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Gus Bakas
Director, MA Hydro

March 15, 2014

FERC0046

FERC Project No. 1889 – Turners Falls

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

- References:
1. Order Issuing New License, Project No. 1889, issued May 5, 1980.
 2. Letter, E. T. Tracy to W. G. Council, dated December 13, 1984.

Dear Secretary Bose:

Turners Falls Project: Fish Passage Facilities 2013 Annual Report of Operations

In Reference 1, The Federal Energy Regulatory Commission (FERC) issued a new license to the Western Massachusetts Electric Company (WMECO) to operate the Turners Falls Project, FERC Project No. 1889. Article 38 required the Licensee to file an annual report detailing operation of the Project's fish passage facilities. The current Licensee is FirstLight Hydro Generating Company.

In Reference 2, the FERC Regional Engineer requested that this report be submitted annually by March 15. Enclosed is the Fish Passage Facilities 2013 Annual Report of Operations for the Turners Falls Project.

Should you have any questions or require further information, please call Mr. Robert J. Stira, at (413) 422-5910, or Mr. Donald E. Traester at (413) 659-4416.

Very truly yours,

A handwritten signature in blue ink, appearing to read "Gus Bakas", is written over a horizontal line.

Gus Bakas
Director, MA Hydro

cc:

Mr. John Warner
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Enclosure

**FISH PASSAGE FACILITIES
2013 ANNUAL REPORT OF OPERATIONS**

**TURNERS FALLS PROJECT
FERC PROJECT NO. 1889**

FirstLight Hydro Generating Company

by
**FirstLight Power Resources Services, LLC
Northfield Mountain Station
99 Millers Falls Rd
Northfield, MA 01360**

March 2014

Introduction

Upstream fish passage facilities at the Turners Falls Project (Project), FERC Project No. 1889, were first put into operation in 1980. The complex consists of three fish ladders: Cabot fish ladder adjacent to Cabot Station; spillway fish ladder at Turners Falls Dam; and gatehouse fish ladder at the upstream end of the power canal. The Cabot and spillway fish ladders are of modified "Ice Harbor" design and the gatehouse fish ladder is a vertical slot ladder. Counts of anadromous fish (as available) using the fish passage facilities during 34 years of operation are listed in Table 1.

On June 2, 1989, U. S. Fish and Wildlife Service (FWS) requested that the Federal Energy Regulatory Commission (FERC) require additional downstream fish passage facilities at the Turners Falls Project. Following that correspondence and a succession of discussions, the Licensee's predecessor, Western Massachusetts Electric Company, signed a Memorandum of Agreement (MOA) on July 26, 1990 with the Connecticut River Atlantic Salmon Commission (CRASC), Connecticut Department of Environmental Protection (now Connecticut Department of Energy and Environmental Protection), Massachusetts Division of Fisheries and Wildlife (MADFW), New Hampshire Fish and Game Department, Vermont Fish and Wildlife Department, FWS, and the National Marine Fisheries Service, setting a schedule for provision of downstream passage facilities. Downstream passage facilities are now in place, and are operated by FirstLight Power Resources Services, LLC (FLPR) for the current Licensee, FirstLight Hydro Generating Company.

Article 38 of the FERC license for the Project requires the Licensee to file an Annual Report of Operations describing the upstream fish passage facility operations. This report fulfills this requirement for 2013. Also included are summaries of downstream passage facility operation and usage of the fishway visitors' center.

Upstream Fish Passage

Period of Operation

Gatehouse and spillway fishways were opened on May 6, Cabot fishway on May 3. All the fishways were closed on July 2 after consultation with MADFW and FWS. The ladders were run 24 h daily.

Fish Passage

Counting of American shad and other anadromous fish species that passed through the ladder system in 2004 through 2013 has been supported by the Licensee because of ongoing evaluation of fish passage through the Project. Prior to 2004, counts had been provided by the MADFW (Table 1). A digital system for observing fish has been deployed at the counting windows at all three ladders since the 2007 passage season. The 2013

counts at the three fishways are presented in Tables 2, 3, and 4. The Licensee will continue to support counts during 2014.

The Licensee has been evaluating fish passage and/or potential structural modifications of the fishways at the Project since 1999. The ladder modifications and evaluations are part of a plan initially proposed to the agencies in August, 1998 and updated several times since to investigate and enhance upstream passage at the Project. The following paragraphs summarize activities under the plan.

Evaluation of Cabot Ladder

The Licensee began a multiple-year investigation of American shad passage through the Cabot ladder in 2000. The investigation was conducted in consultation with representatives of CRASC and the Conte Anadromous Fish Research Center (CAFRC). Several modifications of the weir crests and their alignment in various ladder sections were evaluated by CAFRC over a six-year period. None of the modifications were successful in raising the efficiency of shad passage at Cabot to an acceptable level. The modification tested in 2005 has been left in place since then, and will be left in place for the 2014 passage season.

The long-term plan for improving passage at Cabot ladder may include replacement of the ladder with a fish lift. The preliminary design of a lift had been discussed with the agencies, but the parties agreed that further discussion would become part of the broader relicensing process the Licensee is currently undergoing. In fact, the Licensee is required to conduct various upstream and downstream fish passage studies as required by FERC. The outcome of the relicensing proceeding will likely dictate any modifications, enhancements or new fish passage facilities at the Project. The Project's current license expires in 2018.

In the interim, FLPR will continue to work with the resource agencies to optimize passage through the existing structure. In December, 2012, FWS suggested modifications of Cabot fishway flow and weir configuration that were intended to improve hydraulics in the fishway pools. The modifications were installed and tested in pools at the upper end of Cabot fishway prior to the 2013 passage season in consultation with the agencies. The modifications did not appear to improve hydraulics, so they were removed from the fishway.

Modifications at Gatehouse Ladder

After extensive evaluation and consultation with CRASC and CAFRC, a new entrance to gatehouse ladder was installed during 2007 for operation during the 2008 passage season (Figure 1). Construction followed several years of evaluation and testing of a prototype structure. The new entrance, comprising a 70-ft-long flume was built on the side of the canal opposite the existing entrances. The flume joins the existing gatehouse entrance gallery near the spillway ladder exit. Only one of the three original gatehouse fishway

entrances was opened in order to ensure sufficient flow through the new entrance and the spillway ladder.

Bolts holding two side panels within the new entrance flume loosened and fell out during the 2012 migration season. The first loose panel (about halfway up the flume) was noted on May 17, and by May 21 that panel had pulled away from its support and was interfering with flume flow. The panel was removed by about 0600 h on May 25. The second loose panel (near the entrance) was noted on June 8 and removed by about 0600 h on June 15. Both panels were on the right side of the flume, looking downstream. The panels were replaced after the period of fishway operation and all the bolts holding these panels and all the other panels in the flume were welded in place. Despite that, one of the panels pulled away again in 2013. It is not known when that occurred; the displacement was noted during a canal outage in September, 2013 and the panel was replaced.

Evaluation of shad passage through the new entrance configuration commenced in 2008 and has continued through 2013. The evaluation was designed and executed by CAFRC, with funding provided by FLPR. It led to modifications implemented prior to the 2010 and/or 2011 migration seasons. The changes included:

- installing grating to create a picketed lead and ramp outside the new entrance to guide fish into it; and
- installing (2010) and modifying (2011) a weir inside the entrance gallery and removing stoplogs to provide greater depth at the original entrance.

In addition to the entrance evaluation, FLPR commissioned a computational fluid dynamics (CFD) model of the gatehouse fishway, the pre-existing and new gatehouse fishway entrances, and the upper canal to gain an understanding of the complex hydraulics in those areas as they may relate to shad passage. The model was developed at Alden Research Laboratory (Alden) in Holden, Massachusetts.

The model suggested two changes that were made during 2012. The first was to block three grated openings that were creating potentially deleterious flow patterns at the lower end of the gatehouse fishway; this change was made prior to the 2012 migration season. The second was to change the protocol for deployment of the canal head gates to reduce an eddy that forms at moderate canal flows downstream of the original entrance. These operational modifications were implemented again during 2013.

Improvements in shad passage through the gatehouse fishway, 2010 through 2013, may have been attributable to the changes at the new entrance, along with adjustments in canal flow control.

Excessive turbulence at the original entrance has been a deterrent to passage by that route since the area inside the entrance was modified to accommodate flow needs at the new entrance and spillway fishway. FLPR and Alden have modeled modifications inside the gatehouse fishway that could improve hydraulics at the original entrance and help control

flows to the new entrance and spillway fishway. These modifications are expected to be discussed during the ongoing relicensing process at the Project.

Downstream Fish Passage

The log sluice at the downstream end of the Cabot Station forebay was used to pass fish downstream. The sluice was open most of the time from April 1 through November 15, 24 h/d, for downstream passage of Atlantic salmon smolts, post-spawned adult shad, juvenile shad and adult American eel (24 h/d). Exceptions included short periods when the sluice was closed for maintenance, and longer periods of high river flow when the sluice was closed to prevent erosion of the riverbank near the sluice discharge (see below). In addition the sluice was closed during a canal outage conducted from September 29 through October 6; river flow was passed over Turners Falls dam during the outage.

Periods of sluice closure caused by high river flow were:

<u>Start date</u>	<u>End date</u>
April 10	April 12
April 20	April 23
May 25	June 2
June 12	June 14
June 29	June 30
July 3	July 6
July 11	July 12
July 24	July 24.

Public Viewing Facility

The viewing facility at Gatehouse Fish Ladder was open to the public daily, Wednesday through Sunday, from May 11 through June 16, and on Memorial Day, Monday, May 27, 9:00 a.m. to 5:00 p.m. A total of 5,054 people visited the facility, 718 of whom were students participating in school programs.

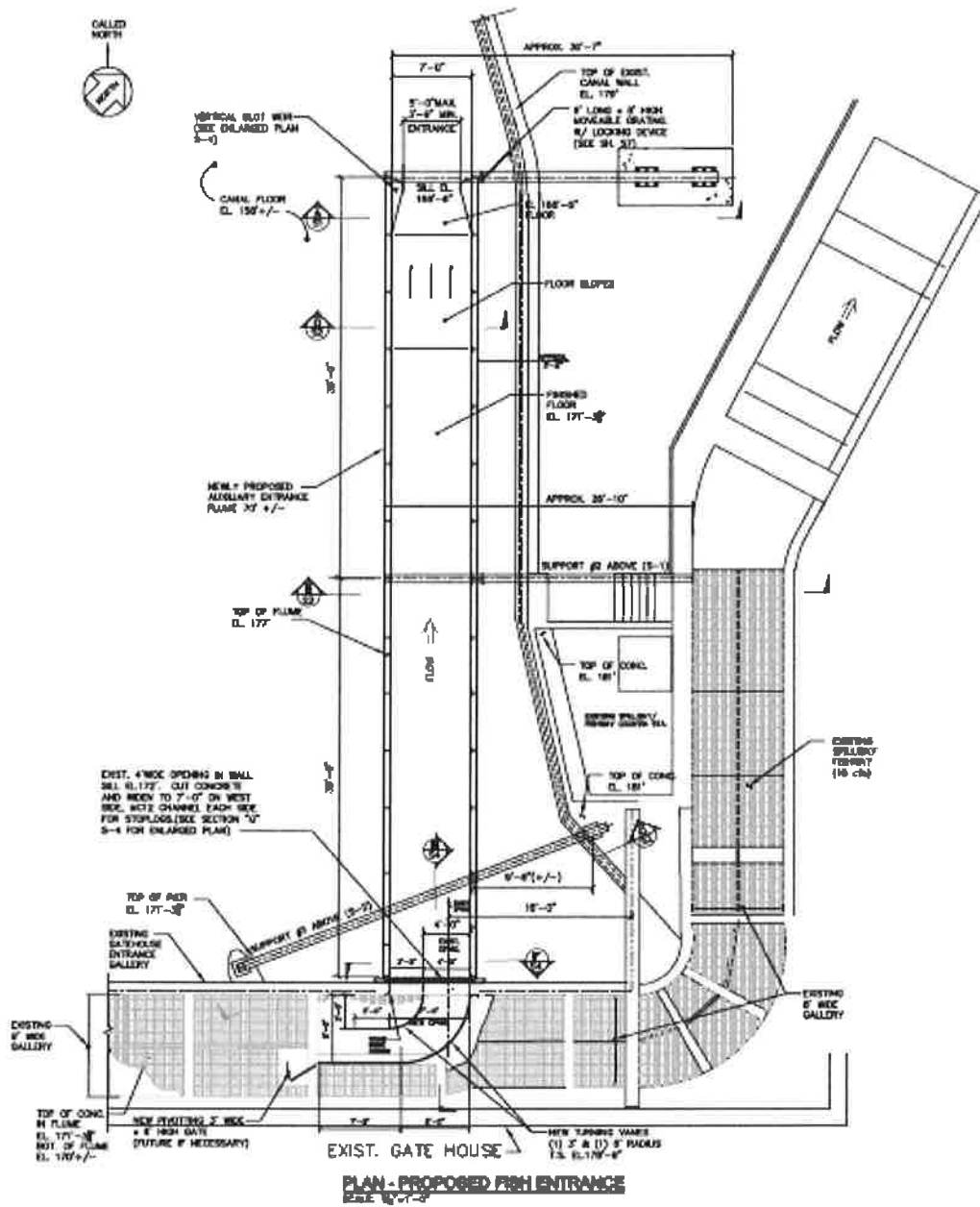


Figure 1. Drawing of the new entrance to the gatehouse fishway at the Turners Falls Project, Connecticut River, Turners Falls, Massachusetts.

Table 1. Anadromous fish passage recorded at the Turners Falls fish passage facilities, Connecticut River, Massachusetts, 1980 to 2013.

Year	Location	American shad	Blueback herring	Striped bass	Sea lamprey	Atlantic salmon	Gizzard shad ¹
1980	Cabot	687	0	11	187	0	
	Spillway	5	0	0	0	0	
	Gatehouse	298	0	1	66	1	
1981	Cabot	224	0	0	1,622	7	
	Spillway ²						
	Gatehouse	200	0	0	935	8	
1982	Cabot						
	Spillway ²						
1983	Cabot	26,697	106	6	859	0	
	Spillway	263	1	1	649	0	
	Gatehouse	12,705	28	7	703	0	
1984	Cabot	1,831	4	0	334	1	
	Spillway	4,563	12	0	851	1	
	Gatehouse	4,333	21	0	683	1	
1985	Cabot	31,000	1,726	0	3,198	2	
	Spillway	843	243	0	3,185	3	
	Gatehouse	3,855	301	0	1,809	3	
1986	Cabot	22,144	7,091	0	1,424	5	
	Spillway	5,857	6,248	0	2,230	4	
	Gatehouse	17,858	9,578	0	1,961	10	
1987	Cabot	33,114	2,866	0	1,324	2	
	Spillway	3,679	2,841	0	2,921	3	
	Gatehouse	18,959	5,091	0	2,590	12	
1988	Cabot	28,546	349	0	335	2	
	Spillway	3,354	865	0	1,912	2	
	Gatehouse	15,787	1,079	0	1,175	7	
1989	Cabot	14,403	199	0	578	1	
	Spillway	1,494	279	0	947	0	
	Gatehouse	9,511	510	1	868	2	
1990	Cabot	31,056	711	0	1,304	8	1
	Spillway	5,898	768	0	1,013	2	0
	Gatehouse	27,908	1,585	0	1,301	16	13
1991	Cabot	87,168	6,433	1	2,089	2	0
	Spillway	6,282	2,718	0	3,026	2	0
	Gatehouse	54,656	7,522	3	4,090	4	1

Table 1. Anadromous fish passage recorded at the Turners Falls fish passage facilities, Connecticut River, Massachusetts, 1980 to 2013.

Year	Location	American shad	Blueback herring	Striped bass	Sea lamprey	Atlantic salmon	Gizzard shad ¹
1992	Cabot	94,046	1,765	1	1,836	9	0
	Spillway	11,760	884	0	3,275	6	0
	Gatehouse	60,089	2,157	2	2,170	14	7
1993	Cabot	21,045	243	0	711	7	0
	Spillway	898	90	0	2,082	3	0
	Gatehouse	10,221	278	0	1,637	7	0
1994	Cabot ²						
	Spillway	1,507	17	0	1,740	1	0
	Gatehouse	3,729	97	0	1,702	5	0
1995	Cabot	33,938	4,234	0	1,417	2	1
	Spillway	543	31	0	1,372	0	0
	Gatehouse	18,369	2,957	0	1,813	4	4
1996	Cabot ²						
	Spillway	2,293	13	0	2,651	4	0
	Gatehouse	16,192	515	0	4,556	3	3
1997	Cabot	22,518	231	0	2,374	2	4
	Spillway	3,473	15	0	2,219	1	3
	Gatehouse	9,216	128	0	2,265	2	2
1998	Cabot	14,947	2	0	8,707	6	1
	Spillway	4,721	0	0	8,642	2	2
	Gatehouse	10,527	4	0	7,579	5	2
1999	Cabot	11,501	5	0	2,014	2	543
	Spillway	4,215	0	8	1,449	2	440
	Gatehouse	6,751	2	0	916	0	275
2000	Cabot	12,289	0	0	1,455	0	9
	Spillway	2,240	0	0	1,962	4	358
	Gatehouse	2,590	0	0	1,350	5	199
2001	Cabot	20,933	0	0	3,678	0	0
	Spillway	2,344	0	0	5,280	0	0
	Gatehouse	1,540	0	0	2,144	0	0
2002	Cabot	7,922	0	0	14,709	0	0
	Spillway	5,372	0	0	12,367	4	7
	Gatehouse	2,870	0	0	10,160	4	2
2003	Not monitored						
2004	Cabot	6,489	0	0	13,352	1	0
	Spillway	2,024	0	0	5,821	0	0
	Gatehouse	2,235	0	0	8,418	0	0

Table 1. Anadromous fish passage recorded at the Turners Falls fish passage facilities, Connecticut River, Massachusetts, 1980 to 2013.

Year	Location	American shad	Blueback herring	Striped bass	Sea lamprey	Atlantic salmon	Gizzard shad ¹
2005	Cabot	5404	2	7	12974	5	0
	Spillway	1626	0	7	9990	1	2
	Gatehouse	1581	2	2	215843	5	0
2006	Cabot	11530	0	Unknown	5378	4	9
	Spillway	2577	0	Unknown	5144	Unknown	0
	Gatehouse	1810	0	Unknown	3005	7	0
2007 ³	Cabot	11130	0	0	11061	5	0
	Spillway	1793	0	0	5555	3	0
	Gatehouse	2248	0	0	15438	5	0
2008	Cabot	15809	0	0	NC	6	0
	Spillway	627	0	0	NC	5	0
	Gatehouse	3995	0	0	NC	10	0
2009	Cabot	13360	NC	NC	NC	1	NC
	Spillway	928	NC	NC	NC	9	NC
	Gatehouse	3947	NC	NC	8296	9	NC
2010	Cabot	30232	NC	NC	NC	2	NC
	Spillway ⁴	2735	NC	NC	NC	4	NC
	Gatehouse	16768	NC	NC	6352	8 ⁵	NC
2011 ⁶	Cabot	27077	NC	NC	NC	2	NC
	Spillway	1966	NC	NC	NC	6	NC
	Gatehouse	16798	NC	NC	2032	7	NC
2012 ⁶	Cabot	51901	NC	NC	NC	2	NC
	Spillway	10608	NC	NC	NC	3	NC
	Gatehouse	26727	NC	NC	4503	2	NC
2013 ⁶	Cabot	46886	NC	NC	NC	0	NC
	Spillway	10571	NC	NC	NC	1	NC
	Gatehouse	35494	NC	NC	6016	0	NC

¹1990 was the first year that the number of gizzard shad was recorded

²Not monitored

³Partial counts because of digital system start-up problems

⁴Count is a minimum; a power outage (2010) and/or multiple video system failures resulted in missing counts.

⁵Two salmon were observed at neither Cabot nor spillway, probably because of power outage at both locations or video system failures at spillway

⁶High turbidity reduced visibility at times, resulting in counts lower than actual passage.

Source: Massachusetts Division of Fisheries and Wildlife (1980-2002), Northeast Generation Services (2004-2005), FirstLight Power Resources Services, LLC (2006-2012).

Table 2. Daily number of American shad passed upstream through the Cabot fish ladder, Turners Falls Project, 3 May through 2 July 2013.

American shad		American shad	
5/3/2013	13	6/3/2013	1876
5/4/2013	66	6/4/2013	786
5/5/2013	314	6/5/2013	919
5/6/2013	1453	6/6/2013	679
5/7/2013	1521	6/7/2013	416
5/8/2013	4474	6/8/2013	56
5/9/2013	4760	6/9/2013	4
5/10/2013	4223	6/10/2013	19
5/11/2013	3681	6/11/2013	10
5/12/2013	2197	6/12/2013	0
5/13/2013	1780	6/13/2013	0
5/14/2013	1361	6/14/2013	0
5/15/2013	1511	6/15/2013	0
5/16/2013	472	6/16/2013	0
5/17/2013	657	6/17/2013	0
5/18/2013	1453	6/18/2013	8
5/19/2013	2643	6/19/2013	88
5/20/2013	1585	6/20/2013	64
5/21/2013	2311	6/21/2013	54
5/22/2013	2720	6/22/2013	78
5/23/2013	156	6/23/2013	105
5/24/2013	0	6/24/2013	60
5/25/2013	0	6/25/2013	64
5/26/2013	0	6/26/2013	43
5/27/2013	0	6/27/2013	32
5/28/2013	0	6/28/2013	2
5/29/2013	0	6/29/2013	0
5/30/2013	0	6/30/2013	0
5/31/2013	0	7/1/2013	0
6/1/2013	275	7/2/2013	0
6/2/2013	1897	Total	46886

Table 3. Daily number of American shad and Atlantic salmon passed upstream through the spillway fish ladder, Turners Falls Project, 6 May through 2 July 2013.

	American shad	Atlantic salmon		American shad	Atlantic salmon
5/6/2013	51	0	6/4/2013	160	0
5/7/2013	427	0	6/5/2013	287	0
5/8/2013	1848	0	6/6/2013	374	0
5/9/2013	1169	0	6/7/2013	162	0
5/10/2013	1399	0	6/8/2013	13	0
5/11/2013	476	0	6/9/2013	4	0
5/12/2013	284	0	6/10/2013	29	0
5/13/2013	85	0	6/11/2013	26	0
5/14/2013	71	0	6/12/2013	5	0
5/15/2013	32	0	6/13/2013	0	0
5/16/2013	20	0	6/14/2013	0	0
5/17/2013	94	0	6/15/2013	0	0
5/18/2013	306	0	6/16/2013	0	0
5/19/2013	565	1	6/17/2013	0	0
5/20/2013	615	0	6/18/2013	1	0
5/21/2013	932	0	6/19/2013	2	0
5/22/2013	44	0	6/20/2013	1	0
5/23/2013	29	0	6/21/2013	16	0
5/24/2013	0	0	6/22/2013	7	0
5/25/2013	0	0	6/23/2013	18	0
5/26/2013	0	0	6/24/2013	9	0
5/27/2013	0	0	6/25/2013	20	0
5/28/2013	0	0	6/26/2013	2	0
5/29/2013	0	0	6/27/2013	7	0
5/30/2013	0	0	6/28/2013	0	0
5/31/2013	0	0	6/29/2013	0	0
6/1/2013	627	0	6/30/2013	0	0
6/2/2013	8	0	7/1/2013	2	0
6/3/2013	344	0	7/2/2013	0	0
			Total	10571	1

Table 4. Daily number of American shad and sea lamprey passed upstream through the gatehouse fish ladder, Turners Falls Project, 6 May through 2 July 2013.

	American shad	Sea lamprey		American shad	Sea lamprey
5/6/2013	4	0	6/4/2013	780	255
5/7/2013	496	25	6/5/2013	1066	316
5/8/2013	2021	100	6/6/2013	776	66
5/9/2013	3124	284	6/7/2013	326	41
5/10/2013	1259	300	6/8/2013	81	9
5/11/2013	383	219	6/9/2013	49	2
5/12/2013	2802	197	6/10/2013	101	7
5/13/2013	811	76	6/11/2013	35	3
5/14/2013	46	24	6/12/2013	0	3
5/15/2013	18	11	6/13/2013	0	2
5/16/2013	116	24	6/14/2013	0	0
5/17/2013	1474	103	6/15/2013	2	0
5/18/2013	3878	159	6/16/2013	5	0
5/19/2013	3358	712	6/17/2013	6	1
5/20/2013	2277	182	6/18/2013	0	7
5/21/2013	2828	539	6/19/2013	6	3
5/22/2013	1625	731	6/20/2013	13	4
5/23/2013	878	387	6/21/2013	22	14
5/24/2013	244	216	6/22/2013	19	11
5/25/2013	6	27	6/23/2013	46	9
5/26/2013	1	0	6/24/2013	26	17
5/27/2013	0	0	6/25/2013	52	4
5/28/2013	0	0	6/26/2013	14	2
5/29/2013	0	0	6/27/2013	15	0
5/30/2013	2	1	6/28/2013	6	0
5/31/2013	454	15	6/29/2013	0	0
6/1/2013	912	102	6/30/2013	2	0
6/2/2013	1154	343	7/1/2013	0	0
6/3/2013	1875	463	7/2/2013	0	0
			Total	35494	6016

Document Content(s)

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