

# NHDES Development of PFAS Soil Remediation Standards

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# General Rulemaking Process

- Statute requires that rulemaking be initiated by November 1, 2023 for soil remediation standards for:
  - Perfluorononanoic acid (PFNA)
  - Perfluorooctanoic acid (PFOA)
  - Perfluorooctane sulfonic acid (PFOS)
  - Perfluorohexane sulfonic acid (PFHxS)
- These PFAS have AGQS (Ambient Groundwater Quality Standards) established in Env-Or 600
- Rulemaking required by RSA 485-H:13 (July 2022)



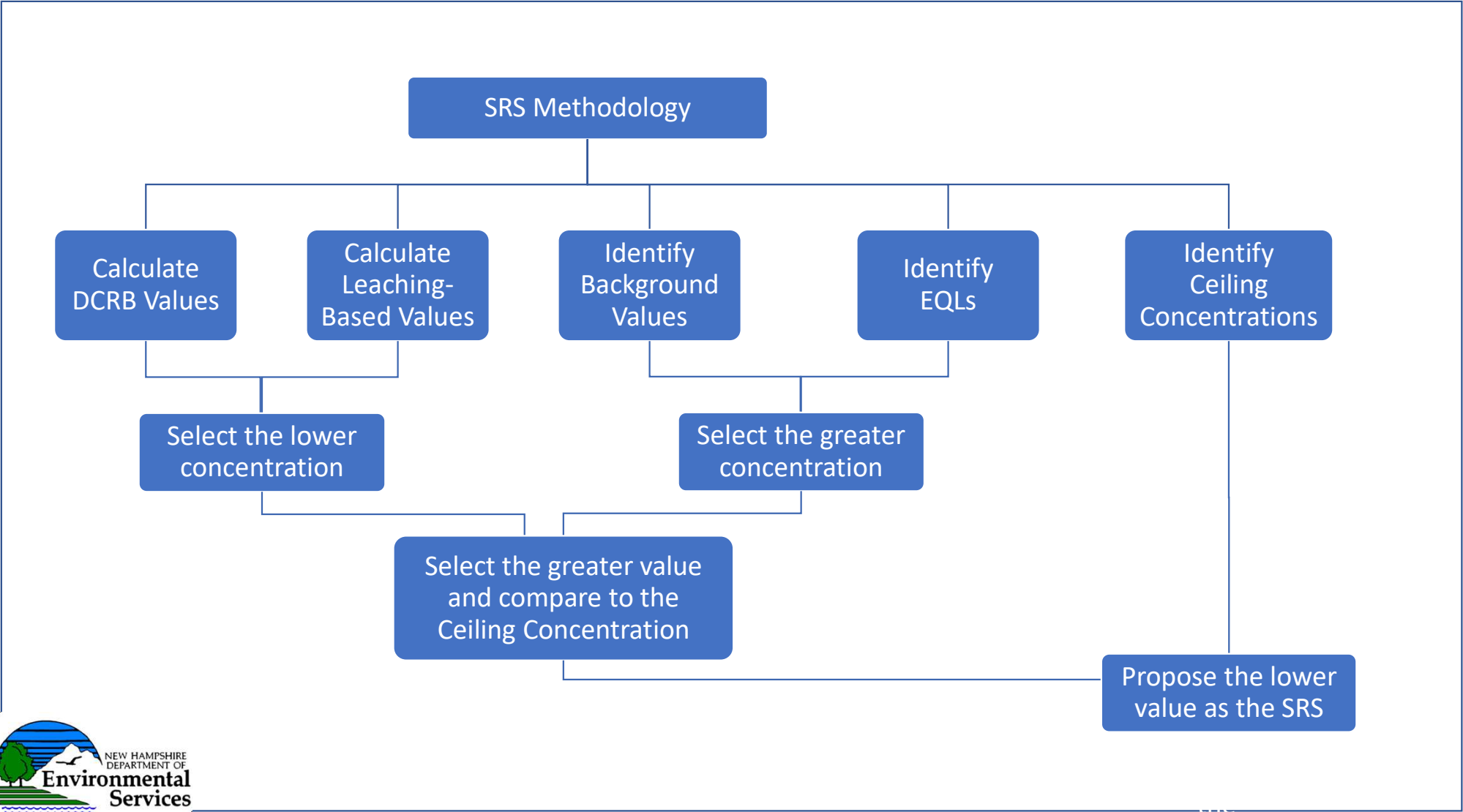
# SRS Development Methodology

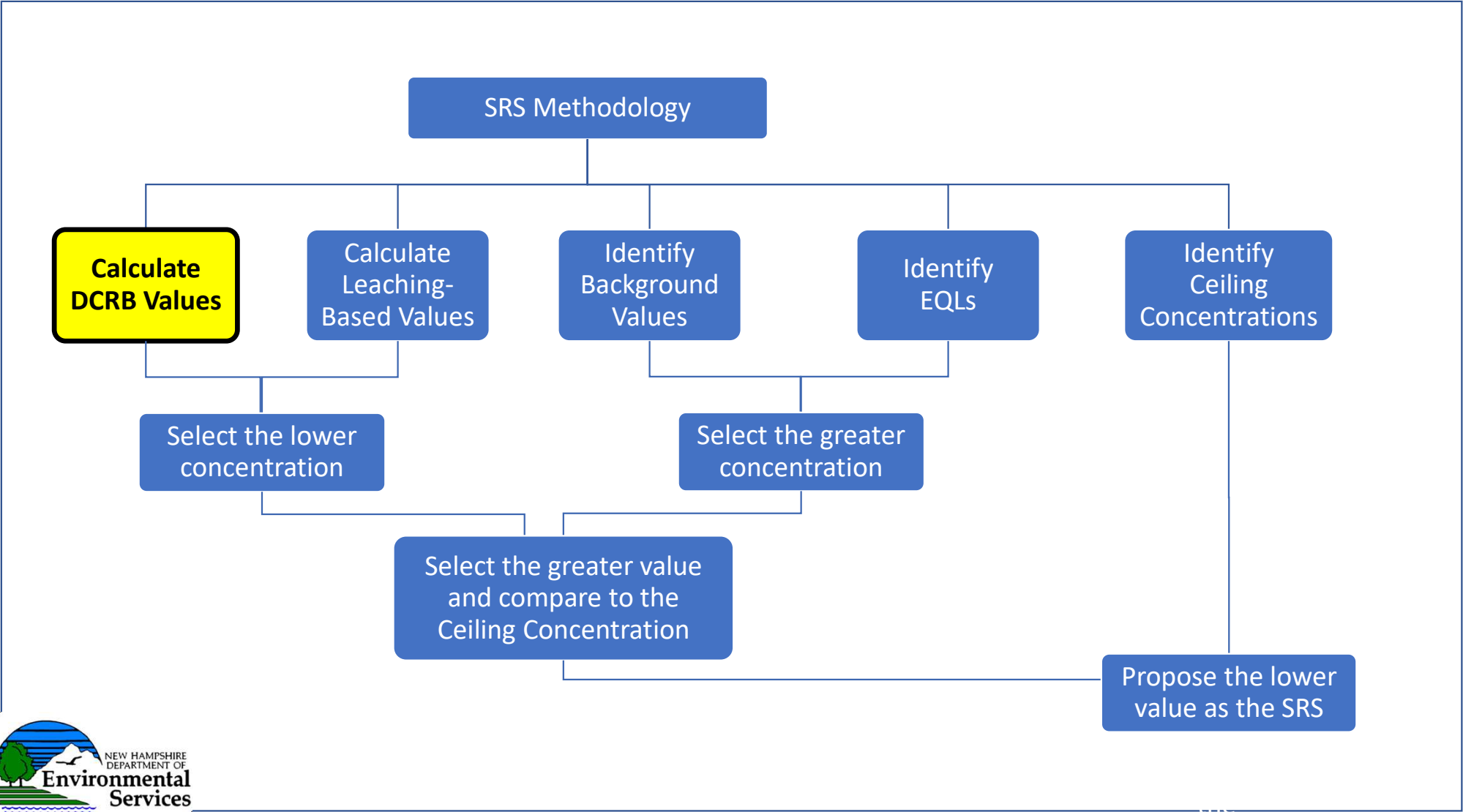
- Evaluate factors that influence standard selection and document in summary table (Risk Characterization Management Policy Appendix E)

Appendix E											
NHDES Risk Characterization and Management Policy											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chemical Name	CAS No.	NH S-1 (mg/kg)	NH S-2 (mg/kg)	NH S-3 (mg/kg)	Risk S-1 (mg/kg)	Risk S-2 (mg/kg)	Risk S-3 (mg/kg)	Leaching (GW-1) (mg/kg)	Back- ground (mg/kg)	EQL (mg/kg)	Ceiling Conc. (mg/kg)
Acetone	67-64-1	75	75	75	35,000	310,000	310,000	75		0.5	
Acrylonitrile	107-13-1	0.5	0.5	0.5	3	9	83	0.2		0.5	

- Direct Contact Risk-Based Soil Concentrations (RCMP Appendix A)
- Leaching-Based Soil Concentrations Protective of Groundwater Quality (RCMP Appendix B)
- Background Values
- Estimated Quantitation Limits (RCMP Appendix C)
- Ceiling Concentrations (RCMP Appendix D)







# Direct Contact Risk-Based Soil Concentrations

- Methodology consistent with RCMP Appendix A
- Calculate protective values for three exposure scenarios
  - S-1: residential
  - S-2: outdoor worker/passive recreator
  - S-3: construction/utility worker
- Most recent DCRB values were for S-1 and S-2 (December 2019)
- Proposed revisions
  - Update adult body weight in S-2 scenario to be consistent with PFAS MCL development
  - Add S-3 exposure scenario

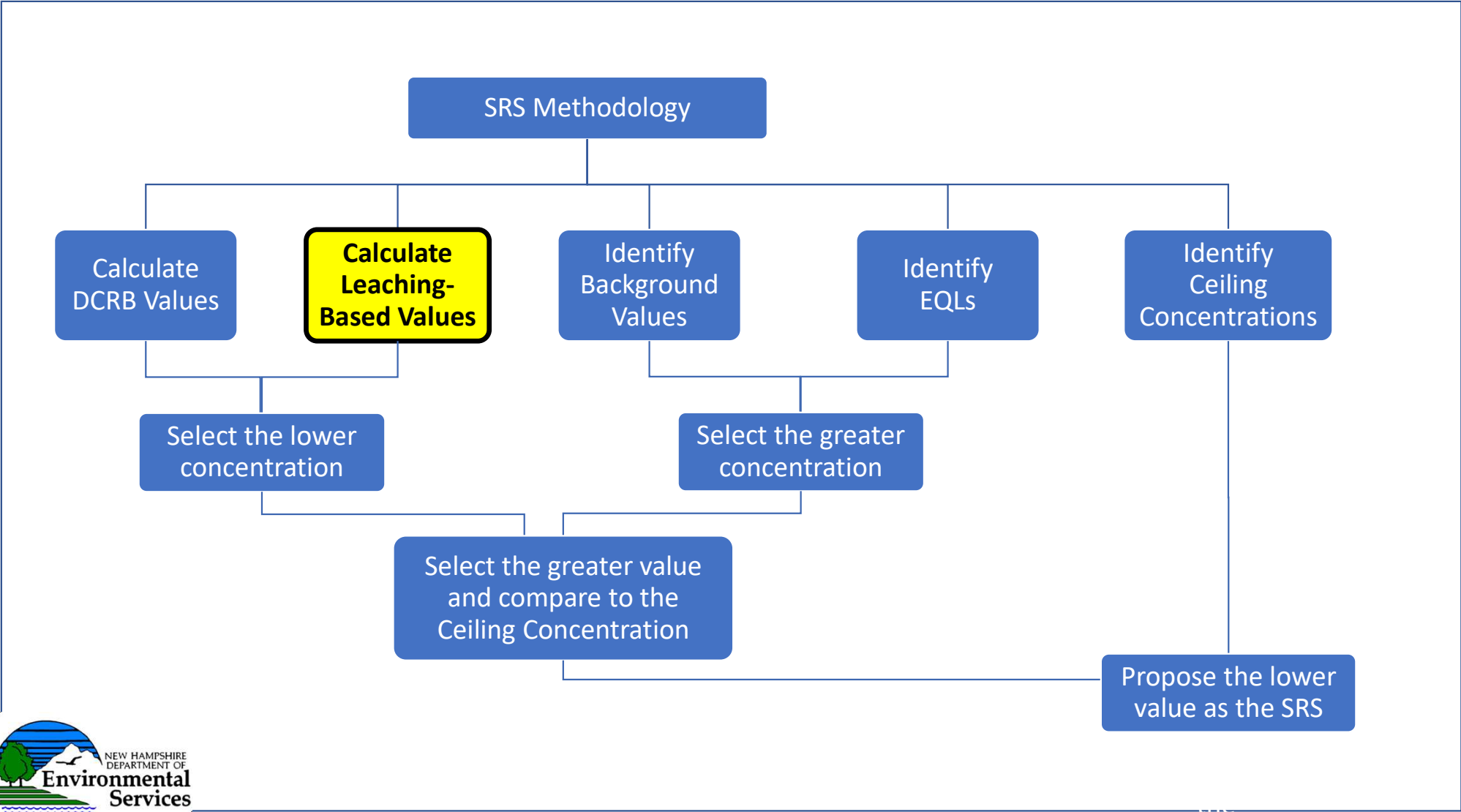


# DRAFT Proposed Direct Contact Values

PFAS	Proposed SRS	Direct Contact			Leaching	Background	EQL	Ceiling		
	S-1/ S-2/ S-3	S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA		<b>200</b>	<b>1,400</b>	<b>1,400</b>						
PFNA		<b>100</b>	<b>1,000</b>	<b>1,000</b>						
PFHxS		<b>100</b>	<b>900</b>	<b>900</b>						
PFOS		<b>100</b>	<b>700</b>	<b>700</b>						

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)







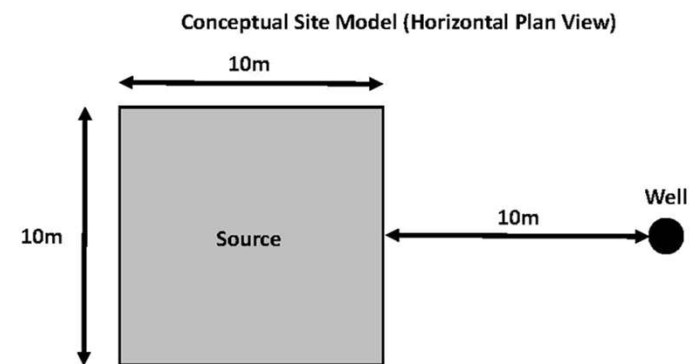
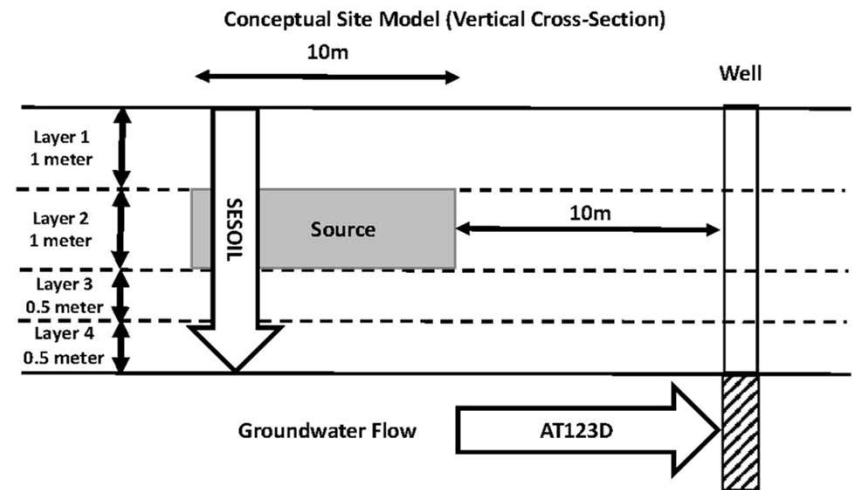
# Leaching-Based Soil Concentrations Protective of Groundwater

- Selected computer leaching model: SEVIEW Transport and Fate Modeling Software by ESCI, LLC
  - Model selection and chemical-specific parameters based on NHDES' independent evaluation of consultant's review of potential leaching models
  - Consistent with historical derivation of leaching-based values
  - Used protective release site setting and parameters similar to the approach in RCMP Appendix B
  - Protective but representative of state hydrogeological conditions
  - Selected model limitations – used USGS data to address some uncertainty



# Development of Leaching-based Soil Values – Modeling Approach

Subsurface release consistent with derivation of leaching based values for other contaminants (RCMP Appendix B)



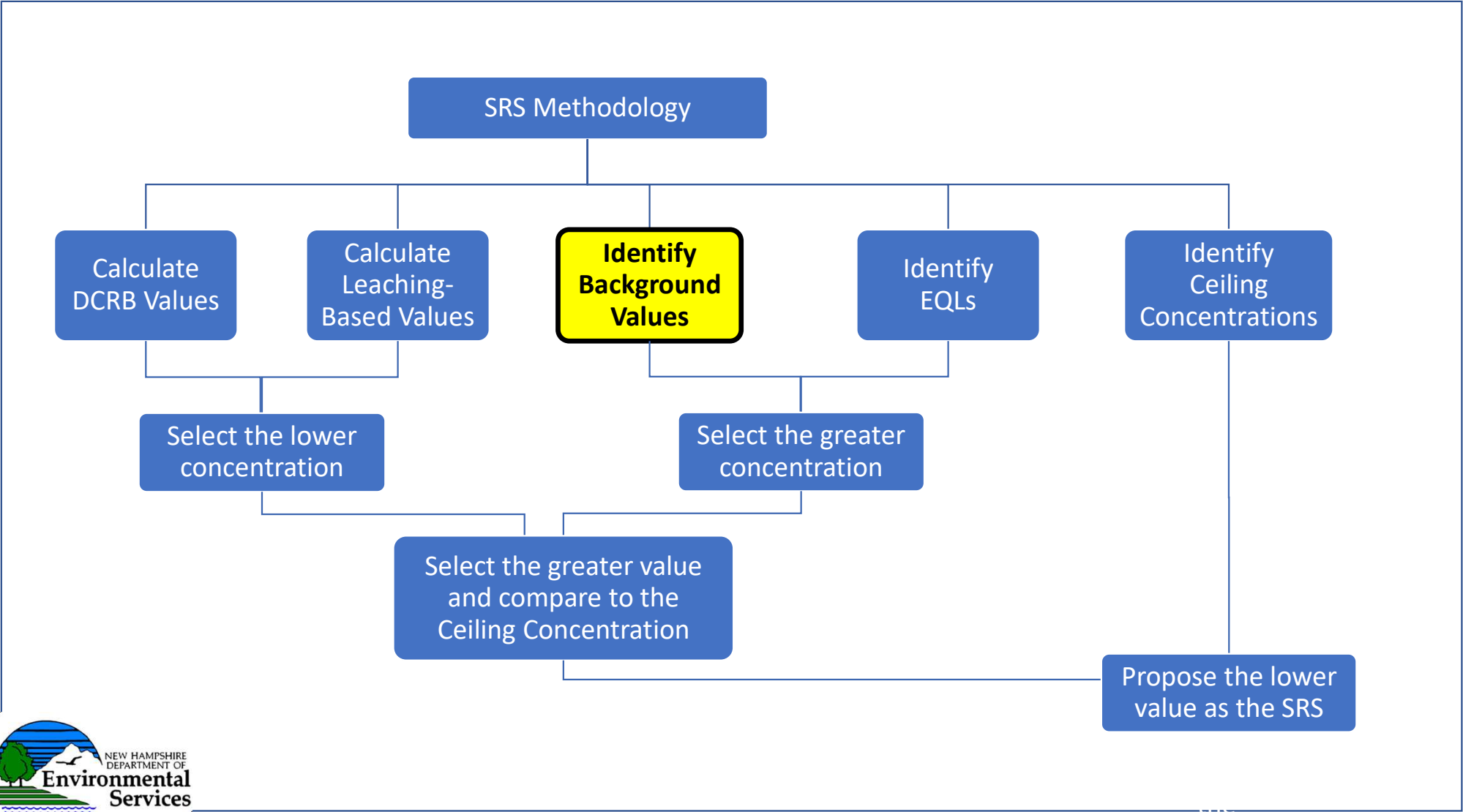
Draft from Sanborn, Head & Associates

# DRAFT Proposed Leaching Values

PFAS	Proposed SRS	Direct Contact			Leaching	Background	EQL	Ceiling		
	S-1/ S-2/ S-3	S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA		200	1,400	1,400	<b>0.1</b>					
PFNA		100	1,000	1,000	<b>0.4</b>					
PFHxS		100	900	900	<b>0.2</b>					
PFOS		100	700	700	<b>0.5</b>					

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)





# Identify Background Values

- PFAS are manmade, therefore no natural background concentrations are proposed for SRS derivation
- NHDES proposes to consider anthropogenic ambient background conditions in shallow soil on a site-by-site basis
  - Consistent with Env-Or 606.19(f), SRS will not apply to sites where contamination is at or below background levels
  - Site-specific background evaluations may be warranted, because shallow soil might be impacted based on the findings of the USGS Shallow Soil Study

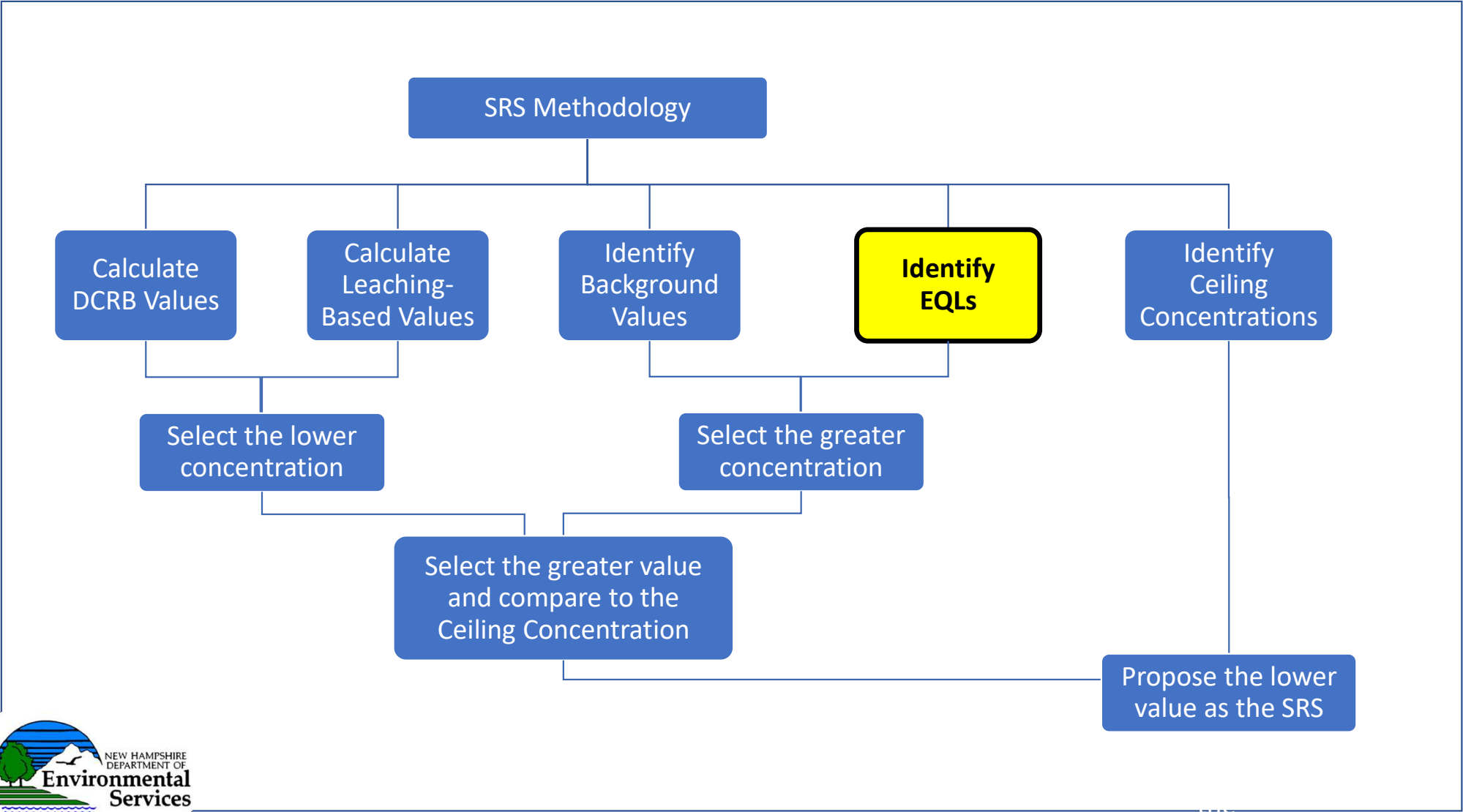


# DRAFT Proposed Background Values

PFAS	Proposed SRS	Direct Contact			Leaching	Background	EQL	Ceiling		
	S-1/ S-2/ S-3	S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA		200	1,400	1,400	0.1	-				
PFNA		100	1,000	1,000	0.5	-				
PFHxS		100	900	900	0.2	-				
PFOS		100	700	700	0.8	-				

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)





# Estimated Quantitation Limit (EQL)

- How low can laboratories reasonably measure the contaminant?
- EQLs are typically tabulated in RCMP Appendix C
- For PFAS
  - Table 8 of EPA's Fourth Draft Method 1633, dated July 2023
  - Draft Method 1633 is currently the only EPA method validated for soil
  - EQLs are subject to change as the draft Method 1633 is finalized and with any future updates to the method



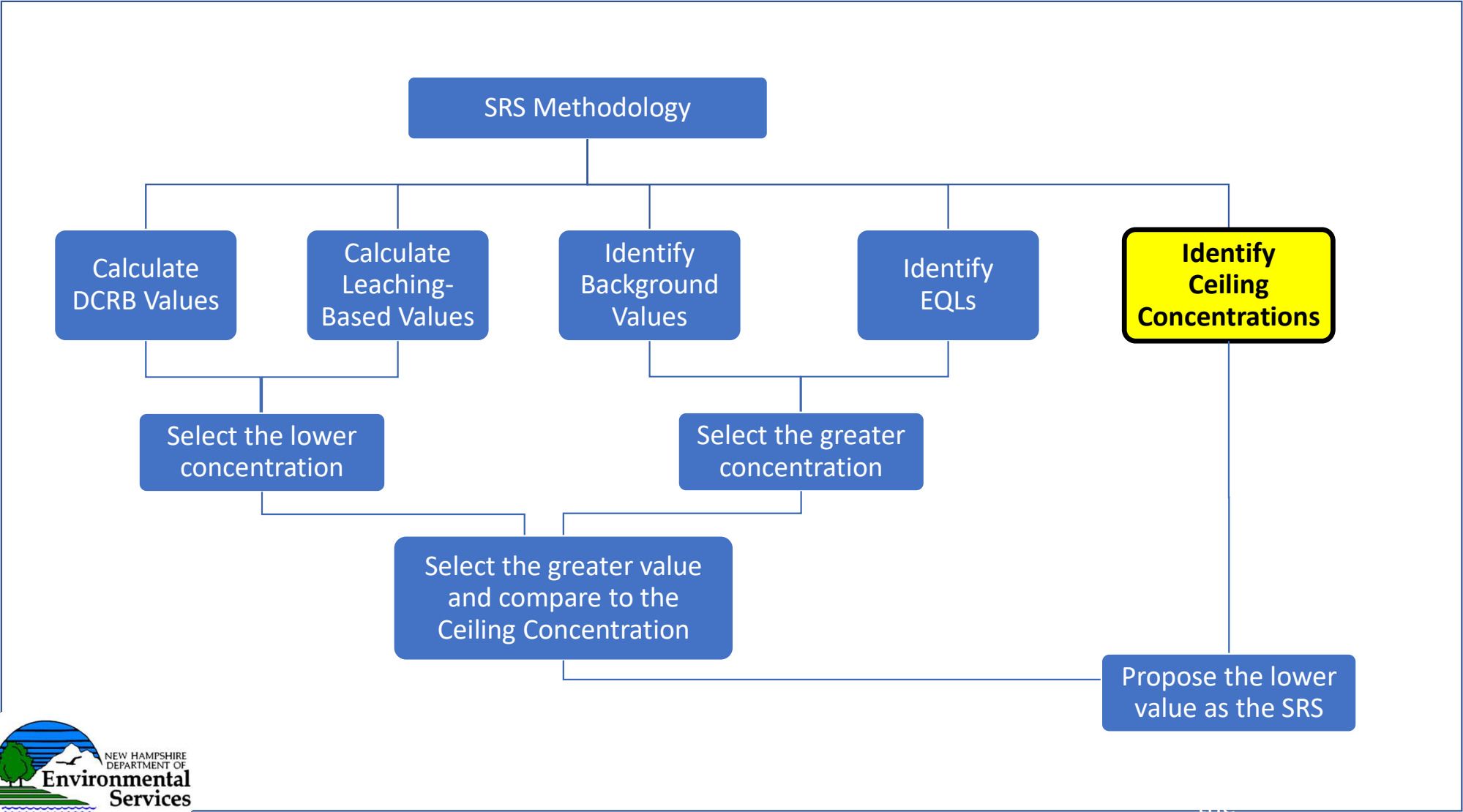


# DRAFT Proposed EQL Values

PFAS	Proposed SRS	Direct Contact			Leaching	Background	EQL	Ceiling		
	S-1/ S-2/ S-3	S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA		200	1,400	1,400	0.1	-	<b>0.2</b>			
PFNA		100	1,000	1,000	0.5	-	<b>0.2</b>			
PFHxS		100	900	900	0.2	-	<b>0.2</b>			
PFOS		100	700	700	0.8	-	<b>0.2</b>			

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)





# Ceiling Concentrations

- Selected from a matrix in RCMP Appendix D based on the odor index and volatility of the chemical
- Odor index is the ratio of the vapor pressure (VP) for a chemical at ~20° to 30° Celsius (C) and the 50<sup>th</sup> percentile odor recognition threshold (ORT<sub>50%</sub>)

$$\text{Odor Index} = \text{VP}_{20^{\circ} - 30^{\circ} \text{C}} / \text{ORT}_{50\%}$$

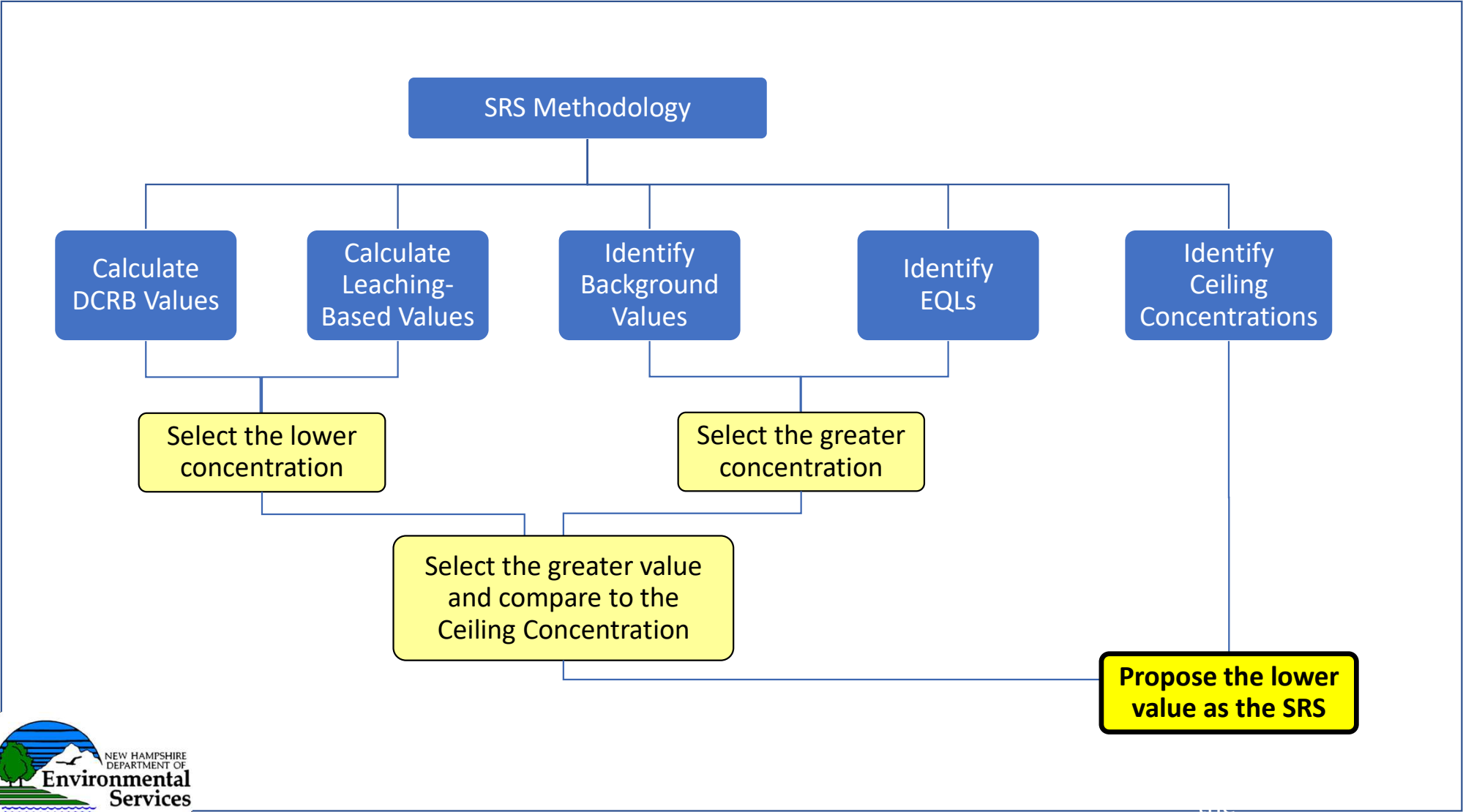
- Volatile chemicals (VP greater than 1 Torr) at ~20° to 30° C are assigned relatively low ceiling concentrations
- Limited PFAS data available

# DRAFT Proposed Ceiling Concentrations

PFAS	Proposed SRS	Direct Contact			Leaching	Background	EQL	Ceiling		
	S-1/ S-2/ S-3	S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA		200	1,400	1,400	0.1	-	0.2	<b>100,000</b>	<b>500,000</b>	<b>1,000,000</b>
PFNA		100	1,000	1,000	0.5	-	0.2	<b>100,000</b>	<b>500,000</b>	<b>1,000,000</b>
PFHxS		100	900	900	0.2	-	0.2	-	-	-
PFOS		100	700	700	0.8	-	0.2	-	-	-

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)





# DRAFT Proposed SRS and Summary of Values

PFAS	Proposed SRS S-1/ S-2/ S-3	Direct Contact			Leaching	Background	EQL	Ceiling		
		S-1	S-2	S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1/ S-2/ S-3	S-1	S-2	S-3
PFOA	<b>0.2</b>	200	1,400	1,400	0.1	-	<b>0.2</b>	100,000	500,000	1,000,000
PFNA	<b>0.4</b>	100	1,000	1,000	<b>0.4</b>	-	0.2	100,000	500,000	1,000,000
PFHxS	<b>0.2</b>	100	900	900	<b>0.2</b>	-	<b>0.2</b>	-	-	-
PFOS	<b>0.5</b>	100	700	700	<b>0.5</b>	-	0.2	-	-	-

Values are in nanograms per gram (ng/g), equivalent to parts per billion (ppb)



# On-going Work

- Development of written guidance from HWRB for:
  - Site-specific background assessments for PFAS
  - Site-specific leaching-based soil standards for PFAS
- Coordination with other NHDES programs that might consider SRS, such as:
  - Solid waste
  - Residuals
  - Drinking water
  - Air resources
- Incorporating concepts from public feedback



# For Additional Information

[Second Technical Listening Session](#) – slides and recording

## NHDES Risk Characterization and Management Policy (RCMP)

- [RCMP Appendices, 2013 update](#)
- [RCMP 2018 update of Appendix B and Appendix E](#)

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