



UNDERWATER ACOUSTIC MONITORING SYSTEM

LoggLaw NAD-W

Near-real-time Automated Detection and Warning system

A moored broadband recorder for passive acoustic monitoring. It writes unfiltered underwater audio to an SD card at 192 kHz, and the recordings are classified by LoggLaw Cloud after retrieval. Adding the LTE module moves the classifier onto the device, so detections reach the dashboard while the unit stays in the water.



NAD-W main unit and hydrophone. Cable length is specified per deployment.

01 Overview

What the system does

One deployment runs from mooring the unit to reading the detections. NAD-W records raw underwater sound throughout, and the AI decides what was in it. Where that AI runs is the only structural choice: in the cloud after retrieval, or on the device while it is moored.

	Pathway A — Basic unit	Pathway B — With LTE module
Where the AI runs	LoggLaw Cloud, after upload	On the device (Edge AI), then the cloud
When results arrive	After the unit is serviced	Every 15 minutes
What you retrieve	SD card with the full WAV recordings	Same card. Classification results arrive separately over LTE
Site requirement	Boat access for retrieval	Cellular coverage at the surface float, and a SIM the customer arranges
Suited to	Seasonal surveys and soundscape ecology, where the archive matters more than the wait	Alerting, vessel-traffic response, and fleets watched from one dashboard

Both pathways keep the full raw audio on the card for re-analysis.

Applications

- Marine mammal detection
 - Endangered population monitoring
- Vessel traffic and noise
 - Soundscape ecology
- Dynamic MPA management
 - Construction and dredging

Fit

Where NAD-W fits

- The target animal is detectable by sound rather than by sight
- The raw archive has to be kept, so recordings can be re-run as models improve
- Detections have to reach someone who acts on them → **LTE module**

Consider another approach when

- You need the position of one animal from a single unit. Localisation needs an array and is on the roadmap
- You need to follow one animal rather than watch one place, which is what an attached logger does
- The target sound sits above 96 kHz, beyond the recorded band

02 Signal Flow

Sound to detection

The recording chain is the same in every configuration. The two pathways below differ only in where classification happens and how long it takes to see the result.



Only the classification results travel over LTE. The audio itself stays on the card, so a Pathway B deployment still returns the full archive at the next service visit.

03 Hardware Specifications

Main unit

03 PRESSURE HOUSING · INTEGRATED BATTERY · SD STORAGE

NAD-W Basic Unit

A single pressure housing holds the recorder, the battery, and the card. The hydrophone and both antennas attach through underwater connectors, so the same unit is moored with or without the LTE module.

Housing

Ø 11 cm × 40 cm

Weight in air

Approx. 3 kg

Depth rating

600 m

Battery

Approx. 2 weeks

Storage

256 / 512 GB

Main unit

Recorder, pre-amplifier, MCU, integrated battery, and SD card inside one housing rated to 600 m.

Hydrophone

Broadband transducer on a cable, attached through an underwater connector. Cable length is set per deployment.

Underwater connectors

Separate ports for the hydrophone, the LTE antenna, and the GPS antenna. Antennas are fitted only when the LTE module is installed.

Service access

The housing opens for card exchange and battery replacement. Configuration is read from a file on the card.



Main unit and hydrophone

Supplied as one assembly. The LTE and GPS antennas are added with the optional module.

Main Unit

Common to both pathways

Dimensions	Diameter 11 cm × length 40 cm (main unit)
Weight	Approx. 3 kg in air, with the integrated battery
Depth rating	Housing rated to 600 m
Operating temperature	−10 °C to +50 °C
Battery life	Approx. 2 weeks on the standard pack, which is carry-on compliant for air travel An extended pack of up to 1 month is planned for the same 40 cm housing. Not yet available.
Memory capacity	256 GB standard, 512 GB optional Industrial-grade high-endurance SD card, specified for continuous long-duration writing.
Data interface	Removable SD card. Recordings are retrieved by taking the card out, and no proprietary reader or cable is required.
Configuration	Written as a config file onto the SD card before deployment
Connectors	Underwater connectors for the hydrophone, the LTE antenna, and the GPS antenna
Deployment	Compatible with surface floats, stakes, and bottom anchors. The battery is replaced at each service visit.

The 40 cm housing is sized for the extended battery, so external dimensions will not change when it is released. Specifications are subject to change without notice.

04 Recording

Signal chain and recording modes

NAD-W writes what the hydrophone hears, with no filtering applied on the device. Detection is a separate step performed by the AI, so the archive stays intact for a later model. Acoustic performance figures are issued separately, on request.

Recording Format

Sampling rate	192 kHz
Frequency range	Up to 96 kHz (Nyquist frequency)
Resolution	16-bit
Channels	Mono
File format	WAV with embedded timestamps
Data rate	384 KB/s, approx. 1.38 GB per hour 192,000 samples/s × 2 bytes. Section 05 works the card life out from this.
On-device filtering	None. Raw audio is stored as recorded, and all filtering and classification is done by the AI engine.

Recording Modes

Selected in the config file

Continuous	Records without interruption until the card fills or the battery runs down
Duty cycle	Repeating on and off intervals, set to stretch a deployment across a longer window
Scheduled	Recording confined to specified periods of the day
30 s record, 30 s analyse	Alternating cycle used when the Edge AI classifies on the device. Available with the LTE module, see section 09.

Choosing a mode

Record continuously when

- The target sound is brief and would be missed between sampling windows
- The survey is shorter than the card allows, which is 7.7 days on 256 GB
- The archive itself is the deliverable and will be re-analysed later

Use a duty cycle when

- The survey has to span longer than one card of continuous recording
- The target sound recurs often enough to fall inside a sampled window
- A service visit part-way through the survey is not practical

The 30 s cycle is set by the Edge AI rather than chosen freely. Recording and inference share one processor, so a unit classifying on the device records for half of each minute.

05 Deployment Planning

How long one deployment runs

Two limits end a deployment: the card fills, or the battery runs down. Which one arrives first depends on the recording mode, so the mode is chosen against the length of the survey.

Continuous

Every second of the deployment is written



7.7 days

256 GB · 15.4 days on 512 GB

50 % duty cycle

Recording alternates with an idle interval



15.4 days

256 GB · 30.8 days on 512 GB

30 s record, 30 s analyse

Edge AI configuration, with the LTE module



15.4 days

256 GB · results sent every 15 min

■ Recording ■ Recording, Edge AI between cycles ■ Idle

Which limit arrives first

Configuration	Card fills in	Battery lasts	Deployment ends when
256 GB, continuous	7.7 days	approx. 14 days	the card fills
256 GB, 50 % duty	15.4 days	approx. 14 days	the battery runs down
512 GB, continuous	15.4 days	approx. 14 days	the battery runs down
512 GB, 50 % duty	30.8 days	approx. 14 days	the battery runs down

Card figures follow from 1.38 GB per hour at 192 kHz, 16-bit, mono.

Past roughly two weeks the battery, not the card, sets the length of a deployment. Going further means a service visit, a second unit, or the extended pack once it is released.

Mooring and service

Supported arrangements

- Surface float, required for LTE and GPS
- Stake, for shallow water and fixed stations
- Bottom anchor, where the unit stays out of sight

Done at each service visit

- Battery replacement
- Card exchange, which collects the Pathway A recordings
- Config file, rewritten if the mode changes

06 Detection

What the AI classifies

The classifier reports whether a target sound is present in each segment of a recording, with a timestamp and a confidence score. The same model runs in the cloud and, in a reduced form, on the device.

Target	What is detected	What it needs	Status
Dolphin vocalisations	Clicks and whistles, classified as present or absent per segment	Shipped model. Trained on Irrawaddy dolphin recordings	Available
Vessel noise	Vessel traffic passing the station	Recordings of vessels at your site, used as training data	Available once site data is supplied
Vessel type	Separation by class, such as long-tail boat against cargo vessel	Labelled recordings of each class at your site	Available once site data is supplied
Other species	Dugong vocalisations, fish choruses, snapping shrimp, and similar targets	A custom model, scoped with you	Custom development

Accuracy

How accuracy is stated	
Design target	70 % or better for dolphin clicks and whistles A target set against controlled test data, not a figure measured at your site.
Measured accuracy	Per site, on request Governed by site conditions: background noise, distance to the animals, and mooring.
How it improves	Field recordings are fed back into training, and the updated model is applied to the archive as well as to new recordings. Nothing already collected is lost work.

What we ask from the site

- Recordings that contain the target sound, for training and for checking
- Vessel recordings if that is in scope, since engine sound differs by region and hull
- Field notes or sightings that detections can be matched against

What we do not claim

- Detection is not counting. Numbers are not derived from a single unit
- No detection is not proof of absence, only that nothing was classified in that segment
- Accuracy measured elsewhere does not transfer to a new site unchecked

07 Results and Data Interfaces

What comes back

A deployment returns two things: the detections, and the recordings they were derived from. The table separates what ships today from what is still on the roadmap.

Output	Description	Basic	With LTE
Presence and absence	Detection per time segment, timestamped, with a confidence score	Yes	Yes
Raw audio	The full WAV recordings on the card, for manual review and re-analysis	Yes	Yes
Device position	GPS coordinates of each unit, acquired once per day and plotted on the map	Not available	Yes
Number of individuals	Estimated by cross-referencing detections across several units. Alignment algorithm under development	Roadmap	Roadmap
Source position	Position of the animal or vessel by time difference of arrival across an array of units	Roadmap	Roadmap

Roadmap rows are not part of a current order and carry no delivery date.

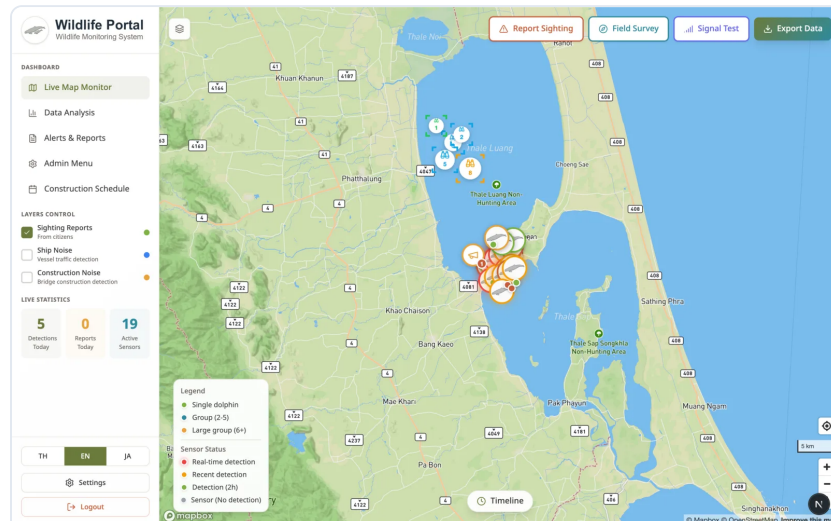
Interfaces

How data moves	
SD card	Physical retrieval of the raw WAV files. Standard card, no proprietary reader.
LTE transmission	Classification results sent to the cloud every 15 minutes. Requires the LTE module.
LoggLaw Cloud	Browser-based upload, review, and management, on desktop or phone.
CSV export	Detection results for downstream analysis Timestamp, detection type, confidence score, and device position where available.
Alerts	Email or SMS on specified detection events. Near real-time with the LTE module, and on upload otherwise.

Detection results are exportable in full. Nothing in the workflow requires you to keep the analysis inside LoggLaw Cloud.

08 Dashboard

LoggLaw Cloud

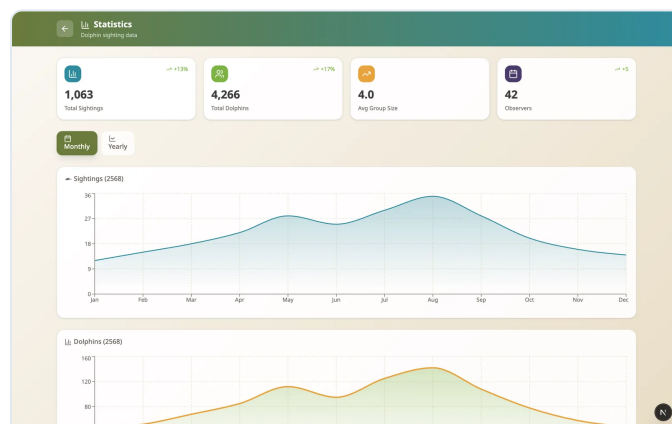


Live map

Units, detections, and sighting reports on one map, with layers for detection type and vessel noise.

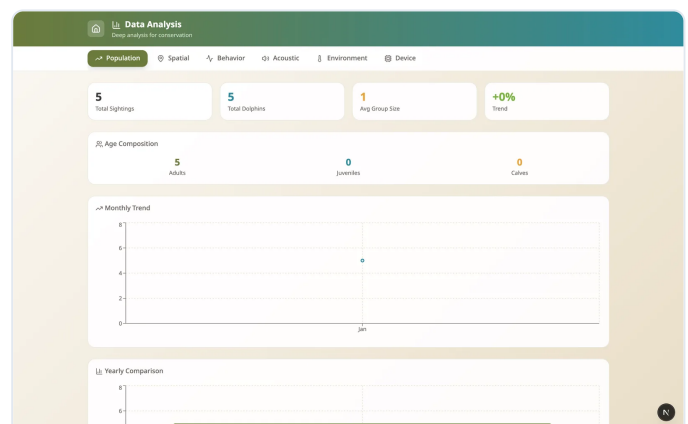
Every deployment reports into the same dashboard, whether the results arrive over LTE or after an upload. Detections stay linked to the recording they came from.

- **Map**, unit positions and detection events
- **Timeline**, detections per unit over time
- **Statistics**, counts aggregated by hour, day, and year
- **Alerts**, email and SMS on specified events
- **Sighting reports**, entered from a phone in the field
- **Fleet view**, dozens of units managed from one account



Statistics

Totals and monthly trends across the deployment, with group size and observer counts.



Data analysis

Population, spatial, behaviour, acoustic, and environment views over the same records.

Screens are from a working deployment and show that site's data. What appears in your account depends on the units, the trained targets, and the records your team enters.

09 Near Real-time Option

LTE data transmission module

09 OPTIONAL UPGRADE · PATHWAY B

LTE Data Transmission Module

The module adds an Edge AI processor, an LTE modem, and a GPS receiver. Classification runs on the device and only the results are transmitted, so a deployment reports without being lifted.

Transmission
Every 15 min

Network
3G / 4G LTE

Protocol
MQTT

GPS
1 fix per day

Module Specifications

Edge AI	Acoustic classification on the device, covering dolphin clicks and whistles, and vessel noise where site training data has been supplied Extensible to other targets by custom model.
Model updates	A pre-trained model is embedded and can be replaced after cloud-side retraining
Communication	3G / 4G LTE. Coverage at the surface float is required.
Transmission interval	Classification results every 15 minutes. Audio is not transmitted.
Position	GPS fix once per day, shown on the dashboard map
Interrupted link	Results are cached on the device and retransmitted once the connection returns
Fitting	LTE and GPS antennas attach through underwater connectors on the main unit
Customer provides	SIM card and cellular data plan, procured and maintained locally

Monitoring Devices

Acoustic detection devices

All 5

Active 3

Low Battery 1

Offline 1

NAD-W-01

3.80V

19

05:25 PM

Active

NAD-W-02

3.20V

12

04:55 PM

Low Battery

NAD-W-03

3.90V

30

05:25 PM

Active

NAD-W-04

N/A

7

03:25 PM

Offline

NAD-W-05

4.00V

48

05:25 PM

Active

Select a device to view details

Device monitor

Battery voltage, signal, and last contact for each unit in the deployment.

With the module fitted, the state of every unit is visible without a boat. A unit that stops reporting, or whose battery is falling, shows up before the next service visit is planned.

Recording continues at the set mode whether or not the link is up. Losing coverage delays the results, it does not lose them.

10 Cloud AI Service

Collaborative research partnership

Cloud AI analysis is normally a paid service. Under the collaborative research framework it is provided at no charge, in exchange for field recordings and feedback that go back into the models. The arrangement is reciprocal and is written into the agreement.

Service	Description	Fee
Dolphin detection	Automatic detection of clicks and whistles in uploaded recordings	Free *
Vessel noise detection	Identification of vessel traffic, once site recordings have been used for training	Free *
Dashboard	Map, timeline, and statistics over the classification results	Free *
Alerts and notifications	Email or SMS on specified detection events	Free *
Sighting registration	Sighting reports entered from a phone or a computer in the field	Free *
User management	Accounts, login, and permissions for the team	Free *
Data export	CSV export of detection results	Free *
Custom model development	Additional species or event detection, for example dugong vocalisations or a named fish species	Scoped separately

* **Collaborative research partnership.** These features are free of charge under the framework, in return for field recordings and feedback that let detection accuracy improve against real conditions rather than test data. If cloud infrastructure costs grow materially we will discuss cost sharing, with the aim of keeping the service accessible.

What each side contributes

Biologging Solutions

- Cloud analysis, dashboard, and export, at no charge under the framework
- Model retraining as new field recordings arrive, applied to past recordings as well
- Guidance on deployment, configuration, and reading the results

Research partner

- Field recordings from the deployment sites
- Feedback on detections, including the ones that were wrong
- Sighting records or field notes that detections can be checked against

11 Contact Us

Inquiries & Consultation

Inquire About LoggLaw NAD-W

For deployment planning, pricing, and case studies, please feel free to reach out.

We will propose a configuration matched to your site and your target species.

www.biologging-solutions.com/en/contact

COMPANY

Biologging Solutions Inc.
Headquartered in Japan

WEB

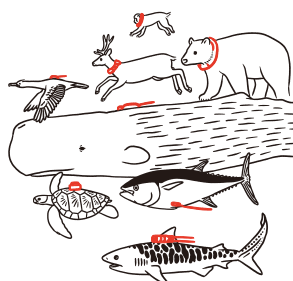
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PRODUCTS

LoggLaw NAD-W, underwater acoustics
LoggLaw C / G / CAM, animal-borne
loggers

CATALOG

LoggLaw NAD-W Specification Catalog
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