

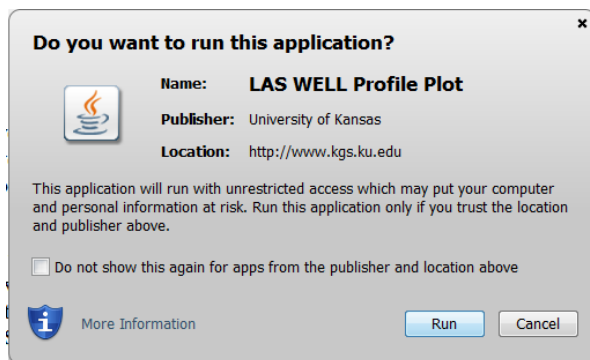
LAS File Viewer Java Applet

by John R. Victorine

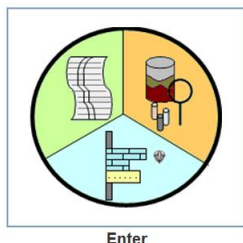
Introduction

The LAS File Viewer web app has 2 sources for importing well data, 1) the user's PC or 2) the Kansas Geological Survey (KGS) Server & ORACLE Database. This program allows the user to import Log, Tops, Core, and Geologist Cuttings Report/Core Description/Measured Sections Data.

There will be occasions when the user would like to inspect the contents of a LAS file. So, for example, the user may wish to find the identity of the well, the types of logs, depth range, well or log parameters. Alternatively, the user can suspect that the file is not coded correctly in LAS format if the Import LAS function fails, and wishes to examine the file to troubleshoot the problem. The LAS file is an ASCII file and can be read by any text editor, i.e. Notepad, WordPad, TextPad, etc. The CSV (Comma Separated Values) files are also ASCII and can be edited in the same way or with Microsoft Excel.



To access LAS File Viewer go to <http://www.kgs.ku.edu/stratigraphic/LAS/>. At the top of the web page there is a menu "Main Page|Description|Applet|Help|Copyright & Disclaimer|". Select the "Applet" menu option a "Warning - Security" Dialog will appear. The program has to be able to read and write to the user's PC and access the Kansas Geological Survey (KGS) Database and File Server, ORACLE requires this dialog. The program does not save your files to KGS, but allows you to access the KGS for well information that may be missing in your Kansas logs. The program does not use Cookies or any hidden software it only reads the LAS and CSV files for the LAS File Viewer Session and writes a LAS 3.0 File to your PC to save your LAS File Viewer Session and the well data imported. The blue shield on the warning dialog is a symbol that the Java web app is created by a trusted source, which is the University of Kansas. Select the "Run" Button, which will show the LAS File Viewer "Enter" Panel illustrated below,



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Loading Well Data

Click the "LAS File Viewer Enter" Icon Button, which will show the "Load Data" Dialog. The dialog below displays an example of the Wellington KGS 1-32 well data loaded from the PC Data icon buttons with the data in the tables above. The icon buttons in the Data Source Panel assists the user in loading well data into the LAS File Viewer Applet.

Data Source Panel

Load existing well data. User can load from multiple sources.

Data Loaded Panel

Positive feedback to user to verify what source data was loaded and location of the source.

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	.....	YES	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	.....	YES	.....	.....
Tops Data	.....	YES	.....	.....			

Load data from Kansas Geological Survey (KGS) Database and Server.

Load ASCII Delimited Data Files from PC.

Displays the filename of files loaded.

Show the source of the data and type.

Dialog Buttons:

Continue – Build LAS File Viewer Plot

Clear – Clear loaded data from this dialog.

Exit – Exit Program

Data Source Panel

The Data Source Panel provides two methods of importing data into the LAS File Viewer Web App. The Kansas Geological Survey (KGS) Database & File Server and the user's PC. A number of icon buttons are provided to assist the user in importing the specific data type of interest. When the user selects the icon button a search dialog is provided specific to the data type. The CSV (Comma Separated Values) icon buttons under the "PC ASCII Delimited Data Files" Panel are expecting a general type of data presentation. Although the order of the specific data columns is not important, the "Mnemonics" of the data column is. Each data type in GEMINI Tools web apps have a data mnemonic list that will be presented later as each icon search dialog is presented. The CSV Search Dialog will use the first two lines of the CSV file to automatically match the file column data mnemonics with the web app curve mnemonics, but if the program does not recognize the file data mnemonic then it will leave it blank and expect the

user to match the file data mnemonic to the web app curve mnemonics, this will be explained later.



Kansas Geological Survey (KGS) Database & Server Data



Kansas Well Data

This button allows the user to access well data stored in the Kansas database & Server. LAS ASCII Standard (LAS) version 2.0 Files & Core Images JPEG Files (Boxes, Core Slab, Thin Sections) Database Data: Perforations Depth Data, Formation Tops (Stratigraphic Units), Measured Core Data



Kansas Measured Sections

Measured Sections (precise measurements and descriptions of a cross section of an outcrop or road cuts) for selected counties in Kansas.



PC ASCII Delimited Data Files



Log ASCII Standard (LAS) File Read

This version will read up to 3 Log ASCII Standard (LAS) Files, versions 2.0 & 3.0. This read process does not necessarily distinguish between the two versions. The LAS Java Read classes follow the rules set up by the Canadian Well Logging Society for both versions.



Tops CSV (comma separated values) ASCII File Read

This version will allow the user to map a comma delimited ASCII file data columns to the tops data variables in the Profile Web Application.



Measured Core CSV (comma separated values) ASCII File Read

This version will allow the user to map a comma delimited ASCII file data columns to the measured core data variables in the Profile Web Application.



Geologist Report delimited ASCII File Read

This version will allow the user to read & parse a delimited geologist report ASCII file data.

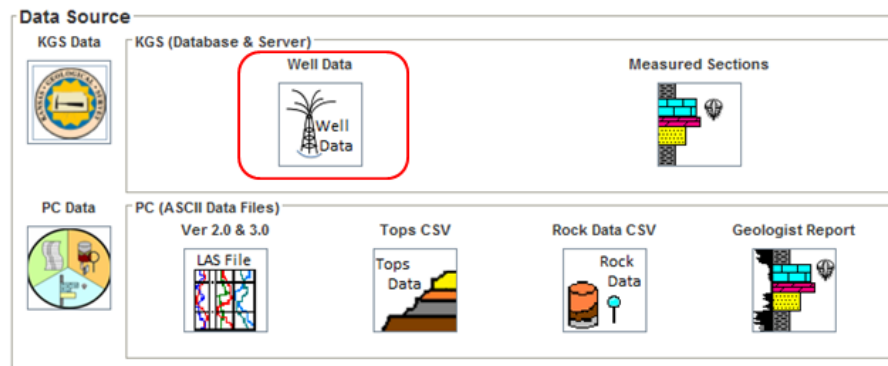
Data Loaded Panel

The Data Loaded Panel provides a visual feedback that the data type was loaded, by the file names of the files that were accessed to load the data and by the data type that is loaded. The data type is important in that it shows where the data came from. The KGS data has the ORACLE Database from which the Tops Data, and Core Data, etc. are retrieved from a XML (Extensible Markup Language) data stream that is constructed using the ORACLE PL/SQL for each data type. The user's PC will load the data from CSV (Comma Delimited Values) files or a delimited file for the Geologist Report. The LAS File can be downloaded automatically from the KGS Server in the program or from the user's PC. This program allows the user to import up to 3 Log ASCII Standard (LAS) version 2.0 or 3.0 files. The LAS version 3.0 file can hold all the well data, but if the user wishes to add log curves from a LAS version 2.0 File it is advised that the LAS version 3.0 file be loaded last. In most cases the user is importing multiple LAS version 2.0 files, which can be saved into a single LAS version 3.0 file.

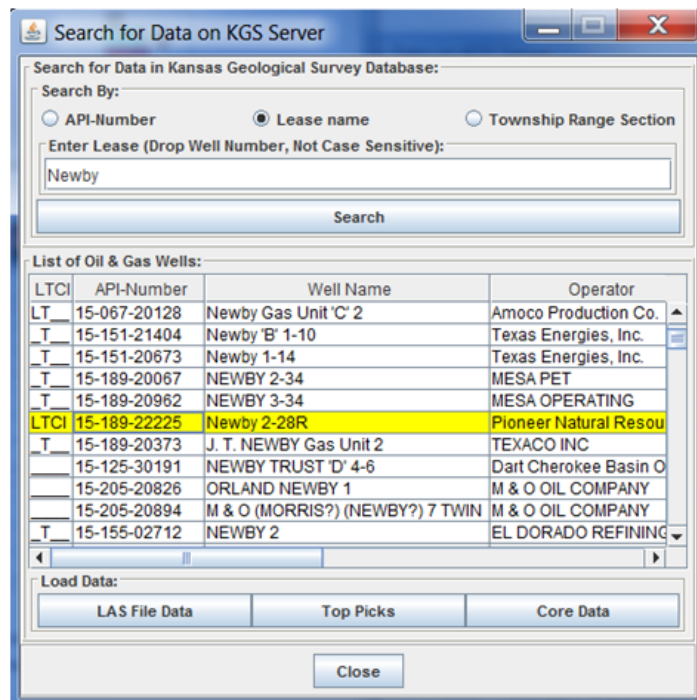
Importing KGS (Database & Server) Data

KGS (Database & Server) - Importing Well Data

The Kansas Geological Survey (KGS) has a good collection of well data stored in the ORACLE Database and File Server as Files Log ASCII Standard (LAS) version 3.0 Files. In this example the user will download the well data available from the KGS, Log data (LAS version 2.0 File), Tops Data, Measured Core Data, and Perforation Data. The ORACLE Database is accessed by making Stored Procedure PL/SQL calls to the ORACLE Database from which an Extensible Markup Language (XML) data stream is created containing the well data that is passed back to the web app making the request.



Left Click on the “Well Data” Icon Button in the Data Source Panel of the Load Data Dialog.



Search for Well Data in KGS Database Search By:

- **API-Number** – The user can search the KGS Database for well data by API-Number. The Format for the API is SS-CCC-99999 where
 - SS – Two Digit State Code
 - CCC – Three Digit County Code
 - 99999 – 5 Digit Well Number
- **Lease Name** – The user can search for well data by lease partial phrase, i.e. “Newby”, which will look for all wells with the phrase “Newby” in the lease name.
- **Township-Range-Section** – Search for a list of Wells by a specific area.

List of Kansas wells that match the search criteria

Load Well Data Buttons

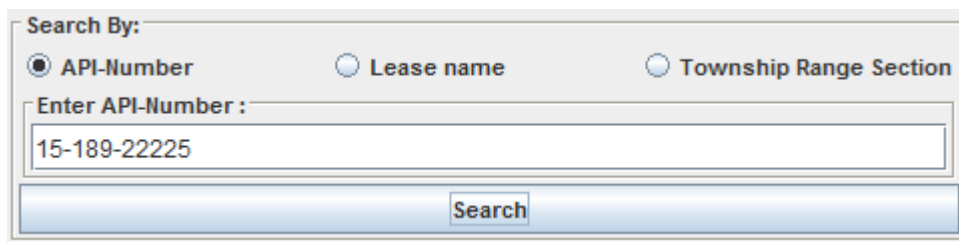
- **LAS File Data** – Load Log ASCII Standard (LAS) Files
- **Tops Picks** – Load Formation Tops Picks
- **Core Data** – Load Measured Core Data

NOTE: L/TCI Column in Table: L-LAS Files; T-Formation Tops; C-Measured Core Data; I-Core Images

This will display the “Search for Data on KGS Server” Dialog, see above image. This dialog allows the user to search the KGS database for well data. In this example, the well of interest will be the Newby 2-28R, this well contains all the well data that can be retrieved from the KGS Database, i.e. Log Data (LAS version 3.0 File), Tops Data, Core Data, and Perforations.

As the Summary image suggests there are 3 methods for searching for the well data within this dialog,

- By API-Number – KGS has a specific format for the API-Number, i.e. SS-CCC-99999 where SS is the state code for Kansas 15, CCC is the county code for Newby 2-28R it is 189 for Stevens County and the 5-Digit Well Number for Newby 2-28R it is 22225.



Search By:

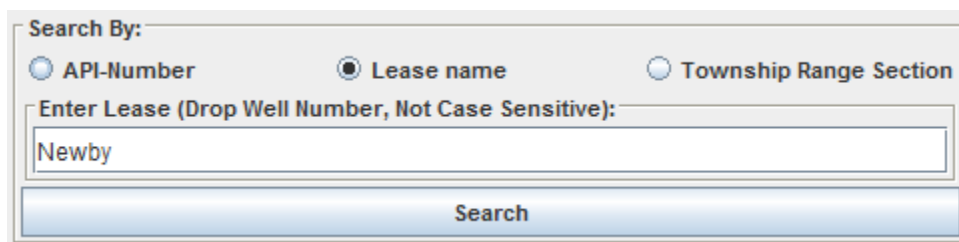
☒ API-Number ☐ Lease name ☐ Township Range Section

Enter API-Number : _____

15-189-22225

Search

- By Partial Lease Name – The stored procedure used to retrieve the well header information allows the user to enter a partial phrase, in this example Newby. The program places a ‘%’ in front and back of the phrase and sends the request to the Database, i.e. “%Newby%”.



Search By:

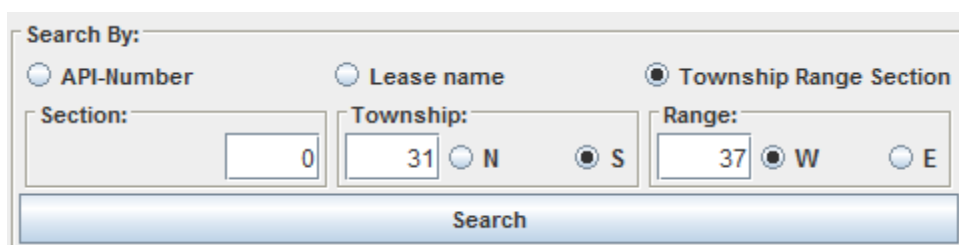
☐ API-Number ☒ Lease name ☐ Township Range Section

Enter Lease (Drop Well Number, Not Case Sensitive): _____

Newby

Search

- By Township Range Section – This search is by location in Kansas, this search also allows the user to enter just the Township and Range to search for wells, e.g. to look for the Newby 2-28R, enter Township as 31 set the S (South) Radio button and Range as 37 set the W (West) Radio button.



Search By:

☐ API-Number ☐ Lease name ☒ Township Range Section

Section: _____ Township: _____ Range: _____

0 31 ☐ N ☒ S 37 ☒ W ☐ E

Search

The user only needs to enter the above data and select the “Search” Button to display the list of Wells in the Kansas Database that match the search criteria. In the image below the Lease Name “Newby” was entered to search for all wells in Kansas with the Phrase Newby in it. The user searches through the list until they find the well of interest. In this example it is the Newby 2-28R, which is highlighted.

Search for Data on KGS Server

Search for Data in Kansas Geological Survey Database:

Search By:

☐ API-Number ☒ Lease name ☐ Township Range Section

Enter Lease (Drop Well Number, Not Case Sensitive):

Newby

Search

List of Oil & Gas Wells:

LTCI	API-Number	Well Name	Operator
LT	15-067-20128	Newby Gas Unit 'C' 2	Amoco Production Co.
T	15-151-21404	Newby 'B' 1-10	Texas Energies, Inc.
T	15-151-20673	Newby 1-14	Texas Energies, Inc.
T	15-189-20067	NEWBY 2-34	MESA PET
T	15-189-20962	NEWBY 3-34	MESA OPERATING
LTCI	15-189-22225	Newby 2-28R	Pioneer Natural Resou
T	15-189-20373	J. T. NEWBY Gas Unit 2	TEXACO INC
	15-125-30191	NEWBY TRUST 'D' 4-6	Dart Cherokee Basin O
	15-205-20826	ORLAND NEWBY 1	M & O OIL COMPANY
	15-205-20894	M & O (MORRIS?) (NEWBY?) 7 TWIN	M & O OIL COMPANY
T	15-155-02712	NEWBY 2	EL DORADO REFINING

Load Data:

LAS File Data Top Picks Core Data

Close

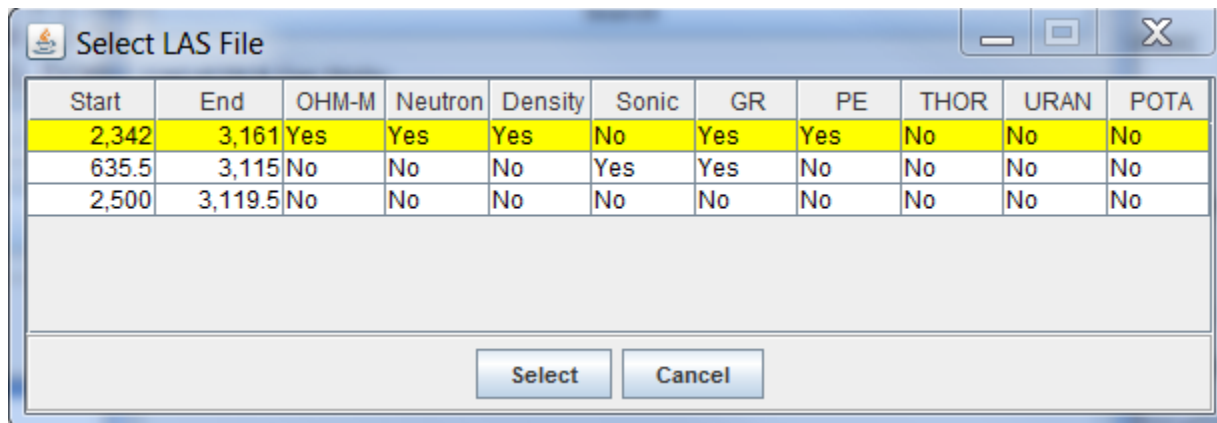
Notice that the LTCI represents the type of data that the well contains. It is a visual aid that lets the user see what is available before trying to download the data. If you require a LAS file you would want to see an L in that column. The LTCI labels stand for the following,

- L – Log ASCII Standard (LAS) version 2.0 Files
- T – Tops Data (Stratigraphic Unit Horizons)
- C – Measured Core Data
- I – Core Joint Photographic Experts Group (JPEG) Image Files

This dialog allows the user to now download each of the data types that are available.

Load KGS Well Data – LAS File Data

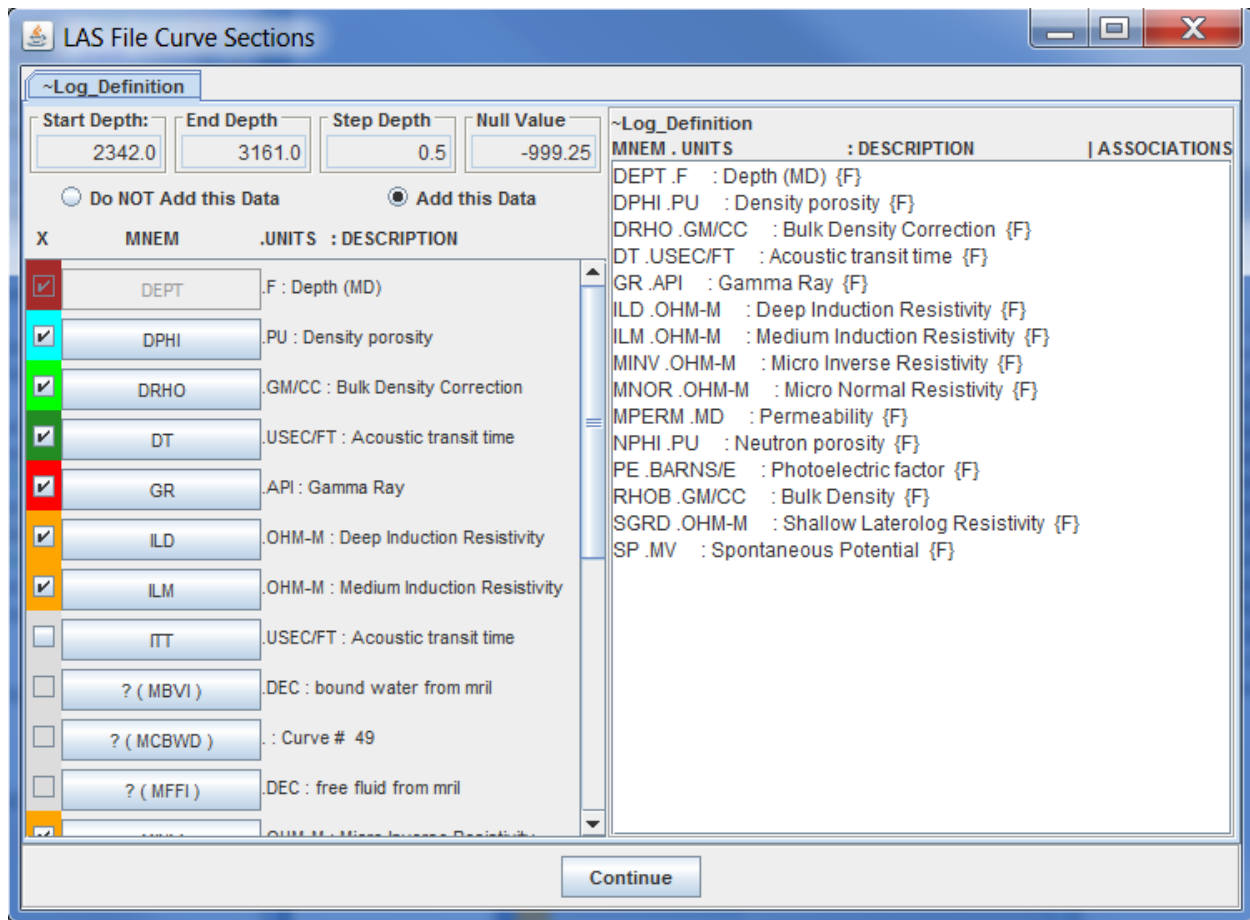
The “Search for Data on KGS Server” Dialog allows the user to download data from the KGS Database & Server to the web app. The “LAS File Data” Button will display the “Select LAS File” Dialog with a list of LAS version 2.0 Files that are available.



In this example there are three LAS files available, with a table suggesting the log data type in the file. In the beginning of the GEMINI Project (2000-2003) a precursor to the GEMINI Tools the KGS populated the Tool Types from every log that was in the KGS Server at that time. Unfortunately KGS has not maintain that table for wells uploaded after 2003 so the LAS File may have “No” for all the log types, which is not accurate. The user will need to open or download the file or search for the Well on the KGS Master List of Oil and Gas Wells in Kansas Web Page (<http://www.kgs.ku.edu/Magellan/Qualified/index.html>) to see what is in the File Header before deciding to download data from this program. For this example the first log has most of the data necessary except the Spectral Gamma Ray Logs. The Table above identifies the following log types,

- OHM-M – Resistivity Logs
- Neutron – Neutron Porosity Log
- Density – Bulk Density and/or Density Porosity Log
- Sonic – Acoustic Transit Time and/or Sonic Porosity Log
- GR – Gamma Ray (API units) Log
- PE – Photoelectric Factor Log
- THOR – Thorium Concentration
- URAN – Uranium Concentration
- POTA – Potassium Concentration)

In this example the first log contains the data needed, highlight the first log and click on the “Select” Button to display the “LAS File Curve Sections” Dialog. The “LAS File Curve Sections” Dialog allows the user to map unknown LAS Curve Mnemonics to the KGS “Standard” Curve Mnemonics so they will be plotted in the LAS File Viewer Plot. This program reads the “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File (http://www.kgs.ku.edu/software/gemini/data/las_standard_tools.xml), which will automatically maps the Curve Mnemonics from the LAS file to one of 31 KGS “Standard” Curve Mnemonics.



As you can see this log has all the log types of interest, Gamma Ray API, Resistivity, Neutron/Density, Photoelectric Factor, Sonic and Permeability. If a curve Mnemonic is not recognized the program will place a “?” in front of the Mnemonic, e.g. “?(MPERM16)” for the “: Curve # 51” Log Curve. If the user is satisfied with the automatic curve selections, which are checked and color coded, they only need to select the “Continue” Button at the bottom of the Dialog to import the file. The next section will take the user through a series of examples in changing the curve selections and mapping unknown curve mnemonics.

Notice that some of the check boxes are colored with different colors, which shows that the curves were automatically selected, but also to represent the curve type by color. The Curves are colored by type (data units) as follows,

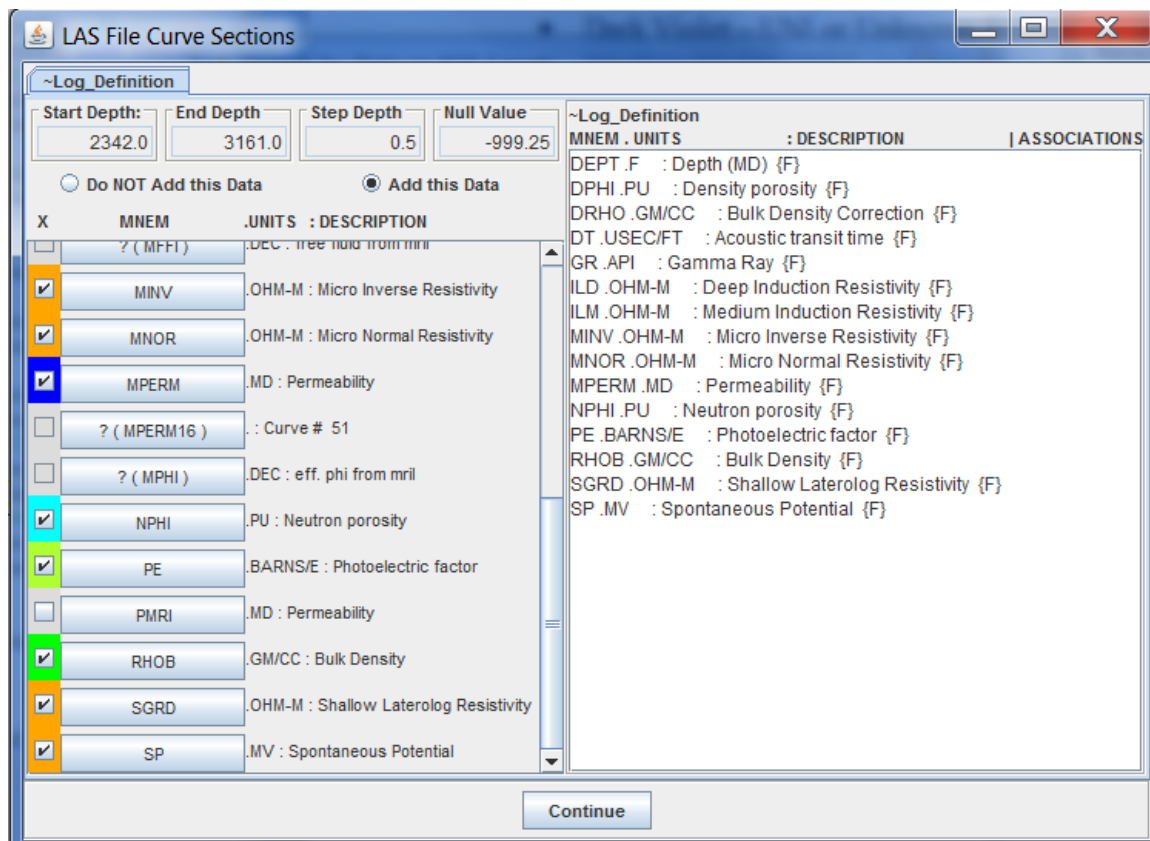
- Orange - OHM-M or Resistivity Logs
- Cyan – PU or porosity Logs, Neutron Porosity, Density Porosity, etc.
- Greenish yellow – BARNS/E or Photoelectric Factor Logs
- Green – GM/CC or Bulk Density Log
- Forest Green – USEC/FT or the Acoustic Transit Time Log
- Red – API, PPM or “%” as Radioactive logs, Gamma Ray, Spectral Gamma Ray, etc.
- Blue – MD or Permeability Logs
- Brown – F, FT or IN or Depth

- Middle yellow – FRAC, or other log curve types.
- Dark Violet – UNI or Unknown Linear Curves
- Medium Violet – UNL or Unknown Logrithum Curves

The color coding of the selected curves were added to also help the user visually recognize that a curve was selected or not.

Map Curves & Change Curve Selections

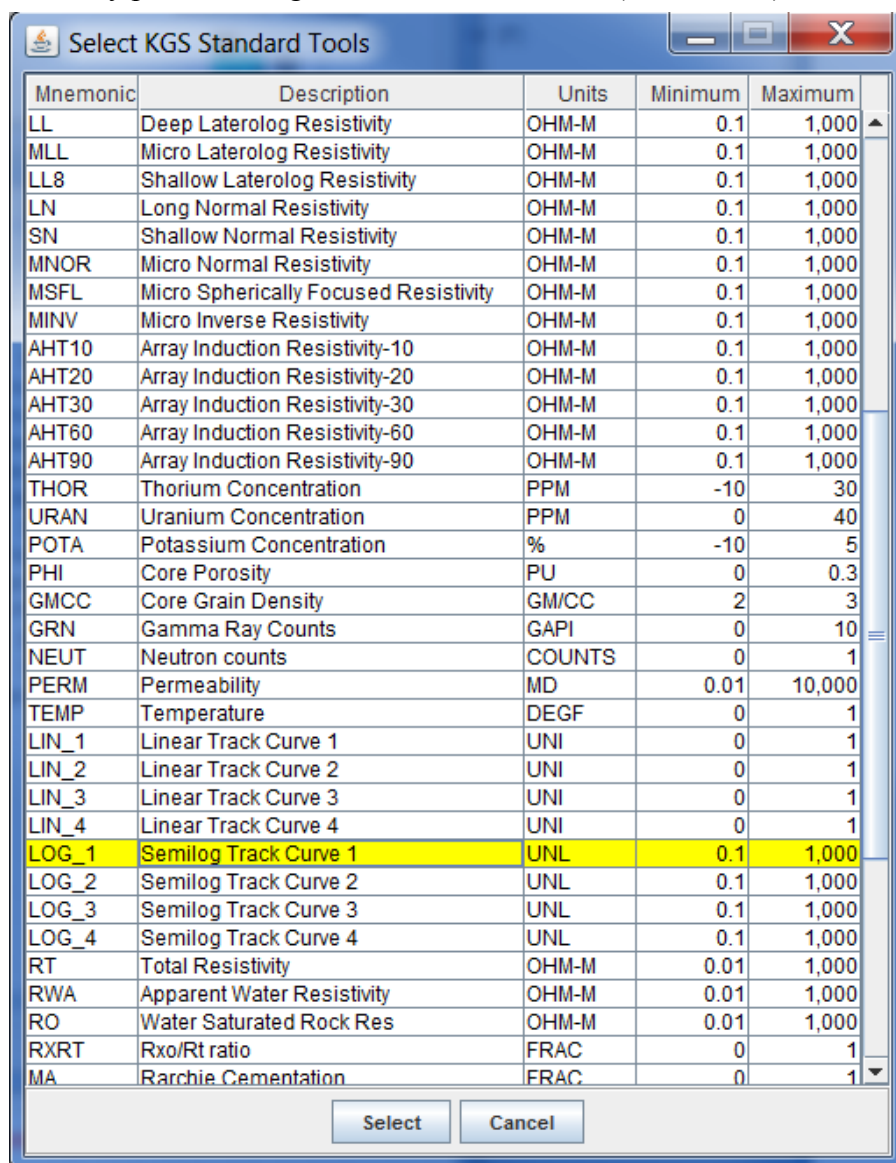
Some logs will have curve mnemonics that are not recognized as one of the KGS “Standard” Curve Mnemonics. The user will need to map the log curve to one of the KGS standard curves if they want to display the curve. Slide the scroll bar down to the Permeability Curves MPERM and ?(MPERM16).



Click on the “?(MPERM16)” Button to display the “Select KGS Standard Tools” Dialog. This dialog provides a list of the KGS “Standard” Curve Mnemonics, from which the user can map an unrecognized log curve to one of the KGS standard curve mnemonics. The KGS “Standard” Curve Mnemonics List was created as a way to standardize the alpha bit soup of Log Mnemonics. Each logging company has their own curve mnemonics to represent similar tools. The LAS File Viewer program is a later version of code from the GEMINI Project LAS File Viewer Module, which needed to standardize the log curves so the curves could be automatically read and assigned a plot track. The “LAS Tool Curve Mnemonics map to KGS Standard

Mnemonics” XML File was created to map the log curves from logs that were part of the KGS LAS File Collection which is not a complete list of possible curve mnemonics.

To map the unknown curve mnemonic “?(MPERM16)” you first notice that it similar to the MPERM curve above, which is a permeability curve. In this example both curves will be plotted together, but the Permeability Plot Track can only plot one curve. The web app has the ability to allow the user to plot up to 4 unknown logarithm curves and 4 unknown linear curves. The permeability is usually plotted as logarithmic. Click on the “?(MPERM16)” Button to display the



“Select KGS Standard Tools” Dialog. Slide the scroll bar down to the “LOG_1” Mnemonic – Semilog Track Curve 1 and highlight that curve. Click on the “Select” Button to map the “?(MPERM16) to the Semilog Track Curve 1.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input type="checkbox"/>	? (MFFI)	.DEC : free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M : Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M : Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.MD : Permeability
<input type="checkbox"/>	MPERM16	.UNL : () Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC : eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	PMRI	.MD : Permeability
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input checked="" type="checkbox"/>	SGRD	.OHM-M : Shallow Laterolog Resistivity
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential

Continue

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth (MD) {F}	
DPHI .PU	: Density porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
DT .USEC/FT	: Acoustic transit time {F}	
GR .API	: Gamma Ray {F}	
ILD .OHM-M	: Deep Induction Resistivity {F}	
ILM .OHM-M	: Medium Induction Resistivity {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
MPERM .MD	: Permeability {F}	
NPHI .PU	: Neutron porosity {F}	
PE .BARNS/E	: Photoelectric factor {F}	
RHOB .GM/CC	: Bulk Density {F}	
SGRD .OHM-M	: Shallow Laterolog Resistivity {F}	
SP .MV	: Spontaneous Potential {F}	

The ?(MPERM16) Curve has been changed to MPERM16 removing the ?() around the Curve Mnemonic. Also select the check box next to it, which changes to a dark violet.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

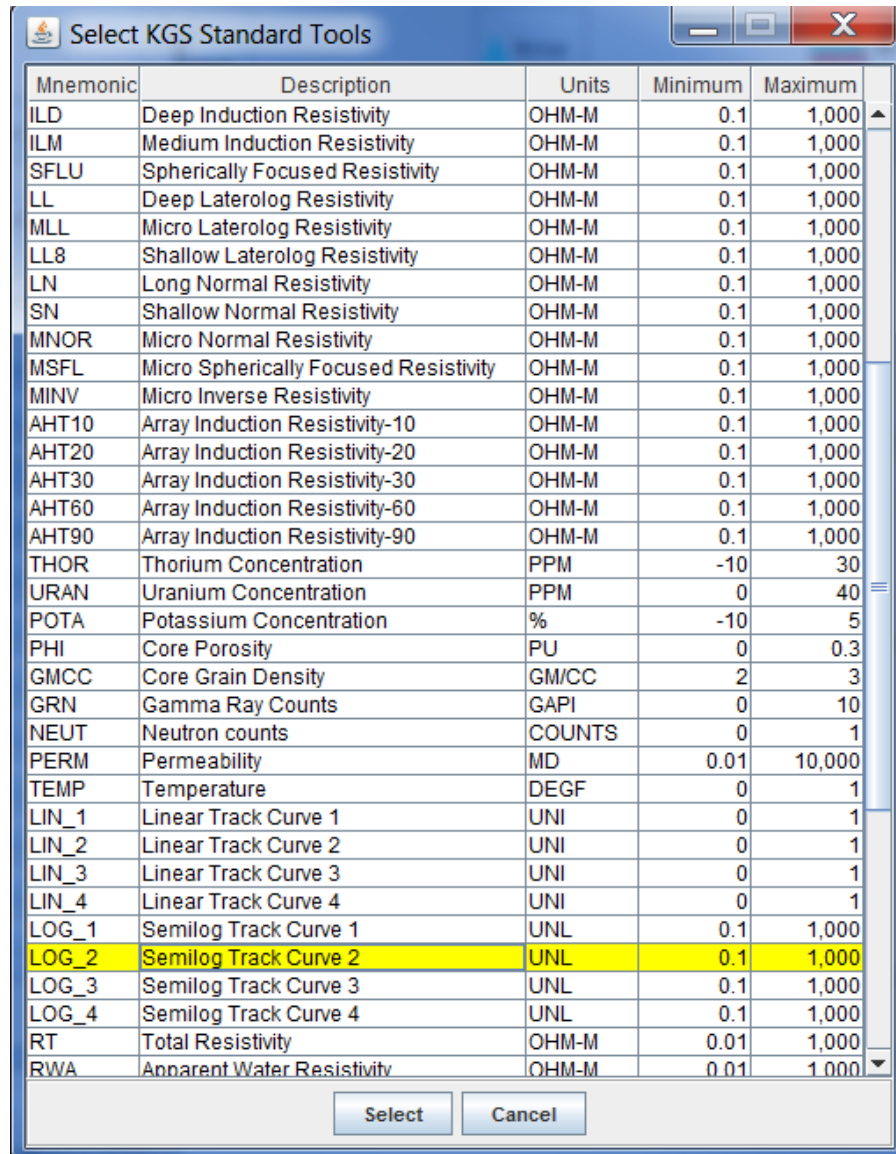
X	MNEM	.UNITS : DESCRIPTION
<input type="checkbox"/>	? (MBVI)	.DEC : bound water from mrii
<input type="checkbox"/>	? (MCBWD)	: Curve # 49
<input type="checkbox"/>	? (MFFI)	.DEC : free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M : Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M : Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.MD : Permeability
<input checked="" type="checkbox"/>	MPERM16	.UNL : () Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC : eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU : Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E : Photoelectric factor
<input type="checkbox"/>	PMRI	.MD : Permeability
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density

Continue

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth (MD) {F}	
DPHI .PU	: Density porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
DT .USEC/FT	: Acoustic transit time {F}	
GR .API	: Gamma Ray {F}	
ILD .OHM-M	: Deep Induction Resistivity {F}	
ILM .OHM-M	: Medium Induction Resistivity {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
MPERM .MD	: Permeability {F}	
MPERM16 .UNL	: Curve # 51 {F}	
NPHI .PU	: Neutron porosity {F}	
PE .BARNS/E	: Photoelectric factor {F}	
RHOB .GM/CC	: Bulk Density {F}	
SGRD .OHM-M	: Shallow Laterolog Resistivity {F}	
SP .MV	: Spontaneous Potential {F}	

In order to plot both Permeability Curves on the same track, the MPERM must be assigned to the unknown Log Curves with MPERM16. Click on the MPERM Mnemonic Button to display the



Mnemonic	Description	Units	Minimum	Maximum
ILD	Deep Induction Resistivity	OHM-M	0.1	1,000
ILM	Medium Induction Resistivity	OHM-M	0.1	1,000
SFLU	Spherically Focused Resistivity	OHM-M	0.1	1,000
LL	Deep Laterolog Resistivity	OHM-M	0.1	1,000
MLL	Micro Laterolog Resistivity	OHM-M	0.1	1,000
LL8	Shallow Laterolog Resistivity	OHM-M	0.1	1,000
LN	Long Normal Resistivity	OHM-M	0.1	1,000
SN	Shallow Normal Resistivity	OHM-M	0.1	1,000
MNOR	Micro Normal Resistivity	OHM-M	0.1	1,000
MSFL	Micro Spherically Focused Resistivity	OHM-M	0.1	1,000
MINV	Micro Inverse Resistivity	OHM-M	0.1	1,000
AHT10	Array Induction Resistivity-10	OHM-M	0.1	1,000
AHT20	Array Induction Resistivity-20	OHM-M	0.1	1,000
AHT30	Array Induction Resistivity-30	OHM-M	0.1	1,000
AHT60	Array Induction Resistivity-60	OHM-M	0.1	1,000
AHT90	Array Induction Resistivity-90	OHM-M	0.1	1,000
THOR	Thorium Concentration	PPM	-10	30
URAN	Uranium Concentration	PPM	0	40
POTA	Potassium Concentration	%	-10	5
PHI	Core Porosity	PU	0	0.3
GMCC	Core Grain Density	GM/CC	2	3
GRN	Gamma Ray Counts	GAPI	0	10
NEUT	Neutron counts	COUNTS	0	1
PERM	Permeability	MD	0.01	10,000
TEMP	Temperature	DEGF	0	1
LIN_1	Linear Track Curve 1	UNI	0	1
LIN_2	Linear Track Curve 2	UNI	0	1
LIN_3	Linear Track Curve 3	UNI	0	1
LIN_4	Linear Track Curve 4	UNI	0	1
LOG_1	Semilog Track Curve 1	UNL	0.1	1,000
LOG_2	Semilog Track Curve 2	UNL	0.1	1,000
LOG_3	Semilog Track Curve 3	UNL	0.1	1,000
LOG_4	Semilog Track Curve 4	UNL	0.1	1,000
RT	Total Resistivity	OHM-M	0.01	1,000
RWA	Apparent Water Resistivity	OHM-M	0.01	1,000

“Select KGS Standard Tools” Dialog. Slide the scroll bar down to the “LOG_2” Mnemonic – Semilog Track Curve 2 and highlight that curve. Click on the “Select” Button to map the “MPERM to the Semilog Track Curve 2.

LAS File Curve Sections

~Log_Definition

Start Depth: 2342.0 End Depth: 3161.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS	DESCRIPTION
<input type="checkbox"/>	? (MBVI)	.DEC	: bound water from mrii
<input type="checkbox"/>	? (MCBWD)	.	: Curve # 49
<input type="checkbox"/>	? (MFFI)	.DEC	: free fluid from mrii
<input checked="" type="checkbox"/>	MINV	.OHM-M	: Micro Inverse Resistivity
<input checked="" type="checkbox"/>	MNOR	.OHM-M	: Micro Normal Resistivity
<input checked="" type="checkbox"/>	MPERM	.UNL : (UNL) (MD)	Permeability
<input checked="" type="checkbox"/>	MPERM16	.UNL : ()	Curve # 51
<input type="checkbox"/>	? (MPHI)	.DEC	: eff. phi from mrii
<input checked="" type="checkbox"/>	NPHI	.PU	: Neutron porosity
<input checked="" type="checkbox"/>	PE	.BARNS/E	: Photoelectric factor
<input type="checkbox"/>	PMRI	.MD	: Permeability

~Log_Definition

MNEM	.UNITS	DESCRIPTION	ASSOCIATIONS
DEPT	.F	: Depth (MD) {F}	
DPHI	.PU	: Density porosity {F}	
DRHO	.GM/CC	: Bulk Density Correction {F}	
DT	.USEC/FT	: Acoustic transit time {F}	
GR	.API	: Gamma Ray {F}	
ILD	.OHM-M	: Deep Induction Resistivity {F}	
ILM	.OHM-M	: Medium Induction Resistivity {F}	
MINV	.OHM-M	: Micro Inverse Resistivity {F}	
MNOR	.OHM-M	: Micro Normal Resistivity {F}	
MPERM	.UNL	: Permeability {F}	
MPERM16	.UNL	: Curve # 51 {F}	
NPHI	.PU	: Neutron porosity {F}	
PE	.BARNS/E	: Photoelectric factor {F}	
RHOB	.GM/CC	: Bulk Density {F}	
SGRD	.OHM-M	: Shallow Laterolog Resistivity {F}	
SP	.MV	: Spontaneous Potential {F}	

Continue

Click the check box next to the MPERM Mnemonic Button you will notice that it has the same color as MPERM16, which now groups the two curves together. Select the “Continue” Button to load the LAS File into the web app.

Load KGS Well Data – Top Picks

The “Search for Data on KGS Server” Dialog allows the user to download data from the KGS Database & Server to the web app. The “Top Picks” Button will display the “Move/Merge KGS Data” Dialog with available top picks grouped by the sources creating the tops.

Move/Merge KGS Data.

KGS Stratigraphic Units:

- ☒ HUG ELOG-EM
- ☐ MKD
- ☐ MKD-07/2006

List of Sources for the tops, e.g. Newby 2-28R has 3 sources of tops data. The user can search through and add some or all to the web app.

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
HUG ELOG-EM	0	0	Council Grove	GROL
HUG ELOG-EM	728	0	Day Creek Dolomite	FORM
HUG ELOG-EM	1,090	1,170	Blaine	FORM
HUG ELOG-EM	1,250	1,412	Cedar Hills Sandstone	FORM
HUG ELOG-EM	1,690	1,759	Stone Corral	FORM
HUG ELOG-EM	2,182	2,516	Wellington	FORM
HUG ELOG-EM	2,291	0	Hutchinson Salt	MEMB
HUG ELOG-EM	2,496	0	Hollenberg Limestone	MEMB
HUG ELOG-EM	2,516	2,832	Chase	GROL
HUG ELOG-EM	2,516	2,536	Herington Limestone	MEMB

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
HUG ELOG-EM	728	0	Day Creek Dolomite	FORMATION	P
HUG ELOG-EM	1,090	1,170	Blaine	FORMATION	P
HUG ELOG-EM	1,250	1,412	Cedar Hills Sandstone	FORMATION	P
HUG ELOG-EM	1,690	1,759	Stone Corral	FORMATION	P
HUG ELOG-EM	2,182	2,516	Wellington	FORMATION	P
HUG ELOG-EM	2,291	0	Hutchinson Salt	MEMBER	P
HUG ELOG-EM	2,496	0	Hollenberg Limestone	MEMBER	P
HUG ELOG-EM	2,516	2,832	Chase	GROUP	P
HUG ELOG-EM	2,516	2,536	Herington Limestone	MEMBER	P
HUG ELOG-EM	2,536	2,538	Paddock Shale	MEMBER	P
HUG ELOG-EM	2,544	2,580	Krider Limestone	MEMBER	P
HUG ELOG-EM	2,580	2,594	Odell Shale	FORMATION	P
HUG ELOG-EM	2,594	2,629	Winfield Limestone	FORMATION	P
HUG ELOG-EM	2,632	0	Gage Shale	MEMBER	P
HUG ELOG-EM	2,655	2,704	Towanda Limestone	MEMBER	P
HUG ELOG-EM	2,742	2,756	East Diley Limestone	MEMBER	P

Buttons: Add, Add All, Clear Selection, Clear Selection, Remove, Remove All, Load Data, Close.

“Add to User's Stratigraphic Units List” Table shows the tops selected by the source, e.g. “HUG ELOG-EM” Source Tops List.

Radio Buttons

Remove & Replace – move the selected tops and replace any duplicate names

Add to List – move the selected tops to the “User's Stratigraphic Units” Table

Add New Units Only – move on the selected tops that are not already in the “User's Stratigraphic Units” Table

Table Buttons

Add – add the highlighted top(s) to the “User's Stratigraphic Units” Table. Note: this table will allow the user to select multiple wells by using the “Ctrl” Key and the left click of mouse.

Add All – copy the list of tops to the “User's Stratigraphic Units” Table.

Clear Selection – remove the highlight on tops selected.

“Add to User's Stratigraphic Units List” Table.

“User's Stratigraphic Units” Table shows the list of tops that will appear in the web app when the user selects the “Load Data” Button.

Table Buttons

Clear Selection – remove the highlight on tops selected.

Remove – remove the highlighted top(s) from the table. Note: this table will allow the user to select multiple wells by using the “Ctrl” Key and the left click of mouse.

Remove All – remove all tops from the table.

Load Data – transfer the tops list to the web app calling.

Close – Close this dialog

This dialog allows the user to add all or some the tops from each of the sources. Both tables are set up so the user can use the “Ctrl” Key with the left click of mouse to select multiple tops, i.e.

Notice that the only some of the tops are selected. You can then select the Add Button to move only the selected tops to the “User’s Stratigraphic Units” Table.

MKD Source Example:

KGS Stratigraphic Units:

☐ HUG ELOG-EM

☒ MKD

☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☒ Remove & Replace ☐ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROL
MKD	2,832	0	Council Grove	GROL
MKD	2,832	2,853.5	Speiser Shale	FORM

(1) Select the MKD Source, which will be displayed in the “Add to User’s Stratigraphic Units List” Table.

Add Add All Clear Selection

KGS Stratigraphic Units:

☐ HUG ELOG-EM

☒ MKD

☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROL
MKD	2,832	0	Council Grove	GROL
MKD	2,832	2,853.5	Speiser Shale	FORM

(2) Select the “Add to List” Radio button.

Add Add All Clear Selection

KGS Stratigraphic Units:

☐ HUG ELOG-EM
☒ MKD
☐ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	R
MKD	0	2,773	Fort Riley Limestone	MEMB
MKD	0	2,693	Towanda Limestone	MEMB
MKD	2,538	2,580	Krider Limestone	MEMB
MKD	2,629	0	Gage Shale	MEMB
MKD	2,712	0	Fort Riley Limestone	MEMB
MKD	2,777	2,789	Florence Limestone	MEMB
MKD	2,807	0	Wreford Limestone	FORM
MKD	2,832	0	Council Grove	GROU
MKD	2,832	0	Council Grove	GROU
MKD	2,832	2,853.5	Speiser Shale	FORM

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,973.5	Stages Shale	FORMATION	P

Once the list of tops are in the "User's Stratigraphic Units" Table the user can edit the list by removing any duplicate or invalid tops. Notice that the "Council Grove" Top occurs 2 times in the list. Highlight the one of the "Council Grove" tops.

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P ▲
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Stearns Shale	FORMATION	P ▼

Buttons: Clear Selection, Remove, Remove All, Load Data, Close

Now select the "Remove" Button.

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P ▲
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easley Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Stearns Shale	FORMATION	P ▼
MKD	2,972.5	2,979	Merrill Limestone	MEMBER	P

Buttons: Clear Selection, Remove, Remove All, Load Data, Close

The MKD-07/2006 has only one top, so this dialog allows the user to add that top to the "User's Stratigraphic Units" Table. The MKD does not have this top and this is an extra top missing from the MKD data set.

KGS Stratigraphic Units:

☐ HUG ELOG-EM
☐ MKD
☒ MKD-07/2006

Add to User's Stratigraphic Units List:

☐ Remove & Replace ☒ Add to List ☐ Add New Units Only

Source	Top	Base	Name	Rank
MKD-07/2006	2,789	2,807	Matfield Shale	FORMATION

(1) Select the MKD-07/2006 Source, which will be displayed in the "Add to User's Stratigraphic Units List" Table.

(2) Select the "Add All" Button to move the contents from the "Add to User's Stratigraphic Units List" Table to the "User's Stratigraphic Units" table.

Buttons: Add, **Add All**, Clear Selection

User's Stratigraphic Units:

Source	Top	Base	Name	Rank	
MKD	2,538	2,580	Krider Limestone	MEMBER	P
MKD	2,629	0	Gage Shale	MEMBER	P
MKD	2,712	0	Fort Riley Limestone	MEMBER	P
MKD	2,777	2,789	Florence Limestone	MEMBER	P
MKD-07/2006	2,789	2,807	Matfield Shale	FORMATION	P
MKD	2,807	0	Wreford Limestone	FORMATION	P
MKD	2,832	0	Council Grove	GROUP	P
MKD	2,832	2,853.5	Speiser Shale	FORMATION	P
MKD	2,853.5	2,894.5	Funston Limestone	FORMATION	P
MKD	2,894.5	2,910.5	Blue Rapids Shale	FORMATION	P
MKD	2,910.5	2,929	Crouse Limestone	FORMATION	P
MKD	2,929	2,933.5	Easily Creek Shale	FORMATION	P
MKD	2,933.5	2,947	Middleburg Limestone	MEMBER	P
MKD	2,947	2,957.5	Hooser Shale	MEMBER	P
MKD	2,957.5	2,962.5	Eiss Limestone	MEMBER	P
MKD	2,962.5	2,972.5	Stearns Shale	FORMATION	P

Buttons: Clear Selection, Remove, Remove All, Load Data, Close

Now with the data set complete select the "Load Data" Button to import the Tops data into the web app.

Load KGS Well Data – Core Data

The "Search for Data on KGS Server" Dialog allows the user to download data from the KGS Database & Server to the web app. The "Core Data" Button will automatically load any measured core data that is in the KGS Database and import directly into the web app.

As the user accepted each data type the “Data Source Filenames:” Panel in the Load Data Dialog changes. The LAS File that was downloaded from the KGS Server to the LAS File Viewer Web App is added to the “Log ASCII Standard (LAS) Files” panel will show the filename downloaded. The Log Data, Perforations, Tops Data, Measured Core Data, and the Geologist Report Data Type have been downloaded from KGS.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data Measured Sections

PC Data PC (ASCII Data Files) Ver 2.0 & 3.0

LAS File Tops CSV Rock Data CSV Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: 1022012442.las

2:

3:

PC ASCII Files:

Tops CSV:

Core CSV:

Geo-Report:

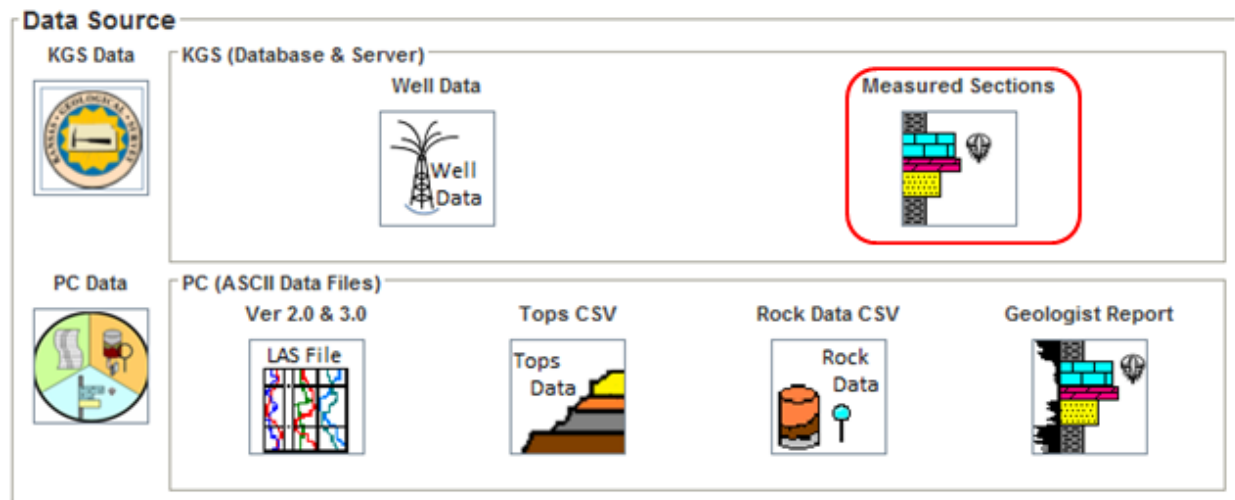
Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data			YES	Rock Measured Data	.....			YES
Perforations			YES	Geologist Report	.....			YES
Tops Data			YES					

Continue Clear Exit



KGS (Database & Server) - Importing Measured Sections

The Kansas Geological Survey (KGS) has a good collection of Measured Section data stored in the ORACLE Database. In this example the user will download the measured sections that are available, for each section will contain Measured Sections Data and Fossil Genera Names (Bio-Stratigraphy) and in some cases top picks. The ORACLE Database is accessed by making Stored Procedure PL/SQL calls to the ORACLE Database from which an Extensible Markup Language (XML) data stream is created containing the measured section data that is passed back to the web app making the request.



To Display the “Search for KGS Measured Sections” left click the mouse on the “Measured Sections” Icon Button in the Data Source Panel of the Load Data Dialog.

Search for KGS Measured Sections

Close Dialog

Search for Data in Kansas Geological Survey Database:

Search By:

- ☐ Directions
- ☐ Sec. Town. Range
- ☒ Counties

BARBER	CHASE
CHEYENNE	COFFEY
DICKINSON	GEARY

Search

List of Measured Sections:

id	Directions	Town	Range	Sec	Latitude	Longiti
3014	W center NW 1/4 of section	11S	2E	12	39.112	-97
3027	SW corner of section	11S	3E	6	39.126	-97
3037	SE corner of section	12S	4E	34	38.965	-96
3066	2 1/2 mi. N of Chapman, center of eastern...	12S	4E	18	39.009	-97
3082		13S	3E	26	38.893	-97
3093	W side of the bridge of Turkey Creek, NE ...	14S	2E	3	38.864	-97
3115	3 1/2 mi. SW of Abilene, S side of Smoky ...	14S	2E	6	38.864	-97
3157	1 3/4 mi. E of Woodbine	14S	4E	36	38.79	-96
3198	Field quarry on W side of county road 2 mi...	14S	4E	20	38.82	-97
3200		15S	4E	29	38.718	-97
3212	Center of eastern line	15S	4E	24	38.732	-97
3232	Composite sample along eroded bank of ...	16S	1E	25	38.631	-97
3240	On west side of draw	16S	1E	25	38.631	-97

Load Data

Search for Measured Sections in KGS Database Search By:

- **Directions** – The user can search for measured sections by directions partial phrase, i.e. “quarry”, which will look for all wells with the phrase “quarry” in the directions text field.
- **Section Township Range** – Search for a list of measured sections by a specific area.
- **Counties** – Search for a list of measured sections within counties available in Measured Section Database Table.

List of Measured Sections that match the search criteria

Load Data Button – transfers the selected measured section to the calling web app.

This will display the “Search for KGS Measured Sections” Dialog, see above image. This dialog allows the user to search the KGS database for measured sections data. In this example, the well of interest will be the Marshall #1 this well contains all the brine samples that can be retrieved from the KGS Database.

As the Summary image suggests there are 3 methods for searching for the well data within this dialog,

- By Partial Directions Phrase – The stored procedure used to retrieve the list of measured sections from the KGS Database allows the user to enter a partial phrase in this example “line” is entered. The program places a ‘%’ in front and back of the phrase and sends the request to the Database, i.e. “%line%”.

- By Township Range Section – This search is for measured sections in Kansas by, e.g. to look for the 3212 Measured Section, enter Section as 24, Township as 15 set the S (South) Radio button and Range as 4 set the E (East) Radio button.

- By County – This panel allows the user to search for measured sections by counties with measured section database table, e.g. select the DICKINSON County Button.

The user only needs to enter the above data and select the “Search” Button to display the list of measured sections in the Kansas Database that match the search criteria. In the image below the Lease Name “line” was entered to search for all measured sections in Kansas with the Phrase “line” in it. The user searches through the list until they find the well of interest.

Search for KGS Measured Sections

Close Dialog

Search for Data in Kansas Geological Survey Database:

Search By:

☒ Directions

☐ Sec. Town. Range

☐ Counties

Enter Phrase:

line

Search

List of Measured Sections:

id	Directions	Town	Range	Sec	Latitude	Longitude
3066	2 1/2 mi. N of Chapman, center of eastern...	12S	4E	18	39.009	-97
3212	Center of eastern line	15S	4E	24	38.732	-96
3550	Wreford formation east of Big Blue, about ...	7S	6E	25	39.414	-96
1962	S line SE 1/4, 2 mi ENE of Alma (140' of G...	12S	10E	13	39.007	-96
2349	Center S line	13S	13E	8	38.936	-96
2519	Along creek bank on county line	15S	11E	13	38.746	-96
2894	Center E line SE NW NE NW	15S	5W	31	38.704	-97
2915	Center W line NW NE NW	15S	5W	31	38.704	-97
2977	SW of Brookville, 1/4 mile east of Ellswort...	16S	5W	6	38.69	-97
56	Center West line	22S	2E	24	38.124	-97
1222	33 miles SW of Topeka via Pauline, Aubur...	12S	13E	31	38.965	-96
1486	W center S line Sec. 26. 1/2 mile south, 1/...	11S	11E	26	39.066	-96
4014	East line	17S	7E	24	38.558	-96

Load Data

The “Load Data” will display the selection on the panel showing the data type by location of data. Notice that the Geologist Report Type is selected. There are tops within the Measured Section Report, but the Tops are within the report and not part of the query process so this panel will not reflect that the tops are there.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data Measured Sections

PC Data PC (ASCII Data Files)

Ver 2.0 & 3.0 Tops CSV Rock Data CSV Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1:

2:

3:

PC ASCII Files:

Tops CSV:

Core CSV:

Geo-Report:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	NO	.....	.....	.....	Rock Measured Data	NO	.....	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	.....	.....	.....	YES
Tops Data	NO	.....	.....	.....		

Continue Clear Exit

KGS Measured Section (3212) T: 15S R: 4E S: 24

Latitude: 38.732338 Longitude: -96.936421 Elevation (GL): 1343.0 Depth: 23.0

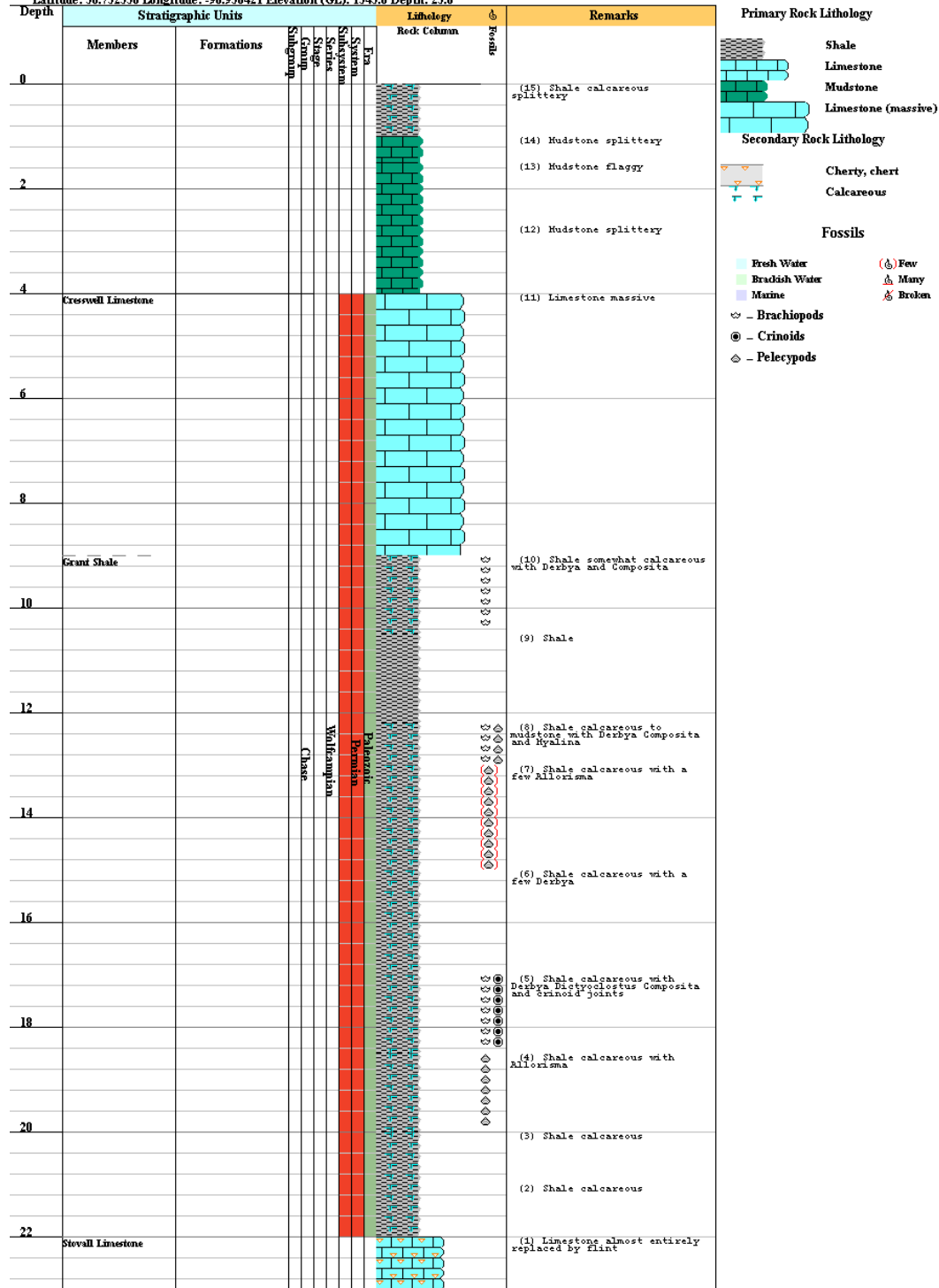


Figure 1: KGS Measured Section (3212) "Center of Eastern Line" Township 15S - Range 4E - Section 24.

Importing PC Data - Download Well Data to PC

Download either the ASCII Text Files directly or the Zip files extracting the contents into a directory. The problem with the ASCII Text Files being downloaded directly from a web page is that the web page will alter the contents so it does not retain the basic structure and add HTML text to the file. The preferred method if you have Zip or WinZip is to download the zip files to your PC and extract.

Well Data: Wellington KGS 1-32, Sumner County, Kansas

Type	ASCII Text Files
LAS 2.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32.las
Tops	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Tops.csv
Core	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Core_Data.csv
Report	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_geo.txt

Type	Zip Files
LAS 2.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32.zip
Tops	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Tops.zip
Core	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_Core_Data.zip
Report	http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington-KGS-1-32_geo.zip

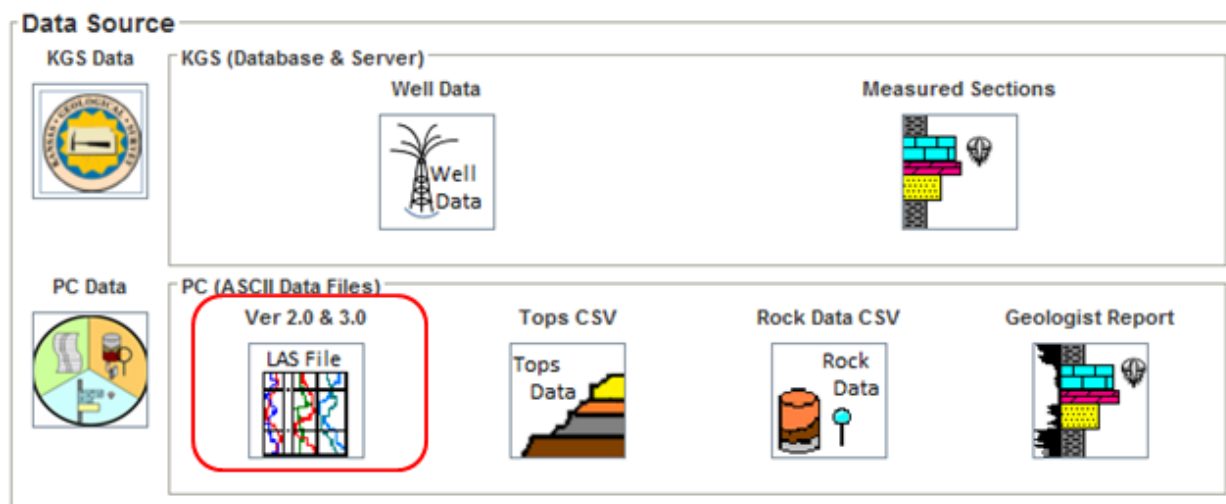
Measured Section: C S Line, Township 16S-Range 7E-Section 10, Riley County, Kansas

Type	ASCII Text Files
Report	http://www.kgs.ku.edu/Gemini/Tools/documentation/C_S_line_S10-T6S-R7E.txt

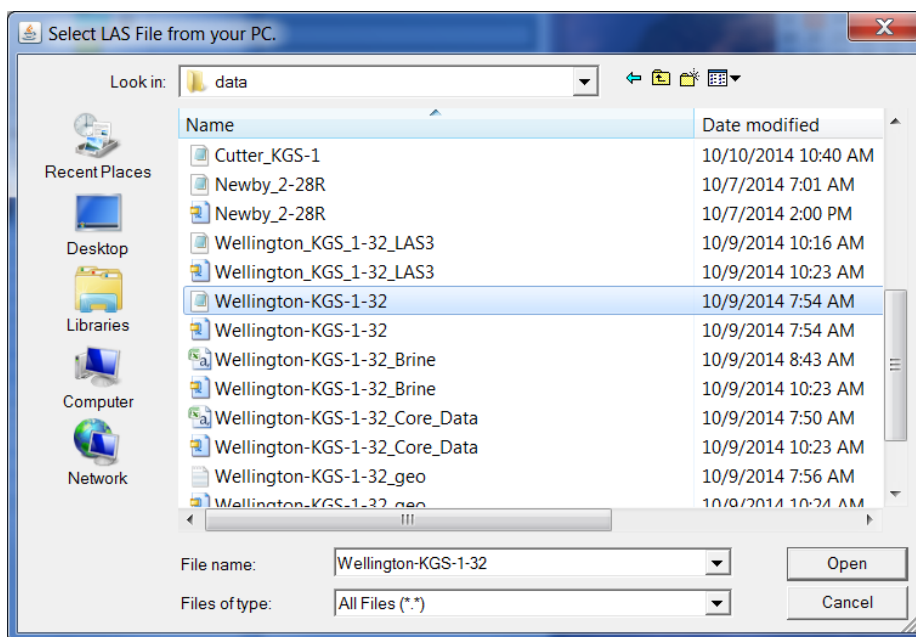
Type	Zip Files
Report	http://www.kgs.ku.edu/Gemini/Tools/documentation/C_S_line_S10-T6S-R7E.zip

Importing PC Data – Log ASCII Standard (LAS) version 2.0 File

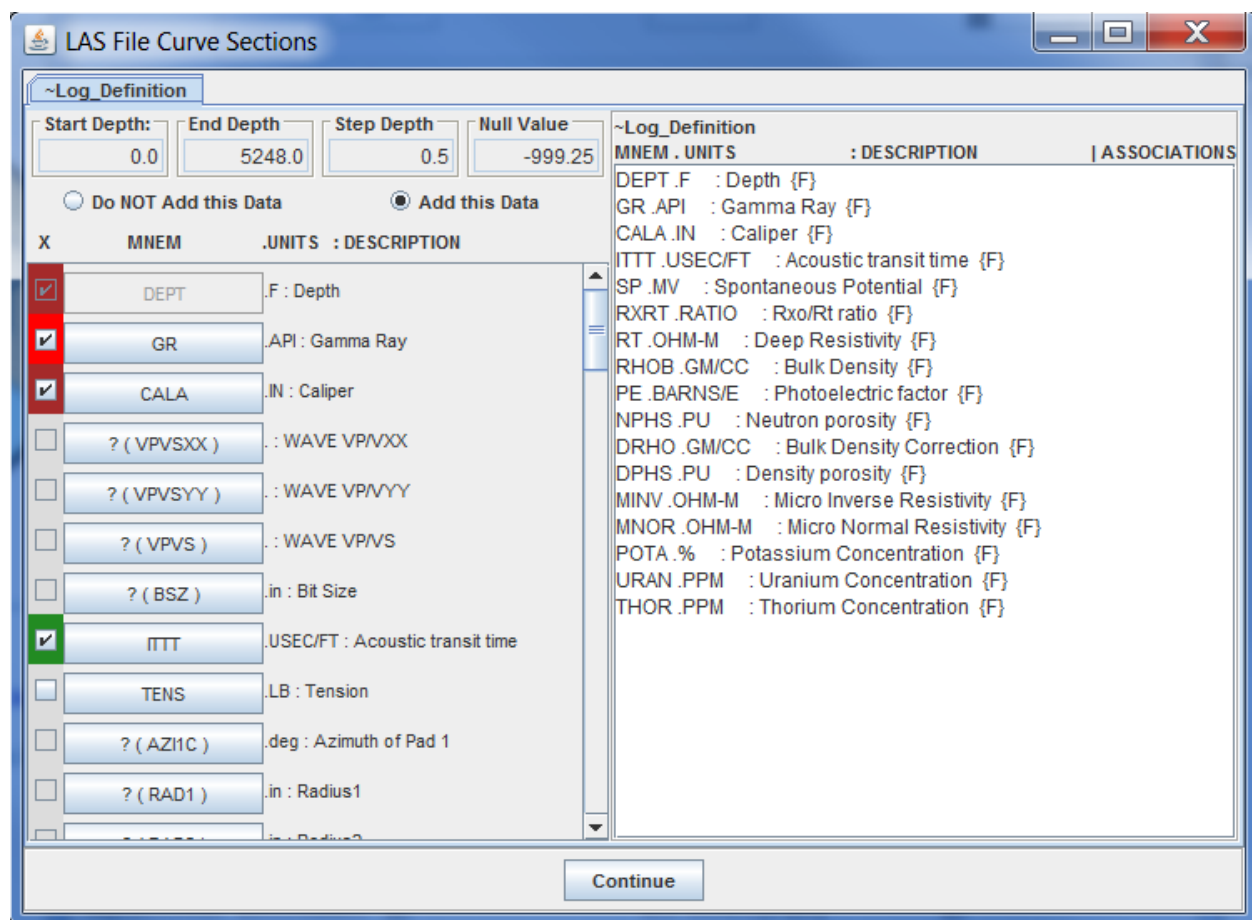
Most of the web apps will use the same input dialogs to import Log ASCII Standard (LAS) version 2.0 or 3.0 files. The Load Data Dialog is basically the same for most of the Web Apps, except they only load a subset of the total data types. In this example a LAS version 2.0 file is being imported into the web app.



Left Click on the “LAS File” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select LAS File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the LAS version 2.0 file Wellington-KGS-1-32.las, highlighted below. Select the Open button to display the “LAS File Curve Sections” Dialog.



The “LAS File Curve Sections” Dialog allows the user to map unknown LAS Curve Mnemonics to the KGS “Standard” Curve Mnemonics so they will be plotted in the LAS File Viewer Plot. This program reads the “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File (http://www.kgs.ku.edu/software/gemini/data/las_standard_tools.xml), which will automatically maps the Curve Mnemonics from the LAS file to one of 31 KGS “Standard” Curve Mnemonics. If a curve Mnemonic is not recognized the program will place a “?” in front of the Mnemonic, e.g. “?(BSZ)” for the “.in : Bit Size” Log Curve. If the user is satisfied with the automatic curve selections, which are checked and color coded, they only need to select the “Continue” Button at the bottom of the Dialog to import the file. The next section will take the user through a series of examples in changing the curve selections and mapping unknown curve mnemonics.



Notice that some of the check boxes are colored with different colors, which shows that the curves were automatically selected, but also to represent the curve type by color. The Curves are colored by type (data units) as follows,

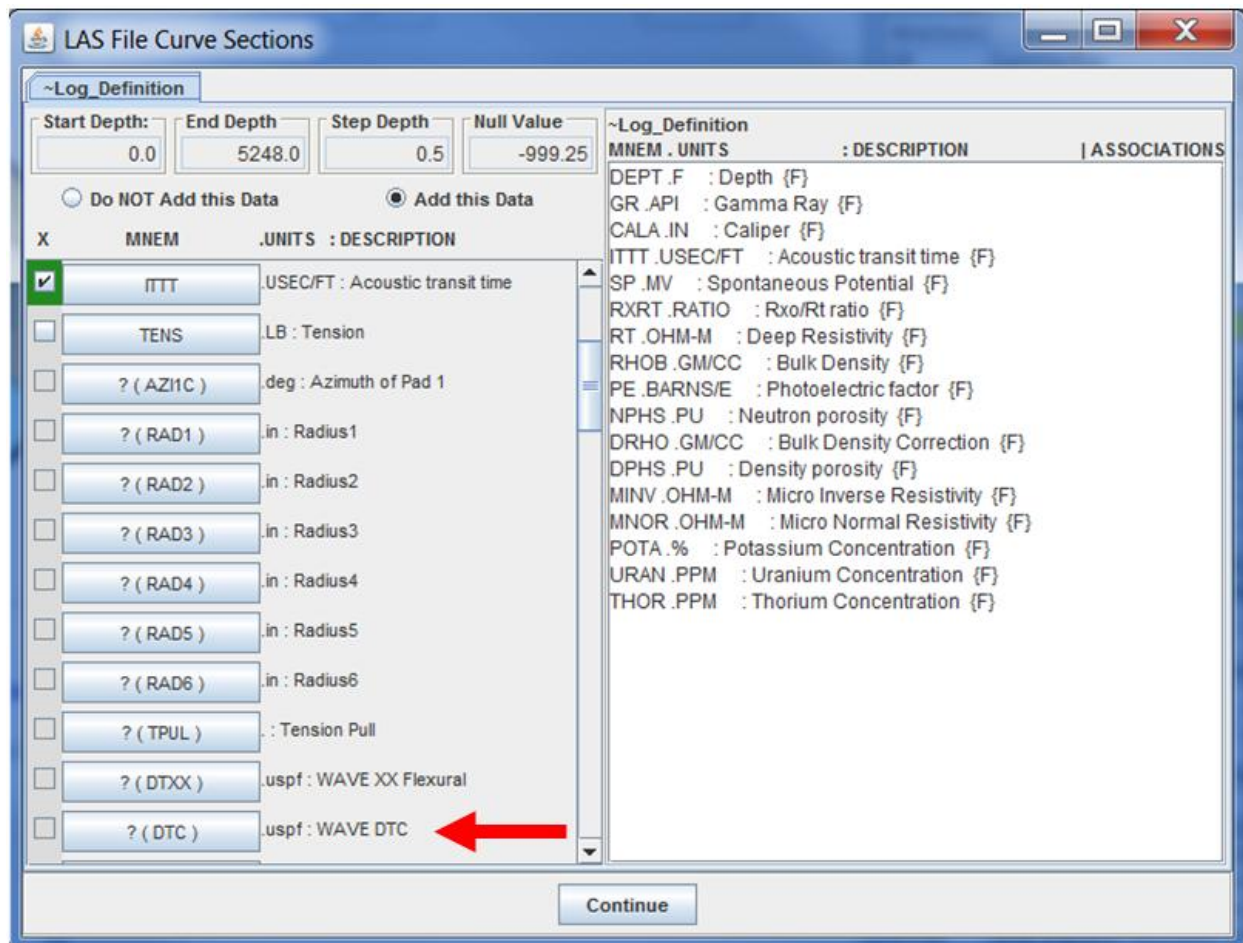
- Orange - OHM-M or Resistivity Logs
- Cyan – PU or porosity Logs, Neutron Porosity, Density Porosity, etc.

- Greenish yellow – BARNS/E or Photoelectric Factor Logs
- Green – GM/CC or Bulk Density Log
- Forest Green – USEC/FT or the Acoustic Transit Time Log
- Red – API, PPM or “%” as Radioactive logs, Gamma Ray, Spectral Gamma Ray, etc.
- Blue – MD or Permeability Logs
- Brown – F, FT or IN or Depth
- Middle yellow – FRAC, or other log curve types.
- Dark Violet – UNI or Unknown Linear Curves
- Medium Violet – UNL or Unknown Logrithum Curves

The color coding of the selected curves were added to also help the user visually recognize that a curve was selected or not.

Map Curves & Change Curve Selections

Some logs will have curve mnemonics that are not recognized as one of the KGS “Standard” Curve Mnemonics. The user will need to map the log curve to one of the KGS standard curves if they want to display the curve. The first example is to map the Acoustic Transit Time (DT), which is labeled as “.uspf : WAVE DTC” log curve in the LAS File. Also notice that the button label “?(DTC)” is not recognized by the LAS FILE VIEWER web app.



Click on the “?(DTC)” Button to display the “Select KGS Standard Tools” Dialog. This dialog provides a list of the KGS “Standard” Curve Mnemonics, from which the user can map an unrecognized log curve to one of the KGS standard curve mnemonics. The KGS “Standard” Curve Mnemonics List was created as a way to standardize the alpha bit soup of Log Mnemonics. Each logging company has their own curve mnemonics to represent similar tools. The LAS File Viewer program is a later version of code from the GEMINI Project LAS File Viewer Module, which needed to standardize the log curves so the curves could be automatically read and assigned a plot track. The “LAS Tool Curve Mnemonics map to KGS Standard Mnemonics” XML File was created to map the log curves from logs that were part of the KGS LAS File Collection which is not a complete list of possible curve mnemonics.

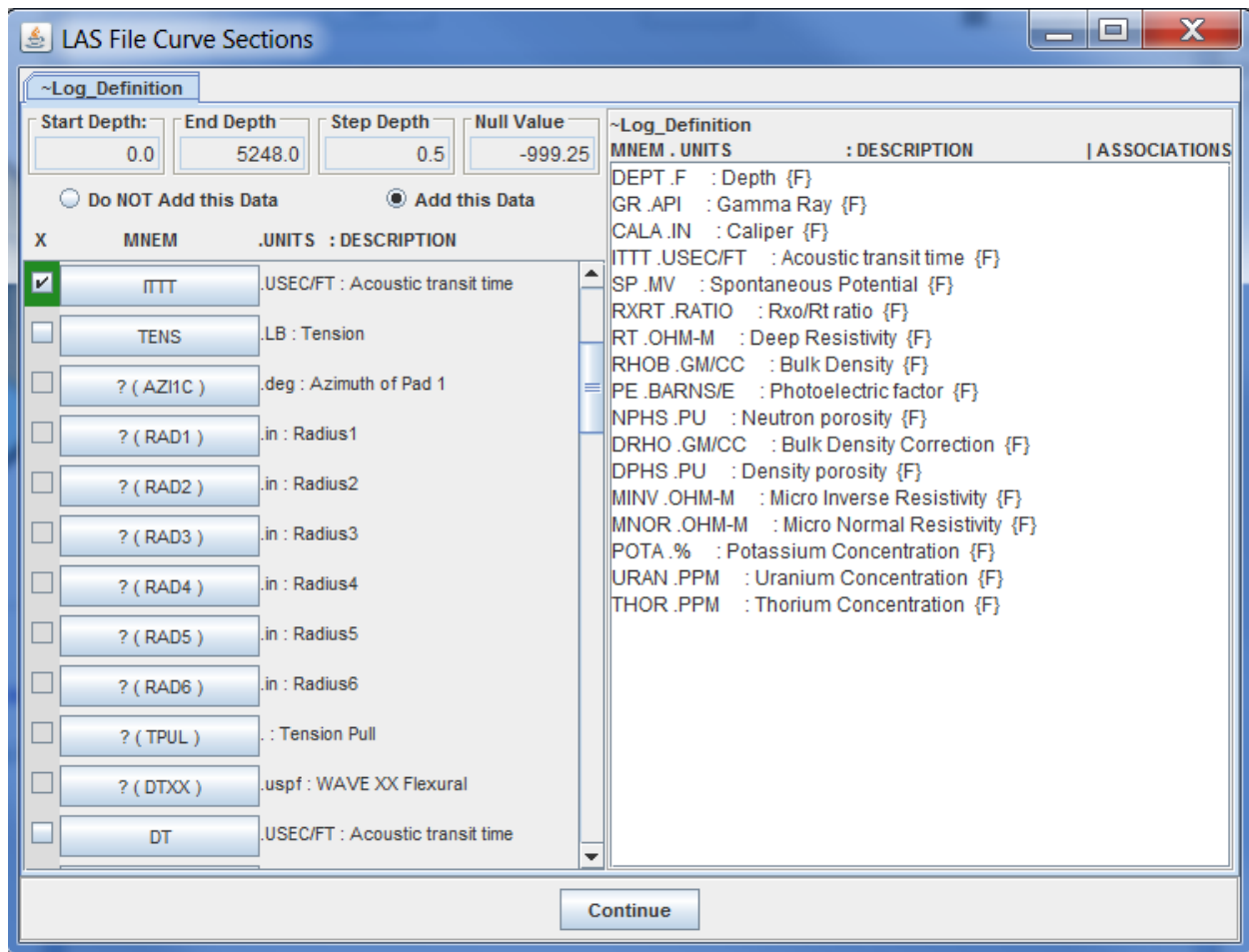
To map the unknown curve mnemonic “?(DTC)” you first notice that the unit is “uspf” (micro seconds per foot) a unit of time. Also the Acoustic Transit Time Curve Mnemonic is similar to the KGS “Standard” Curve Mnemonic “DT”. By selecting the “?(DTC)” Button you will display the “Select KGS Standard Tools” Dialog.

Select KGS Standard Tools

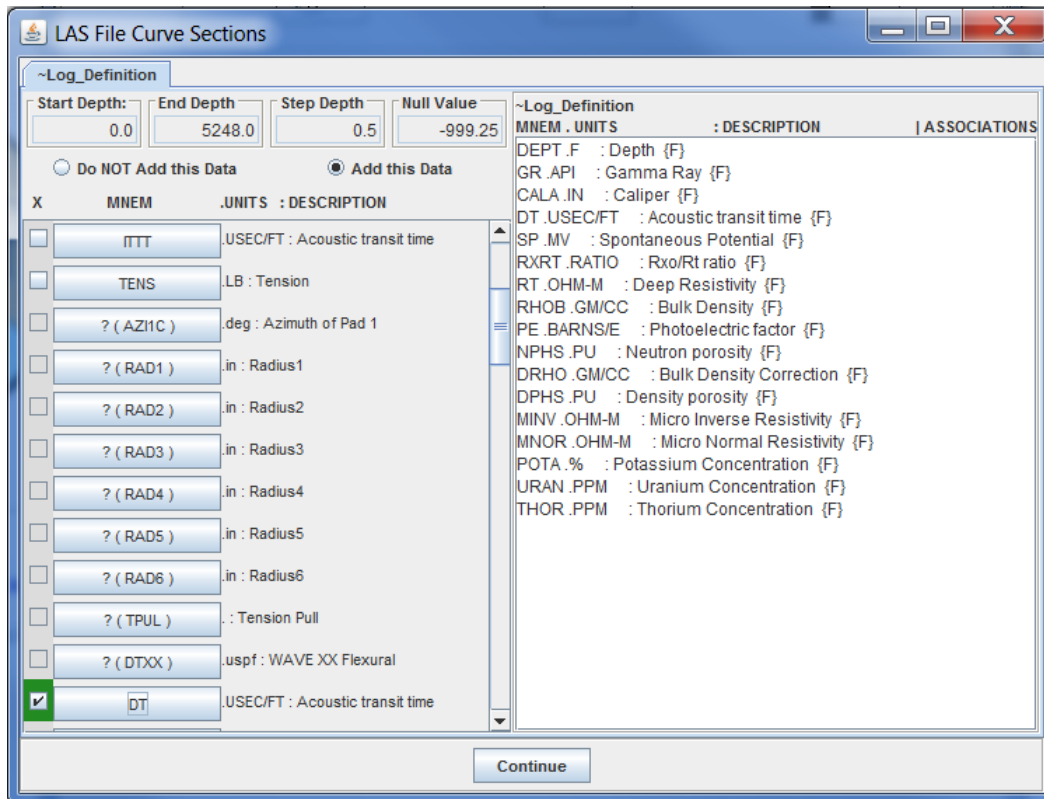
Mnemonic	Description	Units	Minimum	Maximum
GR	Gamma Ray	API	0	150
CGR	Gamma Ray Minus Uranium	API	0	150
SP	Spontaneous Potential	MV	0	1
CAL	Caliper	IN	6	12
PE	Photoelectric factor	BARNs/E	0	20
RHOB	Bulk Density	GM/CC	2	3
DRHO	Bulk Density Correction	GM/CC	-1.5	0.5
DPHI	Density porosity	PU	-0.1	0.3
NPHI	Neutron porosity	PU	-0.1	0.3
SPHI	Sonic porosity	PU	-0.1	0.3
DT	Acoustic transit time	USEC/FT	40	140
COND	Conductivity	MMHO/M	0	2,000
CILD	Deep Induction Conductivity	MMHO/M	0	2,000
CILM	Medium Induction Conductivity	MMHO/M	0	2,000
RES	Resistivity	OHM-M	0.1	1,000
RDEP	Deep Resistivity	OHM-M	0.1	1,000
RMED	Medium Resistivity	OHM-M	0.1	1,000
RSHAL	Shallow Resistivity	OHM-M	0.1	1,000
ILD	Deep Induction Resistivity	OHM-M	0.1	1,000
ILM	Medium Induction Resistivity	OHM-M	0.1	1,000
SFLU	Spherically Focused Resistivity	OHM-M	0.1	1,000
LL	Deep Laterolog Resistivity	OHM-M	0.1	1,000
MLL	Micro Laterolog Resistivity	OHM-M	0.1	1,000
LL8	Shallow Laterolog Resistivity	OHM-M	0.1	1,000
LN	Long Normal Resistivity	OHM-M	0.1	1,000
SN	Shallow Normal Resistivity	OHM-M	0.1	1,000
MNOR	Micro Normal Resistivity	OHM-M	0.1	1,000
MSFL	Micro Spherically Focused Resistivity	OHM-M	0.1	1,000
MINV	Micro Inverse Resistivity	OHM-M	0.1	1,000
AHT10	Array Induction Resistivity-10	OHM-M	0.1	1,000
AHT20	Array Induction Resistivity-20	OHM-M	0.1	1,000
AHT30	Array Induction Resistivity-30	OHM-M	0.1	1,000
AHT60	Array Induction Resistivity-60	OHM-M	0.1	1,000
AHT90	Array Induction Resistivity-90	OHM-M	0.1	1,000
THOR	Thorium Concentration	PPM	-10	30

Select Cancel

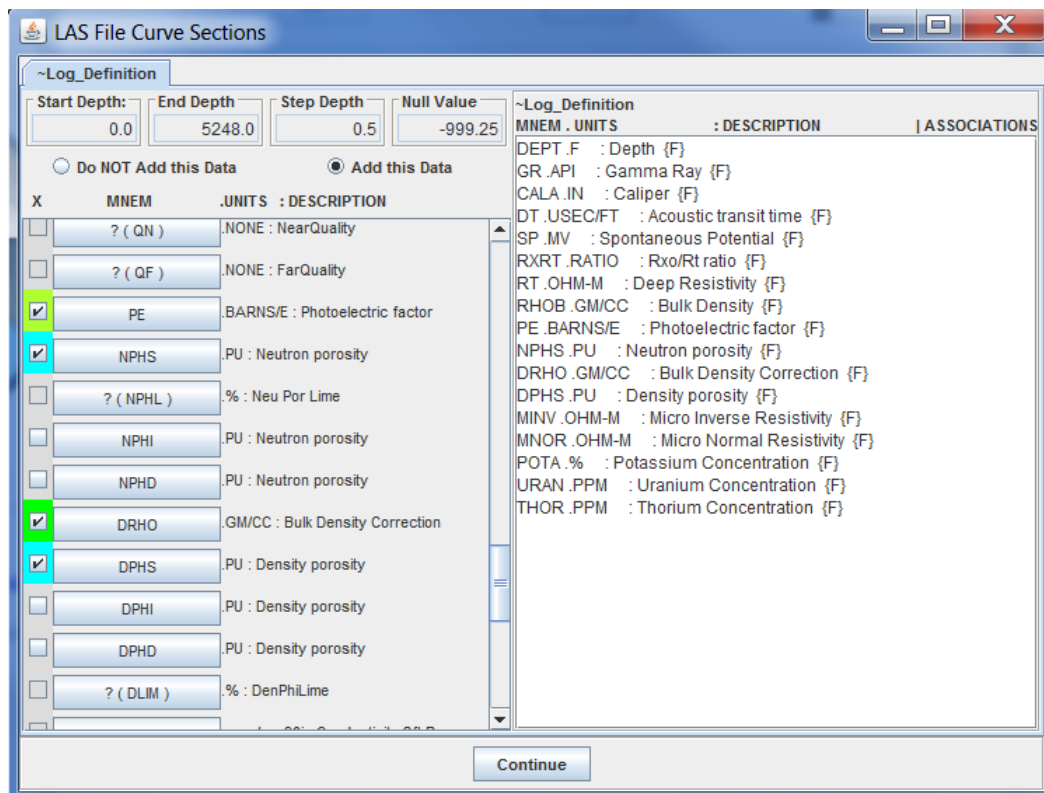
Highlight the “DT” Mnemonic Row and click on the “Select” Button to map the “?(DTC)” Curve Mnemonic to “DT” KGS Standard Curve Mnemonic.



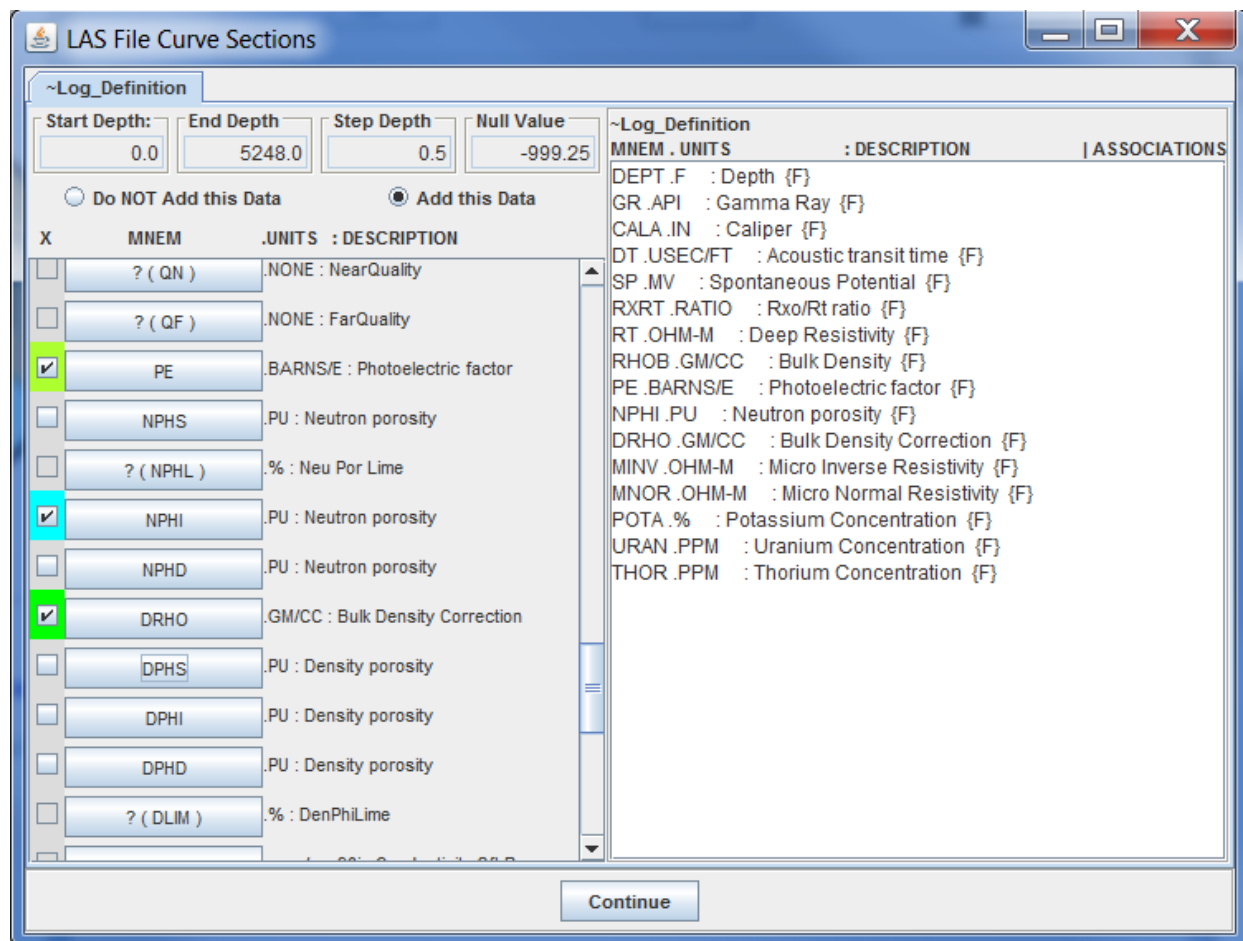
The “?(DTC). uspf : WAVE DTC” has changed to “DT.usc/ft : Acoustic transit time”. We want to change the selected “ITTT” Log Curve to “DT” Log Curve. The reason is that “ITTT” is the wrong curve type for the Acoustic Transit Time. The program found the curve mnemonic as similar to the “DT” Standard Curve Mnemonic, but this curve will not plot correctly in the LAS File Viewer Plot. Just click on the green check box in front of the “ITTT” Mnemonic Button to deselect the curve and then click on the check box in front of the “DT” Mnemonic Button to select it. Also notice that the ~Log_Definition Text Area was modified to show the change.



Moving the scroll bar down to the porosity curves, Neutron Porosity, and Density Porosity.



The LAS File Read will select the first curve that it recognizes and selects and color codes the curve. In this case the Neutron porosity mnemonic selected is “NPHS”, which is a valid curve, but the “NPHI” curve is desired so like the Acoustic Transit Time, you can deselect the “NPHS” and then select the “NPHI” Curve. Also the “DPHS” Density Porosity Curve can be deselected since the “RHOB” Bulk Density Curve has been selected. The reason for deselecting the Density Porosity Curve, if the Bulk Density Curve is present, is to force the LAS FILE VIEWER program to recompute the Density Porosity using a Limestone Matrix. If the Neutron Porosity, Bulk Density, Gamma Ray with/without a Photoelectric Factor Logs are present then the program will automatically compute a Lithology Composition Plot, but the Density Porosity has to be computed with a Limestone Matrix or the Lithology Composition Plot will not be computed correctly.



The above dialog represents the changes made for the neutron/density porosity logs. The last curves to be modified are the Array Induction Logs. Haliburton uses a different curve mnemonic for these logs. Move the scroll bar up to find the Array Induction Logs, RT90, RT60, etc.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	? (RT90)	.ohmm : 90in Resistivity 2ft Res
<input type="checkbox"/>	? (RT60)	.ohmm : 60in Resistivity 2ft Res
<input type="checkbox"/>	? (RT30)	.ohmm : 30in Resistivity 2ft Res
<input type="checkbox"/>	? (RT20)	.ohmm : 20in Resistivity 2ft Res
<input type="checkbox"/>	? (RT10)	.ohmm : 10in Resistivity 2ft Res
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition

MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNS/E	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	

Continue

Like the Acoustic Transit Time the “?(RT90).ohmm: 90in Resistivity 2ft Res” through “?(RT10).ohmm : 10in Resistivity 2ft Res” are not recognized. These curves can be map to the “AHT90 Array Induction Resistivity-90” to “AHT10 Array Induction Resistivity-10” KGS Curves Respectively. Click on the “?(RT90)” Mnemonic Button to display the “Select KGS Standard Tools” Dialog.

Select KGS Standard Tools

Mnemonic	Description	Units	Minimum	Maximum
GR	Gamma Ray	API	0	150
CGR	Gamma Ray Minus Uranium	API	0	150
SP	Spontaneous Potential	MV	0	1
CAL	Caliper	IN	6	12
PE	Photoelectric factor	BARNs/E	0	20
RHOB	Bulk Density	GM/CC	2	3
DRHO	Bulk Density Correction	GM/CC	-1.5	0.5
DPHI	Density porosity	PU	-0.1	0.3
NPHI	Neutron porosity	PU	-0.1	0.3
SPHI	Sonic porosity	PU	-0.1	0.3
DT	Acoustic transit time	USEC/FT	40	140
COND	Conductivity	MMHO/M	0	2,000
CILD	Deep Induction Conductivity	MMHO/M	0	2,000
CILM	Medium Induction Conductivity	MMHO/M	0	2,000
RES	Resistivity	OHM-M	0.1	1,000
RDEP	Deep Resistivity	OHM-M	0.1	1,000
RMED	Medium Resistivity	OHM-M	0.1	1,000
RSHAL	Shallow Resistivity	OHM-M	0.1	1,000
ILD	Deep Induction Resistivity	OHM-M	0.1	1,000
ILM	Medium Induction Resistivity	OHM-M	0.1	1,000
SFLU	Spherically Focused Resistivity	OHM-M	0.1	1,000
LL	Deep Laterolog Resistivity	OHM-M	0.1	1,000
MLL	Micro Laterolog Resistivity	OHM-M	0.1	1,000
LL8	Shallow Laterolog Resistivity	OHM-M	0.1	1,000
LN	Long Normal Resistivity	OHM-M	0.1	1,000
SN	Shallow Normal Resistivity	OHM-M	0.1	1,000
MNOR	Micro Normal Resistivity	OHM-M	0.1	1,000
MSFL	Micro Spherically Focused Resistivity	OHM-M	0.1	1,000
MINV	Micro Inverse Resistivity	OHM-M	0.1	1,000
AHT10	Array Induction Resistivity-10	OHM-M	0.1	1,000
AHT20	Array Induction Resistivity-20	OHM-M	0.1	1,000
AHT30	Array Induction Resistivity-30	OHM-M	0.1	1,000
AHT60	Array Induction Resistivity-60	OHM-M	0.1	1,000
AHT90	Array Induction Resistivity-90	OHM-M	0.1	1,000
THOR	Thorium Concentration	PPM	-10	30

Select Cancel

Highlight the AHT90 and click on the “Select” Button.

LAS File Curve Sections

~Log_Definition

Start Depth: 0.0 End Depth: 5248.0 Step Depth: 0.5 Null Value: -999.25

☐ Do NOT Add this Data ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input checked="" type="checkbox"/>	AHT90	.OHM-M : Array Induction Resistivity-90
<input type="checkbox"/>	? (RT60)	.ohmm : 60in Resistivity 2ft Res
<input type="checkbox"/>	? (RT30)	.ohmm : 30in Resistivity 2ft Res
<input type="checkbox"/>	? (RT20)	.ohmm : 20in Resistivity 2ft Res
<input type="checkbox"/>	? (RT10)	.ohmm : 10in Resistivity 2ft Res
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition

MNEM	.UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT	.F	: Depth {F}	
GR	.API	: Gamma Ray {F}	
CALA	.IN	: Caliper {F}	
DT	.USEC/FT	: Acoustic transit time {F}	
SP	.MV	: Spontaneous Potential {F}	
RXRT	.RATIO	: Rxo/Rt ratio {F}	
AHT90	.OHM-M	: Array Induction Resistivity-90 {F}	
RT	.OHM-M	: Deep Resistivity {F}	
RHOB	.GM/CC	: Bulk Density {F}	
PE	.BARNS/E	: Photoelectric factor {F}	
NPHI	.PU	: Neutron porosity {F}	
DRHO	.GM/CC	: Bulk Density Correction {F}	
MINV	.OHM-M	: Micro Inverse Resistivity {F}	
MNOR	.OHM-M	: Micro Normal Resistivity {F}	
POTA	.%	: Potassium Concentration {F}	
URAN	.PPM	: Uranium Concentration {F}	
THOR	.PPM	: Thorium Concentration {F}	

Continue

The “(?AHT90).ohmm : 90in Resistivity 2ft Res” has changed to “AHT90.OHM-M : Array Induction Resistivity-90” and the orange check box is selected. The rest of the Array Induction Log Curves each are mapped to the respective KGS Mnemonic Curve as follows,

(?RT90).ohmm : 90in Resistivity 2ft Res to AHT90.OHM-M : Array Induction Resistivity-90
 (?RT60).ohmm : 60in Resistivity 2ft Res to AHT60.OHM-M : Array Induction Resistivity-60
 (?RT30).ohmm : 30in Resistivity 2ft Res to AHT30.OHM-M : Array Induction Resistivity-30
 (?RT20).ohmm : 20in Resistivity 2ft Res to AHT20.OHM-M : Array Induction Resistivity-20
 (?RT10).ohmm : 10in Resistivity 2ft Res to AHT10.OHM-M : Array Induction Resistivity-10

LAS File Curve Sections

~Log_Definition

Start Depth:

0.0

End Depth:

5248.0

Step Depth:

0.5

Null Value:

-999.25

☐ Do NOT Add this Data
 ☒ Add this Data

X	MNEM	.UNITS : DESCRIPTION
<input checked="" type="checkbox"/>	SP	.MV : Spontaneous Potential
<input checked="" type="checkbox"/>	RXRT	.RATIO : Rxo/Rt ratio
<input type="checkbox"/>	RXO	.RATIO : Rxo/Rt ratio
<input checked="" type="checkbox"/>	AHT90	.OHM-M : Array Induction Resistivity-90
<input checked="" type="checkbox"/>	AHT60	.OHM-M : Array Induction Resistivity-60
<input checked="" type="checkbox"/>	AHT30	.OHM-M : Array Induction Resistivity-30
<input checked="" type="checkbox"/>	AHT20	.OHM-M : Array Induction Resistivity-20
<input checked="" type="checkbox"/>	AHT10	.OHM-M : Array Induction Resistivity-10
<input checked="" type="checkbox"/>	RT	.OHM-M : Deep Resistivity
<input type="checkbox"/>	? (RMUD)	.ohmm : RMUD
<input checked="" type="checkbox"/>	RHOB	.GM/CC : Bulk Density
<input type="checkbox"/>	? (QN)	.NONE : NearQuality

~Log_Definition


MNEM . UNITS	: DESCRIPTION	| ASSOCIATIONS
DEPT .F	: Depth {F}	
GR .API	: Gamma Ray {F}	
CALA .IN	: Caliper {F}	
DT .USEC/FT	: Acoustic transit time {F}	
SP .MV	: Spontaneous Potential {F}	
RXRT .RATIO	: Rxo/Rt ratio {F}	
AHT90 .OHM-M	: Array Induction Resistivity-90 {F}	
AHT60 .OHM-M	: Array Induction Resistivity-60 {F}	
AHT30 .OHM-M	: Array Induction Resistivity-30 {F}	
AHT20 .OHM-M	: Array Induction Resistivity-20 {F}	
AHT10 .OHM-M	: Array Induction Resistivity-10 {F}	
RT .OHM-M	: Deep Resistivity {F}	
RHOB .GM/CC	: Bulk Density {F}	
PE .BARNSE	: Photoelectric factor {F}	
NPHI .PU	: Neutron porosity {F}	
DRHO .GM/CC	: Bulk Density Correction {F}	
MINV .OHM-M	: Micro Inverse Resistivity {F}	
MNOR .OHM-M	: Micro Normal Resistivity {F}	
POTA .%	: Potassium Concentration {F}	
URAN .PPM	: Uranium Concentration {F}	
THOR .PPM	: Thorium Concentration {F}	



Continue


Select the Continue Button to read and parse the LAS log curves selected into the LAS FILE VIEWER Web App. Notice that the “Data Source Filenames:” Panel lists the LAS version 2.0 File that was just read in as well as the type of data, i.e. Log Data from LAS Data Type.

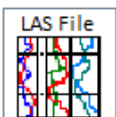
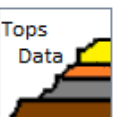


Load Data

Data Source

KGS Data  **KGS (Database & Server)**

Well Data  **Measured Sections** 

PC Data  **PC (ASCII Data Files)**

Ver 2.0 & 3.0  **Tops CSV**  **Rock Data CSV**  **Geologist Report** 

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: [Wellington-KGS-1-32.las](#)

2:

3:

PC ASCII Files:

Tops CSV:

Core CSV:

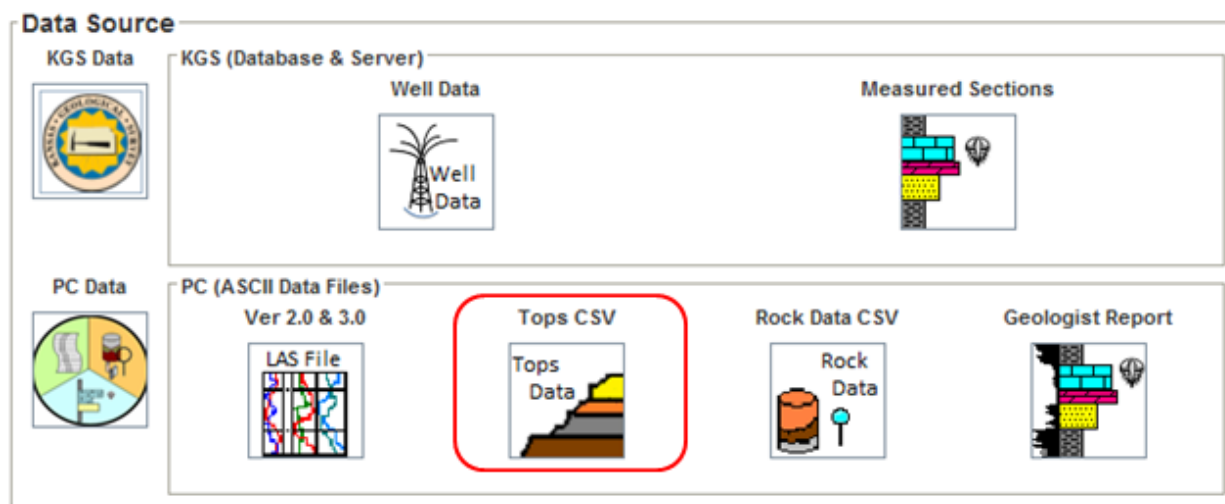
Geo-Report:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	NO	.....	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	NO	.....	.....	.....
Tops Data	NO	.....	.....	.....		

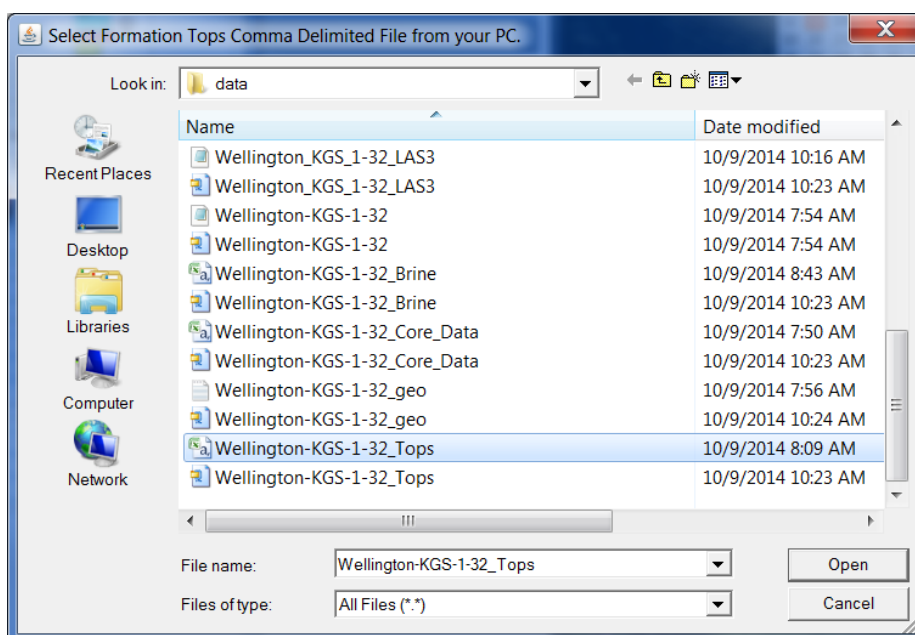
Continue **Clear** **Exit**

Importing PC Data – Tops CSV (Comma Separated Values) File.

Most of the web apps will use the same input dialogs to import tops CSV (Comma Separated Values) file. The Load Data Dialog is basically the same for most of the Web Apps except they only load a subset of the total data types. In this example a Tops CSV file is being imported into the web app.



Left Click on the “Tops Data” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select Formation Tops Comma Delimited File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the Tops CSV file Wellington-KGS-1-32_Tops.csv, highlighted below. Select the Open button to display the “Map File Column Number to Region Column” Dialog.



The “Map File Column Number to Region Column” Dialog allows the user to map the file columns number to the web app tops data structure. In this example the file has the well information in line one of the Tops CSV File and line two of the Tops CSV File has the file data columns. In this case the chosen file columns match the Tops Mnemonics for the tops data structure. The File Column Number is automatically assigned to the Region Column Names. The user only needs to select the “Load Data” Button to parse the Tops Data into the web app.

Map File Column Number to Region Column

1st Line of Comma Delimited File:
Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272

2nd Line of Comma Delimited File:
Top, Name, Rank, System, Subsystem, Series, source

Formation Tops Columns:

Start Reading Data at Row Assume Row & Column Count is 1,2,3 ...

Region Column Name	File Column Number
Depth Top	<input type="text" value="1"/>
Depth Base	<input type="text" value="0"/>
Stratigraphic Unit Rank [SYSTEM, GROUP, etc.]	<input type="text" value="3"/>
Stratigraphic Name	<input type="text" value="2"/>
Alternate Name	<input type="text" value="0"/>
Era	<input type="text" value="0"/>
System	<input type="text" value="4"/>
Subsystem	<input type="text" value="5"/>
Series	<input type="text" value="6"/>
Subseries { Pennsylvanian & Mississippian Series }	<input type="text" value="0"/>
Stage	<input type="text" value="0"/>
Group	<input type="text" value="0"/>
Subgroup	<input type="text" value="0"/>
Formation	<input type="text" value="0"/>
Start Age (Ma)	<input type="text" value="0"/>
End Age (Ma)	<input type="text" value="0"/>

Tops CSV (Comma Separated Values) File Structure.

The Wellington KGS 1-32 Tops CSV example has two introduction lines, the first line is the well header information and the second line is the actual column labels for the tops data, illustrated below,


```

Line 1 Well Header Info Wellington KGS 1-32, 15-191-22591, T31S R1W sec. 32, GL:1259, KB:1272
Line 2 Data Column Labels Top, Name, Rank, System, Subsystem, Series, source
Line 3 Data Start 620, Chase, GROUP, Permian, , Wolfcampian, PG
748, Towanda Limestone, MEMBER, Permian, , Wolfcampian, PG
1595, Wabaunsee, GROUP, Carboniferous, Pennsylvanian, Upper, PG
1622, Root Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1662, Stotler Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1920, Severy Shale, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
1980, Topeka Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
2312, Lecompton Limestone, FORMATION, Carboniferous, Pennsylvanian, Upper, PG
2402, Heebner Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG
2703, Stalnaker Sandstone, BED, Carboniferous, Pennsylvanian, Upper, PG
3039, Kansas City, GROUP, Carboniferous, Pennsylvanian, Upper, PG
3169, Stark Shale, MEMBER, Carboniferous, Pennsylvanian, Upper, PG

```

Figure: Partial Contents of the Wellington-KGS-1-32_Tops.csv File.

The “Map File Column Number to Region Column” Dialog allows the user to map the data in the Tops CSV File to the web app data structure variables. The program first reads the first and second line of the CSV File looking for the data column headers. The lines are each parsed to single out the data column headers and to match those headers to the tops data structure. The program then assigns the column number to the Region Column Name starting at column 1,2,3, ... if the file column name used matches the expected region column name. The Column Names matrix used to parse the file column variables are listed below,

Depth Top	Top	Start
Depth Base	Base	End
Stratigraphic Unit Rank [SYSTEM, GROUP, etc.]	Rank	
Stratigraphic Name	Name	
Alternate Name	Alt Name	
Era		
System	Sys	
Subsystem	subsys	
Series	Ser	
Subseries { Pennsylvanian & Mississippian Series }	Subseries	Subser
Stage	Stg	
Group	Grp	
Subgroup	subgrp	
Formation	Form	
Start Age (Ma)	Start Age	
End Age (Ma)	End Age	

The Wellington KGS 1-32 Tops CSV File example above line 2 has only the Top, Tops Name, Rank, System, Subsystem, Series and Source as the column name variables. The program was able to map each of the column headers to the tops data structure, except Source, i.e.

Column	File Column Label	Tops Data Name
1	Top	Depth Top
2	Name	Stratigraphic Name
3	Rank	Stratigraphic Unit Rank
4	System	System
5	Subsystem	Subsystem
6	Series	Series
7	Source	

When the user selects the “Load Data” Button on the “Map File Column Number to Region Column” Dialog the data is parsed into the LAS File Viewer Program, where the Tops CSV file name is entered into the “PC ASCII Files:” Panel as well as the data type source.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data Measured Sections

PC Data PC (ASCII Data Files) Ver 2.0 & 3.0

LAS File Tops CSV Rock Data CSV Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Core CSV:

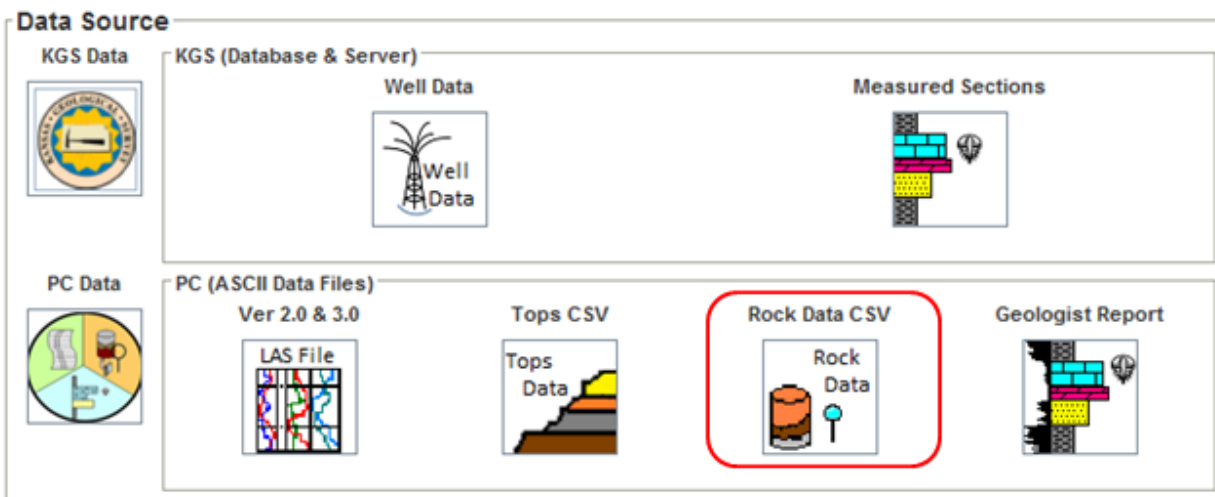
Geo-Report:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	NO	.....	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	NO	.....	.....	.....
Tops Data	.....	.....	YES	.....				

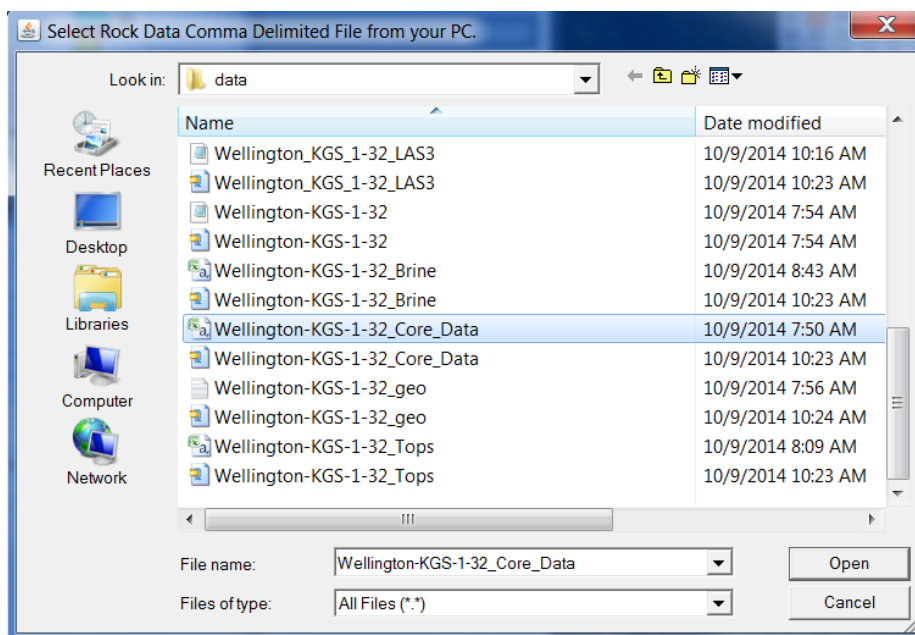
Continue Clear Exit

Importing PC Data – Core CSV (Comma Separated Values) File.

Most of the web apps will use the same input dialogs to import Core Data CSV (Comma Separated Values) file. The Load Data Dialog is basically the same for most of the Web Apps, except they only load a subset of the total data types. In this example a Core Data CSV file is being imported into the web app.



Left Click on the “Rock Data” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select Rock Data Comma Delimited File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the Core CSV file Wellington-KGS-1-32_Core_Data.csv, highlighted below. Select the Open button to display the “Map File Column Number to Rock Column” Dialog.



Map File Column Number to Rock Data Column

1st Line of Comma Delimited File:
 KANSAS GEOLOGICAL SURVEY,FILE NO. : HH-50406,,WELLINGTON-KGS-No. 1-32,FIELD :
 WELLINGTON,"DATE : August 12, 2011","SUMNER COUNTY, KANSAS","ANALYSTS : WH, SB,
 JR",

2nd Line of Comma Delimited File:
 NO,TOP,-,BASE,KMAX,K90,KVRT,GMCC,PCORE,SW,SOIL

Rock Data Columns:

Start Reading Data at Row Assume Row & Column Count is 1,2,3 ...

Rock Data Column Name	File Column Number
Depth Top	<input type="text" value="2"/>
Depth Bottom	<input type="text" value="4"/>
Depth Correction	<input type="text" value="0"/>
Stratigraphic Unit	<input type="text" value="0"/>
Stratigraphic Name	<input type="text" value="0"/>
Depositional Environment	<input type="text" value="0"/>
Lithofacies	<input type="text" value="0"/>
Whole Core Porosity	<input type="text" value="9"/>
Core Plug Porosity Routine	<input type="text" value="0"/>
Core Plug Porosity 800 PSI	<input type="text" value="0"/>
Core Plug Porosity Insitu	<input type="text" value="0"/>
Effective Rock Porosity	<input type="text" value="0"/>
Whole Core Permeability Maximum	<input type="text" value="5"/>
Whole Core Permeability 90 deg	<input type="text" value="6"/>
Whole Core Permeability Vertical	<input type="text" value="7"/>
Core Plug Permeability Routine	<input type="text" value="0"/>
Core Plug Permeability KL Routine	<input type="text" value="0"/>
Core Plug Permeability Insitu	<input type="text" value="0"/>
Core Plug Permeability KL Insitu	<input type="text" value="0"/>
Core Plug Permeability Vertical	<input type="text" value="0"/>
Oil Saturation	<input type="text" value="11"/>
Water Saturation	<input type="text" value="10"/>
Grain Density (gm/cc)	<input type="text" value="8"/>
Density of Rock Dry (gm/cc)	<input type="text" value="0"/>
Density of Rock Wet (gm/cc)	<input type="text" value="0"/>
Archie Cementation Ambient	<input type="text" value="0"/>
Archie Cementation Insitu	<input type="text" value="0"/>
Archie Saturation Ambient	<input type="text" value="0"/>
Archie Saturation Insitu	<input type="text" value="0"/>
Lithofacies Code	<input type="text" value="0"/>

The “Map File Column Number to Rock Data Column” Dialog allows the user to map the file columns number to the web app tops data structure. In this example the file has the well information in line one of the Core Data CSV File and line two of the Core Data CSV File has the file data columns. In this case the chosen file columns match the Core Mnemonics for the core data structure. The File Column Number is automatically assigned to the Rock Data Column Names. The user only needs to select the “Load Data” Button to parse the Core Data into the web app.

Core Data CSV (Comma Separated Values) File Structure.

The Wellington KGS 1-32 Core Data CSV example has two introduction lines, the first line is the well header information and the second line is the actual column labels for the core data, illustrated below,

```

Line 1 Well Header Info KANSAS GEOLOGICAL SURVEY,FILE NO. : HH-50406,,WELLINGTON-KGS-No. 1-32,FIELD : WELLINGTON,
Line 2 Data Column Labels NO,TOP,-,BASE,KMAX,K90,KVRT,GMCC,PCORE,SW,SOIL
Line 3 Data Start
2-29,3627.55,-,3628.00,0.02,<.01,<.01,2.69,0.3,90.9,0.0
2-39,3638.40,-,3638.90,0.01,<.01,<.01,2.70,0.6,80.5,0.0
3-0,3660.40,-,3660.75,2.00,0.08,2.29,2.62,4.7,82.5,0.0
3-1,3661.70,-,3662.00,2.72,1.74,0.02,2.61,6.8,75.1,0.0
3-2,3662.50,-,3663.00,3.70,2.96,4.55,2.59,11.1,45.5,22.5
3-3,3663.00,-,3663.50,25.36,9.94,29.36,2.60,14.1,41.2,29.2
3-4,3664.30,-,3664.75,12.42,8.97,3.84,2.62,8.0,97.6,0.0
3-5,3665.00,-,3665.60,4.20,3.40,3.38,2.61,7.4,98.6,0.0
3-6,3666.00,-,3666.25,8.64,0.40,<.01,2.58,5.5,46.0,10.7
3-7,3667.20,-,3667.70,6.56,5.97,1.93,2.60,5.8,93.9,0.0
3-8,3668.50,-,3669.00,21.77,10.68,5.78,2.59,12.0,82.4,0.0
3-9,3669.30,-,3669.80,20.30,20.03,10.96,2.60,11.8,70.4,0.0
3-10,3670.00,-,3670.60,64.64,60.27,35.99,2.61,13.1,75.8,0.0
3-11,3671.00,-,3671.50,9.68,8.11,2.41,2.79,19.7,50.2,23.9
3-12,3672.30,-,3672.80,14.08,13.60,7.96,2.77,22.7,48.0,27.1
3-13,3673.40,-,3673.90,13.37,12.95,8.20,2.79,24.3,50.1,24.4
3-14,3674.00,-,3674.50,21.85,21.24,9.30,2.77,22.9,52.8,28.2
3-15,3675.30,-,3675.80,22.31,19.92,11.61,2.78,26.4,58.8,25.2

```

Figure: Partial Contents of the Wellington-KGS-1-32_Core_Data.csv File.

The “Map File Column Number to Rock Data Column” Dialog allows the user to map the data in the Core Data CSV File to the web app data structure variables. The program first reads the first and second line of the CSV File looking for the data column headers. The lines are each parsed to single out the data column headers and to match those headers to the core data structure. The program then assigns the column number to the Rock Data Column Name starting at column 1,2,3, ... if the file column name used matches the expected rock data column name. The Column Names matrix used to parse the file column variables are listed below,

Mnem	Description	Mnem	Description
Depth Data		Density Data	
TOP	Depth Top	GMCC	Grain Density (gm/cc)
BASE	Depth Bottom	RHOD	Density of Rock Dry (gm/cc)
CORR	Depth Correction	RHOW	Density of Rock Wet (gm/cc)
Stratigraphic & Environment Descriptions		Permeability Data	
STU	Stratigraphic Unit	KMAX	Whole Core Permeability Maximum
STN	Stratigraphic Name	K90	Whole Core Permeability 90 deg
ENV	Depositional Environment	KVRT	Whole Core Permeability Vertical
LITHO	Lithofacies	KPLG	Core Plug Permeability Routine
Porosity Data		KKL	Core Plug Permeability KL Routine
PCORE	Whole Core Porosity	KINSI	Core Plug Permeability Insitu
PPLUG	Core Plug Porosity Routine	KKLIN	Core Plug Permeability KL Insitu
P800	Core Plug Porosity 800 PSI	KPVRT	Core Plug Permeability Vertical
PINSI	Core Plug Porosity Insitu	Archie Constants	
PEFF	Effective Rock Porosity	MAMB	Archie Cementation Ambient
Saturation Data		MINSI	Archie Cementation Insitu
SOIL	Oil Saturation	NAMB	Archie Saturation Ambient
SW	Water Saturation	NINSI	Archie Saturation Insitu

Mnem	Description	Mnem	Description
Radioactive Data		Computed Data Types	
GR	Gamma Ray	COMPUTED	Th/U Thorium/Uranium Ratio
CGR	Gamma Ray Minus Uranium	COMPUTED	Th/K Thorium/Potassium Ratio
PGR	Pseudo Gamma Ray	COMPUTED	Gamma Ray
THOR	Thorium Concentration	COMPUTED	Grain Density (gm/cc)
URAN	Uranium Concentration	COMPUTED	Porosity
Unknown Linear Data		Unknown Log Data	
LIN_1	Linear Track Curve 1	LOG_1	Semilog Track Curve 1
LIN_2	Linear Track Curve 2	LOG_2	Semilog Track Curve 2
LIN_3	Linear Track Curve 3	LOG_3	Semilog Track Curve 3
LIN_4	Linear Track Curve 4	LOG_4	Semilog Track Curve 4

The Wellington KGS 1-32 Core Data CSV File example above line 2 has only the Top, Base KMAX, K90, KVRT, GMCC, PCORE, SW and SOIL as the column name variables. The program was able to map each of the column headers to the core data structure, i.e.

Column	File Column Label	Core Data Name
1	NO	
2	TOP	Depth Top
3	-	
4	BASE	Depth Bottom
5	KMAX	Whole Core Permeability Maximum
6	K90	Whole Core Permeability 90 deg
7	KVRT	Whole Core Permeability Vertical
8	GMCC	Grain Density (gm/cc)
9	PCORE	Whole Core Porosity
10	SW	Water Saturation
11	SOIL	Oil Saturation

When the user selects the “Load Data” Button on the “Map File Column Number to Rock Data Column” Dialog the data is parsed into the LAS File Viewer Program, where the Core Data CSV file name is entered into the “PC ASCII Files:” Panel as well as the data type source.

Load Data

Data Source

KGS Data KGS (Database & Server)

Well Data Measured Sections

PC Data PC (ASCII Data Files)

Ver 2.0 & 3.0 Tops CSV Rock Data CSV Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Core CSV: Wellington-KGS-1-32_Core_Data.csv

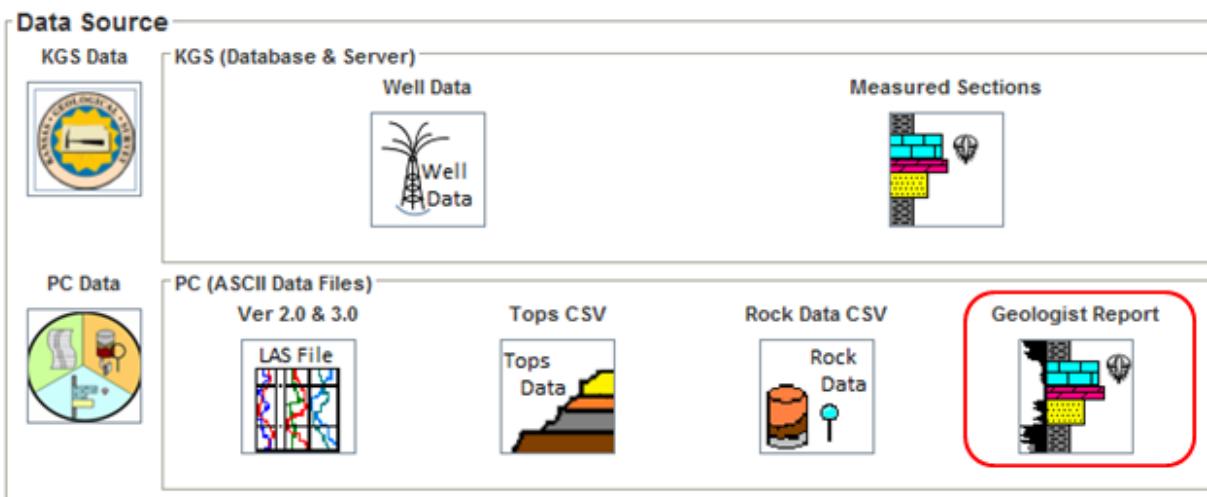
Geo-Report:

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	.....	YES	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	NO	.....	.....	.....
Tops Data	.....	YES	.....	.....			

Continue Clear Exit

Importing PC Data – Geologist Report (Cuttings/Core Descriptions, Measured Sections) ASCII Delimited File.

Some of the web apps will use the same input dialogs to import Geologist Report ASCII Delimited file. The Load Data Dialog is basically the same for most of the Web Apps, except they only load a subset of the total data types. In this example a Geologist Report ASCII Delimited file is being imported into the web app.



Left Click on the “Geologist Report” Icon Button in the Data Source Panel of the Load Data Dialog. This will display the “Select Comments/Remarks/Notes Delimited File from your PC” Dialog. This dialog allows the user to search their PC for the file of interest. In this example it is the Geologist Delimited file Wellington-KGS-1-32_geo.txt, highlighted below. Select the Open button to display the “Parse Comments/Remarks/Notes ASCII Text File” Dialog.

The Select Comments/Remarks/Notes Delimited File from your PC Dialog allows the user to import the geologist report into the web app. The data is parsed into the one of number of rock description data structures, i.e. Rock Color, Rock Lithology, Porosity, Sedimentary Structure, and General Fossils.

There are two sections to this dialog the Top controls how the depth data is found and interpreted. The “User defined” Depth assumes that the first two columns will be the start and stop depth followed by the text as this example below shows. The “Bedding Thickness” Depth assumes that there is one depth with the description. The user should take care to use a delimiter that does not appear in the description if the bedding thickness follows the bed descriptions.

The “Delimiters, i.e. ,;:()” text field has default ‘,’ by default, which for the example below, showed be changed to ‘;’ to match the depth data separation delimiter shown. And the “Start at Row” text field should be changed to 6 since the data starts at line 6. The default depth is in feet, but it is possible that a measured section would be measured in inches, note this setting is for all depths in the file. This panel allows the user to see all the data and to edit the Depth Delimiter,

Starting point of the Data and Bedding Depth Start text fields to match the data and then select the “Parse Data” to parse the text into the rock data structures.

Parse Comments/Remarks/Notes ASCII Text File

Depth Position By:
☒ User Defined ☐ Bedding Thickness

Start Bedding at: Depth Data Units (will be converted to feet)
☒ Feet ☐ Inch ☐ Meter ☐ Centimeter

Delimiters, i.e., ;:()

Start at Row

Lease: Wellington KGS Well 1-32 (15-191-22591) ; operator: BEREXCO LLC; Field: Wellington
 Location: T31S R1W, Sec. 32 ; NE SW NE NE ; 955 South, 877 West, from NE corner
 Longitude: -97.4423481 ; Latitude: 37.3154639
 County: Sumner
 Total Depth: 3660 ; Elevation: 1259 GL
 2340; 2344; Sh, gy, drk gy, frm
 2344; 2352; LS, tan-buff, f-crypto xln, hard, dns, few pcs of drk frs, chrt.
 2352; 2362; LS, tan, fxl, scrd foss, scrd vuggy por, ns
 2362; 2374; Sh, grn, gy drk gy, grn, silty, pyritic, gy silty, scrd foss
 2374; 2380; LS, buff, fxl, hrd dns, with LS, wht-tan, fxl, chky-sub chalky, dns
 2380; 2394; Sh, grn, lt grn, gy, lt grn, soft, sticky, stringers of gy siltstone
 2394; 2406; LS, tan, f-med xln, scrd foss, sub chalky, hrd with LS, buff, fxl, hrd, dns
 2406; Heebner Shale
 2406; 2418; Sh, blk, carb, firm, pyritic
 2418; 2422; LS, buff, f-med xln, foss, hrd, dns, ns
 2422; 2434; SS, wht-clr, f grn, rdd-sub rdd, calc cement, tight, some clr ss with int xln, & vuggy poro, n
 s, stringers of Siltstone, gy, with LS, wht, fxl, soft, chalky
 2434; 2450; LS, wht-tan, fxl, foss, pp & vuggy poro, ns, LS, wht, fxl, hrd, dns, stylite, stringers of pyrite
 2450; 2462; Sh, grn, gy, grn, silty, pyritic
 2462; 2466; LS, tan, fxl, hrd, scrd vuggy poro, ns
 2466; 2474; Sh, grn, gy, with Siltstone grn
 2474; 2478; LS, buff, f-crypt xln, hrd, dns
 2478; 2488; Sh, gy-drk gy, frm
 2488; 2502; LS, wht-tan, f-med xln, v foss, partly oolit, intxln, omoldic and vuggy poro, ns
 2502; 2520; Sh, gy, drk gy, scrd red, some stringers of grn-gy siltstone
 2520; 2540; Sh, gy, grn, and lt grn, intrbdd with Ls, tan, f-med xln, foss, pp & vuggy poro, ns
 2540; 2558; Sh, gy, drk gy, frm, stringers of lt grn-clr, vf grn SS with calc cement, tight
 2558; 2562; LS, tan-buff, fxl, foss, hrd, dns, some drk fresh, chrt
 2562; 2580; Sh, drk gy, gy, intr bdd with some grn, siltstone
 2580; 2590; Sh, grn, gy scrd red, with clr-lt grn siltstone, pyritic
 2590; 2610; Sh, gy, scrd grn with some intrbdd siltstone
 2610; 2650; Sh, gy, drk gy and scrd grn and red, some pcs of blk sh, gy Sh, with thin lyrs of blk sh, pyritic
 , few pcs of LS, wht, f-med xln, foss, chalky, ns
 2650; 2678; Sh, g, drk gy, AA, some lt grn siltstone
 2680; Iatan Limestone
 2678; 2684; LS, buff-brwn, f-med xln, foss, hrd, dns, ns
 2684; 2686; sh
 2686; 2688; LS, tan, fxl, hrd, dns with gy
 2688; 2691; Sh
 2691; Stalnaker Sandstone
 2691; 2696; SS, wht, clr, lt grn, f grn, calc cement, tight
 2696; 2704; Sh, grn gy, few pcs of blk, hrd, frm
 2704; 2730; SS, wht-clr, f-med grain, sub rdd-ang, poorly srtd, int xln & vuggy poro, partl glauc, some wi
 th wht calc cement, tight, ns
 2730; 2746; SS, wht-clr, f-med grn, ang-sub rdd, int xln and vuggy poro, Sh, grn, lt grn, soft
 2746; 2750; LS, tan, fxl, hrd, dns, scrd foss, ns
 2750; 2778; SS, clr-lt grn, f grn, poorly srtd, tight, with some stringers of gy sh, SS, clr, med grn, well srtd,
 sub rdd-ang, int xln & vugy poro, ns
 2778; 2780; LS, wht, fxl, hrd, dns, scrd foss, sub chalky
 2780; 2808; SS, clr, med grn, rdd-sub rdd, well srtd, int xln poro, partly glauc, ns

Parse Data Close Help

Geologist Report ASCII Delimited File Structure.

By Depth Range:

The Wellington KGS 1-32 Geologist Report Delimited file example has a more relaxed format. The well header information is at the top of the file with as many lines needed. The data starts immediately after the header section. The Geologist Report Example for the Wellington KGS 1-32 well is as follows,

Line 1 to Line 5: Well Header Information	Lease: Wellington KGS Well 1-32 (15-191-22591) ; operator: BEREXCO LLC; Field: Wellington Location: T31S R1W, Sec. 32 ; NE SW NE NE ; 955 South, 877 West, from NE corner Longitude: -97.4423481 ; Latitude: 37.3154639 County: Sumner Total Depth: 3660 ; Elevation: 1259 GL
Line 6 Data Start	2340; 2344; Sh. gy. drk gy. frm 2344; 2352; LS. tan-buff, f-crypto xln, hard, dns, few pcs of drk frs, chrt. 2352; 2362; LS. tan, fxln,scrt foss, scrted vuggy por, ns 2362; 2374; Sh. grn, gy drk gy, grn, silty, pyritic, gy silty, scrted foss 2374; 2380; LS. buff, fxln,hrd dns, with LS, wht-tan,fxln, chky-sub chalky, dns 2380; 2394; Sh. grn, lt gn, gy, lt grn, soft, sticky, stringers of gy siltstone 2394; 2406; LS. tan, f-med xln, scrted foss, sub chalky, hrd with LS, buff, fxln, hrd, dns 2406; Heebner Shale 2406; 2418; Sh. blk, carb, firm, pyritic 2418; 2422; LS. buff, f-med xln, foss, hrd, dns, ns 2422; 2434; SS. wht-clr, f grn, rndd-sub rndd, calc cement, tight, some clr ss with int xln, & vuggy poro, ns. 2434; 2450; LS. wht-tan,fxln,foss,pp & vuggy poro, ns, LS. wht, fxln, hrd, dns, styalite, stringers of pyrite 2450; 2462; Sh. grn, gy, grn, silty, pyritic 2462; 2466; LS. tan, fxln, hrd, scrted vuggy poro, ns 2466; 2474; Sh. grn, gy, with Siltstone grn 2474; 2478; LS. buff, f-crypt xln, hrd, dns 2478; 2488; Sh. gy-drk gy, frm

Figure: Partial contents of the Wellington-KGS-1-32_geo.txt File.

In this example the depth range information is separated by semicolons (;) and is in the front of each description, e.g. “2340; 2344; Sh, gy, dark gy, frm”. The depth range parse engine assumes that there will be two numbers at the beginning of each description. The semicolon is not necessarily unique in the line, but the program expects to find two number fields at the front of the line. The program will separate the description from the depth range using the delimiter ‘;’.

Using an example line from above,

“2340; 2344; Sh, gy, dark gy, frm”

The parse engine will determine which part is the description and which is the depth information. The depths are then cleaned of any other non-numeric characters leaving the numbers, e.g. 2340 and 2344. The parse engine sets the starting depth and ending depths for the description and computes the thickness and adds to the cumulative total depth. The description is parsed later (Lithology, Rock Color, Porosity, Sedimentary Structure, Fossils and Fossil Genera/Species Names) when the user selects the “Parse Data” Button.

By Bedding Thickness:

The next example is a measured section done in Riley County, Kansas, see image below. Only the bedding thickness is available for each layer and is placed at the end of the description in parenthesis, e.g. “Shale, gray, red zone near top (10.8)”. The user must chose the “Bedding Thickness” radio button in the “Depth Position By” Panel for this type of example. The bedding

thickness parse engine assumes that the line can be divided in two strings. In this example the parenthesis is the unique delimiter separating the text from the bedding description. The program will separate the text from the bedding thickness using the delimiter ‘(’. Using the example above,

“Shale, gray, red zone near top (10.8)”

The parse engine will determine which part is the bedding description and which is the bedding thickness. The bedding thickness is then cleaned of any other non-numeric characters leaving the number, e.g. 10.8. The parse engine adds the thickness to the cumulative total depth and sets the starting depth and ending depth of the bed. The description is parsed later (Lithology, Rock Color, Porosity, Sedimentary Structure, and Fossils when the user selects the “Parse Data” Button.

Line 1 Location Information Line 3 Data Start Note the Tops Picks Depth will be grouped with the next valid lithology description.	C S line sec. 10, T. 6 S, R. 7 E. Barneston limestone Feet Florence limestone member Limestone, flinty (15) Matfield shale 62.45 feet Blue Springs shale member 41.15 feet Shale, mostly variegated, gray and platy in upper part (15) Limestone, red soft (1.6) Shale, gray, red zone near top (10.8) Limestone, yellow to gray, massive (1.85) Shale, green (0.4) Limestone, chocolate-color, weathers red (0.5) Shale, upper part green and purple, lower part gray (11) Kinney limestone member Limestone, light-gray massive, earthy in texture (1.3) Wymore shale member Shale, upper part gray, mostly red, lower 5 feet gray (20) Wreford limestone 32.5 feet Schroyer limestone member Limestone, gray, granular to crystalline, porous (2) Shale, gray (3) Limestone, gray flinty (3)
---	---

Figure: Partial contents of the Measured Section in Riley County, Kansas ASCII Text File.

The Measured Section Example can be downloaded from the server to the user’s PC. Note that downloading the file directly, web page will insert HTML into the text and change the structure of the document. The URL Links are as follows,

ASCII Text: http://www.kgs.ku.edu/Gemini/Tools/documentation/C_S_line_S10-T6S-R7E.txt
Zip File: http://www.kgs.ku.edu/Gemini/Tools/documentation/C_S_line_S10-T6S-R7E.zip

When the user selects the “Parse Data” Button on the “Parse Comments/Remarks/Notes ASCII Text File” Dialog the data is parsed into the LAS File Viewer Program, where the Geologist

Report Delimited file name is entered into the “PC ASCII Files:” Panel as well as the data type source.

Load Data

Data Source

KGS Data

KGS (Database & Server)

Well Data

Measured Sections

PC Data

PC (ASCII Data Files)

Ver 2.0 & 3.0

Tops CSV

Rock Data CSV

Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Core CSV: Wellington-KGS-1-32_Core_Data.csv

Geo-Report: Wellington-KGS-1-32_geo.txt

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	.....	YES	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	.....	YES	.....	.....
Tops Data	.....	YES	.....	.....			

Continue Clear Exit

Select the “Continue” Button to create a LAS File Viewer Plot as illustrated below,



C S line Section T: 6S R: 7E S: 10

Latitude: 39.543877 Longitude: -96.634571 Elevation (GL): 1309.0 Depth: 152.0

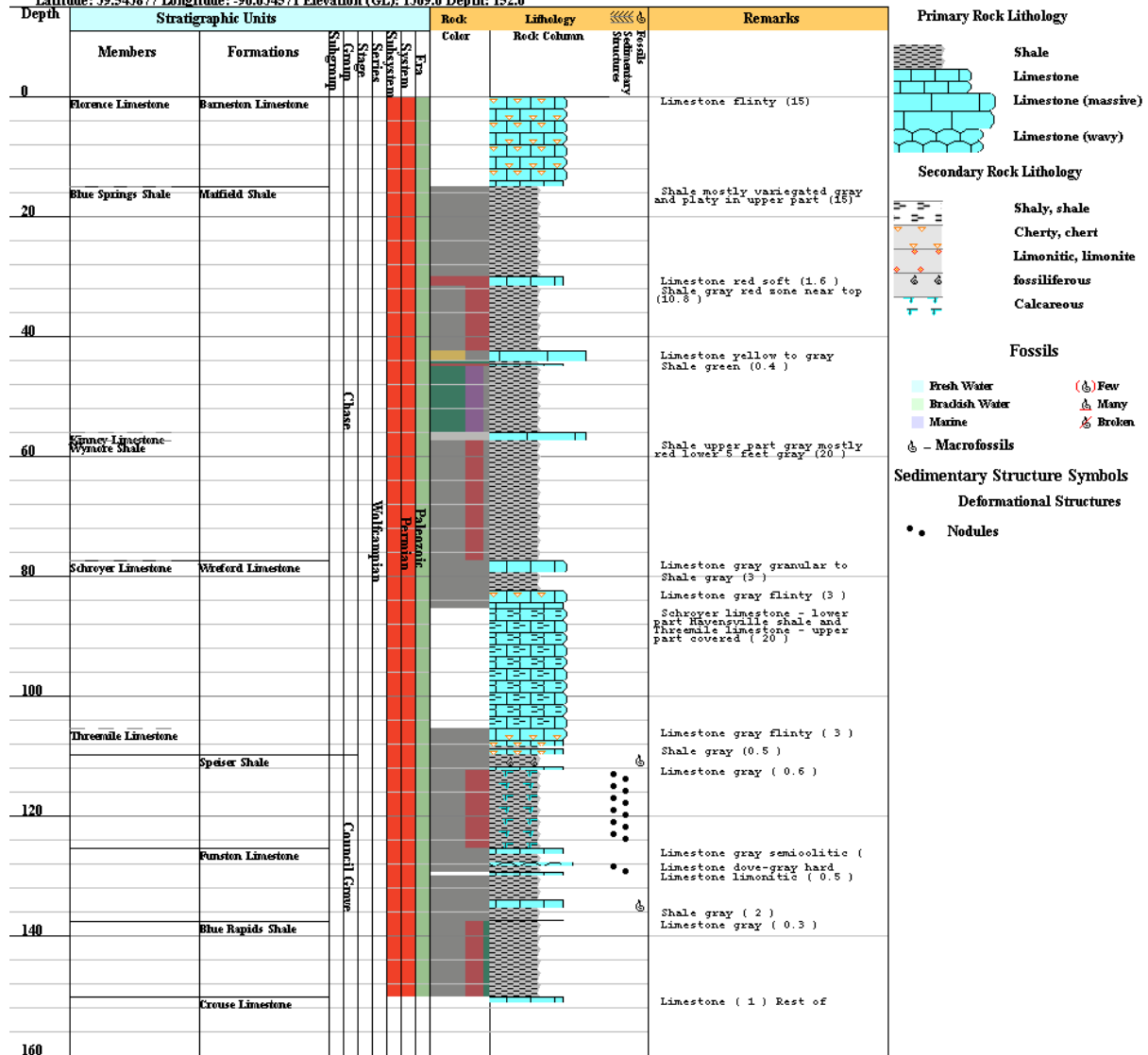


Figure: Measured Section Center Section Line, Township 6S-Range 7E-Section 10, Riley County, Kansas.

LAS File Viewer Plot Control Dialog & Plot

The “Load Data” Dialog is the entry to the LAS File Viewer Plot. The user searches the KGS Database for well data and/or from the User’s PC. The Image below suggests that the well data came from both the user’s PC and the KGS Database. Once the well data is loaded the “Continue” Button at the bottom of this dialog becomes enabled. Click on the “Continue” Button to plot the wells data.

Load Data

Data Source

KGS Data

KGS (Database & Server)

Well Data

Measured Sections

PC Data

PC (ASCII Data Files) Ver 2.0 & 3.0

LAS File

Tops CSV

Rock Data CSV

Geologist Report

Data Loaded

Data Source Filenames:

Log ASCII Standard (LAS) Files:

1: Wellington-KGS-1-32.las

2:

3:

PC ASCII Files:

Tops CSV: Wellington-KGS-1-32_Tops.csv

Core CSV: Wellington-KGS-1-32_Core_Data.csv

Geo-Report: Wellington-KGS-1-32_geo.txt

Data Type	3.0	LAS	CSV	KGS	Data Type	3.0	LAS	CSV	KGS
Log Data	.....	YES	.....	.....	Rock Measured Data	.....	YES	.....	.....
Perforations	NO	.....	.....	.....	Geologist Report	.....	YES	.....	.....
Tops Data	.....	YES	.....	.....			

Continue Clear Exit

The “LAS File Viewer Plot Control” dialog allows the user to change the presentation of the LAS File Viewer Plot, by depth range, by depth scale, by data type, by log type, modify the track curve limits, or add, modify or delete data through data entry dialogs.

Menu Option Buttons

File – Menu Option

The file menu option allows the user to load, save and print well, horizon, rock and geo-report data's into the LAS File Viewer Plot.

Depth Scale – Menu Option

The depth scale menu option allows the user to change the scale (feet / inch) of the LAS File Viewer Plot Data.

Header Information Panel

Displays the header information for the data that is presented. The **“Edit Header Information”** Button allows the user to change that information and to search KGS Database for Well Header Information.

Depth Scale & Range Panel

Displays the selected Depth Scale and allows the user to change the starting & ending depth of the profile plot data.

Change Plot Track Width & Curve Limits

Primary LAS Plot tracks width can be single track width (100 pixels) or expanded track width (200 pixels). The **“Change Plot Limits”** Button will allow the user to change Curve Limits of each plot track by type of data, i.e. all porosity curve data from “-0.1 – 3.0 PU” to “0.0 – 5.0 PU”.

Default Track Order Panel

User is presented with available data track selections. The user has the option to turn on or off data depending on the available data and the desired presentation.

Quick Plot Presentation - Plot Track Type Panel

Allows the user to select plot with Log data and computed colorlith image tracks, log data only or Geologist Report – Cuttings/Core Descriptions.

Quick Plot Presentation - Log Data Type Panel

The Log Data Type Panel allows the user to create quick log plot presentations, i.e. Resistivity button will only display plot tracks associated with the resistivity log data.

User Button presents a table of available plot tracks and allows the user to set the order of the plot tracks.

The Load Data is the primary source for the LAS File Viewer plot, but the LAS File Viewer Plot Dialogs allow the user to add, modify or delete certain well data types, i.e.

- LAS File Viewer Plot Control Dialog
 - Edit Header Information Button – This button will display the “Edit Well Header” Dialog, which allows the user to modify the default well header information from the Log ASCII Standard (LAS) File or the user can search the KGS Well Header Information Database for the well header information of the well.
- LAS File Viewer Plot Dialog – Horizons Plot Tracks
 - Porosity & Resistivity (Conductivity) Colorlith Color Schema Plot Track – The user can left click the mouse on the Porosity & Resistivity (Conductivity) Colorlith Track to change the log curve that will display the colorlith track and the limits to compute the linear color schema plot track.
 - Stratigraphic Units Plot Track – The user can left click the mouse on the stratigraphics units plot track to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Data Entry Panel displayed. This panel assists the user in adding, modifying or deleting tops from the LAS File Viewer plot. This dialog has two buttons to set the Stratigraphic Units for a top, i.e.

- ICS (International Commission on Stratigraphy) Chart Button displays the accepted stratigraphic units.
- 1968 Kansas Chart Button displays the Accepted Kansas stratigraphic units.

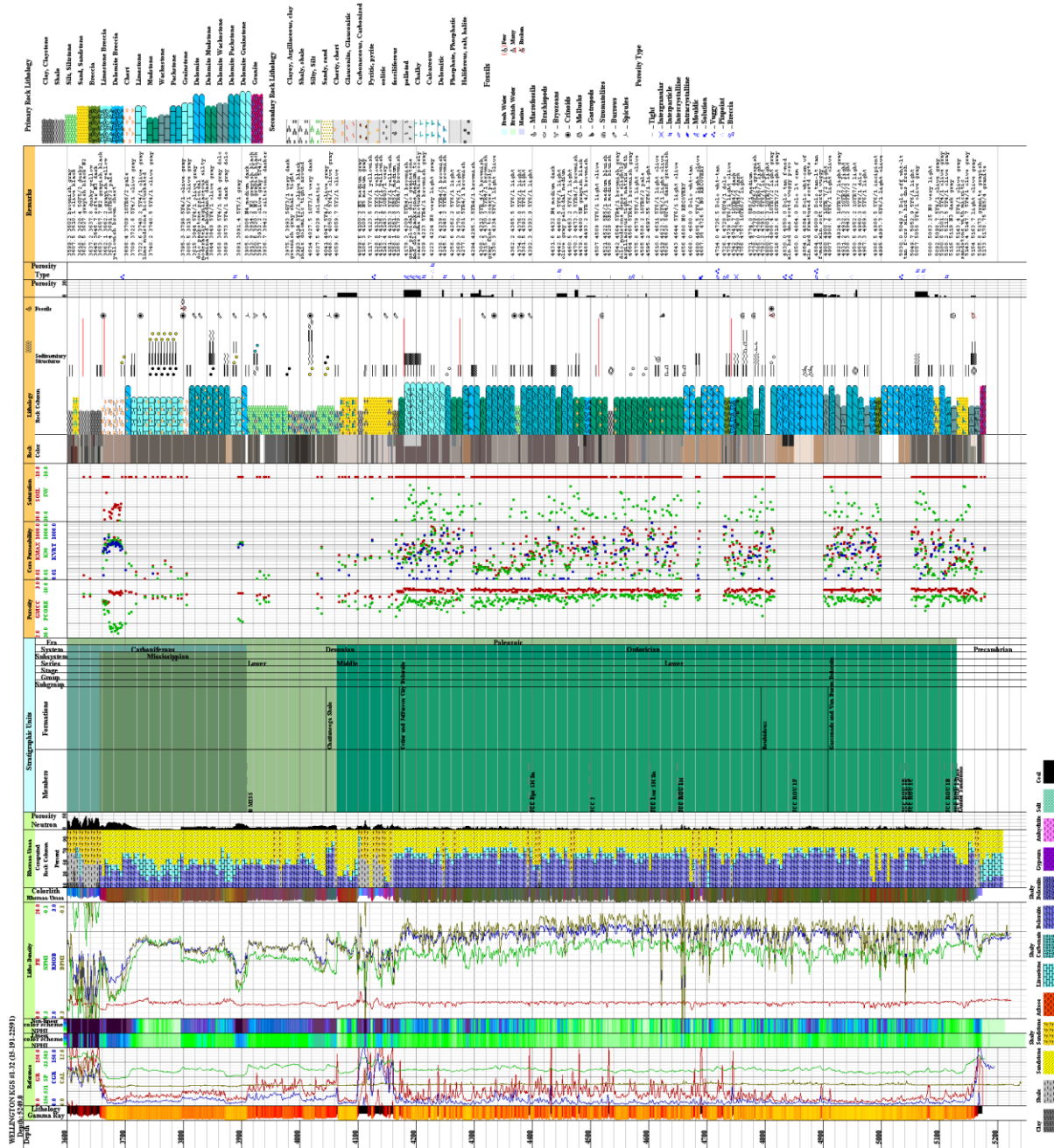


Figure: Wellington KGS 1-32 LAS File Viewer Plot with Log, Tops, Core, and Cuttings/Core Descriptions.

Save Well Data as Log ASCII Standard (LAS) version 3.0 File

The LAS (Log ASCII Standard) is rapidly becoming the accepted industry standard for electronic transmission of digital wire-line logs. Earlier digital formats were commonly coded in binary (such as LIS) and so required specialized software to read them. The LAS standard was introduced by the Canadian Well Logging Society (<http://www.cwls.org/>) in 1989 to standardize the organization of digital log curve information for personal computer users. It did this very successfully and the standard became popular worldwide. Version 1.2 was the first version and was followed in September 1992 by version 2.0 to address some inconsistencies. A more versatile version LAS 3.0 was released in 1999 however at present LAS 2.0 remains the dominant product. LAS 3.0 clarify several of the poorly defined specifications of LAS 2.0 and provide expanded data storage capabilities, but have seen limited implementation.

The GEMINI Tools programs will read either a Log ASCII Standard (LAS) version 2.0 or 3.0 file and version 1.2 but the Well Information Section is backward in data definition and will not be parsed correctly in the GEMINI Tools web apps.

The sections defined for the LAS 2.0 standard are as follows (http://www.cwls.org/wp-content/uploads/2014/09/LAS_20_Update_Jan2014.pdf):

- "**~V**" (also known as "**~VERSION INFORMATION SECTION**") is a required section; has formatting requirements; must be the first section; identifies the version number and whether data is in "wrapped" or "un-wrapped" mode.
- "**~W**" (also known as "**~WELL INFORMATION SECTION**") is a required section; has formatting requirements; is preferably the second section; contains information on the well name, location, and start and stop values of the data in this file.
- "**~C**" (also known as "**~CURVE INFORMATION SECTION**") is a required section; has formatting requirements; contains curve mnemonics and their definitions in the order that they appear in the data section.
- "**~P**" (also known as "**~PARAMETER INFORMATION SECTION**") is an optional section; has formatting requirements; contains information on parameters or constants relevant to the wellbore such as mud resistivity, wire line engineer, truck number, elevation data, etc.
- "**~O**" (also known as "**~OTHER**") is an optional section; has no formatting requirements; contains other information or comments.
- "**~A**" (also known as "**~ASCII LOG DATA**") is a required section; has formatting requirements; is the last section in the file and also referred to as the data section. The index of the data columns is either Depth or Time. The index values always appear in the first column and each column of data must be separated by at least one space (ASCII 32). All values in the ASCII log data section must be floating point or integer (long) values. Other formats such as Text or Exponential values are not supported.

LAS 3.0 (http://www.cwls.org/wp-content/uploads/2014/09/LAS_3_File_Structure.pdf) will be used to save the well data for the GEMINI Tools web apps since it can hold all the well data in one file. You can even think of LAS 2.0 as a subset of LAS 3.0 since the LAS 2.0 is only

concerned with the LOG Data. Note this section includes some of the referenced LAS 3 File Structure PDF; see the above URL for the complete LAS 3.0 File structure.

The **~Version** and **~Well** sections must appear in every LAS 3.0 file as the first and second sections respectively.

Other sections are grouped by data type. Each group consists of two or three sections; a **Parameter Data** section (optional for all but Log data), a **Column Definition** section, and a **Column Data** section, in that order.

For example, core analysis data would have the following three sections:

~Core_Parameter
~Core_Definition
~Core_Data.

At least one group or data type of either the defined LAS 3.0 data types or a user defined type must exist in every LAS 3.0 file.

The **Column Definition** and the **Column Data** sections for each data type are matched sets and must both appear in that order. The corresponding **Parameter Data** section is optional (except for Log data), but if used must appear before the corresponding **Column Definition** Section.

LAS 3.0 defines six specific well related data types and their root Section Title names. They are:

~Ascii or ~Log
~Core
~Inclinometry
~Drilling
~Tops
~Test

Additional data types can be defined by the user and content rules discussed elsewhere in the document may define other section titles.

Stand alone user defined **Parameter Data** sections can be included. Care must be taken to use standalone **Parameter Data** sections only when the data contained does not fit into any of the other defined data types.

When used, the section order of each set of the three sections for each data type must be Parameter, Definition, and then Data.

Blank lines and comment lines can appear within **Column Data** sections, but can only appear BEFORE the first **Column Data** line of that section, or after the LAST **Column Data** line of that section.

The names of each channel can optionally appear above each channel as a comment line immediately before, after or on the section title line of that section if space allows.

Note: Do not use the ~Other section recognized by LAS version 2.0. It is no longer allowed in LAS 3.0. Any data that can be stored in this section must now be stored properly in a user defined **Parameter Data** or **Column Data** section.

The LAS version 3.0 file has the potential to hold all the well data that was collected, i.e. multiple log data files, core data, tops data, DST data, Perforation data, Cuttings Report data, etc. As an example the Newby 2-28R has log, core, tops, perforation data as well as the PfeFFER data created from the log analysis tool, PfeFFER-java. You can view the file at the following URL addresses,

LAS 3.0 Example File: http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington_KGS_1-32_LAS3.las

LAS 3.0 in WinZip File: http://www.kgs.ku.edu/Gemini/Tools/documentation/Wellington_KGS_1-32_LAS3.zip

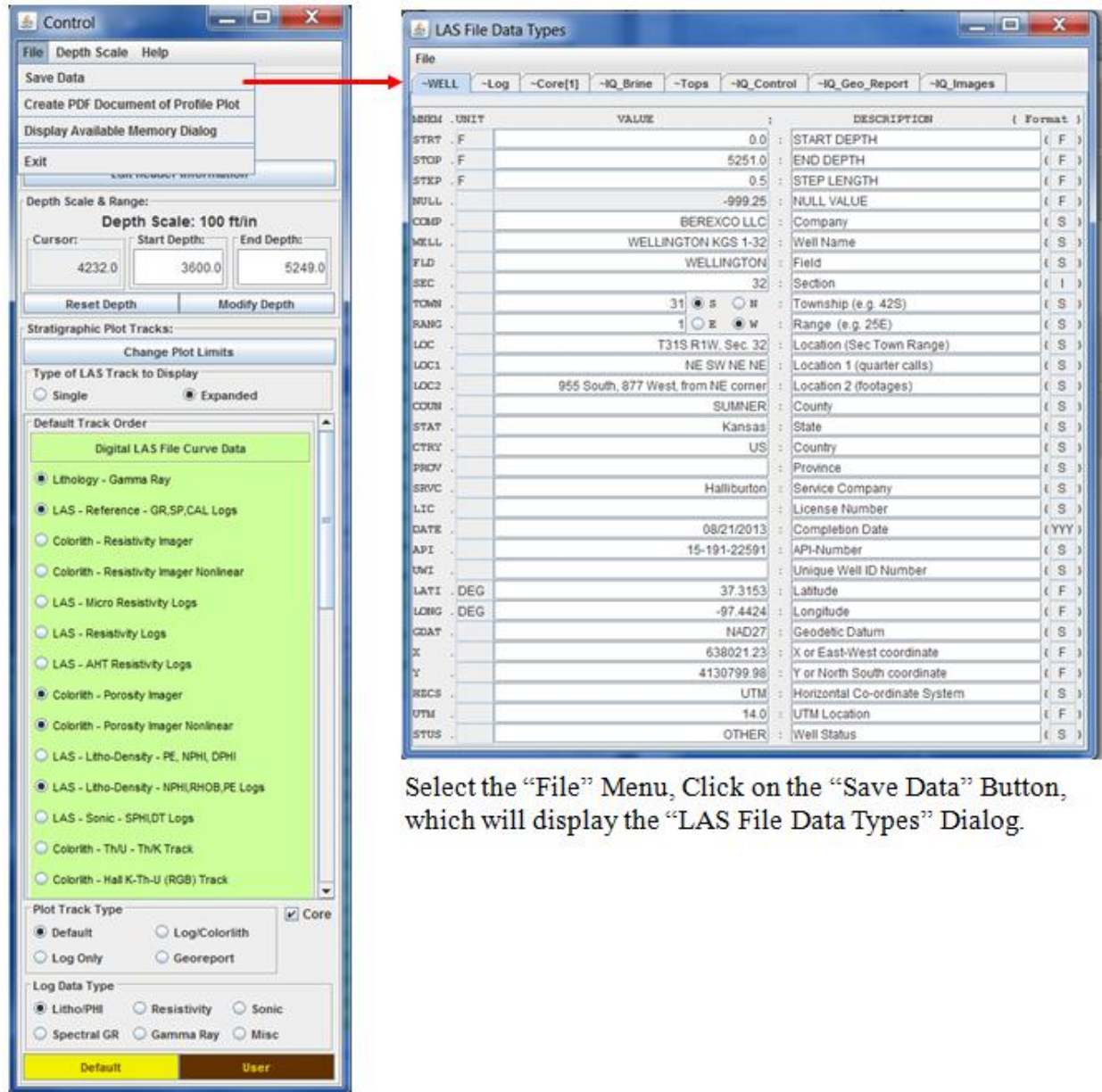
Standard LAS 3.0 Data Sections for the Wellington_KGS_1-32_LAS3.las

- ~Version - Version Section
- ~Well - Well Header Information Section
- ~Log - Log Data Section – for single log data file, see LAS 3.0 PDF reference below for multiple log data runs.
 - ~Parameter
 - ~Curve
 - ~ASCII, which must be the last section in the LAS File if the Log data is present.
- ~Core - Core Data Section
 - ~Core_Parameter
 - ~Core_Definition
 - ~Core_Data | Core_Definition
- ~Tops - Formation Top (Stratigraphic Units) Picks Data Section
 - ~Tops_Parameter
 - ~Tops_Definition
 - ~Tops_Data | Tops_Definition

GEMINI Tools Defined LAS 3.0 Data Sections for the Wellington_KGS_1-32_LAS3.las

- ~IQ_Control - Recreate the LAS File Viewer Plot Data Section
 - ~IQ_Control_Parameter
 - ~IQ_Control_Definition
 - ~IQ_Control_Data | IQ_Control_Definition
- ~IQ_Geo_Report – This data holds the geologist cuttings report/core description
 - ~IQ_Geo_Report_Parameter
 - ~IQ_Geo_Report_Definition
 - ~IQ_Geo_Report | IQ_Geo_Report_Definition
- ~IQ_Images – This data holds the file location of Core Image JPEG images.
 - ~IQ_Images_Parameter
 - ~IQ_Images_Definition
 - ~IQ_Images | IQ_Images_Definition
- ~IQ_Brine – This data holds the measured brine data.
 - ~IQ_Brine_Parameter

- ~ IQ_Brine_Definition
- ~ IQ_Brine | IQ_Brine_Definition
- ~IQ_Las_Parameter - Selected LAS Curves – This Parameter Section was designed to remember the Log Curves selected by the user so the user does not have to map LAS File Curve Mnemonics to KGS Standard Tool Mnemonics when they run this file with other GEMINI Tools.



Select the "File" Menu, Click on the "Save Data" Button, which will display the "LAS File Data Types" Dialog.

The Tabs at the top identifies the data that will be saved to the Log ASCII Standard (LAS) version 3.0 File. This example saves the well info, log data, core data, brine data, tops data, LAS File Viewer plot control data, cuttings/core description and core image file locations on the KGS Server. The "LAS File Data Types" Dialog allows the user to modify the well header data that is being saved to the LAS version 3.0 file. Also noted in the two images are identified "required"

fields for a valid LAS file. The GEMINI Tools Web Apps doesn't care that the LAS file is not valid, just that the data follows the basic rules for the well data sections in the LAS 3.0 file.

LAS File Data Types

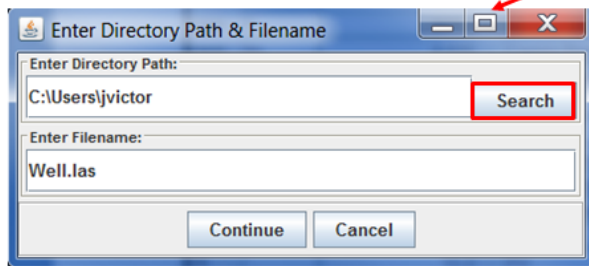
File

~WELL ~Log ~Core[1] ~IQ_Brine ~Tops ~IQ_Control ~IQ_Geo_Report ~IQ_Images

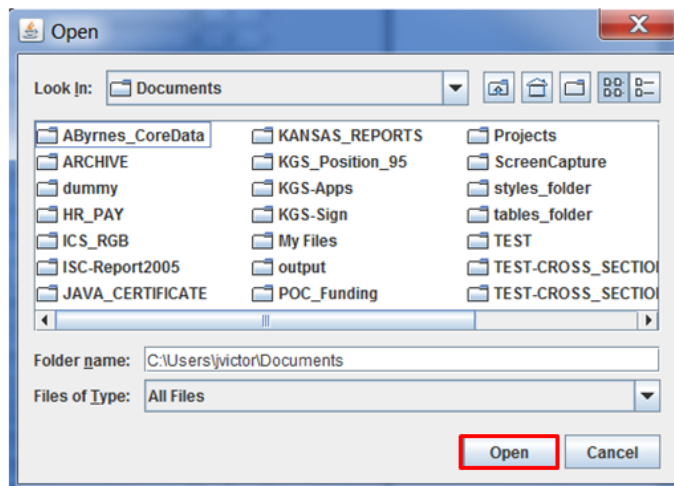
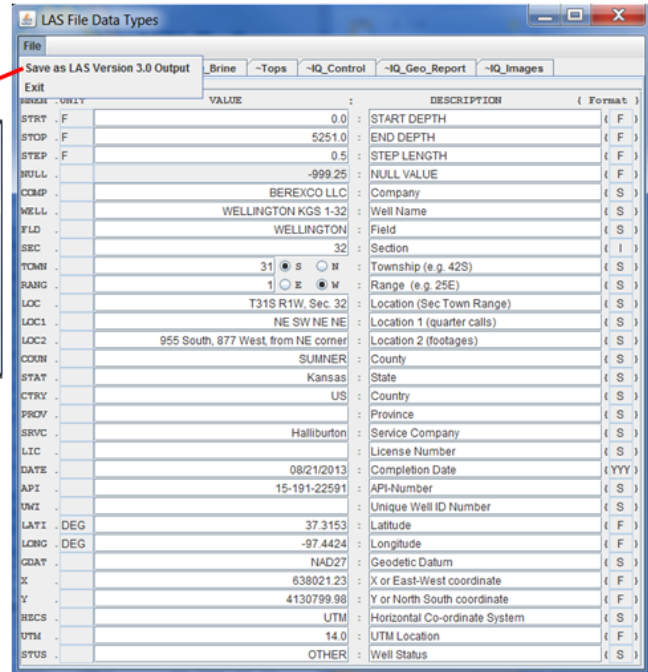
MNEM	UNIT	VALUE	:	DESCRIPTION	{ Format }
STRT	F	Required 0.0	:	START DEPTH	{ F }
STOP	F	Required 5251.0	:	END DEPTH	{ F }
STEP	F	Required 0.5	:	STEP LENGTH	{ F }
NULL		Required -999.25	:	NULL VALUE	{ F }
COMP		BEREXCO LLC	:	Company	{ S }
WELL		WELLINGTON KGS 1-32	:	Well Name	{ S }
FLD		WELLINGTON	:	Field	{ S }
SEC		32	:	Section	{ I }
TOWN		31 <input checked="" type="radio"/> S <input type="radio"/> N	:	Township (e.g. 42S)	{ S }
RANG		1 <input type="radio"/> E <input checked="" type="radio"/> W	:	Range (e.g. 25E)	{ S }
LOC		T31S R1W, Sec. 32	:	Location (Sec Town Range)	{ S }
LOC1		NE SW NE NE	:	Location 1 (quarter calls)	{ S }
LOC2		955 South, 877 West, from NE corner	:	Location 2 (footages)	{ S }
COUN		SUMNER	:	County	{ S }
STAT		Required for US Kansas	:	State	{ S }
CTRY		Required for US US	:	Country	{ S }
PROV		Required for CANADA	:	Province	{ S }
SRVC		Halliburton	:	Service Company	{ S }
LIC			:	License Number	{ S }
DATE		08/21/2013	:	Completion Date	{ YYYY }
API		Required for US 15-191-22591	:	API-Number	{ S }
UWI		Required for CANADA	:	Unique Well ID Number	{ S }
LATI	DEG	Lat/Long Required 37.3153	:	Latitude	{ F }
LONG	DEG	-97.4424	:	Longitude	{ F }
GDAT		NAD27	:	Geodetic Datum	{ S }
X		or X/Y Required 638021.23	:	X or East-West coordinate	{ F }
Y		4130799.98	:	Y or North South coordinate	{ F }
HZCS		UTM	:	Horizontal Co-ordinate System	{ S }
UTM		14.0	:	UTM Location	{ F }
STUS		OTHER	:	Well Status	{ S }

~Log_Parameters						
MNEM		UNIT	VALUE	:	DESCRIPTION	{ Format } | Association
PDAT		Required	GL	:	Permanent Data	{ S }
APD	F	Required	13.0	:	Above Permanent Data	{ F }
DREF		Required	KB	:	Depth Reference (KB,DF,CB)	{ S }
EREF	F	Required	1272.0	:	Elevation of Depth Reference	{ F }
RUN		Required	1	:	Run Number	{ F }
TDL	F		5240.0	:	Total Depth Logger	{ F }
TDD	F		5240.0	:	Total Depth Driller	{ F }
CSGL	F		607.0	:	Casing Bottom Logger	{ F }
CSGD	F		607.0	:	Casing Bottom Driller	{ F }
CSGS	IN		8.625	:	Casing Size	{ F }
CSGW	LB			:	Casing Weight	{ F }
BS	IN		7.875	:	Bit Size	{ F }
MUD		Water Based Mud		:	Mud type	{ S }
MUDS		Flow Line		:	Mud Source	{ S }
MUDD	gm/cc		9.0	:	Mud Density	{ F }
MUDV	s/qt		48.0	:	Mud Viscosity (Funnel)	{ F }
FL	cc		9.2	:	Fluid Loss	{ F }
PH			10.0	:	PH	{ F }
RM	OHM-M		0.65	:	Resistivity of Mud	{ F }
RMT	DEG-F		58.0	:	Temperature of Mud	{ F }
RMF	OHM-M		0.55	:	Resistivity. of Mud Filtrate	{ F }
RMFT	DEG-F		58.0	:	Temperature of Mud Filtrate	{ F }
RMC	OHM-M		0.75	:	Resistivity of Mud Cake	{ F }
RMCT	DEG-F		58.0	:	Temperature of Mud Cake	{ F }
TMAX	DEG-F		125.0	:	Maximum Recorded Temp.	{ F }
TIMC	DATE			:	Date/Time Circulation Stopped	{ D/M/YYYY }
TIML	DATE		02/09/2011	:	Date/Time Logger Tagged Bottom	{ M/YYYY }
UNIT			10546696	:	Logging Unit Number	{ F }
BASE			Liberal, KS	:	Home Base of Logging Unit	{ S }
ENG			J.Bosh	:	Recording Engineer	{ S }
WIT			L.Watney	:	Witnessed By	{ S }

Select the “File” Menu, Click on the “Save as LAS Version 3.0 Output” Button, which will display the “Enter Directory Path & Filename” Dialog.

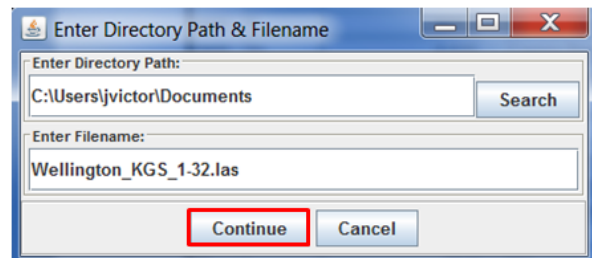


Select the “Search” Button to display the “Open” Dialog to search through the PC for the directory to save the Log ASCII Standard (LAS) version 3.0 File.



Search the PC for the directory that the LAS version 3.0 File will be saved to. Select “Open” Button to transfer the Directory path to the “Enter Directory Path” text field in the “Enter Directory Path & Filename” Dialog.

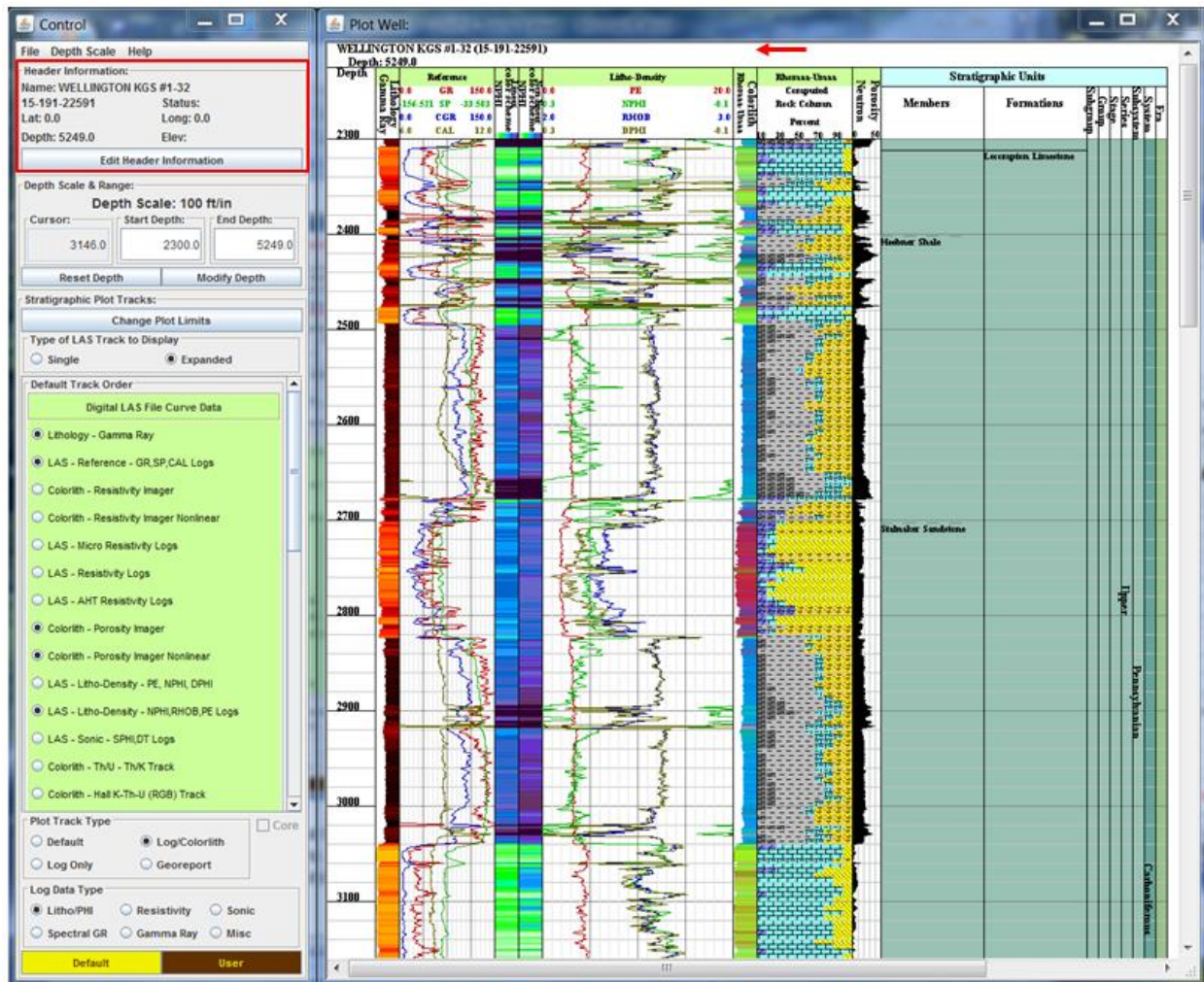
Change the file name in the “Enter Filename” field, e.g. “Wellington_KGS_1-32.las”, then select the “Continue” Button to save the Wellington KGS 1-32 well data to the LAS version 3.0 file.



Data Entry Dialogs

Edit Header Information Dialog

The Well Header Information Summary is displayed in the “Header Information” Panel on the LAS File Viewer Control Dialog as well as at the top of the LAS File Viewer Plot.



It is obvious that there are fields missing in the “Header Information” Panel, i.e. Status, Latitude & Longitude, etc. The “Edit Header Information” Button allows the user to edit the header information that is in the program. This missing information applies to the LAS File Viewer Plot.

The user can select the “Edit Headers Information” Button to display the Edit Header Information Dialog. The data displayed holds the initial information stored in the Log ASCII Standard (LAS) file and the Geologist Report ASCII Delimited file if the user loads the files from their PC. If the user loads the Log ASCII Standard (LAS) File from the KGS Server then the Well Header Information is automatically downloaded from the KGS Well Header Database Table.

Search KGS Database for Well Header Information Button

Displays a “Search for Data on KGS Server” Dialog that allows the user to .

Identification Panel

KGS & PC Primary KEY – Identification Numbers for the well

API-Number – API Number of Well

Well Status - Status, i.e. OIL, GAS, etc.

Name – Lease Name & Number

Other Well Information Panel

Operator Name & KGS Database KEY

Field Name & KGS Database KEY

Location Information Panel

State Name

County Name

Location

Township Range Section

XY Position

Latitude

Longitude

UTM Zone

UTM X Position

UTM Y Position

Z-Position

Depth – Total Depth of Well

Elevation – by Ground Level

Elevation – by Kelly Bushing

Elevation – by Derrick Floor

Comments – User Comments, not saved to the LAS version 3.0.

Header Information Source Buttons:

- **Show Initial Header Data** – Shows the Header Information initially loaded into Program.
- **Show KGS Well Header Data** – Shows the Header Information loaded from KGS Database.

Buttons:

Status – Displays “Select Status of Data” Dialog, user searches for the well status list for status of well.

Kansas TRS to Latitude, Longitude & Elevation

– The buttons calls a KGS database routine to compute the Latitude, Longitude and Elevation from the Township, Range and Section.

Compute UTM – This button calls a UTM Java Math Package to convert Latitude & Longitude into UTM X, Y Coordinates.

OK – Transfer Data Values to Program

Close – Close this Dialog

NOTE: Initially the Basic Header information is loaded from the LAS version 2.0 file and other fields like Comments, Location are loaded from the Geologist Report Header Section.

The Header Information Dialog displays the contents of the header information data structure. The user can edit the fields and select the “Ok” Button to transfer the information back to the LAS File Viewer Program and any summary information will be updated in the LAS File Viewer Control and Plot.

As this example illustrates there are missing fields in the header information data. The user can select the “Search KGS Database for Well Header Information” Button, which will display a “Search for Data on KGS Server” Dialog that will allow the user to build a query that will download all wells that match the query.

This will display the “Search for Data on KGS Server” Dialog, see image below. This dialog allows the user to search the KGS database for well header data. In this example, the well of interest will be the Wellington KGS 1-32.

LTCI	API-Number	Well Name	Operator
	15-191-19025-...	WELLINGTON UNIT 58-INJ	TERRA RESOURCES, A
LT	15-191-10272	DeTurk 3	Stelbar Oil Corp., Inc.
T	15-191-10054	WELLINGTON UNIT was Kamas 7 ...	Sinclair Prairie Oil Co.
T	15-191-10254	Wellington Unit 96	Stelbar Oil Corp. and D
T	15-191-43925	BARLOW 2	SHAWVER E B
T	15-191-19022	WELLINGTON UNIT - KAMAS LEAS...	COOPERATIVE REFGA
T	15-191-10296	Cora Stone 'A' 1	Stelbar Oil Corp., Inc.
LT	15-191-19021	Wellington Unit 141	Coop. Refining Assoc.
LT	15-191-22591	WELLINGTON KGS 1-32	BEREXCO LLC
T	15-191-10062	JOHN LUDWIG 1	STELBAR OIL CORP
T	15-191-43878	MURPHY 7	TRANSWESTERN OIL
T	15-191-10263	Wellington Unit 112	Stelbar Oil Corp., Inc.
T	15-191-10104	WELLINGTON UNIT, was PEASEL ...	SHAWVER E B
T	15-191-10100	WELLINGTON UNIT, was ERKER 9...	STELBAR OIL CORP IN

Search for Well Header Data in KGS Database Search By:

- **API-Number** – The user can search the KGS Database for well data by API-Number. The Format for the API is SS-CCC-99999 where
 - SS – Two Digit State Code
 - CCC – Three Digit County Code
 - 99999 – 5 Digit Well Number
- **Lease Name** – The user can search for well data by lease partial phrase, i.e. “Wellington”, which will look for all wells with the phrase “Wellington” in the lease name.
- **Township-Range-Section** – Search for a list of Wells by a specific area.

List of Kansas wells that match the search criteria

Load Well Header Buttons

- **Select** – Download the header information for the well selected.
- **Close** – Close this dialog

NOTE: LTCI Column in Table: L-LAS Files; T-Formation Tops; C-Measured Core Data; I-Core Images

As the Summary image suggests there are 3 methods for searching for the well header information within this dialog,

- **By API-Number** – KGS has a specific format for the API-Number, i.e. SS-CCC-99999 where SS is the state code for Kansas 15, CCC is the county code for Wellington KGS 1-32 it is 191 for Sumner County and the 5-Digit Well Number for the Wellington KGS 1-32 is 22591.

- **By Partial Lease Name** – The stored procedure used to retrieve the well header information allows the user to enter a partial phrase, in this example Wellington. The program places a ‘%’ in front and back of the phrase and sends the request to the Database, i.e. “%Wellington%”.

- By Township Range Section – This search is by location in Kansas, this search also allows the user to enter just the Township and Range to search for wells, e.g. to look for the Wellington KGS 1-32, enter Township as 31 set the S (South) Radio button and Range as 1 set the E (East) Radio button.

The user only needs to enter the above data and select the “Search” Button to display the list of Wells in the Kansas Database that match the search criteria. In the image below the Lease Name “Wellington” is entered to search for all wells in Kansas with the Phrase Wellington in it. The user searches through the list until they find the well of interest. In this example it is the Wellington KGS 1-32, which is highlighted.

LTCl	API-Number	Well Name	Operator
	15-191-19025-...	WELLINGTON UNIT 58-INJ	TERRA RESOURCES,
LT	15-191-10272	DeTurk 3	Stelbar Oil Corp., Inc.
T	15-191-10054	WELLINGTON UNIT was Kamas 7 ...	Sinclair Prairie Oil Co.
T	15-191-10254	Wellington Unit 96	Stelbar Oil Corp. and D
T	15-191-43925	BARLOW 2	SHAWVER E B
T	15-191-19022	WELLINGTON UNIT - KAMAS LEAS...	COOPERATIVE REFGA
T	15-191-10296	Cora Stone 'A' 1	Stelbar Oil Corp., Inc.
LT	15-191-19021	Wellington Unit 141	Coop. Refining Assoc.
LT_I	15-191-22591	WELLINGTON KGS 1-32	BEREXCO LLC
T	15-191-10062	JOHN LUDWIG 1	STELBAR OIL CORP
T	15-191-43878	MURPHY 7	TRANSWESTERN OIL
T	15-191-10263	Wellington Unit 112	Stelbar Oil Corp., Inc.
T	15-191-10104	WELLINGTON UNIT, was PEASEL ...	SHAWVER E B
T	15-191-10100	WELLINGTON UNIT, was ERKER 9...	STELBAR OIL CORP IN

The user clicks on the “Select” button to transfer the header information to the Edit Header Information Dialog.

LAS File Information

☒ Show Initial Header Data
 ☐ Show KGS Well Header Data

Search KGS Database for Well Header Information

Identification:
 KGS Primary Key: PC Primary Key:
 API-Number: Status:
 Name:

Other Well Information:
 Operator Name: Operator Code:
 Field Name: Field Code:

Location Information:
 State: County:
 Location:
 Township: Range: ☒ N ☐ S ☐ E ☐ W Section:

Kansas TRS to Latitude, Longitude & Elevation

XY Position:
 Latitude: Longitude:
 UTM Zone: Compute UTM
 UTM-X: UTM-Y:

Z-Position:
 Depth: Elevation: Kelly Bushing: Derrick Floor:

Comments:
 Lease: Wellington KGS Well 1-32 (15-191-22591) ; operator: BEREXCO LLC; Field: Wellington
 Location: T31S R1W, Sec. 32 : NE SW NE NE : 955 South, 877 West, from NE corner
 Longitude: -97.4423481 ; Latitude: 37.3154639
 County: Sumner
 Total Depth: 3660 ; Elevation: 1259 GL

KGS Database Information

☐ Show Initial Header Data
 ☒ Show KGS Well Header Data

Search KGS Database for Well Header Information

Identification:
 KGS Primary Key: PC Primary Key:
 API-Number: Status:

Name:

Other Well Information:
 Operator Name: Operator Code:
 Field Name: Field Code:

Location Information:
 State: County:
 Location:
 Township: Range: ☒ N ☐ S ☐ E ☐ W Section:

Kansas TRS to Latitude, Longitude & Elevation

XY Position:
 Latitude: Longitude:
 UTM Zone: Compute UTM
 UTM-X: UTM-Y:

Z-Position:
 Depth: Elevation: Kelly Bushing: Derrick Floor:

Comments:
 Lat Long added from legal survey on intent. (DS-DRL 1-10-2011)

Location is from the Geologist report header section the 2nd line of the ASCII Text file.

Comments are from the Geologist report header section the lines before the start of the data in the ASCII Text file.

The “Show KGS Well Header Data” radio button will become enabled if the KGS well header information has been downloaded. The user can move between the initial header information by selecting the “Show Initial Header Data” radio button the KGS well header information by selecting the “Show KGS Well Header Data” radio button.

There a number of buttons on the panel that will allow the user to change or compute data in the header information. The “Kansas TRS to Latitude, Longitude & Elevation” Button computes the latitude, longitude and elevation from the township, range and section by making an Oracle PL/SQL Stored Procedure, e.g.

http://chasm.kgs.ku.edu/ords/iqstrat.TRS2LL_pkg.getXML?iTownship=31&sTownship=S&iRange=1&sRange=E&iSection=32

The call will return a XML with the latitude, longitude and ground level elevation.

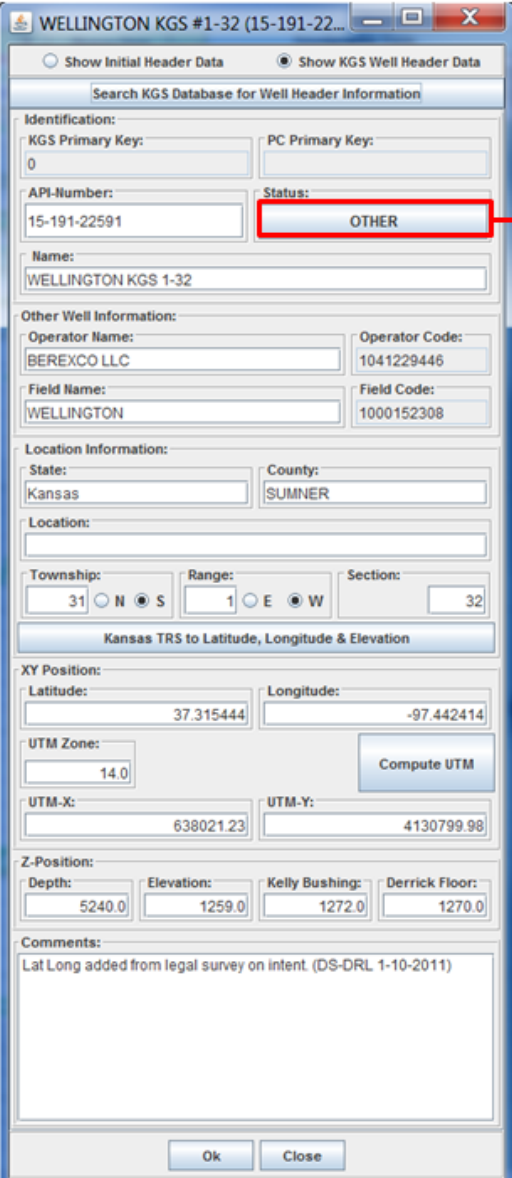
```

<?xml version="1.0"?>
<!DOCTYPE headers [
<!ELEMENT headers (data*)>
<!ATTLIST headers records CDATA #IMPLIED>
<!ELEMENT data (info*,
                other?,
                loc?,
                xy?,
                z?,
                comments?,
                misc?,
                cnt?)>
<!ELEMENT info EMPTY>
<!ATTLIST info kid CDATA #IMPLIED
               well_kid CDATA #IMPLIED
               key CDATA #IMPLIED
               type CDATA #IMPLIED
               api CDATA #IMPLIED
               name CDATA #IMPLIED
               status CDATA #IMPLIED
               error CDATA #IMPLIED>
<!ELEMENT other EMPTY>
<!ATTLIST other operator CDATA #IMPLIED
               oper_kid CDATA #IMPLIED
               field CDATA #IMPLIED
               field_kid CDATA #IMPLIED>
<!ELEMENT loc EMPTY>
<!ATTLIST loc state CDATA #IMPLIED
               state_cd CDATA #IMPLIED
               county CDATA #IMPLIED
               county_cd CDATA #IMPLIED
               loc CDATA #IMPLIED
               town CDATA #IMPLIED
               town_dir CDATA #IMPLIED
               range CDATA #IMPLIED
               range_dir CDATA #IMPLIED
               section CDATA #IMPLIED>
<!ELEMENT xy EMPTY>
<!ATTLIST xy latitude CDATA #IMPLIED
               longitude CDATA #IMPLIED
               zone CDATA #IMPLIED
               utm_x CDATA #IMPLIED
               utm_y CDATA #IMPLIED>
<!ELEMENT z EMPTY>
<!ATTLIST z depth CDATA #IMPLIED
               gl CDATA #IMPLIED
               kb CDATA #IMPLIED
               df CDATA #IMPLIED>
<!ELEMENT comments (#PCDATA)>
<!ELEMENT misc EMPTY>
<!ATTLIST misc user CDATA #IMPLIED
               access CDATA #IMPLIED
               source CDATA #IMPLIED
               date CDATA #IMPLIED>
<!ELEMENT cnt EMPTY>
<!ATTLIST cnt las CDATA #IMPLIED
               tops CDATA #IMPLIED
               core CDATA #IMPLIED
               images CDATA #IMPLIED]>
<headers records="1">
  <data>
    <loc town="31" town_dir="S" range="1" range_dir="E" section="32" />
    <xy latitude="37.311703" longitude="-97.339619" />
    <z gl="1277" />
  </data>
</headers>

```

The “UTM” Button will compute the UTM XY coordinates from the latitude & longitude. The analysis uses A Working Manual by John P. Snyder, U.S. Geological Survey Professional Paper 1395, USG Printing Office, Washington, DC, 1987 (http://pubs.er.usgs.gov/djvu/PP/PP_1395.pdf).

The Status button allows the user to change the well status.



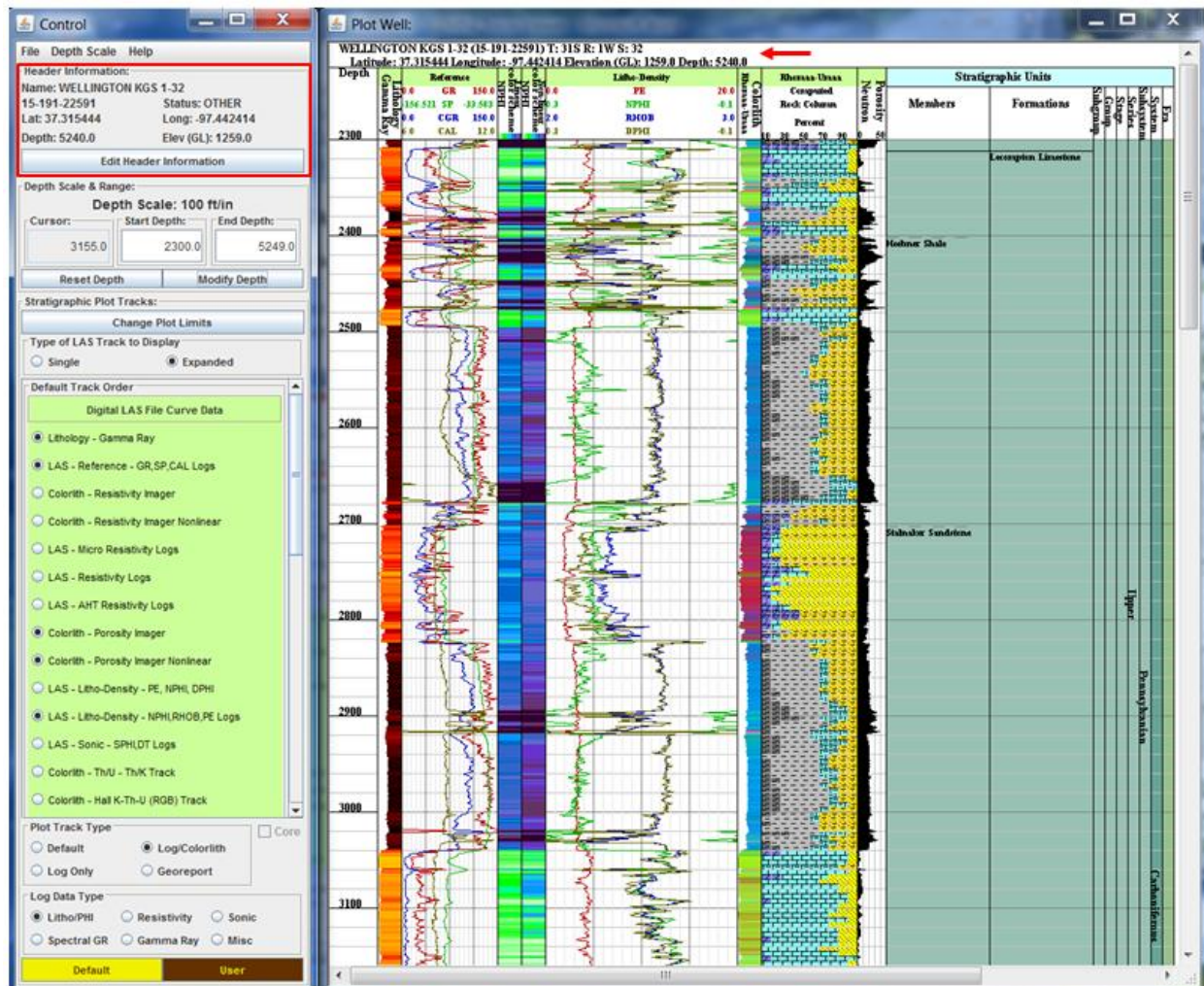
The 'Select Status of Data' dialog box displays a list of well statuses. The 'Status' button in the main window is highlighted with a red box, and an arrow points from it to the 'Select Status of Data' dialog box.

Mnemonic	Description
LOC	Location
INTENT	Intent
D&A	Dry & Abandoned
SUS	Suspended
P&A	Plugged & Abandoned
EOR	Enhanced Oil Recovery
EOR-P&A	Enhanced Oil Recovery - Plugged & Abandoned
OIL	Oil
D&A-O	Dry & Abandoned - Oil Show
SUS-O	Suspended - Oil
OIL-P&A	Oil - Plugged & Abandoned
GAS	Gas
D&A-G	Dry & Abandoned - Gas Show
SUS-G	Suspended - Gas
GAS-P&A	Gas - Plugged & Abandoned
O&G	Oil & Gas
D&A-OG	Dry & Abandoned - Oil & Gas Show
SUS-OG	Suspended - Oil & Gas
O&G-P&A	Oil & Gas - Plugged & Abandoned
OTHER	Other
OTHER-P&A	Other - Plugged & Abandoned
INJ	Injection
INJ-P&A	Injection - Plugged & Abandoned
SWD	Salt Water Disposal
SWD-P&A	Salt Water Disposal - Plugged & Abandoned
CBM	Coal Bed Methane
CBM-P&A	Coal Bed Methane - Plugged & Abandoned
OUTCROP	Measured Section

Select “Status” Button to display the “Select Status of Data” Dialog, which displays the list of possible common well status.

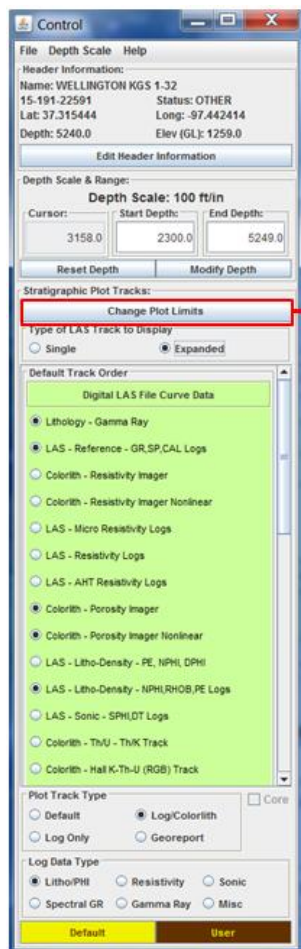
Highlight the desired status and click on the “Select” Button to transfer the Mnemonic to the “Status” Button text.

Select the “Ok” Button to update the Header Information in LAS File Viewer program. The “Header Information” Summary Panel in the Control Dialog will change if any of the fields were modified, e.g. the latitude, longitude, status, depth and elevation and the LAS File Viewer Plot.

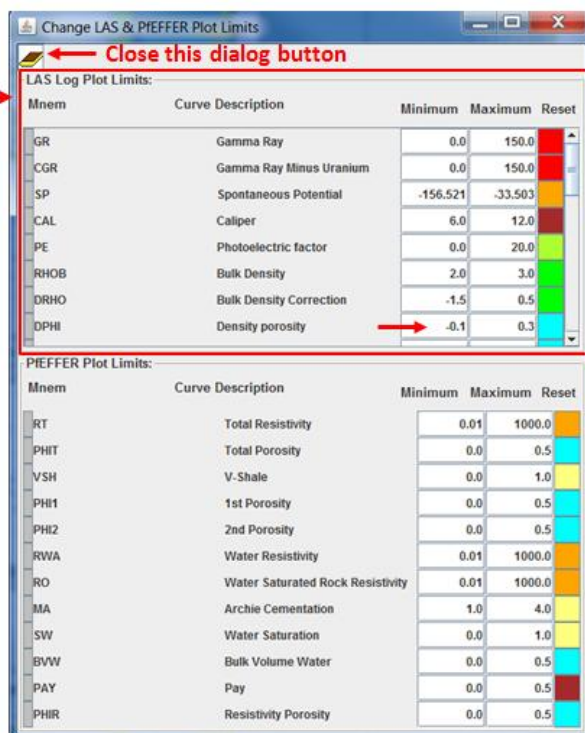


Change the Plot Track Limits

The “Change Plot Limits” Button on the LAS File Viewer Control Dialog allows the user to change the limits of the log curves.



Select “Change Plot Limits” Button to display the “Change LAS & PFEFFER Plot Limits” Dialog. This dialog allows the user to change the plot limits in the Profile Plot. For Profile only the “LAS Log Plot Limits” Panel is important.



The user can change the limits of the curve limits in the plot track by changing the contents in the Minimum and Maximum text fields. The limits will change by group so if you change one porosity limit, e.g. DPHI from “-0.1 - 0.3” to “0.0 – 0.5” then all the porosity curves will change to the same limit.

Each color curve is color coded by unit to visually assist the user in the type of curves present.

Notice that the color boxes next to the curve limits of the curves are colored with different colors, which shows the curve type by unit. The Curves are colored by type (data units) as follows,

- Orange - OHM-M or Resistivity Logs
- Cyan – PU or porosity Logs, Neutron Porosity, Density Porosity, etc.
- Greenish yellow – BARNS/E or Photoelectric Factor Logs
- Green – GM/CC or Bulk Density Log
- Forest Green – USEC/FT or the Acoustic Transit Time Log
- Red – API, PPM or “%” as Radioactive logs, Gamma Ray, Spectral Gamma Ray, etc.
- Blue – MD or Permeability Logs
- Brown – F, FT or IN or Depth
- Middle yellow – FRAC, or other log curve types.
- Dark Violet – UNI or Unknown Linear Curves

- Medium Violet – UNL or Unknown Logrithum Curves

The color coding is the same as the “LAS File Curve Sections” Dialog that helps the user distinguish the type of curves available at a glance.

LAS Log Plot Limits:

Mnem	Curve Description	Minimum	Maximum	Reset
GR	Gamma Ray	0.0	150.0	
CGR	Gamma Ray Minus Uranium	0.0	150.0	
SP	Spontaneous Potential	-156.521	-33.503	
CAL	Caliper	6.0	12.0	
PE	Photoelectric factor	0.0	10.0	
RHOB	Bulk Density	2.0	3.0	
DRHO	Bulk Density Correction	-1.5	0.5	
DPHI	Density porosity	0.0	0.5	
NPHI	Neutron porosity	0.0	0.5	
SPHI	Sonic porosity	0.0	0.5	
DT	Acoustic transit time	40.0	140.0	
RDEP	Deep Resistivity	0.1	1000.0	
MNOR	Micro Normal Resistivity	0.1	1000.0	
MINV	Micro Inverse Resistivity	0.1	1000.0	
AHT10	Array Induction Resistivity-10	0.1	1000.0	
AHT20	Array Induction Resistivity-20	0.1	1000.0	
AHT30	Array Induction Resistivity-30	0.1	1000.0	
AHT60	Array Induction Resistivity-60	0.1	1000.0	
AHT90	Array Induction Resistivity-90	0.1	1000.0	

Notice that the color boxes are changed from gray to the color of the curve that was changed to reflect that the curve limit values have been changed.

Change the Photoelectric factor (PE) curve from “0.0 – 20.0” to “0.0 – 10.0”

The limits will change by group so if you change one porosity limit, e.g. DPHI from “-0.1 - 0.3” to “0.0 – 0.5” then all the porosity curves will change to the same limit.

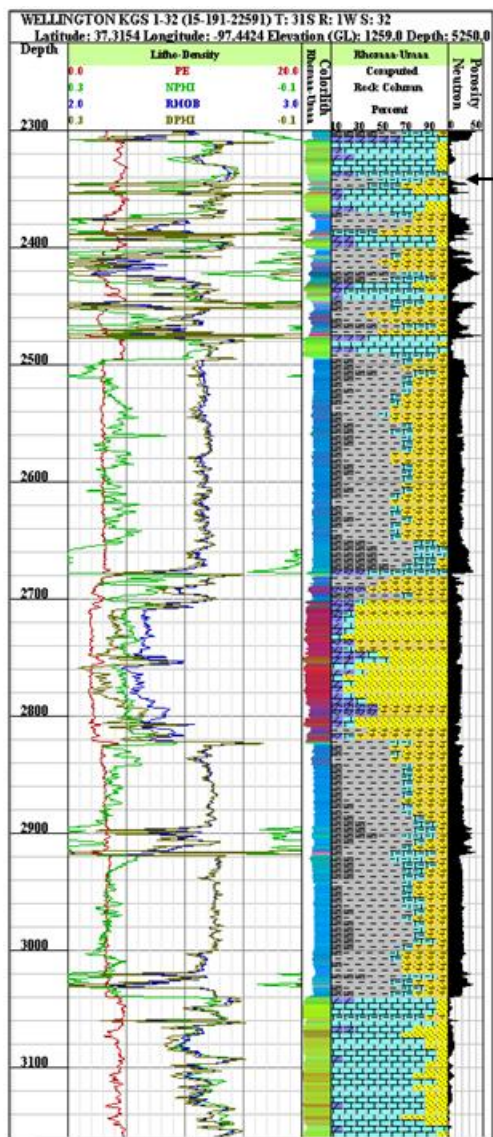
Note: As the user changes each curve limit, the change is automatically updated in the Profile Plot.

The user can change as many curves as they wish, understanding that each plot curves are grouped together, i.e. Porosity. The Resistivity curves are grouped by Plot Track so that if you change the Micro Normal Resistivity (MNOR) and Micro Inverse Resistivity (MINV) the Array Induction Resistivity (AHT) Curves will not automatically change unless the user wishes.

The above changes above are entered, i.e.

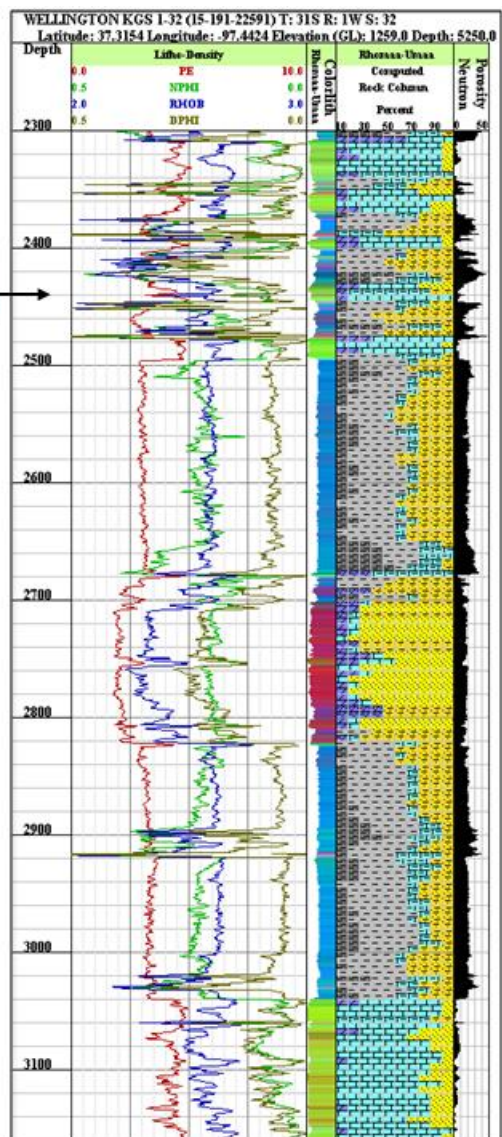
- The Photoelectric factor (PE) curve is changed from “0.0 to 20.0” to 0.0 to 10.0”
- The Neutron Porosity (NPHI) curve is changed from “-0.1 to 0.3” to “0.0 to 0.5” which also modifies the Density Porosity (DPHI) and the Sonic Porosity (SPHI) to the same limits.

As noted in the image the LAS File Viewer plot is automatically modified as the user makes changes to each text field. View the “Litho-Density” Plot track (see image below) reflects the changes made to the plot curves.



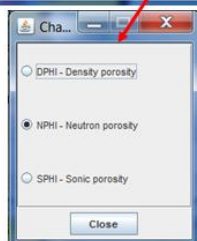
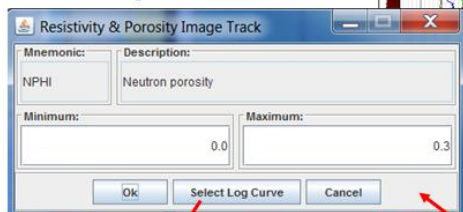
Before Limits
are changed.

After Limits
are changed.

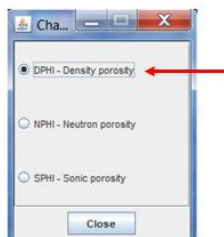
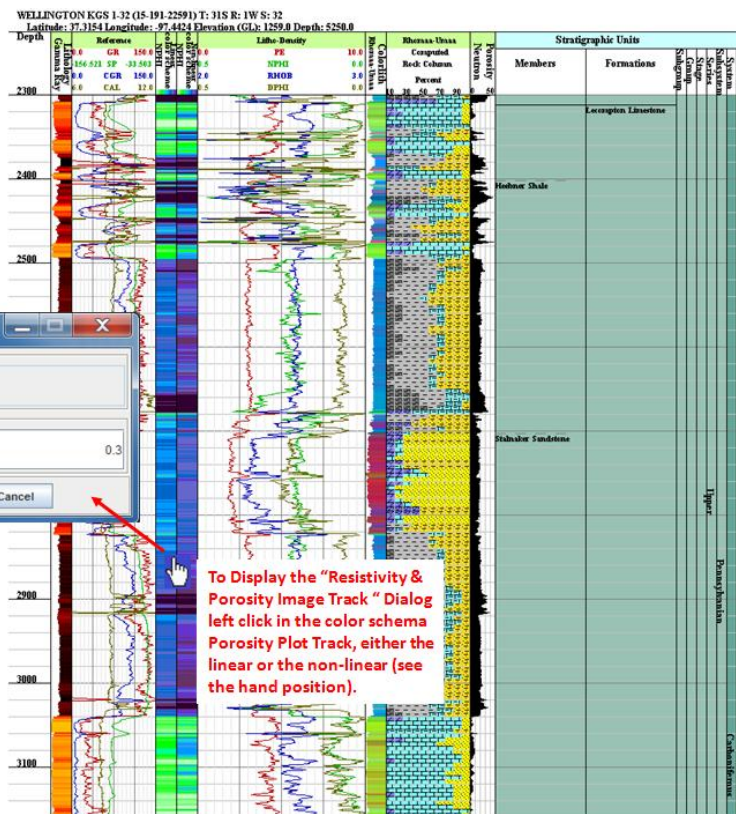


Changing the Colorlith – Porosity Imager Linear & Nonlinear Color Schema Tracks

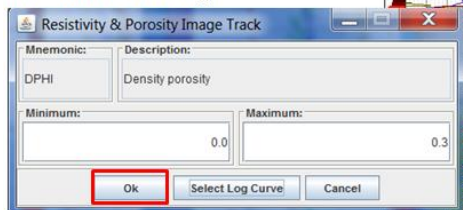
Click on the “Select Log Curve” Button to display the possible porosity curves that can be represented with the Porosity color schema plot track.



To Display the “Resistivity & Porosity Image Track” Dialog left click in the color schema Porosity Plot Track, either the linear or the non-linear (see the hand position).

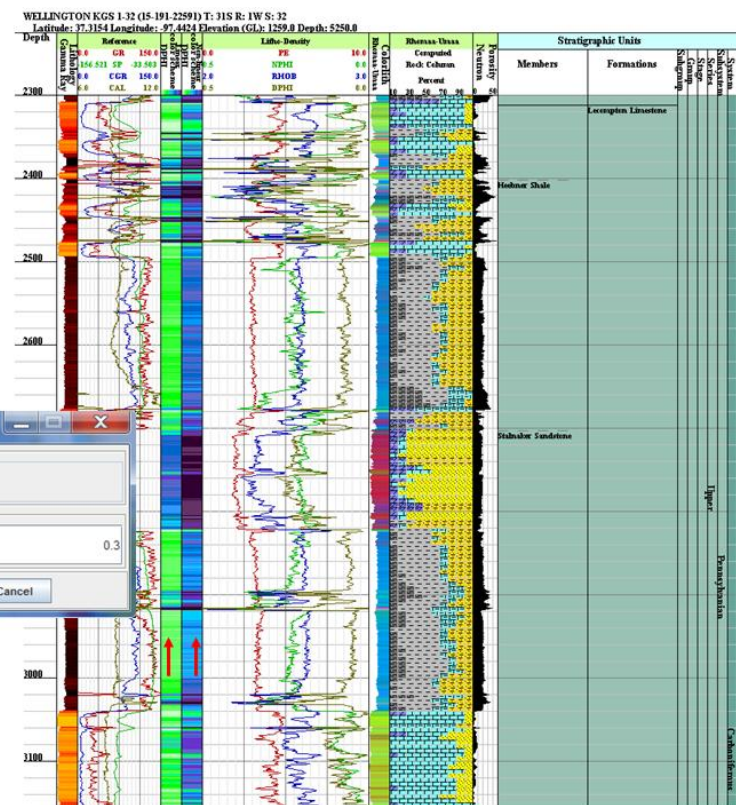


Click on “DPHI-Density porosity” radio button to change the porosity curve used to compute the color schema colorlith tracks. Then select close to close the dialog.



Select the Ok button to change the curve used in building the colorlith tracks.

The linear & non-linear colorlith tracks are changed to represent the Density Porosity curve.



WELLINGTON KGS 1-32 (IS-191-22591) T: 315 R: 1W S: 32
 Latitude: 37.3154 Longitude: -97.4424 Elevation (GL): 1259.0 Depth: 5250.0

Resistivity & Porosity Image Track

Mnemonic: DPHI Description: Density porosity

Minimum: 0.0 Maximum: 0.3

Ok Select Log Curve Cancel

Change the Maximum value from 0.3 to 0.2 to change the color details in the linear track (left porosity colorlith color schema track).

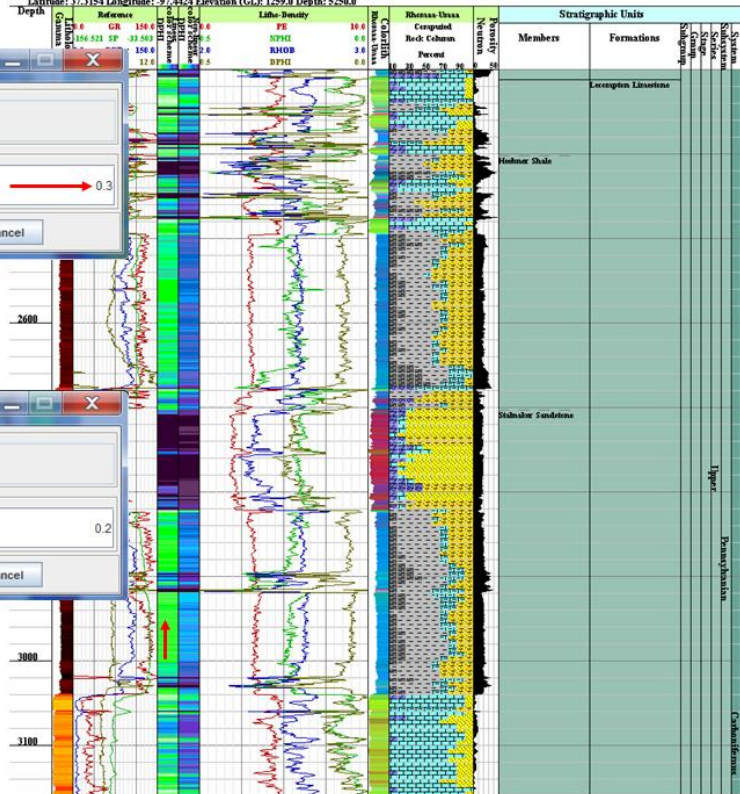
Resistivity & Porosity Image Track

Mnemonic: DPHI Description: Density porosity

Minimum: 0.0 Maximum: 0.2

Ok Select Log Curve Cancel

Select the Ok button to change the color details in the linear track.



Adding & Modifying Tops

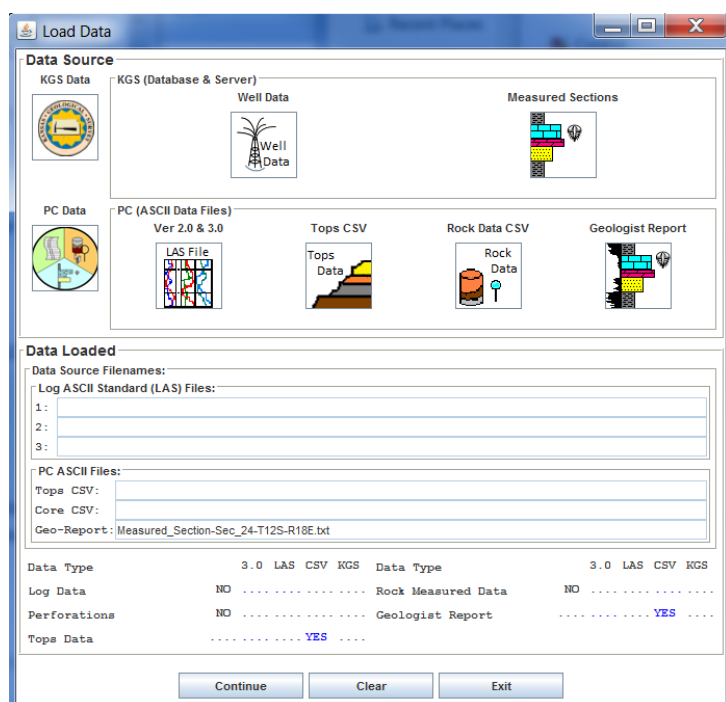
To begin the example uses the measured section ASCII delimited text file. The Measured_Section-Sec_24-T12S-R18E.txt File should be downloaded to your PC. As an option the Measured_Section-Sec_24-T12S-R18E_las.las is the Log ASCII Standard (LAS) version 3.0 generated with the all the examples for this help section.

Download either the ASCII Text Files directly or the Zip files extracting the contents into a directory. The problem with the ASCII Text Files being downloaded directly from a web page is that the web page will alter the contents so it does not retain the basic structure and add HTML text to the file. The preferred method if you have Zip or WinZip is to download the zip files to your PC and extract.

Measured Section: Strata southeast of Lecompton Kansas, Douglas County, Kansas

Type	ASCII Text Files
Measured Section	http://www.kgs.ku.edu/Gemini/Tools/documentation/Measured_Section-Sec_24-T12S-R18E.txt
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Measured_Section-Sec_24-T12S-R18E_las.las

Type	Zip Files
Measured Section	http://www.kgs.ku.edu/Gemini/Tools/documentation/Measured_Section-Sec_24-T12S-R18E.zip
LAS 3.0	http://www.kgs.ku.edu/Gemini/Tools/documentation/Measured_Section-Sec_24-T12S-R18E_las.zip



This example will only require the ASCII Delimited File Measured Section (Measured_Section-Sec_24-T12S-R18E.txt) File to be loaded into the Load Data Dialog. The purpose of this exercise is to show how to enter data into the Stratigraphic Units (Tops) Panel.

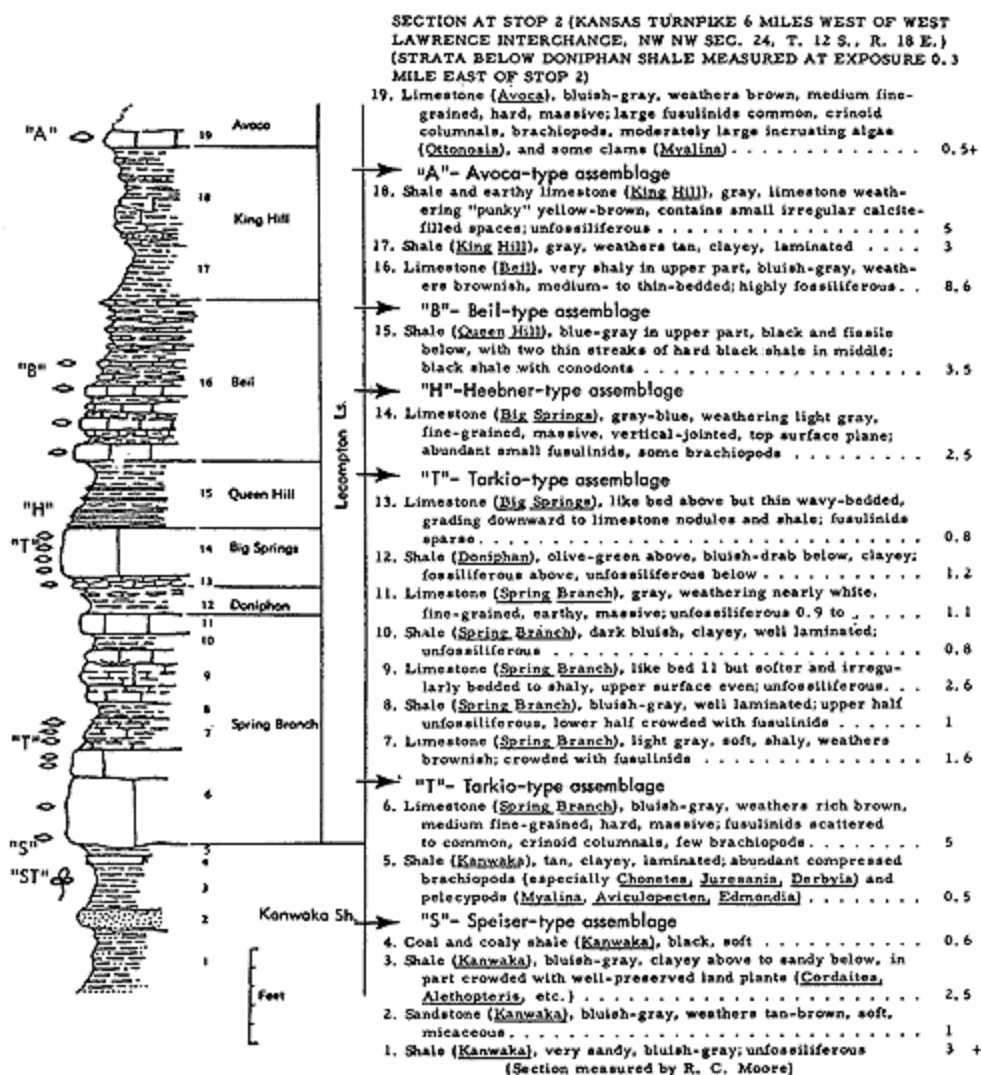
Presently the LAS File Viewer Plot assumes that the user will load some or all of the data from the “Load Data” Dialog and modify the data in the LAS File Viewer plot data entry dialogs.

Notice that this data has Tops Data and Geologist Report loaded into the LAS File Viewer Program.

To display the LAS File Viewer Plot select the “Continue” button.



The measured section is from the Bulletin 169: Paleocological Aspects of Kansas Pennsylvanian and Permian Cyclothems, by Raymond C. Moore, University of Kansas, Lawrence, Kansas, <http://www.kgs.ku.edu/Publications/Bulletins/169/Moore/>.



Paleocological Aspects of Kansas Pennsylvanian and Permian Cyclothems, by Raymond C. Moore, "Figure 16--Typical section of uppermost Kanwaka Shale and most of Lecompton Limestone southeast of Lecompton, Kansas, showing stratigraphic occurrence of some ecosystems ("A," Avoca-type; "B," Beil-type; "H," Heebner-type; "S," Speiser-type; "ST," Stranger-type; "T," Tarkio-type)"

Some of the beds were modified to expand the implied sub-beds, i.e. Bed 16. "Limestone (Beil), very shaly in upper part, bluish-gray ..." implies that the upper half is shaly, so 2 beds were created to represent this one bed description. As you noticed in the text the tops are in parenthesis within each bed description. The text file was also modified to automatically load the tops by placing the top above the first bed to mention it, i.e. Bed 12 has Doniphan in parenthesis; Doniphan Shale was placed just above this bed. Some generic fossils were also added to Bed 16 to illustrate the type of Beil-type fossils and for the Heebner Shale Phosphatic are also added to the lithology.

Enter Horizon Data - Stratigraphic Units Panel

The Stratigraphic Units Panel allows the user to Add, Modify or Remove Stratigraphic Units. There are two files that are used to assist in mapping Stratigraphic Units to a specific top name.

- The 2010 International Commission on Stratigraphy Stratigraphic Units and RGB color for the Stratigraphic Units XML File (<http://www.kgs.ku.edu/software/gemini/data/ISC.xml>) are used to display the tops in the Stratigraphics Plot Track by Age (RGB Color).
- The Kansas Geological Survey (KGS) Stratigraphic Succession in Kansas, edited by D.E. Zeller, December 1968, updated 2012 (<http://www.kgs.ku.edu/software/gemini/data/kansas.xml>) will help map the Kansas Top Names to Stratigraphic Units, System, Sub-System, Series, etc. and to map the top depth of one top pick to the base depth of another top pick.

Starting Depth & Ending Depth of Stratigraphic Name

Confidence Level of the tops selection.

Stratigraphic Unit Rank radio buttons, defines & sets the location of the unit on the Stratigraphic Unit Plot Track.

Stratigraphic Name & Alternate Name Add/Modify – Move data to Table. Clear – Clear all text fields.

List of Stratigraphic Units (Tops).

International Commission on Stratigraphy. User selects the ICS Chart button to display Standard Units.

Stratigraphic Name belongs to section. Allows the user to place a member, bed, etc. with a formation, group, etc.

“Stratigraphic Units Selected” Table.

Table Buttons Modify – Modify the Stratigraphic Units Data. Remove – Remove Stratigraphic Unit from table. Remove All – Clear all content Units from the table.

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

The KGS Stratigraphic Succession of Kansas edited by D. E. Zeller, Dec. 1968, updated 2012 (http://www.kgs.ku.edu/PRS/Ozark/TYPE_LOG/Stratigraphic/index.html).

Add Lecompton Formation to the Stratigraphic Units List

This first example is to add a Lecompton Formation, which is part of the KGS Stratigraphic Succession in Kansas. First place the mouse in the Stratigraphic Units Plot Track and left click with the mouse to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Panel.

Left mouse click on the Stratigraphic Units Plot Track to display the “Enter Horizon Data” Dialog with the “Stratigraphic Units” Panel will be displayed with the list of tops.

Enter Horizon Data: Stratigraphic Units Panel

Starting Depth: 7.1 Ending Depth: 7.0

Confidence: ☐ Excellent ☒ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Era ☐ System ☐ Subsystem ☐ Series ☐ Subseries ☐ Stage ☐ Eon ☐ Super Group ☐ Group ☐ Subgroup ☐ Formation ☐ Member ☐ Bed

Stratigraphic Name:

Alternate Name:

Begin Age (Ma): 0.0 +/- 0.0 End Age (Ma): 0.0 +/- 0.0

Buttons: Add, Clear, Modify, Remove, Remove All, Cancel, Help

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

Stratigraphic Column Plot

Depth: 45.0

Members: Avoca Limestone, King Hill Shale, Beil Limestone, Queen Hill Shale, Big Springs Limestone, Doniphan Shale, Spring Branch Limestone, Kanwaka Shale

Formations: Lecompton Formation

Red Color:

Lithology:

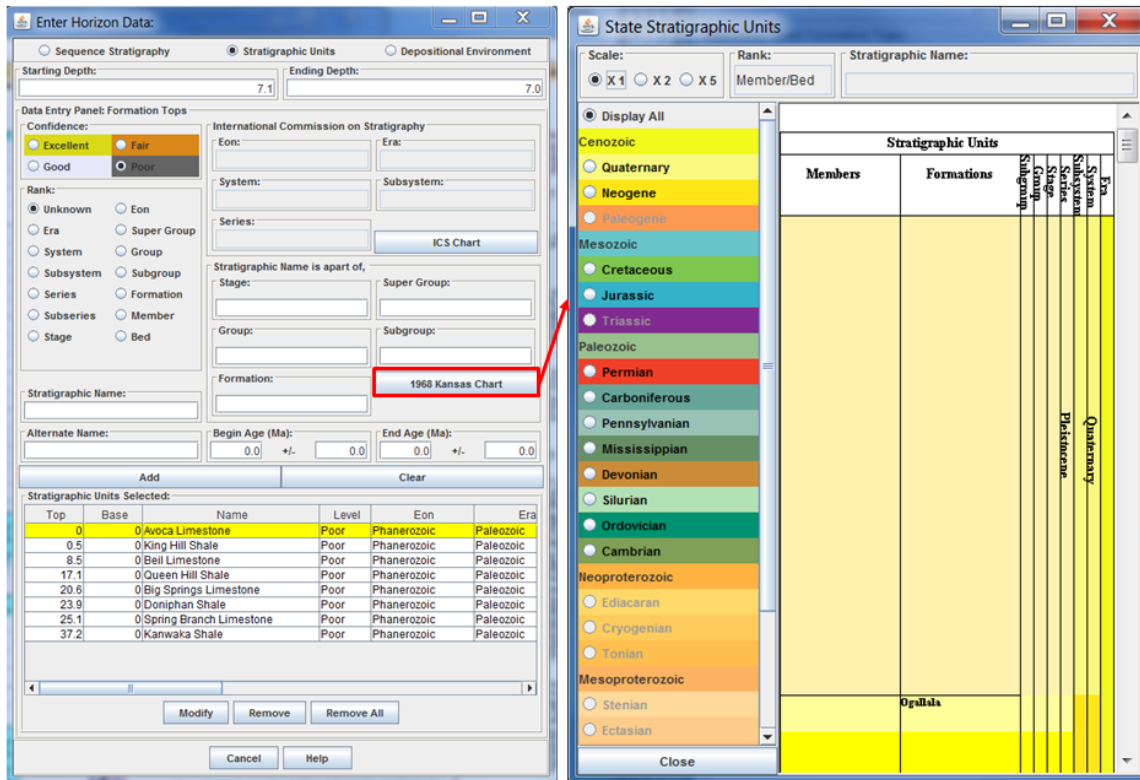
Primary Rock Lithology: Shale, Sand, Sandstone, Anthracite Coal, Limestone, Limestone (massive), Limestone (wavy)

Secondary Rock Lithology: Clayey, Argillaceous, clay, Shaly, shale, Micaceous, Sandy, sand, fossiliferous, Phosphatic, Phosphatic

Left click on this Stratigraphic Units Plot Track

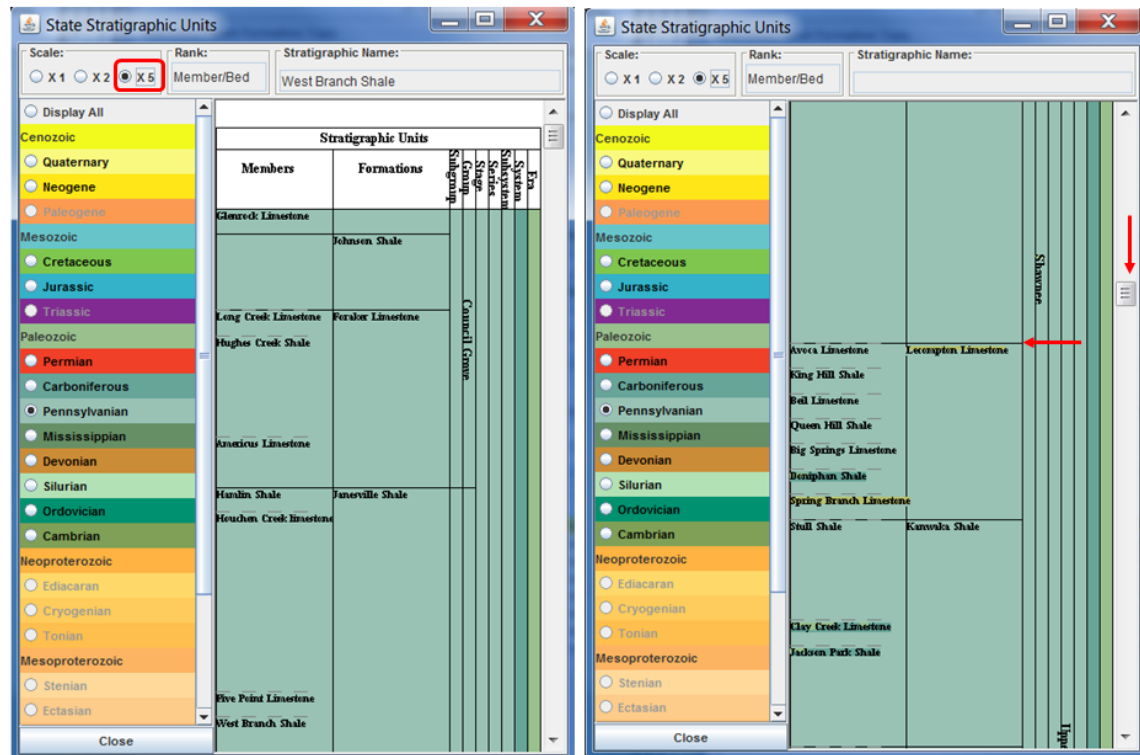
For this example all tops from Avoca Limestone to Spring Branch Limestone belongs to the Lecompton Limestone Formation. The user can manually enter the tops with as much information as they wish to display. If the stratigraphic unit is part of the Kansas Stratigraphic Units List all necessary fields can be loaded by using the “1968 Kansas Chart” button to display the list of Kansas Stratigraphic Units.

Click on the “1968 Kansas Chart” Button to display the State Stratigraphic Units Dialog.

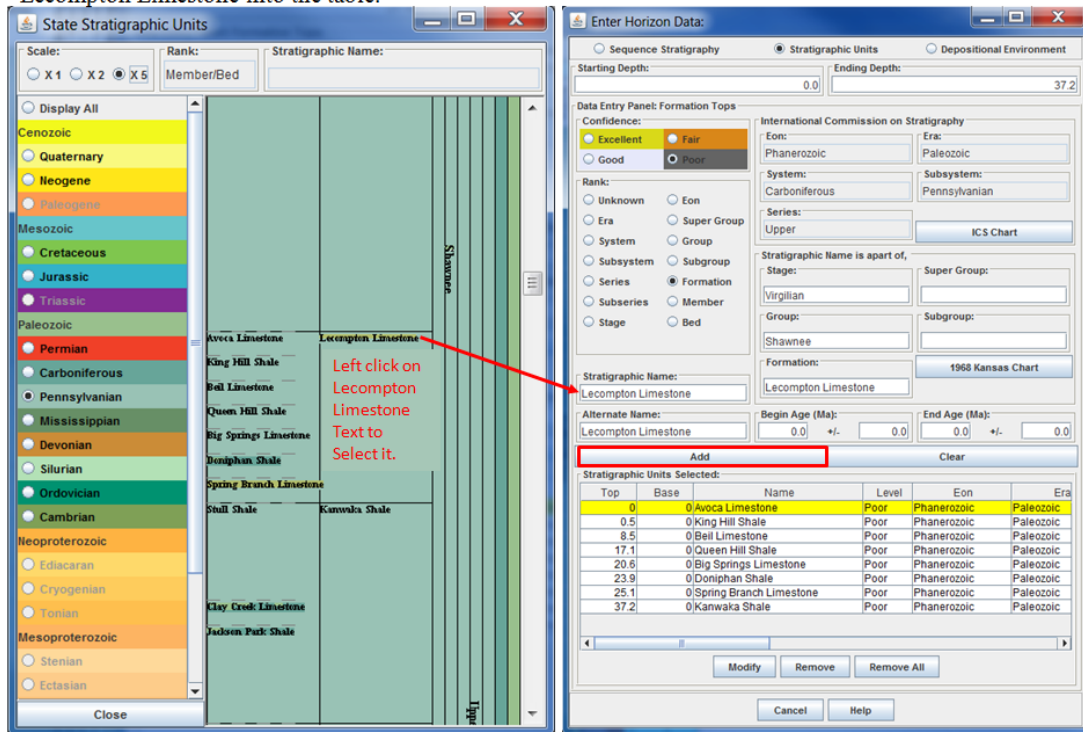


Change the Scale to X5, select the “Pennsylvanian” radio button.

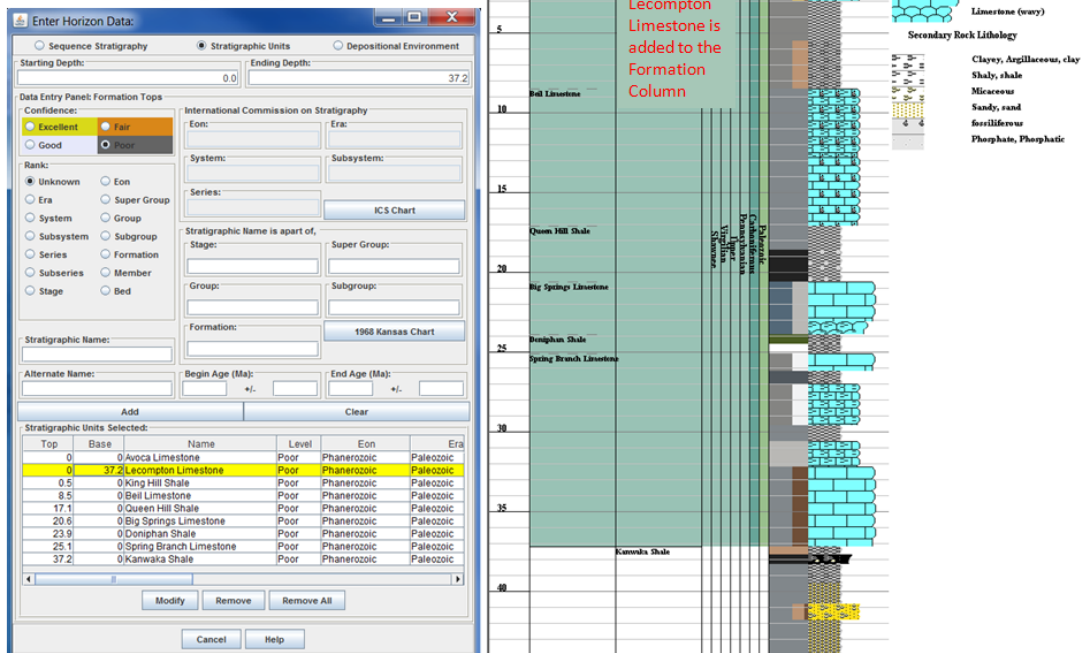
Scroll down to the Lecompton Limestone Formation.



Left mouse click on the Lecompton Limestone text to transfer all the Stratigraphic Units to the “Stratigraphic Units” Panel on the “Enter Horizon Data” Dialog. Select the “Add” Button to move Lecompton Limestone into the table.



Notice that the Lecompton Limestone is added to the Formations Column of the Stratigraphic Units Plot Track. Lecompton Limestone was added to the “Stratigraphic Units Selected” table, see the highlighted top in the table.



Add Unknown Bed (SG-A Bed) to the Stratigraphic Units List

This second example is to add an unknown bed (SG-A Bed) to the Stratigraphic Units List, which is not part of the KGS Stratigraphic Succession in Kansas. Bed 6 “Limestone (Spring Branch), bluish gray, weathers rich Brown...” has Fusulinid fossils and implies a change in sea level to deeper waters. This example will enter the basic information to the Depth Range text fields, the Stratigraphic Name text field and setting the Rank as a BED. The Stratigraphic Units will be provided by the International Commission on Stratigraphy Dialog by selecting the “ICS Chart” Button. The “International Stratigraphic Chart” Dialog displays the stratigraphic units as a series of colored boxes, each stratigraphic unit has the recommended RGB (Red-Green-Blue) Color defined by the International Commission on Stratigraphy. The user only needs to click the colored box to select all the stratigraphic data associated with the selected stratigraphic unit and transfer the data back to the “Stratigraphic Units” Panel in the “Enter Horizon Data” Dialog.

- (1) Add SG-A to the “Stratigraphic Name” Text field.
- (2) Select the Bed Radio Button in the Rank Panel
- (3) Set the Starting Depth to 32.2 and the Ending Depth to 37.2 for the Bed 6. Limestone Depth Range.
- (4) Click on the “ICS Chart” Button to display the International Stratigraphic Chart Dialog.

The left screenshot shows the "Enter Horizon Data" dialog. The "Stratigraphic Units" tab is selected. The "Starting Depth" is 32.2 and the "Ending Depth" is 37.2. The "Stratigraphic Name" is "SG-A". The "Rank" is "Bed". The "ICS Chart" button is highlighted with a red box. The "Stratigraphic Units Selected" table is shown below.

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

The right screenshot shows the "International Stratigraphic Chart" dialog. The "Upper" series under the "Pennsylvanian" system is highlighted with a red box. The "Close" button is visible at the bottom right.

(5) Left mouse click in the Upper Series Color Box under the Pennsylvanian System to transfer the Upper Pennsylvanian Stratigraphic Units Data to the “Stratigraphic Units” Panel on the “Enter Horizon Data” Dialog.

Enter Horizon Data:

☐ Sequence Stratigraphy ☒ Stratigraphic Units ☐ Depositional Environment

Starting Depth: 32.2 Ending Depth: 37.2

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☐ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☒ Bed

Stratigraphic Name: SG-A

Alternate Name: SG-A

Begin Age (Ma): +/- End Age (Ma): +/-

Add **Clear**

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

Modify **Remove** **Remove All**

Cancel **Help**

Notice that the Stratigraphic Units Data from the ICS Chart is transferred to the "International Commission on Stratigraphy" Panel.

Now Select the "Add" Button to transfer the Stratigraphic Units Data for the SG-A Bed to the "Stratigraphic Units Selected" Table.

Notice that the SG-A Bed is added to the Members Column of the Stratigraphic Units Plot Track. SG-A Bed was added to the "Stratigraphic Units Selected" table, see the highlighted top in the table.

Enter Horizon Data:

☐ Sequence Stratigraphy ☒ Stratigraphic Units ☐ Depositional Environment

Starting Depth: 32.2 Ending Depth: 37.2

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☐ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☐ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☒ Bed

Stratigraphic Name: SG-A

Alternate Name: SG-A

Begin Age (Ma): +/- End Age (Ma): +/-

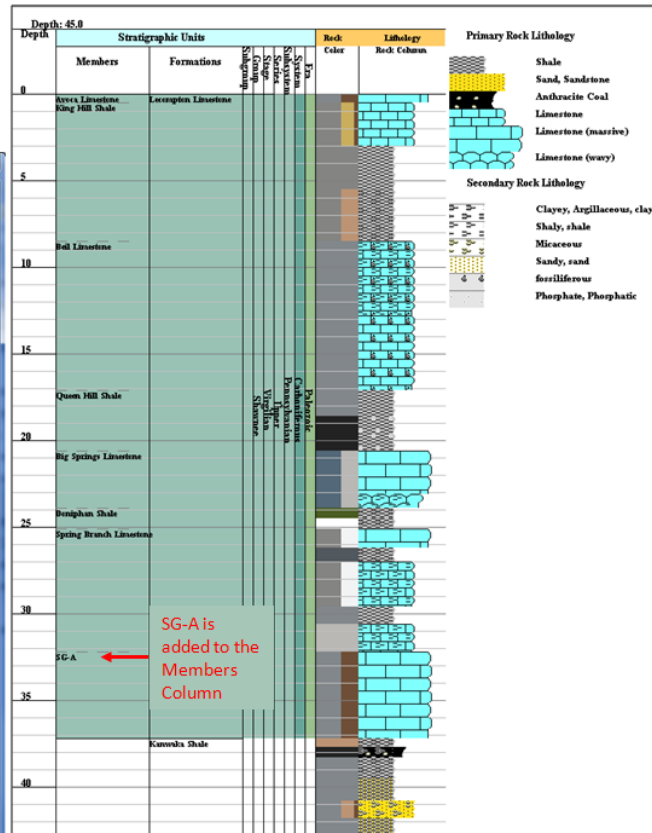
Add **Clear**

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
32.2	37.2	SG-A	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

Modify **Remove** **Remove All**

Cancel **Help**



Modify data for the Kanwaka Shale Formation in the Stratigraphic Units List

This third example is to modify the Kanwaka Shale Formation Data to include an ending depth and to add some other missing terms.

Highlight the Kanwaka Shale, select the “Modify” Button.

The 'Enter Horizon Data' dialog box is shown with the 'Stratigraphic Units' tab selected. The 'Starting Depth' is 32.2 and the 'Ending Depth' is 37.2. The 'Data Entry Panel: Formation Tops' shows 'Confidence' as 'Fair' and 'Rank' as 'Formation'. The 'Stratigraphic Name' is 'Kanwaka Shale'. The 'Stratigraphic Units Selected' table lists the following units:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
32.2	37.2	SG-A	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

The 'Modify' button is highlighted with a red box.

Notice the Stratigraphic Units Data are loaded into the Stratigraphic Units Panel Fields.

The 'Enter Horizon Data' dialog box is shown with the 'Stratigraphic Units' tab selected. The 'Starting Depth' is 37.2 and the 'Ending Depth' is 0.0. The 'Data Entry Panel: Formation Tops' shows 'Confidence' as 'Fair' and 'Rank' as 'Formation'. The 'Stratigraphic Name' is 'Kanwaka Shale'. The 'Stratigraphic Units Selected' table lists the following units:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
32.2	37.2	SG-A	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

The 'Modify' button is highlighted with a red box.

Enter Horizon Data:

☐ Sequence Stratigraphy ☒ Stratigraphic Units ☐ Depositional Environment

Starting Depth: 37.2 Ending Depth: 45.0

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☒ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☒ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☐ Bed

Stratigraphic Name: Kanwaka Shale

Alternate Name: Kanwaka Shale

Begin Age (Ma): 0.0 +/- End Age (Ma): 0.0 +/-

Modify Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
32.2	37.2	SG-A	Poor	Phanerozoic	Paleozoic
37.2	0	Kanwaka Shale	Poor	Phanerozoic	Paleozoic

Modify Remove Remove All

Cancel Help

Change the Ending Depth to 45.0, which is the ending depth of the measured sections.

Change the Confidence from Poor to Fair. This will appear in the Level column of the "Stratigraphic Units Selected" Table.

Add Kanwaka Shale to the "Alternate Name" text field.

Now Select the "Modify" Button to save the changes and modify the contents of the "Kanwaka Shale" Stratigraphic Units in the "Stratigraphic Units Selected" table.

Notice that the Kanwaka Shale Formation has been modified to extend the ending depth to 45.0'. This also extends the Upper Pennsylvanian Color all the way down to the end of the measured section.

Enter Horizon Data:

☐ Sequence Stratigraphy ☒ Stratigraphic Units ☐ Depositional Environment

Starting Depth: 37.2 Ending Depth: 45.0

Data Entry Panel: Formation Tops

Confidence: ☒ Excellent ☒ Fair ☐ Good ☐ Poor

Rank: ☒ Unknown ☐ Eon ☐ Era ☐ Super Group ☐ System ☐ Group ☐ Subsystem ☐ Subgroup ☒ Series ☐ Formation ☐ Subseries ☐ Member ☐ Stage ☐ Bed

Stratigraphic Name: Kanwaka Shale

Alternate Name: Kanwaka Shale

Begin Age (Ma): 0.0 +/- End Age (Ma): 0.0 +/-

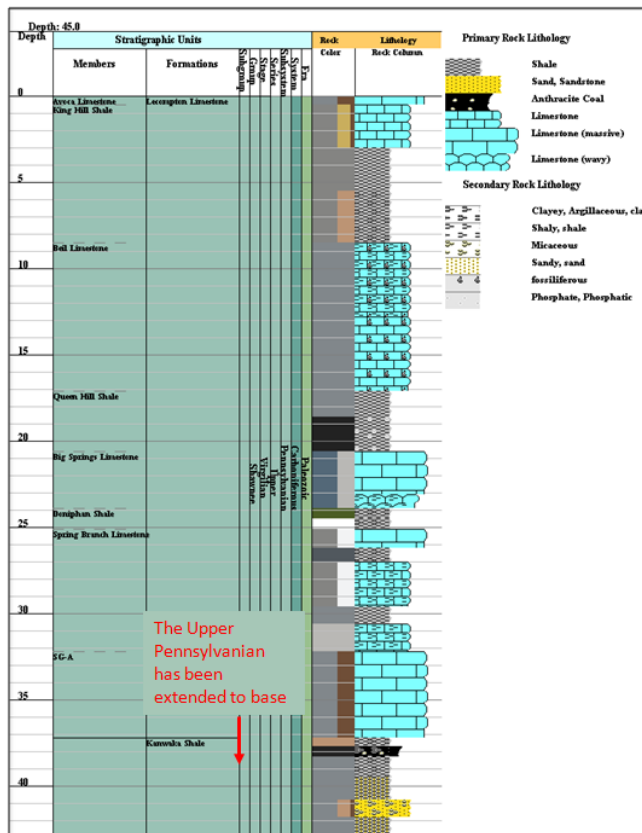
Add Clear

Stratigraphic Units Selected:

Top	Base	Name	Level	Eon	Era
0	0	Avoca Limestone	Poor	Phanerozoic	Paleozoic
0	37.2	Lecompton Limestone	Poor	Phanerozoic	Paleozoic
0.5	0	King Hill Shale	Poor	Phanerozoic	Paleozoic
8.5	0	Beil Limestone	Poor	Phanerozoic	Paleozoic
17.1	0	Queen Hill Shale	Poor	Phanerozoic	Paleozoic
20.6	0	Big Springs Limestone	Poor	Phanerozoic	Paleozoic
23.9	0	Doniphan Shale	Poor	Phanerozoic	Paleozoic
25.1	0	Spring Branch Limestone	Poor	Phanerozoic	Paleozoic
32.2	37.2	SG-A	Poor	Phanerozoic	Paleozoic
37.2	45	Kanwaka Shale	Fair	Phanerozoic	Paleozoic

Modify Remove Remove All

Cancel Help



Quick Plot Buttons – Plot Track Type

- Default

Plot Track Type		<input checked="" type="checkbox"/> Brine
<input checked="" type="radio"/> Default	<input type="radio"/> Log/Colorlith	<input checked="" type="checkbox"/> Core
<input type="radio"/> Log Only	<input type="radio"/> Georeport	<input checked="" type="checkbox"/> Images
Log Data Type		
<input checked="" type="radio"/> Litho/PHI	<input type="radio"/> Resistivity	<input type="radio"/> Sonic
<input type="radio"/> Spectral GR	<input type="radio"/> Gamma Ray	<input type="radio"/> Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Porosity Imager
- Colorlith – Porosity Imager Nonlinear
- LAS – Litho-Density – NPHI, RHOB, PE Logs
- Colorlith – Rhoma-Umaa Track
- Lithology – Rhomaa-Umaa Track
- Thin Porosity Track

Horizons

- Horizons – Stratigraphic Units

Rock Data

- Data – Core Density & Porosity
- Data – Whole Core Permeability
- Data – Saturation
- Color – Rock RGB Values
- Lithology – Measured Sections
- Sedimentary Structures
- Fossils
- Porosity Track
- Porosity Type
- Description



- **Log/Colorlith**

Plot Track Type

☐ Default ☒ Log/Colorlith ☐ Georeport

☐ Log Only

☐ Brine ☐ Core ☐ Images

Log Data Type

☒ Litho/PHI ☐ Resistivity ☐ Sonic

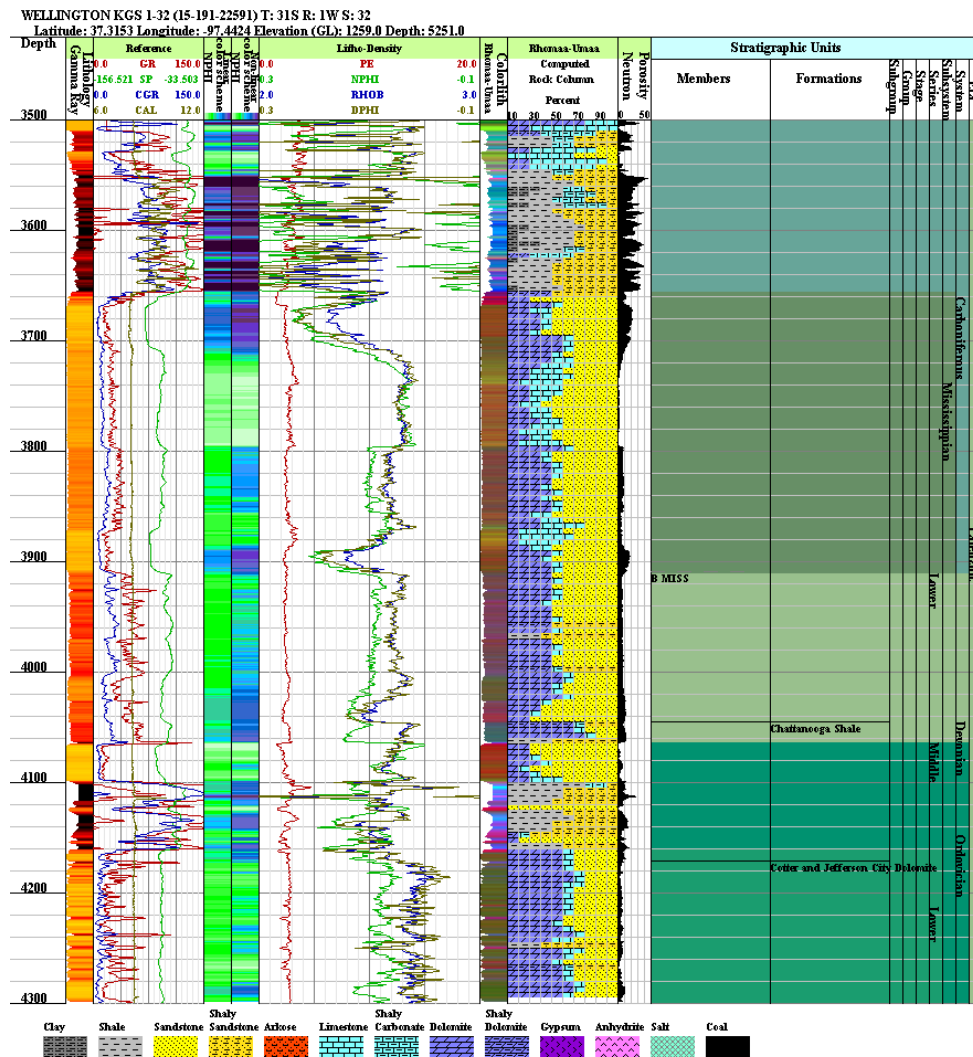
☐ Spectral GR ☐ Gamma Ray ☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Porosity Imager
- Colorlith – Porosity Imager Nonlinear
- LAS – Litho-Density – NPHI, RHOB, PE Logs
- Colorlith – Rhoma-Umaa Track
- Lithology – Rhomaa-Umaa Track
- Thin Porosity Track

Horizons

- Horizons – Stratigraphic Units



Quick Plot Buttons – Plot Track Type

- Log Only

Plot Track Type

☐ Default
☐ Log/Colorlith
☒ Log Only
☐ Georeport

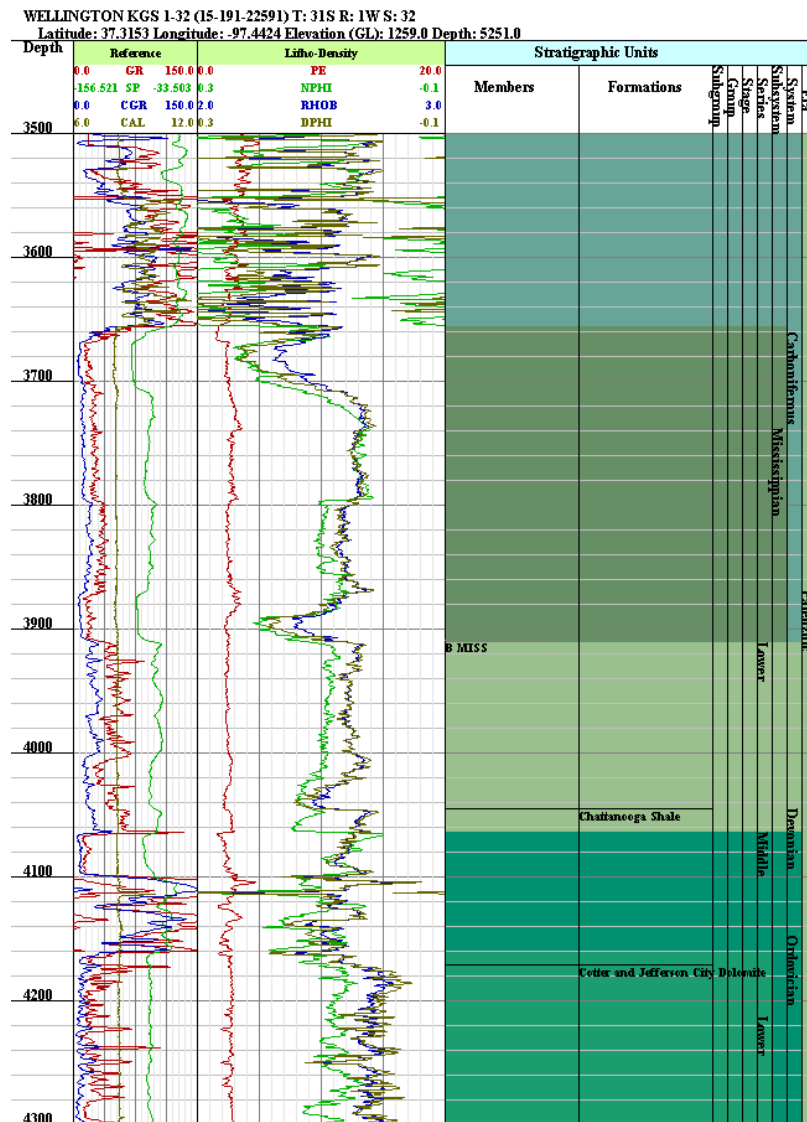
☐ Brine
☐ Core
☐ Images

Log Data Type

☒ Litho/PHI
☐ Resistivity
☐ Sonic
☐ Spectral GR
☐ Gamma Ray
☐ Misc

Digital LAS File Curve Data

- LAS – Reference – GR, SP, CAL, Logs
- LAS – Litho-Density – NPHI, RHOB, PE Logs
- Horizons
- Horizons – Stratigraphic Units



Quick Plot Buttons – Plot Track Type

- Georeport

Plot Track Type

☐ Default
☐ Log/Colorlith
☐ Log Only
☒ Georeport

☐ Brine
☐ Core
☐ Images

Log Data Type

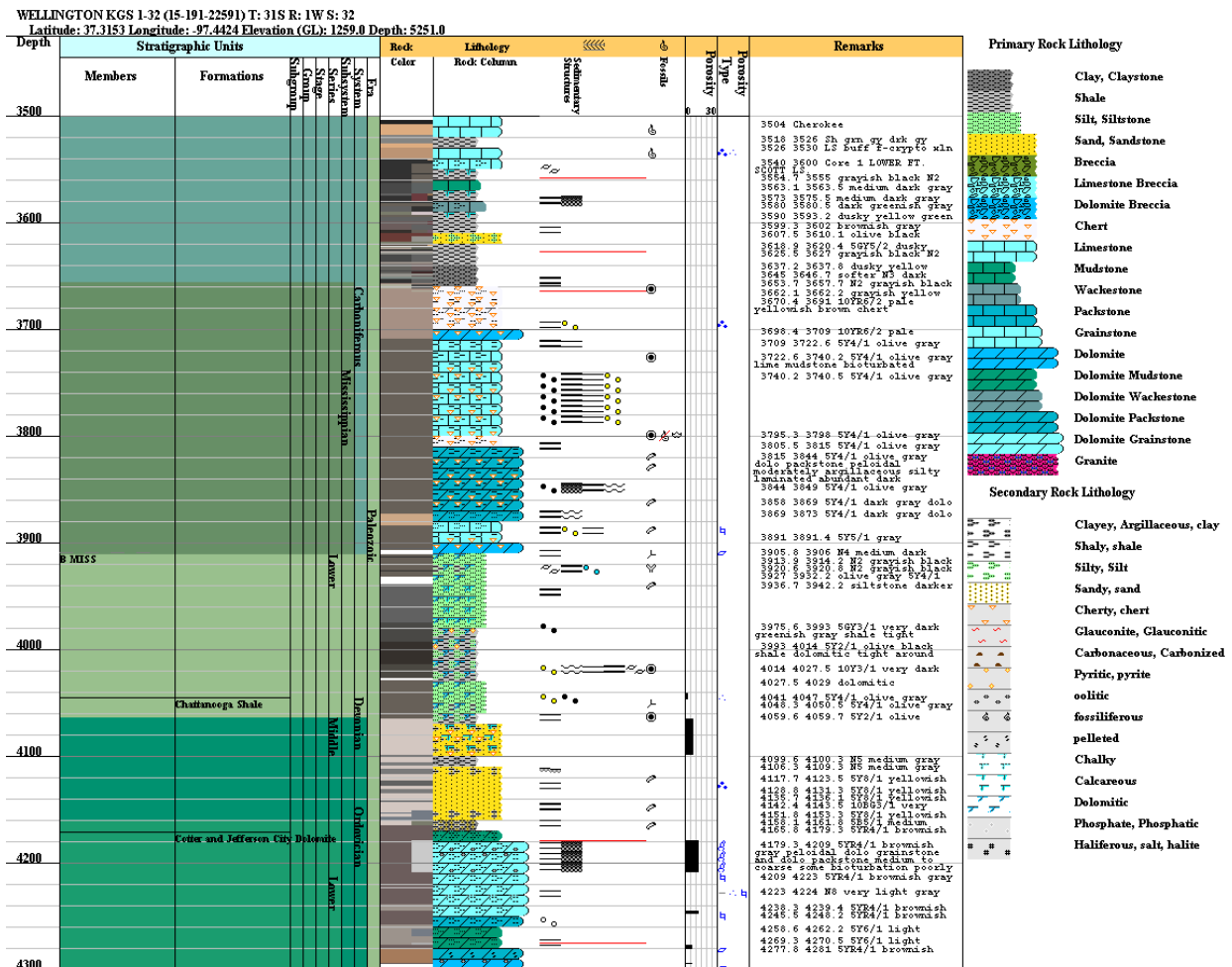
☒ Litho/PHI
☐ Resistivity
☐ Sonic
☐ Spectral GR
☐ Gamma Ray
☐ Misc

Horizons

- Horizons – Stratigraphic Units

Rock Data

- Color – Rock RGB Values
- Lithology – Measured Sections
- Sedimentary Structures
- Fossils
- Porosity Track
- Porosity Type
- Description



Quick Plot Buttons – Log Data Type

- Litho/Phi**

Plot Track Type

☐ Default ☒ Log/Colorlith
☐ Log Only ☐ Georeport

☐ Brine
☐ Core
☐ Images

Log Data Type

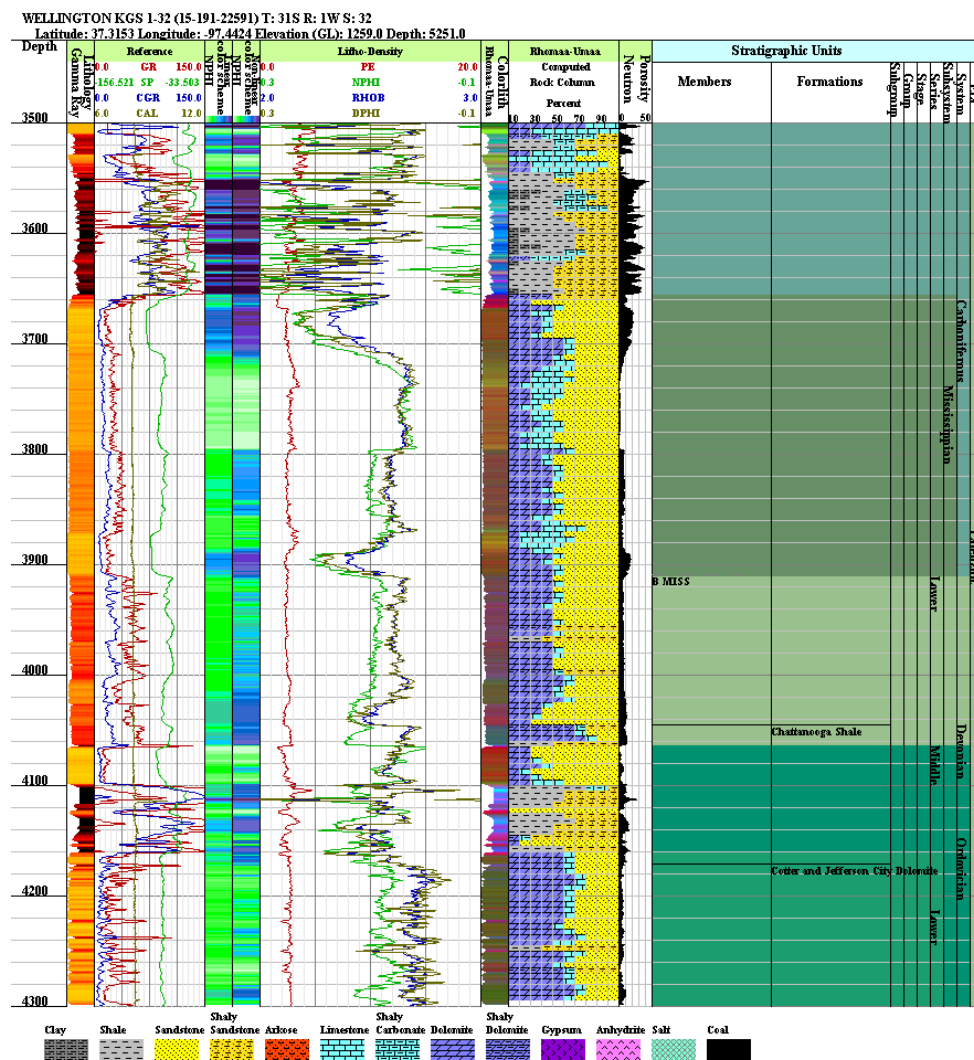
☒ Litho/PHI ☐ Resistivity ☐ Sonic
☐ Spectral GR ☐ Gamma Ray ☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Porosity Imager
- Colorlith – Porosity Imager Nonlinear
- LAS – Litho-Density – NPHI, RHOB, PE Logs
- Colorlith – Rhoma-Umaa Track
- Lithology – Rhomaa-Umaa Track
- Thin Porosity Track

Horizons

- Horizons – Stratigraphic Units



Quick Plot Buttons – Log Data Type

- Resistivity

Plot Track Type
☐ Default
☒ Log/Colorlith
☐ Log Only
☐ Georeport

☐ Brine
☐ Core
☐ Images

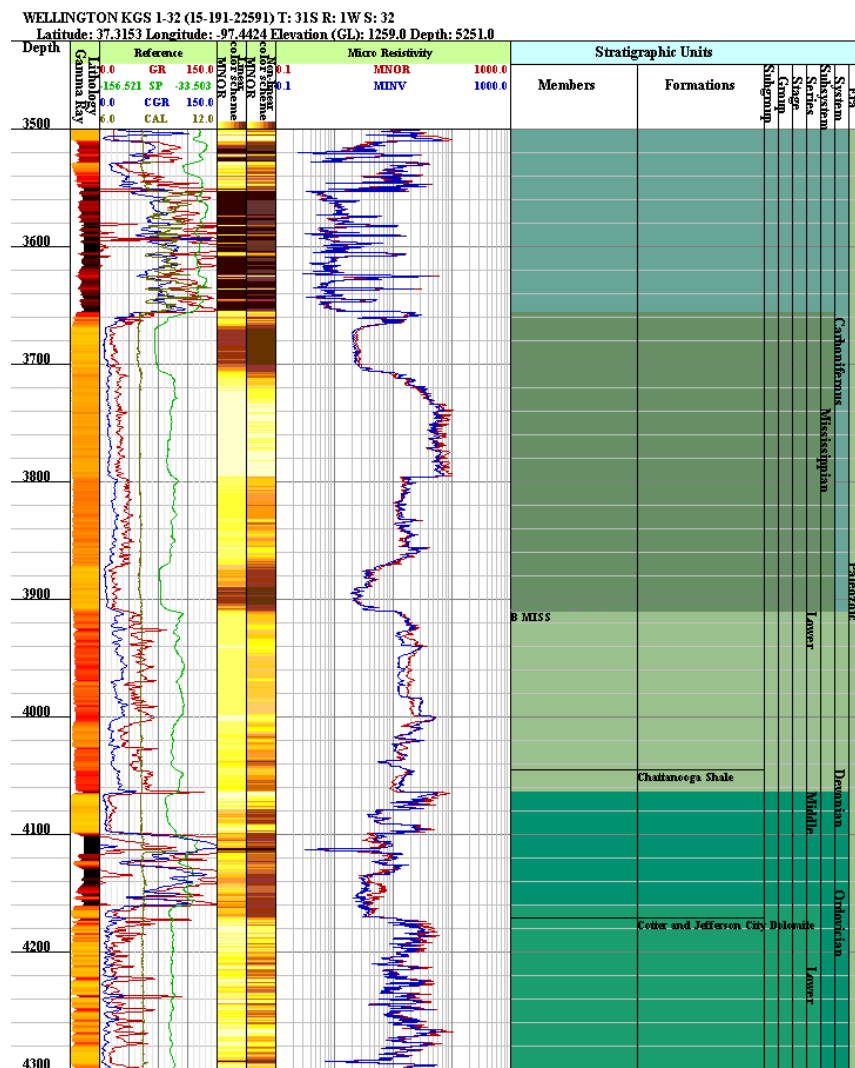
Log Data Type
☐ Litho/PHI
☒ Resistivity
☐ Sonic
☐ Spectral GR
☐ Gamma Ray
☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Resistivity Imager
- Colorlith – Resistivity Imager Nonlinear
- LAS – Micro Resistivity Logs

Horizons

- Horizons – Stratigraphic Units



Quick Plot Buttons – Log Data Type

- Sonic

Plot Track Type

☐ Default
☒ Log/Colorlith
☐ Log Only
☐ Georeport

☐ Brine
☐ Core
☐ Images

Log Data Type

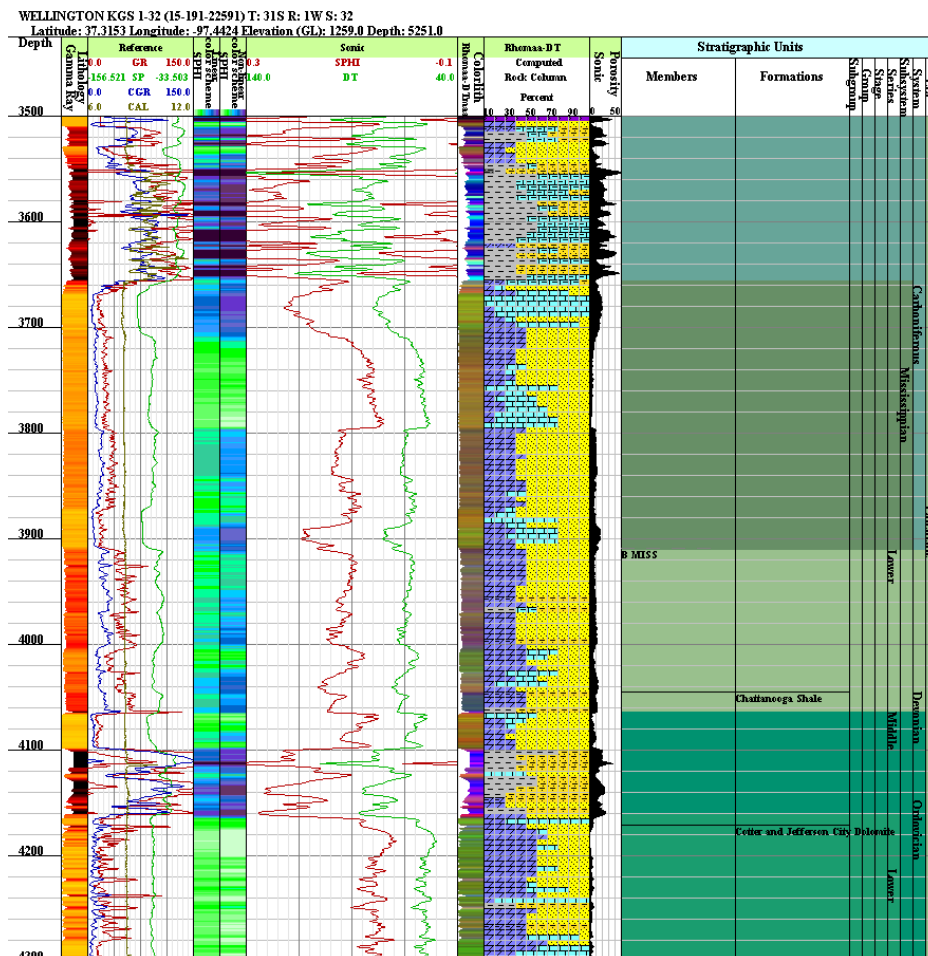
☐ Litho/PHI
☐ Resistivity
☒ Sonic
☐ Spectral GR
☐ Gamma Ray
☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Porosity Imager
- Colorlith – Porosity Imager Nonlinear
- LAS – Sonic – SPHI, DT Logs
- Colorlith – Rhomaa-DT Track
- Lithology – Rhomaa-DTmaa Track
- Thin Porosity Track

Horizons

- Horizons – Stratigraphic Units



Quick Plot Buttons – Log Data Type

- Spectral GR

Plot Track Type

☐ Default
☒ Log/Colorlith
☐ Log Only
☐ Georeport

☐ Brine
☐ Core
☐ Images

Log Data Type

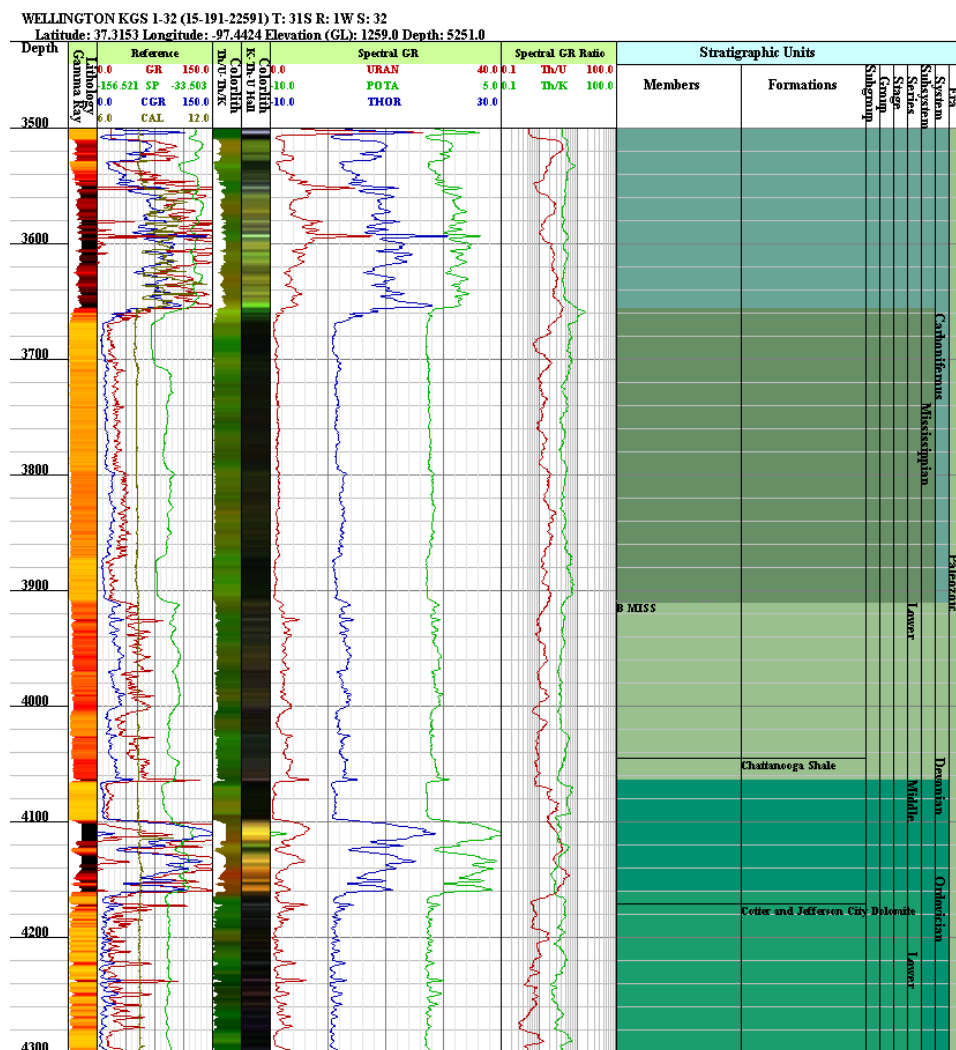
☐ Litho/PHI
☐ Resistivity
☐ Sonic
☒ Spectral GR
☐ Gamma Ray
☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Colorlith – Th/U – Th/K Track
- Colorlith – Hall K-Th-U (RGB) Track
- LAS – Spectral Gamma Ray – Th, U, K Logs
- LAS – Spectral Gamma Ray Ratios

Horizons

- Horizons – Stratigraphic Units



Quick Plot Buttons – Log Data Type

- Gamma Ray

Plot Track Type

☐ Default
☒ Log/Colorlith
☐ Log Only
☐ Georeport

☐ Brine
☐ Core
☐ Images

Log Data Type

☐ Litho/PHI
☐ Resistivity
☐ Sonic
☐ Spectral GR
☒ Gamma Ray
☐ Misc

Digital LAS File Curve Data

- Lithology – Gamma Ray
- LAS – Reference – GR, SP, CAL, Logs
- Horizons
- Horizons – Stratigraphic Units

