HULLPROOF

AI Powered Hull Intelligence

# Hull Inspection Report

## MV Atlantic Pioneer

Inspection Date: 04 May 2026

Survey Type: In Water Inspection

Owner: Atlantic Maritime Holdings Ltd

Technical Manager: Sample Ship Management AS

Compliance: IMO / GloFouling (MEPC.378(80))

62

MEDIUM RISK

IMO Rating: 2/4

| | | | |
|---|---|---|---|
| HULL SURFACE<br>HEAVY | STRUCTURAL<br>LIGHT | WELDS<br>NONE | PROPULSION<br>LIGHT |
| STEERING<br>NONE | SEA CONNECTIONS<br>LIGHT | CATHODIC<br>LIGHT | APPENDAGES<br>NONE |
| MARKINGS<br>NONE | DAMAGE MECH.<br>NONE | VESSEL-TYPE<br>NONE | |



Report ID: sample-2026-05-04 | Generated: 04/05/2026, 13:58:28

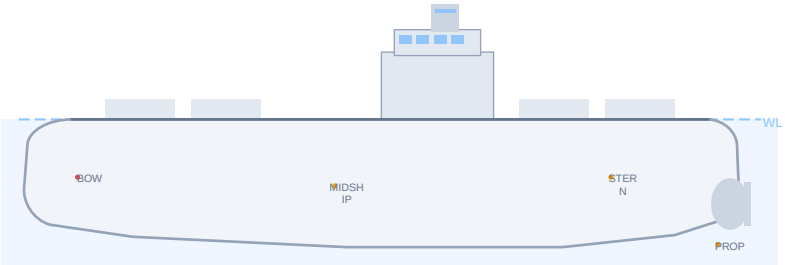
# CONDITION ASSESSMENT

| HULL SURFACE | STRUCTURAL | WELDS | PROPULSION |
|---|---|---|---|
| HEAVY | LIGHT | NONE | LIGHT |

| STEERING | SEA CONNECTIONS | CATHODIC | APPENDAGES |
|---|---|---|---|
| NONE | LIGHT | LIGHT | NONE |

| MARKINGS | DAMAGE MECH. | VESSEL-TYPE |
|---|---|---|
| NONE | NONE | NONE |

GENERAL CARGO




| RISK SCORE | IMO FOULING RATING | FINDINGS | DOMAINS AFFECTED |
|---|---|---|---|
| 62 / 100 | 2 / 4 (target: <=1) | 8<br>2 critical/heavy | 14<br>of 17 core |

# EXECUTIVE SUMMARY

## Overall Assessment

- MV Atlantic Pioneer is currently incurring an estimated $1,840/day in excess fuel costs due to moderate-to-heavy biofouling on the flat bottom and a localised hard-fouling cluster at the bow boot-top — total annual exposure approximately $670,000 if unaddressed. The single highest-priority finding is the bow shell-plating dent, which requires class notification within 24 hours and NDT confirmation at the next port call. In-water cleaning with capture, scheduled within 30 days, is the clear financial decision: estimated cleaning cost $14,000–18,000 yields payback in under two weeks at current fuel exposure. CII rating is projected to degrade from C to D within 8 months at current fouling trajectory. Cathodic protection, propeller condition, and sea-chest blockage are all within manageable envelopes and require monitoring rather than immediate intervention.

## Compliance Status

Target framework: IMO / GloFouling (MEPC.378(80))

IMO Fouling Rating: 2/4 (Exceeds threshold)

# FINANCIAL IMPACT

Estimated additional fuel cost if current hull condition is not addressed:

| DAILY PENALTY | MONTHLY PENALTY | ANNUAL PENALTY |
|---|---|---|
| $1,840 | $55,200 | $671,600 |

Based on 65% slime coverage on flat bottom (19–25% drag penalty per IMO/GloFouling), localised barnacle cluster at bow (additional 3–5% hull-effective drag), 280 days/year at sea, fuel consumption 32 t/day at design speed, VLSFO at $620/t.

# DETAILED FINDINGS (8)

## #1 Flat bottom, midship port

HEAVY | WITHIN 30 DAYS

| TIMESTAMP | TYPE | CONFIDENCE | IMO RATING | COVERAGE | FUEL IMPACT |
|---|---|---|---|---|---|
| 0:14 | BIOFOULING_SOFT (slime) | HIGH | 2/4 | 65% | 15-25% |

Continuous slime film with isolated grass-stage filamentous algae across approximately 65% of the flat-bottom area. IMO fouling rating 2 — at the upper threshold of MEPC.378(80) target of "d1. Slime films alone increase frictional drag sufficient to raise fuel consumption by an estimated 19–25% on a vessel of this size and operating profile (ref. IMO/GloFouling research, 2022). Coverage is consistent with extended port time and warm-water trading since last out-of-water cleaning.

ROOT CAUSE

Extended idle time in fouling-pressure ports combined with antifouling coating approaching end of effective service life (last applied at previous drydock 38 months ago — typical AF coating effectiveness 36–60 months depending on system).

IF NOT ADDRESSED

Continued progression to macrofouling within 4–8 weeks at current trajectory. Each step up the IMO fouling scale compounds fuel penalty; macrofouling (rating 3+) adds another 15–35% on top of the current penalty. CII rating projection: degradation from current C-band toward D within 6–9 months without intervention.

RECOMMENDATIONS:

1. Schedule in-water cleaning at next port call with appropriate water clarity. Slime-stage cleaning does not require effluent capture per MEPC.1/Circ.918 (rating <2).
2. Document observation in Biofouling Record Book per IMO Resolution MEPC.378(80) §6.
3. Plan AF coating reapplication at next drydock; consider lower-friction or biocide-free alternatives consistent with destination port restrictions.

## #2 Boot-top, bow port

MODERATE | WITHIN 30 DAYS

| TIMESTAMP | TYPE | CONFIDENCE | IMO RATING | COVERAGE | FUEL IMPACT |
|---|---|---|---|---|---|
| 0:28 | BIOFOULING_HARD (barnacles) | HIGH | 3/4 | 12% | 5-15% |

Localised cluster of acorn barnacles (~150–200 individual organisms) on the boot-top stripe, port bow, between approximately 0.5 m and 1.2 m below the loaded waterline. Calcareous attachment will require mechanical or cavitation-based removal — soft cleaning brushes are inadequate. Coverage is geographically constrained but progression is observed at the cluster perimeter.

ROOT CAUSE

Boot-top zone receives intermittent UV exposure and lower coating dose than the flat bottom in many AF systems, creating a known fouling-prone band. Cluster origin likely a specific fouling event in port (settling within 3–5 days of submerged static contact).

IF NOT ADDRESSED

Hard-fouling area expands radially; once colonies merge the cleaning cost scales superlinearly. Local drag coefficient at the bow disproportionately affects propulsive efficiency due to upstream-flow position. If unaddressed before next port-state inspection in a high-biosecurity jurisdiction (Australia, New Zealand), risk of cleaning denial and forced re-routing.

RECOMMENDATIONS:

1. Schedule in-water cleaning with effluent capture per MEPC.1/Circ.918 (calcareous fouling, rating "e2 requires capture).
2. Cleaning contractor must hold approval for hard-fouling removal in destination port jurisdiction.
3. Inspect AF coating condition at cleaning sites; coating likely abraded and needing local touch-up at next opportunity.

## #3 Bow shell plating, port (~1m below WL)

HEAVY | IMMEDIATE ACTION

| TIMESTAMP | TYPE | CONFIDENCE |
|---|---|---|
| 0:41 | IMPACT_DAMAGE | MEDIUM |

Visible inward deformation of bow shell plating, port side, approximately 1 m below the waterline. Maximum dent depth estimated at 80–120 mm over an area of approximately 600 mm × 400 mm. No cracking or coating loss visible at the dent perimeter under current camera resolution and water clarity. Morphology is consistent with a single low-energy impact event (floating debris, fender contact, or quay impact during berthing) rather than progressive structural distress.

ROOT CAUSE

Single impact event — exact cause not determinable from inspection footage. Cross-reference against bridge log, port operations log, and any prior condition reports for bow contact incidents.

IF NOT ADDRESSED

Plate deformation alone is not an immediate structural concern at this magnitude on a vessel of this scantling, but unverified hidden damage (internal stiffener fracture, weld toe cracking, or coating disbondment with progressing corrosion) is a class concern. Class rules (IACS UR Z3/Z7) require notification to class for any deformation suspected to compromise structural strength.

RECOMMENDATIONS:

1. Notify classification society of finding within 24 hours per applicable URs.
2. Schedule NDT survey (typically magnetic particle or dye penetrant on coating-removed area, plus ultrasonic on adjacent stiffeners) at next port call with NDT-qualified surveyor.
3. Inspect internal stiffener bay corresponding to impact location for paint cracking, distortion, or weld defects.
4. Document with calibrated photogrammetry or laser scan to enable comparison at next inspection (deformation progression is the key distinguishing factor for active damage).

## #4 Bow thruster tunnel rim, starboard

LIGHT | WITHIN 30 DAYS

| TIMESTAMP | TYPE | CONFIDENCE | FUEL IMPACT |
|---|---|---|---|
| 0:53 | COATING_DISBONDMENT | HIGH | 0-5% |

Coating blistering and edge disbondment around the starboard rim of the bow thruster tunnel, extending approximately 200 mm aft along the hull plating. Underlying steel visible in three small (<50 mm²) breakthrough sites. Adjacent coating shows colour mismatch consistent with prior touch-up that has not bonded reliably to the original system.

ROOT CAUSE

Combination of high local hydrodynamic loading at the thruster tunnel transition zone (turbulent flow during thruster operation) and inadequate surface preparation of prior touch-up — likely manual application without full Sa 2.5 blast preparation.

IF NOT ADDRESSED

Localised underfilm corrosion will progress at coating-substrate interface. Disbondment perimeter will expand; within 6–12 months substrate exposure will exceed self-protective oxide layer capacity and active corrosion will accelerate. At the thruster rim this also increases turbulence and local cavitation risk.

RECOMMENDATIONS:

1. Schedule local touch-up at next port call with proper surface preparation (minimum Sa 2.5, preferably with abrasive blast).
2. Use AF coating system compatible with adjacent original coating to prevent edge disbondment.
3. Re-inspect thruster tunnel rim at every subsequent in-water inspection — known recurrence point.

## #5 Sea-chest grating, port forward

MODERATE | WITHIN 30 DAYS

| TIMESTAMP | TYPE | CONFIDENCE | COVERAGE | FUEL IMPACT |
|---|---|---|---|---|
| 1:07 | SEA_CHEST | HIGH | 25% | 0-5% |

Approximately 25% of grating apertures occluded by mixed soft fouling (slime + filamentous algae) and isolated mussel attachments. Grating bars themselves show light surface corrosion but no structural deformation. Internal sea-chest condition not assessable from external inspection.

ROOT CAUSE

Sea-chest is a known biofouling 'niche area' per MEPC.378(80) §6.6 — recessed geometry traps organic matter and provides shelter from antifouling coating action. Reduced flow during port stays accelerates settlement.

IF NOT ADDRESSED

Continued occlusion will reduce sea-water cooling capacity for engine and auxiliaries. Threshold concern at >40% occlusion. Mussel growth may also detach during operation and enter intake systems, risking pump/heat-exchanger blockage.

RECOMMENDATIONS:

1. Clean sea-chest grating during next in-water cleaning operation. MEPC.1/Circ.918 capture requirements apply (calcareous content).
2. Document in Biofouling Record Book — niche area requires explicit attention per IMO §6.6.
3. Internal sea-chest inspection recommended at next drydock; consider grating mesh-size review if recurrent fouling pattern observed across fleet.

## #6 Stern tube seal area

LIGHT | WITHIN 30 DAYS

| TIMESTAMP | TYPE | CONFIDENCE |
|---|---|---|
| 1:18 | STERN_TUBE_SEAL | MEDIUM |

Trace oil sheen observed at three points on the water surface during stern-area inspection pass. Direct seal condition not visible due to propeller-area geometry, but pattern is consistent with low-rate leakage at the inboard seal. Volume estimated at <10 mL during the inspection observation window.

ROOT CAUSE

Possible seal lip wear or shaft surface degradation at sealing band — common at 12,000–18,000 operating-hour interval. Could also be operational-pressure transient if vessel was recently maneuvering before inspection.

IF NOT ADDRESSED

MARPOL Annex I Regulation 14 prohibits oil discharge to the sea. Even trace leakage from stern tube is a notifiable event in many jurisdictions. Untreated seal leakage typically progresses; cumulative discharge over 6–12 months can exceed reporting thresholds and trigger PSC inspection focus.

RECOMMENDATIONS:

1. Verify with engine-room oil-loss log and chief engineer; correlate with stern-tube oil consumption trend over preceding 90 days.
2. Schedule diver inspection of seal assembly at next port call; if confirmed leakage, plan seal replacement at next drydock.
3. Review stern-tube oil pressure setpoints; reduce if vessel is operating with elevated head pressure (DNV-GL CG-0044 guidance).
4. Document observation and corrective action; retain evidence for any future MARPOL inquiry.

## #7 Propeller blade tip, blade 3

LIGHT | MONITOR

| TIMESTAMP | TYPE | CONFIDENCE | FUEL IMPACT |
|---|---|---|---|
| 1:31 | PROPELLER_BLADE | HIGH | 0-5% |

Light edge erosion at the leading-edge tip region of propeller blade 3, extending approximately 80 mm radially inward from the tip. Erosion is uniform with no individual cavitation pits >2 mm. Other three blades show comparable wear consistent with normal operating cycle. No fouling on blade surfaces.

ROOT CAUSE

Tip cavitation under partial-load operating conditions, typical of vessels operating in transit speeds below design speed. Erosion rate is within normal envelope for the operating profile.

IF NOT ADDRESSED

Continued erosion will progress at characteristic logarithmic rate — manageable within next inspection cycle. No immediate propulsive efficiency impact at current state.

RECOMMENDATIONS:

1. No immediate action required. Re-inspect at next scheduled hull cleaning to track progression.
2. Consider blade-edge restoration during next drydock if erosion exceeds 5 mm depth at any point.

## #8 Anode block, midship starboard (typical of fleet)

LIGHT | NEXT DRYDOCK

| TIMESTAMP | TYPE | CONFIDENCE |
|---|---|---|
| 1:44 | ANODE_SACRIFICIAL | HIGH |

Sample anode block midship starboard estimated at 50% remaining mass — within typical service envelope at 18 months post-drydock. All other inspected anodes show comparable condition. No detached anodes or galvanic indicators of inadequate protection observed elsewhere on hull.

ROOT CAUSE

Normal galvanic consumption rate. Vessel operating profile (cargo trade with moderate port time in brackish waters) is consistent with observed wastage rate.

IF NOT ADDRESSED

Anodes are within remaining-life envelope for next drydock cycle. No corrective action required this inspection cycle.

RECOMMENDATIONS:

1. No action required. Plan full anode replacement at next drydock per existing schedule.
2. Maintain visual records to track wastage rate consistency across drydock cycles — sudden acceleration is the early indicator of CP system imbalance.

# RECOMMENDED ACTIONS

| 2 | 3 | 3 | 3 |
|---|---|---|---|
| Immediate | Within 30 days | Next drydock | Monitoring |

## & IMMEDIATE ACTION REQUIRED

- Notify classification society of bow shell-plating dent (IACS UR Z3/Z7).
- Verify stern-tube seal oil-loss trend with engine-room log; flag if elevated.

## %¶ WITHIN 30 DAYS

- Schedule in-water hull cleaning with capture at next port call (slime + barnacle removal, sea-chest grating).
- NDT survey of bow dent — magnetic particle on coating-removed area plus ultrasonic on adjacent stiffeners.
- Local touch-up of bow thruster tunnel rim coating with proper surface preparation.

## %Ë NEXT DRYDOCK

- Full antifouling coating reapplication; consider lower-friction or biocide-free system per destination jurisdiction.
- Stern-tube seal replacement if leakage confirmed.
- Full anode block replacement on schedule.

## ' MONITORING

- Re-inspect bow dent area at every subsequent in-water inspection — track any deformation progression.
- Re-inspect bow thruster tunnel rim — known coating-failure recurrence point.
- Track propeller blade tip erosion progression at next cleaning.

# COMPLIANCE SUMMARY

Inspection ID: sample-2026-05-04

Date: 04 May 2026

Vessel: MV Atlantic Pioneer

Areas Covered: Full hull — bow to stern, port and starboard; Flat bottom, midship port; Boot-top, bow port; Bow shell plating, port (~1m below WL); Bow thruster tunnel rim, starboard; Sea-chest grating, port forward

Analysis: Dual stage (Standard + Advanced) | AI-powered hull intelligence

## JURISDICTION COMPLIANCE

This report is structured to support IMO / GloFouling (MEPC.378(80)). Observations record extent and types (algae, slime, barnacles, mussels, tubeworms) and, where applicable, niche areas. Use in conjunction with vessel specific Biofouling Management Plan, PAR, or authority documentation as required by the jurisdiction.

# FULL COVERAGE INVENTORY (54 DOMAINS)

Every inspection covers the same 54 condition domains across 11 categories. Domains marked [if fitted] are vessel-type-specific and only flagged when present. Status reflects the worst severity observed across the inspection footage.

NONE — not observed | LIGHT — present, monitor | HEAVY — action required

## HULL SURFACE (8)

| | | | |
|---|---|---|---|
| Biofouling — soft growth | HEAVY | Biofouling — hard growth | LIGHT |
| Coating loss | LIGHT | Coating disbondment / underfilm corrosion | LIGHT |
| General corrosion | LIGHT | Pitting corrosion | LIGHT |
| Calcareous deposit (CP over-protection) | NONE | Recent paint touch-up | LIGHT |

## STRUCTURAL INTEGRITY (6)

| | | | |
|---|---|---|---|
| Impact damage | LIGHT | Structural fatigue cracks | NONE |
| Hull plate deformation / setdown | NONE | Loose / missing fasteners | NONE |
| Bilge keel attachment | LIGHT | Doubler plate / cement box | NONE |

## WELDED JOINTS (3)

| | | | |
|---|---|---|---|
| Weld crown defect | NONE | Weld root defect | NONE |
| Burning / repair scar | NONE | | |

## PROPULSION (9)

| | | | |
|---|---|---|---|
| Propeller blade condition | LIGHT | Propeller hub | NONE |
| Propeller boss cap / rope cutter | NONE | Shaft & shaft bracket | NONE |
| Stern tube seal | LIGHT | Bow thruster | LIGHT |
| Stern thruster | NONE | Azipod / azimuth thruster [if fitted] | NONE |
| Waterjet inlet/outlet [if fitted] | NONE | | |

## STEERING (3)

| | | | |
|---|---|---|---|
| Rudder blade | NONE | Rudder pintle / gudgeon / bearing | NONE |
| Steering nozzle (Kort) [if fitted] | NONE | | |

## SEA CONNECTIONS (4)

| | | | |
|---|---|---|---|
| Sea-chest gratings | LIGHT | Overboard discharge fittings | NONE |
| Sea suction strainer | NONE | Through-hull penetration | NONE |

## CATHODIC PROTECTION (3)

| | | | |
|---|---|---|---|
| Sacrificial anodes | LIGHT | ICCP system | NONE |
| Galvanic corrosion at dissimilar metals | NONE | | |

## APPENDAGES & SENSORS (4)

| | | | |
|---|---|---|---|
| Stabilizer fin [if fitted] | NONE | Sonar dome [if fitted] | NONE |
| Echo sounder / log / transducer wells | NONE | Acoustic window [if fitted] | NONE |

### COMPLIANCE MARKINGS (4)

| | | | |
|---|---|---|---|
| Draft marks | NONE | Load line (Plimsoll) marks | NONE |
| IMO number | NONE | Vessel name & port of registry | NONE |

### DAMAGE MECHANISMS (4)

| | | | |
|---|---|---|---|
| Erosion-corrosion (high-flow areas) | NONE | Stress corrosion cracking | NONE |
| Microbiologically influenced corrosion | NONE | Cavitation erosion (non-prop) | NONE |

### VESSEL-TYPE FEATURES (6)

| | | | |
|---|---|---|---|
| Moonpool [if fitted] | NONE | Heli-deck underside [if fitted] | NONE |
| Ice belt / ice knife [if fitted] | NONE | Air lubrication outlets [if fitted] | NONE |
| Bow / stern door underside [if fitted] | NONE | Other findings | NONE |

## AUDIT TRAIL & METADATA

Report ID: sample-2026-05-04
Generated: 04/05/2026, 12:00:00
Input Hash: sample-input-hash-placeholder
Output Hash: sample-output-hash-placeholder
Analysis: dual-stage (Standard + Advanced)

Video: 2m 12s | 3840x2160 | 30 fps

Hull Section: Full hull — bow to stern, port and starboard

### USER ANNOTATIONS (2)

0:41 — Class notification required
1:18 — Cross-check engine room log