



Funded by
the European Union



ENIGMA

Endorsing safeguarding, protection, and
provenance management of cultural heritage

Pilot Case 1

Novel Documentation of
Museum Items

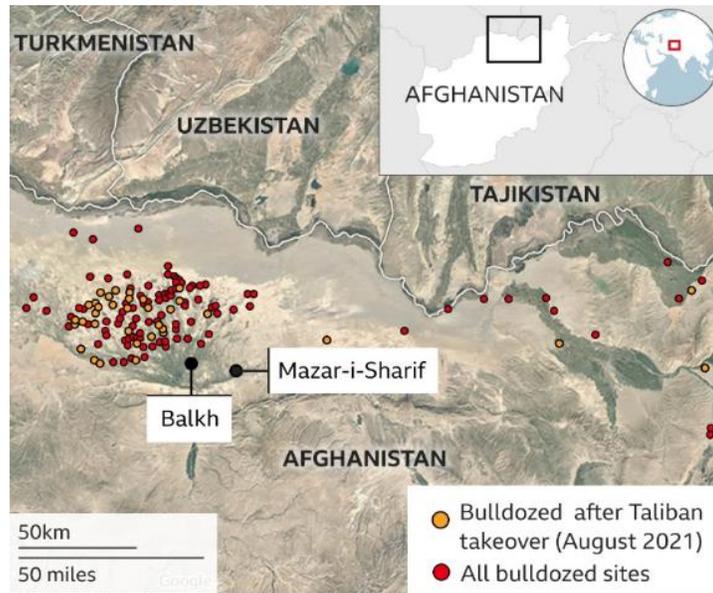


The ENIGMA consortium



The ENIGMA Project

- ENIGMA is a Horizon Europe EU-funded research project, 12 partners, 2023-2025
- Endorsing safeguarding, protection & provenance management of cultural heritage
- Main threats to Cultural Goods consist of armed conflict, natural disasters and human actions.
- Small cultural objects are one of the most illicitly traded, forming a specific focus for ENIGMA.
- Thus, ENIGMA works closely with Law Enforcement Agencies (LEAs), museums and cultural experts.



Source: University of Chicago. Image: Google, CNES/Airbus



ENIGMA's Objectives

ENIGMA develops tools and technology to help in the fight against looting and the illicit trade and excavation of cultural goods.

- ENIGMA will help to protect cultural goods and artefacts by:
 - Co-design an authenticity concept for authentication, identification and provenance of cultural goods
 - Use satellite earth observation to monitor heritage sites
 - Develop a decision support platform, validated through pilot cases, for law enforcement agencies and cultural experts.

Provenance Tool - Archaeologist/Expert

Assigned jobs

CG presence event analysis

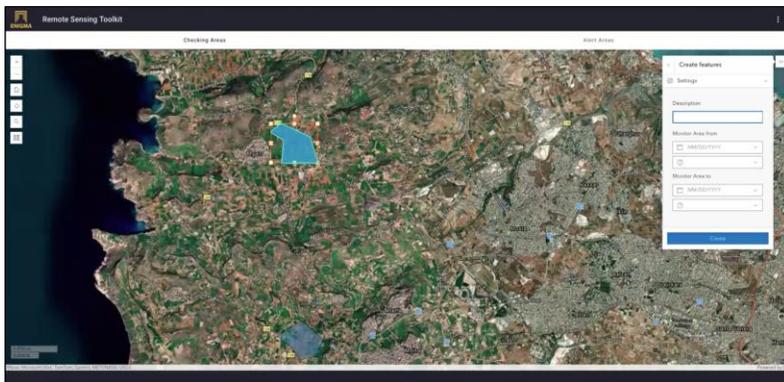
Provenance Analysis and UAI based similar objects

Remote Sensing Alerts

Crowd Sourcing hot spot analysis

CG ID	Title	Type	Reg. Date	Status
(0FF28028-F16C-4358-8777-541A8FAF5E4)		other	8/5/2025	Pending
(DC3A8888-8C7C-4AF2-903C-68FC438480F)	test test	other	8/5/2025	Pending
(DB0C208A-9A22-4F84-AB00-6D969C6F884)	test test 2	figurines	8/5/2025	Pending
(FE68F9EC-8857-471A-83AC-C8007199FCT0)	Akhenaten	figurines	12/5/2025	Pending
(D9AC708B-AE8D-4274-8452-30DE5014DFA2)	Tanagra Trixax Dancer	figurines	12/5/2025	Released
(76AFDEED-9E63-4092-9204-4332D1028C6)	Chimu	figurines	12/5/2025	Pending
(25764CDE-9112-48F2-821C-12F52C88883)	Scorpion Man	other	12/5/2025	Pending
(487184EA-5D71-48AF-AFD8-51786C5E5685)	Cycladic Statue	figurines	12/5/2025	Pending
(780DFE12-10C6-453F-925F-5888D085F08)	Scarab	amulets	12/5/2025	Pending
(12F16276-A024-402F-8308-4854585EAD4)	Egyptian Statue White	figurines	12/5/2025	Pending

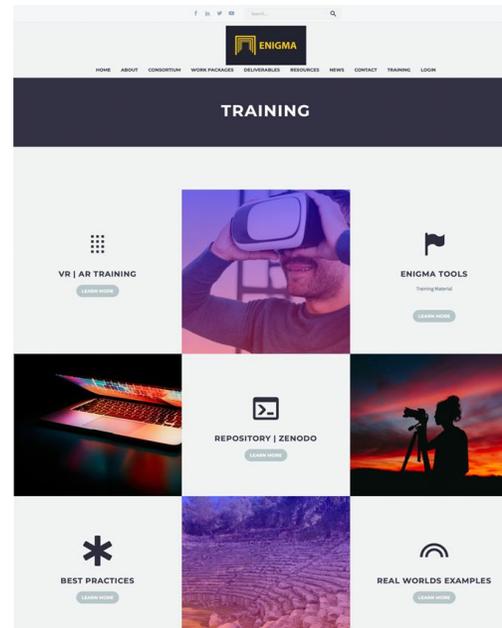
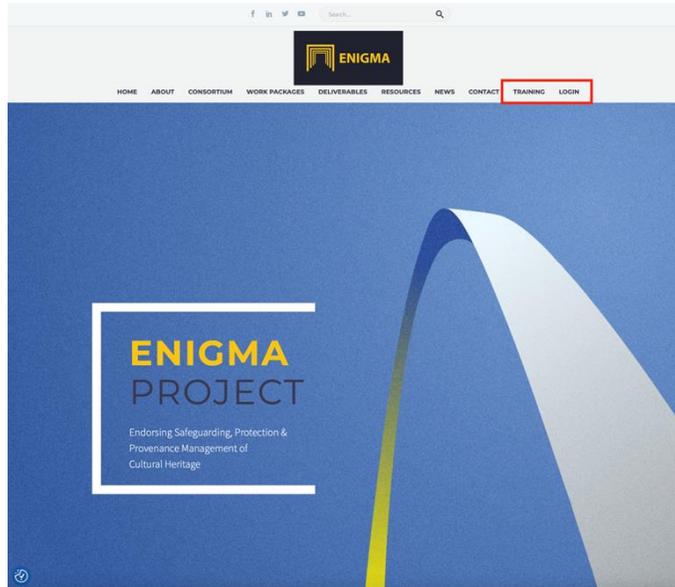
Items per page: 10 | 1 - 10 of 11



ENIGMA's Impact & Outcomes

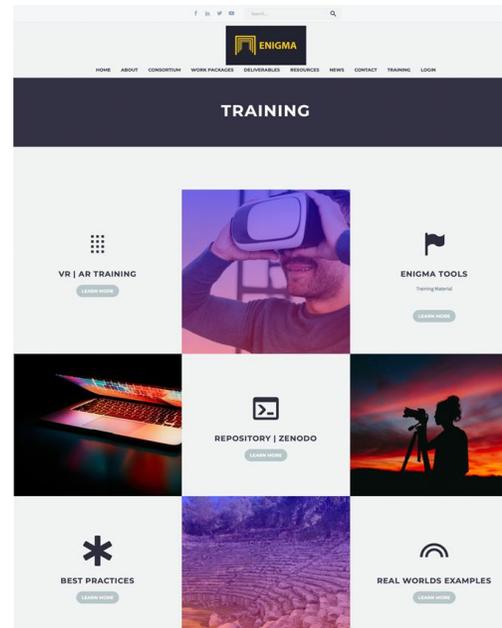
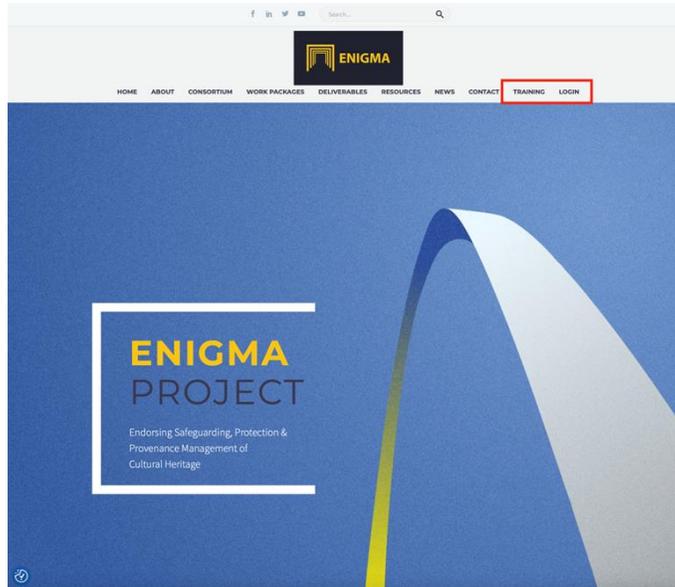
- Creating a Decision-support platform for law enforcement and cultural heritage experts for protecting cultural goods
- Increase the protection of cultural goods against anthropogenic threats
- Decrease cultural heritage destruction and improve identification of illicit trafficking
- Provide end-user training

Trained our systems with data, including from **Ashmolean, Arte Orientale Turin, National Museums Scotland, MAO Ca'Pesaro**



Learning Objectives (LOs)

- LO1: Recognize the value of the ENIGMA platform and tools for professional settings
- LO2: Categorize and organize information in real-world simulations and scenarios
- LO3: Assess and formulate ENIGMA workflows to enhance performance
- LO4: Apply ENIGMA tools to facilitate collaboration in protecting cultural goods



Further Training Resources

Please find further learning materials on the ENIGMA website: eu-enigma.eu (register/login)

- Training manuals
- Training videos
- Best practices
- Real-world examples
- VR learning environment



Pilot Case 1: What?

- The dominant cases of smuggling and illicit trade consists of small CGs and thus forms the focus of this pilot study.
- Pilot 1 focuses on CG documentation and the efficiency and adaptability of ENIGMA's documentation process.
- The pilot simulates real-world scenarios to test ENIGMA tools and workflow: focusing on authenticity, provenance and traceability.
- Pilot 1 will validate the efficiency and efficacy of the proposed ENIGMA workflow.
- It evaluates the tools in different practices in Malta and Belgium.



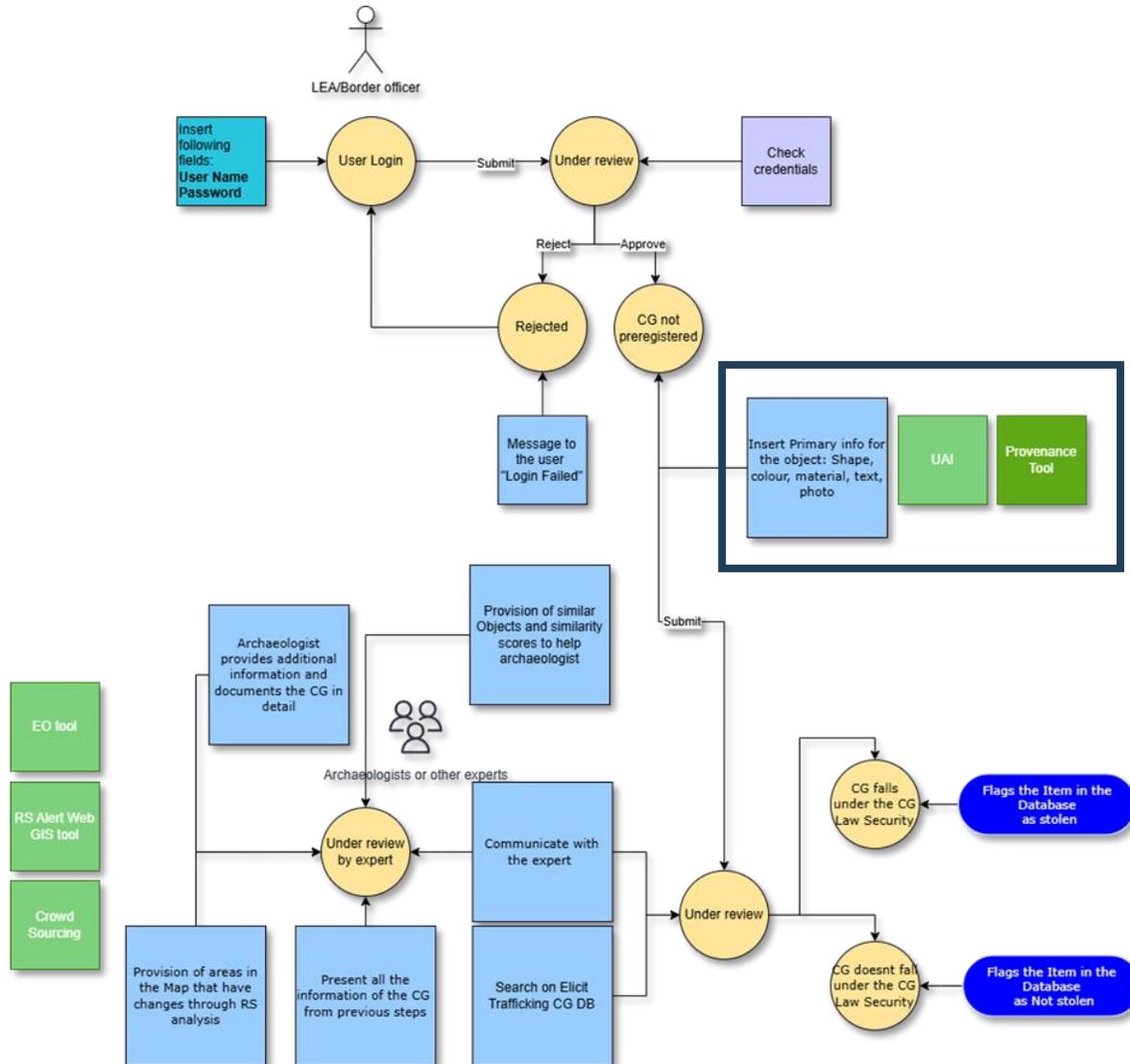
Pilot Case 1: The Platform

- Accessing the platform:
<https://enigma.cellock.com/>
- Please use the **login details** that have been provided to you.
- The Platform follows data standards and schemes from AAT, ULAN, TGN, EDM, CIDOC CRM and Dublin Core.
- These standards allow for data entry consistency and interoperability.
- ENIGMA uses metadata entry paired with AI and ML tools for provenance.

Pilot Case 1: Your role



- **CH Profiles:** Curators, Historians, Provenance Researchers, Archivists, Archaeologists, Collection Management, Conservators, Ethnologists, etc.
- **Scenario:** You will both enter detailed and accurate CG information into the Platform and retrieve information from the ENIGMA database.
- **What you are given:** a series of object information and data (6-8 each).
- **What you will test:** Verify if the LEA input is accurate (if you can) and add new information in the system.



Pilot Case 1: Workflow Steps

- **Step 1:** You are assigned an array of objects
- **Step 2:** Check the LEA data input, and amend data if needed
- **Step 3:** Review 2D images or 3D Model to the Provenance tool (the platform)
- **Step 4:** The platform generates a similarity score based on your input.
- **Step 5:** Review and/or amend the information. You can refer the object to another expert.
- **Step 6:** The CGs Report is created, this is called the Unique Authenticity Identifier Record or UAI Record.



ENIGMA Platform: Login

- Login to **eu.cellock.eu** to access the tool
- Login details for you have been provided
- Top right: click login/register
- Left: click log in
- Enter your email and password
- Click login

You now have access to the Expert section of the ENIGMA Platform.



Basisgegevens (intern rapport)

ROYAL MUSEUMS OF ART AND HISTORY
KONINKLIJKE MUSEA VOOR KUNST EN GESCHIEDENIS
MUSÉES ROYAUX D'ART ET D'HISTOIRE

no domain, deelcollectie Ancient Greece

A.13-1
Hydria
Hydria van het Hadra-type
Hadra-hydria met versiering van bladeren, wijranken en zeedieren.

Peintre des Coureurs
Deuxième moitié du II^e siècle av. J-C

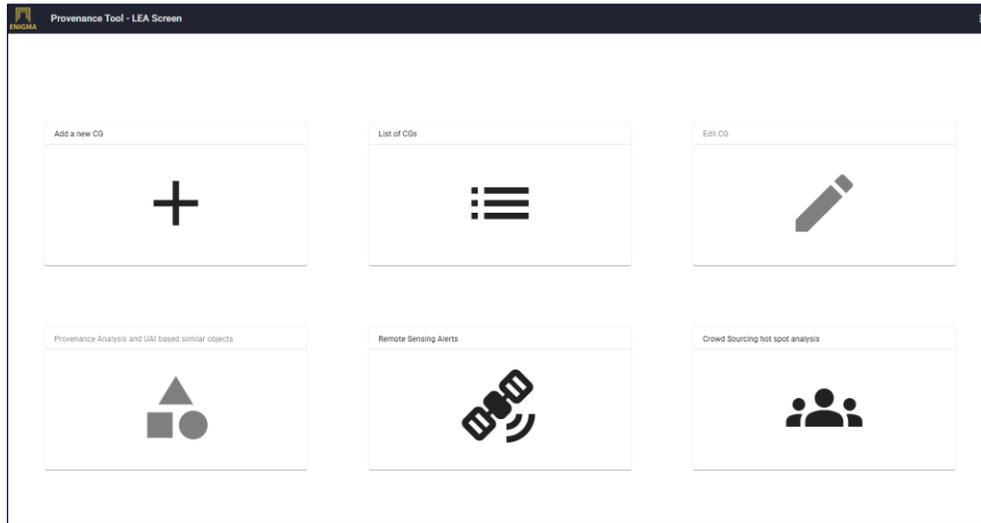
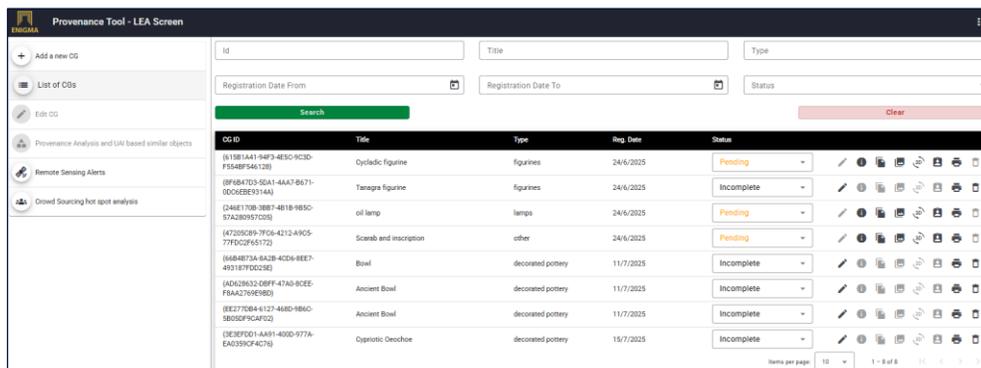


Afmetingen	: Afmetingen H x B x D: 37 cm
Materialen/Technieken	: Materiaal - Keramiek
Geografische referenties	: Productieplaats - Kreta (eiland) Vindplaats - Cyprus (Arsinoë)
Huidige standplaats	: Intern, Koninklijke Musea voor Kunst en Geschiedenis, Museum Kunst en Geschiedenis, Sector 1, Verdieping 2, 1.2.07 (tentoonstellingszaal Griekenland - Apamea), Exposé VII 2
Bibliografie	:
Objecthistoriek	:
Staat van het object	: . 0

ENIGMA Platform: 6-8 Objects

- You are assigned 6-8 objects to test as part of Pilot Case 1.
- These objects include authentic and fake objects in museum and non-museum settings.
- Some objects have extensive provenance and metadata, some are unprovenanced.
- Some input data (simulated by a LEA) could be wrong.

The items cover a wide range of data, including text, 2D images, 3D models, and with varying metadata, descriptions and complexities.

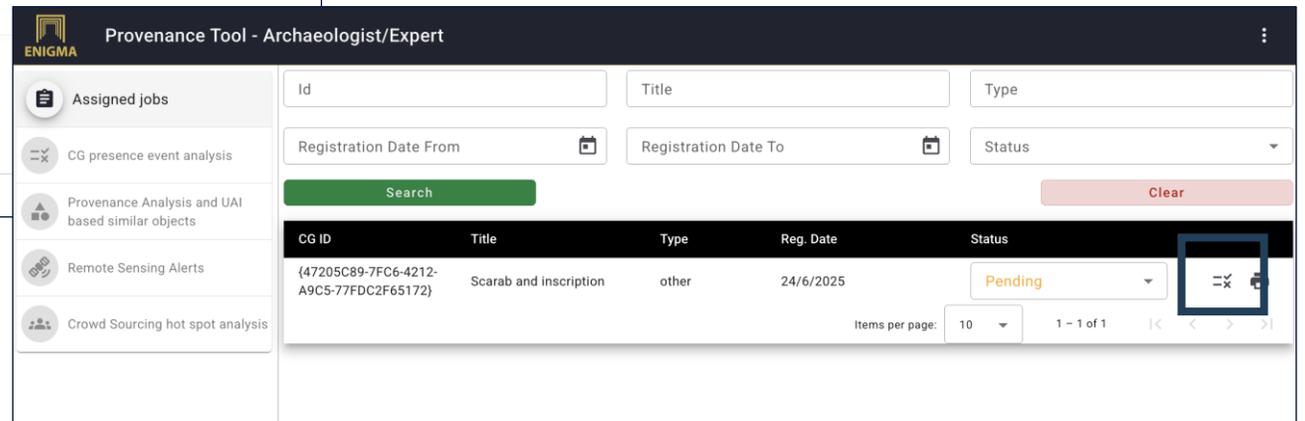
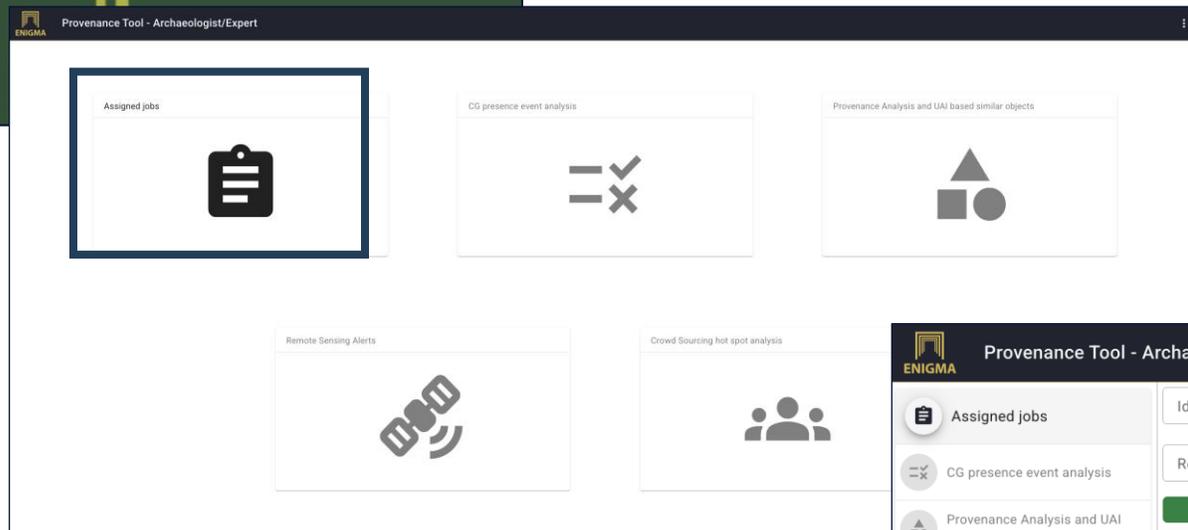
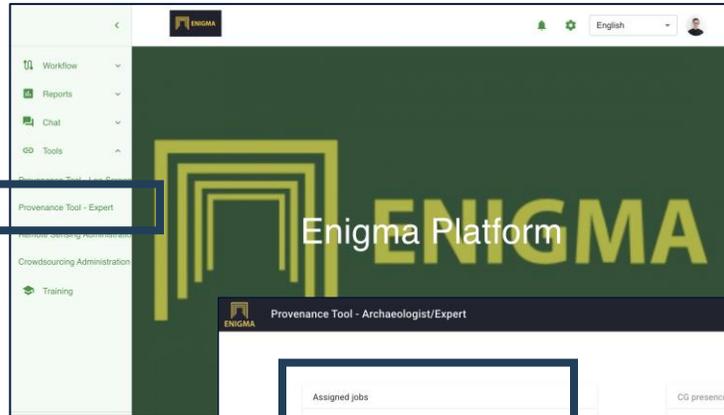
CG ID	Title	Type	Reg. Date	Status
(6181AA1-94F3-4E5C-9C1D-F548F346128)	Cycladic figurine	figurines	24/6/2025	Pending
(8F4B7D5-5D41-4AA7-8671-00C6E8E9314A)	Tanagra figurine	figurines	24/6/2025	Incomplete
(246170B-3887-4B18-9B5C-57A28957C03)	oil lamp	lamps	24/6/2025	Pending
(4729C99-7706-4212-A9C5-776C2F4657D)	Scarab and inscription	other	24/6/2025	Pending
(4684E73A-8A2B-4C06-8EE7-4931B7F0D3E)	Bowl	decorated pottery	11/7/2025	Incomplete
(AD626632-58FF-47AD-8CEE-F8A4270E9D)	Ancient Bowl	decorated pottery	11/7/2025	Incomplete
(8E277884-412F-468D-9B6C-5B05E9CA5D2)	Ancient Bowl	decorated pottery	11/7/2025	Incomplete
(D3E3FDD1-AA91-400D-977A-EA0359CFAC76)	Cypriot Clevehoe	decorated pottery	15/7/2025	Incomplete

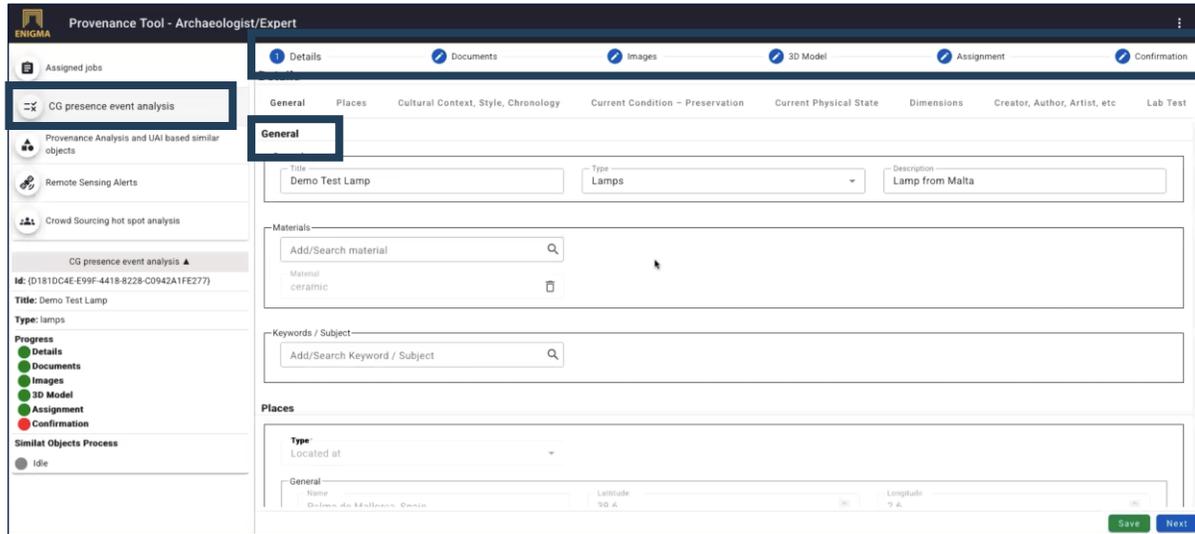
ENIGMA Platform: LEA Input

- Heritage Malta and Royal Museums of Art and History, Brussels provide basic metadata input (acting as LEAs)
- The LEA user interface diverges from that of Experts and has different capabilities
 - LEAs and Experts both use Provenance and Authenticity Tools
 - The LEAs have the physical authentic or forged object, the Experts see the digital records
- The LEAs provide basic input and assigned them to you as a CH Expert

Step 1: Assigned CGs

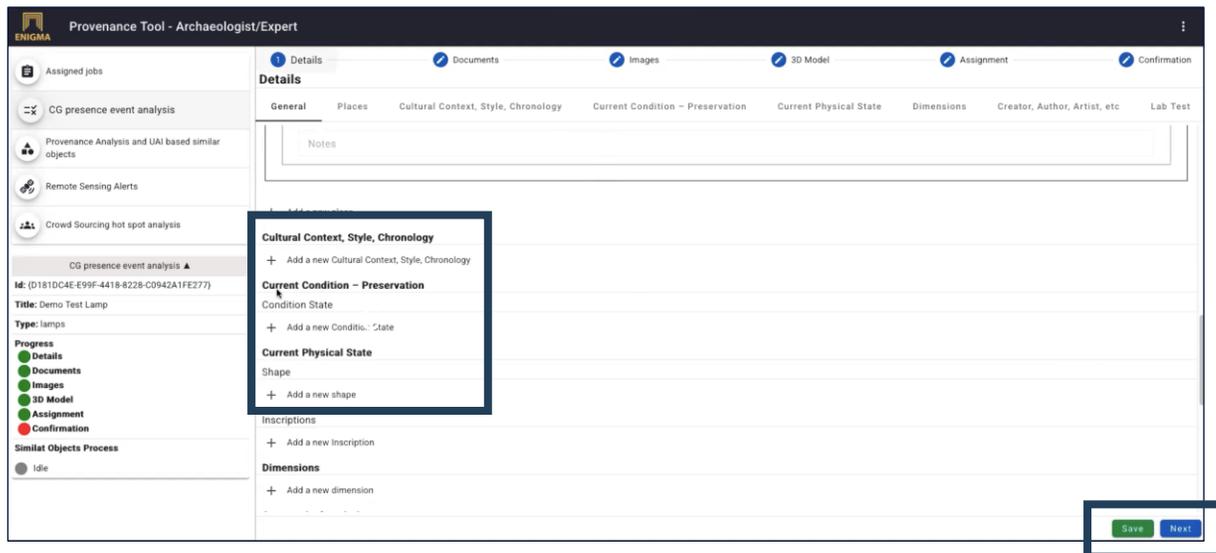
- Access: Provenance Tool – Expert
- Click: Assigned Jobs
- You will then see a screen with assigned jobs
- To edit the object data, click the icon on the right with the check sign and X mark.

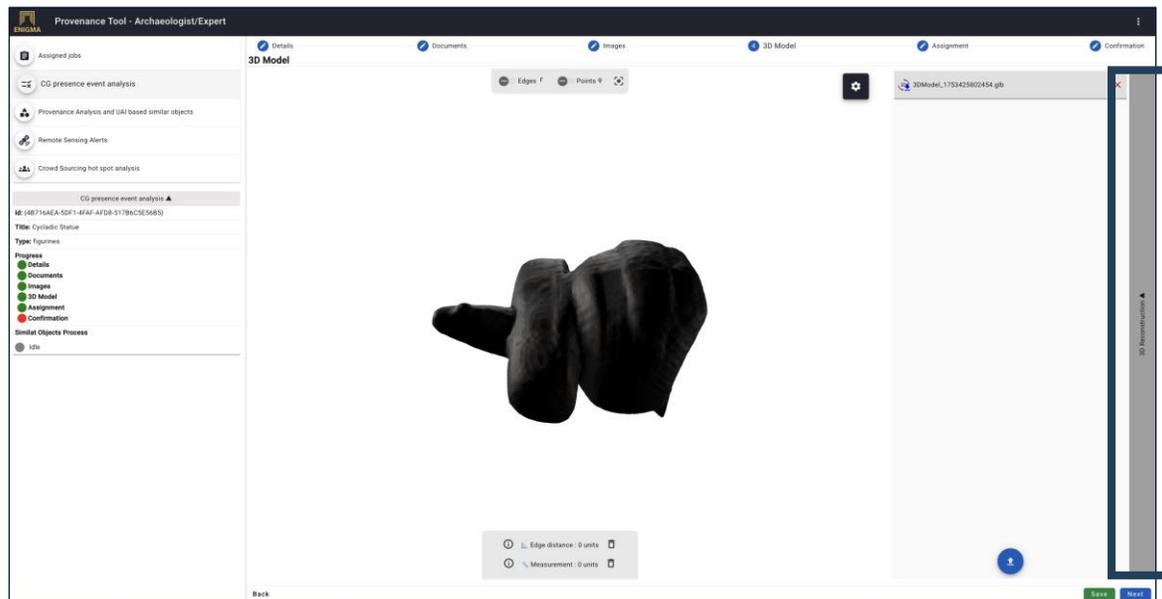
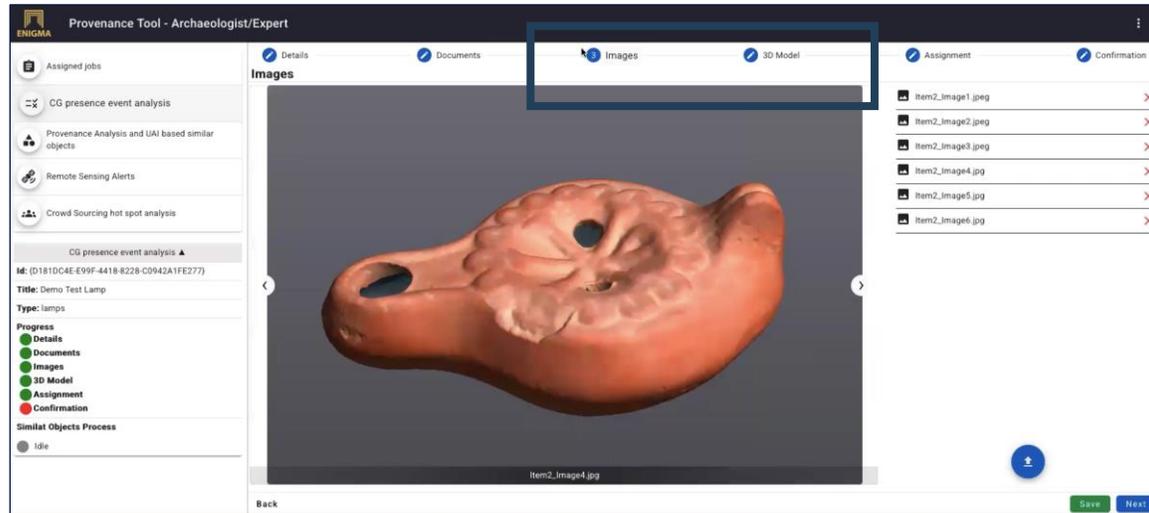




Step 2: Check and amend LEA input data

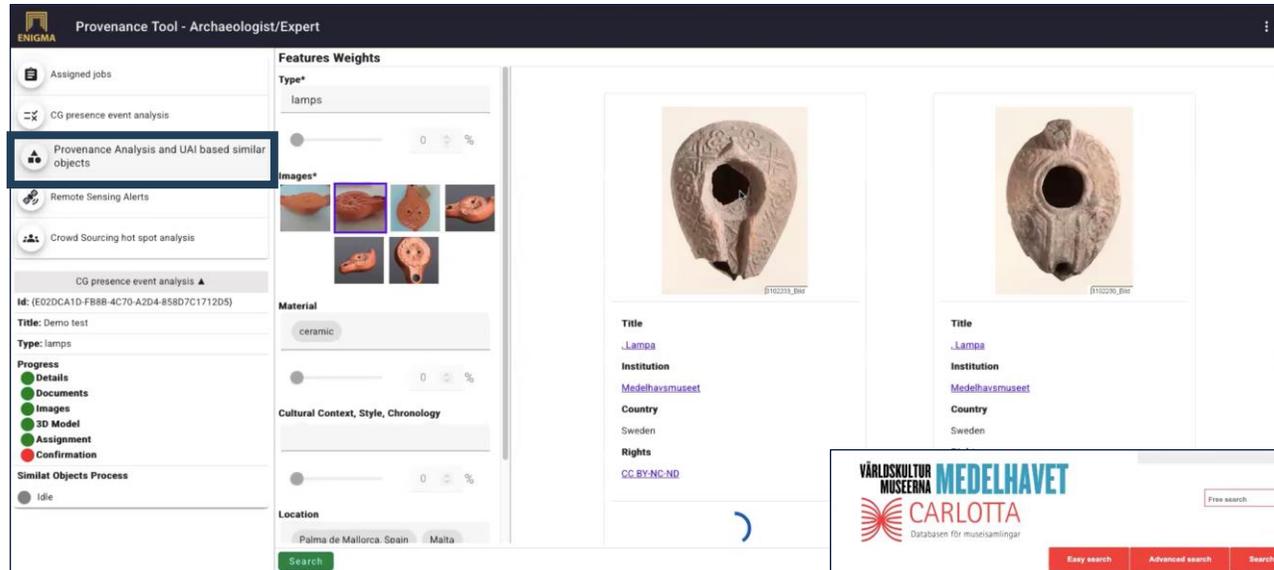
- Left: Work in the CG Presence and analysis section
- Top: Section Tab with object details, document uploads, images, 3D models etc.
- Check: Data input & descriptions.
- Add: Expert information. E.g., object style, chronology, condition, state etc.
- On the bottom right: click save or next to proceed
- Use CH vocabularies (AAT, etc.)





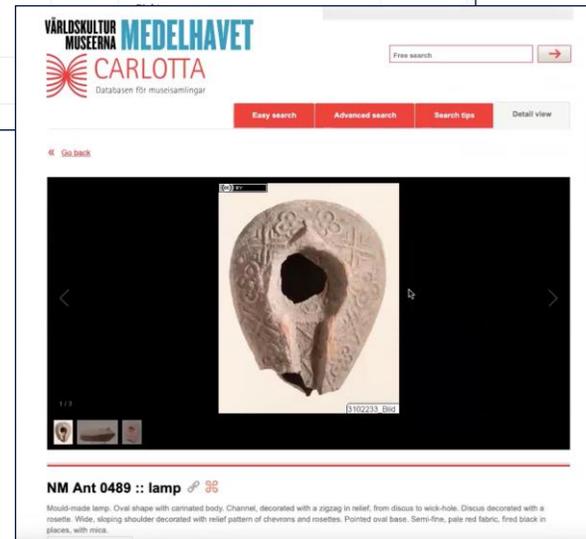
Step 3: 2D images / 3D models

- In this section you can check the 2D images (a single photo or a series of photographs)
- You can also check a 3D model if available
- This information is essential for determining the object's authenticity and similarity check
- Check the 3D reconstruction tool (see right: side bar) to create a model if needed. You can use your own description or LEA images.
- Save the process if amendments were made.



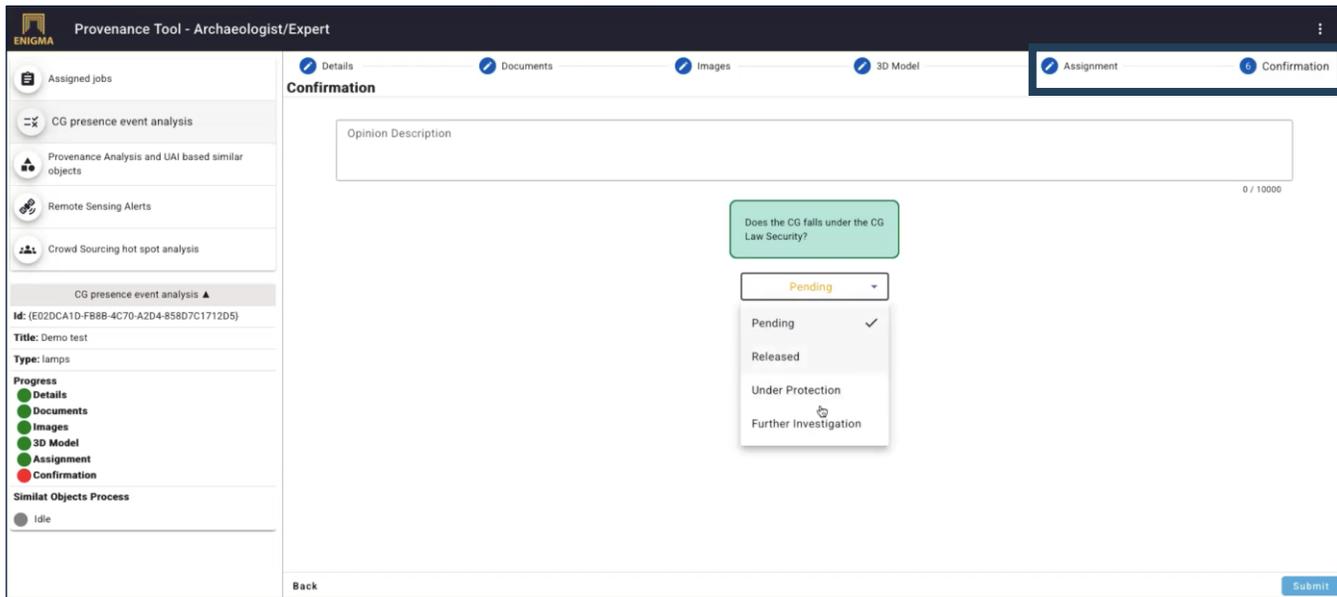
Step 4: Check similarity

- Left: Work in the Provenance Analysis and UAI based section
- Click an image and 'submit.' It will take 5 minutes to check similarity
- ENIGMA will check its database of 500,000 objects
- The 100 best matching objects will be generated to help authenticate the object
- You can click the link to see the original object in other museum collections

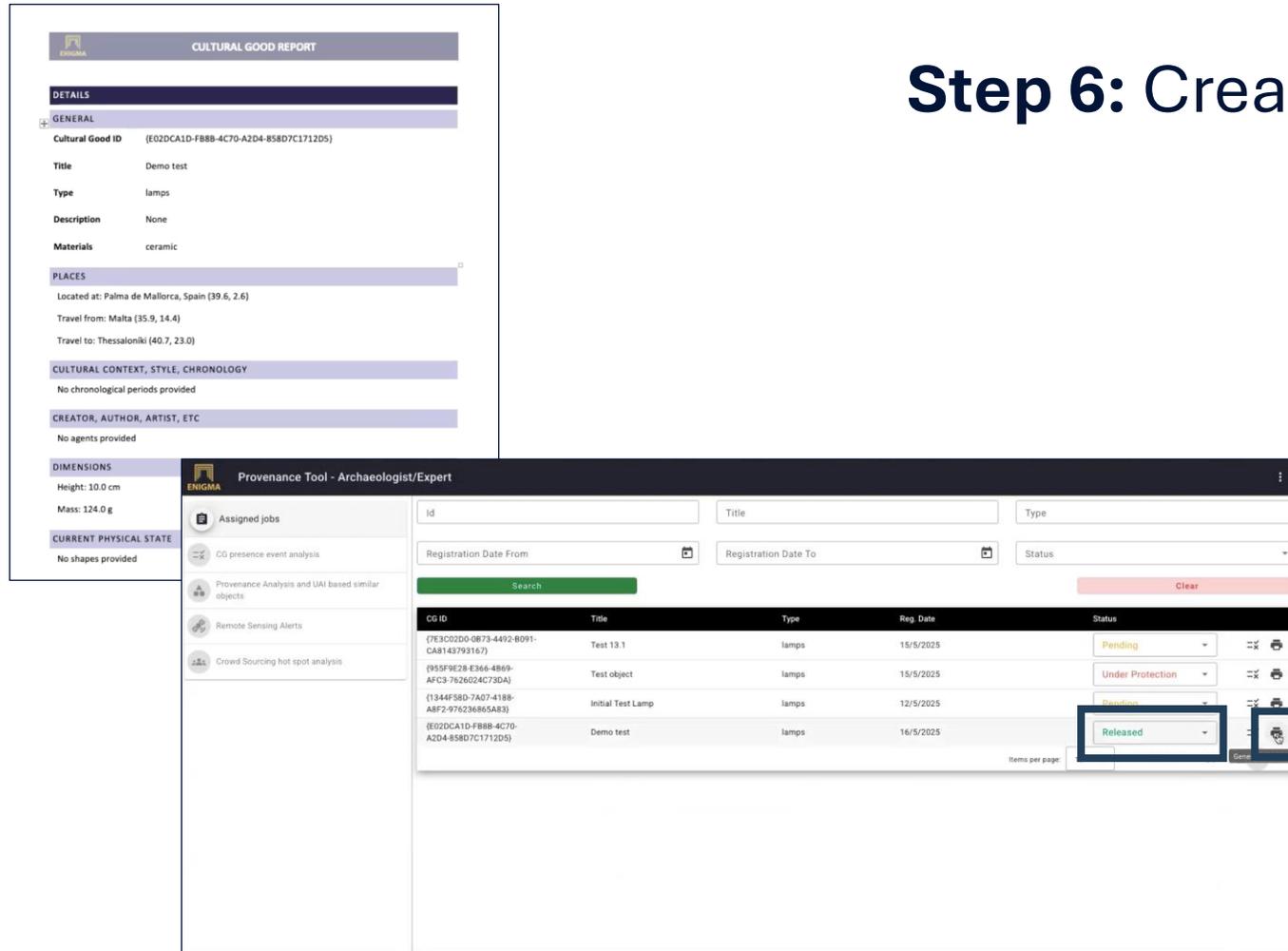


Step 5: Review information or refer object

- Go back to the CH presence event analysis section
- Go to the Assignment and Confirmation sections
- Add final descriptions, remarks or opinions
- Decide if you want the object to be released (safe), place it under protection (for police custody), or ask for further investigation
- Bottom right: Submit the details



The screenshot shows the 'Provenance Tool - Archaeologist/Expert' interface. The 'Confirmation' step is active, indicated by a blue checkmark in the top navigation bar. The main content area features a large text input field for 'Opinion Description' with a character count of '0 / 10000'. Below this is a green question box: 'Does the CG falls under the CG Law Security?'. A dropdown menu is open, showing options: 'Pending' (selected with a checkmark), 'Released', 'Under Protection', and 'Further Investigation'. The left sidebar contains a list of analysis tools and a progress indicator for the current workflow: Details, Documents, Images, 3D Model, Assignment, and Confirmation. The bottom right corner has a 'Submit' button.



The image shows two screenshots from the ENIGMA system. The top screenshot is a 'CULTURAL GOOD REPORT' for a 'Demo test' lamp. The bottom screenshot is the 'Provenance Tool - Archaeologist/Expert' interface, showing a table of cultural goods with a status dropdown menu set to 'Released'.

CULTURAL GOOD REPORT

DETAILS

GENERAL

Cultural Good ID: (E02DCA1D-F888-4C70-A2D4-858D7C1712D5)

Title: Demo test

Type: lamps

Description: None

Materials: ceramic

PLACES

Located at: Palma de Mallorca, Spain (39.6, 2.6)

Travel from: Malta (35.9, 14.4)

Travel to: Thessaloniki (40.7, 23.0)

CULTURAL CONTEXT, STYLE, CHRONOLOGY

No chronological periods provided

CREATOR, AUTHOR, ARTIST, ETC

No agents provided

DIMENSIONS

Height: 10.0 cm

Mass: 124.0 g

CURRENT PHYSICAL STATE

No shapes provided

Provenance Tool - Archaeologist/Expert

CG ID	Title	Type	Reg. Date	Status
(7E3C02D0-0B73-4492-8091-CA8143793167)	Test 13.1	lamps	15/5/2025	Pending
(955F9E28-E366-4869-AFC3-7626024C73DA)	Test object	lamps	15/5/2025	Under Protection
(1344F58D-7A07-4188-ABF2-976236865A83)	Initial Test Lamp	lamps	12/5/2025	Released
(E02DCA1D-F888-4C70-A2D4-858D7C1712D5)	Demo test	lamps	16/5/2025	Released

Step 6: Create CG Report (the UAI Record)

- After submitting and confirming the amended information, you can go back to the assigned jobs
- The CG status has been updated from pending to your suggestion – here displayed as released
- On the right you can click the print icon. This will generate the UAI Record containing all information
- This will be available for LEAs and will be used for legal purposes

YOU HAVE NOW COMPLETED THE PILOT



ENIGMA Next Steps

- This pilot forms part of a tool validation process and 4 pilots in total, the other being:
 - **Pilot 2:** Identification/ Tracing of unregistered CGs
 - **Pilot 3:** Monitoring Endangered Heritage Sites
 - **Pilot 4:** Validation of the ENIGMA Platform
- Your inputs help us to refine and improve our platform and technology
- Your input helps us to refine our training materials and presentations
- We aim to develop tools up to prototype level at the end of 2025



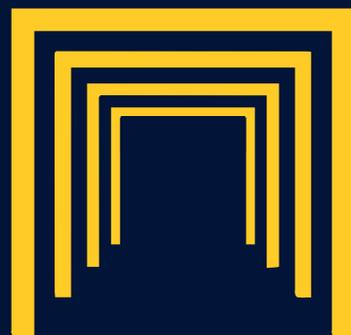
getting started ...

Thank you for your attention





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