

Sample Collection and Documentation

Table 5B. Continued

Site name	Y, km	X, km	GR, m	Sample type	Collector ^b	Year collected	Architectural Ref	Measurement Ref
Oka machi	34.117	-25.218	217	tile, roof or floor of roof	HPM	1963		9
N2	34.296	-25.628	239	tile, roof or floor of roof	HPM	1963		25
(river embankment) ^a	0	0	249	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	252	andesite rock	NU	<1996		31
Urakami gawa location No. 109	33.977	-25.419	270	granite	NU	<1991		41
Takatani House	0	0	290	iron rebar in concrete	NU/NICH	?		34
Urakami gawa location No. 107	33.972	-25.506	297	granite	NU	<1985		30, 41
Urakami gawa location No. 104	33.945	-25.418	302	granite	NU	<1985		30, 41
Urakami gawa location No. 105	33.944	-25.424	304	granite	NU	<1985		30, 41
(river embankment) ^a	0	0	305	andesite rock	NU	<1996		31
Yamazoto cho	34.473	-25.186	307	tile	HPM	1963		9
(river embankment) ^a	0	0	307	andesite rock	NU	<1996		31
Yanase bridge	33.936	-25.401	310	granite	NU/NICH	?	5-3	43
(river embankment) ^a	0	0	311	andesite rock	NU	<1996		31
Urakami gawa location No. 102	33.938	-25.497	325	granite	NU	<1991		41
(river embankment) ^a	0	0	330	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	331	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	343	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	344	granite	NU	<1996		31
(river embankment) ^a	0	0	347	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	353	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	358	andesite rock	NU	<1996		31
N3	34.547	-25.599	364	tile, roof or floor of roof	HPM	1963		25
(river embankment) ^a	0	0	384	andesite rock	NU	<1996		31
N4	34.580	-25.622	405	granite	NICH	<1983		25
(river embankment) ^a	0	0	430	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	437	andesite rock	NU	<1996		31
N5	34.361	-25.817	439	tile, roof or floor of roof	HPM	1963		25
Urakami Church	34.645	-25.167	458	granite	NU/NICH	?	2-3, 4-2	?
(river embankment) ^a	0	0	460	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	464	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	472	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	477	andesite rock	NU	<1996		31
Shiroyama Elementary School	33.757	-25.362	490	tile, roof or floor of roof	HPM	1963	1-1	9
Urakami Church	34.682	-25.115	517	brick	AB	1963	2-3	5, 6, 18, 19
(river embankment) ^a	0	0	523	andesite rock	NU	<1996		31
Nagasaki University School of Medicine	34.752	-25.529	523	iron rod	NZ	<1960	4-6	33
N7 (Urakami Church)	34.716	-25.122	542	granite	NICH	<1983		25

Sample Collection and Documentation

Table 5B. Continued

Site name	Y, km	X, km	GR _m	Sample type	Collector ^b	Year collected	Architectural Ref	Measurement Ref
Shiroyama Elementary School	33.704	-25.416	543	iron rebar in concrete	NU/NICH	?	1-1	34, 43
N6	34.711	-25.679	545	granite	NICH	<1983		25
(river embankment) ^a	0	0	556	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	561	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	596	granite	NU	<1996		31
Nagasaki University Hospital	34.758	-25.731	613	iron rod	AB	1963	4-7	5, 6
Shiroyama cho	33.823	-25.850	623	tile, roof or floor of roof	HPM	1963		9
(river embankment) ^a	0	0	629	andesite rock	NU	<1996		31
Ueno cho	34.682	-24.933	634	tile, roof or floor of roof	HPM	1963		9
(river embankment) ^a	0	0	636	andesite rock	NU	<1996		31
N8	34.516	-24.813	640	tile, roof or floor of roof	HPM	1963		25
Gokoku shrine - A & B	33.704	-25.036	650	granite	NU/NICH	?		43
Nagasaki University Hospital	34.632	-25.921	653	concrete	RE	1989	4-7	42, 43
Nagasaki University Hospital	34.629	-25.925	655	tile, wall	RE?	1989	4-7	43
Nagasaki University Hospital	34.629	-25.925	655	iron handrail	RE	1989	4-7	34, 43
(river embankment) ^a	0	0	675	andesite rock	NU	<1996		31
Nanzan school	34.509	-24.741	703	granite	NU/NICH	?	4-11	43
(river embankment) ^a	0	0	715	andesite rock	NU	<1996		31
Motoki Bridge	34.217	-24.651	743	iron rebar in concrete	NU/NICH	?		34, 43
(river embankment) ^a	0	0	755	andesite rock	NU	<1996		31
Shiroyama cho	33.604	-25.800	760	tile, roof or floor of roof	HPM	1963		9
Sakamoto cho	34.663	-26.033	763	tile, roof or floor of roof	HPM	1963		9, 19
Shimoda house	34.6	-26.093	784	granite	NU/NICH	?		43
(river embankment) ^a	0	0	788	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	795	andesite rock	NU	<1996		31
(river embankment) ^a	0	0	848	andesite rock	NU	<1996		31
Hachiman jinja nearby house	33.399	-25.244	861	brick	AB	1963		5, 6
N9	34.523	-24.558	881	granite	NICH	<1983		25
Prefectural gymnasium B (Taiikukan)	33.504	-24.896	894	granite	NU/NICH	?		43
Hachiman jinja	33.359	-25.268	896	brick	AB	1963	(2-13)	5, 6
St. Maria school	33.323	-25.21	941	granite	NU/NICH	?		43
Mitsubishi Steel	34.121	-26.328	943	steel rail	NU/NICH	?	4-12-1	43

Sample Collection and Documentation

Table 5B. Continued

Site name	Y, km	X, km	GR, m	Sample type	Collec- tor ^b	Year collected	Architec- tural Ref	Measure- ment Ref
Urakami cho	34.336	-24.430	967	tile, roof or floor of roof	HPM	1963		9
Anakoboji Temple	35.159	-25.842	1017	tile, roof or floor of roof	KU	2000?		26, 11
Yamada-Furukawa family graveyard gatepost, Sakamoto cho	34.719	-26.32	1040	brick	RE	1991		43
Municipal Commercial High School	33.420	-24.758	1042	iron rod	AB	1963	4-13	5, 6
Ide residence	33.206	-25.611	1063	tile, roof or floor of roof	KU	2000?		26
Sakamoto cho Foreigners' Cemetery	34.721	-26.35	1068	brick	AB	1963		5, 6, 18, 19
Mitsubishi Steel and Arms Works	34.223	-26.468	1075	concrete	RE	1989	4-12-1	43
Fuchi Middle School	33.798	-26.459	1156	concrete	RE	1989	4-14	43
Ieno wall	34.132	-23.978	1424	brick	RE or AB	1963, 1981		18, 19
Shoutoku Temple, Zenza machi	34.545	-26.790	1428	brick	RE	1981		18, 19
Nagasaki University Charnel	34.578	-26.807	1452	brick	RE	1989		43
Konpirasan Mt. antiaircraft battery	35.512	-26.343	1582	concrete	RE	1997		43
Yamada Oil Storehouse	34.39	-27.433	2045	brick	RE	1981, 1989		43
Inasa (Warehouse) A	34.416	-27.437	2050	brick	RE	1981		18, 19
Honren Temple, Chikugo machi	35.179	-27.528	2329	brick	RE	1981		18, 19

^aThese sites could not be evaluated for DS02 using the Geographical Information System (GIS), due to lack of location data.

^bCollector: NU = Nagasaki University; NICH = Nagasaki International Cultural Hall; KU = Kanazawa University

Note: Long-distance copper samples measured for ⁶³Ni background in this work are listed in Table 4 but are not included in Table 5 because Table 4 contains all relevant available information for these particular samples.

Geographical Information System (GIS)

The GIS enables a solution to the problems identified above, because it allows the two sets of maps to be aligned in a way that has been thoroughly examined and determined to be acceptable, and for which the uncertainty has been carefully estimated. Just as importantly, it allows the same alignment to be done for war-era aerial photographs. The problem with the accuracy of locations on the U.S. Army map can be checked by using a superimposed aerial photograph, as can the problem with features not depicted or possibly changed on the newer city plan maps. The relationship between locations as depicted on one map vs. the other can easily be visualized by superimposing the two maps. Numerically, the alignment obtained with the GIS allows an automated transformation of coordinates using spreadsheets or simple programs, as defined in Chapter 5. An additional improvement of the GIS is that it allows a location to be measured more easily and more accurately than was the case with paper maps: the map image can be magnified and easily manipulated (zoom, pan, etc.) on the computer display, and the coordinates of any depicted location can be determined easily and accurately with tools built into the software and graphical user interface.

Uncertainty of Sample Locations

With the use of these tools, a sample location in a known position with respect to a building, bridge, or other structure that can be identified on the new city maps or the aerial photographs can be localized with very good precision, i.e., with an error standard deviation of 5 m or less in each coordinate. This applies to a large proportion of the samples collected beginning in the 1980s. For samples taken from an unknown position within a structure, the uncertainty in the sample location is typically dominated by a term corresponding to the extent of the structure in a given direction. For samples taken from cemeteries, this latter condition almost always applies by definition, because samples available for measurement are virtually always ones that have been moved into a storage area, and their original location within the graveyard in 1945 is unknown. Finally, in a few cases, primarily samples taken during the 1960s, uncertainties are even larger because of a lack of clear information about the location of the site. Detailed information on location-related uncertainty estimates that investigators making measurements have used for measurements reported in this work is given in the corresponding chapters (Chapters 7 through 9), and a detailed discussion of map and location-related uncertainty issues, along with recommended formulae, is given in Chapter 5.

Sample Information Maintained for Post-DS86 Samples at RERF (Database and Files)

RERF maintains a database for all samples collected after DS86, which have been documented with a complete set of information. The fields in each record of the database include:

- Autosequence Number for entry
- Building identification number
- Material
- Sample point number
- Sample type sequence number

- Sample's RERF Identification (ID) Number
- New city map X coordinate
- New city map Y coordinate
- Ground distance
- Height above ground
- Elevation of ground level above ground level at hypocenter
- Identities of investigators to whom samples have been supplied for measurements.

The database was designed and originated by S. Fujita, who has ported it to contemporary software and maintained it. In addition to the information in the database, RERF maintains site drawings, annotated maps, and other materials, typically including photographs of the sample collection site for samples collected after DS86. This type of detailed location information has been vital to the construction of the corresponding site models that were used for adjoint Monte Carlo calculations to determine overall effective transmission factors in this work (see Chapters 7, 8 and 9).

Complete Listing of Samples and Locations

A complete list of all samples from which measurements were considered in the formulation of DS02 is given in Table 5. The map coordinates given are in the 1,000-m plane rectangular coordinates system of the newer city maps of Hiroshima (1979) and Nagasaki (1981) (see Chapter 5 for details). The column "Architectural Reference" gives the number used for the associated site in the book by the Hiroshima Peace Memorial Museum (Museum 1996) or the City of Nagasaki (Nagasaki 1996), as applicable.

Acknowledgement

We are grateful to the numerous sample collectors, private donors, and public agencies listed herein, as well as to the temples, shrines, and cemeteries listed, who have so graciously donated these materials in the interest of advancing scientific knowledge about the effects of the atomic bombs, and to any other collectors or donors whom we may have inadvertently omitted.

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