	0.496	0.552	0.489
0.591	0.492	0.601	0.403
0.529	0.604	0.483	0.557
0.649	0.466	0.645	0.513
0.585	0.606	0.599	
0.571	0.565	0.579	
0.597	0.471	0.612	
0.535	0.527	0.439	
0.589	0.457	0.332	
0.517	0.558	0.431	

min: 0.332 **max:** 0.649 **V-types:** 4

COMMENT

Poor polish. Sample comprised of <10 carbonaceous shale rock fragments containing in situ and dispersed vitrinite.

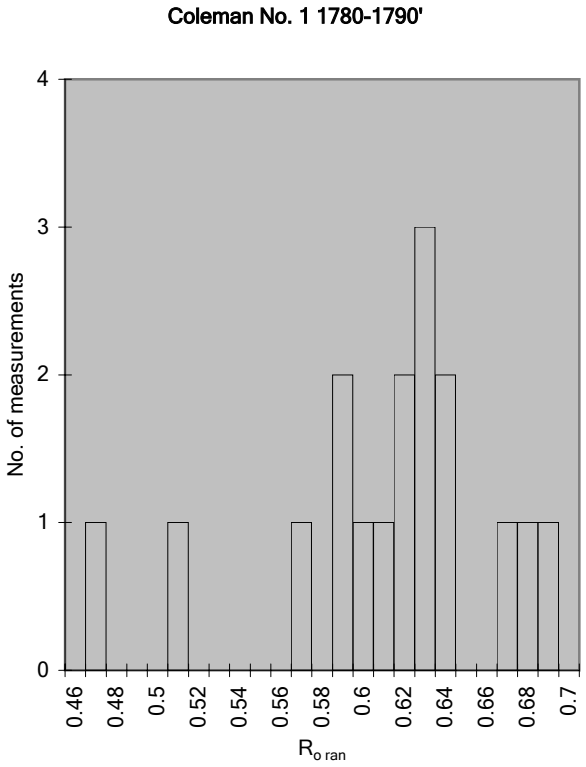
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1780-1790'**
Sample Type	well cuttings
Date Analyzed:	3/16/2006
Operator:	P. Hackley

RESULTS

# measurements:	17	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.61	
s.d.:	0.05	



DATA

0.618	0.596
0.621	0.587
0.636	0.504
0.663	0.686
0.674	0.586
0.564	0.636
0.615	0.623
0.624	
0.601	
0.465	

min: 0.465 **max:** 0.686 **V-types:** 3

COMMENT

Carbonaceous shale. Sample comprised of approximately 20 fragments, of which 1 (the largest) contains in situ vitrinite stringers as well as tri-maceral layers. All measurements are on this fragment. All other fragments are mineral matter.

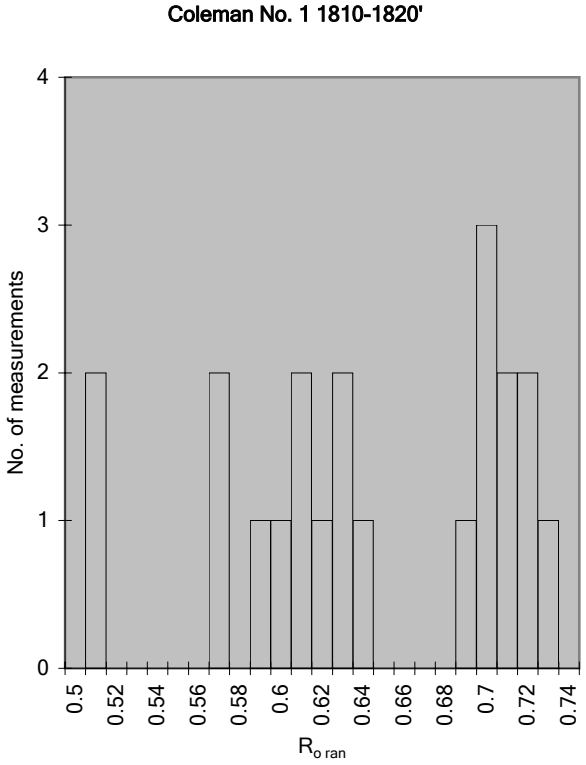
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	Coleman No. 1 1810-1820'
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	21 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.64
s.d.:	0.07



DATA

0.700	0.622	0.704
0.700	0.621	
0.712	0.682	
0.709	0.562	
0.638	0.605	
0.568	0.730	
0.611	0.593	
0.586	0.693	
0.507	0.711	
0.501	0.602	

min: 0.501 **max:** 0.730 **V-types:** 3

COMMENT

Carbonaceous shale. Sample is approximately 15 rock fragments containing scattered vitrinite and inertinite.

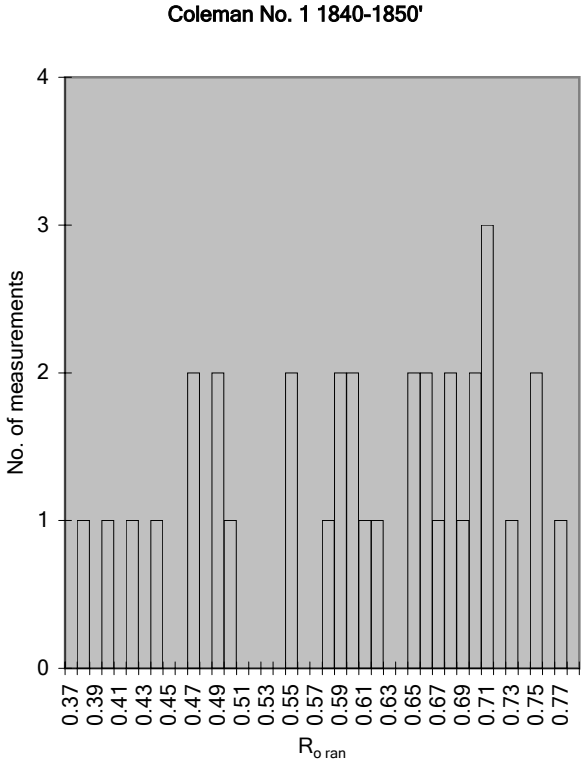
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Coleman No. 1 1840-1850'**
Sample Type	well cuttings
Date Analyzed:	2/9/2006
Operator:	P. Hackley

RESULTS

# measurements:	35 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.60
s.d.:	0.11



DATA

0.375	0.699	0.614	0.419
0.641	0.651	0.500	0.548
0.594	0.705	0.549	0.578
0.675	0.765	0.647	0.487
0.486	0.729	0.609	0.584
0.709	0.684	0.678	
0.594	0.743	0.654	
0.694	0.743	0.584	
0.661	0.397	0.465	
0.702	0.469	0.431	

min: 0.375 **max:** 0.765 **V-types:** 5

COMMENT

Carbonaceous shale. Dispersed organic material in mineral matter. Some in-situ organic (vitrinite) layers.

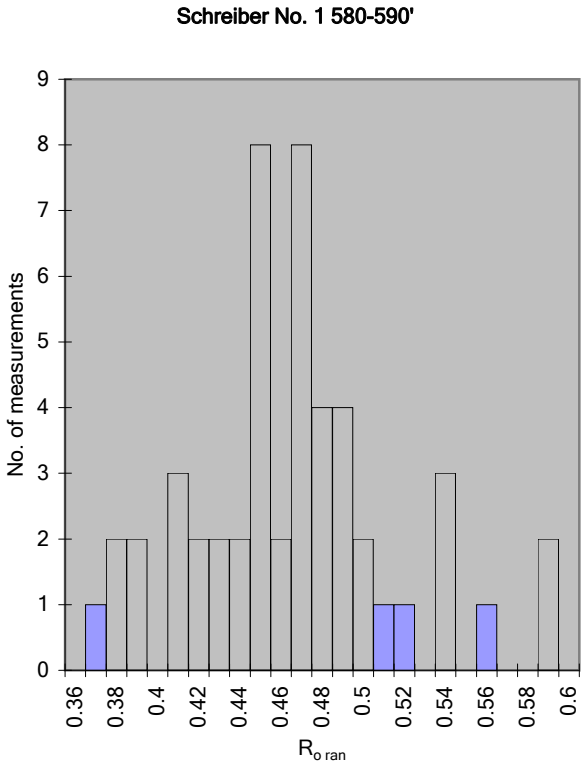
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 580-590'**
Sample Type	well cuttings
Date Analyzed:	3/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.46
s.d.:	0.05



DATA

0.417	0.382	0.587	0.442	0.461
0.443	0.435	0.464	0.431	0.455
0.461	0.462	0.483	0.375	0.464
0.498	0.516	0.449	0.364	0.441
0.447	0.537	0.406	0.486	0.476
0.428	0.378	0.557	0.443	0.471
0.466	0.418	0.449	0.490	0.489
0.471	0.421	0.465	0.461	0.401
0.536	0.473	0.493	0.443	0.510
0.536	0.587	0.385	0.406	0.454

min: 0.364 **max:** 0.587 **V-types:** 3

COMMENT

Carbonaceous shale.

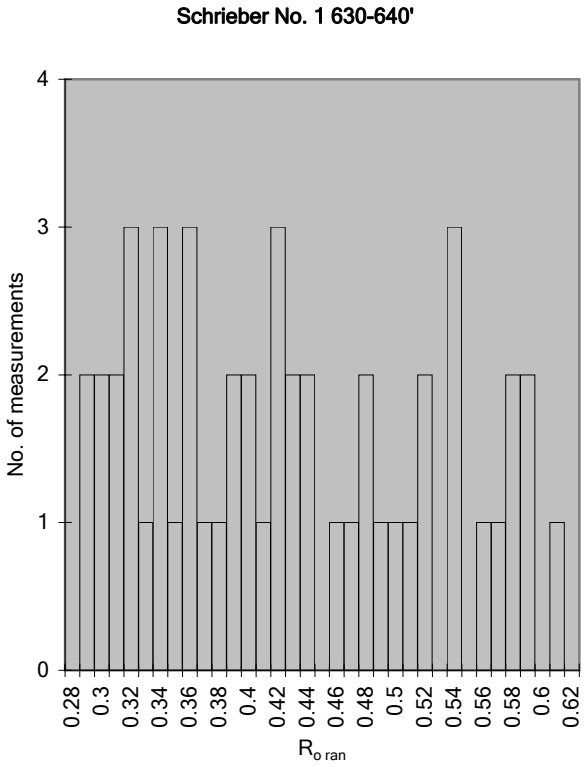
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schrieber No. 1 630-640'**
Sample Type	well cuttings
Date Analyzed:	1/30/2006
Operator:	P. Hackley

RESULTS

# measurements:	60	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.42	
s.d.:	0.09	



DATA

0.519	0.437	0.505	0.334	0.399	0.417
0.516	0.495	0.310	0.335	0.362	0.459
0.451	0.412	0.566	0.535	0.416	0.365
0.610	0.554	0.385	0.418	0.425	0.354
0.397	0.586	0.286	0.463	0.385	0.525
0.572	0.296	0.318	0.306	0.321	0.494
0.539	0.405	0.474	0.333	0.313	0.386
0.371	0.281	0.438	0.576	0.353	0.347
0.473	0.540	0.358	0.297	0.481	0.590
0.587	0.346	0.354	0.319	0.426	0.375

min: 0.281 **max:** 0.610 **V-types:** 5

COMMENT

Organic material appears very similar to 580-590' sample.

VITRINITE REFLECTANCE REPORT

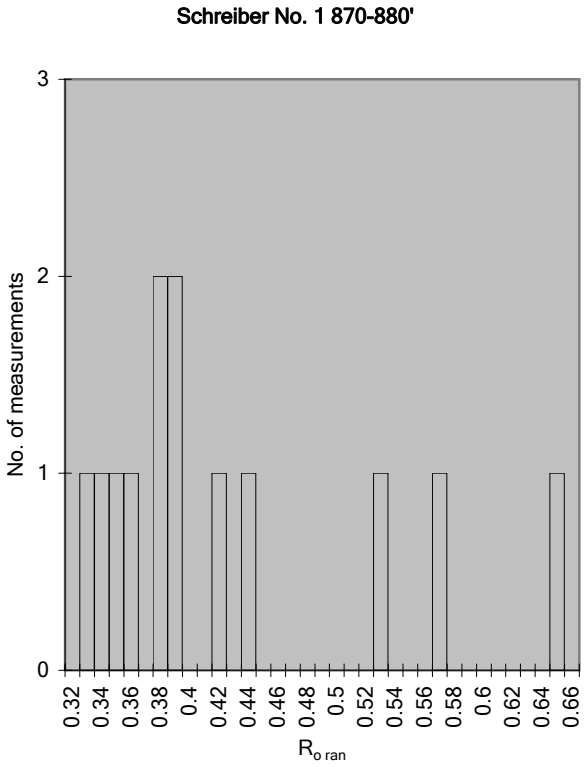
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 870-880'**
Sample Type	well cuttings
Date Analyzed:	2/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	13	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.42	
s.d.:	0.09	



DATA

0.434	0.321
0.372	0.337
0.348	0.415
0.384	
0.388	
0.566	
0.360	
0.379	
0.641	
0.526	

min: 0.321 **max:** 0.641 **V-types:** 4

COMMENT

Sample contains approximately 10 cuttings, of which only 1 contains vitrinite. Others contain inertinite (variety fusinite) or mineral matter.

VITRINITE REFLECTANCE REPORT

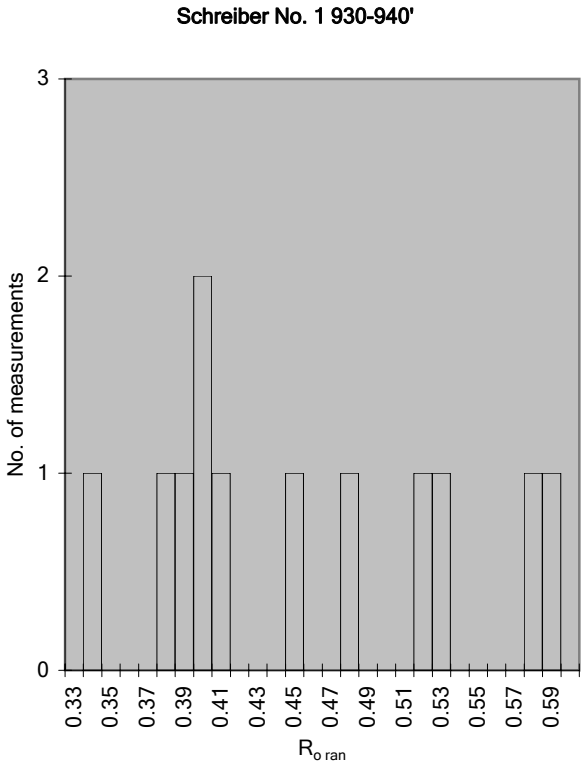
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 930-940'**
Sample Type	well cuttings
Date Analyzed:	2/27/2006
Operator:	P. Hackley

RESULTS

# measurements:	12 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.45
s.d.:	0.08



DATA

0.387	0.574
0.523	0.379
0.397	
0.393	
0.339	
0.477	
0.410	
0.445	
0.520	
0.582	

min: 0.339 **max:** 0.582 **V-types:** 3

COMMENT

Most of organic material is inertinite (variety fusinite).

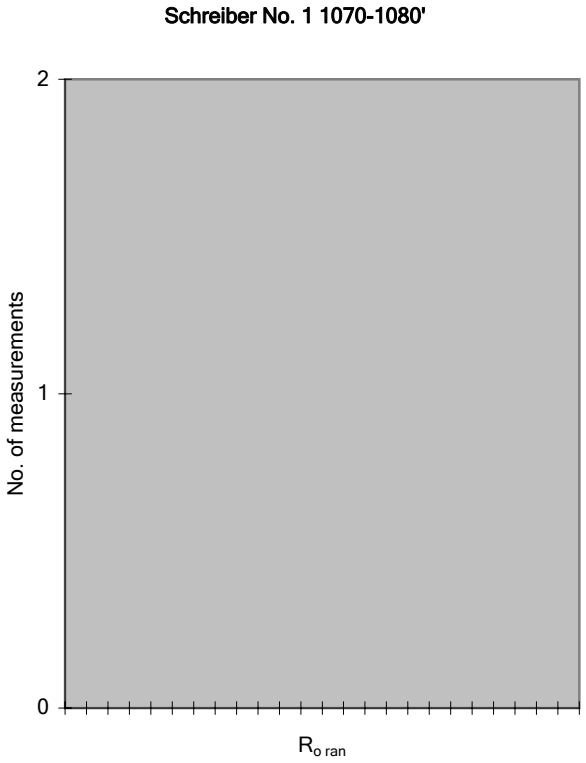
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1070-1080'**
Sample Type	well cuttings
Date Analyzed:	2/23/2006
Operator:	P. Hackley

RESULTS

measurements: 0 <ASTM/ISO Standards



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

All organic material in sample appears to be inertinite.

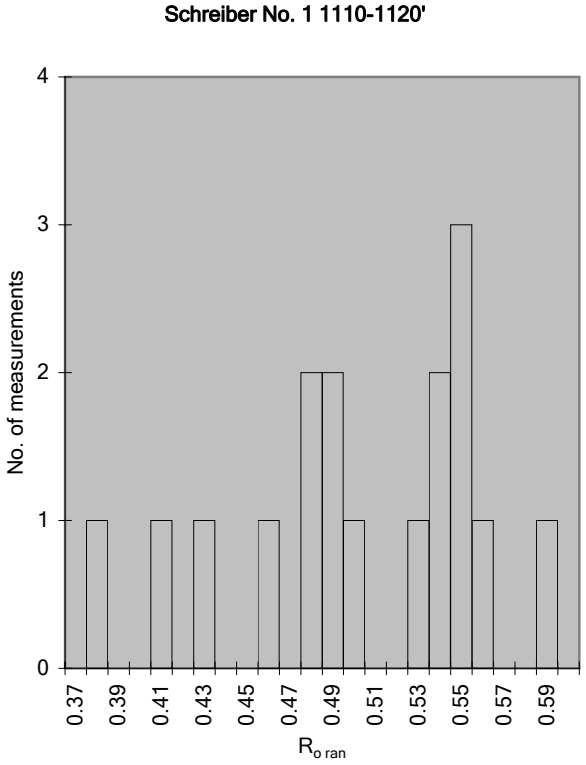
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1110-1120'**
Sample Type	well cuttings
Date Analyzed:	2/27/2006
Operator:	P.Hackley

RESULTS

# measurements:	17 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.50
s.d.:	0.06



DATA

0.421	0.487
0.477	0.556
0.406	0.531
0.480	0.542
0.492	0.535
0.544	0.371
0.588	0.452
0.527	
0.481	
0.545	

min: 0.371 **max:** 0.588 **V-types:** 3

COMMENT

Result (0.50%) is higher than samples from deeper in well, possibly indicating diagenetic oxidation of vitrinite, or caving in deeper samples. Instrument calibrated pre-, and post-analysis.

VITRINITE REFLECTANCE REPORT

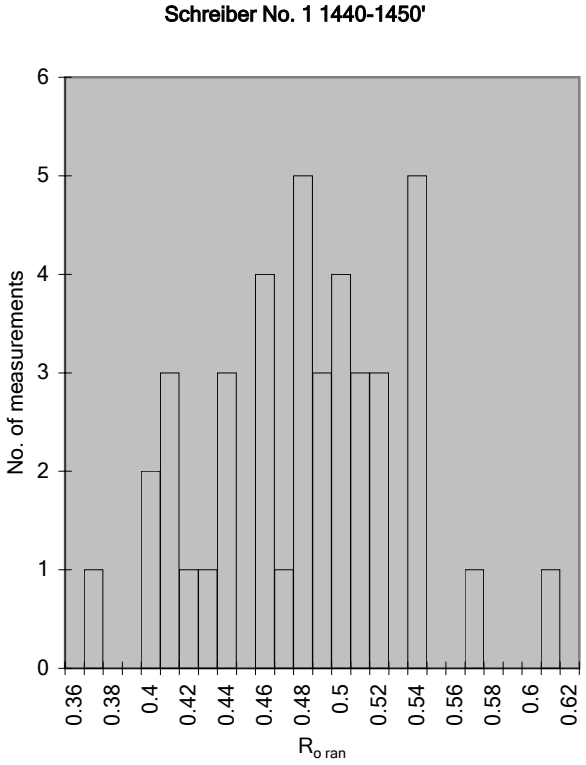
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1440-1450'**
Sample Type	well cuttings
Date Analyzed:	3/16/2006
Operator:	P. Hackley

RESULTS

# measurements:	41	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.48	
s.d.:	0.05	



DATA

0.463	0.491	0.536	0.407	0.472
0.454	0.508	0.538	0.404	
0.485	0.511	0.365	0.492	
0.431	0.420	0.505	0.485	
0.516	0.538	0.476	0.454	
0.492	0.565	0.479	0.398	
0.458	0.407	0.606	0.437	
0.519	0.473	0.437	0.453	
0.426	0.473	0.395	0.534	
0.490	0.494	0.501	0.534	

min: 0.365 **max:** 0.606 **V-types:** 4

COMMENT

Carbonaceous shale. High polishing relief. Dispersed and in situ vitrinite in mineral matter. Several fragments of 0.6-0.7% reflectance telovitrinite are present from a higher than in situ rank coal.

VITRINITE REFLECTANCE REPORT

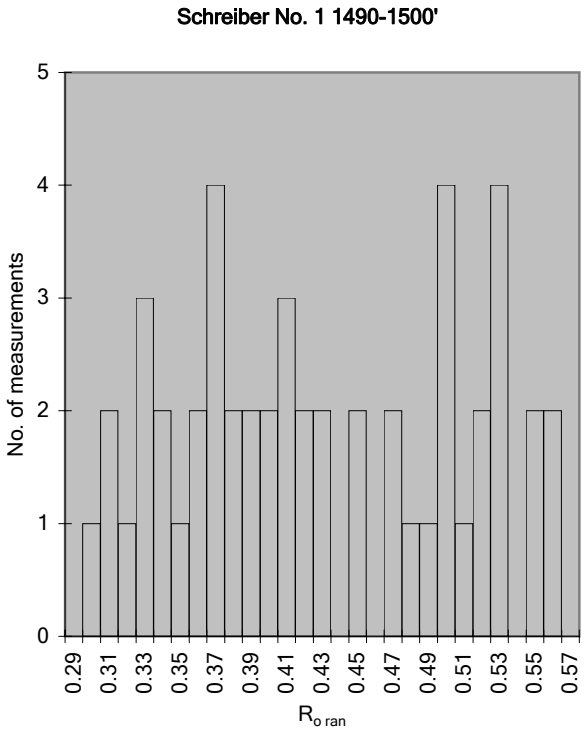
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1490-1500'**
Sample Type	well cuttings
Date Analyzed:	1/30/2006
Operator:	P.Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.42	
s.d.:	0.08	



DATA

0.500	0.399	0.337	0.367	0.328
0.526	0.406	0.309	0.476	0.499
0.503	0.519	0.338	0.424	0.305
0.523	0.556	0.385	0.524	0.360
0.541	0.414	0.384	0.445	0.364
0.465	0.516	0.368	0.372	0.423
0.499	0.544	0.482	0.343	0.406
0.493	0.371	0.461	0.557	0.356
0.443	0.396	0.319	0.410	0.362
0.522	0.330	0.299	0.327	0.416

min: 0.299 **max:** 0.557 **V-types:** 4

COMMENT

VITRINITE REFLECTANCE REPORT

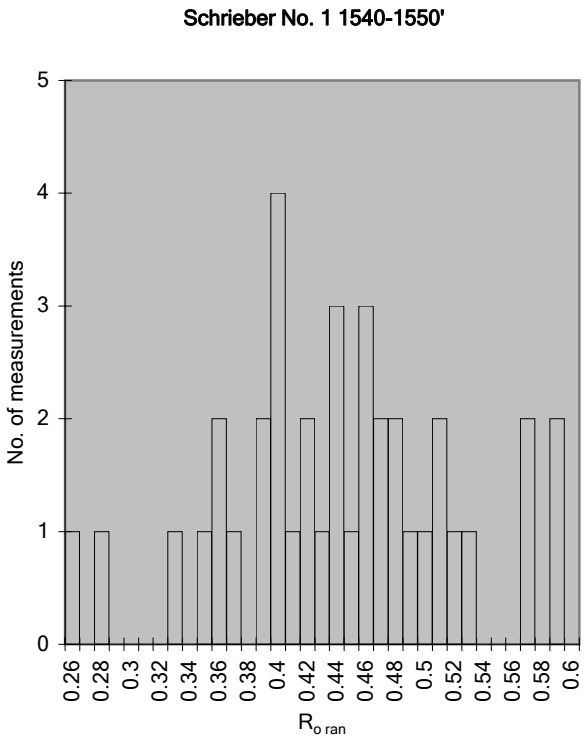
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schrieber No. 1 1540-1550'**
Sample Type	well cuttings
Date Analyzed:	1/30/2006
Operator:	P. Hackley

RESULTS

# measurements:	38 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.44
s.d.:	0.08



DATA

0.260	0.520	0.505	0.587
0.565	0.389	0.393	0.526
0.350	0.437	0.422	0.500
0.329	0.508	0.409	0.562
0.280	0.472	0.368	0.385
0.356	0.484	0.464	0.460
0.460	0.438	0.353	0.393
0.464	0.432	0.411	0.413
0.455	0.585	0.393	
0.398	0.445	0.473	

min: 0.260 **max:** 0.587 **V-types:** 4

COMMENT

VITRINITE REFLECTANCE REPORT

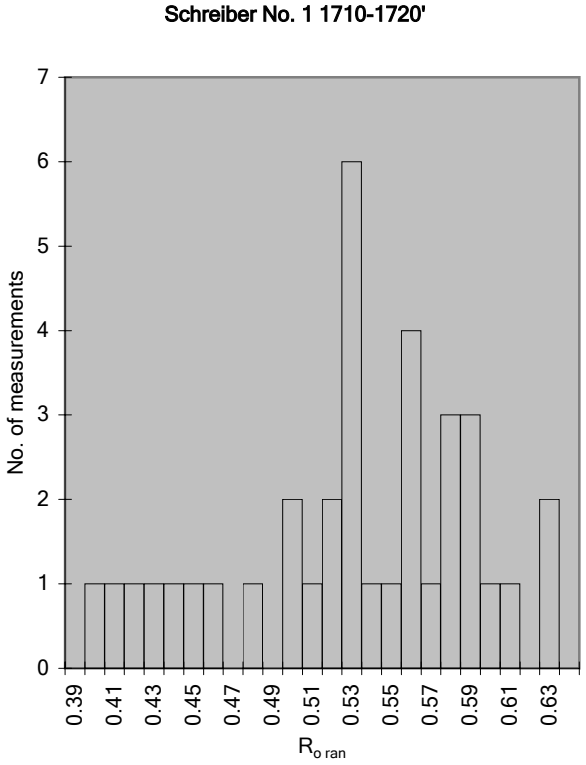
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1710-1720'**
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	36	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.53	
s.d.:	0.06	



DATA

0.517	0.419	0.551	0.509
0.581	0.473	0.455	0.558
0.562	0.500	0.628	0.537
0.600	0.545	0.401	0.553
0.525	0.577	0.440	0.586
0.526	0.552	0.621	0.527
0.573	0.511	0.496	
0.575	0.449	0.583	
0.603	0.530	0.430	
0.529	0.522	0.396	

min: 0.396 **max:** 0.628 **V-types:** 4

COMMENT

Carbonaceous shale. Sample contains approximately 15 rock fragments containing dispersed and in situ vitrinite. Abundant inertinite-liptinite. High polishing relief.

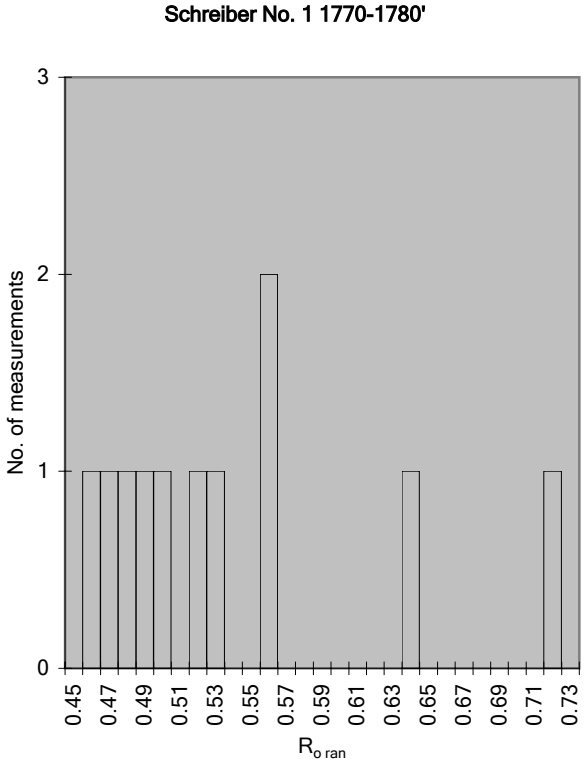
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1770-1780'**
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	11 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.53
s.d.:	0.08



DATA

0.717	0.496
0.637	
0.479	
0.456	
0.553	
0.511	
0.552	
0.486	
0.523	
0.462	

min: 0.456 **max:** 0.717 **V-types:** 4

COMMENT

Sample contains <10 rock fragments with dispersed vitrinite fragments. Poor preparation - fragments are dispersed to edges of briquette.

VITRINITE REFLECTANCE REPORT

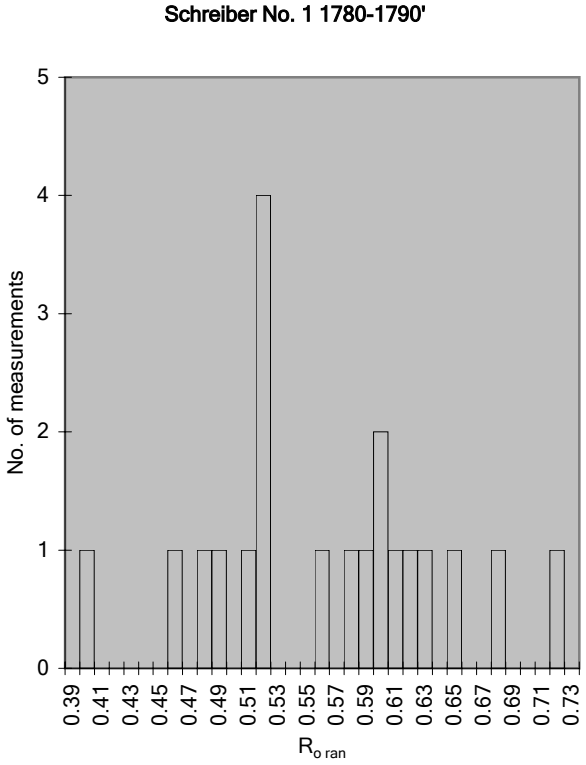
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Schreiber No. 1 1780-1790'**
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	20 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.56
s.d.:	0.08



DATA

0.712	0.512
0.591	0.511
0.625	0.583
0.479	0.676
0.620	0.556
0.396	0.592
0.502	0.604
0.512	0.649
0.485	0.515
0.456	0.577

min: 0.396 **max:** 0.712 **V-types:** 5

COMMENT

Sample contains 3 fragments, of which 2 contain dispersed vitrinite.

VITRINITE REFLECTANCE REPORT

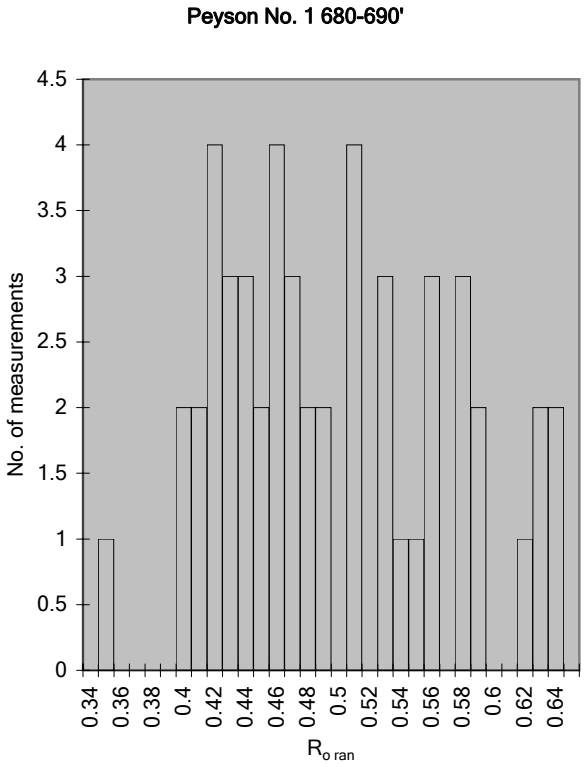
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 680-690'**
Sample Type	well cuttings
Date Analyzed:	2/28/2006
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.49
s.d.:	0.07



DATA

0.524	0.556	0.431	0.489	0.459
0.508	0.435	0.397	0.449	0.467
0.552	0.423	0.574	0.622	0.463
0.624	0.581	0.633	0.465	0.557
0.526	0.460	0.535	0.405	0.572
0.459	0.504	0.348	0.478	0.637
0.522	0.410	0.504	0.419	0.509
0.572	0.426	0.459	0.412	0.393
0.424	0.417	0.441	0.590	0.415
0.473	0.485	0.541	0.618	0.438

min: 0.348 **max:** 0.637 **V-types:** 4

COMMENT

Abundant in situ vitrinite.

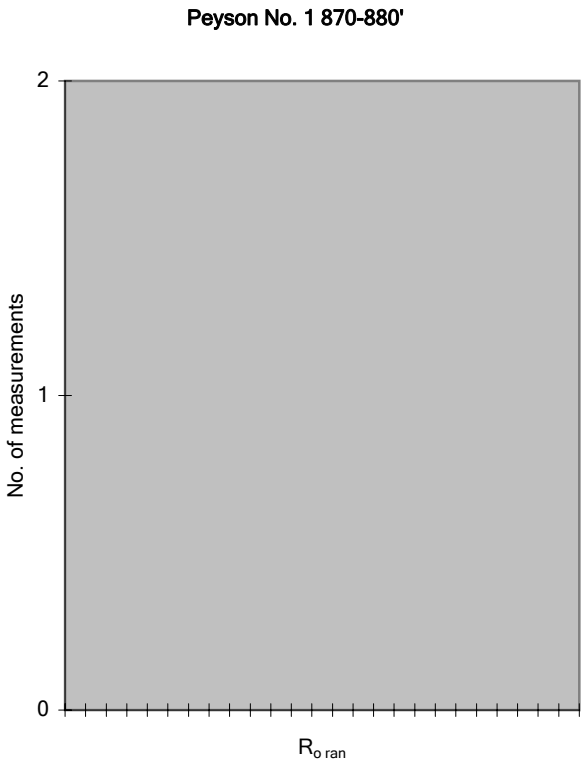
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 870-880'**
Sample Type	well cuttings
Date Analyzed:	2/28/2006
Operator:	P. Hackley

RESULTS

# measurements:	0 <ASTM/ISO Standards
maceral type:	telohuminite



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

All of organic material in sample is inertinite (variety fusinite). Sample consists of 8 cuttings.

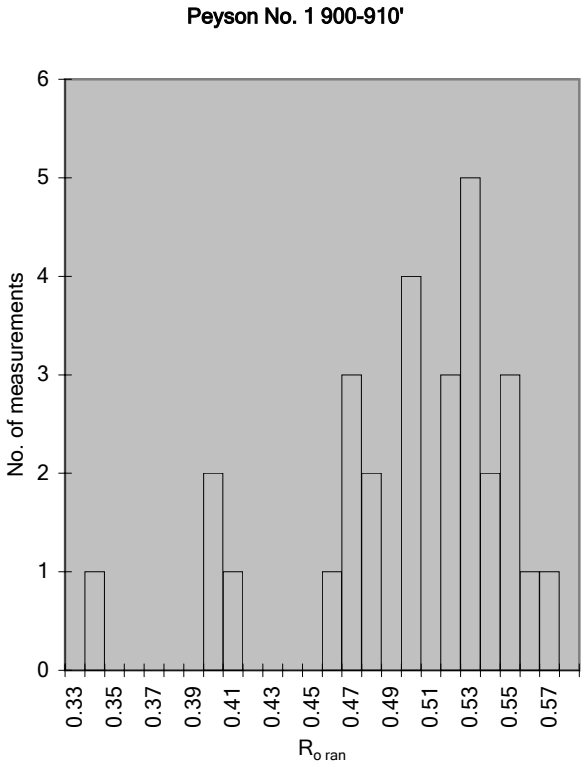
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 900-910'**
Sample Type	well cuttings
Date Analyzed:	3/17/2006
Operator:	P. Hackley

RESULTS

# measurements:	29 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.49
s.d.:	0.05



DATA

0.549	0.515	0.393
0.533	0.524	0.337
0.525	0.406	0.556
0.527	0.465	0.538
0.544	0.460	0.521
0.465	0.547	0.526
0.467	0.567	0.477
0.475	0.398	0.491
0.494	0.517	0.514
0.494	0.492	

min: 0.337 **max:** 0.567 **V-types:** 3

COMMENT

Carbonaceous shale. Dispersed and in situ vitrinite and inertinite. Sample consists of approximately 15 rock fragments.

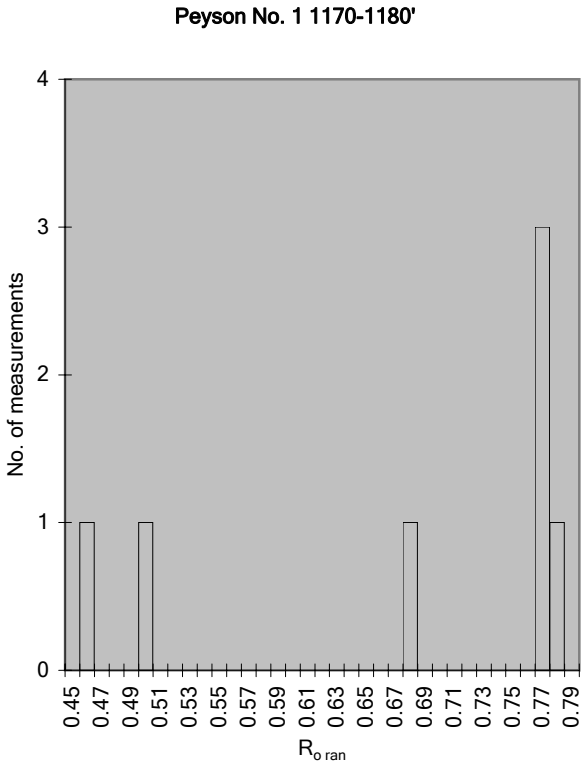
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1170-1180'**
Sample Type	well cuttings
Date Analyzed:	2/28/2006
Operator:	P. Hackley

RESULTS

# measurements:	7 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.67
s.d.:	0.13



DATA

0.765
0.451
0.770
0.772
0.672
0.491
0.769

min: 0.451 **max:** 0.772 **V-types:** 4

COMMENT

Sample contains 3 cuttings. Higher reflectance values may be on inertinites; however, all measurements are tentatively interpreted to be on vitrinite.

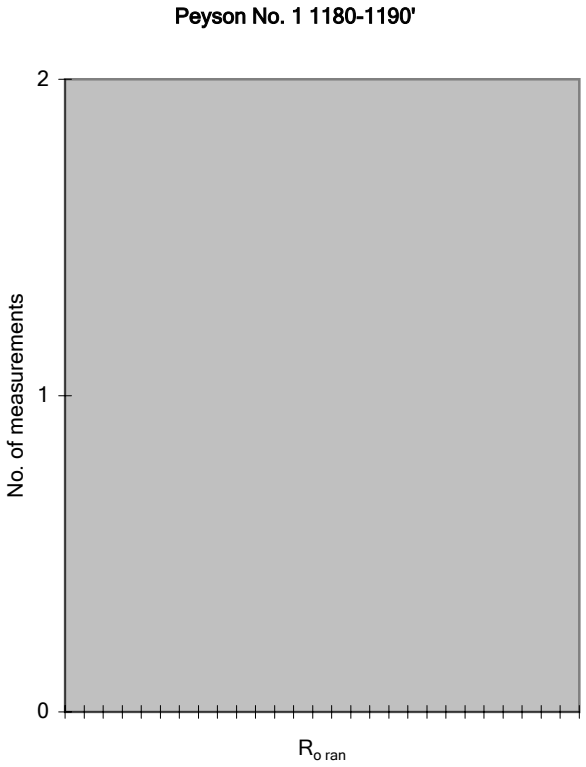
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1180-1190'**
Sample Type	well cuttings
Date Analyzed:	3/21/2006
Operator:	P. Hackley

RESULTS

# measurements:	0	<ASTM/ISO Standards
maceral type:	N/A	
$R_{o\ ran}$ (ISO/ASTM):	N/A	
s.d.:	N/A	



DATA

min: 0.000 **max:** 0.000 **V-types:** 0

COMMENT

Sample consists of 3 rock fragments which contain dispersed inertinite particles. No vitrinite present.

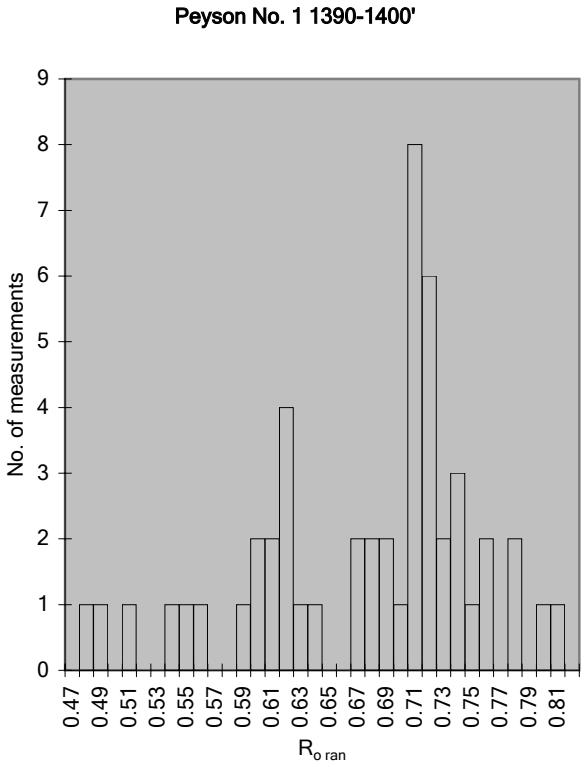
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1390-1400'**
Sample Type	well cuttings
Date Analyzed:	2/9/2006
Operator:	P. Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.67	
s.d.:	0.08	



DATA

0.590	0.595	0.740	0.703	0.624
0.548	0.611	0.687	0.682	0.754
0.701	0.724	0.677	0.750	0.699
0.474	0.715	0.736	0.779	0.610
0.677	0.704	0.775	0.706	0.559
0.616	0.604	0.719	0.798	0.713
0.636	0.669	0.701	0.737	0.502
0.616	0.719	0.806	0.487	0.611
0.665	0.703	0.598	0.703	0.532
0.715	0.729	0.712	0.757	0.702

min: 0.474 **max:** 0.806 **V-types:** 5

COMMENT

Carbonaceous shale. Abundant in situ vitrinite. High polishing relief.

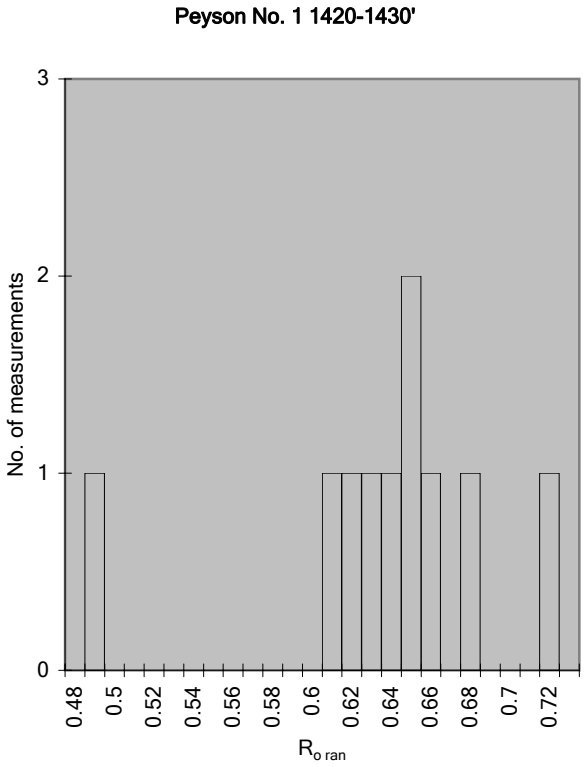
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1420-1430'**
Sample Type	well cuttings
Date Analyzed:	2/25/2006
Operator:	P. Hackley

RESULTS

# measurements:	10	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.63	
s.d.:	0.06	



DATA

0.622
0.676
0.644
0.612
0.649
0.486
0.656
0.716
0.633
0.605

min: 0.486 **max:** 0.716 **V-types:** 4

COMMENT

Most of the organic material in sample is inertinite; variety fusinite.

VITRINITE REFLECTANCE REPORT

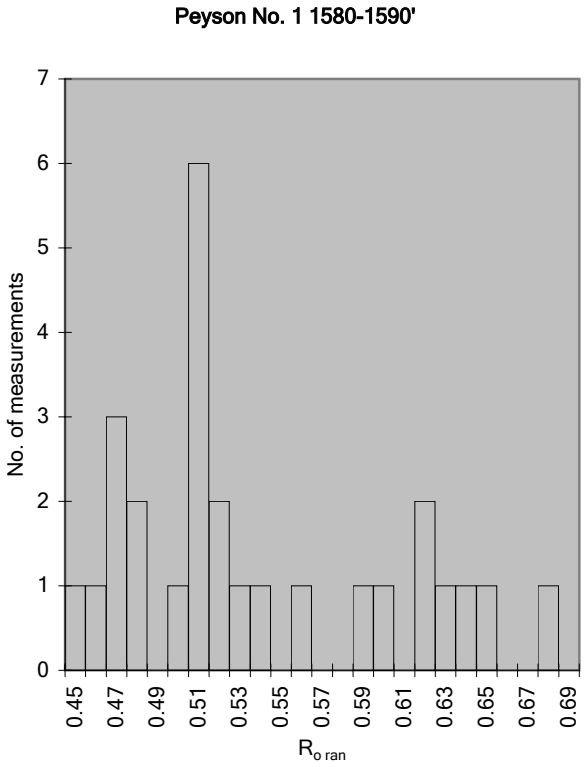
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1580-1590'**
Sample Type	well cuttings
Date Analyzed:	2/28/2006
Operator:	P. Hackley

RESULTS

# measurements:	27	<ASTM/ISO Standards
maceral type:	telohuminite	
$R_{o\ ran}$ (ISO/ASTM):	0.53	
s.d.:	0.06	



DATA

0.519	0.477	0.621
0.505	0.465	0.673
0.644	0.505	0.599
0.505	0.522	0.512
0.469	0.503	0.638
0.450	0.615	0.539
0.462	0.508	0.559
0.475	0.492	
0.451	0.586	
0.615	0.505	

min: 0.450 **max:** 0.673 **V-types:** 3

COMMENT

Carbonaceous shale. Result (0.53%) is inconsistent (lower) than samples from higher in well at approximately 1400 ft (0.6-0.7%). Sample contains approximately 10 cuttings with dispersed and indigenous vitrinite. Possible caving from higher in hole?

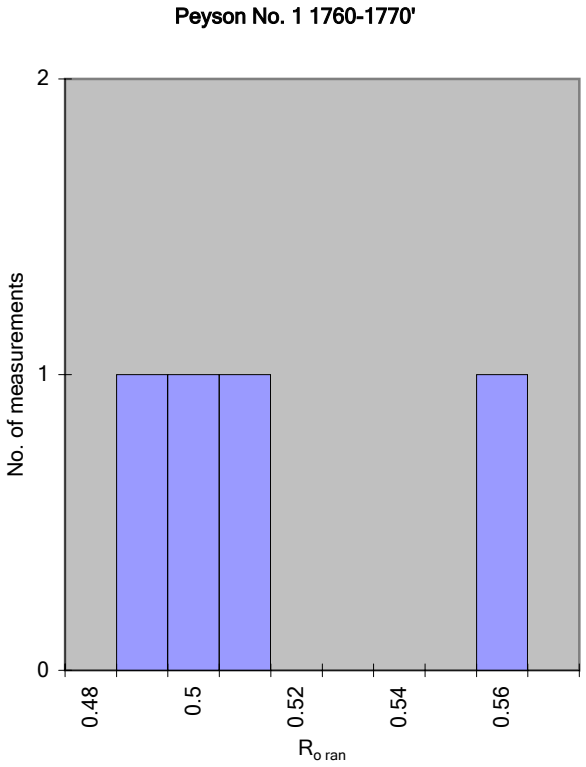
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 1760-1770'**
Sample Type	well cuttings
Date Analyzed:	2/28/2006
Operator:	P. Hackley

RESULTS

# measurements:	4 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.51
s.d.:	0.02



DATA

0.497
0.488
0.551
0.507

min: 0.488 **max:** 0.551 **V-types:** 2

COMMENT

Sample contains abundant fusinite; approximately 95% of cuttings (of 35-45 particles). Reflectance measurements were made on the one cutting that did contain vitrinite. Result (0.51%) is inconsistent with higher values from shallower depths and probably is from caving.

VITRINITE REFLECTANCE REPORT

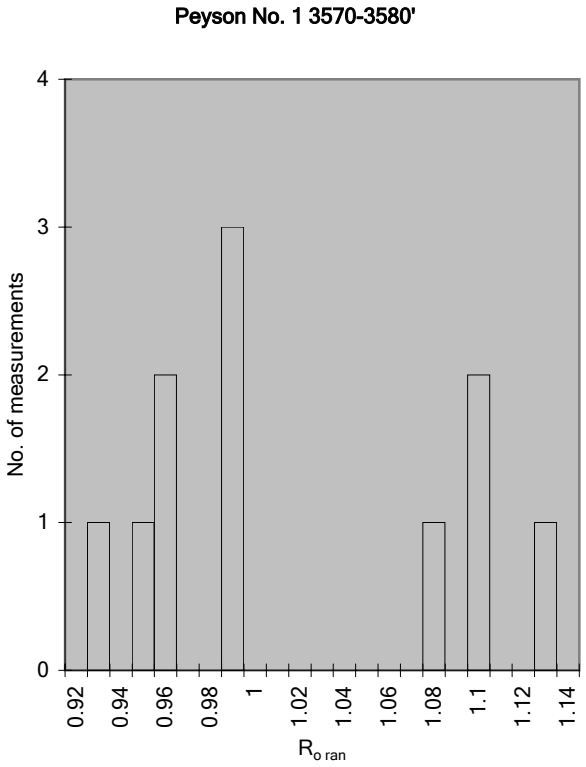
USGS

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 3570-3580'**
Sample Type	well cuttings
Date Analyzed:	3/3/2006
Operator:	P. Hackley

RESULTS

# measurements:	11 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	1.01
s.d.:	0.07



DATA

1.075	0.954
0.984	
1.092	
1.098	
1.121	
0.981	
0.989	
0.924	
0.949	
0.959	

min: 0.924 **max:** 1.121 **V-types:** 3

COMMENT

Sample is one cutting (1-2 other cuttings lost during polishing of briquette). Cutting is approximately 1 x 2 mm, and dominated by massive pyrite with minor vitrinite fragments. Result (1.01 %) is inconsistent with all other values from Archer County. Value probably is impacted by proximity to high-reflecting pyrite.

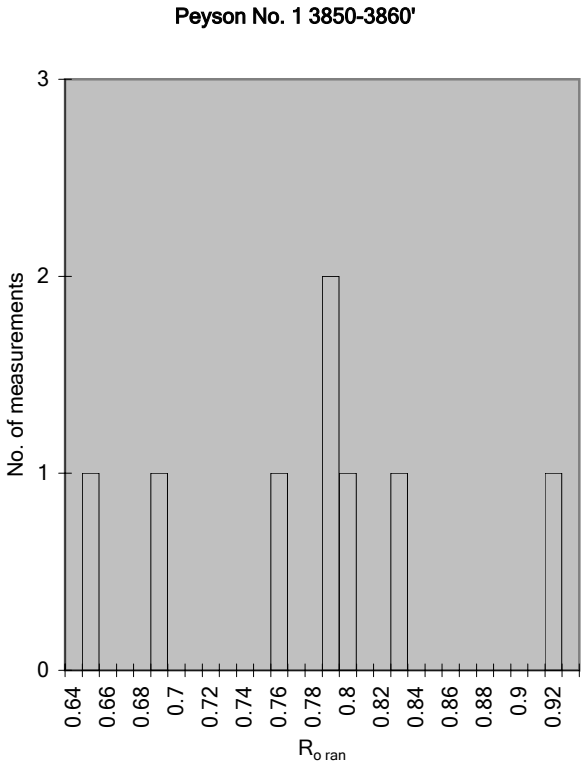
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/1/2005
Project:	Texas CBM
Sample:	**Peyson No. 1 3850-3860'**
Sample Type	well cuttings
Date Analyzed:	3/3/2006
Operator:	P. Hackley

RESULTS

# measurements:	8 <ASTM/ISO Standards
maceral type:	telohuminite
$R_{o\ ran}$ (ISO/ASTM):	0.77
s.d.:	0.08



DATA

0.791
0.649
0.914
0.822
0.687
0.782
0.754
0.788

min: 0.649 **max:** 0.914 **V-types:** 4

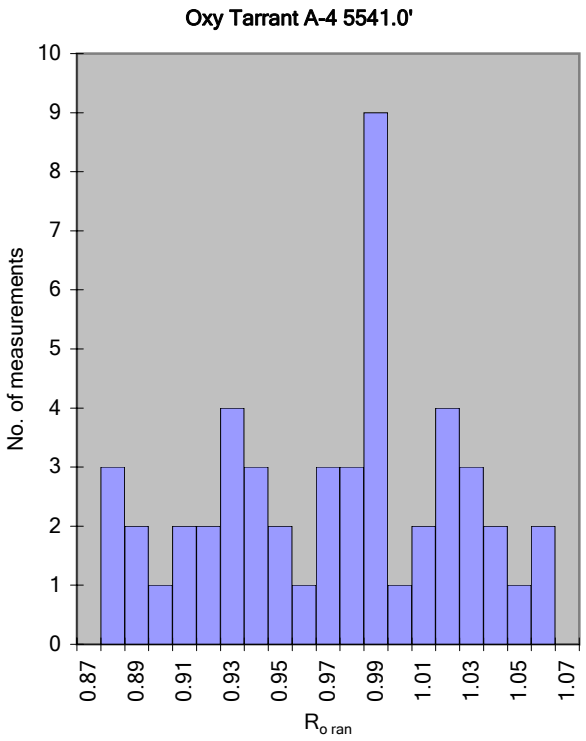
COMMENT

Sample is two cuttings, one of which contains vitrinite (1-2 other cuttings lost during polishing of briquette). Value is consistent with other deep Archer and Young County cuttings samples.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**Oxy Tarrant A-4 5541.0'**
Sample Type	core
Date Analyzed:	3/30/2007
Operator:	P. Hackley



RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.97	
s.d.:	0.05	

DATA

0.965	1.013	0.913	0.973	0.945
1.023	0.964	0.927	0.872	0.901
1.022	0.982	0.925	0.985	1.057
1.019	1.033	0.991	1.010	1.013
0.878	1.021	1.003	0.989	1.014
0.939	0.888	0.896	1.060	0.940
0.987	0.927	0.930	1.048	0.977
0.913	1.037	0.950	0.969	0.973
0.985	0.982	0.872	0.883	0.938
0.985	0.982	0.956	0.901	0.984

min: 0.872 **max:** 1.060 **V-types:** 3

COMMENT

Measured value consistent with previously determined lower Atoka samples. Comprised of mostly homogenous vitrinite with relic cellular structure. Fragments of mineral-matter-rich carbonaceous shale contain dispersed and in situ vitrinite as well as most of sample inertinite. Scattered fragments of trimaceral coal present.

VITRINITE REFLECTANCE REPORT

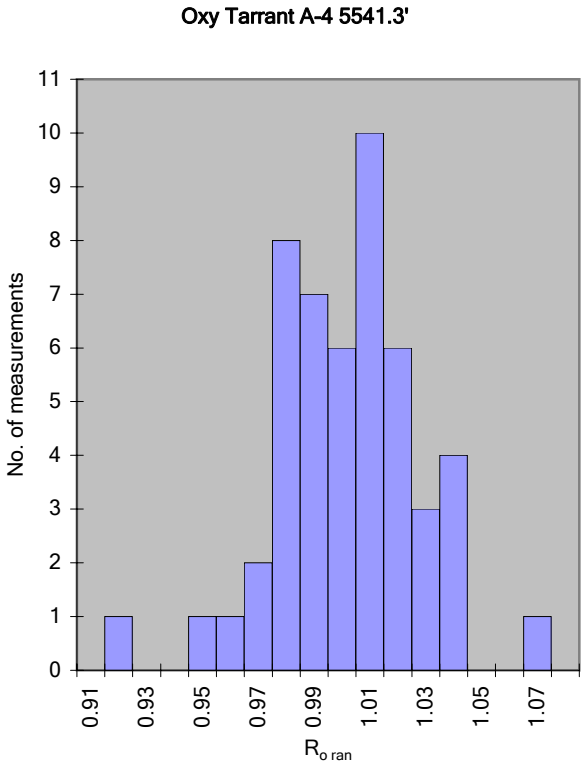
USGS

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**Oxy Tarrant A-4 5541.3'**
Sample Type	core
Date Analyzed:	3/28/2007
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	1.00
s.d.:	0.03



DATA

1.016	1.002	0.979	0.986	0.962
1.036	1.017	0.979	1.012	0.973
1.022	1.016	0.997	0.972	0.948
0.991	1.062	0.989	1.017	1.022
0.913	1.035	0.984	1.007	0.972
0.982	0.980	1.038	1.008	1.001
0.957	1.003	1.002	1.027	0.991
0.986	1.036	0.992	0.983	0.965
0.998	0.978	0.991	1.012	1.009
0.982	0.975	1.002	1.006	1.003

min: 0.913 **max:** 1.062 **V-types:** 2

COMMENT

Measured value consistent with three previously determined Atoka samples. Comprised of mostly homogenous vitrinite with relic cellular structure. Fragments of mineral-matter-rich carbonaceous shale contain dispersed and in situ vitrinite as well as most of sample inertinite.

VITRINITE REFLECTANCE REPORT

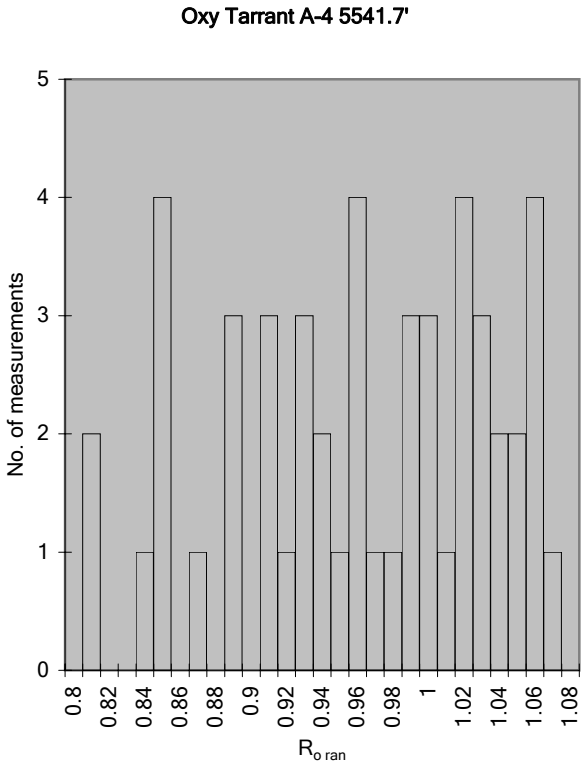
USGS

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**Oxy Tarrant A-4 5541.7'**
Sample Type	core
Date Analyzed:	3/30/2007
Operator:	P.Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.96
s.d.:	0.07



DATA

1.039	0.801	0.927	0.842	0.927
0.844	0.985	0.922	0.887	0.869
0.831	0.974	1.042	0.806	1.014
0.916	0.935	0.902	0.847	0.952
0.908	0.947	0.909	1.052	1.053
0.968	1.064	0.889	1.011	0.887
1.028	1.027	0.987	0.952	1.028
1.053	1.058	0.955	1.008	1.041
1.014	0.993	1.040	0.938	0.842
1.012	0.956	0.992	0.992	0.988

min: 0.801 **max:** 1.064 **V-types:** 3

COMMENT

Sample contains dispersed indigenous vitrinite, inertinite, and vitrinite bands in coaly shale fragments. Contains more mineral matter than other lower Atoka samples examined to-date.

VITRINITE REFLECTANCE REPORT

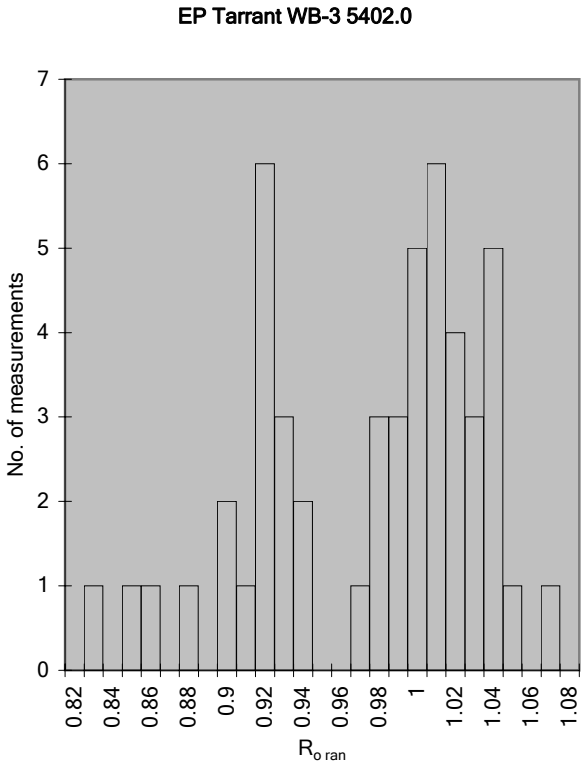
USGS

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**EP Tarrant WB-3 5402.0**
Sample Type	core
Date Analyzed:	3/14/2007
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.97
s.d.:	0.06



DATA

1.031	0.934	0.920	0.964	1.038
0.972	0.929	0.995	0.927	0.917
0.995	1.026	1.015	0.856	1.035
1.003	0.938	1.007	0.891	1.008
0.827	0.912	0.908	0.872	1.014
0.844	0.982	0.930	0.976	0.996
0.894	1.022	1.031	0.997	1.003
1.005	1.021	0.997	0.912	0.989
1.062	0.982	0.915	0.972	1.012
0.915	1.036	1.012	1.004	1.042

min: 0.827 **max:** 1.062 **V-types:** 3

COMMENT

Sample is mineral-matter-rich banded coal, with very sparse inertinite. Pyrite framboids abundant. Most vitrinite is homogenous and unstructured. Sparse resinite is almost equivalent in reflectance to vitrinite.

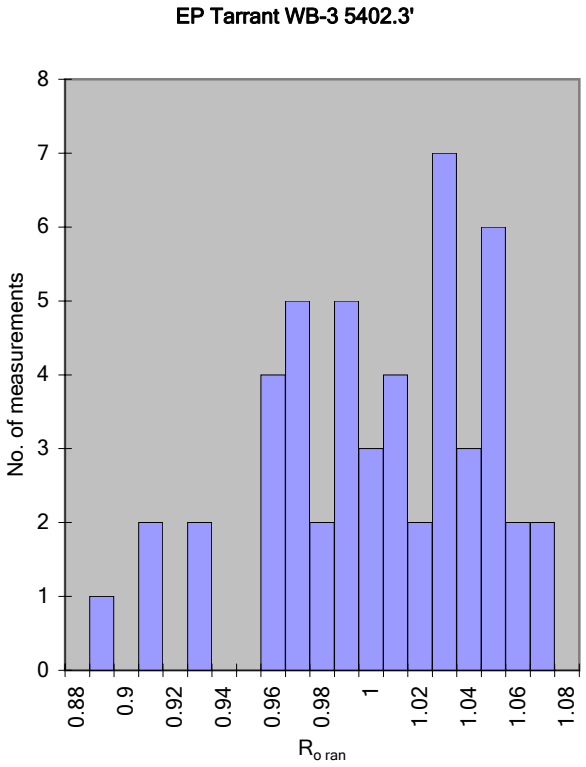
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**EP Tarrant WB-3 5402.3'**
Sample Type	core
Date Analyzed:	3/28/2007
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	1.00
s.d.:	0.04



DATA

1.030	0.902	0.906	1.027	0.967
0.962	0.982	0.928	1.026	0.924
1.031	1.025	1.032	0.976	1.041
1.008	0.960	1.036	0.983	1.062
0.958	0.963	0.986	0.998	1.046
1.012	1.044	0.886	0.976	1.007
1.021	0.956	1.014	0.985	0.993
1.045	1.047	0.969	1.022	0.955
1.003	1.002	1.054	1.055	1.063
0.983	0.991	0.962	1.047	1.022

min: 0.886 **max:** 1.063 **V-types:** 3

COMMENT

Determined reflectance is consistent with other Atoka samples examined to-date. Sample comprised of mostly homogenous vitrinite with some relic cellular structure, mineral-matter-rich fragments containing in situ and dispersed vitrinite particles and inertinite. Very similar to other Atoka samples in appearance.

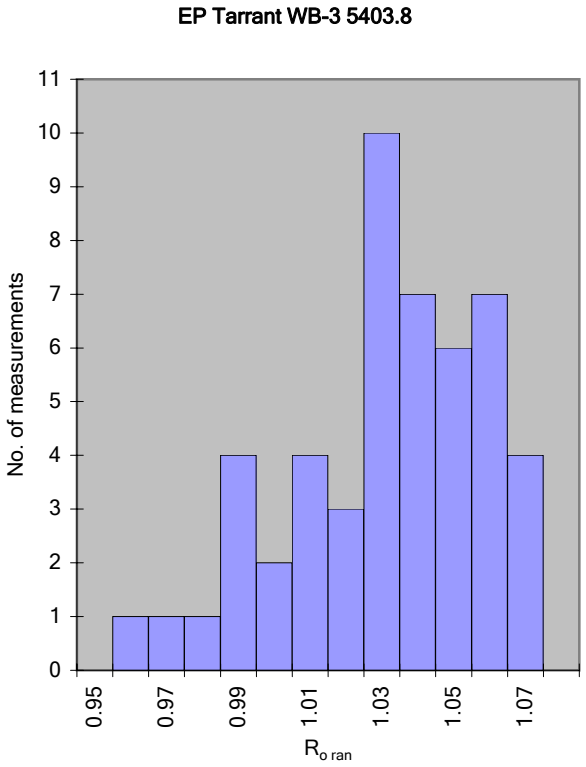
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**EP Tarrant WB-3 5403.8**
Sample Type	core
Date Analyzed:	3/14/2007
Operator:	P. Hackley

RESULTS

# measurements:	50 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	1.03
s.d.:	0.03



DATA

1.052	1.041	1.057	1.022	1.003
1.035	1.047	1.067	1.024	1.025
0.984	1.006	1.044	1.022	1.022
1.008	1.032	1.035	0.991	0.978
1.021	1.054	0.985	1.025	1.051
1.054	1.043	0.998	1.062	1.033
1.056	1.042	0.964	1.016	1.063
0.985	0.959	1.035	1.011	1.029
1.011	1.024	0.987	1.036	1.008
1.052	1.028	1.031	1.049	1.064

min: 0.959 **max:** 1.067 **V-types:** 2

COMMENT

Sample essentially is identical to EP Tarrant WB-3 5402.0, also examined on 3/14/07. Composed of mostly homogenized vitrinite; some telinite structure apparent. Some oxidation cracks visible. Bands of mineral matter are associated with pyrite mineralization and greater abundance of inertinite. Inertinite essentially absent from homogenous telinite fragments. Liptinite not readily apparent in white light.

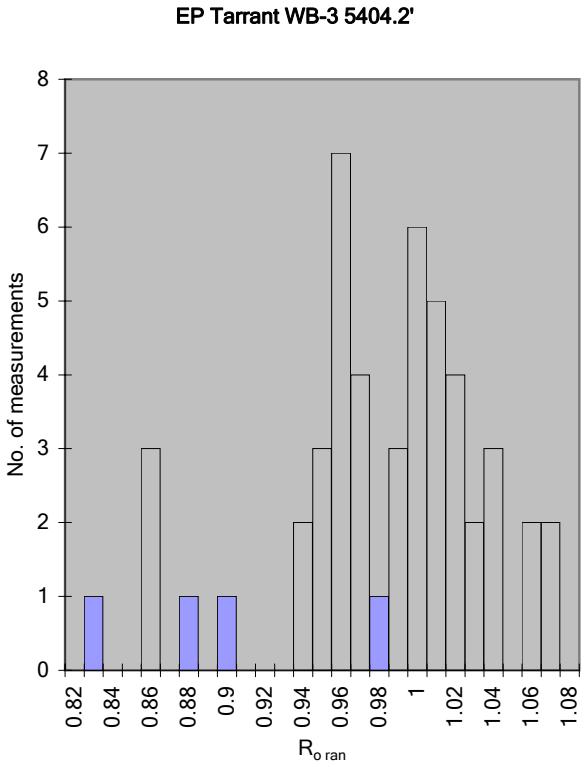
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Tucker Hentz
Date Submitted:	2/28/2007
Project:	Texas CBM
Sample:	**EP Tarrant WB-3 5404.2'**
Sample Type	core
Date Analyzed:	3/28/2007
Operator:	P. Hackley

RESULTS

# measurements:	50	<ASTM/ISO Standards
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.98	
s.d.:	0.05	



DATA

0.952	0.857	0.983	0.993	1.003
0.995	0.854	0.967	0.984	1.032
1.029	1.037	0.956	1.052	1.013
1.054	1.028	0.969	1.012	1.061
1.018	0.945	0.943	0.994	0.896
0.942	0.962	0.952	1.011	1.001
0.858	1.031	1.007	0.982	0.935
0.824	0.992	0.998	0.956	0.962
0.873	0.932	0.995	0.957	0.953
0.953	1.064	1.006	1.008	0.971

min: 0.824 **max:** 1.064 **V-types:** 3

COMMENT

Determined reflectance is consistent with two other Atoka samples measured to date (~0.9%). Comprised of mostly homogenized vitrinite, with relic cellular structures. Some dispersed mineral-matter-rich fragments with indigenous vitrinite layers and disseminated vitrinite particles. Inertinite relatively rare.

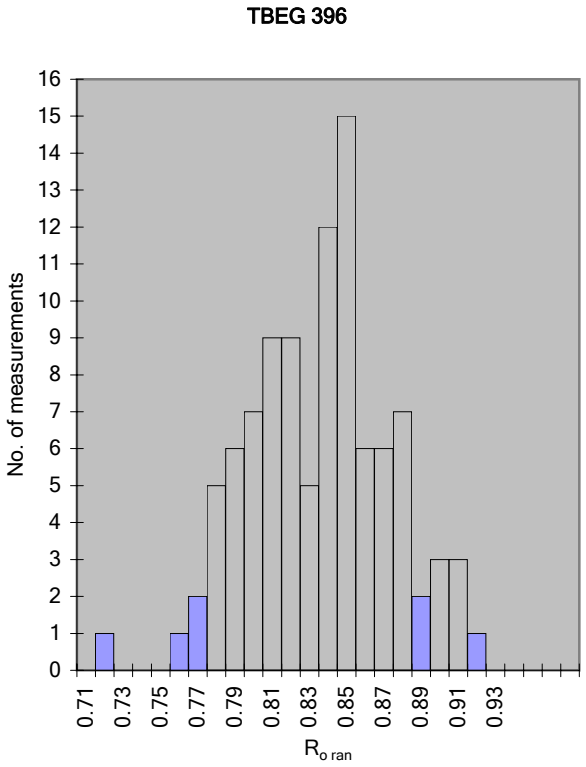
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	3/13/2006
Project:	Texas CBM
Sample:	TBEG 396
Sample Type	grab sample
Date Analyzed:	2/21/2007
Operator:	P. Hackley

RESULTS

# measurements:	100
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.83
s.d.:	0.04



DATA

0.797	0.804	0.838	0.770	0.826	0.774	0.844	0.797	0.756	0.848
0.789	0.897	0.845	0.877	0.717	0.815	0.846	0.802	0.813	0.818
0.844	0.765	0.780	0.875	0.813	0.866	0.843	0.852	0.846	0.785
0.856	0.785	0.818	0.870	0.848	0.860	0.876	0.828	0.846	0.860
0.861	0.861	0.795	0.846	0.796	0.866	0.905	0.890	0.803	0.820
0.877	0.814	0.850	0.810	0.838	0.917	0.843	0.833	0.831	0.797
0.828	0.802	0.788	0.773	0.819	0.856	0.791	0.876	0.775	0.850
0.836	0.903	0.805	0.774	0.896	0.833	0.843	0.838	0.823	0.850
0.796	0.907	0.803	0.864	0.856	0.838	0.785	0.833	0.831	0.786
0.801	0.875	0.893	0.805	0.875	0.818	0.886	0.838	0.826	0.835

min: 0.717 **max:** 0.917 **V-types:** 3

COMMENT

Sample is clean coal, of higher maturity than other two TBEG grab samples. One hundred measurements of random reflectance per ASTM D 2798. Sample is from Crystal Falls, Stephens County.

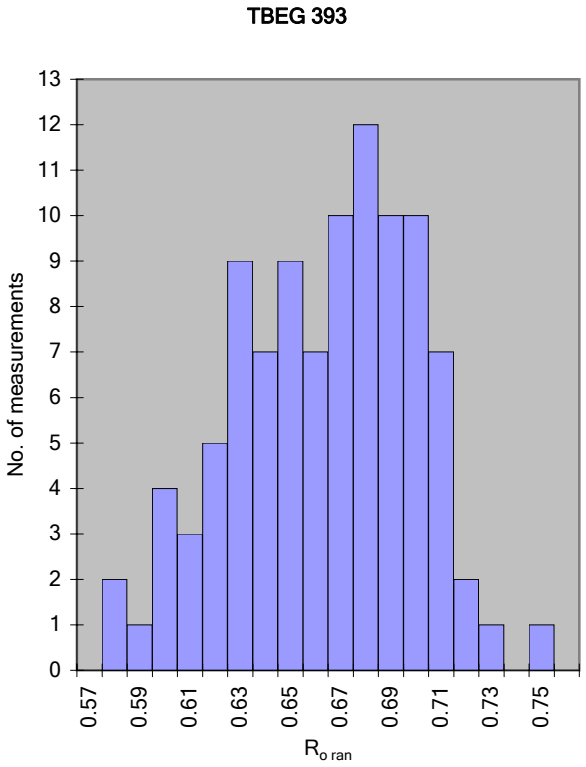
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Edgar Guevara
Date Submitted:	7/5/2006
Project:	Texas CBM
Sample:	TBEG 393
Sample Type	grab (coal core)
Date Analyzed:	2/13/2007
Operator:	P. Hackley

RESULTS

# measurements:	100
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.66
s.d.:	0.04



DATA

0.692	0.665	0.672	0.708	0.685	0.695	0.611	0.663	0.578	0.642
0.651	0.665	0.677	0.699	0.685	0.691	0.611	0.640	0.623	0.626
0.639	0.682	0.702	0.692	0.714	0.633	0.629	0.626	0.637	0.612
0.678	0.645	0.701	0.688	0.673	0.658	0.576	0.645	0.592	0.622
0.676	0.678	0.670	0.678	0.672	0.659	0.607	0.591	0.672	0.654
0.683	0.694	0.599	0.664	0.608	0.639	0.667	0.598	0.683	0.589
0.667	0.643	0.722	0.675	0.702	0.662	0.636	0.623	0.624	0.663
0.703	0.676	0.682	0.661	0.658	0.643	0.694	0.615	0.612	0.641
0.690	0.638	0.719	0.624	0.704	0.703	0.650	0.610	0.655	0.642
0.628	0.681	0.642	0.692	0.741	0.683	0.658	0.695	0.695	0.675

min: 0.576 **max:** 0.741 **V-types:** 3

COMMENT

Sample was collected from TBEG core library by Guevara and Tewalt. Sample consisted of random chunks pulled from coal sample. Clean banded coal, with some scattered carbominerite bands. Analysis per ASTM D 2798. Sample is from 1 mile north of the old Stephens Mine, Montague County.

VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

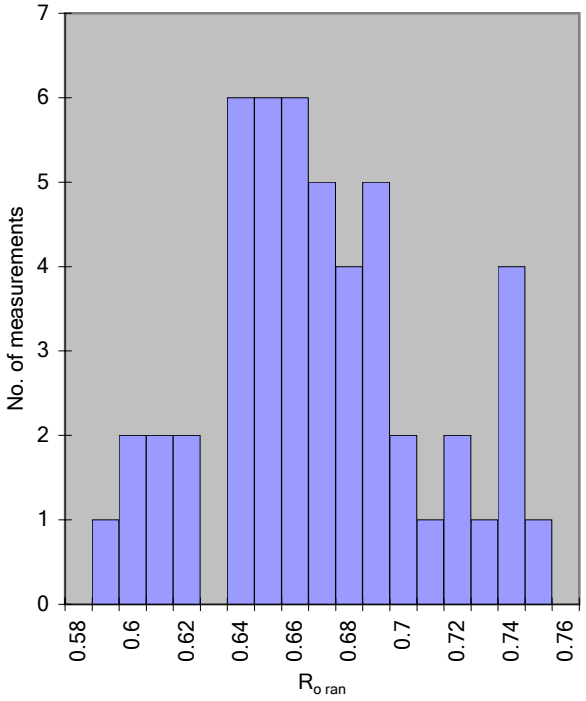
Edgar Guevara
7/5/2006
Texas CBM

TBEG 384
grab - coal core
2/13/2007
P. Hackley

RESULTS

50 <ASTM/ISO Standards
telovitrinite
0.66
0.04

TBEG 384



DATA

0.731	0.675	0.645	0.747	0.674
0.635	0.633	0.647	0.637	0.631
0.658	0.641	0.703	0.675	0.610
0.652	0.663	0.693	0.611	0.634
0.661	0.607	0.737	0.661	0.731
0.732	0.661	0.688	0.665	0.656
0.649	0.688	0.684	0.593	0.645
0.659	0.645	0.723	0.686	0.656
0.581	0.683	0.711	0.616	0.638
0.595	0.657	0.691	0.717	0.676

min: 0.581 **max:** 0.747 **V-types:** 3

COMMENT

Sample collected from TBEG core library by Tewalt and Guevara. Sample consisted of random chunks grabbed from coal sample. Sample is from Johnson Mine. B pellet severely tarnished on 2/13/07 and was not analyzed. Determined value consistent with other coal sample (TBEG 393). Sample consists of clean coal - may be slightly more detrital in character than TBEG 393.

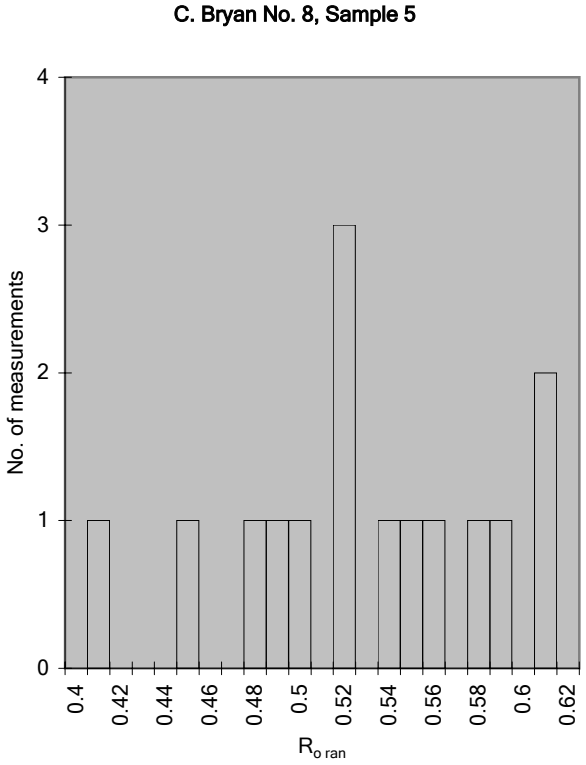
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	S. Tewalt
Date Submitted:	10/1/2006
Project:	Texas CBM
Sample:	C. Bryan No. 8, Sample 5
Sample Type	core
Date Analyzed:	3/30/2007
Operator:	P. Hackley

RESULTS

# measurements:	15 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.52
s.d.:	0.06



DATA

0.583	0.498
0.609	0.578
0.401	0.512
0.446	0.514
0.553	0.512
0.545	
0.604	
0.482	
0.535	
0.479	

min: 0.401 **max:** 0.609 **V-types:** 3

COMMENT

Sample is from Little Bull Creek mine, Coleman County, Texas. Core is through 2.5-3.0 ft Harpersville Fm. (Cisco Group) coal. Collected by Tewalt in 1988. Sample is one large fragment (10 x 35 mm) of core. Fragment composed of highly heterogeneous vitrain band, including sparse inertinite fragments. Abundant disseminated mineral matter. Corpogelinite avoided during analysis. Fm. = Formation.

VITRINITE REFLECTANCE REPORT

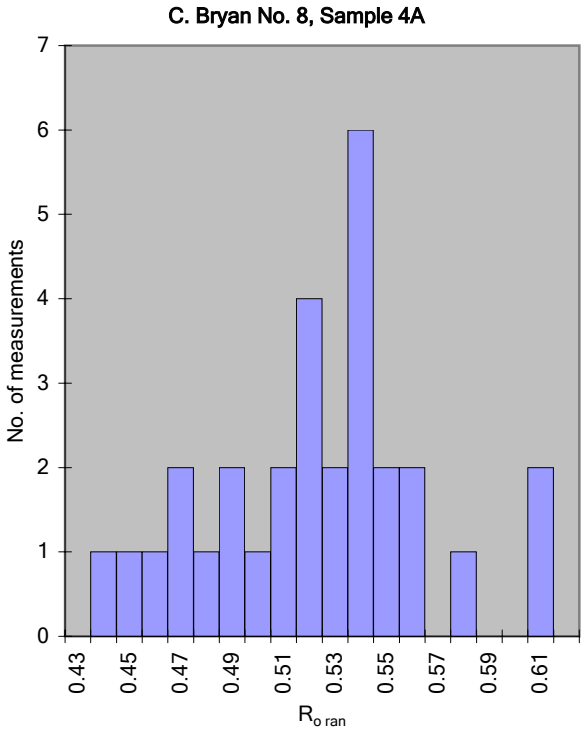
USGS

SAMPLE INFORMATION

Submitted by:	S. Tewalt
Date Submitted:	10/1/2006
Project:	Texas CBM
Sample:	C. Bryan No. 8, Sample 4A
Sample Type	core
Date Analyzed:	3/30/2007
Operator:	P. Hackley

RESULTS

# measurements:	30 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.52
s.d.:	0.04



DATA

0.448	0.535	0.602
0.453	0.572	0.550
0.532	0.533	0.523
0.511	0.485	0.515
0.467	0.483	0.533
0.498	0.467	0.540
0.431	0.515	0.471
0.502	0.508	0.552
0.608	0.545	0.532
0.530	0.554	0.515

min: 0.431 **max:** 0.608 **V-types:** 3

COMMENT

Sample is from Little Bull Creek mine, Coleman County, Texas. Core is through 2.5-3.0 ft Harpersville Fm. (Cisco Group) coal. Collected by Tewalt in 1988. Sample is four fragments of core. Fragments composed of highly heterogeneous vitrain bands including sparse inertinite fragments and liptinite. Abundant disseminated mineral matter. Corpogelinite avoided during analysis. Measurement consistent with one other previously determined value from Little Bull Creek. Fm. = Formation.

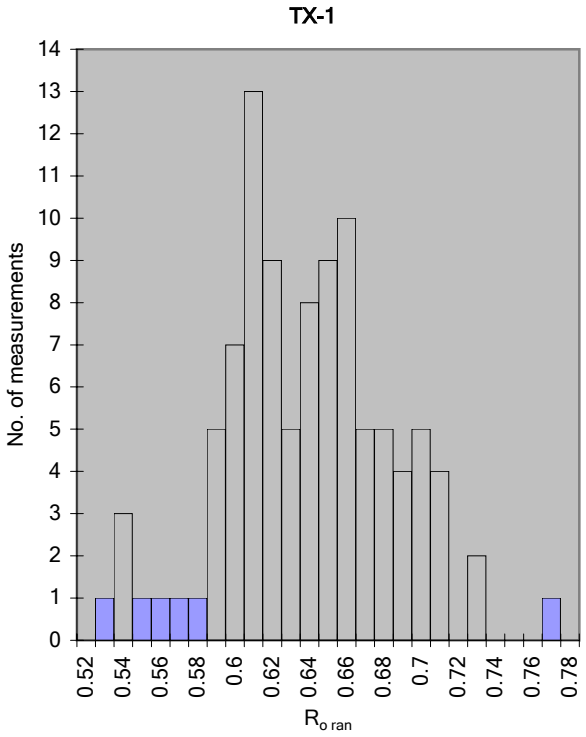
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-1
Lab ID	155
Sample Type	channel
Date Analyzed:	6/7/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.63	
s.d.:	0.05	



DATA

0.613	0.606	0.707	0.666	0.632	0.708	0.709	0.725	0.610	0.624
0.585	0.597	0.590	0.695	0.616	0.676	0.608	0.602	0.638	0.612
0.632	0.633	0.606	0.642	0.703	0.589	0.627	0.616	0.614	0.601
0.650	0.535	0.695	0.649	0.548	0.634	0.624	0.597	0.653	0.652
0.585	0.640	0.600	0.607	0.634	0.649	0.615	0.611	0.600	0.658
0.648	0.637	0.691	0.611	0.657	0.677	0.668	0.666	0.601	0.655
0.676	0.683	0.594	0.644	0.602	0.657	0.589	0.648	0.686	0.558
0.609	0.602	0.681	0.655	0.668	0.658	0.564	0.641	0.593	0.648
0.629	0.680	0.668	0.652	0.726	0.691	0.682	0.527	0.575	0.533
0.694	0.643	0.620	0.535	0.582	0.674	0.769	0.607	0.630	0.594

min: 0.527 **max:** 0.769 **V-types:** 3

COMMENT

Sample does not contain significant fluorescing organic material. Contains some scattered fluorescent mineral matter.

VITRINITE REFLECTANCE REPORT

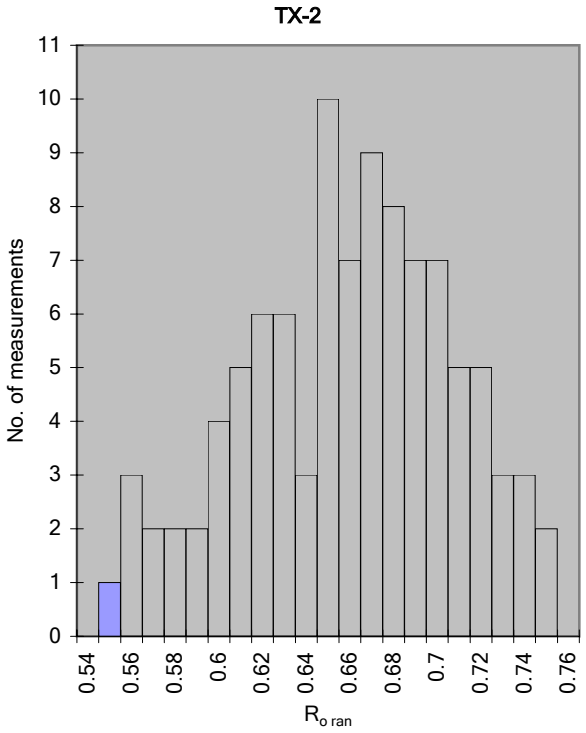
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-2
Lab ID	156
Sample Type	channel
Date Analyzed:	6/7/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.65	
s.d.:	0.05	



DATA

0.613	0.710	0.696	0.672	0.628	0.674	0.692	0.543	0.624	0.688
0.643	0.681	0.669	0.649	0.633	0.646	0.665	0.730	0.650	0.649
0.715	0.590	0.719	0.569	0.718	0.703	0.653	0.720	0.623	0.685
0.655	0.578	0.680	0.664	0.596	0.716	0.628	0.714	0.732	0.644
0.668	0.668	0.632	0.661	0.679	0.670	0.666	0.656	0.608	0.677
0.615	0.740	0.679	0.683	0.620	0.655	0.557	0.598	0.709	0.623
0.674	0.617	0.616	0.680	0.599	0.694	0.555	0.643	0.745	0.674
0.703	0.706	0.668	0.698	0.658	0.729	0.601	0.635	0.744	0.657
0.697	0.608	0.583	0.648	0.566	0.589	0.624	0.601	0.698	0.574
0.690	0.611	0.651	0.641	0.605	0.690	0.553	0.675	0.726	0.643

min: 0.543 **max:** 0.745 **V-types:** 3

COMMENT

Fluorescence response very dim - rare resinite, sporinite, and cutinite present. Coal is dominantly oxidized telovitrinite with a substantial amount of detrovitrinite present as well. Fusinite was macerated during sample collection/preparation and occurs primarily as finely comminuted fragments along binder matrix grain boundaries.

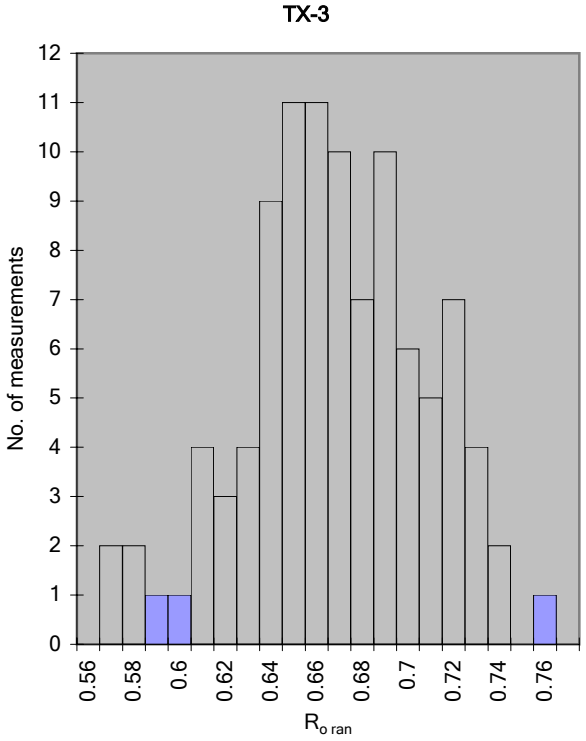
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-3
Lab ID	157
Sample Type	channel
Date Analyzed:	6/7/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.66	
s.d.:	0.04	



DATA

0.720	0.660	0.715	0.705	0.615	0.663	0.621	0.643	0.681	0.595
0.724	0.670	0.700	0.643	0.561	0.663	0.664	0.680	0.604	0.671
0.583	0.627	0.683	0.704	0.633	0.654	0.646	0.686	0.643	0.678
0.722	0.657	0.750	0.682	0.677	0.686	0.642	0.651	0.603	0.654
0.653	0.668	0.715	0.668	0.646	0.657	0.632	0.660	0.677	0.668
0.623	0.561	0.692	0.729	0.639	0.692	0.686	0.691	0.577	0.616
0.717	0.701	0.711	0.682	0.734	0.684	0.626	0.667	0.637	0.635
0.638	0.679	0.686	0.739	0.703	0.656	0.632	0.575	0.636	0.644
0.718	0.704	0.715	0.654	0.699	0.645	0.605	0.666	0.675	0.645
0.632	0.605	0.698	0.643	0.721	0.655	0.662	0.683	0.648	0.613

min: 0.561 **max:** 0.750 **V-types:** 3

COMMENT

Telovitrinite exhibits abundant oxidation/shrinkage cracks from weathering at outcrop. Reflectance value probably influenced by oxidation. Organic material very similar to TX-1, TX-2. Measured reflectance essentially identical to TX-2 (0.65%).

VITRINITE REFLECTANCE REPORT

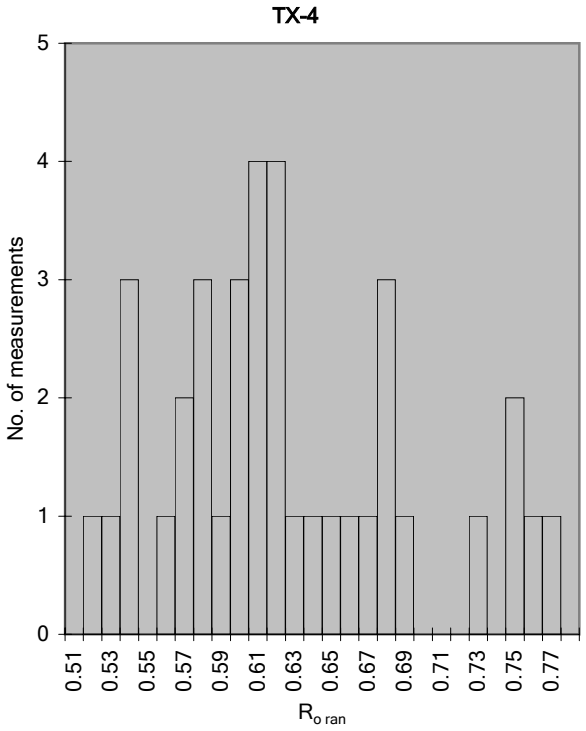
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-4
Lab ID	158
Sample Type	outcrop
Date Analyzed:	6/7/2007
Operator:	P. Hackley

RESULTS

# measurements:	37 <ASTM/ISO Standards
maceral type:	telovitrinite
$R_{o\ ran}$ (ISO/ASTM):	0.62
s.d.:	0.07



DATA

0.653	0.558	0.683	0.530
0.752	0.671	0.668	0.625
0.614	0.564	0.530	0.534
0.721	0.519	0.745	0.606
0.633	0.595	0.764	0.610
0.672	0.607	0.581	0.604
0.569	0.612	0.590	0.598
0.642	0.577	0.580	
0.677	0.612	0.525	
0.580	0.617	0.748	

min: 0.519 **max:** 0.764 **V-types:** 3

COMMENT

Sample is mostly mineral matter (>90%). High polishing relief; briquette surface contains numerous plucks. Organic material mostly is oxidized. Rare fragments of trimaceral coal present. Reflectance value very similar to nearby samples of better analysis quality. Sample was collected from roadside outcrop for reflectance analysis only.

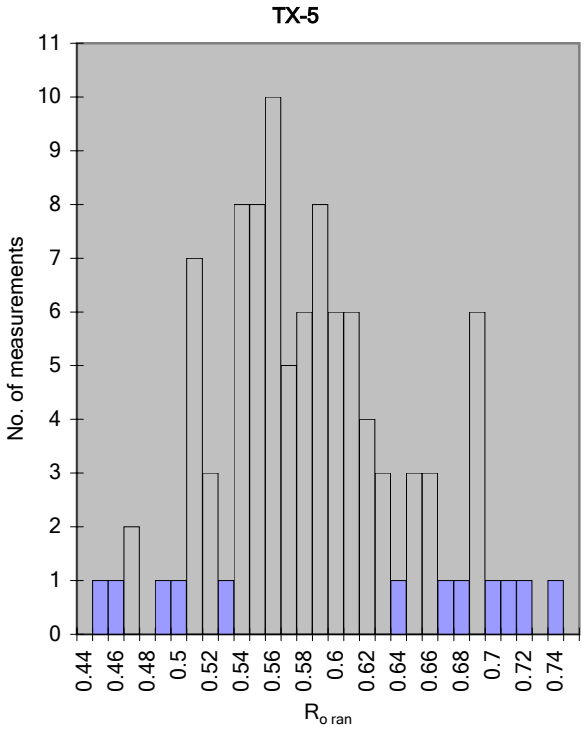
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	P. Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-5
Lab ID	184
Sample Type	channel
Date Analyzed:	5/24/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.58	
s.d.:	0.06	



DATA

0.714	0.595	0.688	0.580	0.609	0.549	0.511	0.558	0.552	0.607
0.692	0.675	0.468	0.654	0.510	0.599	0.620	0.506	0.538	0.582
0.563	0.532	0.450	0.686	0.681	0.659	0.645	0.578	0.588	0.502
0.602	0.560	0.553	0.592	0.662	0.483	0.544	0.531	0.457	0.634
0.518	0.541	0.626	0.580	0.499	0.607	0.567	0.524	0.532	0.508
0.732	0.469	0.582	0.625	0.563	0.682	0.623	0.559	0.545	0.557
0.537	0.544	0.596	0.606	0.554	0.552	0.595	0.589	0.507	0.689
0.683	0.571	0.614	0.506	0.642	0.589	0.549	0.651	0.573	0.566
0.560	0.514	0.615	0.536	0.609	0.547	0.583	0.612	0.571	0.597
0.650	0.554	0.578	0.532	0.704	0.541	0.589	0.506	0.538	0.563

min: 0.450 **max:** 0.732 **V-types:** 4

COMMENT

VITRINITE REFLECTANCE REPORT

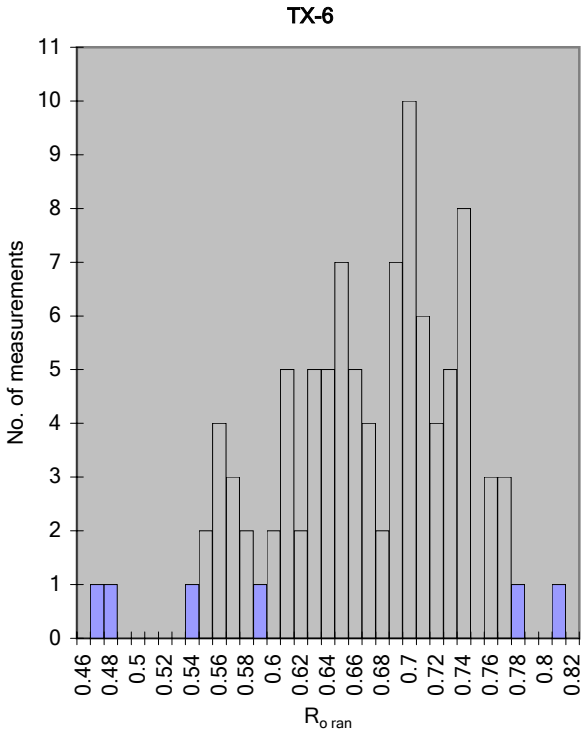
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-6
Lab ID	185
Sample Type	channel
Date Analyzed:	5/24/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.66	
s.d.:	0.07	



DATA

0.731	0.737	0.760	0.633	0.683	0.666	0.725	0.734	0.679	0.604
0.640	0.760	0.772	0.753	0.695	0.660	0.732	0.768	0.561	0.562
0.769	0.669	0.646	0.649	0.633	0.716	0.687	0.554	0.631	0.624
0.627	0.710	0.651	0.721	0.605	0.572	0.733	0.698	0.586	0.704
0.642	0.727	0.674	0.682	0.652	0.629	0.703	0.544	0.684	0.696
0.683	0.626	0.565	0.578	0.666	0.734	0.719	0.634	0.460	0.699
0.697	0.559	0.595	0.471	0.708	0.559	0.534	0.656	0.699	0.547
0.603	0.703	0.601	0.693	0.648	0.732	0.689	0.636	0.736	0.722
0.707	0.759	0.601	0.655	0.612	0.681	0.650	0.726	0.551	0.622
0.706	0.692	0.643	0.697	0.595	0.715	0.801	0.697	0.617	0.654

min: 0.460 **max:** 0.801 **V-types:** 5

COMMENT

Value is significantly higher than for adjacent upper coal bed (0.58% - sample TX-5). Standard had drifted high (0.968%). Recalibrated and reevaluated. Higher reflectance than adjacent bed - compare to calculated value of 0.63% from Humble Rock-Eval analysis.

VITRINITE REFLECTANCE REPORT

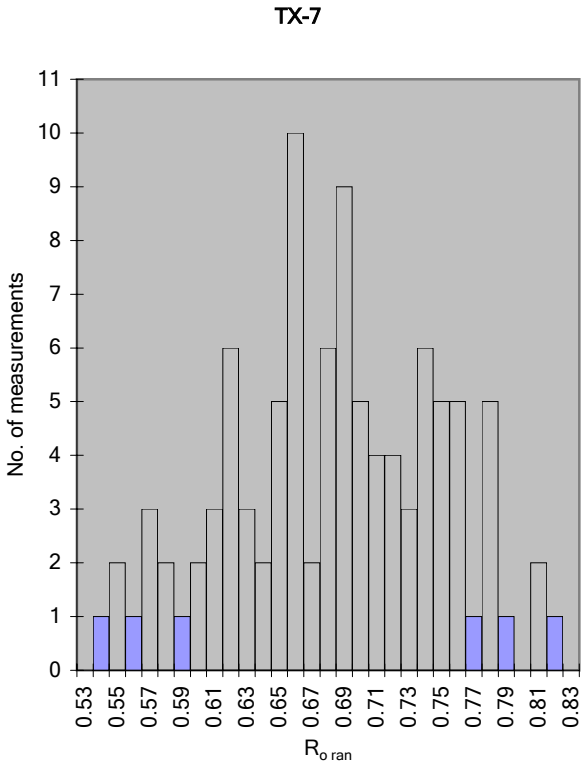
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-7
Lab ID	186
Sample Type	channel
Date Analyzed:	5/29/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.68	
s.d.:	0.07	



DATA

0.707	0.771	0.691	0.627	0.759	0.766	0.700	0.596	0.552	0.645
0.653	0.731	0.670	0.704	0.790	0.617	0.731	0.617	0.681	0.686
0.742	0.737	0.741	0.620	0.682	0.804	0.652	0.591	0.710	0.695
0.706	0.642	0.713	0.658	0.772	0.656	0.729	0.739	0.560	0.601
0.750	0.664	0.612	0.668	0.697	0.570	0.651	0.730	0.679	0.747
0.609	0.655	0.653	0.676	0.650	0.647	0.613	0.672	0.810	0.819
0.687	0.627	0.692	0.577	0.654	0.541	0.750	0.680	0.714	0.722
0.759	0.635	0.660	0.565	0.686	0.640	0.758	0.780	0.546	0.731
0.653	0.779	0.627	0.678	0.737	0.716	0.680	0.753	0.649	0.567
0.676	0.771	0.611	0.685	0.538	0.698	0.603	0.686	0.743	0.584

min: 0.538 **max:** 0.819 **V-types:** 4

COMMENT

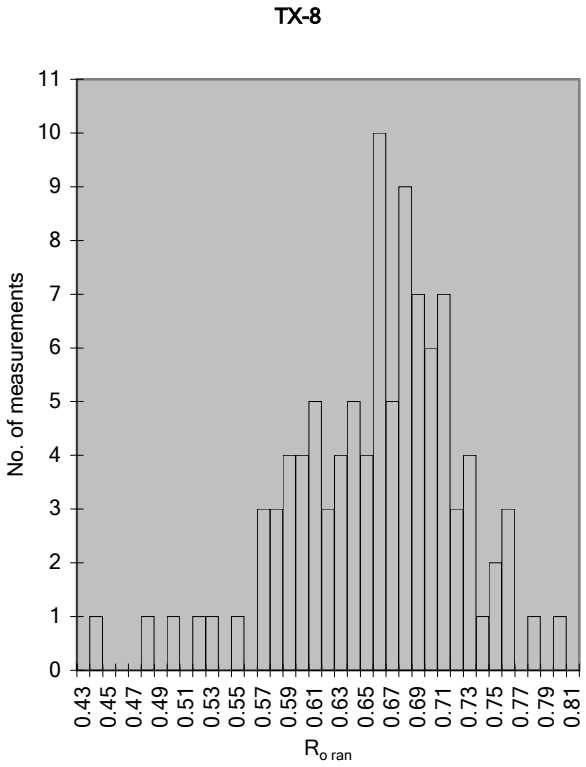
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-8
Lab ID	187
Sample Type	channel
Date Analyzed:	5/29/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.65	
s.d.:	0.06	



DATA

0.603	0.703	0.603	0.669	0.652	0.726	0.729	0.528	0.774	0.655
0.590	0.724	0.511	0.545	0.581	0.660	0.645	0.614	0.627	0.476
0.624	0.672	0.707	0.687	0.626	0.682	0.497	0.637	0.592	0.696
0.632	0.723	0.674	0.674	0.600	0.663	0.618	0.669	0.752	0.703
0.682	0.675	0.750	0.643	0.598	0.636	0.653	0.657	0.797	0.660
0.576	0.661	0.687	0.619	0.651	0.717	0.640	0.682	0.706	0.651
0.653	0.684	0.666	0.586	0.634	0.609	0.710	0.705	0.736	0.685
0.561	0.676	0.703	0.573	0.675	0.641	0.589	0.651	0.440	0.702
0.674	0.632	0.566	0.571	0.694	0.747	0.622	0.692	0.696	0.675
0.610	0.565	0.717	0.676	0.597	0.755	0.691	0.695	0.602	0.754

min: 0.440 **max:** 0.797 **V-types:** 4

COMMENT

VITRINITE REFLECTANCE REPORT

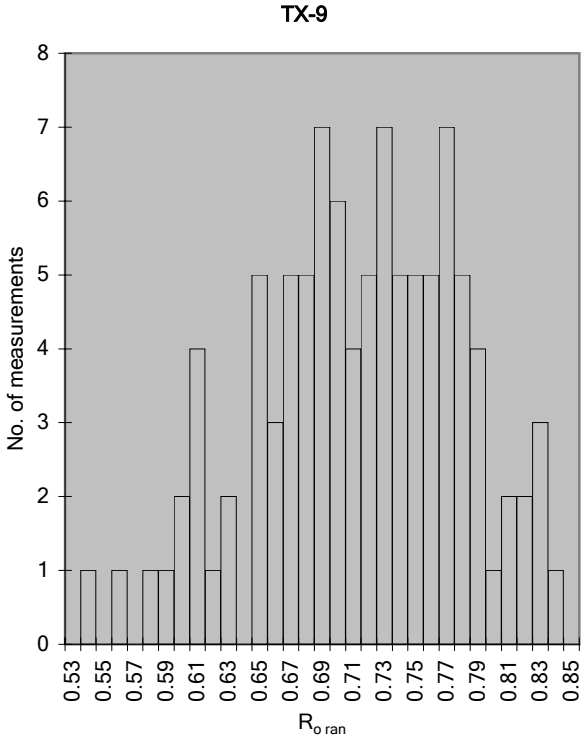
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-9
Lab ID	188
Sample Type	channel
Date Analyzed:	5/29/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.71	
s.d.:	0.06	



DATA

0.677	0.784	0.754	0.578	0.821	0.664	0.747	0.668	0.763	0.737
0.776	0.779	0.604	0.672	0.745	0.670	0.649	0.724	0.656	0.735
0.686	0.699	0.701	0.687	0.822	0.671	0.683	0.705	0.721	0.779
0.684	0.766	0.733	0.720	0.685	0.658	0.763	0.718	0.783	0.833
0.824	0.728	0.668	0.763	0.599	0.777	0.787	0.724	0.699	0.714
0.648	0.664	0.722	0.649	0.761	0.699	0.608	0.703	0.798	0.751
0.774	0.819	0.755	0.689	0.696	0.743	0.644	0.781	0.596	0.702
0.655	0.755	0.624	0.722	0.808	0.732	0.800	0.741	0.608	0.641
0.740	0.690	0.606	0.538	0.551	0.711	0.812	0.742	0.630	0.610
0.763	0.692	0.664	0.717	0.586	0.694	0.674	0.754	0.712	0.767

min: 0.538 **max:** 0.833 **V-types:** 4

COMMENT

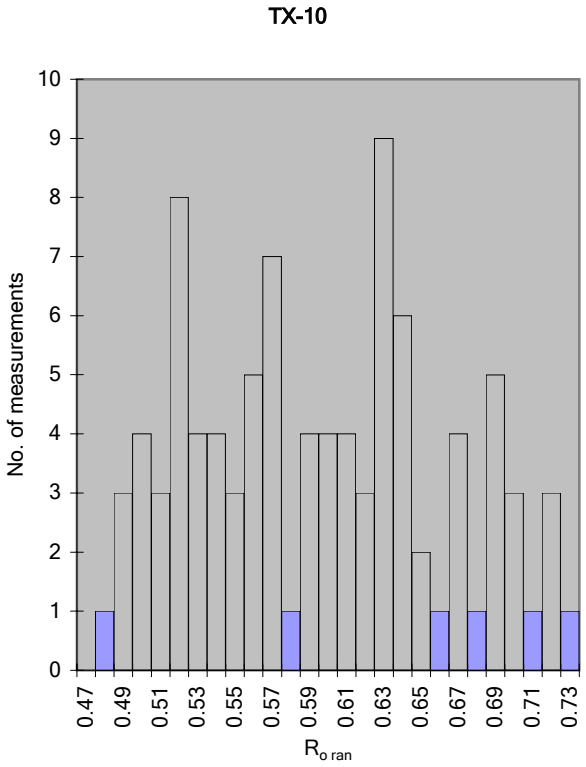
VITRINITE REFLECTANCE REPORT

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-10
Lab ID	189
Sample Type	channel
Date Analyzed:	5/31/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.60	
s.d.:	0.08	



DATA

0.489	0.521	0.634	0.630	0.627	0.516	0.666	0.776	0.515	0.601
0.481	0.684	0.587	0.569	0.540	0.508	0.630	0.596	0.703	0.632
0.554	0.496	0.549	0.638	0.600	0.687	0.502	0.539	0.661	0.550
0.602	0.656	0.563	0.665	0.677	0.538	0.519	0.692	0.561	0.613
0.514	0.614	0.640	0.661	0.633	0.760	0.503	0.605	0.518	0.569
0.628	0.496	0.533	0.776	0.556	0.557	0.594	0.805	0.684	0.624
0.695	0.606	0.523	0.623	0.686	0.614	0.517	0.494	0.533	0.587
0.647	0.687	0.760	0.713	0.517	0.781	0.524	0.562	0.691	0.564
0.478	0.582	0.593	0.623	0.542	0.625	0.499	0.643	0.567	0.514
0.524	0.481	0.575	0.560	0.586	0.728	0.623	0.715	0.626	0.714

min: 0.478 **max:** 0.805 **V-types:** 5

COMMENT

Value is significantly lower than other benches of bed (0.65-0.71). According to proximate analysis, sample contains 2x ash yield of other benches. Organic material similar to other benches, in particular, occurrenece of telinite with resin-filled lumens.

VITRINITE REFLECTANCE REPORT

USGS

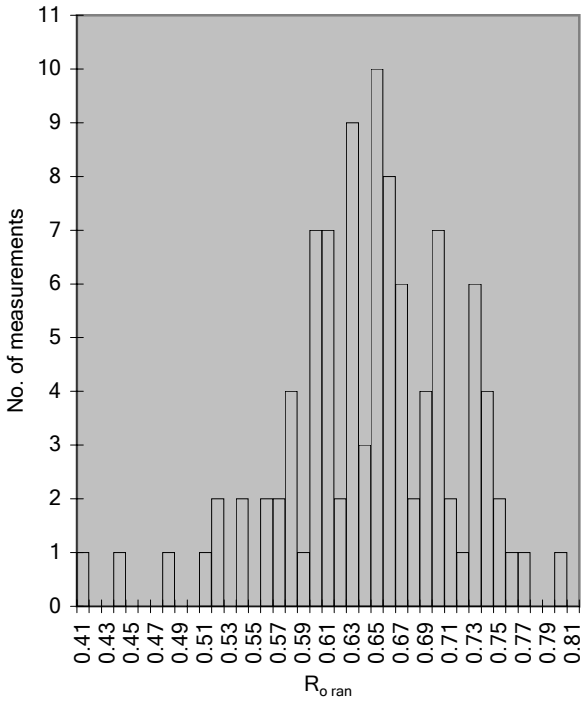
SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-11
Lab ID	190
Sample Type	channel
Date Analyzed:	5/31/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.64	
s.d.:	0.07	

TX-11



DATA

0.578	0.506	0.692	0.682	0.568	0.590	0.726	0.596	0.621	0.738
0.660	0.625	0.602	0.684	0.591	0.742	0.688	0.741	0.736	0.656
0.578	0.656	0.555	0.514	0.608	0.536	0.704	0.690	0.647	0.722
0.410	0.696	0.645	0.762	0.566	0.729	0.682	0.650	0.643	0.629
0.624	0.651	0.643	0.630	0.671	0.660	0.607	0.631	0.721	0.665
0.431	0.613	0.609	0.668	0.592	0.557	0.622	0.646	0.578	0.604
0.476	0.592	0.652	0.598	0.731	0.535	0.699	0.646	0.693	0.596
0.591	0.635	0.623	0.655	0.695	0.623	0.511	0.679	0.699	0.662
0.643	0.662	0.648	0.728	0.602	0.722	0.622	0.647	0.713	0.799
0.610	0.664	0.656	0.736	0.627	0.705	0.751	0.657	0.575	0.615

min: 0.410 **max:** 0.799 **V-types:** 4

COMMENT

Measured value is consistent with other measurements from TX-7 through TX-10.

VITRINITE REFLECTANCE REPORT

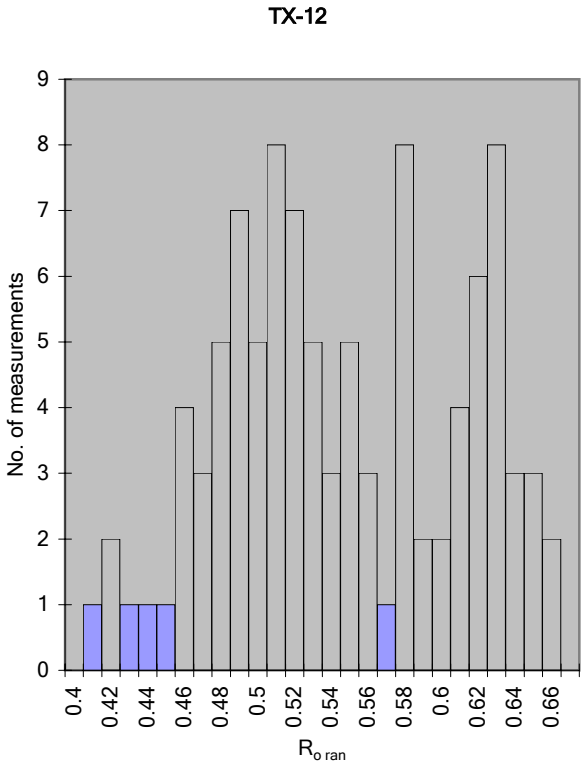
USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-12
Lab ID	191
Sample Type	channel
Date Analyzed:	5/31/2007
Operator:	P. Hackley

RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.54	
s.d.:	0.06	



DATA

0.510	0.416	0.585	0.658	0.494	0.628	0.637	0.569	0.634	0.459
0.482	0.612	0.416	0.515	0.552	0.462	0.572	0.520	0.570	0.622
0.554	0.527	0.657	0.547	0.551	0.485	0.538	0.632	0.472	0.607
0.503	0.488	0.649	0.609	0.457	0.576	0.516	0.620	0.504	0.484
0.463	0.629	0.623	0.515	0.525	0.650	0.405	0.475	0.478	0.507
0.496	0.612	0.484	0.578	0.459	0.472	0.436	0.523	0.531	0.526
0.481	0.545	0.545	0.604	0.622	0.610	0.629	0.578	0.505	0.504
0.622	0.542	0.520	0.549	0.451	0.492	0.584	0.642	0.611	0.504
0.530	0.430	0.611	0.519	0.474	0.464	0.519	0.571	0.530	0.574
0.600	0.627	0.502	0.445	0.571	0.491	0.613	0.499	0.486	0.600

min: 0.405 **max:** 0.658 **V-types:** 3

COMMENT

Sample previously was measured for maximum reflectance on the Leitz instrument. Maximum reflectance value determined on Leitz was 0.55%.

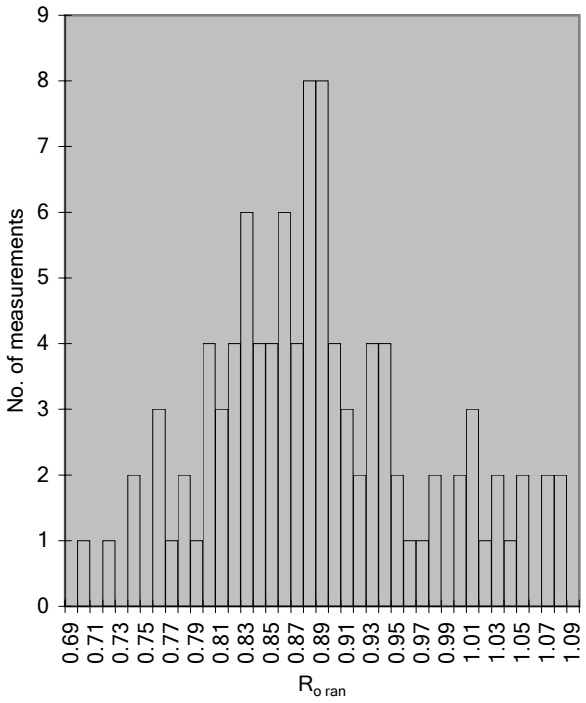
VITRINITE REFLECTANCE REPORT

USGS

SAMPLE INFORMATION

Submitted by:	Paul Hackley
Date Submitted:	9/30/2006
Project:	Texas CBM
Sample:	TX-13
Lab ID	192
Sample Type	channel
Date Analyzed:	6/1/2007
Operator:	P. Hackley

TX-13



RESULTS

# measurements:	100	ASTM 2798
maceral type:	telovitrinite	
$R_{o\ ran}$ (ISO/ASTM):	0.88	
s.d.:	0.09	

DATA

0.882	0.955	0.853	0.809	0.858	0.790	0.973	0.930	0.860	0.937
0.764	1.075	1.049	0.824	0.859	0.813	0.875	0.758	0.949	0.940
0.861	1.022	0.795	0.699	0.824	0.879	0.833	0.776	0.781	0.877
0.873	0.876	0.907	0.871	0.796	0.887	0.939	0.731	0.916	0.924
0.886	0.875	1.037	0.844	1.002	0.864	0.899	0.801	0.915	0.881
0.924	0.948	1.008	0.791	1.068	0.871	0.889	0.735	0.813	0.822
0.831	1.066	0.801	0.971	0.833	0.861	1.027	0.928	0.845	0.882
0.902	0.965	1.017	0.828	0.836	0.860	0.826	0.820	0.845	0.894
0.883	1.071	0.895	0.712	0.771	0.888	0.815	0.825	0.994	0.905
1.007	1.049	0.755	0.844	0.752	0.937	0.856	0.853	0.995	0.892

min: 0.699 **max:** 1.075 **V-types:** 5

COMMENT

This sample was determined to have maximum reflectance of 0.93% on the Leitz instrument. Standard deviation is high.

Appendix 2

Vitrinite reflectance data from Humble Geochemical Testing, Inc.

Appendix 2. Vitrinite reflectance data from Humble Geochemical Testing, Inc. See Guevara and others (2007) for original data.

Sample ID (depth in ft)	R_o	s.d.	n.
Baldwin No. 1 560-570'	0.61	0.06	27
Baldwin No. 1 1460-1470'	0.63	0.05	19
Morrison No.1 310-320'	0.48	0.06	65
Morrison No.1 1350-1360'	0.52	0.05	10
Morrison No.1 2030-2040'	0.84	0.00	1
Furr No. 1 820-830'	n.v.	-	-
Furr No. 1 2160-2170'	0.55	0.04	26
Thompson No. 1 780-790'	0.52	0.06	27
Donnell No. 1 390-400'	n.v.	-	-
Donnell No. 1 1630-1640'	0.53	0.08	10

n.v. = no vitrinite.