Appendix 1. Chronology of selected 27 June flow events and actions taken by Federal, State, and County agencies and stakeholders, June 2014 to April 2015.

Date	Agency	Action/Comment
2014		
27 Jun	HVO	New fissures form on Pu'u 'Ō'ō, new flows move NE.
10 Jul	HVO	New flow forms from different section of June 27th fissure.
13 Jul	HVO	Flow travels 2.2 km from Pu'u 'Ō'ō.
6 Aug	HVO	Flow reaches forest boundary, 7 km from Pu'u 'Ō'ō.
7 Aug		Hurricane Iselle makes landfall on the Island of Hawai'i.
18 Aug	HVO	Flow enters crack system on East Rift Zone, 10 km from Pu'u 'Ō'ō.
20 Aug	HCCD, HVO	Briefing at HCCD, including Hawai'i County mayor and various
		stakeholders, on flow status and potential flow scenarios.
22 Aug	HVO	News release, Kīlauea lava flow northeast of Pu'u 'Ō'ō potential
		concern; increase helicopter overflights to 3x per week.
24 Aug	НСОМ	Sponsors first of 28 public meetings with residents of Kaohe
_		Homesteads at Community Center in Pāhoa.
26 Aug	HCCD	Begins daily overflights (except for weather and maintenance) for
		situational awareness, GPS coordinates of flow front provided to
		HVO.
28 Aug	HCCD	Begins daily public-radio message of flow status and response
		activities.
3 Sep	HCCD	Begins door to door notification of potential hazard to residents in
		Kaohe Homesteads.
4 Sep	HVO	Volcano Activity Notice (VAN): ground based alert level raised
		from WATCH to WARNING, flow could reach Kaohe Homesteads
		boundary within 5-7 days; aviation color code remains at ORANGE.
4 Sep	HCOM; HG	Hawai'i County mayor signs emergency proclamation, which allows
		county authorities to restrict access to Kaohe Homestead to residents
		(Hawaii Tribune-Herald, 4 September 2014).
		Hawaii Governor signs emergency proclamation, which allows re-
5.0	ироц	establishing or improving roads for public transit.
5 Sep	HDOH	Advises residents to plan for smoke exposure from burning
		vegetation, low levels of sulfur dioxide gas (Wakida, C., 5
6.0		September 2014).
6 Sep	HVO	Flow travels north from the crack system along steepest-descent
0 C	HVO	path, 1.2 km west of Kaohe Homesteads.
8 Sep	HVO	Likely flow path identified from Favalli and other (2005) analysis, leads directly into $P\bar{p}hoa$, which the flow follows within two days
11 Sep	HCDPW	leads directly into Pāhoa, which the flow follows within two days. Work begins to widen and level Government Beach Road along the
11 Sep		coast and the abandoned section of Railroad Avenue to provide
		alternate transit routes to the Puna District if June 27th flow covers
		Highway 130 (Callis, T., 12 September 2014).
		1151114, 150 (Cullis, 1., 12 September 2017).
	HVO	Flow follows steepest-descent path leading into Pāhoa.
L		ren renous steepest descent puil reduing into i unou.

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12 Sep	DLNR	Closes Wao Kele O Puna Forest Reserve (Department of Land and Natural Resources, 12 September 2014).
13 Sep	News Media	Reports real estate offices receiving rush of inquiries from residents in lower Puna District about available housing rentals near Hilo (Stewart, C.M., 13 September 2014).
15 Sep	News Media	Pahoa Preschool, operated by Kamehameha Schools, closes temporarily (Stewart, C.M., 24 September 2014).
		Hawaii Property Insurance Association places moratorium on new insurance policies in lower Puna District (Callis, T., 20 September 2014).
15 Sep	HCCD	Establishes remote Incident Command Center and Information Resource Center at Community Center in Pāhoa, the latter open to public 8 am to 4 pm Monday through Friday (Big Island Video News, 16 September 2014).
17 Sep		Hawai'i County and state election workers prepare for possible road burials by flow for the 4 November election (Callis, T., 17 September 2014a).
	HCDPW	Construction to be delayed for roundabout at intersection of Pahoa Village Road and Highway 130, a \$4.8 million project that was slated to begin in October. (Callis, T., 17 September 2014b).
	HCDPW	Delays construction of Pahoa District Park, the "biggest recreational project in the history of Hawai'i County" because equipment is needed for alternate road construction; County Environmental Management director looks for temporary site for the waste-and- recycle transfer station in Pāhoa (Corrigan, D., 16 September 2014).
19 Sep	HVO	Flow front stalls for first time, breakouts active upslope.
20 Sep	HCFD	First brushfire caused by June 27th flow, contained by HCFD by 22 September.
23 Sep	HCDPW	Work begins on Kalapana side of buried Highway 130 and Chain of Craters Road; surveying alignment of original road path ongoing (Callis, T., 22 September 2014).
23 Sep	Media	Montessori Country School in Pāhoa closes after 31 years in operation (Stewart, C.M., 24 September 2014).
25 Sep	HDOE	Announces contingency plans to build 17 temporary classrooms for as many as 500 students and staff who may not be able to reach their schools if Highway 130 is covered by the June 27th flow; initial estimated cost is \$9 million (Hawaii State Department of Education, 25 September 2014a).
30 Sep	HCOM, HCCD, HVO	Begin daily multi-agency media briefings (telephone bridge), attended by HCCD administrator and HVO scientist.
1 Oct	HCDPW	Work is completed on Government Beach Road and Railroad Avenue, and work continues on Kalapana side of Highway 130 and Chain of Craters road (Lincoln, M., 1 October 2014).

	NPS	NPS approves single lane, unpaved road to restore Chain of Craters as alternate route within Park.
	HVO	Breakout advances past the stalled flow front.
7 Oct	HCFD	Firefighters extinguish 300-acre brush fire, started by lava flow (Tribune Herald).
	FAA	FAA establishes TFR in airspace above the leading edge of flow in response to increased air traffic.
11 Oct	NPS	NPS submits request to DOI to restore Chain of Craters alternate route to original 22-foot easement, allowing for two lanes instead of one (Callis, T., 11 October 2014).
14 Oct	HCG	Places moratorium on new rental leases in lower Puna for residents seeking new government housing assistance (reported Oct 30 by Stephens Media Hawaii via Tribune Herald).
16 Oct	HVO	Flow front stalls, weakly active with little to no advance through 21 Oct.
18 Oct	NWS	Tropical Storm Ana passes south of Island of Hawai'i, forecasted earlier to hit the island as a hurricane (Hawaii Tribune-Herald, 16 October 2014).
22 Oct	HVO	Breakout advances past stagnated flow front, enters narrow gully, increases advance rate to about 300 m/day.
23 Oct	HCCD	Cemetery Road and Apa'a Street near solid waste Transfer Station are closed to the public (Hawaii Tribune-Herald, 23 October 2014). Begins 24-hour watch of activity in Pāhoa.
24 Oct	HG	Requests Federal assistance to support local emergency protective measures in response to the flow (Hawaii Tribune Herald, 24 October 2014).
	HCCD	Begins providing video clips to media through contract.
	NPS	Work begins in Hawai'i Volcanoes National Park on 2-lane emergency access route to connect Chain of Craters Road to Highway 130 (Hawaii Volcanoes National Park, 21 October 2014).
25 Oct	HCCD/ HVO	Flow crosses Cemetery Road, 3:50 am HST, advancing about 250 m/day.
	HCCD	Door to door notification of flow status and issuing evacuation notices to residents downslope of flow south of Apa'a Street between Cemetery Road and Pahoa Village Road, but no evacuation is ordered.
26 Oct	HVO	Begins 24-hour observation and mapping of lava flow in Pāhoa, which ended on 1 November.
27 Oct	HDOE	Announces implementation of contingency plans to begin in two

		days, affecting about 1,700 students and 300 employees at school complexes in Kea'au and Pāhoa (Hawaii State Department of
		Education, 27 October 2014b).
30 Oct	HVO	Flow front stalls 150 m from Pahoa Village Road, breakouts active upslope.
	HCCD	Hawaii Army and Air National Guard members (>80) deployed in Puna District to assist police (Burnett, J., 30 October 2014).
4 Nov	POTUS	Signs a Disaster Declaration for Public Assistance (FEMA-4201- DR-HI).
5 Nov	HCDPW	Rough grade completed of emergency route, connecting Highway 130 to Chain of Craters Road (Big Island News Video, 6 November 2014).
7 Nov	FEMA	FEMA coordinates and releases first Joint Incident Action Plan (IAP) with County, State, and Federal agencies.
10 Nov	HCCD	House burned and buried by lava, only residence destroyed by June 27th flow.
14 Nov	HVO	Large breakout near Pu'u 'Ō'ō, within three days the June 27th flow becomes inactive below crack system and near Pāhoa.
18 Nov	HVO	Most distant breakout 12 km from Pu'u 'Ō'ō forms new lobe atop flow that entered Pāhoa in October.
3 Dec	HVO	New lobe travels north of the first lobe, moving through forest several hundred meters per day
8 Dec	HCCD	Organizes first of several field trips for displaced students to the lava flow at Pahoa transfer station (Hawaii State Department of Education, 8 December 2014).
11 Dec	HVO	Flow is following steepest-descent path that intersects Pahoa Village Road and Highway 130, 3 km downslope.
16 Dec	HVO	Issues VAN, with flow moving average of 285 m/day between 9-16 December, flow could reach Pahoa Village Marketplace (1.5 km downslope) in 5 days.
18 Dec		Many businesses in Pahoa Village Marketplace begin shutdown and removal of equipment and materials.
23-30 Dec	HVO	Flow advance slows to between 0 to <40 m/day.
30 Dec	HVO	Reports flow front stalled 530 m from marketplace, breakouts active upslope.
2015		
1 Jan	HVO	Reduces overflights to about one per week and conducts at least weekly ground-based field work near flow front.
22 Jan	HCOM	Last public community meeting in Pāhoa.
23 Jan	USGS VSC	Launches "USGS Volcanoes" Facebook page.
1-7 Mar	HVO	Surface flows noticeably diminish in vigor following largest deflationary tilt at Kīlauea's summit during June 27th flow activity.
13 Mar	HVO	Surface flows near Kaohe Homesteads and Pahoa Marketplace inactive, breakouts upslope <8 km from Pu'u 'Ō'ō.

18 Mar		Malama Market reopens at Pahoa Marketplace.							
25 Mar	HVO	Issues Volcano Activity Notice: ground based alert level lowered							
		from WARNING to WATCH, no flows active more than 6 km from							
		Pu'u 'Ō'ō.							
27 Mar	FEMA	Announces closure of incident time period (FEMA-4201-DR-HI) to							
		be 25 March 2015.							
27 Apr	HDOE	Announces plans will be developed for next school year to reopen							
		Keonepoko Elementary School and return students and teachers to							
		pre-flow school complexes.							
2016									
8 Jun	HVO	June 27th flow inactive following new Pu'u 'O'ō vent opening on 24							
		May.							
25 July	HVO	61g lava flow crosses Emergency route, enters the ocean next day.							

Agency acronyms: FAA (Federal Aviation Administration); FEMA (Federal Emergency Management Agency); DLNR (Department of Land and Natural Resources); HCG (Hawai'i County government); HCCD (Hawai'i County Civil Defense); HCDPW (Hawai'i County Department of Public Works); HCFD (Hawai'i County Fire Department); HCOM (Hawai'i County Office of Mayor); HDOE (Hawaii State Department of Education); HDOT (Hawaii Department of Transportation); HG (Hawaii Governor); HVO (Hawaiian Volcano Observatory); NWS (National Weather Service).

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APPENDIX 2. Selected list of outreach activities of the U.S. Geological Survey's Hawaiian Volcano Observatory in 2014-2015.

Volcano A	Awareness	Month, public presentations, January 2014							
Date	Location	Title							
7-Jan	HVNP	Kīlauea Volcano's East Rift Zone: 31 years and still erupting							
8-Jan	OVE	Mauna Loa: How Well Do You Know the Volcano in Your Backyard?							
9-Jan	UH	Human footprints tell of tragedy in 1790 or do they?							
14-Jan	HVNP	Happenings in Halema'uma'u: An update on Kīlauea's summit eruption							
16-Jan	UH	What is a fissure eruption and how does it work?							
21-Jan	HVNP	What is a fissure eruption and how does it work?							
22-Jan	Kona	From Ka'ū to North Kona: Stories of lava flows and volcanic landscapes							
28-Jan	HVNP	Decades of degassing: Wake up and smell the coughing!							
4-Feb	HVNP	What we don't know about Hawaiian volcanoes							
Other pu	blic preser	ntations in 2014							
Date	Location	Title							
22-Feb	Hilo	Eruptive History and Current Status of Mauna Loa							
24-Feb	HCCD	Kīlauea Lava Flow Update							
28-Feb	РТА	Mauna Loa							
3-Mar	HVNP	Eruptive history and current status of Mauna Loa							
4-Mar	HVNP	Hualālai and Mauna Loa Lava Flows							
11-Mar	Kona	Hualālai and Mauna Loa Lava Flows							
2-Apr	OVE	Hualālai and Mauna Loa Lava Flows							
4-Apr	MVS	Kīlauea Volcano's Active Lava Flow Update							
3-May	Hilo	Astro Day (Interactive displays at community event)							
13-May	HVNP	Kīlauea Volcano's 1924 Explosive Eruption							
24-Jun	Volcano	Hawaii State Civil Defense Training Workshop							
2-Jul	Hilo	Current Status of Mauna Loa							
Commun	ity meeting	gs about June 27th flow organized by Mayor's Office, 2014-2015							
Month	Date								
Aug	24, 25, 26,	27							
Sep	2, 4, 9, 11,	17, 18, 22, 23, 25, 29, 30							
Oct	2, 9, 16, 23								
Nov	6, 13, 20								
Dec	4, 11, 18								
Jan	8, 22								
Other con		presentations and briefings							
Date	Location	Title							
30-Aug	Kea'au	Puna Regional Emergency Fair							
13-Sep	Pāhoa	Lava Flow Information Fair							
23-Sep	Pāhoa	Kīlauea eruption updates and Mauna Loa status, Hawaii Electric Light							
p	- 41104	Company (HELCO) management team							

24 San	Dahaa	June 27th flow undets Howeii State Department of Education Deputy							
24-Sep	Pāhoa	June 27th flow update, Hawaii State Department of Education, Deputy							
		Superintendent and administrators							
		June 27th flow undets, Debos Elementary School students and families							
10 Oct	Hilo	June 27th flow update, Pahoa Elementary School students and families							
10-Oct		June 27th flow update, Congressional briefing							
15-Dec	Pāhoa	HCCD-sponsored briefing with Pahoa Marketplace business managers and							
(Iau	D=1	workers							
6-Jan	Pāhoa	HCCD-sponsored briefing with businesses							
28-Jan	Maku'u	June 27th flow update for families residing in the Maku'u Farm Lots,							
	Market	Department of Hawaiian Home Lands, Maku'u Farmer's Association							
		icles relating to the June 27th flow, August 2014 - March 2015;							
-	-	.gov/volcanowatch (update URL when new Web site is launched & add							
URL's to	each artic	le listed)							
Date	Title								
28-Aug		lava flow activity continues, so stay informed!							
4-Sep		entists are closely watching Kīlauea—and Mauna Loa							
11-Sep	The June 27th flow advances toward Pāhoa								
18-Sep	HVO and	Hawai'i County Civil Defense jointly track the June 27th lava flow							
25-Sep	Why do lava flows stop advancing?								
2-Oct	Emergene	cy preparedness in Hawai'i encompases mulitiple hazards							
9-Oct	The curre	ent state of activity in Kīlauea Volcano's lower East Rift Zone							
23-Oct	Pāhoehoe	e lava makes for fitful advance of the June 27th lava flow							
30-Oct	The June	27th lava flow slows, surges into Pāhoa, then slows again							
6-Nov	How long	g will Kīlauea Volcano's June 27th flow last?							
13-Nov	Coming u	ip for air in lower Puna							
20-Nov	HVO loo	ks ahead while there's a break(out) in the activity							
26-Nov	Kīlauea is	s a moody volcano							
11-Dec	Revisiting	g Kalapana amidst the current flow activity							
18-Dec	HVO ush	ers in the New Year with "Volcano Awareness Month"							
25-Dec	What doe	es it take to successfully divert a lava flow?							
1-Jan	Plumbing the depths of Pu'u' Ō'ō								
8-Jan	Commun	icating information during a lava flow crisis							
15-Jan	Satellites	are now an essential tool for tracking lava flows							
22-Jan		ng lava flows with boots on the ground and eyes in the sky							
5-Feb	1	27th lava flow: It's more than just a flow front							
26-Feb	1	s at the top: HVO's Scientist-in-Charge steps aside							
5-Mar	HVO wel	comes its new Scientist-in-Charge: Christina Neal							

List of acronyms: HCCD (Hawai'i County Civil Defense, Emergecny Operations Center, Hilo); HVNP (Hawai'i Volcanoes National Park); MVS (Mountain View Elementary School); OVE (Ocean View Estates subdivision); PTA (U.S. Army Pōhakuloa Training Area, Island of Hawai'i); UH (University of Hawai'i, Hilo). APPENDIX 3. Summary of lava-flow projections based on Volcano Activity Notices issued by the Hawaiian Volcano Observatory, 4 September 2014 to 25 March 2015 (USGS VANs are archived online, https://volcanoes.usgs.gov/vhp/archive_search.html).

VAN#	Date, VAN Issued	Time; HST	Flow length, km	Advance rate, m/day	Interval of advance rate	Projection of lava flow location										Conditions
						Kaohe Homesteads boundary		Cemetery Road or Apa'a St.		Pahoa Village Road (government road)		Marketplace		Highway 130		
						days	date	days	date	days	date	days	date	days	date	
2014/H1	9/4/2014	10:45 AM	13.2	250	7/10–9/13	5-7	9/18–9/20									Alert level from WATCH to WARNING; " within 5-7 days should lava resume advancing within the crack system."
2014/H2	9/8/2014	5:01 PM	13.7	400	9/6–9/8					16-18	9/24–9/26					"if lava not further confined within cracks and down-dropped blocks within the ERZ."
						NW ed	ge Kaohe H.									
2014/H3	9/10/2014	7:21 PM	14.5	400	9/6–9/10	1.5	9/11 - 9/12			14–16	9/24–9/26					"if lava not further confined within cracks and down-dropped blocks within the ERZ."
2014/H4	9/12/2014	8:03 PM	14.9	250	9/10-9/12	<1	9/13			20	9/22					"if lava not further confined within cracks and down-dropped blocks within the ERZ."
2014/H5	9/15/2014	5:15 PM	15.5	215	9/12-9/15			15	9/30	<20	<10/5					"At the average rate of advancement of 215 m/day"
2014/H6	9/17/2014	5:42 PM	16	290	9/15–9/17			9	9/26	<13	<9/30					"At the average rate of advancement of 290 m/day"
2014/H7	9/19/2014	3:59 PM	16.3	190	9/17–9/19			13	10/2	<18	<10/7			21	10/10	"Using the most recent rate of advancement of 190 m/day"
2014/H8	9/24/2014	8:39 PM	16.4	0	9/24			none		none				none		
2014/H9	9/26/2014	5:17 PM		0				none		none				none		
2014/H10	9/29/2014	5:34 PM		0				none		none				none		" nearest lobe is about 125 m behind the stalled flow front;" lobes behind front have moved 65-80 m in past 3 days.
2014/H11	10/1/2014	5:42 PM	16.4	75	9/29–10/1			none		none				none		" narrow flow front moved about 75 m" in past 2 days.
2014/H12	10/3/2014	6:08 PM	16.7	135	10/1-10/3			none		none				none		
2014/H13	10/6/2014		17	120	10/3-10/6			16	10/22							The advance rate "has varied significantly during the past month, meaning this projection is subject to change."
2014/H14	10/8/2014		17.3	120	past week			14	10/22							Same as H13
2014/H15	10/10/2014	5:56 PM	17.4	86	10/3-10/10			18	10/28							Same as H13

2014/H16	10/13/2014	4:54 PM	17.6	74	10/6-10/13			19	11/1							Same as H13
2014/H17	10/15/2014	5:28 PM	17.6	25	10/13-10/15			none								Because "flow has slowed in the past 2
																days to about 25 m/day, we do not offer a
																future projection of the flow's advance."
2014/H18	10/17/2014	5:42 PM	17.6	25	10/15-10/17			none								Same as H17
2014/H19	10/20/2014	7:45 PM	17.6	0	10/17-10/20			none								Same as H17
	On 22 Ocotb	er, Status Re	ports wer	e issued af	ter overflights i	n lieu of	f VANs when	no signif	icant chang	e in flow	v behavior, e	xcept to	highlight pot	ential of	lava inunda	tion of infrastructure within 7 days.
2014/H20	10/25/2014	1:40 PM	~18.8	240					Lava	none				none		Recent observations: "As shown by the
									crossed							varying advance rates of the past several
									road							weeks, the flow's future advance rate is
									10/25,							likely to continue fluctuating, making it
									3:50 AM							difficult to forecast arrival times at
																particular sites."
2014/H21	12/16/2014	10:06 PM		285	12/9 - 12/16							5	12/21	5	12/21	"could reach the marketplace and
																Highway 130 in about 5 days, warranting
																this VAN."
2014/H22	3/25/2015	2:17 PM		0												Alert level changed from WARNING to
																WATCH