

## TECHNICAL MEMORANDUM

**To:** Brian Rakvica (NDEP)  
**From:** Ranajit Sahu (BRC)  
**cc:** Jim Najima (NDEP)  
Paul Black (Neptune)  
Mark Jones (ERM)  
**Date:** March 25, 2010  
**Subject:** Technical Memorandum – Correlation of Radon Activities in Indoor Air and Shallow Zone Groundwater, BMI Common Areas (Eastside) Site, Clark County, Nevada

### Introduction

As part of the soils closure process for BMI Common Areas (Eastside) property that has been approved by the Nevada Division of Environmental Protection (NDEP), human health risk assessment is conducted to determine if chemical concentrations in Site soils are: (1) either representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and anticipated future use conditions. The human health risk assessments are to follow the basic procedures outlined in U.S. Environmental Protection Agency (USEPA) and NDEP guidance documents. The human health risk assessment also conforms to the methodology included in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007).

Various transfer pathways for which chemicals can migrate from impacted soil to other media are identified during the risk assessment process. One of these pathways that is expected for Eastside property is volatilization from soil (and underlying groundwater) and upward migration into ambient air, which includes both indoor and outdoor air. This pathway is to be evaluated using surface flux measurements collected during site-specific sampling in accordance with an approved Sampling and Analysis Plan (SAP). The flux chamber is used to measure the emission rates from surfaces emitting gas species. Use of the flux chamber reduces the need for modeling surface flux rates which reduces the uncertainty in the air representative exposure concentrations and the risk characterization. Because the flux chamber measurements are conducted outdoors on open soil, an “infiltration factor” is applied to the outdoor flux data to generate data supporting the inhalation of indoor air exposure pathway. Indoor air exposures are then evaluated on a sample by sample basis, per NDEP requirements, using these surface flux data measurements. To date, for this purpose, BRC has implemented surface flux sampling across the Site at several sub-areas. This sampling conformed to the most recent NDEP-approved version of SOP-16 (BRC,

ERM and MWH 2009), which included use of a static flux chamber with activated charcoal (AC) canisters for radon sampling and analysis.

However, due to possible issues associated with characterizing the results of these radon measurements, BRC elected to address the issue of radon risk in the vapor intrusion pathway more directly. Pursuant to an NDEP-approved work plan, BRC conducted radon sampling of groundwater and indoor air at two representative locations for the Eastside. The specific purpose was to evaluate whether the presence of radon in groundwater was causing elevated radon levels in indoor air. For risk assessment, this direct measurement approach for indoor air is considered more reliable as a reflection of actual conditions than using modeled data to predict indoor air radon activities.

### **Scope of the Study**

Because development has not yet occurred at the Eastside property, it is not currently possible to collect indoor air radon data within the property boundaries. However, per the work plan approved by the NDEP, existing buildings have been constructed on adjacent properties were used. For the purpose of this study, BRC identified two structures where indoor radon could readily be measured (that is, access was currently available). Two shallow zone groundwater monitoring wells were also located from the pool of existing monitoring wells, one near each of these two structures, such that it would be possible to collect roughly co-located indoor air and shallow zone groundwater samples. The indoor air sample locations and co-located shallow zone groundwater monitoring wells identified and evaluated were (see Figure 1):

#### **Indoor Air Sampling Address**

#### **Nearby Monitoring Well**

Residence at 1041 Via Sanguinella

DBMW-13

BRC Office at 875 W Warm Springs Rd

WS1-14

Both locations are considered representative for the purposes of this study because (1) they are located in areas where there are not likely to be radon activities in soils beyond what would be expected for background conditions; (2) they are representative of conditions applicable to different areas of Eastside property; and (3) they provide a range of depths to shallow zone groundwater (the depth to water measured in DBMW-13 in August 2009 was 59.69 feet bgs; no depth to groundwater data were located for WS1-14 [screened from 14 to 34 feet bgs]).

### **Indoor Air Sampling Procedures and Data**

The indoor air sampling was conducted from January 11 to January 14, 2010, by Converse Consultants (Converse) at two locations within each structure, as discussed in a letter report dated January 27, 2010 (enclosed as Attachment A). The indoor air samples were submitted to Environmental Microbiology Laboratory, Inc. (Phoenix, Arizona) for analysis for radon. As summarized in that letter, the indoor air radon testing results are as follows:

<b><u>Indoor Air Sampling Address</u></b>	<b><u>Minimum Measured Activity (pCi/L)</u></b>	<b><u>Maximum Measured Activity (pCi/L)</u></b>
Residence at 1041 Via Sanguinella	0.9	1.3
BRC Office at 875 W Warm Springs Rd	2.0	2.0

According to the report, all four measured activities were below the USEPA Action Level (4 pCi/L), and the residential measurements were also below the USEPA Action Level for homeowners to consider mitigation (2 pCi/L). The report also noted that the indoor air measurements at the Tuscany house were also at or below the national average radon activity level in homes (1.3 pCi/L). Based on these findings, Converse noted that no further action was recommended per USEPA guidelines. BRC also believes that these data are consistent with indoor radon levels measured by others in Clark County.

### **Groundwater Sampling Procedures and Data**

Groundwater sampling of the two wells was conducted by Converse on January 14, 2010. The samples were submitted to GEL Laboratories LLC (Charleston, South Carolina) for radon analysis. The analytical results are provided in the attached laboratory report (Attachment B) and are as follows:

<b><u>Well ID/Location</u></b>	<b><u>Result (pCi/L)</u></b>	<b><u>Uncertainty</u></b>
DBMW-13 (near Tuscany Residence)	223	+/- 58.1
WS1-14 (near BRC Office)	435	+/- 66.5

These measured activities were compared to the following health-based comparison levels:

- The 300 pCi/L USEPA Maximum Contaminant Level (MCL); and
- The 4,000 pCi/L USEPA Alternative MCL.

As seen in the above table, the measured activity near the Tuscany housing development was lower than the MCL, while the measured activity near the BRC office was higher than the MCL. Both results were well below the alternative MCL.

### **Summary and Conclusions**

Based on the above data, it appears that the presence of radon in groundwater in the vicinity of the Eastside property is not resulting in radon levels in indoor air that pose a threat to human health. The groundwater data demonstrate that while radon is present in groundwater beneath each location; activities were close to the USEPA MCL. The sampling event found higher measured radon activities in groundwater and indoor air at the western sampling location near the BRC office than at the eastern sampling location near the Tuscany housing development, but all the indoor air activities were lower than the USEPA Action Level for mitigation.

These data support the use of the 300 pCi/L USEPA MCL as a conservative comparison level for measured radon activities in groundwater. Specifically, the groundwater measurement that was lower than the USEPA MCL (223 pCi/L in the Tuscany development area) had an associated indoor air measurement that was lower than the USEPA Action Level for homeowners to consider mitigation. The groundwater measurement that was higher than the USEPA MCL (435 pCi/L in the BRC office area) had an associated indoor air measurement that was equal to the USEPA Action Level for homeowners to consider mitigation<sup>1</sup> and was lower than the USEPA Action Level for mitigation.

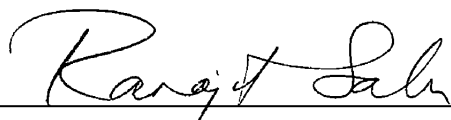
Based on these findings, BRC proposes that no further action regarding radon is needed in areas where measured radon activities in groundwater are at or below the levels evaluated during this study (*i.e.*, less than 435 pCi/L), because associated indoor air levels likely would not pose a threat to human health. Instances where radon concentrations exceed this level will be discussed with NDEP on a case-by-case basis.

Attachments: Figure 1 – Radon Shallow Zone Groundwater and Indoor Air Sample Locations  
Attachment A – Indoor Air Radon Testing Report  
Attachment B – Laboratory Report for Groundwater Sampling

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<sup>1</sup> Because the facility in question is not a residence, this action level is not directly applicable to the BRC office building.

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.



March 25, 2010

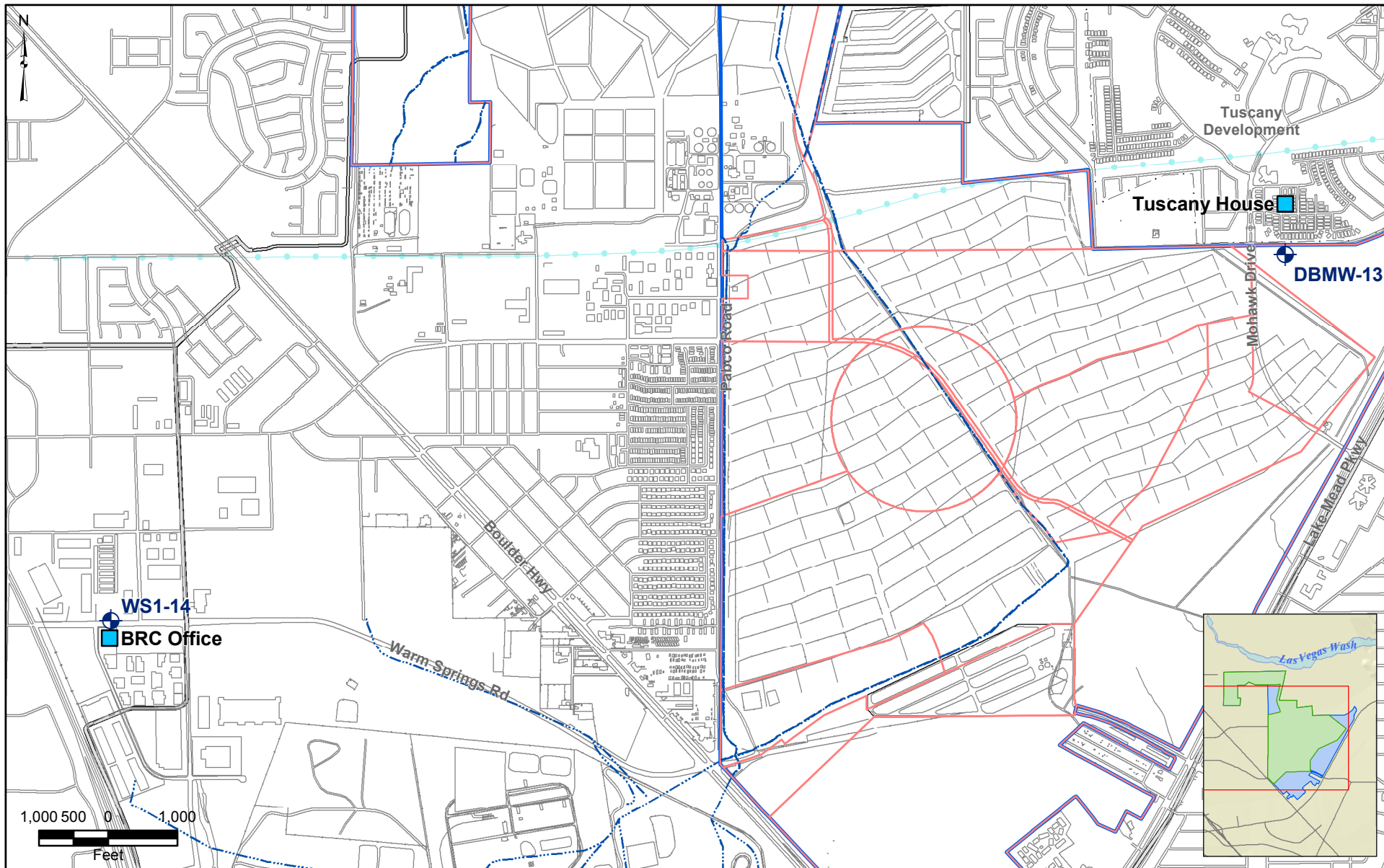
Dr. Ranajit Sahu, C.E.M. (No. EM-1699, Exp. 10/07/2011)  
BRC Project Manager






Date

## **REFERENCES**

- Basic Remediation Company (BRC), Environmental Resources Management (ERM), and Daniel B. Stephens & Associates, Inc. 2007. BRC Closure Plan, BMI Common Areas, Clark County, Nevada. May. Chapter 9 updated December 2009.
- Basic Remediation Company (BRC), Environmental Resources Management (ERM) and MWH. 2009. BRC Field Sampling and Standard Operating Procedures, BMI Common Areas, Clark County, Nevada. December.

## FIGURES



- |   |  |
|---|--|
|  Site AOC3 Boundary      |  Shallow Zone Groundwater Radon Sample Location |
|  Eastside Soil Sub-Areas |  Indoor Air Radon Sample Location               |
|  Ditches                 |  |

BMI Common Areas (Eastside)  
Clark County, Nevada

FIGURE 1

# RADON SHALLOW ZONE GROUNDWATER AND INDOOR AIR SAMPLE LOCATIONS



Prepared by  
MKJ (ERM)



Date  
03/22/10

JOB No. 0064276  
FILE: GIS/BRC/RADON\_TECH-MEMO/FIGURE\_1.MXD



ATTACHMENT A

INDOOR AIR RADON TESTING REPORT



# Converse Consultants

Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services



BY: \_\_\_\_\_

January 27, 2010

09-43402-01

Mr. Ranajit Sahu  
Basic Remediation Company (BRC)  
875 West Warm Springs Road  
Henderson, NV 89011

Subject: **Report**  
*Radon Testing*  
Residential Location  
1042 Via Sanguinella (Tuscany Development)  
Commercial Location  
875 West Warm Springs Road (BRC Offices)  
Henderson, Nevada

Dear Mr. Sahu:

In accordance with our Professional Services Agreement dated April 15, 2004 and your Task Order 11178, Converse Consultants (Converse) conducted the subject radon testing from January 11 to January 14, 2010. The subject services were reportedly requested to obtain data regarding potential radon levels in future homes to be built in the 89011 zip code.

## Scope of Services

The subject assessment included the professional services of Mr. Dale Walsh, a Converse employed Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP), and Certified Environmental Manager (CEM). Two tests were conducted in each of the two subject locations.



Printed on  
Recycled Paper

731 Pilot Road, Suite H, Las Vegas, Nevada 89119-4429

Telephone: (702) 269-8336 ♦ Facsimile: (702) 269-8353 ♦ e-mail: lasvegas@converseconsultants.com

The samples were sent using chain-of-custody methods for analysis to EMLab P&K (EML) in Phoenix, Arizona. EML is certified under the National Environmental Health Association's National Radon Proficiency Program.

The testing was performed using the Rad Elec E-PERM Electret Ion Chamber (refer to enclosed photograph) which was analyzed with the SPER-1 Electret Reader. The tests were collected at the lowest floor levels of the buildings sampled, in middle areas of the rooms, and at a height of approximately five feet above ground. The buildings had been closed as much as possible the two days before testing (e.g., sampling started Monday morning).

## Results and Discussion

The radon testing results are described in Table 1. The laboratory report is enclosed.

**Table 1**  
**Radon Testing Results measured in picoCuries per Liter of air (pCi/L).**

Location / Sample No.	Start Time and Date	End Time and Date	Results pCi/L
Tuscany House Dining Room / SDI601	0915 – 1/11/10	1545 – 1/14/10	1.3
Tuscany House Downstairs Bedroom / SBU916	0915 – 1/11/10	1545 – 1/14/10	0.9
BRC Office Main File Room / SDM355	0845 – 1/11/10	1515 – 1/14/10	2.0
BRC Office Landwell File Room / SBU791	0845 – 1/11/10	1515 – 1/14/10	2.0
<i>EPA Action Level for Mitigation</i>			4.0
<i>EPA Level for Homeowner to Consider Mitigation</i>			2.0
<i>National Average in Homes</i>			1.3

Note 1: Radon mitigation is relatively simple. The soil below the slab is exposed and a vent is sealed and attached to the hole and vented to the outdoors to provide another path for the gas besides going into the home. The EPA is encouraging new homes to be built with a mitigation system in place or with the main constituents present for ease of installing the system by the homeowners.

Note 2: University of Nevada Cooperative Extension data from three tests in the 89011 indicated radon levels below 4 pCi/L (refer to the enclosed map and chart).

## **Conclusions**

Based upon the previously described results, the following conclusions are made:

1. The radon levels detected at the residence were below both the EPA Action Level and homeowner mitigation consideration level. The levels detected were also at or below the national average.
2. The radon levels detected at the BRC office were below the EPA Action Level and at the homeowner mitigation consideration level. The levels detected were above the national average by approximately 50%.

## **Recommendations**

Based upon the previously described results and conclusions, the following recommendations are made:

1. Per EPA guidelines, no further action is recommended. However, consideration should be given to conducting a follow up to the testing during the summer months to confirm the results obtained under different climatic conditions.

## **Limitations**

This report is for the use of Basic Remediation Corporation as it applies to the subject site. Converse is not responsible for any claims or damages associated with interpretation of available information. This assessment should not be regarded as a guarantee that no other hazardous conditions exist at the subject site. In the event that changes in the nature of the property occur, or additional relevant information about the property is brought to our attention, the conclusions and recommendations contained in this assessment may not be valid unless these changes and additional relevant information are reviewed and the conclusions and recommendations of this assessment are modified or verified in writing.

BRC  
Project No. 09-43402-01  
January 27, 2010  
Page 4

Thank you for the opportunity to be of service. Should you have any questions or comments regarding this report, please do not hesitate to call.

Respectfully submitted,

CONVERSE CONSULTANTS



Dale W. Walsh, CIH, CSP, CEM  
Certified Industrial Hygienist

DWW:ls

Encl: EMLab P&K Analysis Report  
University of Nevada Cooperative Extension Clark County Radon  
Test Results  
Photographs  
Sketch of BRC Office Sample Locations

Dist: 2/Addressee



## EMLab P&K

Report for:

**Mr. Dale Walsh**  
**Converse Consultants, Las Vegas**  
731 Pilot Road  
Suite H  
Las Vegas, NV 89119-4429

Regarding: Project: 094340201; BRC Radon  
EML ID: 617446

Approved by:

Dates of Analysis:  
Radon in Air: 01-18-2010

Lab Director  
Christine Meyer

Project SOPs: Radon in Air (20-137 Radon In Air)

For clarity, we report the number of significant digits as calculated; but, due to the nature of this type of biological data, the number of significant digits that is used for interpretation should generally be one or two. All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank corrections of results is not a standard practice. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Document Number: 200091 - Revision Number: 5



The Proven Leader

North Phoenix Arizona Laboratory  
1501 West Knudsen Drive, Phoenix, AZ 85027  
800.651.4802 • Fax. 623.780.7695 • EMLAP# 102297

## Radon Test Report

**Converse Consultants**  
731 Pilot Road, Suite H  
Las Vegas, NV 89119  
Attn: Mr. Dale Walsh

**EMLab ID#:** 617446  
**Project ID:** 094340201  
**Date Received:** January 15, 2010  
**Date Analyzed:** January 15, 2010  
**Certification #:** NRPP#102969AL  
NRPP#103751RT

**Methods:** Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Short-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

### Deployment Information

Start Test: 1/11/2010 9:00 AM  
Finish Test: 1/14/2010 3:30 PM  
Test State: NV-LE  
Elevation (ft): 2100

Project Description: BRC Radon

### Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L
SDI601	Tuscany House Dining	SST	January 15, 2010	TEG	1.3
SBU916	Tuscany House Bedroom	SST	January 15, 2010	TEG	0.9
SDM355	BRC Office Main File Rm	SST	January 15, 2010	TEG	2.0
SBU791	BRC Office Loadwell File Rm	SST	January 15, 2010	TEG	2.0

*Michael J. Magry*

01/18/10

Authorized Signature/Date: \_\_\_\_\_

Quality Assurance Manager-Western Region

ENVIRONMENTAL MICROBIOLOGY LABORATORY, INC.  
800.651.4802 • www.emlab.com • info@emlab.com



The Proven Leader

North Phoenix Arizona Laboratory  
1501 West Knudsen Drive, Phoenix, AZ 85027  
800.651.4802 • Fax: 623.780.7695 • EMLAP# 102297

### **What Do My Test Results Mean?**

The concentration of radon in the home is measured in picocuries per liter of air (pCi/L). If your average radon level is less than 4.0 pCi/L, no action is necessary. However, radon levels less than 4.0 pCi/L can still pose some health risk, and in many cases can be reduced. The national average indoor radon level is about 1.3 pCi/L while the average outdoor radon concentration is about 0.4 pCi/L. The higher a home's radon concentration, the greater the health risks to you and your family.

### **What Do I Do If My Test Results Are Greater than 4.0 pCi/L?**

If the test results are 4.0 pCi/L or greater, the EPA recommends that you mitigate your home. There are simple ways to fix a radon problem that aren't too costly, and even very high concentrations can be reduced to acceptable levels.

### **What Is the Health Risk Associated with Radon Gas?**

Radon is a radioactive gas that comes from the natural breakdown of uranium in the soil. Radon is estimated to cause many thousands of deaths each year from lung cancer, and in fact, it is the second leading cause of lung cancer after smoking. If you smoke, and your home has high radon levels, your risk of lung cancer is especially high.

### **Where Can I Get Additional Information on Radon?**

For more information, please refer to <http://www.epa.gov/radon/index.html>

### **Data Qualifiers**

The *Data Qualifiers* identify issues or events that are relevant to your analytical results. A data qualifier includes information about the validity, the source of the data whether calculated, entered or estimated, and the value of an observation. In each case the data qualifiers provide significant information vital to the interpretation of the laboratory data.



**Cherry Hill, NJ:** 1936 Olney Avenue, Cherry Hill, NJ 08003 • (866) 871-1984  
**Phoenix, AZ:** 1501 W. Knudsen Drive, Phoenix, AZ 85027 • (800) 651-4802  
**San Bruno, CA:** 1150 Bayhill Drive, #100, San Bruno, CA 94066 • (666) 666-6653



000617446

WEAT

Age	Gender	Class
18-24	Male	10
25-34	Female	15
35-44	Male	20
45-54	Female	25
55-64	Male	30
65-74	Female	35
75-84	Male	40
85-94	Female	45
95-104	Male	50
105-114	Female	55
115-124	Male	60
125-134	Female	65
135-144	Male	70
145-154	Female	75
155-164	Male	80
165-174	Female	85
175-184	Male	90
185-194	Female	95
195-204	Male	100
205-214	Female	105
215-224	Male	110
225-234	Female	115
235-244	Male	120
245-254	Female	125
255-264	Male	130
265-274	Female	135
275-284	Male	140
285-294	Female	145
295-304	Male	150
305-314	Female	155
315-324	Male	160
325-334	Female	165
335-344	Male	170
345-354	Female	175
355-364	Male	180
365-374	Female	185
375-384	Male	190
385-394	Female	195
395-404	Male	200
405-414	Female	205
415-424	Male	210
425-434	Female	215
435-444	Male	220
445-454	Female	225
455-464	Male	230
465-474	Female	235
475-484	Male	240
485-494	Female	245
495-504	Male	250
505-514	Female	255
515-524	Male	260
525-534	Female	265
535-544	Male	270
545-554	Female	275
555-564	Male	280
565-574	Female	285
575-584	Male	290
585-594	Female	295
595-604	Male	300
605-614	Female	305
615-624	Male	310
625-634	Female	315
635-644	Male	320
645-654	Female	325
655-664	Male	330
665-674	Female	335
675-684	Male	340
685-694	Female	345
695-704	Male	350
705-714	Female	355
715-724	Male	360
725-734	Female	365
735-744	Male	370
745-754	Female	375
755-764	Male	380
765-774	Female	385
775-784	Male	390
785-794	Female	395
795-804	Male	400
805-814	Female	405
815-824	Male	410
825-834	Female	415
835-844	Male	420
845-854	Female	425
855-864	Male	430
865-874	Female	435
875-884	Male	440
885-894	Female	445
895-904	Male	450
905-914	Female	455
915-924	Male	460
925-934	Female	465
935-944	Male	470
945-954	Female	475
955-964	Male	480
965-974	Female	485
975-984	Male	490
985-994	Female	495
995-1004	Male	500
1005-1014	Female	505
1015-1024	Male	510
1025-1034	Female	515
1035-1044	Male	520
1045-1054	Female	525
1055-1064	Male	530
1065-1074	Female	535
1075-1084	Male	540
1085-1094	Female	545
1095-1104	Male	550
1105-1114	Female	555
1115-1124	Male	560
1125-1134	Female	565
1135-1144	Male	5

RH	30%	None	X	X	X			
		Light					X	
Temp	60%	Moderate					X	
		Heavy						

Account No. \_\_\_\_\_ Page 1 of 1

Company: Converse Consultants

Address: 731 Pilot Road, Suite H

City, State, Zip: Las Vegas, NV 89119

Contact: Dale Walsh	Sampling Date/Time: 1/11/10 vi 9AM
---------------------	------------------------------------

Phone: 7022637600	Project Zip Code: 89011
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Fax: 707 269 8353	Project ID: 074340201
-------------------	-----------------------

Form 10-2000-010	Project: BKC Redo
E-mail: <a href="mailto:al@kain.org">al@kain.org</a>	Project: BKC Redo

Results: ☒ Email ☐ Fax PO Number: 094340201

Special Instructions:

### Sample Type Codes

A - Air    B - Bulk    D - Dust    S - Swab    T - Tape  
W - Water    WC - WallChek    Other: *E-1, E-2*

### Turn Around Time Codes - (TAT)\*

STD Standard (DEFAULT)

ND - Next Business Day

SD - Same Business Day Rush

WH - Weekend/Holiday

\* Rushes received after 2pm or on weekends, will be considered received the next business day. Please alert us in advance of weekend analysis needs.

### Analyses Requested<sup>1</sup>

## RADON

## Sample Information

[illegible]

## Deployment Information

The following information is required to calculate radon concentrations.

Start Date: 1/11/2010

Start Time: 9 AM

End Date: 1/14/2010

End Time: 3:30 PM

Test State: Nevada

Elevation: 2100 ft.  
(Estimate acceptable)

### Payment Information

<input checked="" type="checkbox"/>	On Account (must have preapproved credit)
-------------------------------------	---

Check Enclosed - Check Number:	Amount: \$
--------------------------------	------------

Credit Card Payment - (please circle one)					VISA	MC	AMEX	Discover
---	--	--	--	--	------	----	------	----------

Credit Card Payment (Please circle one)	Exp. Date	Signature
Card Number -		

Date	Time	Samples Relinquished By
------	------	-------------------------

### Samples Received By

Date	Time	Location
11/1/84	11:00 AM	Wall Hill

11/9/2010	10:10	10:10
11/9/2010	10:10	10:10

\*\* Please see service guide for requested services. Not all locations perform same analysts, please contact your Project Manager if you have questions.

By Submitting this Chain of Custody, you agree to be bound by the terms and conditions set forth at [www.emlabpk.com/terms.html](http://www.emlabpk.com/terms.html)

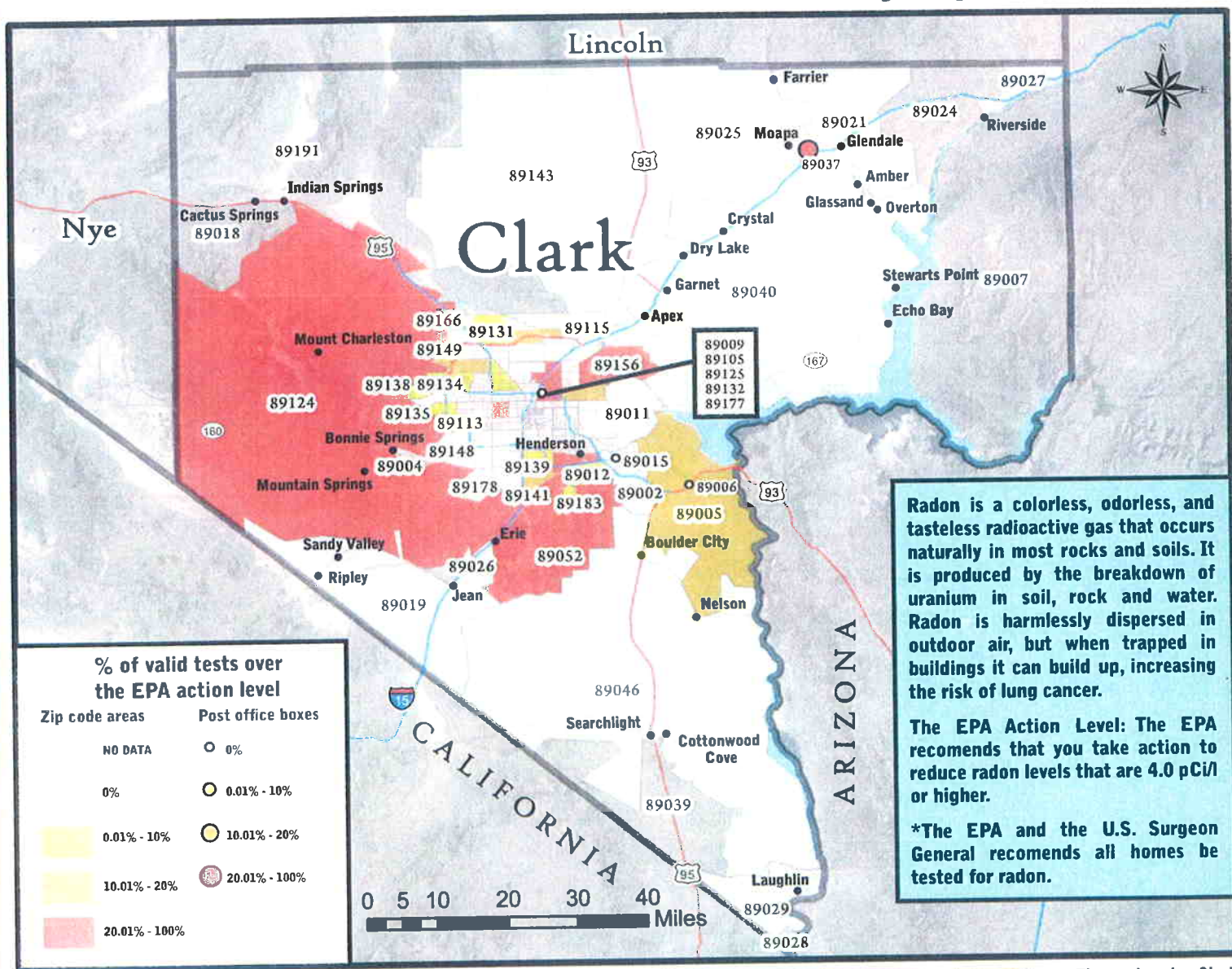




University of Nevada  
Cooperative Extension

# Clark County

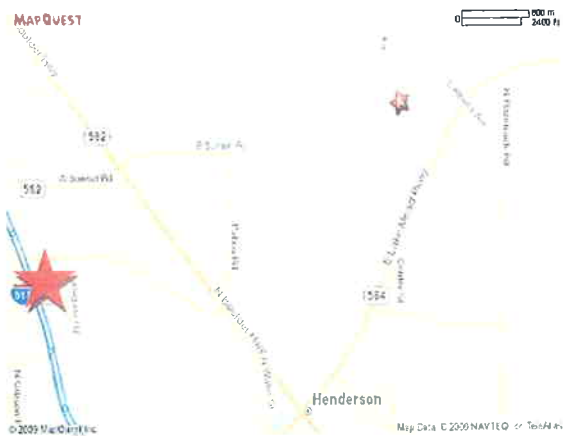
## Radon Test Results by Zip Code



Clark	Range of radon levels in pCi/l										Total Number of Tests	Radon Levels by pCi/l	
	< 0.4	0.4 - 0.5	0.5 - 0.6	0.6 - 0.7	0.7 - 0.8	0.8 - 0.9	0.9 - 1.0	1.0 - 1.1	1.1 - 1.2	1.2 - 1.3		Average	Highest
89007 HENDERSON	7	0	0	0	0	0	0	0	0	0	7	1.8	3.5
89008 BOULDER CITY	22	4	0	0	0	0	0	0	0	0	26	18.8	37.0
89009 P.O. Box	1	0	0	0	0	0	0	0	0	0	1	0.8	2.8
89010 HENDERSON	1	0	0	0	0	0	0	0	0	0	1	0.8	0.8
89011 HENDERSON	3	0	0	0	0	0	0	0	0	0	3	0.5	1.2
89012 HENDERSON	17	1	0	0	0	0	0	0	0	0	18	1.7	5.6
89014 HENDERSON	14	0	0	0	0	0	0	0	0	0	14	1.4	3.8
89015 HENDERSON	8	0	0	0	0	0	0	0	0	0	8	1.5	2.8
89019 JEAN	1	0	0	0	0	0	0	0	0	0	1	0.5	0.5
89021 LOGANDALE	2	0	0	0	0	0	0	0	0	0	2	1.6	1.8
89025 MOAPA	1	0	0	0	0	0	0	0	0	0	1	2.4	2.4
89027 MESQUITE	10	0	0	0	0	0	0	0	0	0	10	1.2	2.9
89029 LAUDON	4	0	0	0	0	0	0	0	0	0	4	1.5	1.7
89030 NORTH LAS VEGAS	1	1	0	0	0	0	0	0	0	0	2	50.0	5.1
89031 NORTH LAS VEGAS	7	0	0	0	0	0	0	0	0	0	7	1.0	2.0
89032 NORTH LAS VEGAS	3	0	0	0	0	0	0	0	0	0	3	0.5	0.7
89033 NORTH LAS VEGAS	1	0	0	0	0	0	0	0	0	0	1	0.5	0.5
89037 P.O. Box	0	1	0	0	0	0	0	0	0	0	1	1.4	2.3
89040 OVERTON	2	0	0	0	0	0	0	0	0	0	2	0.5	0.5
89044 HENDERSON	27	2	0	0	0	0	0	0	0	0	29	8.5	1.1
89046 SEARCHLIGHT	1	0	0	0	0	0	0	0	0	0	1	0.8	1.1
89052 HENDERSON	20	11	2	0	0	0	0	0	0	0	33	4.2	20.4
89074 HENDERSON	13	4	0	0	0	0	0	0	0	0	17	2.4	1.5
89081 NORTH LAS VEGAS	4	0	0	0	0	0	0	0	0	0	4	1.0	1.0
89084 NORTH LAS VEGAS	5	1	0	0	0	0	0	0	0	0	6	1.7	5.1
89087 NORTH LAS VEGAS	1	0	0	0	0	0	0	0	0	0	1	0.5	0.5
89088 NORTH LAS VEGAS	2	0	0	0	0	0	0	0	0	0	2	2.7	3.7
89101 LAS VEGAS	3	1	0	0	0	0	0	0	0	0	4	2.0	4.1
89102 LAS VEGAS	20	0	0	0	0	0	0	0	0	0	20	0.9	2.1
89103 LAS VEGAS	15	0	0	0	0	0	0	0	0	0	15	1.1	2.1
89104 LAS VEGAS	5	0	0	0	0	0	0	0	0	0	5	1.1	1.1
89105 P.O. Box	2	0	0	0	0	0	0	0	0	0	2	0.6	1.5
89106 LAS VEGAS	1	0	0	0	0	0	0	0	0	0	1	0.7	1.3
89107 LAS VEGAS	14	0	0	0	0	0	0	0	0	0	14	1.4	1.4
89108 LAS VEGAS	20	1	0	0	0	0	0	0	0	0	21	1.1	4.7
89110 LAS VEGAS	8	1	0	0	0	0	0	0	0	0	9	0.8	1.6
89113 LAS VEGAS	3	0	0	0	0	0	0	0	0	0	3	1.3	1.6
89115 LAS VEGAS	3	0	0	0	0	0	0	0	0	0	3	1.3	1.6

	Clark	Range of radon levels in pCi/l										Total Number of Tests		% Radon Potential	Radon Levels by pCi/l	
		< 0.4	0.4 - 0.5	0.5 - 0.6	0.6 - 0.7	0.7 - 0.8	0.8 - 0.9	0.9 - 1.0	1.0 - 1.1	1.1 - 1.2	1.2 - 1.3	Average	Highest			
89117	LAS VEGAS	12	0	0	0	0	0	0	12	0	0	0	0.8	1.7		
89118	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.7	1.5		
89119	LAS VEGAS	13	0	0	0	0	0	0	13	0	0	0	1.0	2.5		
89120	LAS VEGAS	7	0	0	0	0	0	0	7	0	0	0	0.8	1.5		
89121	LAS VEGAS	10	0	0	0	0	0	0	10	10	0	0	1.2	1.5		
89122	LAS VEGAS	2	0	0	0	0	0	0	2	2	0	0	0.8	1.6		
89123	LAS VEGAS	22	1	0	0	0	0	0	23	22	1	0	1.4	1.6		
89124	LAS VEGAS	0	1	0	0	0	0	0	0	0	2	100	14.5	21.0		
89125	P.O. Box	1	0	0	0	0	0	0	0	0	0	0	0.8	1.4		
89126	LAS VEGAS	11	0	0	0	0	0	0	0	0	0	0	1.1	4.5		
89127	LAS VEGAS	7	0	0	0	0	0	0	6	7	1	12.5	1.1	4.5		
89128	LAS VEGAS	14	0	0	0	0	0	0	14	14	0	0	0.8	1.5		
89129	LAS VEGAS	11	1	0	0	0	0	0	12	11	1	8.3	1.6	5.0		
89130	P.O. Box	1	0	0	0	0	0	0	1	1	0	0	0.9	1.0		
89131	LAS VEGAS	28	1	0	0	0	0	0	27	28	1	3.7	1.2	13.0		
89132	LAS VEGAS	31	0	1	0	0	0	0	32	31	1	3.1	1.2	13.0		
89133	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89134	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89135	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89136	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89137	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89138	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89139	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89140	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89141	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89142	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.5	0.5		
89143	LAS VEGAS	3	0	0	0	0	0	0	3	0	0	0	0.7	1.1		
89144	LAS VEGAS	5	0	0	0	0	0	0	5	0	0	0	0.6	0.9		
89145	LAS VEGAS	4	1	0	0	0	0	0	7	0	0	0	0.9	1.4		
89146	LAS VEGAS	7	0	0	0	0	0	0	6	5	33.3	6.5	35.4			
89147	LAS VEGAS	4	0	0	0	0	0	0	9	0	0	0	0.7	1.0		
89148	LAS VEGAS	6	0	0	0	0	0	0	6	0	0	0	0.8	1.2		
89149	LAS VEGAS	5	0	0	0	0	0	0	5	0	0	0	0.8	1.7		
89150	LAS VEGAS	3	0	1	0	0	0	0	4	1	25.0	3.7	11.3			
89151	LAS VEGAS	2	0	0	0	0	0	0	3	0	0	0	1.0	2.0		
89152	LAS VEGAS	1	0	0	0	0	0	0	1	1	0	0	0.7	0.7		
89153	LAS VEGAS	1	0	0	0	0	0	0	1	1	0	0	0.4	0.4		
89154	P.O. Box	1	0	0	0	0	0	0	1	1	0	0	0.7	0.7		
89176	LAS VEGAS	1	0	0	0	0	0	0	1	1	0	0	0.6	0.6		
89178	LAS VEGAS	1	0	0	0	0	0	0	1	1	0	0	1.0	1.0		
89179	LAS VEGAS	4	0	1	0	0	0	0	5	4	1	28.0	3.1	11.4		
89183	LAS VEGAS	4	0	1	0	0	0	0	5	4	1	28.0	3.1	11.4		
Totals		517	24	5	3	0	0	0	550	517	40	7.5%	1.7	5.0		





Map of 89011 Zip Code Area



E-Perm electrets ion chamber



BRC Landwell File Room



BRC Main File Room



BRC Office Building



Tuscany Residence Bedroom



Tuscany Residence Dining Room



Tuscany Residence

# WEST WARM SPRINGS ROAD EMERGENCY EVACUATION ROUTE

OVERHEAD VIEW  
NORTH EAST CORNER

North - PARKING SECTION

OVERHEAD VIEW  
NORTH EAST CORNER

100' 100'



Sample  
SDM355

Sample  
SBU791

PROVANE  
TANK

GENERATOR

HIGH PRESSURE  
WATER HOSE

FROM BUILDING TO  
BACK WALL OF PARKING  
LOT 150' SOUTH

NORTH

LEGEND	
	FIRE EXTINGUISHER
	EMERGENCY EXITS
	EXIT DIRECTION

**ATTACHMENT B**

**LABORATORY REPORT FOR GROUNDWATER SAMPLING**

**General Narrative  
for  
BRC  
Tuscani GW  
SDG: 244697**

**January 18, 2010**

**Laboratory Identification:**

GEL Laboratories LLC  
2040 Savage Road  
Charleston, South Carolina 29407  
(843) 556-8171

**Summary**

**Sample receipt**

The sample(s) arrived at GEL Laboratories, LLC, Charleston, South Carolina on January 14, 2010, for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

**Sample Identification**

The laboratory received the following samples:

<b><u>Laboratory Identification</u></b>	<b><u>Sample Description</u></b>
244697001	DBMW-13
244697002	MW-WS1-14

**Case Narrative**

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

**Data Package**

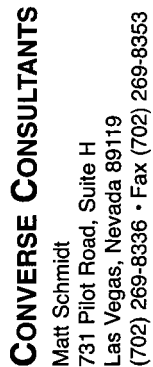
The enclosed data package contains the following sections: General Narrative, Chain of Custody and Supporting Documentation, and data from the following fractions: Radiochemistry. This package, to the best of my knowledge, is in compliance with technical and administrative requirements.

GEL Laboratories, LLC appreciates this opportunity to provide you with analytical results and trusts that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate in contacting me at (843) 556-8171.



Ann Skradski

Project Manager

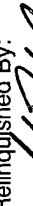
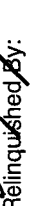


**GEL LABORATORIES, LLC**  
Contact: Amanda Raslo  
2040 Savage Road  
Charleston, SC 29407  
(843) 556-8171

# CHAIN OF CUSTODY FORM

[illegible]

Comments/Instructions:

Fed-Ex # 8659 4851 5233	Relinquished By: 	Date/Time: 1-12-10 1600	Received By: R.M. Stelling	Date/Time: 1/14/10 845	Turnaround Time: (Check) <input type="checkbox"/> Same Day <input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 72 Hours <input type="checkbox"/> 5 Days <input type="checkbox"/> Normal
Relinquished By: 	Date/Time:	Received By:	Date/Time:	Sample Integrity: (Check) <input checked="" type="checkbox"/> Intact <input type="checkbox"/> On Ice	

**Note:** By relinquishing samples to Converse Consultants, client agrees to pay for the services requested on this chain of custody form and any additional analysis performed on this project. Payment for services is due within 30 days from the date of invoice. Sample(s) will be disposed of after 30 days.

# SAMPLE RECEIPT & REVIEW FORM

Client: <u>Brom</u>		SDG/ARCOC/Work Order: <u>244697</u>	
Received By: <u>RM6</u>		Date Received: <u>1/14/10</u>	
Suspected Hazard Information	Yes	No	*If Counts > x2 area background on samples not marked "radioactive", contact the Radiation Safety Group of further investigation.
COC/Samples marked as radioactive?		<input checked="" type="checkbox"/>	Maximum Counts Observed*: <u>30cpm</u>
Classified Radioactive II or III by RSO?		<input checked="" type="checkbox"/>	
COC/Samples marked containing PCBs?		<input checked="" type="checkbox"/>	
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		<input checked="" type="checkbox"/>	

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken    damaged container    leaking container    other (describe)
2	Samples requiring cold preservation within 0 ≤ 6 deg. C?	<input checked="" type="checkbox"/>			Preservation Method: <u>ice bags</u> blue ice    dry ice    none    other (describe) <u>3°</u>
3	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			
4	Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: seals broken    damaged container    leaking container    other (describe)
5	Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
7	Are Encore containers present?			<input checked="" type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	<input checked="" type="checkbox"/>			Id's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Sample ID's affected:
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Sample ID's affected:
12	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			

Comments:

Fx: 8659 4851 5233

PM (or PMA) review: Initials RM6

Date

1/14/10



**List of current GEL Certifications as of 18 January 2010**

<b>State</b>	<b>Certification</b>
Arizona	AZ0668
Arkansas	88-0651
CLIA	42D0904046
California – NELAP	01151CA
Colorado	GEL
Connecticut	PH-0169
Dept. of Navy	NFESC 413
EPA Region 5	WG-15J
Florida – NELAP	E87156
Georgia	E87156 (FL/NELAP)
Georgia DW	967
Hawaii	N/A
ISO 17025	2567.01
Idaho	SC00012
Illinois – NELAP	200029
Indiana	C-SC-01
Kansas – NELAP	E-10332
Kentucky	90129
Louisiana – NELAP	03046
Maryland	270
Massachusetts	M-SC012
Nevada	SC00012
New Jersey – NELAP	SC002
New Mexico	FL NELAP E87156
New York – NELAP	11501
North Carolina	233
North Carolina DW	45709
Oklahoma	9904
Pennsylvania – NELAP	68-00485
South Carolina	10120001/10120002
Tennessee	TN 02934
Texas – NELAP	T104704235-07B-TX
U.S. Dept. of Agriculture	S-52597
Utah – NELAP	GEL
Vermont	VT87156
Virginia	00151
Washington	C1641

**Radiochemistry Case Narrative  
BRC (BRCM)  
SDG 244697**

**Method/Analysis Information**

**Product:** Liquid Scint Rn222, Liquid

Analytical Method: SM 7500 Rn B

Analytical Batch Number: 941700

<b>Sample ID</b>	<b>Client ID</b>
244697001	DBMW-13
244697002	MW-WS1-14
1202015593	Method Blank (MB)
1202015594	244697001(DBMW-13) Sample Duplicate (DUP)
1202015595	244697001(DBMW-13) Matrix Spike (MS)
1202015596	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-007 REV# 11.

**Calibration Information:**

**Calibration Information**

All initial and continuing calibration requirements have been met.

**Standards Information**

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

**Sample Geometry**

All counting sources were prepared in the same geometry as the calibration standards.

**Quality Control (QC) Information:**

**Blank Information**

The blank volume is representative of the sample volume in this batch.

**Designated QC**

The following sample was used for QC: 244697001 (DBMW-13).

**QC Information**

All of the QC samples met the required acceptance limits.

**Technical Information:****Holding Time**

All sample procedures for this sample set were performed within the required holding time.

**Sample Re-prep/Re-analysis**

None of the samples in this sample set required reprep or reanalysis.

**Miscellaneous Information:****Data Exception (DER) Documentation**

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. A data exception report (DER) was not generated for this SDG.

**Additional Comments**

Additional comments were not required for this sample set.

**Qualifier information**

Manual qualifiers were not required.

**Certification Statement**

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

**Review Validation:**

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

**The following data validator verified the information presented in this case narrative:**

Reviewer/Date: \_\_\_\_\_



# SAMPLE DATA SUMMARY

## GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

### Certificate of Analysis Report for

BRCM001 BRC

Client SDG: 244697 GEL Work Order: 244697

**The Qualifiers in this report are defined as follows:**

\* A quality control analyte recovery is outside of specified acceptance criteria

\*\* Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the detection limit.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Ann Skradski.

Reviewed by



# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : BRC  
Address : 875 W. Warm Springs Road  
Henderson, Nevada 89011

Report Date: January 18, 2010

Contact: Mr. Ron Sahu  
Project: **Tuscani GW**

Client Sample ID: DBMW-13  
Sample ID: 244697001  
Matrix: Water  
Collect Date: 12-JAN-10 10:20  
Receive Date: 14-JAN-10  
Collector: Client

Project: BRCM00136  
Client ID: BRCM001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Liquid Scintillation Analysis</b>											
<i>Liquid Scint Rn222, Liquid "As Received"</i>											
Radon-222		223	+/-58.1	82.3	200	pCi/L		KXK2 01/15/10 0801	941700	1	

### The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SM 7500 Rn B	

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

## Certificate of Analysis

Company : BRC  
Address : 875 W. Warm Springs Road  
Henderson, Nevada 89011

Report Date: January 18, 2010

Contact: Mr. Ron Sahu  
Project: **Tuscani GW**

Client Sample ID: MW-WS1-14  
Sample ID: 244697002  
Matrix: Water  
Collect Date: 12-JAN-10 13:00  
Receive Date: 14-JAN-10  
Collector: Client

Project: BRCM00136  
Client ID: BRCM001

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
<b>Rad Liquid Scintillation Analysis</b>											
<i>Liquid Scint Rn222, Liquid "As Received"</i>											
Radon-222		435	+/-66.5	80.8	200	pCi/L		KXK2 01/15/10 0817	941700	1	

### The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SM 7500 Rn B	

# QUALITY CONTROL DATA



# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Report Date: January 18, 2010

Page 1 of 2

BRC

875 W. Warm Springs Road  
Henderson, Nevada

Contact: Mr. Ron Sahu

Workorder: 244697

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Liquid Scintillation											
Batch	941700										
QC1202015594	244697001	DUP									
Radon-222			223	260	pCi/L	15.5		(0% - 100%)	KXK2	01/15/10	08:49
			+/-58.1	+/-60.2							
QC1202015596	LCS										
Radon-222	10900			11000	pCi/L		102	(75%-125%)		01/18/10	07:31
				+/-278							
QC1202015593	MB										
Radon-222			U	-17.3	pCi/L					01/15/10	08:33
				+/-34.1							
QC1202015595	244697001	MS									
Radon-222	10900		223	11400	pCi/L		103	(75%-125%)		01/18/10	07:15
			+/-58.1	+/-283							

### Notes:

The Qualifiers in this report are defined as follows:

- \*\* Analyte is a surrogate compound
- < Result is less than value reported
- > Result is greater than value reported
- A The TIC is a suspected aldol-condensation product
- B For General Chemistry and Organic analysis the target analyte was detected in the associated blank.
- BD Results are either below the MDC or tracer recovery is low
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of the sample
- F Estimated Value
- H Analytical holding time was exceeded
- J Value is estimated
- M M if above MDC and less than LLD
- M Matrix Related Failure
- N/A RPD or %Recovery limits do not apply.
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

Workorder: 244697

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Y	QC Samples were not spiked with this compound										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

\* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**RAW DATA**

# Radiochemistry Batch Checklist, Rev10

Batch# 941700 Product: Radon 222 Date: 1-18-10

Criteria:	Yes	No	Comments
Sample Solids are less than or equal to 100 mg for GAB.			NA
Samples have been blank corrected (if required)			NA
If activity less 10* MDA/ MDC, error is 150% or less of sample activity. If greater 10* MDA/ MDC, error is 40% or less. If below the MDA/ MDC, error is okay.	✓		
Instrument source check is within limits.	✓		
Instrument bkg check is within limits.	✓		
Method RDL/ LLD has been met.	✓		
If duplicate activities are less 5* MDA/ MDC, then RPD is 100% or less. If greater 5* MDA/ MDC, then RPD 20% or less. If below the MDA/ MDC, the RPD is 0%.	✓		
Or meets the client's required RER acceptance criteria.			
Tracer yield is 15-125% . Carrier yield 25-125%.			NA
Or meets the client's contract acceptance criteria.			
Method blank is less than the RDL/ LLD.	✓		
(If rad samples, < 5% of lowest activity)			
Sample was run within hold time.	✓		
Sample was correctly preserved if required.	✓		
Smears Taken for Radioactive batches.			NA
Method Spike and LCS are within 75-125% or meets the client's contract acceptance criteria.	✓		
No blank spaces on data forms.			
All line outs initialed and dated.	✓		
No transcription errors are apparent.			
Aux data is correct.			NA
Client Special requirements page has been checked.	✓		
Raw Data and/ or spectrum are included and properly statused.	✓		
QC data entered into QC database and batch is in REVW	✓		
Hit notification complete (if necessary)			NA
Batch entered into Case Narrative.	✓		
Batch Data Exception Reports (DER) completed, if applicable.			NA
Batch Data Exception Reports (DER) second reviewed and disposition verified to be completed.			NA
Aliquot Correction completed if required.			NA
Review sample historical results if available (If REMP, results above MDC have been verified by historical results, recount or re-analysis.)	✓		

GEL Laboratories, LLC

RADchecklistrev10, revised 1/13/2010

Primary Review Performed By: [Signature]

Secondary Review Performed By: [Signature] 1/18/10

NSFI  
BRCM 1-28-10

# Radon 222 Que Sheet

01/14/2010

Batch #: 941700

Analyst: KKK2

First Client Due Date: 01/28/2010

Internal Due Date: 01/24/2010

Spike Isotope: Radium-226 Spike Code: 0630-E Expiration Date: 4/9/10 Vol: 0.1 Nom Conc: 10853.8481

LCS Isotope: Radium-226 LCS Code: 0630-E Expiration Date: 4/9/10 Vol: 0.1 Nom Conc: 10853.8481

Comments

Prep Date: 1/14/10 Pipet ID: 2970968 Initials: YK Witness: MCB 1-14-10

Sample ID	Client Description	Type	Hazard Code	Min CRDL	Matrix	Client	Collection Date	Label	Sample Mass (g/ml)	LSC Rack #	Time Spike Added
244664001-1	S-0000722604	SAMPLE	2 pCi/mL	2 pCi/mL	DRINKING WATNSFI001		12-JAN-10 12:00 PM	1	10	60-2	
244697001-1	DBMW-13	SAMPLE	2 pCi/mL	2 pCi/mL	WATER	BRCM001	12-JAN-10 10:20 AM	2	10	60-3	
244697002-1	MW-WSI-14	SAMPLE	2 pCi/mL	2 pCi/mL	WATER	BRCM001	12-JAN-10 01:00 PM	3	10	60-4	
1202015593-1	MB for batch 941700	MB	2 pCi/mL	2 pCi/mL	WATER	QC ACCOUNT		4	10	60-5	
1202015594-1	DBMW-13(244697001DUP)	DUP	2 pCi/mL	2 pCi/mL	WATER	QC ACCOUNT	12-JAN-10 10:20 AM	5	10	60-6	
1202015595-1	DBMW-13(244697001MS)	MS	2 pCi/mL	2 pCi/mL	WATER	QC ACCOUNT	12-JAN-10 10:20 AM	6	10	45-2	16:40
1202015596-1	LCS for batch 941700	LCS	2 pCi/mL	2 pCi/mL	WATER	QC ACCOUNT		7	10	45-3	16:40

Bkg Rack #: 60-1 / 45-1

dailes ✓

Comments:

Data Reviewed By: JN 1-18-10

Instrument Used: LS6000 (Red) 7065155, LS6500 (Black) 7069123, LS6500 (Blue) 7067083, LS6500 (Green) 7067404  
Wallac (Yellow) 4040127, Wallac (Pink) 2200082, Purple 7069123, Silver 7060656

GEL Laboratories LLC, Radiochemistry Division

## Radon-222 Liquid

Filename : RN222.XLS  
File type : Excel  
Version # : 1.2.5

Batch : 941700  
Analyst : KXK2  
Prep Date : 1/14/2010

Rn-222 Abundance : 1  
Rn-222 Method Uncertainty : 0.1111  
Geometry : 10ML MINERAL OIL/10ML  
SAMPLE

Spike S/N : 0638-E  
Spike Exp Date : 4/9/2010  
Spike Activity (dpm/ml): 2409.55  
Spike Volume Added: 0.10  
Spike Date/Time: 1/14/2010 16:40

LCS S/N : 0638-E  
LCS Exp Date : 4/9/2010  
LCS Activity (dpm/ml): 2409.55  
LCS Volume Added: 0.10

Procedure Code : LSC22RNL  
Parmname : Radon-222  
Required MDA : 200  
Half-life of Radon-222 : 3.8235  
pCi/L  
days

Pipet, 0.1 ml Stdev : +/- 0.000701 ml  
Pipet, 0.5 ml Stdev : +/- 0.002564 ml

Sample Characteristics				Count raw Data									
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Rack Position #	Counting Time (min.)	Quench#	Gross cpm	Background cpm	Background Count Time (min.)	Count Start Date/Time	Sample Decay	
1	244664001.1	0.0100	4.2391E-06	1/12/2010 12:00	60-2	15	45.8	16.13	9.20	15	1/15/2010 7:45	0.599	
2	244697001.1	0.0100	4.2391E-06	1/12/2010 10:20	60-3	15	47.4	19.6	9.20	15	1/15/2010 8:01	0.590	
3	244697002.1	0.0100	4.2391E-06	1/12/2010 13:00	60-4	15	50.1	29.87	9.20	15	1/15/2010 8:17	0.601	
4	1202015593.1	0.0100	4.2391E-06	1/14/2010 0:00	60-5	15	43	8.13	9.20	15	1/15/2010 8:33	0.781	
5	1202015594.1	0.0100	4.2391E-06	1/12/2010 10:20	60-6	15	49.8	21.27	9.20	15	1/15/2010 8:49	0.587	
6	1202015595.1	0.0100	4.2391E-06	1/12/2010 10:20	45-2	15	43.8	442.4	9.27	15	1/18/2010 7:15	0.345	
7	1202015596.1	0.0100	4.2391E-06	1/14/2010 0:00	45-3	15	46.2	429.67	9.27	15	1/18/2010 7:31	0.457	

Calibration Data				Backgrounds				Correction Factors			Net Sample Activity for MS pCi/L
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Rack Position #	Count Start Date/Time	Spike Date/Time	Rn-222 Ingrowth	Rn-222 Count Correction	
1	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	60-1	1/15/2010 7:29	NA	NA	0.599	159.623
2	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	60-1	1/15/2010 7:29	NA	NA	0.590	
3	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	60-1	1/15/2010 7:29	NA	NA	0.601	
4	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	60-1	1/15/2010 7:29	NA	NA	0.781	
5	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	60-1	1/15/2010 7:29	NA	NA	0.587	
6	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	45-1	1/18/2010 6:59	1/14/2010 16:40	0.481	0.481	
7	LSCRED	7/28/2009	7/31/2010	3.5654	0.00792	45-1	1/18/2010 6:59	1/14/2010 16:40	0.482	0.482	

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Results		Decision Level		Critical Level		Required MDA		MDA		Sample Act. Conc.		Sample Act. Error		Net Count Rate		Net Count Rate Error		2 SIGMA Counting Uncertainty		2 SIGMA Total Prop. Uncertainty		Sample QC		Sample Type		RPD		RER		Nominal pCi/L		Recovery	
Pos.	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	CPM	CPM	CPM	CPM	pCi/L	pCi/L	pCi/L	pCi/L												
1	54.4410	38.4358	200	81.0909	146.1975	0.1877	6.9300	1.2995	53.7322	62.4965	SAMPLE																						
2	55.2424	39.0016	200	82.2846	222.6316	0.1335	10.4000	1.3856	58.1380	75.7777	SAMPLE																						
3	54.2506	38.3014	200	80.8072	434.5357	0.0785	20.6700	1.6139	66.4993	115.8501	SAMPLE																						
4	41.7318	29.4630	200	62.1604	-17.3034	1.0046	-1.0700	1.0749	34.0689	34.0697	MB																						
5	55.5791	39.2393	200	82.7862	259.9560	0.1183	12.0700	1.4252	60.1643	82.7069	244697001.1																						
6	68.0978	48.0777	200	101.4130	11386.3997	0.0149	433.1300	5.4874	282.7413	2501.7954	244697001.1																						
7	67.9491	47.9727	200	101.1916	11027.6119	0.0151	420.4000	5.4095	278.1197	2423.4516	LCS																						



ID#RN-222

15 JAN 2010 07:36

USER:12 COMMENT:RED

```

PRESET TIME :      15.00
DATA CALC   :      CPM  HH   :YES  SAMPLE REPEATS:   1  PRINTER      :EDIT
COUNT BLANK :      NO  IC#  : NO  REPLICATES    :   1  RS232       :EDIT
TWO PHASE   :      NO  AOC  : NO  CYCLE REPEATS :   1  DISK        : OFF
SCINTILLATOR: LIQUID LUMEX: NO  LOW SAMPLE REJ:   0
LOW LEVEL   :      YES  HALF LIFE CORRECTION DATE: none

```

```

CHAN: 600.0 - 875.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0
CHAN:  0.0 - 900.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0

```

ALPHA-BETA DISCRIMINATION: NO

SAM NO	POS	TIME MIN	HH	WIND1 RAW CPM	WIND2 RAW CPM	<u>WIND1</u>		<u>WIND2</u>		LUMEX %	ELAPSED TIME
						CPM	%ERROR	CPM	%ERROR		
1	60-1	15.00	45.4	9.20	29.27	9.20	17.03	29.27	9.55	0.80	15.62
2	60-2	15.00	45.8	16.13	37.07	16.13	12.86	37.07	8.48	0.56	31.70
3	60-3	15.00	47.4	19.60	41.07	19.60	11.66	41.07	8.06	0.57	47.78
4	60-4	15.00	50.1	29.87	52.73	29.87	9.45	52.73	7.11	0.46	63.87
5	60-5	15.00	43.0	8.13	27.73	8.13	18.11	27.73	9.81	0.92	79.97
6	60-6	15.00	49.8	21.27	45.47	21.27	11.20	45.47	7.66	0.74	96.05

Sample Count Start Time:

15 Jan 2010 07:29:04

Data Capture Date

15 Jan 2010 07:44:26

User Filename

S12011560-1A.XLS

U12011560-1A.XLS

Spectrum Type

Log Counts

User Number

12

User Id

RN-222

User Comment

RED

Isotope Name

14C

Scintillator

LIQUID

Sample, Rack-Pos, Time:

160-115.00

H#, Total Counts:

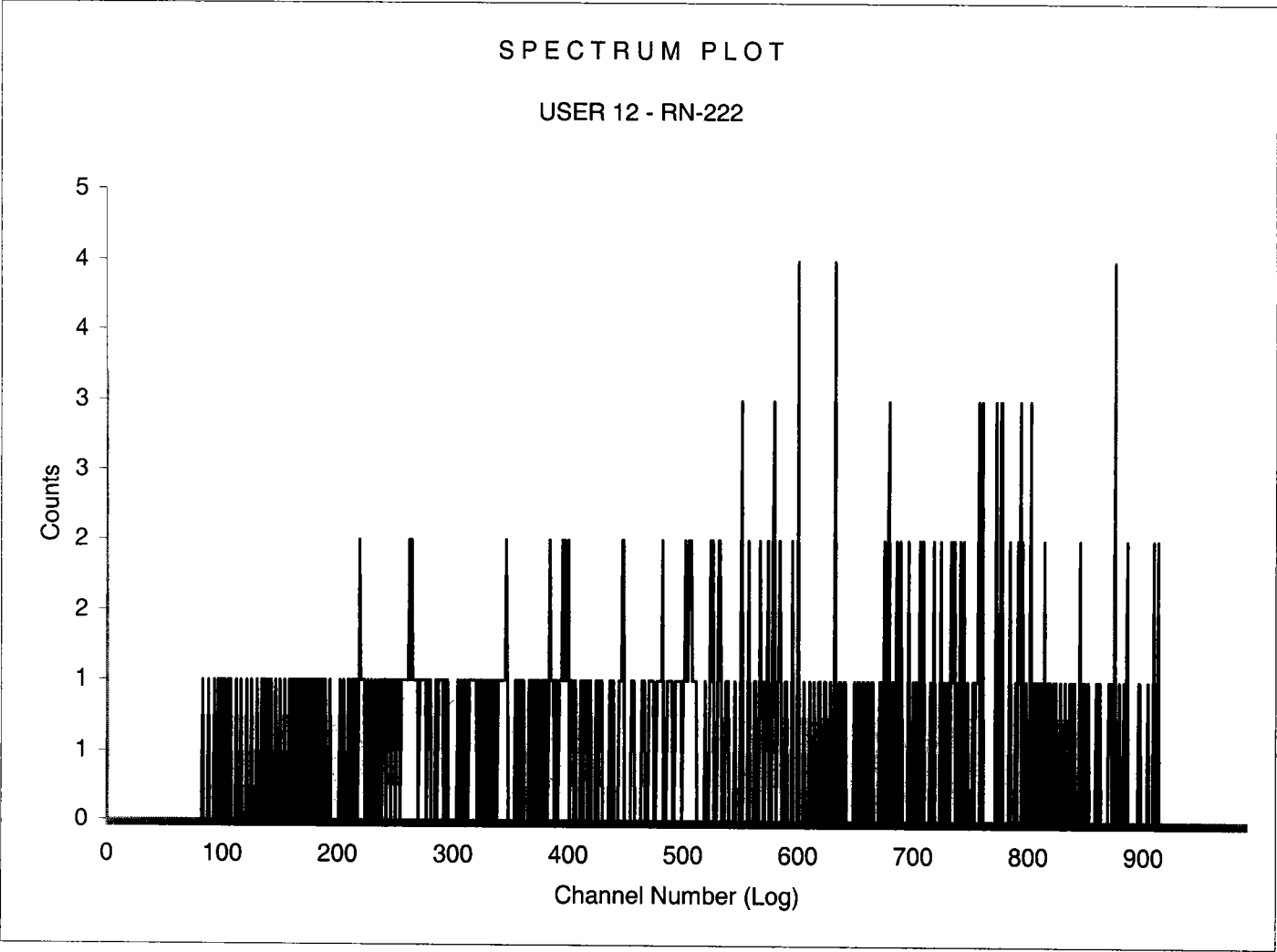
45.4445

Win1: Rn-222 - Start, End, Counts:

600875138

Win2: - Start, End, Counts:

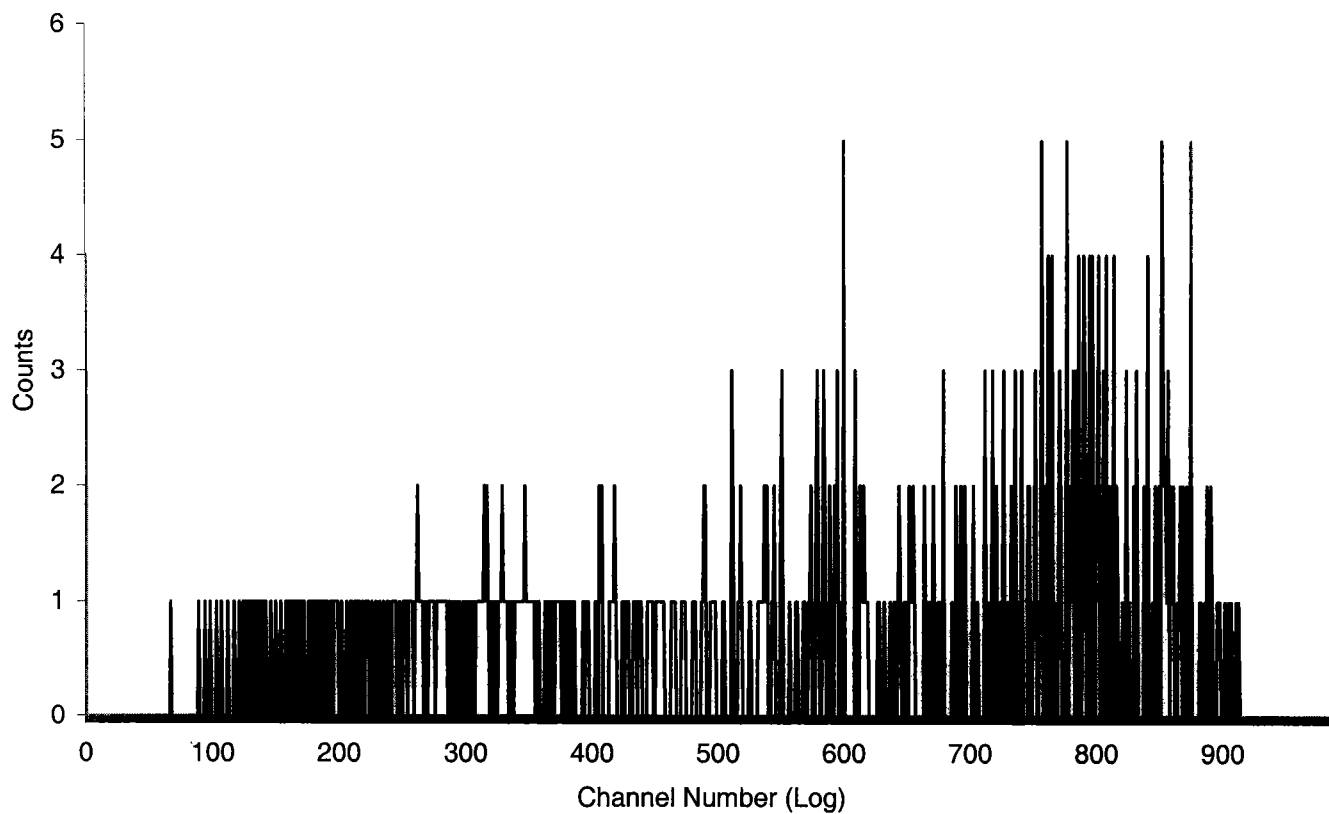
0990445



Sample Count Start Time:	15 Jan 2010 07:45:09		
Data Capture Date	15 Jan 2010 08:00:31		
User Filename	S12011560-2A.XLS		
	U12011560-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	2	60-2	15.00
H#, Total Counts:	45.8	561	
Win1: Rn-222 - Start, End, Counts:	600	875	242
Win2: - Start, End, Counts:	0	990	561

# SPECTRUM PLOT

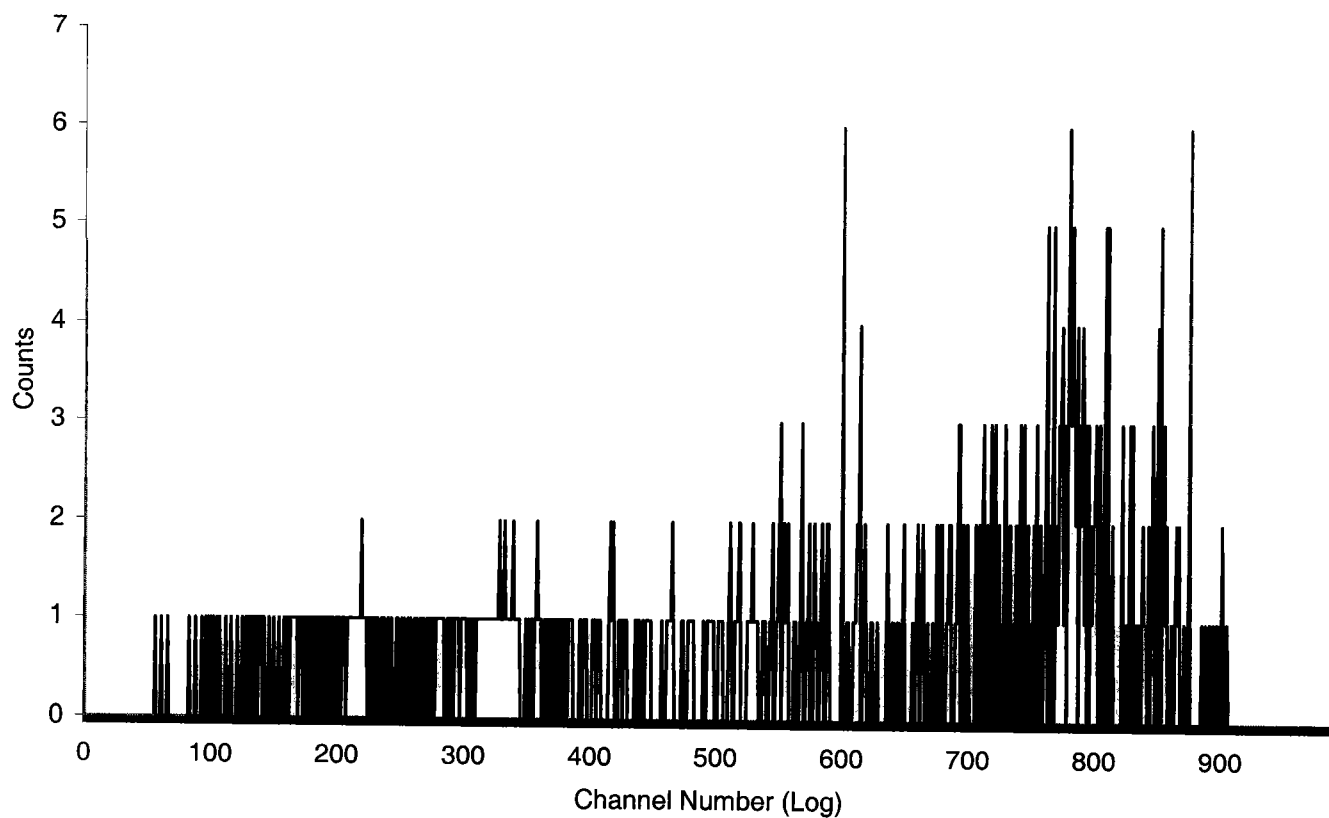
USER 12 - RN-222



Sample Count Start Time:	15 Jan 2010 08:01:14		
Data Capture Date	15 Jan 2010 08:16:36		
User Filename	S12011560-3A.XLS		
	U12011560-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	3	60-3	15.00
H#, Total Counts:	47.4	621	
Win1: Rn-222 - Start, End, Counts:	600	875	294
Win2: - Start, End, Counts:	0	990	621

# SPECTRUM PLOT

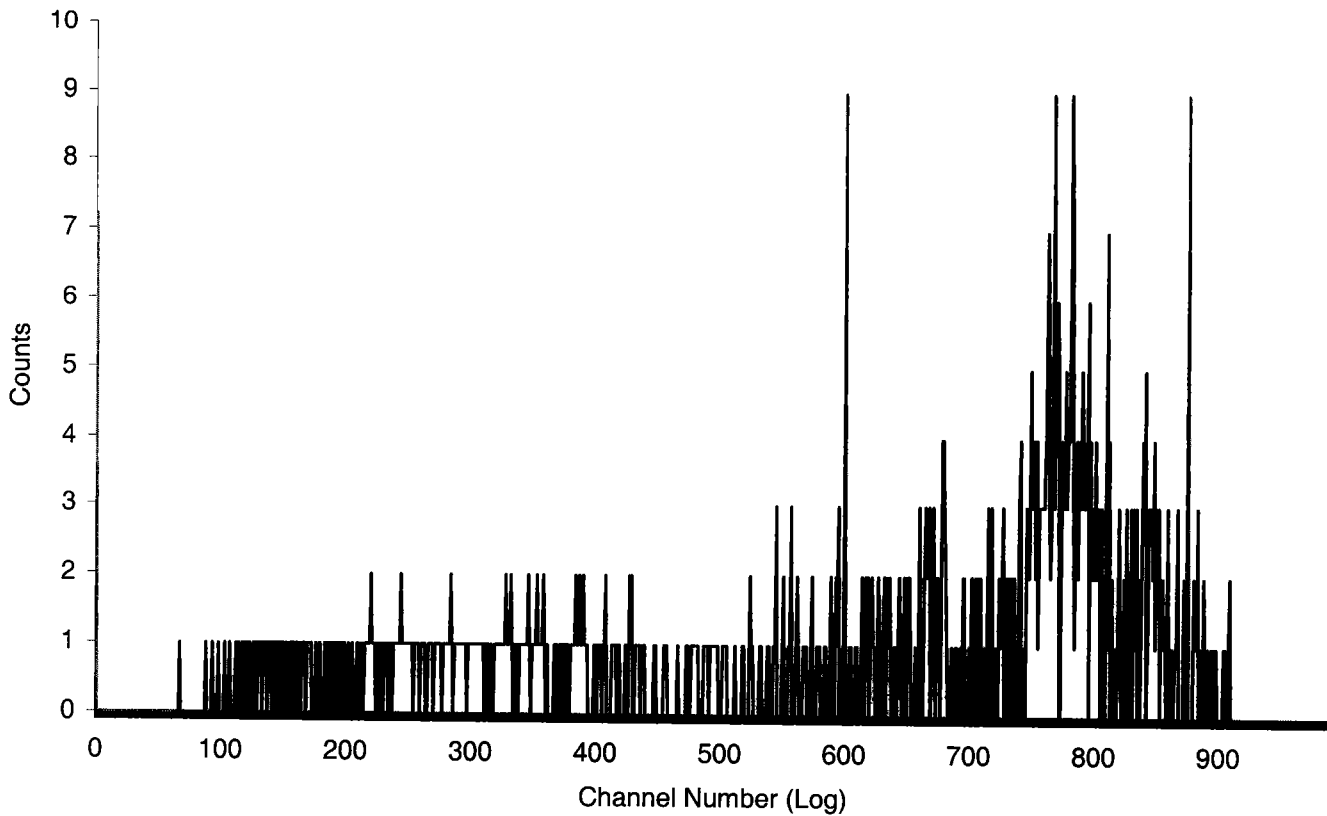
USER 12 - RN-222



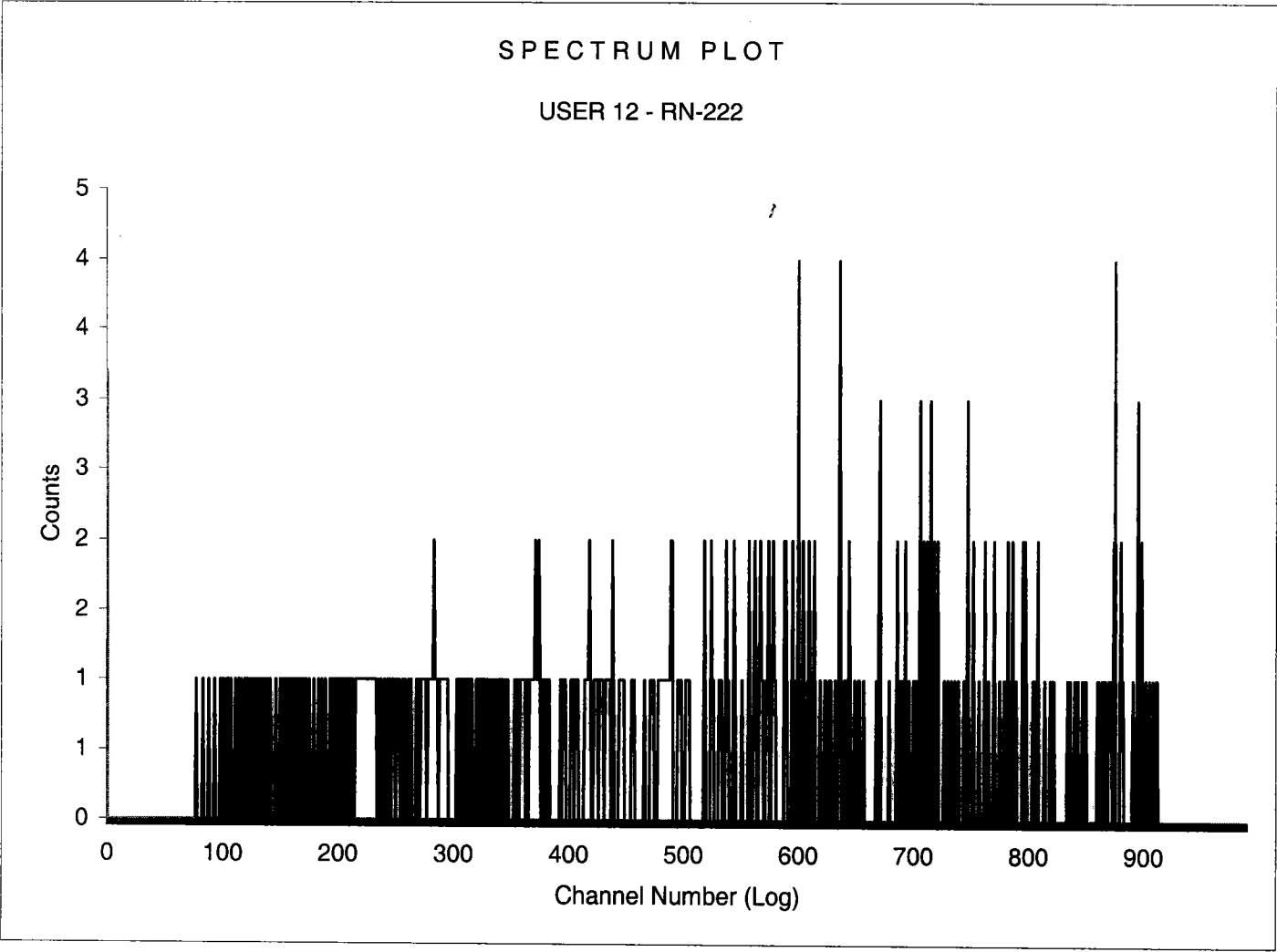
Sample Count Start Time:	15 Jan 2010 08:17:19		
Data Capture Date	15 Jan 2010 08:32:42		
User Filename	S12011560-4A.XLS		
	U12011560-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	4	60-4	15.00
H#, Total Counts:	50.1	796	
Win1: Rn-222 - Start, End, Counts:	600	875	448
Win2: - Start, End, Counts:	0	990	796

### SPECTRUM PLOT

USER 12 - RN-222



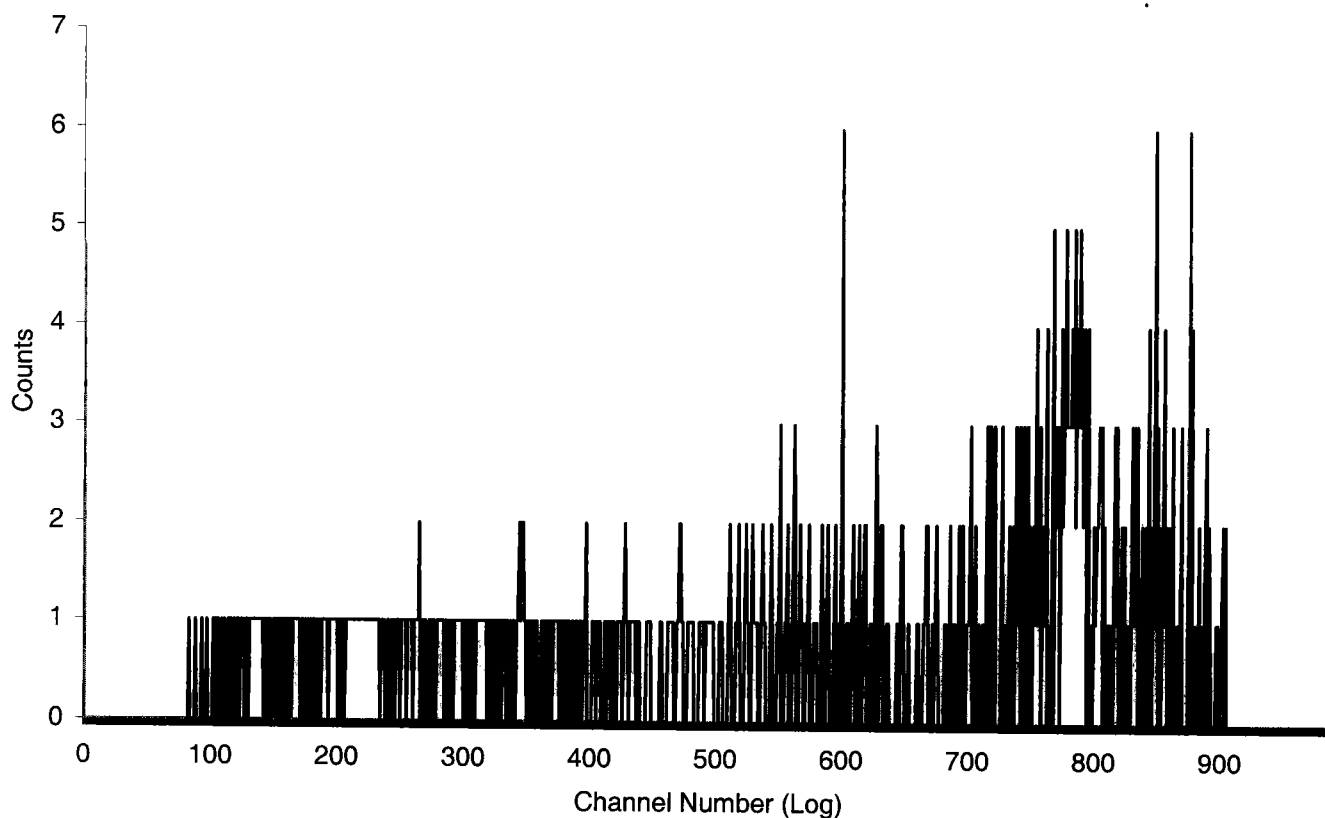
Sample Count Start Time:	15 Jan 2010 08:33:25		
Data Capture Date	15 Jan 2010 08:48:47		
User Filename	S12011560-5A.XLS		
	U12011560-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	5	60-5	15.00
H#, Total Counts:	43.0	421	
Win1: Rn-222 - Start, End, Counts:	600	875	122
Win2: - Start, End, Counts:	0	990	421



Sample Count Start Time:	15 Jan 2010 08:49:30		
Data Capture Date	15 Jan 2010 09:04:53		
User Filename	S12011560-6A.XLS		
	U12011560-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	6	60-6	15.00
H#, Total Counts:	49.8	687	
Win1: Rn-222 - Start, End, Counts:	600	875	319
Win2: - Start, End, Counts:	0	990	687

# SPECTRUM PLOT

USER 12 - RN-222



Instrument Type LS 6000  
 Data Capture Date 18 Jan 2010 06:58:55  
 User Filename C:\LSCCAPTURE\RED\USER12\UN011801.BSF

User Number 12  
 User Id RN-222  
 User Comments RED

Scintillator Choice: LIQUID

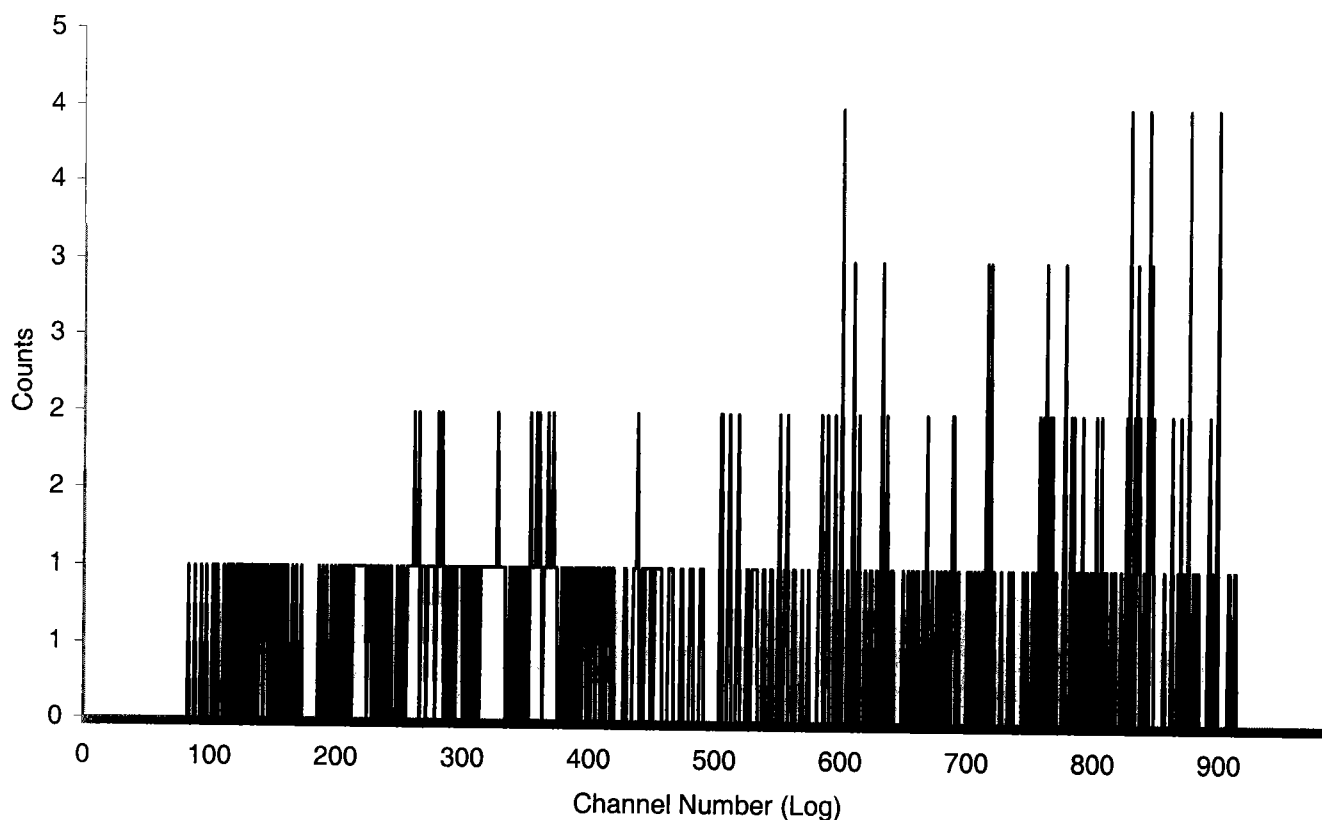
Sam	Rack	Time	H#	Raw CPM1	Raw CPM2	CPM Iso1	%Err1	CPM Iso2	%Err2	LumEx	ElTime
1	45-1	15.00	43.9	9.27	29.00	9.27	16.96	29.00	9.59	0.53	15.72
2	45-2	15.00	43.8	442.40	558.00	442.40	2.46	558.00	2.19	0.03	31.78
3	45-3	15.00	46.2	429.67	531.67	429.67	2.49	531.67	2.24	0.03	47.89



Sample Count Start Time:	18 Jan 2010 06:59:38		
Data Capture Date	18 Jan 2010 07:14:59		
User Filename	S12011845-1A.XLS		
	U12011845-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	1	45-1	15.00
H#, Total Counts:	43.9	439	
Win1: Rn-222 - Start, End, Counts:	600	875	139
Win2: - Start, End, Counts:	0	990	439

# SPECTRUM PLOT

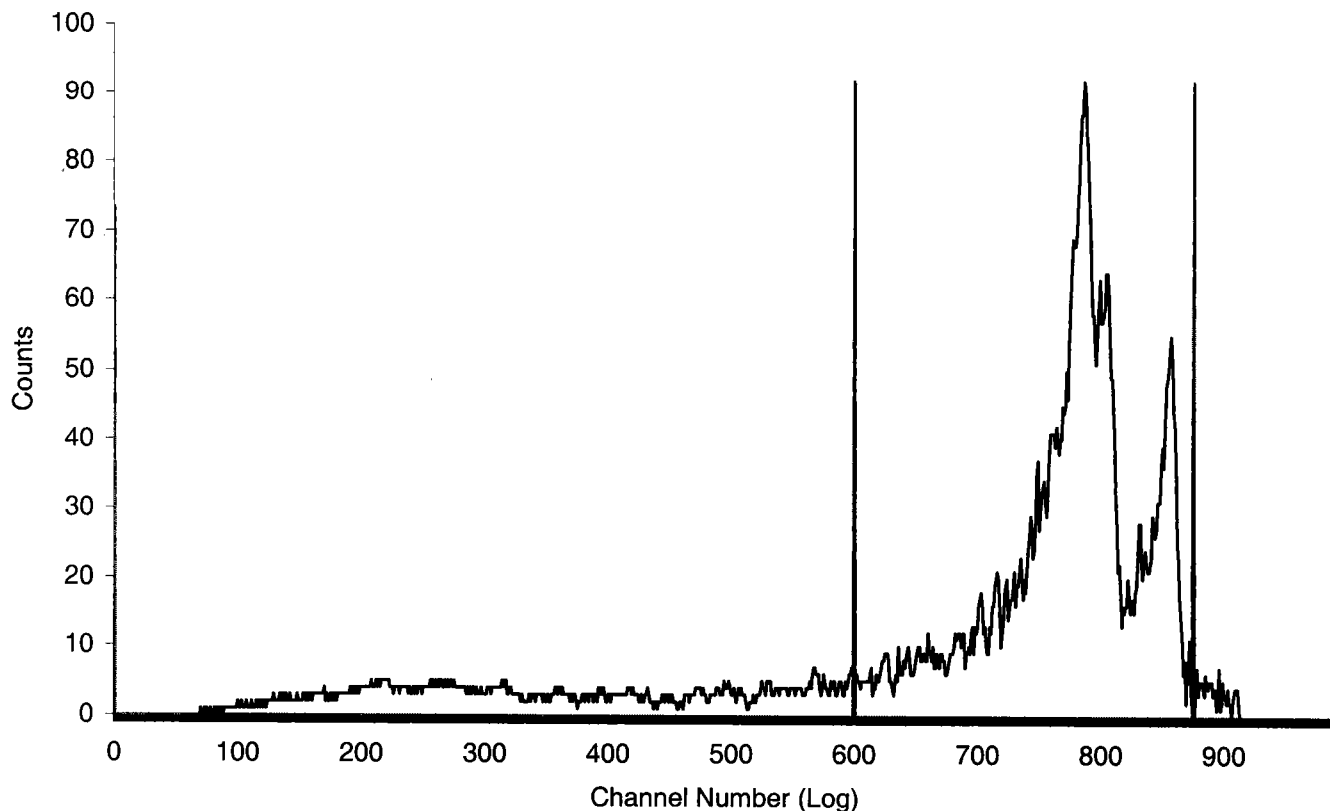
USER 12 - RN-222



Sample Count Start Time:	18 Jan 2010 07:15:42		
Data Capture Date	18 Jan 2010 07:31:06		
User Filename	S12011845-2A.XLS		
	U12011845-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	2	45-2	15.00
H#, Total Counts:	43.8	8401	
Win1: Rn-222 - Start, End, Counts:	600	875	6636
Win2: - Start, End, Counts:	0	990	8401

# SPECTRUM PLOT

USER 12 - RN-222



Sample Count Start Time:	18 Jan 2010 07:31:48		
Data Capture Date	18 Jan 2010 07:47:12		
User Filename	S12011845-3A.XLS		
	U12011845-1A.XLS		
Spectrum Type	Log Counts		
User Number	12		
User Id	RN-222		
User Comment	RED		
Isotope Name	14C		
Scintillator	LIQUID		
Sample, Rack-Pos, Time:	3	45-3	15.00
H#, Total Counts:	46.2	8013	
Win1: Rn-222 - Start, End, Counts:	600	875	6445
Win2: - Start, End, Counts:	0	990	8013

### SPECTRUM PLOT

USER 12 - RN-222

