January 27, 1984

Australia: Northern Territory OP 191 - Exploratory Well

RECOMMENDATION

Amoco recommends drilling an exploratory well to test Proterozoic rocks in the Broadmere area of Block 191.

The Broadmere-1 well would be drilled at the intersection of seismic lines 83-120 and 83-117 to a total depth of 10,000 feet and will test the Roper and McArthur groups at an estimated gross cost of $4.0 MM. (Enclosure 1)

BACKGROUND

Amoco Australia petroleum Company was awarded a Permit to Prospect for Petroleum for Block OP 191 on September 11, 1980. The block covers a land area of 22,932 square kilometers (8854 sq. miles) within the Northern Territory of Australia (Attachment 1). Kennecott Exploration (Australia) Ltd. (SOHIO), was awarded a similar Permit to Prospect for OP 198 on August 20, 1981. Block OP 198 covers a land area of 16,835 square kilometers (6500 sq. miles) and lies directly to the north of Amoco's OP 191, with which it is contiguous (Attachment 1). Amoco and Kennecott subsequently agreed to cross-assign 50% interest in both blocks. Currently, obligations for OP 191 have been satisfied to September 1984 - the end of the 4th year (Attachment 2). The fifth year requires drilling one well to economic basement and expenditures of AU$ 4MM.

Work can be carried out in advance of an obligation and fulfill that obligation with the consent of the Northern Territory Government. Relinquishments can be made at the end of each contract year provided all prior obligations have been met, with the consent of the Minister.

The 1981 and 1982 geologic work programs covering both OP 191 and 198 included geologic mapping and a series of shallow core holes. In 1983, 333 line kilometers of seismic were acquired in over the Broadmere OP 191 area (Attachment 3).

Gravity and magnetic data was acquired on all seismic lines.

REGIONAL GEOLOGY

The Proterozoic McArthur Basin outcrops in a northwest trending belt along the south and west coasts of the Gulf of Carpentaria. It is limited by the Murphy Inlier of the southeast and the Pine Creek Inlier to the northwest. The northeasterly and southwesterly limits of the basin are obscured by more recent cover (Attachment 4).

The three Proterozoic rock groups recognized in the basin are, from oldest to youngest, the Tawallah, McArthur and Roper Groups (Attachment 5).

Tawallah Group sediments consist of volcanics, clastics, and a few carbonates. In general, these rocks are highly fractured. Evidence, in the form of chlorite-lined fractures, exists for local low-grade metamorphism along some faults.

The McArthur Group consists of algal dolomites, black shales and occasional sandstones and conglomerates. Development of north trending pull-apart basins by a northwest-trending right-lateral wrench system controlled deposition of McArthur Group sediments. An initial phase of downwarping resulted in the deposition of red beds, sabkhas, and shallow water carbonates (Mallapunyah through Teena Formations).

Following this, a series of high angle, north-trending normal faults formed. Relatively rapid subsidence of graben-like, pull-apart basins controlled deposition of deeper water organic-rich mudrocks such as the Barney Creek and Lower Lynott Formations. Pulses of fault movement allowed formation of thick clastic wedges adjacent to these faults. The actual mode of basin formation appears to be alternating motion on faults, and "graben" formation due to formation of two half-grabens.

For instance, within the Batten Trough, Barney Creek deposition was controlled by the Emu Fault whereas the Tawallah Fault appears to have controlled clastic influx at the time of deposition of the Lynott Formation. Northwest-trending faults also exhibit growth during this phase of sedimentation, though their cumulative effects on sedimentation, are not presently well understood.

The final phase of McArthur Group sedimentation involved deposition of shallow water sediments (Middle Lynott through Dungaminnie Formations). More quiescent conditions prevailed throughout this period; fault movement was sporadic and of lesser magnitude. Resultant deposition of shallow

water carbonates (stromatolitic, intraclastic, oolitic), thin shale units, siltstone and sandstone occurred. Numerous periods of emergence are evidenced by the presence of paleokarsts within some of the carbonate units. Local uplifts resulted in deposition of the Mt. Birch Sandstone.

Downwarping to the west, coupled with clastic deposition prograding from the west, constituted Roper Group sedimentation. Deposition of thick, clean quartz sandstone and variably-organic shales occurred. Possible growth along northwest-trending faults may have taken place at this time.

Reactivation of north-trending normal faults through dextral transcurrent motion caused the formation of small en-echelon folds. Later sinestral transcurrent motion along the northwest-trending faults appears to have been responsible for formation of a set of en-echelon folds, larger in extent than the older and smaller features already mentioned. The Broadmere anticline in OP 191 is one of this type of fold.

Subsequent to the Proterozoic, there appears to have been little significant tectonic activity in the area, although organic geochemistry and petrographic analyses indicate that, at some stage, the Proterozoic rocks have been buried quite deeply in some areas. Flat-lying Cambrian sandstones outcrop over broad areas along the flanks of the Batten Trough. Similarly, flat-lying Mesozoic cover is also occasionally found and may represent the remnants of what was a substantial thickness of cover.

RESERVOIR PROPERTIES

Porosity, permeability and grain density measurements taken on samples collected in the 1981 and 1982 field programs indicate reservoir potential for the following formations, in order of reservoir quality:

Abner Sandstone	Good
Bessie Creek	Good
Stretton Formation	Fair
Yalco Formation	Fair

In addition, the Coxco Dolomite of the Emerugga Formation flowed gas in the Amoco Minerals Glyde River 79-9 corehole (Attachment 3).

In Broadmere #1, the Abner and Bessie Creek Sandstones are anticipated to be the primary reservoirs within the Roper Group with porosity estimates of 12-15% and 10% respectively. These porosity estimates are based on analysis of coreholes 82-3 and 82-8 (Attachment 3). Some porosity enhancement due to weathering is interpreted for the Abner Sandstone. However, the degree of enhancement is difficult to determine. The Bessie Creek in corehole 82-8 flowed water and exhibited patchy porosity of up to 22%. Both units are interpreted to have been deposited in shallow, near-shore environments.

Within the McArthur Group, the Stretton Formation clastics and the Yalco Formation dolomites are the primary potential reservoirs. The coarser facies of the Stretton have good porosity and permeability developed locally. These sandstones are interpreted to have been deposited during a

regional transgression resulting from renewed activity on the Emu Fault. The Yalco dolomites display vuggy porosity developed on local unconformities. These unconformities represent emergence of intertidal stromatolitic dolomites and resultant vadose weathering.

In addition, the potential of the Coxco Dolomite of the Emerugga Formation is recognized but not quantified.

SOURCE POTENTIAL

Geochemical analyses of the 1981 and 1982 samples were used to rank source potential of the various units as follows:

Yalco Formation	Good
Barney Creek Formation	Good
Corcoran Formation	Good to Poor
Lynott	Good to Poor

The degree of thermal maturity of the various units varies across the area and is possibly related to previous burial by Cambrian and younger sediments.

GEOPHYSICAL CONSIDERATIONS

In 1983 Amoco acquired a total of 333 line kilometers of Sign-bit recorded vibroseis data over the Broadmere (OP 191) area. The objectives of the seismic survey were to map structure at depth, to confirm that surface

structure persists with depth, to tie surface outcrop data into the subsurface and where possible to identify gross litho-stratigraphic intervals.

The seismic data acquired was 512 channel vibroseis recorded in Sign-bit mode and was processed (128 fold) in the field. Penetration was achieved to 4 seconds (TWT) or approximately 40,000 feet. Velocities are characteristically high through the entire section probably reflecting the extreme age of the sediments.

Selected lines over the Broadmere area totalling 189 line kilometers were reprocessed by Interseis in New Orleans, Louisiana. These are lines 83-117, 83-118, 83-120, 83-122 and parts of lines 83-111, 83-113, 83-115 and 83-116. Seismic interpretation was carried out on unmigrated data using both reprocessed Final Stack sections and field processed sections. Reprocessed sections are noted on each enclosed seismic map by green arrows.

Seismic mapping was carried out on four horizons which were identified through seismic ties to surface outcrop, by character and by gross lithologic thicknesses. These horizons are Approximate Top Bessie Creek (Orange), Approximate Top Abner (Green), Approximate Top McArthur Group (Blue) and Approximate Top Emmerugga (Red).

BROADMERE STRUCTURE

The Broadmere anticline is a prominent surface feature in the northwest part of block OP 191. Seismic mapping indicates that 4-way dipping surface

structure persists to approximately 11,000 feet. The Roper Group is projected into the subsurface from outcrop and is well defined seismically. The base of the Roper/Top McArthur is based on stratigraphic thickness and a seismic character change noted on the west flank of the structure. The deeper seismic reflectors are thought to represent reflection from within the McArthur and Tawallah Groups.

Approximate Top Bessie Creek (Orange):

The orange horizon was very reliably carried along a very continuous, low frequency, high amplitude event. This event was mapped at the trough-to-peak inflection just below the orange color (Enclosures 6, 7 and 8). The seismic event was projected to the surface on the east to tie reliably to the expected Bessie Creek subcrop, thereby identifying this horizon. The Approximate Top Bessie Creek time structure map (Enclosure 2) clearly demonstrates four-way dip closure encompassing an area of approximately 7,200 acres and 120 ms. (~720 feet) of vertical closure.

Approximate Top Abner (Green):

The green horizon was reliably picked at the trough-to-peak inflection along the upper leg of a regionally continuous, generally three-legged set of events. Since the reprocessed Final Stack sections appear to enhance the locally variable character of this event, the field processed sections, which demonstrate more clearly the continuity at this level, were used in conjunction with reprocessed sections to map closure. The green seismic

horizon was reliably tied to surface outcrop to the east and identified as Approximate Top Abner. The time structure map at this level (Enclosure 3) again clearly demonstrates four-way dip closure of 7,200 acres with 100 ms. ($\sim$ 750 feet) of vertical closure.

Approximate Top McArthur Group (Blue):

The blue horizon was reliably mapped only within the syncline directly west of the prospect. This horizon was carried as a "ghost" below the green horizon over the structure, assuming constant isopaching. Therefore the reliability of this horizon is poor over the structure, as indicated by dashed contours on the time structure map (Enclosure 4). The blue horizon was identified as Approximate Top McArthur Group based on predicted lithologic thicknesses below the Abner and its unconformable appearance where the seismic character is well defined (Line 83-120, VP 1200-1600).

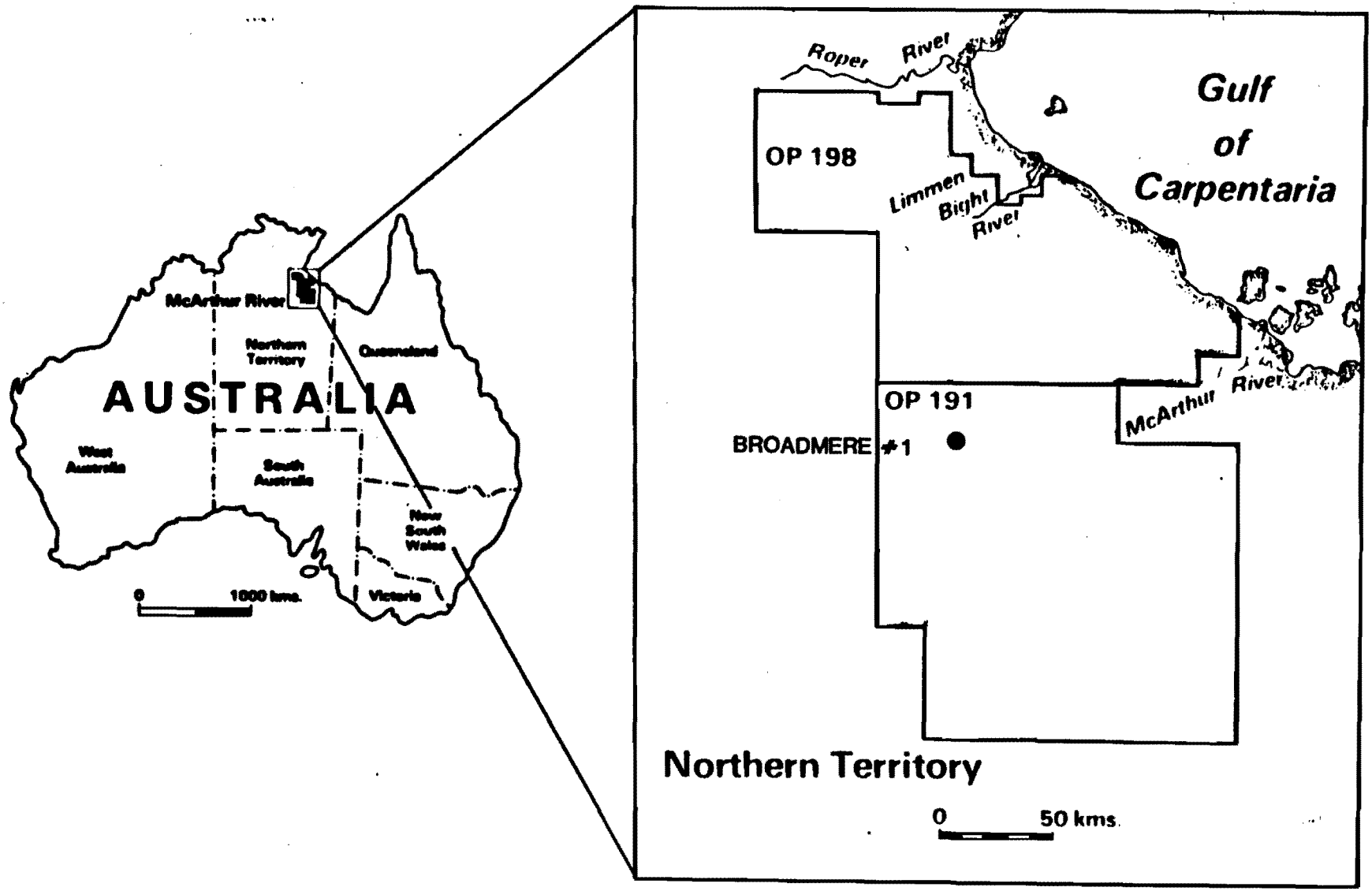
Approximate Top Emmerugga (Red):

The red horizon was picked with fair reliability over the structure along a partially continuous, variable amplitude reflector. This reflector appears to mark a lithologic character change between a shallower seismically quiet zone and a deeper somewhat chaotic zone which exhibits variable unconformable dips and discontinuous high amplitude events. Where the red reflector weakens or disappears, the seismic pick was based on this character change and the reliability is poor. The Approximate Top Emmerugga time structure map (Enclosure 5) denotes fair and poor reliabilities by solid and dashed

contours, respectively. This map supports four-way dip closure encompassing an area of 3,500 acres and 60 ms (~500 ft) of vertical closure. This horizon was identified by predicted gross lithologic thickness below the Abner and by the abrupt character change which is believed to represent the unconformity separating the seismically quiet deep water shales from the higher density Emerugga Dolomite.

BOUGUER GRAVITY:

The Bouguer Gravity Map - Third-Order Residual (Enclosure 9) exhibits a very good correlation with the seismic structure maps. It is inferred from this correlation that a gravity survey would be effective in determining whether other Proterozoic structures are present in the area but obscured by more recent cover.



Attachment 1

SUMMARY OF OBLIGATIONS

MCARTHUR RIVER AREA

OP 191

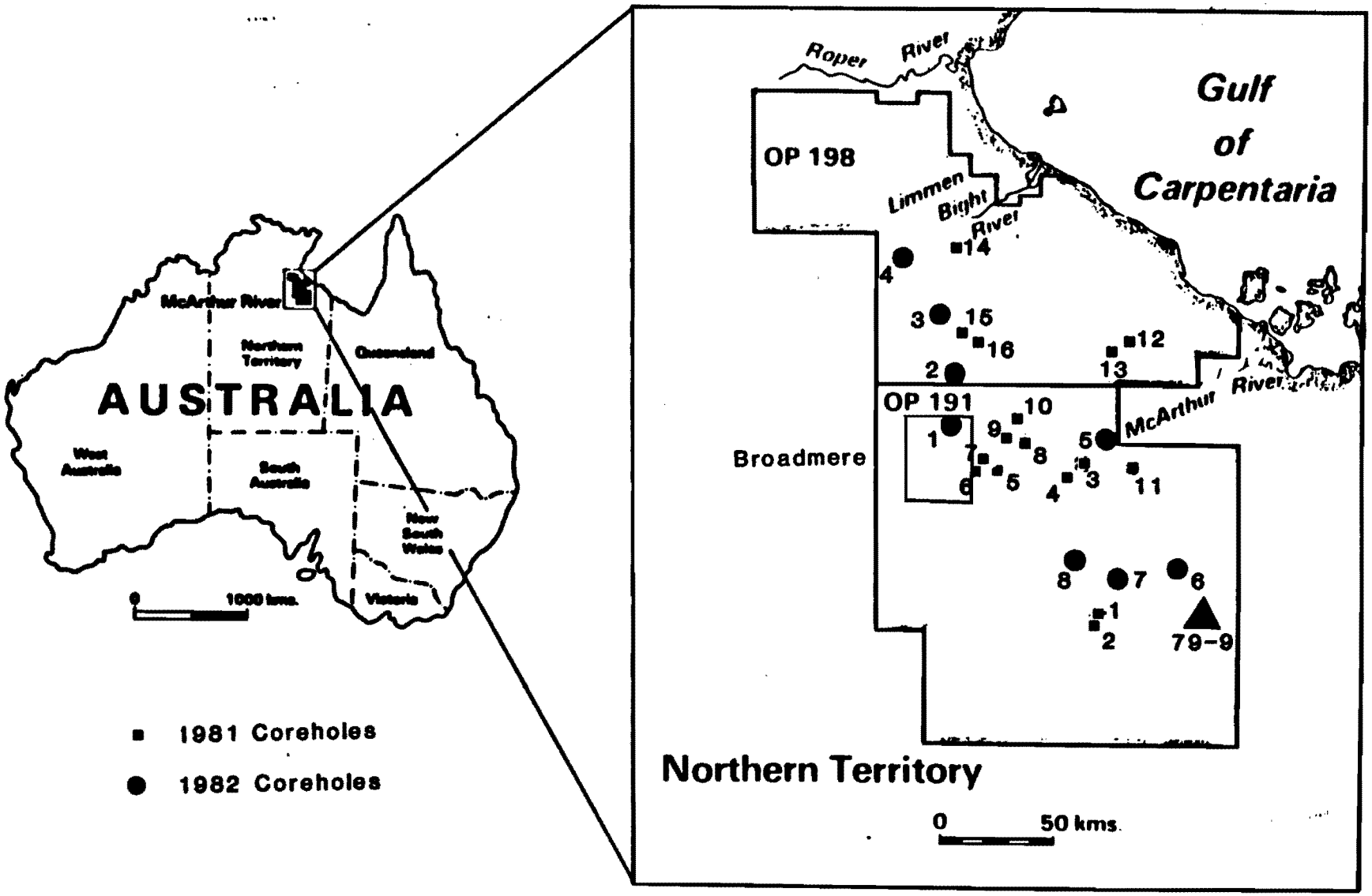
AWARDED SEPTEMBER 11, 1980

1980-81	(yr 1)	Geologic field work AU$ 0.1 MM
1981-82	(yr 2)	Geologic field work AU$ 0.3 MM
1982-83	(yr 3)	250 kms seismic AU$ 1.75 MM
1983-84	(yr 4)	
1984-85	(yr 5)	One well to economic basement AU$ 4.0 MM

End of exploration term - September 10, 1985

Attachment 2

242/L



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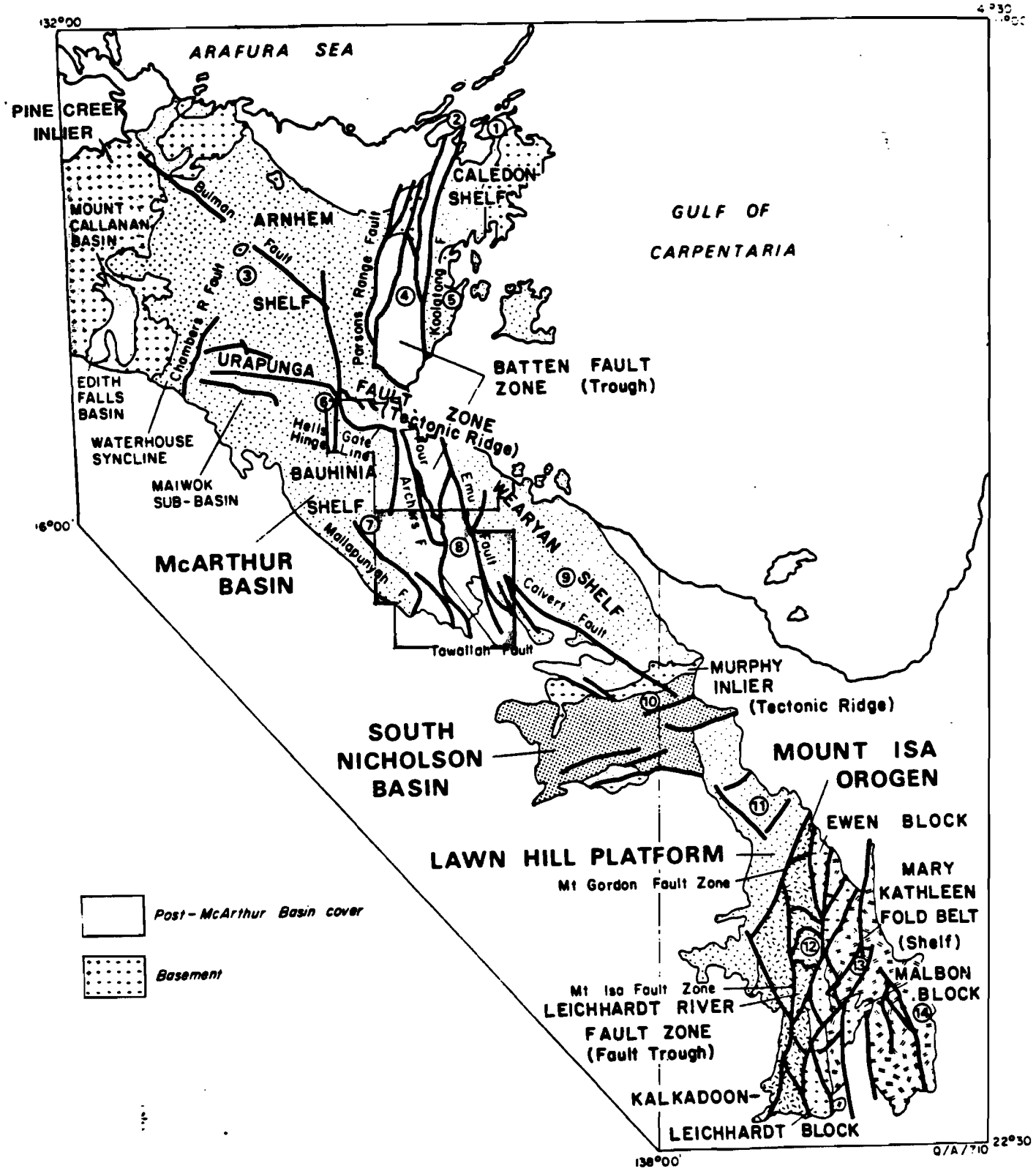
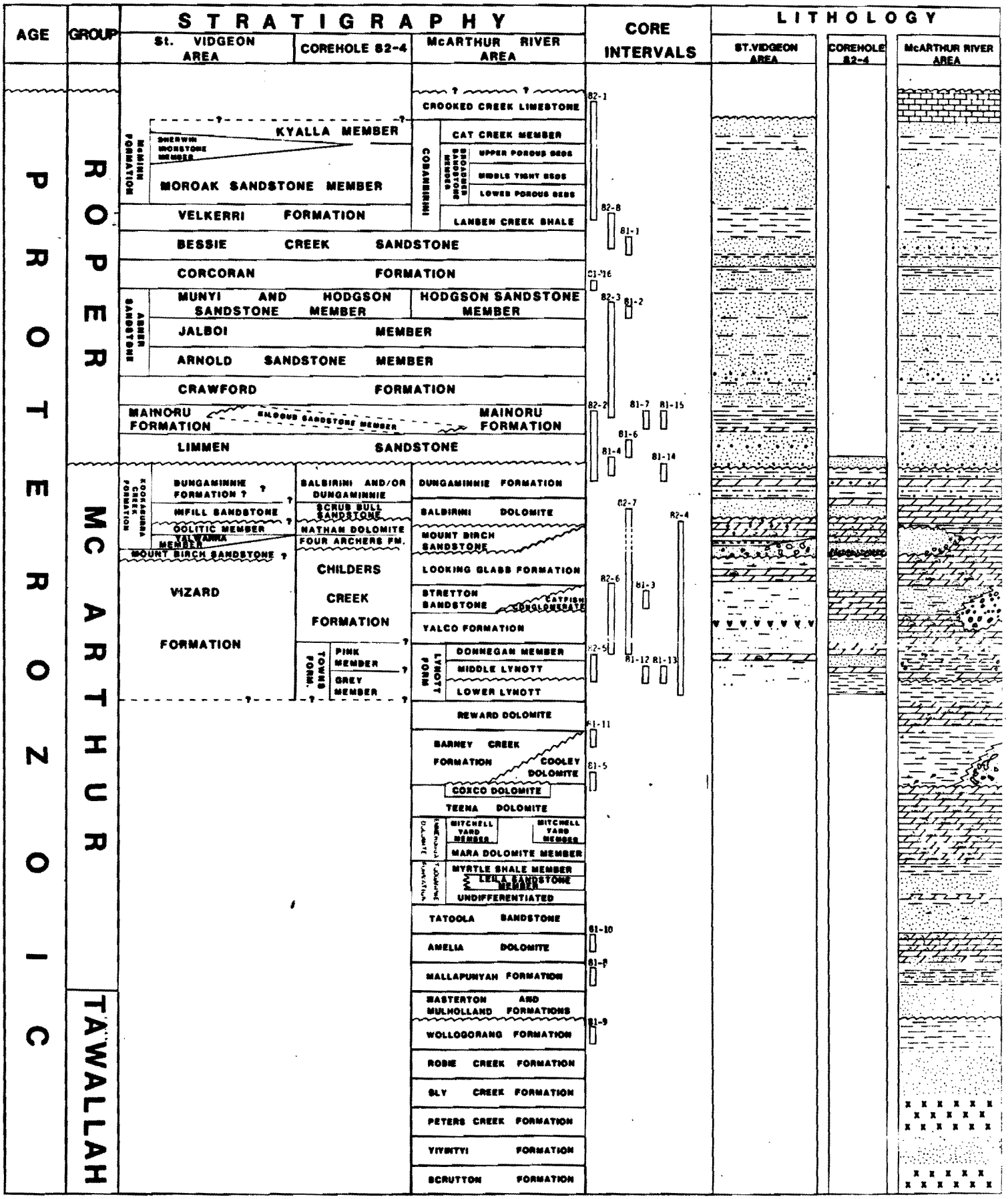


REGIONAL SETTING McARTHUR BASIN

Attachment 4



Attachment 5

January 27, 1984

Australia: Northern Territory OP 198

RECOMMENDATION

Amoco as operator of Permit OP-198 requests that its third year obligation to drill one well to economic basement and incur expenditures of AU $0.75MM be transferred to the fifth contract year.

Amoco expects to begin drilling the Broadmere-1 well on Permit OP-191 in late April to a total depth of 10,000 feet for an estimated cost of US $4.0MM. The play that we are making in this area is very unusual. Proterozoic-age rocks are commonly considered to have no hydrocarbon potential and therefore are ignored by most operators. The results of analysis of samples collected in our 1981 and 1982 fieldwork suggest the possible existence of source and reservoir rocks in the subsurface. However, the actual potential of the area will not be know until a deep well is drilled. The seismic data that we acquired in 1983 indicates that the structures in OP-198 are smaller in areal closure than in OP-191 and do not persist to depth. In comparison the largest structure in OP-198 has about 800 acres of closure versus 7500 acres in OP-191. Because of this, we believe the best place to first test theProterozoic in the McArthur Basin is on the Broadmere structure. If the well is successful it will open up a vast new frontier for exploration.

BACKGROUND

Kennecott Exploration (Australia) Ltd. (SOHIO) was awarded a Permit to Prospect for Petroleum for OP 198 within the Northern Territory of

Australia on August 21, 1981 (Attachment 1). Block OP 198 covers a land area of 16,835 square kilometers (6500 sq. miles). Amoco Australia Petroleum Company was awarded a similar Permit to Prospect for Block OP 191 on September 11, 1980. The block covers a land area of 22,932 square kilometers (8854 sq. miles) and lies directly to the south of Block OP 198. Amoco and Kennecott subsequently agreed to cross-assign 50% interest in both blocks. Contract obligations for OP 198 require the drilling of one well to economic basement and expenditures of AU$ 0.75MM by August 20, 1984, the end of the 3rd contract year. The fourth and fifth contract years each have a well obligation (Attachment 2).

Work can be carried out in advance of an obligation and fulfill that obligation with the consent of the Northern Territory Government. Relinquishments can be made at the end of each contract year provided all prior obligations have been met, with the consent of the Minister.

The 1981 and 1982 geologic work programs covering both OP 191 and 198 included geologic mapping and a series of shallow core holes. In 1983, 409 line kilometers of seismic were acquired over the Cox River and St. Vidgeon areas in OP 198 (Attachment 3).

Gravity and magnetic data was acquired on all seismic lines.

REGIONAL GEOLOGY

The Proterozoic McArthur Basin outcrops in a northwest trending belt along the south and west coasts of the Gulf of Carpentaria. It is limited by the

Murphy Inlier to the southeast and the Pine Creek Inlier to the northwest. The northeasterly and southwesterly limits of the basin are obscured by more recent cover (Attachment 4).

The three Proterozoic rock groups recognized in the basin are, from oldest to youngest, the Tawallah, McArthur and Roper Groups (Attachment 5).

Tawallah Group sediments consist of volcanics, clastics, and a few carbonates. In general, these rocks are highly fractured. Evidence, in the form of chlorite-lined fractures, exists for local low-grade metamorphism along some faults.

The McArthur Group consists of algal dolomites, black shales and occasional sandstones and conglomerates. Development of north trending pull-apart basins by a northwest-trending right-lateral wrench system controlled deposition of McArthur Group sediments. An initial phase of downwarping resulted in the deposition of red beds, sabkhas, and shallow water carbonates (Mallapunyah through Teena Formations).

Following this, a series of high angle, north-trending normal faults formed. Relatively rapid subsidence of graben-like, pull-apart basins controlled deposition of deeper water organic-rich mudrocks such as the Barney Creek and Lower Lynott Formations. Pulses of fault movement allowed formation of thick clastic wedges adjacent to these faults. The actual mode of basin formation appears to be alternating motion on faults, and "graben" formation due to formation of two half-grabens.

For instance, within the Batten Trough, Barney Creek deposition was controlled by the Emu Fault whereas the Tawallah Fault appears to have controlled clastic influx at the time of deposition of the Lynott Formation. Northwest-trending faults also exhibit growth during this phase of sedimentation, though their cumulative effects on sedimentation, are not presently well understood.

The final phase of McArthur Group sedimentation involved deposition of shallow water sediments (Middle Lynott through Dungaminnie Formations). More quiescent conditions prevailed throughout this period; fault movement was sporadic and of lesser magnitude. Resultant deposition of shallow water carbonates (stromatolitic, intraclastic, oolitic), thin shale units, siltstone and sandstone occurred. Numerous periods of emergence are evidenced by the presence of paleokarsts within some of the carbonate units. Local uplifts resulted in deposition of the Mt. Birch Sandstone.

Downwarping to the west, coupled with clastic deposition prograding from the west, constituted Roper Group sedimentation. Deposition of thick, clean quartz sandstone and variably-organic shales occurred. Possible growth along northwest-trending faults may have taken place at this time.

Reactivation of north-trending normal faults through dextral transcurrent motion caused the formation of small en-echelon folds. These features are most common in OP 198: the St. Vidgeon anomalies are of this type. Later sinestral transcurrent motion along the northwest-trending faults appears

to have been responsible for formation of a set of en-echelon folds, larger in extent than the older and smaller features already mentioned. This is the prominent structural style in the western portion of OP 191.

Subsequent to the Proterozoic, there appears to have been little significant tectonic activity in the area, although organic geochemistry and petrographic analyses indicate that, at some stage, the Proterozoic rocks have been buried quite deeply in some areas. Flat-lying Cambrian sandstones outcrop over broad areas along the flanks of the Batten Trough. Similarly, flat-lying Mesozoic cover is also occasionally found and may represent the remnants of what was a substantial thickness of cover.

RESERVOIR PROPERTIES

Porosity, permeability and grain density measurements taken on samples collected in the 1981 and 1982 field programs indicate that, in the OP 198 area, the Abner and Bessie Creek Sandstones are anticipated to be the primary reservoirs within the Roper Group with porosity estimates of 12-15% and 10% respectively. These porosity estimates are based on analysis of coreholes 82-3 and 82-8 (Attachment 3). Some porosity enhancement due to weathering is interpreted for the Abner Sandstone. However, the degree of enhancement is difficult to determine. The Bessie Creek in corehole 82-8 flowed water and exhibited patchy porosity of up to 22%. Both units are interpreted to have been deposited in shallow, near-shore environments.

SOURCE POTENTIAL

Geochemical analyses of the 1981 and 1982 samples were used to rank source potential of the various units as follows:

Yalco Formation	Good
Barney Creek Formation	Good
Corcoran Formation	Good to Poor
Lynott	Good to Poor

The degree of thermal maturity of the various units varies across the area and is possibly related to previous burial by Cambrian and younger sediments. In the OP 198 area, the McArthur Group is less well understood than in the areas to the south because of lack of surface outcrop and subsurface coreholes. The Upper McArthur Group, where observed, is different than what has been seen in the south and the presence of Barney Creek and Lynott has not been confirmed by observation.

GEOPHYSICAL CONSIDERATIONS

In 1983 Amoco acquired a total of 409 line kilometers of Sign-bit recorded vibroseis data over the Cox River and St. Vidgeon (OP 198) areas. The objectives of the seismic survey were to map structure at depth, to confirm that surface structure persists with depth, to tie surface outcrop data into the subsurface and where possible to identify gross lithostratigraphic intervals.

The seismic data acquired was 512 channel vibroseis recorded in Sign-bit mode and was processed (128 fold) in the field. Penetration was achieved to 4 seconds (TWT) or approximately 40,000 feet. Velocities are characteristically high through the entire section probably reflecting the extreme age of the sediments.

Selected lines over the St. Vidgeon area totalling 108 line kilometers were reprocessed by Interseis in New Orleans. Seismic interpretation was carried out on unmigrated data using both the field processed and reprocessed sections.

ST. VIDGEON

The St. Vidgeon area is typified by a number of very small structures which appear to be intimately associated with north-trending faults. Some of these faults exhibit strike slip movement. The objectives of the seismic program were met with varying degrees of satisfaction. Surface structures as interpreted from air photo interpretation did not all prove to have subsurface expression and, in cases where structure was identified in the subsurface, the closure was confined to the Roper Group. The tie into the surface outcrop proved difficult as neither the Bessie Creek nor the Abner outcrop in the immediate area of the seismic survey. Regional isopach values were used to tie from the Sherwin Ironstone outcrop, which was present on a number of lines, down into the Bessie Creek and Abner. Some adjustments were necessary in order to match seismic character from the Abner pick in the Broadmere area. Assumptions were made to equate the

Sherwin/Moroak section to the Cobanbirini sand which was cored in corehole 82-1 and mapped over the Broadmere structure.

The Top McArthur Group has proven to be difficult to pick. The Roper Group is known to thicken to the north over OP 198 but the degree of this thickening has not been quantified. The difficulty is compounded by the fact that the lithology of McArthur Group in OP 198 is not well understood.

Selected lines over the St. Vidgeon prospect totally 108 kilometers were reprocessed by Interseis in New Orleans, Louisiana. These are lines 83-166, 83-172, 83-174, 83-177 and parts of lines 83-161, 83-167, 83-168, 83-169 and 83-170. Seismic interpretation was executed on unmigrated data using both reprocessed Final Stack sections and field processed sections. Reprocessed sections are noted on each enclosed map by green arrows.

Seismic interpretation was carried out on three horizons, Approximate Top Bessie Creek (Orange), Approximate Top Abner (Green) and Top or Within McArthur Group (Blue). The orange and green horizons were identified with fair reliability based on seismic character similarities in the Broadmere area and on predicted lithologic thicknesses between these horizons and the Sherwin Ironstone, which outcrops in the St. Vidgeon area. The blue horizon was unreliably identified as Top or Within McArthur Group based on character or lithologic isopaching, respectively.

Approximate Top Bessie Creek (Orange):

The orange horizon was reliably carried on a continuous high frequency moderate amplitude event. The event was mapped at the trough-to-peak

inflection above the color (Enclosures 5, 6 and 7). The time structure map (Enclosure 2) demonstrates several small closed structures related to faulting; however, the best seismically defined structure is seen on lines 83-168 and 83-177. This four-way anticlinal structure is closed over 880 acres with vertical closure of ~30 ms (~250 feet) at the orange level.

Approximate Top Abner (Green):

The green horizon was reliably picked along the upper, high-amplitude leg of a continuous, generally three-legged set of events. Field processed sections were used in conjunction with reprocessed lines to ensure reliability of picks, particularly near the ends of reprocessed lines. Structural trends and closures similar in style and size to those seen at the orange level are demonstrated by the Approximate Top Abner time structure map (Enclosure 3).

Top or Within McArthur Group (Blue):

The blue horizon was carried on a partially continuous, generally high amplitude reflector. Reliability at this horizon is fair but is considered less accurate than the orange or green level. Although structural trends similar to those detailed above are apparent from the time structure map (Enclosure 3) closed structures are not present at this level.

COX RIVER

In the Cox River area, no surface structures were recognized prior to acquisition of the 1983 seismic data. The area is covered with Cambrian

sediments and it was thought that this younger cover might obscure structures at the Proterozoic level. However, the program failed to identify significant structures at depth.

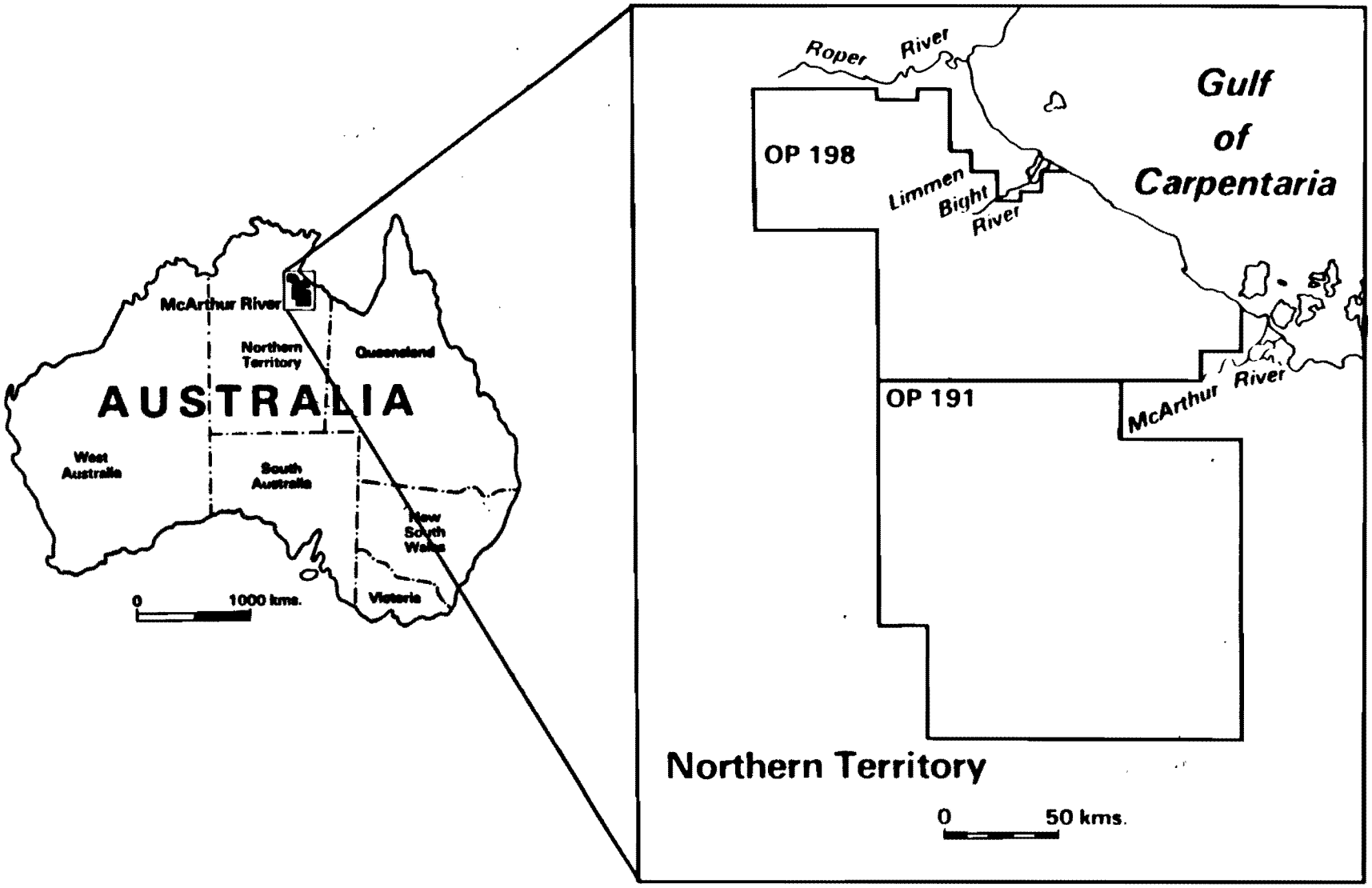
Seismic interpretation was executed on unmigrated field processed data. Two horizons were mapped within Roper Group (Green) and Approximate Top McArthur Group (Blue).

Within Roper Group (Green):

The green horizon was picked on a relatively continuous, moderate-amplitude event within a uniformly conformable sequence of events believed to represent the entire Roper Group clastic section. No drillable structures were identified within the Roper Group (Enclosure 8).

Approximate Top McArthur Group (Blue):

This horizon was carried on a generally continuous, low-frequency, high-amplitude event which represents an abrupt change in seismic character. Based on its seismic character and unconformable appearance, this event has been identified as the Approximate Top McArthur Group. No drillable structures exist at this level (Enclosure 9).



Attachment 1

SUMMARY OF OBLIGATIONS

MCARTHUR RIVER AREA

OP 198

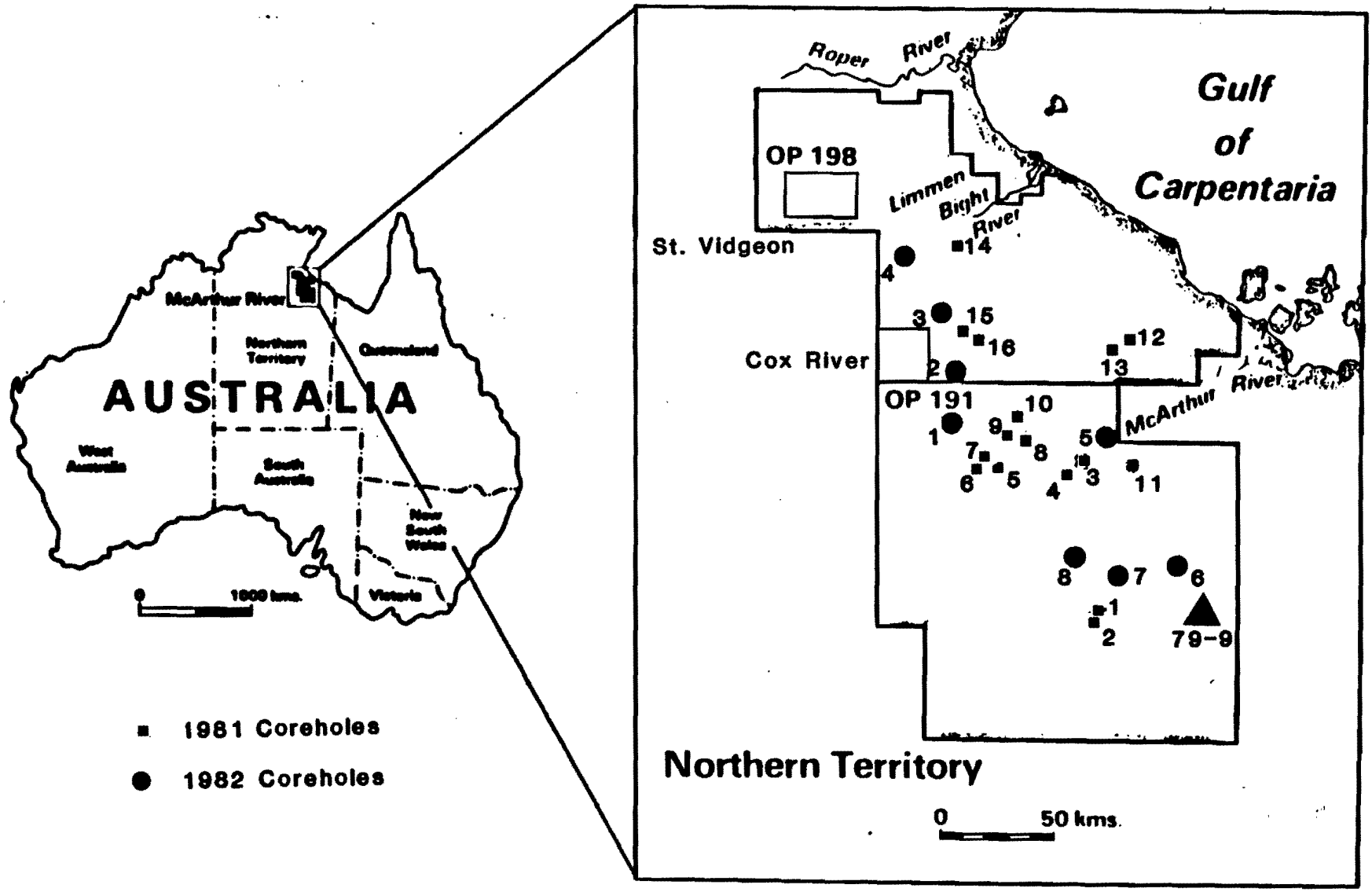
AWARDED AUGUST 21, 1981

1980-81	(yr 1) G & G AU$ 0.2 MM
1981-82	(yr 2) Regional Gravity - 320 km seismic AU$ 2.24 MM
1982-83	(yr 3) One well to economic basement AU$ 0.75 MM
1983-84	(yr 4) One well to economic basement AU$ 1.0 MM
1984-85	(yr 5) One well to economic basement AU$ 1.0 MM

End of exploration term - August 20, 1986

Attachment 2

242/N



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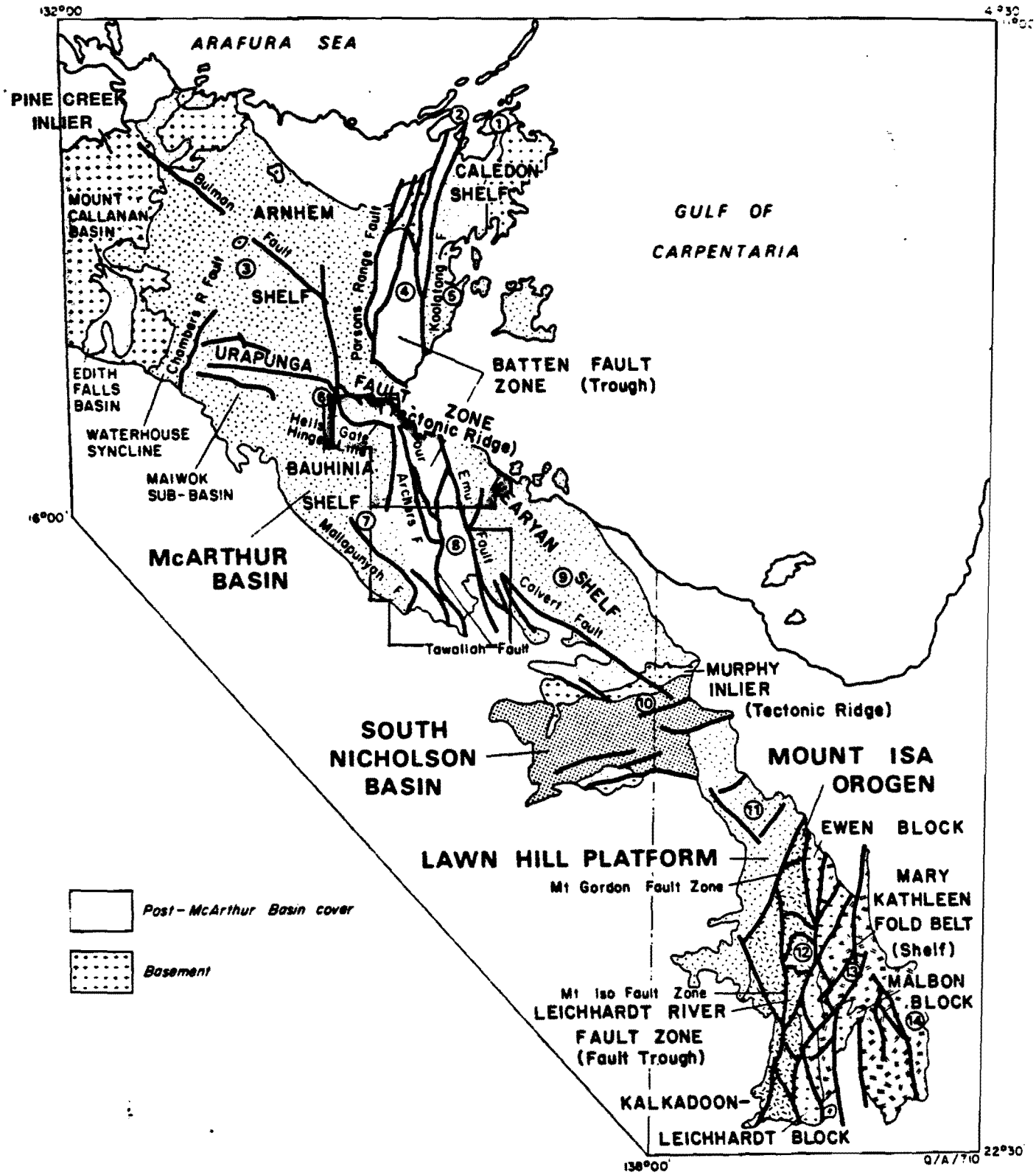
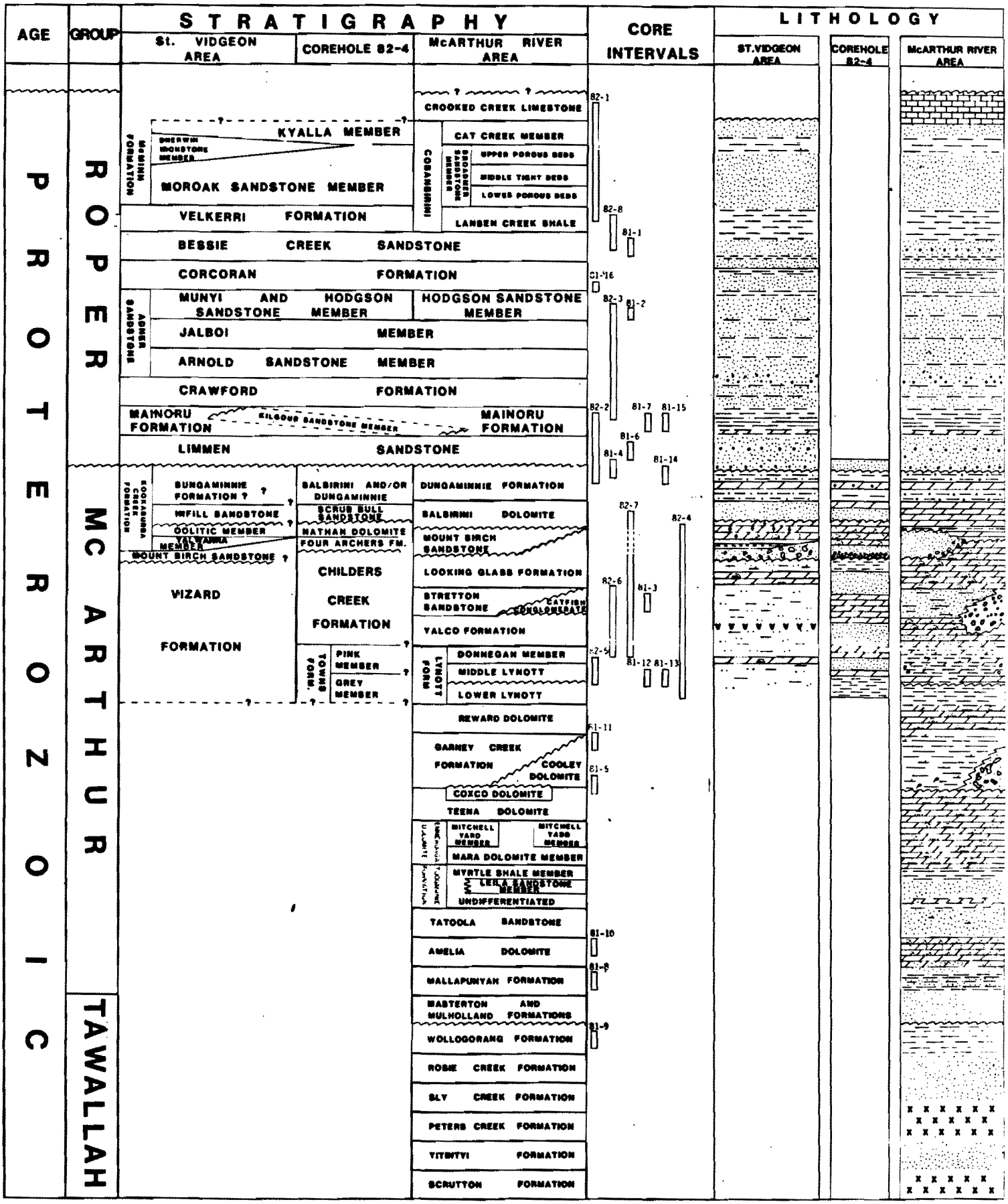


REGIONAL SETTING McARTHUR BASIN

Attachment 4



Attachment 5