



**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Oil and Gas Management



# Coal and Water Protection

PADEP: Well Plugging & Subsurface Activities Division  
Bureau of Oil and Gas Planning & Program Management

# ▶ Review of Applicable Regulations & Laws

***Coal protective casing:*** A string of pipe which is installed in the well for the purpose of coal segregation and protection. In some instances the coal protective casing and the surface casing may be the same.

***Surface casing:*** A string or strings of casing used to isolate the wellbore from fresh groundwater and to prevent the escape or migration of gas, oil or other fluids from the wellbore into fresh groundwater. The surface casing is also commonly referred to as the water string or water casing.

***Intermediate casing:*** A string of casing set after the surface casing and before production casing, not to include coal protection casing, that is used in the wellbore to isolate, stabilize or provide well control.

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***Deepest Fresh Groundwater:*** The deepest fresh groundwater bearing formation penetrated by the wellbore as determined from drillers logs from the well or from other wells in the area surrounding the well or from historical records of the normal surface casing seat depths in the area surrounding the well, whichever is deeper.

***Fresh Groundwater:*** Water in that portion of the generally recognized hydrologic cycle which occupies the pore spaces and fractures or saturated subsurface materials.

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# Review of Applicable Regulations & Laws

## Act 13:

§ 3217 Must protect fresh ground water

§ 3217 Specific citations related to mine voids and workable coals

- § 3217(c) Coal removed: the well shall be drilled and cased to prevent migration of gas or fluids into the seam from which coal has been removed in a manner prescribed by regulation of the department
- § 3217(d) Coal intact: the well shall be drilled to a depth and of a size sufficient to permit placement of casing, packers in and vents on the hole at the points and in the manner prescribed by regulation to exclude gas or fluids from the coal

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# Review of Applicable Regulations & Laws

## Act 13:

§ 3219 Must have sufficient casing strength and safety devices

§ 3259 Defines unlawful conduct

- Conduct an activity related to drilling for or production of oil and gas:
  - (i) contrary to this chapter, rules or regulations adopted under this chapter, an order of the department or a term or condition of a permit issued by the department; or
  - (ii) in any manner as to create a public nuisance or adversely affect public health, safety, welfare or the environment



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# Review of Applicable Regulations & Laws

## **Act 214:**

Communication with coal owner

- Notification of well bore deviations with 60 days of completion

## **Act 359:**

During drilling, casing, operation, and plugging of wells

- Prevent escape of oil and gas
- Prevent detrimental water intrusion into oil or gas pool
- Prevent blowouts, cavings, seepages, and fires

## **25 Pa. Code Chapter 79**

### **§ 79.12** Waste prevention

Casing recommendations – waste prevention through use of suitable and safe surface casing

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# Review of Applicable Regulations & Laws

## 25 Pa. Code Chapter 78

### § 78.71 Use of safety devices – well casing.

- Discusses equipping wells with proper casing and control devices and to address concerns regarding chemical environments and potential mechanical damage to the well.

### § 78.73 General provision for well construction and operation

- The operator shall prevent gas, oil, brine, completion and servicing fluids, and any other fluids or materials from below the casing seat from entering fresh groundwater, and shall otherwise prevent pollution or diminution of fresh groundwater.

### § 78.81 Casing and cementing – General provisions

- The operator shall drill through fresh groundwater zones with diligence and as efficiently as practical to minimize drilling disturbance and commingling of groundwaters.

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# Review of Applicable Regulations & Laws

## 25 Pa. Code Chapter 78

§ 78.83 Surface and coal protective casing and cementing procedures

§ 78.84 Casing standards

- The operator shall install casing that can withstand the effects of tension, and prevent leaks, burst and collapse during its installation, cementing and subsequent drilling and producing operations.
- When casing through a workable coal seam, the operator shall install coal protective casing that has a minimum wall thickness of 0.23 inch.

§ 78.85 Cement standards

- Isolate the wellbore from fresh groundwater
- Protect the casing from corrosion as a result of, and degradation by, the geochemical, lithologic and physical conditions of the surrounding wellbore.

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§ 78.86 Defective casing or cementing

§78.87 and § 78.401 Additional casing and cementing relevant in gas storage areas

- To protect the gas storage reservoir, an operator shall run intermediate or production casing from a point located at least 100 feet below the gas storage horizon to the surface. The operator shall cement this casing by circulating cement to a point at least 200 feet above the gas storage reservoir or gas storage horizon.
- Cement the surface and intermediate casings with sufficient cement to circulate cement to the surface or to equal at least 120% of the calculated volume to fill the annular space on the outside of the casing.



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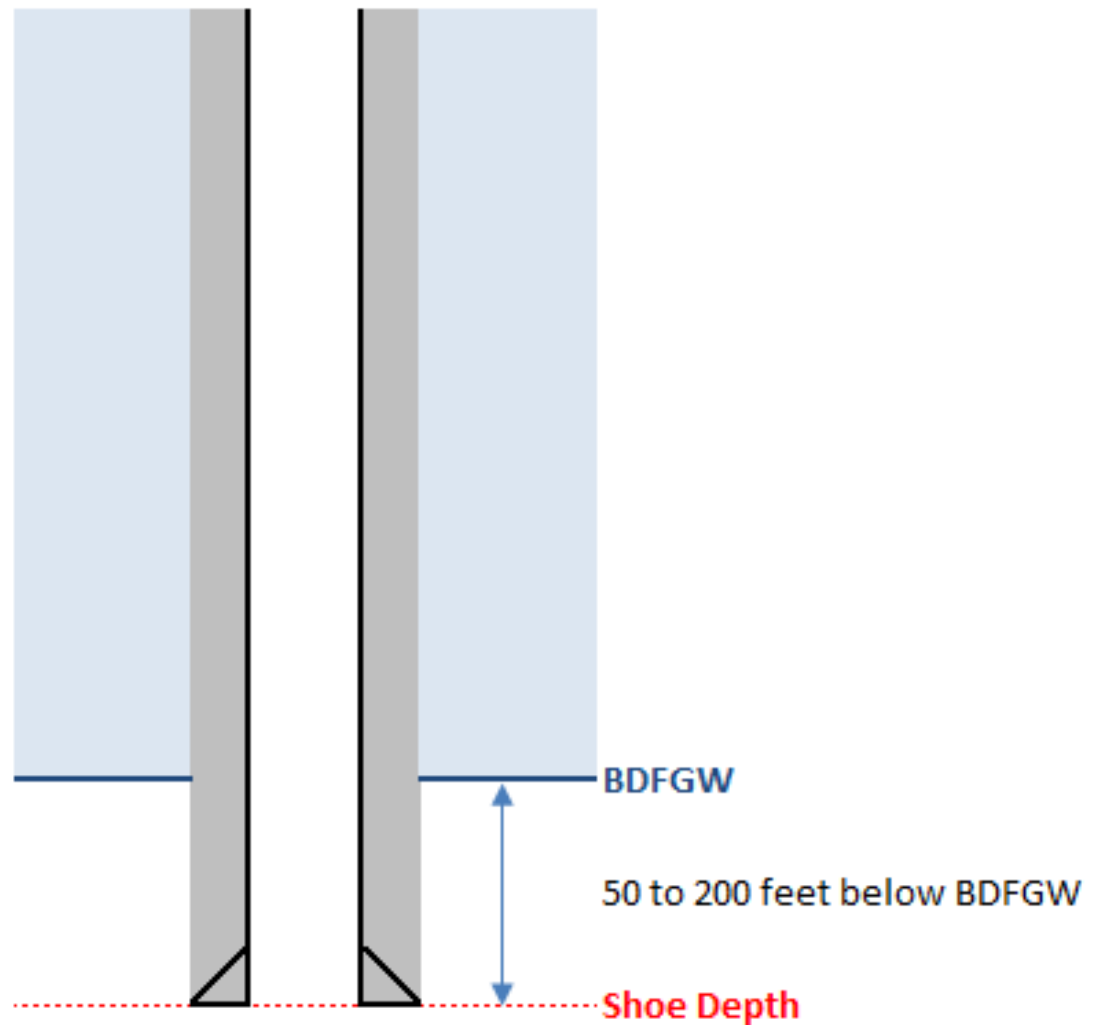
# Corresponding Casing Designs for Both Freshwater and Coal Isolation

- A Note on “Workable” Coals...
  - Per policy, workable coals are defined as **laterally extensive** seams that are **at least 28 inches thick** and **deeper than 100 feet** as measured from the land surface
  - “Laterally extensive” refers to one of the 13 potential bituminous coal seams (listed from shallowest to deepest):
    - Washington
    - Waynesburg
    - Sewickley
    - Redstone
    - Pittsburgh
    - U. Freeport
    - L. Freeport
    - U. Kittanning
    - M. Kittanning
    - L. Kittanning
    - Clarion
    - Brookville
    - Mercer

# Corresponding Casing Designs for Both Freshwater and Coal Isolation

## Surface Casing Scenarios – Standard: 78.83(c)

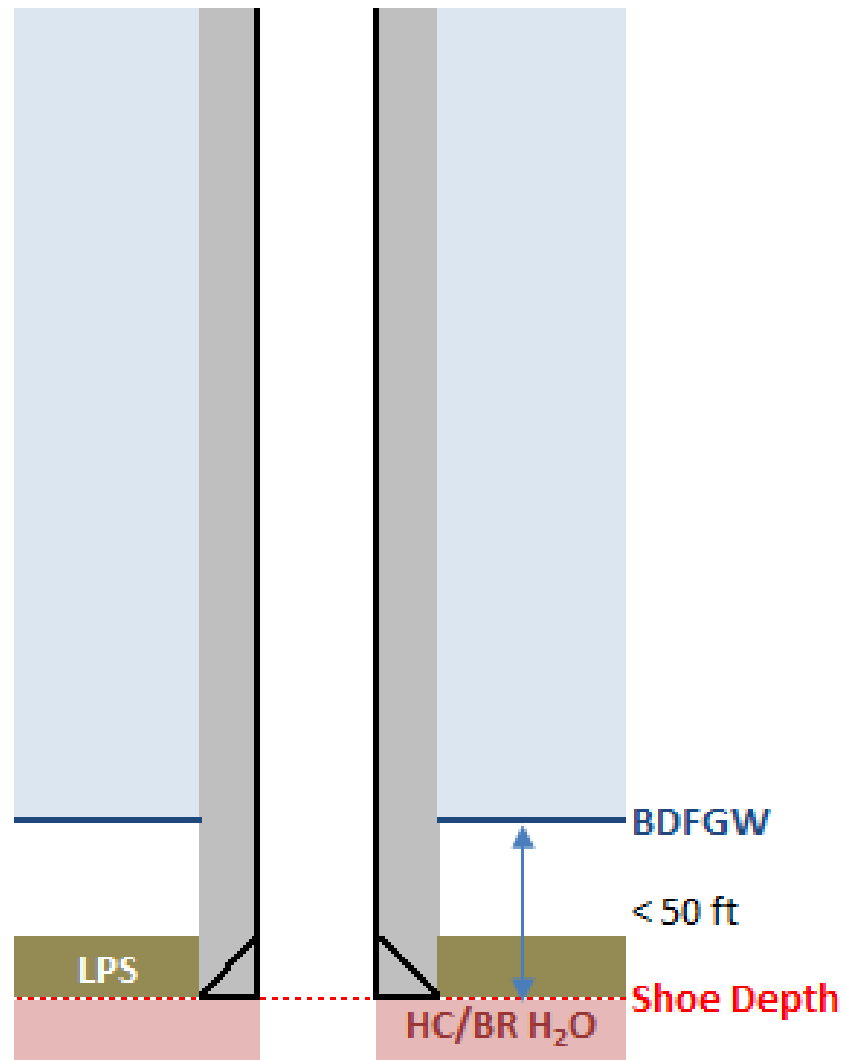
**BDFGW:** Base of  
Deepest Fresh  
Groundwater



# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Surface Casing Scenarios – Hydrocarbon/Brine Zone Within 50 Feet of Shoe: 78.83(e)

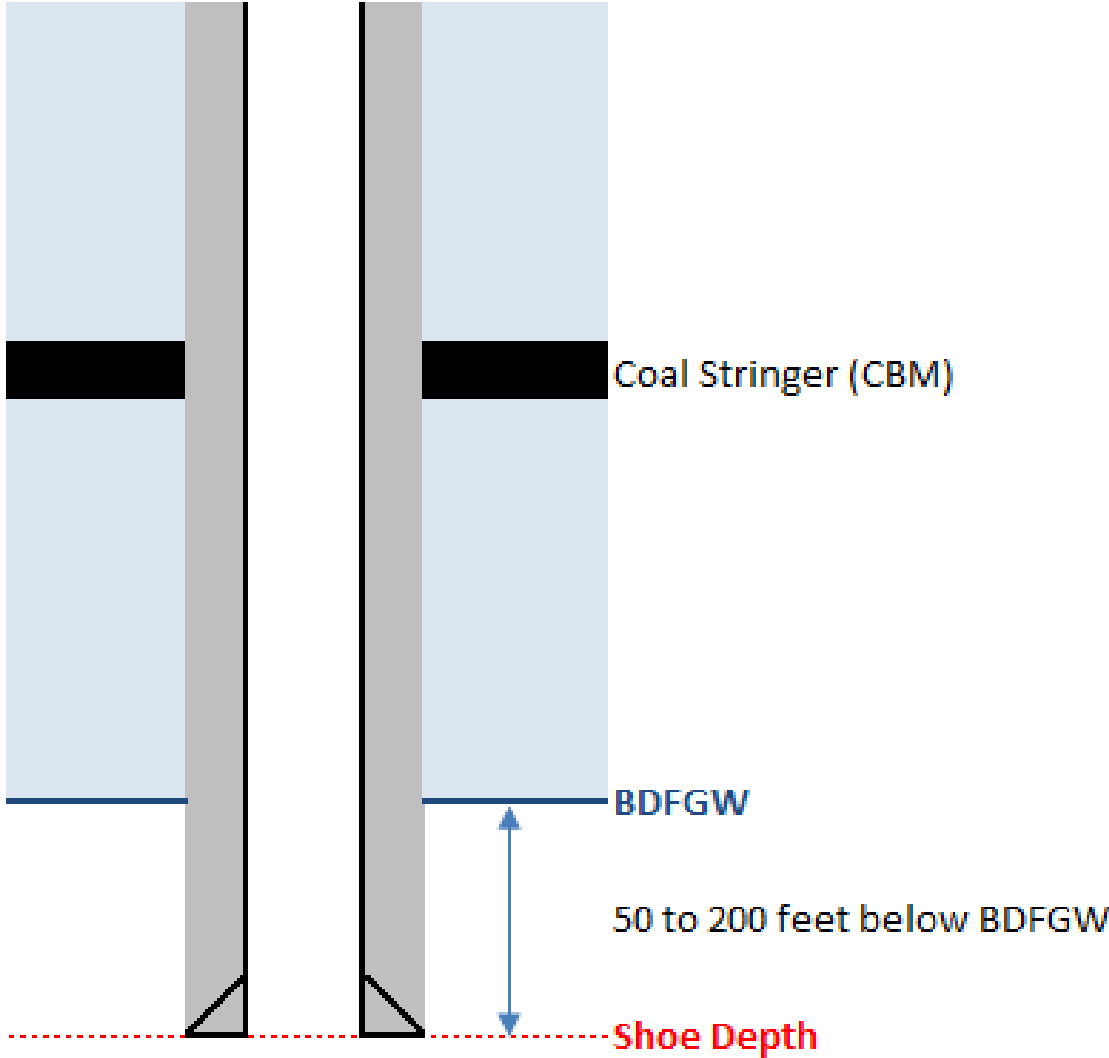
**LPS:** Low Permeability Seal  
**HC:** Hydrocarbon  
**BR H<sub>2</sub>O:** Brine/ Brackish Water



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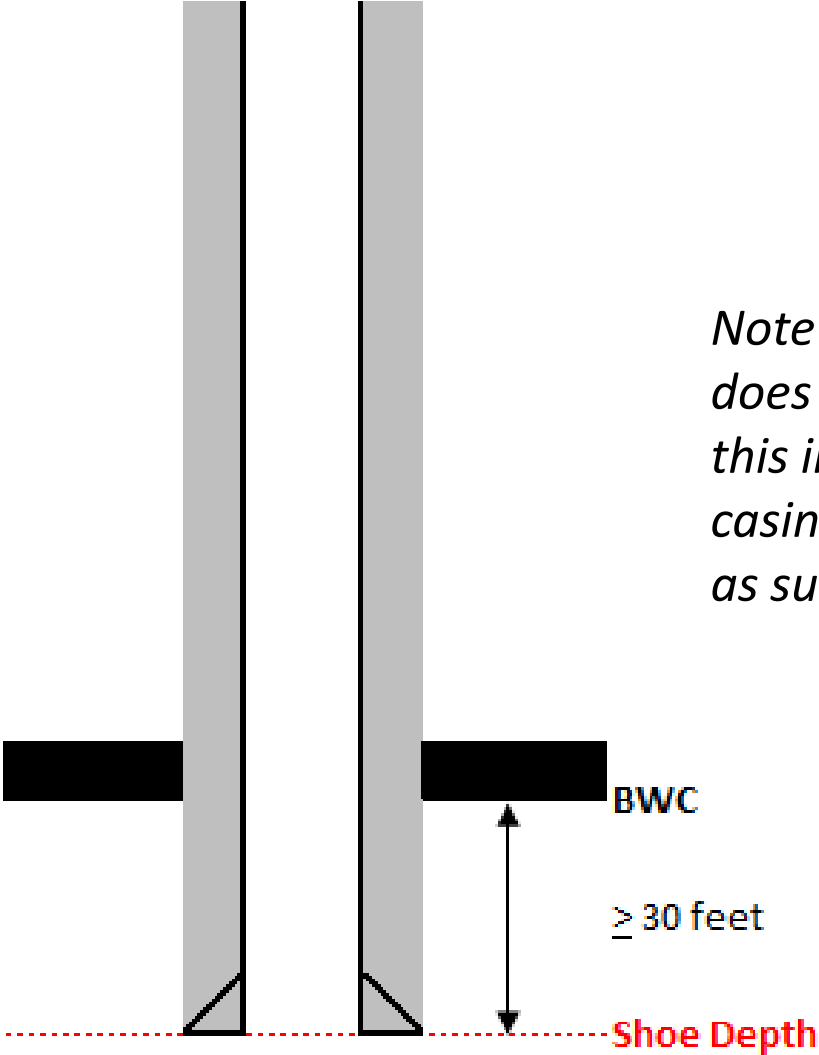
**BDFGW:** Base of  
Deepest Fresh  
Groundwater  
**CBM:** Coalbed  
Methane



# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Coal Protective Casing Scenarios – Standard: Single, Intact Coal Seam that is “Workable”:  
78.83(g)

**BWC:** Base of Workable Coal

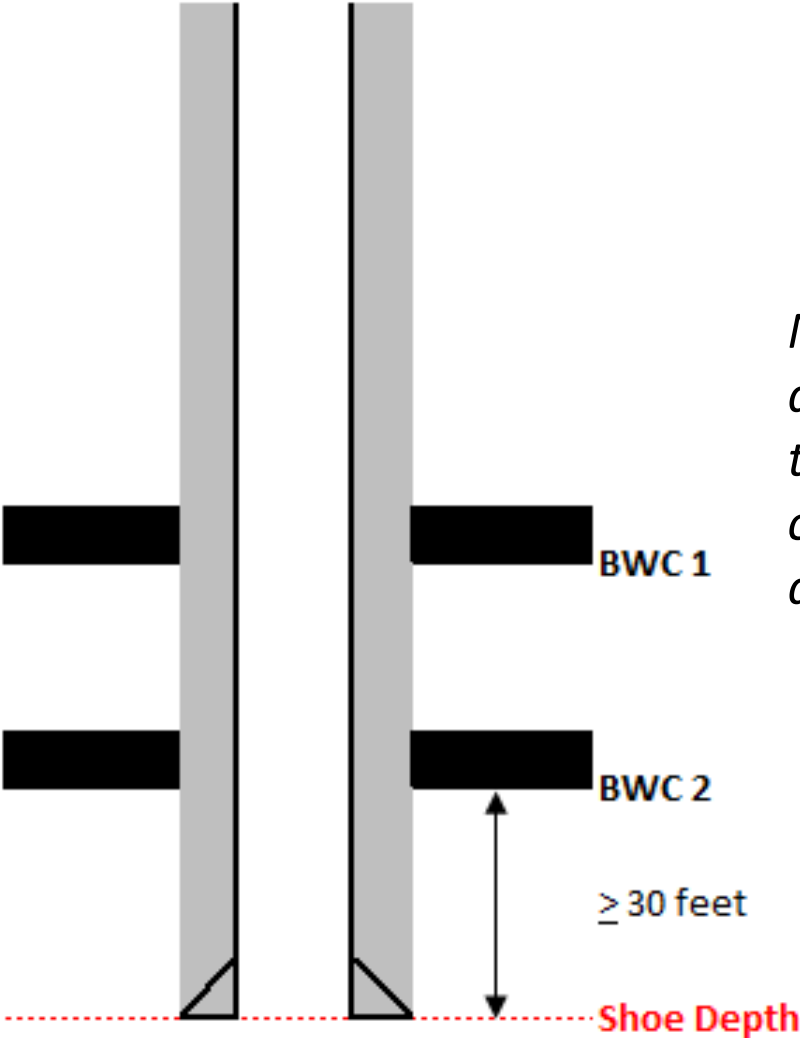


*Note water quality does not matter over this interval unless casing is also serving as surface string*

# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Coal Protective Casing Scenarios – Multiple, Intact Coal Seams that are “Workable”:  
78.83(g)

**BWC:** Base of Workable Coal

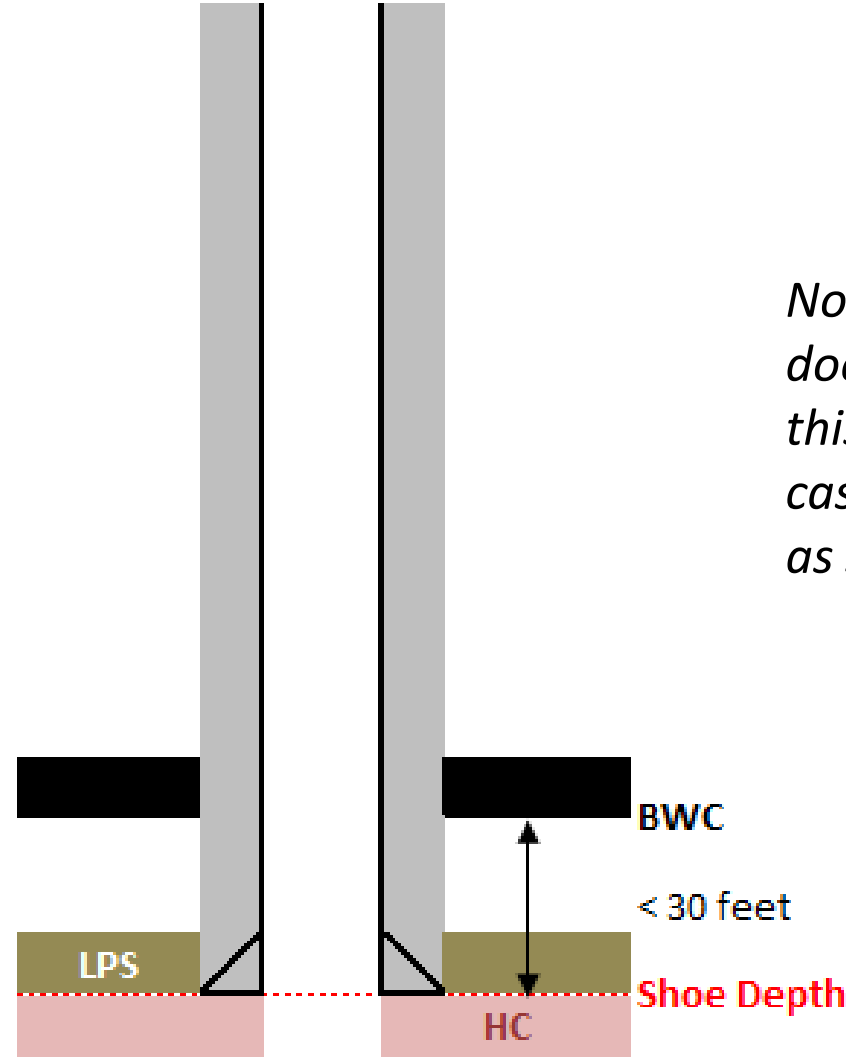


*Note water quality does not matter over this interval unless casing is also serving as surface string*

# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Coal Protective Casing Scenarios – Single, Intact Coal Seam that is “Workable” with Shallow Gas Zone: 78.83(g) and Act 13, Section 3217(d)

**BWC:** Base of Workable Coal  
**LPS:** Low Permeability Seal  
**HC:** Hydrocarbon



*Note water quality does not matter over this interval unless casing is also serving as surface string*

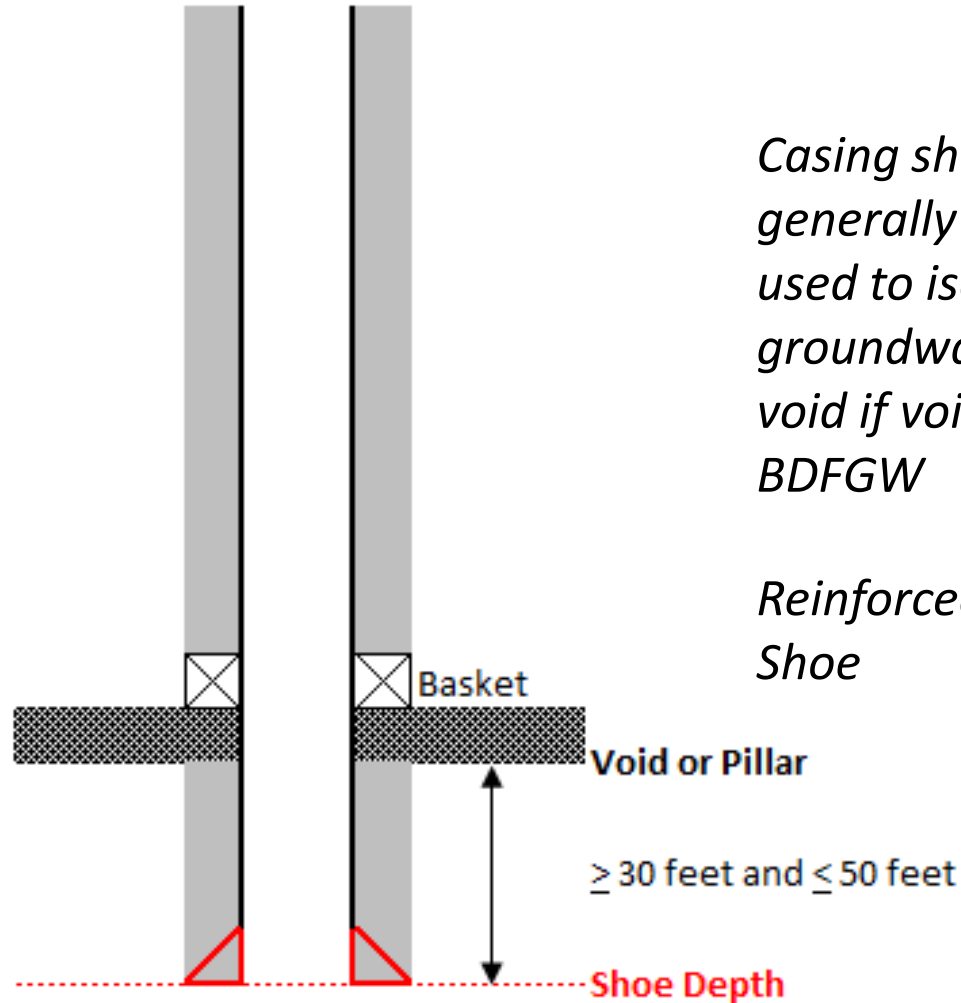


# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Mine Protective Casing Scenarios – Standard: Single, Voided Coal Seam/Pillar: 78.83(h)

*Stage cementing preferred as BMP*

*Casing should generally not be used to isolate fresh groundwater and void if void is below BDFGW*



*Reinforced Casing Shoe*

$\geq 30$  feet and  $\leq 50$  feet

**Shoe Depth**

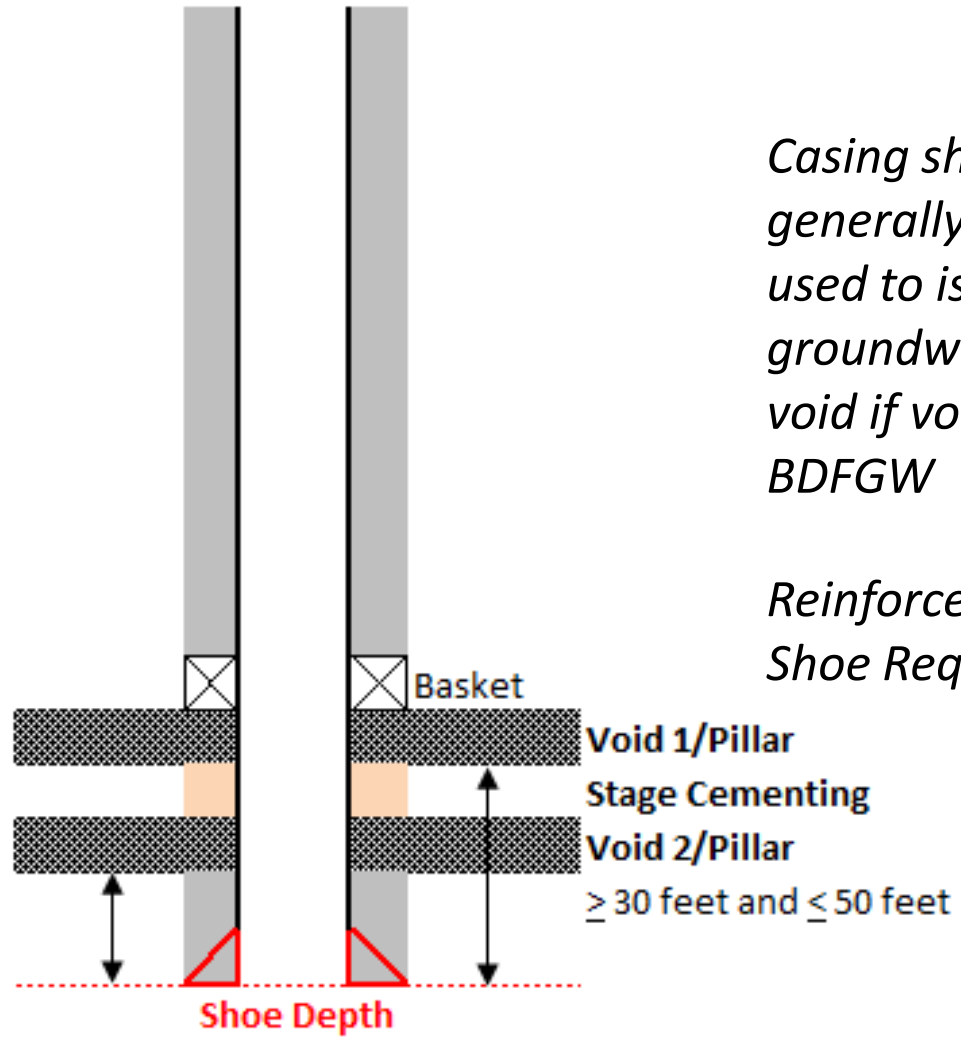
# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Mine Protective Casing Scenarios – Multiple, Voided Coal Seams within 50 feet/Pillar:  
78.83(h) and Act 13, 3217(c)

*Stage cementing  
necessary*

*Casing should  
generally not be  
used to isolate fresh  
groundwater and  
void if void is below  
BDFGW*

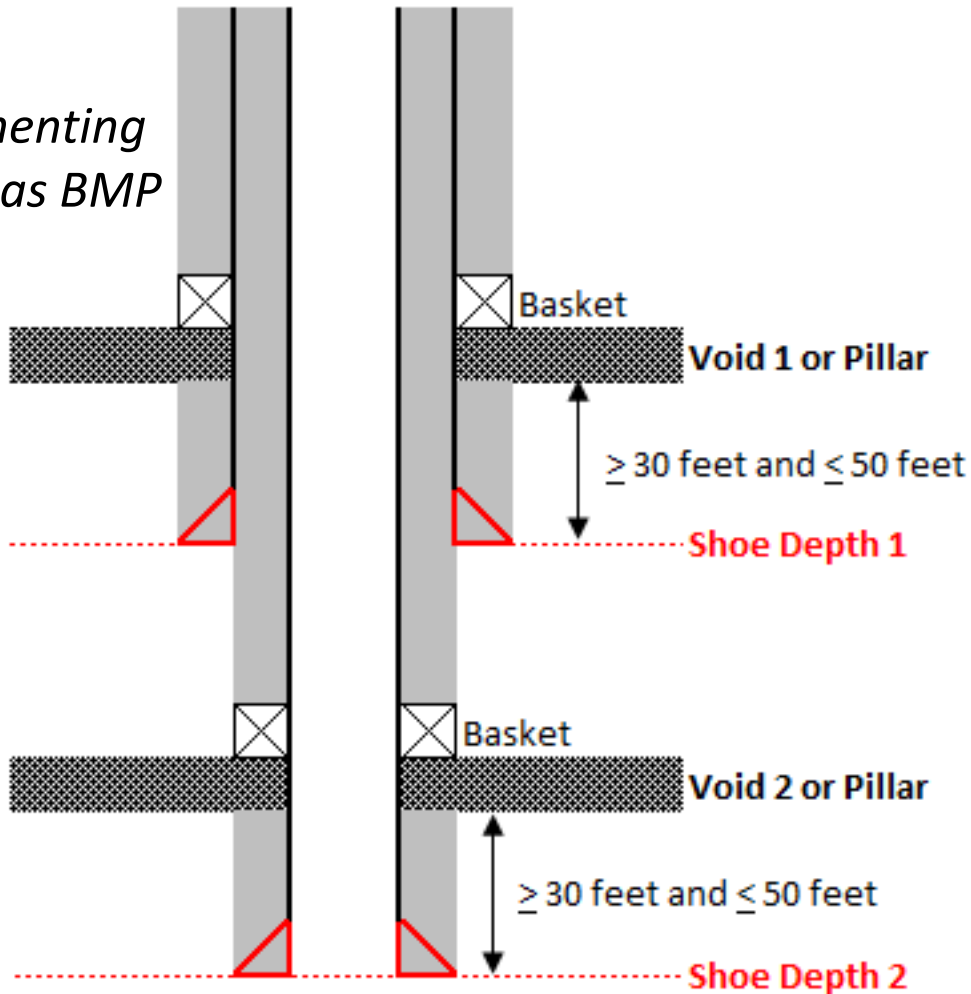
*Reinforced Casing  
Shoe Required*



# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Mine Protective Casing Scenarios – Standard: Multiple, Voided Coal Seams Greater than 50 feet Apart/Pillar: 78.83(h)

*Stage cementing preferred as BMP*



*Casing should generally not be used to isolate fresh groundwater and void if void is below BDFGW*

*Reinforced Casing Shoes Required*

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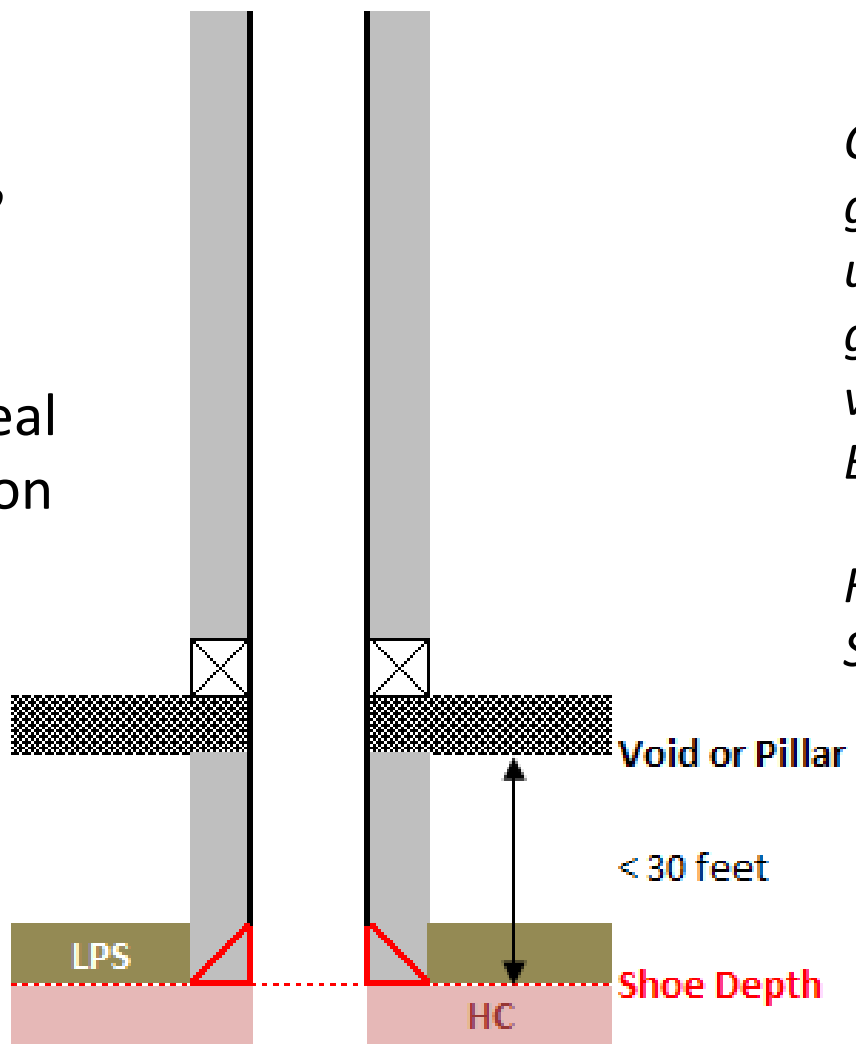
Mine Protective Casing Scenarios – Single, Voided Coal Seam/Pillar and Hydrocarbon Zone Within 50 Feet of Shoe : 78.83(h) and Act 13, Section 3217(c)

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**LPS:** Low Permeability Seal  
**HC:** Hydrocarbon

*Casing should generally not be used to isolate fresh groundwater and void if void is below BDFGW*

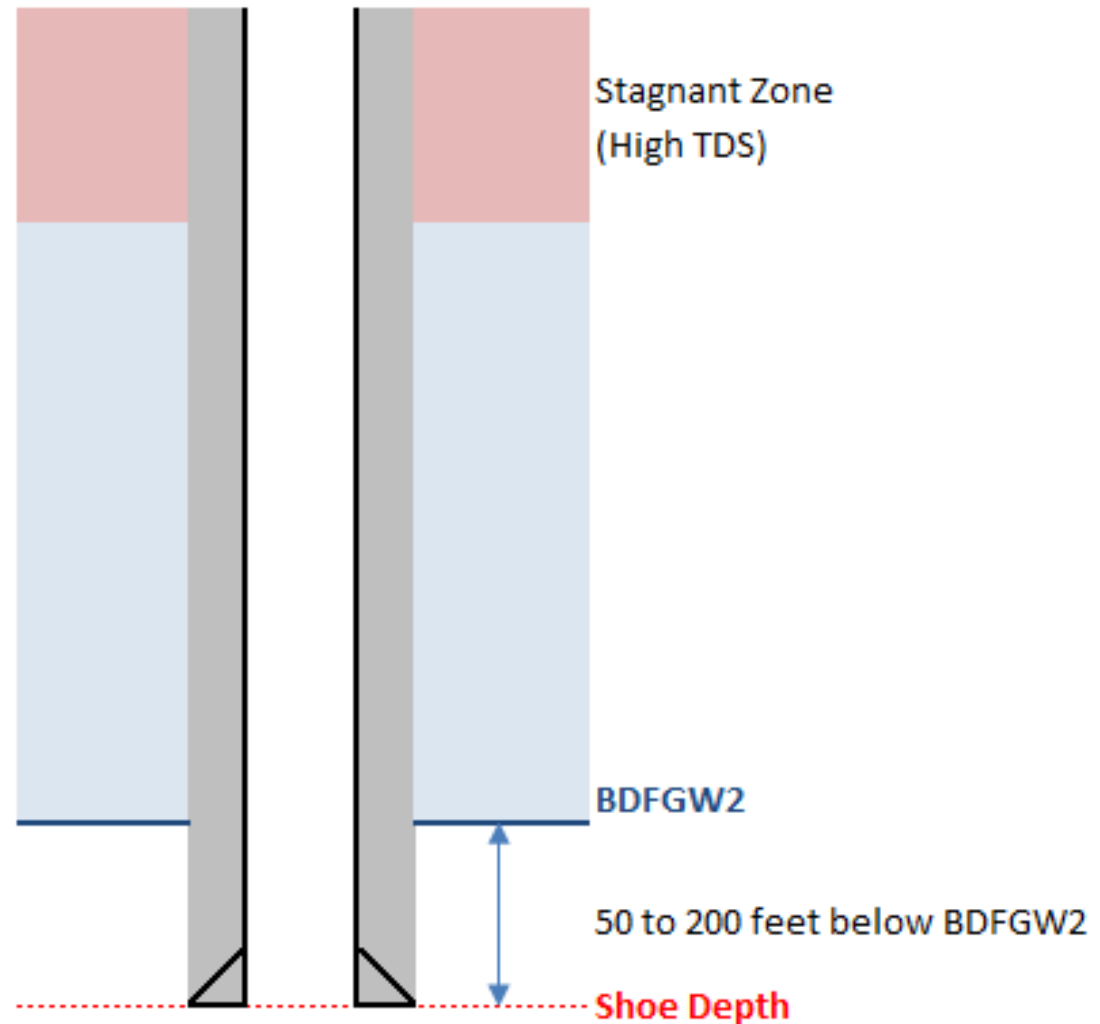
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# Corresponding Casing Designs for Both Freshwater and Coal Isolation

Fresh Groundwater Zone Below Initial Base of “Deepest” Fresh Groundwater, i.e.,  
Secondary Surface Casing Scenarios – Standard: 78.83(e) and (f)

**BDFGW2:** Base of  
Lower Deepest  
Fresh  
Groundwater  
**TDS:** Total  
Dissolved Solids



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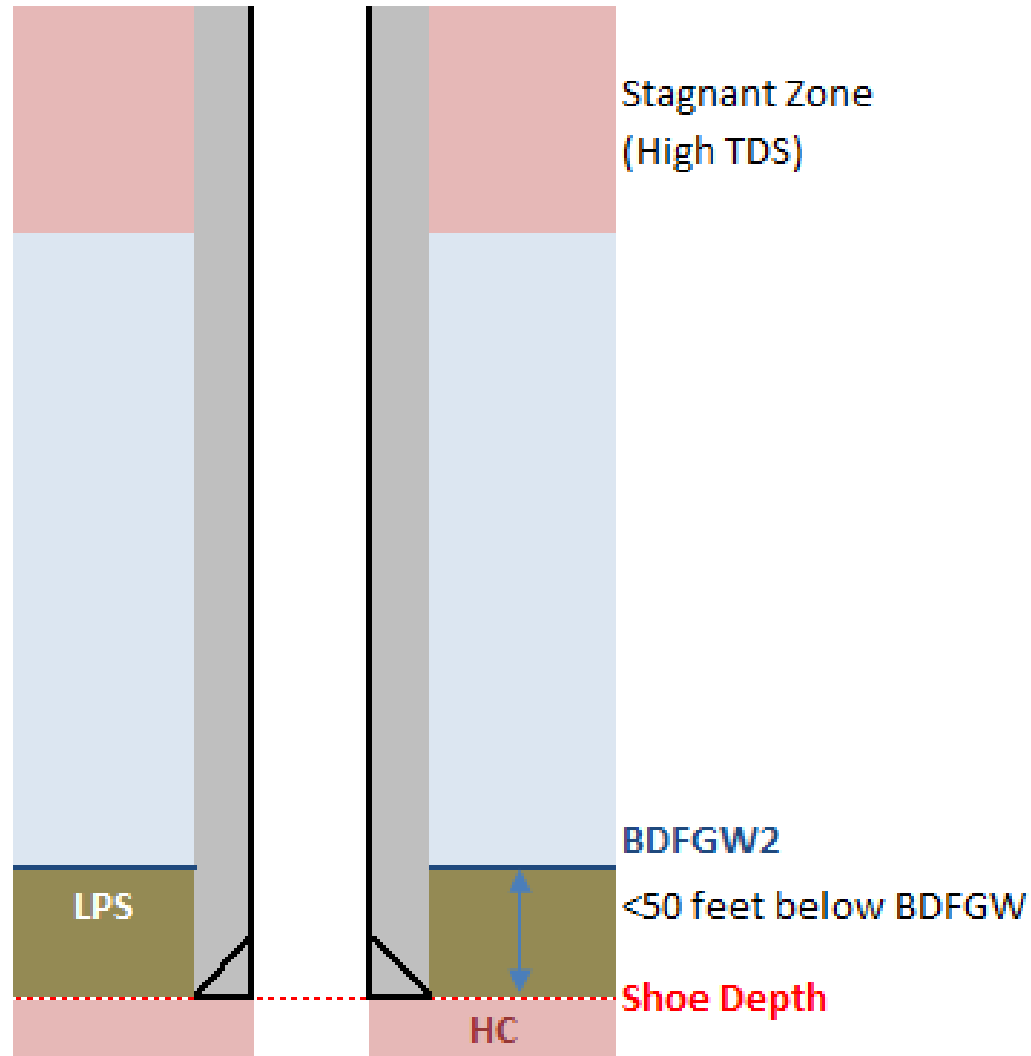
Fresh Groundwater Zone Below Initial Base of “Deepest” Fresh Groundwater, i.e., Secondary Surface Casing Scenarios – Shallow Hydrocarbon Zone: 78.83 (e) and (f)

**BDFGW2:** Base of Lower Deepest Fresh Groundwater

**LPS:** Low Permeability Seal

**TDS:** Total Dissolved Solids

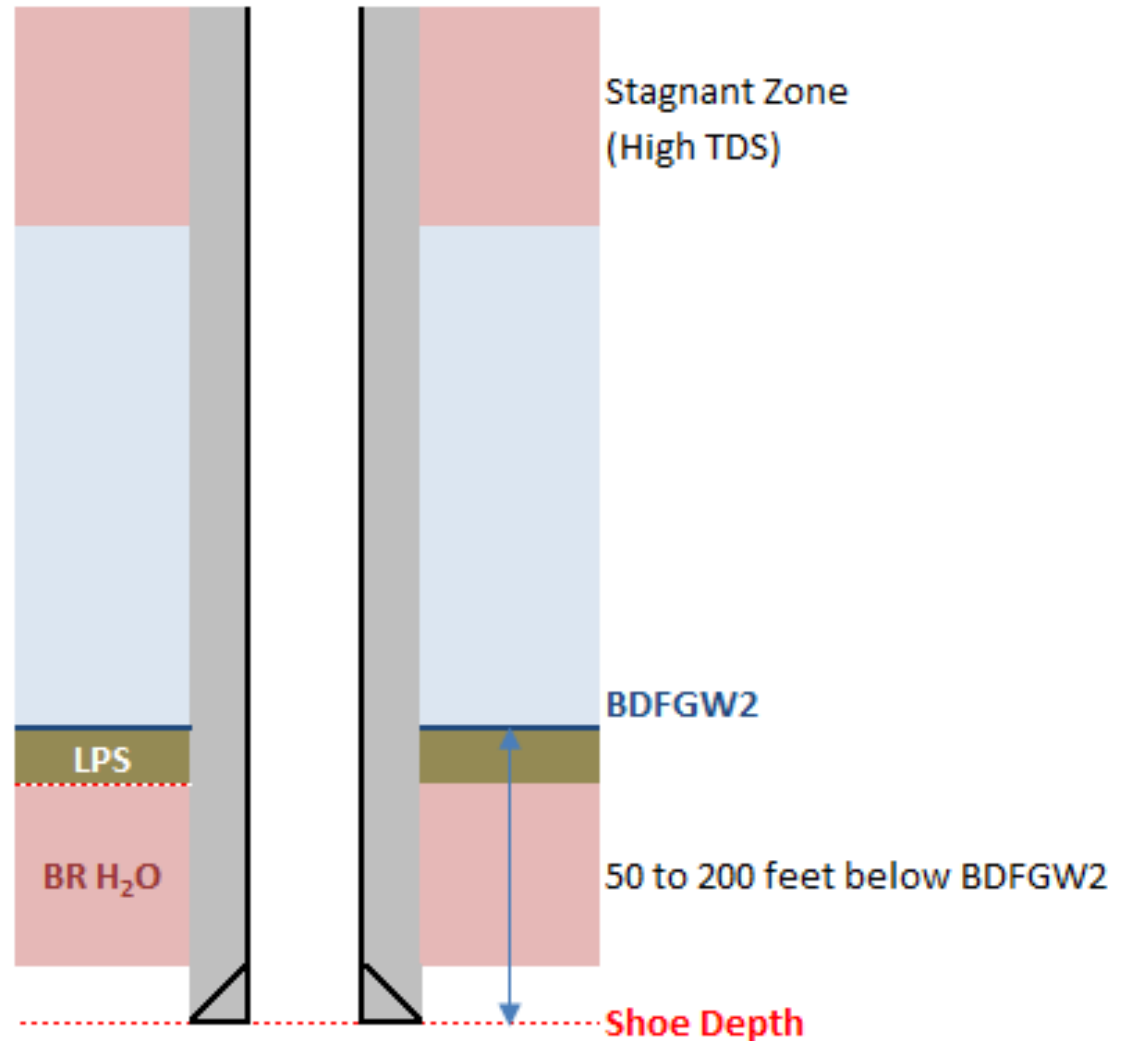
**HC:** Hydrocarbon



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Fresh Groundwater Zone Below Initial Base of “Deepest” Fresh Groundwater; i.e.,  
Secondary Surface Casing Scenarios – Shallow Brine/Brackish Water: 78.83 (e) and (f)

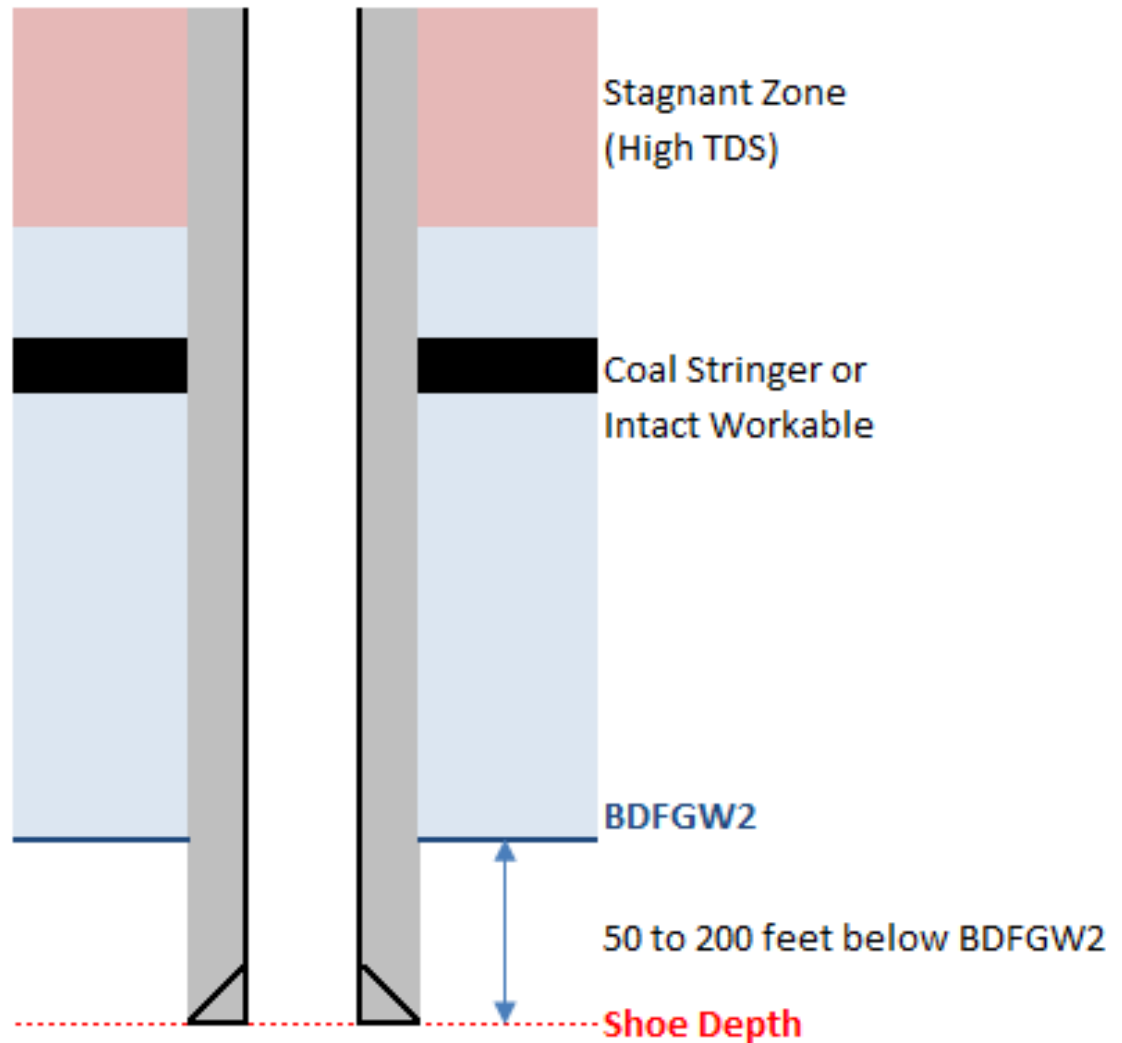
**BDFGW2:** Base of Lower Deepest Fresh Groundwater  
**TDS:** Total Dissolved Solids  
**BR H<sub>2</sub>O:** Brine/Brackish Water  
**LPS:** Low Permeability Seal



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# Thanks!

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**Please contact Seth Pelepko with any questions**

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Special acknowledgments to Doug Catalano, Stew Beattie, Lindsay Byron, Harry Wise, Rick Swank, and Bruce Jankura for their contributions.