Floridan aquifer system subsurface elevation retrieval

Technical - how it works

Lester J. Williams | LCG Mapper In Chief | Methods benchmark v2 | October 22, 2026

The Floridan aquifer system subsurface elevation retrieval translates the regional PP1807 hydrogeologic framework into a computational service. A well driller, geologist or other user supplies longitude and latitude, or clicks a map, to obtain estimated tops and bottoms of applicable major hydrogeologic units. The intended presentation combines a table of contact elevations, depths and thicknesses with a concise explanation of the units and mapped regional conditions at that location.

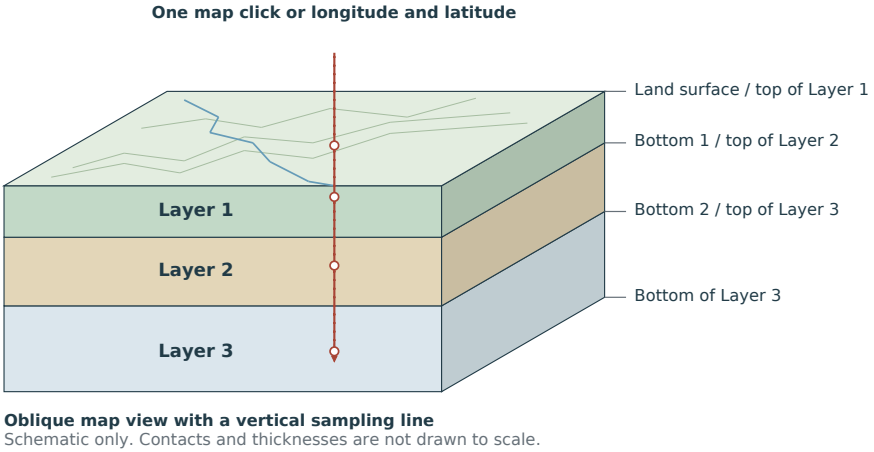


Figure 1. One horizontal location samples a vertical stack of surfaces. Adjacent units can share a boundary; a top or bottom may be unavailable. Generic layers below are illustrative, not a claim that all Floridan units occur everywhere.

Example unit	Top elevation	Bottom elevation	Depth to top	Depth to bottom	Thickness
Layer 1	200	140	0	60	60
Layer 2	140	20	60	180	120
Layer 3	20	-180	180	380	200

Illustrative values only. Land elevation is 200 feet NAVD88; elevations and depths are in U.S. survey feet. Depth = land elevation minus contact elevation. Thickness = top minus bottom. These synthetic values explain the interface and are not results for a real well.

Release scope. This benchmark describes the expanded major-unit and detailed-unit service, accepted by the author for publication after local evaluation. The methods and notebooks accompany that release. Publication is complete only after the cloud data, API, custom-domain HTTPS, and website pass the release checks; this paper does not certify that an individual endpoint is live. Runtime configuration and manifest hashes identify the service actually queried.

1 Regional framework and scientific background

USGS Professional Paper 1807 by Williams and Kuniansky, first published in 2015 and revised in March 2016, provides the regional hydrogeologic framework for Florida and parts of Georgia, Alabama and South Carolina [1]. It distinguishes the Upper and Lower Floridan aquifers and mapped internal zones. Its composite-unit concept accommodates units whose hydraulic character varies regionally. The LCG service preserves this regional context rather than treating every mapped horizon as a universal aquifer boundary.

Data Series 926 by Williams and Dixon (2015) supplies the companion digital structural surfaces, thickness rasters, control points, contours, clipping polygons and regional features [2]. Those components serve different purposes: a control-point measurement may exist where a generalized raster was deliberately clipped. DS760 provides supporting borehole-log references, and SIM 3182 provides May-June 2010 potentiometric context [3,4]. Miller (1986) is an important antecedent for the earlier regional framework [5].

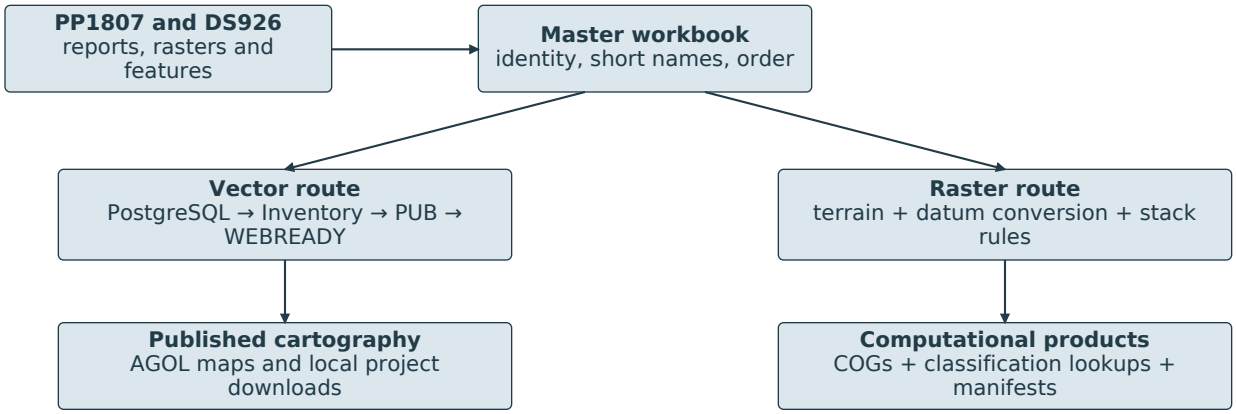


Figure 2. Source inventory supports both cartographic publication and computation. The pathways share identities and provenance but produce different deliverables.

The service development began by asking how these independent products could support a consistent vertical column. Thickness rasters described intervals but did not, by themselves, establish all contact elevations. A continuous land reference was also needed. The project therefore assembled a USGS seamless DEM, organized explicit unit relationships, and separated source observations from derived contacts and geographic qualifiers.

The working principle is to select applicable boundaries using geology, geography and documented rules. Sorting every sampled elevation from highest to lowest would produce an orderly-looking list without establishing the correct hydrogeologic relationships. Regional mapping also does not provide site-specific drilling precision.

2 Unit schemes and short names

The master workbook records both an **all aquifers and zones** scheme and a **major aquifers and units** scheme in Surface_Relationships_LJW. The former describes internal zones; the latter groups them into a simpler user view. The workbook also separates conceptual surface identity from individual datasets, aliases, applicability and source references. Short names make the products readable; they do not replace those stable identities.

Display order	Short unit or boundary	Meaning in the computational collection
00	Land	Independent terrain reference
01	Surficial	Shallow deposits / surficial aquifer interval where applicable
02	UCU	Upper confining unit branch
03	Residuum	Alternative shallow-cover branch
04	FAS top / uppermost permeable zone	Top of system and start of the upper Floridan section
05	OCAPLPZ	Ocala-Avon Park lower-permeability zone
06	Dolostone	Upper dolostone unit
07	APPZ	Aggregated Avon Park permeable zone
08	Middle units	Regional MCU, LISAPCU, MAPCU or Bucatunna, as applicable
09	LFA / LAPPZ	Region-specific lower Floridan/permeable-zone boundaries
10	Glauconite	Marker unit; separate marker horizon retained
11	OLDSPZ	Oldsmar permeable zone and regional designations
12	Low resistivity	Interval below the Oldsmar permeable zone
13	FAS base	Terminating boundary, not another aquifer
14	TDS reference	Hydrochemical reference, not another rock unit

This table uses the readable evaluation order, not the separate 25-map publication sequence in Appendix A. UCU and residuum are branch alternatives, not necessarily successive layers. Several entries at order 08 or 09 are geographic alternatives. The authoring schemes contain proposed relationships that still require regional selection rules; a workbook QC flag alone does not approve every geological equivalence.

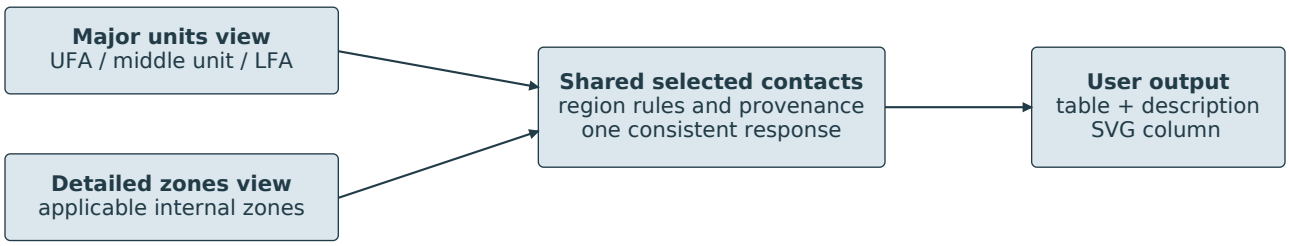


Figure 3. Major-unit and detailed-zone views share the same selected contacts. Parent aquifers and their child zones must not be added together as independent, nonoverlapping thicknesses.

3 Inventory database and cartographic preparation

The initial inventory enumerated 40 source rasters and 148 feature classes, preserving original names, geometry types, fields and publication references. The subsequent vector-publication workflow included 147 feature classes: 51 point, 43 line and 53 polygon classes. One closed-depression-density polygon class was excluded from that database-publication scope. These counts describe that inventory/publication checkpoint, not the number of rasters deployed in the live service.

The master spreadsheet became the crosswalk between a geological concept and its source representation. For each product it records dataset identifiers, conceptual surface identifiers, short names, units, datum, top/base or thickness role, regional applicability and related features. Relationships and derivation recipes document how a boundary can be selected or calculated. This prevents a filename, a map label or a folder location from becoming the only record of scientific meaning.

PostgreSQL and the ArcGIS Inventory project

DS926 vector data were ingested into PostgreSQL/PostGIS for source management, publication views and spatial work. Raw and published representations support reproducible queries while retaining source identity. The ArcGIS Pro Inventory project reads these data and organizes the control points, contours, extents and qualifiers into publication maps. PUB maps establish the reviewed presentation; WEBREADY maps carry the approved web cartography and stable publication identities into ArcGIS Online.

The published collection contains 25 map products, ordered from regional context and shallow cover through deeper units and water-quality references. Their map sequence is a browsing/catalog order. It is not a set of 25 geological layers occurring at every coordinate. Original publication elevation attributes and matching map rasters remain NGVD29 unless explicitly converted; the analytical elevation collection uses NAVD88.

Separate authoring from the point-query engine

PostgreSQL remains valuable for polygon geometry, control points, joins and future nearby-well functions. The selected point-query meanings can instead be precomputed into numeric and categorical COGs. For those represented meanings, a request can read the rasters and decode lookups without connecting to PostgreSQL. This is a design choice for a simple, fast runtime, not a claim that the database or original vectors are no longer useful.

Identity rule. A short display name such as 04 FAS top identifies a role for users. The release still records which particular published, aligned or terrain-constrained dataset supplies that role. Alternative versions are not selected merely because their filenames look similar or their cells happen to be non-null.

4 Terrain units and vertical datum harmonization

A single regional terrain reference allows depths to be computed consistently and provides a local ceiling for shallow-unit erosion. The recorded full DEM preparation used 144 tiles from the USGS 1 arc-second seamless bare-earth product, mosaicked/projected with bilinear resampling onto the project's custom NAD83 Albers grid at 30 m. USGS describes seamless products as terrain datasets assembled across source projects and distributed in mergeable tiles [6].

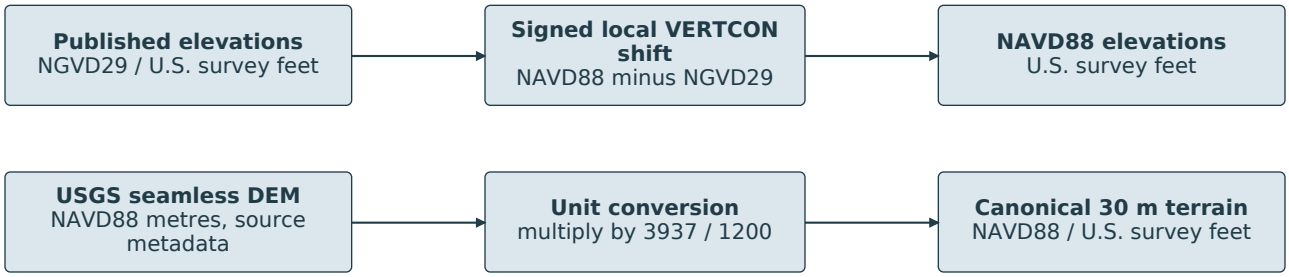


Figure 4. Datum transformation and unit conversion are distinct operations. The two elevation routes meet in NAVD88 U.S. survey feet before depth or erosion calculations.

$$L_{ft} = L_{m} \times (3937 / 1200)$$

The DEM was converted once from metres to U.S. survey feet. Horizontal coordinates remain metres in the actual custom DS926 Albers projection. Its central meridian is -84 degrees; it must not be relabeled as EPSG:5070, whose definition differs. Input longitude/latitude must be transformed into each raster's actual horizontal reference.

$$Z_{NAVD88,ft} = Z_{NGVD29,ft} + \Delta Z_{m} \times (3937 / 1200)$$

Published elevations use the signed local NAVD88-minus-NGVD29 correction from the accepted VERTCON 3.0 release 20190601 grid [7]. The correction varies spatially; a constant offset or changed datum label is insufficient. The grid identity, sign, units and transformation coverage are retained in processing records. Thicknesses are differences and do not receive this additive elevation shift.

The terrain provenance describes its source datum as typical CONUS NAVD88 with retained source metadata to verify; the draft preserves that qualification rather than claiming a new geodetic audit of every tile. An older preparation manifest contemplated converting terrain into NGVD29. The later adopted direction converts the geological elevations into NAVD88 and terrain into feet; the older intent is not the current computational equation.

5 COG storage and regional classification rasters

A Cloud Optimized GeoTIFF is a georeferenced raster organized into tiles and reduced-resolution overviews. Its layout supports targeted access; with HTTP range support, a client can retrieve needed byte ranges instead of downloading the complete file [8]. LCG selected COGs to keep precomputed numerical surfaces portable between local GIS, cloud storage and the point service. Point analysis reads the intended full-resolution cells; overviews serve display or other explicitly selected scales.

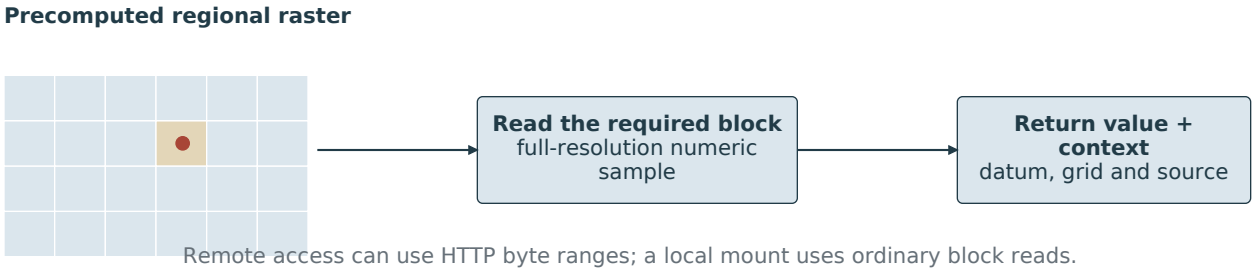


Figure 5. A point query needs the relevant raster block, not the complete regional surface. COG layout helps I/O but does not supply geological selection rules.

The initial Azure installation reads a data mount. Its speed does not establish that every request is using remote HTTP byte-range access, and file format alone does not guarantee a particular response time. Precomputing expensive spatial operations also contributes to the lightweight runtime.

One source feature class one classification COG

A polygon feature class can be represented by one categorical raster containing separate integer codes for its regions. Separate display layers from the same source are combined where their common origin has been established. Independent qualifiers retain separate rasters so one meaning does not overwrite another. Slight category overlaps use the accepted deterministic precedence rule; code lookups retain the interpretation of each value.

Classification family	Information returned
LISAPCU and MAPCU	Component region / hydraulic character
Top and base FAS geology	Mapped geology and related regional description
OLDSPZ regions	Boulder Zone or Fernandina permeable-zone designation
OLDSPZ saline areas	Mapped estimated TDS greater than 10,000 mg/L area
Gulf Trough	Regional lower-permeability qualifier
Apalachicola	Independent salinity qualifier
UCU confinement	Mapped degree of confinement; approved Thin or absent class
IAS and Brunswick	Regional aquifer-system designation without invented numeric contacts

Regional qualifiers currently use a 1,000-m grid. Containing-cell classification can differ from exact polygon intersection at boundaries or narrow features. Code 0 means no mapped designation, not verified physical absence or freshwater. NoData remains a separate state. Continuous elevations and categorical codes must not share a global interpolation rule.

6 Build the shallow stack upward from the FAS

Early workbook equations derived FAS top by subtracting surficial and UCU thicknesses from terrain. That approach was retired because it could transfer local drainage texture into the deeper regional structural surface. The approved model starts with the aligned published FAS elevation and builds the cover upward. Terrain limits the stack through top-down erosional truncation.

Let F be the aligned NAVD88 published FAS top, L the canonical 30-m terrain, U the governed UCU thickness, S the governed surficial thickness and R the governed residuum thickness. These inputs must already satisfy the adopted branch and nonnegative-thickness policies. Governed zero substitution is not a general license to turn any missing cell into absence.

```
Z_stack = F + U + S; E = max(Z_stack - L, 0); G = max(L - Z_stack, 0)

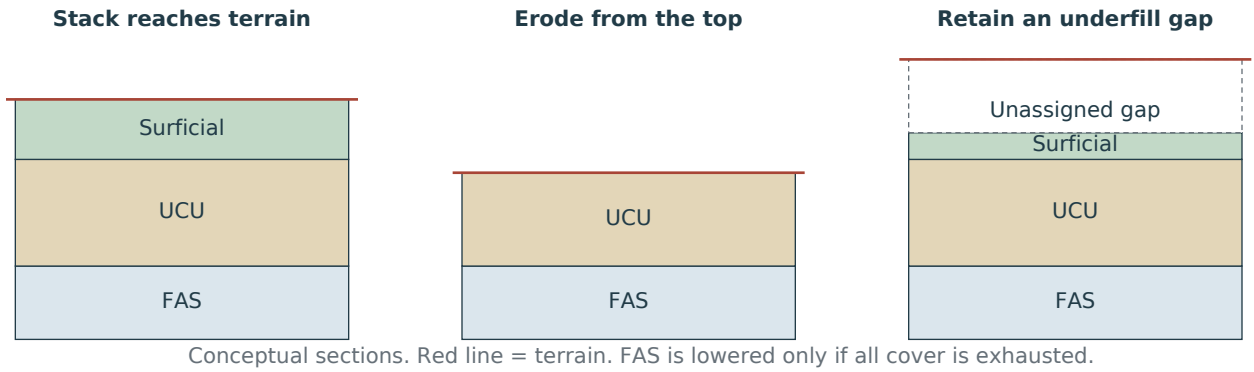
S_eff = max(S - E, 0)

E1 = max(E - S, 0); U_eff = max(U - E1, 0)

E2 = max(E1 - U, 0); F_service = F - E2

Top_UCU = min(F_service + U_eff, L)
```

The order matters: first remove surficial material, then UCU, and lower the FAS contact to land only when all cover has been exhausted. For valid nonnegative inputs in this branch, F_service is equivalent to min(F,L). This erosion calculation does not raise the structural anchor. The separate mapped-exposure completion rule below is an explicitly documented exception. Effective thickness means the thickness retained after this calculation, not the original interpolated thickness at an independently sampled native-grid cell.



Conceptual sections. Red line = terrain. FAS is lowered only if all cover is exhausted.

Figure 6. The same structural anchor can support a complete cover stack, an eroded stack or an underfilled stack. Empty space in the third panel is an unresolved interval, not newly assigned surficial material.

On the residuum branch, Z_stack = F + R. Erosion removes residuum first; any remaining demand lowers FAS to land. R_eff = max(R-E,0), and positive underfill remains explicit. The legacy composite confining horizon equals UCU top on the UCU branch and terrain on the residuum branch. That convenience horizon does not prove that confining material is present everywhere.

7 Detailed terrain and accepted shallow unit decisions

The original common-grid calculation used a 1,000-m terrain derivative. Comparing its contacts with an independently sampled 30-m DEM exposed above-ground shallow contacts in locally lower terrain. The correction evaluates the approved upward-stack kernel directly against the canonical 30-m terrain. It retains the earlier structural/thickness alignment and containing-coarse-cell sampling; it does not create finer geological control.

Corrected outputs include FAS top, UCU top, the composite confining horizon, erosion class, effective surficial/UCU/residuum thicknesses and underfill. The selected TDS reference depth is recomputed using the same terrain. A separate native-grid published FAS surface was converted to NAVD88 without expanding the existing service branch mask.

These are counts of 153 sample records, including repeated well identifiers, rather than 153 independent boreholes. They do not validate every possible presence/absence setting. At ROMP132, land and corrected UCU top both equal 109.28 ft NAVD88; FAS top is 74.11 ft, leaving 35.17 ft of effective UCU and zero effective surficial thickness. At R001, UCU top now equals the local 317.16-ft land elevation.

P649 and the published UCU boundary

P649 has a 42-ft UCU control-point value but NoData in the clipped regional UCU raster and current branch. Lester Williams explained that regional mapping clipped small perturbations along the east-to-west transition into thin, eroded or absent UCU. This point lies at the representative published extent. The limitation is accepted; P649 is not treated as confirmed zero UCU or used to fill the clipped raster. Edge flags and nearby-well measurements are recorded as future enhancements, explicitly deferred.

The null-attribute confinement polygons tracing eroded stream segments have the author-approved description Thin or absent, retained as code 4 without changing their pixels. Their interpretation qualifies the result; it does not independently create a numeric elevation. No test record in the latest shallow set samples this class, so a targeted interior example remains useful.

Current exposure completion. The older branch mask did not cover every legitimate FAS location. The current service therefore checks the independent FAS-domain and material-extent masks, numeric cover evidence, the full published NAVD88 FAS anchor, and mapped confinement. Where the configured evidence establishes no mapped cover, FAS top is approximated by local land surface. Confinement class 3 (unconfined, cover absent or very thin) can support this regional interpretation when positive cover evidence does not contradict it. Class 4 (Thin or absent) alone is not sufficient. This is a configured interpretation, not a blanket replacement of NoData with zero.

Geographic applicability: extent masks and classification rasters

Elevation NoData cannot, by itself, distinguish a unit that is not mapped here from a unit that should be mapped but has a missing elevation. The service therefore uses geographic applicability evidence before constructing the hydrogeologic column. A dedicated FAS mapping mask describes the overall study footprint. Material and deeper-unit masks describe the mapped footprints of their individual units.

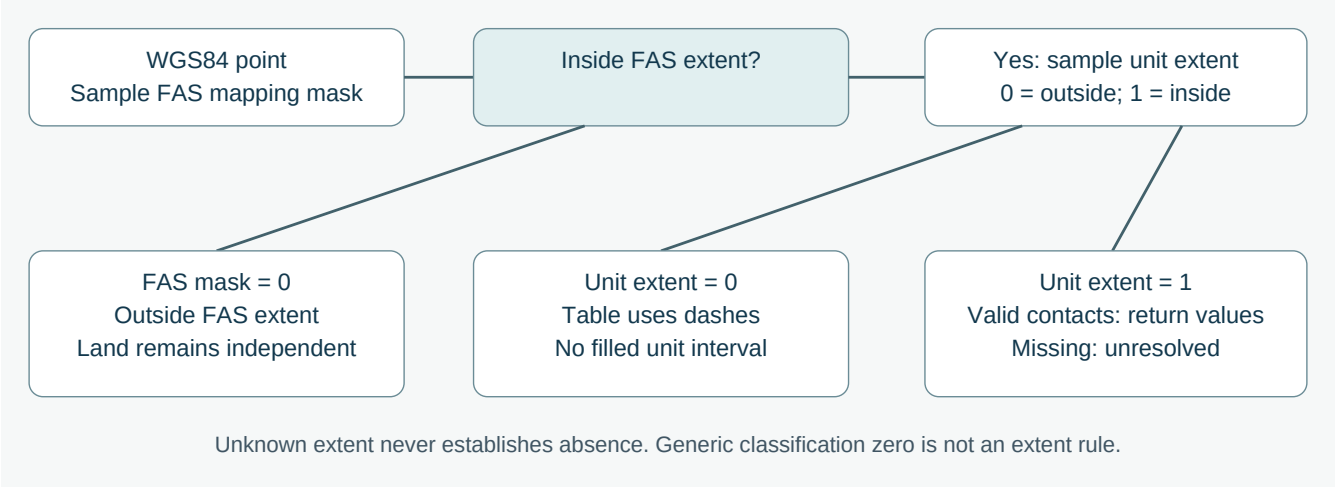


Figure 8. Geographic applicability precedes contact selection. Land elevation remains independent; a missing elevation inside an applicable unit stays unresolved.

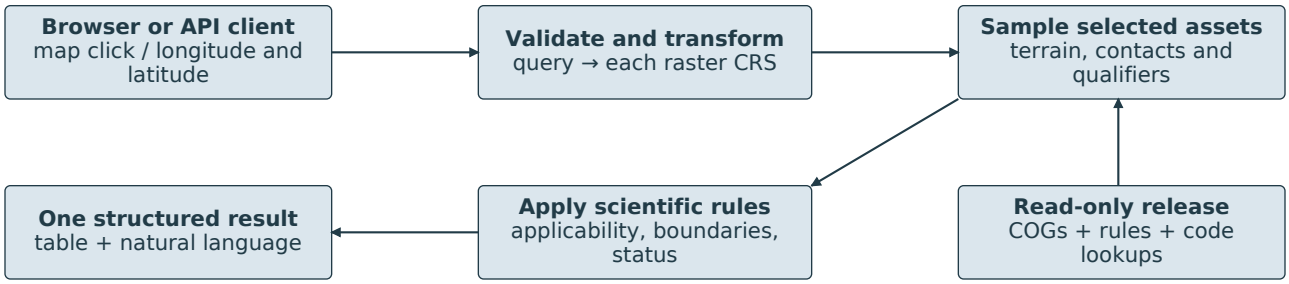
Condition	Interpretation and response
FAS mask = 0	Outside FAS mapping extent; suppress hydrogeologic intervals, retain independent land data.
FAS mask = 1; unit mask = 0	Outside this unit's mapped extent; table uses dashes and omits a filled interval.
FAS mask = 1; unit mask = 1; contacts valid	Return contacts, depths and thickness under the configured relationships.
Inside unit; required contact missing	Unavailable or partial; do not convert the missing elevation to absence.
Extent evidence missing	Unknown applicability; do not infer absence.

A unit mask uses 1 inside, 0 outside and 255 for NoData. Its grid retains the template cell size, alignment and actual custom Albers projection, and expands as necessary to contain its full source polygon. Outside that complete grid is outside the mapped polygon. Cell-center assignment at 1,000 m is a raster approximation to polygon membership; boundary and narrow-feature differences remain possible. The general-area FAS polygon is used, not the broader western-extension polygon. Its relationship to coastal publication clips remains a review consideration; elevation availability is still checked separately.

One categorical COG can provide both a region code and extent evidence when its complete positive footprint has been verified against the unit polygon on the same grid. The builder tests projection, resolution, alignment and full footprint equality, including positive cells beyond the comparison grid. Successful reuse is recorded with a SHA-256 and the manifest refers to the existing file; no duplicate raster is created. Original classification codes remain available for descriptions. If the check fails, an independent binary mask is built.

LISAPCU and MAPCU classifications are candidates for reuse, not automatic substitutes. Boulder and Fernandina classes describe selected OLDSPZ zones rather than the entire OLDSPZ. Salinity, geology and Gulf Trough qualifiers likewise must not be mistaken for universal unit footprints. In the accepted build all twelve extents were separate binary masks. A generic classification zero still means no mapped designation unless its extent interpretation has explicitly been validated.

8 From sampled cells to a useful response



Offline preparation uses the workbook, PostgreSQL and ArcGIS Pro.
Represented point queries need no live database intersection; the basemap supplies no elevations.

Figure 7. Intended expanded request path. Current deployments must identify which subset of these contacts and rules they actually implement.

For each WGS84 longitude/latitude, the service transforms the point into each raster's actual CRS and samples its containing full-resolution cell. The 30-m terrain is evaluated independently from the regional geological contacts and 1,000-m categorical grids. A missing branch or salinity cell does not hide a valid land elevation. Geographic applicability is evaluated before contacts are selected. The major and detailed tables, SVG columns, and batch CSV use the same configured interpretation. A map click selects coordinates; the user presses Retrieve elevations to run the request and focus the results.

For an applicable unit with top T, bottom B and terrain L: depth to top = L-T; depth to bottom = L-B; thickness = T-B. If a boundary is missing, dependent quantities remain unavailable. A shared contact can serve as one unit's bottom and the next unit's top. Where the model underfills, the table must disclose the unassigned interval before claiming that a unit extends from land to a deeper contact.

Water quality references remain distinct from rock boundaries

Mapped interpretation	Numerical and descriptive response
Numeric TDS interface available	Return the selected estimated 10,000-mg/L interface and its depth
Fresh to Base	Use FAS base as the lower reference; do not rename it a measured TDS interface
Interpretation known but reference missing	Retain the mapped interpretation and report unavailable numeric values

Apalachicola and other independent qualifiers remain attached to the result. They are regional interpretations, not a groundwater sample or a complete vertical salinity profile. A TDS reference depth below zero is a relationship to investigate or qualify, not a value to silently clamp away. The correction receipt records a regional minimum near -85.59 ft below land, which remains a release-review item.

9 Verification current state and distribution

The author accepted the expanded service for publication after the Ocala regression point and additional regional tests. These are evaluation checks of behavior, not a claim of borehole-scale accuracy or exhaustive regional validation. The extent build receipt reports COMPLETE, twelve binary masks, and no missing sources. LISAPCU and MAPCU were emitted as independent masks in this run; no classification-reuse entries were recorded.

Ocala check	Result
Location	29.183302, -82.211380
Land / interpreted FAS top	70.99 ft NAVD88; FAS depth 0 ft
Surficial / UCU / residuum	Outside their mapped extents; display dashes
OCAPLPZ / APPZ / Bucatunna	Outside their mapped extents; display dashes
Regional MCU top / LFA top	-572.20 / -805.60 ft NAVD88
FAS base / LCU top	-1751.37 ft NAVD88
Salinity interpretation	Fresh to FAS base; depth 1822.37 ft

At Ocala the published FAS anchor is 50.92 ft NAVD88, whereas land is 70.99 ft. Mapped-exposure completion adjusts the interpreted FAS top upward by 20.07 ft; the raw service FAS value remains NoData and both source and selected values remain in provenance. The uppermost permeable interval starts at land. This is precisely the explicit exposure exception; it must not be described as an erosion-only result that never raises the anchor.

The author also confirmed the website returns Outside FAS mapping extent for points beyond the domain. Both LISAPCU and MAPCU are mapped at the Ocala point; the major view uses the regional separator while detailed intervals retain their own contacts and may overlap.

The standalone ArcGIS Pro project and raster layer package passed extraction, relocation and visual review and are linked from the LCG Downloads page. Publication NGVD29 layers and analytical NAVD88 layers remain separated. The large 30-m land DEM is excluded from those desktop packages.

Limitations include regional geological control, clipped and generalized boundaries, coarse-cell qualifiers, unrepresented narrow features, disagreements among source products, underfill, overlapping detailed interpretations, and estimated boundaries. Nearby-well enrichment and edge warnings remain deferred. Geologists should review source control, drilling and logs for site-specific decisions.

The original deployed v0.1 package contained fifteen COGs and two manifests. The expanded runtime package is a separate manifest-defined collection, including the 30-m DEM and applicability masks. Deployment instructions keep it in a separate private container so the earlier deployment remains recoverable. Confirm the runtime manifest and configuration hashes after cutover.

Configuration, reproducibility and notebook clients

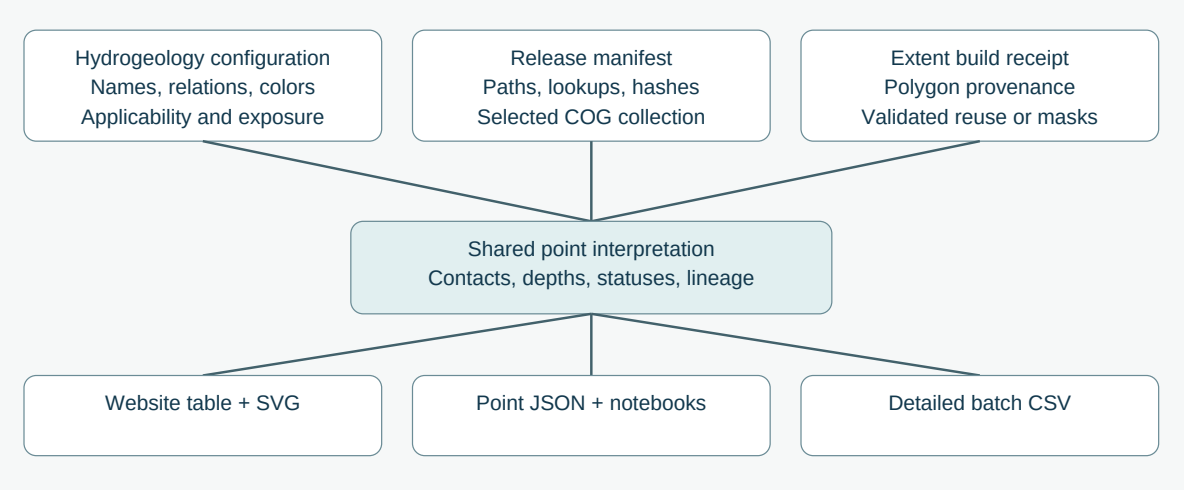


Figure 9. Configuration and the manifest separate scientific interpretation from transport and presentation.

The authoring workbook is the conceptual inventory. The deployed scientific rules are in src/lcg_subsurface_api/config/hydrogeology.json: unit IDs, display names, colors, descriptions, top/bottom expressions, region selection, shallow exposure rules, and batch limits. config/stack-assets.json records logical source IDs and paths; stack-manifest.json resolves the selected release files, byte counts, checksums and lookups. The extent build receipt records polygon sources, mask generation, and any verified classification reuse.

GET /v2/assets lists the selected COG IDs, relative paths, byte counts and SHA-256 hashes; these inventory paths are not anonymous raster download URLs. GET /v2/model exposes the loaded scientific configuration and its hash; GET /v2/point returns selected contacts, statuses, raw source diagnostics, and configuration/manifest lineage. POST /v2/batch applies the same point interpretation to each input row and returns a wide CSV. There is no live PostgreSQL requirement for these represented queries.

Names, descriptions, colors and existing expression combinations can be edited in configuration. New operators or a fundamentally new geological algorithm still require code changes and tests. Rebuild the manifest when selected rasters or classification lookups change, and restart the API to load new configuration or data registrations. A static website API URL is a build-time setting and requires a website rebuild when changed.

Two downloadable notebooks illustrate the public HTTP pattern without ArcPy. The point notebook retrieves basic and detailed views, saves JSON/CSV, and draws a simple column. The batch notebook accepts a pasted tab-delimited UWI, latitude, longitude table, preserves row order and identifiers, requests the server-generated detailed CSV in bounded chunks, and can draw rough major-unit sticks. Neither notebook recalculates the hydrogeology locally.

Batch CSV column names include OCAPLPZ_top, OCAPLPZ_bot and related depth, thickness and status fields. Elevations are U.S. survey feet NAVD88; depths are below the independently sampled land elevation. Blank numeric values must remain missing, not zero. Review row and unit statuses before plotting. Estimated tops/bottoms and overlapping child zones require the same cautions as the website. A stick section is a set of point estimates, not an interpolated geological cross section.

Lester J. Williams
LCG Mapper In Chief
Join me and become an LCG mapper - let's learn together. Community discussions, articles and new-log submissions are future directions, not features implemented in this release.

Appendix A Published map sequence

The workbook's October 10 publication registry records this 25-map collection. These are publication product numbers, distinct from the unit display order in Section 2. The table is a recorded catalog, not a new live-access audit.

Sequence	Published product
01	Key Wells and Cross Sections (Figure 2 / Plate 1)
02	Generalized Geologic Map (Figure 9)
03	Closed Depressions and Major Springs (Figure 12)
04	Surficial-Deposit Thickness (Figure 20)
05	Upper Confining Unit (Figure 21 / Plate 3)
06	Top of the Floridan Aquifer System (Figure 22 / Plate 4)
07	Top of the Ocala-Avon Park Lower Permeability Zone and Head Difference (Figure 28)
08	Top of the Aggregated Avon Park Permeable Zone (Figure 30)
09	Top of the Upper Dolostone Unit (Figure 17)
10	Upper Floridan Aquifer Thickness (Figure 32)
11	Top of the Lisbon-Avon Park Composite Unit (Figure 33)
12	Top and Estimated Properties of the Middle Avon Park Composite Unit (Figure 38)
13	Top of the Bucatunna Clay Confining Unit (Figure 43)
14	Top of the Lower Floridan Aquifer (Figure 44)
15	Top of the Lower Avon Park Permeable Zone (Figure 46)
16	First Permeable Zone Beneath LISAPCU/Bucatunna Clay (Figure 45)
17	Top of the Glauconite Marker Unit (Figure 48)
18	Glauconite Marker Horizon (Figure 19)
19	Top of the Oldsmar Permeable Zone (Figure 49)
20	Top of the Low-Resistivity Interval Below the Oldsmar Permeable Zone (Figure 24)
21	Base of the Floridan Aquifer System (Figure 23 / Plate 5)
22	Floridan Aquifer System Thickness (Figure 25 / Plate 6)
23	May 2010 Potentiometric Map (Kinnaman and Dixon, 2011)
24	Estimated 10,000 mg/L TDS Boundary (PP1807 Figure 53 / DS926 Figure 54)
25	Fresh- and Brackish-Water Zone Thickness (PP1807 Figure 54 / DS926 Figure 55)

Public map links and item identifiers remain in the master workbook AGOL Registry and the existing LCG ArcGIS Maps page. Map context such as potentiometric head difference is not an additional stratigraphic unit. The 2010 head-minus-FAS raster is distributed as a property difference in feet, not an absolute elevation.

References and document provenance

[1] Williams, L.J., and Kuniansky, E.L., 2016. Revised hydrogeologic framework of the Floridan aquifer system in Florida and parts of Georgia, Alabama, and South Carolina, version 1.1, March 2016. USGS Professional Paper 1807, 140 p., 23 plates. First published 2015.
https://doi.org/10.3133/pp1807

[2] Williams, L.J., and Dixon, J.F., 2015. Digital surfaces and thicknesses of selected hydrogeologic units of the Floridan aquifer system in Florida and parts of Georgia, Alabama, and South Carolina. USGS Data Series 926, 24 p.
https://doi.org/10.3133/ds926

[3] Williams, L.J., Raines, J.E., and Lanning, A.E., 2016. Geophysical log database for the Floridan aquifer system and southeastern Coastal Plain aquifer system in Florida and parts of Georgia, Alabama, and South Carolina, version 1.1, December 2016. USGS Data Series 760, 12 p.
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Project sources and precedence

This narrative consolidates DS926 complete subsurface service blueprint v0.1; TECHNICAL_METHOD_DRAFT.md; the master workbook DS926_reference_workbook_v0_21_AGOL_COMPLETE_LJW.xlsx, especially Surface_Relationships_LJW, Surface Reference and AGOL Registry; the terrain preparation manifest; the successful correction receipt; the latest shallow sampling receipt/table; and the P649 decision supplied by Lester Williams on October 18, 2026. Later explicit scientific decisions supersede historical formulas and output-management instructions in earlier drafts.

The workbook source hash recorded in the blueprint is e6933e8d0c0d4d9a7ed30afade86476180e04a47760c3c8ed3ba96ea7f662da9. The reused upward-stack kernel hash recorded in the correction receipt is 68a3484e51e11ab2e6fb82b14ab572f369565b06aa794da589911d6a4c78502f. These identify development evidence; a final deployment receipt must identify the actual released files.