POWERTECH (USA) INC.

RICHARD E. BLUBAUGH
Vice President – Environmental
Health and Safety Resources

October 19, 2012

Office of Federal and State Materials and
Uranium Recovery Licensing Branch
Division of Waste Management and Environmental Protection
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTN: Ron Burrows, Project Manager

Re: Powertech (USA) Inc.'s Supplemental Sampling Plan and Responses to Comments Regarding Draft License SUA-1600; Dewey-Burdock Project; Docket No. 40-9075; TAC No. J 00606

Dear Mr. Burrows:

This letter serves to transmit information Powertech agreed to provide related to the draft license conditions for Draft License SUA-1600 during the Public Meeting of August 30, 2012, and the NRC's summary of that meeting that was provided September 13, 2012 (ML12255A258). The Supplemental Sampling Plan for selected media is included herewith as Attachment A. The responses to draft license conditions related to monitoring and health physics addressed in the Summary of the Public Meeting are enclosed as Attachment B. Powertech believes the responses reflect the clarifications provided in the public meeting of August 30, 2012. Powertech appreciates the opportunity to provide this additional information in support of its application for a source and byproduct material license for uranium ISR development and operation.

This letter and ADAMS-compliant enclosures are being transmitted by FedEx with an accompanying electronic copy (CD).

We look forward to hearing from you at your earliest convenience should you need further clarification from us in these regards. Also, we would appreciate being notified should the Supplemental Sampling Plan and responses be deemed satisfactory.

Sincerely,

Richard E. Blubaugh
Vice President – Environmental, Health & Safety Resources

POWERTECH (USA) INC.

Enclosures: ATTACHMENT A – Supplemental Sampling Plan
ATTACHMENT B – Responses to Comments Related to Draft License Conditions and Public Meeting of August 30, 2012

cc: R.F. Clement
John Mays
M. Hollenbeck
Bob Townsend, SD DENR
Mike Cepak, SD DENR
Marian Atkins, BLM
Valois Shea, EPA
Jack Fritz, WWC

Attachment A
Supplemental Preconstruction and Preoperational Sampling Plan
Dewey-Burdock Project

The following supplemental sampling plan was discussed during the U.S. Nuclear Regulatory Commission (NRC) public meeting held August 30, 2012 and incorporated into the NRC meeting summary memorandum dated September 13, 2012 (ML12255A258). The order of sampling media presented generally follows the order provided in NRC Regulatory Guide 4.14, Revision 1, April 1980 (RG 4.14). Table 1 summarizes sample timing, sampling locations, sampling frequencies, analytical frequencies, and analytical parameters.

1.0 Plan for Supplemental Air Sampling

The supplemental air sampling program will consist of air particulate sampling and radon gas sampling as follows:

- Air particulate samples will be collected continuously at AMS-BKG, AMS-08 and AMS-09 for one year. Sample results will supplement those collected earlier at AMS-01, AMS-02, AMS-03, and AMS-04. Quarterly composites of weekly filter changes will be analyzed for natural uranium, radium-226, thorium-230, and lead-210.

- Air particulate samples will also be collected between August 13 and October 2 (period 1 in the previous sampling program) and between October 2 and January 4 (period 2 in the previous sampling program) at AMS-01, AMS-02, AMS-03, AMS-04, and AMS-BKG. Samples will be analyzed for natural uranium only.

- Radon-222 samples will be collected continuously during air particulate sampling at AMS-BKG, AMS-08 and AMS-09 using passive track etch film detectors. The detectors will be exchanged quarterly.

A solar-powered Hi-Q CF-5624-WR Air Sampler is expected to be used at AMS-09 because power is not available at this location. The Hi-Q CF-5624-WR model sampler has been used successfully at several other in situ recovery projects including the Willow Creek, Ross, and Moore Ranch sites. A Hi-Q HVP-4200AFC sampler, which was used during Powertech (USA) Inc.'s initial baseline sampling program at the Dewey-Burdock site, will be used at AMS-01, AMS-02, AMS-03, AMS-04, AMS-08, and AMS-BKG. Supplemental air particulate monitoring locations are shown on Figure 1, enclosed. Analyses will be performed to meet lower limits of detection (LLDs) and analytical reporting formats specified in RG 4.14. Results will be provided to NRC at least 30 days prior to commencement of construction as defined in 10 CFR § 40.4.

2.0 Plan for Supplemental Groundwater Sampling

Supplemental groundwater samples will be collected quarterly for four quarters from domestic, stock and irrigation wells within two kilometers of proposed monitor well rings (including samples already collected) and from selected monitor wells as follows:

- Domestic wells 40, 43, 703, and 704 will be sampled to supplement samples collected earlier at domestic wells 2, 7, 13, 16, 42, 703, 704, and 4002.

- Stock wells 1, 3, 4, 6, 12, 14, 15, 17, 38, 41, 49, 51, 61, 113, 114, 220, 270, 510, 618, 620, 639, 640, 642, 645, 656, and 668 will be sampled to supplement samples collected earlier at stock wells 4, 5, 41, 49, 619, 628, 650, and 7002.

- Monitor wells 690, 693, 707, 708, 709, four new alluvial wells, two new Fall River wells, and one new Chilson well will be sampled to supplement samples collected earlier at monitor wells 631, 676, 677, 678, 679, 680, 681, 688, 689, 690, 693, 694, 695, 696, 697, 698, 705, 706, and 3026.

There currently are no irrigation wells within two kilometers of proposed monitor well rings.

Sampling is conditioned upon well suitability for proper sample collection and, at wells outside the proposed license boundary, owner consent to sample.

Supplemental groundwater sampling locations are shown on Figure 2, enclosed. Analyses will be performed to meet LLDs and analytical reporting formats specified in RG 4.14. Results will be provided to NRC for review and written verification.

3.0 Plan for Supplemental Surface Water and Sediment Sampling

Supplemental surface water samples will be collected quarterly from surface water impoundments for four quarters and monthly from selected stream sampling locations for 12 months, when water is available, as follows:

- Surface water in impoundments Sub20, Sub21, Sub22, Sub29, Sub30, Sub31, Sub32, Sub33, Sub34, Sub35, Sub36, Sub40, Sub49, and Sub50 will be sampled quarterly for four quarters to supplement surface water samples collected earlier from impoundments Sub02, Sub03, Sub04, Sub05, Sub06, Sub07, Sub08, Sub09, Sub10, and Sub11.

- Surface water from stream locations BVC11, BVC14, PSC11, PSC12, UNT02, and UNT03 will be sampled monthly for 12 months to supplement surface water samples collected earlier at stream locations CHR01, CHR05, BEN01, and UNT01. Grab samples will be collected at BVC11 and BVC14 while passive samplers will be installed at PSC11, PSC12, UNT02, and UNT03. Passive samples will be collected following ephemeral flow events.

Supplemental sediment samples will be collected at surface water sampling locations as follows:

- Supplemental sediment samples Sub20S, Sub21S, Sub22S, Sub29S, Sub30S, Sub31S, Sub32S, Sub33S Sub34S, Sub35S, Sub36S, Sub40S, Sub49S, and Sub50S will be collected once from each surface water impoundment sampling location. Samples will supplement those collected earlier at Sub02S, Sub03S, Sub04S, Sub05S, Sub06S, Sub07S Sub08S, Sub09S, Sub10S, and Sub11S.

- Supplemental sediment samples BVC11S, BVC14S, PSC11S, PSC12S, UNT02S, and UNT03S will be collected at surface water stream sampling locations. Samples will be collected twice, once following spring runoff and once during late summer following an extended period of low flow. Several sediment samples will be collected by traversing each stream sampling location and compositing sediment into one sample for analysis. Samples will supplement those collected earlier at CHR01S, CHR05S, BEN01S, and UNT01S.

Supplemental surface water sampling locations are shown on Figure 3, enclosed. Sediment sampling locations coincide with surface water sampling locations. Analyses will be performed to meet LLDs and analytical reporting formats specified in RG 4.14. Supplemental surface water sample results will be provided to NRC within 3 months of initiating operations. Supplemental sediment sample results will be provided to NRC at least 30 days prior to operation.

4.0 Plan for Supplemental Vegetation and Food Sampling
Supplemental vegetation and food sampling will include sampling vegetation near AMS-08 and AMS-09, sampling soil from area vegetable gardens and sampling tissue from area livestock as follows:

- Forage vegetation surrounding AMS-08 and AMS-09 will be sampled three times during the grazing season. The locations of AMS-08 and AMS-09 are shown on Figure 1.

- One composite surface soil sample will be collected from each of six vegetable gardens located within 3.3 kilometers of the project boundary. Samples will be collected from 0 to 15 centimeters (cm) at the corners and center of each garden and composited to form a single soil sample per garden. Figure 4, enclosed, shows vegetable garden locations (VG1, VG2, VG3, VG4, VG5, and VG6).

- Tissue from one additional cow and two additional pigs raised within 3.3 kilometers of the project boundary will be sampled prior to operation. Samples will supplement those collected earlier from two cows and one pig. Cattle are raised throughout the project area while pigs are raised in the limited area shown on Figure 4.

Analyses will be performed to meet LLDs and analytical reporting formats specified in RG 4.14. Vegetation and soil sampling results will be provided to NRC at least 30 days prior to construction and livestock sampling results will be provided to NRC for review and written verification prior to operation.

5.0 Plan for Supplemental Soil Sampling
Supplemental soil sampling will include the following:

- Fifteen supplemental surface soil samples (0 to 15 cm) will be collected in the Dewey portion of the project area to more closely match the soil sampling density applied across the Burdock portion of the project area. Supplemental soil sampling locations are shown on Figure 5, enclosed.

- One surface soil sample (0 to 5 cm) will be collected at AMS-08 and AMS-09, the locations of which are shown on Figure 1.

Analyses will be performed to meet LLDs and analytical reporting formats specified in RG 4.14. Results for supplemental soil samples will be provided to NRC at least 30 days prior to construction.

6.0 Plan for Supplemental Direct Radiation Sampling

Supplemental gamma exposure rate measurements will be made continuously during air particulate sampling at AMS-BKG, AMS-08 and AMS-09. Passive integrating devices (thermoluminescent dosimeters or an equivalent dosimeter) will be submitted quarterly for analysis.

The locations of AMS-BKG, AMS-08 and AMS-09 are shown on Figure 1. Dosimeters will be provided and analyzed by an approved National Voluntary Laboratory Accreditation Program (NVLAP) provider. Results will be reported to NRC at least 30 days prior to construction.

Table 1: Summary of Supplemental Preconstruction and Preoperational Sampling

Sample Type	Sample Timing	Sampling Locations	Sampling Method	Sampling Frequency	Analytical Frequency	Analytical Parameters
Air Particulate	Prior to construction	AMS-BKG, AMS-08, AMS-09	Continuous	Weekly filter changes composited quarterly for one year	Quarterly	Natural uranium[a], Ra-226, Th-230, and Pb-210
	August 13 - October 2 and October 2 - January 4 prior to construction	AMS-BKG, AMS-01, AMS-02, AMS-03, AMS-04	Continuous	Weekly filter changes composited once per period	Once during each period	Natural uranium[a]
Radon Gas	Prior to construction	AMS-BKG, AMS-08, AMS-09	Continuous	Quarterly for one year	Quarterly	Rn-222
Groundwater	Prior to operation	Domestic wells - 40, 43, 703, 704 Stock wells - 1, 3, 4, 6, 12, 14, 15, 17, 38, 41, 49, 51, 61, 113, 114, 220, 270, 510, 618, 620, 639, 640, 642, 645, 656, 668 Monitor wells - 690, 693, 707, 708, 709, four new alluvial wells, two new Fall River wells, one new Chilson well	Grab	Quarterly for four quarters	Quarterly	Table 6.1-1 in Powertech (2011). The concentrations of trace and minor elements and radionuclides will be dissolved portions.
Surface Water	Prior to operation	Impoundments - Sub20, Sub21, Sub22, Sub29, Sub30, Sub31, Sub32, Sub33, Sub34, Sub35, Sub36, Sub40, Sub49, Sub50	Grab	Quarterly for four quarters	Quarterly	Dissolved and suspended natural uranium[a], Ra-226, Th-230, Pb-210, and Po-210
		Streams - BVC11, BVC14, PSC11, PSC12, UNT02, UNT03	Grab and passive	Monthly for 12 months	Monthly	

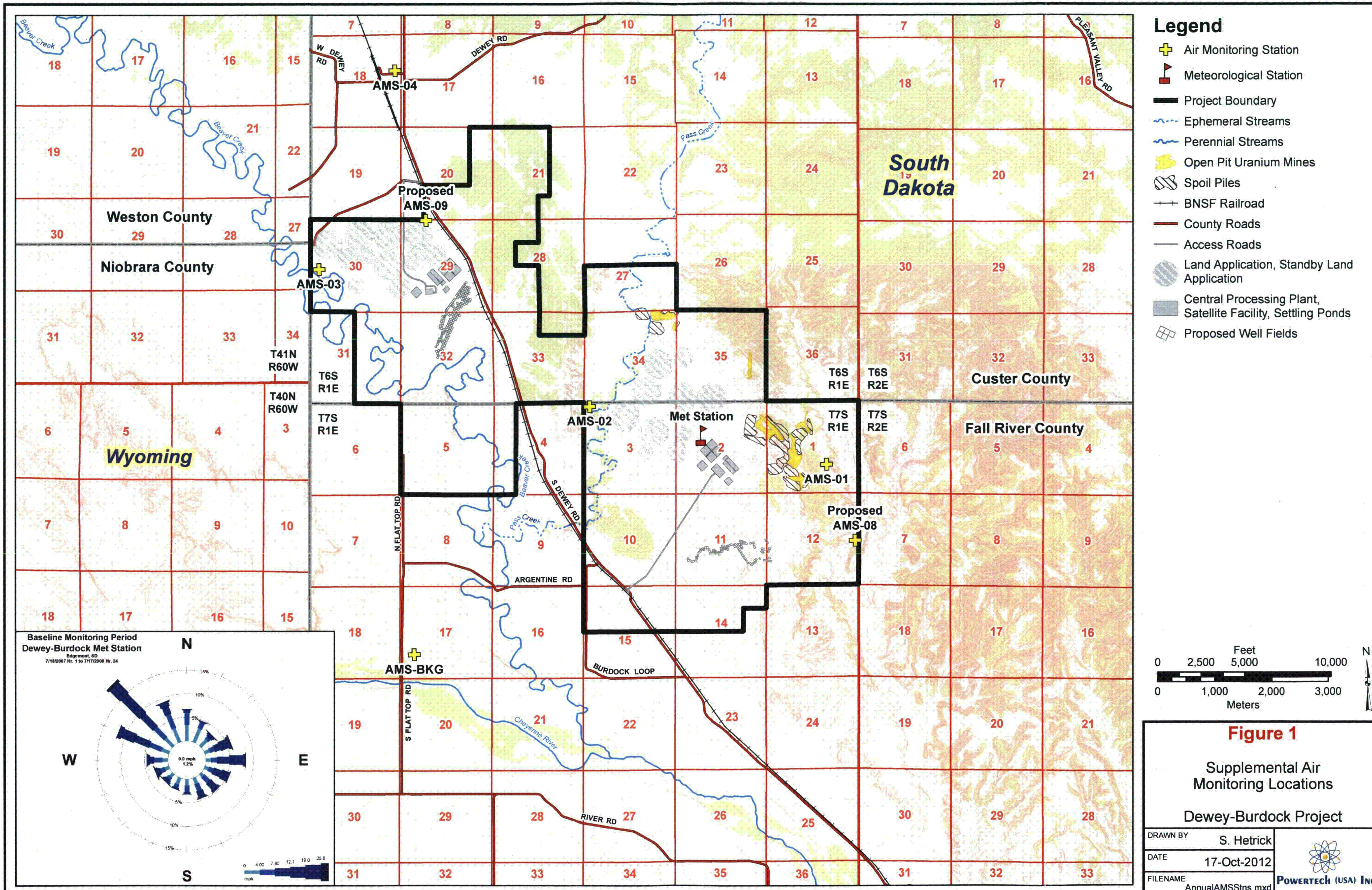
Table 1 (continued): Summary of Supplemental Preconstruction and Preoperational Sampling

Sample Type	Sample Timing	Sampling Locations	Sampling Method	Sampling Frequency	Analytical Frequency	Analytical Parameters
Sediment	Prior to operation	Sediment from impoundments - Sub20S, Sub21S, Sub22S, Sub29S, Sub30S, Sub31S, Sub32S, Sub33S, Sub34S, Sub35S, Sub36S, Sub40S, Sub49S, Sub50S	Grab	Once	Once	Natural uranium[a], Ra-226, Th-230, and Pb-210
		Sediment from streams - BVC11S, BVC14S, PSC11S, PSC12S, UNT02S, UNT03S	Composited traversing stream	Once following spring runoff and once during late summer following period of extended low flow	Twice	
Vegetation and Food	Prior to construction	Forage vegetation - AMS-08, AMS-09	Grab	Three times during grazing season	Three times	Natural uranium[a], Ra-226, Th-230, Pb-210, and Po-210
		Vegetable garden soil - VG1, VG2, VG3, VG4, VG5, VG6	Composite four corners and center 0 to 15 cm	Once	Once	
	Prior to operation	Livestock - Beef3, Pork2, Pork3	Grab	Once during time of slaughter	Once	
Soil	Prior to construction	Surface soil in Dewey area - DS1, DS2, DS3, DS4, DS5, DS6, DS7, DS8, DS9, DS10, DS11, DS12, DS13, DS14, DS15	Composite 0 to 15 cm	Once	Once	All samples for Ra-226, 10% of samples for natural uranium[a], Th-230 and Pb-210
		Surface soil at AMS-08 and AMS-09	Composite 0 to 5 cm	Once	Once	Natural uranium[a], Ra-226, Th-230, and Pb-210
Direct Radiation	Prior to construction	AMS-BKG, AMS-08, AMS-09	Continuously	Quarterly for one year	Quarterly	Gamma exposure rate using TLD or equivalent

a. Uranium concentrations will be converted to natural uranium activity after analysis.

References:

Powertech (USA) Inc., 2011, Dewey-Burdock Project Technical Report RAI Responses, June 2011. Available from NRC ADAMS document server: http://pbadupws.nrc.gov/docs/ML1120/ML112071064.html.


Legend
Air Monitoring Station
Meteorological Station
Project Boundary
Ephemeral Streams
Perennial Streams
Open Pit Uranium Mines
Spoil Piles
BNSF Railroad
County Roads
Access Roads
Land Application, Standby Land Application
Central Processing Plant, Satellite Facility, Settling Ponds
Proposed Well Fields
South Dakota
Wyoming
Weston County
Niobrara County
Custer County
Fall River County
AMS-04
AMS-03
AMS-02
AMS-01
Proposed AMS-09
Proposed AMS-08
AMS-BKG
Met Station
T41N R60W
T40N R60W
T6S R1E
T7S R1E
T6S R2E
T7S R2E
W DEWEY RD
DEWEY RD
S DEWEY RD
PLEASANT VALLEY RD
N FLAT TOP RD
S FLAT TOP RD
ARGENTINE RD
BURDOCK LOOP
RIVER RD
Beaver Creek
Pass Creek
Cheyenne River
Baseline Monitoring Period
Dewey-Burdock Met Station
N
S
W
E
Feet
0 2,500 5,000 10,000
0 1,000 2,000 3,000
Meters
Figure 1
Supplemental Air Monitoring Locations
Dewey-Burdock Project
DRAWN BY S. Hetrick
DATE 17-Oct-2012
FILENAME AnnualAMSStns.mxd
POWERTECH (USA) INC.

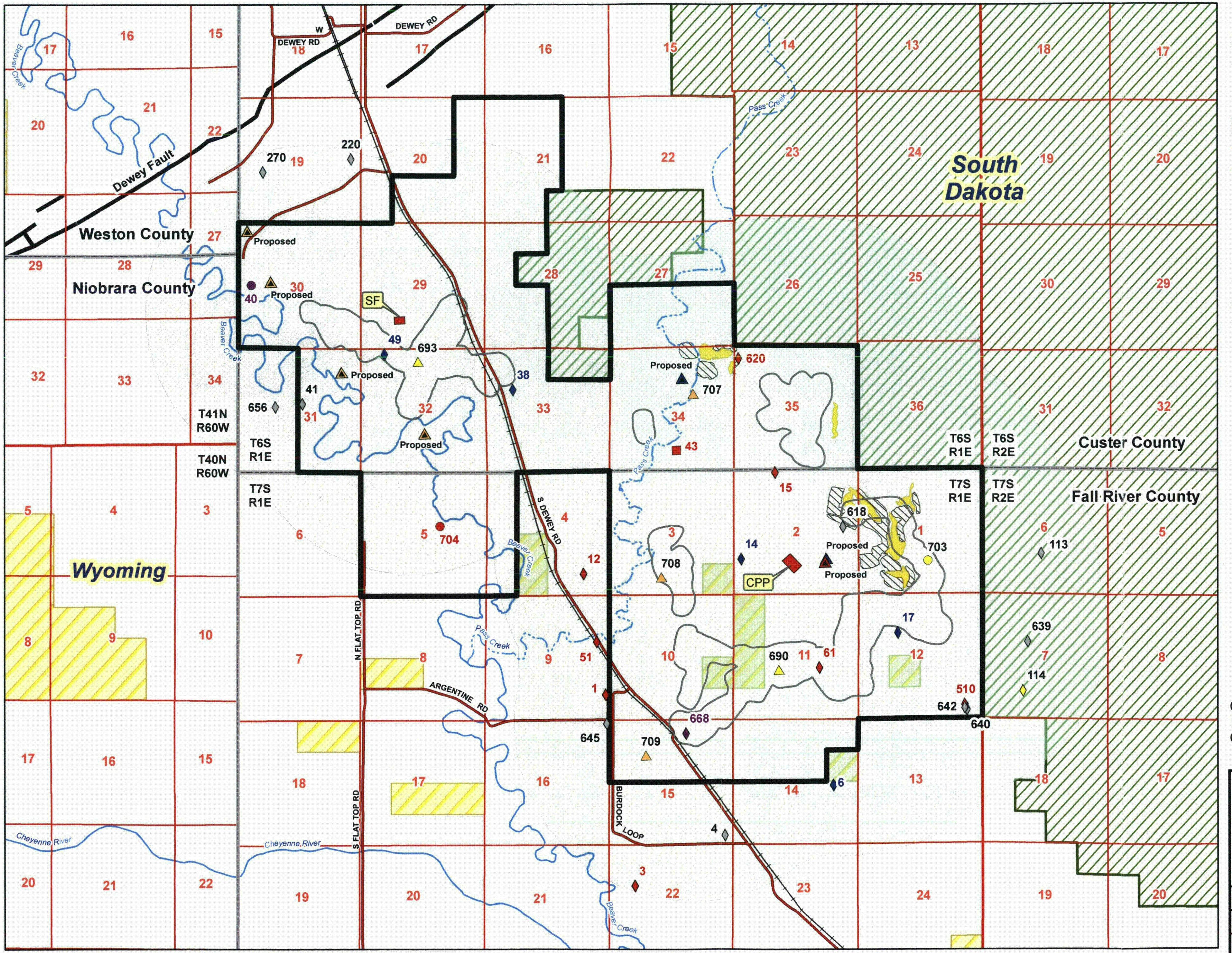


Figure 2

Supplemental Groundwater Sampling Locations

Dewey-Burdock Project

DRAWN BY	S. Hetrick
DATE	17-Oct-2012
FILENAME	SuppGWSampLoc.mxd

POWERTECH (USA) INC.

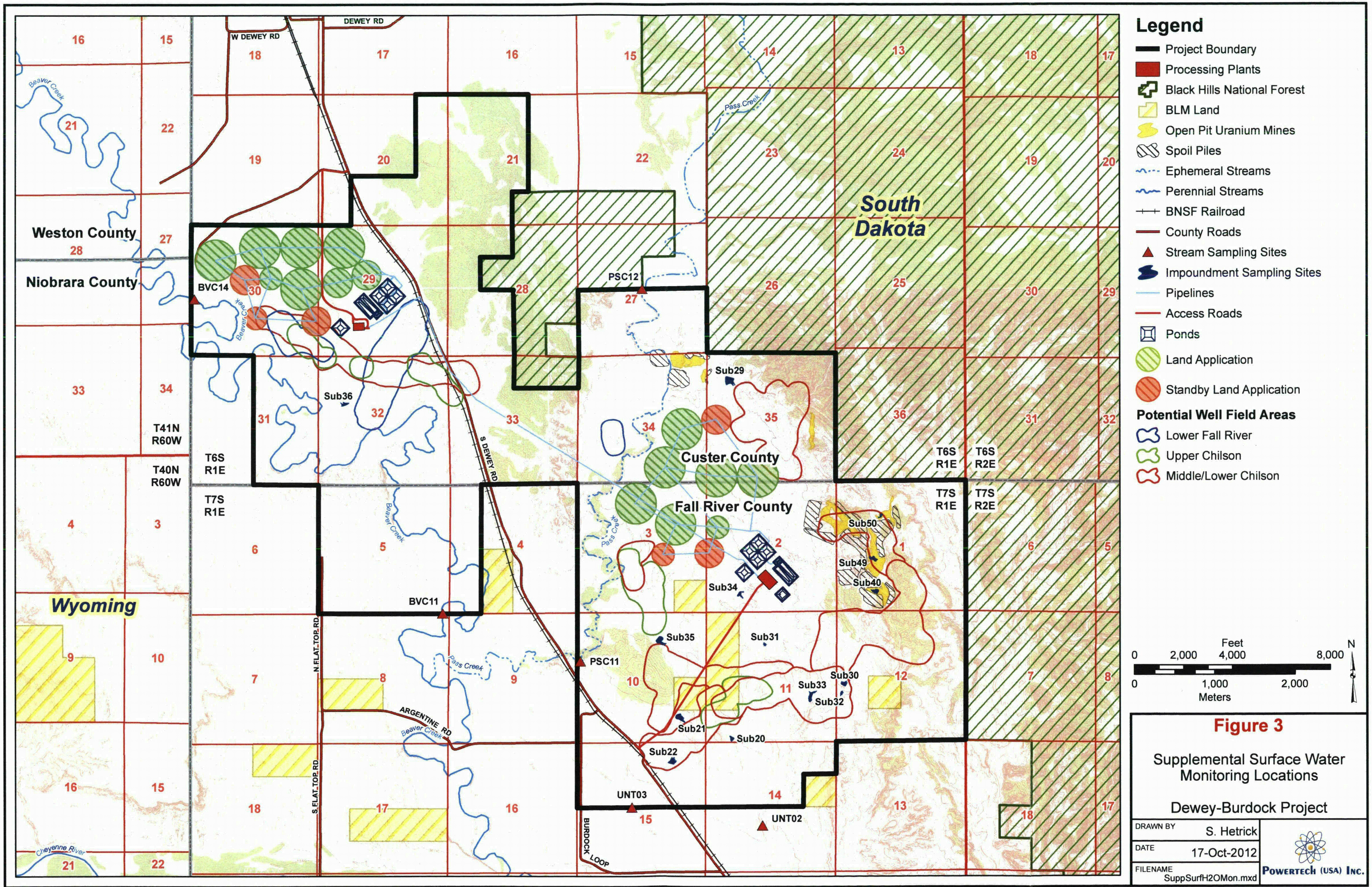


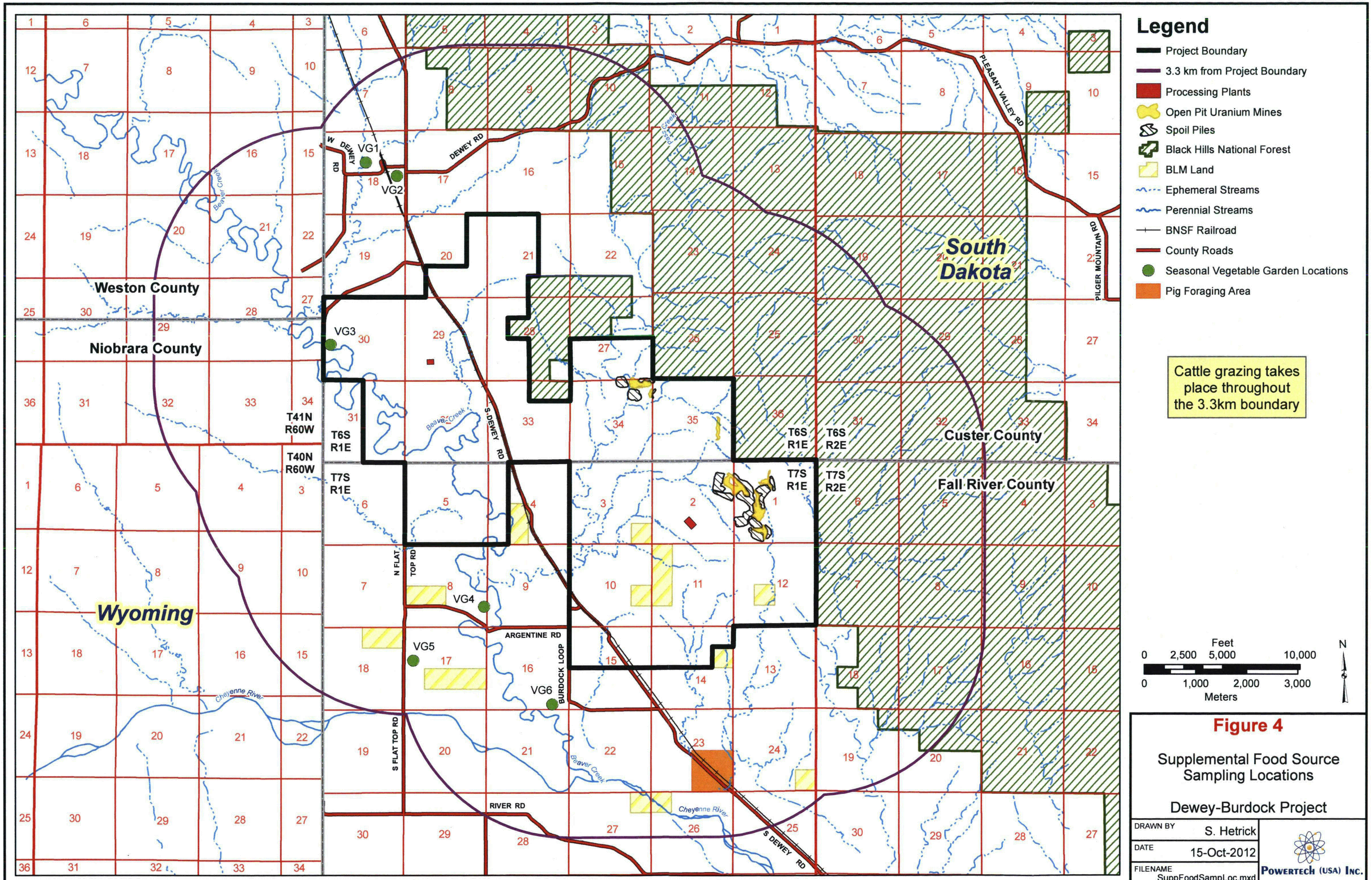
Figure 3

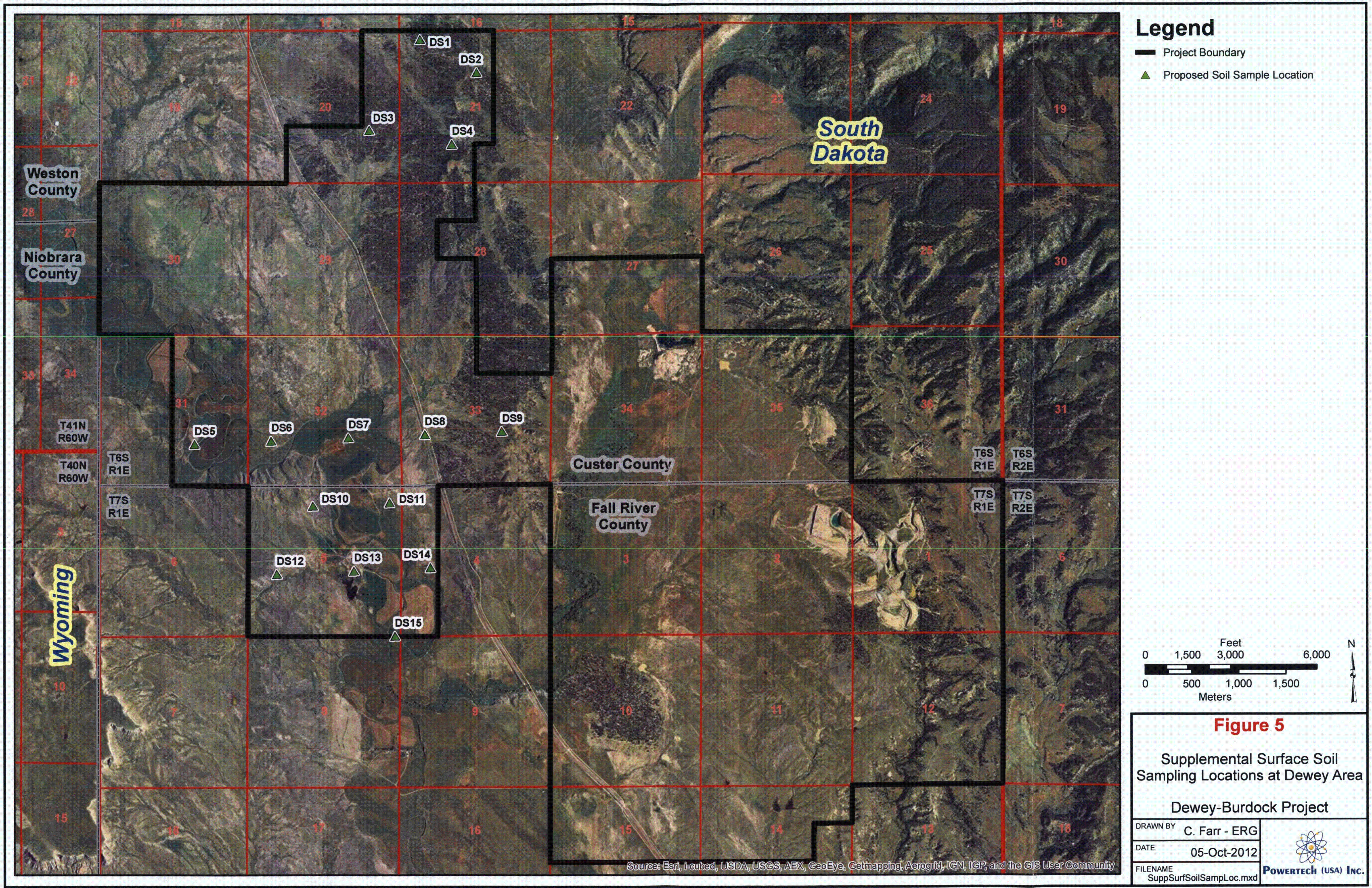
Supplemental Surface Water Monitoring Locations

Dewey-Burdock Project

DRAWN BY	S. Hetrick
DATE	17-Oct-2012
FILENAME	SuppSurfH2OMon.mxd

POWERTECH (USA) INC.


Legend
Project Boundary
3.3 km from Project Boundary
Processing Plants
Open Pit Uranium Mines
Spoil Piles
Black Hills National Forest
BLM Land
Ephemeral Streams
Perennial Streams
BNSF Railroad
County Roads
Seasonal Vegetable Garden Locations
Pig Foraging Area
Cattle grazing takes place throughout the 3.3km boundary
Weston County
Niobrara County
Wyoming
South Dakota
Custer County
Fall River County
T41N R60W
T40N R60W
T6S R1E
T7S R1E
T6S R2E
T7S R2E
VG1
VG2
VG3
VG4
VG5
VG6
W DEWEY RD
DEWEY RD
S. DEWEY RD
PLEASANT VALLEY RD
PILGER MOUNTAIN RD
N FLAT TOP RD
S FLAT TOP RD
ARGENTINE RD
BURDOCK LOOP
RIVER RD
S DEWEY RD
Beaver Creek
Cheyenne River
Feet
0 2,500 5,000 10,000
0 1,000 2,000 3,000
Meters
N
Figure 4
Supplemental Food Source Sampling Locations
Dewey-Burdock Project
DRAWN BY S. Hetrick
DATE 15-Oct-2012
FILENAME SuppFoodSampLoc.mxd
POWERTECH (USA) INC.


Legend
Project Boundary
Proposed Soil Sample Location
DS1
DS2
DS3
DS4
DS5
DS6
DS7
DS8
DS9
DS10
DS11
DS12
DS13
DS14
DS15
South Dakota
Weston County
Niobrara County
Wyoming
Custer County
Fall River County
T41N R60W
T40N R60W
T6S R1E
T7S R1E
T6S R2E
T7S R2E
Feet
0 1,500 3,000 6,000
0 500 1,000 1,500
Meters
N
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
Figure 5
Supplemental Surface Soil Sampling Locations at Dewey Area
Dewey-Burdock Project
DRAWN BY C. Farr - ERG
DATE 05-Oct-2012
FILENAME SuppSurfSoilSampLoc.mxd
POWERTECH (USA) INC.

POWERTECH (USA) INC.

ATTACHMENT B

Responses to Comments on the Draft License Conditions and Public Meeting of August 30, 2012

Response to LC 12.12 (A). Air Particulate Sampling Stations

In an August 30, 2012 meeting between Powertech (USA) Inc. (Powertech) and the US Nuclear Regulatory Commission (NRC) regarding the environmental monitoring program for the proposed Dewey-Burdock Project (the project), the NRC requested justification for only two air monitoring stations (AMS) on the project boundary near the Dewey satellite location. All AMS locations associated with the project include an air particulate sampler, a passive radon detector, and a dosimeter. Surface soil samples (0-5 cm depth) were also collected at each AMS. NRC Regulatory Guide 4.14 (RG4.14) recommends air particulate sampling at three locations near the project boundary. RG4.14 also recommends that the following factors be considered when determining the sampling locations:

1) average meteorological conditions (wind speed, wind direction, atmospheric stability)
2) prevailing wind direction
3) site boundaries nearest to mill, ore piles, and tailings piles
4) direction of nearest occupiable structure
5) location of estimated maximum concentrations of radioactive materials

It is important to mention that Powertech has treated the project as one "milling site". This strategy was presented to the NRC staff during public meetings on August 22, 2007 and on April 29, 2008; no deficiencies regarding this strategy were communicated to Powertech by the NRC staff as a result of these presentations. This strategy was also discussed in Powertech's response to TR RAI 2.9-40 (Powertech, 2011). Considering Powertech's commitment to add an additional AMS near the southeast boundary of the Burdock area and the interpretation of the project being one "milling site", Powertech believes it meets the RG 4.14 selection criteria and number recommendations for AMS locations at the project.

However, the NRC stated in the August 30, 2012 meeting that it is treating the Dewey and Burdock areas as separate "milling sites" when applying RG4.14 recommendations. While Powertech doesn't agree with this approach and believes the existing AMS locations in the Dewey area are appropriate for the pre-operational and operational monitoring programs, a new AMS location based on the siting criteria above and NRC's perceived insistence for another location is proposed as shown on Figure 1 – Supplemental Air Monitoring Stations (Attachment A). A justification for this AMS location on the NNW boundary around Dewey is provided.

An updated annual wind rose for the project was provided to the NRC in Powertech's response to TR RAI 2.5-4 (Powertech, 2011). This wind rose shows that the predominant winds at the project are from the northwest (including the WNW, NW and NNW sectors) and the east (including the ENE, E and ESE sectors). These six directions represent approximately 60% of the wind direction frequency for the site. Existing air monitoring stations AMS-02 and AMS-03 are positioned downwind of the proposed satellite facility in the Dewey area, near the southeastern and western site boundary, respectively. The only other direction with a wind frequency greater than 6% is from the north (refer to Figure TR RAI 2.9-1-2 in Powertech, 2011). Powertech believes there is no justifiable technical reason to place an AMS location near the southern boundary of the Dewey area due to the large distance from potential sources and the likely result of monitoring near this boundary would be background conditions. The data in Table 1 support this conclusion.

Powertech used MILDOS-AREA to evaluate the potential consequence of estimated releases of radioactive materials from proposed activities. Specifically, MILDOS –AREA was used to estimate radon and long-lived radionuclide concentrations (natural uranium, thorium-230, radium-226, and lead-210) in air at site boundary receptors in 16 directions around the Dewey satellite facility. Theses MILDOS-AREA results are summarized in Table 1.

Radon is by far the largest predicted contributor to radioactive materials in air at boundary locations around the site. Because of this, an evaluation of radon concentrations as it applies to criterion 5 above is most appropriate when compared to the long-lived radionuclides. The highest predicted radon concentration in air from site activities is 2.6×10^{-11} μCi ml^{-1}. The average background radon concentration in air measured at AMS-02 and AMS-03 was $1.7 \times 10^{-9} \pm 7.6 \times 10^{-10}$ μCi ml^{-1} and $1.2 \times 10^{-9} \pm 9.3 \times 10^{-10}$ μCi ml^{-1}, respectively. The detection limit for radon in air recommended in RG4.14 is 2×10^{-10} μCi ml^{-1}. The highest predicted radon concentration at a site boundary location in the Dewey area is lower than the recommended detection limit for radon in RG4.14 and nearly two orders of magnitude lower than the measured background levels at AMS-02 and AMS-03.

As mentioned above, another component of environmental monitoring at AMS locations is soil sampling at a 0-5 cm depth to evaluate potential radionuclide deposition from site operations. Radon is a noble gas so no significant ground deposition of radon is expected. However, radon has several short-lived progeny that are susceptible to soil deposition. These short-lived progeny ultimately decay to lead-210 which has a longer half-life of approximately 22 years. Environmental deposition of short-lived radon progeny will ultimately result in lead-210. MILDOS-AREA estimates the magnitude of ground deposition of short-lived radon progeny as well as lead-210. Table 1 summarizes these estimates as well as the resulting predicted increase in soil concentrations in the 0-5 cm depth interval. The highest predicted increase of lead-210 concentrations in soil is 7.9×10^{-10} μCi g^{-1}. The background soil concentration of lead-210 measured at AMS-02 and AMS-03 is $3.0 \times 10^{-6} \pm 3.0 \times 10^{-7}$ μCi g^{-1} and $2.0 \times 10^{-6} \pm 2.0 \times 10^{-7}$ μCi g^{-1} respectively. The recommended limit of detection for lead-210 in soil in RG4.14 is 2×10^{-7} μCi g^{-1}. The highest predicted increase in lead-210 concentration in soil at a site boundary location in the Dewey area is more than two orders of magnitude lower than the RG4.14 recommended detection limit for lead-210 in soil and more than three orders of magnitude lower than the measured background level at AMS-02 and AMS-03.

ATTACHMENT B

Powertech believes AMS-02 and AMS-03 are adequate to monitor the boundary in the Dewey area for the following reasons:

1) AMS-02 and AMS-03 are located in the predominant wind directions (to the southeast and west). Winds from the northwest and east account for 60% of the wind direction frequency.
2) Locating another AMS in the next highest wind direction (to the south) accounts for only 6% of the wind direction frequency.
3) The estimated air concentration of "project-attributable" radon at any site boundary location is very low and is well within the natural background variability of radon. It will be difficult to distinguish project-related radon from background sources at any boundary location.
4) The estimated soil concentration of "project attributable" lead-210 at any site boundary location is very low and is well within the natural background variability of lead-210. It will be difficult to distinguish project related lead-210 from background sources at any boundary location.
5) An additional AMS location near the Dewey area boundary in any direction would provide no additional information regarding the background conditions of the project or potential environmental impacts during operations when compared to information collected at AMS-02 and AMS-03.

If the NRC requires an additional AMS station to fulfill the recommendations in RG4.14, then Powertech proposes siting it in accordance with criteria 3 and 5 above since monitoring locations for criteria 1, 2, and 4 are being met with the existing monitoring system. Other than the satellite facility and the well fields, the land application areas are the only other potential sources of licensed radioactive materials and the only potential sources of licensed long-lived radionuclides. The highest estimated (modeled) long-lived radionuclide concentration in air occurs near the NNW boundary near the Dewey area. Therefore, placing an AMS near the NNW boundary of the Dewey area as Powertech proposes would meet the intent of both criteria 3 and 5 above. The predicted concentrations of long-lived radionuclides is greater than the LLDs recommended in RG4.14, therefore, locating an additional AMS in this location and making a commitment to meet RG4.14 LLDs in the pre-operational and operational monitoring programs would allow Powertech to evaluate potential environmental impacts from the proposed operation.

Table 1. Summary of Radioactive Material Concentrations in Air and Lead-210 Deposition on Ground at Site Boundary Locations around the Dewey Satellite Facility.

Direction	Predicted Radon-222 Air Concentration (µCi ml^{-1})	[3]Predicted Long Lived Radionuclide Air Concentration (µCi ml^{-1})	[1]Predicted Lead-210 Deposition (pCi m^{-2})	[2]Predicted Lead-210 Soil Concentration Increase (0-5 cm depth) (µCi g^{-1})
N	1.09E-11	4.83E-16	26.20	3.49E-10
NNE	1.09E-11	3.74E-16	26.23	3.50E-10
NE	6.70E-12	2.89E-16	16.88	2.25E-10
ENE	1.68E-11	6.70E-16	37.57	5.01E-10
E	1.91E-11	7.63E-16	42.65	5.69E-10
ESE	2.63E-11	8.84E-16	59.17	7.89E-10
SE	2.09E-11	1.21E-15	49.70	6.63E-10
SSE	1.55E-11	6.25E-16	38.75	5.17E-10
S	1.25E-11	3.69E-16	31.88	4.25E-10
SSW	1.71E-11	5.50E-16	41.67	5.56E-10
SW	1.37E-11	5.18E-16	33.23	4.43E-10
WSW	1.46E-11	8.11E-16	33.67	4.49E-10
W	1.04E-11	6.83E-16	24.62	3.28E-10
WNW	8.51E-12	7.87E-16	20.43	2.72E-10
NW	9.64E-12	1.28E-15	22.65	3.02E-10
NNW	1.51E-11	4.26E-15	34.01	4.54E-10
	[1] Lead-210 activity includes contribution from all short lived radon-222 progeny. Deposition period is 1 year. [2]Soil concentration based on an assumed soil dry density of 1.5 g cm^{-3}. [3]Long-lived radionuclide concentration includes contribution from natural uranium, thorium-230, radium-226, and lead-210			

References

Powertech (USA) Inc., 2011, *Technical Report RAI Responses.* June, 2011

TR RAI 2.9-12: Regulatory Guide 4.14 provides recommendations for the collection and analysis of crop samples raised within 3 km of the mill site. In Section 2.2.2 of the TR, the applicant only addressed crop production within the Permit Area. Consistent with Regulatory Guides 4.14 and 3.46, please provide the results of crop sample analyses or a justification for not collecting crop samples. In this response, please describe actions taken by the applicant to determine the agricultural use of adjacent lands, including vegetable gardens.

TR RAI 2.9-12 Response (Revised):

Powertech's original assessment of land use for food sources did not identify any vegetable gardens within 3.3 km of the project area. More recently, Powertech has determined that vegetable gardens are present in the town of Dewey and at one location within the project area as shown on Figure TR RAI 2.9-11-1 in the response to TR RAI 2.9-11. Due to the large sample size (> 10 lbs) typically required to satisfy Regulatory Guide 4.14 suggested LLDs for vegetation and the relatively small size of the vegetable gardens, Powertech is proposing the following alternate approach to sampling vegetables from local gardens.

Powertech proposes to sample vegetable garden soil rather than the vegetables themselves and then apply plant-to-soil concentration factors to estimate the radionuclide concentrations in vegetables.

Methods and parameters contained in NUREG/CR- 5512, *Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent,* (NRC, 1992a) are proposed to estimate radionuclide concentrations in root and leafy vegetables and fruit based on soil radionuclides concentrations. Equation 1, modified from Section 5 (Equation 5.5) of NUREG/CR- 5512 to evaluate a single radionuclide, will be used to calculate vegetable concentration factors as follows:

$$C_{svhj} = 1000(ML_v + B_{JV})W_v\ A\{C_{sj}, t_{gv}\}/C_{sj}(0) \qquad \text{(Equation 1)}$$

Where:

C_{svhj} = concentration factor for radionuclide *j* in plant *v* at harvest from an initial unit concentration in soil (pCi/kg wet-weight plant per pCi/g dry-weight soil)

B_{jv} = concentration factor for uptake of radionuclide *j* from the soil in plant *v* (pCi/kg dry-weight plant per pCi/kg dry-weight soil)

ML_v = plant soil mass-loading factor for resuspension of soil to plant v (pCi/kg dry-weight plant per pCi/kg dry-weight soil)

W_v = dry to wet-weight conversion factor (unitless)

$A\{C_{sj}, t_{gv}\}$ = decay operator notation used to develop the concentration of radionuclide *j* in soil at the end of the crop growing period t_{gv} (pCi/g dry-weight).

C_{sj} = concentration of radionuclide *j* in soil during the growing period (pCi/g dry-weight)

$C_{sj}(0)$ = initial concentration of radionuclide *j* in soil during the growing period (pCi/g dry-weight)

t_{gv} = growing period for food crop (d)

1000 = unit conversion factor (g/kg)

The radionuclides recommended for analysis in vegetation in Regulatory Guide 4.14 are natural uranium, thorium-230, radium-226, lead-210, and polonium-210. These radionuclides, with the exception of polonium-210, have long half-lives when compared to the growing season and the decay correction during the growing season can be ignored. For polonium-210, the initial soil concentration and soil concentration during the growing season will be assumed identical. This assumption will allow simplification of Equation 1 to Equation 2.

$$C_{svhj} = 1000(ML_v + B_{JV})W_v \qquad \text{(Equation 2)}$$

Table 2 presents the parameters that will be used to estimate wet-weight vegetable and fruit concentrations from dry-weight soil concentrations.

Reference

NRC, 1992a, NUREG/CR-5512, Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent. October 1992.

Table 2. Parameters that Will Be Used to Estimate Wet-Weight Vegetable Concentrations from Dry-Weight Soil Concentrations

Parameter	Parameter Description	Plant Type	Radionuclide	Value	Unit
ML_v	Mass loading factor	Root Vegetables	Parameter is not radionuclide specific.	0.1	pCi/kg dry-weight plant per pCi/kg dry-weight soil
		Leafy Vegetables			
		Fruits			
B_{jv}	Concentration factor for root uptake	Root Vegetables	Natural uranium	0.014	pCi/kg dry-weight plant per pCi/kg dry-weight soil
			Thorium-230	0.00012	
			Radium-226	0.0032	
			Lead-210	0.0032	
			Polonium-210	0.009	
		Leafy Vegetables	Natural uranium	0.017	
			Thorium-230	0.0025	
			Radium-226	0.075	
			Lead-210	0.0058	
			Polonium-210	0.0025	
		Fruits	Natural uranium	0.004	
			Thorium-230	0.000085	
			Radium-226	0.0061	
			Lead-210	0.009	
			Polonium-210	0.0004	
W_v	Dry weight to wet weight conversion factor	Root Vegetables	Not radionuclide specific	0.2	Unitless
		Leafy Vegetables		0.25	
		Fruits		0.18	

ATTACHMENT B

Response to NRC Regarding LLD for Natural Uranium in Air.

In an August 30, 2012 meeting between Powertech (USA) Inc. (Powertech) and the US Nuclear Regulatory Commission (NRC) regarding the environmental monitoring program for the proposed Dewey-Burdock Project (the project), the NRC stated that the justification for an alternative lower limit of detection(LLD) for natural uranium in air provided in the response to TR RAI 2.9-5 (Powertech, 2011) was not acceptable and that the LLD values in Regulatory Guide 4.14 (RG4.14) "have to be used".

It should be made clear that RG4.14 is a guidance document and alternatives to any recommendation in RG4.14 can be provided and should be considered. The NRC did not provide Powertech with the basis for the LLDs contained in RG4.14. NUREG/CR-4007, "Lower Limit of Detection: Definition and Elaboration for a Proposed Position for Radiological Effluent and Environmental Measurement" (Currie, 1984), provides a basis for a measurement process sensitivity and states:

"In the monitoring environment, for low levels of effluent and environmental radioactivity associated with the operation of nuclear power reactors, the measurement process must be capable of detecting the relevant radionuclides at levels well below those of concern to the public health and safety."

Powertech believes the response to TR RAI 2.9-5 meets this expectation. After review of all LLDs reported for particulate monitoring in air contained in the license application, the only radionuclide that does not meet RG4.14 LLDs for all monitoring periods is natural uranium. Table 3 below summarizes the monitoring periods and the associated LLD for natural uranium during that period. The LLDs for Period 1 are much larger than the RG4.14 recommended value of $1x\ 10^{-16}$ µCi ml^{-1} for all AMS locations. Period 1 represents s only 14 percent of the total monitoring period of 366 days. The LLDs for period 2 are only slightly above the RG4.14 recommended value for all AMS locations. The remaining LLDs for each period and monitoring location are well below the RG4.14 recommended value.

The NRC stated in the August 30, 2012 meeting that when evaluating potential environmental impacts from proposed project activities, it is difficult to compare operational data to baseline data if the LLDs are significantly different. Powertech agrees with this premise provided the data you are comparing are all close to the LLD or non-detects. It should be noted that typically operational data are compared to the background location data for the same monitoring period when evaluating potential environmental impacts, not pre-operational baseline data. This practice is because of potential temporal variability of background radionuclide concentrations not only from season to season, but from year to year. Further, the pre-operational data set is small and may not fully represent the background condition of the site.

In the response to TR RAI 2.9-5, Powertech committed to meet the RG4.14 detection limits for natural uranium during the operational monitoring program. Powertech will start the operational monitoring program prior to major site construction to capture an equivalent to period 1 and period 2 in order to obtain a complete set of pre-operational data that meets the RG 4.14 LLD for natural uranium.

ATTACHMENT B

Table 3. Summary Natural Uranium LLDs in Air for Each Monitoring Period and Location around the Dewey Burdock Project.

Monitoring Period #	Monitoring Period	Number of Days	Fraction of Total Monitoring Period (366 days)	Lower Limits of Detection for Natural Uranium in Air (μCi ml^{-1})							
				AMS-01	AMS-02	AMS-03	AMS-04	AMS-05	AMS-06	AMS-07	AMS-BKG
1	8/13/07 to 10/02/07	50	0.14	7.1E-15	7.0E-15	5.0E-15	5.0E-15	5.9E-15	5.0E-15	4.8E-15	5.7E-15
2	10/02/07 to 01/04/08	94	0.26	1.6E-16	1.5E-16	1.6E-16	1.6E-16	1.6E-16	1.5E-16	1.4E-16	1.6E-16
3	01/04/08 to 04/01/08	88	0.24	1.7E-18	1.6E-18	1.5E-18	1.7E-18	1.6E-18	1.6E-18	1.4E-18	1.6E-18
4	04/01/08 to 07/09/08	99	0.27	1.5E-18	1.4E-18	1.5E-18	1.5E-18	1.4E-18	1.4E-18	1.3E-18	1.4E-18
5	07/09/08 to 08/13/08	35	0.10	4.3E-18	4.0E-18	4.2E-18	4.2E-18	4.1E-18	4.0E-18	3.7E-18	4.0E-18