

TECHNICAL REVIEWERS' RATING SUMMARY

G018-B

Determination of the Uniqueness of Reserves and Productivity from the Middle Bakken and the Three Forks Sanish Zones

Submitted by Continental Resources, Inc.

Principal Investigator: Gene Carlson

Request for \$1,395,000; Total Project Costs \$7,395,000

Rating Category	Weighting Factor	Technical Reviewer			Average Weighted Score
		18B-03	18B-04	18B-05	
Objective	9	3	4	5	36.0
Availability	9	4	2	4	30.0
Methodology	7	3	3	3	21.0
Contribution	7	3	3	5	25.7
Awareness	5	3	2	2	11.7
Background	5	5	3	4	20.0
Project Management	2	5	4	3	8.0
Equipment Purchase	2	5	5	5	10.0
Facilities	2	5	3	5	8.7
Budget	2	5	2	3	6.7
Average Weighted Score		185	149	199	177.8
Maximum Weighted Score					250

OVERALL RECOMMENDATION

FUND

FUNDING TO BE CONSIDERED

DO NOT FUND

X X X

G018-B

“Determination of the Uniqueness of Reserves and Productivity from the Middle Bakken and the Three Forks Sanish Zones”

Submitted by: Continental Resources, Inc

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1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Oil and Gas Research Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.

Reviewer 018B-03 (Rating: 3)

The proposal meets some of the goals by potentially generating information necessary to add additional investment dollars by adding bankable reserves. This affects jobs, production levels, market potential and such. It may affect the ultimate recovery from new and existing oil pools which would increase the wealth and tax revenues for the State. The possibility of splitting the single reservoir into two may also encourage production out of the current area.

Reviewer 018B-04 (Rating: 4)

The proposed project aims to conduct a study of the nature of the oil in various production zones in Mountrail County. It is suggested that the oils in the zones have different origin. Proving the assumption will allow for better estimation of the reserves and ultimately for the optimization of the production. However, no discussion of the practical outcome is given in the proposal which did not allow the project to score the highest in this category.

Reviewer 018B-05 (Rating: 5)

The objective to determine if the Middle Bakken and Three Forks production is separate meets the goals of the OGRC by looking to confirm that a new resource could be developed. A separation of the two productive intervals would create more hydrocarbon recovery potential than currently is known for a single well spacing unit. Technologies to develop the separate resources are available by optimizing drilling and completion technology. In the event the two productive intervals are proven to be in communication, industry technology development should follow to optimize completion of either a single well or two boreholes, one above the other, so that efficient recovery is optimized.

The investigation represents a direct measurement of the communication potential between the two formations. Attempts to understand fracture stimulation growth have been evaluated with tilt meters and microseismic; inferences have been made with these methods that have technical limitations. The follow up reservoir modeling will predict the resource attached to the wells.

2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.

Reviewer 018B-03 (Rating: 4)

The project will most likely answer the question for that location in the given time frame and meet the objectives. The scale of the study is of concern addressing only one or two drilling units. As seen in earlier exploration involving these formations, single wellbores may or may not cross the fractures that are totally or in part responsible for production. Wells that cross the necessary fractures may have a profound effect on wells that are a significant distance away.

Reviewer 018B-04 (Rating: 2)

The proposer plans to conduct the test using several wells, one of which will be a producer and the others will serve to monitor pressure response to the production. However, interpretation of pressure response is a common problem of reservoir engineering and its analysis can provide non-unique solutions. Moreover proving the lack of communication between the zones does not provide the firm understanding of oil generation and transport mechanism.

Reviewer 018B-05 (Rating: 4)

The project involves industry standard drilling and completion practices utilized in the North Dakota Bakken and Three Forks plays. Delays may occur due to tool failure of pressure bombs with a slight risk of the pressure bombs not recording data during the fracture stimulation and monitoring stage if surface readout of the pressure data is not incorporated in the data gathering plan. Data capture from the stimulation tracer program by running logs in the horizontal also has an element of risk. Logging tools can be stopped from tripping into the hole by fill or ledges in the wellbore. Conveying the logging tools into the hole on tubing as opposed to coil reduces the risk of not acquiring data necessary to determine where the fracture stimulation affected the reservoir.

Phase II of the project, reservoir modeling, should be successful assuming that the data quality from Phase I is capable to recognized differences in the pressure changes between the wells.

3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.

Reviewer 018B-03 (Rating: 3)

The methodology is acceptable as present.

Also, the answer to this question is in part answered by Question 2, the study is dealing with a limited area. To truly test this hypothesis, the model would have to include the geology and production from other wells for the area. Additionally, it would be interesting to see whether the drilling and completion of the Mathistad well has affected other Bakken/Three Forks wells in the area, either by a decline in pressure, production or both. Interference is known to occur between horizontal wells within this play.

Reviewer 018B-04 (Rating: 3)

The non-uniqueness of the interpretation of pressure response has been mentioned above. It could be suggested that geochemical study could provide more rigorous results.

Reviewer 018B-05 (Rating: 3)

The methodology is clear and not complicated. Success is dependent on the operator successfully implementing the drilling, completion and pressure monitoring activities. The methodology used for Phase II is not described, but standard reservoir engineering practices can be employed to resolve the answers from the data. Gathering quality production data in Phase I to monitor well performance is necessary.

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Oil and Gas Research Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.

Reviewer 018B-03 (Rating: 3)

The scientific contribution of this project is significant addressing the reserve question. Are the technically recoverable reserve estimates that the USGS has given realistic for the Bakken/Three Forks reservoir or are they low based on the incorrect assumption that the oil is held in a single reservoir? The project may partially answer this question. The project will also place good data into the public domain with no period of confidentiality.

Additional questions that need to be asked concern the optimum length and orientation of the wellbore, stratigraphic placement of the wellbore(s), and actual drainage area.

Reviewer 018B-04 (Rating: 3)

If the assumption regarding the sources of oils is proven to be true, knowledge gained in the proposed study can potentially serve for increasing oil production in ND and bring new investors and producers to the state.

Reviewer 018B-05 (Rating: 5)

A successful project will begin to answer one of the significant questions facing the Bakken/Three Forks play. Understanding if the two formations are communicated prior to stimulation, after stimulation, through time of the completions or any combination of the possibilities plays directly into determining the resources available for production and the methods necessary to exploit the resources. Bakken and Three Forks development and completion methods continue to evolve. The impact on development affects if wells have a lateral in the Bakken and one in the Three Forks. The type of stimulations that are pumped affect vertical/horizontal drainage of wells.

5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 018B-03 (Rating: 3)

There are limited citations to the literature in the proposal. The principal investigator is aware of the USGS Bakken assessment and appears to pay attention to current drilling activity reported in the news media.

There is additional literature available on the subject.

Reviewer 018B-04 (Rating: 2)

The principal investigator seems to have extensive expertise pertaining to the proposed study. However, it will be more convincing if the proposer would discuss the alternative techniques (e.g. geochemical analysis) and why the techniques are not suggested for the study.

Reviewer 018B-05 (Rating: 2)

No references are made regarding applicable research. Research in the Bakken / Three Forks is limited because of the immature nature of the play. Application of this type of investigation perhaps exists in other basins or by inference to other similar applications where closely vertical spaced horizons are developed like water injection or steam flood. The investigator has significant experience and his company has longstanding operations both in the Williston Basin and elsewhere which would contribute to a successful project implementation and technical

evaluation. Again, the methods are standard industry practices; the concept of communication between the two formations is worthy of investigation with these methods.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 018B-03 (Rating: 5)

The credentials of the investigator appear to be exceptional. There appears that necessary personnel are available to perform the project tasks.

Reviewer 018B-04 (Rating: 3)

The project task force consists of CRI geologists, engineers and field personnel. It is not specified what the specializations of the engineers are. However, it can be suggested that CRI personnel is adequately trained for conducting the proposed study.

Reviewer 018B-05 (Rating: 4)

Continental Resources operates oil and gas properties in a number of locations including the Williston Basin. The company has personnel who are trained in implementing this project and creating reliable interpretations from the data. In the event the expertise does not exist within Continental Resources, the company has the resources to employ resources to assist to create a successful project.

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 018B-03 (Rating: 5)

The project plan involves routine drilling and completions so there would be no expectations missing deadlines, etc.

Reviewer 018B-04 (Rating: 4)

The division of the work plan into subtask and timeline for their execution looks reasonable.

Reviewer 018B-05 (Rating: 3)

The project will have some changes given the nature of well work, availability of contractors, reliability of tools and the uncertainty associated with how the wells behave after production begins; however, meeting the end date of the project time table should not be difficult. Continental Resources performs this work on a regular basis.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 018B-03 (Rating: 5)

No comment.

Reviewer 018B-04 (Rating: 5)

No equipment will be purchased.

Reviewer 018B-05 (Rating: 5)

Not applicable.

9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 018B-03 (Rating: 5)

All the equipment is readily available and should allow for the proposed research project to follow the timetable presented.

Reviewer 018B-04 (Rating: 3)

No description of the equipment is provided in the proposal. It can be suggested that the infrastructure and the equipment satisfy the existing oil and gas field standards.

Reviewer 018B-05 (Rating: 5)

Not applicable.

10. The proposed budget “value”¹ relative to the outlined work and the financial commitment from other sources is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 018B-03 (Rating: 5)

The financial commitment is significant with a seventh of the cost of the total budget requested.

Reviewer 018B-04 (Rating: 2)

The proposer requests \$1,395M in OGRC funds. The proposer will contribute \$6,000M. However, proposer’s money will be spent purely on the drilling and completion of a well which eventually will become a producer. It looks like the proposed well will be drilled anyway. If this is the case then the proposed project will be essentially funded purely from the OGRC funds. It also can be suggested that geochemical studies of oil composition can be very beneficial to achieve the objectives of the proposed study. If this is the case the desirable results can be obtained with lower expenditures.

Reviewer 018B-05 (Rating: 3)

The requested funds for the project are heavily weighted by delayed production costs. Certainly this is a cost of getting the work done; however, the value assigned to this delay looks abnormally high, more like a lost production value. Re-allocating some of these funds to acquire more technical data, improve reliability of the data or reducing the requested funds is suggested.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 018B-03 (Funding May Be Considered)

The proposal intends to address the issue of whether or not the Bakken/Three Forks formations are a single continuous reservoir or separate reservoirs. If the test is successful, it would improve the bottom line of Continental Resources by increasing bankable reserves. The State would potentially benefit by increased drilling, jobs, reserves and tax revenue.

The project may add information as to whether the horizontal leg(s) should be placed in drilling these formations. It may add information about the effective drainage area. It will add additional

data to the understanding of the reservoir and may be important data for secondary or tertiary recovery.

The flaws in the project start with the limited amount of literature that has been incorporated into the planning. Since the reservoirs produce similar fluids, as stated in the proposal, it still strongly suggests a connection of some sort at some time. This connection may or may not be currently open. Information obtained by the test may not hold true elsewhere.

The most important problem with the project is the limited scale. Locally, the reservoir may be very compartmentalized. This has been seen in other areas where wells in these formations have encountered virgin reservoir pressures in well developed areas indicating a heterogeneous reservoir. It would be incorrect to state that this conclusively answers the question.

The proposal has also not addressed the affect, if any, that the Mathistad has had on any adjacent wells in the area. There is also no indication as to whether or not the geology has been taken into account in this model.

The other advantages to this proposal are small. The project would place good reservoir data into the public domain. Also, a large portion of the cost of this project is provided by the companies.

Based on the information above it is suggested that the project be only partially funded.

Reviewer 018B-04 (Funding May Be Considered)

I would suggest forwarding the proposal to a petroleum geochemist to define whether the objectives of the project are achievable with geochemical methods and whether geochemical study (if feasible) will decrease costs of the project. I would recommend consulting with Dr. Julie LeFever.

Reviewer 018B-05 (Funding May Be Considered)

The project is significant for the oil system that is connected to the Bakken shale source rocks. Understanding if the Bakken and Three Forks are individual pools or if they are connected is important. Field developments, stimulation plans, facility infrastructure all are influenced by an understanding of the conditions that this project is investigating. Regardless of the outcome, the understanding should result in changes for the industry and more overall production and jobs. Operational difficulties may occur, but the likelihood of success is high. The project should be considered for funding; however, the cost structure might need a review per item #10.