SUMMARY OF ADVISORY BUILDING SAFETY ASSESSMENTS BY INTERNATIONAL ENGINEERS FOLLOWING THE AUG 14 M7.2 HAITI EARTHQUAKE

SARAID (Search and Rescue Assistance in Disasters – UK)
Swiss Embassy – (NOTE: assessments not included in this report)
EUCP (European Civil Protection Mechanism)

Report compiled by SARAID UK

25th August 2021

Summary

This report summarizes the outcome of detailed building safety evaluations of priority buildings in the Les Cayas area following the M7.2 earthquake that struck the Tiburon Peninsula of Southern Haiti on 14th Aug 2021.

These assessments were conducted at the request of the Director General of the Directorate of Civil Protection, Dr Jerry Chandler, in order to provide preliminary advice on the safety of buildings of key public interest.

Assessments were carried out by Structural Engineers of the UK NGO SARAID, the EUCPT, and the Swiss Embassy, on 23rd and 24th August 2021. Note that the Swiss assessments are not included in this report, but their icon is included on the front page to indicate the very strong collaboration in the field.

Assessments were conducted in parallel with efforts to support initiation of the government-led safety assessment coordination system. As such the assessments presented are advisory only, as they are conducted by international engineers without the accompaniment of government officials/engineers, as government officials/engineers were not available to support at that time.

Recommendations are provided for safety measures for relevant buildings. However, as stated, all buildings are to be reassessed by government-led assessment teams, and all advice presented here is merely to support that process, and provide rapid recommendations for critical buildings.

The selection of priority buildings for these preliminary assessments is based on situation reports from various sources, and discussion with the COUD (Centres d'Opérations d'Urgence Départementaux) located within Les Cayes. The buildings assessed are primarily hospitals, schools and churches.

Revisions

Rev Number	Description	Date
-	Incomplete DRAFT (awaiting addition of Swiss assessments)	25th Aug 2021
A	Completed document, with additional text	27th Aug 2021

Contents

1. Background

Following the M7.2 earthquake that hit the Suds region in Haiti on the 14th August 2021, the international community was asked to respond to Haiti to provide assistance, namely in selected Urban Search and Rescue teams with the USA, and Columbia initially the first rescue assets. An EU Civil Protection Team (EUCPT) consisting of initially 12 emergency management experts and two Liaison Officers from the Emergency Response Coordination Centre (ERCC) deployed to support the national authorities and coordinate EU assistance in response to the quake.

Initially a 10 person UNDAC team was mobilizing. The team was supported by the Americas Support Team (AST) and Atlas Logistique and a OSOCC was established out of the Civil Defence HQ, Port au Prince.

In the aftermath of the devastating 7.2-magnitude earthquake that hit Haiti on 14 August, authorities report more than 2,200 people dead, at least 344 missing, over 12,000 injured and upwards of 130,000 homes damaged or destroyed. The most affected areas were Sud, Grand'Anse and Nippes.

SARAID (a UK NGO), EUCPT (EU Civil Protection Team), and the Swiss Embassy deployed, at the request of the Haiti government and representatives, an Engineering team to Haiti to provide various levels of support to the Haiti Civil Defence and Government departments. Their initial role was to support the damage assessment process and support coordination of damage assessments working in collaboration across the wide multi-agency and sector arena.

2. Evaluation Procedure

The evaluations were conducted according to a methodology based on the assessment form and training material developed by the College National des Ingenieurs et Architectes Haitien (CNIAH), USAID and Miyamoto International. See appendix for the assessment forms used.

Note that these differ from the assessment forms proposed by the Ministere des Travaux Publics Transport et Communication (MTPTC), as the MTPTC forms were not available to the international assessors at the beginning of the assessments. As the assessments of this report are to provide preliminary advice to inform later-stage government-led assessments, it was deemed most time-efficient to select the CNIAH/USAID forms/method as they are developed specifically for the Haiti context, and the MTPCTC forms were not initially available.

The purpose of these evaluations is to determine whether entry to damaged or potentially damaged buildings should be restricted of prohibited, or if the structural capacity has not been impaired by the earthquake in which case it might be deemed safe to occupy (recognizing the continued risk of aftershocks and future events).

For all evaluations, each building will be designated as either "Green – Inspected", "Yellow – Access limited", or "Red – Access prohibited" (see table 1).

Categories	Descriptions
Green – Inspected	No apparent hazard found, although repairs may be required. Original lateral- and vertical-load capacity, not significantly decreased. No restriction on use of occupancy.
Orange – Access limited	Safety is questionable or hazardous conditions exist (or are believed to exist) that required restrictions on the occupancy or use of the structure. Entry on used have been restricted as indicated on the placard. (Note: further evaluation may result in the building being marked as Green or Red).
Red – Access prohibited	Extreme hazard or unsafe situation present. Significant risk of further damage or collapse. Unsafe for occupancy or entry, except authorized by the local building department. (Note: Marking a building Red is not a demolition).

Table 1 - Building Safety Evaluation Categories.

Please note that if a building is designated as Green, this does not mean that the building will not sustain more damage in future earthquakes, but that the damage caused by the earthquake on 14th August 2021 did not significantly reduce the load-bearing capacity of the structure rendering the building unsafe for normal use.

Please also note that if a building is also designated as Red this does not necessarily mean that the building is to be demolished (the reason for the Red marking and related recommendations will be provided with the marking). For example, an undamaged building may be marked as Red (access prohibited) because of an adjacent overhanging structure that may pose a risk of falling onto the building being assessed.

3. Evaluated Sites

Buildings of public interest such as hospitals, medical centres, schools and churches have been focused on.

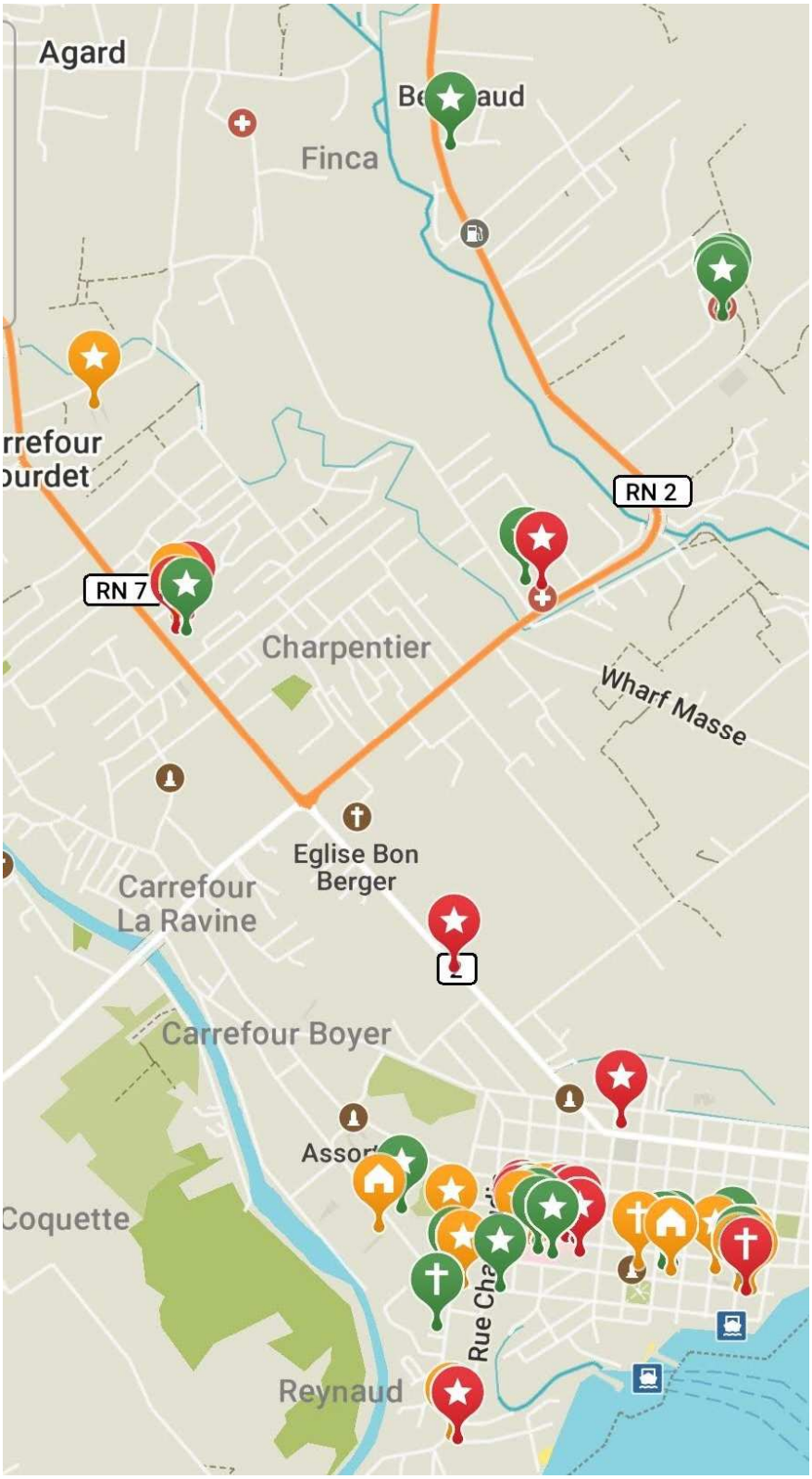

Figure 1 - Location of building evaluation locations

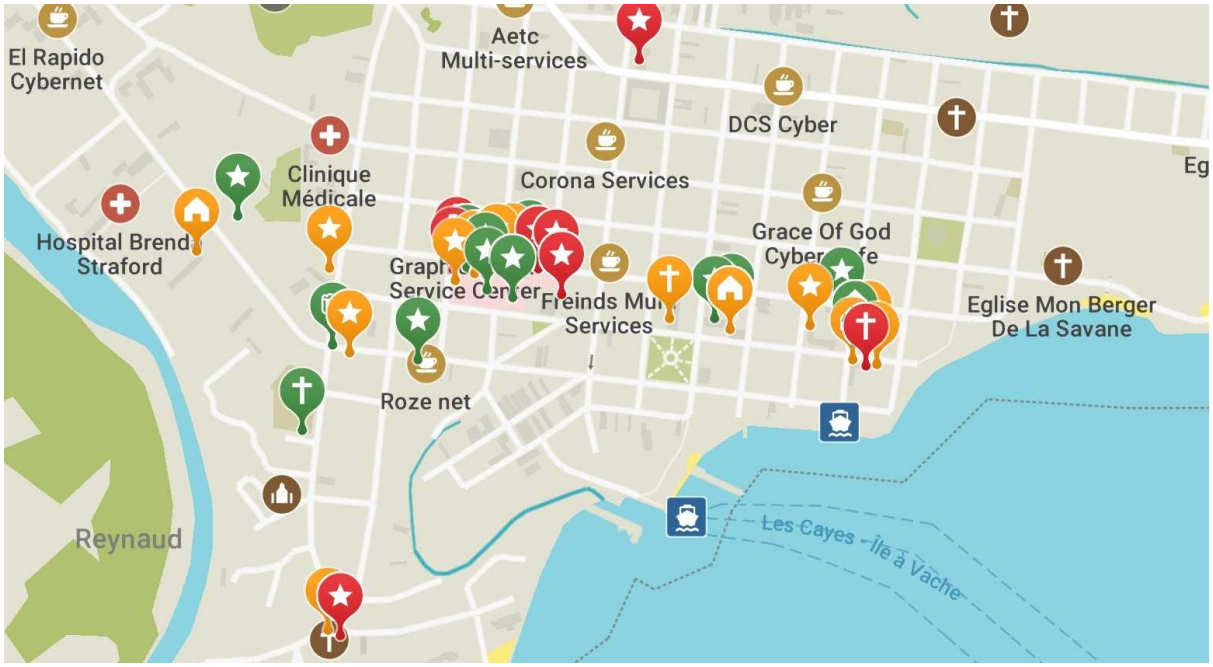

Figure 2 - Location of building evaluation – Close-up of central Les Cayes

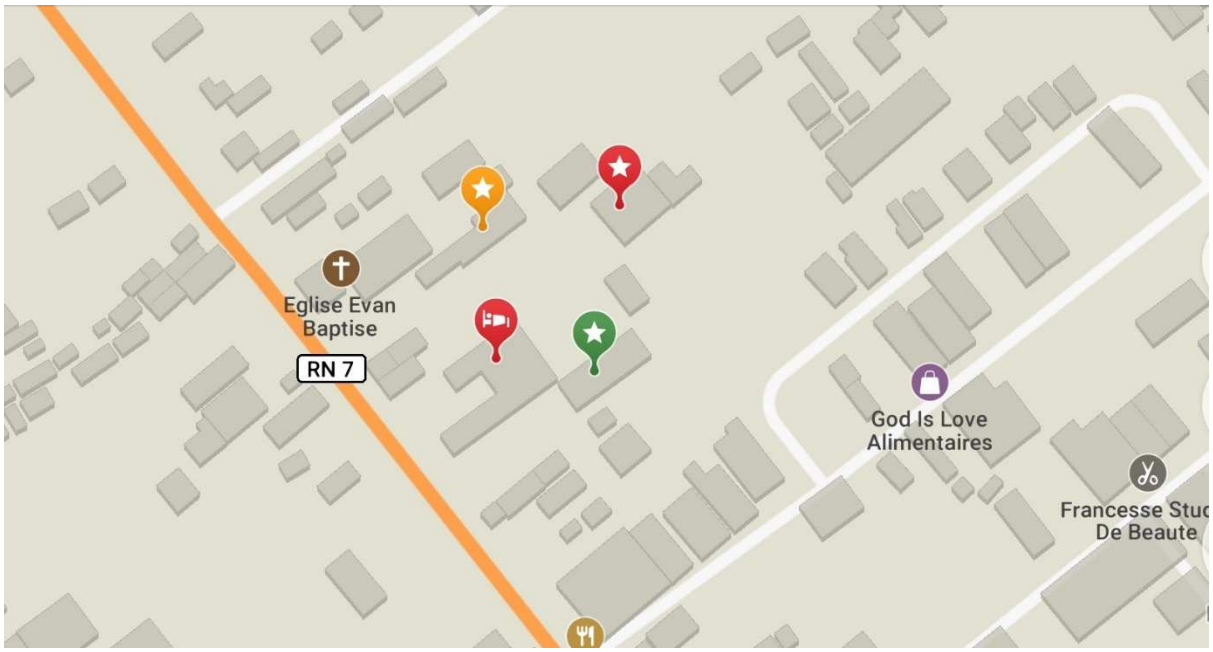

Figure 3 - Location of building evaluation – Close-up of Hotel Le Manguier

Building Safety Evaluation Summary

Advisory only. Official assessments to be conducted by MTPTC-led assessments, as coordinated by the Damage Assessment Coordination Centre (DACC)

No.	Date	Building Name	GPS Coordinates	Result
1	22/08/2021	Hospital Immaculate Conception	N18.193293 W73.751263	Orange - Access limited
2			N18.193457 W73.751819	Green - Inspected
3			N18.193639 W73.751868	Red - Access prohibited
4			N18.193800 W73.751796	Red - Access prohibited
5			N18.193677 W73.751615	Orange - Access limited
6			N18.193563 W73.751482	Orange - Access limited
7			N18.193541 W73.751284	Red - Access prohibited
8			N18.193685 W73.751090	Green - Inspected
9			N18.193705 W73750821	Green - Inspected
10			N18.193746 W73750503	Red - Access prohibited
11			N18.19365 W73.750355	Red - Access prohibited
12			N18.193591 W7375004	Green - Inspected
13			N18.193314 W73.749911	Orange - Access limited
14			N18.193169 W73.750812	Green - Inspected
15		Hospital Sanatorium des Cayes	N18.222168 W73.74527	Green - Inspected
16			N18.222048 W73.745403	Green - Inspected
17			N18.221839 W73.743349	Green - Inspected
18		Hospital Notre Dame SA	N18.22708 W73.75408	Green - Inspected
19		Lycee Phillipe Guerrier	N18.193010 W73.745121	Green - Inspected
20			N18.193010 W73.745121	Orange - Access limited
21		Ecole des Mains Ouverts	N18.192252 W73.744720	Orange - Access limited
22			N18.192265 W73.744516	Red - Access prohibited
23			N18.192387 W73.744850	Green - Inspected
24		Ecole Sainte Famille	N18.1921471 W73.7442248	Orange - Access limited
25		Souer de la Charire Saint Louis	N18.192321 W73.744563	Orange - Access limited
26		College Frere Odile Joseph	N18.192799 W73.747371	Green - Inspected
27			N18.192886 W73.746829	Green - Inspected
28			N18.192671 W73.746912	Orange - Access limited
29		City Med Hospital	N18.192260 W73.752508	Green - Inspected
30		College Pierre Corneille	N18.194301 W73.756180	Orange - Access limited
31		College Jean Jacques Dessalines	N18.192484 W73.753923	Green - Inspected
32		College Mixte Elie Dubois	N18.192293 W73.753653	Green - Inspected
33		University of Caribbean Integree	N218.193655 W73.754053	Green - Inspected
34	23/08/2021	Hotel La Cretonne	N18.239858 W73.772746	Green - Inspected
35		Cathedrale des Cayes	N18.192602 W73.747892	N/A
36		Dispensaire du Sacre Coeur	N18.213709 W73.751100	Green - Inspected
37			N18.213709 W73.751101	Red - Access prohibited
38		Eglise du sacre coeur	N18.198144 W73.750211	Red - Access prohibited
39	24/08/2021	Hotel Manguier	N18.212259 W73.762854	Red - Access prohibited
40			N18.212604 W73.762957	Orange - Access limited
41			N18.212698 W73.762482	Red - Access prohibited
42			N18.21224 W73.762567	Green - Inspected
43		Petit Pas Hotel	N18.201959 W73.753883	Red - Access pohibited
44		Eglise Sainte Therese	N18.1875794 W73.7540603	Orange - Access limited
45		Adjacent to St Therese	N18.1875320 W73.7538328	Red - Access prohibited
46		Eglise Lutherienne	N18.1909370 W73.7546150	Green - Inspected
47		CEM Ecole	N18.194365 W73.755685	Green - Inspected
48		Hoptial OFTAMA	N18.219079, W73.7652576	Orange - Access limited
49		Hoptial OFTAMA - OR	N18.218667, W73.764682	Green - Inspected

Table 2 - Summary of Inspected Buildings

4. Main Recommendations

The recommendations for each building are given in the summary table at the end of this documents. The key recommendations for each location are below.

Buildings 1-14 relate to Hospital Immaculate Conception, with site layout shown in Figure 4.

Figure 4- Location map of buildings within Hospital Immaculate Conception

Building 1 – Hospital Immaculate Conception (Medical) – Orange

- Damage: There was significant cracking to one of the internal columns. The column was on the left in the room straight ahead of the entrance, as indicated in Figure 6.
- Assessment constraints: We were unable to access any of the upstairs floor and large parts of the ground floor.
- **Recommended restrictions: Access to the room with the damaged column (it appeared to be an operating theatre) should be prohibited, including the area that is above this room.**

Figure 5 - Building 1

Figure 6 - Access into the room with a damaged column is indicated by the red arrow.

Building 2 – Hospital Immaculate Conception (Medical) - Green

- Damage: There was some cracking to the right of the entrance, but this was deemed to be affecting non-structural elements.
- Recommended restrictions: None

Figure 7 - Building 2

Building 3 - Hospital Immaculate Conception, Water Tank (Medical) - Red

- Damage: Cracking was observed between most of the beam and column joints. There was also spalling on some of the concrete beams although its assumed, due to the condition of the rebar, this was historic damage
- Recommended restrictions: Cordon off the damaged water tower to a distance of 1.5 times the height of the tower area

Figure 8 - Building 3, concrete water tower

Figure 9 - Cracking between the beam and column joints

Figure 10 - Spalling of the concrete on the beam

Building 4 - Hospital Immaculate Conception (Medical) - Red

- Damage: Large cracks were observed in the rear wall
- Recommended restrictions: Our recommendation is that the building is unsafe to use

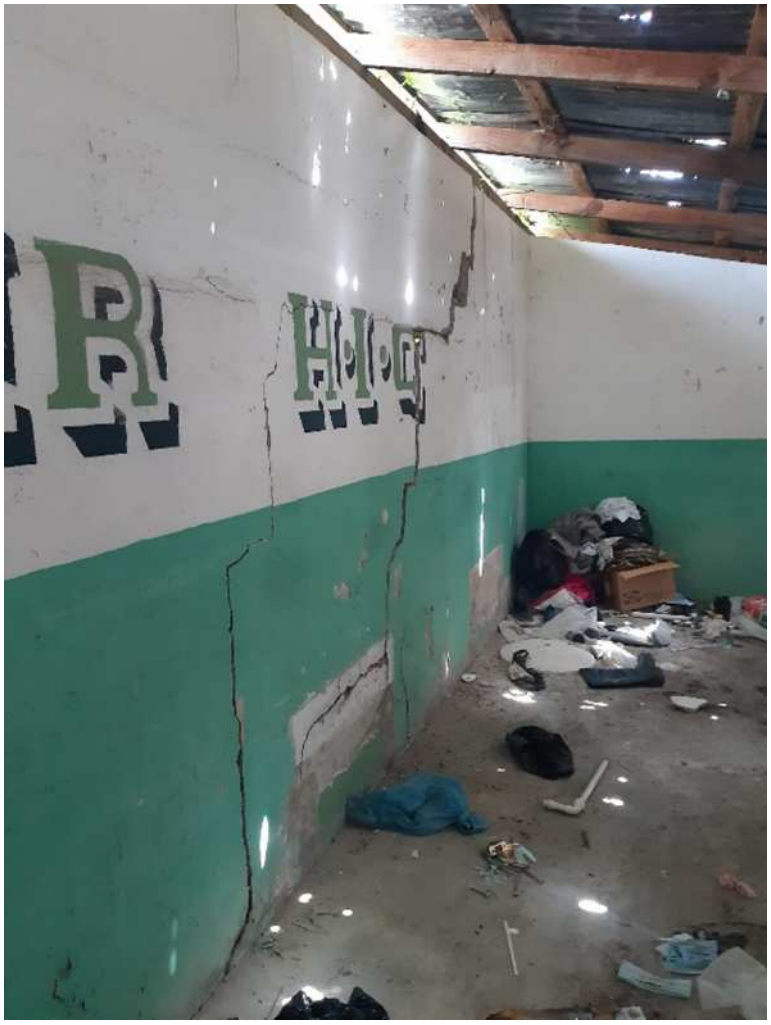

Figure 11 - Building 4, cracks in the rear wall

Building 5 - Hospital Immaculate Conception (Medical) – Orange

- Damage: The wall next to the rear doorway has some cracking and was leaning.
- Recommended restrictions: Access through the rear entrance should be restricted, and this end of the building should be cordoned off.

Figure 14 - Cracking observed on the opposite side of the wall shown above

Figure 13 - Cracked and leaning wall in Building 5

Figure 12 - Cracked and leaning wall in Building 5

Building 6 - Hospital Immaculate Conception (Medical) – Orange

- Damage: Cracking was observed on the external edge of the roof slab, shown in Figure 15 below
- Assessment constraints: The rear of the building, behind the first set of rooms could was not accessed
- Recommended restriction: Cordon off the external area around the cracked beam

Figure 15 - Building 6, image shows cracking to the external edge of the roof slab

Building 7 - Hospital Immaculate Conception (Medical) - Red

- Damage: Cracking through a beam that is supporting the floor above. Cracking present where the beam changes depth.
- Assessment constraints: We were unable to access any of the upstairs floor. The rear of the building, behind the first set of rooms could was not accessed
- Recommended restrictions: Our recommendation is that the building is unsafe to use

Figure 16 - Building 7

Figure 17 - Cracking of the supporting beam

Building 8 - Hospital Immaculate Conception (Medical) - Green

- Damage: This building had no damage that was identified during the assessment
- Assessment constraints: Only the outside of the structure was inspected as we could not gain access
- Recommended restrictions: None required

Figure 18 - Building 8

Building 9 - Hospital Immaculate Conception (Medical) - Green

- Damage: There was some mold to one of the ceilings however no structural damage was identified during the assessment
- Recommended restrictions: None required

Figure 19 - Building 9

Building 10 - Hospital Immaculate Conception, Water Tank (Medical) - Red

- Damage: The tower was significantly leaning which has displaced the water butt which is no longer secure.
- Recommended restrictions: Cordon off the damaged water tower at a distance of 1.5 times the height of the tower area

Figure 20 - Building 10

Building 11 - Hospital Immaculate Conception (Medical) - Red

- Damage: A significant crack is present on the entrance arch causing it to be structurally unsafe (see Figure 22). A crack in a supporting beam (see Figure 23). Damage to an external wall that is supported a steel trussed roof. Damage to lintels.
- Recommended restrictions: Our recommendation is that the building is unsafe to use

Figure 21 - Building 11

Figure 22 - Crack in the entrance arch

Figure 23 - Crack in a supporting beam

Building 12 - Hospital Immaculate Conception (Medical) - Green

- Damage: This building had no damage that was identified during the assessment
- Assessment constraints: Only the outside of the structure was inspected as we could not gain access
- Recommended restrictions: None required

Figure 24 -Building 12

Building 13 - Hospital Immaculate Conception (Medical) – Orange

- Damage: The supporting structure to the edge of the entrance overhang was cracked and leaning, see Figure 27.
- Assessment constraints: The area shown in Figure 26 was not accessed.
- **Recommended restrictions: We advise that the area under the right-hand side of the portico (when looking at the building, Figure 27) should be restricted.**

Figure 25 - Building 13

Figure 26 - Area of building 13 that could not be accessed

Figure 27 - Crack on the supporting structure of the portico

Building 14 - Hospital Immaculate Conception (Medical) - Green

- Damage: This building had no damage that was identified during the assessment
- Assessment constraints: Only the outside of the structure was inspected as we could not gain access
- Recommended restrictions: None required

Figure 28 - Building 14

Building 15 - Hospital Sanatorium des Cayes (Medical) - Green

- Damage: Minor cracking to external infill walls, deemed as non-structural damage. Cracking was observed along a movement joint. The structures either side had moved separately from on another and although looks like a significant crack it does not effect the structural integrity of the building.
- Recommended restrictions: None required

Figure 29 - Building 15

Figure 30 - Cracking along the movement joint in building 15

Building 16 - Hospital Sanatorium des Cayes (Medical) - Green

- Damage: This building had no damage that was identified during the assessment
- Assessment constraints: Only the outside of the structure was inspected as we could not gain access
- Recommended restrictions: None required

Figure 31 - Building 16

Building 17 - Hospital Sanatorium des Cayes (Medical) - Green

- Damage: This building had no structural damage that was identified during the assessment
- Assessment constraints: Only the outside of the structure was inspected as we could not gain access
- Recommended restrictions: None required

Building 18 - Hospital Notre Dame SA (Medical) - Green

- Damage: This building had no structural damage that was identified during the assessment
- Recommended restrictions: None required

Figure 32 - Building 18

Building 19– Lycee Phillipe Guerrier, (Education) - Green

- Damage: With the exception of the junction between legs of the southern classroom block the building is undamaged and users can move readily throughout the premises. At the junction of the building's legs there is an infill section, comprising a reinforced concrete walkway, where relative displacement has resulted in a slight gap at either side. Users can negotiate this without risk.
- Recommended restrictions: None required

Figure 33 - Building 19

Building 20 - Lycee Phillipe Guerrier (Education) - Orange

- Damage: The North-East end of this classroom block exhibits structural cracking that is detrimental to the safe use of the facility In the quadrangle between the classroom blocks there is a UNICEF tent which local residents are using as a safe refuge. This is sufficiently distant from the buildings to avoid hazards associated with further seismic events.
- Recommended restrictions- Access to the building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 34 – Building 20

Figure 35 - UNICEF Tent in school quadrangle

Building 21 – Ecole des Mains Ouverts - South (Education) - Orange

- Damage: The rectangular classroom block encloses a paved courtyard where it is evident that the ground surface has risen significantly above its original level. Also it appears that the building level has dropped relative to the adjacent pavement. Some ponding of surface water around the building reflects these changes. The degree of "ground heave" internally raises concern regarding potential for voiding below the surface that could represent a hazard to users or to circumstances associated with redressing the level differentials. In the south eastern part of the building there is some significant structural cracking of ground floor walls and this appears to relate to the ground movement.
- Recommended restrictions: Access to the building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 36 - Building 21

Figure 37 - Building 21 courtyard heave

Building 22 – Ecole des Mains Ouverts - Eglise Saint Joseph (Education) - Red

- Damage: There is significant cracking evident externally at the east facade and extensive further structural cracking that is most readily observed from inside the "auditorium" building. The "ground heave" of the building's paved floor appears to correspond with cracking in the walls. The degree of structural cracking of this building renders it hazardous to people in its vicinity and potentially vulnerable to failure in the event of further seismic effects.
- Recommended restrictions: Our recommendation is that the building is unsafe to use.

Figure 38 – Building 22 structural cracking visible at the East facade

Figure 39 - Extensive structural cracking observed from inside the "auditorium" building

Building 23 – Ecole des Mains Ouverts - North (Centre Professional Sainte Famille), (Education) – Green

- Damage: Inspection of the building externally and from within did not reveal structurally significant damage. The condition of this classroom block permits continued use. - There is some limited evidence of downward displacement relative to the adjacent street which has resulted in some ponding of surface water.
- Recommended restrictions: None required.

Figure 40 - Building 23

Building 24 – Ecole Sainte Famille (Education) - Orange

- Damage: This building exhibits areas of varied cracking that are insufficient to suggest that the building structure is compromised. However the presence of the adjacent, and significantly damaged, "auditorium" building should be regarded as a considerable hazard.
- Recommended restrictions: Access to the building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 41 - Building 24

Building 25 – Souer de la Charire Saint Louis, (Education) - Orange

- Damage: The administration building itself is found to be free from any significant damage. However the property's 7m high southern boundary wall has failed by rotating at its base and is only prevented from collapse by leaning against the neighbouring property. This adjacent property is inhabited and the current circumstances are unsafe and very unsatisfactory.
- Recommended restrictions: Access to the neighbouring building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 42- Building 25 boundary wall

Building 26– College Frere Odile Joseph, Building A (Education)– Green

- Damage: The classroom block does not exhibit any significant structural that would limit its use.
- Recommended restrictions: None required.

Figure 43 - Building 26

Building 27 – College Frere Odile Joseph ,Building B (Education)- Green

- Damage: There are instances of minor cracking around stairs and on the ground floor but these are not structurally significant. The recent development of the building above the adjacent pavement area exhibits no ill-effects of seismic effects.
- Recommended restrictions: None required.

Figure 44 - Building 27

Building 28– College Frere Odile Joseph -Building C (Education) - Orange

- Damage: The FIC college building, seen beyond the scaffolded structure, may need to have structural repairs subject to the outcome of further inspection when access can be arranged.
- Recommended restrictions: Access to the building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 45 - Building 28

Building 29– City Med Hospital (Medical) - Green

- Damage: External examination of this clinic showed no signs of damage.
- Recommended restrictions: None required

Figure 46 - Building 29

Building 30 - College Pierre Corneille (Education)- Orange

- Damage: This college building extends for a 100m distance perpendicular to the road. For the most part it is free from damage but at the end remote from the road there is evidence of ground movement that has resulted in structural cracking.
- Recommended restrictions: It is recommended that access into the building is prohibited in the zone of ground settlement and of the associated structural defects.

Figure 47 - Building 30

Building 31–College Jean Jacques Dessalines (Education)- Green

- Damage: The condition of the College building is free from significant damage that would curtail its use.
- Recommended restrictions: None required for the building. However the adjacent boundary wall exhibits significant damage and access around it should be prohibited.

Figure 48 - Building 31

Building 32 –College Mixte Elie Dubois (Education)- Green

- Damage: Access for inspection was limited but sufficient external viewing was made to enable recommendation unrestricted use of the college building.
- Recommended restrictions: None required.

Figure 49 - Building 32

Building 33–University of Caribbean Integree (Education)-Green

- Damage: No visible damage was discernible for this particularly robust construction.
- Recommended restrictions: None required.

Figure 50 - Building 33

Building 34 - Hotel La Cretonne (Hotel)- Green

- Damage: Limited nature of identified cracking is not a concern for safety of buildings.
- Recommended restrictions: None required. However, presence of clients' tents close to buildings is risky in case of falling debris during aftershocks and should be prohibited.

Figure 51 - Building 34

Building 35 – Cathedrale Les Cayes (Church)- Not Assessed

- Damage: The building has been made secure and only external assessment was possible. However evident change of relative levels at street frontage appears to have occurred and requires further investigation.

Figure 52 - Building 35

Building 36 –Dispensaire du Sacre Coeur - various buildings (Medical) - Green

- Damage: The extent of structural damage to this particular facility building is minor.
- Recommended restrictions: Continued use is acceptable subject to removal of loose material.

Figure 53 - Building 36

Building 37 –Dispensaire du Sacre Coeur - outside shelter (Medical) - Red

- Damage: The structural failure of column supports exhibits extreme effects of sway frame behaviour. The consequent damage renders this shelter/car port unsafe to use.
- Recommended restrictions: Our recommendation is that the structure is unsafe to use.

Figure 54 - Building 37

Building 38 –Eglise du sacre Coeur (Church) - Red

- Damage: Extensive cracking and areas of localised collapse render this building highly unstable.
- Recommended restrictions: Our recommendation is that the structure is unsafe to use. Significant expansion of the existing exclusion zone around it is recommended.

Figure 55 - Building 38

Building 39 – Hotel Manguier- Main block – (Hotel)- Red

The major 4-storey building structure that had been constructed approx 10 years ago has been demolished and cleared from site shortly after the 2021 earthquake event.

Figure 56 - Building 39 - destroyed by earthquake and subsequently cleared from site

Figure 57 - Hotel Le Manguier - Plan Layout of Building Complex

Building 40 – Hotel Manguier- Reception building (Hotel) -Orange

- Damage: The reception building, built at the same time as the now-demolished main block, has suffered minor cracking while uplift and cracking have affected floors at ground level.
- Recommended restrictions: Access to the building to be restricted until a detailed evaluation confirms whether it is safe for use or needs to be evacuated.

Figure 58 - Building 40

Building 41 –Hotel Manguier- Restaurant/kitchen (Hotel)-Red

- Damage: The roof over the restaurant has a substantial reinforced concrete structure that has suffered significant damage resulting from the earthquake. This damage is beyond repair.
- Recommended restrictions: Our recommendation is that the structure is unsafe to use.

Figure 59 - Building 41

Building 42 – Hotel Manguier- Extension/ new development (Hotel)- Green

- Damage: The recently constructed extension to hotel exhibits negligible damage and remains in usable condition.
- Recommended restrictions: None required.

Figure 60 – Building 42

Building 43 - Hotel Petit Pas (Hotel)– Red

- Damage: The building was destroyed by the earthquake and has subsequently been cleared from the site.

Figure 61 – Building 43 (Photo Credit: Joseph Odelyn, Associated Press)

Figure 62 – Building 43 – Site cleared

Building 44 – Eglise Sainte Therese (Church) – Orange

- Damage: The central column that supports the east side of the roof has lost its structural integrity and the deep spanning beam above has developed a shear crack.
- Recommended restrictions: Access to the building to be restricted and **people should be excluded from the area on the east side of the central aisle.**

Figure 63 - Building 44

Building 45 - School Adjacent to St Therese (Education) - Red

- Damage: The collapsed building that was adjacent to the St Therese church has been cleared.

Figure 64 - Building 45

Building 46 - School Eglise Lutherienne (Education)- Green

- Damage: The building shows no external signs of significant damage.
- Assessment constraints:The large and recently built church on the school site was inaccessible for assessment.
- Recommended restrictions: None required.

Figure 65 - Building 46

Building 47 - School CEM Ecole (Education) – Green

- Damage: The ancillary building that bordered the school's recreation area has collapsed completely. No further visible damage observed.
- Recommended restrictions: None required.

Figure 66 - Building 47

Building 48 – Hospital OFATMA (Medical) – Orange

- Damage:
  - Cracking along a movement joint was visible (see Figure 68), this does not affect the structural integrity of the building.
  - Cracking around a column head and the surrounding slab was visible (see Figure 70).
  - A second movement joint, to the right of the reception area as you walk in, has cracked. This has left a 2m cantilever on the external corridor where there is no secondary column on the other side of the movement joint. Although the cantilever it-self hadn't appeared to result in any damage, there is loose debris between the movement joint which could cause harm (see Figure 68).
  - A column on the left wing had some cracks on it that appeared on both sides (see Figure 71). It was unclear if this was just to the plaster however it was agreed there's a risk this could be structural damage. A small extension had subsided.
- Recommended restrictions: External corridor to the left as you walk from reception to the courtyard (with cracking on the ceiling) should be cordoned off. The external corridor with the damaged column to be cordoned off. Extension that has subsided to be cordoned off.

Figure 67 - Building 48

Figure 68 - Movement joint cracking

Figure 69 - Movement joint cracking resulting in loose fill

Figure 70 - Cracking around the column head and slab

Figure 71 - Column cracking and short column shear crack

Figure 72 - Subsided extension

Building 49 - Hospital OFATMA, OR (Medical) – Green

- Damage: This building had no damage that was identified during the assessment
- Recommended restrictions: None required

5. Detailed Evaluation Forms

The evaluations were conducted according to a methodology based on the assessment form and training material developed by the College National des Ingenieurs et Architectes Haitien (CNIAH), USAID and Miyamoto International.

The following spreadsheet contains the evaluation/ recommendations for each building evaluated (buildings are presented in the same order above).

@usaip

RAPID ASSESSMENT OF DAMAGE AFTER A TREMOR DE TERRE

IDENTIFICATION OF THE INSPECTOR AND BÂTIMENT

Inspector ID: _____ Area inspected:

Building ID: _____ ☐ Outdoor only

Date and time: _____ _____ hour Outdoor and indoor AM / PM ☐ ☐

RESULT OF Green (No risk) Yellow (Access limited) Red (Access prohibited)

Building name: _____ Contact person: _____ (phone)

Address: _____ Number of occupants: _____

_____ Year of construction: _____

Number of floors: Above ground: _____ GPS Coordinates: _____

Below ground: _____ Area approx. _____ m²

Soil description: Sand Loose earth ☐ Ferme ☐ Rocher

Description site / slope: Flat area Moderate slope Steep slope

Type of construction:

☐ Wood frame ☐ Metal frame ☐ Concrete frame filled with block masonry

☐ Reinforced concrete structure ☐ Shear wall ☐ Unreinforced masonry (URM)

☐ Reinforced masonry ☐ Metal structure ☐ Other: _____

Roof type: Concrete / Slab Wood ☐ Tôle ☐ Other: _____

Building shape (Plan):

☐ Square / Rectangular Triangular Cross ☐ O ☐ E ☐ H ☐ L ☐ T ☐ U

☐ Other: _____

Irregularities noted:

☐ Flexible Floor Facade removal Short ductile coupled walls Interlocking

Primary Occupation:

☐ Residence (single family) Residence (multifamily) Administrative Emergency services

☐ Shopping mall ☐ Office ☐ Industrial ☐ Government

☐ Bâtiment historic ☐ School ☐ Other: _____

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DAMAGE ASSESSMENT (To check the conditions below, check the appropriate column)

Damage status:	None / Minor (0-10%)	Moderate (10-50%)	Severe (50-100%)	Remark:
General:				
Total or partial collapse	☐	☐	☐	
Building / leaning floor	☐	☐	☐	Maximum tilt CM:
Interlocking adjacent building	☐	☐	☐	
Inadequate foundation	☐	☐	☐	
Other:	☐	☐	☐	
Structural damage:				
Foundation	☐	☐	☐	
Vertical load capacity of roof / floor	☐	☐	☐	
Crack collonnes, pilasters / Chipping	☐	☐	☐	
Fissureslab, beam, joist Crack / chipping	☐	☐	☐	
Wall crack Int & Ext / collapse	☐	☐	☐	
Other (Specify in remarks)	☐	☐	☐	
Non-structural damage:				
Damage parapet, Canopy, Staircase	☐	☐	☐	
Cladding Systems and Windows	☐	☐	☐	
Ceilings & Lighting	☐	☐	☐	
Interior walls (partitions)	☐	☐	☐	
Elevator	☐	☐	☐	
Stairs and exits	☐	☐	☐	
Electricity, Gas / Fuel	☐	☐	☐	
Other (Specify in remarks)	☐	☐	☐	
Geotechnical				
risks: Landslide	☐	☐	☐	
Floor movement, Cracks	☐	☐	☐	
Damage in the underground structure	☐	☐	☐	
Liquefaction	☐	☐	☐	
Other (Specify in remarks)	☐	☐	☐	

	Inspector Name	Date	Area Inspected	Result	Recommended Restrictions	GPS Coordinates	Building Name	Number of floors	Number below ground	Site description	Type of construction	Roof Type	Building shape (plan)	Primary Occupancy	Observations
1	GBR01	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Access into room with damaged column to be restricted, including the area above this room.	N18.193590, W73.749983	Hopital Immaculee Conception	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	Column on ground floor damaged.
2	GBR01	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.193435, W73.749827	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	
3	GBR01	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Cordon off the damaged water tower at a distance of 1.5 times the height of the tower area	N18.193305, W73.749827	Hopital Immaculee Conception - Concrete water tank	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	Water tower
4	GBR01	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Restrict access into the building	N18.193194, W73.749857	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Wood	Rectangle	Medical	Huge cracks in the wall. Already not in use
5	GBR01	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Cracking on wall adjecent to rear entrance - Restrict access through back door and in rear of the building	N18.193272, W73.749928	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Wood	Rectangle	Medical	Corner of wall next to dorrway at the back of the building damage and leaning. Access though door way to be restricted
6	GBR01	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Beam on edge of building cracked - Restrict access under and around the external area	N18.193361, W73.749987	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	Beam on edge of bulding cracked. Restrict access under and around the external area
7	GBR01	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Restrict access into the building	N18.193375, W73.750069	Hopital Immaculee Conception	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	Didn't see upstairs. Crack in beam supporting the floor structure
8	GBR01	22/08/2021	O - Outdoor only	Green - No Risk		N18.193403, W73.750339	Hopital Immaculee Conception	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	
9	GBR01	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.193236, W73.750694	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	
10	GBR01	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Cordon off the damaged water tower at a distance of 1.5 times the height of the tower area	N18.193111, W73.750872	Hopital Immaculee Conception - Steel water tank	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	Water tower
11	GBR01	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Restrict access into the building	N18.193189, W73.751014	Hopital Immaculee Conception	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	Top floor not fully construcred. Beam damage. Lintel damage. External wall damaged, reduing support to the steel trussed roof. Crack above entrance arch
12	GBR01	22/08/2021	O - Outdoor only	Green - No Risk		N18.193297, W73.751282	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	
13	GBR01	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Corner support of entrance portico cracked - Access through entrance to be restricted	N18.193553, W73.751302	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	Corner support of entrance portico cracked. Access through entrance to be restricted
14	GBR01	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.193611, W73.750352	Hopital Immaculee Conception	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	
15	GBR01	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.222168 W73.74527	Hopital Sanatorium des Cayes	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Rectangle	Medical	Had some roof damage but not structural
16	GBR01	22/08/2021	O - Outdoor only	Green - No Risk		N18.222048 W73.745403	Hopital Sanatorium des Cayes	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	
17	GBR01	22/08/2021	O - Outdoor only	Green - No Risk		N18.221839 W73.743349	Hopital Sanatorium des Cayes	1	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	
18	GBR01	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.22708 W73.75408	Hopital Notre Dame SA	2	0	F - Flat	Reinforced concrete structrue	Concrete slab	Square	Medical	
19	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.193010 W73.745121	Lycee Phillipe Guerrier	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	Minor spalling and cracks

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20	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Do not use north end of structure and associated stairs	N18.193010 W73.745121	Lycee Phillipe Guerrier	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	L	School	Significant cracking of 2 columns
21	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.192252 W73.744720	Ecole des Mains Ouverts - South	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Other	School	Minor cracking of main structure. Paved courtyard has been raised by approx 0.8m height at centre. Significant cracking of paving. Some ponding around perimeter.
22	GBR02	22/08/2021	O+I - Outdoor and indoor	Red - Access pohibited		N18.192265 W73.744516	Ecole des Mains Ouverts	1	0	F - Flat	Concrete frame filled with block masonry	Wood	Rectangle	Religious	Major cracks and structural damag. Paved flooring raised to new height.
23	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.192387 W73.744850	Ecole des Mains Ouverts - North (Centre Professional Sainte Famille)	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	
24	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.1921471 W73.7442248	Ecole Sainte Famille	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	Widespread cracking, generally minor but significant locally. Adjacent building rated Red with access implications
25	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.192321 W73.744563	Souer de la Charire Saint Louis	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	7m high east side boundary wall failed and rotated against adjacent residential building
26	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.192799 W73.747371	College Frere Odile Joseph -Bldg A	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	
27	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.192886 W73.746829	College Frere Odile Joseph -Bldg B	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	Minor cracking around stairs. Cracks in paved flooring.
28	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.192671 W73.746912	College Frere Odile Joseph -Bldg C	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	Paved flooring raised by 0.2m at centre
29	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk	West adjacent wall leaning. Restrict west hall	N18.192260 W73.752508	City Med Hosoital	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Medical	
30	GBR02	22/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Do not use entrance to south end affected by settlement	N18.194301 W73.756180	College Pierre Corneille	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	
31	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk	Avoid collapsed perimter wall	N18.192484 W73.753923	College Jean Jacques Dessalines	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	
32	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.192293 W73.753653	College Mixte Elie Dubois	1	0	F - Flat	Unreinforced masonry	Wood	Rectangle	School	
33	GBR02	22/08/2021	O+I - Outdoor and indoor	Green - No Risk		N218.193655 W73.754053	University of Caribbean Integree	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	School	
34	GBR02	23/08/2021	O+I - Outdoor and indoor	Green - No Risk	Hotel manager advised to exclude camping residents from positing tents close to buildings.	N18.239858 W73.772746	Hotel La Cretonne	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Other	
35	GBR02	23/08/2021	O - Outdoor only	N/A	Engineers not allowed inside as building locked due to danger	N18.192602 W73.747892	Cathedrale des Cayes	1	0	F - Flat	N/A	N/A	Rectangle	Religious	
36	GBR02	23/08/2021	O+I - Outdoor and indoor	Green - No Risk	Loose material to be removed	N18.213709 W73.751100	Dispensaire du Sacre Coeur - various buildings	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Medical	
37	GBR02	23/08/2021	O+I - Outdoor and indoor	Red - Access pohibited		N18.213709 W73.751101	Dispensaire du Sacre Coeur - outside shelter	1	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Medical	Sway failure due to heavy roof
38	GBR02	24/08/2021	O - Outdoor only	Red - Access pohibited	Exclusion zone around building to be extended	N18.198144 W73.750211	Eglise du sacre coeur	1	0	F - Flat	Unreinforced masonry	Concrete slab	Cross	Church	

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1	GBR02	24/08/2021	O+I - Outdoor and indoor	Orange - Acess limited		N18.212604 W73.762957	Hotel Manguier	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Other	Hotel. Floors and surrounding ground affected by ground heave
2	GBR02	24/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Restrict access as roof strucure compromised	N18.212698 W73.762482	Hotel Manguier	1	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Square	Other	Hotel. Roof supported by significsntly damaged ring beam
3	GBR02	24/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.21224 W73.762567	Hotel Manguier	2	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Other	Hotel
4	GBR02	24/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Total collapse. Site cleared already	N18.201959 W73.753883	Petit Pas Hotel	3	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Rectangle	Other	Hotel
5	GBR02	24/08/2021	O - Outdoor only	Orange - Acess limited	Prevent people from occupying east side seating in compromised area	N18.1875794 W73.7540603	Eglise Sainte Therese	1	0	F - Flat			Rectangle	Religious	main roof support beam (east) has lost support of central column
6	GBR02	24/08/2021	O+I - Outdoor and indoor	Red - Access pohibited	Total collapse. Site cleared already	N18.1875320 W73.7538328	Adjacent to St Therese	2	0	F - Flat			Rectangle	School	
7	GBR02	24/08/2021	O - Outdoor only	Green - No Risk		N18.1909370 W73.7546150	Eglise Lutherienne	1	0	F - Flat			Rectangle	School	
8	GBR02	24/08/2021	O - Outdoor only	Green - No Risk		N18.194365 W73.755685	CEM Ecole	1	0	F - Flat			Rectangle	School	modest ancillary structure collapsed
48	GBR01	24/08/2021	O+I - Outdoor and indoor	Orange - Acess limited	Corridor with cracking above to be cordoned off. Corridor wih damaged column to be cordoned off. Extension that has subsided to be cordoned off.	N18.219079, W73.7652576	Hoptial OFTAMA	1	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	U	Medical	
49	GBR01	24/08/2021	O+I - Outdoor and indoor	Green - No Risk		N18.218667, W73.764682	Hoptial OFTAMA - OR	1	0	F - Flat	Concrete frame filled with block masonry	Concrete slab	Square	Medical	