

APPENDIX J

HPMS SUBMITTAL SOFTWARE

INTRODUCTION

The Federal Highway Administration (FHWA) developed the HPMS software system to facilitate the submission and analysis of HPMS data in a microcomputer environment. The system provides the States with the ability to enter data directly into the system, view section-by-section data on the screen, modify section-by-section data on screen, validate the data, calculate data values, query the data for inconsistencies in the coding, and analyze current year data and compare them with prior years' data.

SYSTEM REQUIREMENTS

The software should be installed on at least a Pentium or Pentium II (preferred) 200 Mhz with MMX extensions or AMD K6 with 3D Now with at least 64 MB of memory (96 MB RAM or 128 MB RAM preferred) and at least a 4 gigabyte hard drive running Windows NT or Windows 98 or better. The resolution of the monitor should be at least 800 x 600 True Colors.

The software requires 20 MB of free space on C:\ for installation and approximately five times the size of the current HPMS data file free space for running the system. Without a sufficient amount of free space, the system will hang or display an error message while performing some of the processes. The free space must be on the same drive on which the software is installed and running.

If installed on a drive other than C:\, users still need 20 MB of free space on C:\. However, the drive on which HPMS is installed needs to be five times the size of the current HPMS data file. The software installation procedure initially copies compressed files to C:\ and decompresses them on the drive where the software will be installed. The software will use approximately 4 MB of space on the C:\ drive regardless of where the software is installed because of files that are placed in the Windows directory.

Please Note: Windows NT Version 4.0 users need service pack 5, or higher, installed on the PC. Service pack information can be found at the top of the screen when the computer is started and Windows is loading. The service pack information is displayed at the end of the line. Users can also go to Start, Program Files, Administrative Tools (Common), Windows NT Diagnostics and view the version information.

IMPORTING THE DATA

The State's roadway information data prepared for the HPMS submission is imported into the software system as a comma delimited ASCII file. The data must be coded as outlined in Chapter IV and must follow the table layout listed below.

The HPMS data is stored as a Microsoft Access table. Therefore, each data segment in the file must have a unique Section ID (data Item 5) within the county code (data Item 4); the Section ID must not contain all blanks or all zeros. These data items are two of the record keys for the HPMS table in the Microsoft Access database.

HPMS COMMA DELIMITED ASCII FILE

The layout for the comma delimited ASCII file that is imported into and exported from the HPMS Windows-based software is shown in the table below. The ASCII file contains items included in the HPMS field manual. The following table lists the data items in the order they appear in the ASCII file. The first five items are record keys for the HPMS table in the Microsoft Access database.

Item #	Item Name	Data Type	Max. Length
1	Year of the Data	Numeric; Integer	9999
2	State Code	Numeric; Codes	99
3	Is Metric	Numeric; Integer	9
4	County Code	Numeric; Codes	999
5	Section Identification	Character Field	Max 12 characters *
6	Is Standard Sample	Numeric; Codes	9
7	Is Donut Sample	Numeric; Codes	9
8	State Control Field	Character Field	Max 100 characters *
9	Is Section Grouped	Numeric; Codes	9
10	LRS ID	Character Field	Max 12 characters *
11	LRS Start Point	Numeric; Decimal	99999.999
12	LRS End Point	Numeric; Decimal	99999.999
13	Rural/Urban Designation	Numeric; Codes	9
14	Urbanized Area Sampling Technique	Numeric; Integer	9
15	Urbanized Area Code	Numeric; Integer	999
16	Nonattainment Area Code	Numeric; Integer	999
17	Functional System	Numeric; Codes	99
18	Generated Functional System	Numeric; Codes	9 **
19	National Highway System (NHS)	Numeric; Codes	9
20	Planned Unbuilt Facility	Numeric; Codes	9
21	Official Interstate Route Number	Character Field	Max 5 characters *
22	Route Signing	Numeric; Codes	9
23	Route Signing Qualifier	Numeric; Codes	9
24	Signed Route Number	Character Field	Max 8 characters *
25	Governmental Ownership	Numeric; Codes	9
26	Special Systems	Numeric; Codes	9
27	Type of Facility	Numeric; Codes	9
28	Designated Truck Route	Numeric; Codes	9
29	Toll	Numeric; Codes	9
30	Section Length	Numeric; Decimal	99999.999
31	Donut Area AADT Volume Group	Numeric; Integer	9
32	Standard Sample AADT Volume Group	Numeric; Integer	99
33	AADT	Numeric; Integer	9999999
34	Number of Through Lanes	Numeric; Integer	99
35	Measured Pavement Roughness (IRI)	Numeric; Decimal	999.99
36	Present Serviceability Rating (PSR)	Numeric; Decimal	99.9
37	HOV Operations	Numeric; Codes	9

Item #	Item Name	Data Type	Max. Length
38	Highway Surveillance Systems A	Numeric; Codes	9
39	Highway Surveillance Systems B	Numeric; Codes	9
40	Highway Surveillance Systems C	Numeric; Codes	9
41	Highway Surveillance Systems D	Numeric; Codes	9
42	Highway Surveillance Systems E	Numeric; Codes	9
43	Highway Surveillance Systems F	Numeric; Codes	9
44	Highway Surveillance Systems G	Numeric; Codes	9
45	Highway Surveillance Systems H	Numeric; Codes	9
46	Highway Surveillance Systems I	Numeric; Codes	9
47	Sample Identifier	Character Field	Max 12 characters *
48	Donut Area Expansion Factor	Numeric; Decimal	99999.999 **
49	Standard Expansion Factor	Numeric; Decimal	99999.999 **
50	Surface/Pavement Type	Numeric; Codes	9
51	SN or D	Numeric; Decimal	999.9
52	Climate Zone	Numeric; Codes	9
53	Year of Surface Improvement	Numeric; Integer	9999
54	Lane Width	Numeric; Decimal	999.9
55	Access Control	Numeric; Codes	9
56	Median Type	Numeric; Codes	9
57	Median Width	Numeric; Decimal	999.9
58	Shoulder Type	Numeric; Codes	9
69	Shoulder Width – Right	Numeric; Decimal	99.9
60	Shoulder Width – Left	Numeric; Decimal	99.9
61	Peak Parking	Numeric; Codes	9
62	Widening Feasibility	Numeric; Codes	9
63	Curves by Class A	Numeric; Decimal	99.999
64	Curves by Class B	Numeric; Decimal	99.999
65	Curves by Class C	Numeric; Decimal	99.999
66	Curves by Class D	Numeric; Decimal	99.999
67	Curves by Class E	Numeric; Decimal	99.999
68	Curves by Class F	Numeric; Decimal	99.999
69	Horizontal Alignment Adequacy	Numeric; Codes	9 **
70	Type of Terrain	Numeric; Codes	9
71	Vertical Alignment Adequacy	Numeric; Codes	9 **
72	Grades by Class A	Numeric; Decimal	99.999
73	Grades by Class B	Numeric; Decimal	99.999
74	Grades by Class C	Numeric; Decimal	99.999
75	Grades by Class D	Numeric; Decimal	99.999
76	Grades by Class E	Numeric; Decimal	99.999
77	Grades by Class F	Numeric; Decimal	99.999
78	Percent Passing Sight Distance	Numeric; Integer	999
79	Weighted Design Speed	Numeric; Integer	999 **
80	Speed Limit	Numeric; Integer	999
81	Percent Peak Single Unit Trucks	Numeric; Integer	999
82	Percent Average Daily Single Unit Trucks	Numeric; Integer	999

Item #	Item Name	Data Type	Max. Length
83	Percent Peak Combination Trucks	Numeric; Integer	999
84	Percent Average Daily Combination Trucks	Numeric; Integer	999
85	K-Factor	Numeric; Integer	99
86	Directional Factor	Numeric; Integer	999
87	Number of Peak Lanes	Numeric; Integer	99
88	Turning Lanes – Left	Numeric; Codes	9
89	Turning Lanes – Right	Numeric; Codes	9
90	Prevailing Type of Signalization	Numeric; Codes	9
91	Typical Peak Percent Green Time	Numeric; Codes	999
92	Number of At-Grade Intersections – Signals	Numeric; Integer	99
93	Number of At-Grade Intersections – Signs	Numeric; Integer	99
94	Number of At-Grade Intersections – Other	Numeric; Integer	99
95	Peak Capacity	Numeric; Integer	99999 **
96	Volume/Service Flow Ratio (V/SF)	Numeric; Decimal	9.99 **
97	Future AADT	Numeric; Integer	9999999
98	Future AADT Year	Numeric; Integer	9999

* Character fields do not use double quotes (“) within the data item.

** Field calculated by the software.

All fields should be separated by comma (,).

All character fields should be enclosed with double quotes (“”).

For Numeric Data Items:

- Leading zero must be coded in a decimal value when the value is less than an integer (length = 0.21); otherwise, leading zeros are not required.
- Decimal points are required for all data items labeled “Numeric; Decimal”; i.e., those reported in tenths, hundredths, or thousandths (PSR=2.3, length = 8.253, etc.).
- One digit must be coded after a decimal point for all data items labeled “Numeric; Decimal”; PSR = 3 must be coded 3.0; additional trailing zeros are not required for the decimal portion of a data value.
- When data not available, code “0” or “0.0” as appropriate.

For Character Data Items:

- Any alphanumeric character (A through Z; 0 through 9; space) may be coded.
- DO NOT use double quotes within the character data item.
- Leading and embedded spaces are required, trailing spaces are optional.

For Data Items with Assigned Values (Codes):

- Select the appropriate value from the table.
- The value must be coded precisely as listed in the table.

HPMS record with Universe only information:

All 98 HPMS Data Items must be accounted for in the comma-delimited record. The record for a universe section would look like:

1999,44,0,1,"SECTION63810",0,0,"State Control Field",0,"000006395102",1.35,
 10.0,4,0,26,26,14,0,0,0,"00000",3,0,"00000103",1,0,2,0,0,2.063,0,6,23145,4,0,3.5,0,0,0,0,0,0,0,0,0,0,,,,,
 ,,

51 commas are coded at the end for the sample data items.

The software calculates item 18 - Generated Functional System. A zero value must be used for all calculated fields.

There is no need to supply zero values for the sample portion of the record.

The following table corresponds to the above example:

Item #	Item Name	Data Value
1	Year of the Data	1999
2	State Code	44
3	Is Metric	0
4	County Code	1
5	Section Identification	SECTION63810
6	Is Standard Sample	0
7	Is Donut Sample	0
8	State Control Field	STATE CONTROL FIELD
9	Is Section Grouped	0
10	LRS ID	000006395102
11	LRS Start Point	1.35
12	LRS End Point	10.0
13	Rural/Urban Designation	4
14	Urbanized Area Sampling Technique	0
15	Urbanized Area Code	26
16	Nonattainment Area Code	26
17	Functional System	14
18	Generated Functional System	0
19	National Highway System (NHS)	0
20	Planned Unbuilt Facility	0
21	Official Interstate Route Number	00000
22	Route Signing	3
23	Route Signing Qualifier	0
24	Signed Route Number	00000103
25	Governmental Ownership	1
26	Special Systems	0
27	Type of Facility	2
28	Designated Truck Route	0
29	Toll	0
30	Section Length	2.063

Item #	Item Name	Data Value
31	Donut Area AADT Volume Group	0
32	Standard Sample AADT Volume Group	6
33	AADT	23145
34	Number of Through Lanes	4
35	Measured Pavement Roughness (IRI)	0
36	Present Serviceability Rating (PSR)	3.5
37	HOV Operations	0
38	Highway Surveillance Systems A	0
39	Highway Surveillance Systems B	0
40	Highway Surveillance Systems C	0
41	Highway Surveillance Systems D	0
42	Highway Surveillance Systems E	0
43	Highway Surveillance Systems F	0
44	Highway Surveillance Systems G	0
45	Highway Surveillance Systems H	0
47	Highway Surveillance Systems I	0
47-98	Sample Data Items	51 Commas are coded

ENTERING MANUAL CAPACITIES

The software system contains procedures to determine the capacity for each standard sample highway segment in the data. The procedures used in the HPMS software for calculating highway capacity conform to the Highway Capacity Manual (HCM). Capacity calculation procedures are described in Appendix N.

The capacity calculations are based on service flow rates for level of service E and are for the peak direction. The capacity coded in HPMS is used for system planning analysis, not project level analysis. The number of peak lanes (number of through lanes used in the peak period in the peak direction) coded in HPMS (Item 87) is used in the procedures for determining capacity. The number of through lanes coded in HPMS (Item 34) is used in the procedures to determine the number of lanes on the facility. The assumptions made by FHWA for adjustment factors used in the procedures are consistent with the recommended values in the HCM.

The user may override the calculated capacity if he/she determines that the capacity is too low or too high because of operational conditions that are not appropriately reflected in the HPMS data items used in the calculation. Once the capacity has been entered manually, the system will flag that highway segment and will not overwrite the capacity when running calculations. Once the switch is set, it will remain set for future year's data as well as for the current year's data. If in the future the user wants the system to calculate the capacity, enter a zero for the capacity for that highway segment. This will remove the flag the system has set for that highway segment in the data table.

A report, which lists all segments that have the capacity set by the user, is available. For each segment with a user set capacity the county code (Item 4), sample identifier (Item 47), section identification (Item 5) and peak capacity (Item 95) are listed.

ENTERING MANUAL GENERAL CLIMATE ZONE

The software system contains procedures to locate the standard sample highway segment in one of nine general climate zones. This numeric item is coded from county/climate zone equivalency tables. The definitions for the nine climate zones are included in Appendix I.

The climate zone should be checked and may be changed if found not to be representative of the area in question. The climate zone can be manually entered into individual highway segments or entered into the county name directory in the software. Entering the climate zone information into the county name directory will apply the new climate zone information to all sections in the county after running calculations. When entering the climate zone information segment-by-segment, the software flags the segments and will not overwrite the climate zone when running calculations. If in the future, the user does not want the manual climate zone coded, turn the flag off by entering a zero and the software will calculate the climate zone for the affected segment(s).

A report, which lists all segments that have the climate zone set by the user, is available. For each segment with a user set climate zone the county code (Item 4), sample identifier (Item 47), section identification (Item 5) and climate zone (Item 52) are listed.

BATCH UPDATING

Batch updating in the HPMS system assumes that a batch transaction file has been prepared outside of the system and is available for use. This file consists of a series of transaction records whose first 17 characters are in fixed field form which represent the action to take and the highway segment key on which to take the action. The fixed fields are:

Action Field (one character) in position 1 of the transaction record. The acceptable actions are:

- A add a new highway segment or portion of a highway segment to the data table.
- M modify an existing highway segment in the data table.
- D delete an entire highway segment from the data table.

NOTE: Once the segment is deleted in a batch update the segment **cannot** be retrieved and put back in the table. It is recommended that the delete in the batch update be used with extreme care. If the segments are deleted using the EDITOR feature in the software one at a time, a table is built with the deleted segments and they can be retrieved if the wrong segment is deleted.

County Code (three characters) in positions 2 to 4 of the transaction record. Leading zeros must be coded.

Section Identifier (twelve characters) in positions 5 to 16 of the transaction record. If the transaction is to take place on an existing segment, M or D, the section identifier (Item 5) **must be** coded exactly as in the existing data segment. If the transaction is A, add a new segment to the data table, the section identifier **must not** match any existing section ID within the county.

Place Holder (one character) in position 17 **must be** a semicolon (;).

NOTE: If the action is **D**, delete an existing segment, the transaction would end with the 17 positions coded.

Starting in position 18, code the transaction specific information. This information consists of a repeating set of data including:

Data Item Number (as contained in Chapter IV) followed by a comma (,).

Data Value (specific to the item number- see comma delimited ASCII file description) followed by a semicolon (;). The types of data values are:

Assigned values (codes) – the value must be coded precisely as listed in the table with the codes for the particular data item.

Character data – any alphanumeric character (A through Z; 0 through 9; space) may be coded. Do **not** use double quotes (“), a comma (,) or a semicolon (;) within the character string. Leading or embedded spaces **are** required. Trailing spaces **are not** required.

Numeric data may be either **integer** or **decimal**. Leading zeros **are not** required for an integer. A leading zero **must be** coded in decimal values when the value is less than an integer (length = 0.21); otherwise, leading zeros **are not** required. Decimal points **are** required and one digit **must be** coded after the decimal point (PSR = 3, code 3.0); additional trailing zeros **are not** required for the decimal portion. When data are not reported or missing, code “0” or “0.0” as appropriate.

These sets (data item number, data value;) are repeated until the batch update information for a particular highway segment key is specified on the transaction record. There is no limit to the length of the transaction record. The set **must** end with a semicolon (;).

The data item number **must be** coded as listed for the data item in Chapter IV. To code the right shoulder width to “10” one would code 59,10;. The State Control Field, Item 8, needs to have only the positions used coded – i.e., to code the data in the 5-15th positions of the 100 character field, one would code:

bbbbMain Street; (where ‘b’ indicates a space would be coded)

If the **action field is M**, modify an existing segment in the data, the section identifier in the transaction record **must be** coded exactly as the section ID (Item 5) in the data table. If the segment section ID includes leading spaces and embedded spaces, they **must be** coded in the exact same position in the 12-character section identifier in the transaction record.

If the **action field is A**, add a new section, all data items for the universe, donut, or standard sample segment do not have to be coded on the transaction set (data item number, data value;). The rural urban designation (Item 13), functional system (Item 17), and section length (Item 30) **must be coded** for any section added. When adding a sample segment, either donut or standard sample, the sample identifier (Item 47) **must be coded** along with any data items beyond item number 49. For the added segment numeric data items not coded will be set to zero in the data table and character fields will be blank. The section identifier coded on the transaction record **must not** be the same as any section ID (Item 5) for an existing segment in the county where the segment to be added is located.

When doing a batch update the following rules apply:

- **Do not** delete a segment and add the same segment in the same execution.
- **Do not** add a segment and then modify that segment in the same execution.
- The only validation of the data values is that a numeric field cannot contain a character value.

Reports are generated which summarize the results of the batch update.

Examples:

A001TEST ADD 111;8,Peach Street;13,2;17,16;25,1;

Add a universe segment in county 001 with section ID TEST ADD 111. The segment is on Peach Street in a small urban area, functional system 16, and is owned by the State.

M003R17 003 3285;19,4;34,6;87,3;

Modify an existing segment in county 003 with section ID R17 003 3285. Three data items are to be updated – NHS, number of through lanes and number of peak lanes.

D112U22112144875;

Delete an existing segment in county 112 with ID U22112144875. Once the segment is deleted it cannot be retrieved.

A123ADDSAMP34186;8,STATE HIGHWAY 34;13,1;17,2;19,1;47,341 86 12323;54,12;55,2;

Add a standard sample segment in county 123 with ID ADDSAMP34186 on State Highway 34. The segment is rural, functional system 2, on the NHS, sample identifier 341 86 12323, lane width 12, and access control 2.

SUBMIT HPMS DATA TO FHWA

The software is used by the State to submit the HPMS data annually to FHWA by June 15th. The data may be submitted electronically, on a CD-ROM, or on a diskette. Included with the data should be a comment file which addresses any remaining issues with the data – validation errors which are valid for the State, missing data not collected, etc. The comment file should be saved as a rich text format (RTF) file from the software used to create the file.