1.0 Glossary.

1.1 LMN830 Format.

New Orleans District (NOD) uses a data format called the LMN830 format. This is a format that is required by numerous legacy systems, for Point-on-Range (POR) survey data. The LMN830 data format is required for machine-readable POR data submission from surveying contractors. The format is used for both topographic and hydrographic surveys. A descriptor of "Fw.n" shall refer to a FORTRAN floating point number specifier. The "w" specifies field width and "n" specifies the digits to the right of the depicted decimal. The decimal point must be explicit, unless otherwise specified. All numeric fields shall be right justified and all character fields shall be left justified unless otherwise stated.

The format consists of repeating sets of an A01 record, A02 record, and a varying number of data point records. The data records contain a Station Number and four sets of Distance, Elevation, and 3-character Note. The record format is F12.2, 4(F7.1,F7.2,A3) and a 9999999 terminator is used in the last distance field.

Each POR's range distance value represents the distance from the baseline to the perpendicular projection of the survey location onto a straight range line. This procedure adjusts the survey boat's meandering along a range line and considers this drift a minimal factor in hydrographic survey accuracy.

1.2 Extended LMN830 Format.

The Extended LMN830 format is a revised format that includes file header records that very narrowly define the conditions and location of that file's surveys. This additional information is required for loading data into NOD's ProjectWise data management system. The new format includes additional geodetic coordinate information that is the actual boat (survey) location before it is projected onto a straight range line.

1.3 Station and Range Order.

The surveyed stations must appear in the file in ascending Station order, unless otherwise specified. For Revetment Ranges, the ranges must appear in upstream-to-downstream range order. For example, U-400 to D-300.

2.0 Extended LMN830 Data Specification.

2.1 Title Record Descriptions.

"T" records are required at the beginning of each survey data file. These records narrowly define the specific datum, units, and location information about a survey. If a survey is broken into several files, each file should contain the same header information.

T01 RECORD:

Data Labels :	Column	Label
	(01:03)	T01
	(07:18)	FILE NAME :
	(43:48)	ORDER:
	(61:73)	HORIZ. DATUM:

Element Name : File Name
Field Length : 26
Data Type   : Alpha/Numeric
Data Format : XXXXXXXX
Record Loc. : (20:41)
Description : The name of the data file itself. The name
should begin with an alpha character in order to be loadable
to various operating systems. Avoid file name extensions,
other than **830** or **TXT**

Default Value: None, required entry.
Validation   : The name must match its given system name at
                the time of file generation.

Element Name : Order
Field Length : 1
Data Type   : Numeric
Data Format : X
Record Loc. : (50:50)
Description : The Order of Accuracy of the survey. 1st, 2nd
                or 3rd order.
Default Value: No default value.
Validation   : 1 = 1st Order, 2= 2nd Order, & 3 = 3rd Order.

Element Name : Horizontal Datum
Field Length : 5
Data Type   : Alpha/Numeric
Data Format : XXXXX
Record Loc. : (75:79)
Description : The North American Datum upon which the survey
                was based. This will vary according to the
                specifics of the contract.
Default Value: No default value.
Validation   : The values are:
                NAD27 = North American Datum of 1927
                NAD83 = North American Datum of 1983

T02 RECORD:
Data Labels : Column   Label
                (01:03)   T02
                (07:18)   JOB NUMBER :
                (43:48)   UNITS:
                (61:73)   VERT. DATUM:

Element Name : Job Number
Field Length : 8
Data Type   : Alpha/Numeric
Data Format : XX-XXXXX
Record Loc. : (20:27)
Description : The Job Number is the survey contract job
                number assigned by the Survey Section,
                It identifies the survey contract and its
                requirements, duration, location, etc.
Default Value: None, required entry.

Validation   :   The number consists of a year and sequence
                  number. For example, the second contract job
                  for 1990 would have a number of 90-2.
                  Alphabetic characters are sometimes added;
                  90-2A

Element Name :   Units
Field Length :   2
Data Type   :   Alpha/Numeric
Data Format :   XX
Record Loc. :   (50:51)
Description :   The units in which the survey was taken. All
                 positions: X, Y, and Z's must be in the same
                 units.
Default Value: None, required entry.
Validation   :   Valid entries are: FT = feet
                                      SI = System International
                                           (Meters)

Element Name :   Vertical Datum
Field Length :   6
Data Type   :   Alpha/Numeric
Data Format :   XXXXXX
Record Loc. :   (75:80)
Description :   The vertical plane to which the elevations'
                 were referenced.
Default Value: None, required entry.
Validation   :   MLG = Mean Low Gulf
                 MSL = Mean Sea Level
                 NGVD29 or NGVD88 = National Geodetic Vert.
                 Datum
                 NAVD = North Atlantic Vertical Datum

T03 RECORD:
Data Labels :   Column   Label
                 (01:03)   T03
                 (07:18)   SURVEY DATE:
                 (43:48)   ZONE :
                 (68:73)   EPOCH:

Element Name :   Survey Date
Field Length :   11
Data Type   :   Alpha/Numeric
Data Format :   DD-MON-YYYY
Record Loc. :   (20:30)
Description :   The date on which the survey was completed.
Default Value: None, required entry.
Validation   :   Value must be a valid date: 01-JAN-1990

Element Name :   Zone
Field Length :   12
Data Type   :   Alpha/Numeric
Data Format :   LAMBERT xxxx -or- UTM xx
Record Loc. :   (50:61)
Description :   The State Plane, Lambert, or UTM zone which to
                 the survey's XYZ points have been referenced.

```
        Default Value: None, required entry.
        Validation   : The value must be: LAMBERT xxxx or UTM xx
                       The "xxxx" and "xx" represent the zone
                       numbers. Represent single digit zones with
                       leading zeroes: 01, 02, 03...


        Element Name : Epoch
        Field Length : 7
        Data Type    : Numeric
        Data Format  : YYYY
        Record Loc.  : (75:81)
        Description  : The year in which the given vertical Benchmark
                       elevation was adjusted or derived.
        Default Value: None. Required entry, when a region has an
                       Epoch value.
        Validation   : Value must be a valid year: 1990
                       New epoch formats show decimal value years,
                       such as 2004.65, where the 65 is the decimal
                       value of the year. 65/100ths of the year.
                       0.65*366 (2004 is a leap year) = 238th
                       day of the year.



        T04 RECORD:
        Data Labels  : Column          Label
                       (01:03)         T04
                       (07:18)         BANK REF.  :
                       (41:48)         CHANNEL:


        Element Name : Bank Reference
        Field Length : 3
        Data Type    : Alphabetic
        Data Format  : XXX
        Record Loc.  : (20:22)
        Description  : The bank from which the survey was referenced.
        Default Value: Optional entry, only needed for hydrographic
                       surveys and topographic bank surveys.
        Validation   : RDB = Right Descending Bank
                       LDB = Left Descending Bank


        Element Name : Channel
        Field Length : 30
        Data Type    : Alphabetic
        Data Format  : 30(X)
        Record Loc.  : (50:79)
        Description  : The channel on which the survey was taken.
        Default Value: Optional entry, only needed for hydrographic
                       surveys and topographic bank surveys.
        Validation   : Generally None. For Revetment Maintenance
                       Surveys, channel must be: "Mississippi River"
                       or  "Atchafalaya River"
```

T05 RECORD:

```
Data Labels  :  Column          Label
                (01:03)         T05
                (07:18)         CONTRACTOR :
```

Element Name : Contractor
```
Field Length :  60
Data Type    :  Alpha/Numeric
Data Format  :  60(X)
Record Loc.  :  (20:79)
Description  :  The name of the survey contractor.
Default Value:  Required.
Validation   :  None.
```

T06 RECORD:

```
Data Labels  :  Column          Label
                (01:03)         T06
                (07:18)         LEVEE DIST.:
```

Element Name : Levee District
```
Field Length :  60
Data Type    :  Alpha/Numeric
Data Format  :  60(X)
Record Loc.  :  (20:79)
Description  :  Levee District name where the survey was
                taken.
Default Value:  None, required entry.
Validation   :  The name should be one of the following:

                Grand Prairie Below Bohemia
                Grand Prairie Above Bohemia
                Point A LA Hache Relief Outlet
                Lake Borgne
                Orleans East
                Orleans West
                Pontchartrain
                Baton Rouge Front Levee
                Buras
                Lafourche Below New Orleans
                Lafourche Above New Orleans
                Atchafalaya Basin
                Fifth Louisiana
                Above Baton Rouge (Left Bank)
                Pass A Loutre  (Left Bank)
                Pass A Loutre  (Right Bank)
                South Pass     (Left Bank)
                South Pass     (Right Bank)
                Southwest Pass (Left Bank)
                Southwest Pass (Right Bank)
                Bonnet Carret' Spillway (Left Bank)
                Old River, Old RIver Outflow
                Chalmette
                Larose to Golden Meadow
                New Orleans to Venice Levees (Reach A)
```

```
                        New Orleans to Venice Levees (Reach B-1)
                        New Orleans to Venice Levees (Reach B-2)
                        New Orleans to Venice Levees (Reach C)
                        East Jefferson
                        West Jefferson
```

T07 RECORD:

```
Data Labels  :  Column          Label
                (01:03)        T07
                (07:18)        TITLE        :
```

Element Name : Title
```
Field Length :  60
Data Type    :  Alpha/Numeric
Data Format  :  60(X)
Record Loc.  :  (20:79)
Description  :  A description of the location that was
                surveyed.
Default Value:  None, required entry.
Validation   :  Generally None. For Revetment Maintenance
                Surveys the title must be the Corps standard
                name of the Revetment, followed by "Revetment
                Maintenance Survey" For example:
                "Fort Jackson Revetment Maintenance Survey"
```

2.2 Range Survey Description. Represent each range survey a data block containing a varying number of records. This block has its own pair of title records called A01 and A02 records, and then the data body.

A01 RECORD:

Element Name : Cross Section Code
```
Field Length :  8
Data Type    :  Numeric
Data Format  :  8(N)
Record Loc.  :  (01:08)
Description  :  The Cross Section Code is used in the
                Revetment Maintenance System as an identifier.
Default Value:  As required.
Validation   :  Validation will be provided.
```

```
Data Labels  :  Column          Label
                (09:11)        A01
```

Element Name : Latitude
```
Field Length :  11
Data Type    :  Numeric
Data Format  :  DDDMMSS.SSS
                (I3,I2,F6.3 decimal point @ col 42)
Record Loc.  :  (14:24)
Description  :  The latitude value at the intersection of the
                established range line and a reference
                baseline.
Default Value:  Required.
Validation   :  Value must be a valid deg, min, sec
```

                    coordinate.
        Element Name : Longitude
        Field Length : 11
        Data Type   : Numeric

        Data Format : DDDMMSS.SSS (I3,I2,F6.3 decimal pt @ col 32)
        Record Loc. : (25:35)
        Description : The longitude value at the intersection of the
                       established range line and a reference
                       baseline.
        Default Value: Required.
        Validation   : Value must be a valid deg, min, sec
                       coordinate.

        Element Name : Range Azimuth
        Field Length : 9
        Data Type   : Numeric
        Data Format : DDDMMSS.S (I3,I2,F4.1 decimal point @ col 43)
        Record Loc. : (36:44)
        Description : For NAD27 datum, the 0° azimuth shall be true
                       south, with azimuths increasing clockwise.
                       For NAD83 datum, the 0° azimuth shall be true
                       north, with azimuths increasing clockwise.
                       Azimuths are measured at the intersection of
                       the range and the baseline.
        Default Value: Required.
        Validation   : Value must be a valid deg, min, sec
                       coordinate.

        Element Name : Station
        Field Length : 12
        Data Type   : Numeric
        Data Format : F12.2 (decimal point @ column 54)
        Record Loc. : (45:56)
        Description : The distance along the baseline from the
                       reference 0.0) in feet. A typical value could
                       be 1500.00.
        Default Value: Required.
        Validation   : None.

        Element Name : Range Name
        Field Length : 12
        Data Type   : Alpha/Numeric
        Data Format : X(12)
        Record Loc. : (64:75)
        Description : The official alpha-numeric range name (label)
                       appropriate for plan layouts. Typical values
                       are R-01, R-02, U-022, D-022, or R-201.25
        Default Value: Required, if name exists.
        Validation   : Generally None. For Revetment Surveys, the
                       range names must be 5 characters long and
                       zero-filled. For example:
                       D-002, D-001, R-000, U-001, and U-002

        Element Name : Starting Range Endpoint
        Field Length : 2 Fields of 12

```
Data Type    :  Numeric
Data Format  :  2(F12.3)
Record Loc.  :  (81:104)
Description  :  The starting Easting & Northing coordinate of
                The range. These values should be in units of
                feet or meters and the coordinates should
                match the specified zone from the T03 record.
Default Value:  Required.
Validation   :  None.
```

Element Name : Ending Range Endpoint
```
Field Length :  2 Fields of 12
Data Type    :  Numeric
Data Format  :  2(F12.3)
Record Loc.  :  (105:128)
Description  :  The ending Easting & Northing coordinate of
                    the range. These values should be in
                units of feet or meters and the coordinates
                should match the specified zone from the T03
                record. NOTE: The two range endpoints must be
                in order of increasing range distance.
Default Value:  Required.
Validation   :  None.
```

A02 RECORD. The A02 record contains information about the benchmark
and/or gage that was used as reference for creating the current range.
If the range is entirely topographic data, only the PBM name and ELEV
fields need to be completed. If the range is entirely hydrographic
data, the GAGE, WSE, DATE, and TIME fields need to be completed. If the
range is a combination of both overbanks and water bottoms, all fields
need to be completed.

```
Data Labels  :  Column          Label
                (09:11)         A02
                (15:18)         PBM:
                (48:52)         ELEV:
                (65:69)         GAGE:
                (81:84)         WSE:
                (95:99)         DATE:
                (114:118)       TIME:
```

Element Name : Permanent Benchmark (PBM)
```
Field Length :  25
Data Type    :  Alphanumeric
Data Format  :  25(X)
Record Loc.  :  (20:44)
Description  :  The name of the Permanent Benchmark from
                which elevation of the surveyed range was
                based.
Default Value:  N/A
Validation   :  N/A
```

Element Name : Gage Name (GAGE)
```
Field Length :  6
Data Type    :  Alphanumeric
```

```
          Data Format  :  X(6)
          Record Loc.  :  (71:76)
          Description  :  The gage code of the gage read to establish a
                          Water Surface Elevation for this range at the
                          time of survey. This field is only used for
                          Hydrographic Surveys. Gage name are typically
                          in the format of Gxxxxx. For example, the code
                          for Carrollton Gage is G08080.
          Default Value:  N/A
          Validation   :  N/A
```

Element Name : Water Surface Elevation (WSE)
```
          Field Length :  7
          Data Type    :  Numeric
          Data Format  :  xxxx.xx
          Record Loc.  :  (86:92)
          Description  :  The Water Surface Elevation read from the gage
                          used for this range. This field is only used
                          for Hydrographic Surveys.
          Default Value:  N/A
          Validation   :  N/A
```

Element Name : Hydrographic Survey Date (DATE)
```
          Field Length :  11
          Data Type    :  Alphanumeric
          Data Format  :  DD-MON-YYYY
          Record Loc.  :  (101:111)
          Description  :  The date that the hydrographic survey was
                          taken. Note that this date may be different
                          from the T03 Record's Survey Date field which
                          indicates when the survey was completed.
          Default Value:  N/A
          Validation   :  Value must be a valid date:  01-JAN-1990
```
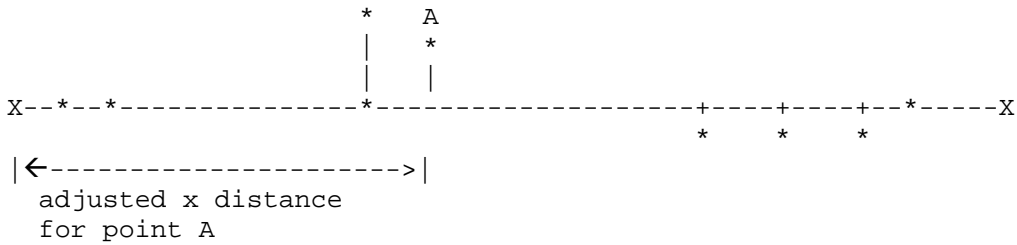
Element Name : Hydrographic Survey Time (TIME)
```
          Field Length :  4
          Data Type    :  Numeric
          Data Format  :  HHMM
          Record Loc.  :  (120:123)
          Description  :  The time that the hydrographic survey was
                          taken. This time should be in hours and
                          minutes in the 24 clock format. For example,
                          0730 is 7:30 am.
          Default Value:  N/A
          Validation   :  N/A
```

RANGE DATA BLOCK. The range data block contains a varying amount of
records that are required to represent a single range. Each range
requires a terminator of 7 nines (9999999) in a distance field. The
terminator indicates the end of the range. Each record contains
information for 4 coordinates. There are two data sets. The first set
carries a Station Number and four sets of Distance, Elevation, and
Note. The record format is F12.2, 4(F7.1,F7.2,A3). Each point's

distance value represents the perpendicular projection of the surveyed
POR location on the straight range line. This procedure adjusts the
survey boat's meandering along a range line and assumes this drift is a
minimal factor in hydrographic survey accuracy.

The figure below illustrates the perpendicular adjustment of the
survey points onto the range line:

* = survey points
X = range endpoints

```
                               *    A
                               |    *
                               |    |
X--*--*---------------*--------------------+----+----+--*-----X
                                           *    *    *
|←--------------------->|
  adjusted x distance
  for point A
```

The record also contains a 2nd data set that represents the actual
non-adjusted coordinates corresponding to the four adjusted points.
These XY points are in the same units as the adjusted points and they
are represented in the coordinates of the projection zone listed in the
T03 title record.

```
         Element Name :  Station
         Field Length :  12
         Data Type    :  Numeric
         Data Format  :  F12.2  (decimal point @ col. 10)
         Record Loc.  :  (01:12)
         Description  :  The distance along the baseline from the
                         reference station in feet. A typical value
                         could be 1500.00 which represents station
                         15+00.00.
         Default Value:  Required.
         Validation   :  None.
```

Four Sets of Distance, Elevation, and Note.

```
         Element Name :  Distance
         Field Length :  7
         Data Type    :  Numeric
         Data Format  :  F7.1
         Record Loc.  :  (13:19),(30:36),(47:53),(64:70)
         Description  :  The distance value along the range from the
                         reference  baseline to the surveyed point.
                         The 0 distance value is at the intersection
                         of range with the baseline.  The distance
                         values for each range must be in increasing
                         order. A 9999997 value may be entered into
                         the Distance Field.

                         This value acts as an indicator flag for a
```

Change in Height of Instrument (HI) for unreduced data. The HI value should be entered in the Elevation field that matches this Distance Field. The HI will be subtracted from all following coordinate pairs in that range. Ranges may have multiple 9999997s and HIs.

Default Value: Required.
Validation   : None.

Element Name : Elevation
Field Length : 7
Data Type   : Numeric
Data Format : F7.2
Record Loc. : (20:26),(37:43),(54:60),(71:77)
Description : The height of a POR above the reference datum. Values should be in units of feet or meters.
Default Value: Required.
Validation   : None.

Element Name : Note
Field Length : 3
Data Type   : Alphabetic
Data Format : XXX
Record Loc. : (27:29),(44:46),(61:63),(78:80)
Description : A 3-character note using standard survey notations for levee profiles and cross sections.
Default Value: As Required.
Validation   : The note may be one of the following values:

              CCL = Center Line Levee
               FS = Flood Side of Levee
               PS = Protected Side of Levee
               BL = Levee Baseline
              FSC = Flood Side Crown (Edge)
               TR = Top Riprap Protection
               TC = Top Concrete Pavement
              WES = Water Edge and Surface
              LSC = Protected Side Crown (Edge), Land Side
              LST = Protected Side Toe
              UTL = Paralleling Utilities
               PL = Pipeline Crossing
              RMP = Ramp Centerline
               CR = Crown or High Point Levee
               ER = Edge of Road or Highway
              BLD = Edge of Building or Obstruction
              TSP = Top of Sheet Piling or Wall
              TPR = Top of "Potato Ridge" Levee
              CLR = Centerline of Road
               TR = Treeline
               NG = Natural Ground

Four Sets of Corresponding XY Range Coordinates.

These XY coordinate values represent the non-adjusted "field" values
for the surveyed range data that was adjusted to the range line.

        Element Name : XY Range Coordinates
        Field Length : 8 Fields of 12 per coordinate
        Data Type   : Numeric
        Data Format : 8(F12.3)
        Record Loc. : (81:176)
        Description : The non-adjusted Easting & Northing (XY)
                        coordinates of the range. These values should
                        be in units of feet or meters.
        Default Value: Required.
        Validation   : None.

   3.0 Method of Delivery. Data shall be directly electronic
transmitted, as specified in Section C of contract.

Revision History:

Revision 8, 30-JUN-1992

       Section 3.0 Method of Delivery:
       Removed reference to floppy disk external label requirements.

Revision 9, 06-MAY-1993

       A01 Record, Ending Range Endpoint:
       Corrected record position from (104:128) to (105:128)

       A02 Record:
       Added PBM Elevation, Gage Code, Water Surface Elevation, Time,
       and Date Fields.

       Distance Field:
       Added a definition that allows entering a Height of Instrument
       (HI) for unreduced data.

Revision 10, 19-July-2001

       Conversion of spec into MS Word from ASCII format.
       Increase of the T01 record filename length from 8 to 28
       characters.

Revision 11, 06-March-2006

       Increase the length of EPOCH from 4 to 7, to capture
       new epoch values with decimal years, e.g. 2004.65