Calculation of Drainage Areas

Pc = 670 psia
Tc = 387 degrees R are the critical properties of the Feather Morrow gas

T = 184 degrees F or 644 degrees R is the bottomhole temperature
P = 5481 psia is the original bottom-hole pressure from DST #3 on UTP #1

Then, Pr = Pressure/Pc = 5481/670 = 8.18
Tr = Temperature/Tc = 644/387 = 1.66
The Standing and Katz chart says the Compressibility Factor (z) = 1.02 for this gas.

The formation volume factor is Bg = 35.35*P/z*T
where P = 5481 psi
z = 1.02
T = 644 degrees R

so that Bg = 35.35*5481/(1.02*644)
Bg = 295 Scf per cubic foot

Then, we calculate the drainage area (A) from the volumetric equation

Gp = Rf*43560*A*H*Phi*(1-Sw)*Bg

where Gp = Gas Produced in Scf
Rf = Recovery Factor (assumed equal to 0.80 for normal rock)
A = Drainage Area in acres
H = Reservoir height in feet
Phi = Reservoir porosity, fraction
Sw = Water Saturation, fraction
Bg = Formation Volume Factor in Scf/cubic foot

Note that H*Phi*(1-Sw) = H*Phi*Sg is the hydrocarbon pore volume calculated for each of the wells.

Now Gp = 0.80*43560*A*[H*Phi*Sg]*295

Gp = 5.719*10^6*A*[H*Phi*Sg]

and **A = 1.748*10^-7*Gp/[H*Phi*Sg]**

where we already know the equivalent gas produced (Gp) and the hydrocarbon pore volume (H*Phi*Sg) for each of the wells.

As an example for the current drainage area of the UTP #1 well,

A = 1.748*10^-7*1.792*10^9/1.826

A = 313.2/1.826 = **172 acres**

Yates Petroleum
Case 12596
Exhibit 17