

USGS REPORT: WHITE MESA URANIUM MILL

Utah Division of Radiation Control
Public Presentation, Blanding Utah
July 9, 2012

USGS Report on White Mesa

- USGS Scientific Information Report, SIR-2011-5231

9 Recommendations Made

- DRC Agrees: Nos. 1, 2, 3, 4, 5, 7, and 9
- DRC Disagrees: No. 6
- DRC Agrees and Disagrees: No. 8

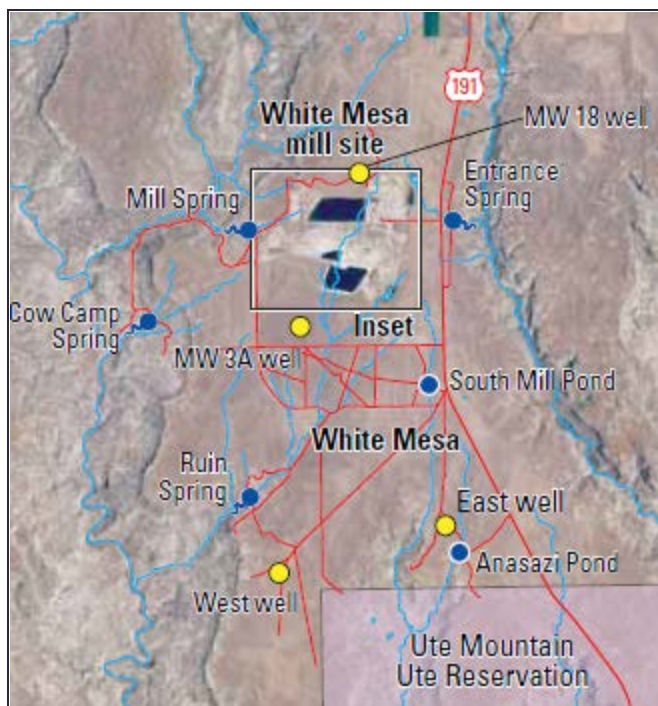
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DRC Disagrees

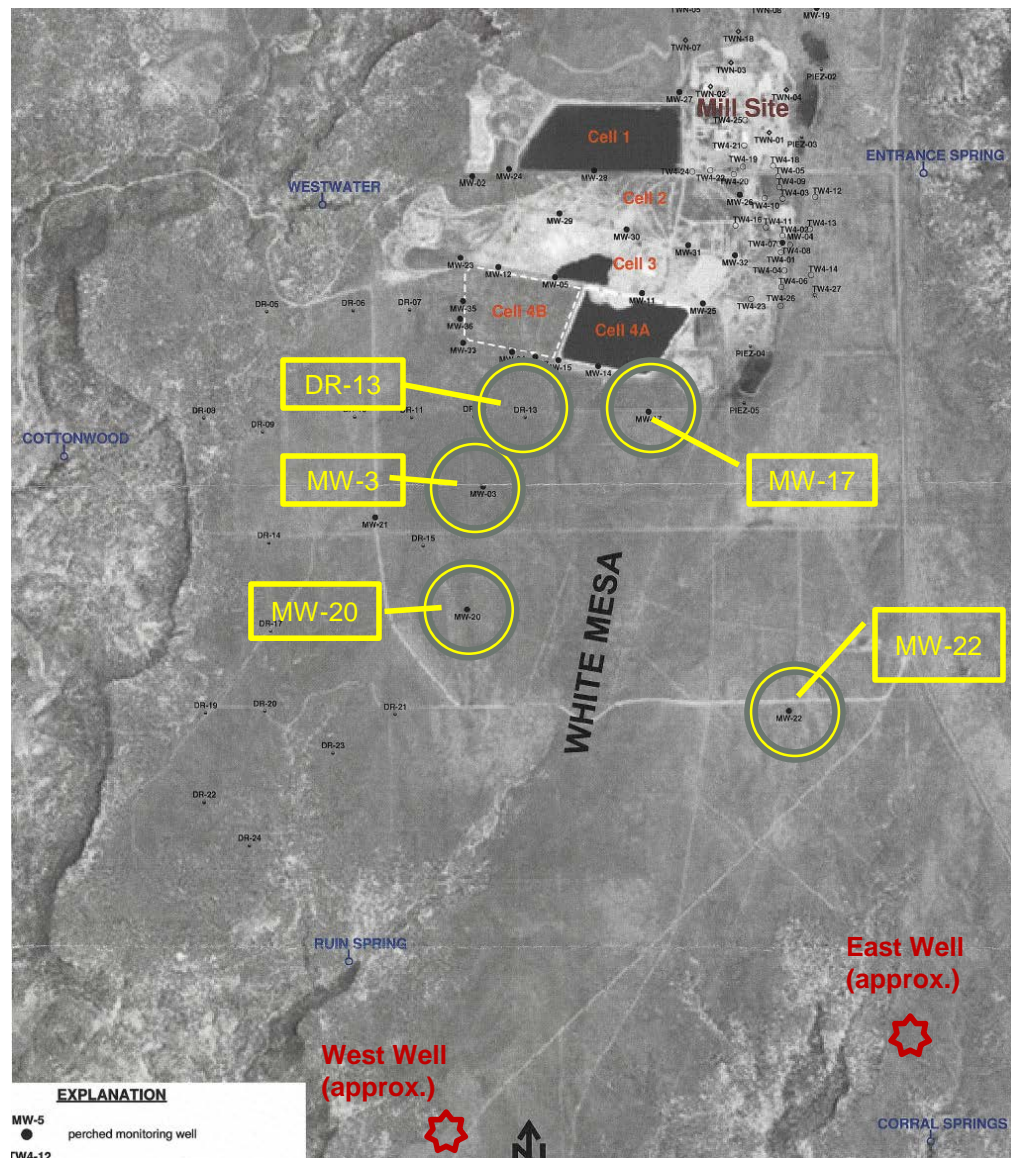
- USGS No. 6:
 - Installation of new monitoring well(s)
 - Upgradient of East and West wells
 - Tribe installed on BLM land
 - Early warning

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DUSA Monitoring Wells to South



USGS SIR, Fig. 19



EXPLANATION
 MW-5 ● perched monitoring well
 TW4-12 ○

DUSA 1st Qtr, 2012 GW Report, Fig. A-1

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DRC Agrees and Disagrees

- USGS No. 8

- Monitoring programs at DUSA should add:

1. Uranium isotopes

- ^{238}U
 - ^{235}U
 - ^{234}U
- DRC agrees,
see response to
USGS No. 2 (below)

2. $\delta^{34}\text{S}$ (ratio of ^{34}S to ^{32}S)

3. $\delta^{18}\text{O}$ (ratio of ^{18}O to ^{16}O)

4. δ Deuterium or $\delta^{2}\text{H}$ (ratio of ^2H to ^1H)

DRC disagrees

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DRC Agrees and Disagrees

- USGS No. 8 - *continued*

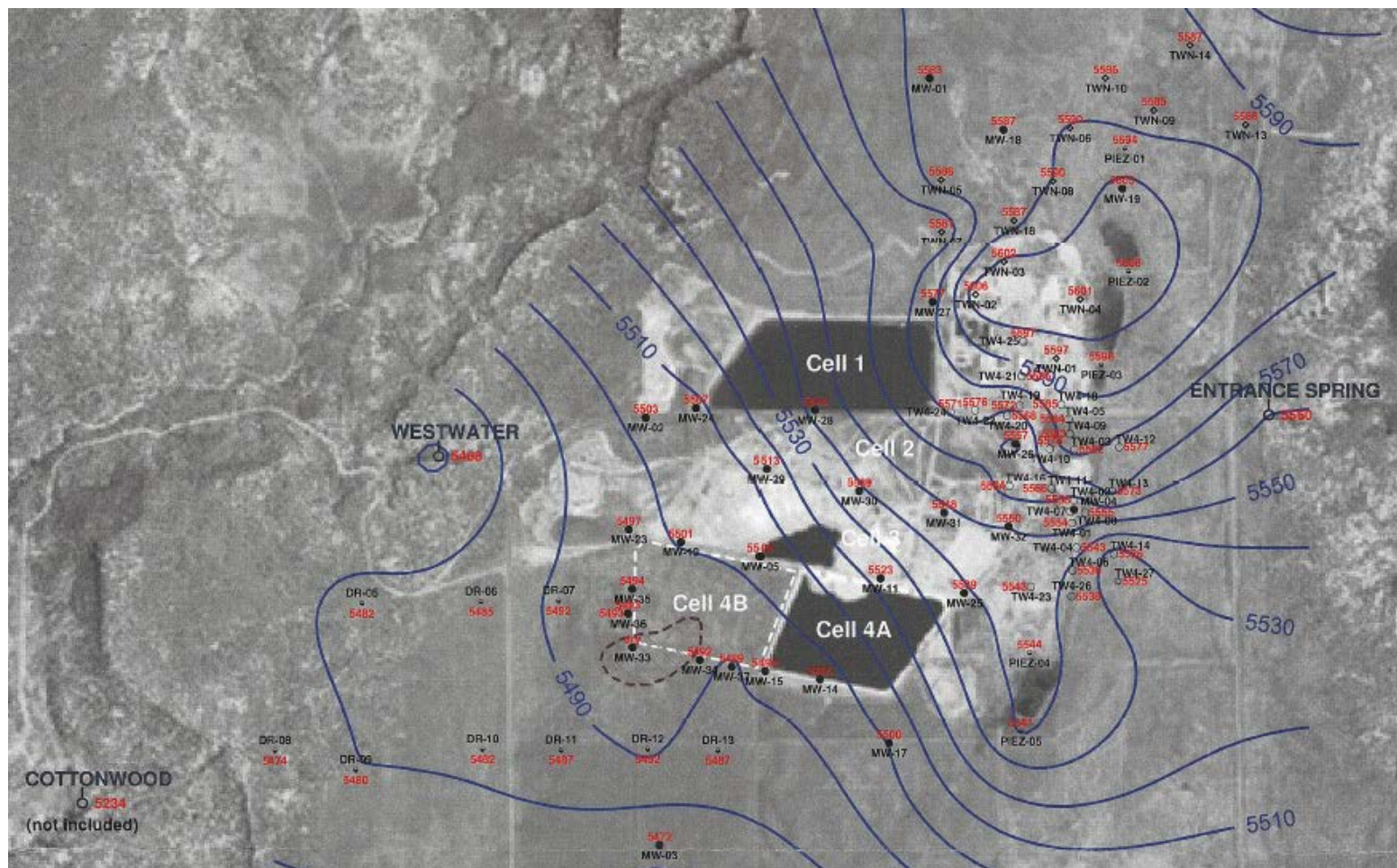
DRC Disagrees because:

- Isotopic analysis
 - Few, if any, standardized methods in Environmental Industry
 - Few laboratories in USA (largely universities)
- Mixed Signals: $\delta^{34}\text{S}$, $\delta^{18}\text{O}$, and $\delta^2\text{H}$
 - DUSA Northwest Wildlife Pond (NWP):
 - Fed by Recapture Reservoir
 - Leaks to Shallow Aquifer (groundwater mound in mill area)
 - NWP $\delta^{34}\text{S}$ Signal: same as tailings wastewater (U. of Utah)
 - ❖ 3 possible transfer mechanisms
 - Ore storage pad runoff – discharge into NWP
 - Air deposition - tailings aerosols
 - Sulfuric acid emissions – mill stacks

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DRC Agrees and Disagrees

- USGS No. 8 – *continued*



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DRC Agrees

- USGS No. 1

1. Quarterly monitoring of springs and wells - should continue
 - Mill Spring (*aka Westwater Spring*)
 - Entrance Spring
 - Cow Camp Spring (*aka Cottonwood Spring*)
 - East and West Wells

DRC Response:

1. Agree for Mill, Entrance, and Cow Camp Springs
 - Caution \Rightarrow Mill Spring flow = seasonal (*no flow in dry years*)
2. Disagree for East and West Wells –
 - Other DUSA wells are: Upgradient
Closer to tailings cells

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DRC Agrees

- USGS No. 1 - *continued*
 2. Monitor: Field Parameters
Major and Trace Elements

DRC Response:

1. Some technical differences in field analysis
 - USGS field tests: HCO₃, CO₃, dissolved Fe, dissolved S₂
 - None = State Ground Water Quality Standards
 - No change in DUSA field parameters expected
2. East and West Wells
 - Tribe is free to sample / analyze for their purposes
3. Major and Trace Elements
 - Most USGS analytes in groundwater, already tested at DUSA

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DRC Agrees

• USGS No. 2

1. Continued monitoring at Entrance Spring needed
 - Due to elevated Uranium (U) concentrations
2. Suggested groundwater tests for:
 - U isotopes
 - $\delta^{34}\text{S}$, $\delta^{18}\text{O}$, and $\delta^2\text{H}$

DRC Response:

1. Agree for U isotopes \Rightarrow Uranium Activity Ratio (UAR)
 - $\text{UAR} = \frac{^{234}\text{U activity}}{^{238}\text{U activity}}$
2. *USGS Research @ Other U mills:* Canon City, CO & Fry Canyon, UT
 - U Tailings wastewater / raffinate: UAR ~ 1.0
 - Natural Shallow Groundwater: $1.24 < \text{UAR} < 1.46$

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DRC Agrees

- USGS No. 2 - *continued*

DRC Response - *continued*:

2. UAR - Standardized Methods: alpha spectrometry
3. More water sources (*besides Entrance Spring*)
 - a) Other Springs (quarterly?)
 - Mill Spring (aka Westwater)
 - Cow Camp Spring (aka Cottonwood)
 - Ruin Spring
 - b) Tailings Wastewater (annual?)
 - c) Monitoring Wells (quarterly & semi-annual?)
 - d) Groundwater Permit \Rightarrow general monitoring parameter

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DRC Agrees

- USGS No. 2 - *continued*

DRC Response - *continued*:

3. Disagree – for $\delta^{34}\text{S}$, $\delta^{18}\text{O}$, and $\delta^2\text{H}$
 - a) Use UAR now instead (may consider others later)
 - b) Same as DRC concerns above (slide 6):
 - Few, if any, standardized methods
 - Limited number of laboratories USA (i.e., universities)
 - Mixed Signals problem (NWP)

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DRC Agrees

- USGS No. 3

1. Annual monitoring at Oasis Spring needed
 - Field Parameters, Major & Trace Elements
2. Millview Well: Needs to be re-drilled
Annual Sampling

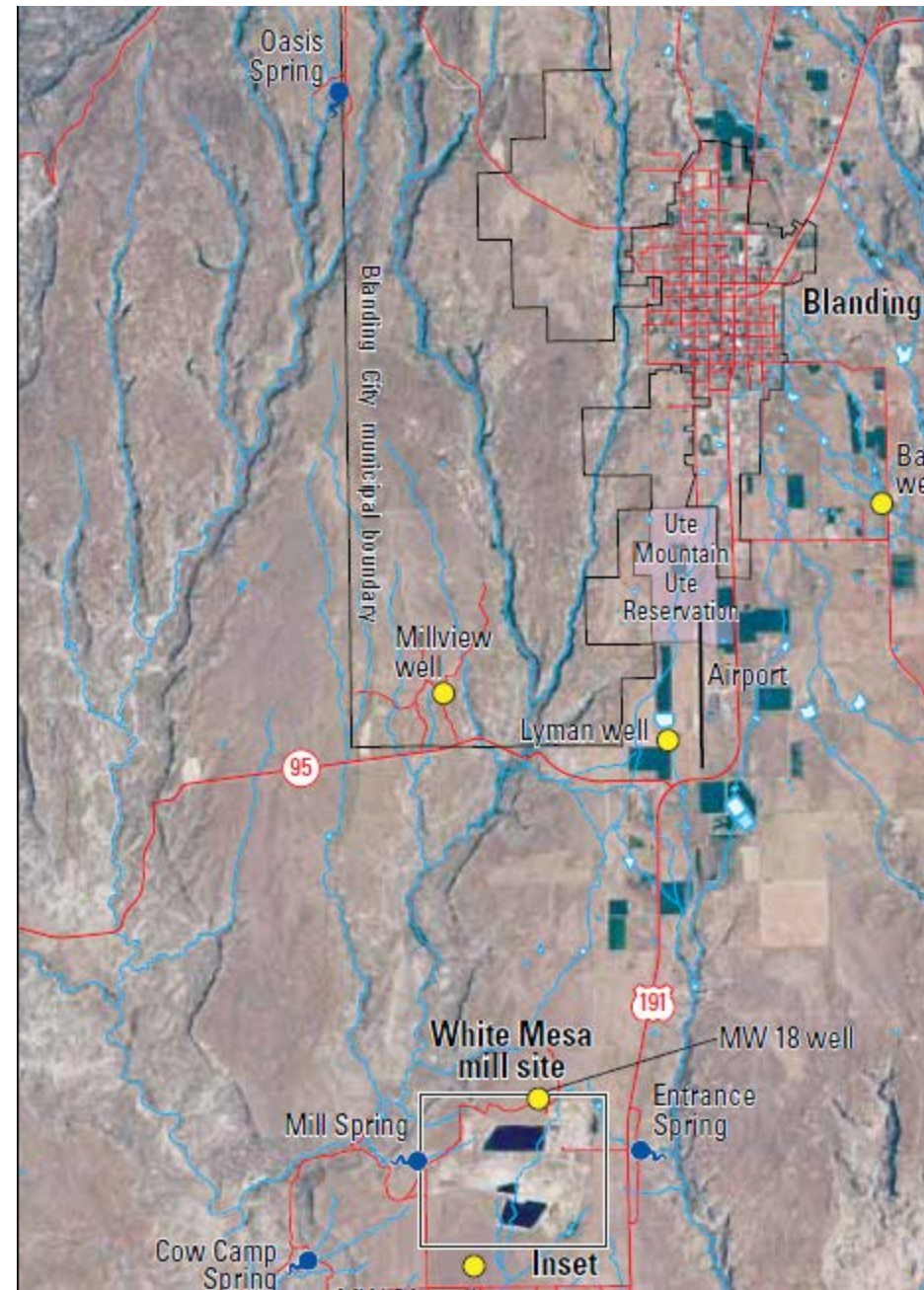
DRC Response:

1. Oasis Spring & Millview Well = good location for background
2. Oasis Spring: Low flow (difficult to find in June, 2012)
3. Millview Well – likely a more reliable water source
 - a) Re-drill Funding?
 - BLM
 - EPA
 - Tribe

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DRC Agrees

- USGS No. 3
 - b) Millview Well -
ongoing DRC Sampling / Analysis
⇒ State funding possible



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DRC Agrees

• USGS No. 4

1. Sagebrush Sampling \Rightarrow *East of mill area*
 - Every 3 years, same grid pattern (USGS)
 - Same analytes as USGS (~ 40)

DRC Response:

1. Leaf Resins: good for passive air monitoring
2. DUSA Environmental Monitoring Plan (EMP)
 - Plant Species: EMP not specific (now)
3. Opportunity to Improve Current DUSA EMP
 - a) Field / Lab Methods – need adjustment; USGS equivalent?
 - b) Number of Analytes: USGS: > 40 tested
U ore related: 7 (Sb, As, Mo, Se, S, W, and U)

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DRC Agrees

- USGS No. 4 - *continued*

DRC Response:

c) Sampling Locations \Rightarrow Prevailing Wind: SSW (to NNE)

- Both East and North?
- Co-locate w/ High Volume Air (HVA) stations: new and existing

4. Sagebrush Sampling Frequency? – need to coordinate with:

- Soil sampling (currently annual), and
- HVA monitoring (currently weekly, composited quarterly)

5. Data Interpretation: challenging

- USGS Methods: no discrimination: dusts vs. internal plant tissue
- Background Concentrations @ White Mesa: need additional study

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DRC Agrees

- USGS No. 4

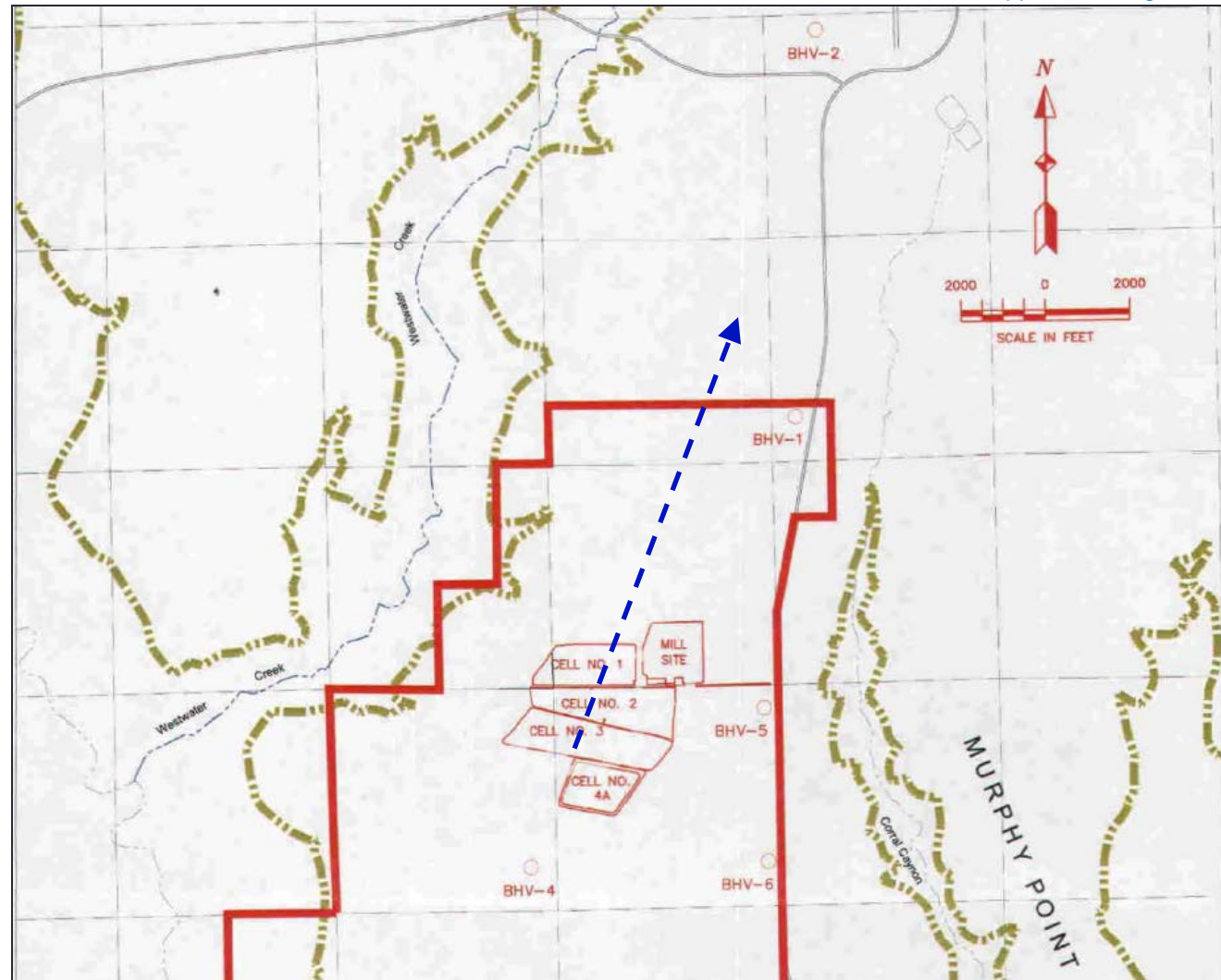
- continued

DRC Response:

DUSA HVA Air
Monitoring Stations

Prevailing
Wind Direction
(to NNE)

2/07 DUSA License Renewal Application, Fig. 6.5-1



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DRC Agrees

- USGS No. 4 - *continued*

DRC Response:

6. **Monitoring Options / Alternatives:**

Option 1: Start Sagebrush Monitoring – w/ USGS equivalent methods

- Determine background concentrations @ White Mesa
- Annual sampling / reporting
- Compliance Limits

Option 2: Adjust Existing DUSA EMP

- Additional HVA stations
- Additional soil sampling stations

Option 3: No action

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DRC Agrees

- USGS No. 5

1. Consider dust emissions monitoring \Rightarrow *East of mill area*

DRC Response:

1. **DRC agrees:**

- a) White Mesa Area: Soil Background for U < 3.6 ppm
- b) Area East of Mill Site: U soil concentrations ~ 2 x background

2. **Possible Explanations:**

- a) USGS Hypothesis: dust emissions and stormwater transfer
- b) Alternative: historic ore truck traffic

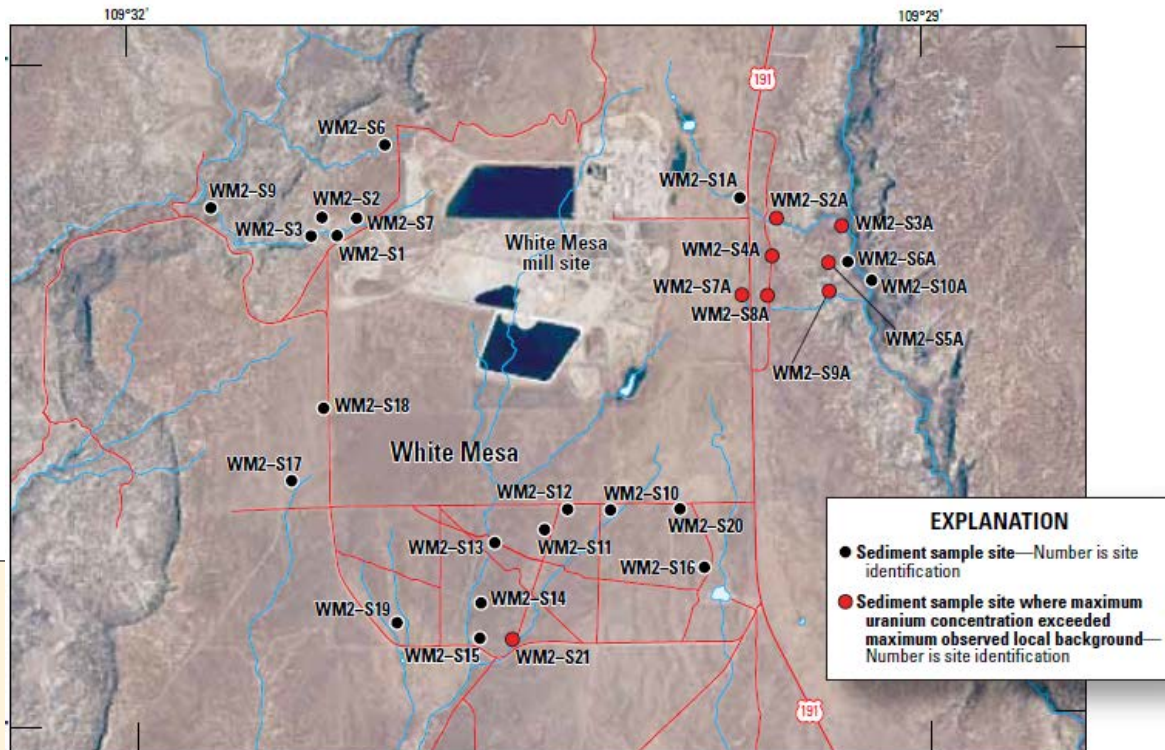
3. **Need to Test USGS Hypothesis: additional soil sampling**

- a) North of Cell 1 and Mill Area - none done by USGS
- b) DUSA Mega-ditch - *can also collect air emissions*
- c) USGS Soil Station WM2-S21 - **apparent hotspot**

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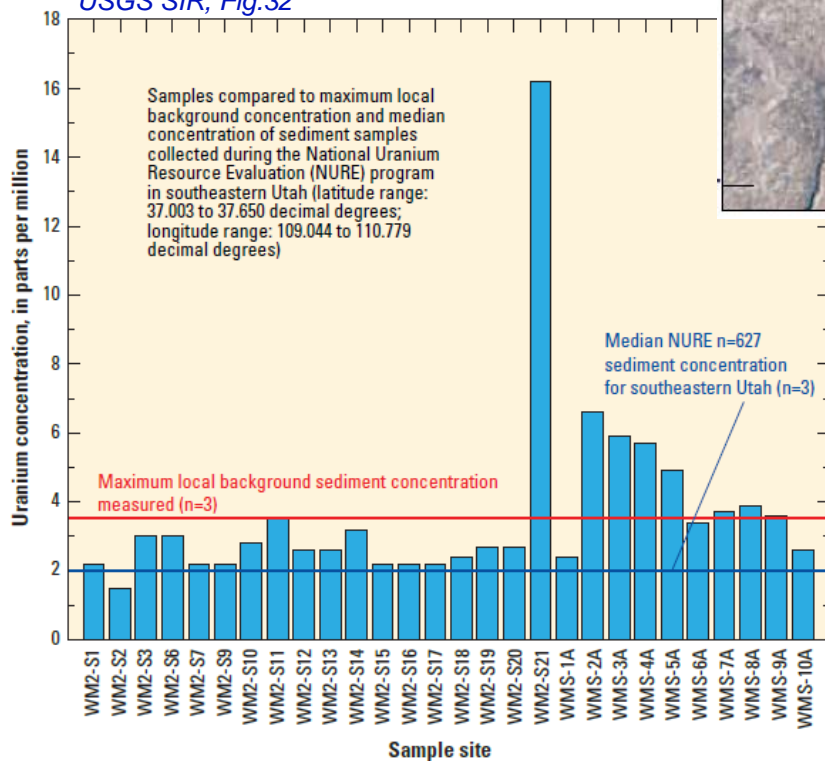
DRC Agrees

USGS No. 5 - continued



USGS SIR, Fig.33

USGS SIR, Fig.32



East of Mill Area:

7/10 samples > soil BG for U (3.6 ppm)

USGS Hypothesis:

Dust emissions & stormwater transport

Alternative: ore truck spills / emissions

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DRC Agrees

- USGS No. 5 - *continued*

DRC Response:

4. **Options / Alternatives:**

Option 1: Start Improved Soil Monitoring – DUSA EMP

- Add Soil Monitoring Locations – grid system or in dry washes
- Update Soil Background – need > 30 samples
- Annual sampling / reporting

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DRC Agrees

- USGS No. 5 - *continued*

DRC Response:

4. Options / Alternatives:

Option 1 – *continued*

- Compliance? \Rightarrow 2 Approaches: Risk Assessment Models
 - NRC “Radium Benchmark Dose”
 - Basis = radioactive dose to humans
 - Assume 1,000 yr in-growth (decay products)
 - Multiple exposure scenarios / pathways
 - EPA Soil Screening Limits, SSL (Superfund Program)
 - Focus = kidney toxicity (human)
 - Multiple exposure scenarios
 - Near term risk

USGS Report on White Mesa

DRC Agrees

- USGS No. 5 - *continued*

**EPA Superfund Human Health
Regional Risk Based Concentration Tables:
Soil Screening Level (SSL) Guidance**
(developed by Oak Ridge National Laboratory)

Scenario	Risk	Exposure Route	Soil Concentration For Uranium (soluble salts)
Industrial Soil	Non-cancer	Ingestion	3,100 ppm
Residential Soil	Non-cancer	Ingestion	230 ppm
Tapwater	Non-cancer	Ingestion	47 ppm
Residential Soil to Groundwater (to protect drinking water MCL, 30 ug/l)	Non-cancer	Ingestion	14 ppm

from: <http://www.epa.gov/reg3hwmd/risk/human/index.htm>.

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DRC Agrees

- USGS No. 5 - *continued*

DRC Response:

4. **Options / Alternatives** - *continued*

Option 2: Implement Additional HVA Monitoring – DUSA EMP

- Add HVA Stations – to East and North (prevailing wind to NNE)

Option 3: Compliment HVA Monitoring with Sagebrush Sampling

- Add HVA Stations – to East and North (prevailing wind to NNE)
- Add sagebrush sampling – grid or ephemeral drainages

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DRC Agrees

- USGS No. 7

1. Additional soil sampling in 2 dry washes North of USGS study area
(*East of mill area*)

DRC Response:

1. **DRC agrees:**

- Additional soil sampling should be done in these areas
- 1-time basis, then decide if more (*see USGS No. 5*)

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DRC Agrees

- USGS No. 9

1. Future Monitoring data should be easily accessible, in database similar to USGS.

DRC Response:

1. **DRC agrees and will (starting August, 2012):**

- Post all 2012 DUSA monitoring reports – on DRC website, including:
 - Quarterly Groundwater Monitoring
 - Quarterly Chloroform Corrective Action
 - Quarterly Nitrate Corrective Action
 - Semi-annual Environmental Monitoring
 - Annual Tailings Water Quality
 - Annual Seeps / Springs Water Quality
- Post all future reports – as soon as available
- **Maintain 2 year “running” collection on website**

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Conclusions

9 USGS Recommendations:

- **DRC Agrees: Nos.**
 - 1 – Quarterly monitoring wells, springs - continue
 - 2 – Isotopic monitoring @ Entrance Spring - UAR
 - 3 – Groundwater monitoring @ Oasis Spring / Millview Well (?)
 - 4 – Sagebrush sampling – can be done (3 options)
 - 5 – Dust emissions monitoring – can be improved (3 options)
 - 7 – Additional soil sampling in 2 dry washes, NE of mill site area
 - 9 – Make future monitoring data available to public
- **DRC Disagrees:**
 - 6 – Install new wells to North of Tribe's East and West Wells
- **DRC Agrees and Disagrees: No. 8**
 - 8 - DUSA Water Monitoring Programs should add:
 - U isotopes – Agree, UAR
 - Other isotopes ($\delta^{34}\text{S}$, $\delta^{18}\text{O}$, and $\delta^2\text{H}$) - Disagree

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Thank you for your time

Comments / Suggestions?