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Non-nuclear RSR Opra Scheme

Version 2, 1 November 2010

Non-nuclear RSR Opra Scheme

1. About non-nuclear RSR Opra

Non-nuclear RSR Opra (Radioactive Substances Regulation - Operational Risk Appraisal) is an operational screening tool that we will use in our work to regulate organisations keeping and using radioactive substances and producing radioactive waste (except those on nuclear licensed sites) under the Environmental Permitting (England and Wales) Regulations 2010, which came into force on 6 April 2010.

It is one step towards our goal of developing a common approach to our assessment and regulation across a range of regulatory regimes. We want to:

- make regulation more effective and efficient
- make the process easier for both industry and ourselves
- target our resources to the environment.

The scheme is simple to apply – it provides a simple profile for sites based on factors related to their complexity, the radioactive discharges and disposals they make, and the resources we need to deploy to regulate them. This assessment may be influenced by the recent performance of the operator, in terms of level of compliance with the permit conditions. We will use the scheme to inform our compliance planning activities to ensure that they are prioritised and to decide upon the charges that operators need to pay.

The non-nuclear RSR Opra scheme is a “tier 2 Opra” scheme which does not use a full Opra profile. More information is available on Agency Opra schemes in general on our web site (search for Opra). This is because the likelihood of harm to the environment is low for these types of permitted sites and the standards of control in place are generally high. For most permit types, the permits issued contain set conditions with numerical limits set according to the operational needs and judged by the Environment Agency to be acceptable. Accordingly a simple scheme is sufficient. We recognise that the likelihood of harm to the environment and members of the public is low from most non-nuclear sites, but that a degree of effort needs to be expended in establishing that and confirming that it continues to be the case to the expected standard. In developing this scheme we have given weight both to the radioactive discharges and disposals made at sites and the need to target our resources to those requiring most effort to issue permits and ensure compliance with them.

The outputs from the scheme are separate base bands for permitting and compliance assessment work. These reflect the relative amounts of effort required to determine different permit types and the effort we need to employ in assessing an operator’s compliance with those permits at a site. The permitting base band will inform charging for permitting-type activities. The compliance base band will inform subsistence charging but will be modified by a factor related to the level of non-compliance with permit conditions, as identified by our inspection and other compliance assessment activities.

A complicating factor in developing this scheme is our practice (formerly driven by the structure of the Radioactive Substances Act 1993 (RSA93)) of issuing separate permits to cover specific aspects of work involving radioactivity. This means that an operator on a single site can routinely hold up to four RSA93 permits. Migration of the regulatory regime into the Environmental Permitting Regulations (EPR) should allow us to simplify this somewhat but some sites will need to hold two separate permits driven by national security considerations. Even after implementation RSA93 permits will remain in their current format until varied.

2. Non-nuclear RSR Opra screening methodology

2.1 Use for Permitting-type activities

We need to allocate sufficient resources to enable us to assess applications for permits to use radioactive substances and dispose of radioactive waste and to issue the appropriate permits. Our charges for this work need to cover our costs.

For security reasons under EPR we will need to issue permits relating to keeping, using and disposing of sealed sources separately from other uses of radioactive substances. In order to reflect the different hazards and legal requirements applying to different categories of sealed sources, it is necessary to issue different types of permits for them. The resource requirements for determination of each of these permit types are different and the proposed scheme takes account of this.

Whilst the permits that we will issue for other uses of radioactive substances (ie not relating to sealed sources) will use a single permit, the effort required to determine them will be depend on the type of site. The scheme takes account of this.

2.1.1 Permitting Base bands

We have used our experience and judgement to allocate permitting 'base bands' to various permit types which reflect the resource requirements for determination. See Tables A, B and C below – the numbers are the Opra permitting bands. Those permits requiring similar levels of determination effort are allocated the same permitting band and higher numbers require greater effort. The lowest amount of resource is needed to determine standard rules permits and the highest for high complexity open source use and disposal permits.

It is important to note that the permitting part of the scheme is based around the types of permits that we will be issuing under EPR and not the current RSA93 structure. There will be 8 different EPR permit types, 4 for sealed source use (Types A, B, C and D) and 4 for open source use and disposal (Types E, F, G and H). Table D below explains how the new EPR permit types read-across to existing RSA93 permit types.

Our charges for variation, transfer and surrender of permits will also be based on the permitting base bands as set out in the EPR charging scheme. Under this scheme each permitting base band maps to a single standard charge for applications, variations, transfers and surrenders.

We have come to the conclusion that we want to keep the scheme as simple as possible consistent with the overall objective. We have used the minimum number of groups, taking advantage of existing source categorisations where possible, and created simple distinctions between users where not possible. Following the charging consultation and discussion with users, the division between normal and high complexity open source use has been chosen to be related to discharges and disposals of radioactive waste, as set out in the Annex to this document. Other criteria were considered but rejected because they would be more difficult to apply in practice, leading to uncertainty in users and regulators and offered little overall benefit.

Permitting base bands can be derived from the permits issued previously under RSA93 and continuing in force or will need to be stated on applications for permits under EPR.

Table A Permit types

Radioactive substances activities covered (see notes below for definitions of terms)	Permit Type
Standard facility for sealed sources in category 5	**A**
Keeping or use of one or more sealed sources where each source, and all sources taken together, fall within source category 5 and/or accumulation and/or disposal of category 5 waste sealed sources	**B**
Keeping or use of one or more sealed sources in categories 1 to 4 and/or accumulation and/or disposal of those waste sealed sources	**C**
Keeping or use of one or more high-activity sealed sources and/or accumulation and/or disposal of those waste sealed sources	**D**
Keeping or use of open radioactive sources only, ie with no permitted disposal	**E**
Keeping or use of open radioactive sources and/or accumulation and/or disposal of radioactive waste open sources – low quantity	**F**
Keeping or use of open radioactive sources and/or accumulation and/or disposal of open source radioactive waste – not being low quantity or high complexity	**G**
Keeping or use of open radioactive sources and/or accumulation and/or disposal of open source radioactive waste - high complexity – see below	**H**

Notes for Table A
* Sealed source categorisation is specified in "Security Requirements for Radioactive Sources, May 2008".
* High-activity sealed sources are as specified in the Environmental Permitting (England and Wales) Regulations 2010.
* For Permit type F low quantity means that the total holdings of open source radioactive materials do not exceed 10 GBq of technetium-99m or 20 MBq of other radionuclides.
* For Permit type H high complexity means that the site is used for the production of gaseous tritium light devices (GTLD) or gaseous tritium light sources (GTLS), or discharges and disposals are above a threshold of 30000 as calculated using the method in the Annex to this document.
* Permits for Storage of radioactive packages in transit are treated as type C unless we have accepted a case for low hazard leading to reduced fees, when they become type B.

Table B – Sealed source Opra bands

Permit type	A	B	C	D
Opra permitting Band	**1**	**2**	**3**	**4**

Table C - Open source Opra bands

Permit type	E	F	G	H
Opra permitting Band	**2**	**4**	**5**	**6**

Table D Indicative mapping between RSA93 and EPR permit types.

EPR Permit Type from Tables A and B above	RSA93 permits (tariff type in the current RAS charging scheme)
A - Use of sealed sources – very low level	Fixed condition registration (RAS4J or RAS4K)
B - Use of sealed sources – low level	Sealed source registration not included elsewhere (RAS4A, 4D, 4E or 4G)
C - Use of sealed sources – medium level	Sources of similar potential hazard to HASS registration (RAS4S)
D - Use of sealed sources – high level	HASS registration (RAS4H)
E - Use of open sources – very low level	Open source registration (RAS4B or 4F) and no authorisation
F - Use and disposal of open sources – low level	Authorisation (RAS3A or 3B) plus open source registration (RAS4A)
G - Use and disposal of open sources – medium level	Authorisation (RAS3 or 3I) plus open source registration (RAS4A or 4I)
H - Use and disposal of open sources – high level	Authorisation (RAS3) plus open source registration (RAS4A) – differentiation from above dependant on notes to Table B

Table D is provided to show approximately how some combinations of RSA93 permits transfer to the new system. In practice the combinations of permits issued at some sites are complex and not readily summarised in a table. Individual decisions have been made about each site and if you are unclear about what band you come within you should seek advice from your local RSR regulator.

2.2 Use for Compliance activities

We need to check your compliance with your permits according to their complexity. This will require different resources at different sites. In order to do that we are proposing a scheme based on the work activities at various types of sites and how well you comply with the conditions of your permits.

We will set a compliance base band for each operator on a site. This gives us a general assessment of different types of non-nuclear activities undertaken on a site, ie those activities covered by all the permits issued to the operator for that site. We will also use a factor called "compliance rating", which is an indication of how compliant you are with your permit conditions, to modify the base band.

Compliance rating is used in our other Opra schemes and uses information from our Compliance Classification Scheme (CCS). While this is an important part of the scheme, we believe that the generally good performance of most users of radioactive substances will lead to few having their charges increased as a result of compliance issues.

2.2.1 Compliance Base Bands

Broadly, the more complex the work activities that are carried out at a site, the more likelihood of environmental harm. Also more work will be needed by us to understand and check on the processes and their pollution potential.

We have used our experience and judgement to allocate compliance 'base bands' to the various permitted activities that are undertaken at a site or premises. See Table E below. Because those activities may relate to the use and disposal of both sealed and open sources it is presented in the form of a matrix. If the operator of a site holds permits types C and F then the compliance base band is 4. If the operator of the site only holds a permit type A then the compliance base band is 1. Those activities requiring similar levels of compliance effort are allocated the same base band with the higher numbers requiring greater effort. Charges for compliance are set by the compliance base band possibly modified by the compliance rating.

Table E

Use of open sources inc disposal	Use of sealed sources: None	A Opra band	B Opra band	C Opra band	D Opra band
None Opra band		1	1	3	4
E Opra band	1	1	1	3	4
F Opra band	2	2	2	4	5
G Opra band	4	5	5	6	8
H Opra band	7	8	8	9	9

Note that there is no read-across between compliance base bands and permitting base bands. They represent the output of entirely different assessments of the resource requirements for different activities.

The compliance base band for a site can be derived directly from the permits held. Once a compliance base band has been established it will be unlikely to change unless significant changes are made to the activities undertaken at the site.

2.2.2 Compliance Rating

In order to inform our subsistence charging and compliance planning we need to take account of how well you comply with the conditions of your permits. This is done by calculating a compliance rating band from the number and severity of non-compliance events (recorded on our Compliance Classification Scheme (CCS)). The assessment period for the compliance rating attribute is one calendar year. More information is available on the CCS scheme in general on our web site (search for CCS). In assessing your compliance rating band we take account of the following factors:

- Non-compliance with permit requirements
- Potential impact on the environment as a result of non-compliance
- Additional compliance assessment effort required to deal with permit breaches

The compliance rating band reflects your level of compliance with the conditions of your permits. Non-compliances with the conditions of all RSR non-nuclear permits held at a site will be included.

You will be informed as soon as possible of any non-compliance that we have identified and how we will classify it under the CCS. You will have the opportunity to clarify/discuss with an Environment Agency officer why the event has been awarded the specific CCS category. You will be made aware of all non compliance events that we use to calculate your compliance rating band.

The categorisation of non-compliance with permits is undertaken as follows:

Table F – Scoring permit non-compliance

CCS Category	Point for each CCS non-compliance recorded
1	60
2	31
3	4
4	1

The compliance rating is calculated annually by adding up the total number of non-compliances for all the permitted activities at a site in each of these four categories and applying the points multipliers given above to give a total points score. This total score is then used to allocate a banding.

Table G – Compliance Rating Band

Total score	Compliance Rating Band
Reserved for future use	Band A
0-10	Band B
11-30	Band C
31-60	Band D
61-150	Band E
151+	Band F

Compliance rating is based on CCS events over the course of a calendar year. For example, non-compliances recorded in 2011 will be used to derive a compliance rating for a 2012/13 Opra profile and subsistence charge.

Subsistence charges derived from the compliance base band (from Table D above) will be modified as follows:

Table H – Subsistence charge multipliers

Total score	Subsistence charge multiplier
Band A	Reserved for future use
Band B	1.0
Band C	1.1
Band D	1.25
Band E	1.5
Band F	3.0

These multipliers reflect the fact that we have to deploy more resources to deal with non-compliance at permitted sites and to ensure their return to compliance.

2.3 Example

An operator of a site holds permits of types B and G. From Table E that places the operator in compliance base band 5.

During 2011 our compliance activities identify one category 3 and seven category 4 non-compliances which we have recorded on CCS.

Those CCS scores translate to an annual total score of 1 x 4 + 7 x 1 = 11 (Table F)

This places the site in compliance rating band C (Table G).

As a result the subsistence charge for 2012/13 will be 1.1 x the standard subsistence charge (Table H) for compliance base band 5.

Subsistence charges are set out in the EPR charging scheme. Under this scheme each compliance base band maps to a single standard charge.

Annex

Deciding whether a site is permit type H (high complexity open sources)

1. GTLS/GTLD manufacture is permit type H.
2. From the permit covering disposal of open sources, find the maximum annual activity permitted for discharge, transfer or disposal for each radionuclide and group of radionuclides.
3. Calculate the ratio of maximum permitted discharge or disposal to the appropriate value for each radionuclide in the table below.
4. Treat radionuclides authorised as a group as per the spreadsheet.
5. Transfers (in or out) to be included using appropriate value. Treat all transfers as one and take largest permitted limit for each radionuclide or group of radionuclides.
6. Disregard low-volume VLLW.
7. Use annual limits in permits or 12* monthly limits.
8. Sum all ratios.
9. If sum of ratios is 30000 or more then categorise as permit type H.
10. If a permitted radionuclide or group of radionuclides is not shown in the table, then seek advice from us.

Table

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Activated air and coolant - beta/gamma emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Activated dust - beta/gamma emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Activation products	1.E+06	1.E+07	1.E+08	1.E+08
Activation products - short-lived gaseous	1.E+09	1.E+10	1.E+11	1.E+11
Americium-241	1.E+07	1.E+08	1.E+06	1.E+06
Americium-241 & curium-242	1.E+07	1.E+08	1.E+06	1.E+06
Americium-241 mixed with beryllium	1.E+07	1.E+08	1.E+06	1.E+06
Americium-241, iron-55, promethium-147 & caesium-137	1.E+06	1.E+07	1.E+08	1.E+08
Antimony-125	1.E+07	1.E+09	1.E+08	1.E+08
Argon	No value	No value	1.E+11	1.E+11
Argon and krypton	No value	No value	1.E+11	1.E+11
Argon-37	No value	No value	1.E+11	1.E+11
Argon-41	No value	No value	1.E+11	1.E+11
Astatine-211	1.E+09	1.E+10	1.E+11	1.E+11
Barium-133	1.E+06	1.E+07	1.E+08	1.E+08
Barium-137m	1.E+09	1.E+10	1.E+11	1.E+11
Bismuth-210	1.E+06	1.E+07	1.E+08	1.E+08
Bismuth-213	1.E+09	1.E+10	1.E+11	1.E+11
Bromine-76, 77 & 82	1.E+08	1.E+09	1.E+10	1.E+10
Bromine-82	1.E+08	1.E+09	1.E+10	1.E+10
Bromine-82 & sodium-24	1.E+08	1.E+09	1.E+10	1.E+10
Cadmium-109	1.E+06	1.E+07	1.E+08	1.E+08
Caesium-134	1.E+06	1.E+07	1.E+08	1.E+08
Caesium-137	1.E+06	1.E+07	1.E+08	1.E+08
Calcium-45	1.E+08	1.E+09	1.E+10	1.E+10
Californium-252	1.E+06	1.E+07	1.E+05	1.E+05
Carbon-11	1.E+10	No value	1.E+11	1.E+11
Carbon-11 & fluorine-18	1.E+09	1.E+10	1.E+11	1.E+11
Carbon-14	1.E+08	1.E+08	1.E+10	1.E+10
Carbon-14 & other beta-emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Carbon-14 & sulphur-35	1.E+08	1.E+08	1.E+10	1.E+10
Carbon-14 and other beta emitters	1.E+06	1.E+07	1.E+08	1.E+08
Carbon-14, chromium-51, technetium-99 & indium-111	1.E+06	1.E+08	1.E+08	1.E+08
Carbon-14, cobalt-57 & cobalt-58	1.E+07	1.E+07	1.E+09	1.E+09
Cerium-144	1.E+08	1.E+09	1.E+09	1.E+09
Chlorine-36	1.E+07	1.E+09	1.E+08	1.E+08
Chromium-51	1.E+09	1.E+09	1.E+11	1.E+11
Chromium-51, manganese-52, cobalt-56, cobalt-57, cobalt-58 & other beta/gamma emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Chromium-51, rubidium-86 & indium-111	1.E+07	1.E+07	1.E+08	1.E+08
Chromium-57	1.E+06	1.E+07	1.E+08	1.E+08
Cobalt-55	1.E+09	1.E+10	1.E+11	1.E+11
Cobalt-56	1.E+06	1.E+07	1.E+08	1.E+08
Cobalt-56, cobalt-57, cobalt-58, manganese-52 & manganese-54	1.E+06	1.E+07	1.E+08	1.E+08
Cobalt-57	1.E+08	1.E+09	1.E+09	1.E+09
Cobalt-57 & cobalt-58	1.E+07	1.E+07	1.E+09	1.E+09
Cobalt-57 & cobalt-59	1.E+08	1.E+09	1.E+09	1.E+09
Cobalt-58	1.E+07	1.E+07	1.E+09	1.E+09
Cobalt-60	1.E+06	1.E+07	1.E+07	1.E+07

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Copper-64	1.E+09	1.E+10	1.E+11	1.E+11
Copper-67	1.E+08	1.E+08	1.E+08	1.E+08
Curium-242 & curium-243	1.E+07	1.E+08	1.E+06	1.E+06
Curium-244	1.E+07	1.E+09	1.E+06	1.E+06
Europium-152	1.E+06	1.E+07	1.E+08	1.E+08
Europium-154	1.E+06	1.E+07	1.E+08	1.E+08
Fluorine-18	1.E+09	1.E+10	1.E+11	1.E+11
Gadolinium-153	1.E+07	1.E+07	1.E+08	1.E+08
Gallium-67	1.E+09	1.E+10	1.E+11	1.E+11
Gallium-67, indium-111, thallium-201 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Gallium-68	1.E+09	1.E+10	1.E+11	1.E+11
Germanium-68	1.E+07	1.E+07	1.E+08	1.E+08
Gold-195	1.E+07	1.E+07	1.E+08	1.E+08
Gold-198	1.E+08	1.E+08	1.E+10	1.E+10
Holmium-166	1.E+06	1.E+07	1.E+08	1.E+08
Indium-111	1.E+08	1.E+08	1.E+10	1.E+10
Indium-111 & other radionuclides (excluding alpha-emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Indium-111, gallium-67 & iodine-123	1.E+08	1.E+08	1.E+10	1.E+10
Indium-111, gallium-67, chromium-51, selenium-75 & thallium-201	1.E+06	1.E+08	1.E+08	1.E+08
Indium-111, iodine-125 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Indium-113	1.E+06	1.E+07	1.E+08	1.E+08
Indium-113m	1.E+09	1.E+08	1.E+11	1.E+11
Indium-113m, bromine-82 & sodium-24	1.E+08	1.E+08	1.E+10	1.E+10
Indium-113m, iodine-123, erbium-171, gallium-67, sodium-24, potassium-42, gold-198, yterrbium-69/175 & iron-59	1.E+07	1.E+07	1.E+08	1.E+08
Iodine isotopes	1.E+08	1.E+08	1.E+08	1.E+08
Iodine isotopes (excluding iodine-131)	1.E+07	1.E+08	1.E+07	1.E+07
Iodine-121	1.E+09	1.E+10	1.E+11	1.E+11
Iodine-122	1.E+09	1.E+10	1.E+11	1.E+11
Iodine-123	1.E+10	1.E+10	1.E+11	1.E+11
Iodine-123 & iodine-125	1.E+09	1.E+09	1.E+08	1.E+08
Iodine-123 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-123, iodine-125 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-123, iodine-125, iodine-129 & iodine-131	1.E+07	1.E+08	1.E+07	1.E+07
Iodine-124	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-124, iodine-125 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-125	1.E+09	1.E+09	1.E+08	1.E+08
Iodine-125 & iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-125 & other iodine isotopes	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-129	1.E+07	1.E+08	1.E+07	1.E+07
Iodine-131	1.E+08	1.E+08	1.E+08	1.E+08
Iodine-131 & other radionuclides (excluding alpha-emitters)	1.E+08	1.E+08	1.E+08	1.E+08
Iridium-192	1.E+07	1.E+07	1.E+08	1.E+08
Iron-52	1.E+09	1.E+10	1.E+11	1.E+11
Iron-55	1.E+08	1.E+10	1.E+10	1.E+10
Iron-59	1.E+07	1.E+08	1.E+09	1.E+09
Krypton-75	No value	No value	1.E+12	1.E+12
Krypton-79	No value	No value	1.E+12	1.E+12
Krypton-81	No value	No value	1.E+13	1.E+13
Krypton-81m	No value	No value	1.E+13	1.E+13
Krypton-85	No	No	1.E+13	1.E+13

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Krypton-85, americium-241, iron-55, promethium-147 & caesium-137	1.E+06	1.E+07	1.E+08	1.E+08
Krypton-85m	No value	No value	1.E+12	1.E+12
Lanthanum-140	1.E+07	1.E+08	1.E+10	1.E+10
Lanthanum-140 & sodium-24	1.E+07	1.E+08	1.E+10	1.E+10
Lead-210	1.E+06	1.E+06	1.E+07	1.E+07
Lead-210 & daughters	1.E+06	1.E+07	1.E+05	1.E+05
Low energy (<0.3 MeV) beta-emitting radionuclides	1.E+08	1.E+08	1.E+10	1.E+10
Lutetium-177	1.E+09	1.E+10	1.E+10	1.E+10
Manganese-52	1.E+07	1.E+07	1.E+09	1.E+09
Manganese-54	1.E+07	1.E+07	1.E+09	1.E+09
Manganese-56	1.E+07	1.E+07	1.E+11	1.E+11
Mercury-203	1.E+07	1.E+07	1.E+08	1.E+08
Mixed radionuclides including americium-241	1.E+06	1.E+07	1.E+05	1.E+05
Molybdenum-99	1.E+09	1.E+10	1.E+10	1.E+10
Molybdenum-99 & technetium-99m	1.E+09	1.E+10	1.E+10	1.E+10
Neptunium-237	1.E+07	1.E+08	1.E+06	1.E+06
Nickel-63	1.E+10	1.E+11	1.E+10	1.E+10
Nitrogen-13	1.E+09	No value	1.E+11	1.E+11
Non-uranium alpha emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Other alpha-emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Other beta/gamma-emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Other beta/gamma-emitting radionuclides - half-life < 8 days	1.E+08	1.E+08	1.E+08	1.E+08
Other beta/gamma-emitting radionuclides - half-life < 8 hours	1.E+09	1.E+10	1.E+11	1.E+11
Other beta/gamma-emitting radionuclides - half-life > 8 days	1.E+06	1.E+07	1.E+08	1.E+08
Other beta/gamma-emitting radionuclides - half-life > 8 hours	1.E+06	1.E+07	1.E+08	1.E+08
Other beta/gamma-emitting radionuclides (excluding alpha-emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Other beta-emitting radionuclide - half life < 3 months	1.E+07	1.E+07	1.E+08	1.E+08
Other beta-emitting radionuclide - half life > 3 months	1.E+06	1.E+07	1.E+08	1.E+08
Other beta-emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Other beta-emitting radionuclides with max beta energy > than 0.4 MeV	1.E+06	1.E+07	1.E+08	1.E+08
Other gamma-emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Other gases	No value	No value	1.E+11	1.E+11
Other noble gases	No value	No value	1.E+11	1.E+11
Other radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life < 1 day	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life < 1 year	1.E+06	1.E+07	1.E+05	1.E+05

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Other radionuclides - half life < 2 hours	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life < 3 months	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life < 8 hours	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life > 1 year	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life > 3 months	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half life > 8 hours	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half-life < 100 days	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - half-life > 100 days	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides - transuranics	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides (excluding alpha emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters & iodine-125)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters & strontium-90)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters & tritium)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters) - half life < 100 days	1.E+07	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters) - half life < 2 hours	1.E+09	1.E+10	1.E+11	1.E+11
Other radionuclides (excluding alpha-emitters) - half life > 100 days	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters, iodine-125 & iodine-131)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding alpha-emitters, tritium & carbon-14)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding cobalt-60)	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides (excluding indium-111, iodine-131 & alpha-emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Other radionuclides (excluding tritium & caesium-137)	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides (excluding tritium & cobalt-60)	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides (excluding tritium, carbon-14 & cobalt-60)	1.E+06	1.E+07	1.E+05	1.E+05
Other radionuclides (including strontium-90)	1.E+06	1.E+07	1.E+05	1.E+05
Oxygen-15	1.E+09	No value	1.E+11	1.E+11
Oxygen-15, carbon-11, nitrogen-13 & fluorine-18	1.E+09	1.E+10	1.E+11	1.E+11

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Phosphorus isotopes	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32 & chromium-51	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32 & phosphorus-33	1.E+08	1.E+07	1.E+10	1.E+10
Phosphorus-32 & strontium-89	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32 & sulphur-35	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32, chlorine-36 & sulphur-35	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32, phosphorus-33 & sulphur-35	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32, sulphur-35 & chromium-51	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-32, sulphur-35, iodine-125 & iodine-131	1.E+07	1.E+06	1.E+08	1.E+08
Phosphorus-33	1.E+08	1.E+07	1.E+10	1.E+10
Phosphorus-33 & indium-111	1.E+08	1.E+07	1.E+10	1.E+10
Phosphorus-33 & sulphur-35	1.E+09	1.E+10	1.E+10	1.E+10
Plutonium isotopes	1.E+07	1.E+08	1.E+05	1.E+05
Plutonium-238	1.E+07	1.E+08	1.E+05	1.E+05
Plutonium-239	1.E+07	1.E+08	1.E+05	1.E+05
Plutonium-240	1.E+07	1.E+08	1.E+05	1.E+05
Plutonium-241	1.E+09	1.E+10	1.E+07	1.E+07
Plutonium-alpha	1.E+07	1.E+08	1.E+05	1.E+05
Plutonium-alpha & plutonium-241	1.E+07	1.E+08	1.E+05	1.E+05
Polonium-210	1.E+06	1.E+07	1.E+05	1.E+05
Polonium-210 & lead-210	1.E+06	1.E+06	1.E+07	1.E+07
Potassium-42	1.E+09	1.E+10	1.E+11	1.E+11
Promethium-147	1.E+10	1.E+10	1.E+09	1.E+09
Protactinium-231	1.E+06	1.E+07	1.E+05	1.E+05
Protactinium-233	1.E+07	1.E+07	1.E+08	1.E+08
Protactinium-234	1.E+09	1.E+10	1.E+11	1.E+11
Radium isotopes	1.E+06	1.E+07	1.E+06	1.E+06
Radium-223	1.E+07	1.E+07	1.E+06	1.E+06
Radium-223 & other alpha-emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Radium-224	1.E+06	1.E+07	1.E+05	1.E+05
Radium-224 & daughters	1.E+06	1.E+07	1.E+05	1.E+05
Radium-226	1.E+06	1.E+07	1.E+06	1.E+06
Radium-226 & daughters	1.E+06	1.E+07	1.E+06	1.E+06
Radium-226 & thorium-232	1.E+05	1.E+07	1.E+06	1.E+06
Radium-226 (mixed with beryllium)	1.E+06	1.E+07	1.E+06	1.E+06
Radium-227 & Thorium-232	1.E+05	1.E+07	1.E+06	1.E+06
Radium-228	1.E+06	1.E+07	1.E+08	1.E+08
Radium-228 & daughters	1.E+06	1.E+07	1.E+05	1.E+05
Radium-233	1.E+06	1.E+07	1.E+06	1.E+06
Radon-220	No value	No value	1.E+09	1.E+09
Radon-222	No value	No value	1.E+09	1.E+09
Rhenium-186	1.E+08	1.E+08	1.E+08	1.E+08
Rhenium-188	1.E+09	1.E+10	1.E+11	1.E+11
Rubidium-81 & krypton-81m	1.E+09	1.E+10	1.E+11	1.E+11
Rubidium-81, rubidium-82m, rubidium-83 & rubidium-84	1.E+07	1.E+08	1.E+09	1.E+09
Rubidium-82	1.E+08	1.E+08	1.E+11	1.E+11
Rubidium-83	1.E+07	1.E+08	1.E+09	1.E+09
Rubidium-83 & rubidium-84	1.E+07	1.E+08	1.E+09	1.E+09
Rubidium-84	1.E+07	1.E+07	1.E+08	1.E+08

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Rubidium-86	1.E+07	1.E+07	1.E+08	1.E+08
Ruthenium-103	1.E+07	1.E+08	1.E+09	1.E+09
Ruthenium-106	1.E+08	1.E+08	1.E+09	1.E+09
Ruthenium-106 & other radionuclides (excluding alpha-emitters)	1.E+07	1.E+07	1.E+08	1.E+08
Samarium-151	1.E+06	1.E+07	1.E+08	1.E+08
Samarium-153	1.E+09	1.E+09	1.E+10	1.E+10
Selenium-75	1.E+06	1.E+09	1.E+08	1.E+08
Silver-108	1.E+06	1.E+09	1.E+08	1.E+08
Silver-110m	1.E+06	1.E+09	1.E+08	1.E+08
Silver-110m & cobalt-60	1.E+06	1.E+07	1.E+07	1.E+07
Sodium-22	1.E+07	1.E+09	1.E+08	1.E+08
Sodium-22 & iron-59	1.E+07	1.E+08	1.E+09	1.E+09
Sodium-22 & zinc-65	1.E+06	1.E+07	1.E+08	1.E+08
Sodium-24	1.E+08	1.E+10	1.E+10	1.E+10
Strontium isotopes & alpha-emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Strontium-85	1.E+07	1.E+07	1.E+08	1.E+08
Strontium-89	1.E+09	1.E+09	1.E+09	1.E+09
Strontium-90	1.E+07	1.E+08	1.E+08	1.E+08
Strontium-90 & alpha-emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Sulphur-35	1.E+09	1.E+10	1.E+10	1.E+10
Sulphur-35 & iodine-125	1.E+09	1.E+09	1.E+08	1.E+08
Sulphur-35, carbon-14, chromium-51 & phosphorus-33	1.E+08	1.E+07	1.E+10	1.E+10
Tantalum-182	1.E+07	1.E+07	1.E+08	1.E+08
Technetium-94 & technetium-94m	1.E+09	1.E+10	1.E+11	1.E+11
Technetium-99	1.E+06	1.E+09	1.E+08	1.E+08
Technetium-99m	1.E+10	1.E+11	1.E+12	1.E+12
Technetium-99m & molybdenum-99	1.E+09	1.E+10	1.E+10	1.E+10
Thallium-201	1.E+09	1.E+09	1.E+11	1.E+11
Thallium-204	1.E+06	1.E+07	1.E+08	1.E+08
Thallium-207	1.E+08	1.E+08	1.E+08	1.E+08
Thorium - natural	1.E+05	1.E+07	1.E+06	1.E+06
Thorium isotopes	1.E+05	1.E+07	1.E+06	1.E+06
Thorium natural	1.E+05	1.E+07	1.E+06	1.E+06
Thorium-228	1.E+05	1.E+07	1.E+06	1.E+06
Thorium-230	1.E+07	1.E+07	1.E+06	1.E+06
Thorium-232	1.E+05	1.E+07	1.E+06	1.E+06
Thorium-232 & daughters	1.E+06	1.E+07	1.E+05	1.E+05
Thorium-234	1.E+09	1.E+09	1.E+09	1.E+09
Tin-117m	1.E+07	1.E+07	1.E+08	1.E+08
Total alpha-emitting radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Total alpha-emitting radionuclides - half life < 3 months	1.E+06	1.E+07	1.E+05	1.E+05
Total alpha-emitting radionuclides - half life > 3 months	1.E+06	1.E+07	1.E+05	1.E+05
Total alpha-emitting radionuclides (excluding uranium)	1.E+06	1.E+07	1.E+05	1.E+05
Total alpha-emitting radionuclides (non-uranic)	1.E+06	1.E+07	1.E+05	1.E+05
Total beta/gamma-emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Total beta/gamma-emitting radionuclides - half life < 1 day	1.E+09	1.E+10	1.E+11	1.E+11
Total beta/gamma-emitting radionuclides - half life < 3 months	1.E+07	1.E+07	1.E+08	1.E+08
Total beta/gamma-emitting radionuclides - half life > 1 day	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting	1.E+06	1.E+07	1.E+08	1.E+08

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
radionuclides				
Total beta-emitting radionuclides - half life < 3 months	1.E+07	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides - half life < 8 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total beta-emitting radionuclides - half life > 1 day	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides - half life > 3 months	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides - half life > 3 months	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides - half life > 8 hours	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides - therapeutic	1.E+07	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides (>0.4 MeV)	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides (excluding tritium)	1.E+06	1.E+07	1.E+08	1.E+08
Total beta-emitting radionuclides associated with particulate matter	1.E+06	1.E+07	1.E+08	1.E+08
Total halogens	1.E+06	1.E+07	1.E+08	1.E+08
Total noble gases	No value	No value	1.E+11	1.E+11
Total positron emitting radionuclides	1.E+09	1.E+10	1.E+11	1.E+11
Total positron-emiting radionuclides - half-life < 2 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total positron-emitting radionuclides - half-life < 2 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life < 1 day	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides - half life < 1 year	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life < 10 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides - half life < 100 days	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life < 30 minutes	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides - half life < 400 days	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life < 5 days	1.E+08	1.E+08	1.E+08	1.E+08
Total radionuclides - half life < 8 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides - half life > 100 days	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life > 3 hours	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life > 400 days	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life > 8 hours	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides - half life 30 minutes - 3 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides - half life between 5 to 400 days	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides (excluding alpha-emitters & strontium-90)	1.E+06	1.E+07	1.E+08	1.E+08

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Total radionuclides (excluding alpha-emitters)	1.E+06	1.E+07	1.E+08	1.E+08
Total radionuclides (excluding alpha-emitters) - half life < 30 minutes	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides (excluding alpha-emitters) - half life > 3 hours	1.E+06	1.E+07	1.E+08	1.E+08
Total radionuclides (excluding alpha-emitters) - half life 30 minutes - 3 hours	1.E+09	1.E+10	1.E+11	1.E+11
Total radionuclides (excluding carbon-14 & tritium) - half life > 400 days	1.E+06	1.E+07	1.E+08	1.E+08
Total radionuclides (excluding sulphur-35)	1.E+06	1.E+07	1.E+05	1.E+05
Total radionuclides (excluding technetium-99m)	1.E+06	1.E+07	1.E+05	1.E+05
Tritium	1.E+11	1.E+12	1.E+12	1.E+12
Tritium - organically bound tritium	1.E+09	1.E+09	1.E+11	1.E+11
Tritium - tritiated water	1.E+11	1.E+12	1.E+12	1.E+12
Tritium & carbon-14	1.E+08	1.E+08	1.E+10	1.E+10
Tritium & carbon-14 (and iodine-131?)	1.E+08	1.E+08	1.E+08	1.E+08
Tritium & iodine-125	1.E+09	1.E+09	1.E+08	1.E+08
Tritium & sulphur-35	1.E+09	1.E+10	1.E+10	1.E+10
Tritium (excluding tritiated water)	1.E+09	1.E+09	1.E+11	1.E+11
Tritium (in metal foil)	1.E+11	1.E+12	1.E+12	1.E+12
Tritium (insoluble)	1.E+09	1.E+09	1.E+11	1.E+11
Tritium (OBT)	1.E+09	1.E+09	1.E+11	1.E+11
Tritium (soluble)	1.E+11	1.E+12	1.E+12	1.E+12
Tritium, carbon-14 & caesium-134	1.E+06	1.E+07	1.E+08	1.E+08
Tritium, carbon-14 & iodine-125	1.E+08	1.E+08	1.E+10	1.E+10
Tritium, carbon-14 & sulphur-35	1.E+08	1.E+08	1.E+10	1.E+10
Tritium, carbon-14, cobalt-60 & iodine-129	1.E+06	1.E+07	1.E+07	1.E+07
Tritium, carbon-14, cobalt-60, silver-110m & other beta/gamma emitting radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Tritium, carbon-14, iodine-125 & other radionuclides	1.E+06	1.E+07	1.E+08	1.E+08
Tritium, carbon-14, iron-55, cobalt-60, radium-226, thorium-232, uranium and other alpha-emitters & other beta/gamma emitters	1.E+06	1.E+07	1.E+05	1.E+05
Tritium, carbon-14, nickel-63 & promethium-147	1.E+08	1.E+08	1.E+09	1.E+09
Tritium, carbon-14, phosphorus-32 & iodine-125	1.E+07	1.E+06	1.E+08	1.E+08
Tritium, carbon-14, phosphorus-32, phosphorus-33 & sulpur-35	1.E+07	1.E+06	1.E+08	1.E+08
Tritium, carbon-14, phosphorus-32, phosphorus-33, sulphur-35 & iodine-125	1.E+07	1.E+06	1.E+08	1.E+08

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Tritium, krypton-85 & krypton-79	1.E+11	1.E+12	1.E+12	1.E+12
Tungsten-181	1.E+07	1.E+07	1.E+08	1.E+08
Uranium - depleted	1.E+08	1.E+08	1.E+07	1.E+07
Uranium - depleted or natural	1.E+08	1.E+08	1.E+07	1.E+07
Uranium - enriched	1.E+08	1.E+08	1.E+07	1.E+07
Uranium - natural	1.E+08	1.E+08	1.E+07	1.E+07
Uranium & thorium - natural	1.E+05	1.E+07	1.E+06	1.E+06
Uranium daughters	1.E+06	1.E+07	1.E+05	1.E+05
Uranium isotopes	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-234	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-234 & uranium-235	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-235	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-236	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-238	1.E+08	1.E+08	1.E+07	1.E+07
Uranium-238 & daughters	1.E+08	1.E+08	1.E+07	1.E+07

Radionuclide – all values Becquerels	Opra Sewer value	Opra Water value	Opra Air value	Opra Transfer value
Vanadium-48	1.E+07	1.E+07	1.E+09	1.E+09
Xenon isotopes	No value	No value	1.E+13	1.E+13
Xenon-131m	No value	No value	1.E+13	1.E+13
Xenon-133	No value	No value	1.E+13	1.E+13
Ytterbium-169	1.E+07	1.E+07	1.E+08	1.E+08
Yttrium-90	1.E+09	1.E+09	1.E+10	1.E+10
Yttrium-90, cobalt-57, cobalt-58 & phosphorus-32	1.E+07	1.E+06	1.E+08	1.E+08
Zinc-65	1.E+07	1.E+07	1.E+08	1.E+08
Zinc-72	1.E+08	1.E+08	1.E+08	1.E+08
Zirconium-95	1.E+07	1.E+07	1.E+09	1.E+09
Zirconium-95 & niobium-95	1.E+07	1.E+07	1.E+09	1.E+09