

## Magnussonite, manganese arsenite, a fluorite derivative structure

PAUL B. MOORE AND TAKAHARU ARAKI

Department of the Geophysical Sciences, The University of Chicago  
Chicago, Illinois 60637

## Abstract

A single crystal of magnussonite, end-member formula unit  $Mn_{12}^{2+} [As_6^{3+} Mn^{1+} O_{18}]_2 Cl_2$ , was studied in detail by three-dimensional X-ray diffractometry. The mineral is cubic, space group  $Ia\bar{3}d$ ,  $Z = 8$ ,  $a = 19.680(4) \text{ \AA}$ .  $R = 0.112$  ( $R_w = 0.097$ ) for 1373 independent reflections. X-ray diffraction data to  $\sin\theta/\lambda = 0.80$  (MoK $\alpha$  radiation) were collected on a Pailred diffractometer, and the structure was solved by Patterson, Fourier, and least-squares refinement techniques.

The structure is an anion-deficient derivative of the fluorite structure type and possesses a pronounced substructure  $a' = a/4$ . The cell contains 64 fluorite cells and the general fluorite-like formula can be written  $X_{32}O_{36}\square_{28}$ ,  $Z = 8$  where  $\square$  are ordered vacancies over the anion frame. Its underlying principle is a large cluster of composition  $[As_6^{3+} Mn^{1+} O_{18}]$ , where the oxygens define a polyhedron of point symmetry  $\bar{3}$  consisting of 36 edges, 18 vertices, 2 hexagonal faces, 12 triangular faces, and 6 quadrilateral faces. The arsenite oxygens reside on the periphery, and the central core consists of six  $As^{3+}$  octahedrally coordinated to central  $Mn^{1+}$  with an average bond distance  $As^{3+}-Mn^{1+} = 2.65 \text{ \AA}$ ,  $0.08 \text{ \AA}$  longer than  $Mn-As = 2.57 \text{ \AA}$  found in the structure of MnAs (nickel arsenide structure type). This unusual structure is interpreted as satisfying the 18-electron rule with  $2 \times 6 = 12$  electrons donated by the  $As^{3+}$  plus  $6 d^5$  electrons from  $Mn^{1+}$ . The  $Cl^-$  ions reside outside the large hexagonal faces of the oxygen polyhedron.

The rest of the structure consists of  $Mn(1)O_6$  distorted cubes,  $Mn(2)O_4$  distorted squares,  $Mn(3)O_6$  distorted trigonal prisms, and  $Mn(4)O_6$  distorted octahedra.

## Introduction

Magnussonite is an arsenite mineral originally described from the Långban mine in Värmland, Sweden (Gabrielson, 1956), and subsequently found in geochemically similar environments at Sterling Hill, Sussex County, New Jersey (Fronde!, 1961), and the Brattfors mine, Nordmark in Värmland, Sweden (Moore, 1970b). It occurs as granular masses ranging in color from grass-green, emerald green, bluish-green, passing into yellowish-green and orange. It is optically isotropic ( $n = 1.980 \pm 0.005$ ), with vitreous luster, fracture conchoidal, hardness about 4 on Mohs scale (Gabrielson, 1956). Locally it is not rare, and its paragenetic settings suggest that its field of stability, although confined to basic and reduced conditions, may extend over a considerable temperature range.

Earlier study by Moore (1970b) showed it to be cubic, space group  $Ia\bar{3}d$ ,  $a = 19.7 \text{ \AA}$ ,  $Z = 32$  for the composition  $(Mn, Mg, Cu)_6(AsO_3)_6(OH, Cl)$ . A pronounced fluorite-like subcell was recognized,  $a' = a/$

4. This property, compounded with a rather complex cell for such a simple composition, attracted us to the problem. Many fluorite derivative structures, some of considerable complexity, have been recently characterized (Moore and Araki, 1976a, 1977). The present study not only confirms the fluorite-related structure but also affords evidence on the first *bona fide* example of a metal cluster in an oxide matrix for an inorganic natural product.

## Experimental section

Minerals, unlike synthetic materials, usually have crystallized in systems where the number of available components is greater than the end-member composition would suggest, and magnussonite is no exception. Therefore, two problems arise: the determination of the structure type and the assessment of mixed cation populations over the non-equivalent sites in the structure. The three known chemical analyses (Table 1) show that twelve components may play some role in the structure. Solid solution must occur

Table 6. Magnussonite anisotropic thermal vibration parameters ( $\times 10^4$ )<sup>a</sup>

Atom	B <sub>11</sub>	B <sub>22</sub>	B <sub>33</sub>	B <sub>12</sub>	B <sub>13</sub>	B <sub>23</sub>
Mn(1)	9.9(10)	8.6(7)	=B <sub>11</sub>	0.0	0.0	0.0
Mn(2)	7.6(7)	16.1(14)	=B <sub>11</sub>	-0.6(9)	-10.4(8)	=B <sub>12</sub>
Mn(3)	5.9(4)	8.5(7)	=B <sub>22</sub>	0.8(5)	=B <sub>12</sub>	-0.6(3)
Mn(4)	5.9(6)	=B <sub>11</sub>	4.4(4)	-1.5(3)	-0.8(4)	=B <sub>13</sub>
MX	13.7(64)	5.3(44)	59.9(159)	5.9(34)	1.2(46)	19.1(64)
GMW	21.8(71)	=B <sub>11</sub>	26.6(55)	-0.7(32)	-8.3(47)	=B <sub>23</sub>
As	4.7(2)	7.7(2)	7.2(2)	0.0(1)	-0.1(1)	1.4(1)
O(1)	5.0(14)	15.0(19)	18.1(20)	2.6(12)	-6.3(13)	-2.8(16)
O(2)	3.4(12)	12.7(16)	9.7(15)	2.6(11)	-2.5(11)	-2.1(12)
O(3)	7.0(13)	14.3(17)	6.9(14)	-1.8(12)	2.7(11)	-1.3(12)

<sup>a</sup>Coefficients in  $\exp[-(\beta_{11}h^2 + \beta_{22}k^2 + \beta_{33}l^2 + 2\beta_{12}hk + 2\beta_{13}hl + 2\beta_{23}kl)]$ .

Table 7. Magnussonite parameters for the ellipsoids of vibration\*

Atom	$i$	$\mu_i$	$\theta_{ia}$	$\theta_{ib}$	$\theta_{ic}$	$B, 8\pi^2\text{\AA}^2$
Mn(1)	1	0.130(5)	90	0	90	1.47(11)
	2	0.140(7)	--- not determined ---			
	3	0.140(7)	--- not determined ---			
Mn(2)	1	0.102(13)	49(9)	68(24)	49(9)	2.05(14)
	2	0.125(9)	105(17)	22(24)	105(17)	
	3	0.227(19)	135	90	45	
Mn(3)	1	0.104(5)	18(8)	104(5)	76(5)	1.18(8)
	2	0.124(6)	90	135	135	
	3	0.136(6)	108(8)	132(2)	48(2)	
Mn(4)	1	0.089(6)	76(5)	104(5)	19(8)	0.84(7)
	2	0.093(7)	135	135	90	
	3	0.124(6)	132(2)	48(2)	71(8)	
MX	1	-----non positive definite-----				4.1(8)
	2	-----non positive definite-----				
	3	-----non positive definite-----				
ClW	1	0.152(4)	56(7)	56(7)	52(14)	3.6(8)
	2	0.210(4)	135	45	90	
	3	0.265(3)	116(9)	116(9)	38(14)	
As	1	0.096(2)	4(6)	92(5)	87(4)	1.02(2)
	2	0.109(2)	86(6)	50(3)	140(3)	
	3	0.132(2)	91(2)	40(3)	50(3)	
O(1)	1	0.067(18)	22(4)	96(5)	69(4)	1.97(12)
	2	0.162(11)	86(6)	153(10)	116(10)	
	3	0.210(10)	111(4)	116(10)	35(8)	
O(2)	1	0.065(17)	19(6)	100(6)	74(8)	1.34(9)
	2	0.132(11)	82(9)	122(12)	147(11)	
	3	0.171(9)	107(5)	146(11)	61(11)	
O(3)	1	0.091(14)	135(12)	92(7)	45(13)	1.45(10)
	2	1.131(11)	130(13)	112(11)	132(13)	
	3	0.172(10)	74(9)	158(11)	76(9)	

\* $i$  =  $i$ th principal axis;  $\mu_i$  = rms amplitude;  $\theta_{ia}$ ,  $\theta_{ib}$ ,  $\theta_{ic}$  = angles (deg) between the  $i$ th principal axis and the cell axes  $a_1$ ,  $a_2$  and  $a_3$ .

MAGNUSSONITE

SHEET NO. 1 PART 1

H	K	L	FD	FC	H	K	L	FD	FC	H	K	L	FD	FC	H	K	L	FD	FC
4	0	0	724.5	785.9	22	22	0	215.2	225.8	12	9	1	33.4	63.6	29	3	2	48.3	54.5
9	0	0	4152.6	3604.4	6	1	1	453.8	475.1	14	9	1	305.3	380.7	31	3	2	45.2	64.4
12	0	0	338.8	329.7	10	1	1	516.7	498.5	16	9	1	57.7	33.5	6	4	2	275.1	288.1
16	0	0	2355.5	2301.2	14	1	1	705.3	697.0	18	9	1	341.0	347.4	8	4	2	62.4	67.9
20	0	0	62.7	35.9	18	1	1	363.4	381.6	20	9	1	53.3	37.1	10	4	2	431.5	470.9
24	0	0	652.9	676.3	22	1	1	345.4	357.6	22	9	1	444.6	450.6	12	4	2	75.4	71.7
28	0	0	146.3	122.9	26	1	1	136.3	148.7	24	9	1	35.9	34.9	14	4	2	59.2	51.1
4	2	0	49.4	46.9	30	1	1	332.5	323.6	26	9	1	195.1	171.3	16	4	2	113.2	129.4
6	2	0	1091.6	1126.5	3	2	1	177.3	177.3	28	9	1	26.7	25.3	18	4	2	651.5	678.9
6	2	0	49.4	39.8	5	2	1	49.7	42.5	30	9	1	223.2	221.5	20	4	2	203.2	198.1
10	2	0	53.0	18.8	7	2	1	62.9	70.2	11	10	1	50.3	67.3	22	4	2	48.5	27.5
12	2	0	100.3	105.2	9	2	1	146.0	125.1	13	10	1	47.5	13.2	24	4	2	125.3	149.9
14	2	0	704.3	703.1	11	2	1	157.5	144.5	15	10	1	433.7	430.2	26	4	2	451.7	474.3
16	2	0	118.9	132.7	13	2	1	215.8	214.9	17	10	1	265.2	255.6	28	4	2	161.4	170.8
18	2	0	46.9	34.2	15	2	1	510.7	542.0	19	10	1	66.3	98.7	30	4	2	41.3	29.8
20	2	0	210.1	203.7	17	2	1	76.0	23.6	21	10	1	39.7	17.9	5	5	2	246.9	257.7
22	2	0	613.3	627.3	19	2	1	94.2	78.7	23	10	1	220.9	246.5	7	5	2	139.2	150.1
24	2	0	191.0	204.2	21	2	1	140.4	127.3	25	10	1	159.1	143.9	9	5	2	224.1	246.7
26	2	0	118.4	90.7	23	2	1	186.7	205.0	27	10	1	33.8	8.9	11	5	2	255.6	266.7
28	2	0	221.3	226.9	25	2	1	87.8	72.5	29	10	1	51.2	51.7	13	5	2	206.3	221.1
30	2	0	301.5	307.6	27	2	1	94.5	112.6	12	11	1	80.1	21.3	15	5	2	77.3	61.6
4	4	0	21.5	225.1	31	2	1	82.7	45.9	14	11	1	165.7	164.4	17	5	2	186.5	201.6
6	4	0	62.7	29.2	31	2	1	76.5	107.4	16	11	1	64.2	14.5	19	5	2	246.4	258.6
8	4	0	538.8	557.4	4	3	1	62.1	51.0	18	11	1	95.4	9.0	21	5	2	74.1	87.8
10	4	0	34.1	21.9	6	3	1	117.7	120.1	20	11	1	65.9	6.0	23	5	2	70.8	79.8
12	4	0	198.1	230.4	8	3	1	43.7	9.7	22	11	1	59.9	23.5	25	5	2	86.3	124.8
14	4	0	91.3	86.1	10	3	1	46.1	38.1	24	11	1	123.7	111.5	27	5	2	154.7	178.7
16	4	0	458.9	452.7	12	3	1	96.6	41.0	26	11	1	104.6	128.6	29	5	2	67.7	4.0
18	4	0	87.2	99.1	14	3	1	89.3	53.6	28	11	1	41.9	23.5	31	5	2	46.4	58.3
20	4	0	269.5	273.8	16	3	1	78.6	71.7	13	12	1	160.0	155.1	8	6	2	361.7	375.7
22	4	0	90.1	122.1	18	3	1	63.3	88.7	15	12	1	108.1	114.7	10	6	2	45.9	52.8
24	4	0	191.5	208.2	20	3	1	49.6	12.0	17	12	1	39.0	81.2	12	6	2	60.6	15.7
26	4	0	125.1	125.7	22	3	1	48.0	77.8	19	12	1	65.1	38.7	14	6	2	189.9	202.1
28	4	0	151.2	147.9	24	3	1	89.7	98.4	21	12	1	162.4	178.9	16	6	2	34.4	26.5
30	4	0	136.4	130.3	26	3	1	64.0	82.9	23	12	1	88.7	37.8	18	6	2	77.2	144.1
6	6	0	544.1	595.4	28	3	1	47.3	66.9	25	12	1	48.7	28.7	20	6	2	60.1	37.8
8	6	0	122.1	118.4	30	3	1	79.3	82.5	27	12	1	156.7	147.9	22	6	2	77.2	46.6
10	6	0	369.4	366.7	5	4	1	37.9	34.9	29	12	1	291.9	302.4	24	6	2	83.8	71.1
12	6	0	90.9	125.3	7	4	1	50.6	36.7	14	13	1	48.5	31.3	26	6	2	140.5	158.3
14	6	0	96.6	982.2	9	4	1	58.8	67.6	16	13	1	48.4	28.4	28	6	2	56.6	45.5
16	6	0	109.9	120.6	11	4	1	54.6	42.5	18	13	1	233.7	242.8	30	6	2	587.8	635.8
18	6	0	153.0	158.5	13	4	1	197.1	198.8	20	13	1	192.3	204.9	7	7	2	466.2	473.3
20	6	0	45.3	27.5	15	4	1			22	13	1			9	7	2		

22	6	0	550.0	550.3	17	4	1	63.7	21.3	24	13	1	94.4	107.9	11	7	2	416.5	423.7
24	6	0	188.5	202.2	19	4	1	66.3	45.4	26	13	1	57.0	110.1	13	7	2	80.4	34.6
26	6	0	53.2	65.9	21	4	1	62.3	63.5	28	13	1	175.7	159.3	15	7	2	142.8	133.3
28	6	0	80.6	93.2	23	4	1	42.4	19.3	15	14	1	85.7	90.7	17	7	2	196.7	183.8
30	6	0	316.6	316.7	25	4	1	56.0	27.2	17	14	1	255.5	254.0	19	7	2	191.8	203.8
8	8	0	4240.0	4156.7	27	4	1	43.7	29.8	19	14	1	61.0	84.4	21	7	2	90.6	106.5
10	8	0	63.9	16.0	29	4	1	66.4	75.7	21	14	1	237.8	233.3	23	7	2	160.5	164.5
12	8	0	359.9	359.2	31	4	1	35.2	46.5	23	14	1	49.9	34.9	25	7	2	175.6	172.4
14	8	0	51.8	21.2	33	4	1	212.4	219.7	25	14	1	115.7	125.5	27	7	2	72.9	91.3
16	8	0	1582.7	1621.0	35	4	1	150.6	162.5	27	14	1	66.2	95.4	29	7	2	94.1	50.2
18	8	0	67.7	60.0	37	4	1	31.2	6.8	29	14	1	182.5	179.5	31	7	2	48.4	29.6
20	8	0	173.6	186.0	39	4	1	87.3	49.2	31	14	1	182.5	329.0	33	7	2	151.2	148.7
22	8	0	90.7	42.8	41	4	1	142.1	142.6	33	14	1	180.9	175.0	35	7	2	712.8	730.8
24	8	0	510.4	528.2	43	4	1	95.0	106.7	35	14	1	86.4	104.1	37	7	2	112.7	103.4
26	8	0	26.5	34.0	45	4	1	36.6	17.1	37	14	1	119.0	120.5	39	7	2	127.4	124.3
28	8	0	59.3	25.8	47	4	1	106.7	121.7	39	14	1	103.3	86.5	41	7	2	491.9	175.7
30	8	0	62.3	13.8	49	4	1	85.2	134.2	41	14	1	90.0	65.6	43	7	2	122.2	143.4
10	10	0	212.9	228.4	24	5	1	90.8	97.6	19	16	1	62.9	48.0	24	8	2	49.7	72.6
12	10	0	101.7	98.7	26	5	1	61.5	72.9	21	16	1	92.9	195.4	26	8	2	125.2	166.4
14	10	0	609.8	586.5	28	5	1	143.0	159.1	23	16	1	216.9	195.4	28	8	2	284.2	274.4
16	10	0	154.5	161.5	30	5	1	92.0	94.2	25	16	1	108.9	173.2	30	8	2	125.2	166.4
18	10	0	314.3	336.1	32	5	1	45.2	44.0	27	16	1	191.3	182.5	32	8	2	342.3	368.9
20	10	0	256.6	256.4	34	5	1	379.2	363.2	29	16	1	48.1	24.1	34	8	2	97.2	111.1
22	10	0	398.7	404.6	36	5	1	260.1	254.3	31	16	1	212.5	212.9	36	8	2	276.8	268.0
24	10	0	86.2	104.0	38	5	1	39.3	19.6	33	16	1	93.5	79.7	38	8	2	61.4	55.6
26	10	0	208.4	212.6	40	5	1	119.6	121.2	35	16	1	128.7	142.8	40	8	2	65.8	28.7
28	10	0	238.2	222.9	42	5	1	165.0	163.4	37	16	1	126.2	133.6	42	8	2	109.3	138.7
12	12	0	238.3	231.0	19	6	1	245.6	252.3	21	18	1	27.1	15.2	23	9	2	237.0	237.4
14	12	0	88.0	87.5	21	6	1	179.3	180.1	23	18	1	143.6	145.0	25	9	2	70.6	82.4
16	12	0	268.4	262.3	23	6	1	63.8	34.0	25	18	1	52.7	18.8	27	9	2	80.9	83.4
18	12	0	88.4	44.9	25	6	1	71.1	61.6	27	18	1	77.0	63.0	29	9	2	451.4	473.2
20	12	0	88.6	71.2	27	6	1	80.5	111.4	29	18	1	48.1	8.7	31	9	2	58.4	26.4
22	12	0	86.2	115.2	29	6	1	124.9	106.3	31	18	1	108.2	197.0	33	9	2	185.9	184.7
24	12	0	217.8	204.1	31	6	1	693.1	707.1	33	18	1	121.1	126.9	35	9	2	42.4	15.1
26	12	0	109.2	13.6	33	6	1	172.5	180.8	35	18	1	143.2	161.6	37	9	2	91.5	111.1
28	12	0	608.3	602.4	35	6	1	341.8	351.1	37	18	1	307.8	338.0	39	9	2	104.1	84.9
14	14	0	178.7	170.0	14	7	1	87.5	90.7	4	21	2	261.7	208.2	22	10	2	185.8	182.1
16	14	0	250.6	253.9	16	7	1	364.3	374.6	6	22	2	130.6	124.5	24	10	2	61.4	16.3
18	14	0	45.2	11.2	18	7	1	83.5	61.0	8	22	2	90.4	71.4	26	10	2	59.1	8.6
20	14	0	399.1	414.4	20	7	1	400.5	400.7	10	22	2	31.2	13.5	28	10	2	94.1	94.3
22	14	0	103.4	132.8	22	7	1	68.5	23.0	12	22	2	166.3	187.5	30	10	2	210.0	217.5
24	14	0	45.8	61.9	24	7	1	180.6	192.8	14	22	2	82.3	77.9	32	10	2	166.9	186.7
26	14	0	60.3	51.6	26	7	1	102.3	50.7	16	22	2	60.2	80.2	34	10	2	173.9	164.2
16	16	0	809.6	809.9	28	7	1	127.8	147.6	3	22	2	86.2	67.3	19	11	2	53.5	42.8
18	16	0	55.8	10.9	30	7	1	40.1	3.9	5	22	2	94.1	115.9	21	11	2	118.3	149.5
20	16	0	199.2	197.6	32	7	1	75.0	67.7	7	22	2	186.7	202.9	23	11	2	165.6	176.9
22	16	0	65.2	27.0	34	7	1	53.1	68.6	9	22	2	146.3	150.2	25	11	2	58.4	78.7
24	16	0	304.1	304.1	36	7	1	139.6	151.5	11	22	2	76.6	43.2	27	11	2	76.2	60.7
26	16	0	48.9	41.2	38	7	1	74.3	33.4	13	22	2	307.4	326.5	29	11	2	159.4	154.5
18	18	0	390.8	360.5	19	8	1	73.5	42.5	15	22	2	152.5	162.5	14	12	2	139.1	131.6
20	18	0	180.1	180.0	21	8	1	179.1	171.1	17	22	2	198.4	217.9	16	12	2	431.5	437.8
22	18	0	179.7	171.8	23	8	1	89.7	99.8	19	22	2	76.1	56.5	18	12	2	69.6	65.1
24	18	0	65.2	73.9	25	8	1	51.6	5.3	21	22	2	69.9	110.6	20	12	2	58.4	10.4
20	20	0	100.1	74.9	27	8	1	58.5	18.4	23	22	2	108.6	99.3	22	12	2	132.7	133.9
22	20	0	149.7	154.1	29	8	1	187.1	191.4	25	22	2			24	12	2		

MAGNUSSONITE

SHEET NO. 1 PART 2

H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC
26	12	2	351.2	328.4	26	7	3	66.0	33.7	7	5	4	180.7	103.9	17	15	4	102.5	67.1
26	12	2	149.5	163.6	26	7	3	39.1	51.7	9	5	4	37.5	43.0	19	15	4	51.9	24.0
13	13	2	290.8	293.6	30	7	3	59.2	76.4	11	5	4	79.2	54.7	21	15	4	104.4	89.4
15	13	2	58.7	14.6	9	8	3	57.4	54.1	13	5	4	97.2	98.4	23	15	4	26.7	5.5
17	13	2	156.5	162.1	11	8	3	85.7	104.1	15	5	4	149.4	166.8	25	15	4	61.9	68.2
19	13	2	218.5	216.3	13	8	3	100.1	67.5	17	5	4	63.6	5.4	27	15	4	63.1	1.8
21	13	2	167.0	169.0	15	8	3	49.9	42.9	19	5	4	196.2	191.2	16	16	4	96.5	128.4
23	13	2	30.9	52.7	17	8	3	153.9	166.7	21	5	4	61.9	40.0	18	16	4	208.6	63.3
25	13	2	49.9	68.9	19	8	3	130.4	121.2	23	5	4	43.1	51.2	20	16	4	111.9	192.7
27	13	2	01.0	102.9	21	8	3	76.0	69.6	25	5	4	75.4	5.1	22	16	4	111.9	74.7
16	14	2	339.8	347.0	23	8	3	70.7	28.2	27	5	4	51.9	33.4	24	16	4	39.0	4.5
18	14	2	130.8	144.8	25	8	3	148.6	135.5	29	5	4	59.9	46.2	26	16	4	117.3	67.7
20	14	2	141.1	100.5	27	8	3	117.4	83.5	6	6	4	282.2	304.2	19	17	4	77.2	38.9
22	14	2	66.5	36.7	29	8	3	26.7	10.7	8	6	4	97.3	103.8	21	17	4	38.0	38.9
24	14	2	69.2	102.0	10	9	3	213.1	239.7	10	6	4	446.5	465.6	23	17	4	80.9	74.5
26	14	2	81.8	65.6	12	9	3	49.4	7.0	12	6	4	92.7	102.6	25	17	4	40.5	9.1
28	14	2	50.6	82.4	14	9	3	57.5	77.4	14	6	4	413.9	428.2	16	18	4	363.2	377.6
15	15	2	142.2	139.3	16	9	3	125.5	119.1	16	6	4	151.0	168.3	20	18	4	72.5	91.4
17	15	2	272.7	262.2	18	9	3	220.1	232.6	18	6	4	529.4	542.6	22	18	4	69.5	105.3
19	15	2	228.1	233.2	20	9	3	46.7	29.6	20	6	4	97.3	109.5	24	18	4	31.7	56.2
21	15	2	77.0	6.9	22	9	3	80.5	56.6	22	6	4	172.4	166.2	21	19	4	68.9	31.8
23	15	2	26.5	6.3	24	9	3	214.3	212.7	24	6	4	243.4	245.2	23	19	4	47.5	19.7
25	15	2	103.1	88.2	26	9	3	166.7	141.2	26	6	4	372.7	368.4	25	20	4	267.6	261.9
27	15	2	72.4	56.2	28	9	3	85.0	77.5	28	6	4	178.2	182.2	22	20	4	51.8	8.4
18	16	2	105.6	102.2	30	9	3	89.1	34.3	30	6	4	109.8	92.9	23	21	4	46.5	28.1
20	16	2	145.7	150.3	11	10	3	195.2	202.6	9	7	4	124.2	139.9	22	22	4	286.3	269.3
22	16	2	315.7	309.1	13	10	3	153.9	152.2	11	7	4	56.6	27.3	6	5	5	30.0	25.4
24	16	2	81.6	77.0	15	10	3	107.3	117.8	13	7	4	114.2	129.0	10	5	5	445.1	463.5
26	16	2	50.7	87.7	17	10	3	346.6	345.7	15	7	4	68.0	15.5	14	5	5	374.1	387.0
17	17	2	193.2	214.7	19	10	3	45.2	31.8	17	7	4	76.5	89.0	18	5	5	564.9	580.9
19	17	2	42.2	32.8	21	10	3	95.6	119.8	19	7	4	72.7	17.6	22	5	5	201.3	280.0
21	17	2	50.4	55.3	23	10	3	96.3	96.1	21	7	4	97.6	95.1	26	5	5	419.7	420.1
23	17	2	112.2	124.3	25	10	3	168.1	164.8	23	7	4	95.2	52.0	30	5	5	86.0	54.8
25	17	2	114.7	102.4	27	10	3	83.7	77.1	25	7	4	75.0	10.2	7	6	5	112.7	87.9
20	18	2	227.8	233.1	29	10	3	40.6	7.5	27	7	4	41.1	30.3	9	6	5	86.3	67.9
22	18	2	97.3	77.8	12	11	3	46.7	60.3	11	6	4	96.8	75.0	11	6	5	112.7	94.9
24	18	2	155.2	154.9	14	11	3	449.0	448.9	13	6	4	545.8	559.1	15	6	5	484.8	493.2
19	19	2	33.4	2.5	16	11	3	131.4	151.5	10	8	4	46.1	18.0	17	6	5	156.4	176.3
21	19	2	88.8	93.8	18	11	3	246.1	231.8	12	8	4	283.4	282.2	19	6	5	146.6	142.6
23	19	2	66.8	46.2	20	11	3	129.6	131.0	14	8	4	54.5	14.6	21	6	5	339.2	360.2
25	19	2	46.6	50.0	22	11	3	151.2	141.6	16	8	4	263.3	261.1	23	6	5	50.3	18.6
22	20	2	90.6	64.5	24	11	3	93.4	41.4	18	8	4	81.3	79.9	25	6	5	54.6	35.6
24	20	2	137.8	133.2	26	11	3	171.7	163.3	20	8	4	228.4	215.9	23	6	5	92.6	74.7
21	21	2	180.9	176.8	28	11	3	65.4	41.5	22	8	4	59.9	62.0	27	6	5	142.1	162.3

21	21	2	180.9	176.8	28	11	3	65.4	41.5	22	8	4	59.9	62.0	27	6	5	142.1	162.3
23	21	3	93.3	29.9	13	12	3	79.6	79.5	24	8	4	169.8	149.0	29	6	5	104.9	88.3
6	3	3	480.3	464.9	15	12	3	120.9	91.2	26	8	4	83.6	103.2	8	7	5	90.6	91.5
10	3	3	380.0	406.3	17	12	3	49.8	43.6	28	8	4	176.4	160.5	10	7	5	70.1	75.7
14	3	3	436.0	452.9	19	12	3	269.4	276.7	30	8	4	91.5	72.6	12	7	5	132.5	142.0
18	3	3	433.8	449.8	21	12	3	71.5	52.8	11	9	4	40.3	57.5	14	7	5	162.9	159.2
22	3	3	342.8	354.7	23	12	3	67.6	29.0	13	9	4	53.4	45.7	16	7	5	72.0	60.6
26	3	3	324.2	343.1	25	12	3	71.3	8.0	15	9	4	75.9	47.0	18	7	5	94.3	59.4
5	3	3	51.0	15.6	27	12	3	105.7	129.2	17	9	4	47.5	7.9	20	7	5	175.0	158.1
7	4	3	235.0	244.4	14	13	3	421.7	415.3	19	9	4	52.7	48.8	22	7	5	143.1	164.3
9	4	3	136.4	149.5	16	13	3	321.4	322.0	21	9	4	73.4	96.3	24	7	5	68.7	99.7
11	4	3	196.0	205.3	18	13	3	72.9	12.0	23	9	4	89.1	58.3	26	7	5	52.7	17.7
13	4	3	147.2	148.9	20	13	3	265.5	269.8	25	9	4	72.6	13.7	28	7	5	101.1	102.0
15	4	3	123.1	141.6	22	13	3	64.8	77.5	27	9	4	50.8	30.6	30	7	5	119.3	130.2
17	4	3	59.7	32.4	24	13	3	200.0	220.0	29	9	4	657.9	694.9	9	8	5	69.1	81.5
19	4	3	56.6	20.2	26	13	3	90.6	38.4	10	10	4	75.9	100.7	11	8	5	200.6	210.7
21	4	3	99.9	108.6	28	13	3	83.0	94.6	12	10	4	195.6	209.1	13	8	5	68.9	45.5
23	4	3	92.4	71.2	15	14	3	28.7	23.5	14	10	4	41.1	36.0	15	8	5	44.3	29.2
25	4	3	47.2	33.5	17	14	3	251.2	253.9	16	10	4	537.3	547.9	17	8	5	64.8	74.9
27	4	3	105.3	105.4	19	14	3	215.6	205.9	18	10	4	144.4	153.0	19	8	5	164.6	183.2
29	4	3	66.3	60.7	21	14	3	44.9	16.7	20	10	4	141.8	143.0	21	8	5	74.4	81.4
31	4	3	70.2	52.5	23	14	3	49.3	20.7	22	10	4	34.8	25.2	23	8	5	55.8	55.8
6	5	3	534.3	545.3	25	14	3	124.2	117.3	24	10	4	34.8	25.2	25	8	5	151.9	149.8
8	5	3	147.6	155.6	27	14	3	50.7	13.2	26	10	4	167.0	167.5	27	8	5	108.1	105.6
10	5	3	451.3	484.4	28	15	3	83.8	73.3	28	10	4	52.8	16.2	29	8	5	54.4	37.7
12	5	3	92.0	111.1	20	15	3	64.5	34.3	15	11	4	65.3	65.0	10	9	5	152.4	171.2
14	5	3	471.0	493.4	22	15	3	86.2	79.4	17	11	4	47.4	46.7	12	9	5	40.5	14.2
16	5	3	142.9	121.1	24	15	3	73.6	36.2	19	11	4	59.0	73.9	14	9	5	158.7	137.5
18	5	3	408.0	440.6	26	15	3	73.6	24.0	21	11	4	66.5	63.4	16	9	5	88.5	95.8
20	5	3	53.3	19.9	26	16	3	234.3	200.0	23	11	4	73.0	28.7	18	9	5	149.0	160.0
22	5	3	21.7	217.3	17	16	3	116.6	139.3	25	11	4	62.0	28.6	20	9	5	76.4	107.9
24	5	3	44.2	36.8	19	16	3	74.0	50.8	25	11	4	47.9	38.1	22	9	5	62.3	50.8
26	5	3	275.0	273.7	21	16	3	77.1	8.6	27	11	4	100.8	65.1	24	9	5	188.1	170.4
28	5	3	52.8	8.4	23	16	3	216.6	214.4	29	11	4	1575.7	1653.5	26	9	5	147.7	100.0
30	5	3	138.8	156.0	18	17	3	201.4	214.7	12	12	4	63.9	41.8	11	10	5	37.1	30.3
7	6	3	349.0	350.4	20	17	3	85.0	19.4	16	12	4	155.5	172.0	13	10	5	524.6	505.3
9	6	3	52.5	7.9	22	17	3	41.0	34.7	18	12	4	58.9	64.3	15	10	5	161.9	168.7
11	6	3	476.8	511.2	24	17	3	159.1	179.5	20	12	4	711.6	737.0	17	10	5	209.8	219.0
13	6	3	237.1	237.9	26	17	3	177.0	190.0	22	12	4	30.4	17.9	19	10	5	124.2	119.6
15	6	3	98.3	110.2	19	18	3	55.4	78.4	24	12	4	139.4	125.1	21	10	5	151.8	145.0
17	6	3	77.9	77.3	21	18	3	108.5	103.1	26	12	4	42.0	6.9	23	10	5	84.0	84.6
19	6	3	262.6	280.0	23	18	3	80.4	66.9	28	12	4	136.2	170.5	25	10	5	145.7	139.8
21	6	3	257.2	263.9	25	18	3	224.7	198.8	15	13	4	39.0	12.6	27	10	5	88.0	89.2
23	6	3	173.0	149.2	20	19	3	136.7	127.5	17	13	4	56.2	6.4	29	10	5	77.4	77.4
25	6	3	75.7	31.8	22	19	3	148.7	146.7	19	13	4	66.3	41.8	21	11	5	448.5	449.1
27	6	3	185.5	171.6	24	19	3	132.8	125.1	21	13	4	40.7	31.1	16	11	5	186.2	193.6
29	6	3	70.7	96.9	21	20	3	147.9	122.8	23	13	4	47.2	41.8	18	11	5	94.3	60.6
8	7	3	61.3	33.0	23	20	3	44.1	11.2	25	13	4	109.8	66.1	18	11	5	184.3	206.4
10	7	3	268.4	267.4	22	21	3	193.7	179.9	27	13	4	109.8	66.1	20	11	5	98.4	103.5
12	7	3	55.4	21.4	4	4	4	4573.2	4726.9	14	14	4	391.2	398.1	22	11	5	312.3	323.0
14	7	3	50.7	20.9	8	4	4	109.7	98.9	16	14	4	198.2	175.5	24	11	5	153.1	155.1
16	7	3	58.9	62.2	12	4	4	2612.2	2745.1	18	14	4	314.7	308.3	26	11	5	112.9	154.8
18	7	3	33.3	33.7	16	4	4	89.3	92.4	20	14	4	124.7	116.3	28	11	5	55.7	47.7
20	7	3	59.2	47.6	20	4	4	1007.6	1072.4	22	14	4	337.8	321.0	28	11	5	43.8	43.8
22	7	3	54.9	31.3	24	4	4	68.9	83.9	24	14	4	227.8	231.0	15	12	5	43.8	47.4
24	7	3	37.6	16.6	28	4	4	300.3	336.3	26	14	4	223.2	221.8	17	12	5	75.2	23.8

MAGNUSSONITE

SHEET NO. 2 PART 1

H	K	L	FD	FC	H	K	L	FD	FC	H	K	L	FD	FC	H	K	L	FD	FC	H	K	L	FD	FC
19	12	5	160.9	145.2	26	8	6	54.7	25.0	24	16	6	76.0	17.7	27	14	7	45.5	13.1					
21	12	5	146.2	140.7	28	8	6	79.1	64.2	19	19	6	63.3	28.6	16	15	7	103.0	114.6					
23	12	5	40.8	34.6	9	9	6	276.9	272.0	21	19	6	109.7	130.9	18	15	7	192.2	192.7					
25	12	5	78.7	35.1	11	9	6	80.6	106.4	23	19	6	84.1	102.7	20	15	7	87.9	52.6					
27	12	5	241.0	225.5	13	9	6	260.1	252.1	22	20	6	174.3	164.9	22	15	7	203.9	179.9					
14	13	5	149.0	120.3	15	9	6	264.1	263.3	21	21	6	143.0	109.1	24	15	7	39.7	56.5					
16	13	5	60.5	24.6	17	9	6	333.7	337.1	10	7	7	438.3	427.4	26	15	7	59.7	42.6					
18	13	5	373.2	373.0	19	9	6	87.5	88.8	14	7	7	378.2	309.1	17	16	7	57.8	36.3					
20	13	5	53.9	65.0	21	9	6	118.3	123.0	18	7	7	337.6	358.1	19	16	7	40.8	38.7					
22	13	5	105.3	195.2	23	9	6	129.8	129.9	22	7	7	240.4	230.1	21	16	7	47.5	21.6					
24	13	5	34.1	19.5	25	9	6	68.9	111.7	26	9	7	84.4	64.8	23	16	7	123.2	130.3					
26	13	5	297.0	289.0	27	9	6	67.1	66.7	9	8	7	69.2	69.7	25	16	7	109.8	94.9					
28	13	5	50.2	20.5	29	9	6	93.3	73.1	11	8	7	56.7	5.3	25	17	7	272.0	255.6					
15	14	5	126.5	121.5	12	10	6	169.5	168.5	13	8	7	80.0	83.4	18	17	7	192.8	199.2					
17	14	5	73.2	17.7	14	10	6	84.1	79.6	15	8	7	74.2	77.2	22	17	7	82.3	99.2					
19	14	5	302.3	313.0	16	10	6	102.3	89.3	17	8	7	59.1	10.4	22	17	7	87.4	98.6					
21	14	5	191.8	186.3	18	10	6	55.9	52.1	19	8	7	63.7	23.3	24	17	7	53.0	57.1					
23	14	5	54.6	33.8	20	10	6	110.9	95.1	21	8	7	34.0	36.5	19	18	7	45.9	49.6					
25	14	5	43.6	35.5	22	10	6	98.2	69.9	23	8	7	137.2	81.9	21	18	7	84.3	60.2					
27	14	5	143.5	152.6	24	10	6	82.8	66.3	25	8	7	98.0	81.9	20	19	7	51.4	13.0					
16	15	5	82.7	54.9	26	10	6	48.0	61.3	27	8	7	98.0	37.6	22	19	7	67.6	33.9					
18	15	5	73.2	60.9	28	10	6	71.6	15.4	29	8	7	85.9	20.2	22	19	7	67.6	33.9					
20	15	5	60.9	84.7	11	11	6	285.4	261.8	10	9	7	452.6	459.8	24	20	7	67.2	19.2					
22	15	5	138.7	126.2	13	11	6	418.6	408.3	12	9	7	147.9	145.2	23	20	7	231.5	226.0					
24	15	5	78.9	9.1	15	11	6	330.0	332.5	14	9	7	238.9	239.6	23	21	7	84.5	77.7					
26	15	5	27.2	11.8	17	11	6	66.0	41.0	16	9	7	46.8	49.4	22	21	7	193.7	204.6					
17	16	5	230.8	217.8	19	11	6	139.6	160.1	16	9	7	373.9	381.0	8	8	8	2360.6	2501.3					
19	16	5	214.3	220.9	21	11	6	216.6	199.9	20	9	7	154.4	145.7	16	8	8	251.1	266.2					
21	16	5	48.0	4.5	23	11	6	85.4	110.2	22	9	7	181.5	187.6	20	8	8	1292.3	1359.9					
23	16	5	59.1	17.4	25	11	6	59.6	32.2	24	9	7	72.3	37.3	24	8	8	455.8	476.6					
25	16	5	159.7	160.1	27	11	6	96.3	244.1	26	9	7	169.0	174.8	28	8	8	103.8	117.8					
18	17	5	167.8	175.3	14	12	6	259.3	244.1	26	9	7	50.3	46.1	11	8	8	51.9	48.5					
20	17	5	51.9	77.1	16	12	6	199.4	200.6	11	10	7	161.2	158.7	11	9	8	62.1	33.2					
22	17	5	44.3	48.2	18	12	6	302.2	395.8	13	10	7	83.4	100.1	15	9	8	158.7	161.5					
24	17	5	167.1	182.7	20	12	6	121.2	119.9	15	10	7	356.9	360.1	17	9	8	62.7	53.2					
26	17	5	76.2	94.5	22	12	6	228.4	222.5	17	10	7	335.2	337.2	19	9	8	71.2	63.7					
19	18	5	76.1	27.8	24	12	6	195.4	185.8	19	10	7	78.3	100.4	21	9	8	57.2	55.7					
21	18	5	265.4	250.1	26	12	6	301.1	315.1	21	10	7	67.8	8.9	23	9	8	105.0	123.1					
23	18	5	77.8	68.5	28	12	6	67.9	57.9	23	10	7	167.4	163.7	25	9	8	85.8	124.7					
25	18	5	82.0	110.7	13	13	6	222.1	211.2	25	10	7	177.8	161.9	27	9	8	59.3	13.6					
20	19	5	228.0	222.0	15	13	6	91.9	80.2	27	10	7	130.4	125.6	29	9	8	46.8	7.0					
22	19	5	195.2	176.7	17	13	6	77.3	81.2	29	10	7	68.6	39.7	10	10	8	344.5	353.8					
19	20	5	92.4	116.5	19	13	6	239.4	243.5	12	11	7	31.1	25.0	10	10	8	135.6	138.7					
21	20	5	95.0	89.0	21	13	6	77.4	30.0	14	11	7	174.7	178.4	14	10	8	423.7	421.4					



21	20	5	95.0	68.0	21	13	6	77.4	30.0	14	11	7	174.7	178.4	14	10	8	423.7	421.4
23	20	5	93.4	63.1	23	13	6	70.2	73.2	16	11	7	39.9	33.4	16	10	8	49.7	44.1
22	21	5	142.3	115.9	25	13	6	89.6	80.3	18	11	7	76.0	13.6	18	10	8	284.8	276.9
8	6	6	833.1	666.6	27	13	6	92.5	106.3	20	11	7	49.2	9.7	20	10	8	187.1	185.3
12	6	6	468.2	490.6	16	14	6	364.3	348.3	22	11	7	74.1	33.4	22	10	8	349.6	353.4
16	6	6	289.4	292.1	18	14	6	45.6	40.6	24	11	7	34.4	6.5	24	10	8	120.6	122.4
20	6	6	243.2	255.4	20	14	6	250.4	255.8	26	11	7	57.2	38.2	26	10	8	203.3	196.8
24	6	6	59.2	35.4	22	14	6	76.6	2.5	28	11	7	54.4	6.6	28	10	8	259.3	262.2
28	6	6	176.4	185.1	24	14	6	121.0	113.5	30	11	7	201.1	196.3	30	10	8	210.9	215.5
7	7	6	316.2	335.4	26	14	6	69.2	87.2	32	12	7	50.1	101.7	32	11	8	73.2	48.7
9	7	6	147.1	128.0	15	15	6	70.8	87.8	17	12	7	116.6	111.3	17	11	8	110.1	126.3
11	7	6	200.5	214.9	17	15	6	65.8	63.7	19	12	7	59.5	41.7	19	11	8	45.6	42.8
13	7	6	307.8	329.0	19	15	6	116.4	123.3	21	12	7	191.3	188.1	21	11	8	66.4	64.7
15	7	6	93.6	74.2	21	15	6	185.5	177.7	23	12	7	63.1	65.6	23	11	8	46.4	2.4
17	7	6	119.7	111.1	23	15	6	87.9	4.7	25	12	7	95.3	81.7	25	11	8	165.6	157.9
19	7	6	206.9	201.3	25	15	6	78.9	106.9	27	12	7	74.7	4.7	27	11	8	64.2	7.6
21	7	6	194.0	176.3	27	15	6	84.3	45.7	14	13	7	293.6	292.2	12	12	8	160.4	142.1
23	7	6	30.5	41.1	18	16	6	72.0	25.5	16	13	7	61.2	72.4	14	12	8	70.0	64.6
25	7	6	69.5	4.6	20	16	6	86.1	92.6	18	13	7	67.1	52.1	16	12	8	291.7	298.8
27	7	6	48.1	72.9	22	16	6	318.8	309.7	20	13	7	179.7	169.7	18	12	8	45.7	37.1
29	7	6	110.2	124.0	24	16	6	100.6	76.9	22	13	7	212.3	226.8	20	12	8	131.4	123.1
10	8	6	331.3	339.7	26	16	6	50.2	9.1	24	13	7	49.0	17.7	22	12	8	72.4	48.8
12	8	6	68.6	18.3	17	17	6	221.0	225.5	26	13	7	76.4	18.2	24	12	8	148.8	120.3
14	8	6	637.9	634.1	19	17	6	55.0	35.9	15	14	7	171.6	168.8	26	12	8	45.1	28.0
16	8	6	111.5	120.8	21	17	6	85.2	90.5	17	14	7	127.9	115.2	15	13	8	67.4	27.0
18	8	6	120.2	141.3	23	17	6	154.3	134.4	19	14	7	102.0	120.9	17	13	8	129.6	116.8
20	8	6	142.3	153.5	25	17	6	110.0	137.7	21	14	7	278.6	268.2	19	13	8	128.6	137.1
22	8	6	493.7	496.4	27	18	6	209.8	206.6	23	14	7	56.3	19.8	21	13	8	71.1	24.0
24	8	6	150.9	191.4	29	18	6	119.8	130.5	25	14	7	58.1	20.1	23	13	8	48.6	7.1

MAGNUSSONITE

SHEET NO. 2 PART 2

H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC
25	13	8	81.5	96.9	21	14	9	136.4	129.0	23	17	10	82.8	82.5	16	16	12	73.7	81.7
27	13	8	144.9	126.6	23	14	9	140.5	109.3	20	18	10	139.4	139.4	18	16	12	52.6	47.6
14	14	8	542.1	537.4	25	14	9	158.9	152.1	22	18	10	106.3	80.1	20	16	12	136.0	125.9
16	14	8	75.6	61.5	16	15	9	151.0	144.4	19	19	10	77.9	24.3	22	16	12	79.7	68.4
18	14	8	198.2	204.1	18	15	9	234.2	327.8	21	19	10	81.5	92.0	24	16	12	75.2	67.1
20	14	8	59.2	33.8	20	15	9	140.3	153.1	23	19	10	95.0	69.7	19	17	12	66.9	8.4
22	14	8	344.7	346.4	22	15	9	63.4	56.3	22	20	10	75.4	25.2	21	17	12	111.1	118.3
24	14	8	157.1	118.8	24	15	9	75.0	77.8	21	21	10	134.9	123.5	23	17	12	134.6	147.2
26	14	8	53.3	67.6	26	15	9	175.5	171.9	14	11	11	246.9	235.5	18	18	12	226.0	225.8
17	15	8	63.1	44.6	17	16	9	110.2	110.2	18	11	11	243.3	243.3	20	18	12	56.8	51.9
19	15	8	75.8	16.5	19	16	9	63.9	59.5	22	11	11	141.9	99.0	22	18	12	86.0	94.5
21	15	8	49.3	10.8	21	16	9	59.9	52.2	26	11	11	141.9	157.7	21	19	12	75.2	63.7
23	15	8	67.3	34.5	23	16	9	190.5	192.8	13	12	11	146.2	137.5	20	20	12	272.7	253.3
25	15	8	51.7	23.3	25	16	9	81.4	98.0	15	12	11	55.0	9.7	20	20	12	272.7	253.3
16	16	8	811.6	804.6	16	17	9	149.6	148.2	17	12	11	57.1	19.7	14	13	13	101.6	120.7
18	16	8	120.9	66.1	20	17	9	40.2	1.7	19	12	11	85.4	57.8	18	13	13	433.2	415.6
20	16	8	168.1	153.4	22	17	9	300.3	295.5	21	12	11	91.7	77.4	22	13	13	71.3	66.3
22	16	8	45.8	50.4	24	17	9	84.0	36.5	23	12	11	58.0	16.6	17	14	13	69.4	76.7
24	16	8	169.6	103.2	19	18	9	75.6	106.3	14	12	11	372.0	13.0	19	14	13	228.6	228.5
19	17	8	90.9	69.6	21	18	9	27.6	33.8	25	12	11	195.6	356.8	21	14	13	45.7	35.5
21	17	8	97.8	74.0	23	18	9	177.2	151.6	16	13	11	65.2	57.3	23	14	13	64.8	72.9
23	17	8	53.4	38.6	20	19	9	68.9	8.1	18	13	11	65.2	57.3	25	14	13	52.1	17.2
25	17	8	347.1	328.6	22	19	9	78.7	55.1	20	13	11	50.9	37.1	16	15	13	34.9	13.8
18	18	8	211.1	176.0	12	20	9	197.3	191.1	22	13	11	214.7	219.8	18	15	13	85.8	94.2
20	18	8	155.4	160.4	16	10	10	256.3	256.9	24	13	11	106.0	108.5	20	15	13	187.4	182.4
22	18	8	26.0	13.3	20	10	10	215.2	230.1	26	13	11	95.1	78.6	15	15	13	168.3	168.6
24	18	8	119.3	133.2	24	10	10	273.6	282.3	15	14	11	92.9	95.7	24	15	13	81.6	40.1
21	19	8	53.2	23.3	24	10	10	52.5	14.7	17	14	11	102.2	79.9	17	16	13	141.8	127.8
23	19	8	57.8	7.4	28	10	10	121.8	119.1	19	14	11	78.8	83.8	19	16	13	223.1	218.8
20	20	8	65.9	48.7	11	11	10	49.2	16.4	21	14	11	229.6	235.6	21	16	13	35.5	19.4
22	20	8	220.5	233.7	13	11	10	214.6	217.9	23	14	11	90.0	88.3	23	16	13	49.4	4.0
10	9	9	564.2	564.6	15	11	10	195.1	207.6	25	14	11	51.8	48.8	18	17	13	81.3	91.4
14	9	9	97.8	81.7	17	11	10	90.1	76.9	16	15	11	81.6	4.8	20	17	13	88.8	83.7
18	9	9	355.6	369.1	21	11	10	54.7	29.9	20	15	11	68.4	15.3	19	18	13	75.7	51.9
22	9	9	128.1	147.2	23	11	10	87.8	60.8	22	15	11	61.0	23.0	22	17	13	81.2	35.9
26	9	9	140.0	148.7	25	11	10	201.8	187.0	24	15	11	76.3	10.2	21	18	13	202.5	190.3
11	10	9	421.8	427.7	27	11	10	66.4	17.0	24	15	11	75.4	190.3	20	19	13	337.5	320.5
13	10	9	146.6	146.4	27	11	10	202.3	197.3	17	16	11	196.6	151.4	16	14	14	325.7	306.9
15	10	9	69.3	82.0	16	12	10	72.6	77.3	19	16	11	135.0	151.4	24	14	14	83.5	56.9
17	10	9	138.7	146.6	18	12	10	431.8	416.8	21	16	11	62.3	44.4	24	14	14	129.0	134.8
19	10	9	36.6	51.2	20	12	10	50.7	90.4	23	16	11	261.4	248.7	15	15	14	107.6	86.4
21	10	9	235.5	245.0	22	12	10	61.8	44.7	18	17	11	41.0	11.3	17	15	14	72.0	82.0
23	10	9	48.1	60.0	24	12	10	69.2	65.9	20	17	11	70.9	19.2	19	15	14	156.5	160.7

25	10	9	48.1	60.0	24	12	10	69.2	65.9	22	17	11	70.9	19.2	21	15	14	156.5	160.7
27	10	9	63.2	12.0	26	12	10	261.2	260.5	24	17	11	172.1	176.7	23	15	14	64.8	38.7
12	11	9	89.4	66.8	13	13	10	310.0	301.9	19	18	11	98.3	73.8	18	16	14	91.1	112.0
14	11	9	95.8	88.9	15	13	10	69.3	83.4	21	18	11	57.9	30.9	20	16	14	94.2	113.4
16	11	9	162.2	180.0	17	13	10	53.7	61.6	23	18	11	66.8	35.1	22	16	14	180.1	147.6
18	11	9	230.6	237.5	19	13	10	124.4	113.3	20	19	11	83.9	111.3	17	17	14	300.9	287.3
20	11	9	32.3	24.6	21	13	10	297.7	290.8	22	19	11	53.0	5.1	19	17	14	105.1	90.1
22	11	9	50.0	61.7	23	13	10	94.3	79.7	21	20	11	72.9	3.7	21	17	14	66.2	30.1
24	11	9	81.8	83.9	25	13	10	61.1	96.3	12	12	12	1195.0	1199.4	20	18	14	68.3	97.1
26	11	9	196.8	166.9	16	14	10	239.7	236.9	16	12	12	175.1	177.5	19	19	14	97.0	30.4
28	11	9	66.8	44.5	18	14	10	44.4	43.9	20	12	12	452.8	455.5	18	15	15	72.6	24.7
13	12	9	130.5	110.9	20	14	10	58.6	48.3	24	12	12	136.9	139.7	22	15	15	106.5	119.8
15	12	9	271.2	262.2	22	14	10	57.6	49.3	15	13	12	123.8	133.1	17	16	15	70.0	51.6
17	12	9	70.2	37.2	24	14	10	98.0	72.2	17	13	12	119.1	117.2	19	16	15	57.5	4.7
19	12	9	59.0	17.7	26	14	10	81.1	104.5	19	13	12	156.8	145.1	21	16	15	53.1	12.1
21	12	9	147.0	155.5	15	15	10	111.5	105.8	21	13	12	85.3	75.0	18	17	15	194.0	184.0
23	12	9	162.1	164.0	17	15	10	259.7	248.9	23	13	12	43.3	20.6	20	17	15	168.2	163.2
25	12	9	69.8	21.4	19	15	10	123.8	118.8	25	13	12	43.6	20.6	19	18	15	59.8	38.1
27	12	9	53.9	23.5	21	15	10	82.4	63.5	14	14	12	431.0	415.2	21	18	15	49.1	60.7
14	13	9	136.0	143.4	23	15	10	54.3	4.4	16	14	12	209.9	99.3	20	19	15	41.6	11.1
16	13	9	147.1	137.8	25	15	10	86.7	131.5	18	14	12	50.0	7.9	16	16	16	350.0	341.9
18	13	9	64.8	10.0	18	16	10	307.9	295.2	20	14	12	268.1	265.8	20	16	16	144.1	153.5
20	13	9	182.3	181.1	20	16	10	184.7	181.9	22	14	12	215.5	202.3	19	17	16	151.8	128.0
22	13	9	92.6	94.4	22	16	10	219.3	230.1	24	14	12	161.2	166.5	21	17	16	104.0	96.3
24	13	9	139.3	120.2	24	16	10	46.7	31.3	26	14	12	161.2	166.5	18	18	16	290.2	270.4
26	13	9	57.8	56.7	17	17	10	38.0	28.3	19	15	12	66.5	10.7	20	18	16	90.9	93.2
15	14	9	288.9	291.9	19	17	10	129.6	127.5	21	15	12	204.6	172.2	18	18	16	28.3	26.7
17	14	9	124.2	133.6	21	17	10	60.7	78.9	23	15	12	47.3	14.2	19	18	17	159.1	148.7