Citation: Landmark Graphics Corporation (Re), 2021 CACP 31
Commissioner's Decision #1584
Décision du commissaire n^{o} 1584
Date: 2021-06-09

TOPIC:	J00	Meaning of Art
	J10	Computer Programs
SUJET:	J00	Signification de la technique
	J10	Programmes d'ordinateur

Application No. : 2,879,063
Demande n^{o} 2 879 063

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,879,063, having been rejected under subsection 30(3) of the *Patent Rules* (SOR/96-423) as they read immediately before October 30, 2019 ("*former Rules*") has consequently been reviewed in accordance with paragraph 199(3)(c) of the *Patent Rules* (SOR/2019-251) ("*Patent Rules*"). The recommendation of the Board and the decision of the Commissioner are to refuse the application.

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INTRODUCTION

[1] This recommendation concerns the review of rejected Canadian patent application number 2,879,063 ("the instant application"), which is entitled "SYSTEMS AND METHODS FOR ESTIMATING OPPORTUNITY IN A RESERVOIR SYSTEM" and is owned by LANDMARK GRAPHICS CORPORATION ("the Applicant"). A review of the rejected application has been conducted by the Patent Appeal Board ("the Board") pursuant to paragraph 199(3)(c) of the *Patent Rules*. As explained in more detail below, the recommendation of the Board is that the Commissioner of Patents refuse the application.

BACKGROUND

The Application

[2] The instant application was filed under the *Patent Cooperation Treaty* and has an effective filing date in Canada of July 27, 2012. It was laid open to public inspection on January 30, 2014.

[3] The instant application relates to estimating the oil and gas reserves (i.e., opportunity) in a reservoir system and improving upon the method of providing such estimates. In assessing the potential hydrocarbon opportunity in a development field, risk and uncertainty are analyzed, since the actual characteristics of the geological formation being investigated are unknown. Probabilistic simulation methods are used to capture the uncertainty in the formation modelling process. Typically, standard risk analysis critical probability values (P10, P50 and P90) are used to estimate an objective variable such as the primary reserves. However, the choice of these standard critical probability values is arbitrary and does not take into account the influence of intrinsic reservoir parameters such as the formation area, reservoir thickness and porosity. The instant application uses a tornado chart to assess the impact of the reservoir intrinsic parameters to identify the parameter determined to have the greatest impact, this parameter then being used to determine the critical risk (value of the objective variable below which the risk associated with all intrinsic parameters is null or negligible) and critical opportunity (value of the objective variable above which the opportunity associated with all intrinsic parameters is null or negligible). These values are then used to determine reservoir opportunity over the short term, mid term and long term, the results being prioritized and illustrated by means of a geographic map using a greyscale priority code.

Prosecution History

[4] On December 15, 2017, a Final Action ("FA") was written pursuant to subsection 30(4) of the *former Rules*. The FA stated that the instant application was defective on the ground that all of the claims 1-16 on file at the time of the FA ("claims on file") were directed to non-patentable subject-matter and did not comply with section 2 of the *Patent Act*. The FA also stated that the claims on file were indefinite and are therefore non-compliant with subsection 27(4) of the *Patent Act*.

[5] In a June 12, 2018 response to the FA ("R-FA"), the Applicant proposed amendments to independent claims 1 and 9 to clarify the subject-matter claimed. The Applicant also provided arguments in favour of the patentability of the claims on file under section 2 of the *Patent Act*.

[6] As the Examiner considered the application not to comply with the *Patent Act*, pursuant to paragraph 30(6)(c) of the *former Rules*, the application was forwarded to the Board for review on October 2, 2018 along with an explanation outlined in a Summary of Reasons ("SOR"). The SOR set out the position that the claims on file were still considered to be defective as being directed to non-patentable subject-matter and as being indefinite. The SOR also indicated that the proposed amendments to independent claims 1 and 9 would not overcome the non-patentable subject-matter and indefiniteness defects.

[7] In a letter dated October 5, 2018, the Board forwarded to the Applicant a copy of the SOR and requested that the Applicant confirm its continued interest in having the application reviewed.

[8] In a response dated January 7, 2019, the Applicant confirmed its interest in having the application reviewed.

[9] The present panel ("the Panel") was formed to review the instant application under paragraph 199(3)(c) of the *Patent Rules*.

[10] In a preliminary review letter ("PR letter") dated June 19, 2020, the Panel set out its preliminary analysis of the patentable statutory subject-matter and indefiniteness issues with respect to the claims on file and the proposed claims. The Panel was of the preliminary view that the claims on file and the proposed claims were directed to non-patentable subject-matter. However, the Panel was of the preliminary view that the claims

were not indefinite. The Panel also provided the Applicant with an opportunity to make oral and/or written submissions.

[11] In a response to the PR letter dated August 31, 2020, the Applicant resubmitted the proposed claim amendments included with the R-FA ("proposed claims") and provided further arguments in favour of both the claims on file and the proposed claims.

[12] An oral hearing ("first oral hearing") was held on September 10, 2020, at which time the Applicant referred to the Federal Court Decision in *Choueifaty v Canada (AG)* 2020 FC 837 [*Choueifaty*] and its effect on the purposive construction analysis set out in both the FA and PR letter.

[13] Following the publication of the Patent Office patent notice in respect of patentable subject-matter, "Patentable Subject-Matter under the *Patent Act*" (CIPO, November 2020) [*PN2020–04*], the review of the instant application was undertaken anew.

[14] In a Supplemental Preliminary Review letter ("S-PR letter") dated February 10, 2021, the Panel set out a revised preliminary analysis of claim construction and patentable subject-matter, taking into account the revised guidance of *PN2020-04*. The Panel was of the preliminary view that the claims on file were directed to non-patentable subject-matter and that the proposed claims would not overcome this defect. The Panel was of the preliminary view that the claims were not indefinite. The Panel again provided the Applicant with an opportunity to make oral and/or written submissions.

[15] In an email dated April 8, 2021, the Applicant confirmed that no additional written submissions would be filed.

[16] A second oral hearing was held on April 22, 2021.

[17] The Panel has reviewed the instant application in accordance with paragraph 199(3)(c) of the *Patent Rules* and provides its analysis below.

ISSUE

[18] The issues to be addressed by the present review are:

- whether claims 1-16 on file are directed to patentable subject-matter; and

- whether claims 1-16 on file are indefinite.

[19] If the claims on file are considered to be defective, we may turn to the proposed claims and consider whether they constitute amendments necessary for compliance with the *Patent Act* and *Patent Rules*, pursuant to subsection 86(11) of the *Patent Rules*.

LEGAL PRINCIPLES AND OFFICE PRACTICE

Purposive Construction

[20] In accordance with *Free World Trust v Électro Santé Inc*, 2000 SCC 66 and *Whirlpool Corp v Camco Inc*, 2000 SCC 67, purposive construction is performed from the point of view of the person skilled in the art in light of the relevant common general knowledge (CGK), considering the whole of the disclosure including the specification and drawings. In addition to interpreting the meaning of the terms of a claim, purposive construction distinguishes the essential elements of the claim from the non-essential elements. Whether or not an element is essential depends on the intent expressed in or inferred from the claim, and on whether it would have been obvious to the skilled person that a variant has a material effect upon the way the invention works.

[21] "Patentable Subject-Matter under the *Patent Act*" (CIPO, November 2020) [*PN2020–04*] also discusses the application of these principles, pointing out that all elements set out in a claim are presumed essential unless it is established otherwise or such presumption is contrary to the claim language.

Patentable Subject-Matter

[22] The definition of invention is set out in section 2 of the *Patent Act*:

> "***invention***" means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

[23] Subsection 27(8) of the *Patent Act* also prescribes that:

> No patent shall be granted for any mere scientific principle or abstract theorem.

[24] *PN2020–04* describes the Patent Office's approach to determining if a claim is patentable subject-matter:

> To be both patentable subject-matter and not be prohibited under subsection 27(8) of the *Patent Act*, the subject-matter defined by a claim must be limited to or narrower than an actual invention that either has physical existence or manifests a discernible physical effect or change and that relates to the manual or productive arts, meaning those arts involving or concerned with applied and industrial sciences as distinguished in particular from the fine arts or works of art that are inventive only in an artistic or aesthetic sense.

[25] *PN2020–04* further describes the Patent Office's approach to determining if a computer-related invention is patentable subject-matter. For example, the mere fact that a computer is among the essential elements of the claimed invention does not necessarily mean that the claimed invention is patentable subject-matter. An algorithm itself is abstract and unpatentable subject-matter. A computer programmed to merely process the algorithm in a well-known manner without solving any problem in the functioning of the computer will not make it patentable subject-matter because the computer and the algorithm do not form part of a single actual invention that solves a problem related to the manual or productive arts. On the other hand, if processing the algorithm improves the functionality of the computer, then the computer and the algorithm would together form a single actual invention that solves a problem related to the manual or productive arts and the subject-matter defined by the claim would be patentable.

Indefiniteness

[26] Subsection 27(4) of the *Patent Act* requires claims to distinctly and explicitly define subject-matter:

> The specification must end with a claim or claims defining distinctly and in explicit terms the subject-matter of the invention for which an exclusive privilege or property is claimed.

[27] In *Minerals Separation North American Corp v Noranda Mines Ltd*, [1947] Ex CR 306, 12 CPR 99 at 146, the Court emphasized both the obligation of an Applicant to make clear in the claims the ambit of the monopoly sought and the requirement that the terms used in the claims be clear and precise:

> By his claims the inventor puts fences around the fields of his monopoly and warns the public against trespassing on his property. His fences must be clearly placed in order to give the necessary warning and he must not fence in any property that is not his own. The terms of a claim must be free from avoidable ambiguity or obscurity and must not be flexible; they must be clear and precise so that the public will be able to know not only where it must not trespass but also where it may safely go.

ANALYSIS

Claim Construction

The person skilled in the art

[28] In the S-PR at page 5, we restated the characterization of the person skilled in the art that was set out in the PR letter:

> a team comprised of persons skilled in the art of hydrocarbon reservoir modelling techniques, as well as the programming and use of general purpose computers.

[29] The Applicant has not disputed the above characterization and we adopt it for the purpose of this review.

The relevant common general knowledge

[30] In the S-PR letter at page 5, we reiterated the points of CGK that were set out in the PR letter and noted that the Applicant had not disputed any of those points in the R-PR or at the first oral hearing:

> In the first PR letter at page 5, we set out our preliminary view with respect to the relevant CGK of the person skilled in the art. The CGK included points taken from the FA and points set out by the Panel in consideration of information in the BACKGROUND OF THE INVENTION section of the instant application and information taken from the DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS (where such points are described as well-known in the art). Considering the full list, we were of the preliminary opinion that the relevant CGK would have included:
>
> - estimating opportunities in reservoir systems (page 1, "Background of the Invention"), which are typically performed by computers; and
> - general purpose computer hardware and general purpose computer programming techniques. Given the level of detail in the specification, it is presumed that the implementation of the claimed features falls within the common general knowledge in the art;
> - modern geostatistical practices rely on uncertainty analysis to assess statistical variance (spread) of measured data and prepare the input models for subsequent risk management workflows (para 0004]);
> - the simulation methods usually involve the generation of many equally probable scenarios and realizations of reservoir system properties that best mimic the reservoir system heterogeneity (para [0004]);
> - conditional simulation techniques are used to constrain reservoir system property models with variables such as, for example, acoustic impedance (AI) from the inversion of seismic data, which produces a more accurate representation of the opportunity distribution and a more representative and unbiased statistical sampling (para [0004]);

- in standard risk and uncertainty analysis (used to assess and estimate potential hydrocarbon opportunity) critical probability values Pl0, P50 and P90 are used to estimate objective variables such as, for example, primary reserves ("Prim. Res.") and original oil in place ("OOIP") (para [0005]);
- the use of P10 and P90 values is arbitrary and tends to overestimate or underestimate risk and opportunity, as well as failing to consider the influence of intrinsic parameters such as area, reservoir thickness, formation volume factor, porosity, net-to-gross reservoir thickness and recovery factors on the opportunity (para [0005]);
- statistical modelling techniques such as Gaussian modelling or other statistical distribution models used to represent uncertainties of input parameters (para [0025]);
- well-known stochastic modelling techniques (para [0026]);
- well-known simulation techniques such as Monte Carlo simulations (para [0027]);
- well-known mapping techniques to represent the results of geographic modelling simulations using grey scale priority codes for each reservoir system (para [0033]);
- well-known methods of creating tornado charts (para [0035]); and
- well-known computer hardware and software, such as that set out in paras [0037] to [0045]

None of the above was disputed by the Applicant in the R-PR or at the oral hearing. We therefore adopt these points of CGK for our analysis below.

[31] While there were no written submissions in response to the S-PR letter, the Applicant did dispute for the first time, during the second oral hearing, one of the above points of CGK, namely contending that:

- It was not well-known to map the results of geographic modelling simulations of reservoir systems using grey-scale priority codes.

[32] When the Panel originally identified this point as having been part of the relevant CGK, in the PR letter, we pointed to paragraph [0033] of the instant application, which states that after reservoir system fields are prioritized based on the calculated critical risk and a corresponding priority code:

> In step 122, each reservoir system is mapped in a geographic map using its corresponding priority code and techniques well-known in the art.

[33] In our view, the characterization of mapping the modelling results using the "corresponding priority code and techniques well-known in the art" strongly suggests that such mapping was part of the relevant CGK.

[34] In support of the position that mapping reservoir opportunity using grey-scale priority codes was not well-known, at the second oral hearing the Applicant pointed to its

submissions in the R-PR and the arguments therein that the Applicant had developed a unique graphical user interface ("GUI") that provided for the grey-scale priority code mapping. At page 8 of the R-PR, it is stated that:

> the advantages afforded by the instant application cannot be obtained without those improved estimations being output to a user in some way. The Applicant appreciated this fact and consequently developed a unique graphical user interface (GUI) that operates in conjunction with the improved estimation method described in the instant application. The GUI presents the information to a well operator in a meaningful way so that the well operator can easily understand the information and take action on it, so as to benefit from the improved estimations. In particular, the GUI includes "a representation of the opportunity in the reservoir system" that is determined by "mapping the reservoir system using a grayscale priority code corresponding to the critical risk of the objective variable", as recited in claim 1. [Emphasis added]

[35] However, in our view, the position in the R-PR and at the second oral hearing that the Applicant developed a unique GUI to provide for the grey-scale mapping using assigned priority codes, is not consistent with the description of the interface in the instant application that may be used to output the result of the improved reservoir opportunity estimation algorithm.

[36] When describing the systems and software that may be used to implement the invention of the instant application, at paragraph [0040], it is stated that:

> The memory also includes DecisionSpace® Desktop Earth Modeling, which may be used as an interface application to supply input data to the opportunity estimation module and/or display the data results from the opportunity estimation module. Although DecisionSpace® Desktop Earth Modeling. may be used as an interface application, other interface applications may be used, instead, or the opportunity estimation module may be used as a stand-alone application. [Emphasis added]

[37] The Applicant's position that grey-scale mapping of reservoir opportunity based on assigned priority codes is not well-known is based on the premise that the Applicant developed a unique GUI that provided for such functionality. However, as stated in paragraph [0040], set out above, the invention contemplates the use of commercially available software to provide a suitable GUI that will output and display the results from the opportunity estimation algorithm. This does not suggest the development of any kind of unique GUI to provide for the grey-scale mapping of the estimated reservoir opportunity using assigned priority codes.

[38] Having considered the Applicant's submissions in the R-PR and at the second oral hearing,

as well as the content of the instant application itself, it is our view that mapping techniques to represent the results of geographic modelling simulations using grey scale priority codes for reservoir systems was in fact part of the relevant CGK.

Claim terms…measuring critical risk and critical opportunity

[39] In both the PR letter and the S-PR letter, we set out our construction of the claim term "measuring", which the Applicant did not dispute in the R-PR, at the first oral hearing or at the second oral hearing:

> As noted in the FA at page 3, the Applicant contended in response to the previous office action that the claims related to real-life measurements using technical data, that the step of "measuring initial risk and critical opportunity of an objective variable" are to be considered technical and that the invention relates to a technical classification of a reservoir using measured technical data.
>
> In our preliminary view, while the claims use the word "measuring", there is no actual measuring performed. This step is directed to a series of calculations, as is evident from the claimed subject-matter itself, and not to any physical measuring step.

[40] We therefore adopt the above construction for the purpose of our analysis.

The essential elements of the claims

[41] The instant application includes independent claims 1 and 9, claim 1 being directed to a method of determining opportunity in a reservoir system and claim 9 being directed to a non-transitory program carrier device carrying executable instructions for carrying out method steps equivalent to those of claim 1. Dependent claims 2-8 and 10-16 relate to refinements of the parameters of the method steps and refinements of the method of analysis itself. As we did in the first PR letter and the S-PR letter, we take claim 1 as the representative independent claim:

> 1. A method for determining opportunity in a reservoir system, which comprises using a computer system for:
>
> building a tornado chart using all intrinsic parameters used to calculate an objective variable for the reservoir system, a value for risk and a value for opportunity;
>
> measuring critical risk and critical opportunity of the objective variable using one of the intrinsic parameters from the tornado chart that has a greatest impact on the objective variable, wherein risk is represented by:
>
> Critical_ Risk= Correl [Obj.Var.;Intrins.Param.Major _ Impact]$_{IntrinsParam.@P1}$ where Critical_ Risk is the risk, Correl is a correlation function, Obj. Var is the objective variable, Intrins.Param.Major_Impact is the intrinsic parameter from the tornado chart that had the

greatest impact on the objective variable, and Intrins.Param.@Pl is the intrinsic parameter at a first probability value, and opportunity is represented by:
Critical_ Opport= Correl [Obj.Var.;lntrins.Param.Major _ Impact]$_{IntrinsParam.@P99}$ where Critical_ Opport is the opportunity, Correl is a correlation function, Obj.Var is the objective variable, Intrins.Param.Major_Impact is the intrinsic parameter from the tornado chart that had the greatest impact on the objective variable, and Intrins.Param.@P99 is the intrinsic parameter at a ninety-ninth probability value;

estimating the opportunity in the reservoir system for the objective variable over different time horizons using the critical risk and the critical opportunity; and

providing a representation of the opportunity in the reservoir system by mapping the reservoir system using a greyscale priority code corresponding to the critical risk of the objective variable.

[42] In the S-PR letter at page 8, we noted that the previous determination of the essential elements of the claims as set out in the PR letter had been superseded by the guidance provided in *PN2020-04* and we provided an updated determination:

> In the first PR letter, the Panel presented a preliminary analysis of the essential features of the claims on file in accordance with the approach set out in the *Manual of Patent Office Practice*, revised June 2015 (CIPO) at §12.02. We note that the Applicant has previously provided arguments in the R-FA, R-PR and at the oral hearing against the use of such an approach, both in general and in the specific circumstances of this case, the Applicant having specifically pointed to *Choueifaty* in the R-PR and at the oral hearing. As this approach has now been superseded by *PN2020-04*, we undertake anew the identification of the essential elements of the claims on file.
>
> As set out above, *PN2020-04* states in respect of the identification of essential/non-essential elements that:
>
> > In carrying out this identification of essential and non-essential elements, all elements set out in a claim are presumed essential, unless it is established otherwise or is contrary to the language used in the claim.
>
> With respect to the claims on file, the person skilled in the art would understand that there is no use of language in any of the claims indicating that any of the elements in each claim are optional, a preferred embodiment or one of a list of alternatives.
>
> Therefore, in our preliminary view, all the elements of the claims on file are considered to be essential, including the computer implementation and computer-related components.

[43] The Applicant did not dispute the above preliminary view. We proceed on the basis that all the elements of the claims on file are essential.

Patentable Subject-Matter

[44] In the S-PR letter at pages 8-10, we set out our preliminary view that in light of the updated

guidance provided in *PN2020-04*, the claims on file are not directed to patentable subject-matter:

> Starting with representative independent claim 1, in our view, the subject-matter of the claim wholly relates to the processing of an algorithm for improving the accuracy of reservoir opportunity estimates by means of a generic computer.
>
> In particular, there are no input or output steps set out in claim 1 other than generic well-known input/output steps. Claim 1 specifies the initial building of a tornado chart based on data previously stored in the computer system, presumably by means of a generic input device. Once the estimate of opportunity in a reservoir system is produced by means of the claimed estimate algorithm, the output is presented in the form of a map display that uses a greyscale priority code corresponding to the critical risk of an objective variable. As set out above in relation to the relevant CGK, mapping techniques to represent the results of geographic modelling simulations using grey scale priority codes for reservoir systems were well-known methods of presenting the results of reservoir system modelling and therefore would have formed part of a generic computer used in this context.
>
> In accordance with *PN2020-04* and the illustrative examples attached to it, the question then becomes whether or not the computer forms part of the actual invention, the actual invention being the subject-matter against which patentable subject-matter is determined.
>
> In the present case there is no suggestion that the algorithm effects any improvement to the functioning of the computer. Nothing in the claims or the rest of the specification suggests that the running of the claimed algorithm on the computer reduces the resources used in the computer processing in comparison with any previously well-known estimation methods. Rather the use of the claimed algorithm is directed at the issue disclosed in the instant application at pages 1-2, namely the improvement of the accuracy of reservoir opportunity estimates by taking into account intrinsic reservoir parameters:
>
> > that the current risk and uncertainty analysis choose arbitrary critical probability values and in general overestimates o[r] underestimates the risk and the opportunity, and does not consider the range of influence of related intrinsic parameters.
>
> Although stated in response to the previous analysis set out in the first PR letter, the Applicant's statement at page 6 of the R-PR confirms that the purpose of the disclosed and claimed algorithm is to improve the accuracy of the estimates, not to improve the efficiency of their production:
>
> > Accordingly, the problem with existing computer-implemented systems and methods for determining an opportunity in a reservoir system is that these systems and methods fail to accurately represent the opportunity of the reservoir system.
>
> As such, in our preliminary view, the computer is merely used in a well-known manner and the computer and algorithm do not form a single actual invention.

> The instant application is focussed on the algorithm and the improvement in accuracy of reservoir opportunity estimates that it provides. The specification does not provide any detail as to how the steps of the improved algorithm would be implemented on a computer system, which might include some information as to whether the running of the algorithm on a computer system addressed a problem in the functioning of the computer system. Further, the computer-related elements disclosed and claimed are generic and well-known in nature, as described at paragraphs [0037] to [0045] of the instant application.
>
> Given the focus of the description and claims on the improved algorithm, it is our preliminary view that the actual invention is the improved algorithm and its method of analysis. As the algorithm represents a series of abstract data manipulations and mathematical calculations, it is our preliminary view that the actual invention of claim 1 on file is directed to subject-matter that is not "something with physical existence, or something that manifests a discernable effect or change" (*Canada (Attorney General) v Amazon.com Inc*, 2011 FCA 328 [*Amazon*] at paragraph 66).
>
> We further note that the invention in *Schlumberger Canada Ltd v Commissioner of Patents* (1981), 56 CPR (2d) 204 (FCA), referred to in *Amazon*, and the actual invention of claim 1 on file, are very similar. In both cases, a computer may be used to perform the calculations that make up the methods. Both cases relate to the analysis of inputs through various calculations. The claims in *Schlumberger* were not saved through their implementation on a computer to give the algorithm a practical application (*Amazon* at paragraph 69), analogous to claim 1 in this case.
>
> With respect to the other claims on file, dependent claims 2-8 specify further details of the analysis that make up the claimed algorithm and therefore, while part of the actual invention, would not alter the preliminary view that the actual invention is not directed to patentable subject-matter.
>
> Independent claim 9 on file, being directed to a generic means of inputting instructions to a computer, comprises the same actual invention as independent claim 1 and is therefore also not directed to patentable subject-matter.
>
> Dependent claims 10-16, like dependent claims 2-8, specify further details of the analysis method and while part of the actual invention, would also not alter the preliminary view that the actual invention is not directed to patentable subject-matter.
>
> In light of the above, as the actual inventions of claims 1-16 on file are directed to a series of abstract data manipulations and mathematical calculations, claims 1-16 are directed to non-patentable subject-matter and are therefore non-compliant with section 2 of the *Patent Act*. Given the abstract nature of the actual inventions of these claims, they are also prohibited under subsection 27(8) of the *Patent Act*.

[45] At the second oral hearing the Applicant contended that the computer was not operating in a well-known manner, that the output step in claim 1 of "providing a representation of the opportunity in the reservoir system by mapping the reservoir system using a greyscale priority code corresponding to the critical risk of the objective variable" was not generic or well-known. This point was linked to the position that outputting a map to represent the

results of geographic modelling simulations using grey-scale priority codes was not well-known prior to the instant application and therefore not part of the relevant CGK.

[46] As we have addressed the Applicant's position in this respect above and concluded that such mapping using priority codes was, in our view, part of the relevant CGK of the person skilled in the art, we conclude that the computer components of the claims on file are used in a well-known manner and that the input/output steps are generic input/output steps. As such, the computer components and reservoir opportunity estimation algorithm do not form a single actual invention.

[47] At the second oral hearing, the Applicant also contended that the subject-matter of the claims on file is directed to a combination of elements that cooperate to produce a better estimate of reservoir opportunity. The Applicant contended that the algorithm was "not the whole invention but only one of a number of essential elements in a novel combination" (*Amazon* at paragraph 63).

[48] In accordance with the guidance on assessing patentable subject-matter set out in *PN2020-04*, we have considered the nature of the actual invention and whether the reservoir opportunity estimation algorithm combines with the computer components to form a single actual invention.

[49] As was stated in the S-PR letter, the focus of the instant application is on the algorithm and the improvement in accuracy of reservoir opportunity estimates that it provides.

[50] In the R-PR at page 6, the Applicant stated that:

> Accordingly, the problem with existing computer-implemented systems and methods for determining an opportunity in a reservoir system is that these systems and methods fail to accurately represent the opportunity of the reservoir system.

[51] The more accurate representation of the reservoir opportunity is provided by the improved reservoir opportunity estimation algorithm, not the manner of displaying the resultant information, such as by means of mapping the results using grey-scale priority codes.

[52] Having found that the computer components are generic and that they are used in a well-known manner, with no suggestion that their functioning is improved in some manner by the operation of the algorithm, we conclude that the actual invention is the improved algorithm and its method of analysis.

[53] Therefore, we conclude that as the algorithm represents a series of abstract data manipulations and mathematical calculations, the actual invention of the claims on file are directed to subject-matter that is not "something with physical existence, or something that manifests a discernable effect or change" (*Amazon* at paragraph 66).

[54] As we stated in the S-PR letter, we further note that the invention in *Schlumberger*, referred to in *Amazon*, and the actual invention of the claims on file, are very similar. In both cases, a computer may be used to perform the calculations that make up the methods. Both cases relate to the analysis of inputs through various calculations. The claims in *Schlumberger* were not saved through their implementation on a computer to give the algorithm a practical application (*Amazon* at paragraph 69), analogous to the claims in this case.

[55] In light of the above, we conclude that claims 1-16 on file are directed to non-patentable subject-matter and are therefore non-compliant with section 2 of the *Patent Act*. Given the abstract nature of the actual inventions of these claims, they are also prohibited under subsection 27(8) of the *Patent Act*.

Indefiniteness

[56] In the S-PR and PR letters, we set out our preliminary view that the claims on file are clear and compliant with subsection 27(4) of the *Patent Act*, contrary to the position in the FA:

> In the FA at page 4, it was stated that the claims on file are indefinite as the terms "objective variable" and "intrinsic parameters" are not clear.
>
> In the R-FA at page 4, the Applicant asserts that:
>
> The level of detail provided in the disclosure would be more than sufficient for the skilled person to readily understand the meaning and scope of the terms "objective variable" and "intrinsic parameters". For instance, paragraph 5 provides "primary reserves ("Prim Res.") and original oil in place ("OOIP")" as examples of "objective variables" Paragraph 26 defines intrinsic parameters as "parameters used to calculate the objective variable". Paragraphs 5 and 26 further provide examples of such "intrinsic parameters", namely "area (A), a constant (α), reservoir thickness (H), porosity (ϕ), initial water saturation (Sw_i), initial volumetric volume factor (Boi), and primary recovery factor (F_r)" (see paragraph 26). The Applicant therefore submits that further detail would unduly limit the scope of the claims.
>
> …..
>
> The terms "objective variable" is described in the "Background of the Invention" section of the application and is thus a term understood by the

> skilled person. In regard to the term "intrinsic parameters" the Applicant has amended the independent claims to specify that the "intrinsic parameters" are "of the reservoir system". Thus, the skilled person would readily understand that the "intrinsic parameters of the reservoir system" are parameters that are intrinsic to the reservoir system.

In our preliminary view, we agree with the Applicant that the meaning of the terms "objective variable" and "intrinsic parameters" would be clear to the skilled person in view of the specification of the instant application. As the Applicant noted in the above quoted passage, the description provides examples of what is meant by each of these terms in the context of the subject-matter of the disclosed and claimed invention. In our preliminary view, the steps of the claimed method are applicable to various intrinsic parameters and objective variables. As such, we see no reason why the Applicant should be limited to claiming the application of the method to a particular parameter or variable.

In light of the above, it is our preliminary view that the scope of claims 1-16 on file would have been clear to the person skilled in the art and are therefore compliant with subsection 27(4) of the *Patent Act*.

[57] In light of the above, we conclude that the claims on file are compliant with subsection 27(4) of the *Patent Act*.

PROPOSED AMENDMENTS

[58] While the Applicant did not propose amendments in response to the S-PR letter, amendments were proposed in response to the PR letter. These amendments were the same as those submitted with the R-FA. In the S-PR letter we set out our preliminary view as to the effect of these proposed amendments:

> The Applicant submitted proposed amendments to independent claims 1 and 9 with the R-FA and resubmitted these proposed amendments as part of the R-PR. The proposed amendments consist of modifying both claims 1 and 9 by amending the "providing a representation of the opportunity…" step to specify "determining a representation of the opportunity…" [Emphasis added] and adding the following step to each claim:
>
> > rendering, in a graphical user interface of a display device, the representation of the opportunity as a geographic map comprising tile greyscale priority code to illustrate drilling and production priorities.
>
> In our preliminary view, the proposed changes, while altering the essential elements of the claims, would not affect our preliminary view in respect of patentable subject-matter.
>
> In essence the "providing" step of the claims on file has been separated into a "determining" and "rendering" step with the detail that the greyscale mapping of the reservoir opportunity is displayed in a graphical user interface.

> As is the case for claims 1 and 9 on file, the recitation of such generic computer output steps (display of output as part of a graphical user interface being well-known), does not lead to the conclusion that the computer is part of the actual invention. Like the claims on file, the actual invention of the proposed claims is directed to the improved algorithm and its method of analysis.
>
> It is therefore our preliminary view that the proposed claims are also directed to a series of abstract data manipulations and mathematical calculations. As such they are directed to non-patentable subject-matter and are therefore non-compliant with section 2 of the *Patent Act*. Given the abstract nature of the actual inventions of these claims, they are also prohibited under subsection 27(8) of the *Patent Act*.
>
> Therefore, it is our preliminary view that the proposed amendments are not considered "necessary" for compliance with the *Patent Act* and *Patent Rules* as required by subsection 86(11) of the *Patent Rules*.

[59] In light of our consideration of the Applicant's submissions at the second oral hearing in regard to the relevant CGK and whether the computer in the present case is operating in a well-known manner using generic inputs/outputs, and our conclusion in respect thereof that the computer is operating in a well-known manner using only generic inputs/outputs, we conclude that for the reasons set out in the S-PR letter and quoted above, the proposed amendments submitted with the R-PR are also directed to a series of abstract data manipulations and mathematical calculations. As such they are directed to non-patentable subject-matter and are therefore non-compliant with section 2 of the *Patent Act*. Given the abstract nature of the actual inventions of these claims, they are also prohibited under subsection 27(8) of the *Patent Act*.

[60] Therefore, as they would not overcome the non-patentable subject-matter defect, the proposed amendments are not considered "necessary" for compliance with the *Patent Act* and *Patent Rules* as required by subsection 86(11) of the *Patent Rules*.

CONCLUSIONS

[61] We have determined that claims 1-16 on file are not directed to patentable subject-matter and are not compliant with section 2 and subsection 27(8) of the *Patent Act*.

[62] We have also determined that proposed claims 1-16 would not overcome the non-patentable subject-matter defect and are not considered "necessary" for compliance with the *Patent Act* and *Patent Rules* as required by subsection 86(11) of the *Patent Rules*.

[63] Further, we have determined that claims 1-16 on file are not indefinite and are therefore

compliant with subsection 27(4) of the *Patent Act*.

RECOMMENDATION OF THE BOARD

[64] In view of the above, the Panel recommends that the application be refused on the ground that the claims on file are not directed to patentable subject-matter and are non-compliant with section 2 and subsection 27(8) of the *Patent Act*.

Stephen MacNeil	Alison Canteenwalla	Lewis Robart
Member	Member	Member

DECISION OF THE COMMISSIONER

[65] I concur with the conclusion and recommendation of the Board that the application be refused on the ground that the claims on file are not directed to patentable subject-matter and are non-compliant with section 2 and subsection 27(8) of the *Patent Act*.

[66] Therefore, in accordance with section 40 of the *Patent Act*, I refuse to grant a patent on this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Virginie Ethier
Assistant Commissioner of Patents

Dated at Gatineau, Quebec

this 9th day of June, 2021