

War cartography and John Brian Ward-Perkins's archaeological legacy: new perspectives

**L'Aerofototeca
Nazionale
racconta...**

by Lucas Goudard

World War II military intelligence maps remain an important tool for understanding the landscape and also for archaeological research. An in-depth look at the maps produced by the Allies is provided here.



Fig. 1 – AFN, MAPRW-BSR collection. June 4, 1944: 5th Combat Mapping Squadron USAAF photo of the Tiber mouth.

In 1975 the collection of World War II aerial photographs saved by John Brian Ward-Perkins (1912–1981), director of the British School at Rome (BSR) from 1945 to 1974, was deposited at the Aerofototeca Nazionale-AFN (Alvisi 1980; Shepherd 2018). These photos are generally known as “RAF photos,” an inaccurate designation because they were actually taken by various squadrons (British RAF, U.S. USAAF, South African SAAF) belonging to the Allied Mediterranean Photo Reconnaissance Wing (MAPRW). The collection is now referred to as MAPRW-BSR (Shepherd et al. 2012) (Fig. 1).

After the war, the use of these photographs by an entire generation of British archaeologists reshaped the archaeological method and led to the recognition of aerial archaeology as a comprehensive research methodology (Ceraudo 2004). In BSR field research Ward-Perkins emerged as a crucial

figure – carrying on the legacy of his predecessor Thomas Ashby – not least because of his highly refined ability, based on aerial photographs, to read and interpret landscapes. His association with Mortimer Wheeler, followed by the technical refinement resulting from the intensive wartime use of aerial photography and the cartography derived from it, served as an important training ground for Ward-Perkins and made him a true authority (Smith 2018).

It is no coincidence that I refer here to the contribution of aerial-derived cartography. During the conflict, Italian skies were filled with reconnaissance aircraft attempting to capture, through their cameras, every detail of the armies' movements on the ground, enemy positions (including camouflaged ones), infrastructure, road networks, harbour activity, and the railway network; but equally intense was the collateral (and dependent)

production of maps of enemy territory, a fundamental tool for planning troop advances. In short, military operations are planned on a cartographic basis, with data updated at a very rapid pace thanks to aerial photography (Collier 2022).

The British War Office published several series of military maps (Linch, Butler, Quinn 2024) (Fig. 2). The maps and aerial photographs were used in combination, employing the same reference system, to create a common territorial grid that ensured the most precise geographical coverage possible. From their creation to their use, these two information sources coexisted and complemented one another. However, once the war ended, their fates did not follow the same path. The archaeological use of aerial photography now required civilian-style cartography, not the Allied military cartography, which had its own very specific characteristics, including formal ones. However, the close correlation between aerial photographs and wartime maps means that the latter remain invaluable, not only for reconstructing mission planning but also for verifying data consistency. Ward-Perkins, who had used these maps on a daily basis, was fully aware of this, though he also cross-referenced them with postwar IGM maps.

At the time of the deposit of the so-called RAF collection at AFN, however, the WWII cartographic collection was retained at the BSR, with the exception of a small set of wartime maps relating to Italy and also, included in the photo boxes, the so-called “accompanying papers” (Modafferi 2025). Today, thanks to a commendable initiative by the BSR, the two parts are reunited at the AFN, restoring their original unity; this opens up new research perspectives in support of redefining military maps as a fully-fledged research tool.

The Use of Cartography in Warfare

The extensive Allied body of manuals includes several publications that provide guidance on the use of maps, detail their distribution across various sectors, and contain exhaustive reading instructions (Collier 2022). These manuals, classified as confidential information at the time, also provide clarification on the stages of map production and updating, the creation of which followed a structured chain of command spread across multiple areas. From its headquarters in London, the Geographical Section General Staff (G.S.G.S.) assigned responsibility for cartographic publication to three organizations: the Survey Directorate A.F.H.Q. (Allied Forces Headquarters) in Algiers, the U.S. Department of War in Washington, and the Survey Directorate Middle East in Cairo

(Notes 1943). Over the course of several months, aerial observations and surveys continued, and new, corrected, and updated editions were published at various scales.

To produce these maps, the Allied services initially relied on a series of existing maps produced between the late 19th and early 20th centuries by the Istituto Geografico Militare (IGM - the Italian government's cartographic agency - and by the Touring Club Italiano (in 1937 renamed Consociazione Turistica Italiana). These served as the basis for organizing the information, also guiding the choice of scales adopted (Collier 2022). Maps were updated using data derived from aerial photographs taken by MAPRW, active from 1942 to 1945¹ (Dai Prà, De Santia, Scaglione 2021). The objective was to provide information to the Allied forces in preparation for the landing in Italy (“Operation Husky”) and the ground advance to the Northern border.

Initially, production of maps of the Italian territory was not scheduled to begin until 1943, but military requirements and the efficiency of the cartographic services led to the preparations being brought forward; publication then continued until the end of the war (Notes 1943). These maps served two purposes: first as a tool for planning operations, and second as a guide during field

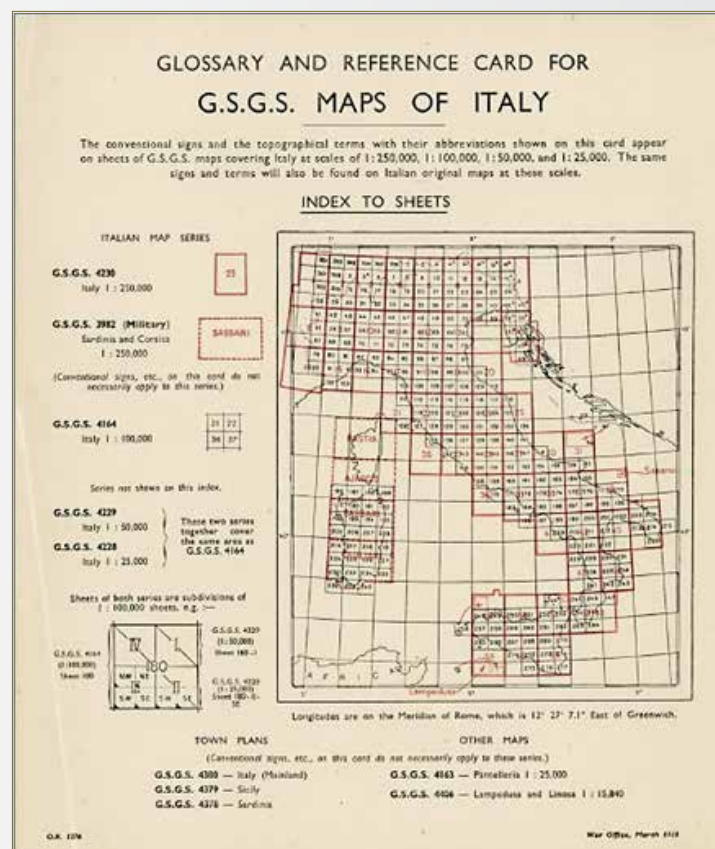


Fig. 2 – Glossary and reference card for G.S.G.S. maps of Italy (from Notes 1943).

operations (Clough 1952). The maps depicted the territory using various colours; purple, for example, was used to ensure easy readability by aircraft crews during night navigation (Collier 2022, 134). It was therefore a resource in which the accuracy of the information and its rapid updating were fundamental; to achieve their objective, the maps and aerial photographs were necessarily complementary.

Establishment of the collection at the BSR

“The School’s topographical collections have been enriched by the gift from the Air Ministry of a large collection of aerial photographs taken during the Italian campaign; and from the Army of a complete set of large-scale military maps of Italy.” (Fig. 3).

These words, taken from the BSR Annual Report 1945–1946, confirm the arrival of the cartographic collection and also reveal the different origins of the two documentary groups: photographs from the Air Force, maps from the Army.

In reality, the entire batch of aerial photographs selected by Ward-Perkins and J.P.S. Bradford (1918–1975) for scientific purposes was initially distributed among various foreign institutes in

Rome, as specified in a letter from Ward-Perkins to Evelyn Shaw, BSR Honorary General Secretary, dated July 30, 1945 (Shepherd et al. 2012; Giovenco, Castrianni, in press). Another batch followed Bradford to the Pitt Rivers Museum in Oxford, where he had been appointed University Demonstrator and Lecturer in Ethnology in 1947; other photos were sent to the British School at Athens on two occasions, immediately after the war and in the 1960s)².

Ward-Perkins played a central role in this distribution. While still in service, he and Bradford already emphasized the importance of this imagery for archaeological work (Shepherd et al. 2012, 16–17). As for the maps, however, it appears that their dispersal did not follow a defined distribution pattern. Produced in series and undoubtedly in large quantities - 4 million were printed in Cairo alone in preparation for the landing in Sicily (Clough 1952, 500) - these maps are now held in many archives in various countries, and multiple copies of the same document can be found (Bradford 1957). This numerical overrepresentation is undoubtedly one of the factors explaining the scant historiographical attention they have received.



Fig. 3 – GSGS map, 1943 (2nd edition), Italy 1:50.000 sheet 149-II Ostia Lido. BSR WWII map collection. *Italy 1:50.000 sheet 149-II Ostia Lido.*

Ward-Perkins and the creation of the collection

A careful review of the documents held in the BSR Administrative Archives enriches our understanding of the collection's formation (BSR, Maps 1946–1950); there are typewritten letters, handwritten notes, and lists. Several letters signed by Ward-Perkins are addressed to various officers of the British General Staff; the first, addressed to Col. Hughes on April 14, 1946, clearly reveals the new BSR director's intentions: “*I am anxious to obtain for the use of the British School a complete set of the 1:25,000 and 1: 50,000 maps of Italy. As you know the School has been for forty years the official centre for British research-work in Italy in the fields of Archaeology, history and art. These maps would be invaluable to its future work. (...)*”. The reasoning is this: without those maps, it is impossible to make sense of the data contained in the aerial photo boxes. It is important to remember that at the time Ward-Perkins had access to the complete set of materials: photographs, maps, and particularly the “accompanying papers” - that is, the transparencies that could be superimposed on the maps, pilot's traces, georeferencing, interpretations, etc. (Modafferi 2025) which, in practice, constitute a work already 50% complete, and thanks to which there is no need to start the entire process from scratch! (Fig. 4)

The request appears to focus on G.S.G.S. 4228 and 4229, two series of maps of Italy at scales of 1:25,000 and 1:50,000 (meters). About six months later, on October 16, 1946, Capt. Leonard of the General Staff replied: “*Reference of your letter of 14 Apr 46 [...] The maps as requested in your above-named letter are now available at this H[ead] Q[uarters](1st floor, room 29), and should be collected as soon as possible.*” (BSR, Maps 1946–1950).

The contents of the BSR cartographic archive were definitively verified in 2025. The editions range from 1915 to 1973, for a total of 4093 maps, of which 3313 were produced between 1943 and 1945 and are dedicated to Italy; the two series, 4228 and 4229, comprise 3185 maps (Fig. 5).

Maps as a Foundation for Archaeological Research

In the 20th century, aerial photography became the standard method for updating cartography, although this process still required on-the-ground verification. In non-cartographic/non-geographic fields, however, aerial photography was soon adopted as a source of knowledge in its own right, often as a single image, without considering that the primary value of aerial photography lies in the

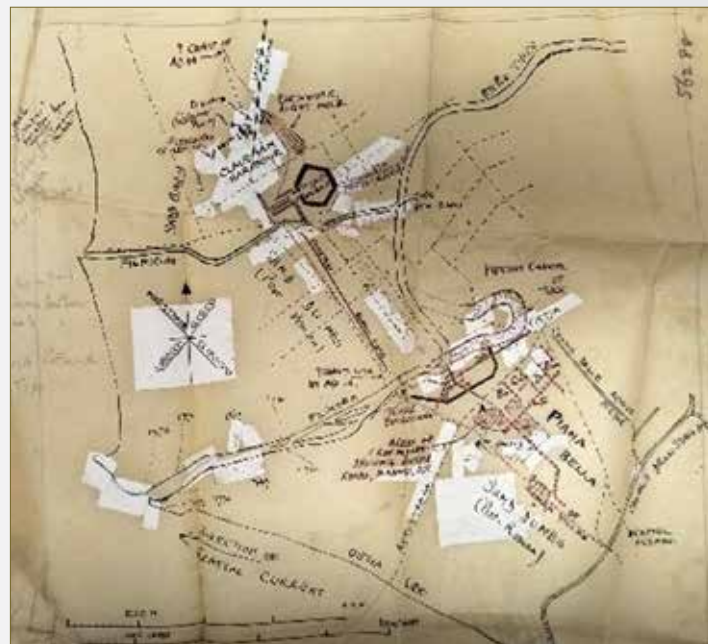


Fig. 4 – Bradford's final draft plan of the Tiber's mouth (see fig. 6). Courtesy Oxford University, Pitt Rivers Museum, Bradford Papers.

possibility of stereoscopic viewing, which, however, requires a pair of partially overlapping images and a stereoscopic device, even a very simple one. Allied maps, updated primarily through aerial photographs, were used for strategic purposes. However, in the eyes of the military personnel who also had a classical academic background (especially archaeologists and surveyors), they also served as an excellent foundation for scientific field research. The best-known case is that of the classicists John P.S. Bradford³ and Peter Williams-Hunt (1919–1953)⁴, stationed in Apulia, who, while flying over the region, recognized the traces of ancient settlements (Bradford, Williams-Hunt 1946). Their expertise and their role in preserving aerial photographs (and maps) in the immediate postwar period were based precisely on this ability to interpret aerial photographs from multiple perspectives. Ward-Perkins, Deputy Director of the Monuments, Fine Arts, and Archives (MFAA) military task force⁵ (better known today as the Monuments Men), also shared this ability: and it is to their combined efforts that we owe not only the survival of this extraordinary reconnaissance archive, but also the launch, in the postwar period, of

scale	GS GS	quantity	published
1:25.000	4228	2203	1943, 1944, 1945
1:50.000	4229	982	1943, 1944, 1945
1:250.000	4230	16	1943
1:500.000	1404	1	1967, 1973
miscell.	various	111	1943

Fig. 5 – Size of the BSR WWII Map Collection.



Fig. 6 - Ancient topography of Ostia, the Tiber, the coast-line, and Portus in Roman times (plan derived from aerial photos and field survey: Bradford 1957, fig. 23).

truly revolutionary archaeological-topographical projects, which culminated in Bradford's *Ancient Landscapes* (Bradford 1957) (Fig. 6) and Ward-Perkins' South Etruria Survey (Smith 2018).

The availability of a greater amount of interconnected historical data and current trends in Open Science will undoubtedly stimulate new research in the future (Boi, Marras, Santagati 2015)

Acknowledgments

The Author is grateful to R. Mouren, B. Gelosia, A. Giovenco, F. Deli, C. Pratillo (BSR), E. Richard-Tremeau (Durham University) for their friendly help; and F. Di Lorenzo, E.J. Shepherd (AFN). AFN is grateful to Elena Martelli, MiC, for help with the English text.

A. Dell'Anna edits the column L'Aerofototeca Nazionale racconta.....

ABSTRACT

The move of the Allied G.S.G.S. Cartographic Collection from the British School at Rome to the Aerofototeca Nazionale, with the aim of bringing together two inextricably linked archives, provides an opportunity to shed light on their history, highlighting the pivotal role of J.B. Ward-Perkins's work in this endeavour. This Collection remains to this day a valuable research tool, given that the production and updating of maps during World War II depended on the informational potential of aerial photographs, which are still useful today.

KEYWORDS

WWII AERIAL PHOTOGRAPHY; WWII CARTOGRAPHY; HISTORICAL ARCHIVES; PHOTO INTERPRETATION.

AUTHOR

LUCAS GOUDARD

LUCAS.GOUDARD@ENSSIB.FR

ÉCOLE NATIONALE SUPÉRIEURE DES SCIENCES DE L'INFORMATION ET DES BIBLIOTHÈQUES (ENSSIB), BSR INTERNSHIP 2025

REFERENCES

- Alvisi, G. (1980). Presentazione della collezione aerofotografica, in AA.VV., *L'aerofotografia da materiale di guerra a bene culturale. Le fotografie aeree della RAF*, Mostra organizzata presso la BSR dall'ICCD, MiBAC, 24 giugno – 10 luglio 1980, Roma: 8-9.
- Boi, V., Marras, A.M., Santagati, C. (2015). Open Access and Archaeology in Italy: an overview and a proposal. *Archäologische Informationen* 38: 137-147.
- Bradford, J.S.P. (1957). *Ancient Landscapes. Studies in Field Archaeology*. London.
- Bradford, J.S.P., Williams-Hunt, P.R. (1946). Siculosa Apulia. *Antiquity* 20: 191-200.
- British School at Rome, Faculty of archaeology, history and letters (1945-1946). *Forty-First Annual Report to the Subscribers 1945-1946*, Richard Clay and Company, printed in Great Britain.
- BSR Research Collections, AR-07.01. PPMA/2. 'Maps, 1946 – 1950'.
- Ceraudo, G. (2004). Un secolo e un lustro di fotografia aerea archeologica in Italia (1899-2004). *Archeologia Aerea. Studi di Aerotopografia archeologica* 1: 47-68.
- Clough, A.B. (1952). *Maps and Survey*. The War Office, London.
- Collier, P. (2022). Allied Military Mapping of Italy during the Second World War. *Nuova Antologia Militare* 3: 131-178.
- Dai Prà, E., De Santia, V., Scaglione, G. (2021). Representing the War. Early Twentieth Century Maps and Models in the Fonds of the Italian War History Museum in Rovereto. *Proceedings of the International Cartographic Association, Geo-Cartographic Centre for Studies and Documentation (GeCo)*, University of Trento, 4, 23 (<https://doi.org/10.5194/ica-proc-4-23-2021>).
- Giovenco, A., Castrianni, L., in press. Rescued from Pulp. Aerial photography and Bradford's cultural legacy across archival collections at the BSR. *Atti del IV Convegno Internazionale di Archeologia Aerea "L'eredità di Bradford (1975-2025)" - Immagini aeree e paesaggi antichi* (Roma, 20-23 maggio 2025).
- G.S.G.S., *Notes on G.S.G.S. Maps of Italy Sicily, Sardinia and Corsica*. War Office, London, 1943.
- Linch, K., Butler, W., Quinn, S. (2024). The architecture and archaeology of War Office records. *Archives and Records* 45, 2: 101-117.
- Modafferi, M. (2025). L' Aerofototeca Nazionale racconta... Le carte di accompagnamento: ricostruire i retroscena delle fotografie aeree. *GEOMedia* 1: 42-45.
- Shepherd, E.J., Palazzi, D.S., Leone, G., Mavica, M.M.M. (2012). La collezione c.d. USAAF dell'Aerofototeca Nazionale. *Archeologia aerea. Studi di aerotopografia archeologica* 6: 13-32.
- Shepherd, E.J. (2018). L' Aerofototeca Nazionale racconta... La fotografia aerea nel teatro di guerra mediterraneo. *GEOMedia* 6: 30-31.
- Smith, Ch. (2018). J.B. Ward-Perkins, the BSR and the landscape tradition in post-war Italian archaeology. *PBSR* 86: 271-292.

LINKS

- <https://www.ncap.org/image-collection/maprw>
- https://www.bsa.ac.uk/about-us/library/collections_and_resources/aerial-photographs
- <https://www.monumentsmenandwomenfnd.org/monuments-men-and-women/john-bradford>
- <https://biblioasia.nlb.gov.sg/vol-5/issue1/apr-2009/williams-hunt-aerial-view-photograph/>
- <https://www.monumentsmenandwomenfnd.org/monuments-men-and-women/john-ward-perkins>

S60G

GNSS RTK Tablet

- **MULTI-CONSTELLATION SYSTEM**

- **ANDROID OPERATING SYSTEM**

- **HIGH-VISIBILITY DISPLAY**

- **RTK AND POST-PROCESSING**

DURABILITY:

- **IP68 AND MIL-STD-810H STANDARD**



10–11 June 2026
EXPANDEO 2026
Earsc Annual Event
Brussels (Belgium)

17 - 18 June 2026
AIT 40 anni di Telerilevamento
in Italia
Bologna (Italy)

25-26 June 2026
14th EARSeL Workshop on
Forest Fires 2026
Lisbon (Portugal)

4 -11 July 2026
XXV ISPRS CONGRESS
Toronto (Canada)

30 August – 5 September 2026
FOSS4G 2026
Hiroshima (Japan)

9 - 11 September 2026
EUROCATO 2026
Brno (CZ)

16–18 September 2026
REMTECH EXPO 2026
Ferrara (Italy)

29 September – 02 October 2026
45th EARSeL Symposium
Athens, Greece

7–10 October 2026
SAIE 2026 La fiera
dell'Edilizia e delle Costruzioni
Ferrara Fiere (Italy)

8–9 October 2026
TRAFFIC 2026
Bologna (Italy)

3–5 November 2026
Smart City Expo World
Congress 2026
Barcelona (Spain)

17 - 20 November 2026
EAASI Summit 2026
Alicanta (Spain)

17 - 20 November
ASITA 2026
Bologna (Italy)



Leica TS20

ROBOTIC TOTAL STATION

Be ready for every survey, with the Leica TS20 robotic total station.

- Ready for the widest variety of measurement tasks and applications.
- Enhanced automation for faster setup and flexible, accurate measuring. AutoHeight, Leica AP20 AutoPole, PowerSearch, Dynamic Lock and advanced prism-type detection reduce downtime and mistakes.
- IP66-rated design: built for all weather conditions.
- Real-time data transfer with cloud connectivity with wireless connection to GeoCloud services supports smooth, secure workflows.
- Future-ready with continuous software enhancements and cutting-edge hardware.

Find out more at
geomatica.it



geomatica.it
by **TEOREMA**^{srl}

Contact us, you'll find out much more!

Via A. Romilli, 20/8 • Milano • Tel. 02 5398739 • teorema@geomatica.it
www.geomatica.it • www.disto.it • www.termocamere.com

Leica
Geosystems

JOIN THE GLOBAL GEOSPATIAL COMMUNITY AT ISPRS 2026

 Toronto, Canada

 4-11 July 2026

TECHNICAL SESSIONS

- ▶ **LiDAR, Laser Altimetry and Sensor Integration**
- ▶ **Large Language Models** for Intelligent LiDAR Point Cloud Processing
- ▶ **Point Cloud** Generation and Processing
- ▶ Roundtable **Digital Twins** for Conservation of World Heritage Sites
- ▶ **Digital Twins** for Mobility and Navigation
- ▶ Advancing **Digital Twins for Urban Environments**: Approaches to Mapping, Monitoring, and Management
- ▶ Advances in **Reality Capture, AI, and Digital Twin** Technologies for Construction Engineering
- ▶ **Mobile Mapping** Technology
- ▶ Spatially Enabled **Urban and Regional Digital Twins**
- ▶ **Disaster Management**
- ▶ **Toward Smart Forests**: Emerging Tools in Remote Sensing, Artificial Intelligence, and Field Robotics

TUTORIAL SESSIONS

- ▶ **Open Point-to-point Correspondences** for Loose or Tight Integration in Kinematic Laser Scanning
- ▶ Open-source Scientific Software **py4dgeo** for **Change Analysis** in 3D/4D Point Clouds
- ▶ Advanced **Topographic Time Series Data Management** Using the Topo4d Extension of the Spatiotemporal Asset Catalog (STAC) for Curation, Analysis, and Visualization of 4D Point Clouds
- ▶ **Digital Twinning** with UAV and Backpack Mobile Mapping Systems



Scan this
QR code &
**REGISTER
NOW**

COMMERCIAL UAV EXPO

SEPTEMBER 1-3, 2026

CAESARS FORUM / LAS VEGAS

**PROVEN TECHNOLOGY.
PRACTICAL INSIGHTS.
POWERFUL CONNECTIONS.**



**REGISTER AT
EXPOUAV.COM**

Use code **SAVE100** to get
\$100 off a Conference Pass
or Exhibit Hall Pass.



PROVEN TECHNOLOGIES

Cutting-edge UAS solutions,
live flying demonstrations, and
exclusive product previews.

PRACTICAL INSIGHTS

Solution-driven presentations
and real-world case studies from
leading UAS thought leaders.

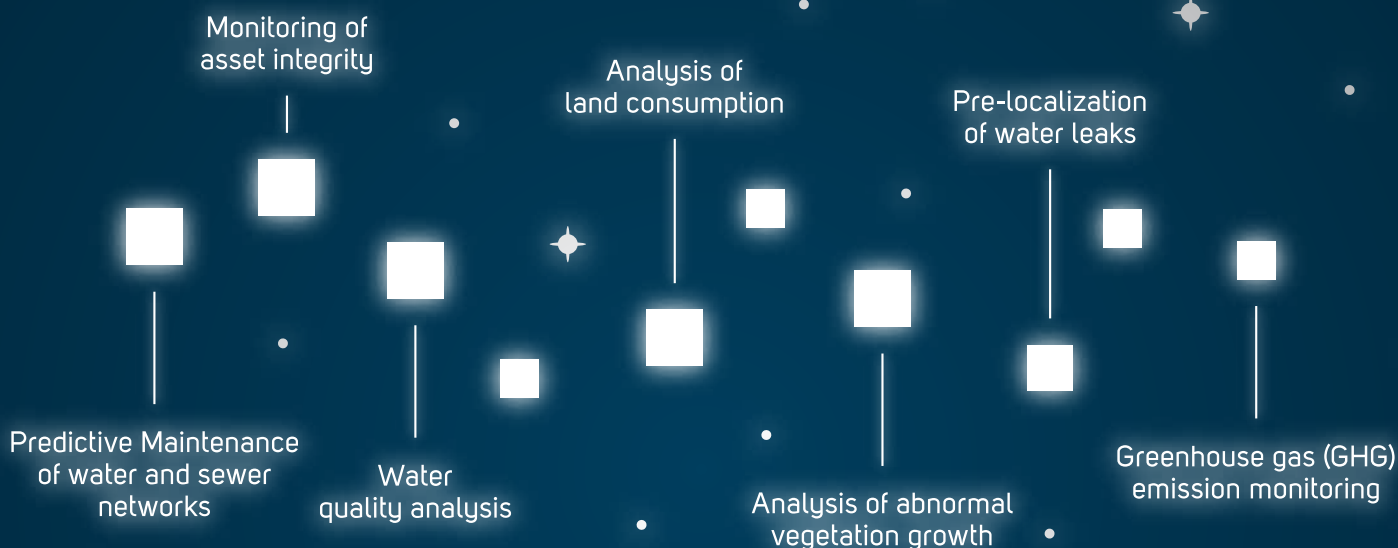
POWERFUL CONNECTIONS

Facilitated networking with
drone professionals from around
the globe.

Presented by: **COMMERCIAL
UAV NEWS**

Event Partners:  **DRONERESPONDERS**  **pilotinstitute**

Produced by: **diversified**



Space for Water Utilities

Empowering Water Supply Management
with Satellite Data & Analytics

EFFEDEMME | Brand builders



The use of satellite data allows for precise surveillance of the impacts of **climate change, hydrogeological instability, extreme weather events, and human-induced transformations**, supporting proactive and informed management, improving environmental impact, and reducing maintenance costs.

Planetek Italia's services, backed by **30 years of experience in the sector**, enable **accurate and timely monitoring**, revolutionizing the **design, implementation, and maintenance** of water supply and sewer infrastructure.



WWW.PLANETEK.IT



Contact our
expert now.

The best SLAM-based mobile scanner in its class.

Emesent GX1 is an all-in-one mobile scanner combining SLAM, LiDAR, RTK, PPK and 360 panoramic imagery into a quick-to-deploy unit designed to accelerate survey operations.

Scan to
learn more

