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DATE: 17 Oct. 2002 No. Of Pages (Including Cover Sheet) 13

TO: WAYNE WESTERN

COMPANY: \_\_\_\_\_

FROM: GARY TAYLOR

REMARKS: \_\_\_\_\_

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#### 4.17 SUBSIDENCE CONTROL PLAN

This section describes in further detail the Permittee's mine plan design, ensuring subsidence effects of the Skyline Mine produce minimum environmental impact. Section 3.1 - SKYLINE MINING OPERATION PLAN describes in detail the proposed methods of coal extraction and mine development which were selected partly on subsidence and nonsubsidence criteria. Section 2.2 presents the detailed geological information which provided an analytical base for mine plan and subsidence control design. The following subsections describe the principal factors involved in measuring and controlling subsidence resultant of the proposed mining operations.

##### 4.17.1 Subsidence Probability Survey

Careful review of the permit area shows that the following areas could face potential subsidence impact which may be of concern: Mountain Fuel Supply gas pipeline, U-264, Burnout Creek and James Creek which cross the permit area. Upper reaches of Electric Lake Reservoir, upper Huntington Creek, Boulger Creek and South Fork of Eccles Creek will not be subsided.

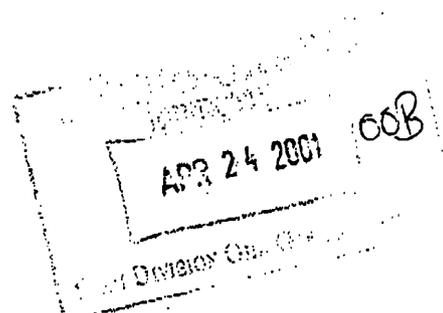
##### 4.17.2 Mining Methods

The mining methods to be used by the Permittee include longwall mining, room and pillar mining with pillar removal, and room and pillar mining with pillars left in place. Certain room and pillar mining systems are designed to provide full support and will prevent subsidence. Subsection 3.1.5 contains descriptions of the mining methods to be implemented.

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Full extraction areas include room and pillar panels with pillar removal and longwall panels. Both methods of mining are planned subsidence areas. Subsidence prediction work has shown the expected maximum planned and controlled subsidence will vary from 0 to 24 feet, assuming that the total cumulative extraction from the three mineable seams will not exceed 30 feet.

#### 4.17.3 Subsidence Effect Prevention Measures

It is anticipated that the planned subsidence will result in a generally uniform lowering of the surface lands in broad areas, thereby limiting the extent of material effect to those lands and causing no appreciable change to present land uses and renewable resources. The Permittee established a subsidence monitoring program in the early stage of mining for use in reviewing the surface effect of mining and as an aid in future mine planning.

In areas where mining related subsidence would damage resources, room and pillar mining methods will be used. Where the yield pillar/barrier system is used, the critical area will not influence the surface. The width of the area of supportive mining is equal to 50 feet (25 feet on each side of the pipeline centerline no surface movement) plus the tangent of 22° draw angle as shown in the 1988 Annual Report and included in Vol. 4, multiplied by the overburden depth of the mined coal bed:

- Nonsubsidence Mining Width = 50 feet + (2 X tan 22° x depth)



The width of the supportive mining area will be adjusted, as appropriate, when future information and monitoring shows it to be necessary.

The 22 degree draw angle is conservative and conforms to the Permittee's data on permit area subsidence as well as experience from other comparable mining activity in the Wasatch Plateau (Plate 4.17.3-1).

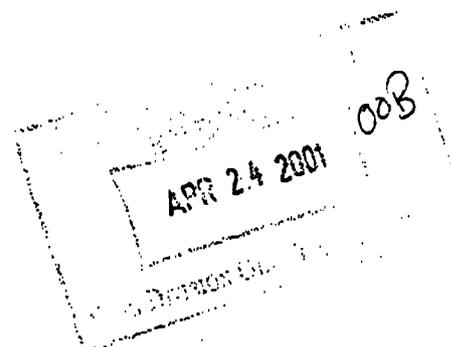
There will be no mining caused subsidence under either the Electric Lake Reservoir, Upper Huntington Creek and Boulger Creek inlets to the reservoir, and no mining from which subsidence at a 22-degree (from vertical) angle of draw would influence either these reservoir inlets or the high-water level of Electric Lake Reservoir. . The width of the buffer zone in these areas was calculated as follows:

- Buffer zone width =  $\tan 22^\circ \times$  overburden depth

The width of the buffer zone has been calculated using the overburden depths to the coal seams.

There is a very substantial tonnage of coal which lies to the west of Upper Huntington Creek and Electric Lake Reservoir, which the Permittee plans to mine.

Mains under Huntington Creek (Drawing 3.1.8-3) will be a full support room and pillar mining system. These mains will be designed to avoid short or long-term surface affects from mining. Prior to abandonment of these mains, measures will be taken to ensure no surface subsidence is induced due to failure of the entries, as mutually agreed with regulatory agencies. The entries in Skyline Mine No. 2 will enter the Huntington Creek buffer zone for a short distance as approved by the Division/U.S. Forest Service.



No mining will be conducted beneath Electric Lake.

Full extraction mining techniques under the creek buffer zones will only be proposed if evidence shows surface effects, if any, can be mitigated. Full extraction mining techniques and associated mitigation plans must first be approved by the Division/U.S. Forest Service.

Drill holes show that there are clay rich shale layers present which will likely swell into an impervious clay when wet. This characteristic is expected to seal possible subsidence cracks to prevent downward migration of water and subsequent loss of springs and other water sources based on information supplied by Roy Full (Volume A-3).

A section of a natural gas pipeline in the Burnout Canyon-Huntington Creek area was decommissioned in October 2000. Its replacement section was constructed in the pre-existing pipeline right-of-way on top of Trough Springs Ridge. Since the Trough Springs Ridge area will not be undermined again and subsidence from previous mining under this area is essentially complete, the Burnout Canyon-Huntington Creek section of the line was relocated to the ridge by Questar. This will allow undermining and subsidence of the portion of the pipeline in Burnout Canyon and Huntington Creek. The Burnout Canyon-Huntington Creek portion of the pipeline is labeled as "old pipeline" on the mine maps and is still owned by Questar. However, it has been decommissioned by Questar to allow undermining by Skyline Mine. The future utilization and status of decommissioned portion of the pipeline is Questar's responsibility.

#### 4.17.4 Mitigation of Subsidence Effects

Surface structures which may be effected by subsidence include the Permittee's buildings and facilities incidental to the coal operation, the natural gas pipeline which crosses the coal lease area, and roads within the area. No additional structures are located within the new UP&L lease area.

Should subsidence damage any of the surface structures despite the planned subsidence prevention measures, the Permittee will arrange for their repair. Any subsidence related damage to SR 264 will be repaired by the Permittee in accordance with the DOT Subsidence Impact Agreement dated July 17, 1989 (see Exhibit 1).



Hydrologic information during a four year period at the Skyline Mine indicates that there is a reasonably good correlation between the amount of mine water discharged and the amount of coal mined (see Drawing 4.11.4-A). Our mine water is being produced from the Blackhawk Formation. Data from our approved water monitoring program indicate our mine dewatering is not affecting any surface springs or seeps. Our experience is showing that the migration of water through the aquifer is extremely slow to the extent that the water should be considered "perched or trapped water."

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**Coastal States Energy Company**

a subsidiary of The Coastal Corporation

175 E. 400 S. • #3 • Suite 800 • Salt Lake City, UT 84111

EXHIBIT 1

July 17, 1989

Mr. Dyke LeFevre  
Director, District 4  
Utah Department of Transportation  
P.O. Box R  
Price, Utah 84501

Re: State of Utah Highway SR-264-Subsidence Impact Agreement

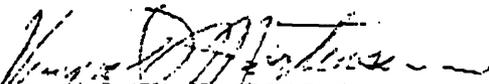
Dear Mr. LeFevre:

Since SR-264 traverses areas which are proposed to be mined by Coastal States Energy Company (Coastal), portions of SR-264 may be affected by subsidence from Coastal's underground coal mining operations. This letter agreement is to set forth the obligations and rights of Coastal with respect to subsidence from Coastal's Skyline mining operations, and the effects therefrom, if any, on SR-264.

If accepted and agreed to by the Utah Department of Transportation (UDOT), UDOT has no objection to and will allow Coastal's mining operations being conducted, as proposed by Coastal, within the area of influence of SR-264. In consideration for such authorization, Coastal agrees to repair promptly all damage, such as surface impacts, to SR-264 due to subsidence caused by the mining activities at Coastal's Skyline Mines.

If UDOT agrees to the provisions contained herein, please sign all three copies of this letter agreement and return one of which to Coastal.

Very truly yours,

  
Vernal J. Mortensen  
Senior Vice President

VJM/jm/0201c

Agreed and accepted this 19<sup>th</sup> day of July, 1989

  
Dyke LeFevre  
Director, District 4  
Utah Department of Transportation

  
Howard Richardson  
Assistant Director  
Utah Department of Transportation

At this point in time it is difficult to suggest any mitigation of impacts or reclamation on renewable resources that are impacted by undermining, since we can only assume those impacts and their effect. Mitigation measures will be contingent upon the findings of the subsidence monitoring program. Surface subsidence experienced to date, as shown in the 1987 and 1988 annual reports, has been less than 50% of the mining height even after 2 years have passed. As data are collected, methods of mitigation will be formulated. This will be done in coordination with appropriate regulatory agencies. Since subsidence may continue to occur after final mining, the monitoring program will continue until it is determined by the Permittee in cooperation with the regulatory agency that it is no longer needed, or subsidence has stopped.

Impacted water rights, if any, will be replaced as discussed in Section 2.5.2.

#### 4.17.5 Subsidence Monitoring Program

The Permittee has chosen to establish a subsidence monitoring program using aerial photogrammetrics patterned after a program developed by the Manti-LaSal National Forest to determine the effects of underground coal mining on surface renewable resources and surface improvements. The monitoring program secures adequate baseline data prior to any subsidence to quantify the existing surface renewable resources and surface improvements on and immediately adjacent to the permit area. The baseline data was established so that future programs of observation can be incorporated at regular intervals for comparison. The monitoring program establishes a system to locate, measure, and quantify the progressive and final affect of underground mining activities on the surface renewable resources and surface improvements. The system utilizes techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the permitted area. The continuum of data shall incorporate and be an extension of the baseline data.

A network of control monuments consistent with the desired photogrammetric map accuracy are being established over both the permit area and the immediate adjacent areas not expected to be disturbed by subsidence. The monuments are constructed as survey control points for monitoring the effects of subsidence on surface renewable resources and surface improvements (Map 4.17.5-1). The monuments are located and tied to a state plane coordinate system which is the same for both the surface and mine control surveys. This allows the surface survey to be superimposed over the subsurface mine workings. The monuments have the X, Y, and Z coordinates accurately measured and established by ground survey methods.

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The initial aerial photography covers the entire permit area and will be either color or black and white, flown at a scale such that elevations to within one foot vertically and horizontally ( $\pm 0.5'$ ) can be attained by photogrammetric methods. It is anticipated that the nominal or mean scale will be 1:6,000 for a 6" focal length camera, unless aerial constraints such as safety dictate flying at a high altitude, but will not exceed 1:7,200. This photography was used for constructing the initial baseline surface map. It also provides the master base to assist in documenting changes caused by subsidence.

To aid in the collection of additional base data on surface renewable resources, color infrared aerial photography (CIR) of the permit area may be utilized. If this technique is used, the photographs will be of the same scale as the other aerial photography.

Subsequent annual black and white or color photography for subsidence monitoring will cover the area mined and the area to be mined in the next 18 months (plus angle of draw). Subsequent CIR photography for monitoring surface resource trends will be flown as needed.

On all aerial photography for both the baseline data and subsequent flights, a photographic overlap of 30 percent between adjacent flight lines and an average of 60 percent overlap of photographs along the same flight line will be obtained. The baseline data will be digitized to show the undisturbed pre-subsided ground elevations and will use a grid with a nominal mean grid scale of 200 x 200 feet. The subsequent flights for subsidence will also be digitized using the same grid scale as the baseline to show the elevational deviation from the baseline elevations. The digitized information will be submitted annually to the regulatory agency after subsidence commences.

An on-the-ground visual inspection will be made annually of the ground surface of subsidence areas (including angle of draw).

This inspection will attempt to locate, photograph, and document the presence of subsidence effects to surface improvements, tension cracks, fissures and other surface effects.

The subsidence monitoring data could be used to determine: 1) the critical width across the pressure arch; 2) the draw angle; 3) the ratio of observed subsidence to predicted maximum subsidence ( $S/S_{max}$ ); 4) the relationship between mining and onset of subsidence and the correspondence between the face advance and subsidence profile development; and 5) the bulking factor.

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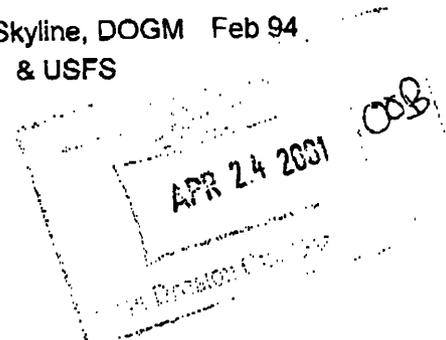
A special three year subsidence monitoring program will be conducted to study the general effects of subsidence related to full extraction coal mining on flows in the upper reaches of Upper Huntington Creek and Burnout Creek drainages.

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The monitoring program will proceed as follows:

<u>Description</u>	<u>Who</u>	<u>When</u>
1. Install parshall flumes for stream flow monitoring as shown on plate 2.3.6-1.	Skyline	July 91
2. Select and install monitoring for spring flows in the subsidence areas as shown on plate 2.3.6-1.	Skyline	July 91
3. Install subsidence monitoring adjacent to stream drainages on a maximum 200 ft. centers as shown on plate 2.3.6-1. Points will be 3' rebar with no concrete.	Skyline	July 91
4. Develop summary report of observed subsidence effects on stream drainages as well as surface and subsurface hydrology to date.	Skyline	Dec. 91
5. Monitor stream, spring, and subsidence points – monthly during field season. Map any surface cracks that form.	Skyline	June-Nov 91 June-Nov 92 June-Nov 93*?
6. Year-end summary reports.		
7. Final report.	Skyline	Jan 92 & 93
8. Evaluation and review.	Skyline	Jan 94

Skyline, DOGM Feb 94  
& USFS



#### 4.17.6 Subsidence Control

The Permittee plans to conduct the underground mining operations so as to prevent subsidence from causing material effect to the surface and to maintain the value and reasonable foreseeable use of that surface in accordance with the preceding subsidence control plan.

#### 4.17.7 Public Notice

Since the surface ownership of the areas of planned subsidence is vested in the United States and is under the authority of the U.S. Forest Service, the annual subsidence monitoring report will be provided to them and to the regulatory authority.

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