

HOLE NO: X-4 SHEET 1 OF 1 DATE: 1-1-75 LOGGED BY: SUNDARL COLLAR: T.D.:
W.R.U.S
KANGAS

FROM	TO	±MM	ASSAY				GAL/TON	DESCRIPTION
			10	20	30	40		
180	190							
	200							
	210							
	220							
	230							
	240							
	250							
	260							L.S. LT. GR. SILTSTONE SLIGHT EFF.
	270							W.R. " "
	280							" "
	290							
	300							LT. GR. SILTSTONE & SS
300	310							LT. GRAY SILTSTONE SLIGHT EFF
	320							" "
	330							" "
	340							" "
	350							LT. GR. FINE GR. SILTSTONE SLIGHT EFF.
	360							" "
	370							" "
	380							LT. BROWN SHALE, SOME GILSONITE SLT. EFF.
	390							LT. BROWN SHALE
	400							" "
400	410							" "
	420							LT. BR. SHALE
	430							" "
	440							" "
	450							LT. TO MED. BROWN SHALE
	460							" "
	470							LT. TO MED. BROWN SHALE SLIGHT EFF.
	480							" "
	490							" "
	500							" "
500	510							LT. TO MED. BR. SHALE WITH MINOR SS
	520							" "
	530							MED. TO DK BR. SHALE MINOR WHITE MINERAL (SOFT)
	540							LIGHT TO MED. BR. SHALE
	550							MED. TO DARK BR. SHALE
	560							" "
	570							" "
	580							" "
	590							" "
	600							W.R. " "
600	610							L.S. Med to Dark BR Shale
	620							" " " "
	630							" " " "
	640							" " " "
	650							" " " "
	660							" " " "

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL/ TON	REC. ERGD	LITH.	DESCRIPTION
660			.3-.9				660	OIL shale Lt br to dk Low grade
661			.58.8					Finally Laminated
662			.2-.6					
663			.12.4					
664			.09					
665			.12					Same as above - badly
666			.07.59.93					broken up - slightly calcareous
667			.4.95					
668			.54.9					
669			.35.68					
670			.18.45.92					Lt BR Low grade oil shale
671			.34.59.9					slightly calcareous
672			.22.6.81					
673			.15.43.18					
674			.53.2					
675			.06.16					Same as above
676			.48					
677			.37					
678			.18.7					Lt brn to Med brn
679			.175.69					Lt. BRN. OIL SHALE (MINOR SS BANDS)
680			.02.175.72					" "
681			.385.85					Lt. BRN. TO MED. BRN OIL SHALE
682			.505.77					" "
683			.275.66					" "
684			.58					" "
685			.265.89					" "
686			.43					" "
687			.65					Med. TO Lt. BRN. LOW GRADE OIL
688			.01.475.78					SHALE BADLY FRACTURED DURING
689			.09.585.82					DRILLING.
690			.45.73					690-70'
691								Lt. TO MED. BROWN LOW GRADE OIL
692								SHALE CALCAREOUS WITH FINE
693								LAMINATIONS.
694								Lt BROWN LOW GRADE OIL SHALE
695								" "
696								" "
697								Lt BR. OIL SHALE
698								" " 72-80 SS OIL SAT.
699			.32					Med BR. OIL SHALE
700								Med. BR. LOW GRADE OIL SHALE 18-30
701			.65					OIL SAT. SS.
702								Lt BR. LOW GR. OIL SHALE
703			.50					" "
704								" " 85-90 OIL SAT. SS
705			.645.81					Lt. BR. LOW GR. OIL SHALE
706								.77-.85 OIL SAT. SS
707	+130		.25					Lt. BR. LOW GR. " "
708			.455.83					Med BR. MED. GRADE OIL SHALE
709								" "

THE CLEVELAND-CLIFFS IRON CO.

PROJECT:

W.K.S.

HOLE NO: X-4 SHEET 2 OF 6 DATE: 2-2-75LOGGED BY: KARBITZCOLLAR: WINDY HILLTD:

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAU TON	REC. ERQD	LITH.	DESCRIPTION
710								MED. GR. BRN OIL SHALE
711								" "
712		.22						OIL SAT. SS. "
713		.71						LT. GRN LOW GR.
714								" "
715		.68						MED. GR. MED. GR.
716		.46						" "
717	+126	.44						" "
718								" "
719		.18	.55					" "
720								
721								
722								
723								
724								
725								
726								
727	+110							
728								
729								
730								
731								
732								
733								
734								
735								
736								
737	+100							
738								
739								
740								
741								
742								
743								
744								
745								
746		PP						
747	+90	.30 .60						Gray with LT BRN bedding
748		.30 .15						Low to Med oil shale
749		.10 .45	.80					
750			.15 .45					Med brn oil shale
751			.10 .50					" "
752			.15 .35					" "
753			.10 .40					" "
754			.15 .47					" "
755			.15 .44	.14 .13				" "
756			.15 .45					" "
757	+80		.15 .45					Low to Med Grade
758			.15 .45					SS with Low " Grade (.39 - .43)
759			.15 .45					OIL shale calcareous
760			.15 .45					Med BRN oil shale

720.15

LOST CORE

Gray with LT BRN bedding
Low to Med oil shale

Med brn oil shale

slightly
calcareous

Low to Med Grade

SS with Low " Grade (.39 - .43)
OIL shale calcareous

Med BRN oil shale

COMMENTS:

THE CLEVELAND-CLIFFS IRON CO.

PROJECT: W.K.S

HOLE NO: X-4 SHEET 3 OF 6 DATE: 1-3-75 LOGGED BY: KANGAS COLLAR: TD:

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	CAL TON	REC. RQD	LITH.	DESCRIPTION
760			.21 .58	.88				MED. BRN. SLIGHTLY LAMINATED
761			.25	.76				OIL SHALE. MED. GRITOE
762			.32 .55	.82				SLIGHT LEE.
763			.17 .53	.76				" "
764			.12 .34	.79				" "
765			.38	.69				" "
766			.32	.75				" "
767	+70		.14 .43	.88				" "
768			.21	.68				" "
769			.20	.70				" "
770			.51					" "
771			.20	.50				MED. TO DARK BRN MED. GR.
772			.35	.61				"
773			.20 .50	.45				"
774			.15 .34	.64				774.67 - 775.37 UPPER WIDELY BED?
775			.37 .50	.70				MED TO DARK BRN MED GRADE
776			.05 .30 .50	.75				776.60
777	+60		.23	.38				MED TO DK. BRN OIL SHALE
778			.31					MED GRADE MILD LEE.
779			.50					THIN LAMINATION
780			.40					"
781			.05	.65				"
782			.67					"
783								"
784								MED. TO DK BRN OIL SHALE
785								"
786			.38 .60	.94				"
787	+50		.27 .50	.95				MED. TO DK BRN MED. GR. OIL SHALE
788								1/2" DK RICH BANDS COMMON
789								"
790			.91					MED TO DK. OIL SHALE MED GR.
791			.28					"
792								LT. TO MED. OIL SHALE LOW GR.
793			.46					" "
794								" " 794.2 SS LENS
795			.50					" "
796								796.4 TO 796.6. OIL SAT. SS
797	+40		.31					LT. TO MED BRN. MED. GR. OIL SHALE
798								"
799			.34	.76				"
800			.61					MED TO DK BROWN, HIGH GR. OIL SHALE
801								@ 801 OIL SS LENS
802			.08	.72				MED. GR. MED. GR. OIL SHALE
803			.75					" "
804			.38	.85				" "
805			.47	.66				LT. BR. TO BUFF MED. GR. OIL SHALE
806			.25 .36	.78				805-806 VUGGY ZONES WITH WHITE GRAY LK
807	+30		.30 .48	.68				807.20' MIN.

COMMENTS: * This fragment is very likely a portion of the Upper Wavy Bed

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC. % RD	LITH.	307.20 DESCRIPTION
808			.55	90				MED. BR. MED. TO HIGH GRADE
809			.09	.32	.98			OIL SHALE. FAINT BANDING
810			.37	.97				WEAK LFE.
811			.60					"
812			.60	.89				"
813								"
814			.98					MED. BR. MED. GRADE OIL SHALE
815			.90					FAINT BANDING DARKER BY
816			.80					DR BANDS LOCALLY. LENSES OF
817	+20							SS WITH PYRITE HIGH GR. ZONES
818			.21					SLIGHT LFE.
819			.10	.19				MED. BR. MED. BR. OIL SHALE
820			.12					"
821			.50					.50-.70 OIL SAT. SS. HIGHLY DISTORTED
822			.45					822.0 TO 822.45 OIL SAT. SS. HIGHLY
823			.31	.68				MED. BR. TO BUFF MED. GR. OIL
824								SHALE. 823-824 OIL SAT. SS
825			.50					BANDS.
826			.45					825.5-827.5 DR. BRN. HIGH GR.
827	+10		.40					OIL SHALE IRREGULAR OIL SAT.
828								SS LENSES.
829								LT. TO MED LOW GR. OIL SHALE
830			.84					"
831			.75					"
832								"
833			.83					"
834			.67					"
835			.64					"
836			.65					836.5-837.1 OIL SAT. SS. CONTACT
837	0		.57					WITH SHALE WAVE
838			.24					837.60' banded Lt brn. buff
839			.41					to dk brn Low grade oil shale
840								
841			.27					S.S. Lense Lt brn to buff calcareous
842								DRK banding med brn oil shale
843								Lt brn slightly calcareous
844								thinly banding
845			.09					Lt brn buff low to med grade
846								oil shale
847	+10		.59					DRK BRN oil shale
848								Lt BRN to DRK BRN dist bed
849			.67					" " " oil shale
850			.11					DRK BRN twisted oil shale med
851			.37	.75				DRK GR. oil shale slightly Grade
852			.68					Lt BRN oil shale calcareous
853			.52					zone (.53) ?
854			.25	.4	.95			
855								Med brown twist S.S. oil shale
856			.83					" " oil shale
857	+20							DR BROWN " "

MM

COMMENTS:

CUT 30-50' RECOVERED 30.40'

MM

HOLE NO: X4 SHEET 5 OF 6 DATE: 1-4-75 LOGGED BY: SUNDEN COLLAR: TD:

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL/ TON	REC. GRQD	LITH.	DESCRIPTION
858								Med BRN - Med grade oil shale slight
859								" " " " " " " oil
860								" " " " " " " " " " " "
861								Lt BRN - Low grade oil shale
862			.5					" " " " " " " " " " " "
863			.18					" " " " " " " " " " " "
864			.25					" " with DK BRN bands - oil shale
865			.3					DRK BRN
866			.35 .7					Med BRN oil shale
867	-30		.55 .9					866.70 Lt BR to Med oil shale
868			.15 .75					S.S. Lenses " " " " " "
869			.84					" " " " " " " "
870								" " " " " " " "
871			.24					Lt BR - Low grade oil shale
872								" " " " " " " "
873			.08					Lt BR DK BR Layers SS Lenses
874			.45					Low grade " " " " " "
875								" " " " " " " "
876			.04					" " " " " " " "
877	-40							" " " " " " " "
878			.66					" " " " " " " "
879			.46					" " " " " " " "
880								Lt BR / DK BRN Layers thin, Low grade oil shale
881			.08					" " " " " " " "
882			0					" " " " " " " "
883								" " " " " " " "
884								" " " " " " " "
885								" " SS Lenses " " " " " "
886			.15					Lt BRN with DK BRN layers Low grade oil shale
887	-50							" " " " " " " "
888			.96					" " " " " " " "
889			.38					" " " " " " " "
890			.15					" " " " " " " "
891			.1 .83					" " " " " " " "
892			.07 .59					" " " " " " " "
893			.27					Lt BRN, Med to Low GR. Oil shale
894			.12 .37					" " " " " " " "
895			.17 .83					" " " " " " " "
896								" " " " " " " "
897	-60		.33 .95					896.70 " " " " " "
898			.15 .33 .55					Lt. BROWN LOW GR. OIL SHALE
899			.71					" " " " " " " "
900			.63					" " " " " " " "
901			.52					Med GRADU OIL SHALE
902			.07 .44 .84					" " " " " " " "
903			.65					902.0 TO 902.44 'SS " "
904			.13 .71					DK. BR. HIGH GR. OIL SHALE
905			.13 .71					904.13 OIL SHALE. V. GR. " "
906			.16					Med. GR. Med. GR. WITH DK BR.
907	-70		.05 .25 .80					BANDS - " " " "

DRILLED 30' 30.20'
 REC. 30.20'

83
 894
 896
 897
 898
 899
 900
 901
 902
 903
 904
 905
 906
 907

HOLE NO: X-4 SHEET 6 OF 6 DATE: 1-4-75 LOGGED BY: KANGAS COLLAR: TD:

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC. BRGD	LITH.	DESCRIPTION
908			.34					MED. BR. MED. GR. OIL SHALE WITH
909			.38					DK BR. BANDS. 908.30 OIL SAT. - BAND
910			.09 & .79					"
911			.38, .59, .48 & .88					"
912			.21, .53 & .92					"
913			.46, .64 & .72					"
914			.36, .73, .90					"
915			.65					MED. BR. MED. GR. OIL SHALE
916			.18 & .75					INT. OIL SHALE & OIL SAT. SS
917	-80		.05, .18 & .83					" "
918			.15					LT. BROWN LOW GR. OIL SHALE
919			.09 & .55					919.55 OIL SAT. SS .05 W. OF
920			.52 & .62					LT. BR. LOW GR.
921			.17 & .92					" "
922			.46					LT. BR. LOW GR. OIL SHALE
923			.13 & .70					"
924			.52					"
925			.57					"
926			.31 & .37					"
927	-40							926.70 "
928								LT. BR. TO BLUE 'LOW. GR. OIL SHALE
929			.36					AFTER PK BANDS
930			.32					LT. BR., LOW GR. OIL SHALE
931								" "
932								" "
933								
934								934.1-934.25 & .50-.70 OIL SAT. SS LAYERS
935								LT. BR. LOW GR. OIL SHALE
936			.45					LT. TO MED. BR. LOW TO MED. GR.
937	-100							" "
938								" "
939			.70					" "
940			.44					940.65 TO .80 OIL SAT. SS
941			.40					LT. BR. LOW GR. OIL SHALE
942			.92					"
943			.92					"
944								"
945			.13, .22 & .38					LT. TO MED. BR. LOW GR. OIL SHALE
946			.80					OIL SAT. SS AT .80
947	-110							LT. BR. LOW GRADE OIL SHALE
948								" "
949								" "
950			.48					"
951			.63					"
952			.40					VERT FRX. COATED WITH OIL
953								"
954			.22					"
955								"
956								"
957	-120							"

COMMENTS: 9 FT. OF CORE LOST BETWEEN 957 & 958. SPLIT CORE HANGING OUT OF CORE-
LIFTER CASE WHEN RUN PULLED

VERT FRX.