## APPENDIX B - TYPICAL FLOOD PEAK TRAVEL TIMES

In using the information contained in this Appendix, consideration needs to be given to the time of travel of the flood peak. A flood on a 'dry' waterway will generally travel more slowly than a flood on a 'wet' waterway (e.g. The first flood after a dry period will travel more slowly than the second flood in a series of floods). Hence, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

Note that flooding will start some time ahead of the time indicated by the following travel times – these are the time between the flood peaks at respective sites.

Only waterways that contain telemeted stream level and flow gauges are included in table B1. Reliable flow travel time information is not presently available for other waterways within Cardinia Shire.

Downstream gauges may experience a flood peak prior to that occurring at an upstream gauge. This phenomenon may be due to the location of the thunderstorm passing through the catchment between the two gauges, or because of the urban environment found downstream causing floodwaters to enter the waterway quicker than those in a more rural setting upstream. Lastly this may be because of the existence of a retarding basin between the two gauges.

## **Typical Travel Times**

Location From (gauge)	Location To (gauge)	Typical Travel Time	Comments				
CARDINIA CRE	CARDINIA CREEK						
Officer South	Cardinia	Between 1 min to 2 hours					
<b>BUNYIP &amp; TAR</b>	AGO RIVERS						
Headworks		Between 4 & 18 hours	Inflows from Tarago River likely to impact on travel time.				
Tonimbuk		Iona may peak up to 16 hours before Tonimbuk or 8 hours after	Tonimbuk is just as likely to peak after lona as before even though it is located upstream. Therefore, flood peak travel times between these gauges should be used with caution. Inflows from Tarago River likely to impact on travel time.				
Longwarry North	lona	lona may peak up to 6 hours before Longwarry North or 6 hours after	Longwarry North may peak after lona even though it is located upstream. Therefore, flood peak travel times between these gauges should be used with caution. Inflows from Tarago River likely to impact on travel time.				
Neerim South		Between 8 & 20 hours	Inflows from Bunyip River likely to impact on travel time.				
Drouin West		lona may peak up to 2 hours before Drouin West or 10 hours after	Drouin West may peak after lona even though it is located upstream. Therefore, flood peak travel times between these gauges should be used with caution. Inflows from Bunyip River likely to impact on travel time.				
lona	Cora Lynn Ford	Between 1 min to 2 hours					
	Koo Wee Rup	Between 4 & 7 hours					

Table B1 - Typical Flood Travel Times between gauges on Cardinia Creek & Bunyip River

## **Historical Travel Times**

CARDINIA CREEK  16th September 1993 Officer South Cardinia Cardinia peaked 1 hour before Officer South  30th July 1996 Officer South Cardinia 1 hour Major  13th November 2004 Officer South Cardinia 1 hour Moderate  3rd February 2005 Officer South Cardinia 1 hour Moderate	Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
10   September 1995	CARDINIA CREEK				CARDINIA
13th November 2004	16 <sup>th</sup> September 1993	Officer South	Cardinia		Minor
31 <sup>rd</sup> February 2005   Officer South   Cardinia   1 hour   Moderate	30 <sup>th</sup> July 1996	Officer South	Cardinia	1 hour	Major
31° October 2010   Officer South   Cardinia   2 hours   Below Minor	13 <sup>th</sup> November 2004	Officer South	Cardinia	1 hour	Moderate
Sth February 2011	3 <sup>rd</sup> February 2005	Officer South	Cardinia	1 hour	Moderate
22*** June 2012   Officer South   Cardinia   1 hour   Minor	31st October 2010	Officer South	Cardinia	2 hours	Below Minor
Tonimbuk	5 <sup>th</sup> February 2011	Officer South	Cardinia	2 hours	Major
Tonimbuk	22 <sup>nd</sup> June 2012	Officer South	Cardinia	1 hour	Minor
Tonimbuk   Iona   Ion	BUNYIP & TARAGO	RIVERS			IONA
Drouin West   10 hours   10 hou					
Tonimbuk   Neerim South   Drouin West   Iona   21 hours   Minor	29 <sup>th</sup> July 1977	Neerim South	lona	18 hours	Minor
10th August 1978   Neerim South   Drouin West   Tonimbuk   Drouin West   Tonimbuk   Drouin West		Drouin West			
Drouin West   S hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 17 hours   Iona peaked 2 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 2 hours   Iona peaked 3 hours   Iona		Tonimbuk		10 hours	
Drouin West   S hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 8 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 2 hours   Iona peaked 17 hours   Iona peaked 2 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 10 hours   Iona peaked 2 hours   Iona peaked 3 hours   Iona	10 <sup>th</sup> August 1978	Neerim South	lona	21 hours	Minor
10   10   10   10   10   10   10   10	· ·	Drouin West			
Drouin West   Inapeaked 2 hours before Drouin West		Tonimbuk			
Prouin West   Before Drouin West   A hours   Iona	20 <sup>th</sup> November 1978	Neerim South	lona	12 hours	Minor
Tonimbuk   Iona   Iona peaked 17 hours before Tonimbuk   Iona   Iona peaked 17 hours before Tonimbuk   Iona   Iona peaked 17 hours   Iona peaked 17 hours   Iona peaked 18 hours   Iona peaked 18 hours   Iona peaked 19 hours   Iona peaked 2 hours before Tonimbuk   Iona peaked 2 hours before Tonimbuk   Iona peaked 2 hours before Tonimbuk   Iona peaked 10 hours before Tonimbuk   Iona peaked 10 hours before Tonimbuk   Iona peaked 10 hours before Tonimbuk   Iona peaked 2 hours before Drouin West   Iona peaked 3 hours   Iona peaked 10 hours   Iona peaked 2 hours before Drouin West   Iona peaked 3 hours   Iona peaked 3 hours   Iona peaked 6 hours before Tonimbuk   Iona peaked 6 hours before Tonimbuk   Iona peaked 6 hours before Tonimbuk   Iona peaked 16 hours   Iona pe		Drouin West			
12   10   10   10   10   10   10   10		Headworks		4 hours	Minor
Drouin West	22 <sup>nd</sup> August 1981	Tonimbuk	lona		
Headworks	-	Neerim South		10 hours	
14th September 1983   Tonimbuk   Iona   Iona peaked 2 hours before Tonimbuk   Minor		Drouin West		1 hour	
14th September 1983   Neerim South   Neerim South   Drouin West		Headworks	lona peaked 2 hou before Tonimbuk 8 hours	11 hours	Minor
Drouin West	14 <sup>th</sup> September 1983	Tonimbuk		·	
Headworks		Neerim South		8 hours	
Tonimbuk   Neerim South   Iona   Iona peaked 10 hours before Tonimbuk   Minor		Drouin West		4 hours	
17th October 1983  Neerim South Drouin West  Headworks Tonimbuk Neerim South Drouin West  19th September 1984  Tonimbuk Neerim South Drouin West  Neerim South Drouin West  Iona  Io		Headworks		9 hours	Minor
Neerim South	17 <sup>th</sup> October 1983	Tonimbuk	lona		
Drouin West  Headworks Tonimbuk Neerim South Drouin West  Tonimbuk Neerim South Drouin West  Tonimbuk Neerim South Drouin West  Tonimbuk Neerim South Neerim South Neerim South Neerim South Neerim South Drouin West  Tonimbuk Neerim South Neerim South Drouin West  Tonimbuk Neerim South Drouin West  Inna Inna Inna Inna Inna Inna Inna In	17 Colober 1000	Neerim South	Iona	15 hours	
Tonimbuk Neerim South Drouin West  Tonimbuk  Neerim South Drouin West  Tonimbuk  Iona  Iona  Inou  Inou  Iona  Ion		Drouin West			
19th September 1984  Neerim South Drouin West  Headworks  Tonimbuk Neerim South Drouin West  Iona  Iona  8 hours  Shours  Iona peaked 6 hours before Tonimbuk  Neerim South Drouin West  I hour  Headworks  Tonimbuk Iona  Iona  Iona  Moderate  Moderate  Moderate  Moderate		Headworks		3 hours	Moderate
Neerim South   8 hours   3 hours   3 hours   5 hours   5 hours   5 hours   10 na peaked 6 hours   10 hours	19 <sup>th</sup> September 1984	Tonimbuk	lona	1 hour	
Tonimbuk Neerim South Drouin West Headworks  Tonimbuk  Iona Iona Iona peaked 6 hours before Tonimbuk  11 hours  1 hour  Headworks  Tonimbuk Iona Iona Iona Iona Iona Iona Iona Iona	19 September 1904	Neerim South	lona	8 hours	
Tonimbuk  Neerim South Drouin West Headworks  Tonimbuk  Iona Iona peaked 6 hours before Tonimbuk  11 hours  1 hour Headworks Iona Iona peaked 6 hours before Tonimbuk  Inna Iona peaked 6 hours before Tonimbuk  Iona Iona peaked 6 hours		Drouin West		3 hours	
7th November 1985    Neerim South   Iona   before Tonimbuk   Minor	7 <sup>th</sup> November 1985	Headworks	lona	5 hours	Minor
Drouin West 1 hour  Headworks 4 hours  Jona peaked 16 hours  Minor		Tonimbuk			
Headworks 4 hours  20th July 1987 Tonimbuk Iona Peaked 16 hours Minor		Neerim South		11 hours	
20th July 1997 Tonimbuk Jona long long peaked 16 hours Minor		Drouin West		1 hour	
		Headworks			Minor
Neerim South 13 hours	29 <sup>th</sup> July 1987		lona .	before Tonimbuk	

Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
	Drouin West		8 hours	
11 <sup>th</sup> June 1989	Headworks	lona	11 hours	Minor
	Tonimbuk		lona peaked 4 hours before Tonimbuk	
	Neerim South		18 hours	
	Drouin West		3 hours	
	Headworks		11 hours	
28 <sup>th</sup> October 1989	Tonimbuk	Iona	lona peaked 3 hours before Tonimbuk	Minor
	Neerim South		15 hours	
	Drouin West		4 hours	
	Headworks		12 hours	
31 <sup>st</sup> October 1989	Tonimbuk	Iona	lona peaked 3 hours before Tonimbuk	Minor
	Neerim South		18 hours	
	Drouin West		7 hours	
	Headworks		4 hours	
12 <sup>th</sup> October 1990	Tonimbuk	Iona	lona peaked 4 hours before Tonimbuk	Major
	Neerim South		10 hours	
	Drouin West		6 hours	
	Headworks		7 hours	
18 <sup>th</sup> September 1991	Tonimbuk	Iona	lona peaked 11 hours before Tonimbuk	Minor
	Neerim South		14 hours	
	Drouin West		3 hours	
	Headworks		6 hours	Minor
11 <sup>th</sup> October 1992	Tonimbuk	1	4 hours	
11 October 1992	Neerim South	lona	13 hours	
	Drouin West		4 hours	
	Headworks		16 hours	Moderate
16 <sup>th</sup> September 1993	Tonimbuk	lona	4 hours	
16 September 1995	Neerim South	IOIIa	20 hours	
	Drouin West		9 hours	
	Headworks		11 hours	
12 <sup>th</sup> June 1995	Tonimbuk	lona	7 hours	Minor
12 Julie 1995	Neerim South	IOIIa	10 hours	
	Drouin West		4 hours	
	Headworks		4 hours	Minor
	Tonimbuk		Less than 1 hour	
23 <sup>rd</sup> October 1995	Neerim South	Iona	15 hours	
	Drouin West		lona peaked 3 hours before Drouin West	
	Headworks	lona	11 hours	- Minor
6 <sup>th</sup> November 1995	Tonimbuk		6 hours	
O MOVELLINGE 1990	Neerim South		15 hours	
	Drouin West		Less than 1 hour	
	Headworks		4 hours	
30 <sup>th</sup> July 1996	Tonimbuk	lona	lona peaked 13 hours before Tonimbuk	Moderate
,	Neerim South		9 hours	
	Drouin West		7 hours	

Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
	lona	Cora Lynn Ford	1 hour	
	Headworks		6 hours	
8 <sup>th</sup> August 1996	Tonimbuk		2 hours	
	Neerim South	lona	13 hours	Minor
	Drouin West		3 hours	
	lona	Cora Lynn Ford	Less than 1 hour	
	Headworks		9 hours	
	Tonimbuk		3 hours	
1 <sup>st</sup> October 1996	Neerim South	lona	12 hours	Minor
	Drouin West		1 hour	
	Iona	Cora Lynn Ford	Less than 1 hour	
	Headworks		8 hours	
	Tonimbuk		7 hours	
	Longwarry North	lona	3 hours	
13 <sup>th</sup> November 2004	Neerim South		13 hours	Moderate
	Drouin West		6 hours	
		Cora Lynn Ford	2 hours	
	lona	Koo Wee Rup	5 hours	
	Headworks	<u> </u>	17 hours	
	Tonimbuk		5 hours	Minor
3 <sup>rd</sup> February 2005	Longwarry North	lona	Less than 1 hour	
	Neerim South		19 hours	
	lona	Koo Wee Rup	6 hours	
	Headworks	<u> </u>	Less than 1 hour	
	Tonimbuk	lona peaked 8 hours before Tonimbuk  Less than 1 hour  19 hours		
	Longwarry North		Less than 1 hour	
13 <sup>th</sup> September 2005	Neerim South		Minor	
	Drouin West		5 hours	
	lona	Cora Lynn Ford	Less than 1 hour	1
		Koo Wee Rup	4 hours	
	Headworks		20 hours	
	Tonimbuk		lona peaked 3 hours before Tonimbuk	
	Longwarry North	lona	2 hours	
28 <sup>th</sup> September 2009	Neerim South		15 hours	Minor
	Drouin West		2 hours	
	lana	Cora Lynn Ford	5 hours	
	lona	Koo Wee Rup	6 hours	
	Headworks		12 hours	
	Tonimbuk		3 hours	Minor
	Longwarry North	lona	lona peaked 1 hour before Longwarry North	
31 <sup>st</sup> October 2010	Neerim South		15 hours	
	Drouin West		lona peaked 5 hours before Drouin West	
	lona	Cora Lynn Ford	1 hour	
	IOIIa	Koo Wee Rup	4 hours	
	Headworks	Iona 3 hou	18 hours	Minor
21st December 2010	Tonimbuk		3 hours	
	Longwarry North		3 hours	

Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
	Neerim South		12 hours	
	Drouin West		12 hours	
		Cora Lynn Ford	1 hour	
	lona	Koo Wee Rup	5 hours	
	Headworks		9 hours	
	Tonimbuk		8 hours	Major
	Longwarry North	Iona	6 hours	
5 <sup>th</sup> February 2011	Neerim South		13 hours	
	Drouin West		8 hours	
		Cora Lynn Ford	2 hours	
	Iona	Koo Wee Rup	Less than 1 hour	
	Headworks		7 hours	
	Tonimbuk		lona peaked 2 hours before Tonimbuk	
12 <sup>th</sup> April 2011	Longwarry North	Iona	lona peaked 7 hours before Longwarry North	Minor
12 April 2011	Neerim South		11 hours	WIIIO
	Drouin West		1 hours	
		Cora Lynn Ford	2 hours	
	lona	Koo Wee Rup	7 hours	
	Headworks		7 hours	
	Tonimbuk		3 hours	Minor
	Longwarry North	Iona	2 hours	
11 <sup>th</sup> August 2011	Neerim South		13 hours	
	Drouin West		4 hours	
		Cora Lynn Ford	Less than 1 hour	
	lona	Koo Wee Rup	7 hours	
	Headworks		9 hours	
	Tonimbuk		3 hours	Minor
	Longwarry North	Iona	2 hours	
30 <sup>th</sup> September 2011	Neerim South		13 hours	
30 September 2011	Drouin West		2 hours	WIIIIOI
	Iona	Cora Lynn Ford	Cora Lynn Ford peaked 1 hour before Iona	
		Koo Wee Rup	5 hours	
	Headworks		13 hours	
	Tonimbuk		6 hours	Minor
	Longwarry North	Iona	4 hours	
10 <sup>th</sup> November 2011	Neerim South		20 hours	
	Drouin West		10 hours	
		Cora Lynn Ford	1 hour	
	Iona	Koo Wee Rup	4 hours	
	Headworks		10 hours	
	Tonimbuk		1 hour	
	Longwarry North	Iona	2 hours	
27 <sup>th</sup> November 2011			16 hours	Minor
	Drouin West		Less than 1 hour	
		Cora Lynn Ford	1 hour	
	Iona	Koo Wee Rup	6 hours	
26 <sup>th</sup> May 2012	Headworks	Iona	11 hours	Minor

Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
	Tonimbuk		lona peaked 17 hours before Tonimbuk	
	Longwarry North		lona peaked 6 hours before Tonimbuk	
	Neerim South		3 hours	
	Drouin West		2 hours	
	lona	Cora Lynn Ford	2 hours	
	IOIIa	Koo Wee Rup	6 hours	
	Headworks		5 hours	
	Tonimbuk		18 hours	
	Longwarry North	Iona	9 hours	
5 <sup>th</sup> June 2012	Neerim South		9 hours	Minor
	Drouin West		3 hours	
	lona	Cora Lynn Ford	1 hour	
	IOIIa	Koo Wee Rup	7 hours	
	Headworks		7 hours	
	Tonimbuk		4 hours	
	Longwarry North	Iona	2 hours	
22 <sup>nd</sup> June 2012	Neerim South		11 hours	Minor
	Drouin West		7 hours	
	1	Cora Lynn Ford	1 hour	
	lona	Koo Wee Rup	5 hours	
	Headworks		4 hours	Minor
	Tonimbuk	Iona	lona peaked 4 hours before Tonimbuk	
	Longwarry North  Neerim South		lona peaked 6 hours before Longwarry North	
3 <sup>rd</sup> July 2012			7 hours	
	Drouin West		lona peaked 1 hour before Drouin West	
	lona	Cora Lynn Ford	5 hours	
	Iona	Koo Wee Rup	6 hours	
	Headworks		6 hours	Minor
	Tonimbuk	lona	1 hour	
	Longwarry North		1 hour	
28 <sup>th</sup> August 2015	Neerim South		14 hours	
	Drouin West		7 hours	
	lona	Cora Lynn Ford	1 hour	
	IUIIa	Koo Wee Rup	5 hours	
	Headworks		6 hours	
	Tonimbuk		1 hour	
	Longwarry North	Iona	3 hours	
22 <sup>nd</sup> July 2016	Neerim South		9 hours	Minor
	Drouin West		2 hours	
		Cora Lynn Ford	2 hours	
		Koo Wee Rup	7 hours	
	Headworks		3 hours	
	Tonimbuk	lona	2 hours	
2 <sup>nd</sup> May 2020	Longwarry North		Less than 1 hour	Minor
	Neerim South		13 hours	
	Drouin West		10 hours	

Flood Event	Location From (gauge)	Location To (gauge)	Flood Peak Travel Time	Flood Class at
	1	Cora Lynn Ford	Less than 1 hour	
	Iona	Koo Wee Rup	3 hours	
	Headworks		15 hours	
	Tonimbuk		4 hours	
	Longwarry North	Iona	1 hour	
23 <sup>rd</sup> August 2020	Neerim South		9 hours	Minor
	Drouin West		6 hours	
	lona	Cora Lynn Ford	1 hour	
		Koo Wee Rup	5 hours	
	Headworks		7 hours	
	Tonimbuk		lona peaked 1 hours before Tonimbuk	
25 <sup>th</sup> October 2020	Longwarry North	lona	lona peaked 3 hours before Longwarry North	Minor
20 000001 2020	Neerim South		9 hours	
	Drouin West		6 hours	
	lona	Cora Lynn Ford	1 hour	
	iona	Koo Wee Rup	8 hours	

Table B2 – Historical Flood Travel Times between gauges on Cardinia Creek and the Bunyip River