

Annual Reliability and Power Quality Report



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Document information

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Executive summary

This Annual Reliability and Power Quality Report (**Report**) informs the Government, customers and other stakeholders how the Western Power Network (**Network**) has performed against the reporting obligations under Schedule 1 of the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (Code)* for the reporting period 1 July 2013 to 30 June 2014 (**2013/14 period**).

The Code sets out performance standards and reporting requirements expected of Western Power for all electricity supply interruptions and the quality of the electricity supply to its customers. The Code also prescribes requirements for investigating and managing customer complaints. This Report presents Western Power's performance against the Code. Unlike other performance standards set up for Western Power (such as service standard benchmarks agreed under the Access Arrangement), the Code's reliability performance measures have no specific exclusions and include all interruptions greater than 1 minute in duration, irrespective of location, cause or circumstance, as seen by the customer.

Overview of Performance

In general, the reliability performance declined across the Network during the 2013/14 period. The drop in performance was primarily due to the number of planned interruptions undertaken to carry out maintenance, followed by environmental factors.

Western Power understands the imperative of meeting customer expectations for a reliable and safe electricity supply. To this end, Western Power is striving to attain a Network that is more capable of withstanding the effects of strong winds and fires and to restore supply to customers as quickly as possible. In addition to the asset work programs, such as pole replacement and asset maintenance activities, key improvement programs include:

- targeted investment in the worst performing parts of the Network; and
- continued retrospective undergrounding of the Network.

Interruptions Exceeding 12 hours

In the 2012/13 period there were 38,820 customers without power for more than 12 hours. This increased to 43,750 in the 2013/14 period.

Multiple Interruptions

In the 2012/13 period there were 8,702 urban customers who experienced more than 9 supply interruptions. This increased to 12,326 in the 2013/14 period.

In the 2012/13 period there were 2,341 rural customers who experienced more than 16 supply interruptions. This increased to 5,154 in the 2013/14 period.

Customer Complaints

In the 2012/13 period there were 792 complaints received. This decreased to 765 complaints in the 2013/14 period.

The majority of these customer complaints were related to reliability of supply, voltage fluctuations, and planned outage notifications.

Payments to Customers

In the 2012/13 period, payments for failure to give the required notice of a planned interruption totalled \$13,660. This increased to \$15,020 in the 2013/14 period.

In the 2012/13 period, payments for supply interruptions exceeding 12 hours totalled \$4.113 million. This decreased to \$1.213 million in the 2013/14 period.

Reliability

Reliability performance was generally lower in the 2013/14 period compared to the 2012/13 period. However, on average, customers experienced a lower number of interruptions in the 2013/14 period compared to the 2012/13 period.

Contents

1	Purpose	6
1.1	Context.....	6
1.2	Definitions.....	6
2	How to read this report	7
3	Network topology	8
4	Overview	9
4.1	Influence of environmental factors.....	9
4.2	Strategies during 2013/14 to improve reliability of the Network.....	9
4.2.1	Routine targeted maintenance and asset intervention.....	10
4.2.2	Continued rollout of the State Underground Power Program.....	10
5	Non-compliances	11
5.1	Reliability.....	11
5.2	Extended Outage Payments.....	12
6	Supply interruptions	13
6.1	Performance - Interruptions exceeding 12 hours.....	13
6.2	Performance - Interruptions exceeding the permitted number of times.....	13
7	Customer Complaints	15
7.1	Performance - Customer complaints.....	15
8	Payments to Customers	16
8.1	Performance - Planned interruptions.....	16
8.2	Performance - Extended outage payment scheme.....	16
9	Supply reliability	17
9.1	Performance - Perth CBD.....	18
9.2	Performance - Urban areas.....	18
9.3	Performance - Isolated networks.....	19
9.4	Performance - Rural areas.....	20
10	Percentile values	21
10.1	Performance - Average length of interruption.....	21
10.2	Performance - Number of interruptions.....	22
10.3	Performance - Total length of all interruptions.....	23
Appendix A.	List of Customer Interruptions Greater than 12 Hours	25

1 Purpose

The purpose of the Annual Reliability and Power Quality Report (**Report**) is to present the performance of the Western Power Network (Network) in accordance with Schedule 1 of the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (Code)*, for the reporting period 1 July 2013 to 30 June 2014 (**2013/14 period**).

1.1 Context

The Code, established by the Minister for Energy under the *Electricity Industry Act 2004* sets out supply reliability and quality standards for electricity network operators in relation to voltage fluctuations, harmonics, unplanned or planned interruptions and complaints. Section 27 of the Code states that a transmitter and distributor of electricity must publish a report setting out the information described in Schedule 1 of the Code (**Schedule 1**).

1.2 Definitions

The terminology used in this Report is in accordance with the definitions presented in item 1 to item 3 of Schedule 1 of the Code. Item 2 of Schedule 1 requires the reliability performance measures to include all planned and all unplanned interruptions, with no exclusions, greater than 1 minute in duration irrespective of location, cause or circumstance, as seen by the customer.

For the purposes of this Report, the discrete area "*all other areas of the State*" as stated in items 2(c) and 3(c) of Schedule 1, will be referred to as "rural" areas and will be specific to the Network.

For clarity, the terminology used in this report and item 11 of Schedule 1 of the Code have the same meaning as set out below:

- Customer Average Interruption Duration Index (**CAIDI**) refers to item 11(a) of Schedule 1, i.e. "*the average length of interruption of supply to customer premises expressed in minutes*";
- System Average Frequency Interruption Duration Index (**SAIFI**) refers to item 11(b) of Schedule 1, i.e. "*the average number of interruptions of supply to customer premises*";
- Average Service Availability Index (**ASAI**) refers to item 11(c) of Schedule 1, i.e. "*the average percentage of time that electricity has been supplied to customer premises*"; and
- System Average Interruption Duration Index (**SAIDI**) refers to item 11(d) of Schedule 1, i.e. "*the average total length of all interruptions of supply to customer premises expressed in minutes*".

2 How to read this report

For contextual purposes, this Report is structured as follows:

- Section 3 provides geographic details of the Network.
- Section 4 provides an overview of the influencing factors that have impacted the reliability performance of the Network. This section also provides an overview of the strategies and activities being implemented to improve the reliability of the Network.
- Section 5 (addresses item 4 of Schedule 1); reports on non-compliances with the provisions of the Code, including remedial action taken.
- Section 6 (addresses item 5 of Schedule 1); reports on the number of customers that experienced power interruptions exceeding 12 hours at least once during the 2013/14 period, or more than the permitted number of times.
- Section 7 (addresses items 6, 7 and 8 of Schedule 1); summarises the complaints which have been received, logged and subsequently actioned.
- Section 8 (addresses item 9 of Schedule 1); reports the payments made for failure to give the required notice for planned interruptions and for supply interruptions that exceed 12 hours (as required under sections 18 and 19 of the Code, respectively).
- Section 9 (addresses items 11, 12 and 13 of Schedule 1); provides discrete area performance data which is inclusive of interruptions on the network greater than or equal to one minute that resulted in loss of power to customers.
- Section 10 (addresses items 14 and 15 of Schedule 1); articulates the customer percentiles of average length of interruption, total length of interruption and number of interruptions for the 2013/14 period.

Appendix A provides a list of interruptions that exceeded 12 hours, the length and number of customers affected.

3 Network topology

Western Power operates and maintains the transmission and distribution electricity network within the South West Interconnected System (**SWIS**) known as the Western Power Network (**Network**).

The Network covers a geographic area from Kalbarri down to Albany, and from Perth through to Kalgoorlie (Figure 1) of 255,064 square kilometres, much of which is isolated and unpopulated. It has a diverse asset base which includes more than 800,000 poles and almost 100,000 circuit kilometres of power lines.

The distribution network consists of over 800 feeders, connected to the transmission network at 156 terminal and zone substations, with over 66,000 distribution transformers providing an electricity supply to over one million customers and over 245,000 streetlights.



Figure 1: Map of the Western Power Network

4 Overview

This section provides an overview of the:

- influence of environmental factors during the 2013/14 period that impacted the actual reliability performance of the Network; and
- strategies and activities being implemented by Western Power to improve the reliability of the Network.

4.1 Influence of environmental factors

In terms of the Code's reporting requirements, the overall reliability performance of the Network during the 2013/14 period declined compared to the 2012/13 period.

This decline in reliability, and the main cause of customer supply interruptions during the 2013/14 period, was primarily driven by an increase in the following factors:

- planned interruptions undertaken to carry out maintenance works across non Perth CBD areas of the network;
- inclement weather, which included:
 - storm activity including high rainfall occurred across the southern parts of the Network on 16 July 2013 bringing severe winds and thunderstorms and resulting in multiple faults and damage to the distribution network. Approximately 49,000 customers experienced supply interruptions.
 - two storm fronts passed through the south west of Western Australia on 22 and 23 September 2013 resulting in damage to overhead network assets and more than 63,000 customers in the Great Southern, South West and Perth Metropolitan areas with supply interruptions.
- Bushfire activity in Parkerville on 12 January 2014, damaging property and Western Power infrastructure, resulting in loss of supply to over 2,300 customers for up to 5 days.

In addition, there was pole top fire activity that occurred across the Mid West region.

4.2 Strategies during 2013/14 to improve reliability of the Network

A number of key strategies and activities have continued to be implemented during the 2013/14 period delivering improvements in the reliability of supply to customers. This section describes these in further detail.

4.2.1 Routine targeted maintenance and asset intervention

This strategy seeks to improve reliability of supply within specific locations and sections of the Network through the reduction of faults caused by equipment failure and wildlife and vegetation interacting with the Network. This is achieved through the installation of interconnections, replacing overhead power lines with covered conductors or underground cables and the augmentation/upgrading of distribution feeders. This strategy focuses on the infrastructure that contributes largely to the system SAIDI.

This also includes Western Power's routine and targeted asset inspection and maintenance programs, as well as inspections and monitoring of assets in conjunction with vegetation management plans. This includes the replacement of under performing assets, deteriorating assets and defective assets, such as poles and conductors.

4.2.2 Continued rollout of the State Underground Power Program

The State Underground Power Program (SUPP) selects areas for the replacement of the overhead distribution network with underground cables.

This program seeks to increase the security of the Network in severe weather conditions, while also reducing:

- safety hazards caused by fallen powerlines;
- vegetation risk around overhead powerlines; and
- car accidents involving network infrastructure

The SUPP is a State Government initiative administered by the Public Utilities Office. The cost of each residential project is shared between the State Government, Western Power and Local Government. Further information on the current SUPP delivery program is available on Western Power's website¹.

¹ See Western Power website, State Underground Power Program web page, <http://www.westernpower.com.au/networkprojects/undergroundPower/upp/UPP.html>

5 Non-compliances

This section is provided in response to the requirements of item 4 of Schedule 1 of the Code.

Code extract:

Item 4:

“In respect of each failure by the transmitter or distributor to comply with a provision of this Code or an instrument under Section 14(3) (as identified by monitoring records or under section 24 or following a complaint) –

- a) the total number of breaches of each provision; and*
- b) the remedial action taken in each case.”*

5.1 Reliability

During the course of the year there were two non-compliances relating to reliability.

Section 12(3)

Section 12(3) of the Code requires Western Power to take prescribed action in the event of a significant interruption to a small use customer. As detailed in sections 6.1 and 6.2 of this report, there were instances where customers experienced supply interruptions:

- lasting longer than 12 hours; or
- occurring more frequently than the permitted number of times

The main reasons for the non-compliances were adverse weather related events which were beyond Western Power’s control. As such, Western Power was unable to remedy the causes of the interruptions so that prescribed standards were met, nor did it enter into alternative arrangements to the small use customer’s satisfaction.

The Code does not exclude adverse weather related events in the calculation of permissible interruptions, therefore Western Power was non-compliant during the 2013/14 reporting year. Further, the Service Standard Benchmarks in Western Power’s Access Arrangement permit the calculation of significant interruptions to be normalised to exclude adverse weather related events.

Western Power will continue discussions with the Public Utilities Office to facilitate alignment of the Code requirements with the Service Standard Benchmarks in the Access Arrangement.

Section 13(2)

Section 13(2) of the Code requires Western Power to perform to the prescribed standard for the average total length of interruptions. Western Power’s performance during the 2013/14 reporting period was below the prescribed standards.

This non-compliance is ongoing and currently Western Power is unable to comply with the standards prescribed in the Code. The reliability standards under the Code exceed the Service Standard Benchmarks under the Access

Arrangement at present therefore, Western Power has two sets of performance standards to comply with. Western Power believes that the Code requires revision.

Western Power will continue engaging with the Public Utilities Office to request revisions to the Code.

5.2 Extended Outage Payments

During the course of the year, Western Power was non-compliant with section 19 of the Code which requires Western Power to make a payment to a customer within a specific timeframe if a supply interruption exceeds 12 hours.

Western Power made 15,166 extended outage payments in the 2013/14 financial year, of which only two payments (0.013%) were not made within the prescribed timeframe.

In order to address the non-compliance, Western Power implemented an IT solution in July 2014 to automatically run a report to identify missing cheques when compared against extended outage payment scheme claims after each cheque run. Any exceptions detected by the IT solution are reviewed by Customer Service Staff and cheques are immediately issued to customers.

Western Power has been compliant with this obligation since 1 August 2014.

6 Supply interruptions

This section sets out Western Power's response to item 5 of Schedule 1 of the Code.

Code extract:

Item 5:

"The number of premises of small use customers the supply of electricity to which has been interrupted –

- a) for more than 12 hours continuously; or*
- b) more than the permitted number of times, as that expression is defined in section 12(1)",*

and in the case of interruptions referred to in paragraph (a), the number of interruptions and the length of each interruption.

6.1 Performance - Interruptions exceeding 12 hours

Item 5(a):

During the 2013/14 period, there were 1,421 incidents resulting in 43,750 customers experiencing one interruption that exceeded 12 hours continuously.

Refer to Appendix A for a complete list of customer interruptions.

The customer interruptions exceeding 12 hours for the 2013/14 period were predominately due to events beyond Western Power's control - specifically storm activity (see section 4).

In comparison to the 2012/13 period, there was an increase in the number of customers interrupted predominantly as a result of equipment failures. These interruptions are addressed through targeted maintenance and asset interventions.

6.2 Performance - Interruptions exceeding the permitted number of times

Item 5(b):

Table 1 shows the number of customers interrupted more than the number of times expressed in section 12(1) of the Code.

Table 1: Customers that have been interrupted more than the number of times expressed in section 12(1) of the Code

	2012/13	2013/14
Urban area (including Perth CBD) customers that have been interrupted more than 9 times	8,702	12,326
Rural area customers that have been interrupted more than 16 times	2,341	5,154

Customers in urban and CBD areas that experienced more than 9 interruptions for the 2013/14 period were predominantly within the Perth Metropolitan region. The higher number of customer impacted more than 9 times in the 2013/14 period was predominantly the result of an increase in planned interruptions from power line upgrades.

Customers in rural areas that experienced more than 16 interruptions during the 2013/14 period were predominantly in the Mid-West and Wheatbelt regions.

The higher number of customers in rural areas impacted more than 16 times in the 2013/14 period was predominantly the result of an increase in unplanned interruptions from pole top fires and overhead equipment failures.

Western Power constantly monitors areas where customers experience recurring interruptions and undertakes remedial action, as required.

7 Customer Complaints

This section sets out Western Power's response to items 6, 7 and 8 of Schedule 1.

Code extract:

Item 6: *"The total number of complaints received"*

Item 7: *"The number of complaints received from customers in each of the discrete areas"*

Item 8: *"The total amount spent by the transmitter or distributor in addressing complaints, other than by way of payment under sections 18 and 19"*

Noting: Item 10:

"The information published for items 4(a), 6, 7, 8 and 9 in respect of the year ending 30 June preceding the year to which the report relates."

7.1 Performance - Customer complaints

The power quality and reliability complaints calculation process has been revised for the 2013/14 period to ensure that all data sources are examined and cross-referenced. The revised process now includes additional power quality data which was previously classified as faults rather than complaints.

A total of 765 complaints were received in relation to the following requirements of the Code:

- Section 6(2) Voltage fluctuations ('flicker' complaints only)
- Section 7 Harmonics (harmonic problems not recognised by customers)
- Sections (9 – 13) Reliability of Supply

Table 2 provides a breakdown of the 765 complaints by each of the discrete areas.

Table 2: Complaints received in 2012/13 and 2013/14 - total and by discrete area as per items 6 and 7 of Schedule 1.

	# Complaints	
	2012/13	2013/14
Perth CBD	3	1
Urban areas other than Perth CBD	457	417
Rural areas	332	347
Isolated systems	0	0
Total	792	765

Following investigations of each customer complaint, the findings were communicated to the customers. The total amount spent during the 2013/14 period for investigation of complaints was \$134,737, compared to \$107,752 during the 2012/13 period.

8 Payments to Customers

This section sets out Western Power's response to item 9 of Schedule 1.

Code extract:

Item 9:

"The number and total amount of payments made by the transmitter or distributor under each of sections 18 and 19"

Noting: Item 10:

"The information published for items 4(a), 6, 7, 8 and 9 in respect of the year ending 30 June preceding the year to which the report relates."

8.1 Performance - Planned interruptions

Table 3 below shows an increase of 10 per cent for the 2013/14 period, compared to the 2012/13 period, in service payments to customers for lack of or insufficient notification of a planned interruption.

Planned interruptions continue to be an area of focus for the business, with attention being paid to additional customer contact during the notification process.

8.2 Performance - Extended outage payment scheme

Table 3 shows the extended outage payments made for the 2012/13 and 2013/14 periods. The payment volumes for the 2012/13 period include payments relating to the June 2012 storm, which were processed and paid in the 2012/13 period.

Table 3: Payments in 2012/13 and 2013/14 as per items 9 of Schedule 1

	2012/13		2013/14	
	Number	Value	Number	Value
Payments for failure to give required notice of a planned interruption	683	\$13,660 ²	751	\$15,020 ³
Payments for supply interruptions exceeding 12 hours	47,523 ⁴	\$4,112,728 ⁵	15,166	\$1,213,280

² In addition to the \$13,660 pursuant to clause 18 of the Code Western Power made \$20,490 ex-gratia payments.

³ In addition to the \$15,020 pursuant to clause 18 of the Code, Western Power made \$22,530 ex-gratia payments.

⁴ Includes 38,659 payments associated with the June 2012 storm which were processed during the 2012/13 period.

⁵ Includes \$3,399,760 in payments associated with the June 2012 storm which were processed during the 2012/13 period.

9 Supply reliability

This section sets out Western Power's response to items 11, 12 and 13 of Schedule 1.

Code extract:

Item 11

"For each discrete area –

- a) the average length of interruption of supply to customer premises expressed in minutes [CAIDI] ;*
- b) the average number of interruptions of supply to customer premises [SAIFI] ;*
- c) the average percentage of time that electricity has been supplied to customer premises [ASAI]; and*
- d) the average total length of all interruptions of supply to customer premises expressed in minutes [SAIDI]."*

Item 12

"The information published for each paragraph of item 11 in respect of each of the 3 years ending 30 June preceding the year to which the report relates."

Item 13

"For each paragraph of item 11, the average of the 4 amounts under that paragraph in respect of the years comprising –

- a) the year to which the report relates; and*
- b) the 3 years referred to in item 12."*

Part 2, Division 3, Sections 13(2) and 13(3) set out the prescribed standards for the average total length of interruptions of supply in particular areas.

Code extract:

"(2) A transmitter or distributor must, so far as is reasonably practicable, ensure that for customer premises in an area referred to in the first column of the Table to this subsection the average total length of interruptions of supply, as calculated under subsection (3), does not exceed the number of minutes specified in the second column opposite the reference to that area.

Area	Standard for average total length of interruptions
the Perth CBD	30
the urban areas other than the Perth CBD	160
any other area of the State	290

(3) For the purposes of subsection (2), the average total length of interruptions of supply is to be calculated as at 30 June in each year –

- a) by taking the average total length, in minutes, of interruptions of supply to customer premises in an area during each year of the period of 4 years ending on that day; and
- b) by then taking the average of the 4 annual figures determined under paragraph (a).”

Tables 4, 5, 6 and 7 show the SAIDI, SAIFI, CAIDI and ASAI performance over the past 4 years ending 30 June each year, including the 2013/14 period, for the discrete areas of Perth CBD, urban, isolated networks and rural areas.

9.1 Performance - Perth CBD

The Perth CBD reliability performance as shown in Table 4 was lower during the 2013/14 period. This was due to an increase in the impact of underground cable failures.

Table 4: Perth CBD area reliability

KPI	Units	Financial year ending 30 June				4 Year Average
		2010/11	2011/12	2012/13	2013/14	
SAIDI	minutes per year	42	25	35	40	35
SAIFI	interruptions per year	0.37	0.23	0.29	0.24	0.28
CAIDI	minutes per interruption	112	108	118	162	125
ASAI	% availability per year	99.992	99.995	99.993	99.992	99.993

9.2 Performance - Urban areas

The reliability performance of the urban areas is shown in Table 5 and shows an improvement in the frequency of interruptions (SAIFI). However, there was an increase in SAIDI in urban areas during the 2013/14 period. This increase was predominantly due to an increase in the following factors in comparison to the 2012/13 period:

- planned interruptions; and
- asset damage from bushfires

However, power line upgrades have contributed to a reduction in the impact of unplanned interruptions caused by equipment failure.

Table 5: Urban areas (other than the Perth CBD) reliability

KPI	Units	Financial Year Ending 30 June				4 Year Average
		2010/11	2011/12	2012/13	2013/14	
SAIDI	Minutes per year	296	522	272	281	343
SAIFI	Interruptions per year	2.31	2.46	2.10	2.04	2.23
CAIDI	Minutes per interruption	128	212	130	138	152
ASAI	% availability per year	99.944	99.901	99.948	99.946	99.935

9.3 Performance - Isolated networks

Table 6 shows reliability performance for customers in the townships of Ravensthorpe and Bremer Bay that were “islanded” from the Network during the 2013/14 period. These two areas were considered ‘isolated’ networks during the time they were islanded from the Network.

Bremer Bay was islanded for a total of 69 days and Ravensthorpe was islanded for a total of 21 days during the 2013/14 period.

Table 6: Isolated Networks (Ravensthorpe and Bremer Bay)

KPI	Units	Financial Year Ending 30 June			
		2010/11	2011/12	2012/13	2013/14
SAIDI	Minutes per year	404	608	246	761
SAIFI	Interruptions per year	3.90	23	17	23
CAIDI	Minutes per interruption	104	27	15	34
ASAI	% availability per year	99.923	99.884	99.953	99.855

9.4 Performance - Rural areas

The reliability performance of the rural areas is shown in Table 7 with an improvement in the frequency of interruptions (SAIFI). However, there was an increase in SAIDI during the 2013/14 period. This increase was predominantly due to an increase in the following factors in comparison to the 2012/13 period:

- the severity of storm events; and
- pole top fire activity.

The reduction in the impact of lighting activity, as well as power line upgrades have contributed to a reduction in the impact of unplanned interruptions caused by equipment failure on SAIFI.

Western Power carried out, and continues to undertake, specific analysis and field investigation activities on the Network to determine the areas in the rural network that require remedial action to improve reliability. Detailed investigations, overhead line patrols and field analysis targeting some of the poor performing areas of the rural networks have been undertaken. Based on this analysis, a range of remedial activities have been undertaken in those specific areas, including maintenance repairs/alteration work on overhead lines, and repair work on reclosers, switching and protection devices.

Table 7: Rural areas reliability

KPI	Units	Financial Year Ending 30 June				4 Year Average
		2010/11	2011/12	2012/13	2013/14	
SAIDI	Minutes per year	956	1,279	863	983	1,020
SAIFI	Interruptions per year	4.43	5.60	5.67	4.93	5.16
CAIDI	Minutes per interruption	216	228	152	199	199
ASAI	% availability per year	98.818	99.757	99.836	99.813	99.556

10 Percentile values

This section sets out Western Power's response to items 14 and 15 of Schedule 1.

Code extract:

Item 14

"For customer premises in each discrete area, an estimate of the 25th, 50th, 75th, 90th, 95th, 98th and 100th percentile values of –

- a) The average length of interruption referred to in item 11(a)*
- b) The number of interruptions; and*
- c) The total length of interruptions."*

Item 15

"For each category of information in item 14 (a), (b) and (c), a graph showing the distribution of customer premises across the range of that category."

Percentiles are selected over the customer premise count for each discrete area.

For an example on how to interpret the tables and figures below, see Table 9 and Figure 4. For the 2013/14 period 50 percent of customers in urban areas had no more than 2 interruptions.

10.1 Performance - Average length of interruption

Table 8 and Figure 3 show the average length of interruptions to customers based on the prescribed percentiles for the 2013/14 period:

The 100th percentile figure for urban areas is due to an emergency isolation due to a bushfire.

The 100th percentile figure for rural areas is predominantly due to asset damage from storm activity.

The 100th percentile figure for the CBD area is predominantly due to planned interruptions.

Table 8: Average length of interruption (minutes) percentile figures as per item 14(a) of Schedule 1

	25 th	50 th	75 th	90 th	95 th	98 th	100 th
Perth CBD	0	0	0	10	56	231	1,819
Urban	0	51	119	239	313	416	1,904
Rural	50	111	206	338	432	608	2,667

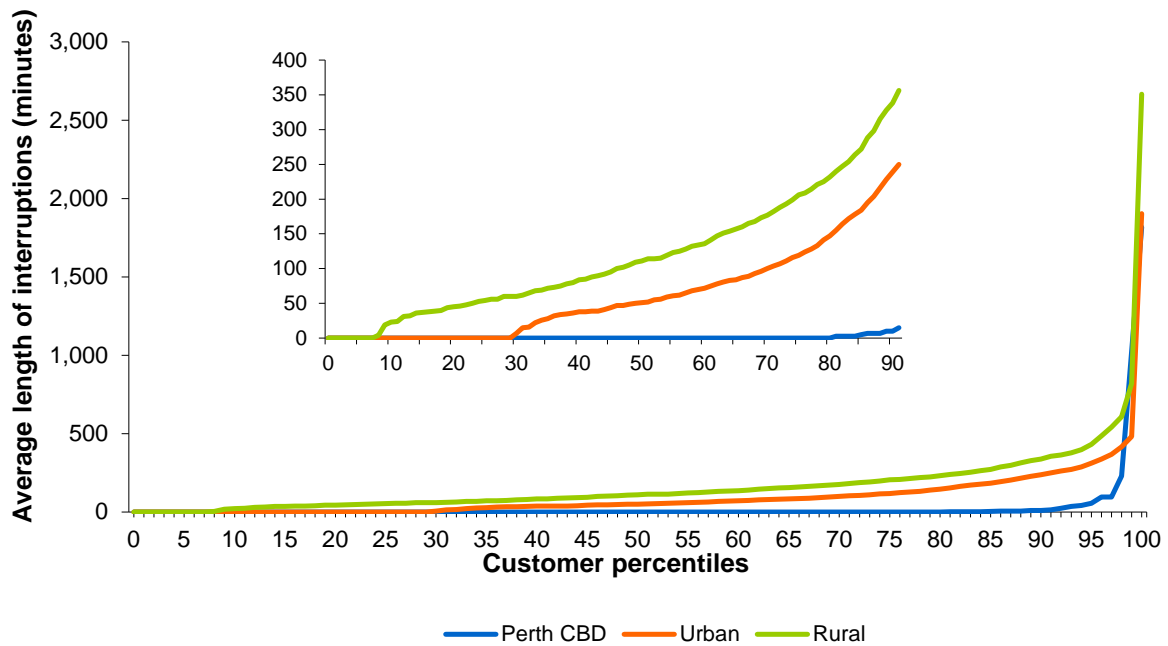


Figure 2: Average length of interruption percentile distribution as per item 15 of Schedule 1

10.2 Performance - Number of interruptions

Table 9 and Figure 4 show the number of interruptions to customers based on the prescribed percentiles.

For the 2013/14 period approximately:

- 80% of CBD customers experienced no interruptions;
- 98% of urban area customers experienced 9 or fewer interruptions; and
- 97% of rural area customers experienced 16 or fewer interruptions.

Areas of Network which have a high frequency of interruptions are monitored and targeted for applicable remedial activities.

Table 9: Number of interruptions percentile figures as per item 14(b) of Schedule 1

	25 th	50 th	75 th	90 th	95 th	98 th	100 th
Perth CBD	0	0	0	1	2	2	4
Urban	0	1	3	4	6	8	29
Rural	2	4	7	11	15	19	38

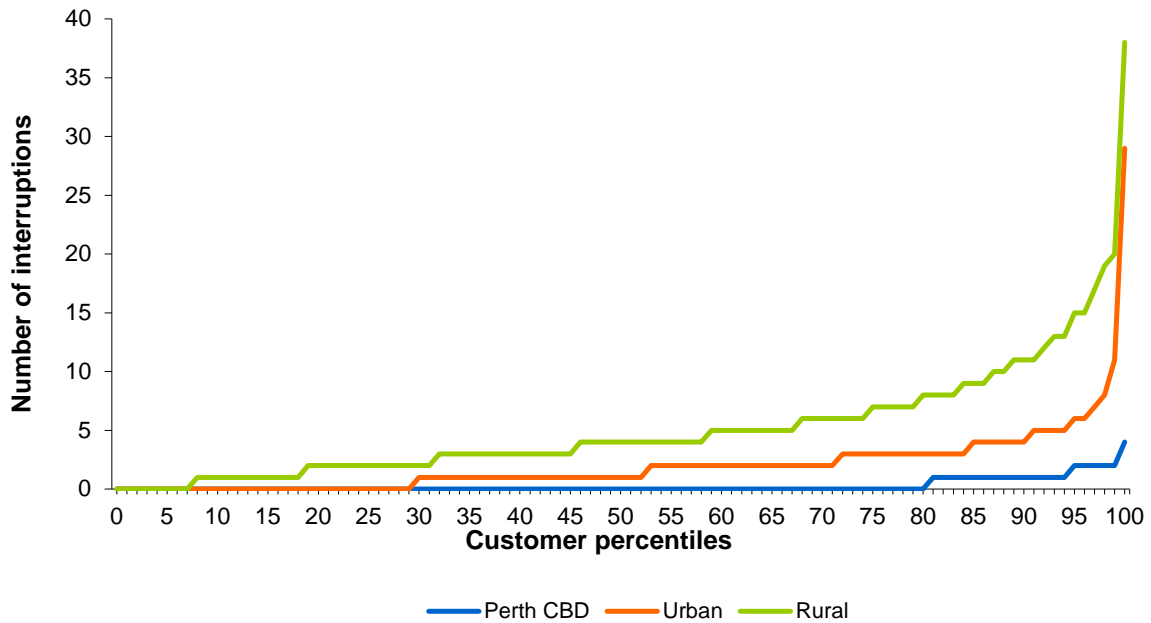


Figure 3: Number of interruptions percentile distribution as per item 15 of Schedule 1

10.3 Performance - Total length of all interruptions

Table 10 and Figure 5 show the total length of interruptions to customers based on the prescribed percentiles.

For the 2013/14 period:

- the 100th percentile figure for urban areas is predominantly due to bushfire activity on 12 January 2014 (see section 4);
- the 100th percentile figure for rural areas is predominantly due to vegetation, wind borne debris and storm activity (see section 4);
- the 100th percentile figure for the CBD area is due to a planned interruption;
- approximately 90% of customers in the CBD area experienced total interruption minutes of less than 30⁶ minutes;
- approximately 61% of customers in urban areas experienced total interruption minutes of less than 160⁷ minutes; and
- approximately 40% of customers in rural areas experienced total interruption minutes of less than 290⁸ minutes.

⁶ Part 2 section 13(2) prescribed value

⁷ Part 2 section 13(2) prescribed value

⁸ Part 2 section 13(2) prescribed value

Table 10: Total length of interruptions (minutes) percentile figures as per item 14(c) of Schedule 1

	25 th	50 th	75 th	90 th	95 th	98 th	100 th
Perth CBD	0	0	0	20	97	231	5,458
Urban	0	93	307	673	1,044	1,855	11,753
Rural	127	461	1,291	2,635	3,812	5,341	16,243

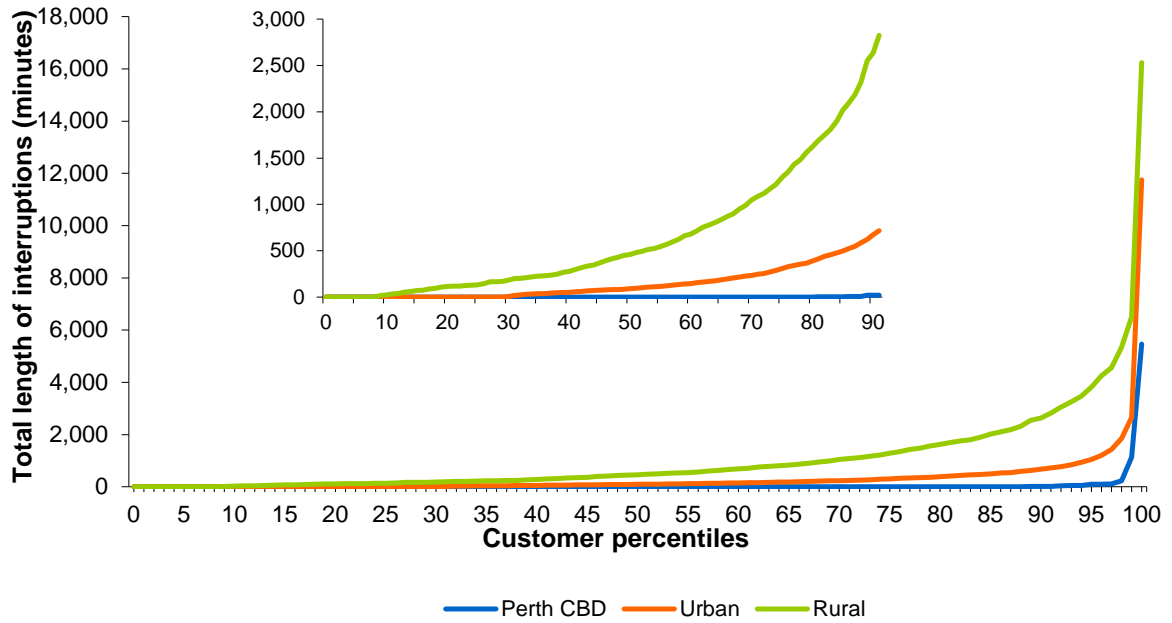


Figure 4: Total length of interruptions percentile distribution as per item 15 of Schedule 1

Appendix A. List of Customer Interruptions Greater than 12 Hours

As per section 6.1 of this report, the list below provides those interruptions exceeding 12 hours including the length and the number of customers affected. Western Power endeavours to minimise the duration of all interruptions and the list below highlights (*) those interruptions where progressive restoration of customer supplies has been possible through switching and reconfiguration of the Network prior to full restoration.

Interruption	First Restoration (hours) after 12 hours	Final Restoration (hours) after 12 hours	Customers Affected
1	19.03	19.03	1
2	14.26	14.26	1
3	31.88	31.88	1
4	13.55	13.55	13
5	18.11	18.11	1
6	14.39	14.39	1
7*	12.06	12.17	5
8	37.04	37.04	1
9	18.18	18.18	63
10	12.85	12.85	1
11	15.13	15.13	58
12	12.17	12.17	11
13	25.58	25.58	1
14	22.30	22.30	7
15	23.78	23.78	1
16	22.55	22.55	236
17	17.04	17.04	1
18	21.40	21.40	49
19	24.38	24.38	11
20	19.31	19.31	1
21	20.85	20.85	1
22	17.91	17.91	1
23	16.72	16.72	3
24	17.32	17.32	2
25	24.71	24.71	1
26	23.78	23.78	6
27	19.43	19.43	10
28	13.73	13.73	1
29	13.75	13.75	1
30	13.55	13.55	1
31*	15.68	15.72	272
32	19.00	19.00	6
33	24.78	24.78	1
34	14.97	14.97	11
35	12.83	12.83	1
36	21.32	21.32	27
37	16.67	16.67	1
38	27.87	27.87	180
39	14.34	14.34	106
40	14.91	14.91	3
41*	13.82	13.95	42

42	13.09	13.09	1
43	17.03	17.03	1
44	13.17	13.17	2
45	13.21	13.21	1
46*	33.53	55.59	29
47	12.08	12.08	1
48	26.51	26.51	1
49	18.70	18.70	10
50	15.55	15.55	1
51*	41.34	46.31	8
52	16.18	16.18	1
53	17.22	17.22	1
54*	37.11	66.56	874
55	16.13	16.13	1
56	17.65	17.65	62
57	40.84	40.84	32
58	84.20	84.20	11
59*	17.09	61.76	256
60	84.18	84.18	24
61	14.62	14.62	2
62*	37.56	84.85	1,446
63	16.50	16.50	49
64	13.51	13.51	134
65	12.52	12.52	271
66	44.03	44.03	129
67	42.83	42.83	1
68	12.79	12.79	2
69	89.67	89.67	18
70	43.25	43.25	42
71	16.06	16.06	1
72	43.50	43.50	1
73*	82.61	88.13	145
74	66.57	66.57	80
75	36.07	36.07	10
76*	64.28	65.99	149
77*	60.80	108.47	462
78	13.19	13.19	66
79*	18.17	90.36	685
80	37.13	37.13	1
81	38.14	38.14	95
82	36.92	36.92	1
83	16.12	16.12	15
84	44.42	44.42	1
85	17.72	17.72	74
86	79.90	79.90	1
87	136.57	136.57	5
88	88.13	88.13	11
89	39.94	39.94	1,496
90	19.83	19.83	953
91	37.55	37.55	1
92*	16.30	42.29	104
93	36.28	36.28	1
94	58.64	58.64	1
95*	18.62	80.89	1,367
96*	14.22	40.19	28
97*	38.17	63.25	978
98*	17.60	60.94	743
99	108.74	108.74	1

100*	18.11	43.52	175
101	21.78	21.78	1
102	13.17	13.17	61
103	17.28	17.28	1
104	14.20	14.20	1
105	29.93	29.93	5
106	16.44	16.44	1
107	32.56	32.56	2
108	15.67	15.67	233
109*	15.28	58.43	47
110	16.65	16.65	1
111	13.44	13.44	1
112	34.57	34.57	1
113	16.75	16.75	1
114	34.03	34.03	1
115	17.96	17.96	1
116	17.81	17.81	1
117	36.24	36.24	1
118*	28.22	32.87	110
119	14.56	14.56	70
120	15.15	15.15	1
121	35.52	35.52	34
122	14.40	14.40	1
123	31.65	31.65	1
124	26.70	26.70	25
125	12.30	12.30	1
126	23.94	23.94	1
127	12.12	12.12	8
128	14.93	14.93	12
129	30.45	30.45	1
130	17.54	17.54	50
131	12.83	12.83	1
132	20.78	20.78	2
133	34.51	34.51	1
134	16.07	16.07	17
135	12.25	12.25	5
136	15.34	15.34	6
137	20.22	20.22	1
138	31.00	31.00	1
139	32.84	32.84	1
140	77.77	77.77	1
141	29.40	29.40	1
142	24.80	24.80	1
143	23.45	23.45	1
144	22.35	22.35	1
145	28.39	28.39	1
146	28.83	28.83	1
147	13.80	13.80	558
148	19.59	19.59	26
149	47.13	47.13	3
150	36.80	36.80	69
151	24.69	24.69	9
152	22.93	22.93	9
153	28.33	28.33	1
154	17.52	17.52	6
155	28.22	28.22	1
156	28.25	28.25	1
157	27.39	27.39	1

158	43.91	43.91	1
159	19.45	19.45	7
160	26.59	26.59	1
161	20.82	20.82	1
162	22.68	22.68	1
163	16.75	16.75	1
164	19.24	19.24	28
165	39.43	39.43	18
166	14.77	14.77	1
167	19.02	19.02	1
168	23.35	23.35	1
169	23.89	23.89	1
170	25.37	25.37	154
171	43.16	43.16	154
172	14.41	14.41	66
173	15.24	15.24	1
174*	13.44	15.82	46
175	20.00	20.00	1,932
176	13.28	13.28	1
177	13.53	13.53	1
178*	19.33	42.24	3
179*	23.72	32.00	367
180	12.45	12.45	18
181	12.48	12.48	1
182	13.94	13.94	15
183	52.74	52.74	1
184	14.50	14.50	9
185	12.82	12.82	30
186	15.48	15.48	6
187	55.29	55.29	1
188	54.03	54.03	1
189	27.42	27.42	1
190*	42.53	67.00	14
191	36.13	36.13	6
192	19.01	19.01	1
193*	25.14	25.81	282
194	17.37	17.37	20
195	14.82	14.82	1
196	86.74	86.74	8
197	44.10	44.10	1
198	84.86	84.86	10
199	38.34	38.34	25
200	13.62	13.62	1
201	12.96	12.96	1
202*	12.53	12.59	1,023
203*	12.80	14.15	995
204*	14.49	14.81	148
205	30.69	30.69	1
206	12.29	12.29	1
207	31.48	31.48	1
208	60.73	60.73	4
209	33.16	33.16	1
210	28.81	28.81	7
211	81.13	81.13	19
212	26.12	26.12	1
213	30.67	30.67	1
214	16.40	16.40	1
215	19.73	19.73	1

216	24.08	24.08	1
217	22.13	22.13	79
218	20.22	20.22	1
219	21.94	21.94	1
220	18.94	18.94	1
221	22.57	22.57	1
222	22.63	22.63	1
223	24.45	24.45	1
224	21.06	21.06	14
225	17.32	17.32	1
226	16.38	16.38	1
227	23.58	23.58	10
228	14.61	14.61	1
229	17.80	17.80	1
230	14.60	14.60	19
231	16.41	16.41	1
232*	13.65	14.64	36
233	29.20	29.20	1
234	26.41	26.41	1
235	24.10	24.10	33
236	22.72	22.72	1
237	26.52	26.52	1
238*	21.97	25.96	41
239	25.79	25.79	12
240	23.73	23.73	1
241	17.84	17.84	1
242	18.26	18.26	1
243	17.10	17.10	1
244	26.26	26.26	1
245	15.27	15.27	1
246	13.02	13.02	1
247	12.74	12.74	1
248	12.67	12.67	9
249*	25.63	28.65	10
250	13.49	13.49	10
251	25.07	25.07	1
252	15.71	15.71	1
253	16.26	16.26	1
254	24.09	24.09	1
255	25.04	25.04	1
256	69.16	69.16	1
257	13.43	13.43	32
258	45.15	45.15	78
259	23.65	23.65	31
260	23.73	23.73	10
261	12.85	12.85	1
262	17.13	17.13	1,223
263	14.90	14.90	1
264	23.47	23.47	17
265	13.54	13.54	1
266*	24.03	24.39	49
267	21.94	21.94	1
268*	12.19	13.09	67
269	14.81	14.81	1
270	14.18	14.18	1
271	22.90	22.90	1
272	22.90	22.90	89
273	18.35	18.35	1

274	12.92	12.92	1
275	21.61	21.61	1
276	22.19	22.19	1
277	12.62	12.62	254
278	16.29	16.29	1
279	21.10	21.10	1
280*	13.86	22.35	10
281	12.08	12.08	1
282	24.52	24.52	11
283	12.79	12.79	61
284	13.18	13.18	8
285	20.35	20.35	1
286*	16.52	16.54	348
287	15.26	15.26	18
288*	12.83	12.88	18
289	17.17	17.17	1
290	13.34	13.34	1
291	34.63	34.63	1
292	16.27	16.27	1
293	22.19	22.19	1
294*	20.71	41.80	142
295	18.29	18.29	1
296	22.31	22.31	1
297	13.21	13.21	1
298	30.15	30.15	192
299	21.73	21.73	4
300	12.98	12.98	1
301	20.86	20.86	1
302	14.77	14.77	2
303	14.12	14.12	1
304	17.91	17.91	1
305	12.60	12.60	5
306	12.80	12.80	30
307	45.05	45.05	1
308	15.34	15.34	1
309	19.81	19.81	1
310	12.63	12.63	1
311	13.96	13.96	1
312	36.47	36.47	33
313	12.91	12.91	17
314	21.25	21.25	15
315	16.26	16.26	1
316	15.50	15.50	1
317	12.81	12.81	9
318	14.51	14.51	1
319	24.92	24.92	1
320	21.77	21.77	1
321	18.46	18.46	1
322	16.25	16.25	6
323	20.32	20.32	1
324	20.67	20.67	1
325*	17.12	17.58	18
326	15.36	15.36	1
327	17.57	17.57	1
328	12.08	12.08	1
329	12.13	12.13	3
330	16.09	16.09	1
331	14.76	14.76	1

332	14.90	14.90	1
333	12.54	12.54	1
334	13.00	13.00	1
335	14.02	14.02	4
336	21.56	21.56	1
337	20.28	20.28	1
338	20.64	20.64	2
339	13.88	13.88	1
340	12.93	12.93	9
341	21.42	21.42	22
342	15.17	15.17	1
343	15.20	15.20	1
344	30.95	30.95	1
345	17.98	17.98	32
346	34.96	34.96	1
347	19.03	19.03	4
348*	21.95	22.43	18
349	12.01	12.01	1
350	18.85	18.85	1
351	21.60	21.60	3
352	17.31	17.31	1
353	16.80	16.80	1
354	12.86	12.86	1
355	12.73	12.73	1
356	24.78	24.78	27
357	13.05	13.05	1
358	12.03	12.03	18
359*	12.92	13.30	67
360	12.15	12.15	1
361	18.15	18.15	1
362	13.09	13.09	1
363	13.13	13.13	1
364	23.66	23.66	1
365	12.36	12.36	1
366	21.74	21.74	1
367	25.42	25.42	4
368	19.99	19.99	32
369*	13.22	19.96	5
370	19.71	19.71	1
371	12.65	12.65	9
372	32.77	32.77	1
373*	28.98	28.99	20
374	28.20	28.20	1
375	26.00	26.00	1
376	16.00	16.00	1
377	19.69	19.69	1
378	21.01	21.01	1
379	40.10	40.10	1
380	12.85	12.85	13
381	16.52	16.52	1
382	13.38	13.38	1
383	21.82	21.82	1
384	22.52	22.52	12
385	20.45	20.45	15
386	21.18	21.18	1
387	12.62	12.62	1
388	14.37	14.37	1
389	15.80	15.80	1

390	13.78	13.78	1
391	19.94	19.94	1
392	16.92	16.92	3
393	25.90	25.90	1
394	15.64	15.64	1
395	19.10	19.10	1
396	21.74	21.74	1
397	23.98	23.98	35
398	14.06	14.06	197
399	14.53	14.53	367
400	12.25	12.25	34
401	19.14	19.14	1
402	19.11	19.11	92
403	30.97	30.97	1
404	44.57	44.57	139
405	22.25	22.25	1
406	20.79	20.79	13
407*	13.70	17.28	10
408	15.55	15.55	1
409	15.52	15.52	1
410	15.33	15.33	1
411	14.72	14.72	1
412	19.81	19.81	1
413	16.17	16.17	1
414*	12.66	12.91	12
415	19.85	19.85	6
416	22.18	22.18	3
417	12.83	12.83	15
418*	24.89	25.77	14
419	66.33	66.33	1
420	15.76	15.76	8
421	15.90	15.90	1
422	12.94	12.94	1
423	18.18	18.18	588
424	24.61	24.61	1
425	16.45	16.45	1
426	19.51	19.51	1
427	13.66	13.66	1
428	13.38	13.38	1
429	33.65	33.65	1
430	14.04	14.04	173
431	12.08	12.08	123
432	13.15	13.15	1
433	18.96	18.96	1
434	17.52	17.52	31
435	12.48	12.48	48
436	24.26	24.26	1
437	15.02	15.02	1
438	42.04	42.04	1
439	15.70	15.70	1
440	14.01	14.01	1
441	13.64	13.64	1
442	21.10	21.10	14
443	21.14	21.14	1
444	16.27	16.27	1
445	22.52	22.52	1
446	17.34	17.34	1
447	17.07	17.07	11

448	37.29	37.29	1
449	15.20	15.20	8
450	16.37	16.37	7
451	15.77	15.77	1
452	17.88	17.88	1
453	12.72	12.72	55
454	20.40	20.40	1
455	19.56	19.56	1
456	13.53	13.53	1
457	16.84	16.84	30
458	12.30	12.30	1
459	12.70	12.70	13
460	20.86	20.86	1
461	12.51	12.51	1
462	20.07	20.07	1
463	13.64	13.64	1
464	30.96	30.96	6
465	17.62	17.62	44
466	12.14	12.14	1
467	21.85	21.85	45
468	17.52	17.52	1
469	12.69	12.69	1
470	12.70	12.70	25
471	30.20	30.20	19
472	27.11	27.11	1
473	15.95	15.95	4
474	15.63	15.63	11
475	13.14	13.14	1
476	15.62	15.62	122
477	18.65	18.65	1
478	15.10	15.10	122
479	98.97	98.97	1
480	12.02	12.02	15
481	28.72	28.72	1
482	16.28	16.28	1
483	19.86	19.86	1
484	13.25	13.25	163
485	12.28	12.28	1
486	22.82	22.82	1
487	21.27	21.27	58
488*	13.46	13.47	185
489	17.27	17.27	7
490	28.66	28.66	1
491	33.37	33.37	36
492	26.33	26.33	10
493	12.19	12.19	1
494	15.59	15.59	33
495	42.07	42.07	4
496	18.69	18.69	1
497	15.53	15.53	4
498	20.06	20.06	183
499	18.79	18.79	1
500	22.39	22.39	1
501	17.33	17.33	1
502	14.81	14.81	1
503	12.43	12.43	1
504*	20.41	31.04	2,350
505	16.23	16.23	1

506	18.33	18.33	94
507	12.71	12.71	7
508*	12.65	15.07	797
509	27.08	27.08	11
510	13.34	13.34	16
511	13.42	13.42	1
512	16.11	16.11	1
513*	13.97	17.28	17
514	14.93	14.93	1
515*	15.36	125.73	1,092
516	44.53	44.53	1
517	26.06	26.06	5
518	16.02	16.02	1
519	21.00	21.00	21
520	27.38	27.38	17
521	24.30	24.30	1
522	21.15	21.15	6
523	22.02	22.02	12
524*	14.62	14.82	101
525	12.30	12.30	64
526	22.76	22.76	1
527	19.29	19.29	1
528	16.81	16.81	2
529	89.37	89.37	1
530	27.45	27.45	4
531	17.07	17.07	1
532	18.65	18.65	1
533	19.87	19.87	1
534	16.52	16.52	1
535	18.46	18.46	15
536	34.50	34.50	2
537	13.09	13.09	1
538	14.63	14.63	1
539*	22.02	22.97	29
540	20.00	20.00	1
541	17.70	17.70	7
542	15.48	15.48	6
543	35.42	35.42	8
544	13.08	13.08	1
545*	12.45	14.60	463
546	19.47	19.47	7
547	16.22	16.22	210
548	13.69	13.69	137
549	12.58	12.58	4
550	12.74	12.74	11
551	24.32	24.32	2
552	12.16	12.16	62
553	13.88	13.88	1
554	12.55	12.55	1
555	15.07	15.07	1
556	15.59	15.59	1
557	13.33	13.33	1
558	12.32	12.32	4
559	27.43	27.43	62
560	27.25	27.25	1
561	21.61	21.61	1
562	13.37	13.37	15
563	15.79	15.79	1

564	25.24	25.24	21
565	67.17	67.17	1
566*	16.87	17.10	810
567	12.28	12.28	12
568	12.58	12.58	1
569	22.61	22.61	1
570	14.17	14.17	93
571	21.60	21.60	1
572	30.38	30.38	31
573	20.02	20.02	1
574	21.03	21.03	1
575	19.76	19.76	1
576	18.84	18.84	21
577	15.06	15.06	20
578	17.70	17.70	1
579	12.02	12.02	1
580	31.24	31.24	1
581	24.14	24.14	1
582	13.70	13.70	51
583	28.22	28.22	1
584	15.51	15.51	1
585	17.21	17.21	1
586	17.31	17.31	3
587	13.01	13.01	1
588	14.17	14.17	1
589	18.45	18.45	1
590	18.19	18.19	1
591	24.07	24.07	22
592	14.11	14.11	1
593	13.32	13.32	1
594	12.85	12.85	8
595	27.77	27.77	1
596	19.87	19.87	7
597	14.52	14.52	9
598	19.17	19.17	1
599	55.72	55.72	2
600	22.49	22.49	1
601	12.39	12.39	1
602	13.55	13.55	12
603	27.62	27.62	1
604	20.70	20.70	1
605	21.77	21.77	1
606	17.14	17.14	1
607	12.86	12.86	1
608	15.18	15.18	25
609	15.04	15.04	1
610	17.36	17.36	15
611	42.40	42.40	2
612*	19.03	28.13	18
613	51.36	51.36	17
614	19.64	19.64	21
615	20.98	20.98	1
616	13.12	13.12	21
617	15.56	15.56	1
618	31.90	31.90	1
619	29.22	29.22	1
620	15.31	15.31	1
621	13.40	13.40	134

622	12.45	12.45	1
623	18.45	18.45	1
624	15.27	15.27	1
625	23.63	23.63	1
626	19.52	19.52	13
627	20.85	20.85	9
628	14.53	14.53	5
629	13.04	13.04	1
630*	12.89	13.52	4
631	29.30	29.30	1
632	25.85	25.85	1
633	25.80	25.80	1
634	14.32	14.32	13
635	14.72	14.72	1
636	16.95	16.95	1
637*	18.65	18.70	363
638	19.10	19.10	12
639	16.37	16.37	1
640	24.67	24.67	5
641	16.94	16.94	1
642	13.01	13.01	1
643	23.08	23.08	1
644	22.06	22.06	12
645	18.74	18.74	1
646	17.21	17.21	1
647*	20.12	23.14	36
648*	18.48	42.38	8
649	16.47	16.47	13
650	16.53	16.53	1
651	43.01	43.01	20
652*	24.87	25.52	140
653	21.15	21.15	21
654	16.42	16.42	12
655	16.41	16.41	1
656	46.02	46.02	28
657	19.80	19.80	4
658	16.67	16.67	19
659	17.33	17.33	1
660	17.85	17.85	1
661	14.89	14.89	29
662	14.36	14.36	1
663	30.50	30.50	6
664	20.68	20.68	6
665	12.28	12.28	1
666	19.11	19.11	1
667	20.45	20.45	17
668	20.95	20.95	8
669	20.98	20.98	1
670	18.31	18.31	1
671	17.60	17.60	1
672	18.32	18.32	1
673	14.26	14.26	15
674	15.20	15.20	1
675	21.92	21.92	24
676	30.50	30.50	1
677	14.20	14.20	21
678	20.42	20.42	1
679	19.75	19.75	1

680	14.98	14.98	31
681	14.87	14.87	1
682	19.51	19.51	1
683	20.97	20.97	1
684	16.44	16.44	1
685	13.39	13.39	1
686	16.57	16.57	1
687	15.56	15.56	1
688	16.22	16.22	1
689	15.37	15.37	1
690	15.37	15.37	1
691	22.10	22.10	1
692*	16.10	17.91	10
693	14.73	14.73	1
694	12.99	12.99	33
695*	15.00	35.70	32
696	16.45	16.45	19
697	15.71	15.71	7
698*	13.79	17.67	52
699	17.63	17.63	1
700	14.81	14.81	7
701	16.04	16.04	1
702	23.50	23.50	1
703	16.04	16.04	1
704	25.11	25.11	5
705	14.04	14.04	1
706	17.63	17.63	1
707	20.95	20.95	1
708	14.19	14.19	1
709	17.22	17.22	1
710	19.57	19.57	27
711	17.39	17.39	1
712	27.25	27.25	2
713	13.04	13.04	27
714	38.26	38.26	1
715	17.09	17.09	36
716	12.59	12.59	1
717	16.20	16.20	1
718	18.99	18.99	13
719	28.23	28.23	3
720	21.42	21.42	41
721	41.13	41.13	1
722*	15.68	17.38	765
723	31.73	31.73	1
724	14.24	14.24	1
725	22.97	22.97	1
726	23.13	23.13	1
727	25.38	25.38	1
728	19.50	19.50	1
729	12.21	12.21	81
730	16.54	16.54	1
731	12.41	12.41	1
732	19.53	19.53	19
733	22.96	22.96	4
734	14.45	14.45	1
735	12.65	12.65	1
736	15.29	15.29	1
737	14.43	14.43	1

738	13.09	13.09	309
739	57.25	57.25	1
740	16.82	16.82	1
741	25.97	25.97	1
742	17.93	17.93	5
743	14.18	14.18	1
744	15.35	15.35	21
745	14.04	14.04	1
746	19.24	19.24	1
747	12.56	12.56	1
748	13.50	13.50	19
749	16.07	16.07	1
750	22.73	22.73	7
751	12.36	12.36	1
752*	12.86	14.16	16
753	16.65	16.65	1
754	23.65	23.65	1
755	16.35	16.35	1
756	19.73	19.73	1
757	27.45	27.45	24
758	20.20	20.20	1
759	22.15	22.15	4
760	14.53	14.53	1
761	16.24	16.24	14
762	17.80	17.80	1
763	19.33	19.33	7
764	16.38	16.38	169
765	13.87	13.87	6
766*	13.18	19.26	24
767	13.00	13.00	13
768	16.76	16.76	1
769*	28.85	32.04	555
770	15.77	15.77	1
771	12.92	12.92	1
772	21.65	21.65	1
773	37.94	37.94	17
774	12.84	12.84	22
775	27.13	27.13	1
776	20.48	20.48	1
777	22.78	22.78	10
778	14.92	14.92	11
779	15.75	15.75	1
780	18.42	18.42	1
781	15.15	15.15	1
782	13.30	13.30	1
783	22.10	22.10	1
784*	19.37	19.42	5
785	32.84	32.84	1
786	28.05	28.05	1
787	63.59	63.59	1
788*	12.94	16.09	109
789	14.99	14.99	1
790	20.37	20.37	1
791	14.59	14.59	1
792	14.16	14.16	1
793	13.91	13.91	1
794	17.43	17.43	3
795	21.45	21.45	7

796	16.60	16.60	97
797	18.88	18.88	19
798	30.22	30.22	1
799	15.64	15.64	3
800*	12.78	30.35	477
801	12.73	12.73	331
802*	12.21	12.35	147
803	13.13	13.13	46
804	24.60	24.60	63
805*	14.28	16.82	171
806	12.25	12.25	70
807	19.37	19.37	1
808	22.91	22.91	1
809	16.30	16.30	2
810*	15.81	17.54	16
811	12.28	12.28	1
812	12.78	12.78	1
813	18.75	18.75	35
814	12.56	12.56	1
815	17.57	17.57	25
816	15.43	15.43	1
817*	14.23	14.43	143
818	16.57	16.57	8
819	12.94	12.94	4
820	18.44	18.44	1
821	20.26	20.26	1
822	16.06	16.06	3
823	20.43	20.43	1
824	34.62	34.62	1
825	25.25	25.25	52
826	20.98	20.98	12
827	30.37	30.37	52
828	13.43	13.43	1
829	40.12	40.12	1
830	28.87	28.87	1
831	25.35	25.35	2
832	19.00	19.00	2
833	18.98	18.98	1
834	22.10	22.10	11
835	46.03	46.03	26
836	64.03	64.03	1
837	12.33	12.33	169
838	12.18	12.18	113
839	15.43	15.43	4
840	12.04	12.04	1
841	14.16	14.16	82
842	17.67	17.67	63
843	14.00	14.00	63
844	13.28	13.28	3
845	64.68	64.68	38
846	12.93	12.93	16
847	12.69	12.69	1
848	22.25	22.25	1,505
849	16.80	16.80	51
850	24.57	24.57	1
851	24.02	24.02	1
852	16.83	16.83	24
853*	13.37	13.52	2

854	19.77	19.77	1
855	21.09	21.09	41
856	16.96	16.96	1
857	16.75	16.75	1
858	18.93	18.93	1
859	15.04	15.04	32
860*	20.71	20.80	134
861*	18.84	19.01	132
862*	12.51	12.54	76
863	16.17	16.17	36
864	22.18	22.18	51
865	14.28	14.28	9
866	15.94	15.94	79
867	17.94	17.94	5
868	19.86	19.86	7
869	18.86	18.86	11
870	16.03	16.03	32
871	12.28	12.28	1
872	13.35	13.35	1
873	13.72	13.72	13
874*	12.97	13.92	5
875	13.41	13.41	1
876	24.50	24.50	14
877	13.08	13.08	1
878	24.90	24.90	6
879	17.25	17.25	1
880	20.18	20.18	1
881	12.74	12.74	1
882	23.78	23.78	1
883	27.67	27.67	34
884	20.48	20.48	1
885	19.32	19.32	15
886*	21.64	21.95	8
887	43.63	43.63	2
888	19.75	19.75	4
889	19.33	19.33	1
890	17.23	17.23	1
891	19.29	19.29	1
892	15.76	15.76	1
893	21.38	21.38	2
894	18.98	18.98	1
895	19.29	19.29	1
896	19.14	19.14	1
897	18.12	18.12	1
898	25.98	25.98	19
899	20.66	20.66	1
900	16.54	16.54	7
901	16.96	16.96	1
902	16.32	16.32	6
903	20.78	20.78	1
904	13.33	13.33	1
905	13.61	13.61	1
906	14.78	14.78	1
907*	14.90	16.02	28
908*	15.22	15.51	340
909	16.56	16.56	1
910	14.35	14.35	1
911	21.46	21.46	1

912	19.78	19.78	1
913	14.55	14.55	1
914	25.51	25.51	1
915	23.72	23.72	4
916	16.16	16.16	1
917	18.60	18.60	1
918	12.15	12.15	24
919	12.10	12.10	4
920	37.76	37.76	1
921	23.46	23.46	1
922	17.50	17.50	93
923	12.57	12.57	34
924	13.04	13.04	77
925	17.74	17.74	1
926	13.34	13.34	1
927	20.19	20.19	2
928	18.13	18.13	2
929*	13.52	18.02	29
930	19.33	19.33	6
931	20.15	20.15	1
932	18.33	18.33	1
933	19.45	19.45	1
934	13.91	13.91	1
935*	15.38	17.58	515
936*	12.09	13.08	124
937	19.03	19.03	1
938	18.92	18.92	42
939	14.03	14.03	1
940	22.49	22.49	40
941	12.03	12.03	28
942	27.90	27.90	1
943	31.12	31.12	47
944	18.86	18.86	27
945	17.49	17.49	1
946	13.38	13.38	1
947*	13.17	13.18	49
948	21.92	21.92	2
949*	19.40	28.17	79
950	26.76	26.76	1
951	48.86	48.86	1
952	24.69	24.69	7
953	19.60	19.60	35
954	14.32	14.32	17
955*	23.13	64.89	72
956	14.90	14.90	53
957	17.42	17.42	4
958	32.38	32.38	1
959	21.76	21.76	1
960	18.21	18.21	1
961	17.98	17.98	1
962	20.94	20.94	1
963	17.69	17.69	1
964	22.58	22.58	1
965	17.20	17.20	6
966	17.36	17.36	1
967	18.68	18.68	1
968	20.11	20.11	1
969	22.81	22.81	1

970	28.85	28.85	1
971	19.41	19.41	1
972	17.15	17.15	1
973	20.44	20.44	1
974	17.64	17.64	1
975	19.91	19.91	1
976	17.11	17.11	1
977	16.78	16.78	10
978	13.96	13.96	1
979	16.45	16.45	1
980	21.56	21.56	1
981	21.33	21.33	1
982	19.11	19.11	1
983	18.95	18.95	1
984	20.12	20.12	102
985	16.49	16.49	1
986	14.07	14.07	99
987	35.14	35.14	1
988	30.20	30.20	1
989*	19.10	20.35	12
990	12.13	12.13	13
991	14.46	14.46	1
992	12.81	12.81	38
993	19.92	19.92	79
994	18.69	18.69	41
995*	16.50	20.17	11
996	12.63	12.63	1
997	15.63	15.63	1
998	13.05	13.05	1
999	12.72	12.72	1
1000*	13.37	13.38	105
1,001	22.63	22.63	4
1,002	13.73	13.73	1
1,003	19.24	19.24	1
1,004	20.44	20.44	1
1,005	13.75	13.75	1
1,006	12.16	12.16	1
1,007	12.70	12.70	1
1,008	12.54	12.54	1
1,009	17.93	17.93	2
1,010	12.85	12.85	27
1,011	24.40	24.40	1
1,012	20.39	20.39	3
1013*	12.52	12.53	12
1,014	24.77	24.77	9
1015*	16.65	16.68	47
1,016	13.46	13.46	27
1,017	13.98	13.98	1
1,018	14.90	14.90	10
1,019	12.32	12.32	14
1,020	13.33	13.33	1
1,021	18.19	18.19	43
1,022	12.47	12.47	1
1,023	14.38	14.38	2
1,024	19.78	19.78	23
1,025	25.38	25.38	1
1,026	17.52	17.52	1
1,027	20.65	20.65	6

1,028	20.71	20.71	22
1,029	26.32	26.32	1
1,030	23.24	23.24	5
1,031	13.27	13.27	1
1,032	14.48	14.48	1
1,033	13.79	13.79	1
1,034	13.96	13.96	1
1035*	14.61	14.71	5
1,036	15.46	15.46	1
1,037	12.29	12.29	1
1,038	48.18	48.18	1
1,039	67.10	67.10	1
1,040	13.09	13.09	73
1,041	25.37	25.37	11
1,042	45.24	45.24	1
1,043	14.80	14.80	1
1,044	14.80	14.80	1
1,045	14.75	14.75	1
1,046	14.57	14.57	1
1,047	14.53	14.53	1
1,048	14.53	14.53	1
1,049	14.48	14.48	1
1,050	14.43	14.43	1
1,051	14.40	14.40	1
1,052	14.34	14.34	1
1,053	14.34	14.34	1
1,054	14.25	14.25	1
1,055	14.08	14.08	1
1,056	14.06	14.06	1
1,057	13.65	13.65	1
1,058	12.17	12.17	1
1,059	21.39	21.39	1
1,060	15.35	15.35	7
1,061	13.90	13.90	4
1,062	23.18	23.18	44
1,063	46.76	46.76	1
1064*	13.05	13.38	187
1,065	17.70	17.70	11
1,066	19.76	19.76	1
1,067	23.49	23.49	1
1,068	14.52	14.52	1
1,069	23.49	23.49	1
1,070	15.19	15.19	1
1,071	14.73	14.73	1
1,072	24.66	24.66	15
1,073	18.01	18.01	11
1,074	20.92	20.92	1
1075*	13.14	13.18	4
1,076	16.44	16.44	1
1,077	12.11	12.11	38
1,078	21.77	21.77	8
1,079	25.27	25.27	1
1,080	23.59	23.59	1
1,081	23.19	23.19	1
1,082	12.64	12.64	1
1,083	31.59	31.59	1
1,084	12.21	12.21	1
1,085	28.00	28.00	1

1,086	12.05	12.05	1
1,087	13.03	13.03	26
1,088	22.46	22.46	6
1,089	15.83	15.83	1
1,090	23.36	23.36	1
1,091	17.18	17.18	26
1,092	18.54	18.54	43
1,093	13.63	13.63	1
1094*	12.38	13.05	64
1,095	13.35	13.35	1
1,096	13.34	13.34	13
1,097	20.31	20.31	1
1,098	23.80	23.80	1
1,099	20.98	20.98	1
1,100	12.72	12.72	1
1,101	12.35	12.35	1
1,102	14.63	14.63	113
1103*	20.85	21.78	61
1,104	20.64	20.64	9
1,105	16.69	16.69	1
1106*	34.75	35.01	2
1,107	15.94	15.94	1
1,108	14.96	14.96	1
1,109	12.42	12.42	73
1,110	20.20	20.20	1
1,111	12.16	12.16	1
1,112	21.37	21.37	3
1,113	13.21	13.21	1
1,114	24.98	24.98	12
1115*	27.48	27.67	3
1,116	15.36	15.36	12
1,117	13.21	13.21	15
1,118	50.04	50.04	1
1,119	40.21	40.21	1
1,120	47.72	47.72	1
1,121	12.00	12.00	7
1,122	29.42	29.42	1
1,123	12.52	12.52	1
1,124	12.15	12.15	1
1,125	12.23	12.23	1
1,126	30.09	30.09	1
1,127	18.69	18.69	64
1,128	17.33	17.33	1
1,129	22.09	22.09	1
1,130	16.20	16.20	1
1,131	46.27	46.27	1
1,132	20.26	20.26	1
1,133	23.99	23.99	1
1,134	45.81	45.81	1
1,135	18.89	18.89	9
1,136	17.89	17.89	16
1,137	20.52	20.52	5
1,138	18.32	18.32	1
1139*	14.74	18.00	11
1,140	15.08	15.08	150
1,141	21.24	21.24	6
1,142	15.88	15.88	30
1,143	16.06	16.06	1

1,144	13.56	13.56	1
1,145	16.79	16.79	10
1,146	18.75	18.75	8
1,147	14.79	14.79	1
1,148	13.32	13.32	1
1,149	16.19	16.19	54
1,150	15.18	15.18	1
1,151	14.02	14.02	1
1,152	14.78	14.78	54
1,153	17.62	17.62	1
1,154	15.52	15.52	1
1,155	21.19	21.19	1
1,156	24.02	24.02	17
1,157	18.46	18.46	1
1,158	16.03	16.03	4
1,159	25.47	25.47	1
1,160	26.87	26.87	1
1,161	13.95	13.95	1
1,162	22.68	22.68	1
1,163	13.25	13.25	2
1,164	19.37	19.37	19
1,165	15.76	15.76	1
1,166	22.13	22.13	1
1,167	22.69	22.69	24
1,168	16.72	16.72	1
1,169	15.40	15.40	1
1,170	14.87	14.87	7
1,171	19.12	19.12	80
1,172	12.28	12.28	6
1,173	15.61	15.61	1
1,174	15.92	15.92	1
1,175	14.15	14.15	37
1,176	15.92	15.92	1
1,177	19.25	19.25	1
1,178	20.08	20.08	1
1,179	39.07	39.07	5
1,180	65.93	65.93	15
1,181	13.04	13.04	122
1,182	20.38	20.38	1
1,183	14.98	14.98	1
1,184	14.59	14.59	1
1,185	22.57	22.57	1
1,186	18.98	18.98	1
1,187	19.58	19.58	1
1,188	18.63	18.63	5
1,189	12.23	12.23	1
1,190	20.48	20.48	1
1,191	15.79	15.79	1
1,192	15.42	15.42	13
1,193	13.32	13.32	1
1,194	19.63	19.63	1
1,195	12.58	12.58	1
1196*	12.74	12.86	14
1,197	14.08	14.08	1
1,198	144.76	144.76	1
1,199	68.67	68.67	1
1,200	19.31	19.31	10
1,201	21.13	21.13	140

1,202	23.85	23.85	24
1,203	26.08	26.08	6
1,204	38.76	38.76	1
1,205	12.80	12.80	1
1206*	34.41	43.98	27
1,207	27.61	27.61	10
1,208	28.05	28.05	21
1,209	22.24	22.24	28
1,210	15.59	15.59	1
1211*	18.68	20.39	42
1,212	19.48	19.48	138
1,213	20.26	20.26	1
1,214	18.55	18.55	75
1,215	17.46	17.46	1
1,216	14.34	14.34	22
1,217	17.46	17.46	67
1,218	21.50	21.50	1
1,219	41.60	41.60	40
1,220	13.88	13.88	1
1,221	43.39	43.39	1
1,222	14.07	14.07	127
1223*	12.65	13.95	24
1,224	18.88	18.88	9
1,225	21.04	21.04	1
1,226	20.70	20.70	1
1,227	16.82	16.82	12
1,228	12.12	12.12	16
1,229	12.07	12.07	6
1,230	15.76	15.76	1
1,231	21.15	21.15	250
1,232	21.65	21.65	2
1,233	16.70	16.70	59
1,234	24.30	24.30	1
1,235	20.69	20.69	1
1236*	15.32	17.90	7
1237*	15.79	17.62	62
1,238	15.64	15.64	76
1,239	16.46	16.46	1
1,240	17.30	17.30	1
1,241	17.29	17.29	1
1,242	16.89	16.89	67
1243*	14.30	18.52	767
1,244	19.38	19.38	91
1,245	19.17	19.17	1
1246*	13.83	14.31	643
1,247	13.26	13.26	247
1248*	12.37	12.52	587
1,249	14.71	14.71	1
1,250	18.41	18.41	77
1,251	13.79	13.79	26
1,252	15.29	15.29	16
1,253	12.11	12.11	53
1,254	16.12	16.12	8
1,255	12.80	12.80	6
1,256	12.49	12.49	137
1,257	22.65	22.65	1
1,258	12.00	12.00	142
1,259	12.46	12.46	19

1,260	15.38	15.38	12
1,261	16.27	16.27	42
1,262	18.43	18.43	1
1,263	25.14	25.14	5
1,264	17.97	17.97	16
1,265	21.94	21.94	1
1,266	19.77	19.77	58
1,267	25.53	25.53	19
1,268	14.24	14.24	48
1,269	17.34	17.34	27
1,270	23.93	23.93	1
1,271	18.12	18.12	40
1,272	18.23	18.23	1
1,273	14.77	14.77	4
1274*	12.59	13.95	51
1,275	12.39	12.39	1
1,276	14.20	14.20	6
1,277	17.32	17.32	450
1,278	15.33	15.33	1
1,279	23.25	23.25	1
1,280	13.47	13.47	25
1,281	17.26	17.26	3
1,282	16.61	16.61	1
1,283	16.81	16.81	1
1,284	22.85	22.85	2
1285*	15.60	16.63	5
1,286	24.29	24.29	6
1,287	13.34	13.34	284
1,288	20.66	20.66	1
1,289	13.22	13.22	1
1,290	14.83	14.83	175
1,291	22.49	22.49	1
1,292	12.03	12.03	28
1,293	14.40	14.40	2
1,294	18.93	18.93	2
1,295	17.78	17.78	1
1,296	12.43	12.43	1
1,297	16.25	16.25	1
1,298	28.51	28.51	1
1,299	14.44	14.44	1
1,300	13.12	13.12	1
1,301	16.40	16.40	1
1,302	17.25	17.25	1
1,303	13.95	13.95	1
1304*	17.03	17.17	12
1,305	22.15	22.15	8
1,306	14.47	14.47	45
1,307	19.07	19.07	3
1,308	23.08	23.08	1
1309*	12.42	12.43	93
1,310	12.29	12.29	182
1,311	29.01	29.01	9
1,312	70.31	70.31	1
1,313	32.09	32.09	38
1,314	32.73	32.73	1
1,315	26.71	26.71	25
1,316	28.93	28.93	3
1,317	21.27	21.27	15

1,318	20.75	20.75	1
1319*	23.16	24.46	77
1,320	23.80	23.80	36
1,321	28.52	28.52	19
1,322	29.82	29.82	17
1,323	25.34	25.34	30
1324*	27.47	27.83	995
1,325	26.71	26.71	8
1,326	25.63	25.63	6
1327*	13.15	16.43	22
1,328	24.84	24.84	1
1329*	26.10	27.85	19
1,330	18.17	18.17	1
1,331	19.18	19.18	51
1,332	25.80	25.80	1
1333*	29.02	44.99	20
1,334	21.39	21.39	14
1,335	21.12	21.12	1
1,336	47.75	47.75	31
1,337	26.25	26.25	1
1,338	24.46	24.46	1
1,339	19.79	19.79	11
1,340	21.36	21.36	27
1341*	29.32	32.01	29
1,342	24.37	24.37	1
1,343	16.86	16.86	26
1,344	19.95	19.95	7
1,345	14.27	14.27	1
1,346	24.11	24.11	1
1,347	21.87	21.87	7
1,348	12.22	12.22	1
1,349	17.80	17.80	3
1,350	53.47	53.47	1
1,351	27.33	27.33	1
1,352	20.70	20.70	4
1,353	35.17	35.17	15
1,354	19.69	19.69	8
1,355	22.72	22.72	26
1,356	47.27	47.27	1
1,357	31.61	31.61	1
1,358	96.55	96.55	25
1,359	46.93	46.93	14
1,360	19.35	19.35	1
1,361	71.70	71.70	11
1,362	33.93	33.93	4
1,363	15.81	15.81	8
1,364	17.57	17.57	1
1,365	32.59	32.59	1
1,366	14.09	14.09	1
1,367	29.82	29.82	1
1,368	71.13	71.13	1
1,369	22.73	22.73	1
1,370	21.90	21.90	1
1,371	21.43	21.43	52
1,372	27.71	27.71	2
1,373	23.00	23.00	3
1,374	15.04	15.04	1
1,375	18.98	18.98	1

1,376	19.79	19.79	1
1,377	19.02	19.02	20
1,378	18.53	18.53	1
1,379	18.26	18.26	1
1,380	12.91	12.91	1
1,381	12.62	12.62	4
1,382	16.60	16.60	67
1,383	16.37	16.37	58
1,384	15.32	15.32	1
1,385	15.20	15.20	1
1,386	21.08	21.08	1
1,387	21.43	21.43	1
1,388	16.78	16.78	1
1,389	20.48	20.48	1
1,390	17.73	17.73	34
1,391	20.00	20.00	1
1,392	18.18	18.18	1
1,393	21.09	21.09	1
1,394	19.94	19.94	1
1,395	13.64	13.64	1
1,396	12.77	12.77	13
1,397	16.72	16.72	10
1,398	28.10	28.10	1
1,399	18.00	18.00	1
1,400	22.74	22.74	1
1,401	16.14	16.14	12
1,402	13.97	13.97	1
1,403	50.25	50.25	11
1,404	13.15	13.15	41
1,405	25.11	25.11	1
1,406	15.06	15.06	12
1,407	20.34	20.34	1
1,408	13.63	13.63	19
1,409	24.79	24.79	1
1,410	23.24	23.24	1
1,411	24.67	24.67	1
1,412	13.52	13.52	8
1,413	19.00	19.00	2
1,414	16.88	16.88	55
1,415	19.75	19.75	1
1,416	13.67	13.67	1
1,417	16.98	16.98	19
1,418	15.62	15.62	19
1,419	13.26	13.26	1
1,420	17.69	17.69	5
1,421	14.91	14.91	22