PROGRESS REPORT: DELIVERABLE ON PROJECT D13-0379 – DARWIN – EAST ARM PORT PROJECT

REPORT TO THE NORTHERN TERRITORY GOVERNMENT
31 JANUARY 2015

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BACKGROUND

This progress report provides an update on the monitoring of migratory shorebirds that roost in the dredge ponds at East Arm Wharf (EAW). Monitoring began in late 2009 and continued through the survey efforts of Conservation Volunteers Australia (CVA). A PhD research project currently being undertaken by Amanda Lilleyman has worked alongside the monitoring program established by CVA. The current report builds on from the May 2014 report summarising the shorebird monitoring program (Lilleyman et al. 2013, 2014).

This project assesses the importance of Darwin Harbour for migratory shorebirds (listed in Table 1) protected under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 1. Migratory shorebird species monitored at East Arm Wharf.

Shorebird	Scientific name	Shorebird	Scientific name
Pacific Golden Plover	*Pluvialis fulva*	Common Greenshank	*Tringa nebularia*
Grey Plover	*Pluvialis squatarola*	Marsh Sandpiper	*Tringa stagnatilis*
Lesser Sand Plover	*Charadrius mongolus*	Wood Sandpiper	*Tringa glareola*
Greater Sand Plover	*Charadrius leschenaulltii*	Ruddy Turnstone	*Arenaria interpres*
Oriental Plover	*Charadrius verenus*	Asian Dowitcher	*Limnodromus semipalmatus*
Black-tailed Godwit	*Limosa limosa*	Great Knot	*Calidris tenuirostris*
Bar-tailed Godwit	*Limosa lapponica*	Red Knot	*Calidris canutus*
Whimbrel	*Numenius phaeopus*	Sanderling	*Calirdis alba*
Eastern Curlew	*Numenius madagascariensis*	Red-necked Stint	*Calidris ruficollis*
Terek Sandpiper	*Xenus cinereus*	Sharp-tailed Sandpiper	*Calidris acuminata*
Common Sandpiper	*Actitus hypoleucos*	Curlew Sandpiper	*Calirdris ferruginea*
Grey-tailed Tattler	*Tringa brevipes*	Broad-billed Sandpiper	*Calidris falcinellus*

2014-15 SHOREBIRD COUNTS FOR EAST ARM WHARF

Counts of migratory shorebirds were conducted each fortnight with most counts performed during spring high tides and some during neap high tides and low tides. All dredge ponds were surveyed for migratory shorebirds, and all other waterbirds were also recorded.

Shorebird abundance varied according to the timing of the season, with September supporting the most individuals and species of migratory shorebirds in Pond E at high tide (Figure 1). The high number of shorebirds in September is due to the birds arriving in Darwin during their southward migration from their breeding grounds. Many shorebirds appear to use the Darwin region for a 'staging' area, resting and feeding after flying south from east Asia before moving to their preferred non-breeding site.

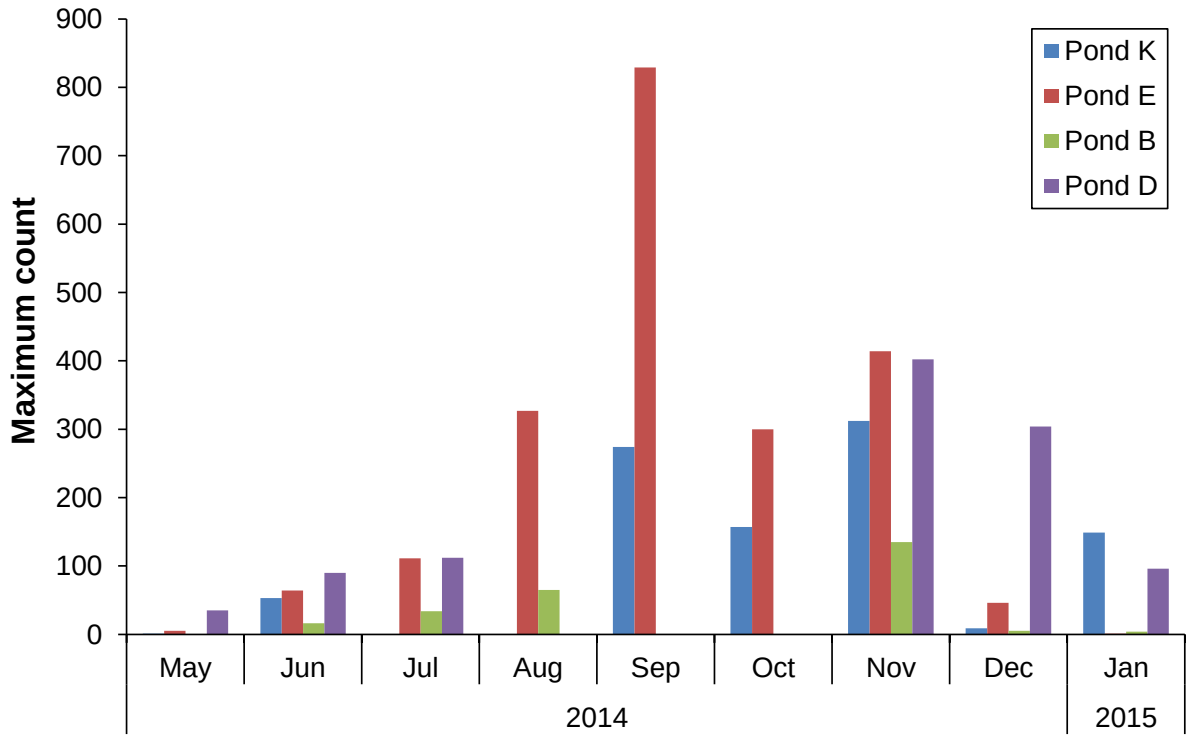

Figure 1. Maximum count of migratory shorebirds in the different dredge ponds at East Arm Wharf for months May 2014 through to January 2015.

September is the most important month for migratory shorebirds at EAW as almost 1000 individuals of up to 17 species used Pond E as a roost site during high tides (Figure 2). Because of this, EAW meets the criteria as a site of national importance under the *Significant impact guidelines for 36 migratory shorebird species* – a background paper to the EPBC Act Policy Statement 3.21 as it has supported more than 15 species at a single time (Australian Government 2009).

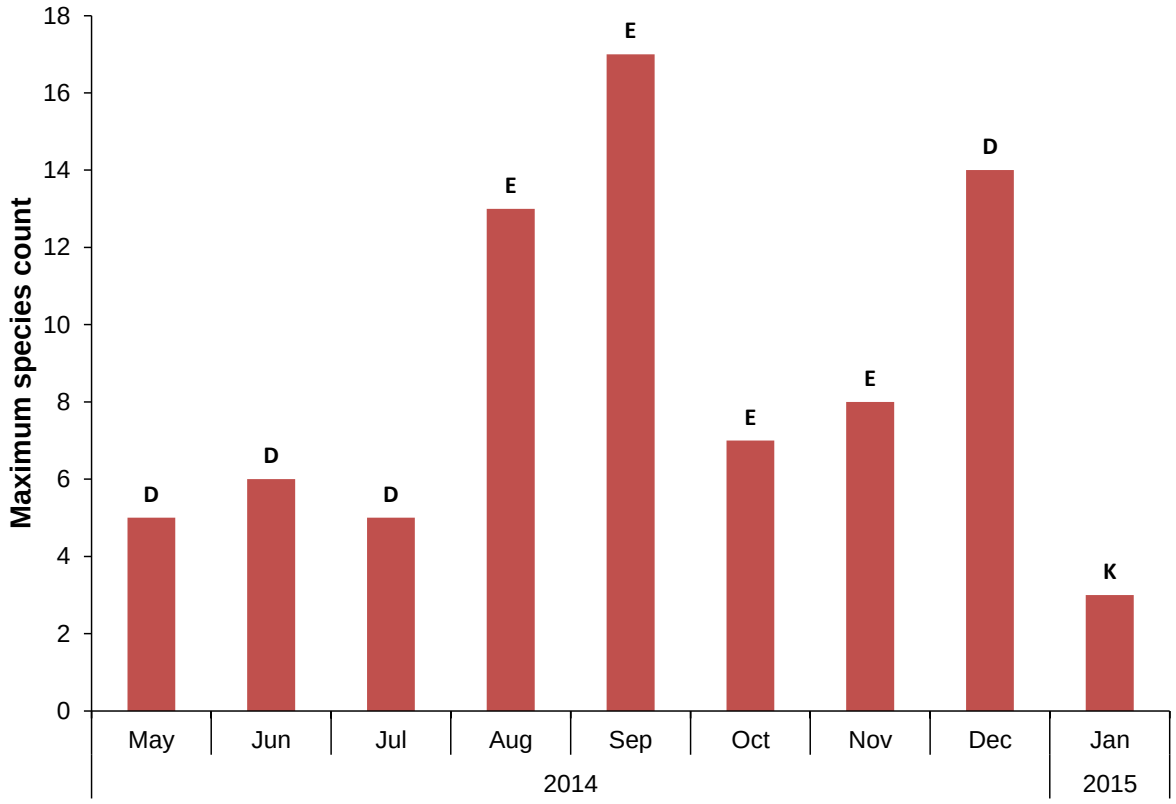

Figure 2. Maximum number of shorebird species in the different dredge ponds at East Arm Wharf from May 2014 through to January 2015. Letters above bars represent the dredge pond that supported the maximum count of species.

The highest number of species that other known roost sites have supported (over the course of this study period) is 14 (Lee Point beach). It is likely that EAW supports a great number of migratory shorebird species because of the variety of habitat available and the size of the roosting area. East Arm Wharf provides freshwater habitat in ponds B and D (when there are no dredging activities) and K and E provide saline (and somewhat tidal) habitats with the EAW as a whole providing ready access to coastal mudflats within easy reach of the EAW. The December count at EAW, in which small numbers of 14 species, is consistent with this hypothesis. However species richness and abundance dropped when freshwater flooded the ponds leaving little of the exposed muddy edge that migratory shorebirds prefer. With the drying of the ponds once the monsoon settles (expected in Mar/Apr), numbers are likely to rise again before the northward migration to the birds' breeding grounds in north Asia and Alaska.

Fortnightly counts at all of the ponds revealed much variation across the EAW site and over time, demonstrating how dynamic the shorebird community can be as a result of both annual long distance movement through and past Darwin and short term movements between sites depending on the tide, food availability and food requirements (Figure 3).

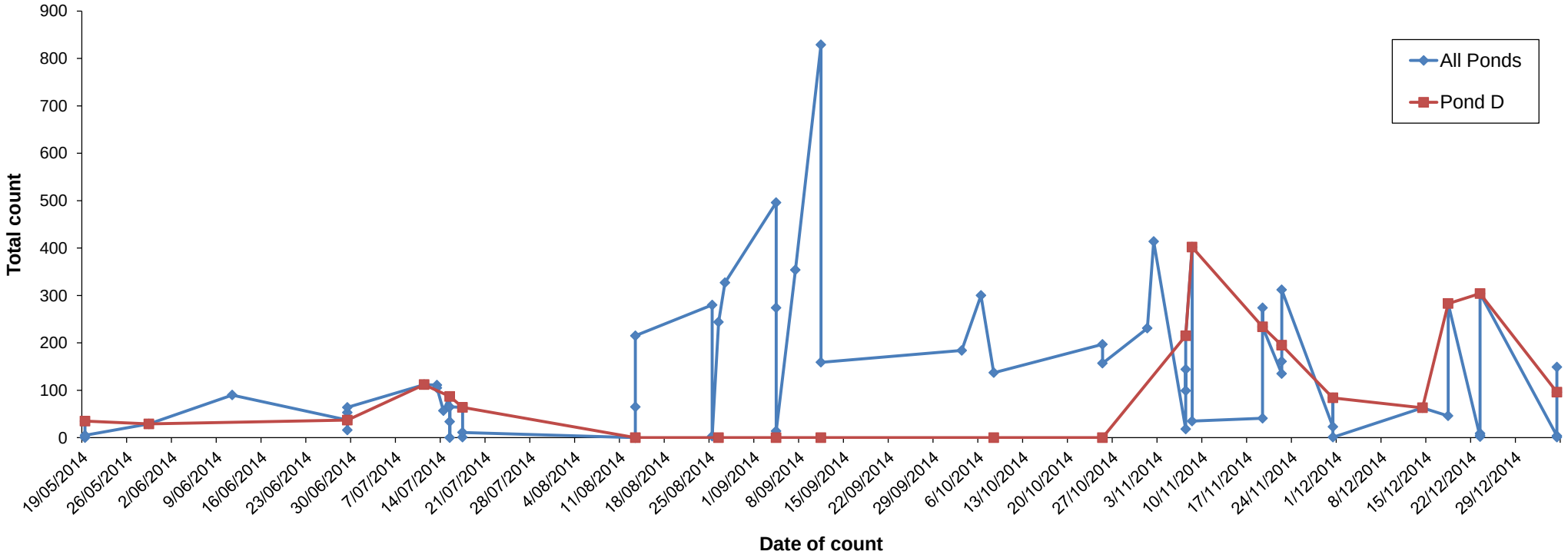

Figure 3. Migratory shorebird counts for all dredge ponds (blue line) and in Pond D (red line) at East Arm Wharf from May 2014 through to January 2015.

CONCLUSIONS

1. In the nine months since the last progress report the migratory shorebirds have returned to Darwin for the non-breeding season, with September supporting the most individuals and species. These large concentrations occurred in Pond E.
2. Pond D has continued to provide quality habitat for migratory shorebirds during the monitoring period. The lack of water available in Pond D from July to October meant that shorebirds used Pond E as their main roosting pond. When rainwater filled to Pond D, the birds also returned.
3. Ponds E, D and K have all supported nationally significant numbers of shorebirds
4. The final report in this contract (to be submitted April 2015) will discuss the use of the harbour by shorebirds that roost at EAW.

ACKNOWLEDGEMENTS

Thank you to Conservation Volunteers Australia and Darwin Port Corporation for supporting the migratory shorebird monitoring program.

REFERENCES

Australian Government. 2009. Significant impact guidelines for 36 migratory shorebird species.*in* Department of Environment Water Heritage and the Arts, editor.

Lilleyman, A., Lawes, M. and Garnett, S.T.. 2013. Migratory shorebirds in Darwin harbour, Northern Territory. Report to the Department of Business, Northern Territory Government. 31 October 2013

Lilleyman, A., Lawes, M. and Garnett, S.T.. 2014. Migratory shorebirds in Darwin harbour, Northern Territory. Report to the Department of Business, Northern Territory Government. 31 January 2014

APPENDICES

Appendix 1. Migratory shorebird monitoring abundance data May 2014 through to January 2015.

Date	19/05/2014	19/05/2014	19/05/2014	19/05/2014	29/05/2014	11/06/2014	29/06/2014	29/06/2014	29/06/2014	29/06/2014	11/07/2014	13/07/2014
Time of count	8:00	8:40	9:04	8:52	4:30	15:00	7:35	8:00	8:35	8:15	14:30	7:15
High Tide time	9:21	9:21	9:21	9:21	6:51	16:25	7:47	7:47	7:47	7:47	16:47	7:00
High Tide (m)	7.19	7.19	7.19	7.19	7.17	5.98	6.99	6.99	6.99	6.99	6.04	7.35
Pond	EAW D	EAW K	EAW B	EAW E	EAW D	EAW D	EAW D	EAW K	EAW B	EAW E	EAW D	EAW E
Time difference with high tide	1:21	0:41	0:17	0:29	2:21	1:25	0:12	0:13	0:48	0:28	2:17	0:15
Latham's snipe												
Pin-tailed snipe												
Swinhoe's snipe												
Black-tailed godwit												
Bar-tailed godwit												
Little curlew												
Whimbrel	1				16	10					7	
Eastern curlew					3	12	7				20	
Common redshank												
Marsh sandpiper												
Common greenshank	4			5	10	22	11		16	4	20	27
Wood sandpiper												
Terek sandpiper										36		44
Common sandpiper												
Grey-tailed tattler										24		15
Wandering tattler												
Ruddy turnstone												
Asian dowitcher												
Great knot						1						
Red knot												
Sanderling												
Red-necked stint	27					44	19	45			62	22
Long-toed stint												
Pectoral sandpiper												
Sharp-tailed sandpiper												
Curlew sandpiper											3	3
Broad-billed sandpiper												
Ruff												
Red-necked phalarope												
Golden plover	1	1										
Grey plover												
Double-banded plover												
Lesser sand plover	2							1				
Greater sand plover						1		7				
Oriental plover												
Oriental pratincole												
Unidentified												

Date	13/07/2014	13/07/2014	14/07/2014	15/07/2014	15/07/2014	15/07/2014	15/07/2014	17/07/2014	17/07/2014	17/07/2014	13/08/2014	13/08/2014
Time of count	7:15	16:20	17:30	7:20	7:17	7:57	6:45	8:55	9:20	9:13	8:16	8:20
High Tide time	7:00	18:23	19:11	8:22	8:22	8:22	8:22	9:33	9:33	9:33	7:58	7:58
High Tide (m)	7.35	6.8	6.96	7.63	7.63	7.63	7.63	7.28	7.28	7.28	7.75	7.75
Pond	EAW E	EAW E	EAW E	EAW D	EAW K	EAW B	EAW E	EAW D	EAW B	EAW E	EAW D	EAW K
Time difference with high tide	0:15	2:03	1:41	1:02	1:05	0:25	1:37	0:38	0:13	0:20	0:18	0:22
Latham's snipe												
Pin-tailed snipe												
Swinhoe's snipe												
Black-tailed godwit												
Bar-tailed godwit												
Little curlew												
Whimbrel		13	9	9						7		
Eastern curlew		18	12	8						4		
Common redshank												
Marsh sandpiper												
Common greenshank	27	25	27	5		34		1	1			
Wood sandpiper												
Terek sandpiper	44						46					
Common sandpiper												
Grey-tailed tattler	15						19					
Wandering tattler												
Ruddy turnstone												
Asian dowitcher												
Great knot												
Red knot												
Sanderling												
Red-necked stint	22	37	6	61				62				
Long-toed stint												
Pectoral sandpiper												
Sharp-tailed sandpiper												
Curlew sandpiper	3	1	1	4				1				
Broad-billed sandpiper												
Ruff												
Red-necked phalarope												
Golden plover												
Grey plover												
Double-banded plover												
Lesser sand plover												
Greater sand plover		11	2									
Oriental plover												
Oriental pratincole												
Unidentified												

Date	13/08/2014	13/08/2014	25/08/2014	25/08/2014	26/08/2014	27/08/2014	4/09/2014	4/09/2014	4/09/2014	7/09/2014	11/09/2014	11/09/2014
Time of count	7:11	6:47	16:30	17:24	15:50	7:05	8:35	10:15	16:40	16:00	6:44	9:15
High Tide time	7:58	7:58	18:17	18:17	18:49	7:21	6:21	11:37	19:11	16:35	7:25	7:25
High Tide (m)	7.75	7.75	6.72	6.72	6.50	7.02	3.76	4.98	2.51	6.05	7.7	7.7
Pond	EAW B	EAW E	EAW E	EAW B	EAW B	EAW E	EAW E	EAW K	EAW E	EAW E	EAW E	EAW K
Time difference with high tide	0:47	1:11	1:47	0:53	2:59	0:16	2:14	1:22	2:31	0:35	0:41	1:50
Latham's snipe												
Pin-tailed snipe												
Swinhoe's snipe												
Black-tailed godwit							1			1	1	
Bar-tailed godwit		3	3		4	4	6			29	45	
Little curlew												
Whimbrel		13	17		18	27	92			84	72	
Eastern curlew		63	96		96	69	123		13	119	99	
Common redshank												
Marsh sandpiper	2											
Common greenshank	8	57	53		55	71	50			71	77	
Wood sandpiper	1											
Terek sandpiper		54	29		6	66	24				125	
Common sandpiper	1		1			2	1			2	1	
Grey-tailed tattler		24	54		25	52	50			3	175	
Wandering tattler												
Ruddy turnstone										3		
Asian dowitcher												
Great knot		1	12		7	17				42	60	
Red knot												
Sanderling												
Red-necked stint	53			3	13	6	33				3	40
Long-toed stint												
Pectoral sandpiper												
Sharp-tailed sandpiper			10		13	7	84				83	
Curlew sandpiper					2		3				3	
Broad-billed sandpiper											1	
Ruff												
Red-necked phalarope												
Golden plover			4		4	4	12				29	
Grey plover			1		1	1	1		1		5	
Double-banded plover												
Lesser sand plover							4	4			2	
Greater sand plover						1	11	270			48	118
Oriental plover							1					1
Oriental pratincole												
Unidentified												

Date	3/10/2014	6/10/2014	8/10/2014	25/10/2014	25/10/2014	1/11/2014	2/11/2014	7/11/2014	7/11/2014	7/11/2014	7/11/2014	8/11/2014
Time of count	9:15	18:37	18:00	5:57	7:12	15:17	17:23	17:08	17:16	17:26	17:37	18:34
High Tide time	11:30	16:31	18:12	6:31	6:31	18:21	19:57	18:14	18:14	18:14	18:14	19:25
High Tide (m)	4.89	6.24	7.38	6.93	6.93	2.82	2.96	7.62	7.62	7.62	7.62	7.7
Pond	EAW E	EAW E	EAW E	EAW E	EAW K	EAW E	EAW E	EAW E	EAW K	EAW B	EAW D	EAW D
Time difference with high tide	2:15	2:06	0:12	0:34	0:41	3:04	2:34	1:06	0:58	0:48	0:37	0:51
Latham's snipe												
Pin-tailed snipe												
Swinhoe's snipe												
Black-tailed godwit				1								
Bar-tailed godwit		14	28	60				1			30	30
Little curlew												
Whimbrel	34	66	10	3		53	72				46	63
Eastern curlew	94	123		3		66	104	3			56	71
Common redshank												
Marsh sandpiper			4	2						2		3
Common greenshank	56			104		42	37	8		95	7	65
Wood sandpiper												
Terek sandpiper				1				2				
Common sandpiper				2				1		2	1	1
Grey-tailed tattler		2		5			1					
Wandering tattler												
Ruddy turnstone												
Asian dowitcher												
Great knot			17	3				1			1	8
Red knot												
Sanderling												
Red-necked stint				6	78	10	36		36		22	47
Long-toed stint												
Pectoral sandpiper												
Sharp-tailed sandpiper		90	76	4		21	2				46	107
Curlew sandpiper		1		3							3	
Broad-billed sandpiper											1	
Ruff												
Red-necked phalarope												
Golden plover						15	1					
Grey plover		4	2			6		2			2	
Double-banded plover												
Lesser sand plover					1							
Greater sand plover					78	18	161		108			7
Oriental plover												
Oriental pratincole												
Unidentified												

Date	8/11/2014	19/11/2014	19/11/2014	19/11/2014	22/11/2014	22/11/2014	22/11/2014	22/11/2014	30/11/2014	30/11/2014	30/11/2014	14/12/2014
Time of count	19:06	16:17	16:43	17:08	15:10	15:57	16:14	17:24	16:00	16:20	16:18	14:45
High Tide time	19:25	16:43	16:43	16:43	18:34	18:34	18:34	18:34	17:53	17:53	17:53	16:32
High Tide (m)	7.7	5.93	5.93	5.93	7.22	7.22	7.22	7.22	2.87	2.87	2.87	3.01
Pond	EAW E	EAW B	EAW E	EAW D	EAW B	EAW E	EAW D	EAW K	EAW B	EAW D	EAW K	EAW D
Time difference with high tide	0:19	0:26	0:00	0:25	3:24	2:37	2:20	1:10	1:53	1:33	1:35	1:47
Latham's snipe												
Pin-tailed snipe												
Swinhoe's snipe												
Black-tailed godwit												
Bar-tailed godwit			4	1			35					
Little curlew												
Whimbrel	24		61			13	42			12		3
Eastern curlew	5		108	3		54	20			12		13
Common redshank												
Marsh sandpiper				1			6		1	3		2
Common greenshank		28	1	74	61	4	29			4		12
Wood sandpiper									2			
Terek sandpiper						20						
Common sandpiper		1			1							1
Grey-tailed tattler	1			1								
Wandering tattler												
Ruddy turnstone												
Asian dowitcher												
Great knot			5				5					
Red knot												
Sanderling												
Red-necked stint		5	8	43			1	80		3		
Long-toed stint												
Pectoral sandpiper												
Sharp-tailed sandpiper		7		110	43		55	2		1		30
Curlew sandpiper	5						2			7		1
Broad-billed sandpiper												
Ruff												
Red-necked phalarope												
Golden plover			1		30				20	33		
Grey plover			10			3						
Double-banded plover												
Lesser sand plover			2	1				1		7		1
Greater sand plover			74			67		226		2	1	
Oriental plover								3				
Oriental pratincole												
Unidentified												

Date	18/12/2014	18/12/2014	23/12/2014	23/12/2014	23/12/2014	23/12/2014	4/01/2015	4/01/2015	4/01/2015	4/01/2015
Time of count	6:27	6:27	15:50	15:59	16:12	16:21	16:48	16:57	17:12	17:00
High Tide time	9:23	9:23	19:38	19:38	19:38	19:38	18:26	18:26	18:26	18:26
High Tide (m)	2.48	2.48	7.69	7.69	7.69	7.69	7.12	7.12	7.12	7.12
Pond	EAW E	EAW D	EAW E	EAW K	EAW B	EAW D	EAW B	EAW E	EAW D	EAW K
Time difference with high tide	2:56	2:56	3:48	3:39	3:26	3:17	1:38	1:29	1:14	1:26
Latham's snipe										
Pin-tailed snipe										
Swinhoe's snipe										
Black-tailed godwit										
Bar-tailed godwit						34				
Little curlew										
Whimbrel		75								
Eastern curlew	46	13		1		15				
Common redshank										
Marsh sandpiper		6							2	
Common greenshank		66		8	5	69	4	1	41	
Wood sandpiper										
Terek sandpiper						22			47	
Common sandpiper			2			2			1	
Grey-tailed tattler		2				6				
Wandering tattler										
Ruddy turnstone										
Asian dowitcher										
Great knot						3				
Red knot										
Sanderling										
Red-necked stint		22				37			1	2
Long-toed stint										
Pectoral sandpiper										
Sharp-tailed sandpiper		75				60			4	
Curlew sandpiper		2				1				
Broad-billed sandpiper										
Ruff										
Red-necked phalarope										
Golden plover		1				46				
Grey plover		2				5				
Double-banded plover										
Lesser sand plover		4				2				3
Greater sand plover		15				2				144
Oriental plover										
Oriental pratincole										
Unidentified										