Silversea Cruises Ltd.

Environmental Impact Assessment
For Ship-Based Tourism

Multi-year Assessment

MS SILVER EXPLORER

01 March 2014 through 01 March 2024

Revised 08 May 2016

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1. CONTACT DETAILS

This document was prepared by an outside consultant. It is the responsibility of the Expedition Organizer to ensure compliance with the activities outlined in this assessment.

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Ms. Wheatley has been active in the expedition cruise industry since 1986 and has participated in well over 150 sea voyages to remote destinations around the world including all seven continents. She has authored a number of Environmental Impact Assessments and is sought after for her expertise with regulatory matters and for planning ship operations in remote and sensitive sea areas.

2. NON-TECHNICAL SUMMARY

This multi-year environmental impact assessment (EIA) has been compiled by Silversea Cruises Ltd. to evaluate environmental aspects of their planned worldwide operations of the MS Silver Explorer for the next ten years, from 01 March 2014 through 01 March 2024 to ensure compliance with requirements under international and national laws and regulations in the areas the vessel will visit.

Information on relevant laws, regulations and/or guidelines not specifically noted here will be elaborated upon in destination-specific Addendums to this assessment (if necessary). (Refer Section 13.)

Where applicable, permit applications have been submitted to the appropriate national authority/ies and are available upon request. Copies of any applicable permits will be carried on board the vessel.

As part of the company's standard operating procedures, annual updates in regards to proposed activities for future seasons will be submitted, if required, to the appropriate authorities in advance of each season.

2.1 Description of the Proposed Activity

The proposed activity, conducted aboard the MS Silver Explorer, a small expedition ship carrying 132 passengers, includes a series of voyages operated each year to destinations around the world. Activities feature a combination of on board and off ship activities with the goal being to provide a well-rounded educational experience. Activities include educational presentations, shore landings and Zodiac cruising.

Shore landings will be limited to not more than 132 passengers ashore at one time at any one landing site unless a lower number is called for in any applicable regulations, guidelines and/or site guidelines.

Operations have been planned to be fully self-sufficient, with activities managed by experienced officers, crew and expedition staff and to be within the search and rescue (SAR) capability of the Expedition Organizer, including for medical evacuation, if required. Details are elaborated upon in Section 3.3.12.

This assessment has considered the range of activities as disclosed by the Expedition Organizer at the time of submission. New activities will be elaborated upon as information becomes available and the details advised in updates as appropriate. Any activities not assessed are the responsibility of the Expedition Organizer.

A list of acronyms used can be found in Section 12.

2.2 Alternatives

Six alternatives have been considered:

- Changes to itinerary,
- Changes to sites visited,
- Changes to number of passengers,
- Changes to vessel used,
- Changes to Zodiac usage, and
- Alternative of not proceeding with cruise program.

None of these alternatives are justified and all have been rejected for environmental, logistic or commercial reasons.

2.3 Assessment of Potential Impacts

Likely impacts resulting from the proposed activity have been assessed. This includes consideration of emissions to air; fuel and oil spills; waste; noise; physical disturbance; introduction of alien species and translocation of diseases; and associated and dependent ecosystems. Cumulative impacts of the proposed activity have also been considered.

2.4 Minimization and Mitigation

This assessment includes a description of measures to minimize and mitigate potential impacts of the proposed activity. The possibility of potential impacts will be minimized by strict adherence to applicable international and national laws and regulations, company policies and standard operating policies; careful pre-trip planning and preparation; briefings; and supervision and monitoring of activities in the field by experienced personnel.

2.5 Conclusion

Direct, indirect and cumulative impacts of the proposed activity have been considered, as have alternatives. Provided that minimization and mitigation measures are adhered to, it is concluded that the proposed activity will have less than a minor or transitory impact on the environment to be visited, including associated and dependent ecosystems, and that the activity should be authorized/permitted to proceed.

3. INTRODUCTION AND BACKGROUND

The Expedition Organizer has undertaken this assessment to document and assess the planned activities by Silversea Cruises Ltd. of the MS Silver Explorer during a ten-year period, 01 March 2014 to 01 March 2024 and to widely circulate the assessment to appropriate national authorities in the destinations to be visited.

In addition to also ensuring compliance with international and national laws and regulations, this assessment has been prepared to meet with general obligations under company-specific guidelines, standard operating procedures, and shipping requirements in general.

3.1 Company Description

Silversea is a cruise company reflecting generations of maritime and travel experience. In the early 1990s, the Lefebvre family of Rome, former owners of Sitmar Cruises, conceived and organized a unique cruise company pledging to build and operate the highest quality ships in the ultra-luxury segment. The name "Silversea" was chosen because it connotes quality and luxury as well as capturing the romance and special sensations of the sea.

Silversea launched its first ship, MS Silver Cloud, in 1994, followed by MS Silver Wind in 1995, MS Silver Shadow in 2000 and MS Silver Whisper in 2001. The fleet was purpose-built for the ultra-luxury market, establishing a new class of smaller, intimate vessels that could slip into more exotic ports off the beaten path. These elite vessels were specifically designed for fewer guests, more space and the highest levels of personalized service, delivered by mainly Italian and other European officers overseeing an International staff. All-ocean view suites, most with private veranda, and open seating dining options so guests dine when, where and with whom they desire, add to the very special ambiance created onboard. But what is also unique is that they incorporate the favorite amenities found on larger ships, such as an elaborate show lounge featuring nightly entertainment, casino, spa and state-of-the-art fitness facility.

Silversea entered the expedition market with the launch of its expedition ship, the MS Silver Explorer (ex Prince Albert II). The Lloyd's Register 1A ice-rated vessel is purpose-built for expedition cruising and recently underwent an extensive multimillion-dollar renovation at the Fincantieri shipyard in Trieste, Italy. To ensure the ship would deliver an expedition cruise experience consistent with Silversea's award-winning luxury standards, the refurbishment included exterior design modifications, state-of-the-art technological enhancements and a comprehensive upgrade of all guest accommodations and public spaces. After the ship's refit, the ice-class vessel carries a reduced number of guests, only 132 in 66 ocean-view accommodations, with many featuring private verandas. With staterooms and suites ranging from 180 to over 600 square feet, the ship provides some of the largest accommodations of any expedition ship. Eighteen suites each feature more than 400 square feet of luxury. Guests aboard Silversea's MS Silver Explorer are inspired by the varied and constantly adapted itineraries that make the most of the natural opportunities created by the landscapes around them. The ship operates in Antarctica from November through March each year, with an extensive program of exploration in the Arctic (Canada, Greenland and Svalbard) between June and September with exceptional voyages in South America, Africa and British Islands in between.

In December 2009, Silversea took delivery of its newest ultra-luxury vessel, MS Silver Spirit. At 36,000 tons, and accommodating just 540 guests, this intimate ship has the largest suites in the Silversea fleet -- with 95% featuring a private veranda -- and one of the highest space-to-guest ratios at sea today. The onboard decor lends a sophisticated 1930s Art Deco ambience to the public spaces, highlights of which include an indoor/outdoor spa measuring over 8,300 square feet (770 square metres), a resort-style pool, four whirlpools, and a choice of six dining venues including Seishin, showcasing Asian-fusion cuisine, and the innovative Stars Supper Club, offering trendsetting menus and all-night entertainment.

In June 2012, Silversea purchased Canodros S.A., the premier Ecuadorian tourism company that operates in the Galápagos Islands, and their up market expedition ship, MS Galapagos Explorer II. In late September 2013, the all-suite, 100-guest ship joined the company's expedition fleet as MS Silver Galapagos, following a major stem-to-stern refurbishment. All public spaces and guest suites have been refreshed with new upholstery, carpeting, curtains, and wall treatments. Each suite is highlighted by a totally renovated bathroom, enhanced with rich marble detailing. Besides a new walk-in rainforest shower, each bathroom features a new vanity, shelving, mirrors, lighting fixtures, and wood flooring. Plus, all guest suites have been outfitted with new flat screen TVs, new mattresses (custom-made exclusively for Silversea), and luxurious Pratesi bed linens. Other ship enhancements include the installation of Wi-Fi access throughout the ship (including all suites) and a new complimentary service providing streaming movies and live television news broadcasts for guests to enjoy on their portable devices. And rounding out the renovations are a new fitness centre, massage room, beauty salon, outdoor Jacuzzi, outdoor furniture, and Silversea's signature outdoor dining venue, The Grill.

MS Silver Discoverer (ex-Clipper Odyssey) joined the expedition fleet in 2013. She recently underwent a major refurbishment prior to entering service on 1st March 2014 and will consist of five suite categories. She can accommodate up to 128 guests and has extensive facilities on board including 10 Zodiac boats; SCUBA and snorkeling equipment (Tropical waters); a swimming pool; a gym and beauty salon; a restaurant and pool grill; a lecture room for in-depth presentations and briefings about the destinations and a panoramic lounge.

Silversea caters to the cosmopolitan world traveler with its main office in Miami, FL, USA and sales and reservation offices in the UK, Germany, Australia, Singapore and Ecuador.

For her Antarctic operations, Silversea Cruises Ltd. is a (full) Member in good standing of the International Association of Antarctica Tour Operators (IAATO) (http://iaato.org/home), having joined the Association in 2008. Silversea's Director Expedition Planning & Strategic Development (Conrad Combrink) is an IAATO-certified Expedition Leader for Antarctica and South Georgia. The company also requires members of their Expedition Team to be IAATO-certified at an appropriate level (Expedition Leader or Expedition Guide) based upon the position hired for. IAATO's online assessment tests the working knowledge of field staff as to the contents of the Field Operations Manual (FOM). The intent behind this service is to provide a free-to-the-user training mechanism for new field staff to test their knowledge of matters relevant to Antarctic guiding. The online assessment also serves as a mechanism for established field staff to refresh their knowledge and ensure they are familiar with new information prior to the season commencing. While the certification program is specific to Antarctica and South Georgia, it provides a framework for operating in Polar Regions in general and gives a basis for work in other Sub-antarctic regions (such as Macquarie Island and/or the New Zealand Sub-Antarctic) and also other remote destinations where environmental protection is paramount.

For Arctic operations, the company is also a (full) Member in good standing of the Association of Arctic Expedition Cruise Operators (AECO) (http://www.aeco.no/) having joined the Association in 2008.

The management teams at Silversea as well as its management partners are all highly experienced in cruising to Antarctica, the Sub-antarctic (South Georgia) and to remote destinations throughout the Arctic with the MS Silver Explorer. As of the submission of this document, since the MS Silver Explorer's inaugural season in 2008-09, over 90 trips to the Polar Regions and 155 voyages worldwide have been operated, all without environment incident of any kind and, to the best of the company's knowledge, without adverse environmental impact on the environment.

Destination-specific information (if applicable) follows in an Addendum to this EIA.

3.2 Vessel Specifications

The technical specifications of the vessel are as follows.

Vessel Name	Silver Explorer
AIS	Furuno FA 150
Antarctic Trips Since Year	2008
Anti-fouling Certificate	Yes
Approved SOPEP	Yes
Auxiliary Engine	Wartsila 2x 870 kw
Ballast Amount – Normal Operation (m. ton)	140
Ballast Capacity (m. ton)	338 t (1.025)
Ballast Exchange Frequency - Antarctica (days)	Infrequent
Ballast Exchange Frequency - Normal Operation (days)	Infrequent
Ballast Water Management Plan	Yes
Bilge Water Holding Capacity (cbm)	9.5
Bilge Water Holding Capacity (days)	30
Black Water Management Plan	no direct discharge
Black Water Capacity (cbm)	4.3
Black Water Capacity (hours)	72
Boiler	2x Wiesloch 900kw
Breadth (m)	15.6m
Call Sign	C6TA8
Category	IAATO Category 1 (13 - 199 passengers)
Certified Black Water Treatment Plant	Yes
Certified Oily Water Separator (OWS)	Yes
Certified OWS with 15ppm Alarm & Automatic Shut-Off	Yes
Class Notation	Lloyds Register +100 A1 PASSENGER SHIP, ICE CLASS 1A FS at a draft 4.511m
Code	PLB
Crew Capacity	120 (inclusive of 11 Expedition Staff) *
Damage Control Equipment	Yes
Deadweight, Normal Operation (m. ton)	750.0
Description	Stores, fuel, water, sewage, etc.
Diver & Equipment for Polar Waters	Yes
Draft Max (m)	4.51 m
Echo Sounder 1,2,3, etc	2
Echo Sounder Transmission Power and Frequency	50 Khz/200 KHZ
Echo Sounder Type	Furuno Fe-700

Email	seexpeditionleader@silversea.com secaptain@silversea.com
Emergency Medical Evaluation Response	Yes
Fax	870783903113
Fresh Water Capacity (cbm)	282
Fresh Water Consumption (cbm/24 Hrs)	80.0
Fresh Water Production (cbm/24 Hrs)	170.0
Fuel Consumption per 24 Hrs - Max (m. ton)	25
Fuel Consumption per 24 Hrs - Normal Cruising (m. ton)	20
Fuel Consumption per 24 Hrs - Penetrating Ice (m. ton)	Tba
Gas Oil (GO) Capacity - Normal Cruising (m. ton)	460 MT (85%)
GMDSS Area	A1, A2, A3, A4
Grey Water Capacity (cbm)	192
Grey Water Capacity (days)	2.4
Gross Tonnage	6130.0
Heavy Fuel Oil (HFO) Capacity - Normal Cruising (m. ton)	Capacity 578.5, however HFO is not used in Antarctica and the Arctic. See HFO Specification below for details.)
Helicopter Deck	Nil
Helicopters On Board	Nil
HFO Specification, Grade (IFO 380, IFO 180, >IFO, etc.)	IFO 180 + MGO
HFO Storage Tanks (Type & Location)	Double bottom, forward, middle, aft
Hydrographic Work	to be advised
IAPP Certificate	Yes
Ice Class	A1 FS + LMC / Lloyd's Register
IMO Number	8806747
Incinerator Burning Temperatures	850-950 deg C
Incinerator Capacity	Yes
Incinerator Frequency of Use	No
Incinerator Used in Antarctica	No
IOPP Certificate	Yes
Length Overall (m)	108.0m
Length pp (m)	95.95m
Life Boats	2 (partly enclosed), 150 persons each
Lubricating Oil Capacity - Normal Cruising (m. ton)	29
Lubricating Oil Storage Tanks (Type & Location)	Aux Engine room, elevated tanks
Main Engine	6R32 Wartsila
Marine Diesel Oil (MDO) Capacity Normal Cruising (m. ton)	500 M3
Member of AECO	Yes
Member of IAATO	Yes
Member of Other	
MMSI	311562000

Morgue facilities	Nil
Name	Silver Explorer
Net Tonnage	1839
Number of Doctors onboard	1
Number of hospital beds	1
Number of Nurses or other medical staff onboard	0
Number of Zodiacs/Landing Craft	10
Oil Record Book	Yes
Oil Spill Containment Equipment	Yes
Oil Spill Response Company	Yes
Operate in the Arctic	Yes
Operator Name	Silversea Cruises Ltd.
Owner Name	Hammonia Adventure and Cruise Shipping Company Limited
P&I Insurance (Amount in USD)	3 billion
Passenger Capacity	132 (maximum of 130 to be carried in Antarctica / maximum of 128 in the Arctic (where bear guards are used) *
Pollution Liability Insurance (Amount in USD)	1,000 million
Port/Country of Registry	Bahamas
PSSC Total # of Persons	280*
Remarks	130 crew and 150 passengers as per PSSC
Sel-Call	N/A
Sludge Oil Holding Capacity (cbm)	20.5
Sludge Oil Holding Capacity (days)	30.0
Sonar	Yes. Model "Wesmar EV 850 Navigation & Security Sonar" (forward facing sonar)
Sonar Transmission Power and Frequency	Transmission power = 1000 watts. Frequency = 110 kilohertz
Sonar Type	No
Speed – Max	14.0
Speed - Normal Cruising	11.0
Status	Full
Telephone/Telefax/Emergency Phones	VSAT: 00 1 954-672-2451 INMARSAT: 00 870 773 169 832 00 870 773 169 833 IRIDIUM: 00 8816 777 01220 (main ship number) 00 8816 2141 4856 and 00 8816 2141 4857 (mobile Iridium numbers – turned on with advance notice) 00 8816 777 01391 (Iridium Phone – Radio Room)

	881 621412794 and 881 621412796 (Iridium Phone for Emergency Purposes/Lifeboats) OTHER: 200059 (Satcom BGAN 1) 870 773200061 (Satcom BGAN 2) 870 783 903113 (BGAN 1 Fax)
Telex	431100222, 431100223 (Inmarsat C)
Type	Ship
Under Water Welding Facilities	No
Untreated Grey Water Discharged Directly Overboard (cbm/hours)	no direct discharge
VDR	Furuno
Waste Management Plan	Yes
X-ray equipment	No
Year Built	1989
Year(s) Rebuilt	2008

Details of all life-saving equipment carried on board (i.e. number and capacity of life rafts, number of survival suits, life jackets, EPIRBS, SARTs, pyrotechnics, etc.) are as follows:

4 pcs.	Life Rafts - 25 persons each
2 pcs.	Life Boats - 150 persons each (partly-enclosed)
17 pcs.	Immersion Suits
447 pcs.	Adult Lifejackets
28 pcs.	Children's Lifejackets
10 pcs.	Infant Lifejackets
2 pcs.	Emergency Position Indicating Radio Beacon (EPIRB)
3 pcs.	Survival Craft Portable Radio
20 pcs.	Lifebuoys
4 pcs.	Line Throwing Apparatus
12 pcs.	Rocket Parachute Flares (Bridge)

Additionally, for auxiliary boat operations using the Zodiacs (see auxiliary equipment below) there are 114 pcs. XINGTAI 107 and REVERE 7 brand lifejackets available. In addition there are 180 pcs. Secumar-brand Golf Twin inflatable lifejackets for guests available.

Auxiliary equipment to be used to support the proposed tourism activities includes:

Type of Craft:	Mark V brand Zodiac inflatable boats
Number of Craft:	8 total (for 12 persons each)
Engines / Fuel Type:	8 Suzuki-brand 60 HP 4-stroke electronic outboard gasoline-powered engines plus three spare engines for back-up/spares
Intended use:	To facilitate shore landings and short sightseeing excursions

Type of Craft:	Mark VI brand Zodiac inflatable boats
Number of Craft:	2 total (for 16 persons each)
Engines / Fuel Type:	2 Suzuki-brand 70 HP 4-stroke electronic outboard gasoline-

	powered engines plus two spare engines for back-up/spares
Intended use:	To facilitate shore landings and short sightseeing excursions

Additional information, including details on the vessel's certification, can be found in Section 6.2.

In regards to communications, further to the information above, the Silver Explorer is equipped with a GMDSS Radio Station, which is authorized to operate in areas A1, A2, A3. The ship is also equipped with VHF radiotelephony and Air Band VHF Radio telephones. Additionally, the vessel is fitted with an Iridium phone.

MS Silver Explorer is equipped with one Integrated Bridge Navigation and not fully implemented Electronic Chart Display System (ECDIS) that includes Automatic Radar Plotting Aids (ARPA) radars, Chartpilots and Multipilot at three conning stations.

The following equipment is also part of the navigation bridge:

- 2 independent DGPS positioning systems
- 1 GPS positioning system
- 1 Forward Facing Sonar - Wesmar Model "EV 850 Navigation and Security Sonar" (110-8 with FT-8 Hydraulic Hoist)
- 1 Automatic Identification System (AIS)
- 1 Doppler Speed Logs
- 1 Echosounder system with forward transducers
- 1 Long Range Identification and Tracking (LRIT) system
- Weather station consisting of wind, temperature and humidity sensors
- Voyage Data Recorder
- 2 Searchlights remotely operable
- 1 NAVTEX

Weather and ice information is obtained by the ship through government and private services by means of telex, voice, internet and e-mail communications. The vessel subscribes to a private weather information service, which sends updated weather daily by e-mail providing current weather, sea conditions and forecasts for up to ten days. Additional ice information can be requested as well as a ship's routing service.

The hull on MS Silver Explorer is ice-strengthened (see above). The expedition itineraries are limited to areas where conditions are suited to the qualifications of the vessel.

All Silversea Cruises Ltd. ships frequently operate in areas that are three to five days distance from land support. This is exceeded on a routine basis with the Antarctic, Sub-antarctic and Arctic operations of the MS Silver Explorer, as is also the case with the MS Silver Discoverer when operating to the New Zealand and Australian Sub-antarctic. Thus, the ships are staffed and equipped to handle most medical emergencies. Details on medical equipment and a list of medications are available upon request. Stabilizing medical care can be provided until patients are safely disembarked to a land facility offering equal or superior care. Medical staff includes one doctor experienced in Emergency Medicine who is on call 24 hours a day. The doctor and ship's command are experienced in arranging air ambulance transfers for critical patients. The vessel does not have on board helicopters or landing platforms, nor are any facilities on board to refuel aircraft. Consequently, air evacuations can only be done when the ship is close enough to land at a site where there is a landing strip so that the aircraft can reach the ship and return with its own fuel supply.

In compliance with Regulation V/7.3 of SOLAS, all Silversea vessels have on board a Plan for Cooperation with Search and Rescue (SAR) services in the event of an emergency. SAR cooperation planning enables the early and efficient establishment of contact in the event of emergency between a passenger ship, its operator's shore based emergency response system, and shore side SAR services.

Each of Silversea's insurers likewise has regional correspondents capable of arranging assistance in the event of a vessel emergency.

3.3 Vessel Operations

3.3.1 In General

Details of the proposed activity are outlined in Section 4. The ship's technical specifications may be found in Section 3.2.

As noted in Section 3.2, to facilitate shore landings and Zodiac tours (where no shore landing is made), the vessel is outfitted with eight Zodiac-brand Mark V HD inflatable boats and two Zodiac-brand Mark VI HD inflatable boats that will be employed during short sightseeing excursions and for shuttling passengers and Expedition Team members to/from shore for landings. An experienced mechanic is on hand for servicing the engines. Zodiac drivers are experienced individuals from the expedition team, including the majority of the lecture team, however crew (from the deck department primarily) may also be utilized on occasion, e.g. for shuttling purposes. Expedition Team members piloting the Zodiacs must complete a Competency Test before being issued a ship-issued certificate. Standard operating procedures are in effect through the company's Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations (ref. Appendix 12.1).

Utilizing the MS Silver Explorer, a vessel with years of worldwide cruising experience, along with an experienced ship's command, bridge team, senior officers and crew and a highly-experienced expedition team will enable the Expedition Organizer to safely conduct these voyages to the highest standard of environmental protection possible. Ship's command, including experienced masters and international mates and engineers, have prior shipboard experience including navigation in and around the areas to be visited as well as knowledge of the areas and landing sites to be visited. Biographical sketches for the Masters and the Expedition Leaders are available upon request.

3.3.2 Relevant Laws and Regulations

3.3.2.1 In General

Itineraries of the MS Silver Explorer will comply with all applicable requirements for ensuring the preservation of wildlife and to conform with any national laws or regulations applicable to tourism operations.

Information on relevant laws and regulations not specifically noted here will be elaborated upon in destination-specific Addendums to this assessment (if applicable). (Refer Section 13.)

3.3.2.2 Applicable Marine Legislation

Activities will be carried out in accordance with applicable marine legislation that applies to virtually all ships at sea, and applicable domestic statutes and regulations, including the U.S. Marine Mammal Protection Act (http://www.nmfs.noaa.gov/pr/laws/mmpa/) and U.S. Endangered Species Act (http://www.fws.gov/laws/lawsdigest/esacdt.html).

A list of all International Maritime Organization (IMO) Conventions, including related protocols, may be found at: http://www.imo.org/About/Conventions/ListOfConventions/Pages/Default.aspx.

Additional information can be found in Section 6.2.

3.3.2.3 Safety of Vessels

Safety of vessels includes marine obligations under:

- International Agreement Concerning Safety of Life at Sea (SOLAS) through the International Maritime Organisation (IMO) (http://www.imo.org)
- International Management Code for the Safe Operation of Ships (ISM Code) (http://www.classnk.or.jp/hp/SMD/ism/pdf/ismcode/ISM_CODE_rev20100701e.pdf)
- International Convention on Loadlines, 1966, amended, including the Protocol of 1988 relating to the International Convention on Loadlines, 1966 IL PROT 88 (http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-on-Load-Lines.aspx),

Further assurance of compliance with vessel safety standards is provided through the various classification societies (e.g. American Bureau of Shipping, Bureau Veritas, Det Norske Veritas, Germanischer Lloyd, Lloyd's Register, Registro Italiano Navale (RINA), Russian Maritime Register of Shipping, etc.). These societies set technical standards (design, construction and periodic survey of vessels) and provide a certificate of classification to a vessel once all standards have been met.

The MS Silver Explorer is classified under Lloyds Register (http://www.ir.org/).

Additional information can be found in Section 6.2.

3.3.2.4 Safe Vessel Operations

International marine legislation to deal with safe vessel operations includes:

- International Labor Organization's Maritime Labor Convention, 2006 (MLC, 2006) (http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:91:0::NO::P91_ILO_CODE:C186)
- International Labor Organization ILO Convention 147 (http://www.admiraltylawguide.com/conven/minstandards1976.html)
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention), 1978 as amended in 1995 (http://www.imo.org/OurWork/HumanElement/TrainingCertification/Pages/STCW-Convention.aspx)
- Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 72) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/COLREG.aspx)
- ISM Code (International Management Code for the Safe Operation of Ships) (http://www.imo.org/OurWork/HumanElement/SafetyManagement/Pages/ISMCode.aspx)
- IACS (International Association of Class Societies) (http://www.iacs.org.uk/)
- International Convention on Tonnage Measurement of Ships, 1969 (Tonnage 69) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-on-Tonnage-Measurement-of-Ships.aspx)
- IMO International Ship and Port Facility Security Code (ISPS Code) (http://www.imo.org/OurWork/Security/Instruments/Pages/ISPSCode.aspx)

Since 1998, SOLAS has required companies and vessels to implement an International Safety Management (ISM) system (see ISM code above). The system must encompass the following:

- Adoption of a safety and environmental policy;
- Instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag state legislation;
- Defined levels of authority between ship personnel and shore management;
- Procedures for reporting incidents;
- Procedures to prepare for and respond to emergency situations; and
- Procedures for internal audits and management reviews.

The system requires a formal, institutionalized system of continuing management to ensure that a high level of safety is achieved and takes accident prevention beyond mere compliance with standards and rules.

V.Ships Leisure SAM, as manager of the MS Silver Discoverer's technical (Deck and Engine) services for the vessel, has in place an Integrated Management Systems Manual (IMS) to accomplish goals and objectives under the

company's Occupational Health, Safety, Environmental and Quality Management System (OHSEQ). The IMS describes in principle all activities related to ship management including, but not limited to, quality, occupational health, safety and environmental protection. The IMS also addresses the requirements of the ISO 9001, ISO 14001 and OSHSAS18001 Standards, along with the ISM Code and is the collection of all environmental policies; procedures and training for every significant environmental aspect generated by a cruise ship and covers all the elements that impact the marine environment (air, water, land, use of resources). Details are provided in Section 6.2.

3.3.2.5 Emergency Response Action

Despite prevention measures, emergency response procedures need to be in effect to deal with emergency situations and potential accidents. Measures include:

- International Convention on Maritime Search and Rescue (SAR), 1979 (IMO) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-on-Maritime-Search-and-Rescue-(SAR).aspx)
- Guidance to Recovery Techniques Using Equipment Currently Available (MSC Circular 1182) (IMO) (http://www.uscg.mil/hq/cg5/cg534/MassRescueOps/IMO%20-%20Guide%20to%20Recovery%20Techniques%20(MSC%201%20Circ%201182)%2031%20May%202006.pdf)
- Enhanced Planning for Passenger Ships Operating in Areas Remote from SAR Facilities (MSC Circular 1184) (IMO) (http://www.imo.org/KnowledgeCentre/PapersAndArticlesByIMOStaff/Documents/International%20requirements%20for%20ships%20operating%20in%20polar%20waters%20-%20H.%20Deggim.pdf)
- Global Maritime Distress and Safety System (GMDSS), 1988 (IMO under SOLAS), mandatory for passenger vessels as of 1999 (http://en.wikipedia.org/wiki/Global_Maritime_Distress_and_Safety_System)

3.3.2.6 Environmental Safeguards

Measures designed to provide environmental safeguards include:

- MARPOL 73/78 – International Convention for the Prevention of Pollution of Ships (1973, modified by the protocol of 1978) (IMO), frequently amended with additional updates (http://www.imo.org). Current Annexes include:
    - Annex I: Oil Pollution
    - Annex II: Chemical Pollution
    - Annex III: Hazardous Materials on Packaged Form
    - *Annex IV: Sewage
    - Annex V Garbage from Ships
    - Annex VI: Air Pollution from Ships

  *Note: Sewage discharges from ocean going ships are in many instances regulated by port states, such as the United States of America. Reference 33 CFR 159.
- International Convention on the Prevention of Pollution by Dumping of Wastes and Other Matter (1972) and its 1996 Protocol (in force 2006) which supplements the provisions of MARPOL 73/78 (IMO) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx)
- International Convention on Oil Pollution Preparedness, Response and Cooperation (in force 1995) (IMO) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-on-Oil-Pollution-Preparedness,-Response-and-Co-operation-(OPRC).aspx)
- Protocol on Preparedness, Response, and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (in force 2007) (IMO) (http://www.imo.org/About/Conventions/ListOfConventions/Pages/Protocol-on-Preparedness,-Response-and-Co-operation-to-pollution-Incidents-by-Hazardous-and-Noxious-Substances-(OPRC-HNS-Pr.aspx)
- International Convention on the Control of Harmful Anti-fouling Systems on Ships - IMO Systems Convention (SFS/CONF/26) (http://www.imo.org/OurWork/Environment/Anti-foulingSystems/Pages/Default.aspx)

NOTE: Operations in Canadian Arctic water will be in accordance with Canadian legislation, which takes precedent.

3.3.3 Oil and Oily Mixtures

The vessel is in compliance with international standards. In addition, the vessel carries an approved Shipboard Oil Pollution Emergency Plan (SOPEP) to prevent oil pollution at sea as required under MARPOL.

No oil or oily mixtures will deliberately be discharged into the seas. All sludge, dirty ballast, tank washing waters and other oily residues and mixtures will be retained on board in a special holding tank for discharge at reception facilities or as otherwise permitted under Annex I of MARPOL 73/78. Discharge ashore (once the vessel has return to port) is the preferred method of disposing of these wastes.

Limited oil spill contingency response equipment is carried on board; officers and crew are trained in emergency response procedures.

3.3.4 Garbage

The vessel fully complies with regulations under the International Convention for the Prevention of Marine Pollution (known as MARPOL) under MARPOL 73/78, Annex V, Rule 9, adopted on July 10, 1996. This resolution elaborates rules for garbage handling under MARPOL for solids, food waste, plastics and other garbage.

The master is mandated to relay to officers, crew and the Expedition Team the ship's garbage handling policy in order to ensure that MARPOL requirements and guidelines are met.

Crew members, under the Captain's responsibility, are required to separate all garbage by type in color-coded bins. Solid matter, plastic, and food garbage is separated into separate containers for disposal. When discharged, a log is kept by color code as to what was discharged and where.

MARPOL totally prohibits the discharge of plastics at sea so all plastic products will be retained for proper disposal ashore.

Food waste will be stored until it can be released or off-loaded to a suitable reception facility. There will be no disposal of poultry products less than 12 nautical miles from land or ice shelves (if applicable). No poultry products will be taken on land, introduced into the water or onto the ice (if applicable) to avoid the spreading of the Infectious Bursal Disease Virus. (Refer also to Section 6.9.2.)

Battery disposal boxes are kept by the Hotel Director, in the engine room, and by deck department personnel and also by the electrician for proper disposal. Passengers, the Expedition Team, and crew are advised of the need to utilize the battery boxes for disposal purposes and urged to turn in any expired batteries at the Reception for collection by the Hotel Director. Should this fail; garbage is then sorted by the cabin attendants and batteries collected prior to the other garbage being sorted by type and bin. The provision master is responsible for collecting and arranging for disposal of all batteries. In addition, all electronic devices containing special chemicals, e.g. toner cartridges, printer cartridges, etc. are also collected for proper disposal ashore.

3.3.5 Sewage

The vessel is in compliance with MARPOL 73/78, according to Appendix V, Rule 9.2 and also MARPOL 33/38, Appendix IV, Rule 3. All sewage, gray water and kitchen sink water is stored in tanks until it can be processed. The treatment plant chlorinates and flocculates sewage, separating solids and liquids. All treated liquid waste will be discharged at a speed of no less than four knots when the ship is more than 12 nautical miles from the coast or ice shelves (if applicable). Sewage sludge is disposed of ashore, once the ship is back to port.

3.3.6 Ballast

The vessel operates in accordance with MARPOL Resolution A.868 (20) (adopted 27 November, 1997). The Company will ensure that ship's command is aware of and will comply with international guidelines for preventing the introduction of unwanted aquatic organisms and pathogens from ship's ballast water and sediment discharges and the related Practical Guidelines adopted by the IMO.

3.3.7 Stack Emissions

The vessel burns marine gas oil. There are no heavy oil bunkers. There are insignificant stack emissions from the vessel into the atmosphere to cause any kind of direct or indirect impact. While burning fuel the ship will produce normal amounts of hydrocarbon, heat and trace chemical emissions. The emissions will be a function of the types and quantity of fuel burned. Impacts to air quality will be no more than minor or transitory as well as local.

3.3.8 Avoidance of Harmful Interference with Biota

To avoid harmful interference with biota, standard operating procedures are in place. In normal circumstances the vessel will not ordinarily approach the landing sites closer than 1500 feet (500 metres), following recommendations for vessels in the wildlife watching guidelines established by the International Association of Antarctica Tour Operators (IAATO). While IAATO is an Antarctic association, these guidelines provide an excellent framework for responsible vessel and small boat operations around marine wildlife in any ocean. These guidelines are as follows:

- General Wildlife Watching Guidelines: (http://iaato.org/documents/10157/19699/5e+i+General+Wildlife+Watching+Information.pdf/29d99a22-ed79-4824-9f91-2de5dfce1d07)
- Cetacean Watching Guidelines (http://iaato.org/documents/10157/19699/5e+ii%29%20IAATO+Cetacean+Watching+Guidelines.pdf/73043f71-28df-4732-aa4c-de93bbf5bbf8)
- Seal Watching Guidelines (http://iaato.org/documents/10157/19699/5e+iii%29%20IAATO+Seal+Watching+Guidelines.pdf/c0873aa4-9d52-4ffe-a40e-c8356d62188e)
- Bird Watching Guidelines (http://iaato.org/documents/10157/19699/5e+iv%29%20IAATO+Birdwatching+Guidelines.pdf/039e2b3d-fa6f-45bb-a6b5-10e7337f390a)

The vessel will encounter marine mammals and seabirds. Whale watching is an exciting experience and ship's command and the Expedition Leader will actively search for marine mammals to show passengers these animals at sea, with a primary focus on large baleen whales and orcas. In these instances, the vessel is instructed to follow the applicable IAATO guidelines (see above) to ensure operations do not have an impact on the animal. The aim is to allow passengers to view wildlife from the decks of the ship by reducing speed, holding a steady course (unless some course changes are necessary) and maintaining a prescribed distance from the animal (300 feet/100 meters is recommended). All efforts will be taken to avoid disturbance.

For Arctic operations, the Association of Arctic Expedition Cruise Operator is in the process of developing a similar set of guidelines (to IAATO) for guidance to operators in the North. As of summer 2016 the only set of guidelines posted available was a set of guidelines to minimize impacts around walrus: http://www.aeco.no/guidelines/wildlife-guidelines/. In the meantime, IAATO's guidelines provide general guidance as do the National Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada available from Environment and Climate Change Canada (www.ec.gc.ca).

Through an initiative led by BirdLife International (www.birdlifeinternational.org), simple practical guidelines have been established to minimize the likelihood of seabirds landing on vessels and to provide guidance on handling stranded birds. Seabirds land on vessels every year. Although the seabirds usually survive the initial impact, they can become hypothermic if they become waterlogged. These incidents occur most frequently during hours of darkness

and usually during nights of poor visibility (snow, fog, or rain). On most occasions, this involves one or two birds landing on deck and only rarely is there mortality. Serious bird strikes (where large numbers of birds land on deck and mortality occurs) are considerably rarer. The intention of this initiative was to promote the very simple mitigation measures, which can be taken to minimize the chance of even rare occurrences happening. Guidelines are conveyed aboard ship by means of a poster ("Seabird Landing on Ships") to be displayed in passenger and crew areas and as a PowerPoint presentation given by the Expedition Leader. Expedition Leaders and ship's command are encouraged to log and report incidents in post voyage reporting.

Zodiacs operated by certified expedition staff will be employed to transport passengers between ship and shore. Should wildlife (e.g. seals, walrus, polar bear, dolphins, porpoises, whales or penguins) be present, drivers are trained to reduce the speed of the boats and to not approach the animal closer than 15 feet (5 metres). Drivers are instructed to follow the provisions of IAATO's Cetacean and/or Seal Watching Guidelines (see above) and instructions in the company's standard operating procedures are in effect through the company's Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations (ref. Appendix 12.1). In some cases, there may be national legislation in place that must be followed or guidelines, e.g. in marine protected areas and/or marine reserves.

Standard operating procedures and procedures such as boot, clothing and equipment decontamination procedures for small boat operations and shore landings will be strictly followed in wildlife areas and sensitive environments to ensure the prevention of introduction of translocation of non-native species and disease. Details can be found in Section 6.9.3, including vessel and auxiliary craft practices, briefings, biosecurity measures (boot washing stations and apparel/gear checks), guidance on shore and inspection and reporting procedures.

Standard operating procedures minimize wildlife disturbance, protect wildlife while ensuring a high-quality wildlife watching experience by responsible observation. Operating procedures minimize harmful impacts on marine wildlife populations by ensuring that the normal patterns of daily and seasonal activity of the animals are maintained in both the short and long term.

3.3.9 Security Plan

The vessel has in place a Security Plan under the ISM Code. The plans include procedures to be followed while the vessel is at anchor and while disembarking passengers and include an introduction, and cover corporate policies, safety management organization, and the safety management system.

3.3.10 Anchor Watch

While the vessel is at anchor the Master will write down his temporary instructions in the book at the bridge indicating the responsibilities of anchor watch of the vessel. According to the conditions of the anchoring point (weather, proximity of dangers, risks of safety incidents), the Master will appoint the Officer of the Watch, his substitute, or both, to provide anchor watch.

It is the duty of the Officer of the Watch to train the Substitute of the Watch. He/she will especially insist on the "responsibility of the watch man" regarding the safety of persons and goods. The Watch Officer informs his/her relief and judges his/her ability to take the watch. The persons responsible for the watch will make sure of the good behavior of the vessel at anchoring by checking the following parameters:

- Soundings,
- Distances, radar bearings, and
- Remarkable alignments, visual cues.

The radar parameters shall not be modified in order to avoid any variation of information, which will perturb the valuation of the vessel drift. In case of chase of the vessel, they will inform the Master and the Chief Engineer to launch the propelling engine. At least, they are responsible for the lighting of the vessel and for the hold of lights, flag and anchoring marks. If the watch is only provided by the substitute, this latter in case of incident, will inform

in priority the officer of the watch, who will judge the situation. Security and safety rounds will be carried out when changing the watch officer by the leaving shift.

3.3.11 Disembarking Passengers

The Officer of the Watch is responsible for all movements of passengers. A Deck Officer will attend each landing and embarkation. He/she informs the Master of any boat launching, stowage, and <in/out> movements of passengers, expedition team members and crew.

Passengers will be checked prior to disembarking the ship for Zodiac operations to make certain they have donned their appropriate floatation device and that it is put on correctly on in order that his/her movements cannot be hindered. A check will be made to ensure they are also dressed properly, have disinfected their footwear (if appropriate) and have signed out according to the vessel's "sign-in/sign-out" procedures.

Deck crew members will assist with the embarkation/disembarkation of the Zodiacs. Passengers will be transferred into / out of the boats using the <wrist-to-wrist> method.

A continuous communication's link with the Master or Watch Officer on the bridge is in effect during Zodiac operations and shore landings.

According to the state of the sea and before the operation, the Master – with the consult of the Expedition Leader – will define the number of passengers to be carried on board each Zodiac. Accounts as to the numbers on board and ashore are provided to the Officer of the Watch as per standard operating procedures.

3.3.12 SAR Arrangements

MS Silver Explorer is a modern cruise vessel that is fully self-sufficient and meets all necessary requirements for an ocean-going ship. Activities will be managed to be within the SAR and medical evacuation capability of Silversea Cruises Ltd. resources. On board there is a well-equipped medical facility that can provide first response leading to stabilization of injured parties. Accompanying all voyages is a general physician. All crewmembers (including the expedition team) must undergo, as part of their induction, a First Aid Familiarization course that includes CPR training.

On tours that visit areas remote from shore side medical facilities, including destinations such as the Antarctic, sub-Antarctic and Arctic, detailed medical questionnaires are forwarded to passengers in advance. These completed questionnaires are then screened by office personnel and the ship's physician contacted should a question arise over someone's suitability to undertake the voyage. Participants are advised that they may be cancelled from a program if deemed to have a physical condition or other disability that might create a hazard or lead to an unsuitable risk medical or otherwise. Once a reservation has been placed, participants are advised it is highly recommended they take out full medical and emergency evacuation insurance to cover the anticipated costs of a medical evacuation for the period of time they will be traveling.

During shore landings the doctor will accompany the group to provide assistance in the event of a medical incident. The doctor will carry a backpack with basic field supplies to tend to an injured person before return to the ship. Some of the Expedition Team members are also trained in basic first aid.

Each of the Zodiacs are outfitted with a fire extinguisher, spare gasoline tank, hand flares and basic engine repair equipment for the driver's use. Radios will be carried by the drivers and support staff as a standard operating procedure as are First Aid Kits (as mentioned above). A continuous communication's link with the Master or Watch Officer on the bridge is in effect during Zodiac operations and shore landings.

Any wastes generated ashore, including spent flares, will be returned to the vessel for disposal. All crew, staff and passengers will wear life jackets at all times while in the crafts. The Zodiac drivers will wear immersion suits or floatation coats (if conditions require). Additional information can be found in Section 4.3.

Standard operating procedures are in effect through the company's Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations (ref. Appendix 12.1).

To deal with the highly unlikely event of an emergency resulting in a stranding ashore, an emergency shore kit is taken ashore prior to every shore landing and returned to the ship at the conclusion of the landing once passengers, expedition team and crew have been returned to the ship. The contents of the shore kit were determined by considering an emergency situation whereby up to an estimated 80 individuals (70 passengers and 11 expedition staff) were stranded on shore for a time period of up to 12-24 hours. The emergency shore kit consists of five labeled bags (A, B, C, D and E) and contains the following:

Bag A:
1 Sleeping Bag
36 Emergency Rations
1 Inflatable Sleeping Mat
1 Medical Kit
1 Rope
1 Nylon Tarp

Bag B:
1 Sleeping Bag
1 Trowel
40 Emergency Rations

Bag C:
84 Sachets of Water
40 Hand Warmers
2 Thick Balaclavas
1 Inflatable Mattress/Sleeping Pad
1 Tent
50 Emergency Blankets

Bag D:
1 Sleeping Bag
1 Tent
2 Sleeping Mats
Garbage/Waste Bags

Bag E:
100 Sachets of Water
50 Emergency Blankets
2 Sleeping Mats
1 First Aid Kit
1 Leatherman Multi-Tool
1 Nylon Tarp
40 Hand Warmers
1 Balaclava

Should a stranding occur, garbage and human waste (liquid and solid) resulting from a stranding will be collected and returned to the ship for proper disposal using garbage/waste bags. If urine cannot be collected in

garbage/waste bags the liquid wastes will be discharged directly into the sea in a manner that does not adversely affect the local environment. At no times would liquid waste (e.g. urine) be disposed of onto sea ice, ice shelves or grounded ice-sheet.

During all Zodiac and landing operations, members of the expedition team are equipped with portable VHF marine radios and spare batteries. A listening watch between the ship and members of the expedition team is routinely maintained throughout these operations.

3.3.13 Insurance Provisions

Details in regards to insurance follow.

Insurance for the vessel includes P&I Club Cover in the amount of US $3 billion any one event in place through February 20, 2015 (renewed annually) with Assuranceforeningen Skuld P&I Club as the insured and Hull and Machinery Insurance in the amount of US $42,000,000 in place through May 31, 2015 (renewed annually) with Generali as the Insured. Certificates of coverage are available upon request.

The Expedition Organizer has planned their activity to be in compliance with the specific requirements under international and national laws and regulations and applicable marine regulations. Appropriate contingency plans and sufficient arrangements for health and safety, SAR, and medical care and evacuation to ensure self-sufficiency are in place in order to ensure that support from other operators or from national governments/programs is not required. Additionally, adequate insurance and other arrangements are in place to cover any costs associated with material losses, search and rescue and medical care and evacuation and in the highly unlikely event that liability was incurred.

4. PROPOSED ACTIVITY

4.1 Itinerary Planning, Site Selection, Route Planning and Management

The proposed voyages covered under this assessment feature a combination of on board and off ship activities with the goal being to provide a well-rounded educational experience and in a manner that provides for safe and environmentally-responsible tourism, while meeting obligations under international and national laws, regulations, guidelines and company established standard operating procedures.

Itinerary planning and management is an on-going effort – both prior to and during the season. Selecting sites for visitation is a three-stage process. The first involves developing proposed itineraries internally prior to the commencement of the activity. The second is ensuring compliance with applicable requirements by an internal review. The third is the adjustment of the itinerary – on board – responding to environmental conditions, the presence of other vessels, and opportunities encountered locally (e.g. the presence of whales which might result in a change of plans to take advantage of this unexpected event or something unexpected on shore that might want to be experienced).

Proposed itineraries can be found on the company's website at www.silversea.com. Itineraries will be submitted in advance to authorities during the authorization/permitting process and included as an Addendum in Section 13 with any destination-specific visit application(s).

The model of expedition ship born tourism to be followed in general terms is that started by Lars-Eric Lindblad, who was the first to offer tourist cruises to Antarctica in 1966. In 1969 Mr. Lindblad, considered to be the "grandfather" of the modern expedition tourism industry, purposely built the MS Explorer, a small specially-constructed vessel for cruising to the Antarctic, Sub-antarctic and the Arctic. Rather than simply offering tourists the opportunity to "cruise," he developed an educational program, incorporated an environmentally-conscious focus to all aspects of the on board program; introduced the use of Zodiacs for off-ship transport; and instituted a model for shore landings that is still followed to this day. This model (of an activity with an educational and environmental focus), has come to be known as the "Lindblad Model" and has led to the development of a method of determining cruise routes and ways in which Expedition Leaders determine which landing sites to use.

Each voyage will be led by an experienced Expedition Leader, selected because of his/her first-hand knowledge of the region(s) to be visited; in-depth knowledge of the particular landing sites; skill at managing groups in remote and sensitive environments; and the ability to carry out the voyage to the company's expectations and in accordance with legal obligations. Expedition Leaders will be assisted by a team of lecturers with a far-reaching range of expertise, along with naturalists and support personnel.

The Expedition Leader, while responsible for the on board program, passenger activities off of the vessel and carrying out the day-to-day itinerary as to what landing sites are to be visited, works hand-in-hand with the Master who is responsible for the safe operating and running of the ship. Background information on the Expedition Leaders and Masters is available upon request.

Despite pre-planning by destination experts, the Expedition Leaders and Masters will make the final itinerary decisions in the field. Changes to pre-planned itineraries can also result from changes in weather or sea conditions; as well as the presence of ice (if applicable); the presence of another ship that was unexpected (e.g. a private yacht or vessel whose schedule was unknown); changes in local conditions that may result in the Expedition Leader deciding to cancel a desired landing; changes to the schedule of pre-arranged visit; as well as factors such as the absence or presence of wildlife. Other conditions that may result in a change to a planned itinerary, as examples, may include a science program in progress (that was unknown at the time of scheduling); deteriorating weather or ice conditions (if applicable); limited or no sufficient landing area to carry out the landing with the desired number

of passengers; presence of plant life close to or at the proposed landing site; close proximity to protected areas; or sensitive wildlife (e.g. during the breeding season). Some landing sites may also precipitate a reduction in the numbers going ashore, e.g. for certain sites where there are limitations on the numbers ashore or concerns about either ensuring safety or environmental impact.

Shore landings utilize Zodiacs as the means of transportation between ship and shore.

Protected areas (if applicable), including Marine Protected Areas or Marine Reserves, will be researched to ensure visits do not enter into these areas or violate provisions of any management plans.

If applicable, research sites will be avoided, although from past experience many of these sites are unmarked. Advice about the location of research sites will be sought from field researchers or station personnel in the vicinity prior to a landing being made (if in the vicinity of these sites).

Reference materials are available on board ship for use by the Expedition Leader, ship's command and the Expedition Team.

Itinerary management includes the appropriate crewing of the vessel as well as staffing of the Expedition Team who will be carrying out the landings and off-ship activities. In general terms, unless a lower number/ratio is called for, the staffing will include 1 guide to every 20 passengers to ensure appropriate supervision and guidance in the field. The staffing will include the hiring of appropriate guides with expertise of the area(s) being visited.

Communications will be maintained with other vessels operating in the area to be visited to minimize the likelihood of itinerary conflicts.

As standard operating procedures, the Expedition Leaders will complete end-of-trip reporting to provide information on each landing, account for the activities and numbers involved, as well as to convey any information needed by the head office, including regards to any environmental disturbances noted, and to assist in planning for future visits.

The assessment of likely impacts, and minimization and mitigation methods, is made in Section 6. A matrix is presented in Table 3 in Appendix 12.2.

4.2 Duration

Voyages will range in length from 7 to 23 days. Details can be found on the company's website at: www.silversea.com. Itineraries will be submitted in advance to authorities during the authorization/permitting process.

4.3 Small Boat Activities and Cruising

The vessel carries a fleet of small auxiliary craft, the details of which were included in Section 3.2.

Small boat activities will vary during each voyage. Zodiacs will be utilized to facilitate shore landings and for cruising (referred to as Zodiac tours) where no shore landing are made.

The first Zodiac ashore for shore landings will always carry the Expedition Team. These staff members are responsible for checking the landing site before passengers come ashore.

In most instances the ship will be a short distance away; however this depends entirely upon the local conditions and other factors, such as familiarity of the landing site/anchorage to the Master and/or Bridge Officers. Factors such as wind, swell, presence of ice (if applicable), etc., can affect the time it will take for the Zodiacs to be loaded and get to shore.

Zodiac craft will be launched by crane, according to the prevailing conditions. All will be run by 4-stroke engines, which are cleaner, more 'environmentally-friendly', and quieter than the older 2-stroke engines. An experienced mechanic is on hand for servicing the engines. Drivers are experienced individuals from the Expedition Team, however crew (from the deck department primarily) may also be utilized on occasion, e.g. for shuttling purposes. As noted previously, all drivers must complete a Competency Test before being issued a ship-issued certificate.

Information about measures to avoid harmful interference with biota (from the Zodiac operations) is addressed in Section 3.3.8. Standard operating procedures are in effect through the company's Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations (ref. Appendix 12.1).

4.4 Education and Training of Passengers, Crew and Expedition Team

Silversea Cruises Ltd. will employ an experienced Expedition Leader and Expedition Team to assist in the preparation and management of each cruise and associated activities. The head office will prepare a Tour Information Manual for each cruise, with relevant documentation, including any permits and details of organized shore landings in the various ports of call. The various ship and expedition operating procedures will be discussed with the Expedition Leader and Master, checked and, if necessary modified.

Details on education and training of the Expedition Team through IAATO's Field Staff Assessment program has been referenced in Section 3.1.

Passengers will be informed and briefed before they depart with pre-tour mailings and receive further briefings during the cruise by the Expedition Leader. Briefings on board include safety instructions, Biosecurity measures, a description of the planned areas to be visited and environmental training.

Crew members who go ashore (for leisure purposes or to assist with the landings) are briefed, same as passengers, and their activities ashore also closely monitored by the Expedition Leader and the Expedition Team.

5. ALTERNATIVES TO THE PROPOSED ACTIVITY

5.1 Changes to Itinerary

Changes to the planned itineraries have been outlined in Section 4.1. Itinerary changes include alternatives to the order, date and duration in places visited or other activities occurring (if not involving shore landings) rather than the choice of specific locality (this is discussed below).

Prior to the commencement of the planned activities, detailed pre-season planning will have been undertaken. Adjustments to the proposed schedule continue to be made during the course of each voyage and changes made as appropriate.

This alternative of changing the stated planned itinerary is deemed to not be warranted and would have no significant benefit.

5.2 Changes to Sites Visited

Expedition cruising on a worldwide basis has occurred since the mid-1960s.

Company policy is to develop an itinerary based against pre-determined criteria that provide passengers with a well-rounded experience while at the same time meeting legal obligations under international and national laws and regulations, guidelines and standard operating procedures. Environmental, safety and educational considerations are all taken into account.

Should the need arise, alternative sites for shore landings will be considered, provided these alternative sites meet with the company's criteria and can be carried out in a manner that will have no more than a minor or transitory impact on the environment and its dependent and associated ecosystems.

In some destinations, national authorities will either authorize the planned activity or issue a permit. If an activity is not deemed appropriate, the activity will be ruled out in advance.

On this basis, there is no justifiable basis for considering other changes to sites visited.

5.3 Changes to Number of Passengers

A reduction in the total number of passengers might reduce the absolute level of any impact, however, against this are weighed the factors of acceptable cost for passengers and financial return for the Expedition Organizer, as well as the carrying capacity of the vessel.

At the present time, ships conducting shore landings with tourists on an expedition basis (utilizing Zodiac landing craft) vary in carrying capacity from 35 to 500 passengers. Carrying a maximum of 132 passengers (130 for Antarctica), the MS Silver Explorer fits in the small end of this range. This enables the Company to comply with the aim of not compromising environmental concerns and quality of passenger experience for economic returns. At sensitive landing sites, limiting to not more than 100 passengers ashore and with a guide-to-passenger ratio of 1:20 provides an alternative to further reduce any impact. In extreme situations, or where called for by applicable site guidelines, a lower passenger number/staff ratio may be warranted. If so, the Expedition Leader will modify the landing groups accordingly.

Work permitting, crew are allowed ashore for leisure activities, however, as discussed previously, crew who do go ashore are briefed, same as passengers, and their activities ashore also closely monitored by the Expedition Leader and the Expedition Team.

Under these circumstances a change in overall passenger numbers is therefore not considered necessary to minimize potential environmental impact.

5.4 Changes to Vessel Used

Company policy is to operate an appropriate vessel -- one designed specifically for expedition cruising with experienced personnel. A different vessel could be utilized but this could result in a vessel of lesser qualification or a vessel with a lower standard of experience in its personnel. Should a vessel of lesser qualification require assistance, a greater impact would result by having a second vessel in the vicinity rendering assistance.

Due to the limited numbers of equally suitable vessels, and contractual obligations, it is not feasible to make a change in vessel as decisions such as these require lengthy advance planning and decisions such as this cannot be made quickly or immediately. Considering the commercial/economic case for the proposed activity of a small expedition vessel operating with not more than 132 passengers, there is no rationale for considering an alternative vessel.

5.5 Changes to Zodiac Usage

There are alternative motorized craft that could be utilized for shore landings and scenic and wildlife cruising however there would be no differences in the potential impacts resulting from this change. Zodiac-brand inflatable boats outfitted with outboard engines have been the standard means of transporting passengers to and from shore of tourist operations since the mid-1960s when expedition cruising began and have proven to be the safest and most reliable means of transportation. The vessel is utilizing four-stroke engines, which are presently the most environmentally-friendly engines available. (They are cleaner and quieter than the older two-stroke engines.) Therefore, there is no basis for making any changes.

5.6 Alternative of Not Proceeding with the Cruise Program

The alternative of not proceeding with the cruise program is the only alternative that could remove all potential risks of environmental impact. Considering that there is national and international acceptance as to the legitimacy of expedition cruising and, provided that reasonable environmental standards have been considered and assessed to minimize the objective environmental risk, this alternative does not appear to be justified.

6. LIKELY IMPACTS, ASSESSMENT, MINIMIZATION AND MITIGATION OF PROPOSED ACTIVITIES

6.1 Relevant Laws and Regulations

Information as to relevant laws and regulations has been covered in Section 3.3.2 including applicable marine legislation, safety of vessels, safe vessel operations, emergency response action and environmental safeguards.

6.2 Standard Operating Procedures

Silversea's efforts to avoid or minimize environmental impacts are in effect every day of the year and in all locations where its ships operate. Silversea is an environmentally proactive cruise line that has extensive policies and procedures to ensure its ships always operate to the highest environmental standards.

V.Ships, the company's contracted ship management company for technical (Deck and Engine) services, has in place an Integrated Management Systems Manual (IMS) to accomplish goals and objectives under the company's Occupational, Health, Safety, Environmental and Quality Management System (OHSEQ). The IMS describes in principle all activities related to ship management including, but not limited to, quality, occupational, health, safety and environmental protection. The IMS also addresses the requirements of the ISO 9001, ISO 14001 and OHSAS18001 Standards, along with the ISM Code and is the collection of all environmental policies; procedures and training for every significant environmental aspect generated by a cruise ship and covers all the elements that impact the marine environment (air, water, land, use of resources).

V.Ship's ISO 9001:2008 Quality Management System (http://www.iso.org/iso/catalogue_detail?csnumber=46486) certification was initially obtained on 21 June 2004 with certification by RINA (http://www.rina.org/en/our-services/certification/management-systems-certification/quality/qms-iso-9001), an independent registrar. The current certification is available upon request. ISO 9001:2008 specifies requirements for a quality management system whereby an organization needs to demonstrate its ability to consistently provide product that meets customer and applicable statutory and regulatory requirements, and aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.

V.Ship's ISO 14001:2004 Environmental Management System standards (http://www.iso.org/iso/home/standards/management-standards/iso14000.htm) certification was initially obtained on 27 July 2006 with certification by RINA (http://www.rina.org/en/our-services/certification/management-systems-certification/environmental-management-systems/environmental-management-systems-iso-14001). The current certification is available upon request. ISO 14001 certification requires identification of all operational environmental aspects and controlling any associated adverse impacts, recognizes robust environmental standards, commitment to continual improvement and policy to prevent pollution. Success in achieving certification demonstrates the company's commitment to be responsible stewards of the environment.

V.Ships OHSAS18001:2007 Occupational Health and Safety Management System Certification was initially achieved on 26 March 2014 with RINA (http://www.rina.org/en/our-services/certification/management-systems-certification/health-and-safety/occupational-health-and-safety-bs-ohsas-18001) and is available upon request. OHSAS18001 ensures all hazards are identified, assessed and controlled to mitigate risk. It actively involves participation by and consultation with the crew in health and safety matters.

Environmental training is provided by the Chief Engineer and Chief Officer, reporting directly to the ship's Master, who are also responsible for overseeing shipboard compliance with company policies (which often exceed legal

requirements), environmental laws, regulations and industry standards. An aggressive and comprehensive annual audit program evaluates each ship in the fleet.

The IMS describes in principle all activities related to ship management including but not limited to quality, safety and environmental protection. The documents in the IMS describe and implement the V.Ships' Quality, Safety and Environmental Management System, which is defined in the following documents/tiers:

1. Safety and Quality Management Manual (SQMM) incorporating also the Company's environmental policies
2. Fleet Operations Manuals (FOM) incorporating also garbage and hazardous waste management manuals and ISO14001 procedures [for accredited ships]
3. Emergency Contingency Plans (ECP)
4. Other Ship Specific Plans and Manuals with Environmental and Emergency Preparedness aspects like Shipboard Oil Pollution Emergency Plan (SOPEP), Ballast Water Management Plan (BWMP), Shipboard Energy Efficient Management Plan (SEEMP), etc.

V.Ships has established and implemented a documented Occupational Health, Safety, Environmental and Quality Management System (OHSEQ) committed to comply with the requirements of the following:

- Quality Management System ISO 9001:2008
- International Safety Management System ISM Code:2010
- Environmental Management System ISO 14001:2004
- Occupational Health, Safety, Environmental and Quality Management System OHSAS18001:2007
- Maritime Labor Convention MLC 2006

Individual documents are dedicated to the management of specific environmental media: oily waste management (in accordance with MARPOL Annex I); gray and black water (sewage) management (in accordance with MARPOL IV); hazardous and non-hazardous (garbage) waste management (in accordance with MARPOL Annex V), air emissions(in accordance with MARPOL Annex VI), energy efficiency, ballast water, and management of hazardous materials.

The IMS addresses the requirements of the ISO 9001, and ISO 14001 Standards, OHSAS18001 along with the ISM Code. It is organized and developed in such a way that goals and objectives are set and strived to be achieved for each aspect in order to continually improve. Regular management reviews and periodical audits ensure that the ISM remains up to date and efficient.

V.Ship's Marine Operations department monitors onboard compliance through a regular routine of auditing; that department also oversees the extensive training program.

In sum, the IMS sets out V.Ship's overall policy; the day-to-day fulfillment of that policy is detailed in its waste stream-specific IMS procedures or manuals and is carried out by officers with the training and oversight by the Company.

Silversea requires V.Ships to have all current relevant certificates and to maintain the vessels by suitably-qualified officers, engineers or mechanics and ratings to meet requirements under the vessel's classification society (Bureau Veritas, (http://www.bureauveritas.com/wps/wcm/connect/bv_com/Group). While these are safety considerations, these also ensure that the ships and their systems and equipment are maintained correctly and to optimal standards for servicing and maintenance.

Silversea's shore-side personnel and shipboard staff are comprised of highly qualified individuals with extensive experience in the maritime industry operating in some of the most environmentally-sensitive waters around the world, including the Polar Regions. The vessel's regular shipboard contingent will be supplemented with an experienced Expedition Team, including an Expedition Leader and Assistant Expedition Leader, as well as multiple

lecturers, naturalists and Zodiac drivers, who bring specialized local knowledge to the planning and execution of each expedition.

Standard operating procedures and guidelines, as they relate to the expedition operations, are contained in the Tour Information Manuals, which provides guidance for office personnel, Expedition Leaders, ship's command, and others, as appropriate (e.g. shipboard department heads). The manuals contains trip-specific information, as well as permits/authorizations (if applicable), information on protected areas, international and national laws and regulations, guidelines and standard operating procedures (which include instructions, briefings and safety guidelines, procedures, manuals, emergency contingency plans including emergency and medical response plan, and information on landing sites) as well as a host of other information needed to operate in a safe and environmentally-responsible manner.

Additional minimization and mitigation measures are in place including the following, along with details provided elsewhere in this assessment.

Appropriate contingency plans and sufficient arrangements for health and safety, search and rescue, and medical care and evacuation have been drawn-up and are in place for these proposed activities. Such plans and arrangements are designed so as not to be reliant on support from other expedition organizers or national authorities/programs.

All SOLAS ships are required to operate under the ISM Code and have an established Safety Management System (SMS) in place. Since it entered into place on 01 July 1998, the ISM Code for Safe Operating of Ships and for Pollution Prevention, adopted by all Flag States, has had a huge impact towards drastically improving the safe operation of ships and in pollution prevention. The ISM Code describes, in broad terms, what a ship operating company's safety management system needs to include.

Arrangements for self-sufficiency with specific regard to medical emergencies have been discussed in Section 3.2.

In some remote cold-weather areas, for example the Sub-antarctic, an emergency shore kit will be taken ashore prior to shore landings in the unlikely event of an emergency resulting in a stranding ashore. The kit is then returned to the ship at the conclusion of the landing once the passengers, expedition team and crew have left shore. The contents of the shore kit have been determined by considering an emergency situation whereby approximately 80 individuals might be stranded on shore for a time period of up to 12-24 hours and based upon protocols for Antarctic and South Georgia operations aboard MS Silver Explorer. Details, including methods of dealing with waste resulting from a stranding, will be provided in an Addendums for destinations where use of the kit is deemed appropriate and/or required.

During all Zodiac and landing operations, members of the expedition team are equipped with portable VHF marine radios and spare batteries. A listening watch between the ship and members of the expedition team is routinely maintained throughout these operations.

IAATO's Guidelines for General Wildlife, Cetacean, Seal and Birdwatching (ref. Section 3.3.8) minimize potential environmental impacts to wildlife by vessels and auxiliary craft by providing a "code of conduct" to help reduce potential disturbance to the marine environment and are used as a generic set of standard operating procedures for worldwide operations for vessel and boat operations when in areas where marine wildlife is present. In cold weather climates where Zodiac activities will be offered, adherence to the IMO/MSC "Guide to Cold Water Survival" (http://www.dr-kohfahl.de/praxis-wissenswertes/Guide_For_Cold_Water_Survival.pdf), along with IAATO's "Guidelines for Operating Small Boats in the Vicinity of Ice," provides advice on how to prevent or minimize dangers from cold exposure that may endanger life.

6.3 Assessment of Impacts

Likely impacts are assessed qualitatively using the criteria and methodologies summarized below in Table 1. Results are presented in Table 3 (ref. Section 12.7 and Appendix 12.2).

Table 1
Criteria for Assessment of Likely Impacts[1]

Heading	*Content*	*Detail*
ACTIVITY		
Nature	Type of activity	
Duration	Time period of activity	Listed in days, weeks, months, etc.
OUTPUT		
	Description of potential results of activity that may cause impact	
IMPACT ASSESSMENT		
Scope	Geographical area affected	Local, regional, continental (L, R, C)
Persistence	Duration of impact	Short (minutes-hours), medium (days-weeks), long (months-years), permanent, unknown (S, M, L, P, U)
Intensity	Severity of impact	Low, medium, high (L, M, H)
Probability	Likelihood of impact occurring	Low (<25%), medium (25-75%), high (>75%) (L, M, H)
Importance	Importance of impact	Low, medium, high (L, M, H)
EFFECTS		
Direct	Qualitative description of what is directly, indirectly and cumulatively impacted by the Activity/Output.	
Indirect	Same	
Cumulative	Same	
MINIMIZATION AND MITIGATION		
	Methods to minimize and/or mitigate effects of the proposed activity	

The terms used in this assessment have been based upon the following definitions[2]:

> **Effects** are the result or consequences of an activity that includes positive and adverse effects, temporary or permanent, direct and indirect and finally cumulative effects.
>
> **Direct, indirect and cumulative effects:** ***direct effects*** result from an action, which causes a direct change to the environment. They are direct cause and effect interactions, for example people or stock trample plants, which as a result, may die. ***Indirect effects*** are those that occur as a result of primary effects but may be separated from them over time or from the area where the original action took place, for example erosion due to vegetation loss (caused by trampling). ***Cumulative effects*** have been described as the accumulation of impacts over time and space resulting from the combination of effects from one activity/development or the combination of effects from a number of activities. As a consequence, cumulative effects can be different in

[1] Source: Poles Apart Ltd., www.polesapart.org.
[2] New Zealand, department of Conservation "Guide to preparing EIA for Concession Applications" document (Docdm367160), http://www.doc.govt.nz/Documents/about-doc/concessions-and-permits/concessions/guide-to-environmental-impact-assessments.pdfhttp://www.doc.govt.nz/Documents/about-doc/concessions-and-permits/concessions/guide-to-environmental-impact-assessments.pdf.

nature, larger in magnitude, greater in significance, longer lasting and/or greater in extent than any individual effect.

A 'significant effect' is an impact that is outside the limit of acceptance, which then must be avoided, remedied or mitigated back below this 'acceptable limit'. If this cannot be undertaken the project or activity may not be approved.

Mitigation: measures to avoid, remedy or mitigate (reducing) adverse environmental effects. Ideally effects should always be avoided and only if this cannot occur should remedying and mitigating options be looked at. Mitigation could, for example, involve putting restrictions on numbers participating, routes taken, use of helicopters, and the avoidance of nesting times of bird species.

The following sections identify and assess the likely effects of MS Silver Explorer's voyages on the environments described in Section 4.1. A summary of the likely outputs and effects are presented in Table 2 (below). Where appropriate, origins and outputs of activities are given and their likely effects assessed. Finally, minimization and mitigation measures are described.

Table 2
Summary of Likely Environmental Effects

	Environmental Effects				
	Flora	**Fauna**	**Water/Ice**	**Soil**	**Further afield**
Emissions to air	X	X			X
Emissions to water		X	X		X
Wastes generated	X	X	X	X	X
Noise		X			X
Physical Disturbance	X	X	X	X	
Translocation of diseases/alien species	X	X			X

In the following sections of this assessment, the assumption has been made that the minimization and mitigation measures outlined will be applied. Silversea proposes to remove completely, as far as practicable, all solid wastes, including food and garbage. Thus, the main potential sources of environmental impacts will be emissions, fuel spills, gray water, noise, physical disturbance and translocation of diseases/alien species.

The operations of the Company would need to be added to activities by others, to consider cumulative effects on the environment described in Section 4.1.

If required, waste management permits will be applied for with information provided in a destination-specific Addendum (ref. Section 13). Post visit reporting to any applicable national authority will occur if required under a permit/authorization.

6.4 Emissions to Air

6.4.1 Origins

Emissions to air generated by fuel burn during the proposed activity will originate from:

- Ship cruising, and
- Small boat operation (e.g. Zodiacs).

In addition, fueling activities or fuel spills could result in a small amount of fugitive emissions to be released. The incineration of waste will also result in emissions.

The following fuels will be used by the Expedition Organizer during the proposed activity:

- Marine Gas Oil (MGO) (MS Silver Explorer), and
- Unleaded gasoline (Zodiacs).

The major components of exhaust emissions from engines comprise free nitrogen (N_2) and oxygen (O_2) with smaller quantities of carbon dioxide (CO_2), oxides of sulfur, water vapor and a variable mix of partially-reacted or non-combusted gases. Nitrogen, forming most of the air intake to an engine, is largely un-reacted during combustion, although a small proportion will form various oxides, especially from the oxidation of organic nitrogen in the fuel.

Exhaust emissions from combustion and emissions from evaporation of fuels used by the ship, Zodiacs will include:

- Carbon dioxide (CO_2),
- Carbon monoxide (CO),
- Nitrogen oxides (NOx, N_2O),
- Sulfur oxides (SOx),
- Methane (CH_4),
- Volatile organic compounds (VOC) including Gasoline Range Organics (GRO) and Diesel Range Organics (DRO), and
- Particulate material.

These emissions contribute both directly and indirectly to the greenhouse effect and to local and regional air pollution.

The estimate of MS Silver Explorer's fuel use for a single voyage is estimated in Table 4 below.

Table 4 Estimated fuel use for a single proposed activity

Fuel Type	*Estimated Use (liters)*
Marine Gas Oil (MS Silver Explorer)	10,000 liters per day.
6 Mark V HD Zodiacs (6 Mark V and 2 Mark VI)	90 liters/day for Arctic operations / 50 liters/day for Antarctic operations

Gaseous emissions will result from the exhaust emissions noted above.

6.4.2 Assessment

Likely impacts of emissions from marine combustion (ship operations and routine small boat operations) are assessed qualitatively using the criteria and methodologies summarized above in Table 1. Results are presented in the matrix contained in Table 3 (ref. Section 12.7 and Appendix 12.2).

Emissions resulting from marine combustion are typically close to the source (ship and/or small boat engines) and well away from land. This is usually an environment where wind is a common feature. Particulates and micro pollutants (trace levels of marine pollutants that have severe adverse effect at low concentrations, e.g. organic micro pollutants and heavy metals) may be significant in marine emissions, than, for example aircraft emissions. Lloyd's Register[3] noted that micro pollutants, such as heavy metals, are well known "inhibitors of biological processes, particularly in aqueous ecosystems."

[3] Lloyds Register, 1995. Marine exhaust emissions research programme. London, Lloyd's Register of Shipping.

Emissions will generally be rapidly dispersed by wind, however any activity producing atmospheric emissions will contribute to regional and global air pollution burdens.

Marine combustion emissions are overall assessed to be of high importance due to high probability, and a medium to long-term persistence and potential for local to continental scope due to dispersal effects.

6.4.3 Minimization and Mitigation

Careful, thorough and routine maintenance is the primary method for minimizing emissions of carbon oxides, unburned hydrocarbon and black smoke.

Partial mitigation is possible through the use of 'clean' fuels and lubricants, and regular care and maintenance of engines. As noted previously, the vessel uses MGO, a lighter and cleaner fuel. No Heavy Fuel Oil (HFO) is carried or used on the vessel.

Silversea, in cooperation with its management company, FleetPro, is continually investigating new technologies and methods to increase the level of safety associated with its operations.

6.5 Emissions to Water – Fuel and Oil Spills

6.5.1 Origins

Maintenance and fueling of Zodiacs and by leakage from fuel containers may result in fuel and oil spills. A catastrophic loss from the ship may result in an emergency fuel jettison however this is an unlikely scenario.

Table 5 gives the total fuel capacity to be carried aboard MS Silver Explorer during a given proposed activity.

Table 5 Total fuel capacity to be carried during a given proposed activity (estimating an activity to be a 15 day voyage)

Fuel Type	*Estimated Use (liters)*
Marine Gas Oil (MS Silver Explorer)	150,000 liters
Unleaded gasoline - 8 Mark V HD Zodiacs and 2 Mark VI HD Zodiacs (based on using an estimated average of 90 liters/day for Arctic operations and 50 liters/day for Antarctic operations)	1,350 liters for Arctic operations / 750 liters for Antarctic operations

In addition, lubricating oils and four-stroke oil will be carried aboard the vessel for the ship and Zodiac engines.

Standard operating procedure calls for refueling of the Zodiacs to be done aboard ship and not in the boats.

Local and regional contamination of the marine and coastal environments and their dependent ecosystems could result as a direct effect of any spill.

6.5.2 Assessment

Fuel spills are most likely to occur due to fueling of the gasoline tanks for the Zodiacs. Should a spill occur aboard ship, it is estimated a spill would be <10 liters.

MS Silver Explorer features a double-hull construction. Because of this, the likelihood of a catastrophic puncture of a fuel tank with a loss of 1000 liters or more of fuel is extremely low.

Fuel spills rapidly evaporate however the rate of evaporation depends upon the conditions (e.g. polar or tropical), for example since at low temperatures evaporation is less complete.[4] In addition, as a number of hydrocarbons are highly soluble in water, their effect depends upon dilution.[5]

6.5.3 Minimization and Mitigation

Fuel spills constitute the most unpredictable accident aboard ship; however occurrence can be minimized through strict adherence to sound operating procedures.

Provided spill procedures are followed according to established standard operating procedures, spills occurring on the ship during fueling operations will be contained. The resultant spill from two fully-loaded tanks of fuel (5 US gallons each) in a Zodiac during a catastrophic event could be in the order of 37.85 liters (equivalent to 10 US gallons) however this would be an extremely rare occurrence. The resultant spill could be significant, especially if it occurred near concentrations of marine wildlife, with local contamination being the direct effect. The amount of fugitive emissions (defined by US EPA[6] as being "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening") would be dependent upon the scale of the spill.

There is a medium probability of minor fuel spills (less than approx. 10 liters) occurring during the proposed activity due to regular use of the Zodiacs and the need for refueling. Minor spills are assessed to be of medium-high importance due to their medium probability and the likelihood that the impact residues will persist for a medium-term period.

Despite a low probability, major fuel oil spills (more than approximately 1000 liters) during the cruise are assessed as being of high importance due to the local to regional scope, medium to long term effect, high intensity and potential for direct, indirect and cumulative effects.

The most effective methods for minimization and mitigation are having a dedicated emergency contingency plan, ensuring strict adherence to established standard operating procedures, having an oil spill kit on board, and effective containment procedures, spill contingency planning, and effective communications. Spill prevention procedures include, but are not limited to, following established fuel bunkering procedures during bunkering operations, the use of funnels, spill mats during fueling and engine maintenance, use of drip trays; and utilizing absorbents.

6.6 Wastes Generated During the Expedition

6.6.1 Origins

The proposed activity will result in liquid wastes being generated during the course of normal ship operation.

Wastes include:

- Domestic waste water (e.g. from cooking and ablution activities),
- Sewage,
- Macerated food waste, and
- Oily Mixtures.

[4] OSRL. 1998. Antarctic oil pollution course: 20-12 August 1998. Southampton, Oil Spill Response Ltd [published course handbook].
[5] Cripps, G.S. and J. Shears. 1997. The fate in the marine environment of a minor diesel fuel from an Antarctic research station. *Environmental Monitoring and Assessment*, 46, 221-232.
[6] Source: http://www.epa.gov/region7/air/title5/t5memos/fug-def.pdf.

Solid wastes will also be generated, including:

- Garbage (e.g. waste paper, clean packaging materials, glass and wood from domestic and work activities on the vessel),
- Food waste (e.g. excess or spoiled food waste which is not suitable for maceration), and
- Hazardous or special waste (e.g. batteries, paints, oils, oily rags, etc., from maintenance or other work on the vessel).

Other sources of waste include ballast water and anti-fouling paint (ref. Section 6.6.2).

6.6.2 Assessment

Sewage will be treated by Biological Sewage Treatment Plant manufactured from Wartsila Evac Vacuum System – UNEX BIO 200E. Effluent will be stored in sewage holding tanks for disposal at sea or return to port for disposal at a certified shore side reception facility. As required under MARPOL, no sewage disposal will be permitted within 12 nautical miles of land or ice shelves. All sewage, gray water, and kitchen sink water will be stored in the holding tanks, which are sufficient for a three-day period. Discharge will occur when the tanks are full, with the vessel ensuring a location appropriate to MARPOL requirements. The waste will be discharged from the vessel while underway at a speed of no less than four knots.

The marine pollution impacts caused by disposal of these wastes generated during the proposed activity are assessed to be of low importance due to their local scope, short-term effect and low intensity.

Burnable wastes will be incinerated if required; with the resultant incinerator ash disposed of in an appropriate manner.

Relevant disposal routes are show in Table 6.

Table 6 Types of waste generated by MS Silver Explorer activities and proposed disposal routes

Waste Type	*Classification**	*Route*
Non-hazardous	Group 3	
Paper, plastics, timber		Separated and incinerated or removed for recycling and disposal
Metal, glass	Group 4	Separated and incinerated or removed for recycling and disposal
Incinerator ash		Disposed of as per regulation
Biodegradable		
Food waste	Group 3 or 4	Food suitable for maceration will be passed through a macerator and disposed as gray water Food not suitable for maceration will be segregated and refrigerated for disposal at certified reception port
Human waste	Group 1	Treated on board, stored and disposed as per MARPOL Requirements
Gray water	Group 1	To be stored on board and disposed as per MARPOL Requirements
Hazardous		
Batteries	Group 4	Separated and removed for recycling or disposal at certified reception port
Medical and sanitary waste	Group 4	Frozen and removed for disposal at certified reception port

Fuels and oils	Group 2	Removed for disposal at certified reception port

*Classification based on Annex III of the Protocol on Environmental Protection to the Antarctic Treaty (ref. http://www.ats.aq/documents/recatt/Att006_e.pdf)

MS Silver Explorer has TBT FREE SPC anti-fouling paint on its hull. The paints, all TBT-free self-polishing antifouling paint types, used were manufactured by International Paint Ltd. Names and colors of anti-fouling systems used are as follows:

- Interswift 455FB (BBA024 Dark Red, BBA028 Brown) containing the following active ingredients:
  - Cuprous Oxide (CAS Number 1317-39-1)
  - Zinc Ethylene bis-dithiocarbamate (CAS Number 12133-67-7)

- Interswift 6800HS (BMA684 Red and BMA688 Brown) containing the following active ingredients:
  - Cuprous Oxide (CAS Number 1317-39-1)
  - Copper Pyrithione (CAS Number 14915-37-8)

Organotin biocides are not contained in the particular brand of anti-fouling paints thereby complying with the IMO Antifouling Systems Convention (AFS/CONF/26) and the Vessel General Permit Scheme under the US Clean Water Act.

The vessel's International Anti-Fouling System Certificate and Record of Anti-Fouling Systems, issued 13 May 2011 by Lloyd's Register, is available upon request.

It is not possible to estimate the marine pollution impact caused by leaching of the paint, though it is perceived that the impact caused by anti-fouling systems may have a more persistent effect than those caused by other wastes (e.g. waste water and sewage).

MARPOL prohibits the discharge of oil-contaminated ballast water, which could cause marine pollution and also introduce exotic species into local waters, resulting in the transfer of aquatic organisms such as plankton, algae and invertebrates, as well as pathogens.[7] Due to the higher diversity of species in shallow coastal zones, the effects of this may be exacerbated. The introduction of invasive marine species could also have serious impacts on the surrounding ecosystem.

6.6.3 Minimization and Mitigation

Where practicable or required by permit, all hazardous and non-hazardous wastes, including ash from the incinerator, will be removed. As stated above, sewage and gray water will be stored in holding tanks until the ship is at sea and can be discharged in accordance with MARPOL requirements. An alternative method of disposal is to pump out on return to port at certified reception facilities.

Some solid wastes may be re-used or recycled, for example empty fuel drums. Wastes returned to port for shore side disposal will be removed from the ship by a certified company for licensed disposal.

Oily mixtures, such as from bilge water from machinery spaces, will be separated from liquid wastes according to established standard operating procedures. A separation process will be used to recover oils from oily mixtures; oils will be retained on board for discharge upon return to port. MARPOL 73/78 allows for the discharge at sea of oil/water mixtures with an oil content of less than 15ppm. The vessel's Oil Record Book will log all discharges.

Waste release incidents will be avoided according to adherence with international standards. Appropriate protocols are in place to minimize accidental releases or discharges that do occur and mitigated by clean-up

[7] Niimi, A.J., 2000. Influence of vessel transit patterns on developing a ballast water treatment strategy for exotic species. *Marine Pollution Bulletin* 40(3), 253-256.

efforts. Natural dispersion – through wave and wind action – will also assist with clean-up efforts should a waste release incident occur. Therefore, accidental discharge of these waste products into the environment will have no more than minor or transitory impacts.

While unlikely, the potential of an accident discharge of fuel and waste products from a marine collision or other event does exist. Impacts to the environment from such events could include the accidental discharge of refuse or accidental release of petroleum fuel, in addition to small quantities of lubricating fluids, oils, and unleaded gasoline for the Zodiacs. Through the implementation of standards as described above, impacts will be no more than minor or transitory.

For visits to the Antarctic, Sub-antarctic and the Arctic, no poultry products will be taken on land, introduced into the water or onto the ice (if applicable) to avoid the spreading of the Infectious Bursal Disease Virus. Poultry products (poultry or parts not consumed) will be handled in a matter that eliminates risk to native flora and fauna; either being incinerated, kept refrigerated or in frozen storage for disposal upon return to port.

Waste management permits will be applied for, if required by the area of operation. A post visit report will be completed and submitted to the national authority (if required under the permit terms).

As stated in Section 6.6.2, organotin biocides are not contained in the particular brand of anti-fouling paint used on MS Silver Explorer, thereby complying with the IMO Antifouling Systems Convention (AFS/CONF/26).

6.7 Noise

6.7.1 Origins

Noise will be generated by:

- Ship operations, and
- Small boat operations.

6.7.2 Assessment

Effect of noise upon wildlife and wilderness and aesthetic values is a key concern. Wildlife can be impacted by noise in two ways: 1) increased stress leading to changes in an individual's behavior and 2) disturbance of whole communities leading to breeding mortality. Species that could be disturbed include whales, seals, penguins and seabirds with disturbance occurring on shore at the colony, nest or haul-out site during breeding, where impact could be the greatest. Other effects of noise can impact species that are resting; in cases such as this, the impact is likely to be less significant. Small boat operations can result in impact by noise disturbance, for example resulting in disturbance to penguins at local colonies (as the birds come and go from their nest sites) and seals and whales in open water. Disturbance to some species could result in them entering the water, potentially increasing predation.

The level of noise disturbance is related to the number of boats used, their movements, speeds, and whether or not the equipment is maintained at optimal conditions. Noise is caused by a combination of engine and engine speeds. Defective exhaust systems or other faulty equipment can also result in greater noise.

While it is perceived that noise may have a transitory effect on the wilderness and aesthetic value of a given location for the duration of the visit, the likely impact is not considered significant provided minimization and mitigation measures are in place and adhered to.

Noise impact from the ship and small boat operations is assessed to be of low importance due to being of low intensity, short-term persistence and local scope.

6.7.3 Minimization and Mitigation

Impacts of noise effect from small boat activities has been poorly studied. As a US-based operator, the vessel and small boat activities of Silversea Cruises Ltd. will be managed in accordance with:

- Marine Mammal Protection Act (MMPA), 1972 and subsequent amendments,
- *50 CFR 216 MMPA Regulation,*
- IAATO's Wildlife Watching Guidelines (General and for Cetaceans, Seals, Seals, and Birds) (ref. Section 3.3.8), and
- Silversea Expeditions Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations (ref. Appendix 12.1).

6.8 Physical Disturbance

6.8.1 Origins

Physical disturbance may result from the following activities:

- Ship operations,
- Small boat operations, and
- Shore landings.

6.8.2 Assessment

Likely physical disturbance from MS Silver Explorer and related small boat operations includes activities such as water turbulence from ship passage, damage to coral reefs (in tropical areas), benthic communities, anchoring and mooring, and effect on wilderness and aesthetic values. The itinerary design will likely result in the vessel not being at anchor for more than one day and plans are for the ship to stop sufficiently far from any wildlife colonies or open water access area in order that its physical presence should have no effect or impact on their behavior. A transitory effect on the wilderness and aesthetic values of the area will result from the vessel's presence. Impact from the physical presence of the ship is assessed as being of low-medium importance due to the local scope, short to medium term persistence, high probability and low intensity.

Landing and shore operations can adversely impact flora and fauna – including native, rare and endangered species. Boat beaching, pedestrian traffic, and physical contact can also adversely impact land, air and water quality, and historic and geologic features. Notably landing and shore operations may adversely impact on nesting birds, hauled out seals, and on the intertidal marine ecosystem. Habitat destruction may be impacted due to trampling nesting sites and fragile plant communities, or impacts to wildlife, for example forced behavior modification, for example causing animals to scatter (and possibly abandoning their nests, possibly also leaving eggs and our young susceptible to predation), or by restricting their movements. Impacts can result from the noise from passengers ashore as well as noise from the Zodiac engines, which could disrupt the activities of shore animals and benthic communities. The introduction of alien species may also occur to island ecosystems. In some areas, impacts may extend to rare and/or endangered species.

In some areas, soil erosion can result from pedestrian traffic. The degradation of buildings and artifacts through physical contact can result from visits to historical sites. Visits can also result in increased humidity inside buildings, the removal of objects or defacement. The introduction of alien species can disrupt scientific studies or from intrusions into protected areas.

Damage to coral reefs (in tropical areas) and to deepwater corals and other substrates can occur if operations of the Zodiacs are not conducted properly to avoid damage to coral reefs and other biota if coral or other substrates are touched. Damage can be significant and lead to local loss of fragile species. Impacts can contribute to the degradation of coral communities both biologically and aesthetically.

The impact due to physical presence of shore landings and the use of small boats is assessed as being of medium-high importance due to the local scope, potential for medium-permanent persistence, low probability and low intensity.

6.8.3 Minimization and Mitigation

Minimization and mitigation measures include education, which is viewed as being the key factor towards ensuring that crew, staff and passengers are educated and briefed appropriately. The Expedition Leader is responsible for ensuring that the appropriate briefings are provided to passengers and staff and that the relevant training is provided to the vessel's crew. Briefings will include examples of non-interfering behavior, specific points regarding movement and behavior ashore at the various landing sites. As the Zodiacs arrive to the landing sites the Expedition Leader and/or expedition staff will brief the passengers, emphasizing specific points of importance. In all briefings, conservation issues will be stressed. Printed materials and lectures serve to address the potential areas of adverse impact by assessing activities that may result in impacts before the first disembarkation.

In some cases national authorities will provide visitor guidelines. These will form the basis of mandatory pre-landing briefings to advise all who are going ashore of their obligations under national law and the legal implications of their conduct.

Protected areas will be known in advance and checked to be certain that landing sites are not in the vicinity of these areas, that landings do not compromise area boundaries or that entry is made. Anchoring is prohibited within marine protected areas or marine reserves.

Ship's command and the Expedition Leader are also aware of protected species in order to ensure that activities do not impact these species.

Prior to disembarking passengers for activities ashore, the Expedition Leader will assess the landing site with the specific purpose of evaluating the landing against safety and environmental conditions. Visits will be managed according to factor such as any visitor site guidelines (if applicable), whether or not the site is in close proximity to any protected area, available space for passenger activities (is there space for the passengers to walk freely without disruption to flora and/or fauna?), species diversity at the site, etc.

The Expedition Leader is responsible for managing activities ashore. He/she will be assisted by a team of experienced field staff. Activities ashore will depend upon the highlights of each site but may include walks or hikes; visits to cultural sites of interest; opportunities to view wildlife, flora and sites of unique geological interest. At some landing sites visits will be made to historic sites and/or research stations. In these cases the visits will be conducted according to established visit guidelines or management procedures established by national authorities. At all times, particular attention will be paid to supervision of passenger activities to minimize impact, etiquette at wildlife areas, personal conduct, geologically-fragile features and boundaries of protected areas.

Should any participant violate the 'rules,' the Expedition Leader and staff supervising shore activities may remove the offending participant from the site and prohibit participation should he/she be concerned over the individual's future behavior. Experience has shown that in nearly all cases, participants are champions of the environment and willingly support measures to minimize adverse environmental impact.

Standard operating procedures minimize physical disturbance and protecting the environment while ensuring safe and responsible operations.

6.9 Introduction of Alien Species and Translocation of Diseases

6.9.1 Origins

The risk of introduction of non-native alien species (those species that do not naturally occur in an area and have been introduced intentionally or unintentionally) and translocation of external diseases is ever-present due to direct and rapid inter-continental transfers. Introduced species include microbes, algae, fungi, vascular plants,

invertebrates, fish, birds and mammals. Introduction could occur through a number of pathways, including packaging, decontaminated clothing or equipment, and even importing uncooked food.

6.9.2 Assessment

Human activities have the potential to act as a vector for non-native species. Populations are susceptible to infection by disease and scavenging of unsecured food waste by birds, for example, is a simple route for these to enter the system. The possibility exists for the spread of diseases from one colony to another should disruption occur. The local biota could be significantly impacted should introduction or translocation of alien species, soils or microbes occur. In some areas, impacts may extend to rare and/or endangered species. Unclean footwear, clothing or equipment and on small boats can introduce soil and seeds which may result in the accidental transfer of non-native organisms. The greatest potential risk to the health of wildlife are highly contagious viral diseases, such as morbillivirus, Newcastle disease and influenza; immuno-suppressant diseases, such as infectious bursal disease and retrovirus; and from agricultural and zoonotic diseases such as brucellosis, tuberculosis and leptospirosis.

The impact is assessed to be of high importance due to its potential to have a regional scope, permanent persistence and high intensity.

6.9.3 Minimization and Mitigation

Standard operating procedures and procedures such as boot, clothing and equipment decontamination procedures for small boat operations and shore landings will be followed strictly to ensure the prevention of introduction of translocation of non-native species and disease.

Silversea will apply the following practices to minimize the likelihood of introduction of alien species or diseases:

For the vessel:

- Rat guards in place on mooring lines,
- Gang plank lifted at night or, if lowered, lit with flood lights,
- External doors and windows closed whenever possible,
- Proper food handling, secure storage and proper disposal of waste generated on board,
- Insect traps in place in food storage areas,
- Old foods removed from food storage areas at the end of each voyage,
- Prohibiting the taking of uncooked poultry products or eggs ashore, and
- Ensuring that procedures are followed for boot, clothing, and equipment decontamination.

For the auxiliary craft (Zodiacs):

- Inside watercraft cleaned,
- Hulls of watercraft cleaned before loading, and
- Cleaning of the Zodiacs in between landings and between areas of operation.

The Expedition Leader has responsibility for briefing all those going ashore (passengers, expedition staff and crew) on Biosecurity measures, including any requirements from national authorities, for example, for visits to the Antarctic, Sub-antarctic islands and the Arctic. Participants will be strongly encouraged to check and, if necessary, clean their clothing (including Velcro cuffs, pockets, seams, socks, trouser hems and cuff turn-ups, fleece, zippers, and/or hood of jackets) and equipment (including items such as camera tripods, trekking poles, daypacks, camera bags and rucksacks, etc.) prior to the shore landings. Those who may have recently gone trekking, tramping, backpacking, or farm visiting prior to the voyage will be advised they must check their items especially carefully to ensure they have removed all foreign material. If necessary, boot washing stations will be established aboard ship with Virkon® or another disinfecting agent, for example Virox-5, to be used as a biocide wash.

On shore, participants will be advised to, where possible, avoid walking in concentrations of organic material such as bird guano, seal placenta, or seal or other animal feces in order to avoid moving this material around the

landing site. Before boarding the Zodiacs for return to the ship, debris, especially organic matter, will be washed off boots and clothing as much as possible. Vigilant checks will be made to ensure that seeds and other vegetation are not transported back to the ship.

At the end of each landing, Zodiacs will be inspected when raised for stowage at the conclusion of the boat operations, and when necessary cleaned, to ensure that no foreign matter is transported between sites.

Expedition Leaders are mindful to watch for extreme situations, such as a high mortality event, and to report the event to assist in the swift dissemination of observed and recorded information to the appropriate authority. They are advised to report any highly unusual event, whether indisputable or perceived, immediately to assist in the analysis of the event and hopeful containment of the potential threat.

Should the discovery of a high mortality event be discovered, the Expedition Leader should:

- Abort the landing,
- Not allow those on shore to walk among sick or dead animals,
- Not allow anyone to collect samples or handle sick or dying animals,
- Photo-document the event and/or obtain video records if possible,
- Immediately report the event, and
- Notify the appropriate national authority of the incident.

The probability of introducing alien species or diseases is assessed to be extremely low.

6.10 Dependent and Associated Ecosystems

6.10.1 Origins

Aspects of the proposed activity that are likely to affect dependent and associated ecosystems are:

- Emissions to air (ref. Section 6.4): contribution to regional and global air pollution burdens,
- Removal of wastes (ref. Section 6.6): increased landfill in port reception facilities; indirect effect of contamination of soil and groundwater and disease transfer during sewage handling, and
- Physical presence (ref. Section 6.8): disturbance of migratory species.

6.10.2 Assessment

Emissions from routine operations have the possibility to lead to impact from airborne pollution and contamination of soils, snow and/or ice with an indirect effect of pollution of local environments. The potential cumulative effect is a contribution to regional and global air pollution.

Routine operations involving domestic, food and/or hazardous waste (removed if possible) can result in an increase in landfill (when offloaded) and an increase in engine emissions (when transporting waste to disposal sites) leading to an indirect impact by contamination of soil and groundwater; damage to local ecosystems and loss of habitat. The potential cumulative effect is a need for more landfill space at reception sites; loss of habitats; increasing soil and groundwater contamination; and an increasing contribution to regional air pollution.

Routine operations involving human waste (solid and liquid) has a direct effect of increasing sewage treatment at reception sites and an increase in engine emissions in the transportation of waste. The indirect effect is disease transfer during sewage handling; impact on human health at reception sites; contamination from the use of detergents during cleaning of containers, and loading on surrounding ecosystems and habitats. The potential cumulative effect is an increased loading on the surrounding ecosystems and increased air pollution.

The physical disturbance from routine operations can lead to a loss of aesthetic or wilderness value and disturbance of wildlife leading to an indirect effect of an increase in the "footprint." A cumulative effect is the loss of tourism value. The potential cumulative effect is a loss of tourism value.

6.10.3. Minimization and Mitigation

Minimization and mitigation measures to avoiding impacting dependent and associated ecosystems include following established standard operating procedures as well as good maintenance, use of newer equipment (emissions); minimize wastes and reduce packaging (domestic/good/hazardous waste); and secure containment and biodegradable containers (human waste).

7. CUMULATIVE IMPACTS

The proposed activities by Silversea Cruises Ltd. will produce outputs that will lead to cumulative impacts.

If repeated often enough, all impacts have the potential to become cumulative. Cumulative impact can be defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions."[8]

Examples of cumulative impacts to which the proposed activity may contribute include:

- Contribution to regional and global air pollution burdens,
- Increased emission loads leading to regional and global climate change,
- Increased landfill in port reception facilities,
- Indirect effect of contamination of soil and groundwater and disease transfer during sewage handling,
- Effect on vegetation or periglacial features through additive effects of pedestrian traffic,
- Gradual establishment of new microbial or plant assemblages through inadvertent introductions over time,
- Effect on breeding populations through long-term modifications due to increased pedestrian traffic,
- Disturbance of migratory species,
- Degradation of historic artifacts from handling, abrasion, theft, etc.,
- Changes in attitudes over time and hence acceptable uses of localities through familiarity and precedent,
- Reduction in scientific, wilderness and aesthetic values of landing sites visited, and
- Changes in the level of visitation to existing sites; interest in finding new sites.

Silversea has planned their proposed activity to sites that are being visited by other tour operators and expeditions; however, limited baseline environmental monitoring data exists for the sites that will be visited by MS Silver Explorer so it is difficult to judge the likely long-term cumulative effects of the visitation.

[8] Council on Environmental Quality. 1997. Considering Cumulative Effects under the National Environmental Policy Act. Washington, USA.

8. MONITORING AND VERIFICATION

To ensure that the proposed activity complies with the minimization and mitigation measures outlined in Section 6 of this assessment, Silversea Cruises Ltd. has responsibility for monitoring and verification.

This will largely take place by the Expedition Leader in the day-to-day monitoring of activities and the compilation of post visit reports by the Expedition Leader and Master at the conclusion of each voyage. Reports will include the details on off-ship and shore landings (site visit data), including the date, time, numbers involved, and the activities. The reports will be supplemented by photo documentation, if necessary, to monitor and manage the ongoing effects of the activity on the locations being visited and their conservation values. Any noted environmental disturbance, incidents (see below), scientific support or transport and medical evacuation will be noted and reported as appropriate.

Incidents may include but are not limited to any of the following:

- Medivac involving several or many people,
- Medical emergency involving serious injury or loss of life,
- Vessel loss or incapacitation (e.g. grounding, sinking, collision, etc.,
- Any incident that involves the need to ask for assistance by another vessel or research station,
- Logistical (e.g. a group stranded ashore for an extended period of time),
- Environmental: Pollution (e.g. oil spill, accidental discharge, etc.), and
- Environmental: Wildlife-related (e.g. harmful disturbance).

In the highly unlikely event of a whale collision, a report will be prepared for the national authority and the International Whaling Commission for their database. The information to be collected includes the following:

- Date of event (day/month/year),
- Known or suspected species struck,
- Fate of whale (killed, injured, unknown),
- Name of ship / length of ship / tonnage,
- Speed of ship at time of collision (in knots),
- Location of event (latitude / longitude), and
- Brief description of the event:
    - Time of event (hour and was this during day, night or dusk)?
    - Sighting conditions (sea state, weather, visibility)?
    - Was the whale seen just before the collision?
    - If seen before the collision, distance in front of the vessel?
    - What was the whale's behavior (e.g. swimming at surface, feeding, breaching, etc.)? Was there any sign of a response to the vessel (e.g. sudden dive or change of course)? Were other whales seen with the whale or in the area?
    - Was the strike felt or heard aboard ship?
    - Was an injured or dead animal or blood in water seen after strike?
    - Was the whale caught and carried to the bow of the ship?
    - Was there any damage to the ship?

Activities will be monitored throughout each season so that improvements can be made immediately to ensure not more than a minor or transitory impact on the locations, environment and culture (if applicable) being visited. An end of season review will also take place with the involvement of pertinent individuals so that improvements can be made to future operations as necessary.

9. CONCLUSION

Provided that the minimization and mitigation measures outlined in Section 6, the cumulative impacts in Section 7 and the monitoring and verification measures in Section 8 are met, the conclusion of this assessment is that the proposed activities of Silversea Cruises Ltd. are likely to have no more than a minor or transitory impact.

10. ACKNOWLEDGMENTS

- Conrad Combrink at Silversea Cruises Ltd. and Lino Calzolari at V.Ships Leisure SAM for their assistance with the preparation of this document and for their insightful comments.

- Poles Apart Ltd. who developed the framework for the matrix of likely environmental impacts tourist IEE's that this assessment has been modeled after.

11. ACRONYMS

ECDIS	Electronic Chart Display System
EIA	Environmental Impact Assessment
EMER	Emergency and Medical Response Plan (IAATO)
EMS	Environmental Management System
EPA	Environmental Protection Agency (United States)
EPIRB	Emergency Position Indicating Radio Beacon
FOM	Field Operations Manual (IAATO)
GMDSS	Global Maritime Distress and Safety System
HFO	Heavy Fuel Oil (under IMO)
IAATO	International Association of Antarctica Tour Operators
IACS	International Association of Class Societies
IEE	Initial Environmental Evaluation (under the Antarctic Environmental Protocol)
IFO	Intermediate Fuel Oil (under IMO)
IMO	International Maritime Organisation
IMS	Integrated Management System Manual (FleetPro)
ISM Code	International Management Code for the Safe Operation of Ships and for Pollution Prevention
MARPOL	International Convention for the Prevention of Pollution from Ships (under IMO)
MGO	Marine Gas Oil (under IMO)
MLC	Maritime Labour Convention (under the International Labour Organization)
MMPA	Marine Mammal Protection Act (United States)
MRCC	Maritime Rescue Coordination Centres
MSC	Marine Safety Committee (IMO)
NSF	National Science Foundation (United States)
QSE	Quality, Safety and Environmental Management System (ISP)
SAR	Search and Rescue
SOLAS	International Convention for the Safety of Life at Sea (under IMO)
SOPEP	Shipboard Oil Pollution Emergency Plan (under MARPOL/IMO)

12. APPENDICES

The following appendices are included:

12.1 Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations
12.2 Table 3 – Matrix of Likely Environmental Impacts

12.1 Standard Operating Procedures for Zodiac, Snorkeling and SCUBA Diving Operations

Please refer to the next 31 pages.

SILVERSEA EXPEDITIONS

STANDARD OPERATING PROCEDURES

Zodiac Operations
Snorkeling Operations
Scuba Diving Operations

M/S Silver Explorer
M/S Silver Discoverer

STANDARD OPERATING PROCEDURES

These instructions have been produced to provide common guidelines for various activities that are part of the Expedition product of Silversea Cruises. These include Zodiac operations, snorkeling & scuba diving.

Copies of this manual have been distributed to each Expedition ship in the fleet.

A copy of this manual is to be retained on the Bridge and in the Expedition Offices.

A copy of this manual is to be retained in the cabins of all Expedition Team members. It is the responsibility of each Expedition team member to read and understand the manual as part of their job responsibilities. Any questions can be directed to the Expedition Leader for clarification.

A digital copy will also be distributed to each Expedition Team member prior to embarkation.

All Expedition Team members are to read the manual and sign a form in the Purser's office stating they have read and understood the manual.

STANDARD OPERATING PROCEDURES

Table of Contents

5. *Snorkel Lookouts & Safety Duties*
6. *In-Water Snorkel Guides*

JELLYFISH MANAGEMENT & TREATMENT

1. *In the Field Treatment*
2. *On Ship Treatment*
3. *Symptomatic Treatment*

ZODIAC OPERATIONS

(MV Silver Discoverer & MV Silver Explorer)

1. General Overview

- Driving Zodiacs involves a high level of responsibility and should always be taken seriously. Be professional at all times.
- Zodiac operations play a key role in the operation of our vessels. They are used widely in our Expedition Operations. They give us the flexibility to land virtually anywhere, to explore islands, coastline, and tributaries and to visit small towns and villages that would otherwise be inaccessible.

2. Responsibility And Authorization

- The Chief Officer/Staff Captain has overall responsibility for Zodiac operations, the drivers, and driver training.
- The Zodiac driver is responsible for safe driving and the safety of the passengers. Under no circumstances should these be compromised. The driver is in command of the Zodiac and passengers should not be allowed to influence his or her decisions. When necessary, passengers should be instructed in a firm, polite manner.
- The Expedition Leader in conjunction with the Chief Officer/Staff Captain will decide on the landing procedure and number of passengers per Zodiac. Their orders must be strictly followed.
- Unauthorized persons are not permitted to drive Zodiacs. Zodiac drivers should hold an approved powerboat drivers certificate or equivalent.

3. Cruise Program & Itinerary

- Before the start of each cruise, the Expedition Leader is to prepare and discuss with the Captain a tentative itinerary of planned activities.
- The Bridge and Deck Fitter/Mechanic are to be given a copy of the itinerary for reference of daily activities.
- The Captain must approve all unscheduled Zodiac cruising, landings etc.
- On a daily basis, the Expedition Leader is to discuss with the Chief Officer/Staff Captain planned Zodiac operations. They are to keep the Captain informed of their planned operations. In planning Zodiac operations, they are to consider:
  - The detailed Zodiac program for the day, including the number of craft & drivers required for each activity,
  - The number of landings/cruises to be conducted,
  - Detailed timing of Zodiac operations,
  - Staff requirements for disembarkation and shore party.
  - Anticipated problems in boarding and landing passengers;
  - By-laws in ports, or permit conditions in national park areas regarding speed limits; wake; prohibited or restricted areas
  - The weather forecast and possible implications of change in weather.

4. Types Of Zodiacs & Engines

Silver Discoverer – total of 12 Zodiacs

- 10 x MK5 Zodiacs
- Tiller arm, electric 60hp Yamaha engines.
- 2 X MK6 Zodiacs
- Central console steering. 80 hp Yamaha engines

Silver Explorer – total of 10 Zodiacs

- 8x MK5 Zodiacs with tiller arm, electric 60 hp Suzuki 4-stroke engines
- 2x MK6 Zodiacs with center console steering wheel, electric 70hp Suzuki engines

5. Starting Engine (Conducted By Drivers)

At the beginning of Zodiac operations and before the boat is released from any tether lines, the Zodiac should be turned on by the driver. Ensure that the throttle is in the neutral position, the kill cord is in place and that the key is in the ignition. Turning the key with the throttle in neutral and the kill cord in place should result in the engine turning over. At this point, with the engine running, any tether lines can be released.

6. Pre-Start Check-List (Conducted By Drivers)

During all operations Zodiac drivers should at all times wear a life vest, appropriate protective clothing and carry a VHF radio.

Upon taking command of a Zodiac the driver should ensure the following:

Engine Secured to Transom

- Make sure that the engine is securely clamped / bolted to the boat.

Fuel

- Make sure your tank is filled with fresh uncontaminated fuel (always carry a full second spare tank). Make sure you have enough fuel for your intended trip and some reserve. If you need more fuel radio your Expedition Leader or the Officer on watch.
- Open vent screw on tank
- Check fuel hose / line are properly connected with the arrow pointing to engine.

Primer Bulb

- Squeeze the bulb until it is firm to allow fuel to reach the outboard engine before start.

Throttle Controls & Steering

- Make sure the controls operate properly
- Turn the steering wheel (if MK6) from one lock position to the other.
- Turn the throttle from ahead to astern

Propeller

- Make sure that the propeller, drive leg, and cooling water intake are free of debris.
- Be sure to check the prop is clear when you start the engine.

Cooling System

- Once engine is on, check if cooling water is squirting from the back of the engine.
- If it is not, or only dribbling out, turn off engine immediately
- Try to clean jet hole with wire and try again
- If not working properly radio the Expedition Leader or Officer on watch.

Bow & Stern Lines

- Check that all lines are inside the boat and properly secured

Kill Cord.

- It is required that all drivers wear a kill cord when operating the Zodiacs.
- Check that there is a second (backup) cord in the boat.

Pontoons

- Make sure that all isolating valves have been turned to “NAVIGATION”
- Check pressure of all chambers, including the centre chamber beneath the floor boards.
- If they need more inflation, radio the Expedition Leader or Officer on watch.

Cleanliness of Zodiac

- Remove any rubbish
- Boats should be clean, water pumped out and pontoons wiped off prior to boarding passengers.

Safety Equipment

- Check that the following equipment is onboard your Zodiac or with the driver

- Anchor & rope
- Paddles (x2)
- Pump / Bailer
- Tool kit
- Fire extinguisher
- Radio
- GPS / compass
- First aid kit
- Flares (& sound signaling device)
- Boat Hook
- Water cooling pin
- Radar reflectors (if required)
- Torch (for night operations)
- Spare fuel tank
- Spare kill chord

7. Defects / Problems / Missing Equipment / Zodiac Maintenance

- Zodiac maintenance should be preventive
- Entering details of the engine and boat performance into the Zodiac Log book is of utmost importance.
- Make an entry only if there were any problems. Each entry should contain:
  - Date and time
  - Engine number
  - Driver's name
  - Defect / problem / missing equipment
- If problem persists, report to the Expedition Leader, who will report to the Chief Officer and Chief Engineer

8. Personal Buoyancy & Clothing

Before you go out on a Zodiac

- You must wear a lifejacket. Nobody, neither crew nor guests, are ever allowed to board a Zodiac, even a Zodiac that is tied up alongside the ship, without a lifejacket. All persons that go onto the embarkation / disembarkation platform MUST wear a lifejacket.
- Make sure you are properly dressed.

Hot Weather.

- Standard SS uniform codes apply
- You must wear, suitable footwear
- You are not allowed to go on Zodiacs barefoot.

Cold Weather

- Standard SS uniform codes apply. You will receive standard SS outdoor gear, which you should wear on the Zodiacs.

9. Passenger Embarkation into the Zodiac at the ship

- Always follow instructions from the Bridge Officer on watch
- Ensure that passengers use the sailor's-grip and have their hands free at all times.
- Drivers should help with the loading of passengers if conditions allow.

- Direct passengers to their seats and insist that they sit down immediately.
- Load passengers on alternate sides so that the boat is always balanced.
- Keep watch for ice or debris floating towards the Zodiac and be ready to drive away from the platform in case of danger. Be alert at all times!
- Before leaving the gangway, double-check to ensure lifejackets are properly donned.
- Leave the gangway slowly, ensuring you do not create a wake until you are clear of any local traffic or other Zodiacs.
- Zodiac drivers should never load or unload passengers without assistance.

10. Passenger Behavior Onboard Zodiacs

- Passengers should always remain seated unless embarking or disembarking from the boat, or unless the boat is stopped and permission is obtained from the Zodiac Driver.
- There should never be more than one passenger standing at one time while underway, or while embarking or disembarking.
- Secure equipment and belongings to avoid losing items overboard.

11. Driving Procedures

- When driving with passengers, always adapt to the conditions to make sure the ride is as smooth and comfortable for the guests as possible.
- It is better to go too slow than too fast.
- Communicate with your passengers and ask them if they are comfortable.
- Be aware of sea & tide conditions before leaving the ship. Get information from the Bridge and scout boat about local conditions.

12. Zodiac Tours

- ALWAYS travel in pairs. A minimum of two Zodiacs should be together at ALL times during a Zodiac tour.
- Please note that the 4-stroke hydraulic engines are always in the locked position. Serious damage to the engines can be caused by hitting the engines on rocks or ice. It is extremely important to drive slowly and carefully, with the engine tilted up when in shallow or foul waters.
- Zodiac cruises are a team effort. Share sightings with other drivers to optimize everyone's experiences.
- Be aware of the location of the other drivers and assist each other as needed.
- You will be buddied up with another driver, please stay with the other Zodiac and work together as a team.
- Be aware of any local traffic conventions.

- Be aware of passengers who wish to photograph and ensure all who wish to do so have taken their pictures before moving on.
- Remember not to favor one side of the boat over the other. Ensure that passengers on one side of the boat do not always have the scenery to their backs.
- Be aware of floating hazards in the water – e.g. fishing nets, lobster buoys or ice.
- If driving in shallow water it is recommended to use the tilt mechanism on the engines to reduce the chance of shaft or propeller damage.
- Be aware of the tide and how it may affect the Zodiac operation.
- If entering caves, watch the swell very carefully for a few moments to see the effect of surges. Often it is safest to enter caves stern first as this allows for a speedy exit in an emergency.
- Be aware of the effect your wake may have on local traffic or other Zodiacs at the gangway.
- In rough weather passengers are susceptible to back injuries in a pitching or bouncing Zodiac – do not sacrifice safety or comfort for speed. Do not allow passengers to sit on the floor of the Zodiac under these conditions as they are more likely to sustain injuries in that position.
- Be aware that during long Zodiac cruises in polar destinations it is possible for passengers to get very cold. Be aware of their comfort and any signs of hypothermia. Hyperthermia can also occur in hot destinations.
- Finally be aware of the effect of the engine fumes on your passengers. CO poisoning has occurred from outboard engines even in open boats. There is a greater chance of this happening in caves or areas with restricted air movement. Symptoms are mild headaches, fatigue, nausea, dizziness and confusion. If any of your passengers appear to be suffering from these symptoms, move them to the front of the Zodiac, or where appropriate either shut the engine off for a while to allow the air to clear or drive away fast to create 'false' air movement and ensure the fumes are blown away.

13. Shore Landings:

- On shore, passengers should always be instructed as to the safest way to disembark appropriate to that specific landing site, whether it is a beach, a jetty or a muddy bank.
- On the approach to the landing, drivers should brief their passengers as to the safest method of disembarkation and tell them repeatedly not to stand up in the Zodiac until it is their turn to disembark.
- As the engines are permanently locked down, it is important to approach the landing slowly and tilt the engine to avoid striking any rocks or submerged objects which may damage the engine.
- Be aware that the EL may call you with specific instructions regarding the landing on your first approach.
- With stern landings it is critically important that no one – neither passengers, crew nor staff – should disembark over, or stand behind, the wooden transom. It is very easy to be knocked over by the surf in that position and then have the full weight of the boat and engine land on top of you.

- During difficult landings, particularly stern landings, drivers should wait until a signal has been given b the lead shore party person that it is safe to approach the shore.
- Always keep an eye on the swell and surf when approaching a landing and use these varying conditions to aid your approach.
- If lifejackets are removed onshore, they need to be stored inside a bag/bin. Dirt, sand or grit may jeopardize the automatic inflation mechanisms of the lifejackets.
- When anchoring the Zodiac onshore or just offshore, remember that it is the driver's responsibility to ensure that the boats are safely secured and clear of any dangers. Be very wary of sharp rocks as well as the status of the tide.

14. Returning To The Ship:

- Pay close attention to the time of "all aboard / last Zodiac" given by the Expedition Leader and ensure that you have returned to the ship at or before the designated time so as not to delay the ship's departure. Punctuality may be critical at certain times during a voyage and a late departure may jeopardize the next outing.
- If muddy conditions were encountered on shore, have passengers scrub their footwear before re-embarking the Zodiac to return to the ship.
- Show consideration for the other drivers returning to the gangway and avoid overtaking them as they approach the gangway. Remember that you are working as a team.
- Follow instructions from the Bridge Officer on watch as they are in charge of the gangway operation.
- Keep watch for floating debris (ice, logs, mats of vegetation, etc.) and be ready to drive away from the platform in case of danger.
- Insist that passengers remain seated until the Zodiac is secured alongside the platform and the able-bodied seamen are ready to assist with embarkation / disembarkation. Ensure that passengers use the Zodiac-grip and have their hands free at all times.
- Assist the able-bodied seamen with passenger disembarkation. Disembark passengers from alternate sides so that the boat is always balanced.

15. Back Onboard:

- Remove any rubbish from the Zodiac and discard it properly (i.e. empty water bottles). Take any towels used for swimming or drying the boat to the laundry. Personal items left by passengers should be taken to Reception at your earliest opportunity.
- If needed, assist the deck crew with Zodiac storage.

16. Radio Operations:

- Monitor your radio throughout the landing. Your safety, as well as the safety of others may depend upon it.
- Keep radio conversations short and to the point
- Be aware of the location of other Zodiacs and share information if appropriate.
- Keep the Expedition Leader informed should you, for any reason, deviate from their original plan.
- Stay off the radio while the ship is anchoring, except in an emergency, so the Bridge can communicate.
- Always remember that everyone, including passengers, can hear radio transmissions.

17. Boat Handling

Some effects to consider when handling a boat include: how much is the windage, how much swell is there, how are the stream effects, how much momentum it has, is there any prop effect, where does it pivot and how is it steered.

Be sure to always observe sea and wind conditions and anticipate their effect on the handling of the Zodiac.

Windage

- A bigger boat i.e. lifeboat has much bigger windage than a Zodiac, but even a small Zodiac will be affected by wind and need to be take into consideration especially when coming alongside the platform and in marinas.

Stream and Current

- Stream and current will affect the maneuverability of your boat. Pay particular attention to currents when maneuvering alongside the platform. Always tie up with the bow facing forwards into the stream.

Momentum – Carrying way and stopping

- Unfortunately boats don't have brakes so you need to learn to use neutral and to be able to assess how quickly it will stop. Good boat handlers spend a lot of time in neutral just letting the vessel move under its own momentum. All boats when put into neutral will keep moving until the momentum has been lost; this is called "carrying way". A large heavy vessel will require more power to make it move in the first place, hence when moving it has greater momentum and will keep moving longer when in neutral.
- Sometimes you may need to use a small amount of engine power (i.e. reverse) to halt the last of this momentum; however it is best to use nature's brakes as much as possible – the wind and the stream.
- Because of the combination of wind, stream, and its handling characteristics, a boat is often traveling because of all these forces. Especially at slow speed it is important to realize that the boat may be traveling in a different direction from the way it is pointing.

- Wind or stream will be trying to move your boat downwind or downstream, therefore it is best to think of all areas downwind or downstream as your "Danger Zone". By knowing which direction stream and wind are trying to take the boat you can use them to your advantage, as nature's brakes to slow you or to assist you onto a berth. Learning how to read the elements and use them to your advantage is one of the key factors in stress free boat driving.

Pivot Points

- Boats when going ahead steer from the stern; the pivot point is about one third of the way towards the back from the bow. When you put the wheel / tiller hard over to the left (port) and engage ahead gear, roughly one third of the vessel will turn to port and the remainder goes to starboard.
- When going astern the pivot point moves aft and when the wheel is hard over to the left (port) with astern gear engaged, one third of the vessel moves to port the remainder to starboard.

Steering

- Outboards and outdrives do not have rudders, they steer by squirting the water in the direction that the drive is turned, as this only happens when it is in gear you need to think – NO GEAR, NO STEER. Because you want the drive in the correct direction before power is applied remember "WHEEL BEFORE GEAR"
- At slow speed a "burst of power" is very effective as it increases the maneuverability of the boat.

Turning

- Steering on boats is not the same as on cars so when turning in a small space you need to take into account all the points above.
- Position the boat roughly in the centre of the space taking into account wind, and stream. Approach as slowly as possible, speed carried into the turn will make the turn larger.
- In order to make the turn pull the wheel hard over to starboard, engage ahead, monitor the turn, and put the gear into neutral when space is short. Then wheel should be turned hard over to port, engage astern, and monitor the turn. Again, put the gear into neutral when space is short. Straighten the wheel, engage ahead and drive out.
- It is usual to turn into whichever element is strongest, either wind or stream.

Coming Alongside

- Successful maneuvering between pontoons and other boats is easier if you take into account how your craft reacts. Check what the wind and stream are doing and what effect it will have on your boat and maneuverability. Approaching into the wind or stream means they can help act as brakes. Ideally try to

approach using whichever one will have the greatest effect. Prepare all lines, and plan your "escape" route, just in case the maneuver goes wrong.

- Start your approach as far off the pontoon as is practical. Your angle of approach should be about 30 – 40 degrees. Use neutral to keep speed and momentum low. When you are about a boat's length away, steer away from the pontoon and give a touch ahead. This will straighten the boat. Try to let the boat stop without engaging the gear astern. If you are too fast or too steep to the pontoon, steer towards the pontoon and engage astern gear momentarily to bring the boat alongside. This has the effect of slowing you and bringing the stern in. Look sideways to be sure that the boat is stationary.

Leaving the pontoon

- Leaving the pontoon can be a very simple maneuver. If the route ahead is clear and there is no wind or stream a good push off the pontoon and driving away in ahead could suffice. However it is usually better to come away in reverse, utilizing the shape of the boat to roll the bow in first.
- Fender the bow, steer towards the pontoon engage ahead briefly, into neutral, then steer away from the pontoon. Engage reverse and as the stern comes away, straighten up the wheel. Once well clear move off ahead.
- To leave with any wind or stream element holding you on, you may need lines. Decide if you want to leave ahead or astern.
- To leave astern - rig a bow line as a slip line and fender the bow area. Turn the wheel away from the dock and engage astern, as the stern comes clear, engage neutral, slip the line and reverse away.
- To leave ahead – rig a stern spring as a slip line. Fender the stern well and engage astern. As the spring tightens it forces the bow out. Engage neutral, slip the spring and motor away.

18. Anchoring

The anchor is one of the most important pieces of safety equipment that you carry on the boat.

Always check that you have an anchor attached to the Zodiac and NEVER leave on a trip without an anchor.

- Look for shelter for the duration of your stay. Check the suitability of the bottom, and consider the rise and fall of the tide. Will there be enough water later? Look at how other craft in the area are anchored – will there be enough room to swing?
- Bring the boat to a stop
- Lower the anchor slowly and in a controlled way until it touches the bottom
- Motor back slowly paying out the anchor cable / rope so that it doesn't pile up upon itself on the seabed
- Once the correct amount of chain / rope has been paid out, tie off and motor astern to help dig the anchor in

- Check to make sure the boat is holding its position, using two objects in line with each other (a transit) ahead and to the side to check you are stationary. If the anchor is dragging raise it and start again.
- When leaving an anchorage, engage ahead briefly to ease the load, haul in the line and chain, taking care not to run over your line. Stow the anchor securely.

19. Man Overboard (MOB)

Alert Someone

- If someone goes overboard, alert the other crew or passengers onboard the Zodiac.
- Shout MAN OVERBOARD! MAN OVERBOARD! MAN OVERBOARD!
- Instruct one person to point at the MOB at all times.

Approaching the MOB

- At slow speed turn the boat towards the MOB, this will move the propeller away from the MOB.
- Make a controlled turn back towards the MOB ensuring you have enough room not to run them down.
- If you are too close you will run in circles.
- Start the approach downwind.
- When the MOB is near, remove power and grab hold of MOB. Put engine into neutral, or if circumstances allow, switch off your engine.
- Radio the MOB situation to the bridge alerting the officer on watch and the other Zodiac drivers.

Picking up the MOB

- You will have to determine if the weather conditions allow for you to pick up the MOB without endangering the other persons on your boat.
- If it is not safe to return to the MOB, move away from the MOB, informing the bridge officer on watch and the nearest Zodiac driver that can assist.
- Always keep an eye on the MOB, never loosing sight of the person in the water.

20. Rules Of The Road

Head On Under Power

- When you are traveling head on to another vessel under power, both vessels should turn to Starboard side.
- Turn so that the skipper of the other vessel can clearly see your intention.

Crossing under Power

- If you are showing your starboard side, you must give way and pass behind the other vessel.
- If you are showing your port side you must stick to your course.

- Only change course if it is the only way to avoid collision.

Overtaking under Power

- It is the responsibility of the overtaking vessel to stay well clear of the vessel being overtaken.

Using Channels

- On the water we drive on the right hand side.
- When you are using a channel stay as close to the starboard hand side as possible.

Lateral Markers

- You should always keep to the right when using a channel.
- Lateral marks are used to show a channel.
- The meanings of the marker vary around the world – be sure you know the rules in the waters were you are operating
- International (non USA or Canada) – "*A little red port left in the glass*" Leave the Red channel markers to the port as you enter into the port (Green markers to the starboard).
- USA & Canada (and some others) – "*red on the right returning*" – leave the Red Markers to your right as you enter (return) to the port (Green markers on the left)

21. Weather

A basic understanding of wind strength, direction, and what effect it has while you are out on the water is essential for skippers of small boats. Remember wind against the stream will make the sea state worse.

The Beaufort Scale and interpreting weather forecasts

Force	Wind Speed	Description	Wave height	Sea State
0	Less than 1 knot	Calm	0 m	Mirror like
1	1 -3 knots	Light Air	Up to 0.1m	Ripples on the surface
2	4 – 6 knots	Light Breeze	Up to 0.3m	Small wavelets with smooth crests
3	7 – 10 knots	Gentle Breeze	Up to 0.9m	Large wavelets with crests starting to break
4	11 – 16 knots	Moderate Breeze	Up to 1.5m	Large waves begin to form with the white foam crests
5	12 – 21 knots	Fresh Breeze	Up to 2.5m	Moderate waves

				and many white horses
6	More than 21 knots	Strong Breeze and more	2.5m and more	Large Waves and higher

Tides

Tides are caused by the gravitational forces of the moon and, to a lesser extent, the sun pulling on the world's oceans. These gravitational effects cause a bulge of water on either side of the Earth (gravitational attraction on the 'near' side and centrifugal/centripetal force on the 'off' side). As the Earth rotates we pass into and out of these bulges of water; the sea near us rises and falls giving us tides.

How big the bulges are and where they are depends on the position of the sun and the moon relative to the Earth.

Spring and neap tides

When the Earth, sun and moon are in line with each other, the sun and the moon pull together on the same part of the ocean, so the bulges of water are bigger. This means as we pass through the bulges of water the sea rises higher and when we are out of the bulge the sea also drops lower as a lot of water has rushed to be in the bigger bulges. These are called spring tides (nothing to do with season of spring). The effect is strongest when the Earth, sun and the moon are directly in line.

When the sun, Earth and the moon are not in line the sun and the moon are pulling against each other on different parts of the ocean, so the bulges aren't as big. So as we pass through the bulges the sea near us does not rise or fall as much; our tidal range is smaller. The tidal range is smallest when the moon, Earth and sun form a right angle. These are called neap tides.

Sea Breeze

The sun heats up the land's surface, especially during the middle of the day. The land transmits this heat to the air above it. Meanwhile, the sea and the air above do not warm up so quickly. The difference in temperature between the air over the land and the air over the sea means there is a pressure difference too. Air rushes from the sea to the land to equalize this pressure difference. This is what creates a sea breeze.

Land Breeze

At night the land cools off very quickly and its temperature drops below the temperature of the sea. The temperature of the air above the land drops too, below the temperature of the air above the sea. The difference in temperatures means a difference in pressure and air rushes out to equalize the pressure. This creates a land breeze. Land breezes are not as strong sea breezes.

Wind against Tide

When the wind is blowing in the opposite direction to the flow of the tide there are often larger, steeper waves. Be especially aware of this around harbour entrances and headlands where the currents are stronger.

Wind With Tide

When the wind blows in the same direction as the tidal flow, the sea will often appear calmer and smoother. Be careful as this may fool you into thinking the wind is light when in fact it may be strong.

22. Natural Hazards To Consider

Ice conditions

- Consider the actual ice conditions.
- Try to avoid ice when driving – it can have very sharp edges that can rip a hole in your Zodiac.
- Ice is as hard as rock, and causes severe propeller damage – just like hitting a rock.
- Always travel through ice slowly and look for a pathway with the least amount of ice .
- In the event of a major glacier calving, be aware that the newly broken off ice can float great distances and surround your Zodiac very quickly.

Drift Sea Ice

- Be aware of the ice drift before the Zodiac operation begins.
- Note what the tide is doing, how the ice is shifting and how quickly.
- Drift ice moves with wind and sea currents. You might suddenly be enclosed when driving in drift ice. ALWAYS watch out for the ice and how it is moving.

Icebergs

- Always try to determine if the iceberg is grounded or floating. Stay a greater distance away from a floating iceberg
- Icebergs are all potentially unstable - all icebergs can suddenly flip over, causing huge waves and sending ice chunks flying through the air at great speeds.
- Keep your distance at all times
- Remember that 90% of the iceberg is under water.
- Never drive over the underwater 'footprint' of an iceberg (you can see the light blue water colour)
- Keep a close eye out for 'poppers' – pieces of ice that dislodge from underneath the iceberg – they can come up under your Zodiac and burst the pontoon or tip you over.
- Never approach an iceberg too closely. Always remain a distance of 1.5 times the height of the iceberg above water away from the iceberg. Even at this distance extreme caution should be used.

- Listen for the sound of cracks, groans, and internal collapses. If there is a lot of activity – stay further back!

Glacier Fronts

- Glacier fronts may calve, causing flood waves, flying ice and lots of floating ice that can block your access away from the site.
- Keep your distance!
- Never approach closer than the equivalent to ten (10x) times the height of the glacier front. It is recommended these days, due to warmer climate and increased calving events (in size and frequency) to stay minimum 500m from the glacier front.
- At some glacier fronts even this is too close – use good judgment.
- Avoid being trapped by islands close to the glacier front if a calving should occur.
- Factors that might affect the probability of a calving:
  - Glacier front height.
  - Gradient of the glacier.
  - Degree of fracturing in the glacier front.
  - Sea and current dynamics under the glacier front.

Cliffs & Falling Rocks

- Stones falling from cliffs, ravines with sand/stones and the breaking up of ice are hazardous.
- For these reasons, do not drive Zodiacs close to cliffs.

23. Wildlife viewing from Zodiacs & Zodiac Tours

Follow all AECO (www.aeco.no) & IAATO (www.iaato.org) guidelines when operating in areas of the world governed by those organizations (Arctic & Antarctica).

Follow all international rules & regulations regarding interactions with wildlife.

Regardless of regulations, it is a SS policy to avoid disturbing animals at all times.

No Disturbance Distance

- The principle is that we will avoid disturbing the animals. That does not mean that we will move forward until we see a reaction, and then stop. The principle is that we shall avoid provoking a reaction in the first place.
- It is the responsibility of the Zodiac drivers to avoid interactions/disturbance of animals and define how disturbance will be avoided.
- It is difficult to establish exact distances to ensure not disturbing wildlife. Different animals, or even the same animals in different situations, will react differently to a given situation.

Avoid disturbing wildlife with noise.

- Avoid making loud noises. Keep radios on a low volume setting. If close to animals keep conversation low and calm. Suspend loudspeaker announcements on deck whenever wildlife is nearby.

Avoid excess engine use, gear changes, maneuvering or backing up to the animals.

- These movements produce sudden, large changes in underwater noise levels, which may startle, agitate or drive the animals away.

Never go at full speed near animals

- Go slowly and carefully when operating near breeding colonies or large congregations of wildlife.
- Accidental strikes could happen and ultimately are each individual driver's responsibility.

Driving around Whales

- All Zodiac drivers must work as a team.
- Keep behind the whales, ideally to one side of the animals and then take it in turns to be the boat closest to the whales to share watching opportunities among all guests.
- Do not 'box-in' animals or cut off their travel or exit routes.
- Do not go closer than 100 feet, 30 meters to whales – unless the whale approaches you.
- Avoid scattering groups of dolphins, seals, whales etc.
- Avoid having too many boats by one animal at any one time.
- Be aware of how the other boats are operating, (i.e. which have and have not had close up views of the animals) and co-operate to ensure each boat gets a good view.

Approaching Birds or Seals on ice or land

- Watch their behavior carefully to note if you are disturbing them (head waving, moving away, opening mouths).
- If you are disturbing them, move off slowly.
- Often you can use the wind or current to drift down past wildlife which is perched on rocks or ice with your engine off. This provides a quiet, peaceful way to approach the wildlife. If, however, you do then need to start the engine do so as quietly as possible, and wait a few moments before changing gear to move off.

Approaching Polar Bears

- Always approach quietly and slowly
- Do not get close to polar bears on ice or rocks,

- These animals are capable of leaping up to two Zodiac lengths.
- Stop immediately if they enter the water – back off slowly to give them full right of way.

Driving with Walrus

- Walrus pose threat to Zodiacs.
- With groups in the water there is usually a large bull which will patrol around the perceived 'threat'. There have been incidents in the past of these males trying to climb into Zodiacs and puncturing the pontoons.
- Do not allow these animals to come too close to the boats.

24. AECO & IAATO Guidelines

- For some animals AECO and IAATO do give specific recommendations as to distances to the animals as a basic starting point.
- Check and familiarize yourself with these distances.

ALWAYS FEEL COMFORTABLE IN THE BOAT.

If you do not feel that your abilities match the requirements of the conditions

THEN DO NOT DRIVE.

Inform the Expedition Leader or Chief Mate and ask to be replaced with another driver.

SCUBA DIVING OPERATIONS

(MV Silver Discoverer)

1. Diving Procedures Onboard The Ship

- Guests "gear up" on deck 7 at least one hour before the dive time.
- Dive masters will load all guests' gear (BCD, tank, weight belt, fins, mask and snorkel) into a loading box, which is lowered by crane from deck 7 to a Zodiac waiting below.
- Make sure Zodiac has all safety equipment like DAN Oxygen set, life ring and a Zodiac ladder.
- All divers meet by the pool for a briefing 15min before the dive time.
- Guests bring their own cameras, lights, wetsuits, towels etc.
- Once briefing is complete we make our way down to the Zodiac.
- Guests will need to "check out" from the ship.
- When guests return from the dive, they swipe their card and then proceed to Deck 7 to wash their gear.
- The Dive masters come up to deck 7, attach the loading box to the crane for it to be lowered to the Zodiac for the gear to be loaded and lifted up to deck 7
- The Dive masters will unload the box, guests will take their gear apart, rinse, wash and hang up.
- The Dive masters will collect all tanks and will start filling the empty tanks, while placing out new tanks for the afternoon dive.

2. Passenger Embarkation Into The Zodiac

- Follow instructions from the Bridge Officer on watch
- Ensure that passengers use the Zodiac-grip and have their hands free at all times. Only three passengers are allowed on the gangway at a time.
- Help with the loading of passengers. Direct passengers to their seats and insist that they sit down immediately. Load passengers on alternate sides so that the boat is always balanced.
- Keep watch for ice or debris, especially floating debris in the Amazon, and be ready to drive away from the platform in case of danger. Be alert at all times!
- Before leaving the gangway double-check to ensure lifejackets are properly donned.
- Leave the gangway slowly, ensuring you do not create a wake until you are clear of any local traffic or other Zodiacs.
- Radio the Bridge to "check out" when leaving the ship. Call in:
  - your name,

- the number of your Zodiac
- the number of guest and/or crew onboard
- where you are going to dive
- estimated duration of time away

3. Passenger Behavior Onboard Zodiac

- Passengers shall always remain seated unless embarking or disembarking from the boat, or unless the boat is stopped and permission is obtained from the Zodiac Driver. There should never be more than one passenger standing at the time while the Zodiac is underway or while disembarking or embarking.
- Secure equipment and belongings to avoid losing items overboard.
- Balance the Zodiac according to the weight of the passengers.

4. Driving Procedures

- When driving with passengers, always adapt to the conditions to make sure the ride is as smooth and comfortable for the guests as possible. Rather go too slowly than too fast. Communicate with your passengers and ask them if they are comfortable.
- Before operating, ask for information about the conditions in the actual area. Allow for a scout boat to check out local conditions.

5. Diving Procedures From The Zodiac

- Scuba gear and weight belts are loaded in the front of the Zodiac just behind the box.
- No diver is permitted to wear a weight belt while the Zodiac is underway.
- Once arriving at the dive site, guests remain seated, the Zodiac driver and Dive master will assist guests with putting on all equipment.
- The Dive master will enter the water first to establish the direction of the current.
- He/she will the return to the Zodiac, brief the guests and Zodiac driver about the present conditions.
- Once all guests are ready, a countdown will begin and on the word “GO” all divers will do a backward roll into the water.
- All divers will meet on the surface, signal they are okay and will then start the dive.
- Always plan your dive and dive your plan.
- The Zodiac driver needs to look out and follow the divers based on the current direction and the bubbles.
- Make a safety stop at 5m/15ft for 3min after all dives.
- Once on the surface, signal to the Zodiac driver that you are “OKAY”.

- Wait for the boat to pick you up and while holding onto the boat, first give your weight belt, then your scuba gear and then your fins to someone in the boat after which you can use the ladder to exit the Zodiac.

6. Returning To The Ship:

- Radio the Bridge to "check in" when leaving the dive site. Call in:
  - your name,
  - the number of your Zodiac
  - the number of guest and/or crew onboard
  - that you are departing from the dive site
  - estimated number of minutes until arriving back to the ship
- Pay close attention to the time of "all aboard" given by the Expedition Leader and ensure that you have returned to the ship at or before the designated time so as not to delay the ship's departure. Punctuality may be critical at certain times during a voyage and a late departure may jeopardize the next outing.
- Show consideration for the other drivers returning to the gangway and avoid overtaking them as they approach the gangway, remember you are working as a team.
- Abide by instructions from the Bridge Officer on watch as they are in charge of the gangway operation.
- Keep watch for floating debris (ice, logs, mats of vegetation, etc.) and be ready to drive away from the platform in case of danger.
- Insist that passengers remain seated until the Zodiac is secured alongside the platform and the able-bodied seamen are ready to assist with embarkation / disembarkation. Ensure that passengers use the Zodiac-grip and have their hands free at all times.
- Assist the able-bodied seamen with passenger disembarkation. Disembark passengers from alternate sides so that the boat is always balanced. Only three passengers are allowed on the gangway at a time.

7. Back Onboard:

- Remove any rubbish from the Zodiac and discard it properly (i.e. empty water bottles). Take any towels used for swimming to the laundry. Personal items left by passengers should be taken to Reception at your earliest opportunity.
- If needed, assist the deck crew with Zodiac storage.

8. Radio Operations:

- Monitor your radio throughout the landing. Your safety as well as others' may depend upon it.
- Keep radio conversations short and to the point
- Be aware of the location of other Zodiacs and share information if appropriate.

- Keep the Expedition Leader informed should you, for any reason, deviate from their original plan.
- Stay off the radio while the ship is anchoring, except in an emergency, so the Bridge can communicate.
- Always remember that everyone, including passengers, can hear radio transmissions.

9. Zodiac Maintenance:

- Zodiac maintenance should be preventive. For this reason, entering details of the engine and boat performance into the Zodiac log book is of utmost importance. Make an entry only if there were any problems. Each entry should contain:
- Date and time
- Engine number, performance and any problems.
- Log of hours run (this is important for servicing and maintenance)
- If you notice a persistent problem, either from your experience of from previous log entries, please keep making entries until the problem is fixed, and report to the Expedition Leader, who will report to the Chief Officer and Chief Engineer.

SNORKELING OPERATIONS

(MV Silver Discoverer & MV Silver Explorer)

1. Gear Handout

Waiver Forms

- Guests must sign a waiver form first before receiving snorkel gear
- Waiver forms must be kept on record for the duration of time the Guest remains onboard the ship

Mesh Bags

- Make sure all bags are clean and empty of gear and trash.

Mask/Snorkel Sets

- Make sure all masks & snorkels have been disinfected and are clean (free of sand, smudges, sunscreen)
- Make sure all masks & snorkels are in good condition (no tears in seal, lugs missing, broken pieces)
- Make sure snorkels are properly attached to the masks

Fins & Other Gear

- Make sure all fins are clean and free of sand
- Makes sure all fins are in good condition (no tears or holes)
- Arrange fins by size groupings

Record Gear Handout on Waiver Form

- Be sure to mark what gear has been borrowed
- Include all sizes, numbers or other ways of identifying the gear for collection purposes

2. Hand-In & Clean Up

- Guests should leave gear in a designated location after their last snorkel
- Wash all gear thoroughly with freshwater
- Disinfect all masks & snorkels –be sure they are CLEAN (no stains, no sand, no smudges)
- Sort & store fins by size in appropriate places
- Refill Snorkel Safety Boxes (vinegar, shampoo, Vaseline, snorkel keepers, whistles)

3. Snorkeling From The Beach

Select best snorkel area

- Take into consideration entry conditions, swell, current, wave action & tides
- Be sure to tell every guest who goes snorkeling what the area limits are
- Have a lookout Zodiac ready onsite before any guest goes into the water

- Check waters for evidence of jellyfish problem. If there are lots of zooplankton (gelatinous 'jellies'), consider cancelling snorkeling
- At the very least inform guests of the chance of getting stung by jellyfish)
- NOTE: there have been many cases of very serious Irukadji stings throughout the areas we will be operating!)

Designated Lookout standing at waterline

- Minimize involvement in gear handout
- Keep a close eye on all persons involved in water activities

Be sure to have a selection of extra gear

- Masks & snorkels & snorkel keepers
- Mixed sizes of fins
- snorkel vests & noodles
- fish ID slates
- first aid kit & large bottle vinegar
- whistle
- baby shampoo

4. Snorkeling From Zodiac Platforms

Determine the best snorkel area

- Take into consideration entry conditions, swell, current, wave action & tides
- Anchor 2 – 3 Zodiacs – each about 100m apart
- Inform all guest what the snorkel limits are
- Check waters for evidence of jellyfish problem. If there are lots of zooplankton (gelatinous 'jellies'), consider cancelling snorkeling
- At the very least inform guests of the chance of getting stung by jellyfish)
- NOTE: there have been many cases of very serious Irukadji stings throughout the areas we will be operating!)

Each Zodiac Platform should have:

- Ladders in place ready to use
- Life Ring inside, ready to use and tied onto the boat
- Tow line to throw to snorkelers ready to use and tied to boat
- Lookout person at the ready

Shuttle Zodiacs

- Drivers should check with Zodiac Platform Lookouts before arriving to determine which Platform to deliver guests to
- Approach carefully preventing any waves, and looking out for snorkelers in the water
- Always shut engine off when guests are transferring between Zodiacs

Completion of Activity

- Radio Bridge and confirm all guests are out of the water and the operation is completed

5. Snorkel Lookouts & Safety Duties

This is very serious! It must be undertaken with care

Number of Lookouts

- Two(2) land or Zodiac lookouts must be on duty at all times
- One lookout is to carry out rescue, one is to continue lookout of other guests in the water
- Lookouts must ONLY do lookout duties
- Lookouts must NOT help in any other duties (e.g. Zodiac loading or lifejackets distribution) while Guests are in the water
- If you must leave your post, make sure another Guide has been assigned to your location.

While On Duty

- Stand in a visible location – in the open
- If on beach watch, stand at or near the waterline
- If in the Zodiac – always face the Guests in the water
- Continuously scan snorkel area – do not get distracted from your lookout duties
- Limit talking while on duty
- Wear polarized sunglasses
- Have radio on you
- Have whistle hanging around neck to use immediately to signal Zodiac lookout
- Have personal gear (mask, fins, snorkel) in arms-length, ready to be used to carry out rescue (not in mesh bag)

Gear To Take

- Snorkel Safety Box (shampoo, vinegar, spare snorkel keepers, whistle)
- Bag with spare masks and snorkels and yellow snorkel vests.

Make Sure Your Gear is Nearby and Ready to Use – Beach & Zodiac Lookout

- Always look out watching guests – do not get distracted by talking with others
- Have gear & whistle within hand's reach ready to put on immediately

6. In-Water Snorkel Guides

- Remain in general area of the guests
- Constantly look around and check on Guests.
- Stay particularly close to any Guest that appears to be weak, afraid or having difficulties
- Do not wander off on your own!

JELLYFISH MANAGEMENT & TREATMENT

1. In The Field Treatment

Do Not Rub

- Rubbing can result in further venom release and make it worse!!!

Use Vinegar

- Flush area thoroughly
- Use generous amounts of vinegar and try to maintain a constant flushing for several minutes (if possible)
- VINEGAR PREVENTS FURTHER STINGING by un-triggered tentacles
- DO NOT USE URINE OR ALCOHOL – they do not work
- DO NOT USE FRESHWATER – it will make it worse because it will trigger off more stinging cells.

Flick Off

- Try to flick off remaining visible venom sacs with a credit card or other kind of flat surface.
- This gets rid of the stinging sacs without crushing them. If crushed, the venom will spread. Be careful that you do not get stung yourself.

2. On Ship Treatment

Soak In Hot Water

- Soak affected area in hot water for 30 to 90 minutes.
- Test the water yourself prior to exposing it to the injured person.
- Use the hottest water that you can tolerate (without burning)
- Envenomation can alter pain tolerance and victims might not feel how hot the water is and can potentially end up scalding themselves.

Apply Ice Packs

- After the first few hours to relieve further pain or itchiness
- Re-apply ice packs regularly, for up to 2 – 3 days (depending on severity of sting reaction)
- Always put the cold pack or ice inside a plastic bag and then wrap this package in a t-shirt or other piece of cloth.
- DO NOT let freshwater contact the skin directly

Elevate

- Elevate extremity, especially if swollen

3. Symptomatic Treatment

- Use Painkillers or anti-inflammatory medications as required
- *Do Not Use* Cortisone cream or any other type of topical cream

12.2 Table 3 – Matrix of Likely Environmental Impacts

Please refer to the next 2 pages.

Table 3 Matrix of Likely Environmental Impacts

Activity		*Output*	*Impact Assessment*	*Impact Description*			*Minimization & Mitigation*
Nature	*Duration*			*Direct Effects*	*Indirect Effects*	*Cumulative Effects*	
EXPEDITION ACTIVITY							
Ship operations	15 days as an average	Engine emissions	Scope: L-C Persistence: M-L Intensity: L Probability: H Importance: H	Airborne pollution; contamination of snow and ice	Pollution of local ecosystems	Contribution to regional and global air pollution	Good maintenance; limit operations (if possible)
Routine ship operations	15 days as an average	Emissions from incinerator	Scope: L-C Persistence: M-L Intensity: L Probability: H Importance: H	Airborne pollution; contamination of soil, snow and ice	Pollution of local ecosystems	Contribution to regional and global air pollution	Good maintenance; limit operations (if possible)
Ship and small boat operations	Minutes, hours, days	Major fuel spill (>1000 liters)	Scope: L-R Persistence: M-L Intensity: H Probability: L Importance: H	Contamination of marine environment	Pollution to marine ecosystems	Loss of biodiversity, loss of scientific value in area; value in area; increased scientific visitation to other areas	Proper containment and fuelling procedures, emergency and spill contingency planning, effective communications.
Ship, small boat operations	Minutes	Minor fuel spill (<10 liters)	Scope: L Persistence: M Intensity: L Probability: M Importance: M-H	Contamination of marine environment	Pollution to marine ecosystems	Loss of biodiversity, loss of scientific value in area; value in area; increased scientific visitation to other areas	Proper containment and fuelling procedures, emergency and spill contingency planning, effective communications.
Routine ship operations	15 days as an average	Food waste, sewage, grey water	Scope: L Persistence: S Intensity: L Probability: H Importance: L	Localized pollution of marine environment	Loading on surrounding ecosystems and habitat	Increasing "footprint" of operations	Dispose of as per MARPOL, noting any Special Area requirements
Routine ship operations; ballast exchange	15 days as an average	Loss of anti-fouling paint on hull	Scope: L Persistence: M-L Intensity: L Probability: H Importance: L	Inhibit the growth of aquatic organisms such as barnacles and algae on hull	Pollution of marine ecosystem; improved fuel economy	Loss of biodiversity, loss of scientific value in area; increased scientific visitation to other areas; reduced use of hydrocarbons.	Use of anti-fouling paint not containing organotins
Ship, small boat operations	15 days as an average	Noise	Scope: L Persistence: S Intensity: L-M Probability: H Importance: L	Disturbance of wildlife	Separation of parent / chick; destruction of eggs; loss of life; decrease in size of colony; migration of colony	Decrease in size of colony; migration of colony; loss of biodiversity; loss of tourism in area; shift of tourism to other areas	Follow all relevant standard operating procedures including all relevant visitor and guidelines
Ship operations	15 days as an average	Physical disturbance	Scope: L Persistence: S-M Intensity: L Probability: H Importance: L-M	Loss of aesthetic or wildneress value; Disturbance of wildlife	Increase of "footprint" from activity	Loss of scientific value	Minimize time on location; comply with all relevant standard operating procedures including all relevant guidelines
Shore landings and small boat operations	15 days as an average	Physical disturbance; trampling	Scope: L Persistence: M-P Intensity: L Probability: L Importance: M	Damage to flora; loss of aesthetic and cultural values	Habitat loss; loss of tourism value	Loss of biodiversity; loss of revenue	Follow all relevant standard operating procedures including all relevant guidelines
Shore landings	15 days as an average	Removal of natural, historical or scientific objects	Scope: L Persistence: L-P Intensity: L Probability: L Importance: M	Aesthetic/cultural values	Loss of tourism value	Loss of revenue	Follow all relevant standard operating procedures including all relevant site guidelines
Shore landings	15 days as an average	Interference with scientific projects	Scope: L Persistence: S-L Intensity: L Probability: L Importance: M	Loss of scientific value	Loss of scientific value	Loss of scientific value	Follow all relevant standard operating procedures including all relevant site guidelines

Activity		Output	Impact Assessment	Impact Description			Minimization & Mitigation
Nature	Duration			Direct Effects	Indirect Effects	Cumulative Effects	
EXPEDITION ACTIVITY							
SCUBA diving and glass bottom boat operations	15 days as an average	Physical disturbance	Scope: M-H Persistence: M Intensity: L Probability: L Importance: M-H	Possible damage to coral and other reef biota Possible dedgradation of coral communities	Habitat loss; loss of tourism	Loss of biodiversity	Follow all relevant standard operating procedures including all relevant guidelines; careful operations and boat anchoring; promotion of minimal impact diving behavior; matching diver competencies and site preferences; selecting sites that match diver expectations and experience; pre-dive briefings; careful monitoring dive conditions.
Passenger load/unload	15 days as an average	Introduction of alien species	Scope: L-R Persistence: P Intensity: H Probability: L Importance: H	Possible death of species; increasing competition; spread of alien disease	Loss/change of habitat	Loss of biodiversity	Avoid poultry products; clean equipment prior to departure; follow relevant biosecurity measures
Routine ship operations; ballast exchange	15 days as an average	Introduction of alien species/oily contamination	Scope: L-R Persistence: P Intensity: L Probability: L Importance: H	Possible death of species; increasing competition; spread of alien disease	Loss/change of habitat	Loss of biodiversity	Consider ballast exchange procedures
DEPENDENT AND ASSOCIATED ECOSYSTEMS							
Routine operations	15 days as an average	Emissions	Scope: L-C Persistence: M-L Intensity: L Probability: H Importance: H	Airborne pollution; contamination of soils, snow and ice	Pollution of local ecosystems	Contribution to regional and global air pollution	Good maintenance; use of newer equipment
Routine operations	15 days as an average	Domestic / food / hazardous waste (removed if possible)	Scope: L Persistence: M-L Intensity: L-M Probability: H Importance: M-H	Increase in landfill (when offloaded); increase in engine emissions transporting waste to disposal sites	Contamination of soil and groundwater; damage to local ecosystems; loss of habitat	Need for more landfill space at reception sites; loss of habitats; increasing soil and groundwater contamination; increasing contribution to regional air pollution	Minimize wastes; reduce packaging
Routine operations	15 days as an average	Human waste (solid and liquid)	Scope: L Persistence: S Intensity: L Probability: H Importance: L	Increase in sewage treatment at reception sites; increase in engine emissions in the transportation of waste	Disease transfer during sewage handling; impact on human health at reception sites; contamination from use of detergents during cleaning of containers; loading on surrounding ecosystems and habitats	Increased loading on surrounding ecosystems; increased air pollution	Secure containment; biodegradable containers
Routine operations	15 days as an average	Physical disturbance	Scope: L Persistence: S-M Intensity: L Probability: H Importance: L-M	Loss of aesthetic or wilderness value; disturbance of wildlife	Increase in "footprint" from activity	Loss of tourism value	

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