



**PROPOSED MONTEGO BAY PERIMETER ROAD,
LONG HILL BYPASS AND WEST GREEN AND
BARNETT STREET UPGRADE, ST. JAMES**

Environmental Impact Assessment

PUBLIC PRESENTATION
Date: Tuesday June 23, 2020
Time: 5:00 PM

1

Project Team


- **CL Environmental Co. Ltd.:**
 - o Carlton Campbell, Ph.D., CIEC (Noise, Noise Modelling, Structure Survey)
 - o Matthew Lee, M.Sc. (Air Quality, Climate, Vibration)
 - o Rachel D'Silva, B.Sc. (Benthic Assessment, Water Quality, Structure Survey)
 - o Karen McIntyre, M.Sc. (Legislation, Socioeconomics, Viewshed Analysis and GIS)
 - o Glen Patrick (Field Technician - Air Quality and Noise, Structure Survey)
 - o Alec Silvera, B.Sc. (Water Quality, Structure Survey)
- **CEAC Solutions Co. Ltd.**
 - o Christopher Burgess, P.E. (Climate Impact, Hydraulic/Hydrology Assessment)
- o Carlinenus Johnson, P.E. (Traffic Impact Assessment)
- o Kristifer Freeman, P.E. (Hydrology and Hydrogeology Assessment)
- o Marc Henry, BSc - Draughtsman
- o Odaine Perry - (Hydraulic/Hydrology Assessment)
- **Jamaica National Heritage Trust** (Heritage and Cultural, Archaeological Impact Assessment)
- **Associate Consultants:**
 - o Marc Rammelaere, M.Phil (Geology, Soils, Geomorphology)
 - o Eric Garraway, Ph.D. (Faunal Survey)
 - o Damion Whyte, M. Phil (Faunal Survey)
 - o Philip Rose, Ph.D. (Vegetation Survey)
 - o Camilo Trench, M.Sc. (Mangrove Survey)
 - o Jannette Manning, M.Sc. (Perception Survey)



2

Presentation Outline

- Issues Raised
- Geotechnical Features
- Hydrology - River Realignment
- Dust (PM10)
- Noise
- Vibration
- Impacted Structures
- Flora and Fauna




3

Issues Raised




4

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
How will the overhead from Temple Gallery Road to Bogue be accessed?	Bogue Road and Temple Gallery intersection is proposed to be grade separated. The grade separation can be accomplished with a tight diamond interchange that accommodates two right turn lanes on the northbound off-ramp and double right-turn lanes from the westbound Temple Gallery leg.
How will Traffic issues during construction be addressed? (supermarket adjacent to Bogue Village; Temple Gallery Road).	Traffic signals will be used to regulate the flow of traffic along Temple Gallery Road. The implementation of the "no right turn" will help to reduce congestion
Will NROCC make provision for suitable access from the highway to the UWI campus at the signalized intersection.	The preliminary alignment made provision for an exclusive access to UWI proposed campus.
Will noise walls be incorporated into the designs of the highway in the vicinity of the UWI campus.	Yes. Noise wall mitigation is covered in the EIA Report.




5

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
With regards to the existing drainage in the Temple Gallery Road area, what are the plans to improve the drainage.	Drainage Assessments were conducted for all section of new road works. With the new roadworks will come upgraded drainage facilities.
How will Drainage and Flooding concerns be addressed? (particularly for Bogue Village Phase 2, Catherine Hall area, police stations and community college)	
What is the process for persons who do not have legal tenure or have common-law-titles and those who have not paid property taxes for years on the land?	NROCC's Land Acquisition team will personally discuss these details with those persons who are within alignment footprint and impact area.
What plans are there for persons who own lands that do not live on the land and may have migrated or are deceased?	
In situations where land/property/structures are in the proposed road alignment, how will such matters be addressed?	




6

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
The process of receiving a title through LAMP is long and may not be coincide with the timeframe of the duration of the project, how will such situations be addressed?	NROCC's Land Acquisition team will personally discuss these details with those persons who are within alignment footprint and impact area.
A mango tree appears to be within the alignment, what will happen to the mango tree?	If it lies on someone's personal property, that person will be compensated for it. This is covered in the Resettlement and Relocation Plan section of the EIA Report.
Will graves be relocated and what is the process of relocation?	Special attention will be given to graves, which have sentimental, emotional and cultural values attached to them. All graves will be interred by licensed undertakers contracted by NROCC. Re-interment will be in an approved family plot or cemetery. Approval for the re-interment of graves will be sought from the St. James Municipal Corporations and Health Department.




7

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
What is the possibility of shifting the alignment to avoid the destruction of the Abundant Life Church?	NROCC will make adjustments in the alignment to avoid the destruction of the church
How long after the close of the project can someone make a claim due to damages?	Issues should be brought to NROCC at any time during the course of the project. These issues can be raised orally or in writing to: NROCC's Land Acquisition Coordinator, NROCC's Chief Executive Office, Commissioner of Lands, or the Court. It is the objective of NROCC to respond to all issues raised within a reasonable timeframe.
How will matters of informal settling be addressed?	An independent assessment of the value of the structures based on current replacement costs is developed, as well as current market value of crops. These valuations are then agreed with the persons who are in possession of the lands. This is covered in the Resettlement and Relocation Plan section of the EIA Report.
What is the turnaround time for compensation?	This is based on the different types of negotiation and compensation involved. This is covered in the Resettlement and Relocation Plan section of the EIA Report.



8

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
Where should concerns/queries/comments/complaints be lodged?	National Road Operating and Constructing Company (NROCC), 4 th Floor DBJ Building – 11A Oxford Road, Kingston 5, Jamaica, (876) 926-7830
What sections of the roadway will be tolled?	Toll plazas have not been included in the design plans or estimate; however, areas have been identified where toll plazas can be located.
Are there any plans for NROCC to adopt a project to improve the community? A suggestion was made that the primary schools and early childhood institutions could benefit from the project.	To be looked at after the start-up date of the project.
What are the impacts to the mangroves to be removed?	Mitigation for Mangrove Community impacts are covered in EIA Report
Two areas of "disturbed broadleaf forest" will be impacted (Irwin Forest Management Area, Montpelier Forest Management Area)	NROCC will develop a Reforestation Plan with the cooperation of the Forestry Department to replant areas identified by the Forestry Department. Discussions have already started.



9

Montego Bay Perimeter Road – Issues Raised	
Issue/Question	Response
<p>NWC Recommendations in light of flood assessment undertaken:</p> <ul style="list-style-type: none"> - Drains need to be cleaned immediately after any large storm event; - Any future developments in the watersheds need to be at an appropriate setback distance from the watercourses; - Measures are to be put in place to mitigate the erosion, sedimentation and debris flows from the upper watershed areas; - Hydrological and hydraulic assessments be carried out to determine the necessary infrastructural improvements. <p>The proposed alignment will intercept NWC's infrastructure in several areas. NWC requires meeting with the design team(s) along with more finalized details before implementation.</p>	Acknowledged - Incorporated into EIA Report
Issue/Question	Response
What are the impacts of the highway alignment on the Fairfield Great House?	The Fairfield Great House lies at a distance of 41 m from alignment. Use of a vibratory roller should have no effect on the Fairfield Great House at this distance. If pile driving is to be conducted, there would be minimal risk for damage to weak or sensitive structures. However, if any blasting is to be conducted, there would be some risk of architectural damage to any ancient monuments and ruins.

10


West Green Dualization – Issues Raised	
Issue/Question	Response
Children traverse West Green Avenue. Will an overhead bridge be provided?	No bridge will be built along West Green Avenue
Will pedestrian crossings be provided?	There will be pedestrian crossings at the intersections along West Green Avenue.
Concern was raised about the noise, dust and vibration that will be caused by movements of heavy units and proximity to structures.	Mitigation for Noise, Dust and Vibration impacts are covered in the EIA Report
A suggestion was made to move the project from West Green Avenue to behind the Megamart.	West Green Avenue is an upgrade as a component of the wider project. This is intended to be a benefit to the community when additional capacity is added to this corridor and by extension help to reduce congestion.
Will there be compensation for the removal of temporary structures?	Compensatory exercises will be conducted according to the Resettlement and Relocation Plan.

11

West Green Dualization – Issues Raised	
Issue/Question	Response
The topography of the area allows for water to flow towards the sea and it settles by the Howard Cooke Boulevard as such concern was raised that raising the road will cause flooding.	Drainage Assessments were conducted for all section of new road works. With the new roadworks will come upgraded drainage facilities.
What will prevent vehicles from running off the road and damaging structures?	Vehicle accident mitigation is covered in the EIA Report.
Where will residents park their vehicles?	Residences that do not lie within the project footprint will not have their properties affected. Those that lie within the impact area will undergo process according to the Land Acquisition Act and the Resettlement and Relocation Plan
Will the road make accommodations for persons with disabilities?	Yes

12

Geotechnical Features



13

Montego Bay Perimeter Road	
Chainage and Location	Geotechnical Features
10+000 to 10+500 Alice Eldemire drive – Boundary of Mobay Freezone	High-water table in association with the sand layers have a high probability of liquefying during major earthquake events. Such liquefaction could cause differential ground subsidence of the road during or shortly after an earthquake
10+500 to 11+200 Boundary of Mobay Freezone to the end Bogue Mangroves	<ul style="list-style-type: none"> • Has not been reclaimed and lacks the layer of calcareous sands and gravels fill raising the ground level above tidal influence. • Waterlogged, with layers of loose sand, clays and partial decomposed organic material including peat. • Excessive settlements should be anticipated and addressed by the roadbed design.
11+200 to 12+700 End Bogue Mangroves – End of Temple Gallery Rd	<ul style="list-style-type: none"> • Between 11+300 and 11+600 the road alignment is located between 2 sewage ponds, which will have to be partially filled to accommodate the road.
14+800 to 17+600 Tucker – Porto Bello	<ul style="list-style-type: none"> • The road will be constructed by cutting and filling the slopes which form the left bank of the Montego River. • Slopes along the river are about 15 degrees (27%). • Cut slope will be in the Montpelier formation. • Stepped slope excavation with a slope ratio of 1:1.00 to 1:1.25 is proposed.

14

Montego Bay Perimeter Road	
Chainage and Location	Geotechnical Features
14+800 to 17+600 (cont'd) Tucker – Porto Bello	<ul style="list-style-type: none"> • Slope stability of the Montpelier is generally good but rock falls must be anticipated to be on-going problem. • Where the fill slope reaches the river channel, river training works will have to be deployed to protect the base from the Montego River. • At 15+300 the road alignment intersects a small stream channel that drains the Irwin area. The cross drain will need to be installed, that cannot only manage the run-off, but also bed-load associated with a major flash flood
17+900 to 21+300 Sign Irwin – Salt Spring	<ul style="list-style-type: none"> • Rugged karst topography of steep hills and closed depressions. • The Montpelier Formation, exposed over the entire length of this segment • To provide a consistent gradient for the construction of the road, the irregular karst topography will be cut and filled. • Slope stability is fairly good, but rock falls can be expected to be an on-going problem
21+300 to 24+650 Salt Spring - Ironshore	<ul style="list-style-type: none"> • Main geotechnical issue of this segment will be the drainage. • Stream is ephemeral (flows only briefly during and following a period of rainfall) and carries only water during heavy rainfall. • Drainage design will not only have to take in account the runoff but also the bed load under extreme rainfall condition.

15

Long Hill Bypass	
Chainage and Location	Geotechnical Features
10+490 to 10+140 Montego West Village - Bogue	<ul style="list-style-type: none"> Consists mainly of gravelly stiff silty clay. The main potential geotechnical issue is differential settlement.
10+140 to 6+200 Bogue - Wiltshire	<ul style="list-style-type: none"> Montpelier formation are basically the same they are along in the Montego Bay Perimeter road. Slope stability of the Montpelier is generally good but rock falls must be anticipated to be ongoing problem where there are steep road cuts. The main geotechnical challenge will be to manage and control the drainage of the Long Hill Bypass to prevent it from becoming another storm drain which deposits limestone debris at the foot of hill similar to what now happens from time to time on the Anchovy to Reading main road.
6+200 to 1+900 Wiltshire - Mount Carey	<ul style="list-style-type: none"> Road alignment is characterized by an irregular topography of steep hills, narrow elongated depressions and semi-circular dolines or sinkholes. Slope stability is not anticipated to be a significant problem in this section. Main geotechnical problems is the potential development of sinkholes and underground drainage in the fill areas causing differential settlement in the bypass road.

16

Long Hill Bypass	
Chainage and Location	Geotechnical Features
1+900 to 0+000 Mount Carey - Mountpelier	<ul style="list-style-type: none"> To the north of 1+000, the soil cover on top of the Montpelier formation is very thin ranging from a few centimetres to about 30cm, consisting of limestone gravel set in a matrix of clayey silt. To the south of the Anchovy Gully beginning at 1+000, the soils are significantly thicker, at least one to few meters and consist of clayey silt to plastic clay (drainage of this soil is very poor). Main geotechnical issue in this section is the potential for differential settlement associate with the presence and potential development of karst features. Design of the bypass has to take into account the ephemeral Anchovy Gully which intersects this road segment at 1+000 and at 0+100.

17


Hydrology (River Realignment)



18



Montego Bay Perimeter Road – Impacts (Montego River Realignment)

- The Montego River is approximately 20 km long, with streams starting from the hills of Equity where it passes through or along the Porto Bello, Fairfield, and Catherine Hall communities and ends in Montego Bay, where it flows into the Caribbean Sea.
- Some areas of the river were noted to have depths as much as 3m, and widths exceeding 13m.
- The river is known to swell and overflow its banks during heavy rainfall events, which results in significant damage to some of the aforementioned communities.
- Realignment of approximately 240m of the Montego River.



19

Montego Bay Perimeter Road – Impacts (Montego River Realignment)



20

Barnett Street Dualization – Potential Erosion Impacts

- The stability of the banks of the Montego River.
- Between mileposts 173+600 and 173+750 the river is very close to the road and tries to shift to east undercutting the slope which forms the right bank of the river.




21

Montego Bay Perimeter Road – Impacts (Montego River Realignment)

Table showing average velocities Post Realignment

Velocity (m/s)		% Change	Description of Location
Pre- Realignment	Post Realignment		
7.0	7.1	1%	Tucker/Irwin (Upstream)
5.5	5.8	5%	Barnett Estates (Downstream)
5.4	5.6	4%	Barnett Street Road Bridge (Downstream)
5.5	5.8	5%	West Gate Shopping Centre (Downstream)
6.1	6.4	4%	West Green Housing Scheme (Downstream)
6.3	6.6	4%	Charles Gordon Market (Downstream)



22



Dust (PM10)



23

Potential Dust (PM10) Impact


- The ambient particulate levels for Montego Bay Perimeter Road, Long Hill Bypass, Barnett Street and West Green were below with NRCA stds.

24


Dust (PM10) Mitigation

- Areas should be dampened every 4-6 hours or within reason to prevent a dust nuisance and on hotter days, this frequency should be increased.
- Minimize cleared areas to those that are needed to be used.
- Cover or wet construction materials such as marl to prevent a dust nuisance.
- Cover trucks carrying construction materials e.g. marl



25

Noise



26

Potential Noise Impacts Example

Cumulative noise levels for West Green without noise mitigation


STN	BASELINE (Leq)			PREDICTED WITHOUT NOISE MITIGATION (Leq)			CUMUATIVE WITHOUT NOISE MITIGATION (Leq)			NRCA STANDARD (dBA)	
	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	Day	Night
	WG1	68.0	69.0	66.0	67.1	69.4	63.3	70.6	72.2	67.9	55
WG2	66.0	67.0	63.0	66.2	68.4	62.3	69.1	70.8	65.7	55	50

NB: Values highlighted in red are non-compliant with the NRCA Standard

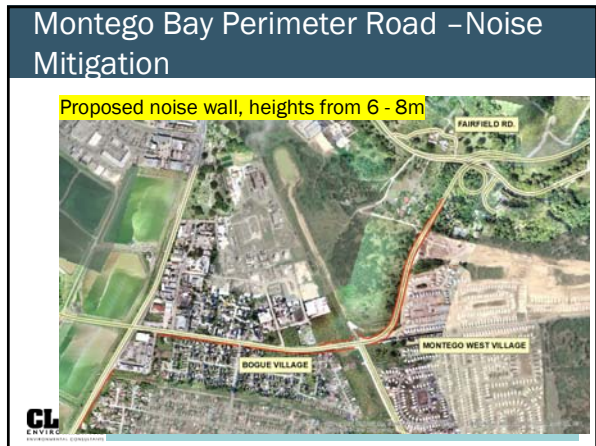
Cumulative noise levels for Green with noise mitigation

STN	BASELINE (Leq)			PREDICTED WITH NOISE MITIGATION (Leq)			CUMUATIVE WITH NOISE MITIGATION (Leq)			NRCA STANDARD (dBA)	
	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	24 Hours	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.	Day	Night
	WG1	68.0	69.0	66.0	60.1	62.4	56.2	68.7	69.9	66.4	55
WG2	66.0	67.0	63.0	52.8	55.1	48.9	66.2	67.3	63.2	55	50

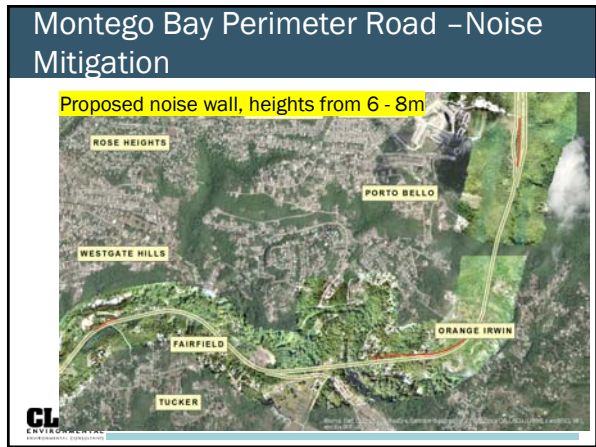
NB: Values highlighted in red are non-compliant with the NRCA Standard



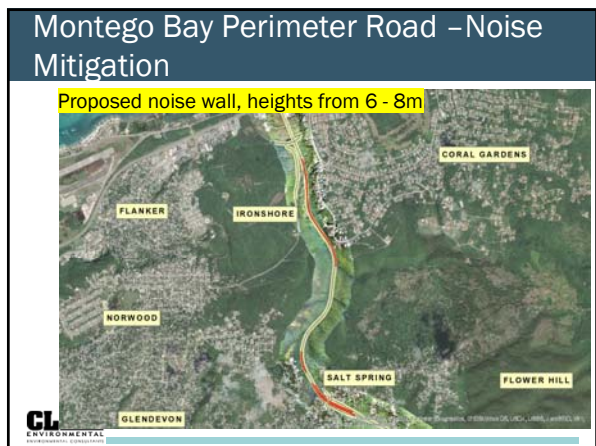
27



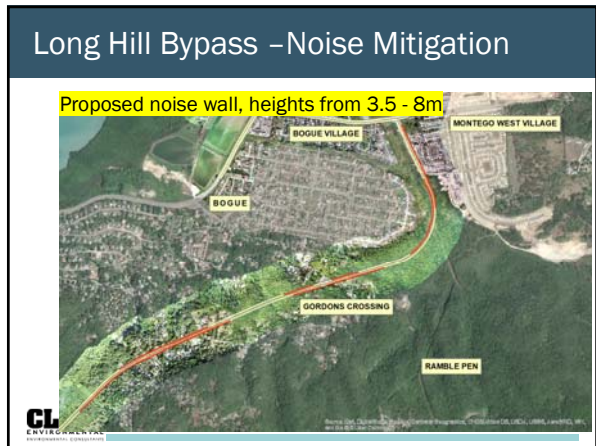
28



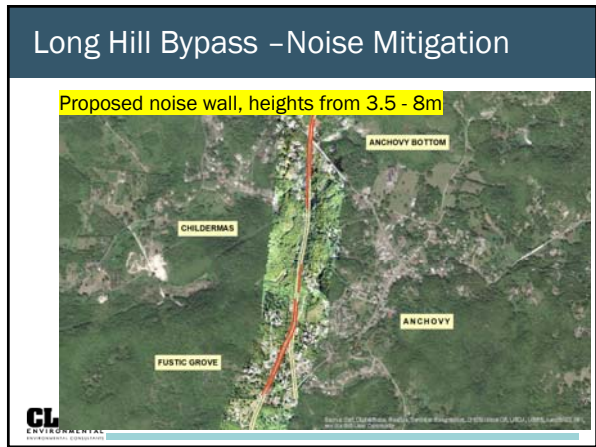
29



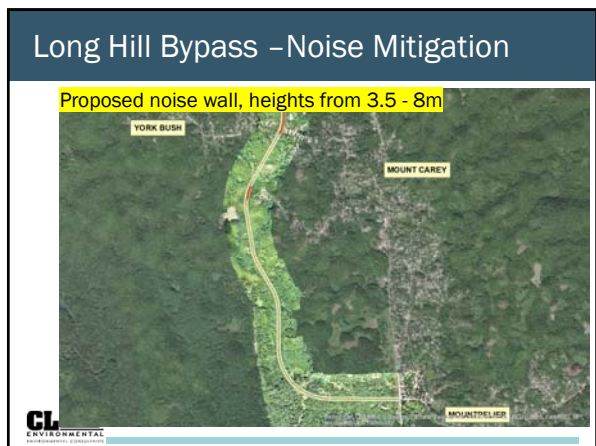
30



31



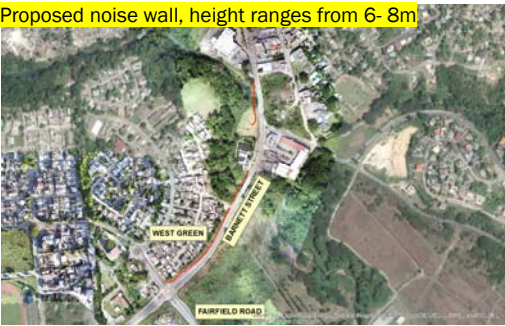
32



33

Barnett Street Dualization – Noise Mitigation

Proposed noise wall, height ranges from 6- 8m

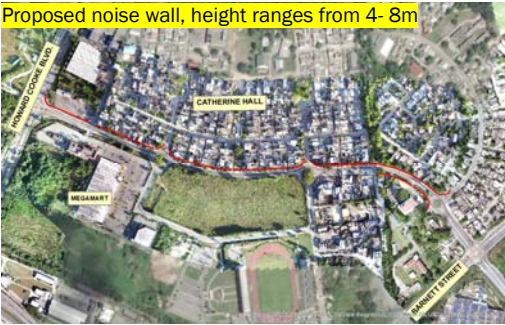


CL ENVIRONMENTAL

34

West Green Dualization – Noise Mitigation

Proposed noise wall, height ranges from 4- 8m



CL ENVIRONMENTAL

35


Vibration

CL ENVIRONMENTAL

36

Effects of Construction Vibration


PEAK PARTICLE VELOCITY (mm/sec)	EFFECTS ON HUMANS	EFFECTS ON BUILDINGS
< 0.127	Imperceptible	No effect on buildings
0.127 - 0.381	Barely perceptible	No effect on buildings
0.508 - 1.27	Level at which continuous vibrations begin to annoy in buildings	No effect on buildings
2.54 - 12.7	Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for damage to weak or sensitive structures
12.7 - 25.4	Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
25.4 - 50.8	Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.
>76.2	Vibration is unpleasant	Potential for architectural damage and possible minor structural damage



37

Montego Bay Perimeter Road – Potential Vibration Impacts

- Closest residential receptors to the proposed Montego Bay Perimeter Road range from 31 metres to 50 metres after road works are completed.
- Persons residing inside of these houses would perceive vibrations from construction activities to be unacceptable if exposed to it for continuous periods.
- If any blasting is to be conducted near these houses located these distances from the proposed alignment, vibrations would be considered bothersome by most persons, even if short term in length.
- Pile driving will most likely take place during bridge construction, e.g., in the vicinity of Irwin where a bridge is proposed to be constructed over the Montego River. Vibrations from pile driving activities would be considered unacceptable for persons in the closest residential receptor in Irwin located 38 metres away, if exposed to it for continuous periods.




38

Montego Bay Perimeter Road – Potential Vibration Impacts

Predicted vibration levels at five closest receptors along the Montego Bay Perimeter Road


CONSTRUCTION EQUIPMENT	RECEPTOR VIBRATION (PPV mm/sec)				
	Montego Hill (31m)	Fairfield (35m)	Irwin (38m)	Coral Gardens (40m)	Salt Spring (50m)
Vibratory Pile Driver	3.48	3.04	2.78	2.64	2.06
Vibratory Roller	1.47	1.28	1.17	1.11	0.87
Bulldozer	0.27	0.24	0.22	0.21	0.16
Excavator	0.27	0.24	0.22	0.21	0.16
Jack Hammer	0.07	0.07	0.06	0.06	0.04
Back Hoe	0.27	0.24	0.22	0.21	0.16
Loaded Dump Truck	0.25	0.22	0.20	0.19	0.15
Frontend Loader	0.27	0.24	0.22	0.21	0.16
Grader	0.27	0.24	0.22	0.21	0.16
Paver	0.25	0.22	0.20	0.19	0.15
Blasting	18.63	16.31	14.9	14.14	11.03



39

Montego Bay Perimeter Road – Potential Vibration Impacts


- Fairfield Great House
 - Fairfield Great House is the closest historical/cultural structure to the proposed alignments and is within 41m from the cut and fill area of the alignment.
 - Pile driving, blasting and vibratory roller has the highest vibration emission of the equipment listed.
 - From a building standpoint, the vibratory roller should have no effect on the Fairfield Great House at this distance.
 - If pile driving is to be conducted, there would be minimal risk for damage to weak or sensitive structures.
 - However, if any blasting is to be conducted, there would be some risk of architectural damage to any ancient monuments and ruins.



40

Long Hill Bypass – Potential Vibration Impacts

- Closest residential receptors to the proposed Long Hill Bypass range from 15 -20 m after road works are completed.
- Persons residing inside of these houses would perceive vibrations from construction activities to be unacceptable if exposed to it for continuous periods.
- If any blasting is to be conducted near these houses, vibrations would be considered unpleasant by most persons.




41

Long Hill Bypass – Potential Vibration Impacts

Predicted vibration levels at three closest receptors along the Long Hill Bypass


CONSTRUCTION EQUIPMENT	RECEPTOR VIBRATION (PPV mm/sec)		
	Mount Carey (15m)	Bogue (18m)	Anchovy (20m)
Vibratory Pile Driver	7.79	6.33	5.59
Vibratory Roller	3.28	2.67	2.36
Bulldozer	0.61	0.50	0.44
Excavator	0.61	0.50	0.44
Jack Hammer	0.17	0.14	0.12
Back Hoe	0.61	0.50	0.44
Loaded Dump Truck	0.56	0.45	0.40
Frontend Loader	0.61	0.50	0.44
Grader	0.61	0.50	0.44
Paver	0.56	0.45	0.40
Blasting	41.72	33.93	29.97



42

West Green Dualization – Potential Vibration Impacts


- Existing Vibration
 - Vibration events recorded (PPV of 0.762 mm/sec) indicated that vibration levels are likely in residential environments to cause complaint
 - Can be tolerated if prior warning and explanation has been given to residents
 - Have no effect on building structures
 - Vibration from loaded truck expected perceptible and may annoy persons inside their homes if continuous.
 - No effect on building structures



43

West Green Dualization – Potential Vibration Impacts

- Predicted Vibration
 - Results show that persons residing inside of these houses would perceive vibrations from construction activities to be bothersome and unpleasant
 - Vibratory roller has the highest vibration emission of all the equipment listed. From a building standpoint, there is potential for architectural damage and minor structural damage of houses located 0.3m and 0.5m from the proposed roadway.
 - Houses located 1.7m and 3m from the proposed roadway, there is the potential for architectural damage of buildings with plastered ceilings and walls.




44

West Green Dualization – Potential Vibration Impacts

- Predicted Vibration

Effects of Construction Vibration


CONSTRUCTION EQUIPMENT	RECEPTOR VIBRATION (PPV mm/sec)			
	0.3 m	0.5 m	1.7 m	3 m
Vibratory Roller	242.85	137.83	35.85	19.20
Bulldozer	45.28	25.70	6.68	3.58
Excavator	45.28	25.70	6.68	3.58
Jack Hammer	12.35	7.01	1.82	0.98
Back Hoe	45.28	25.70	6.68	3.58
Loaded Dump Truck	41.16	23.36	6.08	3.25
Frontend Loader	45.28	25.70	6.68	3.58
Grader	45.28	25.70	6.68	3.58
Paver	41.16	23.36	6.08	3.25



45

Vibration Mitigation

- Conducting pre-blast crack surveys which documents the existing status of structures (homes and residences) within 500m of the alignment.
- Executing pre-blast tests to monitor effects, measure attenuation characteristics and minimize vibration impacts.
- Phase demolition, earth-moving and ground-impacting operations so as not to occur in the same time period.
- Avoid impact pile driving where possible in vibration-sensitive areas. Drilled piles or vibratory pile driving causes lower vibration.
- Have regular meetings or devise a communication strategy to inform the residents and businesses of construction and blasting activities.



46



Impacted Structures



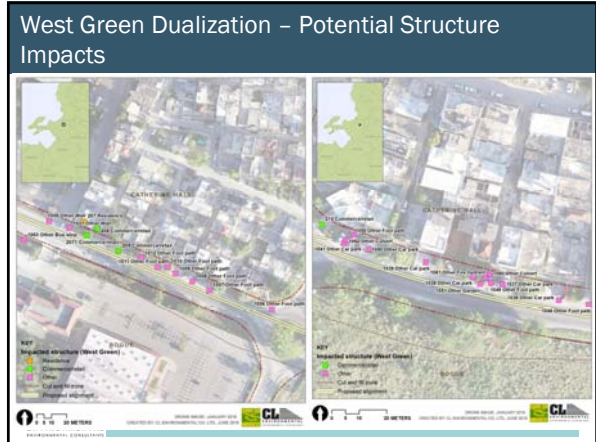
47

Montego Bay Perimeter Road – Potential Structure Impacts

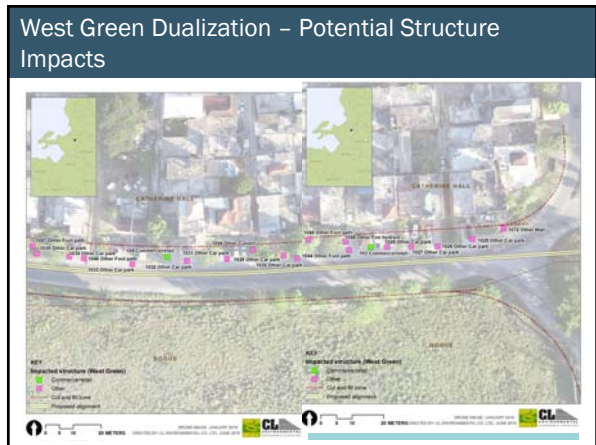
Structure type	Number
Residence	91
Commerce/retail	31
Unfinished Structure/ Building Foundation	20
Not disclosed	13
Other	
Storage	11
Wall	10
Animal rearing/ pet	9
Fence	5
Graves	5
Foot path	4
Not specified	4
Farm	3
water tank	3
Car park	2
Driveway entrance	2
Leeway plant infra	2
Sidewalk	2
Bathroom	1
Bus stop	1
Church	1
container	1
Garage	1
Kitchen	1
School	1
Stairway	1
Total	225

48



52



53


Flora and Fauna

CL ENVIRONMENTAL
Environmental Consultants

54

FLORA

- The study area had a wide variation in both highly developed lands (used for agricultural, semi-industrial and residential purposes) as well as disturbed, woodland vegetation growing on alluvium with some limestone outcroppings
- Summary of Species found
 - 142 along the Montego Bay Perimeter Road
 - 135 along the Long Hill Bypass
 - 76 along West Green
 - 49 plants along Barnett Street




CL ENVIRONMENTAL
ENVIRONMENTAL CONSULTANTS

55

Forest, Mangroves and Endemic Species

- A large percentage of forests in Jamaica are in disturbed and degraded states
- The alignment traverses areas designated as forest estates that are populated by disturbed broadleaf forest, Mangrove and Wetland Areas
- Endemic species are present along the proposed alignment
- Example *Thrinax parviflora* (Broom Thatch)



CL ENVIRONMENTAL
ENVIRONMENTAL CONSULTANTS

56

15 Endemic Species Occurrence and Locations Identified

Scientific name	Common name	Growth form	Scientific name	Common name	Growth form
<i>Cordia bullata</i>		Shrub	<i>Paullinia barbadensis</i>	Supple Jack	Climber/Twiner
<i>Roystonea altissima</i>	Mountain Cabbage	Tree	<i>Sabal jamaicensis</i>	Bull Thatch	Tree
<i>Zamia sp.</i>		Shrub	<i>Roystonea altissima</i>	Mountain Cabbage	Tree
<i>Cordia bullata</i>		Shrub	<i>Serjania laevigata</i>		Climber/Twiner
<i>Eugenia amplifolia</i>		Tree	<i>Eupatorium triste</i>	Old Woman's Bitter Bush	Shrub
<i>Galactia pendula</i>		Climber/Twiner	<i>Hibiscus elatus</i>	Blue Mahoe	Tree
<i>Lisianthus longifolius</i>	Jamaican Fuchsia	Shrub	<i>Piper amalago var. nigrinodum</i>	Black Joints	Tree
<i>Thrinax parviflora</i>	Broom Thatch	Tree	<i>Rytidophyllum tomentosum</i>	Search-me-Heart	Herb
<i>Hohenbergia sp.</i>		Epiphyte			
<i>Hylocereus triangularis</i>	God Okra	Epiphyte			

CL ENVIRONMENTAL
ENVIRONMENTAL CONSULTANTS

57

BROADLEAF FOREST- Montego Bay Perimeter Road – Impacts

- Total area of impacted broadleaf forest along Montego Bay Perimeter Road is 324,895.5 sq. m (32.5 hectares),
- Of which 101,981.4 sq. m (10.2 hectares) is crown land
- Reforestation plan developed and proposal submitted to Forestry Department for Approval.
- **60 hectares of land in NROCC's ownership identified for replanting.**

CL ENVIRONMENTAL

58

BROADLEAF FOREST- Long Hill Bypass – Impacts

- Total area of impacted broadleaf forest along Long Hill Bypass is 347,341.9 sq. m (34.7 hectares)
- Of which 7,736.2 sq. m (0.77 hectares) is crown land.
- Reforestation plan developed and proposal submitted to Forestry Department for Approval.
- **60 hectares of land in NROCC's ownership identified for replanting.**

CL ENVIRONMENTAL

59

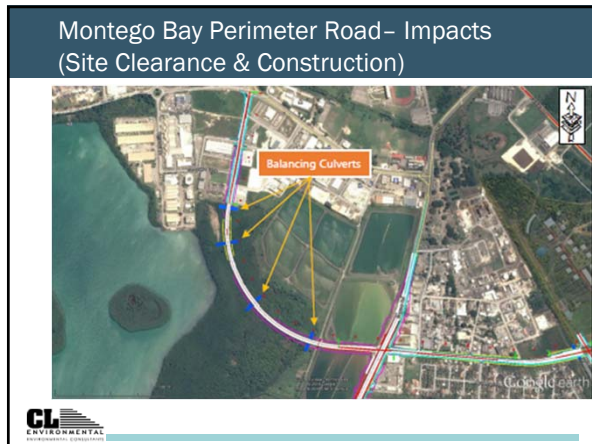
Montego Bay Perimeter Road – Impacts (Site Clearance & Construction)

Mangrove Forest

- Montego Bay Perimeter Road through the mangrove forest at Bogue/Freeport will impact an area of 27,090.02 m² of mangrove (2.71 hectares)

CL ENVIRONMENTAL

60



61

Fauna

- Species with special conservation status and protection were identified, in particular the Endemic Bromeliad Fauna

62

Fauna


- 7 Amphibians; 5 Endemic, 2 introduced.
- 13 Reptiles; 12 Endemic, 1 introduced.
- Land Snails
 - 14 Woodland species
 - 12 Endemic, 1 Introduced, 1 Unknown.
 - 16 Limestone Forest Species
 - 15 Endemic, 1 Introduced.

- Eleutherodactylus luteolus*
 - Endangered Bromeliad frog.
 - Limited range in the western section of Jamaica.
 - Their distribution is severely fragmented.


63

Fauna

- Butterflies
- 12 Woodland Species, 0 Endemic
- 19 Limestone Species, 2 Endemic
- Surveys were conducted during a major drought period, more species expected during the wet season



- Jamaican Bromeliad Crab *Metopaulias depressus*
- 3 Dragonfly species
- Other species include freshwater insects




64

Avifauna

- Terrestrial Species
- 44 Species in Limestone Forest Areas
 - 15 endemic, 20 resident, 8 migrant and 1 introduced
- 32 Species in Woodland Habitats
- More endemic birds seen in forested areas including forest specialists such as the Jamaican Lizard Cuckoo, Jamaican Euphonia and the Jamaica Tody.



- Wetland Species
- Over 500 birds seen at the Bogue Sewage Pond
- The Bogue wetland is a habitat for local and migrant waterfowls.
- Most were migrant waterfowl
- No wetland bird of special conservation status was observed



65

Bats

- The cave surveyed within 1 kilometer of the alignment, did not show any signs of bat.
- The closest cave recorded to have bats is located 553.4 meters away from the proposed Barnett Street upgrade component (Sewell Cave).






66

Mangrove Species

- Mangrove Forest Species
- 13 Wetland bird species were seen in the mangrove
- 2 Species of crab
- Lizards
- Wasps
- Snails

- Prop Root Species
- Oysters (*Isognomon alatus*) – were the main colonizer
- Other colonizing species include, sponges, hydroids and other encrusting species



67

THANK YOU



Feedback and Questions

DOWNLOAD THE FULL REPORT

<http://www.h2kjamaica.com.jm/home>

<http://clenvironmental.com/>

<https://www.nepa.gov.jm/>



68
