AIRBORNE URANIUM MONITORING
U. S. ARMY POHAKULOA TRAINING AREA
ISLAND OF HAWAII

Summary Report - February 2009

Contract No. W9128A-04-D-0019
Task Order 0040

Prepared for

U. S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii

and

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ACRONYMS AND ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
EPA	U. S. Environmental Protection Agency
ICP-MS	inductively coupled mass spectrometry
IDL	instrument detection limit
lpm	liters per minute
μg	micrograms
$\mu g/m^3$	micrograms per cubic meter
MRL	minimal risk level
N	number of samples
ppm	parts per million
PRL	practical reporting limit
PTA	Pohakuloa Training Area
TSP	total suspended particulate matter
U	uranium
^{238}U	uranium-238 isotope
^{234}U	uranium-234 isotope
^{235}U	uranium-235 isotope
WHO	World Health Organization

INTRODUCTION

An airborne uranium monitoring project at the U. S. Army's Pohakuloa Training Area (PTA) commenced on 4 February 2009. Portable samplers operating at a nominal 5 liters per minute (lpm) are located at three (3) sites on PTA (Figure 1). The samplers collect total suspended particulate matter (TSP) from midnight to midnight on sample days. The EPA's published once-every-six-days schedule is generally being followed, but sampling is also performed on days when heavy weapons firing is scheduled for the PTA ranges.

The 47-mm Teflon filters with the collected TSP are sent to laboratories for gravimetric and then uranium analysis. The analysis method for uranium is inductively coupled plasma - mass spectrometry (ICP-MS), a method capable of detecting uranium down to the picogram (10^{-12} gram) level.

Twenty four (24) samples were collected and analyzed during February 2009, and the results are presented herein.

RESULTS AND DISCUSSION

The analysis results for each of the three (3) monitoring stations are summarized in Table 1 and Figures 2 - 4. On sampling days 2/4 through 2/14, there was aerial rocket fire from Army helicopters in the impact area. During sampling days 2/17 through 2/26 there was U. S. Air Force bombing activity on the ranges.

FIGURE 1

MONITORING SITES

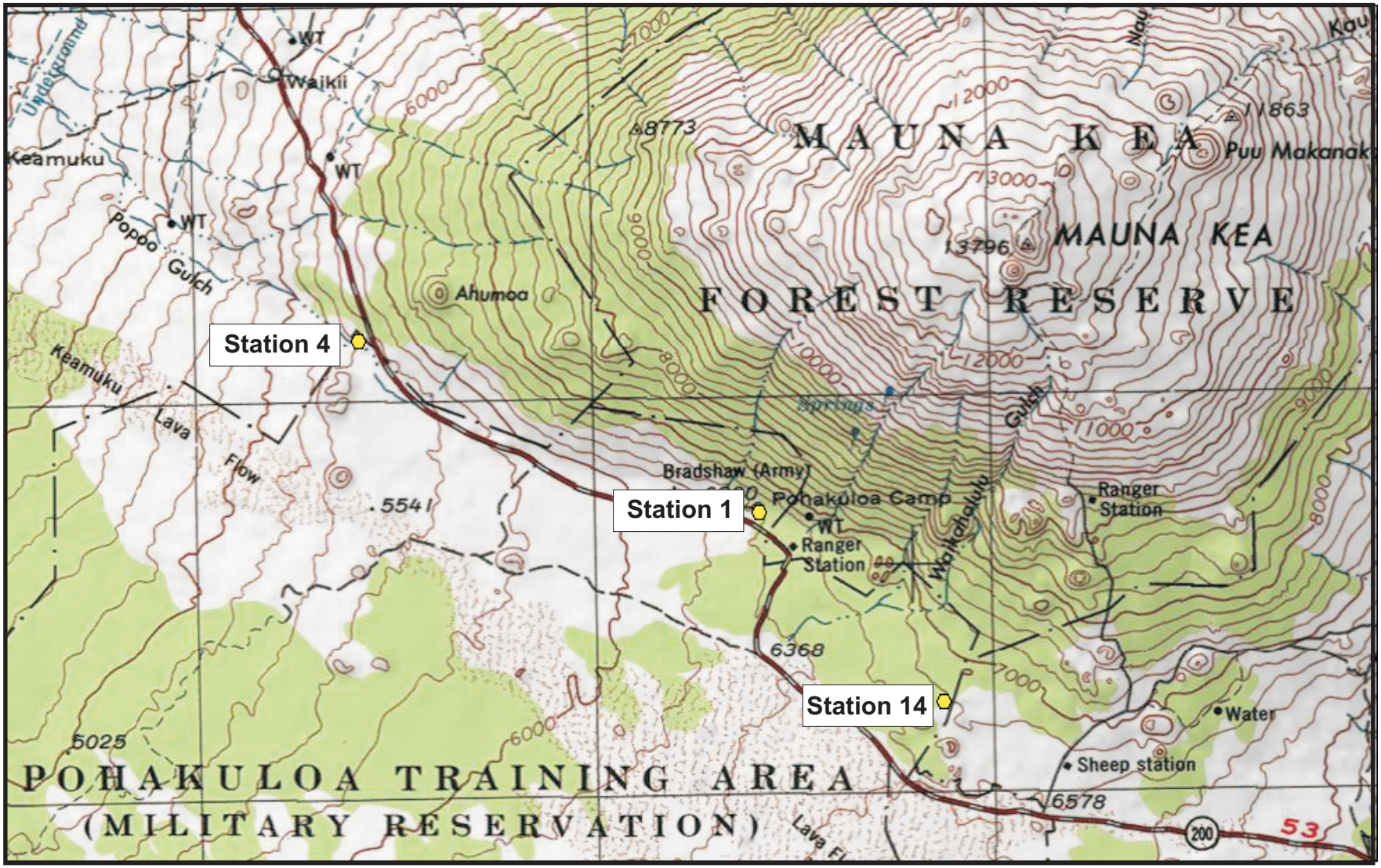


TABLE 1

DAILY TSP & AIRBORNE URANIUM CONCENTRATIONS
FEBRUARY 2009

Station No.	N	TSP Range (μg/m³)	U Range (μg/m³)	U Mean (μg/m³)	ACTIVITY
1	8	3.4 - 29.2	0.000009 - 0.000019	0.000015	Aerial rockets & bombs
4	8	7.1 - 15.4	0.000008 - 0.000016	0.000013	Aerial rockets & bombs
14	8	3.0 - 16.8	0.000012 - 0.000015	0.000013	Aerial rockets & bombs

Figures 2 - 4 also indicate the World Health Organization (WHO) and U. S. Agency for Toxic Substances and Disease Registry (ATSDR) guidelines for uranium exposure protection. The WHO guideline is an annual average while the ATSDR guideline is based on chronic exposure (365 days or longer) to highly soluble uranium compounds. It is clear that the uranium concentrations found at PTA in February 2009 are well below both those health guidelines.

It should be noted that the total mass of uranium found on each filter was well above, i.e., 10 to 17 times, the instrument detection level (IDL) for the ICP-MS method but below the laboratory's practical reporting level (PRL). This means that the measured value is clearly less than the PRL but has an unspecified degree of uncertainty about its true value. At a nominal sampler flow rate of 5 lpm, the laboratory's PRL of 0.00025 microgram (μg) corresponds to an airborne uranium concentration of 0.000035 μg/m^3. Uranium isotopes ^{234}U and ^{235}U were below the IDL and thus could not be quantified.

FIGURE 2

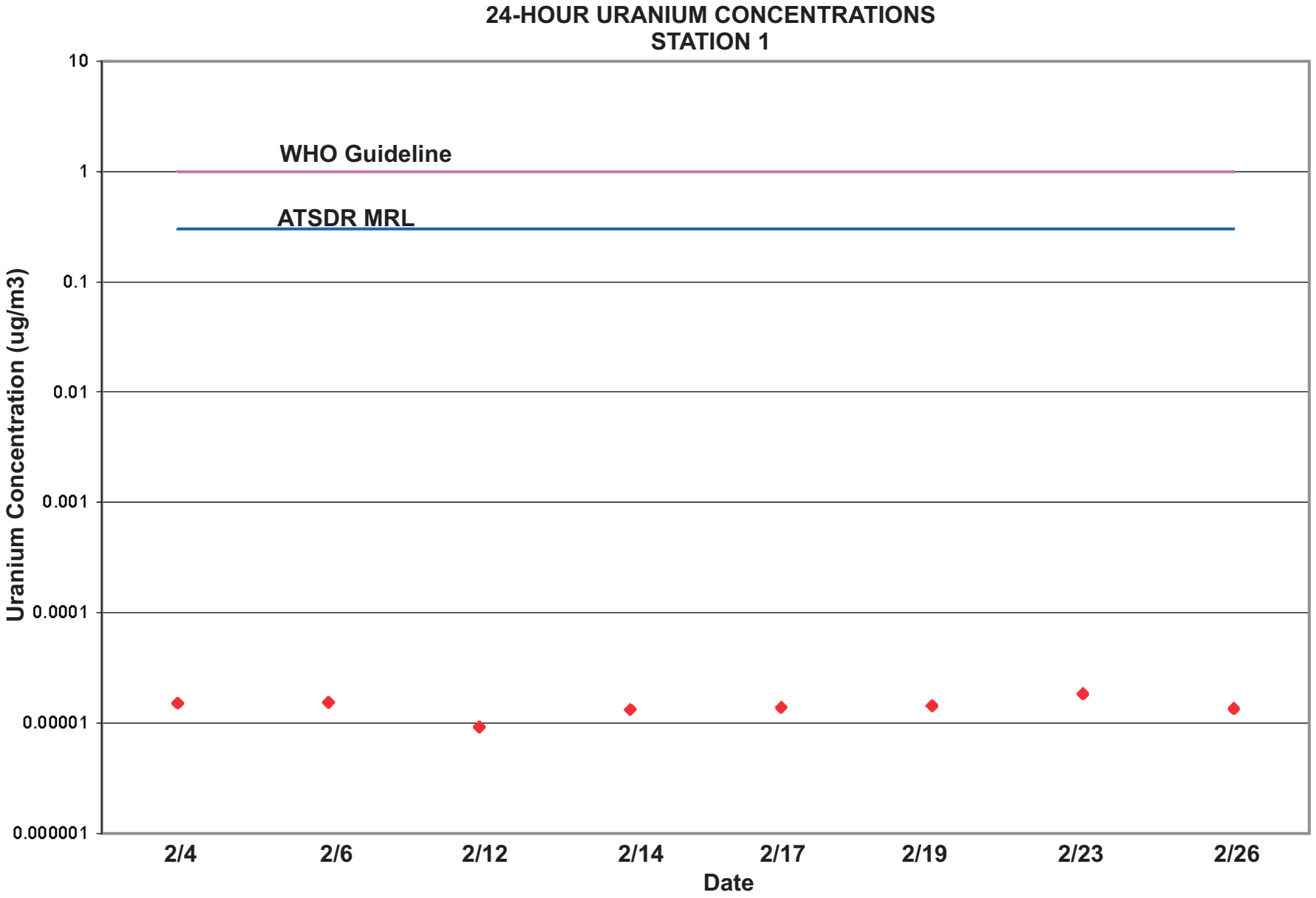

24-HOUR URANIUM CONCENTRATIONS
STATION 1
WHO Guideline
ATSDR MRL
Uranium Concentration (ug/m3)
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
2/4
2/6
2/12
2/14
2/17
2/19
2/23
2/26
Date

FIGURE 3

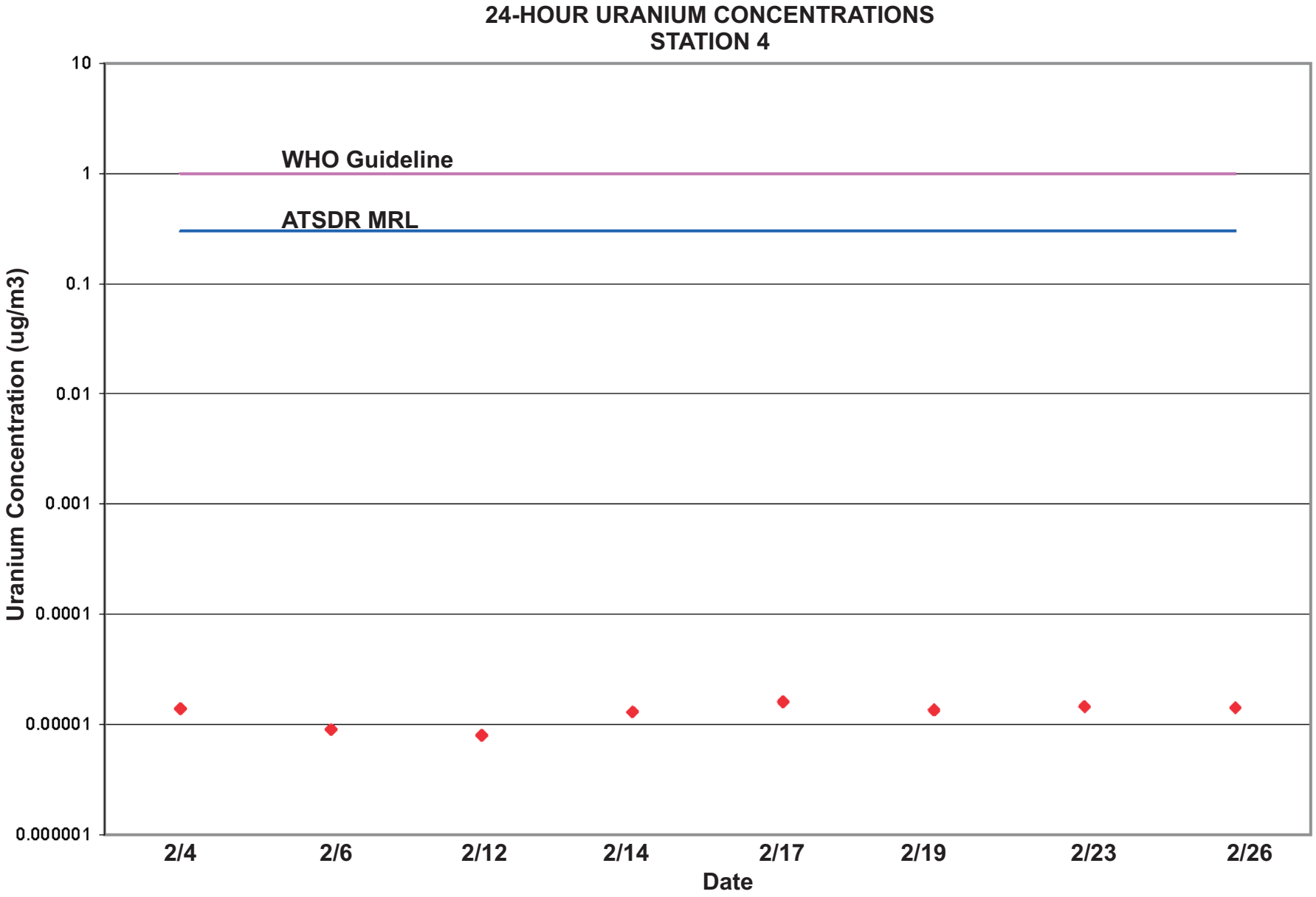
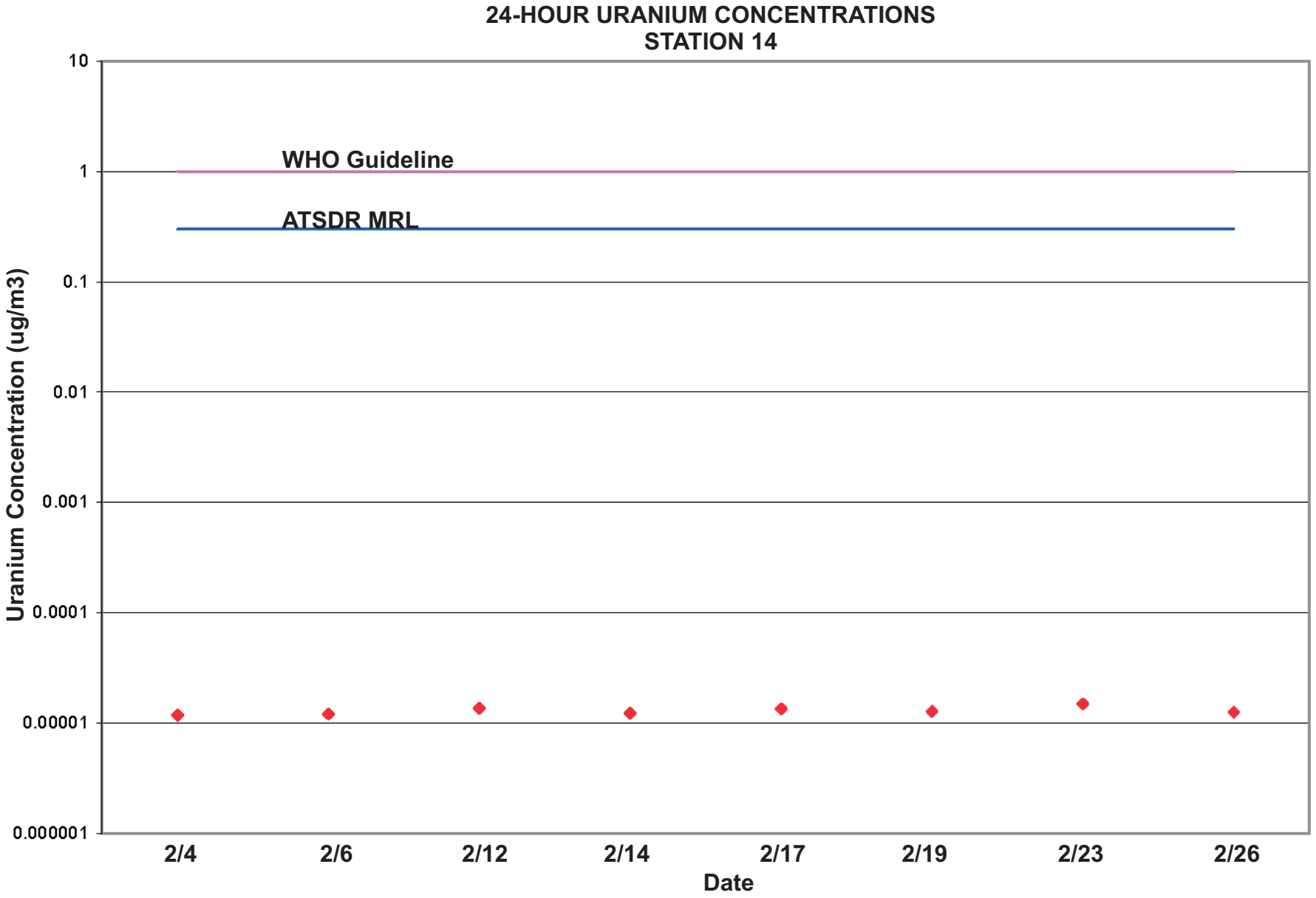

24-HOUR URANIUM CONCENTRATIONS
STATION 4
WHO Guideline
ATSDR MRL
Uranium Concentration (ug/m3)
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
2/4
2/6
2/12
2/14
2/17
2/19
2/23
2/26
Date

FIGURE 4


24-HOUR URANIUM CONCENTRATIONS
STATION 14
WHO Guideline
ATSDR MRL
Uranium Concentration (ug/m3)
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
2/4
2/6
2/12
2/14
2/17
2/19
2/23
2/26
Date

SAMPLING DEVIATIONS

Timer setup errors caused the run times on 2/12/09 at Station1 to be 30.3 hours and at Station 4 to be 31.5 hours instead of the intended 24 hours.

The final air flow rates observed and recorded at Station 4 for the 2/6/09 and 2/12/09 sampling days were above the sampler's set point. With the apparent higher flow rates, one would expect to collect greater amounts of TSP and uranium; however, the collected TSP and uranium were of similar mass to all other samples collected at the correct air flow rate suggesting that the actual flow during the sampling period was probably correct. Nevertheless, in accordance with sampling guidelines, the average flow rates for the sampling periods were based on the observed initial and final rates, and used to calculate the concentrations ($\mu g/m^3$) shown in Figure 3.