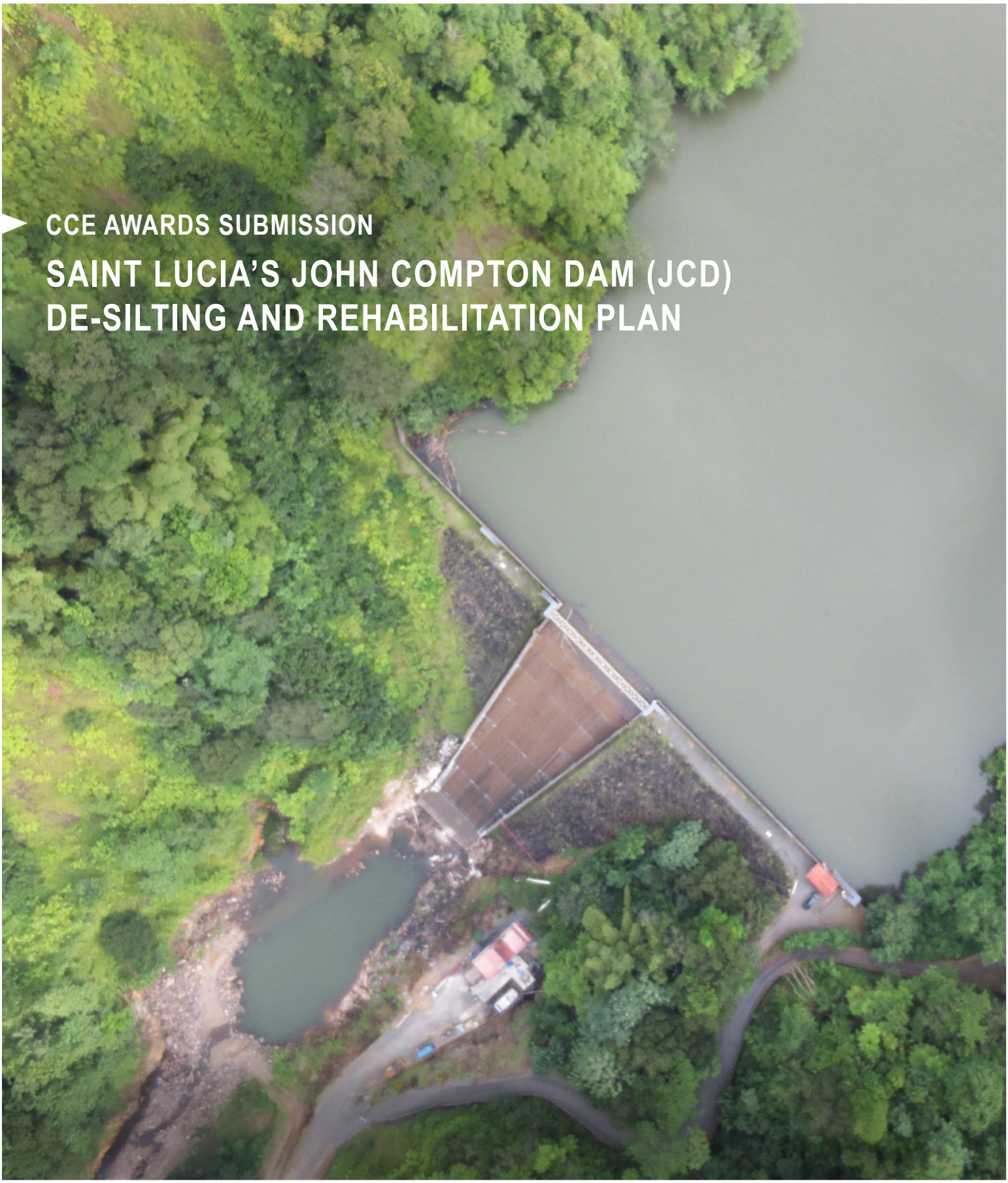


CCE AWARDS SUBMISSION

SAINT LUCIA'S JOHN COMPTON DAM (JCD) DE-SILTING AND REHABILITATION PLAN

Golder Associates

PROJECT SUMMARY

The people of Saint Lucia rely on the water supply from John Compton Dam for about half of the island water supply. Unfortunately, hurricanes and tropical storms have triggered landslides that delivered sediment to the reservoir which reduced the storage capacity by about 50%. Golder Associates developed a recommended plan with designs to restore the water supply, provide opportunities for local employment, be resilient in the event of future climate change, and be environmentally acceptable.

For International Submissions (H): answer Q11-Q15

SOCIAL AND/OR ECONOMIC BENEFITS

Briefly introduce your project, i.e. what was done and why? Then explain the social and economic benefits it provided to the other country. Be specific and provide qualitative and quantitative information.

The Government of Saint Lucia (GOSL), based on a grant from the Caribbean Development Bank (CDB), financed this project to restore the water supply from the John Compton Dam (JCD). The contract was administered by the Saint Lucia Water and Sewerage Company Incorporated (WASCO). The project was of such high importance to the water supply and economy of Saint Lucia that the work occurred over a compressed time line of nine months from October 2014 to June 2015. Golder Associates Ltd. (Golder) with Morrison Hershfield and local partners delivered a report that WASCO is now in the process of implementing.

The JCD project involved developing a plan to restore the island water supply at the main surface water reservoir, which had been compromised by sediment displacing about 50% of the storage capacity.

The recommended plan and designs consist of the following:

- Increase the 37% water supply reliability to 97% (i.e. 97% probability that WASCO can avoid severe water rationing in any given year) by a combination of measures: 1) nominal initial dredging to restore the lower intake port near the dam, 2) utilizing the available storage by adopting a different management rule for triggering water rationing, and 3) utilizing emergency river sources;
- Long-term dredging of sediment of the reservoir at a manageable rate to stay ahead of future sediment loading to the reservoir, and providing permanent local employment opportunities related to the dredge program;
- Remove sediment preferentially after initially restoring the water supply intake, focusing on dredging areas of re-usable sand sediment within the “active storage” portion of the reservoir – thereby maximizing the benefits of dredging towards improved water supply reliability;
- Construct impoundment dykes to deposit the sediment at a nearby site;
- Direct the removal of large woody debris from the reservoir as a potential resource for the local economy; and
- Implement other plans to manage residual environment risks and socio-economic issues.

The resulting plan is expected to initially cost less than $15 million (USD) to restore the water supply, with the potential for future sediment re-use to fund the long-term project.

TECHNOLOGY TRANSFER

Explain how the project transfers new and useful Canadian technology and know-how to the other country.

Golder's recommended plan was achieved because of early stakeholder consultation, and because of the balanced team of experts who contributed ideas to the project. A winning attribute for the project included strong local partners who provided support during the site investigations.

The local partners will also be the target of technology transfer through the construction phase of the project, and are expected to play a large role through construction. New technologies were also utilized, including an unmanned aerial vehicle (UAV) survey of the reservoir and sediment beach. The UAV survey allowed the project to accurately measure the quantity of beach sediment, and provided WASCO and local forest managers with the first high resolution imagery of the surrounding landslide areas. The attached map (Appendix B) shows the UAV imagery, the UAV-derived beach topography, and underwater bathometry from a survey by boat.

ENVIRONMENTAL BENEFITS

Explain how your project addresses environmental/sustainability issues.

The general configuration of JCD is shown on Figure 1.

Recent climate conditions have affected water availability because 9 of the 10 worst droughts have occurred in the past 30 years, based on an analysis of precipitation records dating back to 1890. The drought of 2001, estimated as the 100-year drought, is the worst drought on record. Extreme weather events have also affected the JCD in terms of reservoir sedimentation. Reservoir sedimentation affects WASCO's ability to deliver water during drought conditions, because it reduces the emergency water volume.

An assessment of benefits of costs was used to compare a short list of key options to de-silt the reservoir. The assessment priorities focused on restoring the water supply at a reasonable cost, providing management measures for long-term sedimentation, avoiding environmental impacts where possible, and facilitating further measures to enhance the water supply from Roseau River. The assessment results summarized on Figure 2 provide a basis for selecting a preferred option.

Figure 1: John Compton Dam General Arrangement (imagery from Golder UAV survey, October 2014).

Together, the recommendations and design package provide WASCO with a sustainable and resilient path forward that has the support of stakeholders, government agencies, and funding agencies. The plan is a hybrid solution that involves both capital investments and management measures, and the recommendations do not limit the further development of this or other water sources. The work met a broad range of expectations, including funding agency requirements to protect against climate change vulnerability.

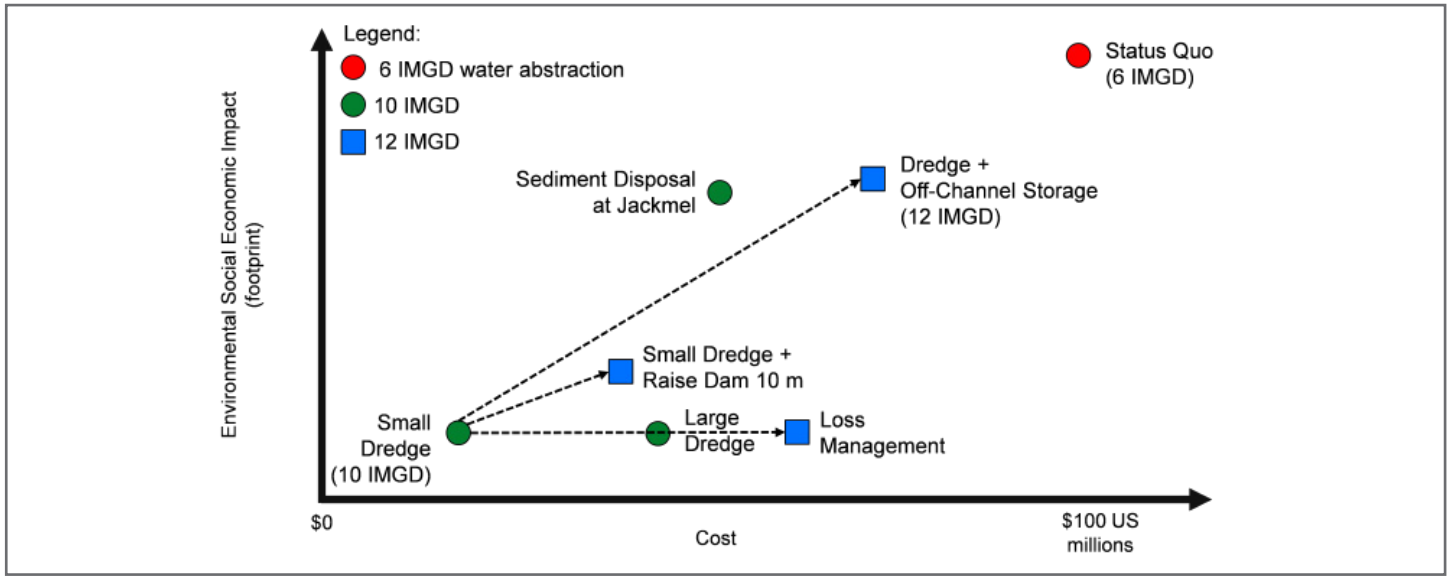


Figure 2: Summary Comparison of Selected Water Management Options

COMPLEXITY

Explain the complex nature of your project and any extraordinary problems and conditions that were overcome.

Three events have impacted the reservoir since the start of construction: Hurricane Debby in 1994, Hurricane Tomas in 2010, and the 2013 Christmas Eve Storm. These events account for the majority of sediment delivery to the reservoir as a result of landslides near the rim of the reservoir. The landslides and potential future landslides are geological hazards that influence the operating life of JCD. The characteristics of this sediment further influences how the sediment can be managed.

The original water storage capacity was 3 million m3. As of October 2014, there were at least 1.5 million m3 of sediment accumulation, of which 1.1 million m3 or 75% of the sediment is within the reservoir below the spillway elevation of 101.5 m. The remaining 0.4 million m3 is deposited on the upstream beach above the spillway elevation. About 2/3 of all the sediment was deposited as a result of landslides triggered during Hurricane Tomas in 2010.

Sediment covers the lower of the two water supply intake ports (see Figure 3) by 3 m to 4 m. The remaining upper intake port has access to the top 6.5 m of water in the reservoir. Below the lower port, the water in the reservoir is “dead” storage because it is not accessible at the intake elevation. The resulting water supply reliability is about 37%, implying that water rationing is needed in most years during the dry season, most likely in the months of March through June.

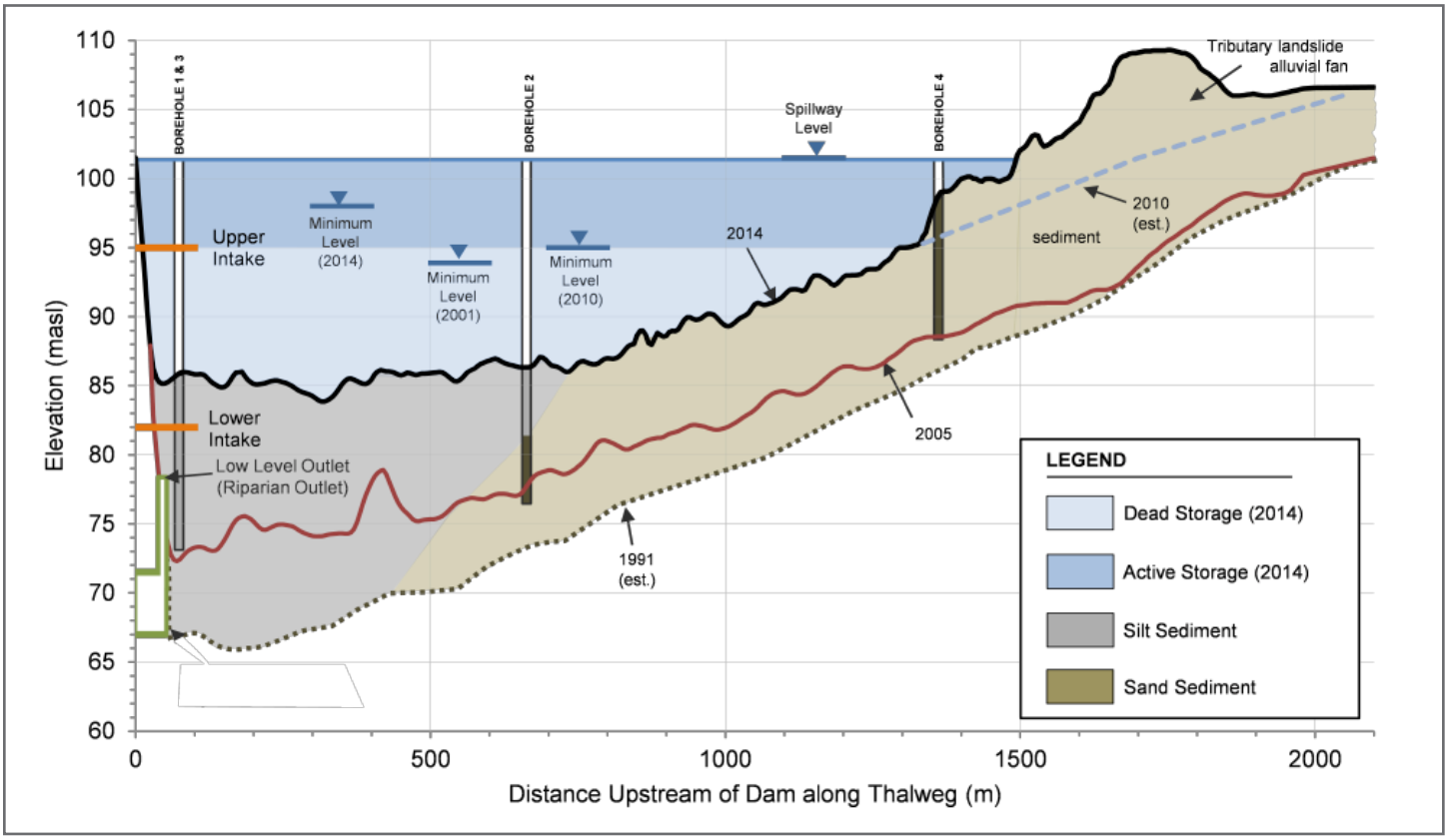


Figure 3: Distribution of Reservoir Sediment (as measured along the Original Roseau River Thalweg)

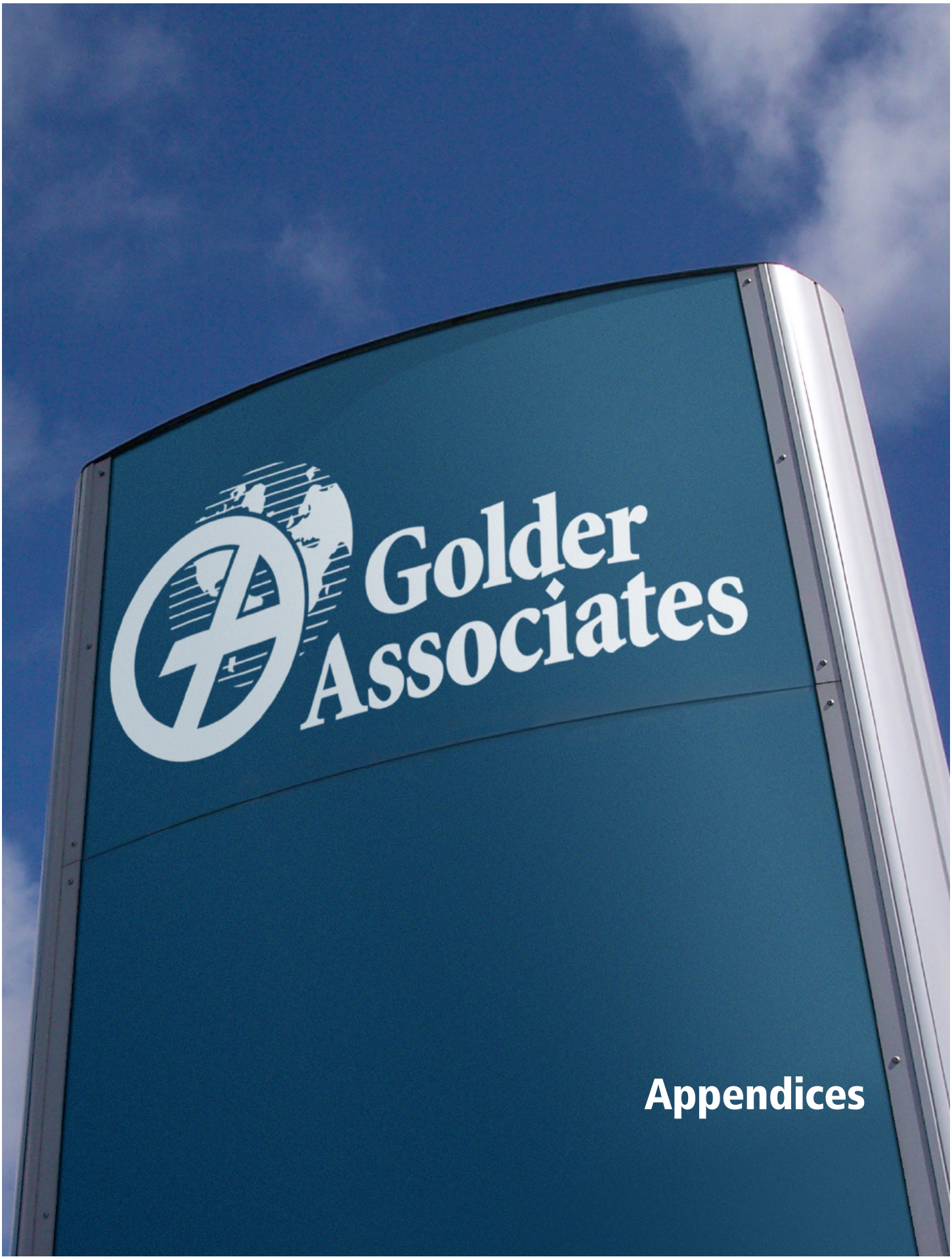
MEETING OWNER'S NEEDS

Explain the client's main project goals and how you met them.

The scope of work included site investigations, public meetings, environmental assessments, recommendations, detailed engineering design, technical specifications and a tender documents. Golder with Morrison Hershfield and local partners delivered a report with design drawings and technical specifications totaling over 1600 pages. The recommended plan restores the reliability of the water supply to acceptable levels at minimum cost.

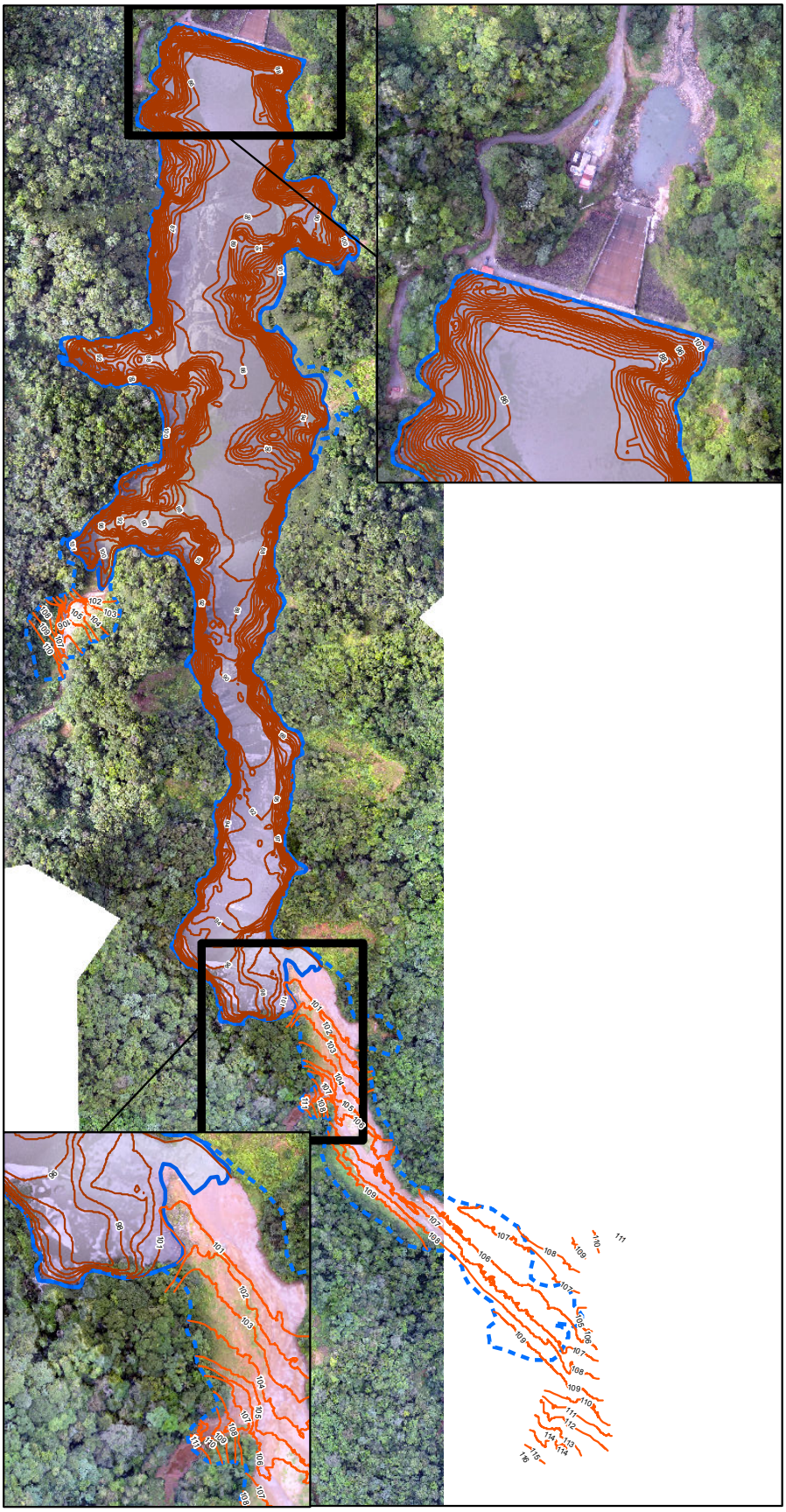
The early assessments required expertise related to water supply planning, hydrology, the environment, local social issues, and water supply infrastructure. Experts in sediment management, dam engineering and dredging developed the designs and specifications. These factors, plus consulting experience in containing dredged sediment, all contributed to the technical quality of the recommendations and subsequent design.

This project should be considered for recognition because it is important to the water supply and economy of Saint Lucia, required a broad range of engineering and environmental expertise, and was delivered in a timely manner in line with emergency conditions.



Appendices

APPENDIX B



LEGEND

1m CONTOUR (UAV SURVEY)

1m CONTOUR (BATHYMETRY)

ROSEAU RESERVOIR AT 101m (2005) APPROXIMATE

ROSEAU RESERVOIR AT 101.5m (2014)

0 250 500

METERS

1:7,500

REFERENCE(S)

IMAGERY AND TOPOGRAPHIC CONTOURS BASED ON UNMANNED AERIAL VEHICLE SURVEY BY GOLDER ASSOCIATES ON OCTOBER 4, 2014. BATHYMETRY CONTOURS BASED ON BATHYMETRY BOAT SURVEY BY GOLDER ASSOCIATES ON OCTOBER 8, 2014.

DATUM: WGS84 PROJECTION: UTM ZONE 20N

CLIENT

WASCO

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-10-17
DESIGNED	A.OOSTING
PREPARED	PTHIEDE
REVIEWED	A.OOSTING
APPROVED	M.BENDER

PROJECT

JOHN COMPTON DAM DE-SILTING

ST. LUCIA

TITLE

RESERVOIR IMAGERY AND SEDIMENT TOPOGRAPHY

PROJECT NO. 1404142

CONTROL

REV. 0

FIGURE

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