1   Environmental

The Environmental message is intended for a wide variety of environmental data, including: current flow, water level, water temperature, visibility, and air gap. The message has the ability to provide both real-time and forecast data. In order to maximize flexibility, this message can be used to transmit from 1 to 8 sensor reports (a 1 sensor report uses 1 slot while a message with 8 sensor reports requires 5 slots). These sensor reports can be data from one location or from multiple locations. In addition, the data does not need to be sent at the same update rate allowing data that changes more rapidly to be sent more often than slowly changing data. Static data such as sensor position can be sent even less frequently.

The framework for the Environmental message is shown in Table 1. Each Environmental message has 56 bits of standard header and from 1 to 8 sensor reports (112 bits each). Each sensor report has 27 bits of common data leaving 85 bits for sensor data. The framework for the sensor report is shown in Table 3

Table 3. There are a variety of sensor types that can be transmitted using this message; 4 bits gives 16 possible values, these are listed in Table 4. Details for the 85 bits of information for each sensor report type are detailed in Tables 5 – 15. All possibilities for each data field are described. In each case *Sensor Not available* means that the specific reading is not ever possible from that sensor location. *Data Not available* means that the reading is possible, but is not available for the current report (sensor could be malfunctioning).

1.1 Usage notes

- The sensor reports are a combination of dynamic and static information; the static information such as location and identification should be transmitted less often than the dynamic information (sensor readings).

- The desired frequency of transmissions is an operational decision based upon how frequently the data is updated (for example, this is 6 minutes for NOAA PORTS data) and the maximum time that a new user should expect to wait to receive the data.

- Old data should never be transmitted if newer data is available. Data should also not be transmitted past the data expiration time.

- Presentation software should automatically update the data display upon receiving new data and should also show the time of the data so that users know the epoch of the data.

- Up to 5-slot messages can be created, but messages with more than 3 slots should be avoided as messages with more slots are less likely to be received due to RF noise or packet collision.

- The Sensor ID is used to link the site location, identification, and sensor data. A single location may have multiple physical sensors at that location, generating a variety of data elements, allowing for the creation of multiple sensor reports from that location.

- From 1 to 8 sensor reports can be assembled into a message; these can be from the same site or multiple sites. The number of reports assembled into a message is an operational decision based upon the maximum number of slots that are desired to be used for a single message. A single slot message can be created by using just one sensor report while it takes 5 slots to send a message with 8 sensor reports.

- This can also be used to link additional text (e.g., a separate text message). However, the same source MMSI needs to send both the Environmental Message and additional Text Description message (See Text Description Message).

Table 1: Environmental Message Framework – Broadcast

	Parameter	# of bits	Description
Standard Message Header	Message ID	6	Identifier for Message 8; always 8.
	Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. (See ITU-R M.1371-3, Annex 2, § 4.6.1). 0 – 3; 0 = default; 3 = do not repeat any more. Set to 0 (default).
	Source MMSI	30	MMSI number of source station. This varies according to the transmitter ID.

	Spare		2	Not used. Set to zero
Binary Data	Designated Area Code		10	Designated area code (DAC). (See Rec. ITU-R M.1371-3 § 2.1, Annex 5). Set to 366 (US).
	Function Identifier		6	Function identifier. Set to 33
	Application Data	Sensor Report 1	112	Sensor report, structured as in Table 14. 1-slot message.
		Sensor Report 2	112	Optional additional sensor report, structured as in Table 14. 2-slot message.
		Sensor Report 3	112	Optional additional sensor report, structured as in Table 14. 3-slot message.
		Sensor Report 4	112	Optional additional sensor report, structured as in Table 14. 3-slot message.
		Sensor Report 5	112	Optional additional sensor report, structured as in Table 14. 4-slot message.
		Sensor Report 6	112	Optional additional sensor report, structured as in Table 14. 4-slot message.
		Sensor Report 7	112	Optional additional sensor report, structured as in Table 14. 5-slot message.
		Sensor Report 8	112	Optional additional sensor report, structured as in Table 14. 5-slot message.
		Total bits	**168 - 952**	**1 – 5 slot message**

Table 2: Environmental Message – Number of Slots

Number of sensor reports transmitted in one message	1	2	3	4	5	6	7	8
Number of bits used for a broadcast message	168	280	392	504	616	728	840	952
Number of slots used for a broadcast message	1	2	3	3	4	4	5	5

Table 3: Environmental Message Sensor Report Framework

Parameter		# of bits	Description
Report Type		4	Environmental Report Type as per Table 15.
Time of Data	UTC day	5	UTC day of the time of the data. 1 – 31; 0 = UTC day not available = default.
	UTC hour	5	UTC hour of the time of the data. 0 – 23; 24 = UTC hour not available = default; 25 - 31 (reserved for future use).
	UTC minute	6	UTC minute of the time of the data. 0 – 59; 60 = UTC minute not available = default; 61 - 63 (reserved for future use).
Site ID		7	Binary identifier of sensor site– combined with transmitter MMSI to fully identify sensor site (i.e., there can be more than one physical sensors, each reporting different data types at a sensor site).
Sensor Data		85	Remaining 85 bits are according to the sensor type – see Tables 16-26.
Total bits		**112**	

Table 4: Sensor Report Types

Value	Description	Table
0	Site Location	16
1	Station ID	17
2	Wind	18
3	Water level	19
4	Vertical Current Profile (2D)	20
5	Vertical Current Profile (3D)	21
6	Horizontal Current Profile	22
7	Sea state	23
8	Salinity	24
9	Weather	25
10	Air gap / Air draft	26
11	(reserved for future use)	N/A
12	(reserved for future use)	N/A
13	(reserved for future use)	N/A
14	(reserved for future use)	N/A
15	(reserved for future use)	N/A

Table 5: Sensor Site Location

Parameter	# of bits	Description
Longitude	28	Longitude of the center in 1/10,000 minute (±180°). East = positive, West = negative (as per 2's complement); 181° (6791AC0h) = not available = default.
Latitude	27	Latitude of the center in 1/10,000 minute (±90°). North = positive, South = negative (as per 2's complement); 91° (3412140h) = not available = default.
Precision	3	Precision of the Lat/Long. Data to be truncated to the number of decimal places specified in this parameter. 0-4 decimal places. Default = 4 (no truncation). 5-6 = Reserved. 7 = Do not use.
Altitude	11	Altitude of the sensor relative to MSL in 0.1 meter steps. 0.0 – 200 m; 2,001 = altitude 200 m or greater; 2,002 = data unavailable = default; 2,003 – 2,046 (reserved for future use); 2,047 (don't use).
Sensor Owner	4	Owner of the sensor/responsible for the sensor data. 0 = unknown = default; 1 = U.S. NOAA (hydrographic office); 2 = U.S. Army Corps of Engineers (inland waterway authority); 3 = coastal directorate; 4 = meteorological service; 5 = port authority; 6 = U.S. Coast Guard; 7 - 13 (reserved for future use); 14-15 (don't use).
Data Timeout	3	Length of time that data is valid (i.e., should not be used after timeout period). 0 = no timeout period = default; 1 = 10 min; 2 = 1 hr; 3 = 6 hrs; 4 = 12 hrs; 5 = 24 hrs; 6 – 7 (reserved for future use)
Spare	9	Not used. Set to zero.
Total bits	**85**	

Table 6: Station ID

Parameter	# of bits	Description
Name	84	Agency reference number. Fourteen 6-bit ASCII characters, 6 bit ASCII characters as per Table 44 in ITU 1371-3. If less than 14 characters are required, then the remainder of the field should be filled with "@" characters (set bits to 0). On the ECS the @ characters at the end should not be displayed.
Spare	1	Not used. Set to zero.
Total bits	85	

Table 7: Wind Report

Parameter	# of bits	Description
Wind Speed	7	Average of wind speed values over the last 10 minutes in 1 knot increments. 0 - 120 knots; 121 = wind 121 knots or greater; 122 = data unavailable = default; 123 – 126 (reserved for future use); 127 (don't use).
Wind Gust	7	Max wind speed reading during the last 10 minutes in 1 knot increments. 0 - 120 knots; 121 = wind 121 knots or greater; 122 = data unavailable = default; 123 – 126 (reserved for future use); 127 (don't use).
Wind Direction	9	Direction of the average wind over the last 10 minutes in 1 degree increments. 0 – 359 degrees; 360 = not available = default; 361 - 510 (reserved for future use); 511 (don't use).
Wind Gust Direction	9	Direction of the max wind over the last 10 minutes in 1 degree increments. 0 – 359 degrees; 360 = not available = default; 361 - 510 (reserved for future use); 511 (don't use).
Sensor Data Description	3	Type of data from Wind sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Forecast Wind Speed	7	Predicted average wind speed in 1 knot increments. 0 - 120 knots; 121 = wind 121 knots or greater; 122 = not available = default; 123 - 126 (reserved for future use); 127 (don't use).
Forecast Wind Gust	7	Predicted maximum wind speed in 1 knot increments. 0 - 120 knots; 121 = wind 121 knots or greater; 122 = not available = default; 123 - 126 (reserved for future use); 127 (don't use).
Forecast Wind Forecast Direction	9	Predicted direction of the average wind in 1 degree steps. 0 – 359 degrees; 360 = not available = default; 361 - 510 (reserved for future use); 511 (don't use).
Val id UTC day	5	UTC day of the forecast. 1 – 31; 0 = UTC day not available = default.

Parameter		# of bits	Description
	UTC hour	5	UTC hour of the forecast. 0 – 23; 24 = UTC hour not available = default; 25 - 31 (reserved for future use).
	UTC minute	6	UTC minute of the forecast. 0 – 59; 60 = UTC minute not available = default; 61 - 63 (reserved for future use).
Duration of Forecast		8	Duration of the validity of the forecast from the time of the forecast, in one minute steps. 1 - 255 minutes; 0 = cancel forecast = default.
Spare		3	Not used. Set to 0.
Total bits		**85**	

Table 8: Water Level Report

Parameter	# of bits	Description	
Water Level Type	1	Type of water level. 0 = relative to reference datum; 1 = water depth.	
Water Level	16	Water level in centimeters. -327.67 to +327.67 m; -32,767 = -327.67 m or less (as per 2's complement); +32,767 = +327.67 m or greater (as per 2's complement); -32,768 = data unavailable = default.	
Water Level Trend	2	Trend in water level. 0 = increasing; 1 = decreasing; 2 = steady; 3 = unknown / data unavailable = default.	
Vertical Reference Datum	5	Defines type of datum used.	
		0 = Mean Lower Low Water (MLLW); 1 = International Great Lakes Datum (IGLD-85); 2 = local river datum; 3 = Station Datum (STND); 4 = Mean Higher High Water (MHHW); 5 = Mean High Water (MHW); 6 = Mean Sea Level (MSL); 7 = Mean Low Water (MLW); 8 = National Geodetic Vertical Datum (NGVD-29)	9 = North American Vertical Datum (NAVD-88); 10 = World Geodetic System (WGS-84); 11 = Lowest Astronomical Tide (LAT); 12 = Pool; 13 = Gauge; 14 = unknown/unavailable = default; 15 - 30 (reserved for future use); 31 (don't use).
Sensor Data	3	Type of data from Water Level sensor.	

Parameter	# of bits	Description
Description		0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Forecast Water Level Type	1	Type of water level for forecast. 0 = relative to reference datum; 1 = water depth.
Forecast Water Level	16	Forecast water level in centimeters; range of -327.67 to +327.67 meters. -327.67 to +327.67 m; -32,767 = -327.67 m or less (as per 2's complement); +32,767 = +327.67 m or greater (as per 2's complement); -32,768 = data unavailable = default.
Valid Time of Forecast	UTC day	5	UTC day of the forecast. 1 – 31; 0 = UTC day not available = default.
	UTC hour	5	UTC hour of the forecast. 0 – 23; 24 = UTC hour not available = default; 25 - 31 (reserved for future use).
	UTC minute	6	UTC minute of the forecast. 0 – 59; 60 = UTC minute not available = default; 61 - 63 (reserved for future use).
Duration of Forecast	8	Duration of the validity of the forecast from the time of the forecast, in one minute steps. 1 - 255 minutes; 0 = cancel forecast = default.
Spare	17	Not used. Set to 0.
Total bits	**85**	

Table 9: Two-Dimensional (x & y) Vertical Current Profile Report

Parameter	# of bits	Description
Current Speed 1	8	Speed of current 1 measured at a chosen level below the sea surface in 0.1 knot increments. 0.0 – 24.5 knots; 246 = speed 24.6 knots or greater; 247 = data unavailable = default; 248 - 254 (reserved for future use); 255 (don't use).

Parameter	# of bits	Description
Current Direction 1	9	Direction of current, in 1 degree increments. 0 – 359 degrees; 360 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).
Current Measuring level 1	9	Measurement level of current 1 below sea surface in 1 meter steps. 0 – 360 m; 361 = 361 m or greater; 362 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).
Current Speed 2	8	Speed of current 2 measured at a chosen level below the sea surface in 0.1 knot increments. (same as Current Speed 1)
Current Direction 2	9	Direction of current 2 in 1 degree steps. (same as Current Direction 1)
Current Measuring level 2	9	Measurement level of current 2 in meters below sea surface in 1 meter increments. (same as Current Measuring level 1)
Current Speed 3	8	Speed of current 3 measured at a chosen level below the sea surface in 0.1 knot increments. (same as Current Speed 1)
Current Direction 3	9	Direction of current 3 in 1 degree increments. (same as Current Direction 1)
Current Measuring Level 3	9	Measurement level of current 3 in meters below sea surface in 1 meter increments. (same as Current Measuring Level 1)
Sensor Data Description	3	Type of data from Current Sensor. 0 = no data = default; 1 = raw real time ; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Spare	4	Not used. Set to 0.
Total bits	**85**	

Table 10: Three-Dimensional (x, y, & z) Vertical Current Profile

Parameter	# of bits	Description
Current 1: vector component North	9	Speed of North component of current 1 measured at a chosen level below the sea surface in 0.1 knot increments, negative values in 2's complement. -25.0 – 25.0 knots; -25.1 = speed less than -25 kts; 25.1 = speed greater than 25 kts; -25.6 = data unavailable = default.
Current 1: vector component East	9	Speed of East component of current 1 measured at a chosen level below the sea surface in 0.1 knot increments, negative values in 2's complement. -25.0 – 25.0 knots; -25.1 = speed less than -25 kts; 25.1 = speed greater than 25 kts; -25.6 = data unavailable = default.
Current 1: vector component Up	9	Speed of Up component of current 1 measured at a chosen level below the sea surface in 0.1 knot increments, negative values in 2's complement. -25.0 – 25.0 knots; -25.1 = speed less than -25 kts; 25.1 = speed greater than 25 kts; -25.6 = data unavailable = default.
Current 1 measuring level	9	Measurement level of current 1 in meters below sea surface in 1 meter increments. 0 – 360 m; 361 = 361 m or greater; 362 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).
Current 2: vector component North	9	Speed of North component of current 2 measured at a chosen level below the sea surface in 0.1 knot steps. (same as for current 1)
Current 2: vector component East	9	Speed of East component of current 2 measured at a chosen level below the sea surface in 0.1 knot steps. (same as for current 1)
Current 2: vector component Up	9	Speed of Up component of current 2 measured at a chosen level below the sea surface in 0.1 knot steps. (same as for current 1)
Current measuring level 2	9	Measurement level of current 2 in meters below sea surface in 1 m steps. (same as for current 1)

Parameter	# of bits	Description
Sensor Data Description	3	Type of data from Current sensor. 0 = no data = default; 1 = raw real time ; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Spare	10	Not used. Set to 0.
Total bits	**85**	

Table 11: Horizontal Current Profile

Parameter	# of bits	Description	
Current Reading Bearing	9	Bearing of current readings from the sensor position, in 1 degree increments (all current readings are along the same bearing line from the sensor). 0 – 359 degrees; 360 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).	
Vertical Reference Datum	5	Defines type of datum used.	
		0 = Mean Lower Low Water (MLLW); 1 = International Great Lakes Datum (IGLD-85); 2 = local river datum; 3 = Station Datum (STND); 4 = Mean Higher High Water (MHHW); 5 = Mean High Water (MHW); 6 = Mean Sea Level (MSL); 7 = Mean Low Water (MLW); 8 = National Geodetic Vertical Datum (NGVD-29)	9 = North American Vertical Datum (NAVD-88); 10 = World Geodetic System (WGS-84); 11 = Lowest Astronomical Tide (LAT); 12 = Pool; 13 = Gauge; 14 = unknown/unavailable = default; 15 - 30 (reserved for future use); 31 (don't use).
Current Reading 1 Distance	9	Distance of current 1 reading from sensor position, in 1 meter steps. 0 – 360 m; 361 = 361 m or greater; 362 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).	
Current 1 Speed	8	Speed of current 1 measured at a chosen level below the sea surface, in 0.1 knot steps. 0.0 – 24.5 knots; 246 = speed 24.6 knots or greater; 247 = data unavailable = default; 248 - 254 (reserved for future use); 255 (don't use).	

Parameter	# of bits	Description
Current 1 Direction	9	Direction of current 1 in 1 degree steps. 0 – 359 degrees; 360 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).
Current 1 Measuring level	9	Measurement level of current 1 in meters relative to specified datum. 0 – 360 m; 361 = 361 m or greater; 362 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).
Current Reading 2 Distance	9	Distance of current 2 reading from sensor position, in 1 meter steps. (same as for current 1 distance)
Current 2 Speed	8	Speed of current 2 measured at a chosen level below the sea surface in 0.1 knot steps. (same as for current 1 speed)
Current 2 Direction	9	Direction of current 2 in 1 degree steps. (same as for current 1 direction)
Current 2 Measuring Level	9	Measurement level of current 1 in meters below sea surface in 1 meter steps. (same as for current 1 level).
Spare	1	Not used. Set to 0.
Total bits	**85**	

Table 12: Sea state

Parameter	# of bits	Description
Swell height	8	Height of the swell, 0.1 meter increments. 0.0 – 24.5m; 246 = height of 24.6m or greater; 247 = data unavailable = default; 248 - 254 (reserved for future use); 255 (don't use).
Swell period	6	Swell period in seconds, in 1 second increments. 0 – 60 seconds; 61 = data unavailable = default; 62 - 63 (reserved for future use).
Swell direction	9	Direction of swells, 1 degree increments. 0 – 359 degrees; 360 = data unavailable = default; 361-511 (reserved for future use); 511 (don't use).

Parameter	# of bits	Description
Sea state	4	Sea state according to Beaufort scale. Scale Sea Conditions 0 = Flat; 1 = Ripples without crests; 2 = Small wavelets. Crests of glassy appearance, not breaking ; 3 = Large wavelets. Crests begin to break; scattered whitecaps ; 4 = Small waves; 5 = Moderate (1.2 m) longer waves. Some foam and spray; 6 = Large waves with foam crests and some spray; 7 = Sea heaps up and foam begins to streak; 8 = Moderately high waves with breaking crests forming spindrift. Streaks of foam; 9 = High waves (6-7 m) with dense foam. Wave crests start to roll over. Considerable spray; 10 = Very high waves. The sea surface is white and there is considerable tumbling. Visibility is reduced; 11 = Exceptionally high waves; 12 = Huge waves. Air filled with foam and spray. Sea completely white with driving spray. Visibility greatly reduced; 13 = Data unavailable = default; 14-15 = (reserved for future use)
Sensor Data Description	3	Type of data from Swell sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Water temperature	10	Temperature of the water in degrees Celsius, in 0.1 degree increments: -10.0C to + 50.0C degrees Celsius. temp = decimal value /10 – 10 for decimal = 0 – 600; 601 = data not available = default; 602 – 1023 (reserved for future use)
Water temperature depth	7	Depth of water temperature sensor, 0.1 meter steps. 0 – 12m; 121 = depth 12 meters or greater; 122 = data unavailable = default; 123 - 126 (reserved for future use); 127 (don't use).

Parameter	# of bits	Description
Sensor Data Description	3	Type of data from Water Temperature sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Significant wave height	8	Height of the waves, 0.1 meter steps. 0.0 – 24.5m; 246 = height of 24.6m or greater; 247 = data unavailable = default; 248 - 254 (reserved for future use); 255 (don't use).
Wave period	6	Wave period, 1 second steps 0 – 60 seconds; 61 = data unavailable = default; 62 - 63 (reserved for future use).
Wave direction	9	Direction of waves, 1 degree steps. 0 – 359 degrees; 360 = data unavailable = default; 361-510 (reserved for future use); 511 (don't use).
Sensor Data Description	3	Type of data from Wave sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Salinity	9	Salinity in 0.1‰ (ppt) steps. 0.0 – 50.0 ‰; 501 = salinity 50.1‰ or greater; 502 = not available = default; 503 = sensor not available; 504 - 510 (reserved for future use); 511 (don't use).
Total bits	**85**	

Table 13: Salinity

Parameter	# of bits	Description
Water temperature	10	Temperature of water in degrees Celsius, 0.1 degree steps -10.0C to + 50.0C degrees Celsius; temp = decimal value /10 – 10 for decimal = 0 – 600; 601 = data unavailable; 602 = sensor unavailable = default; 603 – 1022 (reserved for future use); 1023 (don't use).
Conductivity	10	Water conductivity in Siemens/meter, in steps of 0.01 S/m. 0.0 - 7.00 Siemens/meter; 7.01 = conductivity >7.00; 702 = data unavailable; 703 = sensor not available = default; 704 – 1,022 (reserved for future use); 1023 (don't use).
Water pressure	16	Pressure of water in decibars, in steps of 0.1 decibars. 0.0 to 6000.0; 60001 = pressure >6000.1; 60002 = data unavailable; 60003 = sensor not available = default; 60004 – 65534 (reserved for future use); 65535 (don't use).
Salinity	9	Salinity in 0.1‰ (ppt) steps. 0.0 – 50.0 ‰; 501 = salinity 50.1‰ or greater; 502 = data unavailable; 503 = sensor not available (default); 504 - 510 (reserved for future use); 511 (don't use).
Salinity type	2	0 = measured; 1 = calculated using PSS-78; 2 = calculated using other method; 3 = (reserved for future use)
Sensor Data Description	3	Type of data from Salinity sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Spare	35	Not used. Set to 0.
Total bits	**85**	

Table 14: Weather

Parameter	# of bits	Description
Air Temperature	11	Dry bulb temperature in degrees Celsius, in 0.1 degree steps. -60.0 to +60.0 degrees Celsius(as per 2's complement); -1024 = data unavailable = default; -1023 to -601 (reserved for future use); 601 – 1023 (reserved for future use).
Sensor Data Description	3	Type of data from Air Temperature sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Precipitation (type)	2	According to WMO. 0 = Rain; 1 = Snow; 2 = Rain and snow; 3 = none.
Horizontal visibility	8	Visibility in Nautical Miles, 0.1 nautical mile (NM) steps. 0.0 – 24.0 NM; 241 = visibility 24.1 NM or greater; 242 = data unavailable; 243 = sensor not available = default; 244 - 254 (reserved for future use); 255 (don't use).
Dew point	10	Dew point temperature in degrees Celsius, in 0.1 degree steps. -20.0 to +50.0 C; temp = Decimal value /10 – 20 for Decimal = 0 – 700; 701 = data unavailable; 702 – 1022 (reserved for future use); 1023 (don't use).
Sensor Data Description	3	Type of data from Dewpoint sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Air pressure	9	Air pressure, defined as pressure reduced to sea level, in 1 hPa increments. 0 = pressure <800 hPa; 1 - 401 = 800 – 1200 hPa; 402 = pressure of 1201 hPa or greater; 403 = data unavailable = default; 404-510 (reserved for future use); 511 (don't use).
Air pressure trend	2	Air pressure trend. 0 = steady; 1 = decreasing; 2 = increasing; 3 = undefined/unknown = default.

Parameter	# of bits	Description
Sensor Data Description	3	Type of data from air pressure sensor. 0 = no data = default; 1 = raw real time; 2 = real time with Quality Control; 3 = predicted (based historical statistics); 4 = forecast (predicted, refined with real-time information); 5 = Nowcast (a continuous forecast); 6 (reserved for future use); 7 = sensor not available.
Salinity	9	Salinity in 0.1‰ (ppt) steps. 0.0 – 50.0 ‰; 501 = salinity 50.1‰ or greater; 502 = data unavailable; 503 = sensor not available (default); 504 - 510 (reserved for future use); 511 (don't use).
Spare	25	Not used. Set to 0.
Total bits	**85**	

Table 15: Air Gap

Parameter		# of bits	Description
Air Draught		13	The vertical distance measured from the ship's waterline to the highest point on the ship in 1-centimeter increments. 1 - 8,190 cm (81.9 m); 8,191 = distance 81.91m or greater; 0 = data unavailable = default.
Air gap		13	Air Gap is the vertical distance measured from the surface of the water to the sensor in 1-centimeter increments. 1 - 8,190 cm (81.9 m); 8,191 = distance 81.91m or greater; 0 = data unavailable = default.
Air gap trend		2	Trend of the air gap measurement. 0 = steady; 1 =; increasing gap measurement 2 = ;decreasing gap measurement; 3 = unknown.
Forecast Air Gap		13	The forecast vertical distance measured from the surface of the water to the sensor in 1-centimeter steps. This is the measurement for the time of the forecast. 1 - 8,190 cm (81.9 m); 8,191 = distance 81.91m or greater; 0 = data unavailable = default.
Valid Time of Forecast	UTC day	5	UTC day of the forecast. 1 – 31; 0 = UTC day not available = default.

	UTC hour	5	UTC hour of the forecast. 0 – 23; 24 = UTC hour not available = default; 25 - 31 (reserved for future use).
	UTC minute	6	UTC minute of the forecast. 0 – 59; 60 = UTC minute not available = default; 61 - 63 (reserved for future use).
Spare		28	Not used. Set to zero.
Total bits		**85**	