



Creating a national resource inventory using UNFC, an example from the UK

Tom Bide
Senior Resource Geologist
British Geological Survey

Background

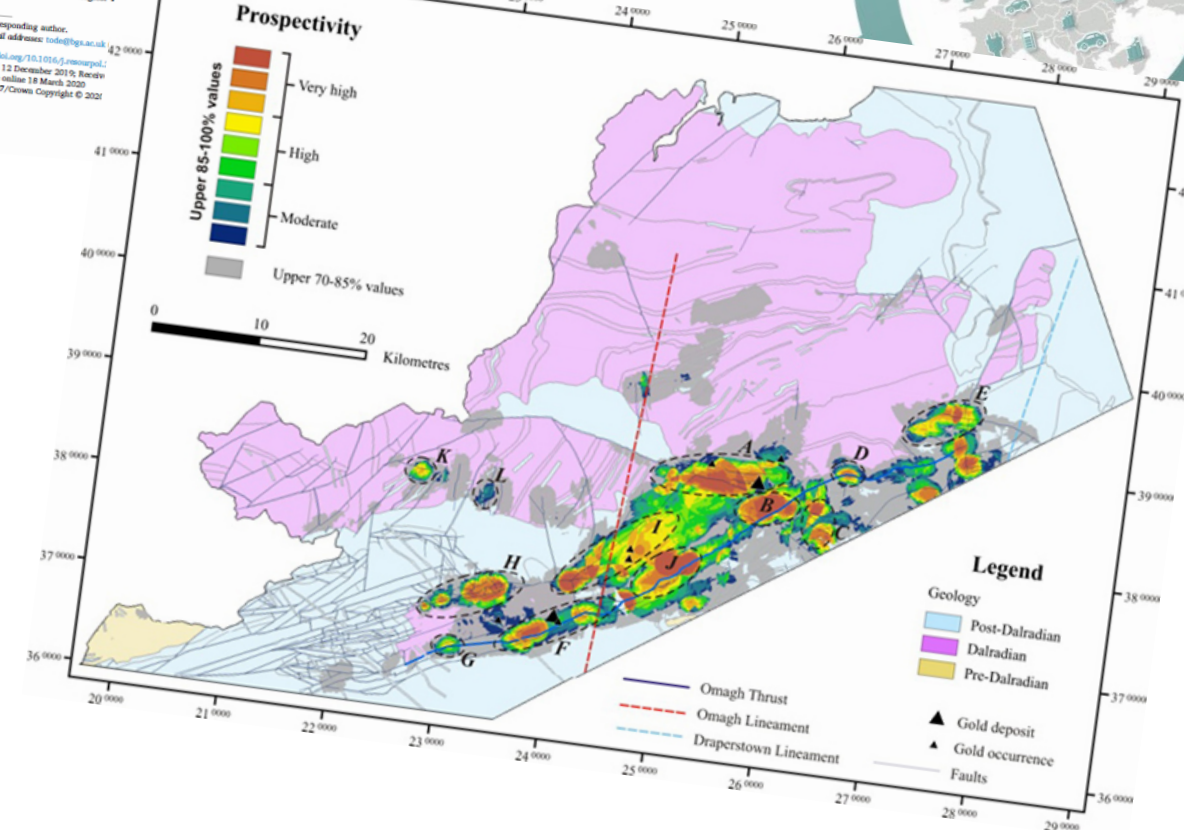
Resources Policy

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ABSTRACT
Mineral resources are vital for economic growth and maintaining quality of life. In order to maintain a steady, adequate development of mineral supply strategies, an important first stage for improving the security of supply of minerals is to identify and estimate the quantities that may be present. Sufficient information must be available to inform a jurisdiction on the feasibility of the development of strategies for their sustainable management, and to inform the development of mineral resource and reserve data in the UK. For the UK and many other countries there is no standard methodology for collecting available data in a consistent way and for filling data gaps. The results show that it is feasible, for relevant organisations such as national geological surveys, to compile new and relevant quantities of mineral resource data. However, resources of some minerals, on which many industrial and manufacturing processes rely, are particularly many metals that are required for new technologies. This study also identifies the challenges involved in compiling national data. Nevertheless, a new dataset for the UK's mineral resources and reserves is presented. This may encourage long-term quantitative appraisals of mineral resources and reserves at a national scale to provide a basis for the development of mineral policy, environmental protection policy and

1. Introduction
Non-energy minerals, ranging from aggregates to metals, play a vital role in the growth of the economy, in maintaining our standard of living and are increasingly important in the transition to a low carbon economy. They are used in a wide range of everyday applications, from the buildings in which we live, to the modern technology, such as smart phones, we increasingly use. Every section of the manufacturing base and almost every part of business and industry in the UK is dependent on the supply of mineral raw materials or the products derived from them. Quite simply minerals are essential to everyday life and feed into the entire national economy (CBI, 2017). Maintaining a steady and adequate supply of mineral raw materials and appropriate policies at all levels of government to inform the land-use planning and mineral supply strategies. T

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Optimising quality of information
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FINAL REPORT - ORAMA Project
TECHNICAL FINAL REPORT
AND RECOMMENDATIONS



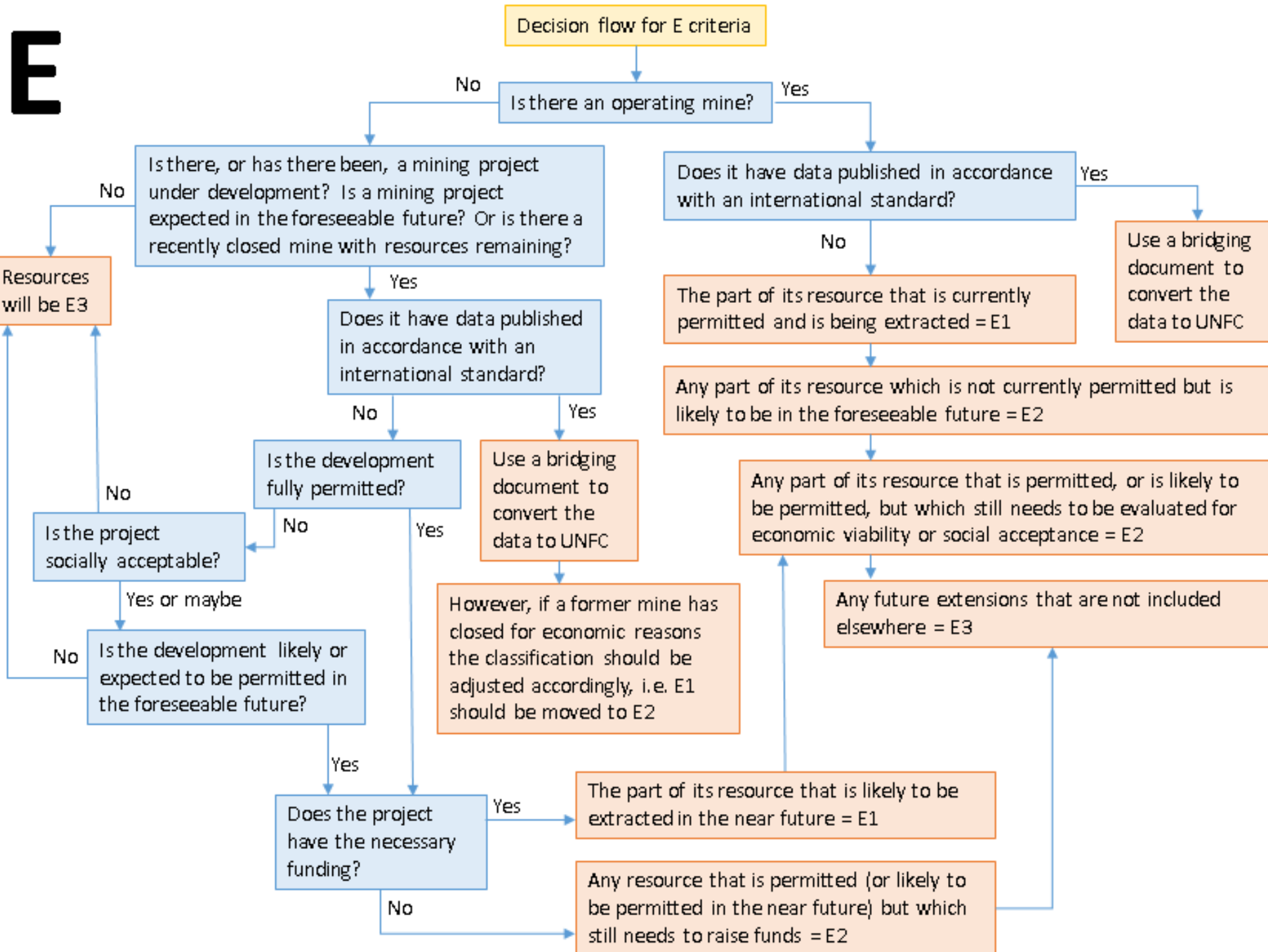
- Provision of mineral resource data for national resource management/planning is often a key role for National Geological Surveys
- In 2019 the UK compiled an inventory of national resource data using UNFC
- Large amounts of data are often available – however it can be complex to classify according to UNFC
- This talk details learnings/insights after undertaking this process

How to classify in UNFC?

- Decision flow sheets
 - E category
 - F category
 - G category
 - CRIRSCO compliant figures

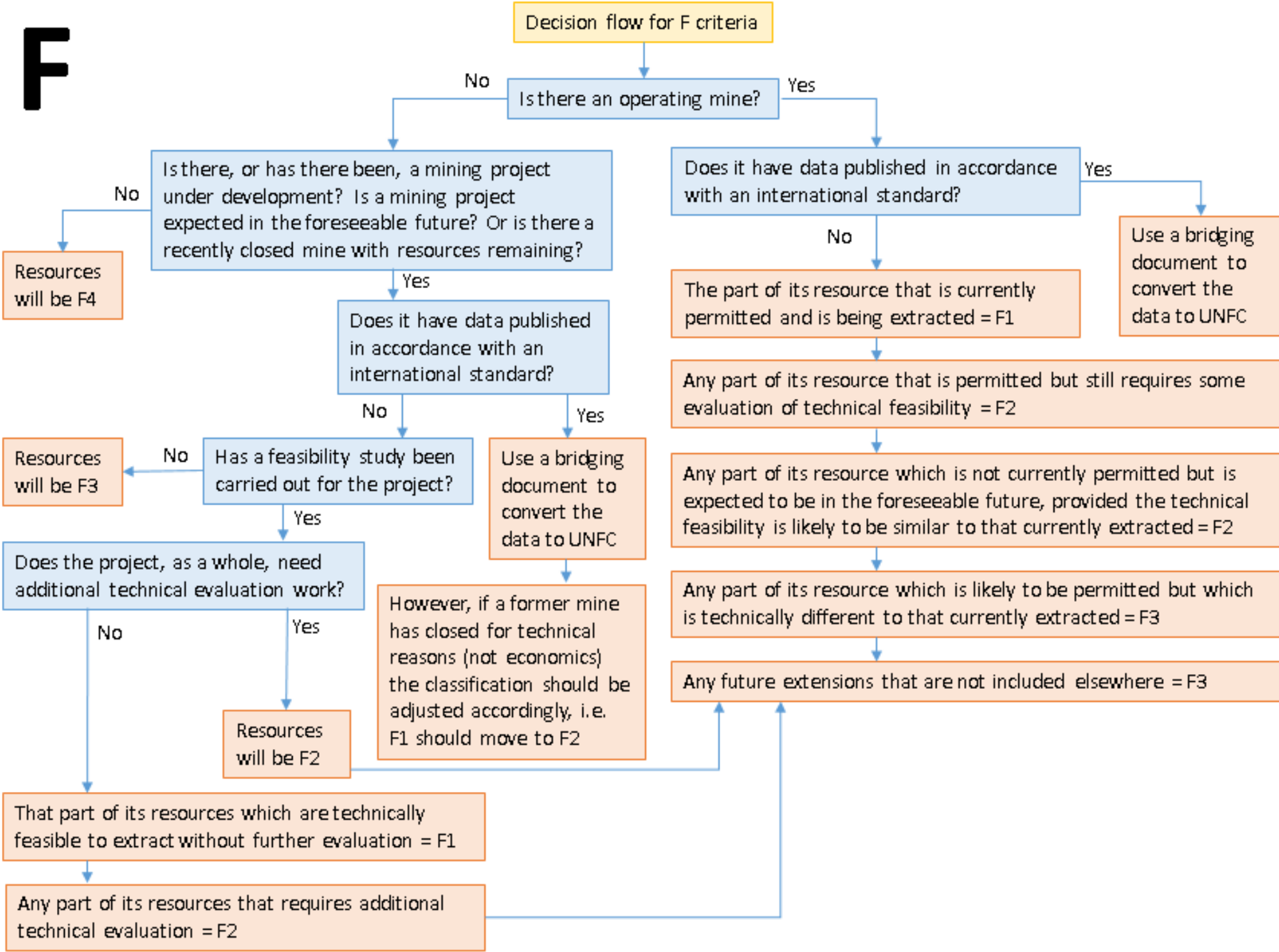
	Class	Categories			
		E	F	G	
Total products	Produced	Sold or used Production			
		Production which is unused or consumed in operations			
	The project's environmental-socio-economic viability and technical feasibility has been confirmed	Viable Projects	1	1	1, 2, 3
	The project's environmental-socio-economic viability and/ or technical feasibility has yet to be confirmed	Potentially viable Projects	2	2	1, 2, 3
		Non-viable Projects	3	2	1, 2, 3
	Remaining products not developed from identified projects		3	4	1, 2, 3
	There is insufficient information on the source to assess the project's environmental-socio-economic viability and technical feasibility	Prospective Projects	3	3	4
	Remaining products not developed from prospective projects		3	4	4

Decision tool for UNFC E axis



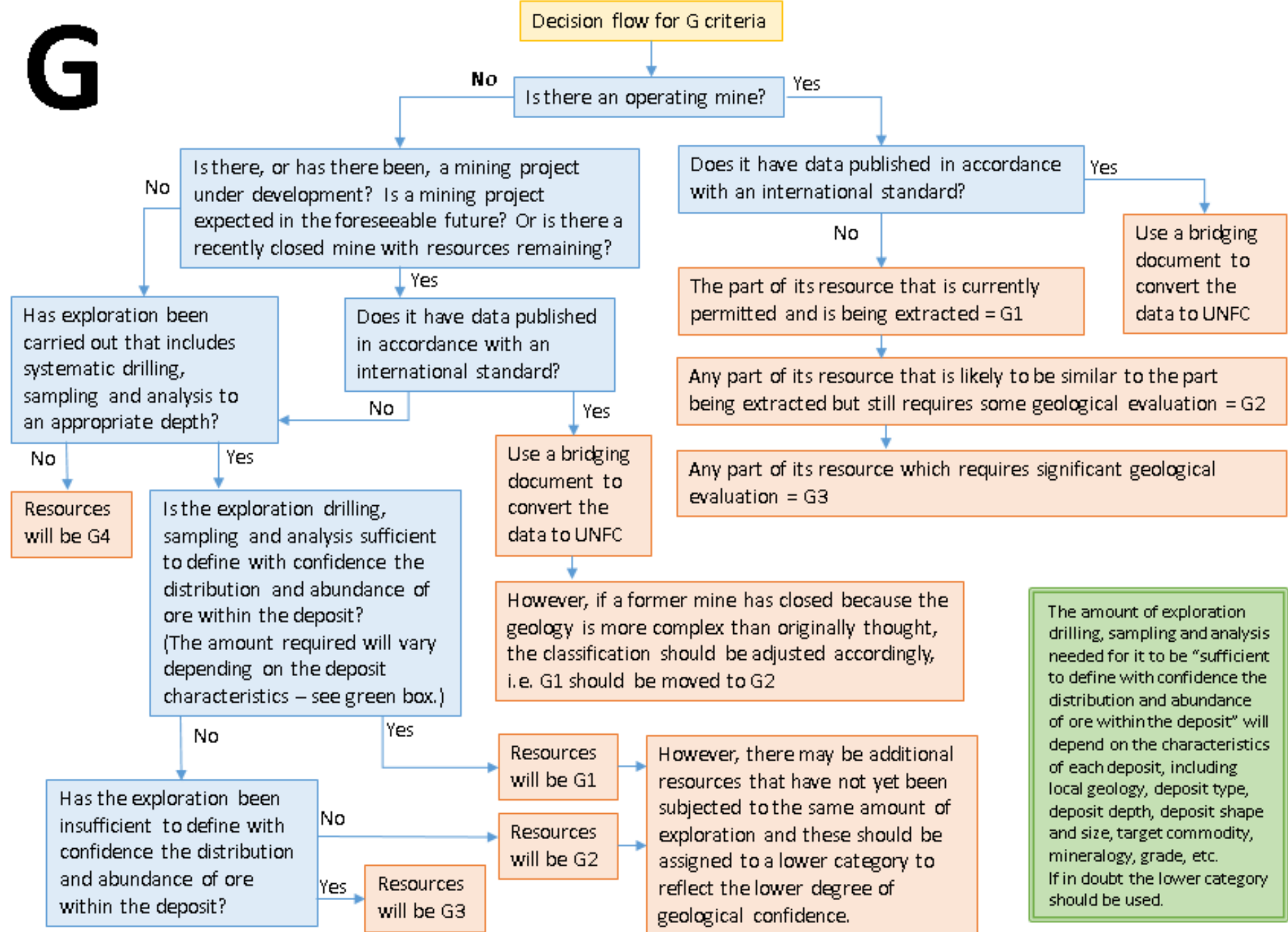
Decision tool for UNFC F axis

F

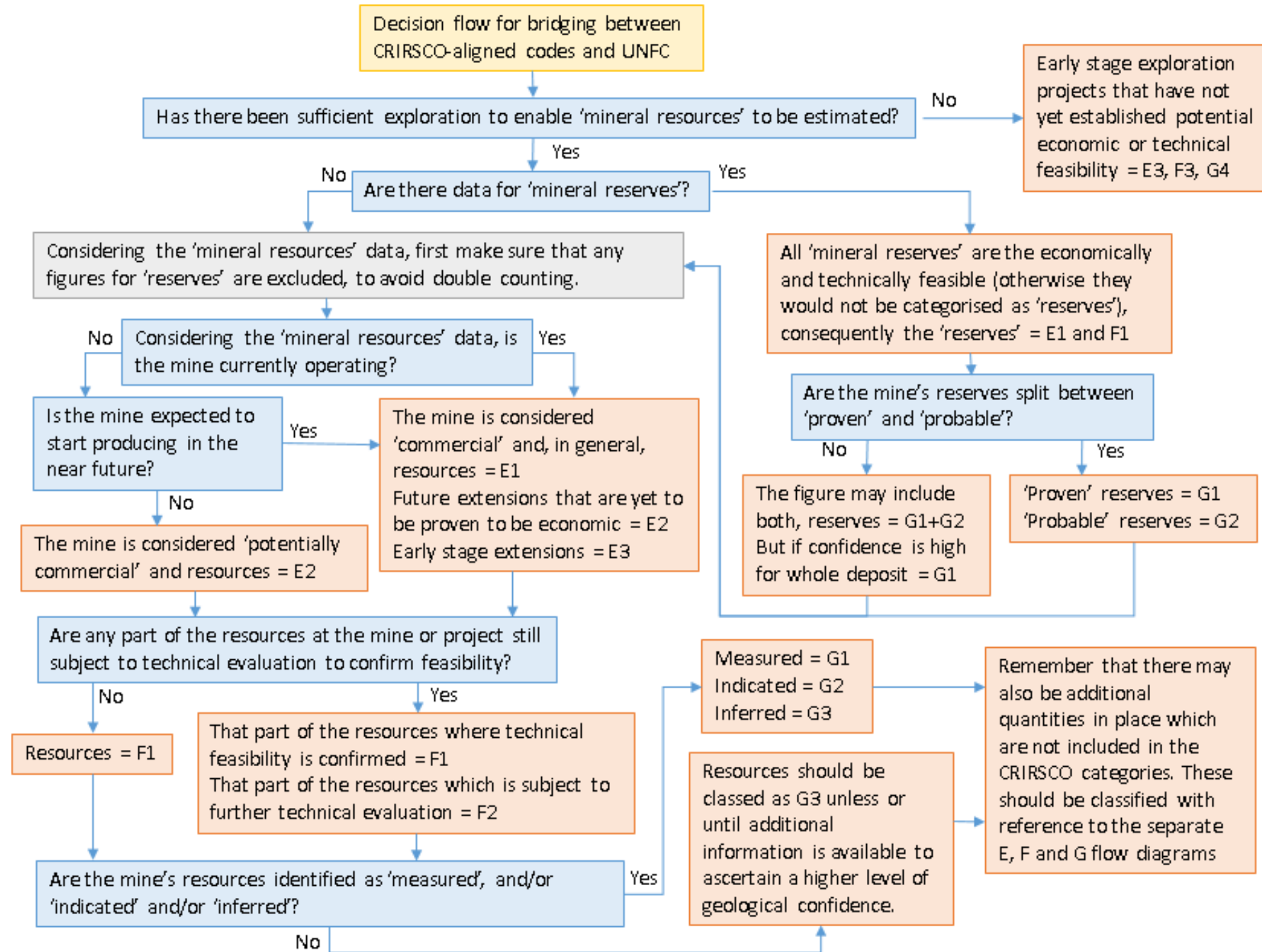


Decision tool for UNFC G axis

G



Decision tool for CRIRISCO compliant data to UNFC



Example 1: Gairloch, Scotland, UK



- A volcanogenic massive sulfide (VMS) deposit in Archaean metamorphic rocks in NW Scotland
- Company exploration for Cu, Zn and Au in 1980s
- 87 boreholes, 9.2 km drillcore
- Stratiform mineralisation, 4 m thick, traced over >1 km
- Resources: 500,000 t @ 1.2% Cu, 0.6% Zn and 1.7 g/t Au
- Data from BGS archives; no information on how the estimate was made, by whom and how many boreholes included

Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category			Comments
				E	F	G	
Resource estimate	Unknown	1980	0.5				



Example 1: Gairloch, Scotland, UK

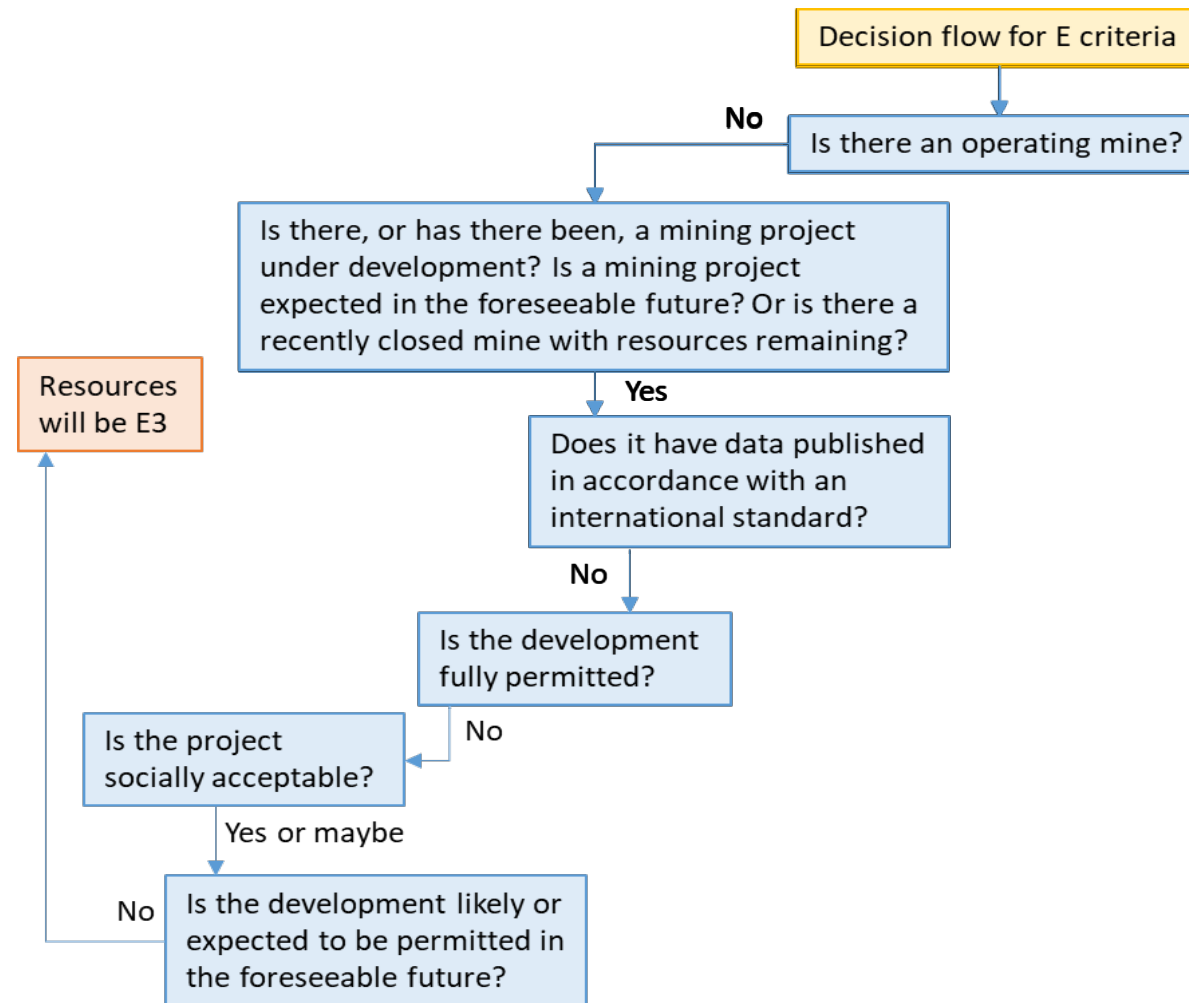


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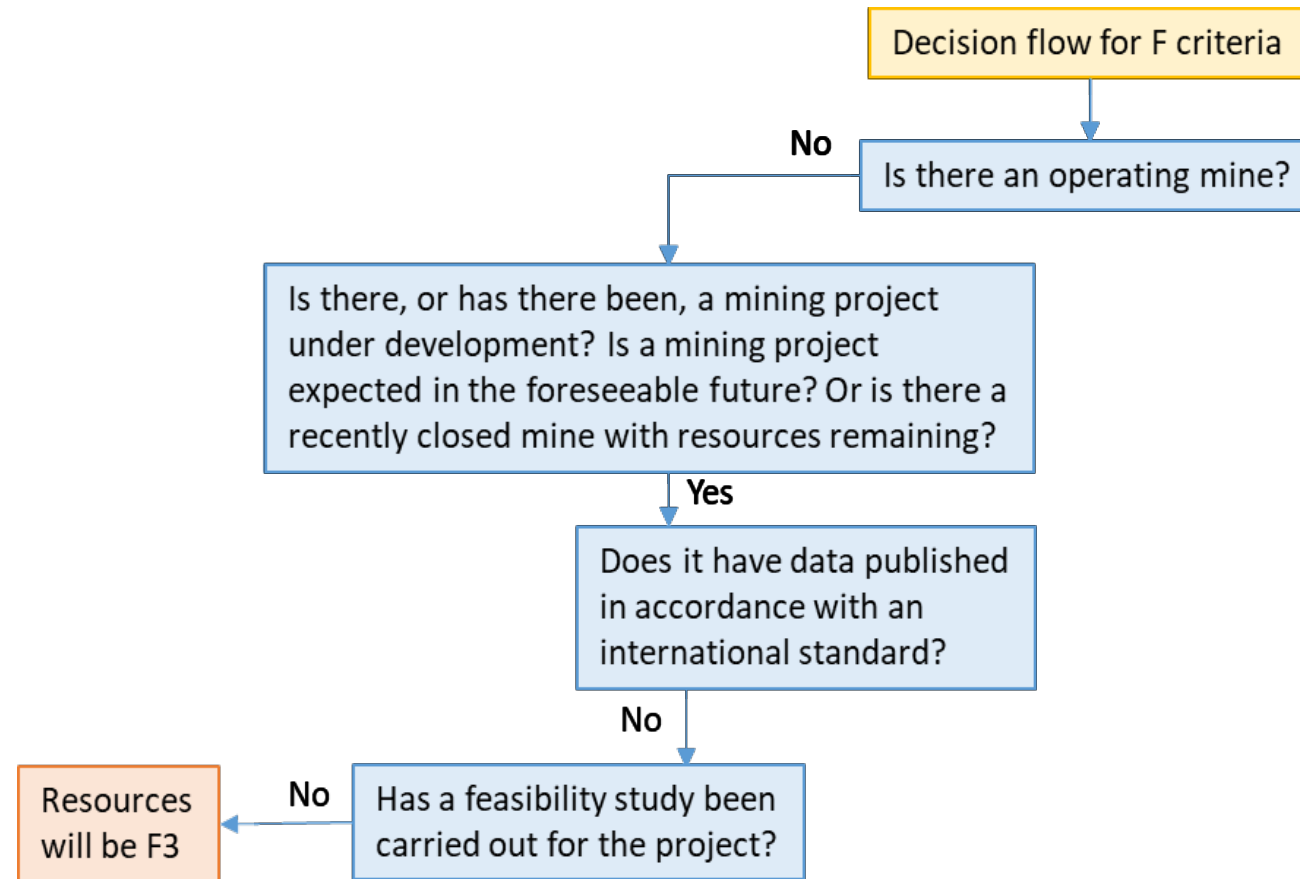
Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category			Comments
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Resource estimate	Unknown	1980	0.5	3	3	3	Moderate amount of drilling and detailed local exploration, BUT no information on how estimate was made.



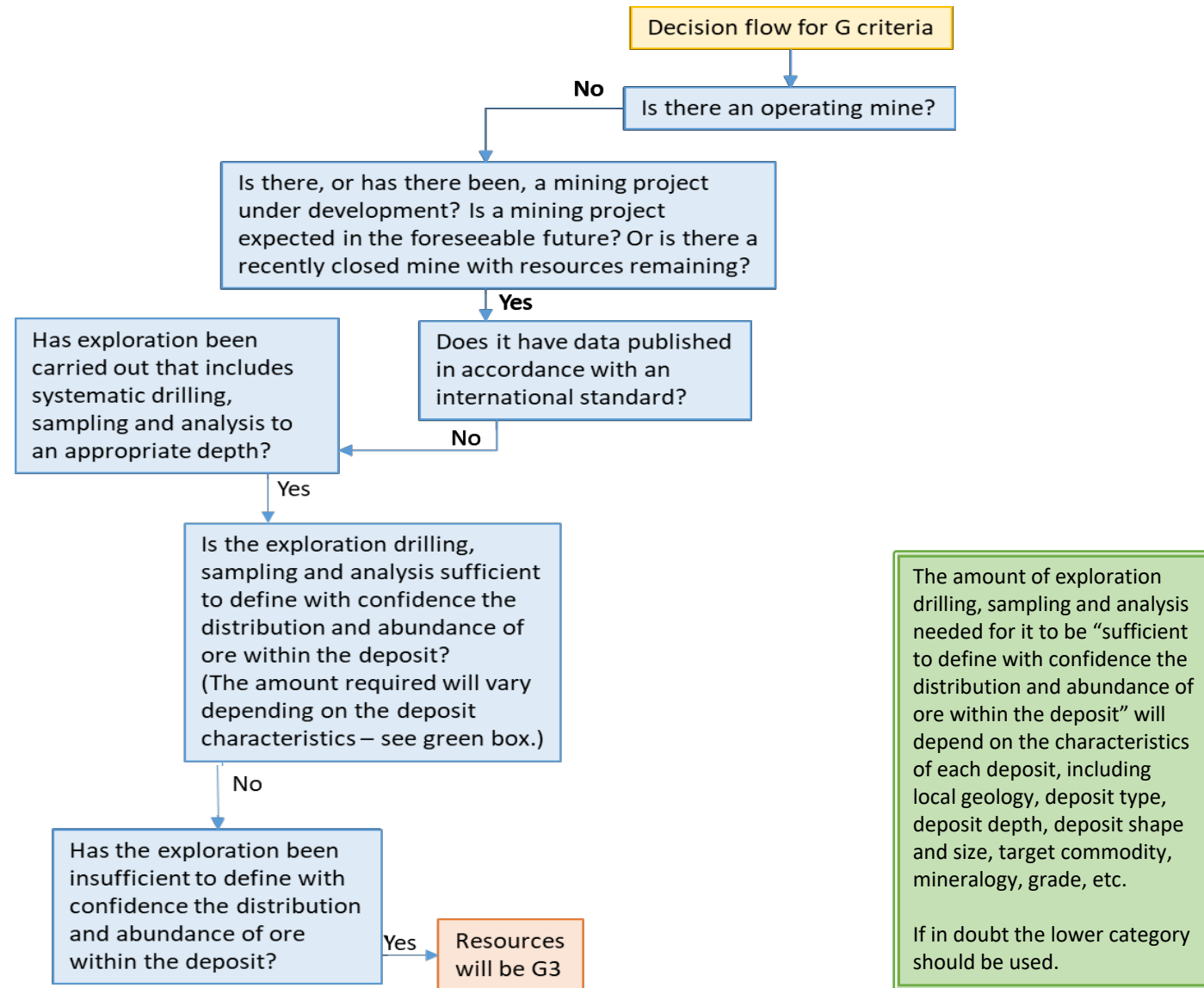
E axis for the Gairloch deposit



F axis for the Gairloch deposit



G axis for the Gairloch deposit



Example 2: Polyhalite resources, NE England, UK



- Two commodities - potash (sylvine, KCl); polyhalite ($K_2SO_4 \cdot MgSO_4 \cdot 2CaSO_4 \cdot 2H_2O$)
- Resources of both are hosted in late Permian evaporite deposits
- Boulby Mine (operated by Cleveland Potash) previously extracted potash, now polyhalite
- Second polyhalite mine (Woodsmith mine) in North Yorkshire under construction, operated by Sirius Minerals
- Probable reserves - Woodsmith only
- Measured resources - Boulby only
- Indicated and inferred resource data aggregated for the two deposits
- Estimate for the total extent of the geologically available resources

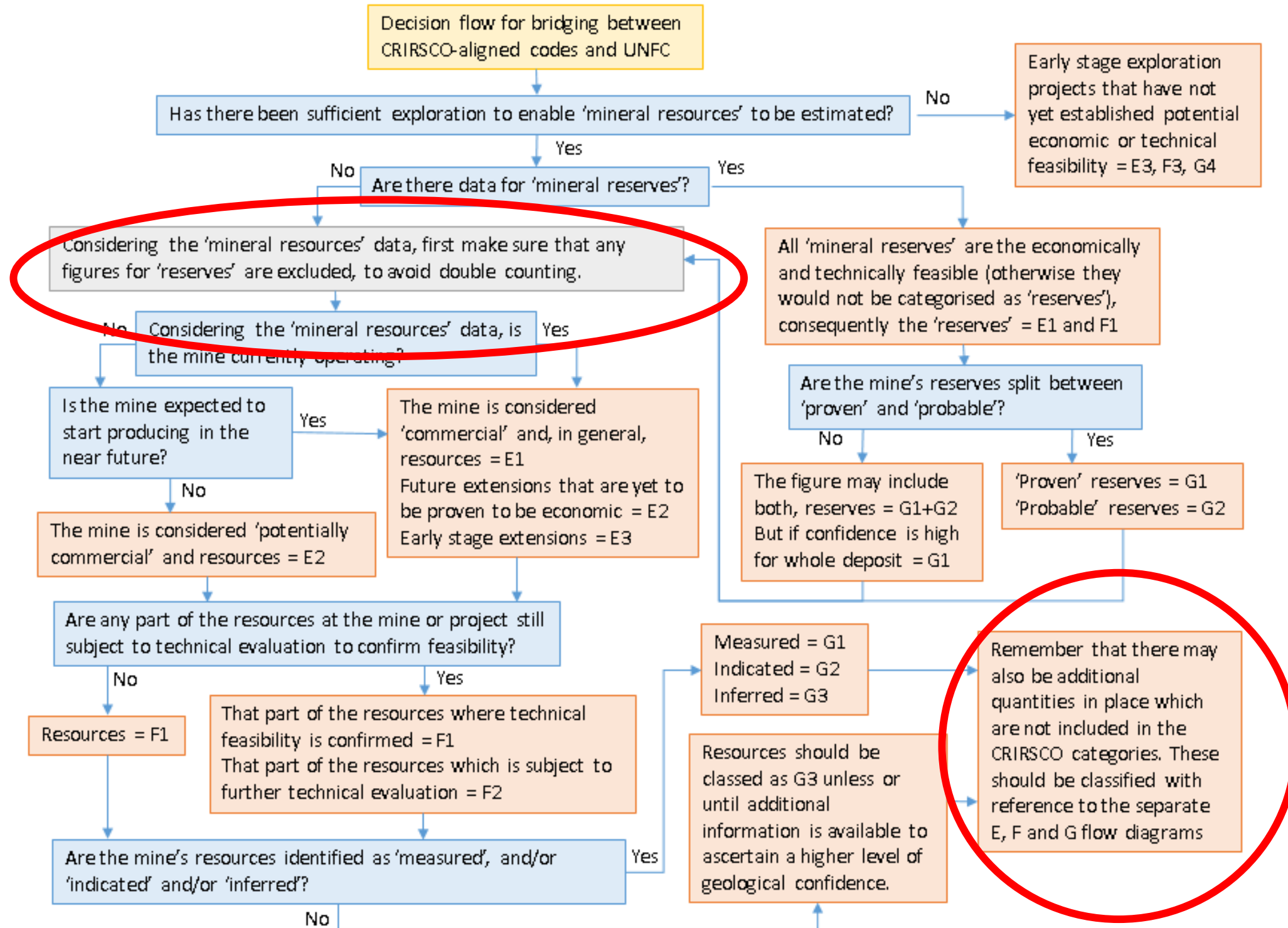
Example 2: Polyhalite resources, NE England, UK

Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category			Comments
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Probable Mineral Reserves	JORC	2016	248				Woodsmith only
Measured Mineral Resource	JORC	2013	39				Boulby only
Indicated Mineral Resource	JORC	2013 and 2016	793				Woodsmith+Boulby
Inferred Mineral Resource	JORC	2013 and 2016	2450				Woodsmith+Boulby
Estimate based on subcrop	None	2017	286200				GIS-based district scale

Example 2: Polyhalite resources, NE England, UK

CRIRSCO Template		UNFC-2009 "minimum" Categories			UNFC-2009 Class
Mineral Reserve	Proved	E1	F1	G1	Commercial Projects
	Probable			G2	
Mineral Resource	Measured	E2	F2	G1	Potentially Commercial Projects
	Indicated			G2	
	Inferred			G3	
Exploration Results		E3	F3	G4	Exploration Projects

Decision tool for CRIRISCO compliant data to UNFC



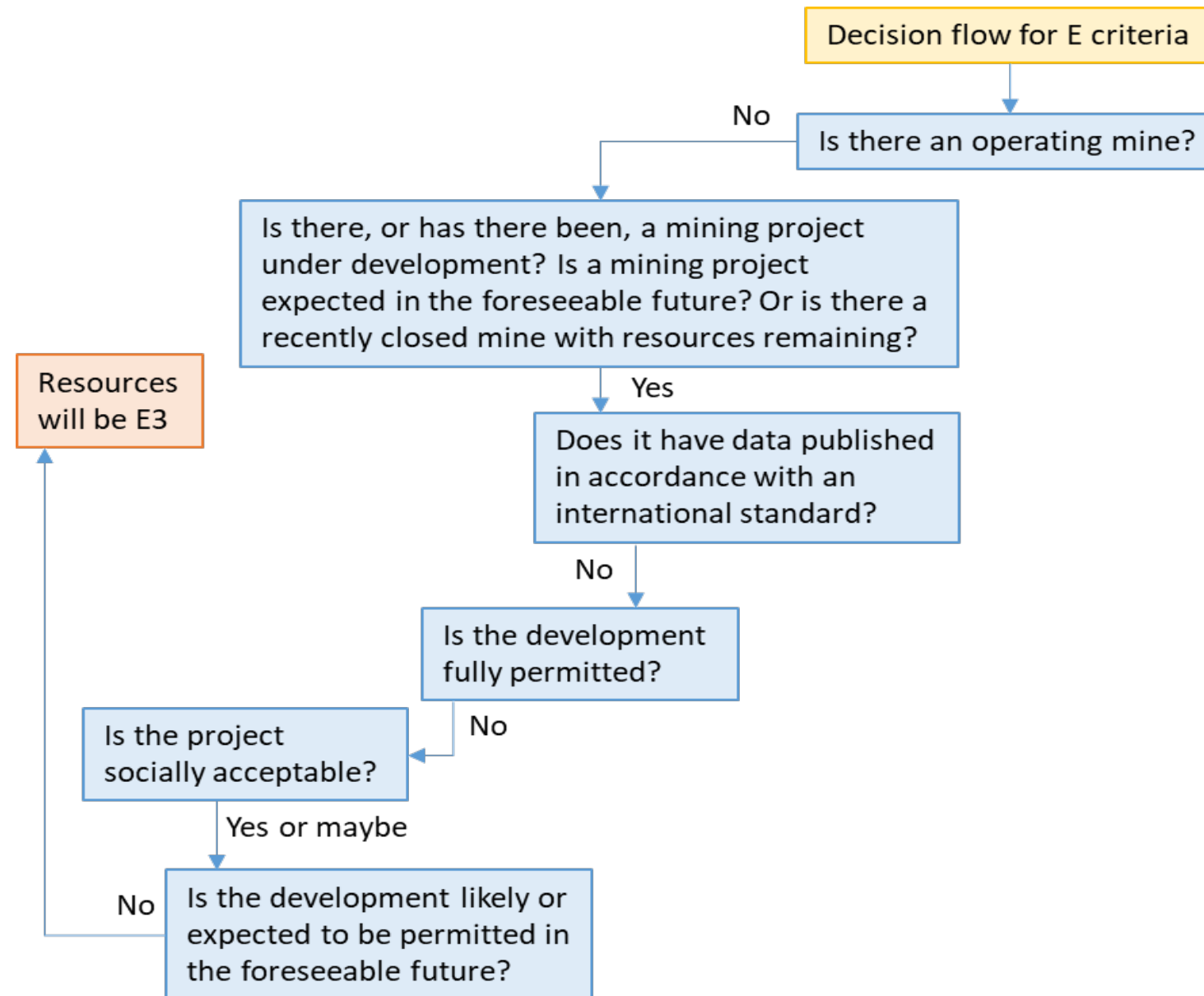
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Indicated Mineral Resource	JORC	2013 and 2016	793	2	2	2	Woodsmith+Boulby
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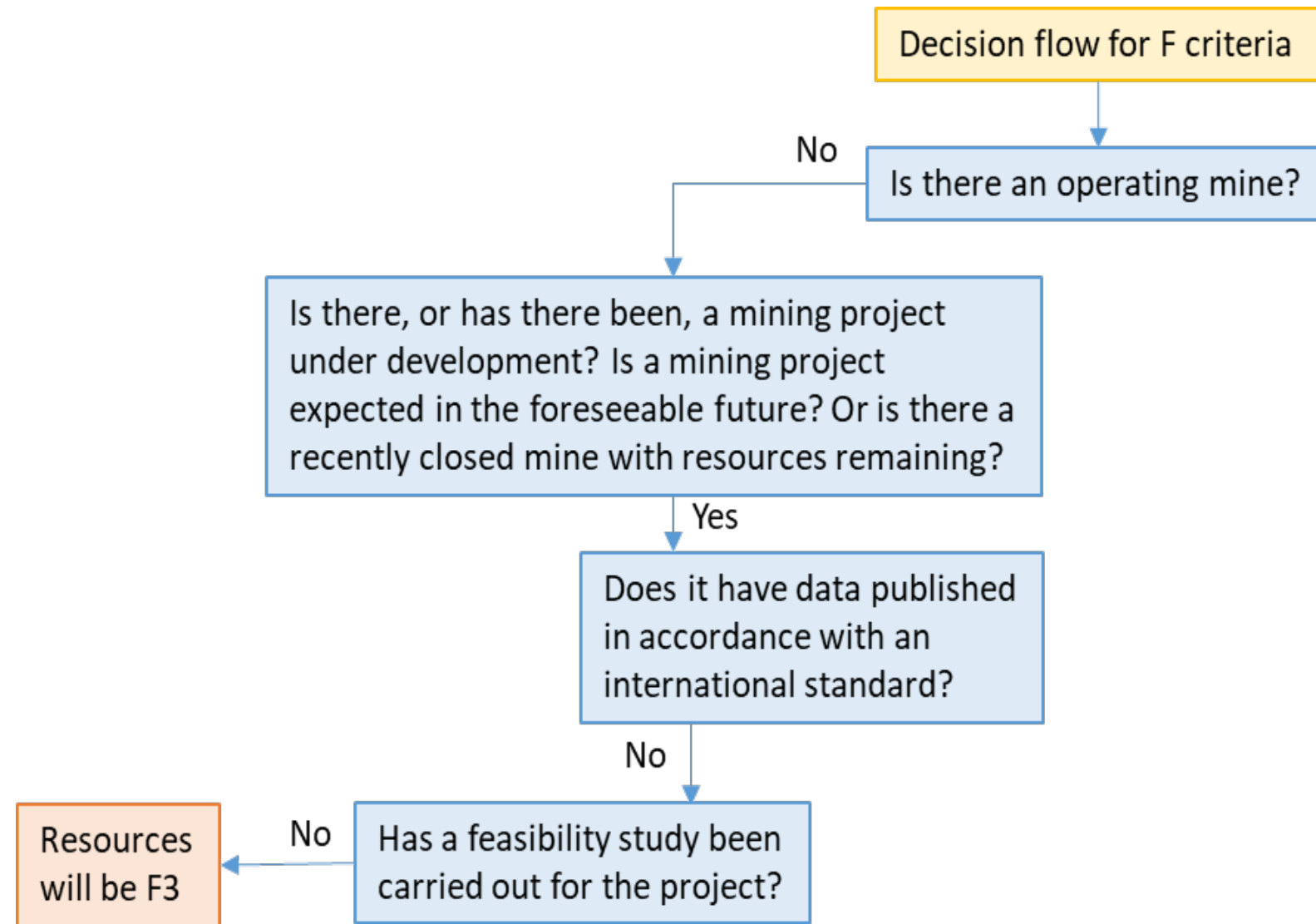
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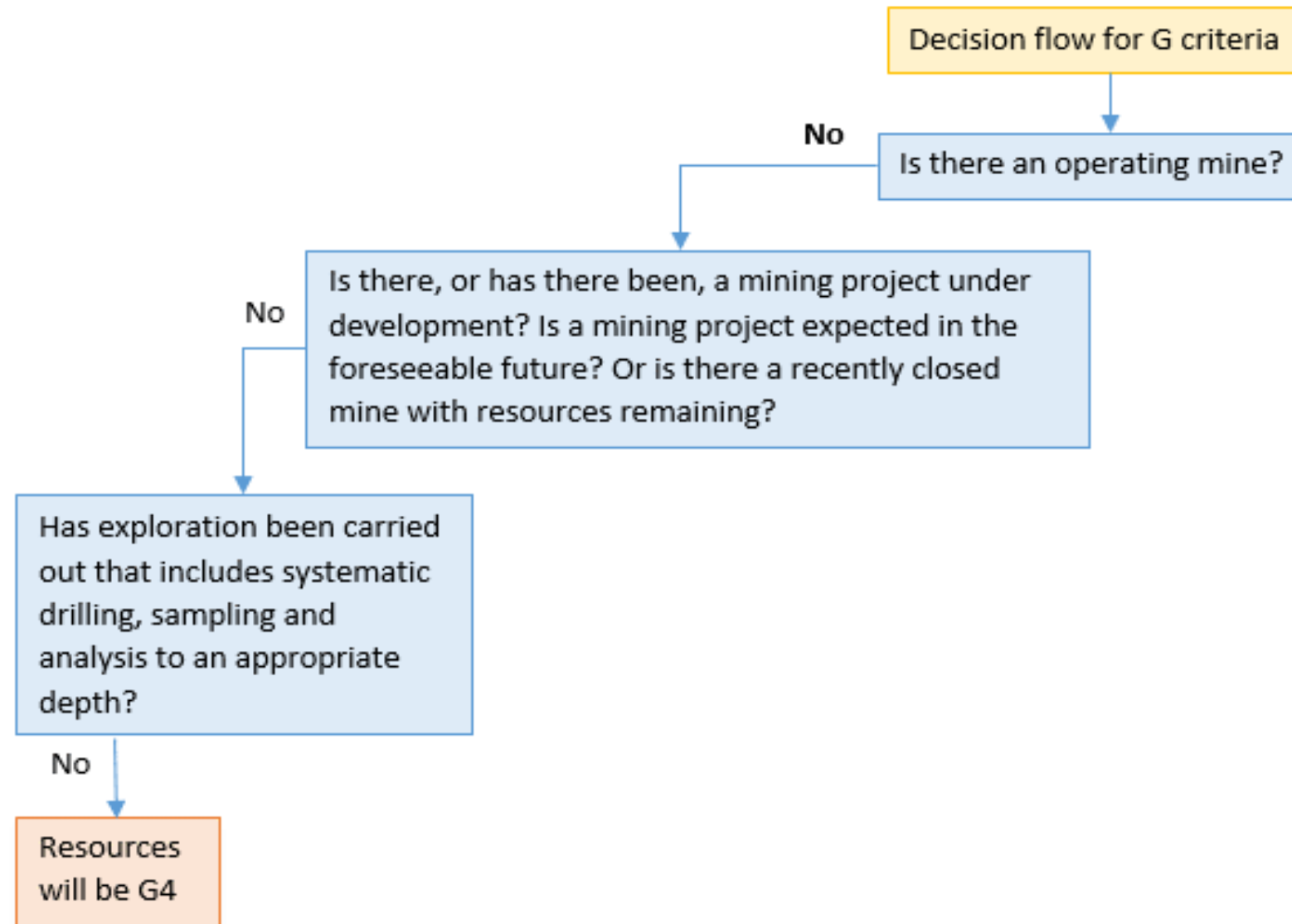
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Thank you!

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Further resources:

Development of decision-making tools to create a harmonised UK national mineral resource inventory using the United Nations Framework Classification
<https://doi.org/10.1016/j.resourpol.2022.102558>

ORAMA project:
<https://orama-h2020.eu/downloads/>