JAN 31 2000

ENGINEERING DATA TRANSMITTAL

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Page 1 of 1

1 EDT

No 614641

2 To (Receiving Organization) Distribution		3 From (Originating Organization) Fluor Federal Services		4 Related EDT No N/A							
5 Proj /Prog /Dept /Div Immobilized Waste		6 Design Authority/Design Agent/Cog Engr F M Mann		7 Purchase Order No N/A							
8 Originator Remarks N/A				9 Equip /Component No N/A							
				10 System/Bldg./Facility ILAW							
				12 Major Assm Dwg No N/A							
11 Receiver Remarks N/A		11A Design Baseline Document? ☐ Yes ☒ No		13 Permit/Permit Application No N/A							
				14 Required Response Date N/A							
15 DATA TRANSMITTED				(F)	(G)	(H)	(I)				
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1	HNF-5769		0	Verification and	N/A	2	1	1			
				Validation for VAM3DF,							
				Version 1 00							
				(FFS version 1 00)							
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Verification and Validation of VAM3DF, Version 1 00 (FFS version 1 00)

S H Finfrock

Fluor Federal Services

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Abstract

VAM3DF, a three-dimensional vadose zone/groundwater flow and transport code, has been approved for use at Hanford VAM3DCF is substantially the same as the earlier version VAM3DCG but with the addition of some significant new features These new features include decay chain nuclide analysis and saturation-dependent variable anisotropy options

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**Verification and Validation for VAM3DF, Version 1 00
(FFS version 1 00)**

Prepared by

Scott H. Finrock
Fluor Federal Services

January 2000

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1 0 INTRODUCTION

VAM3DF (typically called VAM)¹ is a vadose zone/groundwater modeling code. The code and supporting documentation are provided by HydroGeoLogic (HGL). Earlier versions of VAM have been in use at the Hanford Site since the 1980's. Fluor Federal Services (FFS) has acquired this new version to support the 2001 ILAW PA. Prior to using this new version for production calculations, it is necessary to demonstrate that the code is adequately verified and validated. This report serves to document the verification and validation of VAM3DF.

VAM3DF has been verified and validated by HGL (Huyakorn and Panday 1999, and Appendix A). Earlier versions of VAM (e.g., VAM3DCG) have been verified and validated (Lu and Langford 1995 and Puigh, 1998) for use at Hanford. The new version VAM3DF (Huyakorn and Panday 1999), is substantially the same as version VAM3DCG but with the addition of some significant new features. This new version provides an integration technique called 'data fusion' (which will not be used in the ILAW analyses), and provides for decay chain nuclide analysis. In addition, a variable anisotropy feature has been added. In order to qualify VAM3DF for use, it is necessary to complete an installation test of the code and show that the test cases produce the same results as published by HGL (which has validated the code). In addition, VAM3DF will be tested with Hanford specific cases, which were run on version VAM3DCG, to show that any differences in the calculational results (between this version and the previous) are within acceptable limits.

2 0 FFS NT COMPUTER SYSTEM

2 1 Hardware

VAM3DF will be run on the FFS Advanced Computing Center (ACC). This system is composed of a network of Intergraph PC type computers. Each computer is based on an Intel Pentium II Xeon processor. The individual computers have some variations (such as clock speed and amount of RAM) but are generally similar. The minimum configuration is a 400 MHz cpu, 256 MB RAM, and 9.1 GB hard disk (partitioned into smaller drives).

The installation and detailed testing were conducted on one specific computer, id# NW30032274 (currently located in 1200 Jadwin, Room 448).

2 2 Operating System

All of the computers (that will be used for running VAM) in the ACC are running the Microsoft Windows NT operating system, version 4.0, service pack 3.0 or higher.

¹VAM is a trademark of Software Laboratories, Inc.
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3 0 VAM INSTALLATION

VAM3DF was provided by HGL as an NT executable and a dynamic link library (dll) file. Installation of the VAM3DF code only required placing the two files in the desired directory on the host machine.

4 0 VERIFICATION TESTING

Verification testing is intended to assure that the code is calculating results correctly. This can be done by running test cases and demonstrating that the code produces essentially the same results with the new installation as it did with the previous installation. Verification can also be accomplished by comparing results to hand calculations or other data sources. Both of these methods were employed in verifying VAM3DF.

4 1 Test Cases

A suite of cases has been identified for testing the VAM installation. This suite consists of three cases provided by HGL, two cases from a previous Hanford modeling effort (using VAM3DCG), and a variation of one of the Hanford cases to test the new decay chain feature. In addition, three cases were constructed to demonstrate new features (decay chain with variable K_d , and variable anisotropy) that are not amenable to formal validation. These cases were not compared to previous calculations but the results were reviewed qualitatively and will serve as comparisons for new code versions that may be installed in the future. A copy of each of the input files is included in Appendix B. The cases are described below.

- 1) 2-D Transient Unsaturated Flow in a Rectangular Slab
- 2) 2-D Transient Solute Transport in a Rectangular Slab
- 3) 2-D Concurrent Flow and Transport in a Rectangular Slab
- 4) Vadose and Groundwater Flow Beneath a Solid Waste Trench
- 5) Solute Transport Beneath a Solid Waste Trench
- 6) Solute Transport Beneath a Solid Waste Trench with Uranium Decay
- 7) Solute Transport Beneath a Solid Waste Trench with Decay and Variable K_d
- 8) Isotropic Vadose Flow
- 9) Anisotropic Vadose Flow

Case 2 uses the results from case 1 as an input, and case 3 is equivalent to the combination of case 1 and case 2. Cases 5, 6, and 7 use the results of case 4. Case 8 is used as a comparison for case 9.

4.2 Verification Test Results

All of the cases were run on the ACC. For the first five cases, the output files from the benchmark runs were copied to the ACC and the equivalent files from each case were compared. For the sixth case, the results were compared to hand calculations.

4.2.1 HGL Test Cases

The three installation test cases (cases 1-3) were compared to the HGL output files using a 'diff' utility. This comparison indicated that the output files were identical.

4.2.2 Hanford Benchmark Cases

The two Hanford cases (cases 4-5) produced very similar but not identical results when run with VAM3DF and compared to VAM3DCG calculations. This is expected due to the changes in the modeling methods employed in VAM3DCG. The flow runs were compared by using a visualization program (Tecplot) to view the flow field. The overall fields were compared visually and a selection of specific points were compared numerically. The results of the VAM3DF calculation were vertical velocity values of 0.0500 cm/yr throughout the vadose zone (this is equal to the recharge rate and is therefore the correct solution). The results of the VAM3DCG calculation were vertical velocity values of 0.0499 cm/yr. This difference of less than 1% is considered acceptable. The transport cases were evaluated using the mass reaching the 100 m well (one of the primary results of the modeling effort). This value was plotted against time for both cases and found to be nearly identical, with a time offset and magnitude change of less than 2%. This level of agreement is considered acceptable.

4.2.3 Decay Chain

The Hanford transport benchmark case (case 5) was also set up as a decay chain problem (case 6) using an abbreviated uranium decay chain and a K_d of 100 L/mg for all species (the K_d was set to a large value to facilitate the verification effort). The mass percentage in each daughter nuclide was calculated by summing the nodal results produced by the code. As a check, the expected values were calculated using the Bateman equations (Lapp and Andrews 1972) shown below. The results of these calculations are shown in Table 4.1. As can be seen, the differences are small (<1% for the worst case).

$$A_1(t) = A_1(0)e^{-\lambda_1 t}$$

$$A_2(t) = A_1(0) * (\lambda_2 / (\lambda_2 - \lambda_1)) * (e^{-\lambda_1 t} - e^{-\lambda_2 t})$$

$$A_3(t) = A_1(0) * (\lambda_1 \lambda_2) * (a * e^{-\lambda_1 t} + b * e^{-\lambda_2 t} + c * e^{-\lambda_3 t})$$

$$a = (1 / ((\lambda_2 - \lambda_1) * (\lambda_3 - \lambda_1)))$$

$$b = (1 / ((\lambda_1 - \lambda_2) * (\lambda_3 - \lambda_2)))$$

$$c = (1 / ((\lambda_1 - \lambda_3) * (\lambda_2 - \lambda_3)))$$

$$A_4(t) = A_1(0) * (\lambda_1 \lambda_2 \lambda_3) * (a * e^{-\lambda_1 t} + b * e^{-\lambda_2 t} + c * e^{-\lambda_3 t} + d * e^{-\lambda_4 t})$$

$$a = (1 / ((\lambda_2 - \lambda_1) * (\lambda_3 - \lambda_1) * (\lambda_4 - \lambda_1)))$$

$$b = (1 / ((\lambda_1 - \lambda_2) * (\lambda_3 - \lambda_2) * (\lambda_4 - \lambda_2)))$$

$$c = (1 / ((\lambda_1 - \lambda_3) * (\lambda_2 - \lambda_3) * (\lambda_4 - \lambda_3)))$$

$$d = (1 / ((\lambda_1 - \lambda_4) * (\lambda_2 - \lambda_4) * (\lambda_3 - \lambda_4)))$$

Table 4 1

Nuclide Id	Initial Activity (Ci)	Decay Constant (yr ⁻¹)	Activity at t=100 000 yr (Bateman Eqns)	Activity at t=100,000 yr (VAM3DF Calculations)
U235	1	1 55e-10	9 9998E-01	9 9998E-01
Th230	0	9 19e-6	1 0144E-05	1 0143E-05
Bi210	0	2 31e-7	5 3272E-06	5 3407E-06
Pb206	0	0 0	4 4102E-08	4 4361E-08

4 2 4 Decay Chain with Variable Kd

The decay chain case (case 6) was also run with variable Kd's (case 7) to test the effect of this option. It is not practical to check the results of this calculation with a hand calculation but the results can be evaluated qualitatively to ascertain that the results are reasonable. In this case the four isotopes modeled in the decay chain case described in section 4 2 3 were each given a different Kd. The relative formation and transport of each of the different isotopes were then compared and found to be consistent with their relative decay coefficients and Kd values.

4 2 5 Variable Anisotropy

Two numerical simulations were run, one using an anisotropy option (case 9) within VAM3DF and the other for an isotropic case (case 8). There are three anisotropy options included in version 2 0 of the VAM3DF code (Huyakorn and Panday 1999). The anisotropy simulation presented here uses the third option based on the work of Polmann (1990). The results of the simulations are shown in Figure 4 1. This figure shows that the moisture distribution in the upper sand layer is much higher for the anisotropic case than for the isotropic case. In the lower gravel there is more spread in the anisotropic case but the water content ranges are much closer for both isotropic and anisotropic systems. This suggests that the upper sand absorbs much of the water and dominates the system. These results are qualitatively what would be expected for the inclusion of an anisotropic condition.

Figure 4 1 Simulated Water Contents For The Isotropic And The Variably Anisotropic Conditions

Volumetric Water Content from a Continuous Source
Isotropic System After 2000 Years

Volumetric Water Content from a Continuous Source
Anisotropic System After 2000 Years

5 0 CONFIGURATION MANAGEMENT

All files associated with the installation and testing of VAM3DF on the ACC were placed on the hard disk of cpu NW30032274. A directory was created, e \data\vam\vam3df\benchmark, for storing all of the files.

The executable file is named vam3df100.exe, and is identified as VAM3DF version 1.00, FFS installation version 1.00. The executable file and the library file, tecutil.dll is stored on cpu fdnweng02, in subdirectory \applications\vam\bin.

6 0 AUTHORIZED USERS

Authorized users of the VAM3DF code

Scott Finrock*
Gene Freeman
Raz Khaleel
Allen Lu
Mel Piepho

- Code Custodian

7 0 CONCLUSION

VAM3DF has been verified for use on the ACC. The code was installed and the test cases were run and produced identical results to the previous (HGL) installation. Test cases using Hanford site models were run and compared to the same models run with the previous version of Vam (VAM3DCG). These cases produced results that had differences in the results that were within acceptable limits. This gives confidence that cases run with the old version of Vam are still valid.

8 0 REFERENCES

- Huyakorn, P S and S Panday 1999 *VAM3DF - Variably Saturated Analysis Model in Three-Dimensions for the Data Fusion System Documentation and User's Guide*, Version 2 0, HydroGeoLogic, Inc
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- Polmann, D J , 1990, *Application of Stochastic Methods to Transient Flow and Transport in Heterogeneous Unsaturated Soils*, Ph D Dissertation Massachusetts Institute of Technology, Cambridge, Massachusetts

90 TECHNICAL PEER REVIEW CHECKLIST

Practice 134 290 1112
 Publication Date 22Nov99
 Attachment 02 - Sheet 1 of 1

FLUOR DANIEL NORTHWEST

TECHNICAL PEER REVIEWS

CHECKLIST FOR TECHNICAL PEER REVIEW

Document Reviewed.	HNF-5769 Rev 0		
Title	Verification and Validation for VAM3DF, Version 1.00 (FFS version 1.00)		
Author	Scott H. Finfrock		
Date	January 24, 2000		
Scope of Review	Full Document		

Yes	No*	NA	
☐	☐	☒	Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
☒	☐	☐	Problem completely defined.
☐	☐	☒	Accident scenarios developed in a clear and logical manner
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☒	☐	☐	Computer codes and data files documented.
☐	☐	☒	Data used in calculations explicitly stated in document.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☐	☐	☒	Mathematical derivations checked including dimensional consistency of results.
☒	☐	☐	Models appropriate and used within range of validity or use outside range of established validity justified.
☐	☐	☒	Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations
☒	☐	☐	Software input correct and consistent with document reviewed.
☐	☐	☒	Software output consistent with input and with results reported in document reviewed.
☒	☐	☐	Limits/criteria/guidelines applied to analysis results are appropriate and referenced.
			Limits/criteria/guidelines checked against references
☐	☐	☒	Safety margins consistent with good engineering practices.
☒	☐	☐	Conclusions consistent with analytical results and applicable limits
☒	☐	☐	Results and conclusions address all points required in the problem statement.
☒	☐	☐	Format consistent with applicable guides or other standards.
☐		☒	Review calculations, comments, and/or notes are attached.
☒	☐	☐	Document approved (for example, the reviewer affirms the technical accuracy of the document)

Eugene J. Freeman
 Reviewer (Printed and Signed)

1/24/00
 Date

* All "NO" responses must be explained below or on an additional page.

** Any calculations, comments, or notes generated as part of this review should be signed, dated and attached to this checklist. The material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party

NUCLEAR ENGINEERING

FLUOR DANIEL NORTHWEST

TECHNICAL PEER REVIEWS

CHECKLIST FOR TECHNICAL PEER REVIEW

Document Reviewed HNF-5769 Rev 0
Title Verification and Validation for VAM3DF, Version 1 00
(FFS version 1 00)
Author Scott H Finfrock
Date January 24, 2000
Scope of Review Full Document

Yes	No*	NA	
☐	☐	☒	Previous reviews complete and cover analysis, up to scope of this review with no gaps
☒	☐	☐	Problem completely defined
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☒	☐	☐	Necessary assumptions explicitly stated and supported
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			Limits/criteria/guidelines checked against references
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☒	☐	☐	Conclusions consistent with analytical results and applicable limits
☒	☐	☐	Results and conclusions address all points required in the problem statement
☒	☐	☐	Format consistent with applicable guides or other standards
☐		☒	Review calculations comments and/or notes are attached
☒	☐	☐	Document approved (for example, the reviewer affirms the technical accuracy of the document)

Eugene J Freeman
Reviewer (Printed and Signed)

1/24/00
Date

* All 'NO' responses must be explained below or on an additional page

** Any calculations comments or notes generated as part of this review should be signed dated and attached to this checklist The material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party

NUCLEAR ENGINEERING

APPENDIX A
LETTER OF CERTIFICATION

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JAN 04 RECD

Letter of Certification

This is to certify that I have checked the decay chain option and the Polmann variable anisotropy option that have been programmed in the latest version of VAM3DF by Dr Kim, and that they have been correctly implemented and verified

Please call me at 703-736-4567 if you have any questions

Sincerely

A handwritten signature in cursive script that reads "Sorab Panday".

Dr Sorab Panday
Senior Director, Research and Development

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(703) 478-5186 • Fax (703) 471 4180 • [http //www.hgl.com](http://www.hgl.com)

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APPENDIX B
VAM3DF INPUT FILES

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HNF-5769 Rev 0

```

1
2-D FLOW IN RECTANGULAR SLAB
1 -1 0 0 1 10 352 150 0 0 1 0 0 0
1 1 10 0 1 0 01 1 0 0 0
0 1 0 0 1 5 0 5 0 1 0 0
0 0 0 01 1 2 0 05
-90 00
1 E0 1 E0 1 E0 0 E0 0 45E0 0 E0 0 E0
0 333E0 1 E0 -1 E-2 1 E0 -1 E0
11 16 2 0 1 0 1 0 10 0 0
1 0 1 0 15 10 1 1 0
10 0 10 1 0
32 0 0 0 0
166 1 -90
167 1 -90
168 1 -90
169 1 -90
170 1 -90
171 1 -90
172 1 90
173 1 -90
174 1 -90
175 1 -90
176 1 -90
342 1 -90
343 1 90
344 1 90
345 1 -90
346 1 90
347 1 -90
348 1 -90
349 1 -90
350 1 90
351 1 90
352 1 -90
7 1 0
8 1 1
9 1 -2
10 1 -3
11 1 -4
183 1 0
184 1 -1
185 1 2
186 1 -3
187 1 -4
14
7 8 9 10 11 183 184 185 186 187 166 176 342 352

```

[illegible]

HNF-5769 Rev 0

```

1
TRANSPORT IN TRANSIENT FLOW FIELD
0 0 0 0 1 10 352 150 0 0 1 0 0 0
0 0 10 0 1 0 00 1 0 0 0 0 0 01
2 1 0 3 0 0 0 5 0 1 0 0
0 0 01 1 2 0 05
0 00 0
1 E0 0 E0 1 E-2 1 E0 0 45E0 1 46E0
1 E-3 0 308
11 16 2 0 1 1 1 0
1 1 15 10 1 1 0 0
10 10 1 0
10 0 0 0 0
7 1 1
183 1 1
8 1 1
184 1 1
9 1 1
185 1 1
10 1 1
186 1 1
11 1 1
187 1 1
0 0 0 1 1 1 0 0
14
7 8 9 10 11 183 184 185 186 187 166 176 342 352

```

```

GROUP 1
GROUP 2
GROUP 3
GROUP 4
GROUP 5
GROUP 6
GROUP 7
GROUP 11A
GROUP 11B
GROUP 12
GROUP 14
- - - - -
GROUP 15A
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
- - - - -
GROUP 19
GROUP 22A
GROUP 22B

```

HNF-5769 Rev 0

TRANSIENT FLOW AND TRANSPORT IN 2 DIMENSIONS													
2	-1	0	0	1	10	352	150	0	0	1	0	0	0
0	1	10	0	1		0 05		1	0	0	0	0	0 01
0	1	0	3	0	5	0	5	0	1	0	0		
0		0 01		1 2		0 05							
-90 00		0											
1 E0	1 E0			1 E0		0 E0		0 45E0		0 E0		0 E0	
0 333E0	1 E0			-1 E-2		1 E0		-1 E0					
1 E0	0 E0			1 E-2		1 E0		0 45E0		1 46E0			
1 E-3	0 308												
11	16	2	1					1		0			
	1		1		15		10		1		1		0
	10		10		1		0						0
21	0	0	0	0									
7	1		0										
7	2		1										
8	1		-1										
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10	1		3										
10	2		1										
11	1		-4										
11	2		1										
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168	1	-90 00											
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175	1	-90 00											
176	1	-90 00											
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7													
7	8	9	10	11	166	176							

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HNF-5769 Rev 0

[illegible]

G-9a

G 10a

G-14A

G-14Ba i

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

[illegible]

G-14Ba ii

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

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29	32						
8	32	0	0				
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33	1	64	9784				
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97	1	-64	9784				
32	1	-65	0000				
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96	1	65	0000				
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897	1	0	2500				
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901	1	0	5000				
902	1	0	3750				
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G 14Ba111
G-14C
G-15a
G-15b

G 15c

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

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118 1
897 898 899 900 901 902 903 904 905 906 907 908 726 727 728 729
730 731 732 916 917 918 919 920 921 922 923 924 925 926 927 928
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 65 97 129 161 193 225 257 289 321 353 385 417 449 481 513
545 577 609 641 673 705 737 769 801 833 865 64 96 128 160 192
224 256 288 320 352 384 416 448 480 512 544 576 608 640 672 704
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G-23a

G-28

G-29a

G-29b

HNF-5769 Rev 0

[illegible]

G-1

G 3
G 4
G-5
G-6a
G-7a
G 8

2nd plane

HNF-5769 Rev 0

[illegible]

G-11a

G-11b

G-14A

G 14Ba i

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

[illegible]

G 14Baff

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

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0 0000	-1 0000						

29 32

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899	1	0 0000	0 5000	
900	1	0 0000	0 5000	
901	1	0 0000	0 5000	
902	1	0 0000	0 3750	
903	1	0 0000	0 2500	
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906	1	0 0000	0 2500	
907	1	0 0000	0 2000	
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916	1	0 0000	0 1250	
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928	1	0 0000	0 2500	

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16000E+2	18000E+2	20000E+2	22000E+2	24000E+2	26000E+2	28000E+2	30000E+2
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64000E+2	66000E+2	68000E+2	70000E+2	72000E+2	74000E+2	76000E+2	78000E+2

G 14Baiti
G-14C
G-15a

G-15b

G-15c

G-17

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80000E+2	82000E+2	84000E+2	86000E+2	88000E+2	90000E+2	90090E+2	90000E+3
42735E-2	42734E-2	42615E-2	41166E-2	36178E-2	27644E-2	18218E 2	10487E-2
53714E-3	24919E-3	10633E-3	42250E 4	15800E-4	56100E-5	19000E-5	62000E 6
19000E-6	60000E-7	20000E 7	10000E 7	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
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10000E-0	10000E-0	10000E-0	10000E 0	10000E 0	10000E 0	10000E-0	10000E 0
10000E-0	10000E 0	10000E-0	10000E-0	10000E 0	10000E 0	10000E-0	10000E-0
10000E 0	10000E-0	10000E-0	10000E-0	10000E 0	10000E-0	10000E-0	10000E-0
10000E-0	10000E-0	10000E 0	10000E-0	10000E-0	10000E-0	10000E 0	10000E-0
10000E-0	10000E 0	10000E 0	10000E 0	10000E-0	10000E-0	10000E 0	10000E-0
10000E-0	10000E-0	10000E-0	10000E-0	10000E-0	10000E 0	10000E-0	10000E 0
750 1 48 0					G 17		
00000E+0	20000E+1	40000E+1	60000E+1	80000E+1	10000E+2	12000E+2	14000E+2
16000E+2	18000E+2	20000E+2	22000E+2	24000E+2	26000E+2	28000E+2	30000E+2
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80000E+2	82000E+2	84000E+2	86000E+2	88000E+2	90000E+2	90090E+2	90000E+3
10684E-1	10684E-1	10654E-1	10291E-1	90446E 2	69109E 2	45544E-2	26217E-2
13428E-2	62299E-3	26582E-3	10563E-3	39500E-4	14010E-4	47500E-5	15500E-5
49000E-6	15000E 6	40000E 7	10000E-7	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
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751 1 48 0					G-17		
00000E+0	20000E+1	40000E+1	60000E+1	80000E+1	10000E+2	12000E+2	14000E+2
16000E+2	18000E+2	20000E+2	22000E+2	24000E+2	26000E+2	28000E+2	30000E+2
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17094E-1	17094E-1	17046E-1	16466E-1	14471E-1	11057E-1	72870E-2	41947E-2
21485E-2	99678E-3	42531E 3	16901E 3	63200E-4	22420E-4	76000E-5	24700E-5
78000E 6	24000E 6	70000E-7	20000E-7	10000E-7	00000E+0	00000E+0	00000E+0
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80000E+2	82000E+2	84000E+2	86000E+2	88000E+2	90000E+2	90090E+2	90000E+3
21368E-1	21367E-1	21307E-1	20583E-1	18089E-1	13822E-1	91087E-2	52434E-2
26857E-2	12460E-2	53163E-3	21127E-3	79000E-4	28030E-4	95000E-5	30900E-5
97000E-6	30000E-6	90000E-7	30000E-7	10000E-7	00000E+0	00000E+0	00000E+0
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[illegible]

G 20
G 23a

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545	577	609	641	673	705	737	769	801	833	865	64	96	128	160	192	
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736	768	800	832	864	896											
4	32	64	96	128												
0	0000	2000	0000		1	1										G 28
1																G 29a
2000	0000															G 29b

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

[illegible]

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3	1										
1	0										
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2	1										
3	1										
4	1										
2	2	1	1	1	0	1					G-14A
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35 0000	-30 0000	-25 0000	-22 0000	20 0000	-18 0000	-15 0000	-10 0000				
-5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	-90 0000	-80 0000	70 0000	-60 0000	-50 0000	-45 0000	-40 0000				
-35 0000	-30 0000	-25 0000	22 0000	-20 0000	-18 0000	-15 0000	-10 0000				
-5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	-90 0000	-80 0000	-70 0000	-60 0000	-50 0000	-45 0000	40 0000				
35 0000	-30 0000	-25 0000	-22 0000	-20 0000	-18 0000	15 0000	10 0000				
-5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	90 0000	80 0000	-70 0000	60 0000	-50 0000	-45 0000	-40 0000				
-35 0000	-30 0000	-25 0000	-22 0000	20 0000	-18 0000	-15 0000	-10 0000				
-5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	-90 0000	-80 0000	70 0000	-60 0000	-50 0000	-45 0000	-40 0000				
-35 0000	-30 0000	-25 0000	22 0000	-20 0000	-18 0000	-15 0000	-10 0000				
5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
100 0000	-90 0000	-80 0000	-70 0000	-60 0000	-50 0000	45 0000	40 0000				
-35 0000	-30 0000	-25 0000	-22 0000	-20 0000	-18 0000	15 0000	-10 0000				
5 0000	2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	90 0000	80 0000	-70 0000	60 0000	-50 0000	-45 0000	-40 0000				
-35 0000	30 0000	25 0000	-22 0000	20 0000	-18 0000	-15 0000	-10 0000				
-5 0000	-2 0000	0 0000	2 0000	5 0000	10 0000	15 0000	20 0000				
30 0000	40 0000	50 0000	60 0000	70 0000	80 0000	90 0000	100 0000				
-100 0000	-90 0000	-80 0000	70 0000	-60 0000	-50 0000	-45 0000	-40				

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[illegible]

G-14Baii

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

-12 0000	-12 0000	-12 0000	-12 0000	-12 0000	-12 0000	-12 0000	-12 0000
-11 0000	-11 0000	11 0000	-11 0000	-11 0000	-11 0000	-11 0000	-11 0000
-11 0000	-11 0000	11 0000	-11 0000	11 0000	-11 0000	-11 0000	11 0000
-11 0000	-11 0000	11 0000	11 0000	-11 0000	-11 0000	-11 0000	-11 0000
-11 0000	11 0000	-11 0000	-11 0000	-11 0000	-11 0000	-11 0000	-11 0000
-10 0000	10 0000	-10 0000	-10 0000	-10 0000	-10 0000	10 0000	-10 0000
-10 0000	-10 0000	-10 0000	10 0000	-10 0000	-10 0000	10 0000	-10 0000
-10 0000	-10 0000	-10 0000	-10 0000	-10 0000	10 0000	-10 0000	-10 0000
10 0000	-10 0000	-10 0000	-10 0000	-10 0000	-10 0000	-10 0000	-10 0000
9 0000	-9 0000	-9 0000	9 0000	9 0000	-9 0000	9 0000	-9 0000
-9 0000	-9 0000	-9 0000	-9 0000	-9 0000	-9 0000	-9 0000	-9 0000
-9 0000	-9 0000	9 0000	-9 0000	-9 0000	-9 0000	-9 0000	-9 0000
-9 0000	-9 0000	-9 0000	9 0000	-9 0000	-9 0000	-9 0000	-9 0000
-8 0000	-8 0000	-8 0000	-8 0000	8 0000	-8 0000	-8 0000	-8 0000
-8 0000	-8 0000	-8 0000	-8 0000	8 0000	8 0000	8 0000	8 0000
8 0000	8 0000	-8 0000	-8 0000	8 0000	8 0000	8 0000	8 0000
-8 0000	-8 0000	-8 0000	-8 0000	8 0000	8 0000	8 0000	8 0000
-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	7 0000	-7 0000	-7 0000
-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000
-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000
-7 0000	-7 0000	7 0000	-7 0000	-7 0000	-7 0000	-7 0000	-7 0000
6 0000	6 0000	-6 0000	6 0000	6 0000	-6 0000	6 0000	6 0000
-6 0000	-6 0000	-6 0000	-6 0000	-6 0000	6 0000	-6 0000	-6 0000
-6 0000	-6 0000	-6 0000	-6 0000	-6 0000	6 0000	-6 0000	-6 0000
-6 0000	-6 0000	6 0000	-6 0000	-6 0000	-6 0000	-6 0000	-6 0000
-4 0000	-4 0000	4 0000	-4 0000	-4 0000	-4 0000	-4 0000	-4 0000
-4 0000	-4 0000	4 0000	-4 0000	-4 0000	-4 0000	-4 0000	-4 0000
-4 0000	-4 0000	-4 0000	4 0000	4 0000	-4 0000	4 0000	4 0000
-4 0000	-4 0000	-4 0000	4 0000	4 0000	-4 0000	4 0000	4 0000
-2 0000	-2 0000	-2 0000	2 0000	-2 0000	-2 0000	-2 0000	2 0000
2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000
-2 0000	2 0000	-2 0000	-2 0000	-2 0000	2 0000	-2 0000	-2 0000
-2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000	-2 0000
-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000
-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000
-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000	-1 0000
1 0000	-1 0000	-1 0000	-1 0000	1 0000	-1 0000	-1 0000	-1 0000
0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000
0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000
0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000
0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000	0 0000
0 0000	-1 0000						

29	32						
16	121	0	7	0	0	0	0
1	1	0	0000	0	0000		
33	1	0	0000	0	0000		
65	1	0	0000	0	0000		
97	1	0	0000	0	0000		
1	2	0	0000	0	0000		
33	2	0	0000	0	0000		
65	2	0	0000	0	0000		
97	2	0	0000	0	0000		
1	3	0	0000	0	0000		
33	3	0	0000	0	0000		
65	3	0	0000	0	0000		
97	3	0	0000	0	0000		
1	4	0	0000	0	0000		
33	4	0	0000	0	0000		
65	4	0	0000	0	0000		
97	4	0	0000	0	0000		
897	1	0	0000	0	2500		
898	1	0	0000	0	5000		
899	1	0	0000	0	5000		
900	1	0	0000	0	5000		
901	1	0	0000	0	5000		
902	1	0	0000	0	3750		
903	1	0	0000	0	2500		

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G-14C

G 15a
G 15b

G-15c

HNF-5769 Rev 0

904	1	0 0000	0 2500
905	1	0 0000	0 2500
906	1	0 0000	0 2500
907	1	0 0000	0 2000
908	1	0 0000	0 1250
916	1	0 0000	0 1250
917	1	0 0000	0 2000
918	1	0 0000	0 2500
919	1	0 0000	0 2500
920	1	0 0000	0 3750
921	1	0 0000	0 5000
922	1	0 0000	0 5000
923	1	0 0000	0 5000
924	1	0 0000	0 5000
925	1	0 0000	0 5000
926	1	0 0000	0 5000
927	1	0 0000	0 5000
928	1	0 0000	0 2500
897	2	0 0000	0 2500
898	2	0 0000	0 5000
899	2	0 0000	0 5000
900	2	0 0000	0 5000
901	2	0 0000	0 5000
902	2	0 0000	0 3750
903	2	0 0000	0 2500
904	2	0 0000	0 2500
905	2	0 0000	0 2500
906	2	0 0000	0 2500
907	2	0 0000	0 2000
908	2	0 0000	0 1250
916	2	0 0000	0 1250
917	2	0 0000	0 2000
918	2	0 0000	0 2500
919	2	0 0000	0 2500
920	2	0 0000	0 3750
921	2	0 0000	0 5000
922	2	0 0000	0 5000
923	2	0 0000	0 5000
924	2	0 0000	0 5000
925	2	0 0000	0 5000
926	2	0 0000	0 5000
927	2	0 0000	0 5000
928	2	0 0000	0 2500
897	3	0 0000	0 2500
898	3	0 0000	0 5000
899	3	0 0000	0 5000
900	3	0 0000	0 5000
901	3	0 0000	0 5000
902	3	0 0000	0 3750
903	3	0 0000	0 2500
904	3	0 0000	0 2500
905	3	0 0000	0 2500
906	3	0 0000	0 2500
907	3	0 0000	0 2000
908	3	0 0000	0 1250
916	3	0 0000	0 1250
917	3	0 0000	0 2000
918	3	0 0000	0 2500
919	3	0 0000	0 2500
920	3	0 0000	0 3750
921	3	0 0000	0 5000
922	3	0 0000	0 5000
923	3	0 0000	0 5000
924	3	0 0000	0 5000
925	3	0 0000	0 5000
926	3	0 0000	0 5000
927	3	0 0000	0 5000

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HNF-5769 Rev 0

00000E+0	20000E+1	40000E+1	60000E+1	80000E+1	10000E+2	12000E+2	14000E+2
16000E+2	18000E+2	20000E+2	22000E+2	24000E+2	26000E+2	28000E+2	30000E+2
32000E+2	34000E+2	36000E+2	38000E+2	40000E+2	42000E+2	44000E+2	46000E+2
48000E+2	50000E+2	52000E+2	54000E+2	56000E+2	58000E+2	60000E+2	62000E+2
64000E+2	66000E+2	68000E+2	70000E+2	72000E+2	74000E+2	76000E+2	78000E+2
80000E+2	82000E+2	84000E+2	86000E+2	88000E+2	90000E+2	90090E+2	90000E+3
10684E-1	10684E-1	10654E-1	10291E-1	90446E-2	69109E-2	45544E-2	26217E-2
13428E-2	62299E-3	26582E-3	10563E-3	39500E-4	14010E-4	47500E-5	15500E-5
49000E-6	15000E-6	40000E-7	10000E-7	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0	12500E+0
751	1	48	0			G 17	
00000E+0	20000E+1	40000E+1	60000E+1	80000E+1	10000E+2	12000E+2	14000E+2
16000E+2	18000E+2	20000E+2	22000E+2	24000E+2	26000E+2	28000E+2	30000E+2
32000E+2	34000E+2	36000E+2	38000E+2	40000E+2	42000E+2	44000E+2	46000E+2
48000E+2	50000E+2	52000E+2	54000E+2	56000E+2	58000E+2	60000E+2	62000E+2
64000E+2	66000E+2	68000E+2	70000E+2	72000E+2	74000E+2	76000E+2	78000E+2
80000E+2	82000E+2	84000E+2	86000E+2	88000E+2	90000E+2	90090E+2	90000E+3
17094E-1	17094E-1	17046E-1	16466E-1	14471E-1	11057E-1	72870E-2	41947E-2
21485E-2	99678E-3	42531E-3	16901E-3	63200E-4	22420E-4	76000E-5	24700E-5
78000E-6	24000E-6	70000E-7	20000E-7	10000E-7	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
752	1	48	0			G-17	</

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[illegible]

G 20
G 23a

G-28
G-29a
G-29b

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[illegible]

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[illegible]

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

[illegible]

G 14Ba11

HNF-5769 Rev 0

[illegible]

HNF-5769 Rev 0

[illegible]

29	32						
16	121	0	7	0	0	0	0
1	1	0	0000	0	0000		
33	1	0	0000	0	0000		
65	1	0	0000	0	0000		
97	1	0	0000	0	0000		
1	2	0	0000	0	0000		
33	2	0	0000	0	0000		
65	2	0	0000	0	0000		
97	2	0	0000	0	0000		
1	3	0	0000	0	0000		
33	3	0	0000	0	0000		
65	3	0	0000	0	0000		
97	3	0	0000	0	0000		
1	4	0	0000	0	0000		
33	4	0	0000	0	0000		
65	4	0	0000	0	0000		
97	4	0	0000	0	0000		
897	1	0	0000	0	2500		
898	1	0	0000	0	5000		
899	1	0	0000	0	5000		
900	1	0	0000	0	5000		
901	1	0	0000	0	5000		
902	1	0	0000	0	3750		
903	1	0	0000	0	2500		

G-14Ba iii
G-14C

G-15a
G-15b

G-15c

HNF-5769 Rev 0

904	1	0 0000	0 2500
905	1	0 0000	0 2500
906	1	0 0000	0 2500
907	1	0 0000	0 2000
908	1	0 0000	0 1250
916	1	0 0000	0 1250
917	1	0 0000	0 2000
918	1	0 0000	0 2500
919	1	0 0000	0 2500
920	1	0 0000	0 3750
921	1	0 0000	0 5000
922	1	0 0000	0 5000
923	1	0 0000	0 5000
924	1	0 0000	0 5000
925	1	0 0000	0 5000
926	1	0 0000	0 5000
927	1	0 0000	0 5000
928	1	0 0000	0 2500
897	2	0 0000	0 2500
898	2	0 0000	0 5000
899	2	0 0000	0 5000
900	2	0 0000	0 5000
901	2	0 0000	0 5000
902	2	0 0000	0 3750
903	2	0 0000	0 2500
904	2	0 0000	0 2500
905	2	0 0000	0 2500
906	2	0 0000	0 2500
907	2	0 0000	0 2000
908	2	0 0000	0 1250
916	2	0 0000	0 1250
917	2	0 0000	0 2000
918	2	0 0000	0 2500
919	2	0 0000	0 2500
920	2	0 0000	0 3750
921	2	0 0000	0 5000
922	2	0 0000	0 5000
923	2	0 0000	0 5000
924	2	0 0000	0 5000
925	2	0 0000	0 5000
926	2	0 0000	0 5000
927	2	0 0000	0 5000
928	2	0 0000	0 2500
897	3	0 0000	0 2500
898	3	0 0000	0 5000
899	3	0 0000	0 5000
900	3	0 0000	0 5000
901	3	0 0000	0 5000
902	3	0 0000	0 3750
903	3	0 0000	0 2500
904	3	0 0000	0 2500
905	3	0 0000	0 2500
906	3	0 0000	0 2500
907	3	0 0000	0 2000
908	3	0 0000	0 1250
916	3	0 0000	0 1250
917	3	0 0000	0 2000
918	3	0 0000	0 2500
919	3	0 0000	0 2500
920	3	0 0000	0 3750
921	3	0 0000	0 5000
922	3	0 0000	0 5000
923	3	0 0000	0 5000
924	3	0 0000	0 5000
925	3	0 0000	0 5000
926	3	0 0000	0 5000
927	3	0 0000	0 5000

928	3	0 0000	0 2500
897	4	0 0000	0 2500
898	4	0 0000	0 5000
899	4	0 0000	0 5000
900	4	0 0000	0 5000
901	4	0 0000	0 5000
902	4	0 0000	0 3750
903	4	0 0000	0 2500
904	4	0 0000	0 2500
905	4	0 0000	0 2500
906	4	0 0000	0 2500
907	4	0 0000	0 2000
908	4	0 0000	0 1250
916	4	0 0000	0 1250
917	4	0 0000	0 2000
918	4	0 0000	0 2500
919	4	0 0000	0 2500
920	4	0 0000	0 3750
921	4	0 0000	0 5000
922	4	0 0000	0 5000
923	4	0 0000	0 5000
924	4	0 0000	0 5000
925	4	0 0000	0 5000
926	4	0 0000	0 5000
927	4	0 0000	0 5000
928	4	0 0000	0 2500
749	2	0 0000	0 1000
750	2	0 0000	0 1250
751	2	0 0000	0 2000
752	2	0 0000	0 2500
753	2	0 0000	0 2000
754	2	0 0000	0 1250
755	2	0 0000	0 1000
749	3	0 0000	0 1000
750	3	0 0000	0 1250
751	3	0 0000	0 2000
752	3	0 0000	0 2500
753	3	0 0000	0 2000
754	3	0 0000	0 1250
755	3	0 0000	0 1000
749	4	0 0000	0 1000
750	4	0 0000	0 1250
751	4	0 0000	0 2000
752	4	0 0000	0 2500
753	4	0 0000	0 2000
754	4	0 0000	0 1250
755	4	0 0000	0 1000
749	1	48 0	
			G-17
00000E+0	20000E+1	40000E+1	60000E+1 80000E+1 10000E+2 12000E+2 14000E+2
16000E+2	18000E+2	20000E+2	22000E+2 24000E+2 26000E+2 28000E+2 30000E+2
32000E+2	34000E+2	36000E+2	38000E+2 40000E+2 42000E+2 44000E+2 46000E+2
48000E+2	50000E+2	52000E+2	54000E+2 56000E+2 58000E+2 60000E+2 62000E+2
64000E+2	66000E+2	68000E+2	70000E+2 72000E+2 74000E+2 76000E+2 78000E+2
80000E+2	82000E+2	84000E+2	86000E+2 88000E+2 90000E+2 90090E+2 90000E+3
42735E 2	42734E-2	42615E-2	41166E-2 36178E 2 27644E 2 18218E-2 10487E-2
53714E-3	24919E-3	10633E-3	42250E-4 15800E 4 56100E 5 19000E 5 62000E-6
19000E-6	60000E-7	20000E-7	10000E-7 00000E+0 00000E+0 00000E+0 00000E+0
00000E+0	00000E+0	00000E+0	00000E+0 00000E+0 00000E+0 00000E+0 00000E+0
00000E+0	00000E+0	00000E+0	00000E+0 00000E+0 00000E+0 00000E+0 00000E+0
00000E+0	00000E+0	00000E+0	00000E+0 00000E+0 00000E+0 00000E+0 00000E+0
10000E-0	10000E-0	10000E-0	10000E-0 10000E-0 10000E-0 10000E 0 10000E-0
10000E-0	10000E-0	10000E-0	10000E-0 10000E 0 10000E 0 10000E 0 10000E-0
10000E 0	10000E-0	10000E-0	10000E 0 10000E-0 10000E-0 10000E-0 10000E 0 10000E 0
10000E-0	10000E-0	10000E-0	10000E-0 10000E-0 10000E-0 10000E-0 10000E-0 10000E 0 10000E-0
10000E-0	10000E-0	10000E-0	10000E-0 10000E-0 10000E-0 10000E-0 10000E 0 10000E-0
10000E-0	10000E-0	10000E-0	10000E-0 10000E-0 10000E-0 10000E 0 10000E 0 10000E-0
750	1	48 0	
			G-17

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[illegible]

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00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0	00000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0	20000E+0
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754	1	48	0			G 17	
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755	1	48	0			G 17	
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G 20
G-23a

G-28
G-29a
G-29b

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HNF-5769 Rev 0

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GRP23

GRP28
GRP29

DISTRIBUTION SHEET

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