

: ONTARIO FIRST NATIONS : TECHNICAL SERVICES : CORPORATION

Stages in completing a project



The Ontario First Nations Technical Services Corporation is here to help First Nations with technical advice for their engineering projects. This document will help you understand the stages in completing a project, along with how OFNTSC can assist your community.

Generally, the design life for major pieces of infrastructure, like water treatment plants, is around 20 years. Some components such as instrumentation have a design life closer to 10 years.

In your career – as a public works manager, band manager, operator, or Councillor – you may only go through a major upgrade once or twice. The process can seem confusing. OFNTSC Engineering staff work on a number of projects daily, and are happy to be a resource and help guide First Nations through the process.

The process of completing a project involves the following stages:

- 1. Identifying a Problem (or, potential problem?)
- 2. Securing Funding for a Feasibility Study
- 3. Completing a Feasibility Study
- 4. Securing Funding for the Detailed Design
- 5. Completing the Detailed Design
- 6. Securing Funding for Construction
- 7. Tendering and Selection of a Contractor
- 8. Construction Phase
- 9. Commissioning and Start Up Phase
- 10. Warranty Period



IDENTIFYING A PROBLEM

The process below is generally kickstarted when a problem, or potential problem, is identified. This is often raised by your operator, who works with the plant on a daily basis.

Sometimes the issue is easily identified and resolved – a process component has failed and needs replacement, for example. If this is the case, often you can skip ahead past the Feasibility Study to start securing funding to fix the issue.

Sometimes the problem is a concern or question which is raised – does my plant make enough water to support the next 20-year growth of my community? Is my reservoir big enough? Is my water treated to a high enough standard? Is my water quality good enough based on the latest EHO sampling?

Once a potential issue or concern is raised, you can reach out to OFNTSC's team, who will be happy to discuss your concerns further. Generally, the next step which is required by ISC is to hire a consultant to complete a Feasibility Study.



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SECURING FUNDING FOR A FEASIBILITY STUDY

As an initial step in many larger projects such as Water Treatment Plant (WTP) upgrades, roads upgrades, electrical power supply upgrades, school construction, etc., a Feasibility Study must be completed as part of the planning phase.

The purpose of the Feasibility Study is to explores all viable alternatives and recommend the most feasible options in terms of advantages, disadvantages and Capital Costs as well as Life Cycle Costs. A Feasibility Study for a Water Treatment Plant upgrades analyzes all potential treatment technologies and recommends the most feasible treatment alternative. For a road upgrades project, a Feasibility Study may include a detailed assessment of the roads, assessment of the pavement conditions, alignments, visibility, and recommendation of a surface treatment technology.

In order to secure funding for a Feasibility Study, a Minor Capital Application (MCA) along with a BCR must be submitted to Indigenous Services Canada (ISC) for approval. Upon approval of funding, a Terms of Reference (TOR) document outlining the scope of the Feasibility Study is prepared by the "Project Team" and issued to Design Consultants. The TOR may be issued publicly or via invitation. Design Consultants proposals are competitively evaluated by the "Project Team", and a Design Consultant is selected to complete the Feasibility Study.

For smaller projects, such as interim repairs to a WTP, a Feasibility Study may not be required, and the project may proceed directly to the Design Phase. A BCR will be required to support the application.

A Feasibility Study for a Water Treatment Plant Includes:

- Summary of the existing system and issues
- Analysis of population and housing growth projections for the next 20 years
- Consideration for additional distribution piping to support growth (typically the distribution pipping is for the next 8 years of housing growth)
- Calculation of current and future average day flows as well as maximum day, and peak day flows to account for high demand flows
- Analysis of source water options including sampling (groundwater versus surface water)
- Identification of fire flow requirements and reservoir sizing.
- Comparison of different Treatment Technologies in terms of life cycle cost, advantages and disadvantages and recommends the most feasible alternative.
- Comparison against ISC's Levels of Service Standards (LOSS) (i.e. 30 m lot frontage).
- Draft PAR document
- Cost estimate to be used in funding requests

COMPLETING A FEASIBILITY STUDY

As part of the Feasibility Study, the Design Consultant analyzes over a common time horizon (typically 20 years) the technical viability of the project, projected capital costs, and operation and maintenance costs.

For each type of project, whether it is a WTP upgrades, road upgrades, school construction, or power supply upgrades, ISC has a Levels of Service Standards (LOSS)1 that must be met in order for ISC to support the project. Since the life cycle cost and LOSS can vary for each aspect of the project, i.e. the type of treatment technology (centralized vs. decentralized WTP), procurement and project delivery methods, a detailed assessments and justifications of a variety of options must be considered at the Feasibility Study.

The Feasibility Study analyzes all design aspects over the project life cycle. A WTP upgrades Feasibility Study estimates the 20-year period projected population and flows. The flow requirements are calculated based on average day flows and maximum day flows (As per ISC regulations, max day flow is 2.5 times the average day flow). The actual flows may be used based off the operator's data or flows may be estimated based on industry regulation (i.e. using an average consumption per capita).

The Study also considers the projected housing growth of the Community, and outlines the required distribution system upgrades (typically for the next 8 years of growth). The study will look at various source water options – groundwater versus river / lake water – and usually complete sampling, to confirm which would be the best long-term source water option. Required Fire flows and reservoir sizing are also part of the Feasibility Study.

Different Treatment Technologies alternatives are analyzed as part of the Study and the most feasible alternative is recommended based on advantages, disadvantages, Life Cycle Costs, and compliance with ISC's LOSS.

A Feasibility Study can easily take 10 – 12 months + and the end report is several hundred pages long.



SECURING FUNDING FOR DETAILED DESIGN

Once the Feasibility Study is completed, a Project Approval Request (PAR) which summarizes the findings of the Feasibility Study is submitted to ISC in order to secure the Design and Construction Phase funding.

For projects that are high risk and/or over \$15 million in Total Estimated Cost (TEC), and/or above standard cost thresholds, project approval rests with ISC's Headquarter. For projects with TEC between \$5 million and \$15 million, approval authority rests with the ISC's Regional Director General (RDG) if the project is not deemed high risk and cost threshold limits are not exceeded.

The costs threshold limits include the cost per capita and the cost per connection, and are based on a community's location (i.e. Zone). For example, the Zone 2 cost per capita and cost per connection threshold limits as set by ISC Headquarters are \$20,285 and \$50,600, respectively.

Generally, the PAR approval is intended to be for both the design and construction stages of the project, though sometimes ISC only requests approval for the design stage.

A Band Council Resolution (BCR) will be required to support the application, and the PAR will also need to be signed by leadership.

ISC requires a Minor Capital Application (MCA) for projects under \$1.5 million, and a Project Approval Request (PAR) for projects over \$1.5 million.

Currently projects with a cost over \$15 million or that is outside ISC's LOSS requires the project be approved by ISC's Headquarters, which is a longer process than ISC Ontario Region's approval.



SECURING FUNDING FOR DETAILED DESIGN, CONT'D

Upon approval of the PAR for the Design Phase, a TOR is prepared by the "Project Team" and issued to the Design Consultants via public tender or invitation to complete the Design and Contract Administration of the project. The "Project Team" evaluates the submitted proposals and selects a Design Consultant to complete the Design and Contract Administration of the Project. For some projects (typically, larger projects), a Professional Project Manager (PPM) is competitively retained prior to selecting a Design Consultant. The PPM assists with developing the Design Consultant TOR and in selecting a Design Consultant, as well as overseeing the Design and Construction phases.

Competitive procurement is required per ISC's policies; while the Feasibility Study consultant can bid on the design works, and may be well positioned for the works given their knowledge of the project and team, they are not automatically awarded the design contract.



As detailed design progresses, it becomes much costlier and harder to make changes. Therefore, the First Nation should participate in all reviews from the beginning, and let the Consultant know immediately if you have concerns or preferences.

The Consultant works for YOU the First Nation, and no one else. They should be working to make you happy, so let them know if you have thoughts on what you would like to see!

For example, it is easy to change the building orientation around the 33% stage, but much harder at the 66% stage.

Keep your operators involved in the process – once the plant is being turned over it is too late to make changes! Does your operator have preferences in the equipment suppliers, # of washrooms, size and location of office and lab, etc!

COMPLETING THE DETAILED DESIGN

At an early stage of the Design, the selected Consultant conducts site investigations of the proposed project. The site investigations typically includes the Geotechnical investigation, collecting surveying data (i.e. elevations), and may include bathymetric surveys or archaeological investigations. The Design Consultants also confirms the recommendations from the Feasibility Study and documents any proposed changes.

The Design includes the Preliminary Design (33% stage) and Detailed Design (66% and 99% stages). Upon submission of the Preliminary Design, the "Project Team" reviews the design and any comments is incorporated in the 66% submission. Similarly, any review comments in the 66% stage is included in the 99%, and the 99% comments are included in the Final design report. The Project Construction cost estimates are updated at each stage of the Design.

The 66% and 99% design submission also include the Construction Specifications and Tender documents. The Specifications are reviewed by the "Project Team" and any comments are incorporated in the Final Design.

The Consultant will complete all permits required. Generally, work on First Nation owned reserve lands does not require much permits. For water plant upgrades, a Letter of Conformance from the Ministry of Environment (MECP) is required to ensure it provides sufficient water treatment. We recommend that the Consultant start discussions with the MECP around the 66% stage of the project. Environmental approvals are also required.

"Project Team" meetings with the Consultant are held regularly throughout the Design Phase. The Consultant will refine the cost estimate as design progresses, so that at the end of the design they should have a very detailed estimate of what the cost will be!

The detailed design can take upwards of 6 – 12 months. Remote First Nations may want to look at pre-purchasing some equipment to bring up on the winter road. Often in the design stage, proprietary treatment equipment is preselected, as the design needs to be built around the equipment.

When equipment is preselected, there will be some costs to the supplier to produce the shop drawings to include in the design, which should be budgeted for in the PAR costs. In some cases, the equipment can be long-lead items and take a number of months to manufacture, and the team may want to look at pre-ordering the equipment in advance to save time later.

Economic development is important! Work with the Consultant to make them aware of equipment you can rent out to the contractor, members looking for work, and First Nation companies, and what those rates are.

This can include equipment like excavators, flag people, skilled or unskilled labour, and also work like cleaners, cooks, or hotels and B&Bs.

SECURING FUNDING FOR CONSTRUCTION

Upon Completion of the Design, if approval for the Construction Phase has not been secured or if the construction cost estimate is higher, the PAR will be updated and re-submitted to ISC for review and approval.

A band council resolution (BCR) will be required. Approval from Indigenous Services Canada can take many months if the project needs to go to headquarters.



TENDERING AND PRE-QUALIFICATION

Once ISC approves the Construction PAR, the tendering process may commence.

As per ISC's updated tendering policy, projects with estimated construction costs over \$1 million must be tendered publically (such as by Merx).Construction costs between \$200,000 to \$1 million may be by invited tender, and under \$200,000 may be sole sourced.

On complex projects that has to have an open tender, prequalification of the contractors may be done. The prequalification invites Contractors to submit their qualifications, and only those that meet the minimum threshold are invited to then bid on the project. The prequalification is done to ensure only Contractors with the right experience are able to bid on the job.

KEY TERMINOLOGY

RFIs

This stands for "Request for Information." Contractors will ask the consultant for clarification on their design.

02

Shop Drawings

Before the contractor purchases any equipment, they will forward the supplier's drawings to the consultant for their review to ensure it meets their design

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Change Orders

Any work which is extra to what is included in the contract usually has a cost. The Contractor will submit their proposed costs. If it's agreed to, it's documented in a change order. Change Orders can include cost changes, but also schedule changes by increasing the number of days the contractor has to finish the project.

D4 Schedule This should be submitted regularly by the contractor!

Site Instruction

Issued by the Consultant to the Contractor to provide clear direction

CONSTRUCTION PHASE

During the Construction phase, the design is put into action. The Construction is overseen by the Design Consultant to ensure all works is completed according to the design drawings. Regular site meetings are held with the Contractor to monitor the work progress and to ensure the Construction is on schedule. Progress reports are submitted to the "Project Team" regularly by the Design Consultant outlining the completed works.

The Design Consultant also completes the Contract Administration, including ensuring that all records are accurate and up to date, issuance of payment certificates, review of change orders, and responding to the Contractor's Request for Information.

The construction phase can include:

- Mobilization
- Demolition
- Excavation
- Foundation Work
- Backfill
- Structural, Mechanical, and Electrical work
- Site Rough Grading
- Building Erection
- Building Exterior Finishes
- Building Interior Finishes
- Distribution Piping & Connections (For a WTP Construction)
- Site Landscaping

Timing is important! Ideally construction of a new building or expansion should start in spring, so it can be in place by winter. Winter work is better if it's within a heated building. If excavation and concrete pours need to be done in winter, the work must be properly "heated and hoarded" (ie tarped with heaters and constantly monitored), as concrete poured in cold temperatures can be poor quality and prone to failure.

In general, you should be communicating directly with the Design Consultant's site inspector, who will then communicate with the Contractor. Any changes to the project can have cost implications, so if you start telling the contractor you want something done differently, it can make the process messy and have cost or schedule implications – keep things neat and go through the right channels. You should also have an opportunity to bring up any concerns during monthly meetings.

For insurance reasons, the contractor is the "owner" of the site and responsible for the safety of the project. If you need access, such as to operate the existing plant, you will need to coordinate this with the Contactor and ensure you are following their safety protocols. The timing of a construction project depends on the scope of the project, and can often range from 6 months (for a smaller job) to two years (for a new water plant).

COMMISSIONING AND PROJECT START UP

During the Commissioning phase, the Contractor ensures that all equipment is installed and operational prior to commencement of the start-up phase. The Contractor arranges for all applicable mechanical and electrical subcontractors, including authorized equipment representatives and the system programmer to be on site. The equipment representatives demonstrate to First Nation's representative and operator(s) proper operation of their respective equipment.

During commissioning, the contractor will bring in various suppliers to train the operators on the equipment. This should be coordinated well with the First Nation. It's a good idea to video these sessions, for when you have new operators starting. You can talk to the Consultant at the design stage about having some key suppliers come back for more training at the 6 month or 1 year mark, after the operators have some time to work on the equipment.

The Commissioning Phase includes:

- Verification/check-out of all equipment, systems and sub-systems to ensure they meet the design requirements.
- Completion of the 14-day continuous performance and reliability run period.
- Completion of Operator(s) training
- Submission of all deliverables, start-ups and commissioning reports, performance tests, equipment manuals, operation and maintenance manual and report on commissioning and operation of the facility.

At the end of the commissioning period is when the project is formally turned over to the First Nation's responsibility to then run! So ensure your operators stay engaged in the project and are properly trained, so they feel confident in being able to operate the new system.



AS BUILT/RECORD DRAWINGS

No design is perfect, and through construction there will be some changes to what was originally designed. Hopefully, these will be small and manageable. Any changes needs to be properly documented, and both the contractor and consultant should be marking with red pen their set of IFC (Issued for Construction) drawings with any changes as they go.

Once the project is done, the Design Consultant will take all the changes back to their office and complete a final set of drawings – the Record Drawings (or, As-Builts). These are important drawings which should be kept on file – if there is any staff turn-over, or any upgrade work needed in the future, they will show the future Engineers exactly how things were constructed, which will save a lot of time, effort, risk and money when doing future works.

The Contractor should also be providing Operation and Maintenance Manuals, which are large binders with all the supplier information on how to maintain their equipment included. This will be an important reference document that the operators can refer to.

WARRANTY PERIOD

The warranty period begins once construction is substantially completed, and is generally for one year.

Anytime during the one year, if there are issues with the construction (that are not due to not operating the system incorrectly), the contractor MUST come back to fix it at no cost. If you see any issues during this time, let the Design Consultant know RIGHT AWAY so they can coordinate getting it fixed.

Near the end of the one-year warranty period, the Design Consultant arranges a warranty inspection of all major components. As the First Nation, you should make sure you attend this meeting with your operators, as it is your last chance to point out any equipment which isn't operating correctly or issues you have, to have it fixed at no cost as part of the contract.

Following the inspection, the Design Consultant provides a report to the First Nation detailing the findings, and coordinates the timely completion of any corrective work required with the contractor and oversee the completion of the required work identified during the Warranty Inspection.

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We hope you found this overview of the stages of project completion helpful. Thank you to OFNTSC's Engineering team for pulling this information together:

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We are here to help your First Nation with its technical advisory service needs! Feel free to reach out to us at any time.

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