Background and Purpose

This short guidance document and the example risk register templates have been prepared to assist Environmental staff in the identification of environmental risks for project risk registers. Identifying appropriate risks in project risk registers will assist Project Development Teams (PDT) with risk management and the preparation of risk management plans.

Risk and Risk Management

Project risk is known uncertainty and/or an uncertain event or condition that, if it occurs, would have a positive or negative effect on at least one project objective. Risk management is the process of planning for, identifying, analyzing, responding to, monitoring, and managing project risk, as well as advising project decision-makers, or those who have been empowered to provide direction or take action where risk is involved. It is intended to result in the effective management of project risks *during the entire project life cycle*, from project inception through the completion of construction and long-term mitigation and monitoring requirements. It is important that environmental risks are adequately recorded for later phases of the project when Environmental staff may not be as actively involved in the project. For example, if any risks are identified for the construction phase, staff should include the appropriate response action in the Environmental Commitments Record (ECR) and/or contract package to make sure it is communicated to Construction staff including the Resident Engineer, biological and/or cultural resource monitors, and the Environmental Construction Liaison (ECL).

Risk management has three important parts: identification, analysis, and action. The project risk management process offers a structured way to think about risk and how to deal with it. Caltrans documents the risk management process in a project risk register. The Project Manager, project sponsor, and the PDT members, including Environmental generalists and specialists, jointly develop a risk register that enables them to identify, assess, quantify, respond to, monitor, and manage project risks.

Which Projects Require a Risk Register?

The simple answer is that all projects on the State Highway System are encouraged to use a risk register in order to memorialize and communicate known and unknown variables that could influence project risk. All projects over $1 million are *required* to utilize a risk register. The current Risk Management Handbook (Handbook) takes a "scalable" approach to risk management. The Handbook identifies three main levels or scales of projects that require a risk register to be developed, based on project cost as a *minimum requirement*. Scalability Level 1 is for projects with an estimated cost of less than $5 million. These projects would be analyzed using a risk rating qualitative approach. Scalability Level 2 is for projects with an estimated cost of $5 million to $100 million and risk would be analyzed using a probability/impact matrix qualitative approach. Scalability Level 3 is for projects with an estimated cost of more than $100 million and risk would be analyzed quantitatively. Other factors, such as those listed below, may warrant a higher or lower scalability level than the project cost alone would indicate:

- Political sensitivity
- The type of project
- Location of the project and the community it services
- Duration of the project

- Project stakeholders
- The project sponsor's sensitivity to changes in the project's schedule and/or cost
- Level of scoping and/or preliminary planning undertaken in the planning stage

Scaling the analysis *down* (for example, preparing a Level 2 [or qualitative analysis] for a project costing over $100 million [normally a Level 3 project]) requires the approval of the District Single Focus Point. For further information, see the Handbook or the July 1, 2015 Rick Land Project Delivery Directive Memo (PD-09).

Special Note on SHOPP Projects: Following the passage of Senate Bill 1, the *Road Repair and Accountability Act of 2017*, there have been changes to the project initiation and programming processes for State Highway Operation and Protection Program (SHOPP) projects. On January 29, 2018, a guidance memo was issued directing that effective January 29, 2018, Caltrans would use the Project Initiation Report (PIR) format for all SHOPP projects requiring a project initiation document (PID) for programming purposes. Additionally, the California Transportation Commission (CTC) adopted Interim SHOPP Guidelines on June 28, 2017 (amended October 18, 2017). The new Interim SHOPP Guidelines note that every Project Study Report or equivalent (such as the PIR) needs to account for known risks that might impact the project budget, scope, schedule, and achievement of performance goals/targets from initiation through construction completion.

In order to develop a shelf of work (or "contingency projects") that can be released as appropriate, these Guidelines include provisions for the "sequential" programming of SHOPP projects. This means that only the Project Approval and Environmental Document (PA&ED) phase will be programmed with a detailed cost estimate. An "order of magnitude" cost estimate will be prepared for later phases of the project. The estimates for subsequent phases of the project will be refined as those phases are allocated. Since justification for refinement may be dependent on documentation of assumptions in the risk register, this means that a detailed risk register must be prepared and maintained throughout each project phase for SHOPP projects in order to identify any and all risks that will be carried forward with the project.

Identifying Risk

Risk is a two-sided concept and can be identified as a "Threat" (negative risk that we wish to avoid, transfer, or mitigate) or an "Opportunity" (positive risk that we wish to exploit, share, or enhance). Identifying threats and opportunities for a project can begin as early as the initial planning phases but the PID phase is when the risk register for the project is first developed. It is important to focus on those risks, both threats and opportunities, which may affect the project's scope, schedule, and cost. Consideration of the project's scope, schedule, and cost will determine which risks should be included in the risk register, will allow for a ranking of risks by importance (qualitative risk analysis), and will allow for an assessment of how the risks might impact the project's cost and schedule (quantitative risk analysis).

How are environmental risks identified? At the PID stage, environmental risks are first identified in the Preliminary Environmental Assessment Report (PEAR) or "Mini-PEAR" prepared for the project and transferred to its risk register. The PEAR or Mini-PEAR will discuss assumptions and list any environmental risks that were identified during project scoping based on the project description provided at that time. There are a number of tools that the Environmental Planner can utilize to identify project risks. These include the GIS mapping functions of the PEAR Tool, the CEQA checklist, and the PEAR Environmental Studies Checklist. Environmental Planners (usually the "generalists"), who are primarily responsible for ensuring environmental risks are

reflected in project risk registers, should regularly consult with their technical specialists to identify subject-specific risks.

A frequent risk that should be documented when relevant is the lack of PID resources to adequately scope a project. The new PIR format for SHOPP projects, in particular, is intended to provide the minimum amount of information needed to program a project. *This is not, however, equivalent to the minimum amount of information needed to adequately scope a project.* The higher the potential risk related to a project, the more consideration should be given to conducting detailed scoping for the PEAR, since accurate estimates for PA&ED will be critical for these projects. In such cases, it may be necessary to request additional resources for scoping. In other cases, it may be necessary to start with a broad and general list of risks at the PID phase, and then become more specific as the project progresses.

Risks related to scope, schedule, and cost can also be identified by looking at the assumptions used for the PEAR or Mini-PEAR. These assumptions typically should be re-stated as risks and included on the project's risk register. For example, if one assumption documented in the PEAR is that all work will take place within the existing right-of-way, then the risk register should include any risks associated with work taking place *outside* of the existing right-of-way (for example, delays in obtaining permits to enter the properties for needed environmental surveys). At "Begin Environmental," Environmental staff (both generalists and specialists) should check the project's scope, cost, and schedule, which are based on the project description and limited amount of scoping done at the time of the PID. Staff should check to see if the project description and scope of the project stayed the same, if the schedule of environmental studies is what was requested at PID by Environmental staff, and if appropriate resources identified in the PID were actually programmed. In accepting an Environmental Study Request (ESR) for an assigned project, Environmental Branch Chiefs should cross-reference the information provided at this point with what was assumed and requested at the PID stage, document any changes, discuss with the Project Manager and the PDT, and then update the project's risk register accordingly.

Risks to the environmental process can be internal or external. Examples of internal risks include:

- As noted above, inadequate resources provided for environmental scoping and any other subsequent project development phases.
- A delay in receiving a complete ESR without a corresponding change to the project schedule, shortening the overall time to complete environmental studies.
- A delay in receiving design information necessary for permit applications without a corresponding change to the project schedule, shortening the overall time to complete the environmental permit applications.
- Project scope changes *after* the project schedule and workload estimates have been developed (typically during the PID and/or PA&ED phases), *without* any corresponding changes to the project schedule and/or workload estimates. For example, if the project scope at PID led to the expectation that the project would not result in significant impacts, then the estimated schedule and workload estimates would have been based on that assumption. If the scope changes after the schedule and costs have been developed, and the project will result in significant impacts, then additional resources (time and cost) will be required.

- A change in funding after environmental studies are completed (i.e., federal funding is added to a state-only project) requiring additional studies.
- Changes in project scope requiring a late amendment to the MTP/RTP.
- The need for a federal permit for a state-only project. When a project is processed as a state-only project with no FHWA funding or approval, the PDT needs to be informed of potential delays that would occur if a federal permit or approval is later required and Caltrans cannot serve as the NEPA lead agency.
- Environmental resources discovered during the zero phase, but not in the K phase.

External risks can include:

- The discovered presence of previously unknown sensitive environmental resources.
- A change in the designation or applicability of special-status land use such as a Coastal Zone, Williamson Act lands, or a designated California Scenic Highway.
- Property owners refusing permission to enter and delaying environmental studies.
- Delays in obtaining permits or other regulatory agency approvals.
- Public opposition to the project or legal challenges to the environmental document.
- Permit/regulatory conditions with construction work windows requiring an additional construction season and/or mitigation which would require additional funding.
- Inability to secure or delay in securing required project mitigation.
- New or changed environmental laws, regulations, or Executive Orders.
- Hazardous waste remediation.
- Opportunity: streamlining permitting/approval process through use of existing Programmatic Agreements with regulatory agencies, or preparing joint permit applications (e.g., local and state Coastal permits).
- Opportunity: utilizing funding through a local entity or grant to implement environmentally beneficial project features.

Once an environmental risk has been identified, Environmental staff should use the risk statement format found in the Handbook to communicate the risk in the register. For example:

> "As a result of <*definite cause*>, <*uncertain event*> may occur, which would lead to <*effect on objective(s)*>."

Then, as shown in the examples, staff should populate the columns for Risk Type, Category, and Title in the risk register. Each risk is represented as a distinct line-item in the risk register.

Analyzing Risk

Risk is analyzed to prioritize risk response efforts. Risk is analyzed differently depending on the scalability level of the project. Levels 1 and 2 are analyzed qualitatively. Level 1 project risks are assigned a rating. Level 2 project risk is analyzed by assessing the probability of occurrence and the corresponding impact on the project. Level 3 projects are measured quantitatively, which is a numerical estimation of the likelihood that a risk will occur and the probability of a project meeting its cost and time objectives as a result. The risk rating is determined by using the Impact Definitions table (Table 5 on page 20 of the Risk Management Handbook) as a

guide. If risk definitions other than the standard will be used for a specific project, those definitions should be agreed upon by the PDT and provided by the Project Manager. To determine a risk's rating, the Cost Score and Time Score are calculated by multiplying the corresponding Probability Rating number (1-5) and Cost/Time Impact Rating number (1-16) for each risk, as shown in the Risk Matrix tab of the risk registry template, which can be found here: https://projmgmt.onramp.dot.ca.gov/statewide-project-management-improvement-spmi/risk-management. Once the risk ratings have been entered into the register, the Cost Score and Time Score will self-populate. For all scalability levels, the PDT should briefly explain the rationale for why the risk rating was chosen. The Project Manager and Environmental Branch Chief should concur with the risk level assigned by the PDT, and risks with a potentially high impact to cost or schedule should be communicated to management. All Level 3 project risks should be communicated to management.

a. Level 1 Projects: Under the Risk Rating category, the risks can fall into three main sub-categories:
   - Low = does not require a response but is put on a watch list.
   - Moderate/Medium = list of risks requiring response as time and resources allow.
   - High = list of risks requiring response in the near term.

b. Level 2 Projects: Under the Risk Rating category, the Probability, Cost Impact, and Time Impact of each risk can fall into five sub-categories:
   - Very Low, Low, Moderate/Medium, High, and Very High

c. Level 3 Projects: Risk Rating for Level 3 projects typically involves complex and potentially high-impact risks that must be quantified and are usually handled on a case-by-case basis. A qualified Risk Management Coordinator or specialist will estimate risk using *@Risk*, *Crystal Ball*, or *Primavera Risk Analysis* simulation software.

Responding to Risk

Risk response is the process of developing strategic options and determining actions, to both enhance opportunities and reduce threats.

Risk response strategies *for threats* can include:

- *Avoiding* risk by removing the cause of the risk or executing the project in a different way while still aiming to achieve project objectives. Not all risks can be avoided or eliminated and for others this approach may be too expensive or time-consuming or may not be a viable approach to addressing the project's purpose and need. However, this should be the first strategy evaluated. An example would be eliminating a project component (such as a culvert) that would require a regulatory permit, if that component was not an integral part of the project's purpose and need and the project would otherwise not need the permit. However, if installation of the culvert could permanently address re-occurring drainage issues at the location, thereby mitigating the potential for future damage to the facility, then avoidance may not be the correct risk response and Environmental staff could utilize one of the opportunity risk responses below.
- *Transferring* risk to another party willing to take responsibility for its management and cost liability should the risk occur. The goal is to ensure that the risk is owned and managed by the party best able to deal with it effectively. Risk transfer usually involves negotiation or payment of a premium, typically

to an external partner, and the cost-effectiveness of this approach must be considered when deciding whether to adopt a transfer strategy. An example of this would be transferring the risk of mitigation implementation (and possibly failing to meet the success criteria for the mitigation) by purchasing mitigation credits from a bank rather than having Caltrans implement and maintain the mitigation (permittee-responsible mitigation).

- *Mitigating* the risk by reducing the probability and/or the impact of the risk to an acceptable threshold. Taking early action to reduce the probability and/or impact of the risk is often more effective than trying to repair the damage after the risk has occurred. Risk mitigation may require resources or time and thus presents a tradeoff between doing nothing versus the cost of mitigating the risk. Examples could include increasing the level of preliminary design detail provided to Environmental staff or providing Environmental staff more resources for detailed field surveys to lessen the probability of finding unexpected environmental resources at a later date when the potential negative impact to the project cost and schedule would be greater.

Risk response strategies for *opportunities* can include:

- *Exploiting* risk by ensuring that the opportunity is realized. This strategy seeks to eliminate the uncertainty associated with a particular upside risk by taking the action needed to make the opportunity happen. Exploit is an aggressive response strategy, best reserved for those "golden opportunities" having high probability and positive impacts.
- *Sharing* risk by allocating risk ownership of an opportunity to another party who is best able to maximize its probability of occurrence and increase the potential benefits if it does occur. Transferring threats and sharing opportunities are similar in that a third party is used. Those to whom threats are transferred take on the liability and those to whom opportunities are allocated should be allowed to share in the potential benefits.
- *Enhancing* risk by modifying the "size" of the positive risk. The opportunity is enhanced by increasing its probability and/or impact, thereby maximizing benefits realized for the project. If the probability can be increased to 100%, this is effectively an exploit response.

An *acceptance* strategy can be used to address both *threats* and *opportunities*:

- *Accepting* the risk by agreeing to address the risk if and when it occurs. When accepting a potentially high impact risk, the responsible parties should develop a contingency or workaround plan and communication plan to manage the risk if it should occur. A contingency reserve for the project's budget and/or contingency time for the project's schedule should be developed for response to the risk in that eventuality. This strategy is adopted when it is not possible to or practical to respond to the risk by other strategies. An example of this would be accepting the risk that a permitting agency may delay the issuance of their permit for a critical component of the project that cannot be effectively eliminated without affecting its ability to meet purpose and need. It may not be possible to respond to this risk through other strategies because the issuance of the permit is both required for the project's success and is out of Caltrans' immediate control.

Here are some additional examples of responding to environmental risks:

- Remove trees and shrubs outside the nesting season (Avoid).
- Front-loading efforts on those studies and activities that are linked to the greatest risks (Mitigate).

- Regularly attending PDT meetings; if key functions are not present then communicate to the Project Manager and the applicable functional unit(s) the critical information needed and/or discovered (Mitigate).
- Provide bat eviction/exclusion and alternative roosting habitat prior to construction (Accept).
- Coordinating early and often with resource and regulatory agencies, including discussing potential impacts and mitigation and future species listings or other regulatory changes (Accept).
- Keeping project files up-to-date and documenting key internal and external communication—especially important when staff members change (Mitigate).
- Communicating any "surprises" or "late discoveries/hits" as soon as they are known (Mitigate).

As previously mentioned, if any risks are identified for the construction phase, also include the appropriate response action in the ECR and/or contract package to make sure it is communicated to Construction staff as well as the ECL.

Monitoring and Updating the Risk Register

Remember, the risk register is a living document. Regardless of which level of risk register your PTD develops, the risks will need to be monitored and controlled *throughout the entire project life cycle*. This involves team members tracking the identified risks, identifying new risks, asking if project assumptions are still valid, evaluating risk responses, and determining if contingency reserves of project cost and schedule are adequate. A best practice is for the PDT to review the risk register at the end of each team meeting to identify any updates needed. Particular attention should also be paid to identified risks at the beginning of each project phase. If any changes or additions are made to the risk register, enter the revision date into the Updated column.