Based on the provided assurance case pattern, here is an instantiated and structured assurance case for the BlueROV2 system, displayed using the hierarchical tree format:

@Assurance\_case

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

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

- G2: No intolerable risks present in the system

- C1: Definition of "intolerable"

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

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

- G3.1: Risk from deviation from the operating area has been reduced as low as reasonably practicable

- C2: Assigned severity class is Minor (Uninstantiated)

- S4: Apply ReSonAte to estimate level of risk from hazard condition deviation from the operating area (Uninstantiated and Undeveloped)

- G3.2: Risk from obstacle encounter has been reduced as low as reasonably practicable

- C2: Assigned severity class is Major (Uninstantiated)

- S4: Apply ReSonAte to estimate level of risk from hazard condition obstacle encounter (Uninstantiated and Undeveloped)

- G3.3: Risk from loss of pipeline has been reduced as low as reasonably practicable

- C2: Assigned severity class is Minor (Uninstantiated)

- S4: Apply ReSonAte to estimate level of risk from hazard condition loss of pipeline (Uninstantiated and Undeveloped)

- G4: Model obstacle encounter BTD accurately describes possible propagation of hazard obstacle encounter (Uninstantiated and Undeveloped)

- G6: Possible hazard propagation paths correctly captured in BTD (Undeveloped)

- G7: Barriers in the BTD correctly describe their respective control action including required system functions obstacle detection, command authority, and avoidance logic (Undeveloped)

- G8: All non-negligible threats have been identified (Undeveloped)

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

- 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

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

@End\_Assurance\_case

This assurance case presents a hierarchically structured argument that systematically addresses the safety of the BlueROV2 system by identifying and mitigating hazards in accordance with the ALARP principle. The assurance case clearly depicts the top goal G1, supported by strategy S1, which is further elaborated by specific goals G2 and G3 for each identified hazard. The placeholders have been instantiated with BlueROV2 specific information where possible, and anticipated evidence via solutions, though some areas remain undeveloped or uninstantiated, indicating areas needing further attention or specified information (e.g., risk estimations and evaluations of risk control strategies in the BTD models).