



CIRCULAR ECONOMY PROGRAMME

The Driving Force for Ireland's Move to a Circular Economy



Environmental Protection Agency
An Ghníomhaireacht um Chaomhú Comhshaoil

Position Paper

Regulation 27

Consultation to inform development of Draft Guidance for brownfield soil and stone by-product material, incorporating a PFAS screening tool

This position paper has been developed by the Environmental Protection Agency (EPA) providing a rationale for the development of draft guidance for brownfield soil and stone by-product material and consultation submissions are invited from stakeholders.

Foreword

The current National Development Plan identifies brownfield sites in urban areas for increased development of housing, commercial and infrastructure. Brownfield areas are those which have been previously developed; this may include any previous use of the site which may have resulted in contamination of the soil. This includes road, buildings, previous earthworks, industrial activity, etc. The number of brownfield soil and stone by-product notifications received by the Agency has been increasing and it is expected that the number will continue to increase in line with economic activity. Responding to this, the Agency is developing guidance to assist notifiers in a manner that will improve the quality of notifications received and streamline the assessment of such notifications. Such guidance will bring more certainty and clarity to industry and regulators around the beneficial use of excess soil and stone from brownfield developments sites.

Legislative Framework

By-products are substances/objects which *meet* the conditions of Regulation 27 of the European Union (Waste Directive) Regulations 2011-2020¹. These conditions are set out in Regulation 27(1) as follows:

“27. (1) the Agency shall take appropriate measures to ensure that a substance or object resulting from a production process the primary aim of which is not the production of that substance or object is considered not to be waste, but to be a by-product if the following conditions are met:

- a) further use of the substance or object is certain;*
- b) the substance or object can be used directly without any further processing other than normal industrial practice;*
- c) the substance or object is produced as an integral part of a production process;*
- d) further use is lawful in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.”*

Regulation 27(2)(a) requires the holder of a by-product to *notify* the Agency and seek a *determination* on the matter from the Agency.

¹ [S.I. No. 323/2020 - European Union \(Waste Directive\) Regulations 2020](#)

Current Process

While national by-product criteria are in place for *greenfield* soil and stone which supports circularity of that material, brownfield soil and stone notifications are notified and assessed on a case-by-case basis. The notifier is required to submit evidence that the soil and stone is uncontaminated and equivalent to virgin soil or that it is geochemically appropriate for deposit at the use location for the specified use. To demonstrate this, notifiers provide solid soil laboratory testing results which the Agency assess against maximum concentrations and/ or trigger levels set out in Table 3.3 of the EPA, 2020 *Guidance on waste acceptance criteria at authorised soil recovery facilities* (the SFR guidance)². Within the guidance, the country is divided into six different geochemical domains with different limits set for each domain. The limits against which to compare the laboratory results are chosen based on the domain within which the use location lies.

The current assessment process adopts a zero-tolerance approach in relation to several parameters. That is, no total organic carbon (TOC), mineral oil, total polychlorinated biphenyls (PCBs), total polycyclic aromatic hydrocarbons (PAHs) or asbestos result should exceed the respective maximum concentration and/ or trigger level stated in the SRF guidance. However, in relation to metals, the guidance states that the results for up to three parameters in any particular sample may exceed the respective maximum concentration and/ or trigger level. However, no individual result should exceed 1.5 times the respective maximum concentration and/ or trigger level.

Where exceedances do occur, notifiers often submit environmental and human health risk assessments to demonstrate that the use of the material will not lead to adverse human health or environmental impacts, which is assessed by the Agency prior to making a determination.

There is considerable variation in the risk methodologies used by notifiers, a varying quality of data and often a large volume of data submitted. As a result, the assessment of brownfield notifications can be highly complex, protracted and resource intensive.

² [Guidance on waste acceptance criteria at authorised soil recovery facilities](#)

Proposed Approach

The proposed approach is not unfamiliar and involves comparison of laboratory analysis results against a set of pollutant limit values (PLVs), rather than the limits set in the SRF guidance. Assistance was procured from Geosyntec Consultants to develop PLVs and a PFAS screening tool.

The proposed PLVs are screening criteria against which leachate data and total solid soil analysis from brownfield soil and stone material can be compared and are based on broad land use scenarios and the vulnerability of the use location, as described further below. The PLVs have been developed for commonly assessed determinands including metals, inorganic parameters (e.g. chloride, sulphate) and selected organic parameters (dissolved organic carbon, phenol, Mineral Oil, Total BTEX, Total PAH, Total PCBs, benzene, naphthalene, dibenzo(ah)anthracene, benzo(b)fluoranthene and benzo(a)pyrene).

Land Use Scenarios and Solid Soil Analysis

Where possible, PLVs have been derived from existing generic assessment criteria (GAC). Three land use scenarios are considered, each covering a broad end use type.

The three scenarios are:

- **Residential Development Areas** – Covers all areas within a proposed or existing residential development including but not limited to residential buildings, open space, landscaping, play areas and roadways.
- **Commercial and Industrial Development or Parkland** – Covers all industrial and commercial development site and open areas within the land. Parkland areas include public parks with pitches, dedicated sports grounds and nature reserves.
- **Agriculture** – Covers all areas of agriculture, including allotments. Where a house is present or proposed on farmland the “Residential Development” PLV will apply to the footprint of the house and any adjoining garden or drive areas.

When notifying brownfield soil and stone material, the notifier will be expected to identify the appropriate land use scenario based on the proposed end use of the

material and apply the relevant PLVs. The proposed solid PLVs can be seen in *Table 1 of Appendix 1*. As seen in the table, the limits are generally tightest for material intended for use in agricultural settings in comparison to residential and commercial and industrial settings or parkland. PLVs for residential development areas and commercial and industrial development or parkland are the same for many of the parameters but are tighter for residential development areas where they do differ.

As the proposed PLVs have been derived taking into consideration potential risk to human health and the environment to create robust conservative limits, it is considered that any exceedance identified may pose a risk of adverse environmental or human health impact. As such, exceedances of the solid PLVs will not be tolerated and, where notified, will result in a waste determination rather than a by-product determination.

Use Location Vulnerability and Leachate Analysis

PLVs have been developed for two different vulnerability scenarios:

- **Scenario A (PLV-A criteria)** assumes the soil and stone by-product is exposed and present over high permeability subsoil.
- **Scenario B (PLV-B criteria)** assumes the soil and stone is present above a low permeability subsoil. Due to the presence of low permeability subsoil, there is a reduced potential for leachate to reach the groundwater aquifer compared to Scenario A.

It is anticipated that notifiers will select the appropriate scenario based on the use of the material they have notified and will apply the relevant PLVs i.e. based on the vulnerability of the use location. Vulnerability of the use location can be determined using Geological Survey Ireland's Groundwater Data Viewer³. The proposed PLVs can be seen in *Table 2 of Appendix 1*. Exceedances of the leachate PLVs will not be tolerated and, where notified, will result in a waste determination rather than a by-product determination.

A decision flow for applying the proposed PLVs is included in *Figure 1 of Appendix 1*.

³ [IE GSI Groundwater Data Ireland ITM Viewer](#)

If all parameters tested are below the proposed solid soil and leachate PLVs, the by-product material is deemed to not pose adverse risk to the environment and human health and can therefore be determined as by-product, assuming all other conditions of Regulation 27(1) have been demonstrated to be met. If exceedances of solid and/or leachate PLVs are identified the soil and stone material will be deemed to pose a risk of adverse environmental or human health impact and will be determined as waste.

PFAS Screening

In Ireland there is currently no limit for PFAS concentration in soil. Given the emerging and developing challenge of PFAS contamination, there is a need to provide some certainty to industry to support circularity where appropriate in the context of developing urban spaces.

In relation to including PFAS in the guidance, specific PFAS compounds were selected as indicator substances for PFAS use in Ireland. Nine PFAS were identified which have a high potential to be present in Irish soils: PFOS, PFOA, PFNA, PFBA, PFDA, PFHpA, PFHxA, 6:2 FTS and 8:2 FTS. However, due to uncertainty and insufficient data available based on current studies, interim ambient concentrations (IAC) for PFOS and PFOA only are proposed to determine whether soil and stone can be used as by-product. These are the PFAS with the greatest amount of relevant data in literature and expected concentrations in soils are higher than for other PFAS. The relevant IACs for PFOS and PFOA can be seen in *Table 3 of Appendix 1*.

The IACs for PFOS and PFOA are split into two ambient zones, rural, and urban and industrial. It is the Agency's intention to develop a map of Ireland to accompany these IACs. The map will identify rural areas of Ireland versus urban and industrial areas. The map will aid notifiers in identifying the correct set of IACs to use. The application of the correct IACs based on ambient zones is to not worsen the current situation i.e. not add any contamination above existing ambient concentrations.

When applying the IACs it will be necessary for the notifier to identify the risk level of PFAS being present in soil and stone at the source (See *Table 4 of Appendix 1*).

Different scenarios apply depending on the level of risk identified by the notifier. For example, it is recommended that soil and stone material derived from very high-risk source sites not be used as by-product and that instead it is treated as a waste. Soil and stone material originating from low-risk sites (i.e. greenfield sites), may be used as by-product with no soil analysis for PFAS needed. For medium and high-risk sites, it is recommended that notifiers test for PFAS and apply the IACs proposed for PFOS and PFOA. A decision flow for applying the proposed PLVs based on the risk level identified is included in *Figure 2 of Appendix I*.

Submission of your observations/ suggestions

In order to get the most out of your feedback it would be helpful for your feedback to be submitted under specific categories as set out below:

Category No.	Submission Category Description	
1.	Notified material	Brownfield soil and stone.
2.	Solid soil PLVs	Three proposed land use scenarios and the proposed PLVs derived for each.
3.	Leachate PLVs	Scenario A and Scenario B based on groundwater vulnerability at the use location and the proposed PLVs for each.
4.	Decision flow	Decision flow diagram for applying solid soil and leachate PLVs.
5.	PFAS risk table	Various site types identified under different risk categories; very high, high and medium
6.	Decision flow	Decision flow diagram for applying PFAS PLVs based on the level of risk identified.
7.	Other	

Please email your observations/ suggestions which will contribute to the development of guidance for brownfield soil and stone by-product material that will aid in the safe reuse of brownfield soil and stone material whilst demonstrating compliance with Regulation 27(1)(a)-(d).

Email: byproduct@epa.ie

Email Title: *Guidance for brownfield soil and stone by-product material, incorporating a PFAS screening tool*

Feedback: Break your feedback into categories 1-7 above.

Deadline: 5 p.m. Friday 22nd May 2026

Appendix I

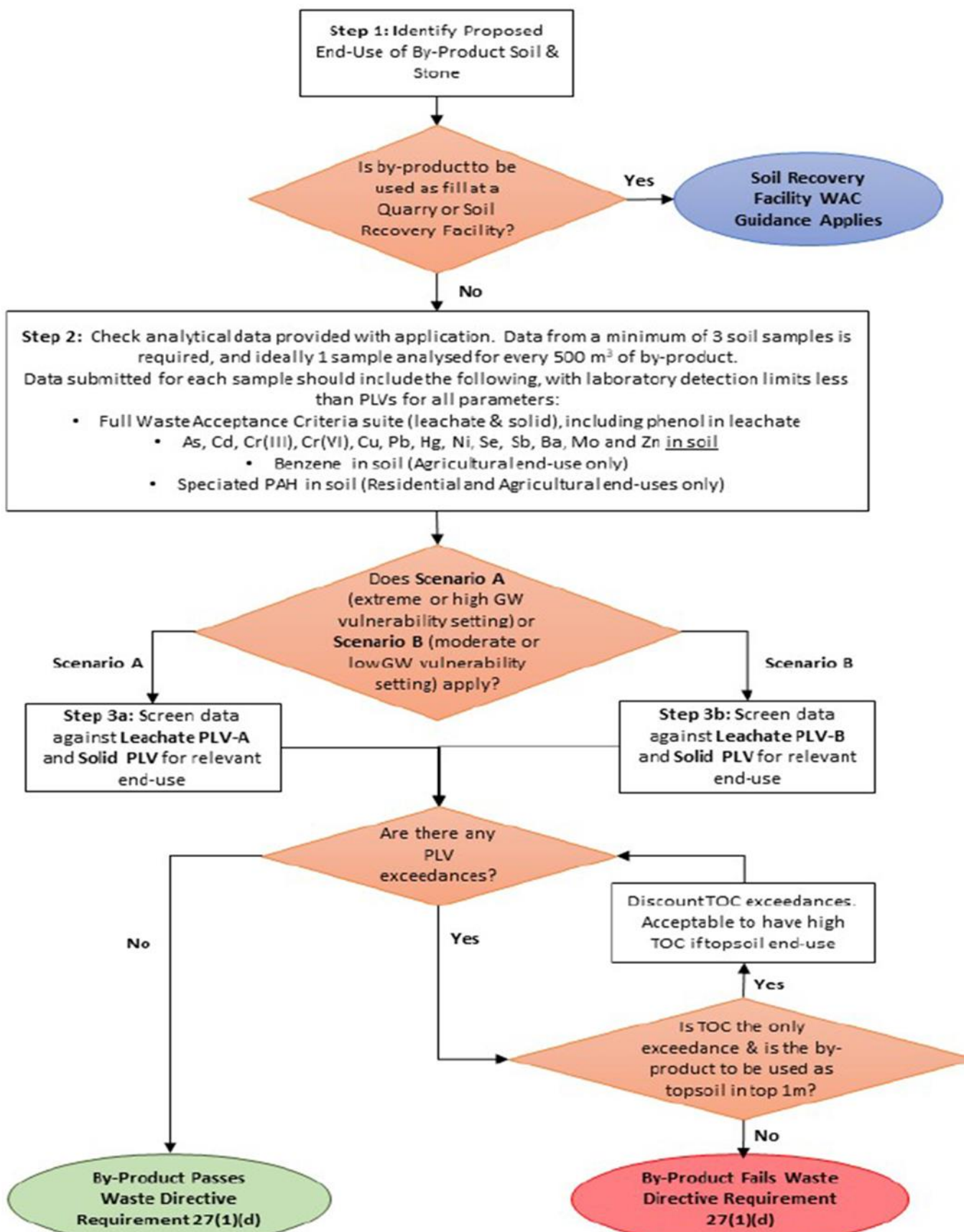


Figure 1: Proposed outline for use of PLV.

Note:

As seen in *Step 1 of Figure 1*, the use of the soil and stone material as fill at a quarry or soil recovery facility is outside of the scope of the three land use scenarios and as such, the proposed PLVs will not apply. Instead, the maximum concentrations and/or trigger levels set out in Table 3.3 of the SRF guidance will continue to apply to material destined for use at quarries and SRFs.

Table 1: Proposed Total (Solid) Concentration Targets (S-PLVs)

Land Use	Residential Development Areas	Agricultural	Commercial and Parkland
Determinand			
Metals & Metalloids			
Arsenic, Inorganic (As)	37	43	86
Barium (Ba) ^{***}	1300	-	5000
Cadmium (Cd)	3.3	1.9	3.3
Chromium, Trivalent (Cr III)	74	74	74
Chromium, Hexavalent (Cr VI)	6	1.8	NR
Copper (Cu)	80	63	80
Mercury, Inorganic (Hg) ^{**}	0.5	0.5	0.5
Molybdenum (Mo)	21	19	21
Nickel (Ni)	66	53	66
Lead (Pb)	109	80	109
Antimony (Sb)	5.3	5.3	5.3
Selenium (Se)	17	17	17
Zinc (Zn)	240	170	240
Hydrocarbons			
Benzene	NR	0.0082	NR
Total BTEX	0.025		
PCBs (7 congeners)	0.035		
Mineral Oil C10-C40	50		
Benzo[a]pyrene	NR	0.36	NR
Benzo[b]fluoranthene	NR	0.37	NR
Dibenzo[a,h]anthracene	NR	0.054	NR
Naphthalene	0.9	NR	NR
Total PAH (17 including Coronene)	1		
Other			
TOC	2.4%*		
Asbestos	No asbestos fibres present		

All values are mg/kg unless otherwise specified, NR = not required

* Total Organic Carbon is a measure of all carbon with a sample including, but not limited to, plant and animal matter, wood, coal or ash and hydrocarbons. If it can be verified that the soil & stone by-product is to be used as a topsoil growth medium within the top 1 m of the surface then this value does not apply.

** PLV applicable to inorganic forms of arsenic and mercury only. Non inorganic forms of arsenic and mercury are considered to potentially relate to former industrial land use.

***Barium is not considered likely to be a risk driver parameter in consideration of brownfield soil and stone. S-PLVs calculated to be protective of human health. No background concentration data for barium in Ireland is available. No suitable plant uptake values have been published for barium therefore an S-PLV protective of agriculture could not be calculated.

Table 2: Proposed Leachate PLVs (as 10:1 L/S Ratio Leachate (mg/kg))

Compound	Target Levels, all values in mg/kg	
	Proposed PLV-A	Proposed PLV-B
As	0.05	0.05
Ba	4.4	9.4
Cd	0.006	0.006
Cr Total	0.23	0.5
Cu	6.7	14
Hg	0.005	0.005
Mo	0.25	0.5
Ni	0.06	0.13
Pb	<0.05	0.06
Sb	0.13	0.29
Se	0.1	0.22
Zn	0.29	0.62
Chloride	400	850
Fluoride	<3	6.1
Sulphate	920	2,000
Phenol	<0.1	<0.1
Dissolved Organic Carbon	180	400

Table 3: Interim Ambient Concentrations.

Ambient Zone	PFOS (µg/kg)	PFOA (µg/kg)
Rural	0.6	1.1
Urban and Industrial	4.4	2.6

Table 4: Risk Level Table for Risk Screening for the Presence of PFAS.

Risk Level	Site Type (Past or present use)
Very High	AFFF* Production Sites (None in Ireland)
	Fire Training Areas, Fire Fighting Incidents
	Military Sites
High	In proximity of Fire Training Area (2)
	In proximity of Fire Incident with known AFFF use (2)
	Airport excluding fire training and incident areas
Medium	In proximity of Military Sites (2)
	Landfills/ Waste Management (2)
	Industrial Use with air emissions, or in proximity (2)
	Industrial Use no air emissions
	Previously developed land, not within other categories
Low ⁴	Agriculture (1)
	Forestry Land
	Pristine Countryside

*AFFF = aqueous film-forming foam

⁴ If the risk level is identified as low, the soil and stone material is considered to be greenfield and as such, testing for PFAS is not a requirement. As seen in Figure 2 of Appendix 1, low risk material may be considered suitable for re-use as by-product anywhere above the water table.

Notes:

If different land use type exists within a large site, then zoning of the site may be appropriate. For example: if there was a past fire-fighting incident in an industrial development, everywhere potentially impacted by the incident would be considered a “Very High” risk zone. Outside of this these areas would be a “Medium” risk zone.

(1) Biosolids from waste water treatment plants are sometimes applied to agricultural land as a fertiliser. At present there is no biosolid register in Ireland and it is not clear what lands biosolids have been applied to. There is potential for PFAS to be present in biosolids and as such, there is increased potential for PFAS to be present in soil where biosolids have been applied, particularly in topsoil. Caution is recommended where topsoil from agricultural land is used as a by-product, particularly at sites with a sensitive land use (i.e. residential development or parkland) and testing should be considered.

(2) Research by Moghadasi et al (2023) using mainland Europe soil data and regression analysis has suggested elevated PFAS soil concentrations may be present in the vicinity of firefighting sites, waste management sites and industrial sites. Off-site migration of PFAS may relate to windblown spreading of dust and AFFF, industrial air emissions, migration in surface water and groundwater flow. If the site which by-product is to be sourced from is situated within:

- o 2 km of a fire training area,
- o 500 m of the site of a fire incident where AFFF was used, or
- o 10 km of a military site, landfills/waste management site or industrial site with air emissions that could contain PFAS,

consideration should be given to whether such off-site sources could impact the source site. If there is potential for impact then the site the by-product is sourced from should be considered “Medium Risk”.

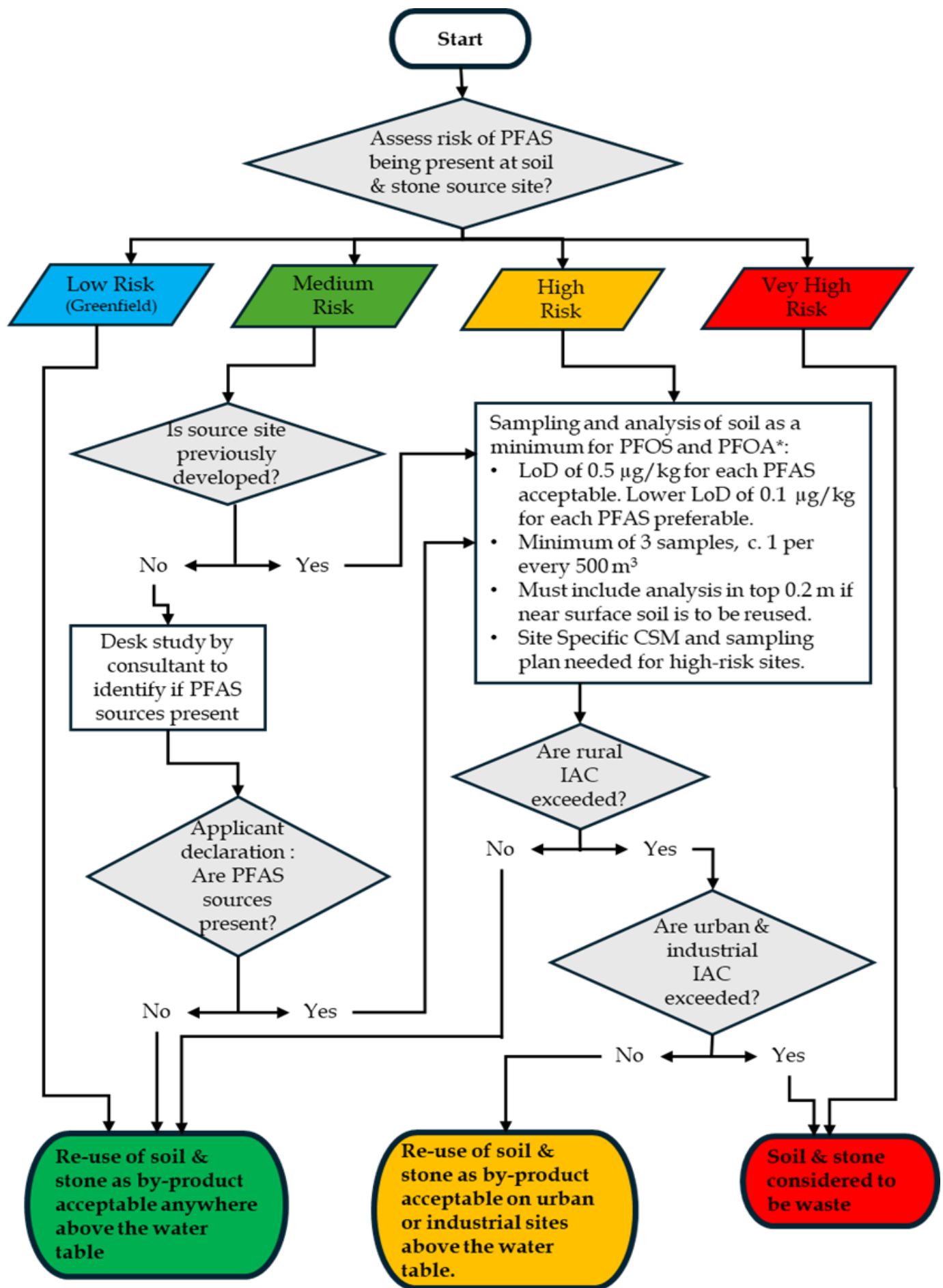


Figure 2: Recommended Use of IAC as PLVs for Assessing Suitability of Re-Use of Soil and Stone.

Note: IAC = Interim Ambient Concentrations. *It is preferred that sampling analysis takes place for 9 PFAS which have a high potential to be present in Irish soils: PFOS, PFOA, PFNA, PFBA, PFDA, PFHpA, PFHxA, 6:2 FTS, 8:2 FTS. Analysis for these 9 PFAS at a LOD of 0.1 µg/kg would help support future refinement of ambient PFAS concentrations. CSM = Conceptual Site Model. **For re-use of Soil & Stone as by-product to be acceptable all sub clauses of Clause 27(1) of European Union (Waste Directive) Regulations 2011-2020 (the Regulations) must be met.**