## Red Hill Hypothetical Release Rates

Assumptions for both scenarios:
- Leak rate of .499 gallons per hours being the maximum theoretically possible based on current Tank Tightness Testing certifications (worst case scenario)
- The leaking tank is at the high operating limit of 212' and is holding 269,000 BBLS of fuel (worst case scenario)
- The leaking tank is a JP-5 tank (most likely scenario)
- Tank is idle (no fuel in or out) (most likely scenario)
- Leak is at dead bottom center of tank bottom of tank (worst case scenario)
- As tank empties, the release rate remains constant at .499 gallons regardless of decreased head pressure
- Flow rate of fuel to Tank 55 will average 5,000 BBLS per hour
- Flow rate from Tank 55 to Red Hill tank will be 5,000 BBLS per hour

UFM alarm parameter:
~ 306 gallons per 1/16" which is the maximum amount per 1/16" and it will actually be less given the reduction in volume in the upper and lower domes and also this doesn't take into account anything which reduces volume within the tank to include the center tower.
- UFM "Warning" alarm will sound at 1/2" = 2,448 gallons
- UFM "Critical" alarm will sound at 3/4" = 3,672 gallons

Detection:

- At a leak rate of .499 gph the UFM "Warning" alarm will require 4,896 hours or 204 days to alert (2,443.104 gallons), and the UFM "Critical" alarm will require an additional 2,448 hours or 102 days to alert (an additional 1,221.52 gallons).

When certified tight the tanks could leak at a rate of no greater than .499 gph, 11.976 gallons per day, and 4,371.24 gallons per year. (worst case scenario)

Drain Down

SCENARIO I: (Near empty Upper Tank Farm available)

| | |
|---|---|
| Time +0.0 hours: | Operator will align fuel from the affected tank to Tank 55 which has 7' of fuel in the tank |
| Time +22.4 hours: | Operator will finish filling Tank 55 which will remove 112,000 bbls from affected Red Hill tank (157,000 BBLS remain in affected tank) |
| Time +44.8 hours: | Operator will pump up 112,000 BBLS of fuel from Tank 55 to near empty Red Hill tank |
| Time +45.05 hours: | Operator will align fuel from the affected tank to Tank 55 which has 7' of fuel in the tank |
| Time +67.45 hours: | Operator will finish filling Tank 55 which will remove 112,000 bbls from affected Red Hill tank (45,000 BBLS remain in affected tank) |
| Time +77.45 hours: | Operator will pump up 50,000 BBLS of fuel from Tank 55 to near empty Red Hill tank |

| | |
|---|---|
| Time +77.7 hours: | Operator will align fuel from the affected tank to Tank 55 which has sufficient ullage to take the affected tank to low suction |
| Time +86.3 hours: | Operator will finish filling Tank 55 which will remove 43,000 bbls from affected Red Hill tank (1,500 BBLS remain in affected tank) |
| Time +86.3 hours: | Fuel workers will remove the remaining fuel (1,500 BBLS) from the tank bottom drain valve to the main pipeline via temporary hose |
| Time +96.3 hours: | Remaining 1,500 BBLS will finished being removed from tank |
| Time +96.3 hours: | COMPLETE: Tank is empty (will show near zero on AFHE) with only residuals and sludge remaining |

Fuel released during drain down: 48.0537 (~48) gallons lost from determination to empty.

SCENARIO II: (No Upper Tank Farm available)

| | |
|---|---|
| Time +0.0 hours: | Pump up Tank 55 to tanks with available ullage until 112,000 BBLS ullage is available in Tank 55 |
| Time +22.3 hours: | Operator will align fuel from the affected tank to Tank 55 which has 7' of fuel in the tank |
| Time +44.7 hours: | Operator will finish filling Tank 55 which will remove 112,000 bbls from affected Red Hill tank (157,000 BBLS remain in affected tank) |
| Time +66.9 hours: | Operator will pump up 112,000 BBLS of fuel from Tank 55 to near empty Red Hill tank |
| Time +67.1 hours: | Operator will align fuel from the affected tank to Tank 55 which has 7' of fuel in the tank |
| Time +67.45 hours: | Operator will finish filling Tank 55 which will remove 112,000 bbls from affected Red Hill tank (45,000 BBLS remain in affected tank) |
| Time +77.45 hours: | Operator will pump up 50,000 BBLS of fuel from Tank 55 to near empty Red Hill tank |
| Time + hours: | Operator will align fuel from the affected tank to Tank 55 which has has sufficient ullage to take the affected tank to low suction |
| Time +108.6 hours: | Operator will finish filling Tank 55 which will remove 43,000 bbls from affected Red Hill tank (1,500 BBLS remain in affected tank) |
| Time +108.9 hours: | Fuel workers will remove the remaining fuel (1,500 BBLS) from the tank bottom drain valve to the main pipeline via temporary hose |
| Time +118.6 hours: | Remaining 1,500 BBLS will be finished being removed from tank |
| Time +118.6 hours: | COMPLETE: Tank is empty (will show near zero on AFHE) with only residuals and sludge remaining |

Fuel released during drain down: 59.1814 (~59) gallons lost from determination to empty

****For this scenario, it could be a little longer than 118.6 hours if we have to switch between multiple tanks, however this would only add a 2-4 hours so total fuel lost is not likely to exceed ~61 gallons