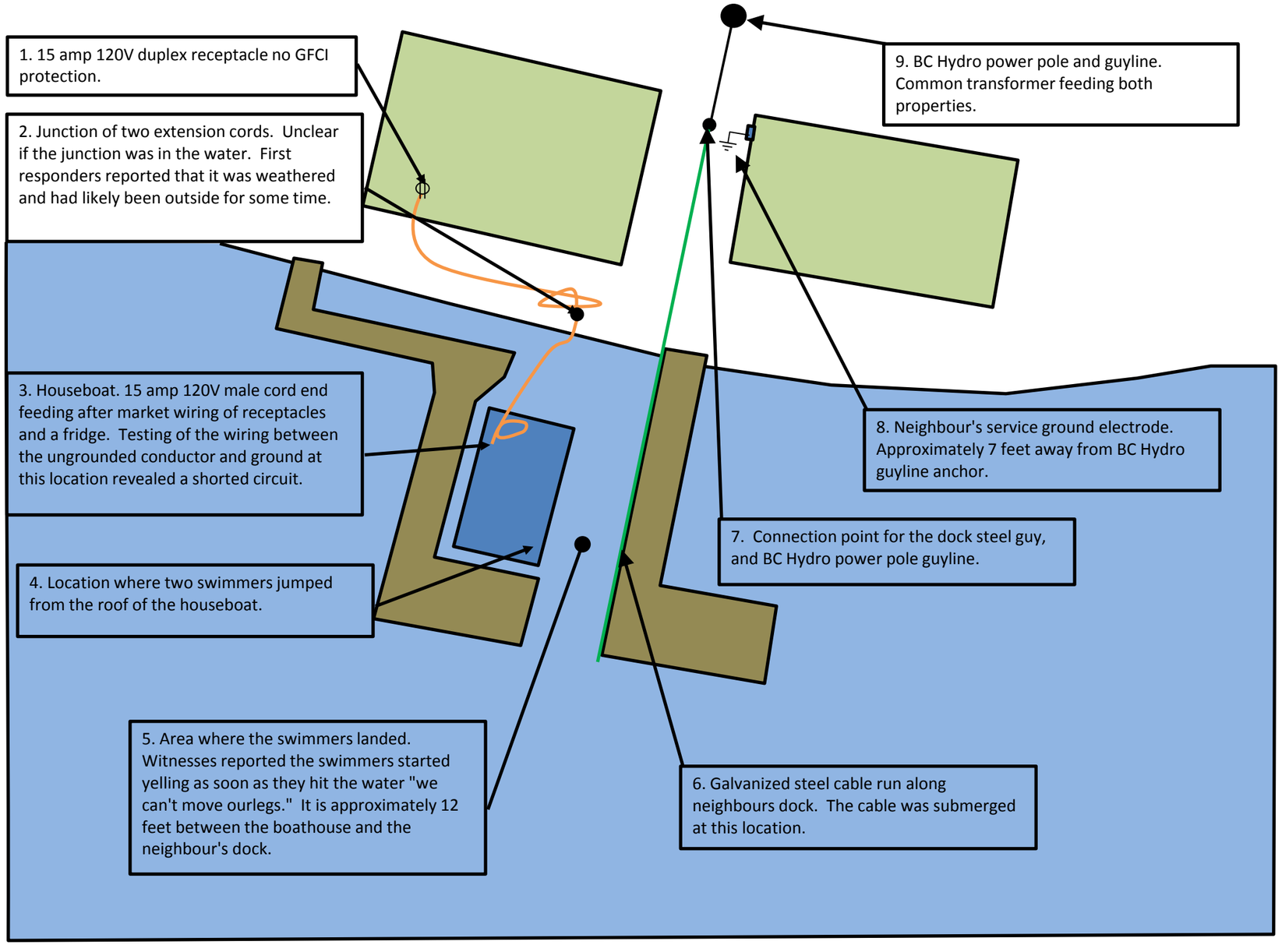
Incident Summary # II-694080

SUPPORTING INFORMATION	Incident Date		May 26, 2018
	Location		Lake Cowichan
	Regulated industry sector		Electrical, low voltage electrical system 30V to 750V
	Impact – Injury	Qty injuries	2
		Injury description	2 people received electric shock
		Injury rating	Insignificant
	Impact – Damage	Damage description	120 volt receptacle and non-metallic sheathed cable melted/burnt.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		Two swimmers became incapacitated due to electric shock while swimming in a freshwater lake.
INVESTIGATION CONCLUSIONS	Site, system and components		Residence on a fresh water lake with a dock and houseboat.
	Failure scenario(s)		Housing of 12volt DC /120volt AC RV style refrigerator became energized by the shorted AC circuit. The 12volt DC system was also connected to the aluminum hull of the boat through the engine and the grounded negative, making both systems common.
	Facts and evidence		Witness statements confirmed that at approximately 4 pm on May 26th two swimmers jumped from the top of a houseboat into Lake Cowichan and received a shock. The houseboat wiring had been altered and an alternating current (AC) circuit was added. Non-metallic sheathed cable (NMD90) fed receptacles and fridge. The fridge was capable of running on either 12V DC or 120V AC. Testing revealed damaged non-metallic sheathed cable shorted out to a metal device box which housed a receptacle located at the forward part of the cabin. The short to ground was able to make a path back to its source through a 12V/120V fridge that was bonded to the aluminum hull of the boat via the 12V system. The neighbours dock had a galvanized steel cable run along it, the cable ran up the bank between the two properties to where it was connected to a power pole guy line. The guy line anchor was located approximately 7 feet from the neighbour's service ground electrode. The steel cable was in the water directly across from where the swimmers jumped into the water. The steel cable through the guy line anchor and the neighbours service ground electrode was a good return path to the common transformer feeding both properties *(See Diagrams).*
	Causes and contributing factors		The facts and evidence strongly suggest that the houseboat became energized by faulty wiring. This was exacerbated by the lack of GFCI protection and possibly a poor bonding connection and or voltage drop that prevented the breaker from tripping. This in turn energized the water and leaked current to the steel cable on the neighbour's dock. The swimmers jumped directly into the path of the leaking current.



Electric Shock Incident Investigation

Date: May, 2018

Location: Lake Cowichan

House	
Dock	
Boathouse	
Extension Cord	
Galvanized Steel Cable	
BC Hydro Power Pole & Guyline	

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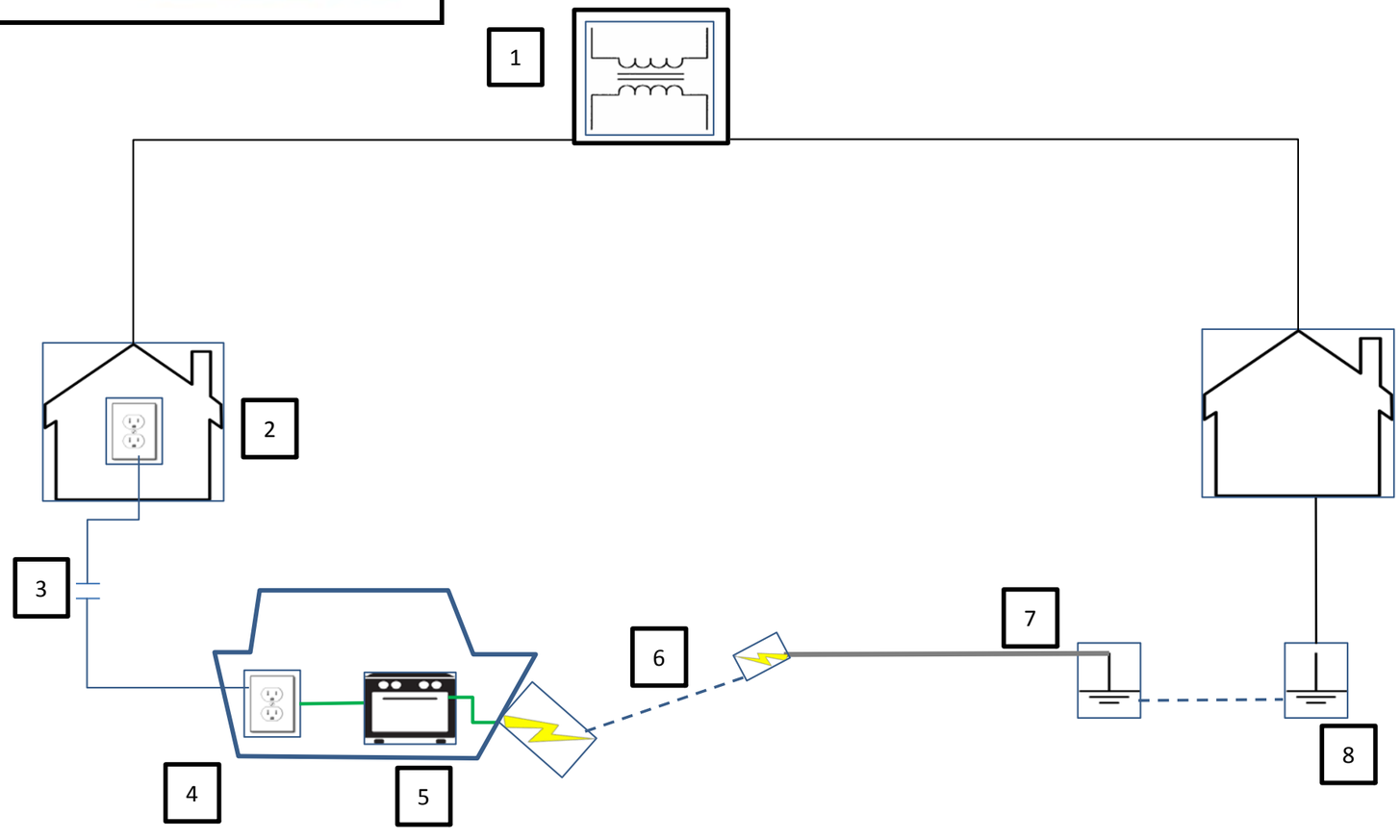


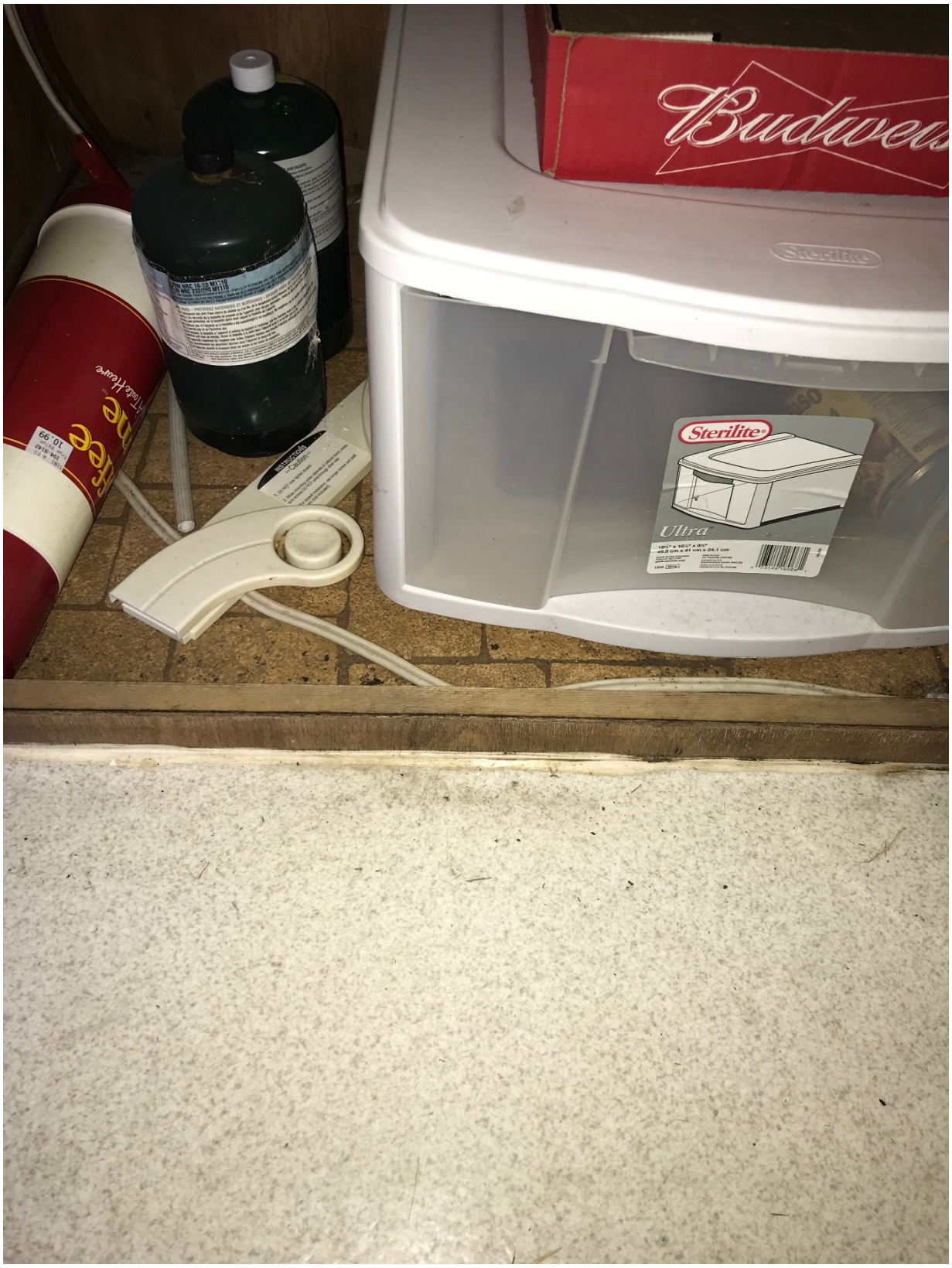
Electric Shock Incident Loop Drawing

Date: May 2018

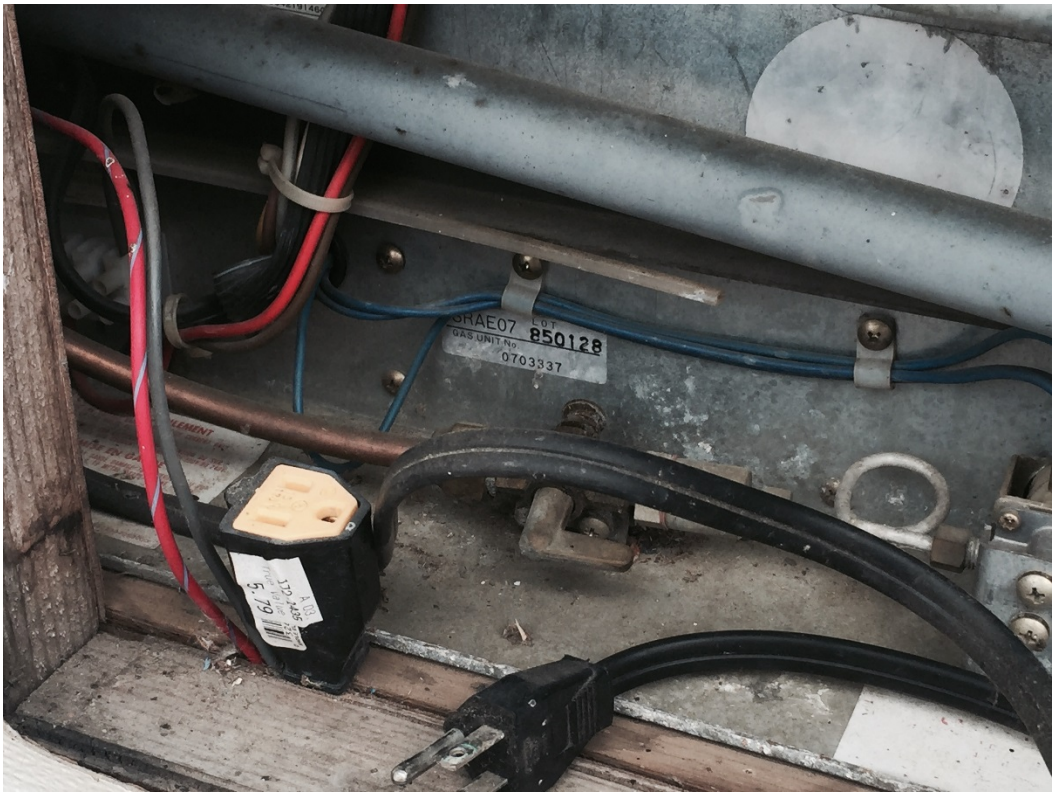
Location: Lake Cowichan

Notes:

1	Utility transformer, common to both properties.
2	Receptacle feeding the boathouse, no GFCI protection.
3	Junction of two extension cords. First responders reported that the junction of the two extension cords used to feed the boathouse was very weathered. It is likely that the ground pin was missing or the bonding connection was corroded enough to prevent the breaker from tripping.
4	120V AC receptacle. NMD90 wiring shorted to the metal device box on houseboat.
5	12/120V appliance connected to the boat hull through the 12V negative. The appliance was also on the same 120V circuit as the shorted receptacle which energized the housing of the appliance and subsequently the hull of the boat.
6	Swimmers jumped from the top of the houseboat and landed directly between the boathouse and the return path to ground.
7	Galvanized steel cable run up from neighbor's dock and anchored 7 feet away from the neighbor's service ground electrode. This cable was in the water approximately 12 feet from the houseboat. It acted as a return path to ground through the ground electrode and neutral of the neighbor's service.
8	Neighbor's service ground electrode.


Budweiser
Sterilite
Sterilite
Ultra


INSTRUCTIONS
*** Caution ***
1. DO NOT over tighten screws
2. When mounting under cabinets or cabinet doors, make sure screws DO NOT poke through other side.
3. For drywall installation, use longer screws and wall anchors (not included).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