DTSC Technical Roundtable
EPA Radiological Trigger Levels
HSA 5C Data &
Lookup Table Process
Santa Susana Field Laboratory

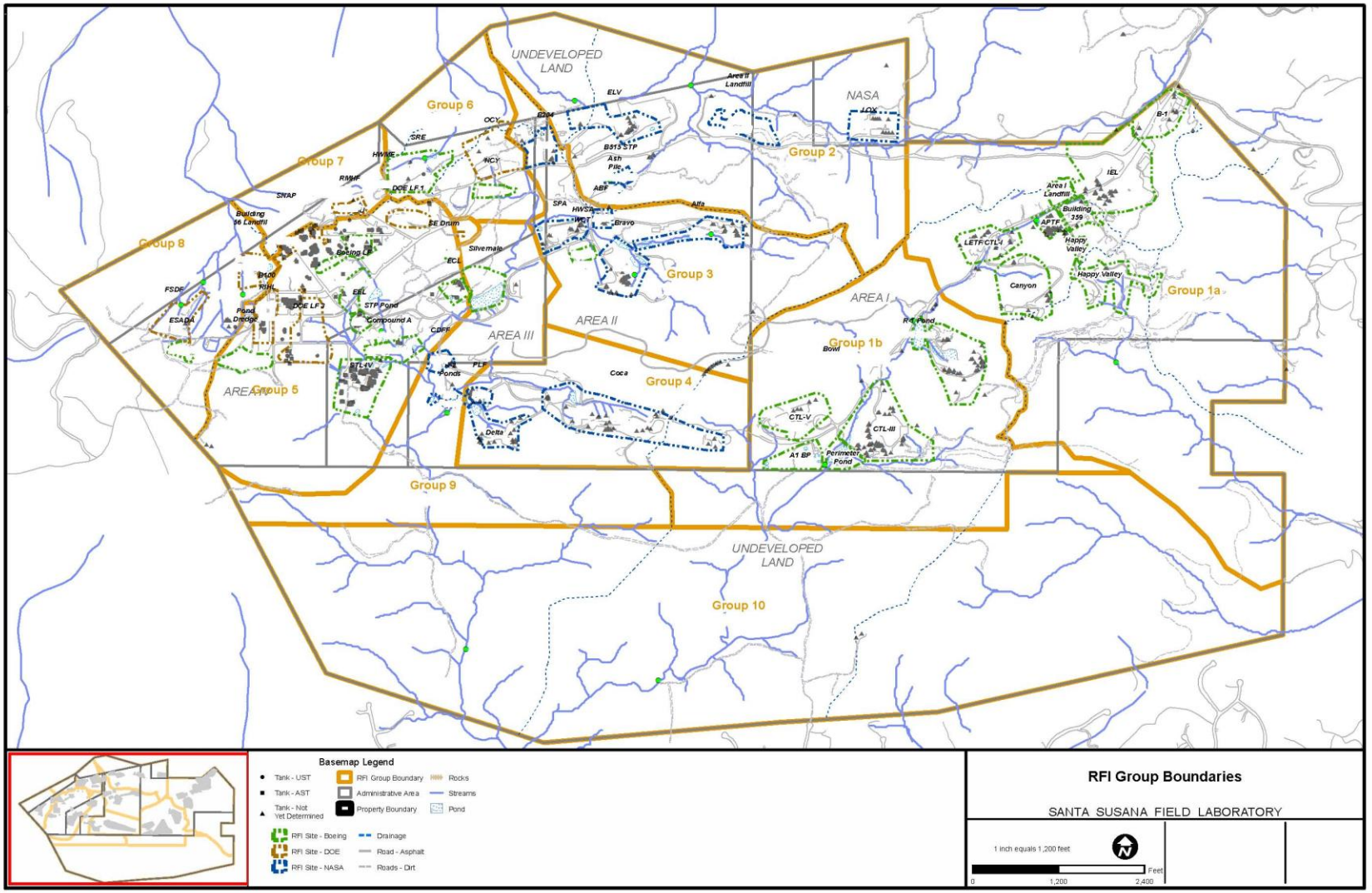
Factors & Considerations
(continued)

January 18, 2012

Meeting Objectives

- Focus on Radiological Trigger Levels & Lookup Table process
- Continue developing common understanding of terms
- Continue laying out fundamental building blocks & considerations to aid Lookup Table development process
- Review EPA data from HSA 5C and relationship to the Trigger levels and discuss Lookup Table approach
- Prepare participants for future Lookup Table roundtable discussions

Santa Susana Field Laboratory



HSA 5C


Subarea 6
Subarea 5A
Subarea 5B
Subarea 5C
Subarea 5D-North
Subarea 5D-South
N

Lookup Table Development Process

- ✓ DTSC met w/ EPA, DOE and NASA to scope
- ✓ Identify key factors & considerations
- ✓ Share factors and considerations and gain common understanding of terms with community
- ✓ Use factors & considerations to develop draft Lookup Table
- ❑ Compare draft Lookup Table to site data
- ❑ Present draft Lookup Table examples w/ community
- ❑ Discuss results w/ community

Terms

- Lookup value = cleanup value
- Minimum Detectable Concentration (MDC)
  - The theoretical amount of radiological activity that would have to be in a sample, in order to be distinguishable from a sample with no activity.
  - In some cases, the MDC of a single sample cannot be achieved at or below background.
- Background Threshold Value (BTV)
  - Report provides background threshold values based on 95% Upper Simultaneous limit (USL95%).
  - Using USL95% is one way to reduce false (+).
- Radiological Trigger Level (RTLs) – EPA (Dec 16, 2011)
  - In lieu of Lookup Table values, RTLs were developed to guide characterization.
  - RTLs based on MDCs & BTVs

Terms

- Lookup values need to address uncertainties
  - Variability
  - Errors (not a mistake - part of scientific method)

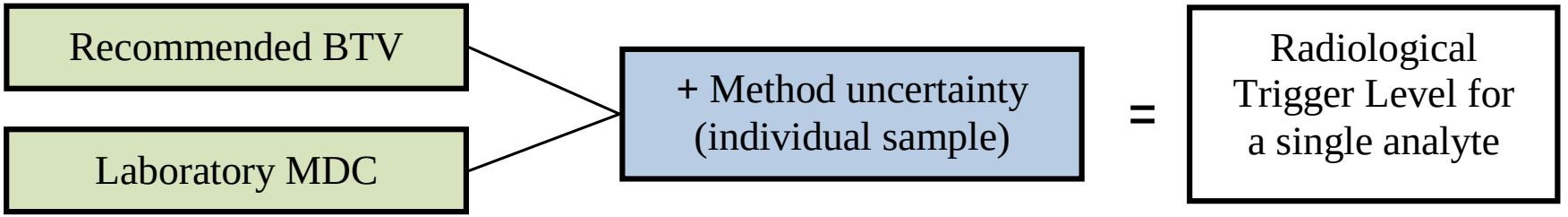
Develop Radiological Trigger Levels from Recommended BTVs and Minimum Detectable Concentrations

Evaluate Site Radiological Results From Lower and Higher Contamination Subareas Using Radiological Trigger Levels

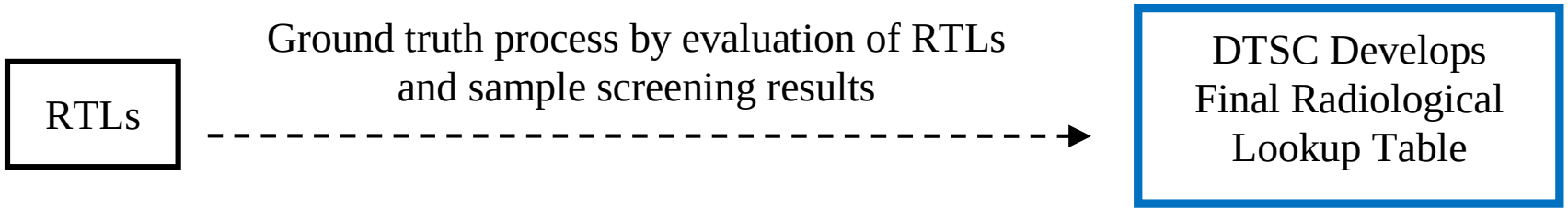
Apply Trigger Levels To Round 1 Results and Recommend Radiological Look Up Table Values To DTSC

Development of Radiological Trigger Levels

Step 1: Develop each RTL



Step 2: Apply RTLs to Subareas 5C and 6 Analytical Results



Radiological Trigger Levels

Radionuclide	Method	Suite	Source	RTL (pCi/g)
actinium-227+D	Gamma	Default	MDC	2.17E-01
actinium-228			BTV	2.40E+00
antimony-125+D			BTV	3.54E-01
bismuth-212			BTV	2.15E+00
bismuth-214			BTV	1.59E+00
cadmium-113m			BTV	3.03E+03
lead-212			BTV	2.69E+00
lead-214			BTV	1.70E+00
cesium-134			MDC	8.64E-02
cesium-137+D			BTV	2.07E-01
cobalt-60			MDC	2.80E-02
europium-152			MDC	5.66E-02
europium-154			MDC	1.50E-01
europium-155			BTV	2.31E-01
holmium-166m			BTV	4.32E-02
neptunium-236			MDC	4.70E-02
neptunium-239			MDC	1.39E-01
niobium-94			MDC	2.14E-02
potassium-40			BTV	3.24E+01
protactinium-231			BTV	9.36E-01
sodium-22			MDC	3.70E-02
tellurium-125m			BTV	8.38E-02
thallium-208			BTV	9.37E-01
thulium-171			MDC	7.24E+01
tin-126			MDC	2.37E-02
strontium-90+D (Y-90)	Sr-Y	Default	MDC	4.85E-01

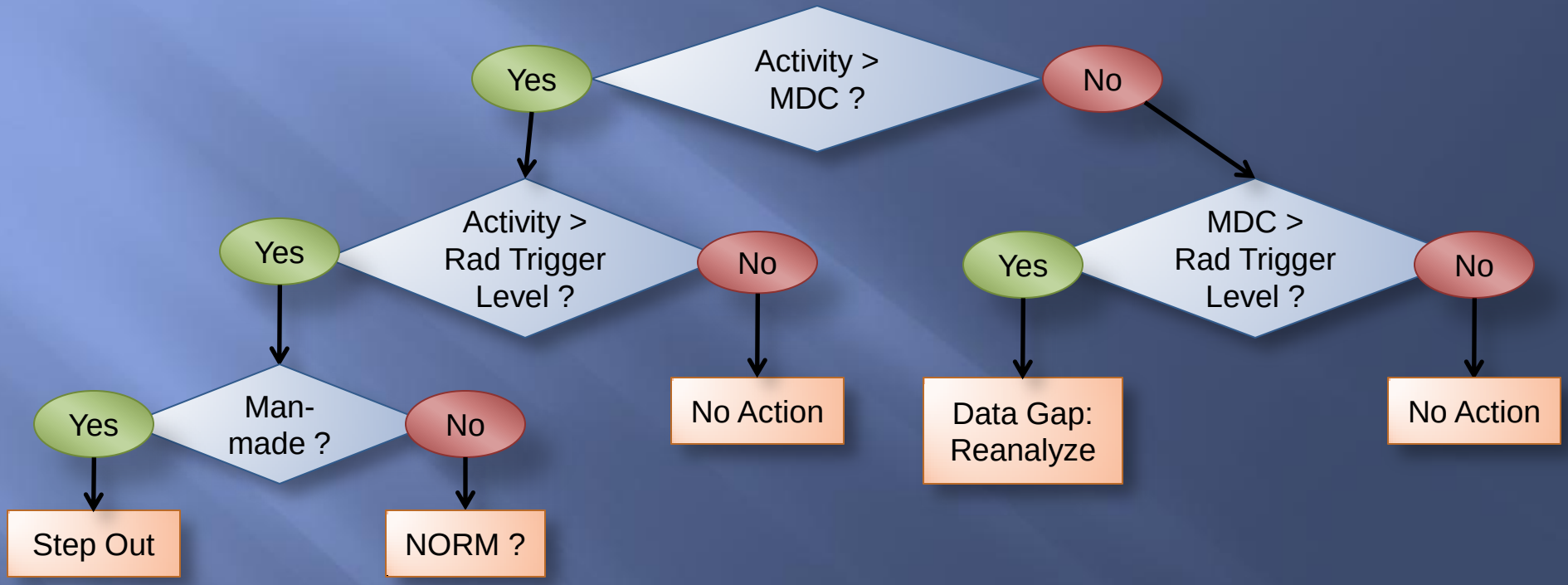
Key

Naturally Occurring Radionuclides

Maximum Non-Detect BTV - Use MDC

Radionuclide	Method	Suite	Source	RTL (pCi/g)
thorium-228+D	Th-isotopic	Default	BTV	3.98E+00
thorium-230			BTV	2.20E+00
thorium-232			BTV	3.10E+00
thorium-234			BTV	3.19E+00
thorium-229+D	Th-229	Site Specific	MDC	1.45E-01
uranium-233/234	U-isotopic	Default	BTV	2.02E+00
uranium-235+D/236			BTV	1.51E-01
uranium-238+D			BTV	1.80E+00
uranium-232	U-232	Site Specific	MDC	1.17E-01
plutonium-238	Pu-isotopic	Default	MDC	4.15E-02
plutonium-239/240			MDC	4.04E-02
plutonium-242			MDC	4.06E-02
plutonium-236	Pu-236	Site Specific	MDC	7.79E+00
plutonium-244+D	Pu-244		MDC	3.13E-02
plutonium-241	Pu-241	Site Specific	MDC	1.04E+01
americium-241	Am-241-Cm Isotopic	Default	MDC	4.54E-02
curium-243/244			MDC	4.43E-02
americium-243+D	Am-243-Cm Isotopic	Site Specific	MDC	4.01E-02
curium-245/246			MDC	3.06E-02
curium-248			MDC	3.33E-02
neptunium-237+D	Np-237	Site Specific	MDC	4.01E-02
radium-226+D	Gamma Ra	Site Specific	BTV	2.03E+00
radium-228+D			BTV	2.40E+00
tritium (H-3) organic	H-3	Site Specific	MDC	1.19E+01
carbon-14	C-14	Site Specific	MDC	2.96E+00
iron-55	Fe-55	Site Specific	MDC	5.94E+00
nickel-59	Ni-59	Site Specific	MDC	5.96E+00
nickel-63	Ni-63	Site Specific	MDC	4.92E+00
technetium-99	Tc-99	Site Specific	MDC	1.63E+00
promethium-147	Pm-147	Site Specific	MDC	1.75E+01

Analytical Result Decision Tree



RTL Screening Example of Subset of Analytical Results

Field Sample ID	Analyte Name	Activity	MDC	Detected? (Activity > MDC)	Radiological Trigger Level (RTL)	Detected Above RTL	Detected Activity /RTL
10242	Pa-231	0.009	0.61		0.936		
10242	Pb-212	1.74	0.025	Yes	2.690		
10242	Pb-214	1.1	0.027	Yes	1.700		
10242	Pu-236	-0.002	0.006		7.790		
10242	Pu-238	0.004	0.004	Yes	0.042		
10242	Pu-239/Pu-240	0.049	0.001	Yes	0.040	**Yes**	**1.203**

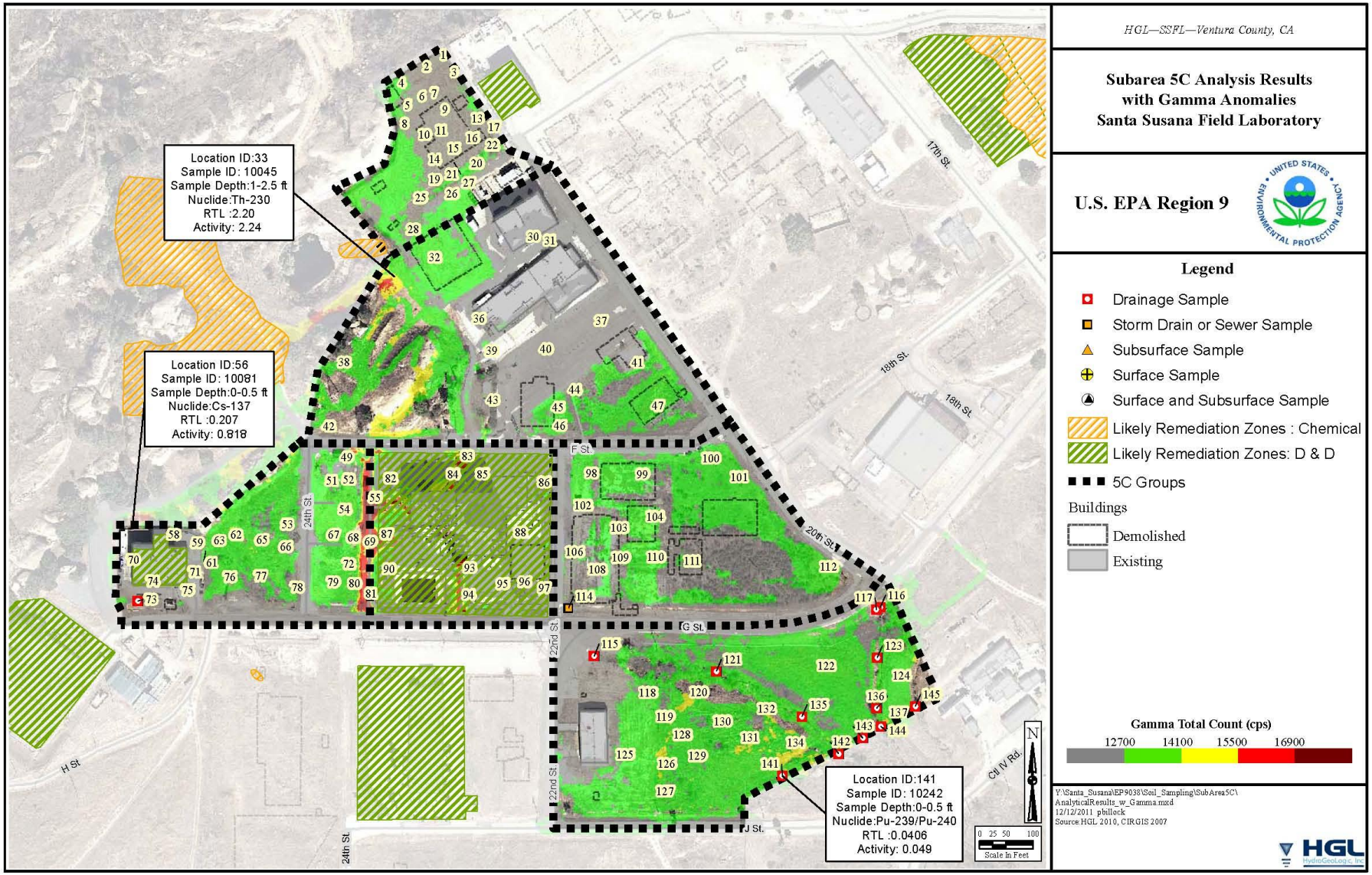
All results in pCi/g

Summary of 5C Screening Results (Preliminary)

Field Sample ID	Analyte Name	Activity	MDC	Detected? (Activity > MDC)	Radiological Trigger Level (RTL)	Detected Above RTL	Detected Activity /RTL
10081	Cs-137	0.818	0.015	Yes	0.207	**Yes**	**3.95**
10242	Pu-239/Pu-240	0.0486	0.0013	Yes	0.040	**Yes**	**1.20**
10045	Pb-214	1.95	0.031	Yes	1.700	**Yes**	**1.15**
10045	Bi-214	1.72	0.031	Yes	1.590	**Yes**	**1.08**
10045	Th-230	2.24	0.008	Yes	2.200	**Yes**	**1.02**
3		**Count**		**4967**		**5**	

All results in pCi/g

Preliminary 5C Results With Gamma Survey



HGL—SSFL—Ventura County, CA

Subarea 5C Analysis Results with Gamma Anomalies Santa Susana Field Laboratory

U.S. EPA Region 9

Legend

- Drainage Sample
- Storm Drain or Sewer Sample
- Subsurface Sample
- Surface Sample
- Surface and Subsurface Sample
- Likely Remediation Zones : Chemical
- Likely Remediation Zones: D & D
- 5C Groups

Buildings

- Demolished
- Existing

Gamma Total Count (cps)

12700 14100 15500 16900

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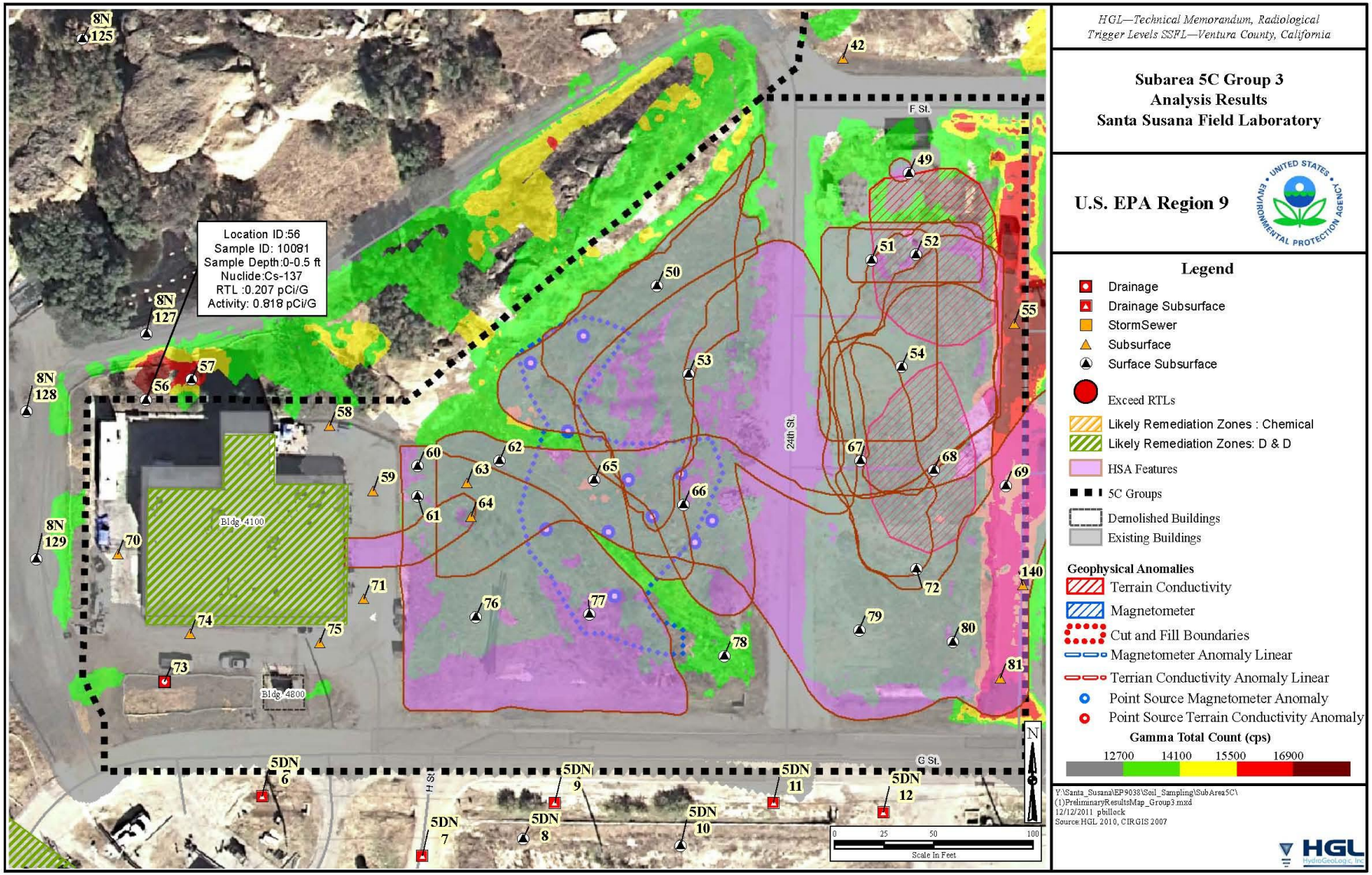
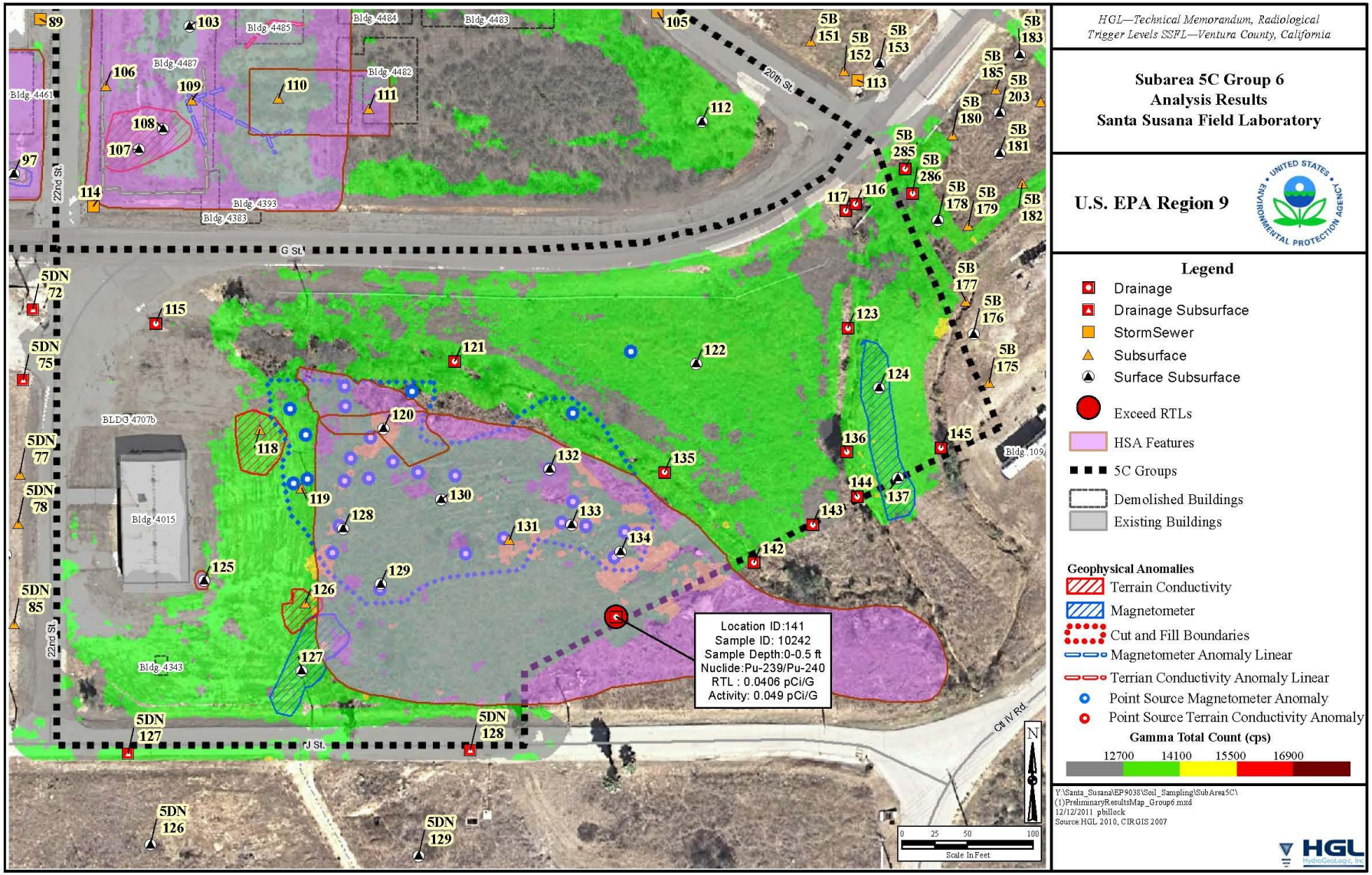
12/12/2011 pbillock
Source:HGL 2010, CIRGIS 2007

HGL

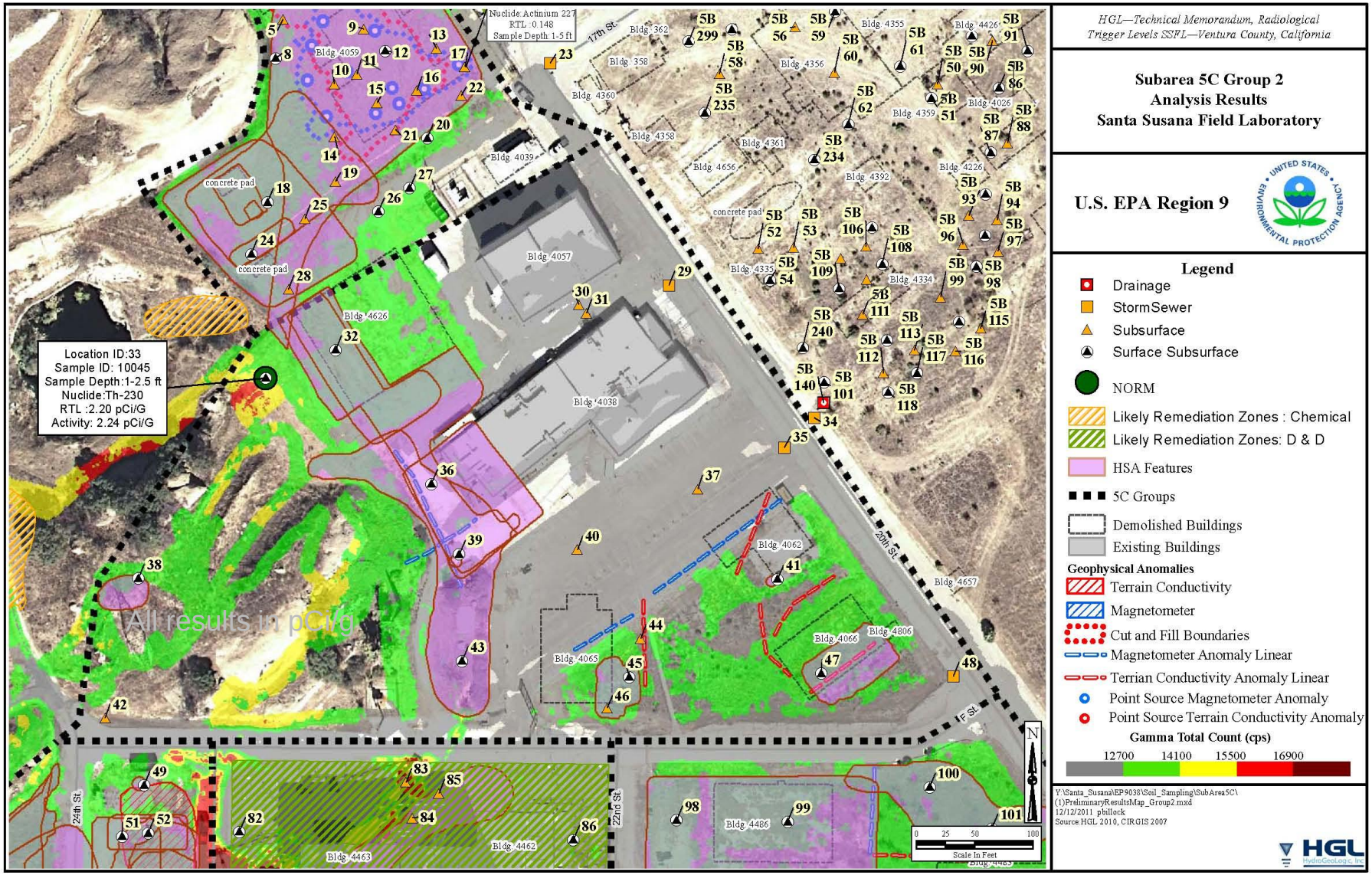
Cs-137 Result Above RTL



Pu-239/240 Result Above RTL



Naturally Occurring Result Above RTL



HGL—Technical Memorandum, Radiological Trigger Levels SSFL—Ventura County, California

Subarea 5C Group 2
Analysis Results
Santa Susana Field Laboratory

U.S. EPA Region 9

Legend

- Drainage
- StormSewer
- Subsurface
- Surface Subsurface
- NORM
- Likely Remediation Zones : Chemical
- Likely Remediation Zones: D & D
- HSA Features
- 5C Groups
- Demolished Buildings
- Existing Buildings

Geophysical Anomalies

- Terrain Conductivity
- Magnetometer
- Cut and Fill Boundaries
- Magnetometer Anomaly Linear
- Terrian Conductivity Anomaly Linear
- Point Source Magnetometer Anomaly
- Point Source Terrain Conductivity Anomaly

Gamma Total Count (cps)

12700 14100 15500 16900

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12/12/2011 pbillock
Source:HGL 2010, CIRGIS 2007

Round 2 Criteria

Step 1: Identify "Elevated" Locations By Screening Soil Results Against RTLs

Step 2: Apply Professional Judgment

- Relative Activity Comparison
- Process History
- Rock Outcrops (i.e., natural radioactivity)

Questions and Discussion

Lookup Table Development Process

- ✓ DTSC met w/ EPA, DOE and NASA
- ✓ Identify key factors
- ✓ Share factors and get input from community
- ✓ Use factors to develop draft Lookup Table
- ❑ Compare draft Lookup Table to site data
- ❑ Present draft Lookup Table w/ community
- ❑ Discuss results w/ community

Future Meetings

- February – March (date TBD)
  - Ongoing workshop(s) coordinated w/ US EPA data presentations from other Historical Site Assessment (HSA) Areas (e.g., HSA 5B and HSA 6)

Thank-you