LithoNav

Drilling & Geosteering System

Comprehensive User Manual

& Technical Reference Guide

Version 2.0

Prepared by Antigravity Support

Table of Contents

Chapter 1: Introduction & System Overview

Chapter 2: Hardware-Locked Licensing

Chapter 3: User Interface & Layout

Chapter 4: Project Management

Chapter 5: Data Import Workflows

Chapter 6: Well & Trajectory Configuration

Chapter 7: The Correlation View

Chapter 8: Well Referencing (Pre-Steering)

Chapter 9: Geosteering Mode (Live Steering)

Chapter 10: Prognosis & Targeting Engine

Chapter 11: 2D Mapping & 3D Visualization

Chapter 12: Advanced Formatting

Chapter 13: Exporting & Reporting

Chapter 14: Keyboard Shortcuts

Chapter 15: Troubleshooting Guide

Chapter 16: Glossary of Terms

Chapter 1: Introduction & System Overview

Welcome to LithoNav, the premier application for high-precision well placement and geosteering. Designed specifically for operational geologists and drilling engineers, LithoNav bridges the critical gap between static structural modelling and real-time dynamic drilling.

1.1 The Purpose of LithoNav

Modern horizontal drilling requires navigating complex subsurface environments where target reservoirs may be only a few feet thick. LithoNav enables geologists to correlate real-time Logging While Drilling (LWD) data against historical offset well logs.

By manipulating a structural model—squeezing, stretching, and faulting geological formations—the user can generate a highly accurate "Synthetic Log". This synthetic curve predicts the log signature ahead of the drill bit, allowing for rapid decision-making to keep the wellbore within the target "sweet spot" and avoid hazardous out-of-zone drilling.

1.2 Core System Capabilities

- **Multi-Well Correlation:** View and align logs across multiple wells simultaneously with delta-synchronized scrolling, ensuring stratigraphic relationships are maintained visually.
- **Dynamic Structural Modelling:** Interactive squeeze/stretch algorithms and fault insertion tools that recalculate the subsurface model instantly.
- **Real-time Synthetic Generation:** Advanced slope-based extrapolation techniques that map vertical offset data onto

complex, undulating 3D trajectories.

- **Prognosis Engine:** First-crossing intersection algorithms that mathematically predict exact Measured Depth (MD), True Vertical Depth (TVD), and TVD Sub-Sea (TVDSS) targets.
- **3D & 2D Visualization:** Comprehensive spatial awareness integrating well paths, structural horizons, and imported grid surfaces.

Chapter 2: Hardware-Locked Licensing

To protect intellectual property and ensure authorized, secure usage across corporate environments, LithoNav employs a stringent Hardware ID (HWID) locking mechanism.

2.1 The HWID Concept

When LithoNav runs for the first time on a new machine, it generates a unique cryptographic hash based on the computer's core physical components (CPU serial, Motherboard identifier, MAC Address). This HWID fingerprint cannot be replicated on another machine, ensuring that a single license key cannot be shared across multiple unauthorized users.

2.2 Step-by-Step Activation Workflow

1. **Launch LithoNav:** Upon startup, if no valid cached license is found, the dark-themed License Activation dialog will block access to the main interface.
2. **Copy the HWID:** The dialog displays a long alphanumeric string unique to your machine. Click the **Copy** button to copy this Hardware ID to your clipboard.
3. **Request a License Key:** Send your copied HWID via email to your software administrator or IT support team to request a license key. Once approved, they will reply with your assigned 20-character license key (format: `XXXXXXXXXX-XXXXXXXXXX`).
4. **Verification:** Paste the provided License Key into the input field in LithoNav and click **Verify Licence**.

> ***Behind the Scenes:*** *LithoNav makes a secure HTTPS POST request to the remote authentication server. The server verifies the key, permanently binds your*

> *HWID to that key in the database, and returns a success payload. LithoNav then caches this validation in an encrypted local file for offline use.*

2.3 Handling License Errors

If activation fails, specific error messages will guide your troubleshooting:

- **"Invalid license key"** - The key does not exist in the database or was typed incorrectly.
- **"License bound to another machine"** - This key was already used and bound to a different computer's HWID. You must request a HWID reset from the administrator.
- **"License expired"** - The subscription period has elapsed.
- **"Server returned invalid response"** - The application cannot reach the server. Ensure outbound HTTPS (port 443) is allowed through your corporate firewall.

Chapter 3: User Interface & Layout

LithoNav's interface is engineered to maximize screen real estate for critical data visualization while keeping complex tools readily accessible via context menus and toolbars.

3.1 The Main Grid Structure

The application is split vertically by a draggable splitter bar:

- **Left Pane (Project Tree):** Occupies roughly 20% of the screen. It is the central repository for all project data.
- **Right Pane (Workspace):** Occupies the remaining 80%. This is a multi-tabbed environment where actual interpretation occurs.

3.2 The Project Tree Hierarchy

The tree organizes data into three primary root nodes:

- **Wells:** Your primary target wells, including both drilled paths and planned trajectories.
- **Offset Wells:** Historical or reference wells used to provide the stratigraphic framework for correlation.
- **Grids:** Imported regional 2D structural surfaces (e.g., ZMAP format).

Expanding a well node reveals its sub-components: *Logs* (GR, Resistivity, Porosity), *Tops* (formation markers), and *Trajectory* (survey data). Every item features a checkbox that controls its visibility globally across all open views.

3.3 The Hamburger Menu

Located in the extreme top-left corner, the ☰ button opens the main application menu. This is your hub for project input/output, unit configuration, display theme toggling (Light/Dark mode), and undo/redo operations.

3.4 The Tabbed Workspace

The core of the application lies within the four main tabs:

1. **Correlation:** Traditional side-by-side vertical log display for multi-well correlation.
2. **2D Map:** Plan-view map of wellheads, horizontal wellpaths, and target lines.
3. **3D View:** Interactive spatial visualization of the entire subsurface environment.
4. **Geosteering:** The primary operational workspace combining horizontal log tracks, vertical section cross-plots, and interactive

referencing vertical tracks.

Chapter 4: Project Management

Managing your LithoNav project effectively ensures data integrity, prevents loss of interpretation work, and facilitates seamless handovers between shift geologists.

4.1 Starting a New Project

Selecting ☰ → **New Project** from the menu will flush all data from memory. If you have unsaved changes, the system will prompt you to save. Always initialize a new project when moving to a completely different geological basin, pad, or field to prevent data contamination.

4.2 Saving and Loading

LithoNav utilizes a proprietary `.lnav` file format. This is a highly compressed binary container that encapsulates:

- All raw imported CSV and LAS data arrays.
- All user interpretations (Squeeze segments, faults, structural tops).
- All visual formatting preferences (colors, line weights, patterns, fills).

Use the standard **Ctrl+S** keyboard shortcut to quick-save frequently during active operations.

4.3 Understanding Project Units

Geosteering frequently involves mixed unit systems, particularly in international operations. LithoNav supports three modes, configurable via ☰ → **Project Units**:

- **Field (ft):** Measured Depth, TVD, Easting (X), and Northing (Y) are all calculated and displayed in feet.

- **Metric (m):** All depths and distances are handled in metres.
- **Field-Metric Hybrid:** Surface coordinates (Easting/Northing) are displayed in metres, while all vertical depths (MD, TVD) are displayed in feet. This specific hybrid is vital in Middle Eastern and North Sea operations where surface grids are metric but drilling contracts strictly specify feet.

> **Critical Warning:** Changing units mid-project does not recalculate raw data arrays. You must set your unit system *before* importing any LAS or CSV data to ensure the scaling algorithms process the input correctly.

Chapter 5: Data Import Workflows

Data import in LithoNav is designed to be robust, forgiving, and highly flexible, handling a wide variety of legacy and modern data formats encountered on the rig.

5.1 The Drag-and-Drop Paradigm

The fastest and most intuitive way to bring data into LithoNav is by dragging files from Windows Explorer directly onto the application window.

- If you drop files while the **"Wells"** node is highlighted in the tree, they are automatically assigned as target wells.

- If you drop them on the **"Offset Wells"** node, they become reference wells.

5.2 Supported File Formats

- **LAS 2.0 & 3.0 (Log ASCII Standard):** The industry standard for wireline and LWD log data. LithoNav's parser automatically detects the NULL value (usually -999.25), extracts well header metadata, and parses curve mnemonics.
- **CSV / TXT:** Comma or tab-separated values. These require manual column mapping via the mapping dialog.
- **DEV / DAT:** Standardized directional survey data formats.

5.3 The Column Mapping Dialog

When importing CSV files, the software cannot guarantee column orders. The Column Mapping Dialog presents a preview grid of your

data file alongside dropdown menus. You must explicitly link your file's columns to LithoNav's internal variables:

- **MD:** Measured Depth (Absolutely required for all data).
- **TVD / TVDSS:** Optional for log curves, but required for trajectories if Inclination and Azimuth are missing.
- **Inc / Azi:** Required for accurate directional survey calculations.
- **Curve Data:** Map columns like 'GR_ARC' or 'RDEP' to custom log names.

5.4 Image Log Integration

Borehole image logs provide high-resolution structural dip information. When importing an image log, a specialized dialog allows you to define the exact top and bottom depth of the image segment to ensure it aligns perfectly with the standard curve data depth indexing.

Chapter 6: Well & Trajectory Configuration

A well in LithoNav is a hierarchical container that holds a trajectory, tops, and logs. Proper configuration of the well's physical parameters is critical for accurate 3D placement.

6.1 The Well Properties Dialog

Right-click a well in the project tree and select **Edit Well**. Key parameters include:

- **KBE (Kelly Bushing Elevation):** The height of the rig floor above mean sea level. This is the crucial variable linking TVD to TVDSS. `TVDSS = TVD - KBE`.

- **Surface X / Y:** The exact geographic or projected coordinates of the wellhead (Easting/Northing). Required for 2D/3D plotting and anti-collision.
- **VS Azimuth (Vertical Section Azimuth):** The compass heading (0-360 degrees) along which the well's horizontal displacement is projected. If set to 90 (East), any North/South movement is ignored in the 2D section view.

6.2 Managing Trajectories

A well requires a trajectory to plot data in TVD or 3D space. Right-click the well and choose **Import Trajectory**.

LithoNav uses the industry-standard **Minimum Curvature Method** to calculate TVD, X, and Y from Measured Depth, Inclination, and Azimuth inputs.

6.3 Drilled vs. Plan Trajectories

LithoNav distinguishes between what has been drilled physically and what is planned.

- **Drilled Trajectory:** Based on actual survey shots taken during drilling. Rendered as a solid line.
- **Plan Trajectory:** A proposed extension of the well path. Rendered as a dashed line.

> ***Trajectory Chaining:*** *When a plan trajectory is imported, it automatically "chains" to the end of the drilled trajectory. As new surveys are imported, the drilled trajectory grows, and the plan trajectory is dynamically pushed forward, recalculating its absolute position based on the new tie-in point.*

6.4 The Survey Editor

Double-click the `Trajectory` node in the tree to open the Edit Survey Window. Here you can manually adjust survey stations, delete erroneous shots, or paste updates directly from directional drillers' reports.

Chapter 7: The Correlation View

Before any geosteering occurs, geologists must understand the broader stratigraphic framework by correlating the target well against nearby offset wells.

7.1 Building the Correlation Panel

Navigate to the **Correlation** tab. Drag and drop log curves from the Project Tree into the empty workspace to spawn new vertical tracks.

- You can place multiple curves in a single track (e.g., placing Gamma Ray and Resistivity together for easy cross-referencing).
- You can reorder tracks by dragging them left or right by their headers.

- Resize tracks horizontally by dragging the splitters between them.

7.2 Navigation and Zooming

The correlation view is optimized for rapid scanning of deep wells:

- **Scroll Wheel:** Zooms in and out on the depth axis.
- **Left-Click Drag:** Pans the view up and down smoothly.
- **Right-Click Drag:** Draws a bounding zoom box for precise depth targeting.

7.3 Delta-Synchronized Scrolling

A powerful feature of LithoNav is delta synchronization. When you pan one track down by exactly 50 feet, all other tracks in the view pan down by exactly 50 feet.

This locks the relative offsets between tracks, allowing you to scan thousands of feet of log data without losing your correlation context or having to constantly manually realign tracks.

7.4 Flattening on Tops

Often, regional dip causes the same geological formation to appear at wildly different measured depths in different wells. By selecting a specific **Top**, you can "Flatten" the correlation view.

When flattened, the software shifts the visual rendering of all tracks so that the selected top forms a perfect horizontal line across the screen. This removes structural dip from the visual equation entirely, allowing you to focus purely on stratigraphic thickness variations and facies changes.

Chapter 8: Well Referencing (Pre-Steering)

Well Referencing is the critical preparatory phase where you construct your structural model. You warp the offset well data to match the stratigraphy of the current target well.

8.1 Initializing the Mode

In the Geosteering tab, select your Target well and Offset well from the top dropdown menus, then click the grey **Well referencing mode** button.

8.2 Placing Tops (Anchors)

Right-click the vertical track at a known geological marker and add a Top.

In this mode, Tops act as **absolute anchors**. They define the rigid boundaries of your formations. If you place "Top Reservoir" at 8,500ft MD, the structural model permanently fixes that boundary at that measured depth.

8.3 Squeeze and Stretch Operations

Stratigraphic formations thin and thicken across a basin. To model this variation:

1. Hold **Shift** and click on the vertical track. A horizontal control line appears.
2. Keep holding the mouse button and drag vertically.
3. The segment of the log between this new point and the nearest anchors will stretch or compress dynamically.

You are effectively altering the apparent thickness of the offset well to match what the bit is currently drilling.

8.4 Inserting Faults

When a sudden displacement occurs without thickness changes (e.g., crossing a normal or reverse fault):

1. Hold **Ctrl** and click on the vertical track.
2. Drag vertically to define the "throw" of the fault.
3. The log data below the fault line shifts by the throw amount. A distinct fault marker is added to the model.

> **Crucial Rule:** All structural manipulation (squeezing, faulting) must be done exclusively on the *Vertical Tracks* while in Well Referencing mode. The horizontal track and the main section plot will automatically inherit these changes globally.

Chapter 9: Geosteering Mode (Live Steering)

Once the baseline model is built, you transition to live steering operations. Click the green **Geosteering mode** button.

9.1 The Visual Layout

The screen is dominated by the **Section Plot**. This cross-section plots Measured Depth (X-axis) against TVD or TVDSS (Y-axis). Your well trajectory snakes across this plot. Overlaid on the trajectory are colored bands representing the formations defined by your tops.

9.2 The Synthetic Log Engine

The synthetic log is LithoNav's predictive core. It answers the fundamental question: *"Based on my structural model and my current trajectory, what should the LWD tool be reading right now?"*

The engine takes the offset data, applies all your squeezes and faults, calculates the intersection angle between the trajectory and the formations (apparent dip), and projects a "Synthetic" log curve perfectly parallel to your trajectory. You compare this against the real-time LWD data plotting alongside it.

9.3 Adjusting Apparent Dip

If the synthetic log diverges from the real LWD data, the structural dip has likely changed ahead of the bit.

1. Click and drag the edges of the colored formation bands on the Section Plot.
2. Tilting the bands changes the Apparent Dip.

3. As you tilt, the synthetic log instantly recalculates and morphs.
4. Adjust the tilt until the peaks and troughs of the synthetic log perfectly match the real LWD log.

9.4 Interpretation Mode

Click **Start Interpretation** in the toolbar to enter a high-precision adjustment state:

- The **Interpretation Depth Box** shows the exact current cursor depth on the section plot.
- The **Shift Box** displays the vertical depth shift being applied.
- This mode allows fine-grained adjustment of the structural model at specific depths using the keyboard arrow keys, fine-tuning the correlation without altering the broader dip model.

Chapter 10: Prognosis & Targeting Engine

The ultimate goal of geosteering is not merely understanding your current position, but predicting where you are going. The Prognosis Engine provides exact geometric target depths for the directional drilling team.

10.1 Accessing the Engine

Click the **Create Prognosis** button in the Geosteering toolbar (or right-click a well plan in the tree). The Create Prognosis Dialog opens.

10.2 The First-Crossing Intersection Algorithm

LithoNav uses a high-precision, mathematically rigorous "first-crossing" sweep algorithm:

1. It retrieves the unified coordinate array of the active well (combining the drilled trajectory and the dashed plan extension into a single continuous vector).
2. It reconstructs the 3D planes of all structural horizons based on your current dynamic dip and squeeze model.
3. It marches forward along the trajectory array, checking for the exact mathematical intersection point with each horizon plane.

10.3 Prognosis Output Metrics

The dialog outputs a tabular grid detailing:

- **Formation Name**
- **Intersection MD:** The exact distance along the pipe the driller must drill to hit the target.

- **Intersection TVD:** The vertical depth target.
- **Intersection TVDSS:** The sub-sea depth target.

> ***Dynamic Updates:*** *The prognosis is directly, computationally linked to your structural model. If you adjust the dip of a band in the Geosteering view, opening the Prognosis dialog again will yield entirely new intersection depths. Always regenerate the prognosis after making significant structural changes to avoid passing stale targets to the rig.*

10.4 Troubleshooting Misalignments

If the calculated prognosis depth does not visually match where the horizon line crosses the dashed trajectory on the screen, ensure that you are referencing the correct plan well iteration. If multiple plan wells exist, the engine strictly references the one currently set as "Active" in the Well Properties Dialog.

Chapter 11: 2D Mapping & 3D Visualization

Spatial awareness is critical for collision avoidance, understanding regional geology, and planning complex wellpaths.

11.1 The 2D Map View

The 2D Map provides a top-down (bird's-eye) perspective. The X-axis represents Easting, and the Y-axis represents Northing.

- **Wellheads** are marked with circular symbols and bold labels.
- **Horizontal Displacements** are plotted as colored lines snaking away from the wellhead based on their survey data.

- **Target Lines:** You can draw interactive lines on the map to represent future drilling targets. When a target line is selected, a special toolbar appears above the map allowing you to calculate the required Dogleg Severity (DLS) to reach the target from your current position, or to instantly generate a new "Plan Well" based on that exact vector.

11.2 The 3D View

The 3D View leverages hardware acceleration to render the entire project in three dimensions, providing unparalleled situational awareness.

- **Navigation:** Click and drag to orbit the camera around a focal point. Middle-click and drag to pan horizontally/vertically. Scroll the mouse wheel to zoom.
- **Trajectories:** Rendered as 3D tubes. Drilled sections are solid; plan sections are dashed.

- **Surfaces:** If you imported ZMAP grids, they are rendered as undulating, semi-transparent meshes. The 3D view makes it easy to see if your trajectory is diving into a fault block or riding parallel to regional structural contours.
- **Tops:** Displayed as 3D discs intersecting the trajectory tube at the exact measured depth.

Performance Note: Visualizing many high-resolution structural grids simultaneously may impact rendering performance on lower-end GPUs. Use the checkboxes in the project tree to hide grids that are not currently relevant to the active well operation.

Chapter 12: Advanced Formatting

LithoNav includes a comprehensive, context-sensitive formatting system to prepare your views for high-quality management reports and daily drilling updates.

12.1 The Dynamic Formatting Toolbar

This unified toolbar appears directly above the tabbed workspace but remains collapsed until you select an element (Well, Log, Top, or Horizon) in the Project Tree or the main graphical view.

12.2 Well Header Formatting

Select a **Well** node in the tree:

- **Text & Background Color:** Customize the label colors to match corporate visual standards or differentiate multi-lateral branches.
- **Label Size:** Increase visibility for large projection screens during presentations.

12.3 Log Curve Formatting

Select a **Log** node in the tree:

- **Line Thickness & Pattern:** Differentiate overlapping logs by setting one to solid (thickness 2) and another to dashed or dotted.
- **Fill Curve:** Crucial for Gamma Ray logs. Enable the fill checkbox and select two colors (e.g., Yellow to Green) to create a lithology-dependent color gradient that automatically fills the area under the curve.

- **Scale Min/Max:** Manually override the auto-scaling algorithm. For example, clamp a GR log strictly between 0 and 150 API to match standardized paper logs.

12.4 Marker & Horizon Formatting

Select a **Top** or **Horizon**:

- **Marker Shape:** Choose from circles, squares, crosses, or triangles to denote different certainty levels of interpreted tops.
- **Horizon Fill:** In the Geosteering view, select a horizon and apply a semi-transparent fill (e.g., 33% opacity Blue) to color the entire formation band between that horizon and the next. This creates the highly visual "banded" look essential for immediately understanding cross-sections.

Chapter 13: Exporting & Reporting

Delivering actionable data to the rig and management is the critical final step of the geosteering workflow.

13.1 Generating Geosteering Reports

Navigate to **File** → **Export** → **Geosteering Report**. LithoNav will automatically compile a professional, multi-page PDF document containing:

1. **Header Information:** Well name, current MD, TVD, inclination, azimuth, and active personnel names.
2. **Section Plot Snapshot:** A high-resolution, scale-accurate image of the Geosteering cross-section showing the synthetic

vs. LWD match and the adjusted structural bands.

3. **Prognosis Table:** The exact MD and TVD targets for the driller based on the latest dip adjustments.
4. **Correlation Logs:** Snapshots of the vertical tracks showing the squeeze/stretch model applied to the offset well.

13.2 Exporting Modified Logs (LAS)

You can export the generated synthetic log or the warped (squeezed/stretched) offset data back into standard LAS 2.0 format for use in third-party petrophysical or reservoir modelling software. Right-click the log in the tree and select **Export to LAS**.

13.3 Data Interoperability (CSV)

LithoNav's CSV export function allows you to dump raw coordinate arrays (the calculated trajectory interpolated at exact 1-foot or 1-

metre increments) along with the calculated apparent dip and synthetic log values for custom spreadsheet analysis or machine learning workflows.

Chapter 14: Keyboard Shortcuts

Mastering keyboard shortcuts is essential for rapid response during high-speed drilling operations, where every minute saved reduces the risk of drilling out of the target zone.

Action	Shortcut / Mouse Action	Context & Description
Undo	`Ctrl + Z`	Reverts the last squeeze, fault, or dip adjustment across the entire application state.
Redo	`Ctrl + Y`	Reapplies the reverted action.

Save Project	`Ctrl + S`	Quick save to the current `.lnav` file location.
Save As	`Ctrl + Shift + S`	Save project to a new file location.
Squeeze / Stretch	`Shift + Left Click & Drag`	Used strictly on vertical tracks in Well Referencing mode.
Insert Fault	`Ctrl + Left Click & Drag`	Used strictly on vertical tracks in Well Referencing mode.
Pan View	`Middle Mouse Button Drag`	Works universally across all 2D tracks, maps, and 3D views.

Box Zoom	`Right Click & Drag`	Draws a bounding box to zoom into a specific depth interval instantly.
Toggle Hand Tool	`H`	Switches cursor to panning mode.
Toggle Select Tool	`S`	Switches cursor to selection mode for interacting with UI elements and opening context menus.

Chapter 15: Troubleshooting Guide

15.1 Licensing & Connectivity Issues

Error Message	Resolution Steps
"Invalid license key"	Verify you copied the key exactly from your dashboard. Ensure no trailing spaces were pasted into the input field.
"License bound to another machine"	You are attempting to use a key that is tied to a different HWID. Contact your administrator to reset the HWID in the portal.

"Missing license key or HWID"	The application failed to send the POST data to the server. Check your internet connection and proxy settings.
"Server returned invalid response"	The API endpoint at Banahosting may be experiencing downtime. Wait 5 minutes and try again.

15.2 Operational Issues

Symptom: Logs Disappear When Switching Modes

When you switch from Well Referencing to Geosteering, the vertical or horizontal logs vanish entirely.

Resolution: 1. Check the Project Tree to ensure the specific log's visibility checkbox is still ticked. 2. The view limits may be locked to a scale range outside the current data bounds. Click the **Display All** button in the toolbar to force a global auto-scale. 3. Ensure you haven't squeezed the entire data range into a 0-foot interval by accident during referencing.

Symptom: Zoom Resets Intermittently During Drag Operations

While dragging a squeeze point or fault, the track suddenly snaps back to showing the entire well length.

Resolution: This occurs if the auto-scale algorithm triggers during an interactive update. Ensure you are not holding the mouse cursor outside the bounds of the plot window while dragging. Release the mouse button within the track area.

Symptom: Prognosis TVD reads zero or "NaN"

The prognosis dialog opens, but all calculated intersection depths are 0.0 or "NaN" (Not a Number).

Resolution: The trajectory coordinate array has failed to generate. This happens if the well is missing a Kelly Bushing Elevation (KBE) or surface coordinates. Right-click the well, open the Well Dialog, and ensure all physical parameters are populated with valid numbers.

Chapter 16: Glossary of Terms

- **Apparent Dip:** The angle at which a geological formation intersects the wellbore, as projected onto the 2D vertical section plane. It differs from True Dip unless the well is drilling exactly perpendicular to the strike of the formation.
- **DLS (Dogleg Severity):** A measure of the change in direction of a wellbore over a specific length, usually expressed in degrees per 100 feet or degrees per 30 metres. High DLS indicates sharp turns that may cause drilling complications.
- **HWID (Hardware ID):** A unique cryptographic identifier generated from your computer's physical components, used for enforcing software licensing security.
- **KBE (Kelly Bushing Elevation):** The absolute elevation of the rig floor (where depth measurements originate) above mean sea level.

- **LWD (Logging While Drilling):** Highly specialized tools incorporated into the bottom-hole drilling assembly that measure and transmit geological data (such as Gamma Ray, Resistivity, and Porosity) to the surface in real-time as drilling progresses.
- **MD (Measured Depth):** The actual physical length of the wellbore, measured along the path of the drill pipe from the surface to the drill bit.
- **Synthetic Log:** A mathematical modelled log curve generated by warping historical offset well data to simulate exactly what the LWD tools should be reading at the current trajectory position.
- **THL (Total Horizontal Length):** The total horizontal displacement of the wellbore from the surface location.
- **TVD (True Vertical Depth):** The absolute vertical distance from the Kelly Bushing directly straight down to the current depth point.

- **TVDSS (True Vertical Depth Sub-Sea):** TVD mathematically adjusted for surface elevation, referenced to mean sea level. This is absolutely essential for comparing depths and finding correlations across multiple wells with different surface elevations.
- **VS (Vertical Section):** The horizontal distance the well has traveled, projected mathematically along a specific compass azimuth (the VS Azimuth).

End of Document

LithoNav Systems - Advanced Agentic Build

© 2026. All Rights Reserved.