Title: CAVITY WELL SYSTEM

Abstract: A method for accessing a subterranean zone (12) includes forming a subterranean cavity (38) coupled to a land surface (16) and forming a plurality of substantially horizontal bores (22) extending at least partially into the subterranean zone (12) and intersecting the cavity (38).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
CAVITY WELL SYSTEM

REFERENCE TO RELATED APPLICATIONS
The present application claims the benefit of U.S. Patent Application No. 11/141,335 filed on May 31, 2005.

TECHNICAL FIELD
The present invention relates generally to accessing subterranean zones.

BACKGROUND
Subterranean deposits of coal contain substantial quantities of entrained methane gas. Production of this gas is desirable both when it can be produced in useful quantities as a natural resource as well as when it is present in areas where mining of the coal is planned or in progress. Substantial obstacles, however, have frustrated extensive development and use of methane gas deposits in coal seams.

The foremost problem in producing methane gas from coal seams is recovery efficiency of the gas from the coal. Recovery efficiency in coal varies widely, and in coals where the recovery efficiency is low, vertical well developments obtain only a small amount of gas from around the well. Further, some coal deposits are not amenable to pressure fracturing and other methods often used for increasing gas production from rock formations. As a result, once the gas easily drained from a vertical well bore in a coal seam is produced, further production in some coal is limited in volume. Additionally, coal seams are often associated with subterranean water, which must be drained from the coal seam in order to produce the methane.

Horizontal drilling patterns have been tried in order to extend the amount of coal seams exposed to a drill bore for gas extraction. Such horizontal drilling techniques, however, require the use of a radiused well bore which presents difficulties in removing the entrained water from the coal seam. In most instances, pumping water from a vertical bore is more efficient and less expensive than pumping water from a horizontal or radiused bore.

Systems based on horizontal bores that intersect the cavity in a vertical well bore combine the advantages of horizontal drainage patterns with the efficiency associated with pumping from a vertical well bore. Liners, often installed to enhance the structural integrity of the bores, are joined at the intersections between lined bores by junctions installed using various techniques.
SUMMARY

The present invention provides an improved method and system for accessing subterranean zones from the surface. In one aspect, the present invention provides an articulated well bore coupled to a well bore pattern that provides access to a large subterranean area from the surface. The well bore pattern includes two or more well bores, one or more of which can, in some instances, be lined. In illustrative embodiments, the articulated well bore and well bore pattern can be coupled to a vertical well bore. The vertical well bore allows entrained water, hydrocarbons, and other deposits to be efficiently removed (e.g. by pumping the fluid, by using a gas lift, or by natural flow from the well) and/or produced. In some illustrative embodiments, the articulated well bore and well bore pattern can be coupled to a cavity that functions as a junction between multiple lined bores. In some illustrative embodiments, the cavity is packed with gravel (e.g. an unconsolidated mixture of pebbles, rock fragments, or other suitable packing material).

In another aspect, a method for accessing a subterranean zone includes forming a subterranean cavity coupled to a land surface; and forming a plurality of substantially horizontal bores extending at least partially into the subterranean zone and intersecting the cavity.

In another aspect, a system for accessing a subterranean zone includes a subterranean cavity coupled to a land surface, and a plurality of substantially horizontal bores extending at least partially into the subterranean zone and intersecting the cavity.

In another aspect, a method of accessing a coal seam includes forming a cavity proximate the coal seam and coupled to a land surface, gravel packing at least a portion of the cavity; and producing fluid from the cavity to the land surface. The phrase “proximate” a seam or zone is defined herein as near or intersecting the seam or zone.

In another aspect, a system for accessing a coal seam includes a cavity proximate the coal seam and coupled to a land surface wherein at least a portion of the cavity is packed with gravel.

In some embodiments, forming the cavity can include forming the cavity (e.g. a cavity including a substantially cylindrical portion) proximate the subterranean zone. Forming a subterranean cavity coupled to a land surface, forming a first bore (e.g. a substantially vertical bore) extending from the land surface, and forming a cavity in the well bore.

In some instances, forming a plurality of substantially horizontal bores extending at least partially into the subterranean zone and intersecting the cavity includes forming an articulated bore (e.g. an articulated bore offset horizontally from the first bore) extending
from a land surface to proximate the subterranean zone and forming the plurality of substantial horizontal bores from the articulated bore. The first bore and the articulated bore can extend from the land surface through an entry bore. In some instances, the subterranean zone can be a portion of coals seam. In some instances, the horizontal bores can be horizontal drainage bores (e.g., bores with liners adapted to communicate fluid between an interior of the liner and the cavity).

In some embodiments, these aspects can also include installing a liner in two or more of the plurality of substantially horizontal bores. In some instances, such liners can terminate proximate the cavity. In other instances, at least one of the liners traverses the cavity.

In some embodiments, the aspects can also include gravel-packing at least a portion of the cavity.

In some embodiments, these aspects can also include withdrawing fluid from the cavity to the land surface through the first bore. In some instances, withdrawing fluid includes providing artificial lift (e.g., pumping the fluid or using a gas lift) to raise the fluid from the cavity to the land surface. In some instances, the systems can include a pump inlet in the first bore.

The above discussions of aspects of the invention include, for clarity of description, language putting necessary elements in context (e.g., coupled to a land surface). This language is not be construed as necessary elements of an individual aspect.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF DRAWINGS

FIG. 1A is a schematic side view of an illustrative system for accessing a subterranean zone.

FIG. 1B is a plan view of the system of FIG. 1A.

FIG. 1C is a plan view of the system of FIG. 1A at a greatly reduced scale.

FIG. 2A is a schematic side view in of another illustrative system for accessing a subterranean zone.

FIG. 2B is a small-scale plan view of the system of FIG. 2A.

FIG. 3 is a schematic side view of another illustrative system for accessing a subterranean zone.

FIG. 4 is a schematic side view of another illustrative system for accessing a subterranean zone.
FIG. 5 is a schematic side view of another illustrative system for accessing a subterranean zone.

Like reference symbols in the various drawings indicate like elements. The drawings are not to scale.

DETAILED DESCRIPTION

Referring to FIG. 1A, an illustrative system 10 for accessing a subterranean zone 12 includes a well bore 14, a cavity 18, and articulated well bore 20, and one or more substantially horizontal bores 22 (three are shown). In this case, the subterranean zone 12 is in a coal seam. However, in other applications, the system 10 can be used to access subterranean zones in other types of formations. For example, the system 10 can be used to access other subterranean zones to remove and/or produce water, hydrocarbons, and other fluids from the zone and to treat minerals in the zone prior to mining operations.

In this instance, the well bore 14 is substantially vertical and will be referred to as the substantially vertical well bore for descriptive purposes. However, embodiments of the systems described below can be implemented where at least a portion of the well bore is a slanted bore.

The substantially vertical well bore 14 extends from a land surface 16 (e.g. directly from the land surface itself, from an entry bore extending directly from the land surface, or from another near-surface feature) to the subterranean zone 12 where the cavity 18 formed in the substantially vertical well bore. In some instances, the cavity 18 is reamed or cut in a cylindrical shape with a diameter that is greater than the diameter of the substantially vertical well bore 14. In other instances, the cavity 18 has a diameter that is approximately equal to or less than the diameter of the vertical well bore 14. The substantially vertical well bore 14 is lined with a suitable well casing 32 that terminates above an upper surface of the cavity 18.

An apertured liner 34 extends from the well casing 32 into the cavity 18. The apertures can be holes, slots, or openings of any other suitable size and shape. The apertured liner 34 can be an expandable liner that is expanded radially when positioned in the cavity 18 to both increase the diameter of the liner and increase the transverse dimension of the apertures therein. In the embodiment of FIG. 1, an inlet 36 of a down-hole pump, such as a sucker rod pump, electric submersible pump, or other type of pump, is located within the well casing 32 slightly above the cavity 18; however, the inlet 36 may be positioned elsewhere. For example, the inlet 36 may be positioned in the apertured liner 34 within the cavity 18.

The articulated well bore 20 extends from the land surface 16 towards the cavity 18 of the substantially vertical well bore 14. The articulated well bore 20 includes a first portion
24, a second portion 26, and a curved or radiused portion 28 interconnecting the first and second portions 24 and 26. In some instances, the first portion 24 is substantially vertical bore, and in other instances, the first portion is a slanted bore. The second portion 26 lies substantially in the horizontal plane of the formation (coal seam) and may follow any up or down dip of the formation and can also have a general overall slope. The one or more (three shown) substantially horizontal bores 22 extend from the vicinity of an open end 30 of the second portion 26 of the articulated well bore 20 through the cavity 18 and into the subterranean zone 12. As with the second portion 26, the horizontal bores 22 lie substantially in the horizontal plane of the formation (coal seam) and may follow any up or down dip of the formation and can also have a general overall slope. In some instances, the general slope of the horizontal bores 22 is upwards from the cavity 18 towards the far ends of the horizontal bores 22 such that fluids in the bores are biased to flow towards the cavity 18.

The bores 22 have liners 40 with apertures 42 providing fluid communication between subterranean zone 12 and interior 44 of the liners 40 as well as between the interior of the liners 40 and the cavity 18. Consequently, it is not necessary to form junctions connecting the liners 40 of the bores 22 with each other or with the articulated well bore. In effect, the cavity 18 itself acts as a junction between the bores 22 and the vertical well (e.g. pumping fluid from inside the apertured liner 34 to the land surface 16 draws fluid from the coal seam through the bores and the cavity into the apertured liner 34). In a coal seam, the fluid can be water and entrained coal fines.

The cavity 18 is packed with gravel 38 encompassing the substantially horizontal bores 22 and the apertured liner 34. The gravel pack 38 helps support the cavity 18 and also acts to filter coal fragments out of pumped fluid before it enters the apertured liner 34 of the vertical well bore 14. In some instances, the gravel may be coarse because, for example, coal fragments breaking off from the coal seam tend to be larger than the sands, silts, and clays that are typically produced by pumping in other formations. For example, gravel with the mean diameter of between about 20 and about 30 mm can be used. The coarse gravel is different from finer gravel (i.e. gravel with a smaller mean diameter) used around the apertured liner when producing from a sandy formation. However, finer gravel can be used in accordance with the concepts described herein.

The substantially vertical well bore 14 is logged either during or after drilling in order to locate the exact vertical depth of the subterranean zone 12. The cavity 18 is formed in the substantially vertical well bore 14 at the level of the subterranean zone 12. In some instances, the cavity 18 is formed using suitable under-reaming techniques and equipment.
Alternatively, other techniques and equipment (e.g. hydrojet technology) can be used. A vertical portion of the substantially vertical well bore 14 continues below the cavity 18 to form a sump 25 for the cavity 18. As described above, the cavity 18 provides a junction for intersection of the substantially vertical well bore by articulated well bore used to form a substantially horizontal drainage pattern 46 in the subterranean zone 12. The cavity 18 also provides a collection point for fluids drained from the subterranean zone 12 during production operations. In embodiments that include a sump 25, the sump also provides a collection point for fluids. In this illustrative embodiment, the cavity 18 has a radius of approximately two meters and a vertical dimension which approximates the vertical dimension of the subterranean zone 12.

Appropriate drilling techniques for installing the system 10 described in U.S. Patent No. 6,357,523 issued to Zupanik which is incorporated herein, by reference, in its entirety. The discussion below focuses deviations from these methods due to differences in the systems being installed.

Conventional drilling operations can result in an "over balanced" drilling operation in which the hydrostatic fluid pressure in the well bore exceeds the reservoir pressure. This can lead to loss of drilling fluid and entrained cuttings into permeable formations. In systems with intersecting wells as described above, gas compressors can be used to circulate compressed gas down the substantially vertical well bore 14 and back up through the articulated well bore 20 to prevent over balance drilling conditions during formation of the horizontal bores 22. In some instances, this approach can be used to achieve “under balanced” drilling conditions (i.e. conditions in which pressure in the formation exceeds the pressure of the drilling mud). Alternatively, “under balanced” drilling conditions can be achieved by withdrawing fluid from the vertical bore 14 or by introducing foam into the drilling mud. Factors including rock stability influence the determination of whether “over balanced” or “under balanced” drilling conditions are most appropriate for a specific formation.

The first portion 24 of the articulated well bore 20 is offset a sufficient distance from the cavity 18 to permit the radius curved section 28 and any desired second section 26 to be drilled while leaving sufficient space to also drill so as to achieve the desired spacing between the separate bores 22 before they intersect the cavity 18. This spacing allows for an increase in the radius of the curved portion 28 to reduce friction in the articulated well bore 20 during drilling operations. As a result, reach of a drill string drilled through the articulated well bore 20 is increased over articulated bores with tighter radiuses.
The articulated well bore 20 is drilled using a drill string that includes a suitable down-hole motor and bit. A measurement while drilling (MWD) device is included in the drill string for controlling the orientation and direction of the well bore drilled by the motor and bit. The first portion 24, the curved portion 28, and at least part of the second portion 26 of the articulated well bore 20 may be lined with a suitable casing.

Now referring also to FIGS. 1B-1C, after the articulated well bore 20 is drilled and cased, appropriate horizontal drilling apparatus (e.g. a mud motor with a bit attached to a running string) is used to drill a first horizontal bore 22. The first horizontal bore 22 extends from the end of the second portion 26 through the cavity 18 and into the zone 12. The first horizontal bore 22 is oriented to pass through the cavity 18 so as to leave sufficient space for a working string or tubing to be inserted while filling the cavity 18 with gravel. The substantially horizontal bores 22 include sloped, undulating, or other inclinations of the subterranean zone 12. During this operation, gamma ray logging tools and measurement while drilling devices may be employed to control and direct the orientation of the drill bit to retain the drainage pattern 46 within the confines of the subterranean zone 12 and to provide substantially uniform coverage of a desired area within the subterranean zone 12. The term “drainage pattern” as used herein refers to two or more horizontal bores extending into the subterranean zone 12. Drainage pattern 46 extends laterally towards the boundary line 48 of the drainage area.

The order in which individual horizontal bores are drilled can be varied. The terms “first,” “second,” and “third” are used simply describe the process of forming the horizontal bores rather to denote a specific horizontal bore 22.

After the first horizontal bore is drilled, the drilling apparatus is withdrawn and liner 40, mounted on a running tool, is extended through the articulated well bore 20 and into the first horizontal bore 22. After the liner 40 reaches the end of the horizontal bore 22, the running tool is operated to release the liner 40 and is then withdrawn. The second horizontal bore 22 is deflected from the first horizontal bore 22 using a directional drilling assembly or a whipstock. The location and angle of deflection are chosen such that the second horizontal bore 22 is oriented to intersect and pass through the cavity 18 again leaving a space clear for a working string or tubing to be inserted while filling the cavity with gravel. This orientation is also set such that the second horizontal bore 22 extends into the zone at an angle which achieves lateral separation from the first horizontal bore 22 to form part of the desired drainage pattern 46.
The drilling apparatus is then withdrawn and the liner 40 for the second horizontal bore 22 is then installed using the process already described. The drilling and lining process is repeated using a slightly different deflection location and angle to form the third horizontal bore 22. The locations where the second and third horizontal bores 22 deflect, or kick off, from the first horizontal bore 22 may be separated along the length of the first horizontal bore 22. In some instances, the bores are separated by about 3 meters. The liners 40 can be provided with apertures before they are installed or can be perforated downhole.

In this illustrative embodiment, the liners 40 extend from the distal ends of the horizontal bores 22 back through the cavity 18 to or near the proximal ends of the horizontal bores. In the second, third and subsequent horizontal bores 22, the liners 40 terminate near the kick off point of the bore from the first horizontal bore 22. Because the liners 40 terminate near the kick off point, if a liner 40 is unintentionally run into a bore that has been previously lined, the liner 40 will travel only a short distance into the bore before colliding with the previously placed liner.

In this illustrative embodiment, the cavity is filled with gravel after the horizontal bores 22 are drilled and lined. Tubing 33 or a working string is inserted through the vertical well bore 14 and into the cavity 18. As discussed above, the horizontal bores 22 are installed so as to leave space in the center of the cavity 18 for subsequent installation of the apertured liner 34. The tubing 33 or working string extends into the space towards the lower portion of the cavity 18. A gravel slurry is pumped down into the cavity 18 through the tubing 33. The tubing 33 or working string is withdrawn as gravel fills the cavity 18. Keeping the end of the tubing 33 or working string near the top of the gravel pack provides feedback as to the level of gravel in the cavity 18 and allows up-and-down motion of the tubing 33 or working string to be used to 'tamper' the gravel down. In other embodiments, the gravel slurry is pumped down an annulus between a working string and the casing 32 of the vertical well bore 14.

The fluid portion of the gravel slurry is pumped out through the working string leaving the gravel in place in the cavity 18. Other approaches (e.g. pumping a gravel slurry down the interior of a working string to a crossover tool which discharges it out of the working string) can also be employed to install the gravel pack.

In this embodiment, the apertured liner 34 is installed after the gravel pack 38 is in place. Thus, the apertured liner 34 can be provided with an end cap or tip at least a portion of which is conical, frustoconical, hemispherical, otherwise pointed or another shape that facilitates driving the liner 34 through the gravel pack 38. Driving the liner 34 through the gravel pack 38 takes advantage of both the compressibility of the gravel pack 38 (i.e.
compressing the gravel pack 38) and any resilience of the formation itself. In particular, coal seams typically exhibit some degree of “give” in response to such pressure. If the apertured liner 34 is of an expandable type, expansion of the liner also compresses the gravel pack 38. After the apertured liner 34 is in place, the running tool and working string are withdrawn.

An alternative embodiment, the apertured liner 34 is placed in the cavity 18 before the gravel pack 38 is installed with the gravel slurry pumped into the cavity 18 around the apertured liner 34. As discussed above, the apertured liner is attached to the tubing 33.

Liquid (e.g. water and entrained coal fines in a coal seam) collected in the cavity 18 and/or the sump 25 is withdrawn through bore 14 while gas is withdrawn through bore 14 or bore 20. If the system 10 is being used for injection, fluid may be input through either bore 14 or bore 20. The pump inlet 36 is installed in the vertical well bore 14 after the apertured liner 34 and gravel pack 38 are in place. The pump inlet 36 can be positioned within the casing or within the apertured liner 34.

The apertured liners 40 of the horizontal bores are exposed to both the subterranean zone 12 and the cavity 18 containing the apertured liner 34. The resulting fluid communication between the zone 12 and the substantially vertical bore 14 means that is not necessary to construct and line multi-lateral junctions joining the horizontal bores 22 to each other and/or to the vertical bore 14. As discussed above, the cavity 18, in effect, acts as the junction.

Referring to FIGS. 2A-2B, another illustrative system 110 for accessing a subterranean zone 112 also includes a well bore 114, a cavity 118, an articulated well bore 120 and one or more (three shown) substantially horizontal bores 122. The articulated well bore 120 is shown with a slanted first portion 124, rather than a substantially vertical first portion as above, extending downward from the land surface 116 to the subterranean zone 112. Multiple slanted bores can extend from a single entry location, entry bore, or drilling pad towards multiple cavities for multiple drainage patterns extending in different directions. The horizontal bores 122 have liners 140 with apertures 142 only in the portions of the horizontal bores that extend beyond the cavity 118. In other embodiments of this aspect of the invention, the first portion 124 of the articulated well bore 120 can be a substantially vertical, rather than slanted, bore.

After a horizontal bore 122 has been drilled and a liner 140 is installed therein, a subsequent horizontal bore 122 may be drilled and a liner 140 placed in the latter drilled horizontal bore 122. Although the liner 140 is inserted back through the articulated well bore 120 and oriented to enter the latter drilled horizontal bore 122, the liner 140 may sometimes
inadvertently enter a horizontal bore 122 that has already been lined. Because the liner 140 in the previously lined horizontal bore 122 terminates about the far side of the cavity 118, it may not be apparent that the liner 140 being run-in is entering a previously drilled and lined horizontal bore 122 until after the liner 140 has traversed the cavity 118.

In this system, the horizontal drainage system 146 is shown laid out with an optional herringbone pattern. Each of the horizontal bores 122 has one or more laterals 123 extending into the subterranean zone 112. These laterals 123 may also be lined, and their liners can be tied back to the liners of the horizontal bores 122 using cavities as described herein or with other types of tieback systems. Horizontal drainage patterns are laid out according to the characteristics of the formation and the access desired by the designer. Therefore, other patterns (e.g. pinnate patterns) can be used with this system as appropriate.

Referring to FIG. 3, another illustrative system 210 also includes a substantially vertical bore 214, a cavity 218 with an associated gravel pack 238, and an articulated well bore 220. System 210 includes a single horizontal drainage bore 222 extending from the vicinity of an opening 230 of the articulated well bore 220 through the cavity 218 and into the subterranean zone 212. In some applications, only the single horizontal drainage bore 222 extends into the subterranean zone. In other applications, multiple lateral bores (not shown) are installed extending from the single horizontal drainage bore 222.

Referring to FIG. 4, another illustrative system 310 includes a substantially vertical bore 314, a cavity 318, and an articulated well bore 320. One or more (three shown) horizontal bores 322 are drilled extending from the vicinity of an opening 330 of the articulated well bore 320 through the cavity 318 and into the subterranean zone 312. The cavity 318 provides a bigger target for interception than a vertical well would. This system does not include liners in the bores 322 and does not include a gravel pack in the cavity. This system is made and used similarly to the systems described above with the exception that the liners and gravel pack are not installed. As above, the cavity 318 collects liquids that can be produced from the vertical bore 314. Gas can be produced from the vertical or articulated bores 314, 320.

Referring to FIG. 5, another illustrative system 410 includes a substantially vertical bore 414 extending from a land surface 416 to a subterranean zone 412 and a cavity 418 in the subterranean zone. The cavity 418 is formed in the vertical bore 414 and contains a gravel pack 438 installed around a apertured liner 434. The apertured liner 434 is attached to tubing 433 that extends to the land surface 416 through the vertical bore 414. No horizontal bores are included in the system 410. The vertical bore 414 and the cavity 418 are made and
used similarly to those described above with the exception that fluid flows into the cavity
directly from the surrounding zone 412 rather than being routed through connected horizontal
bores.

A number of embodiments of the invention have been described. Nevertheless, it will
be understood that various modifications may be made without departing from the spirit and
scope of the invention. For example, although the illustrative systems included at most three
(e.g. zero, one, or three) horizontal bores, some embodiments include four or more horizontal
bores intersecting a cavity in a subterranean zone. In another example, although the
discussions above have focused on applications where fluids are being withdrawn from a
subterranean zone, these systems can also be used for injection of fluids into or sequestration
of fluids into a formation. Accordingly, other embodiments are within the scope of the
following claims.
WHAT IS CLAIMED IS:

1. A method for accessing a subterranean zone, the method comprising:
   forming a subterranean cavity coupled to a land surface; and
   forming a plurality of substantially horizontal bores extending at least partially into
   the subterranean zone and intersecting the cavity.

2. The method of claim 1 wherein forming the cavity comprising forming the cavity
   proximate the subterranean zone.

3. The method of claim 1 further comprising installing a liner in two or more of the
   plurality of substantially horizontal bores.

4. The method of claim 3 wherein at least one of the liners terminates proximate the
   cavity.

5. The method of claim 3 wherein at least one of the liners traverses the cavity.

6. The method of claim 1 further comprising gravel-packing at least a portion of the
   cavity.

7. The method of claim 6 further comprising inserting an apertured liner vertically
   into the portion of the cavity that has been gravel-packed.

8. The method of claim 7 further comprising radially expanding the liner.

9. The method of claim 1 wherein the cavity includes a substantially cylindrical
   portion.

10. The method of claim 1 wherein forming a subterranean cavity coupled to a land
    surface comprises forming a first bore extending from the land surface and forming a cavity
    in the well bore.

11. The method of claim 10 wherein forming the first bore comprises forming a
    substantially vertical bore.

12. The method of claim 11 wherein forming a plurality of substantially horizontal
    bores extending at least partially into the subterranean zone and intersecting the cavity
    comprises forming an articulated bore extending from a land surface to proximate the
    subterranean zone and forming the plurality of substantially horizontal bores from the
    articulated bore.

13. The method of claim 12 wherein the articulated bore is offset horizontally from
    the first bore.

14. The method of claim 12 wherein at least one of the first bore and the articulated
    bore extends from the land surface through an entry bore.
15. The method of claim 10 further comprising withdrawing fluid from the cavity to the land surface through the first bore.

16. The method of claim 15 wherein withdrawing fluid comprises at least one of providing artificial lift to raise the fluid from the cavity to the land surface and discharging from a flowing well.

17. The method of claim 16 wherein providing artificial lift comprises at least one of pumping the fluid and using a gas lift.

18. A system for accessing a subterranean zone, the system comprising:
   a subterranean cavity coupled to a land surface; and
   a plurality of substantially horizontal bores extending at least partially into the subterranean zone and intersecting the cavity.

19. The system of claim 18 further comprising a liner in two or more of the plurality of substantially horizontal bores.

20. The system of claim 19 wherein at least one of the liners terminates proximate the cavity.

21. The system of claim 19 wherein at least one of the liners extends across the cavity.

22. The system of claim 18 wherein at least a portion of the cavity is gravel-packed.

23. The system of claim 18 wherein the cavity comprises a substantially cylindrical portion.

24. The system of claim 18 further comprising a first bore extending from the land surface to the cavity and an articulated bore extending from the land surface and coupled to the cavity.

25. The system of claim 24 further comprising a pump inlet in the first bore.

26. A method of accessing a coal seam, the method comprising:
   forming a cavity proximate the coal seam and coupled to a land surface;
   gravel-packing at least a portion of the cavity; and
   producing fluid from the cavity to the land surface.

27. The method of claim 26 further comprising forming a plurality of substantially horizontal bores intersecting the cavity and extending at least partially into the coal seam, one or more of the plurality of substantially horizontal bores comprising a liner.

28. The method of claim 27 wherein one or more of the liners traverses the cavity.
29. The method of claim 26 wherein producing fluid comprises at least one of providing artificial lift to raise the fluid from the cavity to the land surface and discharging from a flowing well.

30. The method of claim 26 further comprising inserting an apertured liner vertically into the portion of the cavity that has been gravel-packed.

31. The method of claim 30 further comprising radially expanding the apertured liner.

32. A system for accessing a coal seam, the system comprising:
   a cavity proximate the coal seam and coupled to a land surface; and
   wherein at least a portion of the cavity is packed with gravel.

33. The system of claim 32 further comprising a substantially horizontal drainage bore coupled to the cavity and extending into the coal seam.

34. The system of claim 32 further comprising a plurality of drainage bores intersecting the cavity and at least one of the drainage bores comprising a liner adapted to communicate fluid between an interior of the liner and the cavity.