



FIELD DATA / PRECISE COORDINATES

Technical publications • Edition 1.0 • 2026

CONTROLLED TECHNICAL PUBLICATION

HelloGeo MetaSync

Technical Documentation & Product Integration Reference — RTK / GNSS, GCP, media, sync and mobile platform controls

DOCUMENT	Technical Documentation & Product Integration Reference
DOCUMENT ID	HG-MS-TD-1.0
EDITION	1.0 — Publication-ready editable master
ANDROID BASELINE	1.0.4 / versionCode 11 / package com.hellogeo.metasync
CROSS-PLATFORM BASELINE	Google Play + Apple App Store verified 31 August 2026
DISTRIBUTION	Authorized customer, partner, support and audit use

Field-to-cloud engineering reference • Release date: 31 August 2026

hellogeo.world

Publication notice and rights [Contents](#)

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Support	See Support, escalation and evidence package
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Standards position

This publication uses selected global standards and industry references as design and control baselines. It does not claim that MetaSync, HelloGeo or this document is certified, accredited or independently assessed against any named standard unless a separate signed certificate says so.

Publication control

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Field	Controlled value
Document ID	HG-MS-TD-1.0
Edition	1.0 — Publication-ready master
Release date	31 August 2026
Product baseline	Android 1.0.4 (versionCode 11) — supplied technical baseline
Source reviewed	HelloGeo-MetaSync-Technical-Documentation.pdf and HelloGeo-MetaSync-User-Guide.pdf
Official listings verified	Google Play and Apple App Store — 31 August 2026
Scope	Android implementation baseline, cross-platform distribution profile, capture/data architecture, security/privacy, integration, release verification and support controls
Review interval	At every product release and at least annually

Revision history

Edition	Date	Change	Status
0.x	11 Aug 2026	Supplied PDF source baseline	Superseded for publication
1.0	31 August 2026	Reframed, cross-platform store references, QR codes, global terminology, security/privacy, accessibility and release governance	Publication-ready

How statements are qualified

Label	Meaning
Source-verified	Appears in the supplied MetaSync technical or user publication baseline.
Store-verified	Appears on the official Google Play or Apple App Store listing on the verification date.
Recommended control	A publication or operational baseline to validate and implement; not a claim of current product behavior.
Open item	A known gap or behavior requiring evidence, remediation or explicit acceptance.

RELEASE GOVERNANCE Product, Engineering, Security/Privacy and Legal owners should approve functional claims, open-item exposure, jurisdictional terms and support contacts before uncontrolled public distribution. This master is structurally publishable and remains editable for that approval cycle.

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Product overview and scope [Contents](#)

HelloGeo MetaSync is a professional mobile field-data application for acquiring Ground Control Points (GCPs), related media and survey observations. The supplied Android baseline connects to a HelloGeo Point RTK receiver over Bluetooth Low Energy (BLE), can deliver NTRIP/RTCM corrections, parses GNSS observations, validates and averages epochs, assigns quality indicators, commits a canonical point record and synchronises collections with HelloGeo services. Phone GNSS remains available for lower-accuracy work.

ACCURACY CLAIM The Google Play listing states RTK Fixed accuracy up to ± 2 cm. Treat this as a store-listed capability under suitable receiver, correction, environment and method conditions—not a universal guarantee or legal certification.

Intended uses

- Ground Control Point acquisition for aerial mapping and photogrammetry.
- Construction, engineering and infrastructure field observations where the project specification permits mobile RTK/GNSS collection.
- Survey point organisation, map review, standard export and HelloGeo Suite hand-off.
- Geotagged media capture; on compatible iPhone hardware, the official listing also describes LiDAR 3D scanning and point-cloud review.

Non-goals and controlled exclusions

- MetaSync is not a replacement for a licensed surveyor, project control specification, calibrated equipment procedure or jurisdictional survey record.
- The mobile app is not a sole life-safety, navigation, emergency-response or cadastral-boundary system.
- This document does not define backend service-level commitments, retention periods, legal terms or subscription entitlements; governing contracts and live store/account information prevail.
- The iOS source architecture was not supplied. iOS statements are limited to official App Store metadata and must not be read as Android–iOS implementation parity.

Product identity

Attribute	Android source baseline	iOS distribution profile
Application	HelloGeo MetaSync	HelloGeo MetaSync — RTK GNSS Field Survey & GCP
Identifier	com.hellogeo.metasync	App Store listing ID 6791463289
Provider	HelloGeo / HelloGeo Technologies Private Limited	HELLOGEO TECHNOLOGIES PRIVATE LIMITED
Compatibility	minSdk 24 — Android 7.0	iOS 16.4 or later; designed for iPhone
Build baseline	1.0.4, versionCode 11	Store-managed current release; record build in release evidence
Source technology	Kotlin, Jetpack Compose, single Gradle module	Not reviewed in supplied material
Feature distinction	Android GNSS/RTK, collections, media, map, export/sync	Listing adds LiDAR 3D scan and point-cloud preview

CORRECTED PLATFORM MAPPING The supplied PDF paired API 36 with Android 15. Official Android documentation identifies API level 36 as Android 16. This edition records target/compile SDK 36 as Android 16.

Capability and evidence matrix

Capability	Android evidence	iOS evidence	Publication interpretation
Phone GNSS	Supplied source + UI	App Store describes RTK-GNSS	Available; device accuracy varies
HelloGeo Point over BLE	Supplied architecture + field evidence	Bluetooth GNSS receiver integration listed	Receiver compatibility requires field test
NTRIP corrections	Source-verified client and config	Store-listed	Credentials/caster/network required
GCP collections	Source/UI/store verified	Store-listed	Primary field object
CSV/PDF/GCP/Metashape	Source/UI verified	Export generally listed	Confirm format availability by platform/build
HelloGeo Suite sync	Source + Google Play	Cloud sync listed	Requires identity, network and entitlement
Photos/videos	Source/UI + Google Play	User content listed	Privacy and upload controls apply
LiDAR 3D scan	Not in Android source baseline	App Store listed	iPhone + compatible LiDAR hardware only

Canonical product terminology

Term	Use in this publication	Do not confuse with
Collection	Server-side survey unit grouping captured GCP points	Projects tab
GCP Point	One committed GcpPointData record inside a Collection	A photo or unsaved observation
Project / Projects tab	Android UI media gallery for photos and videos	Backend Collection entity
Observation / epoch	One GNSS reading entering validation	Final averaged point
Fix state	Receiver solution such as No Fix, Single, DGPS, RTK Float or RTK Fixed	Accuracy guarantee
CRS	Coordinate Reference System named by authority/code where available	Display unit or map basemap

Official distribution and installation [Contents](#)

Use only the official distribution pages below. The QR codes encode the full store URLs printed beneath them. Store metadata, availability, pricing and compatibility can change after this publication date; the live listing is authoritative.

GOOGLE PLAY



Android package com.hellogeo.metasync
Developer shown: HelloGeo
[Open official listing](#)

APPLE APP STORE



Listing ID 6791463289
Provider shown: HELLOGEO TECHNOLOGIES PRIVATE LIMITED
[Open official listing](#)

INSTALL CONTROL Before installing, confirm the application name is “HelloGeo MetaSync” and the listed developer/provider matches HelloGeo. Do not sideload packages or use copied QR codes from untrusted sources.

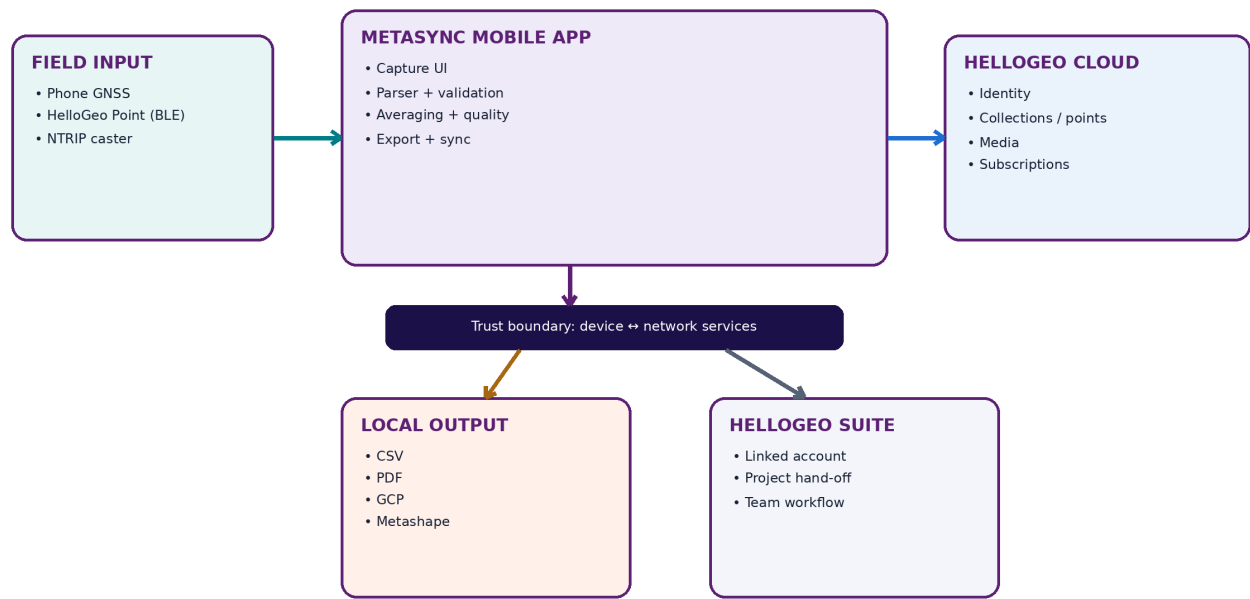
Platform	Channel	Compatibility baseline	Listing-described scope
Android	Google Play	Minimum Android 7.0 / API 24 in supplied baseline	RTK/GPS, NTRIP, GCP collections, import/export, cloud sync, media, map
iPhone	Apple App Store	iOS 16.4 or later per listing	RTK-GNSS, NTRIP, GCP, CRS/height options, LiDAR scan, point-cloud preview, cloud sync

PLATFORM SCOPE Android internal architecture is source-verified from the supplied technical publication. iOS functions above are official App Store listing statements, not a source-code or feature-parity audit. LiDAR requires compatible device hardware.

Google Play was updated 31 July 2026 and lists the app in Business with an Everyone rating. Apple lists the app as designed for iPhone, in Business, English, age 4+, free with in-app purchases. These are store declarations verified on 31 August 2026.

System context and architecture [Contents](#)

MetaSync system context and trust boundaries



Implementation profile: Android source baseline; iOS availability is described separately from official store metadata.

Figure 1 — MetaSync system context and principal trust boundaries.

Android implementation profile

The supplied Android baseline is a single Gradle module. Application state is held in Kotlin StateFlow and reconciled with server state; no local database is described. NTRIP configuration and authentication tokens persist through Jetpack DataStore Preferences. The UI uses Jetpack Compose/Material 3 with a bottom-navigation graph. CameraX handles media capture; Retrofit/OkHttp handles web APIs; OSMDroid renders the map.

PERSISTENCE BOUNDARY Because the source baseline describes no local database, do not represent the Android app as fully offline-durable. A capture may continue while the app remains active, but unsynchronised records must be tested for restart/process-loss survival. Field SOP: verify sync or export before closing the app.

Component and package map

Package / component	Responsibility	Primary risk or control
auth/	Retrofit APIs, TokenManager, SuiteTokenManager, RetrofitClient	Token storage, auth headers, endpoint selection
averaging/	Median-robust, outlier-rejecting AveragingEngine	Determinism, unit tests, minimum sample policy
bluetooth/	BLE HelloGeo Point and legacy classic-Bluetooth paths	Permissions, proximity, reconnect, GATT/RFCOMM separation
camera/	CameraX photo/video capture	Consent, storage, media metadata and upload

Package / component	Responsibility	Primary risk or control
crs/	CRS selection and WGS 84  projected/UTM transforms	Axis order, EPSG code, datum/height disclosure
data/	GcpPointData and CollectionRepository	Null semantics, sync reconciliation, patch-back mitigation
export/	SurveyExportModel, CSV/GCP/Metashape/PDF	Schema/version consistency and safe file naming
gnss/	NMEA parsing, PhoneGpsManager, SurveyObservation	Sentence integrity, time, fix state, duplicates
ntrip/	Caster handshake, sourcetable, RTCM streaming, GGA feedback	Credential protection, TLS capability, reconnect
quality/	Stability, confidence, reliability and overall status	Document thresholds and prevent false assurance
validation/	Pluggable per-epoch validation rules	Evidence for rule configuration and rejected epochs
ui/ + viewmodel/	Compose screens, navigation and state orchestration	State loss, error visibility, accessibility

Principal data paths

Flow	Source → processing → destination	Security / reliability checkpoint
Position	GNSS/receiver → NMEA parser → validation → averaging → GcpPointData	Reject invalid/unset coordinates; retain source/fix evidence
Correction	NTRIP caster → socket/client → receiver connection	Protect credentials; detect RTCM; expose disconnect/retry
Cloud	CollectionRepository → authenticated API → HelloGeo services	TLS, auth scope, retry/idempotency, server response validation
Media	Camera/device → app storage/upload → Projects view/cloud	Permission, user intent, classification, retention
Export	SurveyExportModel → CSV/PDF/GCP/Metashape → device/share target	Schema ID, CRS/units, checksum/size, no secret fields

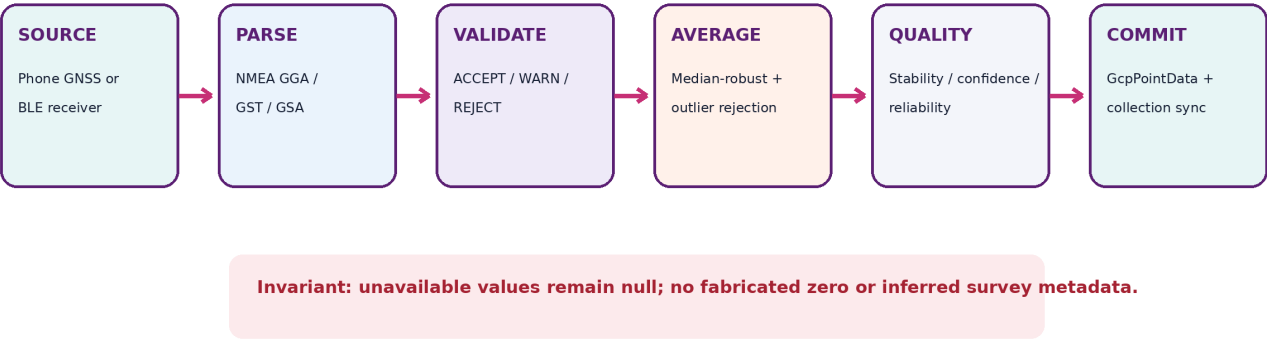
Backend service profile

Host	Source-described responsibility	Publication control
metapi.hellogeo.world	Primary MetaSync identity, collections/points, media, subscription and Flight linking	Production DNS/TLS and API contract must be release-tested
apiv2.hellogeo.world	HelloGeo Suite account linking/sign-up	Treat as separate trust boundary and token audience
apiconnect.hellogeo.world	HelloGeo Connect account linking	Treat as separate trust boundary and token audience

ARCHITECTURE SCOPE Hostnames and packages are reproduced from the supplied technical baseline. This publication is not an API contract, penetration-test report or guarantee of production deployment state.

GNSS, RTK and capture pipeline [Contents](#)

Capture pipeline — observation to committed point



Pipeline labels reproduce the supplied Android technical baseline; thresholds and operational acceptance remain deployment-configured.

Figure 2 — Staged observation pipeline and the no-fabricated-values invariant.

Positioning sources

Source	Transport	Use	Operational qualification
Integrated device GNSS	Mobile OS location service	Rapid, lower-accuracy capture and fallback	Do not label survey-grade; record reported accuracy
HelloGeo Point	BLE/GATT serial emulation	Primary RTK receiver path	Verify pairing, firmware, antenna setup and fix state
Generic receiver	Legacy classic-Bluetooth serial path	Compatibility path	Validate sentence set, baud/profile and reconnect behavior

NMEA observation profile

Sentence	Fields used in source baseline	Absence behavior
GGA	Latitude, longitude, fix quality, HDOP, satellite count and altitude-related values	No valid position → no commit; unavailable fields remain null
GST	Pseudorange error statistics	Accuracy statistics remain unavailable rather than invented
GSA	PDOP, VDOP and satellites-in-use	Known receiver sessions did not emit GSA; PDOP/VDOP may remain blank
GSV	Not parsed in supplied baseline	Satellites visible is unsupported

Each parsed line becomes a SurveyObservation. The source computes a content-based observation identifier intended to support duplicate-notification detection. The supplied validation register reports that duplicate BLE notifications can still pass the current guard at scale; processing remains correct but inefficient, and sample/epoch counts can be misleading unless deduplication is corrected or explicitly accounted for.

NTRIP and correction data

NtripClient establishes the caster session, can parse STR records for mountpoint discovery, forwards correction bytes to the active receiver, and periodically sends the rover position as GGA for VRS/network-RTK operation. Caster host, port, mountpoint and credentials are persisted through NtripConfigStore.

Control point	Expected behavior	Verification evidence
Configuration	Validate host, port, mountpoint and username; mask password after entry	Negative and valid-caster test cases
Transport	Document whether caster connection is protected and prevent credential disclosure	Network capture / configuration review
Format detection	First correction byte 0xD3 identifies RTCM v3; otherwise dataFormat remains null	Known sample stream and non-RTCM negative test
VRS feedback	Periodic valid GGA sent after location is available	Caster log and rover trace
Recovery	Loss is visible; retry is bounded; operator can rerun setup	Drop/reconnect field test

CREDENTIAL PROTECTION The source says NTRIP credentials persist in DataStore but does not demonstrate encryption at rest. Treat encrypted secret storage, redaction from logs/backups and credential-rotation testing as release controls requiring evidence.

Validation engine

Rule	Decision intent	Required record
Fix quality	Reject or warn when fix type is below project policy	Raw fix code + interpreted state
HDOP	Evaluate horizontal satellite geometry against policy threshold	Observed HDOP or null
Satellite count	Evaluate minimum satellites used	Count + sentence source
GST accuracy	Evaluate receiver-reported error statistics	Observed statistic or null
Position jump	Detect implausible movement during a capture window	Delta, time and rule result
Duplicate observation	Prevent repeat notification from inflating epochs	Observation ID and duplicate outcome

Averaging and quality

Only accepted epochs should feed the source-described median-robust, outlier-rejecting average. The result includes RMS, CEP50, CEP95 and per-axis standard deviations when genuine multi-epoch inputs exist. SurveyQualityEngine converts stability, confidence and reliability into READY, WAIT or POOR. These labels are decision aids; the project specification owns the acceptance threshold.

Mode	Trigger / semantics	Publication requirement
AVERAGED	Multi-epoch capture after validation and outlier handling	Report epoch count, duration, rejected count, statistics and source
SINGLE_SHOT	One accepted location or fallback path	Clearly label lower confidence; never attach multi-epoch statistics
NOT COMMITTED	No valid fix, rejected observations or save failure	Show actionable error; preserve no fabricated 0,0 point

Commit and synchronisation

1. Assemble the canonical GcpPointData from only observed or derived values supported by the capture path.
2. Validate point name/identifier, coordinate validity, CRS label, source, fix state, timestamp and capture mode.
3. Submit through CollectionRepository and display explicit saved/sync-pending/sync-failed status.
4. If the backend response omits newer metadata, apply the source-described same-session patch-back only as a visible mitigation; do not call it durable persistence.
5. Export or verify cloud sync before process termination when offline durability has not been acceptance-tested.

Data model and geospatial semantics [Contents](#)

GcpPointData category map

The supplied model describes 61 exportable fields. Newer or receiver-dependent fields are nullable. Null means genuinely unavailable; zero is a valid value only when directly observed or correctly calculated. This invariant prevents physically misleading HDOP, coordinates, heights or error statistics.

Category	Representative fields	Quality rule
Identity	Point ID, point name, description	Stable identifier; name need not be globally unique
Position	Latitude, longitude, ellipsoidal height	Record CRS, axis order and units
GNSS	Fix quality, correction source, HDOP/PDOP/VDOP, satellites, format	Retain null when sentence/value absent
Receiver	Model, firmware, mountpoint, network type	Capture from source/connection, not operator guess
Accuracy	Horizontal/vertical accuracy, CEP50/95, RMS, standard deviations	Differentiate receiver-reported and computed values
Height	Orthometric height, vertical datum, projection	Do not derive without valid geoid/model and transformation
Quality	Validation result, status, confidence, reliability, stability	Store algorithm version/threshold profile when available
Survey	Epoch count, duration, capture mode	Count accepted/rejected/duplicates consistently
Traceability	Observation IDs, receiver session ID	Support provenance and reproducibility
Reference	Coordinate system name and EPSG code	Authority/code must match coordinates

Coordinate reference system contract

Element	Required publication behavior
Authority and code	Record the CRS authority/code, e.g., EPSG identifier, when known; do not use an EPSG code as a decorative label.
Axis / field order	Explicitly label latitude/longitude or easting/northing. Never rely on consumer assumptions.
Datum / frame	Identify geodetic datum/reference frame and epoch when project accuracy requires it.
Height	Differentiate ellipsoidal height from orthometric height; identify geoid model/vertical datum for transformed heights.
Units	Use SI by default: metres, seconds and degrees; label any alternative units and conversion.
Transformation	Record source CRS, target CRS, method and parameters when transforming coordinates.
Precision	Export enough decimal precision to preserve measurement; do not imply accuracy from excess digits.

HEIGHT WARNING The supplied schema contains orthometric height, datum and projection fields but says current Android capture paths do not populate them. Leave them null unless a verified transformation with an identified geoid/vertical datum is performed.

Time and identifier conventions

Field class	Recommended control
Timestamp	ISO 8601 with UTC offset; preserve capture time separately from upload/update time
Report ID	Stable unique ID in each generated report and footer
Collection ID	Server identity; do not derive from mutable display name
Point ID	Stable within export/import; detect duplicates explicitly
Receiver session	Unique per receiver connection/capture session where available
Schema version	Include in machine-readable export metadata or companion manifest

Fields intentionally unsupported in the supplied baseline

Field	Reason	Correct output
GDOP	Requires TDOP; not derivable from the parsed sentence set	Null / blank
Satellites visible	GSV not parsed	Null / blank
Receiver serial number	No source sentence/vendor extension parsed	Null / blank
Base station	Network RTK/VRS may have no single physical base identity	Use mountpoint where appropriate
Covariance	Engine provides per-axis variance and CEP/RMS, not full covariance	Null / blank
Photo available	No point-to-photo association in current Android data model	Null / blank

Backend, API and synchronisation [Contents](#)

Source-described collection interface

Method / path	Purpose	Contract requirement
GET/POST/PUT/DELETE /api/collections	List, create, update and delete Collections	Authorization, validation, audit and ownership checks
PATCH /api/collections/{id}/sync	Synchronise collection state	Idempotency/retry semantics and conflict handling
GET/POST/DELETE /api/collections/{id}/points[/{pointId}]	List, add and remove points	Schema version, null semantics and authorization

Authenticated requests carry a Bearer token attached per call in the supplied Android baseline; no global OkHttp authentication interceptor is described. Token expiry, refresh, revocation, audience, logout invalidation and clock skew must be tested across every API client.

Metadata patch-back mitigation

The source records a production gap: the deployed backend received newer metadata on POST but did not return every field on a subsequent GET. CollectionRepository.addPoint() therefore patched roughly 30 locally known values onto the reloaded point for the current app session. This preserves same-session display but does not repair server persistence and must not be represented as durable sync.

Risk	Effect	Required release control
Restart after capture	Patched metadata can disappear after server reload	Backend schema migration + persistence regression test
Cross-device view	Second device may see incomplete metadata	Read-after-write verification from independent client
Export after reopen	Export may omit values previously shown	Restart/export acceptance scenario
Audit trail	Local patch can mask server incompleteness	Server response logging with secrets removed and field-diff telemetry

Offline and degraded-network state model

State	Permitted operator action	Required UI / data behavior
Online + authenticated	Capture, save, sync, media upload, export	Show last sync and server result
Offline, app active	Capture may continue if positioning path is available	Mark unsynced; warn before closing; allow local export if implemented
Token expired	Local observation may continue per policy; cloud actions stop	Prompt reauthentication without deleting unsynced data
Backend unavailable	Retry or defer	Bound retries; preserve data; no false success
App/process restarted	Behavior is build-dependent	Do not promise recovery until durability is acceptance-tested

Data lifecycle

Stage	Data	Control objective
Collect	Coordinates, GNSS, media, identity and project context	Purpose, permission, minimisation and operator notice
Process	Validation, averaging, quality and transformation	Traceable method, no fabricated values
Store	Device settings/tokens, server collections/media	Encryption, access control, backup, retention
Share	Exports, Suite sync and user-selected share targets	Classification, recipient check and secret exclusion
Delete	Collection/point/media/account request	Confirmation, authorization, retention/legal-hold rules

Stage	Data	Control objective
Audit	Support evidence, logs and release records	Redaction, minimum retention and access control

Export, import and interoperability [Contents](#)

SurveyExportModel.build() is the source-described canonical export record used by CSV and branded PDF writers. This design reduces divergence between formats. GCP and Metashape files intentionally remain minimal ID/X/Y/Z representations and therefore require explicit CRS/axis/height context outside the row data when the consumer format does not carry it.

Format	Intended use	Minimum acceptance checks
CSV	Complete field exchange, spreadsheet/GIS review and re-import	UTF-8, header-driven schema, delimiter/decimal, null, CRS, round trip
Branded PDF	Human-readable survey report	Report ID, summary, receiver/quality, point table, pagination, selectable text
GCP (.gcp)	Control-point import in compatible mapping tools	ID, X, Y, Z order; CRS and height documented
Metashape (.txt)	Agisoft Metashape control-point workflow	Expected delimiter/order and sample import test

Export coverage

Measure	Source value	Interpretation
Master model fields	61	CSV/PDF source record
Supported with real data when source is present	46	Availability remains capture/backend dependent
Reused label pairs	3 pairs	Mountpoint/correction source; notes/description; mean error/RMS
Unsupported by design	6	Must remain blank, not approximated

SEMANTIC REVIEW Reused label pairs can confuse downstream users. Prefer one canonical field name plus explicit aliases in the schema dictionary; do not imply two independent measurements where only one value exists.

Android local file handling

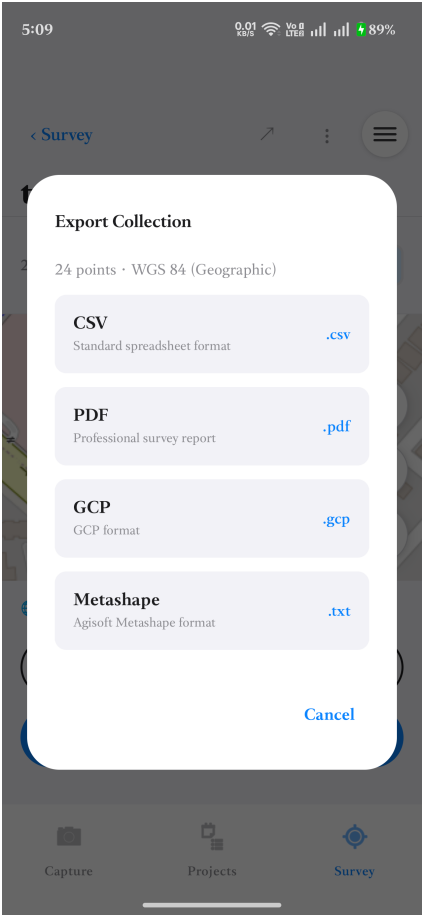
The supplied baseline writes exports to the public Downloads/HelloGeo location using MediaStore on Android 10+ and a scoped legacy path on Android 9 and below. The success dialog offers Open File, Share, Open Folder and Close. A generic application/octet-stream MIME type is used for non-standard extensions so Android does not silently rename them.

Interoperability release checks

- Round-trip a newly exported CSV into the same build and verify row count, IDs, nulls, coordinates, CRS and quality fields.

- Open every format in at least one independent target application; compare point count and a known control coordinate.
- Validate decimal separator and UTF-8 names under at least two device locales.
- Confirm no access token, NTRIP password, account secret or hidden diagnostic payload is exported.
- For transformed coordinates, compare against a trusted reference dataset and record the operation definition.
- Record schema version, app version, platform and test evidence in the release manifest.

Reference Android export UI



5:09 0.01 KB/s VoLTE 89%

< Survey

Export Collection

24 points • WGS 84 (Geographic)

CSV .csv
Standard spreadsheet format

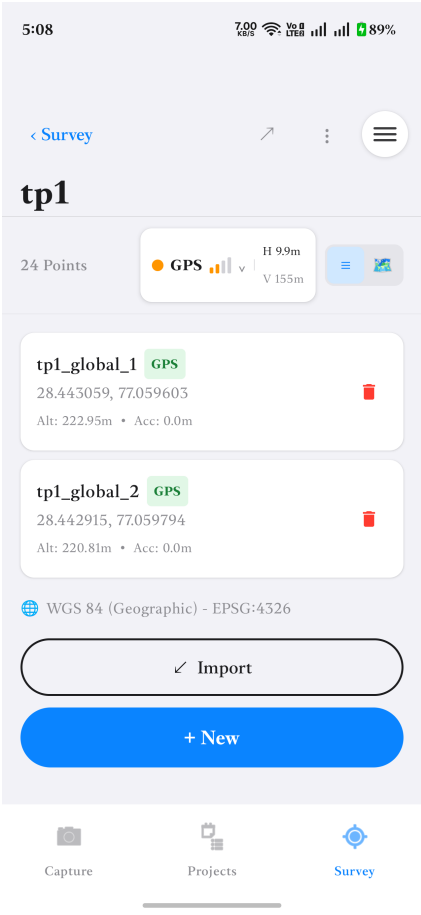
PDF .pdf
Professional survey report

GCP .gcp
GCP format

Metashape .txt
Agisoft Metashape format

Cancel

Capture Projects Survey



5:08 7.00 KB/s VoLTE 89%

< Survey

tp1

24 Points GPS H 99m V 155m

tp1_global_1 GPS
28.443059, 77.059603
Alt: 222.95m • Acc: 0.0m

tp1_global_2 GPS
28.442915, 77.059794
Alt: 220.81m • Acc: 0.0m

WGS 84 (Geographic) - EPSG:4326

Import

+ New

Capture Projects Survey

Export format selector

Collection point list

Reference UI captured from the supplied Android 1.0.4 publication baseline; current store UI may differ.

Permissions, privacy and data classification [Contents](#)

Android permissions

Permission / capability	Source-described purpose	Control
INTERNET / network state	Backend, media and NTRIP connectivity	TLS, endpoint allowlist and degraded-mode behavior
Fine/coarse location	Phone GNSS; older Android BLE scan behavior	Just-in-time rationale and deny/retry path
Camera / record audio	Photo and video capture	Purpose, visible recording state, media consent
BLUETOOTH_SCAN / CONNECT	BLE discovery and connection on Android 12+	Nearby Devices runtime permission
Legacy Bluetooth permissions	Pre-Android 12 discovery/connection	maxSdk 30 as supplied
WRITE_EXTERNAL_STORAGE	Legacy export on Android 9 and below	maxSdk 28; use MediaStore on modern devices

PERMISSION MINIMISATION Request a permission only when the operator starts the associated task. Explain loss of function when denied, avoid repeated coercive prompts and provide a route to system settings when needed.

Store-declared data profile

Source	Developer-declared profile	Qualification
Google Play	May collect Location and Files/documents; no third-party sharing; data encrypted in transit; deletion can be requested	Store declaration can vary by feature, region and future release
Apple App Store	Data linked to user may include purchases, precise location, contact info, photos/videos, user ID and environment scanning	Apple states developer-provided privacy information is not independently verified
HelloGeo privacy policy	Account, technical, geospatial/project and cookie data; customer ownership; service-provider/legal sharing; retention; rights	Public policy effective 28 April 2026; contracts may supplement/override

PUBLICATION REQUIREMENT Data-safety/App Privacy declarations, in-app notices, actual SDK/network behavior and the public privacy policy must describe the same processing. Reconcile discrepancies before release and after every SDK or feature change.

Recommended data classification

Class	MetaSync examples	Handling baseline
Public	Published product material and non-sensitive reference maps	Normal approved distribution
Internal	Build logs, non-production diagnostics and release plans	Authorized workforce/partner access
Confidential	Customer coordinates, imagery, project names, exports, receiver sessions	Need-to-know, encryption, controlled sharing/retention
Restricted	Tokens, OTPs, passwords, NTRIP credentials, payment secrets	Never export/log; secure storage; rotation and incident process

Security architecture and verification controls [Contents](#)

Source-verified security remediation

The source reports that an unconditional OkHttp BODY logging configuration exposed Bearer tokens and full payloads to Android logcat. The release configuration was changed so detailed logging is enabled only for debug builds and Level.NONE is used for release. This is a historical resolved defect; the release artifact must still be inspected because source intent does not prove packaged behavior.

Security control matrix

Domain	Current evidence	Required verification
Authentication	OTP/JWT described by Google Play; Bearer token per call in source	Expiry, refresh, logout, brute force, session revocation, audience
Local storage	DataStore persists tokens/NTRIP config	Encryption, backup exclusion, lock-screen/device-compromise analysis
Network	HTTPS API hosts; raw NTRIP socket described	TLS configuration, certificate validation, sensitive caster transport
Logging	Release BODY logging disabled in source	Release APK/IPA dynamic log test; crash/analytics redaction
Platform	Runtime permissions and share/export actions	Least privilege, URI/file exposure, clipboard/screenshots, deep links
Code / supply chain	Named third-party libraries	SBOM, dependency scan, signing, reproducible release provenance
Privacy	Store declarations + public policy	Data inventory, consent, deletion/export test, SDK traffic review
Resilience	R8/ProGuard disabled in supplied Android release	Risk acceptance, tamper/repackaging analysis and signing protection

Priority threat scenarios

Threat	Potential impact	Control objective
Credential leakage	Account, NTRIP or API compromise	No secrets in logs/exports; secure storage; rotation
Tampered app/package	Altered coordinates, data theft or false reports	Official-store distribution, signing verification, anti-repackaging risk control
MITM / hostile network	Credential or project-data disclosure	TLS validation; protect NTRIP where supported; fail visibly
Unauthorized sharing	Customer geospatial/media exposure	Recipient confirmation, classification and permission-aware sharing
Stale/incomplete sync	Wrong decision from missing metadata	Read-after-write and restart/cross-device integrity checks
Manipulated observation	Incorrect point or false quality	Sentence validation, source/session traceability and project controls

SECURITY BASELINE Use OWASP MASVS as a verification reference across STORAGE, CRYPTO, AUTH, NETWORK, PLATFORM, CODE, RESILIENCE and PRIVACY. This edition does not claim MASVS compliance; retain test-case evidence and deviations in the release record.

Build, dependency and release management [Contents](#)

Supplied Android build profile

Setting	Baseline
Namespace	com.example.hellogeocapture (internal source namespace)
Release application ID	com.hellogeo.metasync
compileSdk / targetSdk	36 / 36 — Android 16 API 36
minSdk	24 — Android 7.0
versionCode / versionName	11 / 1.0.4
Build types	debug and release; no custom flavors described
Code shrinking	Disabled in supplied release (isMinifyEnabled=false)
Java / Kotlin target	11
UI	Jetpack Compose / Material 3

Source-described dependencies

Library	Baseline version	Purpose
CameraX	1.5.3	Photo/video capture
Retrofit / OkHttp	2.11.0 / 4.12.0	HTTP/API communication

Library	Baseline version	Purpose
DataStore Preferences	1.1.7	Token and NTRIP configuration persistence
Kotlin Coroutines	1.8.1	Asynchronous BLE/NTRIP/network work
OSMDroid	6.1.18	Map visualisation
Coil	2.6.0	Image loading
Razorpay Checkout	1.6.41	Subscription payment

DEPENDENCY FRESHNESS Versions above reproduce the supplied baseline and may not be current. Before each release, generate an SBOM, check security advisories and licensing, validate SDK compatibility, and record upgrade or risk-acceptance decisions.

Build and test commands

```
./gradlew assembleDebug
./gradlew testDebugUnitTest
# Release builds must use the controlled signing pipeline, release configuration and evidence manifest.
```

Maintenance-mode governance

The source classifies v1.0 as Maintenance Mode with a tagged/frozen baseline and directs future feature development to a new branch. The source text refers to three allowed categories without enumerating them. This publication establishes the following recommended maintenance categories pending product-owner approval:

Category	Permitted scope	Branch / approval rule
Security, privacy and compliance	Vulnerability, permission, policy, store, legal or platform-required remediation	Controlled fix branch; security/privacy review
Defect and compatibility	Reproducible correction to existing behavior or supported OS/device/service compatibility	Regression evidence; no concealed feature expansion
Validation and documentation	Test evidence, terminology, operator warning, support/runbook or release-record correction	Documentation owner + product approval
New capability	Any new workflow, data type, integration or major UX change	New feature branch and new release baseline

Release manifest

- App version/build, package/bundle identifier, source commit/tag and build timestamp.
- Signing identity/certificate reference, distribution channel and store listing snapshot.
- Dependency SBOM, vulnerability/license results and approved exceptions.
- Backend/API schema/environment versions and migration/rollback plan.
- Field-device, receiver, caster, CRS, export/import and offline/sync acceptance evidence.
- Security/privacy test evidence, known limitations, support runbook and documentation edition.

Known limitations, residual risk and resolved defects

[Contents](#)

Open item register

Open item	Impact	Interim control / release evidence
Backend omits newer metadata on GET	Fields may disappear after restart/cross-device load	Patch-back only same session; backend persistence/reload test required
Receiver has not emitted GSA in tested sessions	PDOP/VDOP remain blank	Leave null; collect raw receiver evidence before claiming support
Validation Result / Survey Quality blank on one RTK Fixed export	Incomplete quality metadata	Reproduce and inspect pipeline/export mapping
BLE reconnect under RSSI -90 to -93 dBm	Session interruption	Maintain proximity; bounded reconnect field test
NTRIP reconnect failed after one drop	Corrections can stop	Expose status; manual setup rerun; drop/recovery test
Duplicate BLE notifications bypass guard	Inflated processing/epoch count	Fix dedup key/path; compare raw vs accepted unique epochs
SINGLE_SHOT saved during stable DGPS	Lower-confidence record than expected	Root-cause validation/workflow; explicit mode before save

Resolved defects retained for regression

Defect	Resolution in source	Regression scenario
CSV export could not be re-imported	Header-name parsing with prior-order compatibility	Export current CSV → import → compare every row/field
Unavailable HDOP exported as 0.0	Removed fabricated fallback	Capture without HDOP → blank/null in every format
Phone GNSS could save 0,0	Phone GNSS auto-start + No GPS Fix dialog	No fix → no commit; retry/cancel only
Silent save failure	Point Not Saved dialog with Retry/Discard	Forced backend failure → visible state and safe retry
Bearer token logged	Release HTTP logging disabled	Release artifact dynamic log inspection

DISCLOSURE CONTROL Open items are preserved because the user requested intact technical content. Before public release, Product and Security owners must decide which operational details belong in a customer publication versus an access-controlled engineering appendix.

Verification and acceptance plan [Contents](#)

Field-verified source example

Metric	Observed value — 30 July 2026
Fix quality / RTK status	4 / Fixed
Correction source / mountpoint	RTCM_MAC
Network / data format	NTRIP / RTCM v3
HDOP / satellites used	0.64 / 12
Epochs / duration	208 / 29.9 s
Horizontal / vertical accuracy	0.0036 m / 0.0157 m
RMS	0.0043 m
Confidence score	100.0

EVIDENCE QUALIFICATION This is a single source-recorded observation (FIELD_VALIDATION_REGISTER, OBS-020), not a product-wide performance guarantee. Reproduce using controlled equipment, environment, project method and independent check points.

Minimum release acceptance matrix

Area	Scenario	Pass evidence
Distribution	Clean install/update from each official store	Publisher identity, signature, version and launch
Identity	Register/OTP/login/logout/expiry/revocation	Expected state; no secret disclosure
Permissions	Allow/deny/revoke location, Bluetooth, camera/media	Just-in-time prompt and graceful degradation
Phone GNSS	No fix, weak fix and valid fix	No 0,0; source/accuracy recorded
BLE	Pair, fixed/float, weak signal, disconnect/reconnect	State visible; unique epochs; no silent fallback
NTRIP	Valid/invalid credentials, mountpoint, drop/recovery	Correction state and safe credential handling
Capture	AVERAGED and SINGLE_SHOT	Mode, duration, counts, stats and validation correct
CRS/height	WGS 84 + selected projected CRS	Trusted-reference comparison; axis/units disclosed
Offline/sync	Network loss, process restart, cross-device reload	No false success; persistence behavior documented
Export/import	All formats + CSV round trip	Counts/coordinates/nulls/schema consistent
Security	Release logging, storage, TLS, share/export, tamper	Approved MASVS-aligned test record
Privacy	Data inventory, deletion/export request and store declarations	Observed processing matches notices/policy
Accessibility	Screen reader, text scaling, contrast, target size	Platform accessibility test record

Release decision

Decision	Criteria
GO	All release-blocking scenarios pass; residual risks have owner, mitigation, date and approval
CONDITIONAL GO	Non-blocking evidence gaps are explicit, time-bounded and do not create safety/privacy/data-integrity misrepresentation
NO-GO	Data loss/fabrication, credential exposure, unbounded sync ambiguity, unsafe accuracy claim, failed store signing or unresolved critical defect

Operations, observability and support runbook [Contents](#)

Operator-visible status vocabulary

Status	Meaning	Required next action
GPS / Integrated	Phone positioning source selected	Review displayed accuracy and project suitability
RTK Fixed	Integer ambiguity fixed by receiver	Hold stable; confirm accuracy/quality and capture method
RTK Float	Ambiguity not fixed	Wait or improve sky/correction/antenna conditions
No Fix	No usable position	Do not save; check environment/source/permissions
NTRIP active	Correction stream connected	Monitor age/continuity if exposed
Saved / synced	Local commit / server acknowledgement	Confirm both states; they are not equivalent
Sync pending / failed	Server persistence not confirmed	Keep app/data; restore network; retry/export

First-response triage

Symptom	Check first	Escalate with
Metadata blank after reopen	Known backend GET gap; compare same-session vs restart	Point ID, field diff, app/server version
PDOP/VDOP blank	Whether receiver emitted GSA	Redacted raw NMEA sample and receiver firmware
BLE disconnect	Distance/RSSI, Bluetooth permission and competing connection	Device/OS, receiver, RSSI/time trace
NTRIP inactive	Network, caster, mountpoint, credential validity	Error code/time; never password
Wrong coordinate/height	Source, CRS, axis order, datum/height type	Known control, raw/export value and transformation
Export/import mismatch	App/schema version and header names	Minimal redacted source/output pair

Support, escalation and evidence package [Contents](#)

For product assistance, email the support contact below. If the issue affects account access, payment, privacy, security, data loss or a field-safety decision, state that category in the subject line so it can be routed correctly.

Channel	Contact	Use
Product support	support@hellogeo.world	General operation, sync, receiver, export and account issues
Store-listed technical contact	hellogeotechnical@gmail.com	Google Play listing contact as verified 31 Aug 2026
Privacy office	privacy@hellogeo.world	Access, correction, deletion, restriction, export or privacy concerns
Website	Open HelloGeo website	Product and company information

Minimum evidence package

- Document the app platform, app version/build, device model, OS version and whether the installation came from Google Play or the App Store.
- Provide the Collection name and point ID; never include NTRIP passwords, access tokens, OTPs, full payment data or unrelated customer records.
- Record time in ISO 8601 with time zone, positioning source, fix state, displayed accuracy, satellites/HDOP if visible, receiver model/firmware and NTRIP mountpoint if relevant.
- Attach the smallest reproducible export or redacted screenshot. For suspected data loss, stop destructive retries and preserve the original files and device state.
- Describe expected result, actual result, exact steps, network state and whether the issue survives restart or occurs only within one session.

Standards and global publication alignment [Contents](#)

Reference	Applied publication/control area	Claim boundary
ISO/IEC/IEEE 26514:2022	Audience, task orientation, structure, lifecycle and maintainability of user information	Design reference; no certification claim
ISO 19111:2019 + amendments	CRS, coordinate operation and reference metadata terminology	Conceptual reference; implementation must be verified
OWASP MASVS	Mobile storage, crypto, auth, network, platform, code, resilience and privacy tests	Test baseline; no compliance claim
NIST CSF 2.0	Govern, Identify, Protect, Detect, Respond and Recover operating model	Risk-management reference
WCAG 2.2	Readable structure, contrast, meaningful links and adaptable information	Accessibility-oriented publication, not certified conformance
NMEA / RTCM / NTRIP terminology	GNSS sentence and correction-stream interface vocabulary	No protocol certification claim

Global release checklist

- Use consistent English terminology; localize from the controlled source and validate layouts after translation.
- Use SI units and ISO 8601 time; always label CRS, axis order, datum/frame and height type.
- Verify support, privacy, legal, company and store details for each region before publishing.
- Confirm document links, QR codes, bookmarks, headings, alt text, table headers, selectable text and embedded fonts.
- Keep copyright, document ID, edition, classification and page numbering on every publication page.
- Archive source, editable master, fixed PDF, approval record, store snapshot, link/QR test and release checksums.

Glossary [Contents](#)

Term	Controlled definition
BLE	Bluetooth Low Energy; the primary source-described transport to HelloGeo Point.
CEP50 / CEP95	Circular Error Probable radii associated with 50% / 95% of observations under the stated method.
Collection	Server-side survey unit grouping GCP points.
CRS	Coordinate Reference System defining how coordinate values relate to the Earth or another reference.
Epoch	One positioning observation at a point in time.
EPSG code	Identifier from the EPSG Dataset for a defined CRS or coordinate operation; not a generic project label.
Fix quality	NMEA solution code, commonly 0 No Fix, 1 autonomous, 2 DGPS, 4 RTK Fixed, 5 RTK Float.
GCP	Ground Control Point with known coordinates used to control or assess mapping/photogrammetry.
GNSS	Global Navigation Satellite System; umbrella term covering satellite positioning constellations.
HDOP / PDOP / VDOP / GDOP	Dilution-of-precision indicators for geometry; lower is generally better, but not direct accuracy measurements.
LiDAR	Light Detection and Ranging; App Store-listed iPhone function requiring compatible hardware.
Mountpoint	Named correction stream on an NTRIP caster.
NMEA	Marine electronics interface vocabulary commonly used for GNSS text sentences.
NTRIP	Networked Transport of RTCM via Internet Protocol; transport used for GNSS correction data.
Orthometric height	Height relative to a gravity-based vertical datum/geoid; distinct from ellipsoidal GNSS height.
RMS	Root Mean Square statistic; interpretation depends on source components and method.
RTCM	Correction-message format family used in differential/RTK GNSS workflows.
RTK	Real-Time Kinematic positioning using carrier-phase corrections to enable high-precision solutions.
SBOM	Software Bill of Materials listing software components and versions in a release.
VRS	Virtual Reference Station; network-RTK service generating corrections appropriate to rover location.

Reference register

[Contents](#)

ID	Reference	Location / record	Use in this edition
R1	HelloGeo MetaSync — Technical Documentation	Supplied PDF, dated 11 Aug 2026	Product architecture, Android baseline, limitations and field evidence
R2	HelloGeo MetaSync — User Guide	Supplied PDF, dated 11 Aug 2026	Operator workflow and reference UI
R3	Google Play — HelloGeo MetaSync	Open Google Play listing	Android distribution, feature and data-safety declaration
R4	Apple App Store — HelloGeo MetaSync	Open Apple App Store listing	iPhone distribution, iOS compatibility, LiDAR and privacy declaration
R5	HelloGeo Privacy Policy	Open privacy policy	Public privacy, ownership, retention, rights and contact baseline
R6	ISO/IEC/IEEE 26514:2022	Open ISO overview	Information-for-users structure and lifecycle reference
R7	ISO 19111:2019 + amendments	Open ISO overview	Coordinate-reference terminology reference
R8	OWASP MASVS	Open OWASP MASVS	Mobile security verification control reference
R9	NIST Cybersecurity Framework 2.0	Open NIST CSF 2.0	Govern, identify, protect, detect, respond and recover reference
R10	WCAG 2.2	Open WCAG 2.2	Accessibility and usability reference
R11	Android Bluetooth permissions	Open Android guidance	Android runtime-permission terminology
R12	Android 16 / API 36	Open Android 16 reference	Correct platform/API mapping for the supplied target SDK

REFERENCE DATE Web references were verified 31 August 2026. Store and living-standard pages can change; retain an evidence snapshot in the product release record.