

Project Management Plan

Introduction Project Management Plan

This teaching example illustrates how a project manager creates a structured, strategic, and effective project management plan to lead the rehabilitation of a main transportation artery in British Columbia which suffered extensive damage from the 2022 flood catastrophe. The devastating floods resulted in extensive damage to highways, railways, bridges and other support infrastructure, cutting off the Lower Mainland from the remainder of Canada's interior. The severe loss of service created a clear need for a coordinated recovery process that would allow the re-establishment of transportation services to occur as quickly and safely as possible.

In this teaching example, the goal is to illustrate how a project manager designs and organizes an effective project plan for the rehabilitation of a transportation artery while utilizing established and proven project management tools and techniques. These tools assist in breaking down complex recovery efforts into manageable components, in assigning responsibility for specific portions of the project, and in supporting the decision-making process with data, structure and foresight.

The first portion of the project plan involves defining the scope of the project; the scope defines the boundaries, responsibilities, and expected outcomes of the construction work. The definition of the project scope at the beginning of the project assists all stakeholders (the government agencies, the engineering teams, the contractor, and the community partners) to understand the objectives of the project. Following the development of the project scope, the next step is to develop a Work Breakdown Structure (WBS). The WBS breaks the construction project into many small, discrete, and actionable tasks including but not limited to, the removal of debris, geotechnical assessment, repair of structures, environmental remediation, and the phased reopening of the transportation corridor. The elements of the WBS provide clarity and facilitate communication among the participants of the project by allowing the large-scale construction project to be divided into smaller segments that can be scheduled and resourced.

Following the development of the WBS, the next element of the project plan is a Gantt Schedule. A Gantt Schedule is a visual representation of the task sequences, task durations, dependencies between tasks and milestones that establish the timing of the project. A Gantt Schedule is a valuable tool for establishing expectations regarding the rate of progress of the project, and for assuring that the project remains on track; both of these factors are

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particularly important in disaster recovery projects where project delays can result in significant economic and social consequences.

Risk management is another element of the project plan. All projects carry inherent risk, and disaster related construction projects carry additional risk due to a variety of factors including but not limited to, unstable soil conditions, variable weather patterns, potential supply chain disruptions, and labor shortages. The project plan addresses each of these issues by identifying potential risks prior to the initiation of the project, and by establishing risk mitigation strategies to address each identified issue. The establishment of proactive response plans reduces the likelihood of costly setbacks resulting from reactive responses to unanticipated events.

Stakeholder identification and stakeholder engagement are additional elements of the project plan. Disaster recovery projects impact a broad range of stakeholders including but not limited to, local residents and indigenous communities, commercial transportation operators, and government regulatory agencies. The project plan establishes a framework for understanding the needs, expectations, and level of influence of each stakeholder group. Through this framework, the project maintains transparency, builds trust, and makes decisions that are aligned with the priorities of both the public and private sectors.

The final element of the project plan is the resource management plan that describes how the project personnel, equipment, materials, and funding will be managed. Effective resource utilization is crucial for facilitating the efficient and timely completion of the project.

In summary, this teaching example demonstrates how established and proven project management tools and techniques can be utilized in real world disaster recovery projects to develop a structured, strategic, and effective plan for the reconstruction of critical infrastructure.

Reconstruction of Principal Corridor for Movement of Goods and Peoples

Description of the Project

Project Selected

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The reconstruction of a principal corridor for the transportation of people and goods (Highway 5)

In British Columbia, a critical component of the province's transportation system, the Coquihalla Highway, is one of the most important routes for the Lower Mainland to connect to the rest of Canada and all of its interior regions. In addition to the highway itself, the corridor includes key bridges and necessary supporting infrastructure including slope stabilization, retaining walls, drainage systems, and culverts. During the 2022 floods, all of these types of infrastructure suffered severe impacts resulting in extensive service disruption, public safety hazards and considerable loss of revenue.

To restore a safe, reliable and sustainable corridor that can handle both present and future volumes, is the main objective of this reconstruction project. Due to increasing frequency and intensity of extreme weather events, the objective of the project is not only to rebuild damaged components of the corridor, but to make it more resilient as well. As an example, all structural components will be built to withstand extreme rain, flooding, erosion and other climate change related hazards.

The reconstruction project is divided into two separate phases.

Phase 1 of the project is focused on the immediate or short-term reconstruction of the corridor to provide the shortest time frame for restoring temporary access to traffic. This includes removing debris from the road, installing temporary bridges, stabilizing slopes, and repairing necessary roadway segments to facilitate restricted but functional access for emergency services, commercial vehicle use and essential passenger travel.

Phase 2 of the project is focused on the long-term or permanent reconstruction and upgrade of the corridor. This includes designing and building permanent bridges, upgrading drainage systems, reinforcing embankments and redesigning sections of the highway that are vulnerable to the same type of extreme weather events. This will result in a rebuilt corridor that meets modern safety standards and is resilient in the event of extreme weather events.

This corridor is fundamental to the economy of British Columbia and to Canada's overall supply chain. It provides access for the movement of commercial goods, facilitates

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emergency response and enables thousands of people to travel each day. Therefore, it is very important to restore this corridor in a timely and responsible manner to maintain regional stability, public safety and to help in the provincial economy's recovery process.

Scope

In-scope:

Assessing damage to infrastructure due to floods and landslides;

Stabilizing slopes and removing debris;

Constructing and rebuilding collapsed bridges;

Building and reconstructing washed-out sections of the road;

Installing new systems to drain and prevent flooding;

Creating temporary detours during construction;

Working with environmental and regulatory bodies;

Out-of-Scope:

Building unrelated local roads;

Designing or building new routes of transportation outside of the corridor footprint;

Providing emergency assistance that has already been provided by other agencies;

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Developing plans for long-term climate adaptation that go beyond the minimum requirements for rebuilding the corridor;

Deliverables

Reports and documentation:

Structural engineering assessment report;

Detailed corridor reconstruction plan;

Documentation and certification:

Rebuilt bridge structures;

Reconstructed highway segments;

Documentation and certification of installed systems:

New flood-resistance systems;

Certification of corridor reopened.

Work Breakdown Structure (WBS)

A WBS is a tool to break down a project into smaller parts.

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Level 1: Corridor Reconstruction Project

1.0 Project Management

1.1 Project Initiation

1.2 Procurement

1.3 Monitoring and Reporting

1.4 Closeout

2.0 Assessment and Planning

2.1 Damage Surveys

2.2 Geotechnical Investigations

2.3 Environmental Approvals

2.4 Engineering Design

3.0 Site Preparation

3.1 Debris Removal

3.2 Landslide Stabilization

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3.3 Temporary Access Roads

4.0 Bridge Reconstruction

4.1 Foundation Preparation

4.2 Structural Construction

4.3 Deck Installation

4.4 Load Testing

5.0 Highway Reconstruction

5.1 Roadbed Rebuilding

5.2 Asphalt Surfacing

5.3 Drainage Installation

5.4 Guardrails and Barriers

6.0 Flood-Mitigation Systems

6.1 Culvert Installation

6.2 Slope Reinforcement

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6.3 Water Management Systems

7.0 Testing and Handover

7.1 Safety Inspection

7.2 Compliance with Regulations

7.3 Final Approvals

7.4 Corridor Reopening

Quad Chart

A Quad Chart is a one-page summary of the entire project.

Upper Left Side: Problem Statement

Severe flooding and landslides in the area destroyed large sections of the transportation corridor, causing isolated communities and disruption to the national supply chain.

Upper Right Side: Objectives

Restoring the corridor so it is functionally operational while being safe for operation

Ensuring the long-term structures will be able to survive extreme weather conditions.

Limiting the time for which supply chains are disrupted.

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Completing all aspects of the reconstruction within budget and time frame established.

Lower Left Side: Methodology

Phase-by-phase recovery of the corridor.

Conduct geotechnical assessments.

Build permanent structural replacements.

Coordinate with all stakeholders involved.

Use risk-based planning methodology.

Lower Right Side: Critical Risks/Constraints

Weather-related delays

Time required for environmental authority approvals

Escalating cost of materials

Restrictions to access the damaged areas.

Gantt Chart

Here is a written description of the type of information that would appear in a Gantt Chart:

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Months 1-2

Assessment and Planning

Damage assessments

Engineering designs

Obtain necessary environmental approvals

Months 3-4

Site Preparation

Remove debris

Temporary access roads

Landslide stabilization

Months 5-9

Bridge and Highway Reconstruction

Foundation and structural work

Reconstruct roadbeds

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Install drainage systems

Months 10-11

Flood Mitigation Systems

Culverts

Slope reinforcement

Month 12

Testing and Handover

Final inspections to ensure the corridor is safe to reopen

Reopen the corridor

(Adjustable timing based upon weather, funding, and engineering complexities)

Stakeholder Involvement

Primary Stakeholders:

British Columbia Ministry of Transportation

Government of Canada

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Contractors providing engineering and construction services

Companies shipping goods by freight and logistics companies

Communities impacted by the closure of the transportation corridor

Emergency responders

Secondary Stakeholders:

Agencies regulating environment and natural resources

Indigenous Communities

Insurance Agencies

Businesses operating locally

Plan for Stakeholder Engagement:

Meetings with primary contractors at least weekly to discuss progress

Public updates regarding the status of the project through the ministry website

Engagement with indigenous communities prior to commencing any land development to identify potential impacts

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Management of detours for freight operators

Coordination with agencies responsible for ensuring environmental regulations are followed.

Resource Allocation

Human Resources

Project Manager

Civil and Structural Engineers

Geotechnical Specialists

Environmental Consultants

Construction Crews

Surveyors

Safety Officers

Equipment Resources

Bulldozers

Haul Trucks

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Bridge Building Equipment

Drone Survey

Asphalt Plant & Paver

Temporary Traffic Control Systems

Budgetary Resources

(This section would normally contain cost-estimation categories, including labour, materials, contingency, overheads, and risk allowance.)

Material Resources

Steel

Concrete

Asphalt

Culverts

Drainage Pipes

Rock and Fill Material

Geosynthetics (reinforcement material)

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Risk Assessment

Risk	Impact	Likelihood	Mitigation	Strategy	
Weather Forecasts	Delays	Severe	High	Medium	Build Buffer Schedule; Monitor Weather
Materials	Cost	Inflation	High	High	Contract Early; Contingency Funds
Delays Engagement	Obtaining with Regulators	Environmental Approval	Medium	Medium	Early
Safety Incidents	High	Low	Mandatory Safety Training; Daily Briefings		
Restricted Access to Damaged Area	Staged Work Zones	Medium	Medium	Temporary Access Roads;	
Disruptions to Supply Chain	Where Possible	Medium	Medium	Multiple Suppliers; Local Sourcing	

Risk Monitoring is an ongoing process during the entire Project Lifecycle.

Conclusion

In addition to the key points previously outlined, the plan also clearly articulates the importance of identifying a rationale for the project prior to initiating the work; in a disaster scenario, there is typically high levels of both urgency and complexity simultaneously, and thus, the Project Manager must continue to articulate a clear and defensible explanation of why the work is being done. Additionally, the Introduction and Project Description sections of the document provide examples of how to explain the problem, the consequences of inaction, and the expected outcome(s) of the project; this provides stakeholders with an understanding of why the project is needed and what the project will achieve.

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Furthermore, the Scope section of the plan clearly outlines how defining the scope of the project helps to avoid ambiguity and ensures that only the necessary elements are included in the project. In the case of reconstruction work following a disaster, competing priorities and needs may exist among various parties affected by the disaster, including multiple agencies and/or community groups. Establishing clear inclusions and exclusions within the scope of the project enables the project manager to keep the project focused on its objectives and ensure that the time, money and personnel available for the project are used effectively to address the most critical issues.

As mentioned previously, the Work Breakdown Structure (WBS) is a methodical way of breaking down a large project into smaller, component parts that are easier to manage and measure. As a result, this section of the plan serves as a practical teaching example for demonstrating how to break down a large, complex engineering task into smaller, measurable components that can be managed using hierarchical planning methods.

In addition to the WBS, the use of a Quad Chart and Gantt Chart are other practical tools for communicating project information to stakeholders. These charts summarize the project timeline and major milestones into a format that is easily interpreted by non-technical individuals. From a teaching perspective, these types of visual aids serve as a reminder to the student of the importance of keeping communications simple and straightforward, especially in projects involving a wide variety of stakeholders including government agencies, contractors, regulatory bodies and members of the general public.

As shown in the Stakeholders Analysis section of the plan, large infrastructure projects affect many different people and organizations. The plan outlines the process for identifying all the individuals, groups and organizations that are impacted by the project, and determining who has input into the project decisions and who should receive regular updates about the project status. The plan demonstrates that stakeholder analysis and management is an integral part of the project management process, and that it is not something that can be ignored if the project is to be successful.

Finally, the Risk Management section of the plan demonstrates a structured approach to identifying potential problems that may impact the project. By outlining the steps involved in identifying, evaluating and mitigating risks, the plan demonstrates to students how they can minimize the likelihood of problems arising and therefore allow them to maintain control over the project schedule and costs.

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This plan serves as a useful teaching example because it demonstrates all of the major components of the project management methodology and illustrates how each of the project management tools contribute to the overall clarity, structure and decision-making framework of the project.

List of References

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Reflection on Feedback



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My supervisors' and peers' comments about my reconstruction project were overwhelmingly favorable and provided me with a clear understanding of the present status of my reconstruction project's progress; identifying both the successful components of the project as well as those that need to be developed further. The comments helped identify which parts of the project have been successfully executed as well as which parts will require additional work and/or resources. My poster presentation highlighted the rebuilding of vital infrastructure within the transportation networks that were severely impacted by flooding in British Columbia. Specifically, I highlighted how major bridges and vital highway sections would provide the connectivity between the devastated area and other regions of Canada allowing for the continued support of the long term social and economic recovery efforts in the affected region.

My supervisor felt that I presented the project clearly, effectively identified the impacts to society (i.e. economic), and carried out an adequate situational analysis (i.e., impacts on farms, public facilities, and supply lines). However, my supervisor indicated that I should have provided greater detail in terms of the project management methodology used, i.e., I should have shown how I would apply WBS, Gantt charts, and risk analysis in a practical manner in this particular project. It was also suggested that I provide a clearer explanation for why I chose the solution for the reconstruction of the damaged infrastructure and how it addressed the unique needs of the stakeholders.

Reflection on Feedback

I also found the comments from my peers to be extremely valuable. Most of them appreciated the visual nature of the poster, i.e. the "before" and "after" pictures of the affected infrastructure illustrated the gravity of the situation. A couple of my peers said that some of the sections could have been improved by adding more detail about the practical application of the project activities, since at times the presentation was overly general. A couple of my peers also stated that including a more detailed plan for communicating with stakeholders (e.g. local communities and transportation companies) would have been beneficial.

In regards to what I did well, I feel I effectively communicated the extent of the problem and the need for immediate intervention in British Columbia. The poster was organized in a visually appealing manner with brief and appropriate content. Also, the oral presentation was consistent and I effectively communicated the relationship between the damaged transportation infrastructure and the overall regional economic impact.

With all of the comments received, I plan to implement changes to improve the final version of the document. First, I will update the Work Breakdown Structure portion of the document to include more of the operational details and show who is responsible for each activity. Second, I will develop the risk analysis further to identify risks associated with climate change and delays in supply line delivery. I will also continue to develop the stakeholder engagement plan, e.g., through regular meetings with the community and open communication channels. Lastly, I will more thoroughly incorporate the project management principles learned throughout the module into the document to demonstrate a thorough application of the methodologies.

Overall, I feel the comments I received provided me with a clear direction to improve the project and ultimately produce a final document that is significantly more comprehensive, detailed, and professional.

Reconstruction of Local Infrastructures In British Columbia after The 2022 Flooding

ID	Risk Description	Likelihood	Impact	Risk Level	Mitigation Strategy	Owner	Project Phase	Duration	Timeline (Weeks)
R1	Extreme weather events delaying construction	Medium	High	High	Build flexible timeline, reinforce work zones, monitor weather forecasts daily	Project Manager	Project Initiation & Approval	2 weeks	Week 1-2
					Conduct detailed geotechnical surveys; reinforce foundations; use flood-resistant materials		Geotechnical & Structural Assessments	4 weeks	Week 3-6
					Pre-order critical materials, use multiple suppliers, create contingency stock		Design of New Bridge & Highway Structures	5 weeks	Week 7-11
R2	Structural instability in flooded or landslide-prone areas	High	High	Very High	Early collaboration with environmental agencies; conduct Environmental Impact Assessment (EIA)	Engineering Team	Environmental Impact Assessment	3 weeks	Week 7-9 (parallel)
					Build 15-20% contingency fund; monitor expenditure weekly		Reconstruction of Bridges	10 weeks	Week 12-21
					Enforce strict safety protocols, PPE, training, and on-site supervision		Highway Reconstruction & Soil Stabilisation	8 weeks	Week 18-25
R3	Supply chain disruptions for construction materials	Medium	High	High	Maintain open communication channels, provide public updates, schedule work to minimise disruption	Procurement Manager	Installation of Drainage & Flood Protection Systems	6 weeks	Week 20-25
							Testing, Safety Inspection & Final Approval	3 weeks	Week 26-28
							Project Closure & Stakeholder Review	2 weeks	Week 29-30
R4	Environmental impact concerns raised by regulators	Low	Medium	Medium		Environmental Consultant			
R5	Budget overruns due to unexpected repairs	Medium	High	High		Finance Team			
R6	Safety risks for workers in hazardous terrain	Medium	High	High		Health & Safety Officer			
R7	Community dissatisfaction due to noise or delays	Low	Medium	Medium		Communications Officer			



Before

After



Conclusion

In addition to responding to the immediate damage from the 2022 atmospheric river event in British Columbia, restoring the primary highway network in BC will be a long-term commitment to the resilience of BC's transportation infrastructure and its long-term reliability and security. The replacement of the bridges damaged or destroyed during the storm, the stabilization of areas prone to landslides and the installation of state-of-the-art protection against flooding, will protect both the economy and the provision of essential services by ensuring the continued connection of BC to the rest of Canada. Through the application of organized project management techniques (risk assessment, coordinating stakeholders, and phased schedules) it is anticipated that the rebuilt transportation corridor will provide a resilient, adaptable corridor for the future; one which can withstand an increasingly unpredictable number of extreme weather events. This rebuilding process is intended to increase British Columbia's ability to respond to natural disaster situations and enhance the well-being of residents, businesses, and all supply chain participants within the country.

References

(Adjust format to use either Harvard, APA or MLA—Here is an example of an Academic Reference Style.)
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