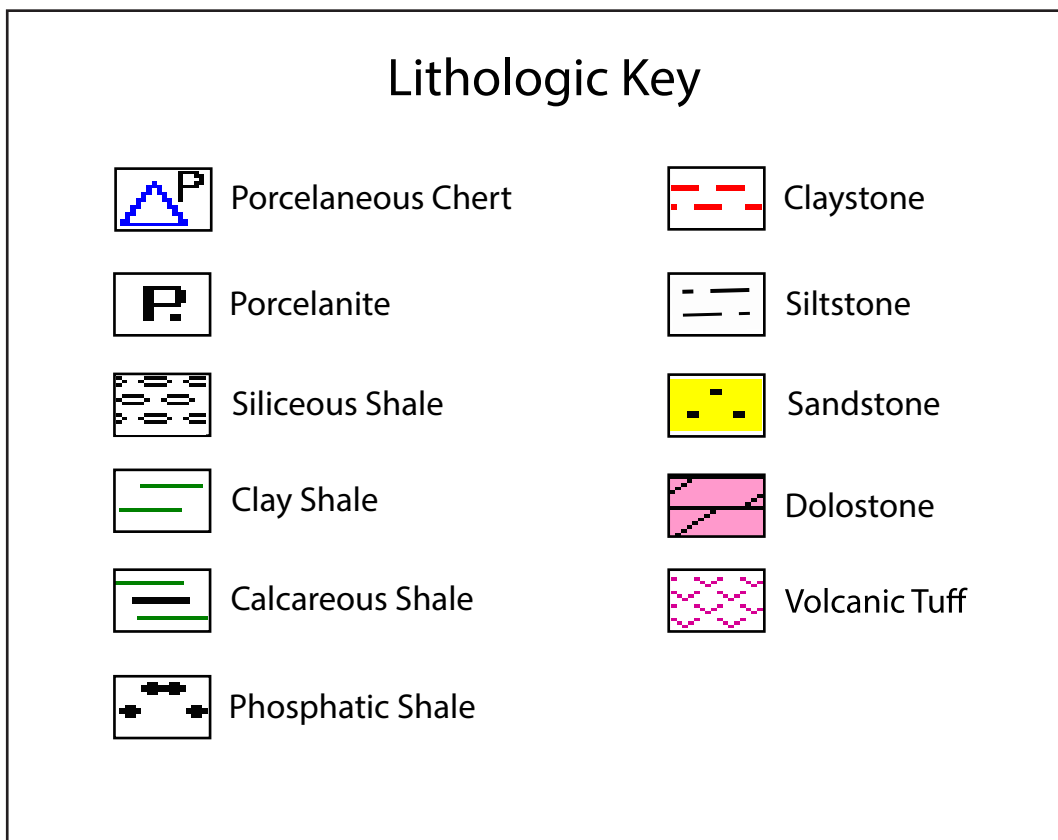
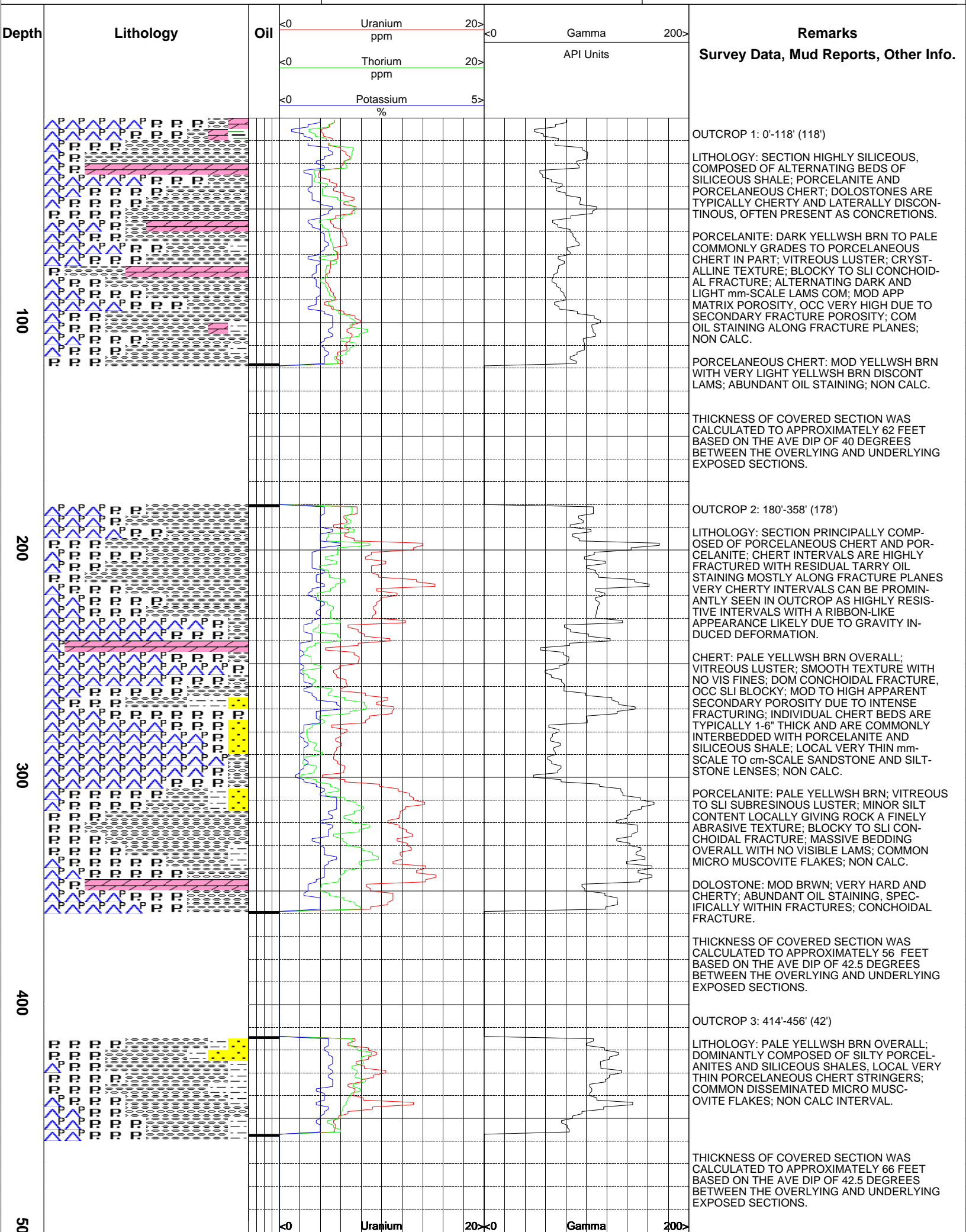


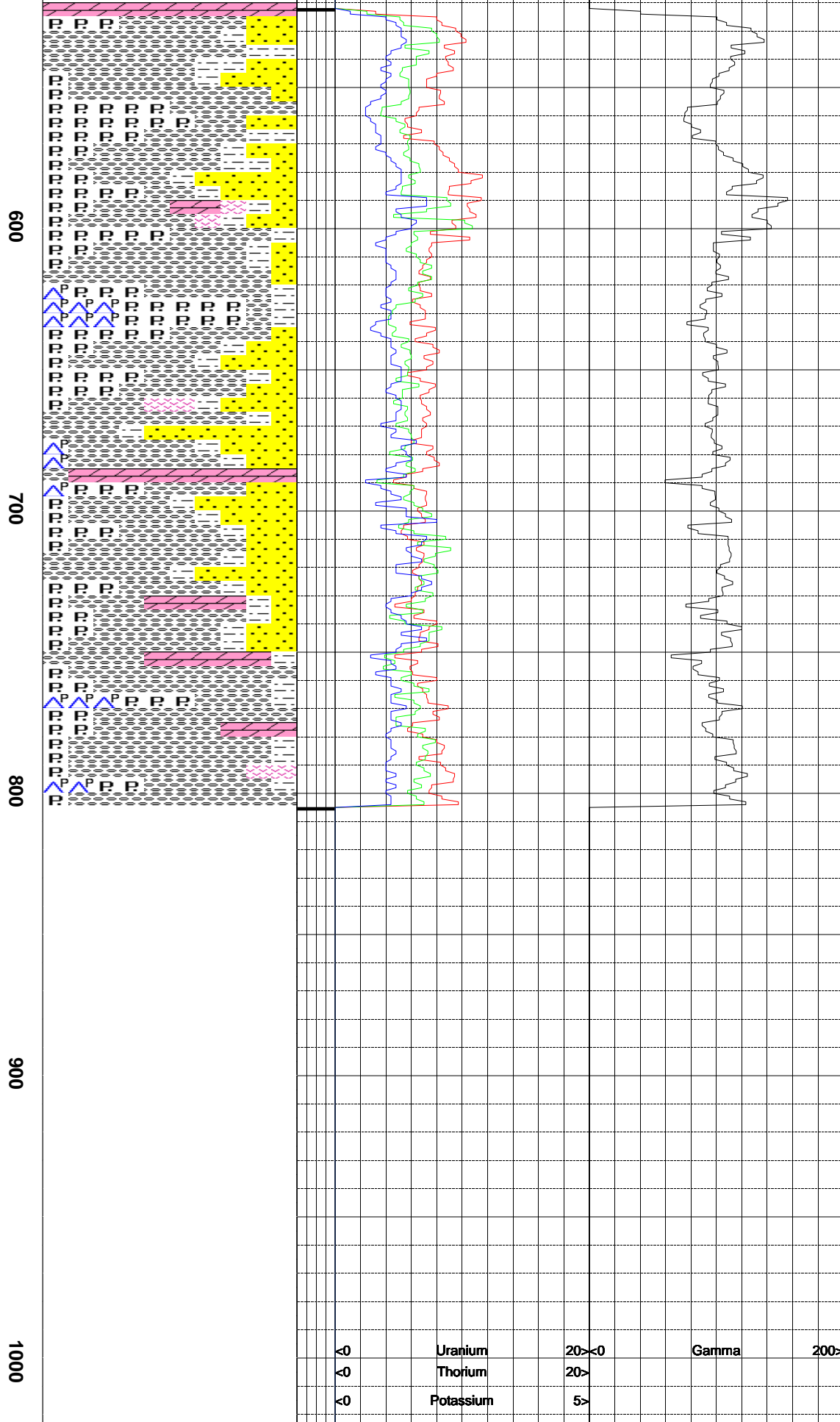


Surface lithology, spectral gamma-ray and total gamma-ray log of the Monterey Formation at Chico Martinez Creek, CA

Annie Mosher, 2013
(Plate 1)







OUTCROP 4: 522'-804' (282')

LITHOLOGY: OVERALL SECTION ALTERNATES BETWEEN 6-8" SILICEOUS SHALE BEDS; 1-3" PORCELANITE BEDS AND VERY LOCALIZED 1-2' CHERT BEDS; ABUNDANT SANDSTONES LENSES AND BEDS THROUGHOUT SECTION. OVERALL MOST CLASTIC-RICH SECTION OBSERVED IN THE CHICO MARTINEZ CREEK FIELD AREA.

QUARTZ ARENITE SANDSTONE: PRESENT IN SECTION LOCALLY AS 1-2" CONTINUOUS BEDS AND LENSES AND VERY THIN cm-SCALE LENSES AND LAMINATIONS; SAND IS MOSTLY COMPOSED OF K-FELDSPAR AND QUARTZ WITH MINOR MUSCOVITE AND UNDIFFERENTIATED LITHIC FRAGS; FINE TO VERY FINE GRAINED, OCC UPPER FINE TO LOWER MED GRAINED; SUBANGULAR TO OCC SLI SUB-ROUNDED GRAINS; MOD SORTED; VARB MATRIX AND GRAIN SUPPORTED; MATRIX TYPICALLY COMPOSED OF SILICEOUS CLAY WITH FLOATING GRAINS; GRAIN SUPPORTED SANDSTONE GRAINS TYPICALLY HAVE POINT CONTACT OR LONG CONTACT; SANDSTONE IS DOMINANTLY FIRM FRIABLE; MOD TO HIGH APPARENT POROSITY; NON CALC.

SILICEOUS SHALE: DARK YELLWSH BRWN TO PALE YELLWSH BRWN; DULL EARTHY LUSTER; SMOOTH TO SLI SILTY TEXTURE DUE TO MINOR SILT CONTENT, OCC VERY SILTY; COMMON QUARTZ AND K-FELDSPAR SAND GRAIN INCLUSIONS; IRREGULAR FRACTURE; TYPICAL cm-SCALE AND mm-SCALE SANDSTONE LENSES; VERY HIGH APPARENT POROSITY AND LOW DENSITY; NON CALC.

PORCELANITE: DARK YELLWSH BRWN TO PALE YELLWSH BRWN; SUBRESINOUS TO VITREOUS LUSTER; FINELY ABRASIVE TEXTURE DUE TO SILT CONTENT; BLOCKY FRACTURE; BRITTLE TENACITY; MASSIVE WITH NO VISIBLE LAMS OR BANDING; NON CALC; PRESENT AS THIN 1-3" BEDS WITHIN A PRINCIPALLY SAN SILICEOUS SHALE SECTION.

CHERT: PALE YELLWSH BRN; PORCELANEUS VITREOUS LUSTER; SMOOTH TO CRYSTALLINE TEXTURE, SLI ABRASIVE DUE TO MINOR SILT CONTENT; PORCELANITE TYPICALLY GRADES TO PORCELANITE ALONG THE SAME BEDDING PLANE, LATERALLY DISCONTINUOUS; MASSIVELY BEDDED WITH NO VIS LAMS; NON CALC VERY LOW APPARENT POROSITY; MOD DENSITY.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 698 FEET BASED ON THE AVE DIP OF 35 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

U	Uranium	20	<0	Gamma	200
Th	Thorium	20	>		
K	Potassium	5	>		

1100

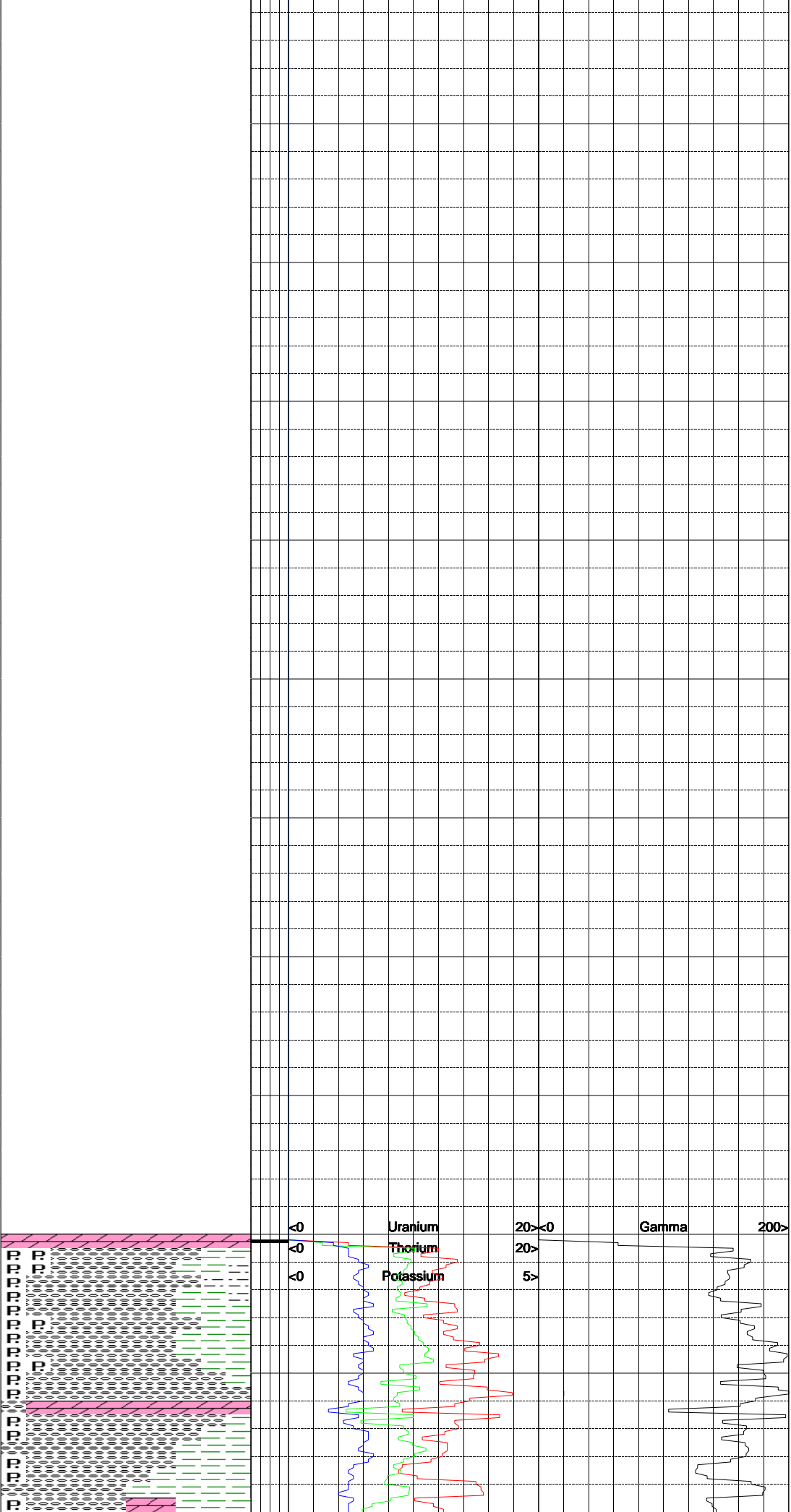
1200

1300

1400

1500

1600



OUTCROP 5: 1502'-1632' (130')

SILICEOUS SHALE: DOM DARK YELLWSH BRWN; DULL EARTHY LUSTER; GRITTY TO FINELY ABRASIVE TEXTURE DUE TO THE MINOR SILT CONTENT; ARGILLACEOUS; IRREGULAR TO SUBBLOCKY FRACUTRE; CRUNCHY TENACITY; MASSIVELY BEDDED WITH NO VISIBLE LAMS; COM DISSEMINATED MICRO MUSCOVITE FLAKES; NON CALC.

DOLOSTONE: DARK YELLWSH BRWN WITH LIGHT BRWN cm-SCALE LAMS AND DARK DUSKY YELLWSH BRN mm-SCALE LAMS; MOD TO VERY HARD; RESINOUS LUSTER; CRYSTAL-LINE TEXTURE; BLOCKY FRACTURE; HIGH CLA CONTENT.

PORCELANITE: VERY PALE YELLWSH BRN; PRESENT AT THE BASE OF SECTION AS THIN

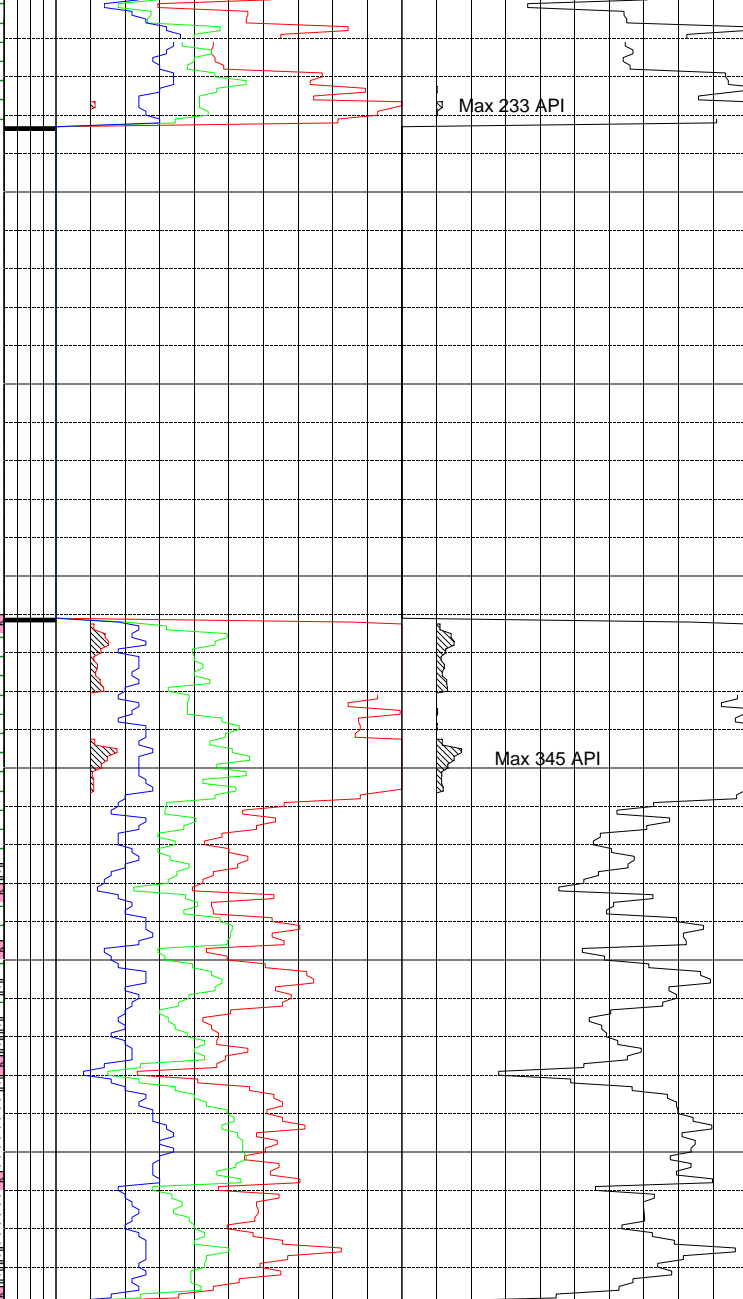
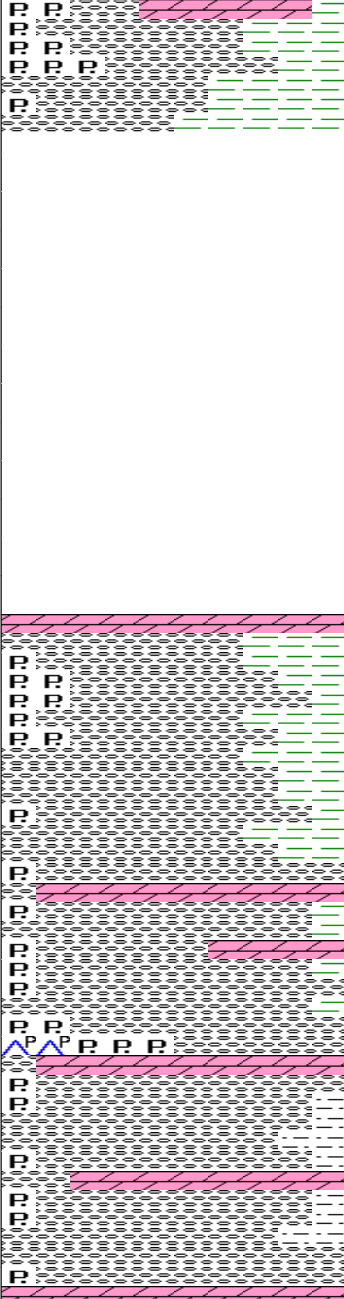
1700

1800

1900

2000

2100



1" STRINGERS IN PRINCIPALLY SILICEOUS SHALE LITHOLOGY; SLI SILTY; RESINOUS TO SLI VITREOUS LUSTER; BLOCKY TO SLI CONCOIDAL FRACTURE; BRITTLE TO TOUGH TENACITY; FINELY LAMINATED WITH VERY SUBTL ALTERATIONS BETWEEN VERY PALE YELLWSH BRWN AND PALE YELLWSH BRWN mm-SCALE LAMS; NON CALC.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 178 FEET BASED ON THE AVE DIP OF 35 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

OUTCROP 6: 1760'-1938' (178')

LITHOLOGY: SECTION PRINCIPALLY COMPOSED OF SLI ARGILLACEOUS SILICEOUS SHALOM DARK YELLWSH BRWN TO DUSKY YELLWSH BRWN, MARKEDLY DARKER THAN PURER SILICEOUS INTERVALS; FAIRLY EVENL SPACED, ALMOST CYCLIC DOLOSTONES.

SILICEOUS SHALE: DARK YELLWSH BRWN TO DUSKY YELLWSH BRWN; MOD HARD; DULL EARTHY LUSTER. COM SPARKLING DISSEMINATED MICRO MUSCOVITE FLAKES; SMOOTH CLAYEY TEXTURE; SHALE IS PLATY TO SLI BLOCKY WITH NO APPARENT FISSILITY; CRUNCHY TENCITY; NO VISIBLE LAMS OR BEDDING STRUCTURE; NON CALC OVERALL; MOD APPARENT POROSITY.

DOLOSTONE: DARK YELLWSH BRWN; DULL TO SLI SUBRESINOUS LUSTER; SMOOTH TO SLI CRYSTALLINE TEXTURE; SLI BLOCKY FRACTUR DOMINANTLY MORE CLAY-RICH THAN DOLOSTONES IN SURROUNDING SECTIONS; MASSIVE BEDDING WITH NO VID LAMS.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 252 FEET BASED ON THE AVE DIP OF 35 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

∅	Uranium	20	<0	Gamma	200
∅	Thorium	20	>		
∅	Potassium	5	>		

2200

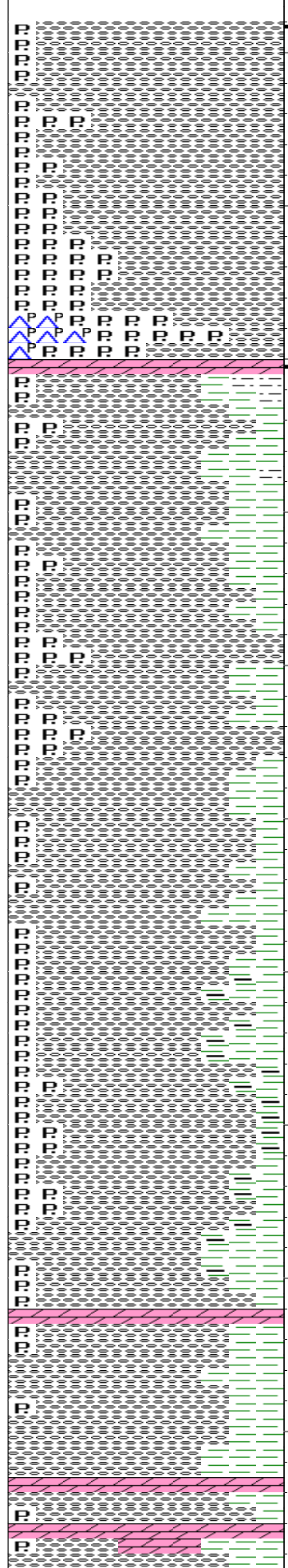
2300

2400

2500

2600

27



OUTCROP 7: 2190'-2302' (112')

NOTE: SECTION HIGHLY SILICEOUS AT THE BASE BECOMING ARGILLACEOUS AT THE TOP.

SILICEOUS SHALE: DARK YELLWSH BRWN TO DUSKY YELLWSH BRN; SLI ARGILLACEOUS; MOD HARD; SUBRESINOUS LUSTER; SUCROSIC TO FINELY ABRASIVE TEXTURE DUE TO MINOR DETRITAL FINES; BLOCKY FRACTURE, COMMONLY BREAKING ALONG WELL DEFINED mm-SCALE BEDDING PLANES; VERY PLATEY AND BRITTLE; VIEN STRUCTURES PRESENT LOCALLY; NON CALC; NO VISIBLE MICROFOSSILS.

CHERT: VERY PALE YELLWSH ORNG; VERY CLEAN WITH NO VIS DETRITAL CONTENT; VERY HARD; RESINOUS LUSTER; CRYSTALLINE TEXTURE; CONCOIDAL FRACTURE; SCATTERED MICRO MUSCOVITE FLAKES; OCCURS IN VERY THIN 1-2" THICK STRINGERS WITHIN LARGER PORCELANITE BEDS.

NOTE: FOLLOWED DOLOSTONE AT THE TOP OF TRENCH 1 TO MARK BASE OF OUTCROP 1.

TRENCH 1: 2302'-2736' (434')

NOTE: OVERALL TOP OF SECTION VERY ARGILLACEOUS WITH A MARKED DECREASE IN SILICA CONTENT.

SHALE: MODERATE YELLWSH BRWN TO DARK YELLWSH BRWN; DULL EARTHLY TO SLI SUBRESINOUS LUSTER; IRREGULAR TO SLI HACKL FRACTURE, COMMONLY FRACTURING ALONG BEDDING PLANES; DENSE TENACITY; MOD HARD WITH MOD SILICA CONTENT, mm-SCALE LAMINATIONS; DISSEMINATED MICRO-MICAS WITH NO DESCERNABLE STRUCTURE; NON CALC; LOW APPARENT POROSITY; MOD DENSITY.

PORCELANITE: DARK YELLWSH BRWN WITH DUSKY YELLWSH BRWN ALTERNATING LAMS; SUBRESINOUS TO SLI VITREOUS LUSTER; CRYSTALLINE TEXTURE; BLOCKY TO SLI IRREGULAR FRACTURE; PROMINENT mm-SCALE LAMS; MODERATELY HARD; NON CALC, ARGILLACEOUS.

SILICEOUS SHALE: DARK YELLWSH BRN; DULL EARTHLY TO SLI SUBRESINOUS LUSTER; SMOOTH TO SLI CRYSTALLINE TEXTURE; BLOCKY FRACTURE; DENSE TO SLI BRITTLE TENACITY; SILICEOUS SHALE BEDS ARE APPROXIMATELY 1-2cm THICK AND ARE NOTABLY MORE RESISTANT THAN SURROUNDING ARGILLACEOUS LITHOLOGIES; DOM NON CALC TO SLI CALC LOCALLY; MOD TO HIGH APPARENT POROSITY.

NOTE: BEDDING PERPINDICULAR VEIN STRUCTURES IN PORCELANITE STRINGERS.

CALCAREOUS SHALE: LIGHT PALE YELLWSH BRWN; DULL EARTHLY LUSTER; CRYSTALLINE TO SLI SUCROSIC TEXTURE; IRREGULAR FRACURE; THIN mm-SCALE LAMS; MORE HIGHLY WEATHERED AND LIGHTER IN COLOR THAN SURROUNDING LITHOLOGIES; COM CALCITE RECRYSTALLIZED MICROFOSSILS AND GHOST CAVITIES; COMMON FISH SCALES.

SILICEOUS SHALE: DOM PALE YELLWSH BRWN DULL TO SLI RESINOUS LUSTER; CRYSTALLIN TO SLI SUCROSIC TEXTURE; IRREGULAR FRACTURE, BECOMING BLOCKY WHEN GRADING TO PORCELANITE; DISSEMINATED MICRO FLAKES OF MUSCOVITE; VERY HIGH APPARENT POROSITY AND LOW DENSITY; DOM NON CALC, CALC LOCALLY.

PORCELANITE: DARK YELLWSH BRWN WITH DUSKY YELLWSH BRWN ALTERNATING LAMS; SUBRESINOUS TO SLI VITREOUS LUSTER; CRYSTALLINE TEXTURE; BLOCKY TO SLI IRREGULAR FRACTURE; BRITTLE TENACITY; COMMON DISSEMINATED MICRO FLACKES OF MUSCOVITE; DOM NON CALC, BECOMING MORE CALC TOWARDS THE BASE OF SECTION; OCCURS AS THIN cm-SCALE BEDS AND STRINGERS, SILICEOUS SHALES COM GRADE TO PORCELANITE; VARIABLE NON CALC AND CALCAREOUS THROUGHOUT SECTION; MOD POROSITY; MOD TO LOW DENSITY.

CALCAREOUS SHALE: LIGHT PALE YELLWSH BRWN; DULL EARTHLY LUSTER; CRYSTALLINE TO SLI SUCROSIC TEXTURE; IRREGULAR FRACURE; THIN mm-SCALE LAMS; MORE HIGHLY WEATHERED AND LIGHTER IN COLOR

Uranium	20	<0	Gamma	200
Thorium	20	>0		
Potassium	5	>0		

THAN SURROUNDING LITHOLOGIES; COM
CALCITE RECRYSTALLIZED MICROFOSSILS AND
GHOST CAVITIES.

TRENCH 2 2736'-2940' (212')

PORCELANITE: DARK YELLWSH BRN WITH
DUSKY YELLWSH BRN FILLED VIEN
STRUCTURES; VIEN STRUCTURES APPEAR AT
2880' AND OCCUR IN DISCRETE PORCELANITE
BEDS THAT APPROXIMATELY 4-6" THICK,
MOTTLED MOSAIC-LIKE APPEARANCE,
STRUCTURES DOM OCCUR BOTH PARALLEL
AND PERPENDICULAR TO BEDDING WITH A
DOMIANT PARALLEL BEDDING PREFERENCE;
SUBVITREOUS LUSTER; CRYSTALLINE TEXTURE
BLOCKY FRACTURE; VERY DENSE; NON CALC.

PORCELANITE: DARK YELLWSH BRN WITH NO
VIS ALTERNATING COLOR LAMS; DULL
LUSTER; SMOOTH TEXTURE; BLOCKY TO SLI
SPLINTERY FRACTURE WHEN VERY BRITTLE;
BRITTLE TO CRUNCHY TENACITY, OCC VERY
TOUGH; NO VISIBLE LAMINATIONS; NON
CALC.

SILICEOUS SHALE: PALE YELLWSH BRWN TO
PALE YELLWSH ORNG; OVERALL LIGHTER IN
COLOR THAN UNDERLYING SECTION; DULL
EARTHY TO SLI SUBRESINOUS LUSTER;
SMOOTH MATTE TEXTURE WITH NO VIS
DETRITAL CONTENT; IRREGULAR FRACTURE,
BECOMING SLI BLOCKY WHEN GRADING TO
PORCELANITE; BRITTLE TO SLI CRUNCHY
TENACITY; THIN mm-SCALE LAMS TO OCC
cm-SCALE LAMS; NON CALC.

CHERT: MOD YELLWSH BRN; OCCUR IN
SECTION AS RARE VERY THIN 1" STRINGERS;
SUBRESINOUS LUSTER; SMOOTH TO SLI CRY-
STALLINE TEXTURE; BLOCKY TO SLI CONCOIDA
FRACTURE; VERY TOUGH TENACITY; COMP-
ACTED FISH SCALES VISIBLE; NON CALC.

SILICEOUS SHALE: DARK YELLWSH BRWN;
INTERVAL BECOMING MORE SHALEY
TOWARDS THE BASE OF TRENCH; SECTION
NON CALC.

NOTE: FOLLOWED DOLOSTONE AT THE TOP
OF TRENCH 3 TO MARK BASE OF TRENCH 2.

TRENCH 3: 2948'-3078' (130')

LITHOLOGY: DOMINANTLY COMPOSED OF
SILICEOUS SHALE WITH PORCELANITE
STRINGERS AND LARGER BEDS; COMMON
DOLOSTONE STRINGERS AND LARGER SCALE
1-2' BEDS.

SILICEOUS SHALE: PALE YELLWSH BRWN TO
PALE YELLWSH ORNG; OVERALL LIGHTER IN
COLOR THAN UNDERLYING SECTION; DULL
EARTHY TO SLI SUBRESINOUS LUSTER;
SMOOTH MATTE TEXTURE WITH NO VIS
DETRITAL CONTENT; BRITTLE TO SLI CRUNCH
TENACITY; NON CALC; COMMON FISH SCALES
ALONG BEDDING PLANES.

SHALE: DOMINANTLY DARK YELLWSH BRWN;
DECREASE IN SILICA CONTENT, BUT STILL S
SILICEOUS; NOTABLE DECREASE IN APP
POROSITY AND INCREASE IN DENSITY WITH
RESPECT TO SURROUNDING LITHOLOGIES;
COMMON FISH SCALES.

NOTE: FOLLOWED DOLOSTONE AT THE TOP
OF TRENCH 4 TO MARK BASE OF TRENCH 3.

TRENCH 4: 3078'-3250' (172')

LITHOLOGY: INTERVAL DOMINANTLY COMP-
POSED OF SILICEOUS SHALE WITH 2 MAJOR 1-
2' DOLOSTONE BEDS AND LOCAL DOLOSTONE
STINGERS; MARKED INCREASE IN PORCEL-
ANITE THAN UNDERLYING SECTION; NON-
CALCAREOUS OVERALL.

SILICEOUS SHALE: PALE YELLWSH BRWN TO
PALE YELLWSH ORNG; OVERALL LIGHTER IN
COLOR THAN UNDERLYING SECTION; DULL
EARTHY TO SLI SUBRESINOUS LUSTER;
SMOOTH MATTE TEXTURE WITH NO VIS
DETRITAL CONTENT; IRREGULAR FRACTURE,
BECOMING SLI BLOCKY WHEN GRADING TO
PORCELANITE; BRITTLE TO SLI CRUNCHY
TENACITY; THIN mm-SCALE LAMS TO OCC
cm-SCALE LAMS; NON CALC; COMMON FISH
SCALES ALONG BEDDING PLANES; COMMON
CARBONATE-FLUORAPATITE.

PORCELANITE: ALTERNATING PALE YELLWSH
BRWN WITH VERY PALE YELLWSH BRWN
LAMS; VITREOUS TO SLI FROSTED LUSTER;
CRYSTALLINE TEXTURE; VERY BLOCKY
FRACTURE; BRITTLE DENSE TENACITY;
PRESENT IN SECTION AS DOMINANTLY THIN
cm-SCALE STRINGERS WITHIN LARGLY
SILICEOUS SHALE SECTION.

2800

2900

3000

3100

3200

Uranium
Thorium
Potassium

20>0
20>
5>

Gamma

200>

Max 292 API

3300

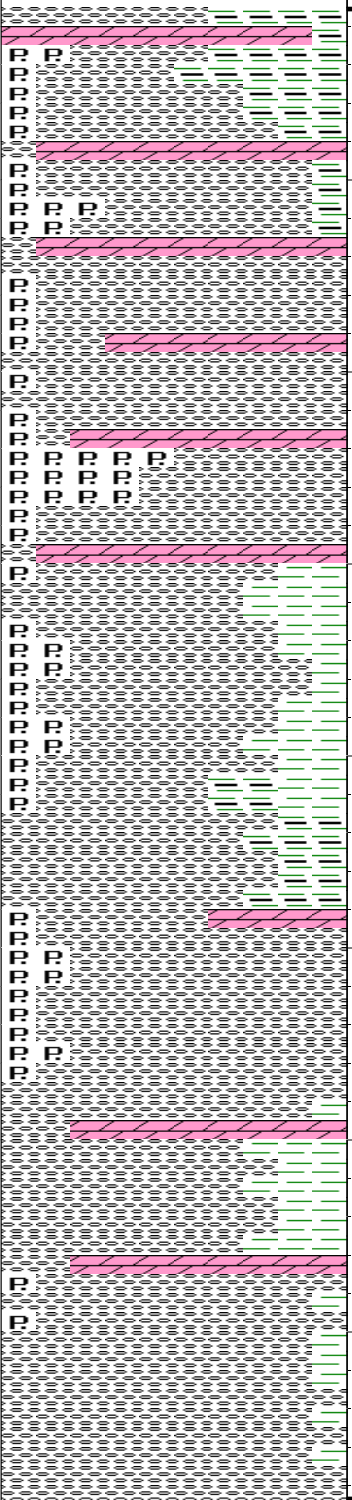
3400

3500

3600

3700

38



Uranium 20 > 0
 Thorium 20 > 0
 Potassium 5 > 0
 Gamma 200 > 0
 Max 419 API

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 104 FEET BASED ON THE AVE DIP OF 50 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

TRENCH 5: 3354'-3742' (388')

ANTELOPE-MCDONALD CONTACT: THIS CONTACT IS NOT ABRUPT, BUT GRADATIONAL IN NATURE; THE CONTACT WAS PLACED AT 3470' WHERE THERE APPEARS TO BE A LARGE INCREASE IN PORCELANITE, HOWEVER, SILIC APPEARS TO INCREASE GRADUALLY THROUGHOUT THE UPPER 900' OF THE MCDONALD; OVERALL THE MCDONALD IS CHARACTERIZED BY AN ABUNDANCE OF PHOSPHATIC AND CALCAREOUS SHALES, AND DOLOSTONES COMPARED TO THE DOMINANTLY SILICEOUS COMPOSITION OF THE ANTELOPE; COLOR CHANGE FROM DARK YELLWSH BRN IN THE MCDONALD TO MORE PALE YELLWSH BRWN LITHOLOGIES IN THE ANTELOPE; TOTAL STRATIGRAPHIC THICKNESS OF MCDONALD = 1308'.

LITHOLOGY: SECTION DOM COMPOSED OF SILICEOUS SHALE AND SILICEOUS CALC SHAL THIN PORCELANITE BEDS AND STRINGERS THROUGHOUT THE SECTION BUT INCREASING IN FREQUENCY TOWARDS THE TOP OF TRENCH AT THE ANTELOPE CONTACT.

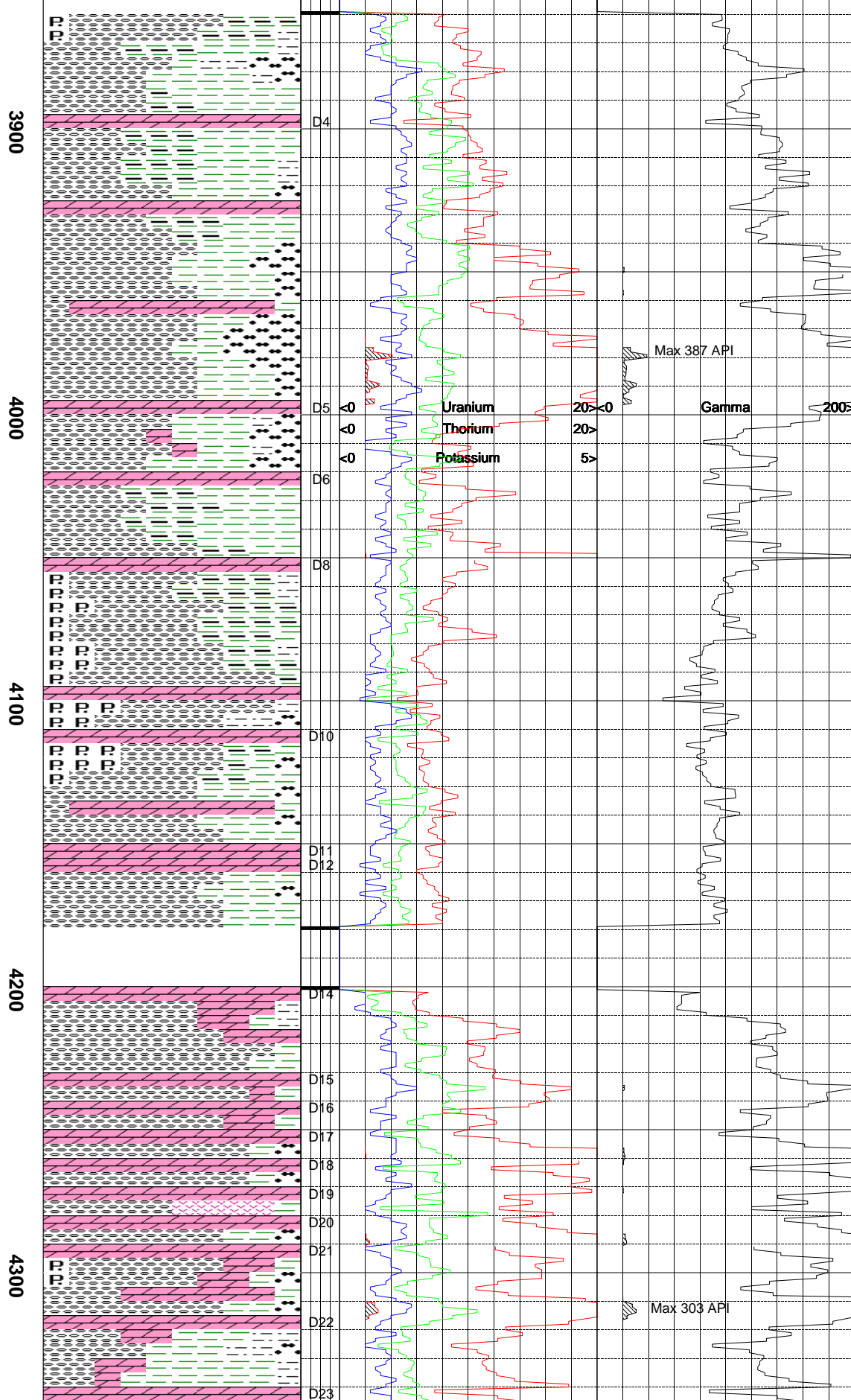
PORCELANITE: ALTERNATING PALE YELLWSH BRWN TO DARK YELLWSH BRWN LAMS WITH ALMOST BANDED APPEARANCE; VITREOUS LUSTER; GRITTY TO FINELY ABRASIVE TEXTU DUE TO THE PRESENCE OF DETRITAL FINES; VERY BLOCKY FRACTURE; TOUGH BRITTLE TENACITY; mm-SCALE LAMS; VARIABLE CALC AND NON-CALC. OCC ONLY CALC ALONG DISCRETE LAMS; MOD POROSITY; MOD DENSITY; MARKEDLY LOWER POROSITY THAN SILICEOUS SHALES; FIRST MAJOR PORCELANITE INTERVALS AT THE TOP OF TRENCH 5, MARKS THE BASE OF THE ANTELOPE SHALE.

DOLOSTONE: ALT MOD YELLWSH BROWN AND PALE YELLWSH BRWN mm-SCALE LAMS MOD HARD TO OCC VRY HARD WHEN MORE SILICEOUS; DOM RESINOUS TO SLI FROSTED LUSTER; CRYSTALLINE TO SLI SUCROSIC TEXTURE; BLOCKY FRACTURE, BECOMING CONCOIDAL WHEN VERY SILICEOUS; PRESENT THROUGHOUT SECTION DOM AS THICK DISCRETE 1-2' BEDS, SCATTERED THIN BEDS AND STRINGERS; DOLOSTONE BEDS INCREASE IN ABUNDANCY TOWARDS THE TOP OF TRENCH 5.

CALCAREOUS SILICEOUS SHALE: DRK YELWSH BRWN TO MOD YELLWSH BRN; SUBRESINOUS LUSTER, OCC SLI EARTHY; SMOOTH TO OCC SLI SUCROSIC TEXTURE; BLOCKY TO SLI IRR ULAR FRACTURE; VARB THINLY LAMINATED ON mm-SCALE TO cm-SCALE LAMS; SHALE RANGE FROM DENSE AND BLOCKY TO HIGHLY WEATHERED AND PLATY EXHIBITING SOME DEGREE OF FISSILITY, THOUGH LIKELY A WEATHERING FEATURE; ABUNDANT GHOST MICROFOSSIL CAVITIES VIS LOCALLY; HIGH APP POROSITY; LOW DENSITY.

SILICEOUS SHALE: LIGHT MOD YELLWSH BROWN, NOTABLY LIGHTER IN COLOR THAN OTHER LITHOLOGIES WITH HIGHER APP POROSITY AND LOWER DENSITY; SUBRESINOUS LUSTER UNDER MICROSCOPE, DULL EARTHY LUSTER IN OUTCROP; SMOOTH TO OCC SLI FINELY ABRASIVE TEXTURE WHEN SILTY; IRREGULAR FRACTURE, BECOMING BLOCKY WHEN PORCELANEOUS; BRITTLE TO SLI CRUMBLY TENACITY; DOM mm-SCALE BEDDING WITH AN ALMOST BANDED APP ALTERNATING BETWEEN LIGHT MOD YELLOW BROWN BEDS AND DARKER YELLWSH BRN BEDS; VARIABLE SLI CALC TO NON CALC, OC ONLY CALC ALONG DISCRETE LAMINATIONS OR WHERE CALCITE RECRYSTALLIZED MICROFOSSIL CAVITIES ARE PRESENT.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 116 FEET BASED ON THE AVE DIP OF 40 DEGREES



TRENCH 6: 3858'-4346' (488')

DESCRIPTION: SLI INCREASE IN SILICA TOWARDS THE TOP OF TRENCH WITH HIGHER APP POROSITY AND LOWER DENSITY; BEGINNING TO TRANSITION INTO THE OVERLYING ANTELOPE SHALE MEMBER; MARKED DECREASE IN PHOSPHATIC SHALE COMPARED TO THE BASE OF THE MCDONALD.

SILICEOUS SHALE: LIGHT MOD YELLWSH BROWN, NOTABLY LIGHTER IN COLOR THAN OTHER LITHOLOGIES WITH HIGHER APP POROSITY AND LOWER DENSITY; SUBRESINOUS LUSTER UNDER MICROSCOPE, DULL EARTHY LUSTER IN OUTCROP; SMOOTH TO OCC SLI FINELY ABRASIVE TEXTURE WHEN SILTY; IRREGULAR FRACTURE, BECOMING BLOCKY WHEN PORCELANEOUS; BRITTLE TO SLI CRUMBLY TENACITY; DOM mm-SCALE BEDDING WITH AN ALMOST BANDED APP ALTERNATING BETWEEN LIGHT MOD YELLOW BROWN BEDS AND DARKER YELLWSH BRN BEDS; VARIABLE SLI CALC TO NON CALC, OC ONLY CALC ALONG DISCRETE LAMINATIONS OR WHERE CALCITE RECRYSTALLIZED MICROFOSSIL CAVITIES ARE PRESENT.

TUFF: MODERATE ORNGSH-BRN WAXY TO SLI WAXY.

CALCAREOUS SHALE: DOM MOD YELLWSH BRN; SUBRESINOUS LUSTER UNDER MICROSCOPE, EXHIBITING AN OVERALL DULL CHALK LUSTER IN OUTCROP; FINELY ABRASIVE CRYSTALLINE TEXTURE; PLANAR FRACTURE, OFTEN BREAKING ALONG BEDDING PLANES; VERY THIN mm-SCALE BEDDING, OCC SLI MORE MASSIVE IN SOME SECTIONS LIKELY DUE TO WEATHERING PATTERN; MOD TO LOW DENSITY; CRMBLY TENACTIY; COMMON CALCITE RECRYSTALLIZED MICROFOSSILS; TRACE TO SCATTERED MUSCOVITE FLAKES; SL MORE SILICEOUS THAN CALC SHALE AT THE BASE OF THE MCDONALD SECTION.

DOLOSTONE: DOM DARK YELLWSH BROWN; MOD TO HARD, BECOMING VERY HARD WHEN SILICEOUS; BECOMING INCREASING SILICEOUS AS SURROUNDING LITHOLOGY INCREASES IN SILICA CONTENT.

PHOSPHATIC SHALE: DOM DARK YELLWSH BROWN TO DSKY YELLWSH BROWN; SILICA CONTENT INCREASE IN THIS SECTION; COM CARBONATE-FLUROAPATITE NODULES, NOT AS PROLIFIC AS BASE OF THE MCDONALD; SLI SUBRESINOUS TO EARTHY LUSTER, SMOOTH TO SLI FINELY ABRASIVE TEXTURE WHEN SILTY; DOM BLOCKY FRACTURE, OCC SLI IRREGULAR; DOM BLOCKY cm-SCALE BEDDING, OCC THIN mm-SCALE BEDDING; DOM NON CALCAREOUS TO OCC SLI CALC LOCALLY.

NOTE: SECTION COVERED FROM 4180 TO 4200 DUE TO STEEP SLOPE AND CONSEQUENT INABILITY TO TRENCH.

SILICEOUS SHALE: LIGHT MOD YELLWSH BROWN, NOTABLY LIGHTER IN COLOR THAN OTHER LITHOLOGIES WITH HIGHER APP POROSITY AND LOWER DENSITY; SUBRESINOUS LUSTER UNDER MICROSCOPE, DULL EARTHY LUSTER IN OUTCROP; SMOOTH TO OCC SLI FINELY ABRASIVE TEXTURE WHEN SILTY; IRREGULAR FRACTURE, BECOMING BLOCKY WHEN PORCELANEOUS; BRITTLE TO SLI CRUMBLY TENACITY; DOM mm-SCALE BEDDING WITH AN ALMOST BANDED APP ALTERNATING BETWEEN LGHT MOD YELLWSH BROWN BEDS AND DARKER YELLWSH BRN BEDS; VARIABLE SLI CALC TO NON CALC, OC ONLY CALC ALONG DISCRETE LAMINATIONS OR WHERE CALCITE RECRYSTALLIZED MICROFOSSIL CAVITIES ARE PRESENT.

CALCAREOUS SHALE: DOM MOD YELLWSH BRN; SUBRESINOUS LUSTER UNDER MICROSCOPE, EXHIBITING AN OVERALL DULL CHALK LUSTER IN OUTCROP; FINELY ABRASIVE CRYSTALLINE TEXTURE; PLANAR FRACTURE, OFTEN BREAKING ALONG BEDDING PLANES; VERY THIN mm-SCALE BEDDING.

NOTE: FOLLOWED DOLOSTONE AT THE TOP OF TRENCH 7 TO MARK BASE OF TRENCH 6.

TRENCH 7: 4344'-4664' (318')

4400

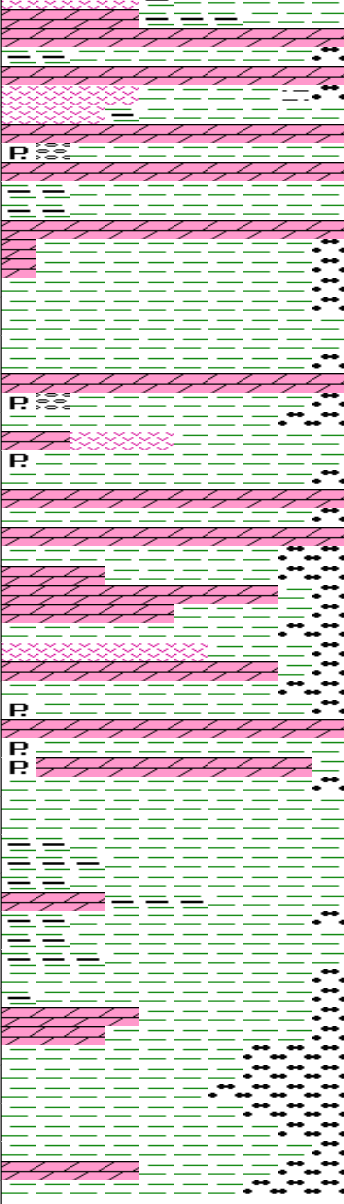
4500

4600

4700

4800

49



D24
D25
D26
D27
D28
D29
D30
D31

Uranium 20 > 0
Thorium 20 > 0
Potassium 5 > 0

Gamma

200 >

BASE McDONALD

LITHOLOGY: OVERALL THIS SECTION IS COMPOSED OF VERY DARK YELLWSH BRWN PHOSPATIC SHALE IN THE LOWER 360' AND TRANSITIONS INTO A LIGHTER MORE CALCAREOUS SHALE TOWARDS THE TOP. SILICA CONTENT ALSO INCREASES TOWARDS THE TOP OF TRENCH; THE LOWER PHOSPATIC ZONE CONTAINS ABUNDANT CARBONATE-FLUORAPATITE NODULES THAT RANGE IN SIZE FROM THIN mm-SCALE COMPACTED AND DEFORMED BLEBS ALONG BEDDING PLANES TO LARGER cm-SCALE NODULES; PHOSPATIC SHALES ARE CHARACTERISTICALLY MORE DENSE AND LOWER IN APPARENT POROSITY THAN OVERLYING SILICEOUS SHALES; SHALES TYPICALLY HAVE A FINELY ABRASIVE TEXTURE DUE TO MINOR SILT CONTENT.

CALCAREOUS SHALE: DOM MOD YELLWSH BRN; SUBRESINOUS LUSTER UNDER MICROSCOPE, EXIBITING AN OVERALL DULL CHALK LUSTER IN OUTCROP; FINELY ABRASIVE CRYSTALLINE TEXTURE; PLANAR FRACTURE, OFTEN BREAKING ALONG BEDDING PLANES; VERY THIN mm-SCALE BEDDING, OCC SLI MORE MASSIVE IN SOME SECTIONS LIKELY DUE TO WEATHERING PATTERN; MOD TO LOW DENSITY; CRMBLY TENACTIY; COMMON CALCITE RECRYSTALLIZED MICROFOSSILS; TRACE TO SCATTERED MUSCOVITE FLAKES; SL SILTY LOCALLY.

VOLCANIC TUFF: DOM DUSKY YELWSH BRN; SMOOTH WAXY TEXTURE; 2" THICK.

DOLOSTONE: DOM DARK YELLWSH BROWN; MOD TO HARD, BECOMING VERY HARD WHEN SILICEOUS; RESINOUS TO ALMOST CRYSTALLINE LUSTER; DOM SUCROSIC TEXTURE, BECOMING SMOOTHER WITH INCREASE IN CLAY CONTENT; COMMON THIN CALCITE FRACTURE HEALINGS; VARIABLE THIN mm to cm-SCALE BEDDING TO OCC MASSIVE BEDDING; VARIABLE SLI SILICEOUS TO SLI MOR CLAY-RICH, WITH VRY PROMINENT RESISTIVE CHERTY DOLOSTONE BEDS IN SOME SECTIONS VARIABLE 1-2' BEDS AND 1-2" STRINGERS.

PHOSPATIC SHALE: DOM DARK YELLWSH BROWN TO DSKY YELLWSH BROWN WITH COMMON WHITE TO SLI PALE PINKISH WHITE CARBONATE-FLUORAPATITE NODULES; NODULES RANGE IN SIZE FROM SMALL mm-SCALE DEFORMED BLEBS TO LARGE cm-SCALE NODULES; DOM DULL EARTHY LUSTER; SMOOTH TO OCC SLI GRITTY TEXTURE WHEN SILTY; DOM BLOCKY FRACTURE, OCC SLI IRR EGULAR; DOM BLOCKY cm-SCALE BEDDING, OCC THINLY BEDDED AND EXIBITING A SLI FISSILITY; DOM NON CALCAREOUS TO SLI CALC LOCALLY.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 504 FEET BASED ON THE AVE DIP OF 40 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

NOTE: THE BASE OF THE McDONALD IS POSITIONED AT 4778' BASED ON AN ABRUPT SLOPE BREAK 112' FROM THE BASE OF TRENCH 7. TOTAL STRATIGRAPHIC THICKNESS OF DEVILWATER SHALE = 802'.

5000

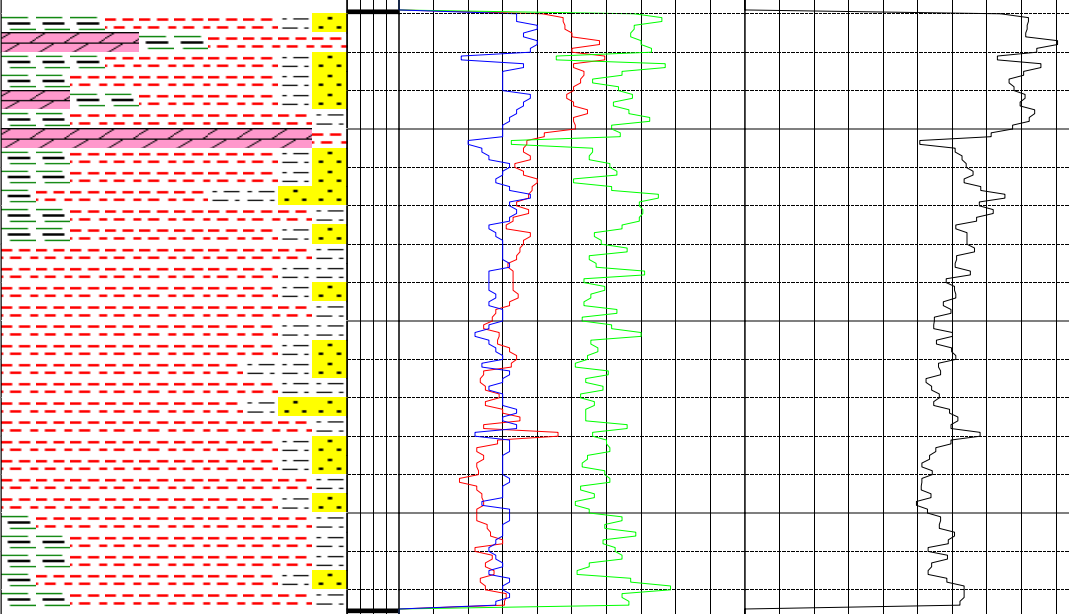
5100

5200

5300

5400

0	Uranium	20	<0	Gamma	200
0	Thorium	20	>		
0	Potassium	5	>		



TRENCH 8: 5168'-5324' (156')

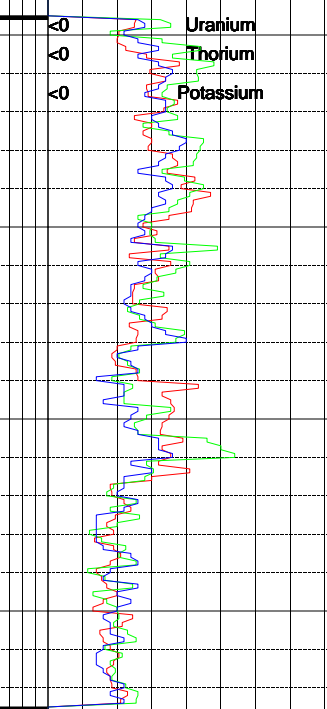
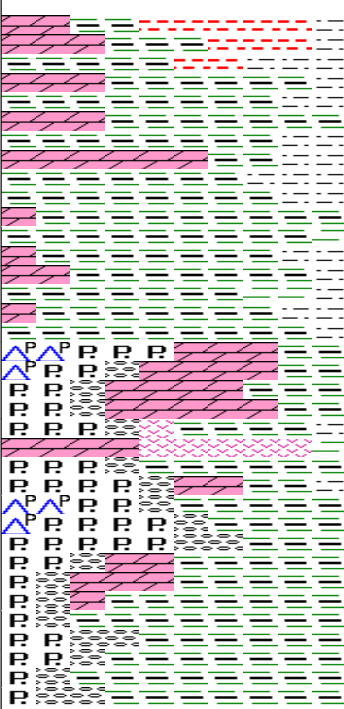
LITHOLOGY: DOM LIGHT OLIVE TO SLI BLUIS GREY SILTY CALCAREOUS CLAYSTONE WITH ABUNDANT RECRYSTALLIZED MICROFOSSIL CAVITIES; LOCAL NON-CALCAREOUS INTERVALS; OVERALL HIGHER DETRITAL CONTENT THAN THE UNDERLYING GOULD MEMBER, DOMINANTLY SILTY, BECOMING SLI SANDY LOCALLY; INTENSLY FRACTURED; ROCKS EXIBIT A SUBRESINOUS TO SLI SPARKLING LUSTER DUE TO DISSEMINATED MUSCOVITE; HIGHLY CALCAREOUS AT THE TOP OF TRENCH BECOMING DOM NON- CALCAREOUS BELOW 5290'; ASIDE FROM THE VARIATION BETWEEN CALC AND NON-CALC INTERVALS, THE LITHOLOGY IN THIS SECTION IS OVERALL FAIRLY HOMOGENOUS.

DOLOSTONE: DOM DARK YELLWSH ORNG; MOD DENSITY; DULL AND EARTHY TO SLI WAXY LUSTER; MATTE TEXTURE; SCATTERED SAND AND SILT GRAINS; NON SILICEOUS WIT HIGHER CLAY CONTENT THAN DOLOSTONE BEDS IN THE GOULD MEMBER.

NON CALCAREOUS SILTY CLAYSTONE: LIGHT OLIVE TO SLIGHTLY BLuish GREY; CONCHOID AL FRACTURE; HIGHLY FRACTURED MAKING BEDDING ATTITUDE DIFFICULT TO DETERMINE DULL TO SLI SUBBRESINOUS LUSTER; ABUNDANT FINE SAND AND SILTSTONE INCLUSIONS NO VISIBLE MICROFOSSIL CAVITIES.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 170 FEET BASED ON THE AVE DIP OF 35 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

5500



Uranium 20><0
 Thorium 20>
 Potassium 5>

Gamma

200>

OUTCROP 8: 5494'-5674' (180')

LITHOLOGY: DOM LIGHT MOD YELLWSH BROWN TO SLI OLIVE BROWN SILTY CLAY-STONE AND SHALE; SLI CALCAREOUS TO NON-CALC, BECOMNG DOM NON-CALC AT THE TOP OF EXPOSED SECTION. CLAYSTONE HAS SUB-CONCOIDAL FRACTURE AND IS TYPICALLY INTENSLY FRACTURED; SILTY SHALE IS THIN BEDDED WITH A FISSILE APP LIKELY DUE TO WEATHERING; COM DISSEMINATED MUSCOVITE AND MICROFOSSIL CAVITIES COMMON; ABUNDANT 4"-1' THICK DOLOSTONE BEDS AND STRINGERS THROUGHOUT INTERVAL; MARKED DECREASE IN INDURATION TOWARDS THE TOP OF SECTION, ULTIMATELY BECOMING COMPLETELY UNEXPOSED.

TOP OF GOULD MEMBER AT 5582'. TOTAL STRATIGRAPHIC THICKNESS OF GOULD = 432'

DEVILWATER-GOULD CONTACT: MARKED SHIFT FROM DENSE THINLY LAMINATED BLOCKY AND BRITTLE CALCAREOUS PORCELANITE TO LOW DENSITY CALCAREOUS SILTY SHALE; SHALE IS PLATY AND HIGHLY WEATHERED; BOTH GOULD AND DEVILWATER SHALE CONTAIN ABUNDANT MICROFOSSILS.

CALCAREOUS PORCELANITE AND SHALE: GREYISH ORNG TO PALE YELLWISH ORNG; BLOCKY 1-2" BEDDING WITH THIN mm-SCALE LAMINATIONS. MOD TO VERY HIGH DENSITY WITH NO LOW APP POROSITY; ABUNDANT CALCITE RECRYSTALLIZED MICROFOSSILS.

CHERT: THIN 1-2" DARK YELLWISH BROWN STRINGERS INTERLAMINATED WITH CALCAREOUS PORCELANITE AND SHALE; MORE INTENSLY FRACTURED ALONG CHERTY BEDS; CALCITE RECRYSTALLIZED FORAMS.

THICKNESS OF COVERED SECTION WAS CALCULATED TO APPROXIMATELY 208 FEET BASED ON THE AVE DIP OF 35.5 DEGREES BETWEEN THE OVERLYING AND UNDERLYING EXPOSED SECTIONS.

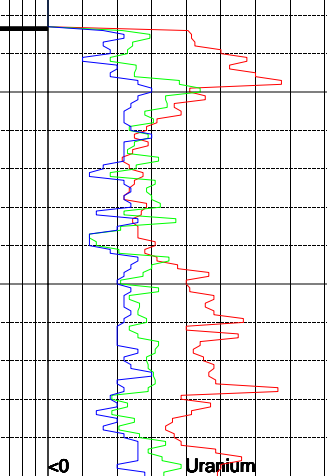
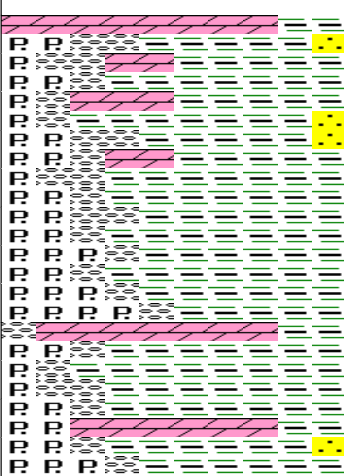
5600

5700

5800

5900

6000



Uranium 20><0
 Thorium 20>
 Potassium 5>

Gamma

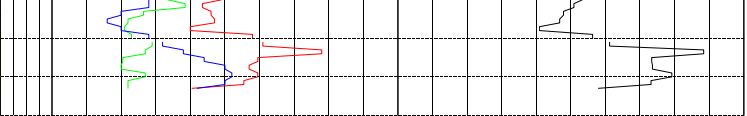
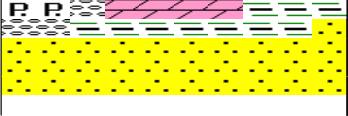
200>

TRENCH 9: 5882'-6024' (142')

LITHOLOGY: HIGHLY CALCAREOUS OVERALL; ABUNDANT MICROFOSSIL CAVITIES AND CALCITE RECRYSTALLIZED MICROFOSSILS; ALTERNATING BETWEEN CLAY-RICH CALCAREOUS ROCKS AND MORE SILICEOUS CALCAREOUS INTERVALS; LOCAL CALCAREOUS PORCELANITE INTERVALS; CLAY-RICH ROCKS ARE HIGHLY WEATHERED WITH A MASSIVE ALMOST INDISCERNIBLE BEDDING STRUCTURE. SILICEOUS INTERVALS ARE RESISTIVE WITH BLOCKY PROMINENT 1-2" BEDS; MINOR MED TO COARSE GRAINED FLOATING SAND GRAINS PRESENT LOCALLY.

DOLOSTONE: VERY DARK ORNG TO DARK ORNGSH-BROWN; HIGH DENSITY AND SLIGHTLY SILICEOUS BECOMING CHERTY IN SOME PLACES; RESINOUS LUSTER; COM CALCITE RECRYSTALLIZED MICROFOSSILS.

GOULD-BUTTONBED CONTACT: ABRUPT



TRANSITION FROM DARK YELLWSH ORNG
 MOD TO POORLY SORTED, MED TO COARSE-
 GRAINED ARKOSIC ARENITE SANDSTONE TO
 CALCAREOUS SHALE AT 6012'.

The log data, interpretations and recommendation provided by Epoch are inferences and assumptions based on measurements of drilling fluids. Such inferences and assumptions are not infallible and reasonable professionals may differ. Epoch does not represent or warrant the accuracy, correctness or completeness of any log data, interpretations, recommendations or information provided by Epoch, its officers, agents or employees. Epoch does not and cannot guarantee the accuracy of any such interpretation of the log data, interpretations or recommendations and Company is fully responsible for all decisions and actions it takes based on such log data, interpretations and recommendations.