Wellhead pressure is restricted to less than 0.63 psi per foot of well depth. Injection rates are adjusted to maintain wellhead pressure below that level.

Each new production well (extraction and injection) will continue to be pressure tested to confirm the integrity of the casing prior to being used for mining operations. Wells that fail pressure testing will be repaired or cemented and replaced as necessary.

Water level measurements will continue to be routinely performed in the production zone and overlying aquifer. Sudden changes in water levels within the production zone may indicate that the wellfield flow system is out of balance. Flow rates would be adjusted to correct this situation. Increases in water levels in the overlying aquifer may be an indication of fluid migration from the production zone. Adjustments to well flow rates or complete shut down of individual wells may be required to correct this situation. Increases in water levels in the overlying aquifer may also be an indication of casing failure in a production, injection or monitor well. Isolation and shut down of individual wells can be used to determine the well causing the water level increases.

To ensure the leach solutions are contained within the designated area of the aquifer being mined, the production zone and overlying aquifer monitor wells will continue to be sampled once every two weeks as discussed in **Section 5.8.8**.

3.1.4 Process Description

Uranium solution mining is a process that takes place underground, or in-situ, by injecting lixiviant (leach) solutions into the ore body and then recovering these solutions when they are rich in uranium. The chemistry of solution mining involves an oxidation step to convert the uranium in the solid state to a form that is easily dissolved by the leach solution. Hydrogen peroxide (H_2O_2) or gaseous oxygen (O_2) is typically used as the oxidant because both revert to naturally occurring substances. Carbonate species are also added to the lixiviant solution in the injection stream to promote the dissolution of uranium as a uranyl carbonate complex.

The reactions representing these steps at a neutral or slightly alkaline pH are:

Oxidation: $UO_{2\ (solid)} + H_2O_{2\ (in\ solution)} \rightarrow UO_{3\ (at\ solid\ surface)} + H_2O$

$UO_{2\ (solid)} + \frac{1}{2}\ O_{2\ (in\ solution)} \rightarrow UO_{3\ (at\ solid\ surface)}$

Dissolution: $UO_3 + 2\ HCO_3^{-1} \rightarrow UO_2(CO_3)_2^{-2} + H_2O$

$UO_3 + CO_3^{-2} + 2HCO_3^{-1} \rightarrow UO_2(CO_3)_3^{-4} + H_2O$

The principal uranyl carbonate complex ions formed as shown above are uranyl dicarbonate, $(UO_2)\ (CO_3)_2^{-2}$, (UDC), and uranyl tricarbonate $(UO_2)\ (CO_3)_3^{-4}$, (UTC). The relative abundance of each is a function of pH and total carbonate strength.