EMSA
Ecological Monitoring System Australia

Ecological Monitoring System Australia

Manual for using the Monitor app

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

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Cover photo: Monitor app logo.

Version control

Readers are advised that this manual will undergo revision as the Monitor app progresses from the demo version through to the production version. Readers will be provided the current version when provided with newer versions of the app. Field names and buttons in the app may vary slightly from the modules and this document during this process.

The version history of this manual is identified below. Enquiries should be directed to emsa_support@adelaide.edu.au

Version	Date	Version update overview
0.1	24 February 2024	Draft document to assist users of the demo version of the Monitor app
0.2	22 May 2024	Updated draft document to improve accessibility and update minor app workflows

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1 Introduction

1.1 Purpose of this manual

This manual is a practical guide intended to assist practitioners, contractors and ecologists who are working on Natural Resource Management (NRM) projects delivered through the Australian Government Panel of Regional Delivery Partners. Monitor is the progressive web app (PWA) that enables field data collection using mobile devices when following the Ecological Monitoring System Australia (EMSA) modules and protocols (see Section 1.3). Users should be familiar with the EMSA modules and protocols relevant to their project and have them on hand while using the app.

This manual covers preparing the Monitor app for a field survey and working through key EMSA modules that are likely to be included in the monitoring requirements for a number of projects (i.e. Plot Selection and Layout, Plot Description, Floristics, Cover). This is expected to enable users to work through the entire app as most of the app functions, components and logic are covered. This manual is not intended to detail the workflow for all of the protocols within the 24 EMSA modules. Support is available if required for working through the remaining protocols (see below).

Monitor guidance consists of online tutorial videos (Section 1.2) and accompanying written guidance (Section 2).

1.2 Tutorial videos

A series of online tutorial videos have been developed to accompany this manual. The videos are intended to demonstrate app and protocol workflows in a way that is easy to follow and understand. A summary of the videos is provided in Table 1 below, including the duration of each video and links to each video. Links to each video are also provided in the relevant sections of this manual. Note the voice-over is silent for some sections of the videos where it wasn't necessary to describe each step.

Table 1. Summary of the online tutorial videos that accompany this manual.

Step	Video	Duration
Pre-field survey	▶ 1. Monitor app installation and login	1:34
	▶ 2. Plot selection and layout (desktop)	3:15
	▶ 3. Preparing for offline collections	0:49
Field survey	▶ 4. Connecting a GNSS receiver	2:27
	▶ 5. Recording an opportune record	4:35
	▶ 6. Plot selection and layout (field)	4:49
	▶ 7. Recording plot description data	4:23
	▶ 8. Recording floristics data	3:40
	▶ 9. Recording cover data	2:10

1.3 Ecological Monitoring System Australia

The EMSA modules and Monitor app have been developed by TERN for the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). Specifically, to support the delivery of Australian Government Natural Resource Management (NRM) investment programs.

The purpose of these tools is to:

- Enable natural resource managers and ecologists to collect, manage and deliver quality, repeatable data for decision-making.
- Establish best practice monitoring protocols targeted to specific project needs.

- Improve the understanding and measurement of the effectiveness of NRM actions.
- Strengthen the evidence used to assess project outcomes.
- Facilitate better access to and re-use of ecological survey data for adaptive management, research and policy.

The Ecological Field Monitoring Protocols Manual contains 24 EMSA modules. Some modules interact and build on each other, while others are stand alone. The EMSA protocols within each module provide clear and proven methods (built upon previous methods where appropriate) to accurately measure environmental change for many variables of interest in Australian terrestrial environments. EMSA is designed to address limitations in previous NRM programs that made quantification of environmental change difficult. The EMSA protocols are supported by a toolset to collect and deliver data to the Australian Government's Biodiversity Data Repository (BDR), and the data collected will inform various management, policy and research outcomes.

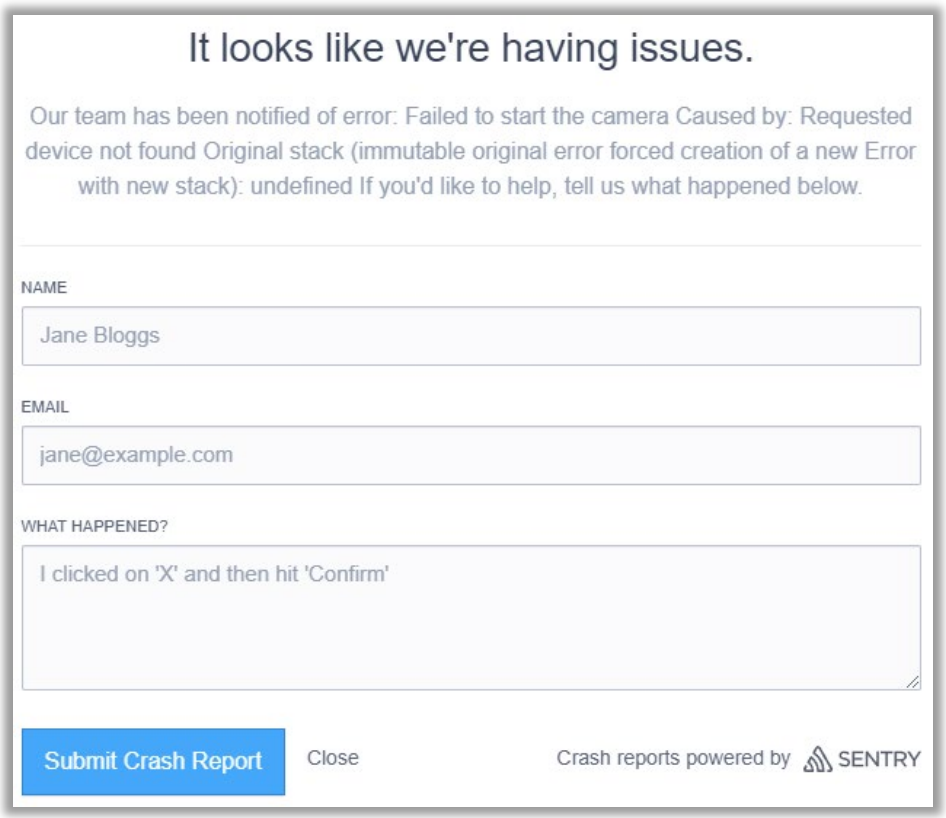
1.4 Support

Monitor app users requiring further support are encouraged to contact the EMSA support team at TERN, University of Adelaide or visit Learning Resources on the EMSA website.

1.4.1 Crash reports

Crash reports may popup in the Monitor app when an issue is encountered (Figure 1). These issues are generally minor and TERN software developers are automatically notified of the error. You should be able to continue using the app by simply closing the popup. If you believe the issue is of significance or the app continues to crash during the same process, you may wish to submit a crash report to provide TERN software developers some more information. If the app completely crashes, please contact the EMSA support team so a TERN software developer can help to resolve the issue.

Figure 1. Example crash report.



1.5 Additional resources

The EMSA website (emsa.tern.org.au) provides background information and support in using the Monitor app, including webinars, help desk, learning resources and additional documents.

1.6 Key definitions and terminology

Table 2. Key definitions and terms used throughout this Manual.

Term	Definition
BDR	Australian Government Biodiversity Data Repository
DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water
EMSA	Ecological Monitoring System Australia
Field Data Collector	A user role in MERIT who has a permission level to enter data into the modules.
GNSS	Global Navigation Satellite System
LUT	Lookup table
MERIT	Monitoring Evaluation Reporting and Improvement Tool – designed to collect and store planning, monitoring and reporting data associated with Natural Resource Management projects funded by the Australian Government.
Monitor app	The progressive web app that enables field data collection using mobile devices when following the Ecological Monitoring System Australia modules and protocols.
NRM	Natural Resource Management
Project Manager	A user role in MERIT who has a permission level to establish the project area and proposed plots, and assign them to one or more projects.
PWA	Progressive web app, a type of application software delivered through the web, built using common web technologies including HTML, CSS, JavaScript, and Web Assembly. Intended to work on any platform with a standards-compliant browser, including desktop and mobile devices.

2 Using the Monitor app

2.1 Pre-field survey tasks

The following tasks should be completed in the office, prior to using the Monitor app in the field.

2.1.1 Monitor app installation and login

(1:34)
Monitor app installation and login

- Open a web browser **(Chrome is recommended at this stage)** and navigate to the Monitor webpage (Monitor demo version).
- Monitor is a progressive web app (PWA) that can be installed on your computer and mobile device.
- Install the app on your computer, select **Install** at the top right of the browser window in the Chrome address bar and follow the instructions.
- Install the app on your Android mobile or tablet (**Android is recommended and supported by the EMSA support team at this stage**), select **Install** and follow the instructions.
- To install the app on your iPhone or iPad (not supported by the EMSA support team at this stage), select **Share** in the address bar, then select **Add to Home Screen**, then confirm or edit the PWA details and select **Add**.
- Use your MERIT login credentials to log into the app on your computer or mobile device.
- When prompted, allow the app to access the location services of your computer or mobile device.
- Wait for the app to load background data (see the 'Loading data in background' message at the top left of the page.
- If new content is available, a banner will be visible at the bottom of the page. Select **Update** and wait for to new content to load.
- After logging in, you should land on the Projects page where you can select from the EMSA modules assigned for your project.
- Select the **Menu** ☰ to check that there is a network connection, your location is being shared with the app and to see your location accuracy. Note that location accuracy will be much better on a mobile phone than on a desktop computer.

2.1.2 Plot selection and layout (desktop)

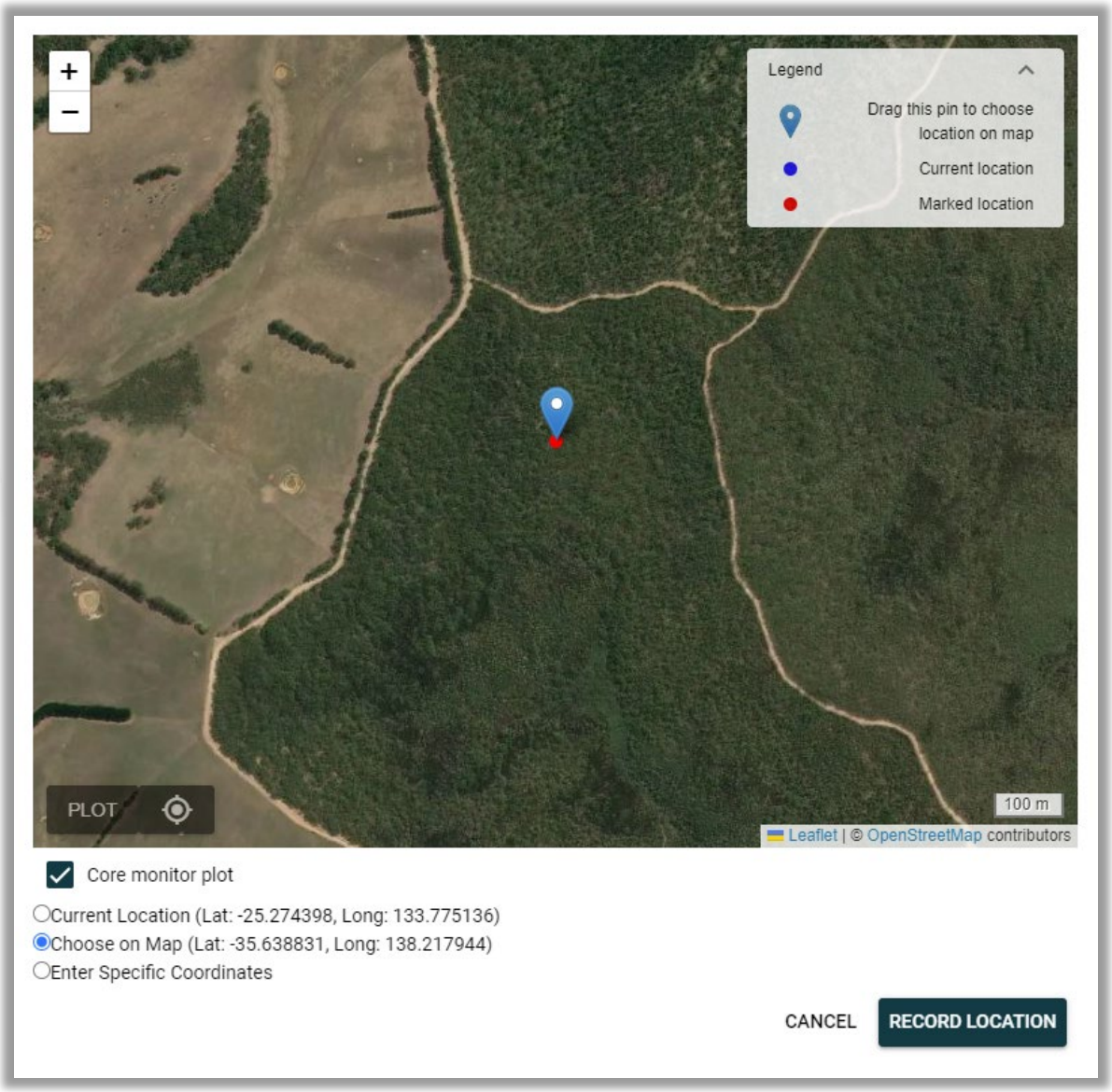
(2:51)
Plot selection and layout (desktop)

- The Plot Selection Protocol must be undertaken to define the project area boundary and select proposed plot locations prior to undertaking a field survey (see the Plot Selection and Layout Module manual, page 5).
- Only a MERIT User with Project Manager permissions has login credentials to establish the project area and proposed plots; and assign them to one or more projects. It is recommended that the Plot Selection Protocol be completed on a desktop computer.
- For new projects, you will need to define your project area. To do this, open the mapping interface, select the relevant project and then map your project area by panning and adding vertices where required.
- Choose the location of the proposed core monitoring plot on the map (Figure 2). Ensure there is enough room for a 100 x 100 m plot.
- Assign the plot to the relevant project/s.
- Repeat if establishing multiple proposed plots.

- Note. Project Managers can associate selected plots to different projects if relevant. A plot drop-down list is created for each project.

Figure 2. Example proposed plot location.

Recommended location point is centre of the plot, with homogenous vegetation for at least 250 m in all directions and vehicle access in three directions.



2.1.3 Prepare for offline collections

(0:49)
Preparing for offline visit

- Prepare all mobile devices being used during the field survey for offline collections. This is particularly important if surveying in areas with limited or no mobile data coverage.
- Click the 'Prepare for offline collection(s)' button at the top of the projects page and then select the relevant project/s (based on the project/s that the proposed plots were assigned to).
- Even if you anticipate that you will have mobile data coverage, this step refreshes the protocol models required for the relevant project/s and syncs the proposed plots that were established during the plot selection process to the mobile device.

2.1.4 Print voucher barcode labels (in MERIT)

- Voucher barcode labels are required for several modules in the Monitor app such as the Floristics Module.
- The Project Manager can request pages of labels by going to the 'Admin' tab in MERIT and selecting 'Request voucher barcode labels'.
- Each page contains 14 labels with unique QR codes.
- Enter the number of pages required and select the 'Request labels' button. This will generate a PDF document with the requested number of pages.

2.2 Field survey

2.2.1 Connecting a GNSS receiver

(2:27 *Connecting a GNSS receiver*)

- Switch on the Global Navigation Satellite System (GNSS) receiver. An indicator light will flash as the receiver looks to connect to your device via Bluetooth.
- Navigate to your device's Bluetooth settings and turn Bluetooth on.
- Check the list of paired Bluetooth devices or list of other Bluetooth devices for the GNSS receiver. Select it and wait for it to connect.
- Navigate to the GNSS receiver app on your device and select the GNSS receiver from the list of recently used receivers or list of available receivers.
- You may need to press the button on the GNSS receiver to begin to determine your location. The indicator light should flash a different colour.
- Allow at least 10–15 minutes for the GNSS receiver to determine your location with sub-metre accuracy. This will take longer the first time the receiver is switched on in a new region and will be quicker if plots are located closer together.
- Open the Monitor app and select the **Menu** ☰ to check that your location is being shared with the app and your location accuracy.

2.2.2 Recording an opportune record

(4:35) *Recording an opportune record*

- The Opportune Protocol is a point-based protocol and does not require the a plot to be defined in the Monitor app.
- Opportune records can be recorded as species are encountered throughout the project area.
- If working in another module, select the **Menu** ☰ and then **Opportune** 👁 for quick access to the Opportune Protocol. Ensure that your current step is completed so that no data is lost. After recording the opportune record, select the module you were working in from the projects page and then Edit ✎ to open the protocol and proceed to the next step.
- Enter all required (*) and relevant fields.
- Units are displayed after each relevant fields in brackets.
- Certain fields have short hints beneath them or help buttons ❓ that display popups with additional information.
- You're able to add media (photos, video or audio) right away to try and record fauna species before they flee.
- The *date time* and *location* are recorded automatically but can be updated.
- Enter the *taxa type* to filter the *species* list and other lookup tables (LUTs) based on taxa.
- For *species*, begin typing to search by common or scientific name.
- Each word in your search will be matched against the contents of the species list. For example, typing 'Australian magpie' will return results where the common or scientific name contains either 'Australian' or 'magpie'.
- You can also input your own *species* and press enter or return to confirm.
- LUTs can be searched by beginning to type a query.
- Observation method tiers filter based on conditional logic.
- Select the 'Save opportune record' button.

- Once all opportune records for the current location are saved, select the back button to return to the projects page.
- To record a new opportune record, select the Opportune Module and then **Edit** to open the opportune records page. Then select the 'Add opportune record' button.
- At the completion of the field survey select the 'Complete opportunes component' button.
- Confirm the survey end date and time then select the 'Complete opportunistic survey (end) component)' button.
- Review the summary of your collected data then select the 'Queue collection for submission' button to queue all opportune records.

2.2.3 Plot selection and layout (field)

(0:00)
Plot selection and layout (field)

- The Plot Selection Protocol should have been undertaken prior to completing the Plot Layout and Visit Protocol (see Section 2.1.2 above).
- The Plot Layout and Visit Protocol involves laying out the proposed plot(s) that was defined during the Plot Selection Protocol (i.e. recording the location of the plot points and marking them on the ground) and establishing a new plot visit. This defines the plot and visit for plot-based data collection.
- Alternatively, an existing plot (i.e. already laid out) and/or visit can be selected in order to define the plot and/or visit in the app for revisits.
- Figure 3 illustrates the different Plot Layout and Visit Protocol workflows.
- Begin with the Plot Layout component.

Create new plot layout

- Select the 'Create new' button and enter all required (*) and relevant fields, including the relevant plot from the list of proposed plots.
- Select the 'Start plot layout' button to open the popup mapping interface.
- Stand at the location of the plot reference point and select the set reference point button to generate the plot grid.
- After marking all plot points on the ground, select the complete plot layout component button. This will take you to the Plot Fauna Layout component.
- Optionally lay out a paired fauna plot, in a similar manner to the core monitoring plot. If you choose not to do this now, you can do so in the future (see below).
- Select the complete plot fauna layout component button. This will take you to the Plot Visit component (see below).

Select existing plot layout

- Select the 'Select existing' button and then select the relevant existing plot from the dropdown.
- Select the 'Start plot layout for revisit' button if you need to physically mark and layout the plot for a revisit (e.g. running transect tapes for Cover Module). The popup mapping interface will open and display your location and the plot grid and plot points to use as a spatial reference to physically mark and layout the plot for a revisit.
- After marking out the plot points, or if you do not need to mark out the plot points, select the 'Complete plot layout component' button.
- If you did not lay out a paired fauna plot when you initially laid out the core monitoring plot, the Plot Fauna Layout component will open. If required, lay out a paired fauna plot in a similar manner to the core monitoring plot.

- Select the 'Complete plot fauna layout component' button. The Plot Visit component will open (see below).
- If you did lay out a paired fauna plot when you initially laid out the core monitoring plot, Plot Visit component will open after selecting the 'Complete plot layout component' button.

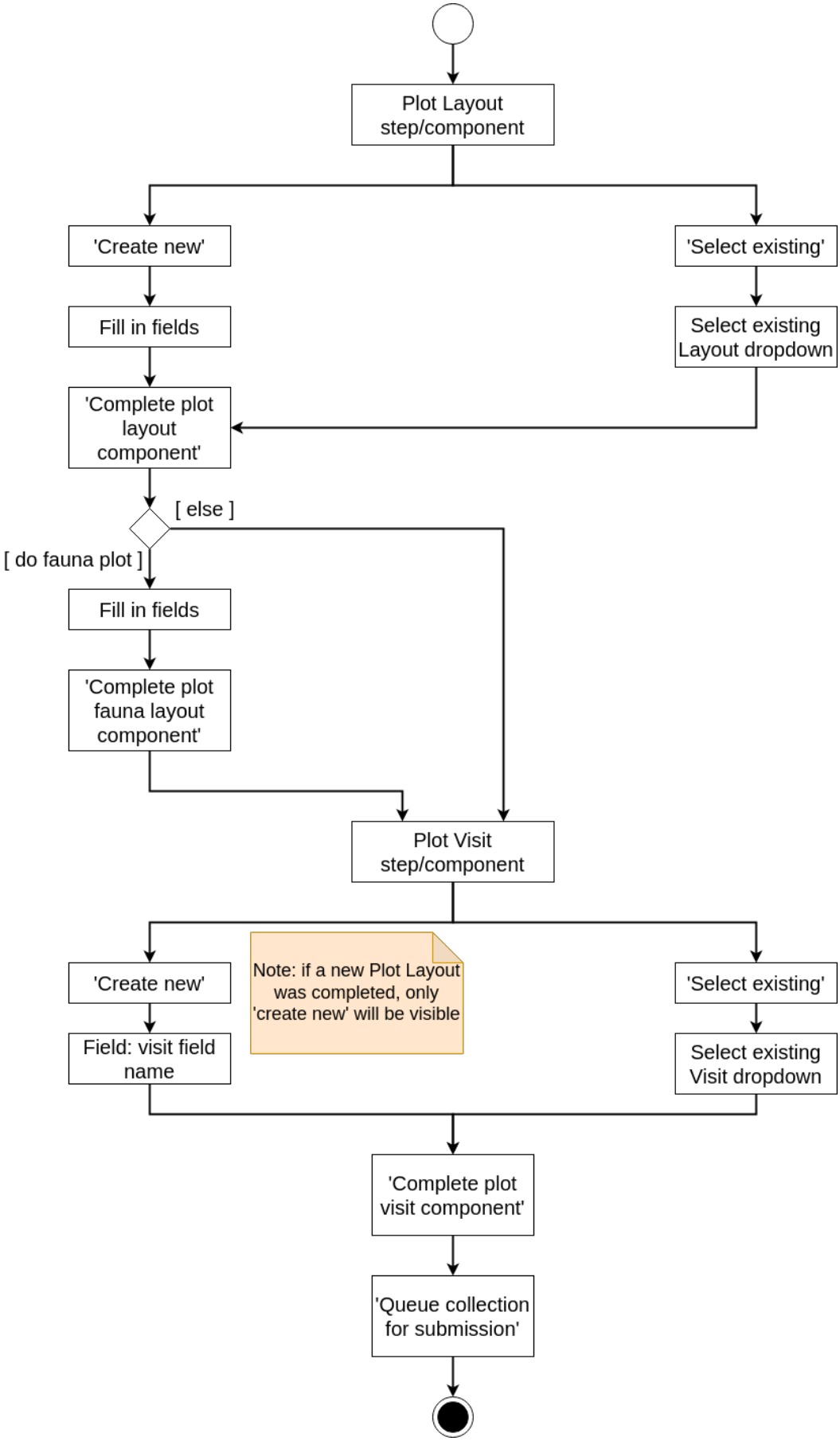
Create new visit

- If you just created a new plot layout, the 'Create new' button plot visit will be automatically selected.
- If you selected an existing plot layout but are creating a new visit, select the 'Create new' plot visit button.
- The *start date* is prefilled. Do not specify an *end date* as this will cause the visit to be considered 'closed' and will not be re-selectable in the future.
- Record the *visit field name*. This is free-text that makes the visit more human-readable for future re-selections (e.g. Deep Creek Spring 2023 Vegetation Monitoring).
- Select the 'Complete plot visit component' button and then the 'Queue collection for submission' button.
- This will automatically create the plot context (i.e. 'current plot' and 'current visit' near the top of the Projects page).

Select existing visit

- Select the 'Select existing' plot visit button and then select the relevant existing plot visit from the dropdown.
- Select the 'Complete plot visit component' button and then the 'Queue collection for submission' button.
- This will automatically create the plot context (i.e. 'current plot' and 'current visit' near the top of the Projects page).

Figure 3. Steps to complete Plot Layout and Visit Protocol



2.2.4 Recording a plot description

- For the first visit to a plot, only the Enhanced Plot Description Protocol will be visible after selecting the Plot Description Module.
- If you're revisiting a plot, the Standard Plot Description Protocol can be selected if you're collecting vegetation information only (i.e. the land surface and landform information collected previously remains valid).
- Enter all required (*) and relevant fields.
- If recording *plant species life stage*, up to 10 *species* at an important *life stage* can be added using the add button ⊕.
- Select the 'Complete plot description component' button and then the 'Queue collection for submission' button to submit the plot description collection.

2.2.5 Recording floristics data

- This module requires voucher barcode labels that must be printed by the Project Manager before commencing field surveys (see Section 2.1.4 above).
- Select the Floristics Module and then the Enhanced or Standard Floristics Protocol.
- Select the 'Are you doing plant tissue vouchering?' checkbox if you're also undertaking the Plant Tissue Vouchering Module in unison with the Floristics Module.
- If selected, a button will be available to launch the Plant Tissue Vouchering Module as a popup inside the Floristics Module to record data for the same species across the modules in unison.

Enhanced floristics protocol

- Enter all required (*) and relevant fields.
- For *field name*, begin typing to search by common or scientific name.
- Each word in your search will be matched against the contents of the species list. For example, typing 'ground fern' will return results where the common or scientific name contains either 'ground' or 'fern'.
- You can also input your own *field name* and press enter or return to confirm.
- Scan the voucher barcode using the barcode reader. Once the barcode is read, it will be displayed in the app. Check that it is correct before selecting the record barcode button. Alternatively, the barcode can be entered manually.
- Record *growth form 2* if there is more than one growth form for the species present within the plot.
- Record a photo by selecting the camera button 📷 to launch your device's camera. Alternatively, select a photo from your device's photo library. Multiple photos can be added using the add button ⊕.
- If undertaking plant tissue vouchering, select the 'Plant tissue voucher' button and enter all required (*) and relevant fields in the popup.
- After a species record is saved, another species record can be added by selecting the 'Add another species' button.
- After all species records have been entered, select the 'Complete floristics veg voucher fulls component' button and then the 'Queue collection for submission' button to submit the floristics collection.

Standard floristics protocol

- The workflow for the Standard Floristics Protocol is similar to the Enhanced Floristics Protocol. However, floristics vouchers collected from previous plots or visits can be recorded again for the current plot or visit, without the requirement to collect another plant specimen voucher.
- This should be done as species are encountered while traversing the plot.
- Select the 'Collect again' button for a species from the floristics vouchers list to open a popup.
- There is an expansion item to view the existing voucher data if required.
- Enter all required (*) and relevant fields for the species within the current plot or visit.
- There are several camera buttons to record plant photo vouchers of different features (e.g. leaf, flower) for the species.
- Specimens for new, unknown, important, contentious and threatened species should be collected and their data recorded below the floristics vouchers list, as in the enhanced floristics protocol (see above).
- After all species records have been entered, select the 'Complete floristics veg voucher lites component' button and then the 'Queue collection for submission' button to submit the floristics collection.

2.2.6 Recording cover data

- Ensure the Floristics Module has been completed as the Cover Module requires floristics vouchers to record species data at each point-intercept.
- Select the Cover Module and then the enhanced or standard protocol.
- The protocols have the same workflow except that the standard protocol has four transects instead of ten, and fractional cover is collected at each point-intercept instead of species and growth form.
- Select the *transect start point* and then the 'Start transect' button. You will be taken to Point 0 for the transect.
- Begin by selecting the substrate at the point-intercept.
- Then select each species that is intercepted from the box of floristics vouchers, recording the height of the intercept and flagging if the individual is dead or if the intercept is in canopy sky. You can scroll through the box or search for the field name.
- If no species are intercepted select the 'Save and next point' button.
- Add multiple species intercepts if required, ordered from the lowest intercepts to the highest.
- A species intercept can be deleted if a mistake is made by pressing the delete button in the summary table.
- When all species intercepts have been recorded, select the 'Save and next point' button. You will be taken to Point 1.
- The previous substrate will be pre-selected for efficiency. Ensure to check this and change it if required.
- Repeat the previous steps for each point along the transect.
- The 'Previous point' button can be used to go back a point if you need to make any changes. Alternatively, a completed point can be selected from the point dropdown list.
- After completing all points along the transect, you can select the next transect button, which will take you to the next *transect start point* (e.g. N2 would follow S1), or the exit transect button if you wish to start at another *transect start point*.

- After all transects have been completed, select the ‘Complete point-intercept data collections component’ button and then the ‘Queue collection for submission’ button to submit the cover collection.