# NVR Map

**Client:** Victorian Department of Energy, Environment and Climate Action
Victorian Department of Energy, Environment and Climate Action

## A valuable, publicly accessible resource to assist management of native vegetation in Victoria

*NVR Map* is an online application that underpins legislated native vegetation management approvals in Victoria. This application allows users to view a range of spatial datasets relating to the State's Native Vegetation Regulations. But its main purpose is to generate Native Vegetation Removal Reports and Offset Reports to support planning applications.

Once fully delivered, it will replace two disparate legacy systems – one browser based (NVIM), the other a desktop Windows application (EnSym). *NVR Map* sets DEECA on a path to assist landowners in native vegetation management into the future and automates some previously manual, and time consuming, tasks.

**Simple User Interface, Comprehensive Report**
*NVR Map* is more than a website, it is an application underpinned by complex geoprocessing tasks. It interrogates thousands of datasets, applies validation and business rules, and carries out complex calculations to produce a detailed PDF report with tables and maps on impacted vegetation and species habitats for the area of interest.

The complexity is hidden from the user in a simple and intuitive user interface. The application was designed to re-use components from the existing Melbourne Strategic Assessment (MSA) Mapshare web application which has proved itself as a user-friendly interface.

In *NVR Map* the user is guided through the steps of data input required for the generation of a report. It does this through an interactive mapping interface which includes layers relevant to native vegetation management.

It has map editing and measurement tools to allow the user to draw and edit polygons and points to define vegetation and/or revegetation areas/trees for the purposes of removal and offset calculations. The upload function provides the ability to import shapefiles to define vegetation and/or revegetation areas/trees. An advanced input function allows DEECA's certified native vegetation assessors to upload detailed data from a site assessment for use in determining the impact of the removal of native vegetation.

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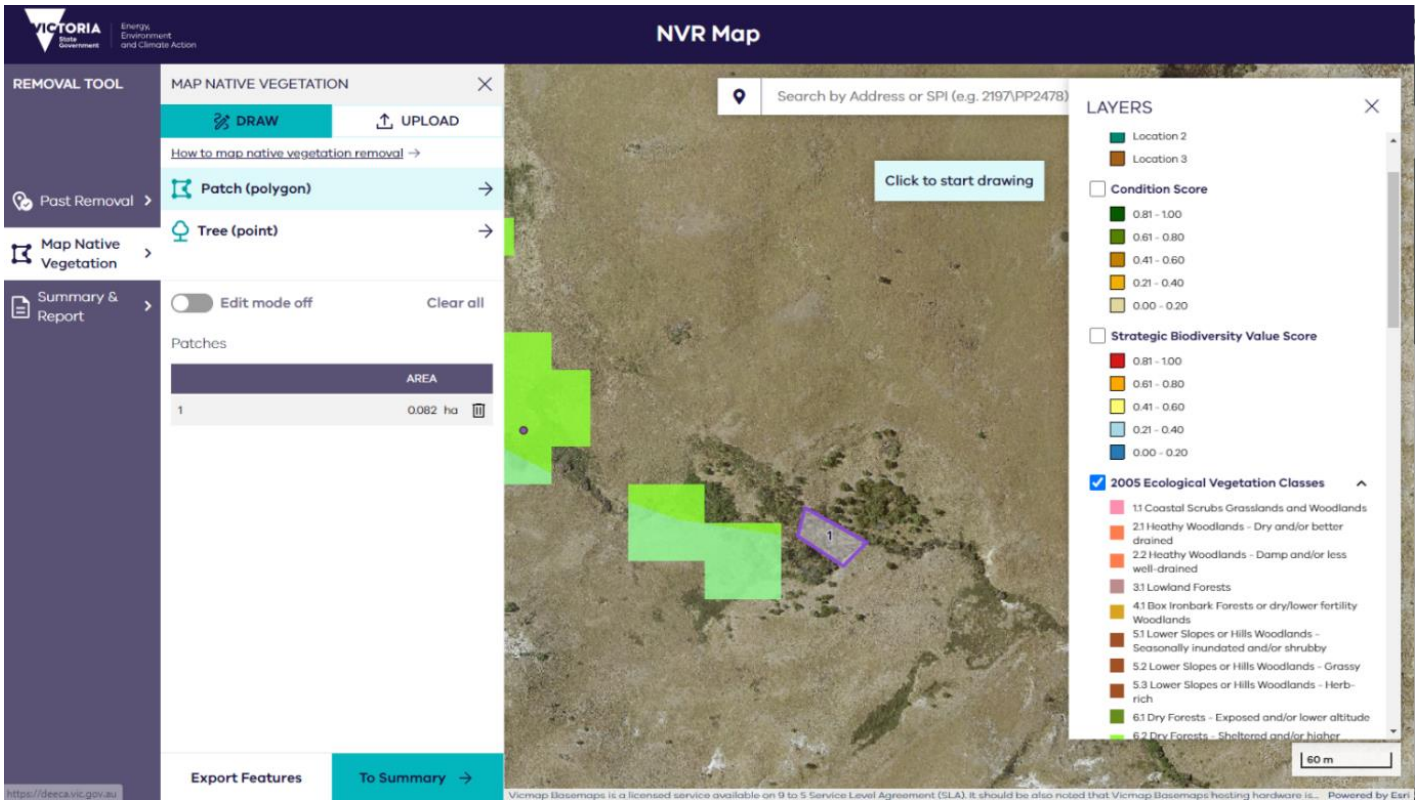
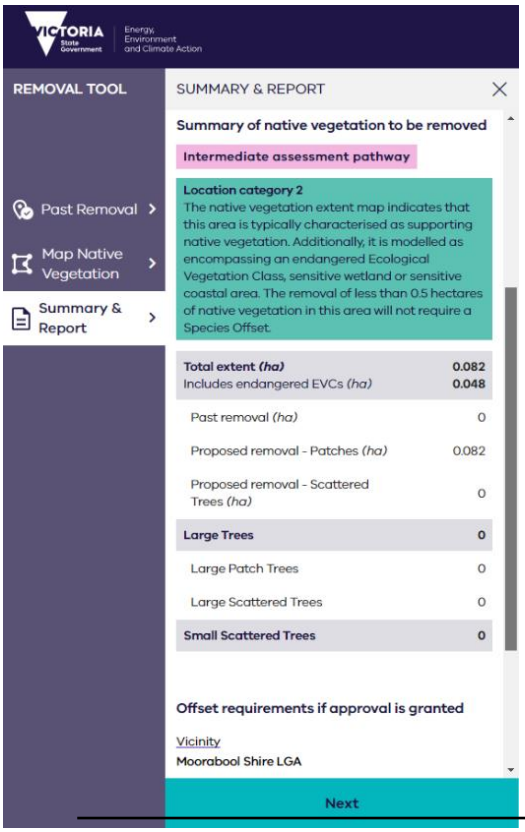



**Existing DEECA Infrastructure**

*NVR Map* is built and deployed to DEECA's MapShare platform hosted on Amazon Web Services (AWS), which provides shared infrastructure for DEECA applications, streamlining maintenance and support. It will save DEECA tens of thousands of dollars per year on infrastructure costs as it makes use of existing environments rather than requiring a customised environment.

**Mixed GIS Cloud Architecture**

The solution uses a service-based architecture to provide geospatial data, analysis and maps to the web application and PDF reporting framework. This also supports persisting geometries, results, and parameters for historical reporting, and integrating GIS resources and services from DEECA's Esri Enterprise GIS platform MapShare.

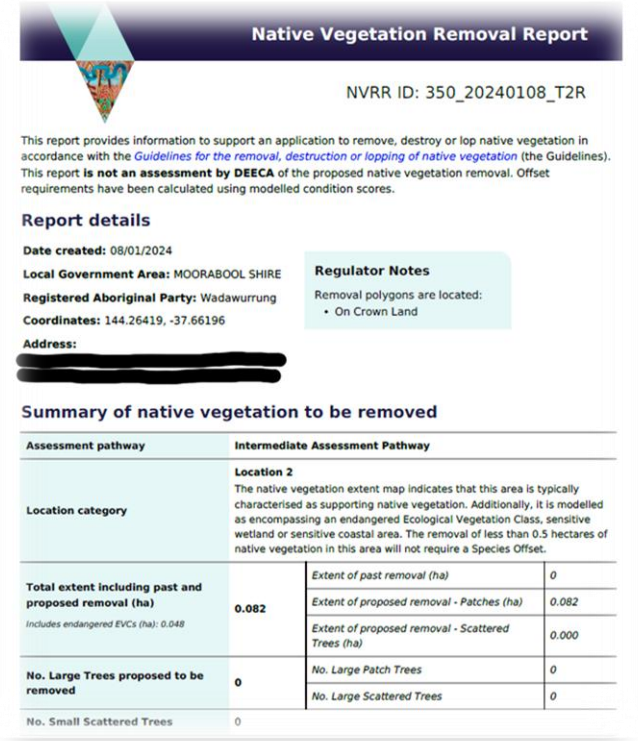
It uses an efficient raster storage format (Cloud Optimised GeoTIFF, COG), and provides an update mechanism for the more than two thousand raster layers which are essential to the complex geoprocessing tasks, while using a scalable open-source container-based raster data processing framework to support the business logic (replacing existing, and unsupportable, MATLAB code).

**Development & Deployment Methodologies**

An agile approach was adopted for the development phase of the application. This included early review and feedback from DEECA as the product owner. The opportunity to test as the software evolved provided the flexibility to support additional or changed requirements while maintaining stability of the application. The collaboration between the Nova Systems development team and the DEECA Native Vegetation Management team was paramount in prioritising and guiding the application development.

The solution uses an Infrastructure-as-Code (IaC) approach for deployments to DEECA's AWS infrastructure. This provided a repeatable and efficient deployment methodology for the application from the outset.

Success of the project also rested on the development of a comprehensive group of test cases for all geoprocessing services. Automated tests to ensure quality and correctness are incorporated into the code base and development processes. These tests will be used to ensure integrity of the application as changes and enhancements are made in the future.



Native Vegetation Removal Report

NVRR ID: 350_20240108_T2R

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines). This report **is not an assessment by DEECA** of the proposed native vegetation removal. Offset requirements have been calculated using modelled condition scores.

**Report details**

**Date created:** 08/01/2024
**Local Government Area:** MOORABOOL SHIRE
**Registered Aboriginal Party:** Wadawurrung
**Coordinates:** 144.26419, -37.66196
**Address:** [redacted]

**Regulator Notes**
Removal polygons are located:
- On Crown Land

**Summary of native vegetation to be removed**

| | | | |
|---|---|---|---|
| **Assessment pathway** | **Intermediate Assessment Pathway** | | |
| **Location category** | **Location 2** The native vegetation extent map indicates that this area is typically characterised as supporting native vegetation. Additionally, it is modelled as encompassing an endangered Ecological Vegetation Class, sensitive wetland or sensitive coastal area. The removal of less than 0.5 hectares of native vegetation in this area will not require a Species Offset. | | |
| **Total extent including past and proposed removal (ha)** *Includes endangered EVCs (ha): 0.048* | **0.082** | *Extent of past removal (ha)* | *0* |
| | | *Extent of proposed removal - Patches (ha)* | *0.082* |
| | | *Extent of proposed removal - Scattered Trees (ha)* | *0.000* |
| **No. Large Trees proposed to be removed** | **0** | *No. Large Patch Trees* | *0* |
| | | *No. Large Scattered Trees* | *0* |
| No. Small Scattered Trees | 0 | | |

**Other Resources**

- Live website - https://mapshare.vic.gov.au/nvr/
- DEECA - https://www.environment.vic.gov.au/native-vegetation/NVRMap

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## Solution Design

**AWS**
Hosting of data, services and the web application is in DEECA MapShare AWS environments.
Generated PDF reports are stored in an S3 bucket with lifecycle rules to transition to S3-IA and Glacier storage.

**ArcGIS Server Services**
Public facing Map Services to support the web mapping application are deployed on the existing MapShare ArcGIS Server site.
Public facing Geoprocessing Services have been migrated from the existing NVIM code base to support Basic and Intermediate Assessment Pathway native vegetation removal calculations and Offset Report calculations. Out-the-box printing tools are used for map rendering.

**PDF Report**
A REST API using API Gateway and Lambda is used to support report creation, polling and download and includes both public and authorised endpoints that provide access to additional functionality for DEECA administrative users.
Step functions are used to orchestrate the collection of data and creation of Removal and Offset reports.

**Step Functions and ECS Tasks**
Parallelised and batched processing of species rasters against input clearing/protection geometries is implemented via the use of Docker based ECS tasks and orchestrated via Step Functions. This provides a highly scalable and configurable approach to perfoming complex and time consuming spatial analysis activities in an efficient and cost effective manner.

**Docker**
A Docker image contains open-source Python libraries and scripts to support ECS Tasks on AWS for extract, transform, and load (ETL) and spatial analysis activities such as conversion of TIFFs to COGs and impacted species processing.

**Cloud Optimised GeoTIFFs**
Cloud Optimised GeoTIFFs (COGs) hosted in S3 buckets are used to provide cloud-native efficient storage used by the impacted species processing ECS tasks.

**Infrastructure-as-Code**
An Infrastructure-as-Code (IaC) approach is used to deploy AWS services and infrastructure. AWS CDK is used to provide automated and repeatable deployments by the DEECA MapShare team.

**DynamoDB Tables**
DynamoDB tables store report details and species metadata. DynamoDB report tables are populated during report creation and queried by Report API functions. For Detailed Assessment Pathway reports, DynamoDB tables store species specific report data as well as species metadata.