To develop the assurance case for the BlueROV2 system using the provided patterns, we must instantiate each element within the pattern such that they are specific to the domain of the BlueROV2 system. Below is the instantiation of the Goal Structuring Notation (GSN) describing the assurance for the BlueROV2 system:

### Top-level Goal

- \*\*G1: Hazards for BlueROV2 addressed in accordance with ALARP principle\*\*

### Strategy to Support G1

- \*\*S1: Argument by risk reduction/elimination of each hazard\*\*

- \*\*Supported by G2 and G3\*\*

### Goals Supported by S1

- \*\*G2: No intolerable risks present in the BlueROV2 system\*\*

- \*\*Context (C1): Definition of "intolerable"\*\*

- \*\*Supported by S2 and S3\*\*

- \*\*G3: Risk from "Obstacle encounter" hazard has been reduced as low as reasonably practicable\*\*

- \*\*Context (C2): Assigned severity class is "Major"\*\*

#### Strategies Supporting G2

- \*\*S2: Argue that risk posed by any remaining hazards is negligible\*\* (Undeveloped)

- \*\*S3: Argue that no other risks have been identified\*\* (Undeveloped)

#### Strategy Supporting G3

- \*\*S4: Apply ReSonAte to estimate level of risk from hazard condition "Obstacle encounter"\*\*

- \*\*Assumption (A1): Function "obstacle detection" required by "BTD for Obstacle Encounter" is available\*\*

- \*\*Supported by G4 and G5\*\*

### Goals Supported by S4

- \*\*G4: Model BTD accurately describes possible propagation of "obstacle encounter" hazard\*\* (Uninstantiated)

- \*\*Supported by G6, G7, G8\*\* (All undeveloped)

- \*\*G5: Quantitative risk estimates are accurate and below acceptable threshold\*\*

- \*\*Supported by G9 and G10\*\*

#### Goals Supported by G5

- \*\*G9: State probability distribution used for risk estimation is an accurate representation of expected system states\*\* (Undeveloped)

- \*\*G10: Estimated probability of "collision" is below allowable threshold for severity class "Major"\*\*

- \*\*Solution (Sn1): Estimated risk level 10^-3 per hour\*\* (Uninstantiated)

The choices (HasChoice) and undeveloped strategies hint at decision points or areas requiring further analysis and development. By instantiating placeholders and focusing on developed areas, we assure that the specific risks and systems like BlueROV2 are appropriately addressed, reflecting realistic scenarios and evidence.